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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

OFFICE OF SECRETARY  
RULEMAKING AND  
ADJUDICATIONS STAFF

Before Administrative Judges:  
Peter B. Bloch, Presiding Officer  
Thomas D. Murphy, Special Assistant

SERVED MAR 18 1999

In the matter of

HYDRO RESOURCES, INC.  
(2929 Coors Boulevard  
Suite 101  
Albuquerque, New Mexico 87120)

Docket No. 40-8968-ML

Re: Leach Mining  
and Milling License

ASLBP No. 95-706-01-ML

MEMORANDUM AND ORDER  
(Questions Concerning Radioactive Air Emissions)

MEMORANDUM

This Memorandum covers Radioactive Air Emission issues raised by the Eastern Navajo Dine Against Uranium Mining (ENDAUM), and the Southwest Research and Information Center (SRIC).<sup>1</sup> ENDAUM and SRIC (collectively Intervenors) request me to reject the license application of HRI on the grounds of these two principal alleged air emission deficiencies:

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<sup>1</sup>ENDAUM and SRIC filed their Brief (Intervenors Brief), accompanied by Testimony of Bernd Franke (Franke Testimony), on January 11, 1999. Hydro Resources, Inc. response on February 11, 1999 (HRI Response) included an Affidavit of Alan C. Eggleston, Ph.D. dated February 10, 1999 (Eggleston Affidavit). The Staff of the Nuclear Regulatory Commission responded on February 18, 1999 (Staff Response) and attached an Affidavit of Christopher A. McKenney (Staff Exhibit 1).

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First, HRI and the NRC Staff fail to provide reasonable assurance that radioactive emissions from the Crownpoint Project will be maintained within regulatory limits in 10 C.F.R. Part 20. In fact, existing non-background levels of radiation at the Church Rock [sic] already exceed regulatory limits, thus precluding the addition of a new source that would further jeopardize public health and safety. Second, the Final Environmental Impact Statement purported to support the issuance of the license misrepresents, distorts, or fails to disclose key information about the significant impacts of airborne emissions from the Crownpoint site.

In order to resolve this issue properly, the Presiding Officer has determined, for reasons set forth below, that additional information is required, as specified in the accompanying ORDER.

#### DISCUSSION

Radiation will be produced from ISL mining because radon is dissolved in pregnant lixiviant, which comes from the ground under pressure. When the lixiviant is no longer under pressure, the radon comes out of solution and is released to the atmosphere.

In support of its first allegation, Intervenors argue that to the extent radon-222 is a decay product of radium-226, a constituent of uranium ore, it can not be considered to constitute background radiation and can not be excluded from evaluating HRI's compliance with Part 20. Intervenors brief at 3-6. Intervenors claim that the Staff and HRI ignore the statement of purpose of Part 20 which clearly provides that the regulations are designed to protect members of the public from all sources of radiation other than background, including unlicensed sources. Intervenors brief at 7; see also 10 C.F.R. § 20.1001(b).

Intervenors also assert that HRI and the Staff in their Environmental Report and FEIS, improperly exclude from their dose calculations contributions from sources of radon and gamma radiation at the Church rock site by mischaracterizing them as "natural background radiation". Intervenors brief at 8. Intervenors cite Section 3.7 of the DEIS as evidence for elevated radiation

levels at the Church Rock site. Intervenors theorize that based on combined elevated radon emissions and elevated gamma radiation readings at off site locations resulting from prior mining activities, the dose to the nearest resident is already in excess of the limits set in Part 20. Intervenors brief at 9-14. Finally, Intervenors [vaguely] challenge HRI's dose projections by citing their expert's contention that a time-weighted groundwater source term should have been used as the basis for the calculations instead of the arithmetically averaged groundwater source term used by the Staff and HRI in their use of the MILDOS code to calculate off site doses.

Intervenors expert, Franke, calculates that a large part of the annual dose from radon-222 in a given year occurs from exposures over very few hours at situations where wind speed and atmospheric dispersion is low. Franke calculates in a "worst case" situation that there is a 50% chance that the regulatory limits will be exceeded. Intervenors brief at 14-19. Franke Testimony Exhibit 2 at 10-12.

HRI responds that Intervenors misinterpret Part 20. HRI argues that:

demonstrating both common sense and a grasp of the obvious, the agency charged with promulgating regulations to control airborne radiological emissions from Atomic Energy Act regulated facilities has developed a regulation requiring licensee's operations to meet prescribed emissions limits calculated based solely on radiation sources within the licensee's control. HRI Response at 7.

The NRC Staff agrees with HRI that the Intervenors have misread Part 20 and disagrees with the findings in Franke's testimony. The Staff argues that 10 C.F.R. § 20.1302(b)(1) actually refers to "the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation." Staff then avers that the dose should be calculated or measured by identifying a real individual, not a hypothetical individual. The Staff's expert, McKenney, then uses conservative assumptions -- other than the assumption that all radiation now on the site is

background radiation -- and finds that HRI could not release sufficient radon to exceed the regulatory requirements during plant operations. McKenney also postulates an alternate worst case scenario for a hypothetical individual and calculates a dose less than regulatory criteria. Staff Response at 4-5 citing Franke Testimony Exhibit 2 at 10-11 and Staff Exhibit at ¶ 9 and ¶ 10.

However, Mr. McKenney rejects the argument made by Intervenors that a substantial portion of the radiation present on the site is *not* entitled to be counted as background. Mr. McKenney states, on pages 2-3 of his affidavit (attached to the Staff Response):

. . . The Franke Report, at 2, states that "existing radon levels generated by previous uranium mining" must be considered in evaluating whether HRI would be able to comply with 10 C.F.R. Part 20 requirements. I disagree. The statement of consideration (SOC) for Part 20 states that the licensee is not responsible for sources beyond the licensee's control. See 56 Fed. Reg. 23360, at 23374 (May 21, 1991). The basis of this SOC guidance lies in the fact that the pedigree of airborne radon (or other nuclides) cannot be determined. Thus, one cannot distinguish between radon produced by the NRC-licensed activities of one or more licensees, and radon emanating from natural background sources. Similarly, one cannot distinguish radon produced by windblown uranium mill tailings from that released as part of in-situ leach mining or from the natural surrounding environment. The pedigree of the radon is based on what the source is, not where the source is located. Moreover, as a practical matter, if licensees had the responsibility to modify their effluents based on the action of other sources nearby, licensees could violate a license condition or the dose limit in Part 20 without releasing anything.

In support of their second allegation about deficiencies in the FEIS, Intervenors state that:

By ignoring data in its own possession regarding existing gamma radiation levels, by distorting data on existing radon levels, and by misrepresenting existing radon levels as "natural background" radiation, the NRC creates the false impression that airborne radiological emissions from the Crownpoint Project will be far below regulatory limits, and that therefore they will have little or no impact on public health. Thus, the FEIS "impairs fair consideration" of the environmental impacts of the Crownpoint Project by misleading agency decision makers and the public into believing that they are benign.

Intervenors cite Franke's testimony, discussed above, as evidence that the combined existing and prospective radiation levels of the Crownpoint project pose a significant health threat

to the neighboring population. According to the Intervenors, these threats are not acknowledged in the FEIS. Intervenors brief at 22-23.

HRI argues that the FEIS is adequate and that Intervenors misinterpret background radiation and NRC regulations. In addition HRI avers that elevated gamma radiation at the Section 8 Church Rock site was measured before a site cleanup was performed. HRI reiterates that in accordance with License Conditions 9.8 and 10.30, it will monitor the site to establish background levels. HRI claims that remnant radiation from previous mining and milling activities at Church Rock is now due only to natural background. HRI Response at 13-14.

The Staff points out that Mr. Franke's findings may show invalidly high radiation readings because a temporary radon cover was placed on the mill tailings cell there in 1995, which was after the Franke Study was completed.<sup>2</sup> Staff also states, without explaining the significance, that the underground mine site on the adjacent Section 16 (*see* FEIS at 3-20) has never been completely remediated.<sup>3</sup>

The NRC Staff does not address any of the Intervenors allegations concerning the FEIS.

## Analysis

### Discussion of Background Radiation

Our analysis of Intervenors argument begins with 10 C.F.R. § 20.1301 and with the regulatory definition of background radiation found in 10 C.F.R. § 40.4 and 10 C.F.R. § 20.1003.

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<sup>2</sup>McKenney Affidavit at 2-3 (¶ 5).

<sup>3</sup>McKenney Affidavit at 3 (¶ 5).

(The definitions of background radiation, source material and byproduct material are identical in both sections.)

10 C.F.R. § 20.1301 states:

(a) Each licensee shall conduct operations so that--

- (1) The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 millisievert) in a year, *exclusive of the dose contributions from background radiation . . . .*

This definition places a limit on the "total effective dose equivalent." It then defines a class of contributions to dose that are excluded. One type of excluded dose is the dose from background radiation. It appears that the list of excluded doses, which includes other irrelevant sources of dose, is intended to be a complete listing of excluded dose. Hence, I infer that if the source of a dose is not *excluded* then it is included in the total effective dose equivalent from licensed operations, for the purpose of complying with 10 C.F.R. §§ 20.1301 and 20.1302.

Background radiation is excluded from the total effective dose equivalent. Background radiation *includes* radiation from "naturally occurring radioactive material." Thus, at first blush, background radiation appears to *include* uranium ore, which is naturally occurring. However, our analysis may not rest there because of the regulatory definition of background radiation:

"Background radiation" does *not* include radiation from source, byproduct, or special nuclear materials regulated by the Commission.

[Emphasis added.] 10 C.F.R. § 40.4 and 10 C.F.R. § 20.1003. It is therefore necessary to determine whether the material left in or on the ground after prior mining activities contains

*source, byproduct or special nuclear materials regulated by the Commission.* If the material is excluded by this clause, then it is *not* part of background radiation.<sup>4</sup>

First, are there radiation or radon emissions from *source material* on HRI's site? The first clause of the definition of source material states that material is source material if it is "uranium or thorium . . . in any physical or chemical form." The second clause of the definition defines the amount of uranium or thorium whose presence qualifies an "ore" as source material. Under this clause, "ore" is source material if it contains "by weight one twentieth of one percent (.05%) or more of . . . uranium [thorium, or a combination of the two]." The record appears to be barren concerning whether ore of the required enrichment is found at Churchrock.

Second, are there radiation or radon emissions from *byproduct material* found at the HRI site? The relevant language from the definition of *byproduct material* is:

tailings . . . produced by the extraction . . . of uranium or thorium from any ore processed primarily for its source material content . . . .

Under this definition, some of the material left underground or on the surface of the ground on the HRI site must be considered "tailings" because it resulted from the extraction of uranium.

Mr. McKenney testifies, in this regard, on page 3 of his affidavit (attached to the Staff Response), that:

one cannot distinguish between radon produced by the NRC-licensed activities of one or more licensees, and radon emanating from natural background sources. Similarly, one cannot distinguish radon produced by windblown uranium mill tailings from that released as part of in-situ leach mining or from the natural surrounding environment. The pedigree of the radon is based on what the source is, not where the source is located. Moreover, as a practical matter, if licensees had the responsibility to modify their effluents based on

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<sup>4</sup>When the words of the regulation are clear, there is no need to refer to the Statement of Considerations to interpret them.

the action of other sources nearby, licensees could violate a license condition or the dose limit in Part 20 without releasing anything.

I have considered Mr. McKenney's testimony and I do not find that it addresses the specific words that define "background radiation." However difficult it may be to separate out radiation coming from source material or byproduct material from background radiation, it is necessary to do so in order to determine the background radiation level, as defined in the regulations.<sup>5</sup> If it is not empirically feasible to make this separation, then it may be necessary to adopt a conservative assumption concerning the amount of radiation that does not qualify as background.

I would note that tailings and an unremediated underground mine site are different from other sources of radiation that are "out of the control" of HRI. These problems were left by a prior landowner that is part of the chain by which HRI obtained its title. If the prior owners chose to leave tailings or a mine on their land, it is appropriate that the value of the land for future mining be affected. It would be a strange regulatory regime that permitted an owner to sell land with tailings or a mine to another owner, who would be allowed to treat this pre-existing condition as background radiation. There is no reason to believe that the Commission would interpret its regulations to foster that result.

This step-by-step interpretation of NRC regulations has taken us part of the way along the road suggested by Bernd Franke in his study, "Crownpoint Uranium Solution Mining Project: Review of Outdoor Radon Levels and External Gamma Radiation," January 5, 1999, attachment to Intervenors Brief. However, it has not taken us the whole way. Mr. Franke concludes, at page 7:

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<sup>5</sup>There is no reason to suspect that special nuclear materials are present on the site.



Second, the levels reported for Church Rock are consistently high; the magnitude of the concentrations is far in excess of what one would expect from natural background and thus constitutes a strong indicator of non-background activity. The results of all available measurements are summarized in Table 1. While one would expect natural background concentrations to be similar to those measured at Crownpoint (between 0.10 and 0.28 pCi/l), the levels at Church Rock are approximately one order of magnitude (i.e., roughly 10 times) higher than those in the Crownpoint area, and 10 to 20 times higher than the range of reported background radon concentrations nationally. It is highly likely that the elevated levels of radon at Church Rock are due to significant contributions from non-background sources.

Prior uranium mining and milling activities are the most likely cause for the elevated concentrations of radon in the Church Rock area. . . .

However, Mr. Franke's conclusion overlooks another likely cause of elevated radon concentrations. These concentrations could be natural, resulting from a rock formation that contains uranium.

If there are releases from a uranium-laden rock formation, the formation may be sufficiently rich to be "source material" or it may be neither source material nor byproduct material. In that case, radiation from the rock formation *is* part of background radiation.

On the other hand, it could well be that land that is not part of the HRI operation and that has not been disturbed by prior mining may have elevated levels of radiation. If that land is not part of the HRI operation, then radiation coming from that land is not included in 10 C.F.R. § 20.1301 because it has nothing to do with how HRI "shall conduct operations." It is not clear how to draw the geographical limit on the area that contributes to radiation from the HRI project and to separate it from land that is outside the project area. Accordingly, I will ask the parties to assist me in determining how to draw that limit.

Discussion of the Legal Standard Limiting HRI's Operations

HRI has attempted to show compliance with 10 C.F.R. Subpart D--Radiation Dose Limits for Individual Members of the Public by complying with 10 C.F.R. § 20.1302(b)(1). If it complies with that subsection, then it need not also comply with 10 C.F.R. § 20.1302(b)(2) because the two subparts are separated by the disjunction "or." Thus, HRI may comply with *either* of the two subsections and be in compliance with the regulations.

10 C.F.R. § 20.1302(b) states:

A licensee shall show compliance with the annual dose limit in § 20.1301 by--

- (1) Demonstrating by measurement or calculation that the *total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation* does not exceed the annual dose limit.

This is the standard with which HRI has chosen to comply. HRI Response at 14.

ORDER

For all the foregoing reasons and upon consideration of the entire record in this matter, it is this 18<sup>th</sup> day of March, 1999, ORDERED, that:

1. Responses to the following questions should estimate annual radiation doses.
2. Based on empirical evidence and analysis, what portion of the total effective dose equivalent (TEDE) from the Churchrock site should *not* be considered to be background radiation either because it is from source material or from byproduct material?
3. Based on legal argument, empirical evidence and technical analysis, how should we calculate the annual TEDE to the individual member of the public likely to receive the highest dose from the HRI Churchrock operations? Include the TEDE from ISL processes. Also include the TEDE from source material and from byproduct material that is inside the geographic area that is part of the HRI Churchrock operations.

4. For the purpose of responding to Question 3, what is the appropriate location of the individual likely to receive the highest dose from the HRI Churchrock operations? Please supply additional estimates of annual radiation doses at locations specified by other parties.

5. Based on legal argument and technical analysis, how did you determine the geographic area that should be considered part of HRI operations in answer to Question 3?

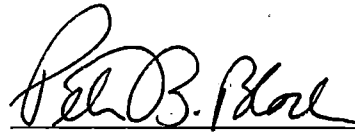
6. Has the FEIS adequately addressed the combined impacts of radiation from the project and from elevated levels of radiation in the area of the project?<sup>6</sup>

7. Answers to the previous questions (presentations) should be filed within 20 days of the receipt of this Memorandum and Order by E-mail.

8. Presentations are limited to 12 pages plus attached evidence of up to 30 pages. Presentations may reference materials that are already in the record.

9. Parties may respond (responses) to presentations within 10 days of when they first receive the complete presentation. Responses may reference materials that are already in the record.

10. Responses are limited to a total of 12 pages.



Peter B. Bloch, Administrative Judge  
Presiding Officer

Rockville, Maryland

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<sup>6</sup>HRI, ENDAUM and SRIC, which have already submitted a responsive discussion, need not answer this question. Failure to file an answer will not preclude them from filing a response.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of  
HYDRO RESOURCES, INC.

Docket No.(s) 40-8968-ML

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing M&O--LBP-99-15...AIR EMISSIONS have been served upon the following persons by U.S. mail, first class, except as otherwise noted and in accordance with the requirements of 10 CFR Sec. 2.712.

Office of Commission Appellate  
Adjudication  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Administrative Judge  
Peter B. Bloch  
Presiding Officer  
Atomic Safety and Licensing Board Panel  
Mail Stop - T-3 F23  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Administrative Judge  
Thomas D. Murphy  
Special Assistant  
Atomic Safety and Licensing Board Panel  
Mail Stop - T-3 F23  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

John T. Hull, Esq.  
Mitzi A. Young, Esq.  
Office of the General Counsel  
Mail Stop - 0-15 B18  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Diane Curran, Esq.  
Harmon, Curran, Spielberg & Eisenberg  
2001 S Street, N.W., Suite 430  
Washington, DC 20009

Douglas Meiklejohn, Esq.  
New Mexico Environmental Law Center  
1405 Luisa Street, Suite 5  
Santa Fe, NM 87505

Jep Hill, Esq.  
Attorney for Hydro Resources, Inc.  
Jep Hill & Associates  
P.O. Box 2254  
Austin, TX 78768

Herb Yazzie, Attorney General  
Steven J. Bloxham, Esq.  
Navajo Nation Department of Justice  
P.O. Box 2010  
Window Rock, AZ 86515

Docket No.(s)40-8968-ML  
M&O--LBP-99-15...AIR EMISSIONS

Wm. Paul Robinson  
Chris Shuey  
Southwest Research and Information  
Center  
P.O. Box 4524  
Albuquerque, NM 87106

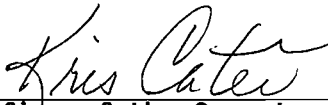
Mitchell Capitan, President  
ENDAUM  
P.O. Box 471  
Crownpoint, NM 87313

Anthony J. Thompson, Esq.  
Shaw, Pittman, Potts & Trowbridge  
2300 N Street, NW  
Washington, DC 20037

Grace Sam  
P.O. Box 85  
Church Rock, NM 87311

Roderick Ventura  
Samuel D. Gollis  
DNA - People's Legal Services, Inc.  
P.O. Box 306  
Window Rock, AZ 86515

Dated at Rockville, Md. this  
18 day of March 1999

  
Office of the Secretary of the Commission