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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD

SERVED 01/06/06

Before Administrative Judges:

E. Roy Hawkens, Presiding Officer
Dr. Richard F. Cole, Special Assistant
Dr. Robin Brett, Special Assistant

In the Matter of	Docket No. 40-8968-ML
HYDRO RESOURCES, INC. P.O. Box 777 Crownpoint, New Mexico 87313	ASLBP No. 95-706-01-ML January 6, 2006

PARTIAL INITIAL DECISION

(Phase II Radiological Air Emissions Challenges To In Situ Leach Uranium Mining License)

I. INTRODUCTION

In November 1994, the NRC Staff issued a "Notice of Opportunity for Hearing" concerning an application by Hydro Resources, Inc. (HRI) to construct and operate an in situ leach (ISL) uranium mining project in New Mexico. In response, timely requests for hearing were filed by the Eastern Navajo Diné Against Uranium Mining, the Southwest Research and Information Center, Grace Sam, and Marilyn Morris [hereinafter referred to collectively as the Intervenors], asserting that HRI's license application should not be granted. The then-Presiding Officer held the hearing requests in abeyance until the Staff completed its review of HRI's license application.

On January 5, 1998, the Staff granted HRI a 10 C.F.R. Part 40 materials license (SUA-1508) to perform ISL mining at the following four sites in McKinley County, New Mexico: Section 8 and Section 17 in Church Rock, and Crownpoint and Unit 1 in Crownpoint. Shortly thereafter, in May 1998, the then-Presiding Officer granted the Intervenors' requests for a hearing to challenge that license, and this protracted litigation ensued.

Although HRI has held its license for eight years, it has not yet started mining at any of the four sites due, in part, to profitability concerns related to the fluctuating price of uranium. This litigation nevertheless has gone forward, focusing initially – in what was characterized as Phase I – on issues specific to mining operations at Section 8, because HRI represented that it would mine this section first.

In February 2004, the then-Presiding Officer completed adjudicating the Intervenors' Phase I challenges to HRI's license (LBP-04-03, 59 NRC 84 (2004)). The Commission, on appeal, sustained the validity of HRI's license to engage in mining operations at Section 8 (CLI-04-33, 60 NRC 581 (2004)).

This litigation then entered Phase II, which involves the Intervenors' challenges to HRI's license insofar as it authorizes mining at the other three sites. For efficiency, the Intervenors' Phase II challenges have been grouped into the following four categories: (1) groundwater protection and restoration, and surety estimates; (2) cultural resources; (3) radiological air emissions; and (4) adequacy of environmental impact statement.

This decision resolves the issues embodied in the third category of Phase II challenges – i.e., radiological air emissions.[1] The Intervenors' challenges here are directed solely at HRI's prospective mining operations at Section 17. The Intervenors argue that HRI's license to mine at Section 17 should be invalidated or amended because: (1) the radiological air emissions incident to HRI's mining operations at Section 17 will result in an annual radiation exposure to the general public that exceeds 0.1 rem, in violation of 10 C.F.R. § 20.1301(a)(1); and (2) HRI's

[1] On July 20, 2005 and September 16, 2005, this Board issued decisions on, respectively, the first and second categories of the Intervenors' Phase II challenges. Each decision concluded that the Intervenors' challenges did not provide a basis for invalidating HRI's license. See LBP-05-17, 62 NRC 77 (2005) (petition for review filed Aug. 9, 2005); LBP-05-26, 62 NRC 442 (2005) (petition for review filed Oct. 5, 2005).

license application for Section 17 contains inadequate data regarding its radiological air emissions calculations and controls.

For the reasons set forth below, I find – with the concurrence of Dr. Richard Cole and Dr. Robin Brett, who have been appointed as Special Assistants – that HRI has demonstrated that the Intervenors' challenges relating to radiological air emissions at Section 17 do not provide a basis for invalidating or amending HRI's license.

II. BACKGROUND

A. AN OVERVIEW OF ISL URANIUM MINING, RADIOLOGICAL AIR EMISSIONS FROM ISL MINING, AND HRI's AIR EMISSIONS CONTROLS FOR SECTION 17

1. ISL Uranium Mining

HRI's license, SUA-1508, authorizes it to perform ISL uranium mining at four proximately clustered sites in McKinley County, New Mexico: Sections 8 and 17 near the town of Church Rock, and Crownpoint and Unit 1 near the town of Crownpoint.

HRI's ISL uranium mining process, briefly explained, will involve two principal steps. First, HRI will inject a leach solution called "lixiviant" (which is a mixture of groundwater charged with oxygen and bicarbonate) through wells located in a targeted zone containing uranium oxide. The uranium oxide, which occurs as small mineral grains within a sandstone host rock, dissolves when it comes into contact with the lixiviant. HRI will also operate production wells located within a pattern of injection wells. The production wells create a reduced pressure in the mined region by withdrawing slightly more water from the ground than is injected, thus controlling the horizontal spread of the pregnant lixiviant (i.e., the lixiviant that now contains dissolved uranium oxide), and causing it to flow toward the production wells where it is pumped to the surface. See Final Environmental Impact Statement to Construct and Operate the Crownpoint Uranium Solution Mining Project, Crownpoint, New Mexico, NUREG-1508, at 2-2 to 2-5 (Feb. 1997) [hereinafter FEIS].

The second step of the ISL mining process occurs after the pregnant lixiviant is pumped to the surface. HRI will pipe the pregnant lixiviant through columns of ion exchange resin, during which the uranium oxide will attach to the resin. Upon leaving the ion exchanger, the now-barren lixiviant will be re-charged as necessary with oxygen and bicarbonate, and it will then be re-injected into the ore zone to repeat the leaching cycle. When the ion exchange capacity of a column of resin is depleted, that column is taken off-line and the uranium oxide is chemically stripped from the resin. The resulting uranium oxide slurry is filtered and dried to produce the finished product – uranium oxide concentrate, or yellowcake – which is packaged and stored for final shipment. See FEIS at 2-5 to 2-12.

As will be discussed infra Part II.A.2, when HRI conducts its mining at Section 17, it will pipe the pregnant lixiviant from Section 17 to a satellite facility at Section 8 that contains the ion exchange columns. When the uranium oxide is chemically stripped from a column of ion exchange resin, the uranium oxide slurry will be trucked from Section 8 to the Crownpoint Processing Plant where it will be dried and packaged (FEIS at 2-9 to 2-11).

2. Radiological Air Emissions From ISL Uranium Mining, And HRI's Air Emission Controls For Section 17

During ISL uranium mining, two types of radiological air emissions can be released to the atmosphere: gaseous radon, and airborne particulates of uranium (FEIS at 2-15).

Radon – a radiological gas product from the uranium decay chain – will be present in the pregnant lixiviant that HRI pumps from the ground (FEIS at 2-15). See Affidavit of Mark S. Pelizza at 4 (July 28, 2005) [hereinafter HRI Exhibit (Exh.) A] ("Uranium-238 decays to Thorium-234 decays to Protactinium-91 decays to Uranium-234 decays to Thorium-230 decays to Radium-226 decays to Radon-222"). HRI plans to minimize radon releases from the lixiviant to the atmosphere by employing a closed and pressurized well field and ion exchange system

that is designed to keep the radon dissolved in the circulating lixiviant and contained in the ISL pumping system (FEIS at 2-15).

During mining operations, radon nonetheless will be released to the atmosphere on a controlled basis from three sources. First, HRI's pumping system will have relief valves located outdoors on the trunk pipelines. These relief valves will vent periodically to release excess vapor pressure resulting primarily from dissolution of carbon dioxide or oxygen in the circulating lixiviant. Radon will also be released during such venting. See FEIS at 2-15, 4-83.

Second, radon will be released when an ion exchange column is opened for resin elution – i.e., when the uranium oxide is chemically stripped from the resin (FEIS at 2-15). The radon released during this process will be no more than the amount dissolved in the discrete volume of lixiviant contained in the ion exchange column, and the radon will be vented through the ventilation system of the processing building (ibid.). Notably, the ion exchange columns that HRI will use for Section 17 mining operations are located adjacent to Section 17 on Section 8 (HRI Exh. A at 3). Accordingly, no radon will be released directly to the Section 17 atmosphere as a result of resin elution activities.

Third, radon will be released during the discharge of wastewater to retention ponds (FEIS at 2-15).[2] HRI will minimize the radon released during the discharge process by (ibid.): (1) removing radon from the wastewater in intermediate holding tanks with a vacuum pump; (2) compressing the radon and dissolving it in the lixiviant injection system; and (3) recirculating the

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[2] Wastewater is liquid waste resulting from the mining process. Its sources include water from filter washing and from the dewatering of uranium oxide slurry (FEIS at 2-12, 2-16). The largest wastewater stream at each mining site occurs as production bleed during mining operations (id. at 2-16), which, as mentioned supra p. 3, creates a reduced pressure in the mined region, thus controlling the horizontal spread of lixiviant and causing it to flow toward the production wells. HRI will discharge wastewater to retention ponds (id. at 2-12). The purpose of these ponds is "to store wastewater until treatment, promote evaporative loss of water which cannot be discharged to the environment, and maintain control of source and 11e(2) byproduct material found in the liquid effluents from solution mining" (ibid.).

radon during mining operations. Notably, the wastewater processing equipment and ponds that HRI will use for Section 17 mining operations are located on Section 8 (HRI Exh. A at 3). Therefore, no radon will be released directly to the Section 17 atmosphere as a result of wastewater discharge activities.

As previously mentioned, ISL uranium mining can also release radiological air emissions in the form of airborne particulates of uranium. Such releases can occur during the yellowcake drying and packaging process (FEIS at 2-15). HRI plans to minimize the release of these particulates by using a vacuum-drying unit that "result[s] in zero emissions, and require[s] no ventilation from the drying chamber to the atmosphere" (ibid.; see also id. at 4-74). HRI's license contains the following license condition to ensure environmentally safe operation of the vacuum-drying unit (License Condition (LC) 10.9):

> The licensee shall ensure that the manufacturer-recommended vacuum pressure is maintained in the drying chamber during all periods of yellowcake drying operations. This shall be accomplished by continuously monitoring differential pressure and installing instrumentation which will signal an audible alarm if the air pressure differential falls below the manufacturer's recommended levels. The alarm's operability shall be checked and documented daily. Additionally, yellowcake drying operations shall be immediately suspended if any emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.

HRI's vacuum-drying unit will not be located at Section 17, but rather will be located about 20 miles northeast at the Crownpoint site (FEIS at 4-83). Hence, the drying and packaging process will not emit airborne particulates of uranium at Section 17 (ibid.).

B. RELEVANT ADMINISTRATIVE PROCEEDINGS IN THIS CASE[3]

1. Phase I Administrative Proceedings

Because HRI plans to start its mining operations at Section 8, the former Presiding Officer – in an unpublished order issued in September 1998 – granted HRI's request to bifurcate this litigation, focusing initially in Phase I on the Intervenors' challenges relating to Section 8 and the overall validity of the license, leaving those issues relating to operations at the other three sites (Section 17, Unit 1, and Crownpoint) subject to later litigation in Phase II.

During Phase I, the Intervenors raised numerous challenges to the validity of HRI's license insofar as it authorizes mining operations at Section 8. For present purposes, however, the only challenges that need be recounted are those in which the then-Presiding Officer and the Commission addressed issues implicating radiological air emissions.

In May 1998, the former Presiding Officer accepted for litigation the area of concern that is germane to this proceeding; namely, the alleged "[i]nadequa[cy of HRI's] air emissions control and the effect of recirculating radon in the mining solution" (LBP-98-09, 47 NRC 261, 282 (1998)).

In March 1999, the former Presiding Officer considered the Intervenors' assertion that HRI's operations at Section 8 would result in a radiation exposure, or total effective dose equivalent (TEDE),[4] to members of the public that exceeded 0.1 rem in a year, in violation of 10 C.F.R. § 20.1301. See LBP-99-15, 49 NRC 261 (1999). Although the Intervenors recognized that background radiation is not included in the calculation of the TEDE (10 C.F.R. §

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[3] This case is being litigated pursuant to the NRC's since-superseded procedural rules in 10 C.F.R. Part 2, Subpart L, which were amended in 2004. See 69 Fed. Reg. 2,182 (Jan. 14, 2004). Because the new rules apply only to proceedings noticed on or after February 13, 2004, they do not apply here.

[4] TEDE is defined as "the sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures)" (10 C.F.R. § 20.1003).

20.1301(a)(1)), they nevertheless argued that HRI's license to mine at Section 8 should be invalidated because "existing non-background levels of radiation at [Section 8 due to a nearby, shut-down underground uranium mine] already exceed regulatory limits, thus precluding the addition of a new source that would further jeopardize public health and safety" (49 NRC at 262).[5] The Presiding Officer agreed with the Intervenors that the existing radiation from the old underground mine is properly viewed as non-background radiation that should be included in the TEDE calculation (id. at 267). He stated, however, that he needed additional information to determine whether HRI's operations at Section 8 would result in a TEDE that exceeded regulatory limits, and he therefore directed the parties to provide further briefing on several factual and legal matters (id. at 268-69).

After the parties provided the requested information, the former Presiding Officer considered whether, as the Intervenors argued, "HRI's operations at Church Rock Section 8 will cause the [TEDE] . . . to exceed the annual dose limit" (LBP-99-19, 49 NRC 421, 425 (1999)). In the course of his analysis, he reiterated his agreement with the Intervenors that radiation from the old underground mine is non-background radiation that should be included in the TEDE calculation, explaining that – pursuant to the regulatory definition of "background radiation" in 10 C.F.R. § 20.1003 – *all* source and byproduct materials (whether regulated by the Commission or not) should be excluded from "background radiation" and, hence, included in the TEDE calculation (id. at 426). He nevertheless concluded that the TEDE resulting from operations at Section 8 would not exceed the regulatory limits (id. at 427). The Commission denied the Intervenors' request to review the decision (CLI-00-12, 52 NRC 1, 3 (2000)).

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[5] As will be discussed infra Part III.A, the putative radiation at Section 8 that the Intervenors characterized as "non-background" allegedly emanated from an underground uranium mine on Section 17 that had been mined intermittently from the 1950s through 1982, and from surface waste and debris from those mining operations.

In October 2004, the then-Presiding Officer denied the Intervenors' request that the FEIS be supplemented for Sections 8 and 17 based on a proposed housing development project that allegedly would be built about two miles from the southern restricted site boundary of Section 17 (LBP-04-23, 60 NRC 441 (2004)). In doing so, the Presiding Officer rejected the Intervenors' argument that HRI had not demonstrated the efficacy of its radiological air emissions controls (id. at 457-58). The Commission denied the Intervenors' request to review this decision (CLI-04-39, 60 NRC 657 (2004)).

2. Phase II Administrative Proceedings

The Intervenors now argue that HRI's license to mine at Section 17 should be invalidated or amended, because: (1) the radiological air emissions from HRI's mining operations at Section 17, combined with the radiation from the old underground mine and its surface waste and debris on Section 17, will result in a TEDE to the general public that exceeds 0.1 rem per year, in violation of 10 C.F.R. § 20.1301(a)(1); and (2) HRI's license application for Section 17 contains incomplete data regarding its radiological air emissions calculations and controls. See Intervenors' Written Presentation in Opposition to [HRI's] Application for a Materials License with Respect to Radiological Air Emissions For Church Rock Section 17 (June 13, 2005) [hereinafter Intervenors' Written Presentation]; Intervenors' Reply to HRI's and NRC Staff's Responses in Opposition to Intervenors' Presentation on Radioactive Air Emissions (Aug. 12, 2005) [hereinafter Intervenors' Reply].

HRI and the NRC Staff responded to these challenges, arguing that: (1) HRI's radiological air emissions from its mining operations at Section 17 will not exceed regulatory limits; and (2) HRI's license application for Section 17 satisfies regulatory requirements regarding radiological air emissions calculations and controls. See HRI's Response in Opposition to Intervenors' Written Presentation Regarding Air Emissions (July 29, 2005) [hereinafter HRI's Response];

NRC Staff's Response to Intervenors' Presentation on Radiological Air Emissions (Aug. 5, 2005) [hereinafter NRC Staff's Response].[6]

For the reasons set forth below, I conclude that HRI has met its burden of demonstrating that the Intervenors' challenges relating to radiological air emissions at Section 17 do not provide a basis for invalidating or amending HRI's license.

III. ANALYSIS

A. THERE IS NO MERIT TO THE INTERVENORS' CLAIM THAT THE TEDE RESULTING FROM HRI's LICENSED OPERATIONS AT SECTION 17 WILL EXCEED THE REGULATORY LIMIT OF 0.1 REM PER YEAR, 10 C.F.R. § 20.1301(a)(1)

Introduction: At the outset, it is helpful to identify some undisputed facts that are material to the parties' arguments. Section 17 contains three extant sources of radiological emissions: (1) natural surface soils containing (as nearly all soils do) trace amounts of uranium and/or thorium; (2) an old, underground uranium mine that was mined intermittently by several operators from the 1950s through 1982 [hereinafter the United Nuclear Corporation (UNC) mine] that, unless properly sealed, could be a source of radon gas emissions; and (3) surface waste and debris [hereinafter referred to as surface spoilage] from operations of the UNC mine.[7] In addition, as discussed supra Part II.A.2, ISL mining operations on Section 17 can

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[6] On December 7, 2005, each party – in compliance with an unpublished order dated November 15, 2005 – submitted a supplemental brief addressing several radiological air emissions issues. See Intervenors' Supplemental Brief on Radioactive Air Emissions (Dec. 7, 2005) [hereinafter Intervenors' Supplemental Brief]; HRI's Response To Presiding Officer's Request For Supplemental Information (Dec. 7, 2005) [hereinafter HRI's Supplemental Brief]; NRC Staff's Supplemental Brief (Dec. 7, 2005).

[7] The record reveals that the uranium ore withdrawn from the UNC mine was not processed at Section 17, but was transported to the UNC milling site located on Section 2, more than three miles from the UNC mine. See Affidavit of Richard A. Weller at 2 (Aug. 5, 2005) [hereinafter NRC Staff Exh. 2]. The surface spoilage on Section 17 was caused by "hauling ore from the Section 17 UNC mine to the UNC mill [at Section 2]. Possible sources of contamination are the use of mine spoils in creating the road, and fugitive dust or rock lost from the haul trucks" (Affidavit of Christepher A. McKenney at 7-8 (Aug. 5, 2005) [hereinafter NRC (continued...)

result in radiological air emissions in the form of radon and uranium air particulates. See NRC Staff Exh. 1, at 3, 5; Declaration of Melinda Ronca-Battista at 9 (June 10, 2005) [hereinafter Intervenors' Exh. K]; Intervenors' Exh. G at 1; Affidavit of Dr. Douglas B. Chambers at 4, 6-7 (July 26, 2005) [hereinafter HRI Exh. B].[8]

A principal controversy in this case is which of the above four sources of radiological emissions should be included in the TEDE calculation or, stated differently, which of the above sources constitute background radiation that should be excluded from the TEDE calculation.

No one disputes that the first source – natural surface soils containing trace amounts of uranium and/or thorium – constitutes "background radiation" that is excluded from the TEDE calculation pursuant to 10 C.F.R. § 20.1301(a)(1). Accordingly, I need not examine that source further.

Likewise, no one disputes that the fourth source – radiological air emissions caused by HRI's ISL mining operations at Section 17 – should be included in the TEDE calculation, because it constitutes a radiological emission "from the licensed operation" (10 C.F.R. § 20.1301(a)(1)). I consider the Intervenors' challenges regarding HRI's calculations and controls of those emissions infra Part III.B.

The parties vigorously disagree whether the radiological emissions from the second source (the underground UNC mine) and the third source (the surface spoilage from the UNC mining operations) should be included in the TEDE calculation. The Intervenors argue that (Intervenors' Written Presentation at 12-22): (1) such emissions are not background radiation and should be included in the TEDE; (2) these existing emissions alone exceed the regulatory

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[7](...continued)
Staff Exh. 1].

[8] The witnesses in this proceeding accompanied their written testimony with credentials establishing their education, experience, and expertise. I find that these credentials qualify the witnesses as experts for purposes of this proceeding.

limit for the general public of 0.1 rem per year (10 C.F.R. § 20.1301(a)(1)); and (3) accordingly, HRI is barred from engaging in any mining operations at Section 17 because they would further increase the TEDE. In particular, the Intervenors claim that "levels of gamma radiation at the eastern fence of the Section 17 restricted area . . . [attributable to the UNC mine and/or its surface spoilage] equat[e] to an annual dose of 1.1 rems" (Intervenors' Written Presentation at 19). They also allege that the annual dose "inside a fenced grazing area leased by Mr. Larry King, east of Section 17 . . . [attributable to the UNC mine and/or its surface spoilage] exceed[s] the regulatory limit" (id. at 19-20).

HRI and the NRC Staff, on the other hand, aver that the UNC mine has been sealed and therefore is not a source of radiological emissions. Further, they aver that radiological emissions from the surface spoilage should not be included in the TEDE calculation; rather, such emissions are properly viewed as radiation from naturally occurring radioactive material – i.e., background radiation – which is excluded from the TEDE. See HRI's Response at 19-29; NRC Staff's Response at 14-24. HRI and the Staff declare that the TEDE for Section 17, properly calculated, is a "small fraction of the regulatory limits" (FEIS at 4-83).

As explained below, I agree with HRI and the Staff. First, I find that undisputed record evidence shows that the UNC mine has been sealed and, accordingly, may be discounted as a source of radiological emissions for purposes of calculating the TEDE. Next, I conclude that the second sentence in the regulatory definition of "background radiation" (10 C.F.R. § 20.1003) does not require that radiation from the surface spoilage on Section 17 be excluded from background radiation. Third, I conclude that, pursuant to the first sentence in the regulatory definition of "background radiation" (ibid.), the surface spoilage is naturally occurring radioactive material whose emissions are background radiation that are excluded from the TEDE calculation (id. § 20. 1301(a)(1)). Finally, I find that the TEDE resulting from HRI's licensed

operations on Section 17 does not exceed the regulatory limit of 0.1 rem per year embodied in section 20.1301(a)(1).[9]

1. Undisputed Record Evidence Shows That The UNC Mine Is Sealed And, Accordingly, Is Not A Source Of Radiological Emissions For Purposes Of Calculating The TEDE

The Intervenors claim that HRI's license to perform ISL uranium mining at Section 17 should be invalidated, because in calculating the TEDE, HRI and the NRC Staff incorrectly failed to include radon emanating from vent holes in the UNC mine. See Intervenors' Written Presentation at 16-18. However, whether such emissions must be included in the TEDE need not be adjudicated, because the record conclusively establishes that the UNC mine is sealed.[10]

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[9] The NRC Staff argues (NRC Staff's Response at 5-6) that the Intervenors are precluded from advancing an argument based on existing levels of radiological emissions at Section 17, because the Intervenors previously raised a concern about existing contamination at the Church Rock site, which the then-Presiding Officer found not to be germane. See LBP-98-09, 47 NRC at 283. The Staff's argument lacks merit. The Intervenors' previous concern related to the fact that HRI's license application did "not address how existing contamination [at] the Church Rock site will be cleaned up" (ibid.). That concern, stated the Presiding Officer, was not germane, because "[u]nless there is some project-related reason, a licensee is not required to clean up problems that it did not create" (ibid.). That non-germane concern is materially different than the Intervenors' present concerns, which include whether the TEDE, including HRI's radiological air emissions, exceeds the limits in 10 C.F.R. Part 20. The Intervenors' concern about radiological air emissions unquestionably is germane (id. at 282). To resolve whether the radiological air emissions at Section 17 will result in a TEDE that exceeds regulatory limits, it is necessary to determine what components must be included in the TEDE, which, in turn, requires resolving whether radiological emissions from the UNC mine and its surface spoilage are background radiation. The Intervenors are not precluded from raising these concerns.

[10] The Intervenors repeatedly characterize the underground material in the UNC mine as "byproduct material" (Intervenors' Written Presentation at 16, 17). Because the mine is sealed and is not a source a radiological emissions, the correctness vel non of the Intervenors' characterization of the underground material is beside the point. I nevertheless note that "by-product material" consists of "tailings or wastes" produced as a result of the *refining* or *processing* of ore primarily for its source material content (infra Part III.A.2.c). Material in the UNC mine was, and is, "ore in its natural form prior to any processing, such as grinding, roasting or beneficiating, or refining" (10 C.F.R. § 40.4) (definition of "unrefined and unprocessed ore"). Hence, the underground material in the UNC mine plainly does not satisfy the definition of "by-product material."

The record shows that the UNC mine contained four openings – the main shaft, a gravel hole, and two ventilation shafts (Affidavit of Salvador Chavez at 2 (July 27, 2005) [hereinafter HRI Exh. C]). Notably, the Intervenors concede that the UNC mine shafts (i.e., the main shaft and the gravel hole) "have been sealed" and are not a source of radiological emissions (Intervenors' Written Presentation at 16 n.5). They also acknowledge that if the UNC mine vents are likewise sealed, their argument regarding radiological emissions from the vents would be moot (ibid.). But they assert that "[n]o evidence . . . has been presented that [the] vent holes" have been sealed (ibid.). The Intervenors are incorrect.

HRI's witness, Salvador Chavez, stated that he supervised the sealing of all four mine openings in October and November of 1994 (HRI Exh. C at 2). As relevant here, Mr. Chavez provided a detailed description of how the vent shafts were sealed (id. at 2-3), and he also submitted photographs of the sealed shafts (Attachment 2 to HRI Exh. C). Another HRI witness, Mr. Pelizza, confirms that all UNC mine openings, including the ventilation shafts, "have been fully sealed" and "do not provide a conduit for radon emanation" (HRI Exh. A at 14).

The record thus negates the Intervenors' assertion that the UNC mine is a source of radiological emissions for purposes of calculating the TEDE.

2. Radiation From The Surface Spoilage On Section 17 Is Not Excluded From Background Radiation Pursuant To The Second Sentence Of The Regulatory Definition Of Background Radiation, 10 C.F.R. § 20.1003

a. The Second Sentence Of The Regulatory Definition Of Background Radiation, 10 C.F.R. § 20.1003, Excludes Radiation From Source Material And Byproduct Material That Are "Regulated By The Commission"

The Intervenors claim that HRI's license to perform ISL uranium mining at Section 17 should be invalidated, because in calculating the TEDE, HRI and the NRC Staff incorrectly failed to include radiological emissions from the surface spoilage on Section 17 (Intervenors' Written Presentation at 12-22). An analysis of this claim begins with 10 C.F.R. § 20.1301,

which establishes dose limits with which licensees must comply. Section 20.1301(a)(1) states in pertinent part that "[e]ach licensee shall conduct operations so that [t]he [TEDE] to individual members of the public from the licensed operation does not exceed 0.1 rem . . . in a year, *exclusive of the dose contributions from background radiation*" (10 C.F.R. § 20.1301(a)(1) (emphasis added)).

Because "background radiation" is excluded from the TEDE calculation, determining the proper meaning and scope of that regulatory definition is critical. "Background radiation" is defined as (10 C.F.R. § 20.1003):

> radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. *"Background radiation"* does not include radiation from source, byproduct, or special nuclear materials regulated by the Commission.

The parties disagree about the proper interpretation of the last sentence. The Intervenors urge me to adopt the analysis espoused by the former Presiding Officer during Phase I of this case. Specifically, relying on the canon of construction known as the "rule of the last antecedent,"[11] the Intervenors argue that the phrase "regulated by the Commission" refers only to the last antecedent noun in the series – i.e., "special nuclear materials" – and that radiation from *all* source and byproduct materials (whether regulated by the Commission or not) is excluded from background radiation (Intervenors' Written Presentation at 12-13) (citing LBP-99-19, 49 NRC at 426). Pursuant to this regulatory definition, argue the Intervenors, surface spoilage from the UNC mine constitutes source and/or byproduct materials whose radiation is

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[11] Pursuant to the rule of the last antecedent, "qualifying words, phrases and clauses must be applied to the words or phrases immediately preceding them and are not to be construed as extending to and including others more remote." Demko v. United States, 216 F.3d 1049, 1053 (Fed. Cir. 2000) (quoting Wilshire Westwood Assocs. v. Atlantic Richfield Corp., 881 F.2d 801, 804 (9th Cir. 1989)).

excluded from background radiation and, hence, must be included in the TEDE calculation (Intervenors' Written Presentation at 15-18).[12]

HRI and the NRC Staff argue that the definition of background radiation advanced by the Intervenors (and accepted by the former Presiding Officer) is a serious misreading of the regulation, and that the phrase "regulated by the Commission" refers to all three antecedent nouns. See HRI's Response at 16-18; NRC Staff's Response at 11-13. Thus, according to HRI and the Staff, although the regulatory definition of background radiation excludes radiation from source, byproduct, and special nuclear materials if they are regulated by the Commission, it does not exclude radiation from such materials if they are *not* regulated by the Commission. I agree.

The Intervenors, in relying on the rule of the last antecedent, fail to recognize that the last antecedent noun – i.e., "materials" – is *plural*, which indicates that it is the object of more than one precedent adjective. In other words, a fundamental rule of syntax supports the conclusion that the plural noun "materials" was meant to be the object of more than one precedent adjective. Because there is no differentiation among the three precedent adjectives, it may reasonably be concluded that "materials" was intended to be the object of them all – "source," "byproduct," and "special nuclear" – and that the qualifying phrase, "regulated by the Commission," applies to them all.

This conclusion is supported by the regulatory definitions in 10 C.F.R. § 20.1003 of "source material," "byproduct material," and "special nuclear material" – which all use a singular form of the noun "material." This regulatory evidence supports the conclusion that the Commis-

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[12] The Intervenors do not argue that the surface spoilage constitutes special nuclear material, nor could such an argument be reconciled with the definition of "special nuclear material" which includes plutonium, uranium-233, and enriched uranium (42 U.S.C. § 2014.aa; 10 C.F.R. § 20.1003). Accordingly, my analysis focuses exclusively on whether the surface spoilage constitutes source and/or byproduct materials within the meaning of "background radiation" (10 C.F.R. § 20.1003).

sion acted knowingly and deliberately when it used the plural form of "materials" in the definition of "background radiation," intending it to be the object of the three precedent adjectives, "source," "byproduct," and "special nuclear." This, in turn, indicates that – contrary to the Intervenors' argument – the phrase "regulated by the Commission" was intended to apply to source and byproduct materials, as well as to special nuclear material.[13]

That the phrase "regulated by the Commission" does not apply solely to special nuclear material is also supported by the canon of construction that, where possible, a regulation should be construed in a manner that avoids internal inconsistencies. See, e.g., United States v. Raynor, 302 U.S. 540, 547 (1938); Water Quality Ass'n Employees' Benefit Corp. v. United States, 795 F.2d 1303, 1307 (7th Cir. 1986); Brotherhood of Locomotive Firemen and Enginemen v. Northern Pac. Ry. Co., 274 F.2d 641, 646-47 (8th Cir. 1960). If, as the Intervenors assert, radiation from *all* source material (whether or not regulated by the Commission) is excluded from background radiation, then radiation from, for example, surface soils and outcrops containing naturally occurring uranium and thorium would be excluded from background radiation. This would create an inconsistency with the first sentence in the regulatory definition of background radiation, which states that radiation from "naturally occurring radioactive material" is background radiation (10 C.F.R. § 20.1003).[14] To harmonize these regulatory

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[13] Notably, the Intervenors fail to provide any rationale as to why radiation from special nuclear material should be treated differently than radiation from source material or byproduct material for purposes of defining background or calculating the TEDE. In fact, they cite regulatory history that cuts in the other direction, because it shows "that the Commission's purpose in adding the second sentence to the definition of 'background radiation' was to ensure that radioactive emissions from other NRC-licensed facilities [e.g., emissions from facilities possessing *materials regulated by the Commission*] would be counted in the TEDE" (Intervenors' Supplemental Brief at 13) (citing 56 Fed. Reg. at 23,274). See also NRC Staff's Supplemental Brief at 7.

[14] In this part of the decision, I explain why radiation from the surface spoilage is not *excluded* from background radiation pursuant to the second sentence of the regulatory definition of "background radiation" (10 C.F.R. § 20.1003). In Part III.A.3 infra, I explain why

(continued...)

provisions, the definition of "background radiation" must be construed, on the one hand, as including "source material" that is not regulated by the Commission (i.e., "naturally occurring radioactive material"), and, on the other hand, as excluding "source material" that is regulated by the Commission. See infra Part III.A.2.b (discussing the distinction between regulated and unregulated source material).

In short, the interpretation advanced by the Intervenors lacks merit. Because the regulatory words "source, byproduct, [and] special nuclear materials" (10 C.F.R. § 20.1003) "are followed by a clause which is applicable as much to the first and other words as to the last, the natural construction of the language demands that the clause be read as applicable to all" (Porto Rico Ry., Light & Power Co. v. Mor, 253 U.S. 345, 348 (1920)).

The Intervenors also assert that this interpretation of the last sentence in the regulatory definition of "background radiation" – and more specifically, the conclusion that the phrase "regulated by the Commission" refers to source and byproduct materials – is barred by the "law of the case" doctrine. See Intervenors' Written Presentation at 13-14; Intervenors' Reply at 9-16. I disagree.

Pursuant to the law of the case doctrine – which is a rule of repose designed to promote judicial economy and jurisprudential integrity – the decision of an *appellate tribunal* should ordinarily be followed in all subsequent phases of that case, provided that the particular question in issue was "actually decided or decided by necessary implication" (Safety Light Corp. (Bloomsburg Site Decontamination), CLI-92-09, 35 NRC 156, 159-60 & n.5 (1992)). Here, the relevant appellate tribunal (i.e., the Commission) did not grant the Intervenors' petition to review the former Presiding Officer's decision (CLI-00-12, 52 NRC at 3), much less render a decision

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[14](...continued)
such radiation is *included* in background radiation pursuant to the first sentence of the regulatory definition.

on the particular question in issue. Moreover, because the Intervenors alone sought review (supra p. 8), the correctness vel non of the former Presiding Officer's regulatory interpretation of "background radiation" was not even brought to the Commission's attention as a basis for review, so it may not fairly be argued that the Commission even considered the issue. In short, the law of the case doctrine is not apposite here.[15]

That the law of the case doctrine is inapplicable here does not mean that the former Presiding Officer's analysis is perforce wholly without precedential value. Cf. Sequoyah Fuels Corp., CLI-95-2, 41 NRC 179, 190 (1995) ("Licensing Board decisions . . . have no precedential effect beyond the immediate proceeding in which they were issued"). Rather, it means that the precedential value of his analysis is limited to its power to persuade. With due respect for the former Presiding Officer's reasoning, I am unpersuaded by his regulatory interpretation. For the reasons discussed above, I conclude that his analysis – which overlooked regulatory syntax, regulatory evidence, and regulatory structure – was incorrect, and I decline to follow it.

The Intervenors nevertheless argue that I should apply the former Presiding Officer's regulatory interpretation "as a matter of policy" (Intervenors' Written Presentation at 22). They assert that its application here will (1) result in including radiation from the UNC mine's surface spoilage in the TEDE, which will (2) result in a TEDE that exceeds the regulatory limit, which will (3) result in the invalidation of HRI's license to perform ISL mining at Section 17. A contrary result, they argue, will pose a risk to public health and safety by ignoring the "cumulative impacts of past and concurrent uranium mining on nearby communities" (ibid.). I reject this argument for two reasons. First, as will be shown infra Part III.A.4, because the calculated TEDEs arising from HRI's licensed operations "are a small fraction of the regulatory limits"

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[15] Of course, the Commission's denial of review is not a decision on the merits. It simply indicates that the appealing party – here, the Intervenors – "identified no 'clearly erroneous' factual finding or important legal error requiring Commission correction" (CLI-00-12, 52 NRC at 3) (citing 10 C.F.R. § 2.786(b)(4)).

(FEIS at 4-83) and will have "negligible effects in terms of health physics and radiological impacts" (id. at 4-87), I am satisfied that HRI's operations will *not* be inimical to public health and safety (10 C.F.R. § 40.32(d)).

Second, and more fundamentally, I lack authority to adopt a "policy" that invalidates a Commission regulation. The second sentence of the regulatory definition of background radiation establishes that radiation from source and byproduct materials "regulated by the Commission" is excluded from background radiation, and, as will be shown infra Part III.A.3, the first sentence of the regulatory definition of background radiation establishes that radiation from "naturally occurring radioactive material" – such as the UNC mine's surface spoilage – is background radiation that, pursuant to 10 C.F.R. § 20.1301(a)(1), is excluded from the TEDE. In urging me to adopt an approach that is at odds with the governing regulations, the Intervenors essentially are attempting to use this proceeding to re-write those regulations. This they may not do. See Baltimore Gas & Elec. Co. (Calvert Cliffs Nuclear Power Plant, Units 1 & 2), 4 AEC 243, 244 (1969); 10 C.F.R. § 2.335. To the extent that the Intervenors disagree with a regulation, their recourse is to petition the Commission for rulemaking to change it (10 C.F.R. § 2.802).

Contrary to the Intervenors' assertion, my resolution of this issue does not "turn a blind eye" to the radiological effects of past uranium mining and "condemn[] certain communities to be radiation sacrifice areas" (Intervenors' Written Presentation at 22-23). Nothing in my analysis relieves the NRC Staff of its obligation under the National Environmental Policy Act to conduct a cumulative impacts analysis, which requires it to take a hard look at the project's cumulative impacts on radiation levels. If the Staff determines that the cumulative radiological impacts of a license applicant's proposed project will be inimical to the public health and safety, it must take steps to address those impacts by imposing license conditions that avoid such harm, or, if such mitigating measures would be unavailing, deny the license application.

Notably, during Phase I of this proceeding, the Commission expressly considered whether the Staff adequately performed the cumulative radiological impacts analysis for mining operations at Section 8, and it resolved this question in the affirmative (CLI-01-04, 53 NRC 31, 60-61 (2001)). The Commission explained (id. at 61-62):

> Cumulative impacts analysis looks to whether the impacts from a proposed project will combine with the existing, residual impacts in the area to result in a significant "cumulative" impact – where, in other words, the new impact is significantly enhanced by already existing environmental effects. The Intervenors simply have not credibly suggested how the relatively minor radiological impact of Section 8 will in fact prove significant even when added to already existing radiological conditions. They have not cast doubt on the FEIS's conclusion that the Church Rock Section 8 mining will make only a minor, insignificant addition to overall preexisting radiological impacts.

Similarly, as will be discussed infra Part III.A.4, the Section 17 mining operations "will make only a minor, insignificant addition to overall preexisting radiological impacts" (id. at 62), thus posing no significant threat to public health and safety.[16]

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[16] As a factual backdrop, the national average dose received by an individual due to background radiation is 0.3 rem per year (Background as a Residual Radioactivity Criterion for Decommissioning, NUREG-1501 (HRI Annex C) at 28, 30 (Aug. 1994) (Draft Report)). However, annual doses can vary significantly from that figure. For example, the record shows that a person living on sandy soil near the ocean might receive an annual background dose of about 0.1 rem, whereas a person living in a mountainous area in Colorado might receive an annual background dose of about 1.0 rem. This range of 0.1 rem to 1.0 rem – a span factor of 10 – "is typical of the variation in background doses for most United States citizens in a given year" (id. at 30; accord HRI's Supplemental Brief, Exh. A at 3). Moreover, this broad range itself is subject to variation, because the cosmic component of background radiation can vary by 10 percent over the 11-year solar cycle, and sporadic geophysical phenomena – such as volcanic eruptions, earthquakes, and floods – can contribute significant additional background doses to the environment (HRI's Supplemental Brief, Exh. A at 3). Assuming arguendo the correctness of the Intervenors' assertion that the "levels of gamma radiation at the eastern fence of the Section 17 restricted area . . . equat[e] to an annual dose of 1.1 rems" (Intervenors' Written Presentation at 19), such a background dose does not substantially differ from the "typical [range of] background doses for most United States citizens in a given year" (HRI Annex C at 30). Equally important for present purposes, pursuant to the governing regulations, such a background dose is excluded from the TEDE calculation (see infra Part III.A.3).

b. The Surface Spoilage On Section 17 Is Not Source Material Regulated By The Commission, And Its Radiation Is Therefore Not Excluded From Background Radiation Pursuant To The Last Sentence Of The Regulatory Definition of Background Radiation, 10 C.F.R. § 20.1003

Having determined that "background radiation" – which is not included in the TEDE calculation – excludes radiation from source material regulated by the Commission, the next question is whether the surface spoilage on Section 17 is source material regulated by the Commission. The Intervenors argue that this question must be answered in the affirmative, and, accordingly, that the radiation emanating from the spoilage must be included in the TEDE calculation (Intervenors' Written Presentation at 15-21). HRI and the NRC Staff argue contrarily that the surface spoilage is not source material regulated by the Commission, and it is therefore not excluded from background radiation (HRI's Response at 19-21; NRC Staff's Response at 15-20). For the reasons discussed below, I agree with HRI and the NRC Staff.

In determining whether the surface spoilage on Section 17 is source material regulated by the Commission, I turn first to the Atomic Energy Act (AEA), where Congress stated that the "processing and utilization of source . . . material must be regulated in the national interest and in order to provide for the common defense and security and to protect the health and safety of the public" (42 U.S.C. § 2012(d)). Congress defined "source material" as follows (id. § 2014.z):

> The term "source material" means (1) uranium, thorium, or any other material which is determined by the Commission pursuant to the provisions of section 61 to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time.

Consistent with the above statutory definition, the Commission promulgated the following definition of "source material":

> (1) Uranium or thorium or any combination of uranium and thorium in any physical or chemical form; or

> (2) Ores that contain, by weight, one-twentieth of 1 percent (0.05 percent), or more, of uranium, thorium, or any combination of uranium and thorium. Source material does not include special nuclear material.

10 C.F.R. § 20.1003; accord id. § 40.4.

It is undisputed that the surface spoilage on Section 17 contains uranium "in any physical . . . form" and thus falls within the first definitional category of "source material" (10 C.F.R. §§ 20.1003, 40.4). Notably, however, not all source material is regulated by the Commission. I conclude that the surface spoilage is source material that is not regulated by the Commission for two reasons.[17]

First, the surface spoilage from the UNC mine is exempt from the licensing requirements of Part 40 pursuant to the regulatory provision that renders licensing unnecessary for "unimportant quantities of source material" (10 C.F.R. § 40.13). The Commission's authority to promulgate this regulation stems from the AEA, which states that a license is not required "for quantities of source material which, in the opinion of the Commission, are unimportant" (42 U.S.C. § 2092). Pursuant to this statutory grant of discretion, the Commission has stated that a license is not required for the possession of ore "in which the source material is by weight less than one-twentieth of 1 percent (0.05 percent) of the [ore]" (10 C.F.R. § 40.13(a)), which "is equivalent to material having uranium concentrated in it at a value of 500 parts per million (ppm)" (NRC Staff Exh. 1, at 5). Because the instant record shows "no materials present on the ground surface of Section 17 exceeding the 500 ppm uranium threshold" for licensable source material (id. at 6; accord HRI Exh. A at 13, 16), I conclude that the surface spoilage from the UNC mine is not source material regulated by the Commission.

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[17] The parties do not raise an issue about the proper definition of the phrase "regulated by the Commission." Rather, they seem to agree that source material is regulated by the Commission if possession of the material requires a license from the Commission. For present purposes, I accept that definition.

Moreover, the surface spoilage is not source material regulated by the Commission for a second, alternative reason. Pursuant to 10 C.F.R. § 40.13(b), a person is exempt from Part 40 licensing requirements "to the extent that such person receives, possesses, uses, or transfers *unrefined and unprocessed ore* containing source material" (10 C.F.R. § 40.13(b)) (emphasis added). "Unrefined and unprocessed ore" is defined as "ore in its natural form prior to any processing, such as grinding, roasting or beneficiating, or refining" (id. § 40.4). The undisputed record establishes that the surface spoilage on Section 17 – which consists of mine spoils used to create roads, and fugitive dust or rock lost from the haul trucks transporting uranium ore to an off-site milling facility on Section 2 (supra note 7) – is unrefined and unprocessed ore from the UNC mine. Accordingly, the surface spoilage is not source material regulated by the Commission.

There is thus no tenable legal or factual basis for concluding that the surface spoilage on Section 17 constitutes source material regulated by the Commission whose radiation should be excluded from background radiation. Rather, as will be discussed in greater detail infra Part III.A.3, this material constitutes "naturally occurring radioactive material" whose radiation is included in background radiation and, therefore, is excluded from the TEDE calculation.[18]

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[18] The Intervenors assert that the record is "barren" regarding the existence of source material at Section 17 (Intervenors' Written Presentation at 16). They argue that "HRI should make clear whether there is source material within . . . Section 17 [and after] HRI provides this information, Intervenors should be given the opportunity to challenge HRI's data and information" (ibid.). For the reasons stated above in text, I find that ample record evidence supports the conclusion that the surface spoilage is *not* source material regulated by the Commission.

c. The Surface Spoilage On Section 17 Is Not Byproduct Material, And Its Radiation Is Therefore Not Excluded From Background Radiation Pursuant To The Last Sentence Of The Regulatory Definition of Background Radiation, 10 C.F.R. § 20.1003

The Intervenors also argue (Intervenors' Written Presentation at 15-22) that the surface spoilage on Section 17 is "byproduct material" whose radiation must be excluded from background radiation (and, hence, included in the TEDE calculation) pursuant to the last sentence of the regulatory definition of "background radiation" (10 C.F.R. § 20.1003). HRI and the NRC Staff disagree. See HRI's Response at 19-21; NRC Staff's Response at 18-20.[19]

Once again, the starting point for determining whether the surface spoilage is byproduct material is the AEA, which provides, in pertinent part, the following definition of "byproduct material" (42 U.S.C. § 2014.e):

> The term "byproduct material" means (1) any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material; (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content . . . .

Because the Intervenors' argument that surface spoilage on Section 17 is "byproduct material" relies solely on the second definitional prong, my analysis will focus exclusively on that prong.

Consistent with the above statutory definition, the Commission defines "byproduct material" in pertinent part as "[t]he tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content" (10 C.F.R. § 20.1003; accord id. § 40.4).

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[19] Because the surface spoilage on Section 17 plainly is not byproduct material pursuant to the regulatory definition, it is not necessary to distinguish between byproduct material that is and is not regulated by the Commission (assuming arguendo that the latter category of byproduct material even exists). Cf. HRI's Response at 17 ("there cannot be . . . byproduct . . . material which is not regulated by the Commission").

The Intervenors assert that surface spoilage on Section 17 "falls squarely under the definition of byproduct material" (Intervenors' Written Presentation at 16-17), because it constitutes "tailings or wastes produced by the extraction or concentration of uranium" (10 C.F.R. § 20.1003). The Intervenors are incorrect.

The Intervenors' assertion ignores that for "tailings or wastes" to fall within the definition of byproduct material, the plain statutory and regulatory language requires that such tailings or wastes be "produced" from ore that has been "processed" for its source material content (42 U.S.C. § 2014.e(2); 10 C.F.R. § 20.1003). See also 57 Fed. Reg. 20,525 (May 13, 1992) ("[f]or the tailings and waste . . . to qualify as 11e(2) byproduct material, the ore must be processed primarily for its source-material content"). In other words, byproduct material occurs as a result of a *processing* activity that *extracts* uranium from ore or otherwise renders the uranium ore into a purer state of uranium. See 10 C.F.R. § 40.4 (defining "unrefined and unprocessed ore" as "ore in its natural form prior to any processing, such as grinding, roasting or beneficiating, or refining"); cf. 42 U.S.C. § 7911(8) & 40 C.F.R. § 192.01(m) (Uranium Mill Tailings Radiation Control Act of 1978 and EPA regulation define "tailings" as "the remaining portion of a metal-bearing ore after some or all of such metal, such as uranium, has been extracted").[20]

Undisputed record evidence establishes that Section 17 contained no processing or milling facility. Thus, uranium ore from the UNC mine was *not* processed on Section 17. It was hauled from Section 17 to the off-site UNC mill located more than three miles away on Section

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[20] Uranium ore from a conventional mine is refined and processed at a milling facility, which is a chemical plant that extracts uranium from the ore. Generally, the ore arrives via truck at the facility, where it is crushed, then leached with sulfuric acid or alkaline. Conventional mills extract 90 to 95 percent of the uranium from the ore. The solid (sandy) portion from the milling process is called mill tailings or wastes, which contain residual uranium and its progeny. To provide for the disposal, long-term stabilization, and control of mill tailings in a safe and environmentally sound manner, Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978, 42 U.S.C. §§ 7901 et seq. See generally Kerr-McGee Chem. Corp. v. NRC, 903 F.2d 1, 2-4 (D.C. Cir. 1990).

2. See NRC Staff Exh. 1 at 6 ("no refining or processing of ore ever took place on Section 17"); accord supra note 7. Because the surface spoilage on Section 17 is unprocessed and unrefined uranium ore, it does not fall within the definition of byproduct material. See NRC Staff Exh. 2 at 2-4 (Section 17 "never contained byproduct materials [because ore from the] Section 17 mine was sent to the UNC mill [on Section 2] for processing").

Because the surface spoilage on Section 17 is not byproduct material, its radiological emissions need not be excluded from background radiation pursuant to the last sentence of the regulatory definition of "background radiation" (10 C.F.R. § 20.1003).

For the same reason, there is no merit to the Intervenors' claim that evaporation pond sludge at Section 17 is byproduct material whose radiation must be excluded from background radiation (Intervenors' Written Presentation at 16). The ponds to which the Intervenors refer are the "mine dewatering ponds typically used at non-ISL underground uranium mines as surface storage areas to keep the mines free from excess water" (NRC Staff Exh. 2 at 4). The putative mine waste contained in the pond sludge was not byproduct material, because, like the surface spoilage on Section 17, it was not the product of a processing activity. In any event, the record shows that the "[m]ine waste – in the form of radium 226 contained in pond sludge – was removed from the ponds more than ten years ago and was disposed of off-site" (ibid.; accord HRI Exh. A at 16).

In sum, there is no tenable legal or factual basis for concluding that Section 17 contains byproduct material whose radiation should be excluded from background radiation.[21]

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[21] The Intervenors opine that "[i]t would be a strange regulatory regime that permitted an owner to sell land with tailings . . . to another owner, who would be allowed to treat this preexisting condition as background radiation" (Intervenors' Written Presentation at 24) (quoting LBP-99-15, 49 NRC at 267). Although the Intervenors' statement is true, it is also quite beside the point, because, as shown above, Section 17 contains no tailings.

3. The Surface Spoilage On Section 17 Is "Naturally Occurring Radioactive Material" Whose Radiation Is Excluded From The TEDE Calculation

That radiological emissions from the surface spoilage on Section 17 are not excluded from background radiation pursuant to the last sentence of the regulatory definition of background radiation does not affirmatively establish that such emissions are part of background radiation and, hence, excluded from the TEDE calculation. To determine the validity of that proposition, I turn first to 10 C.F.R. § 20.1301(a)(1), which sets radiological dose limits for the general public that NRC licensees must meet, and which provides that each licensee shall conduct operations so that:

> The [TEDE] to individual members of the public from the licensed operation does not exceed 0.1 rem . . . in a year, exclusive of the dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with § 20.2003 . . . .

Section 20.1301(a)(1) thus requires a licensee to ensure that the TEDE "to individual members of the public from the licensed operation" does not exceed 0.1 rem per year "exclusive of the dose contributions from background radiation" and other specified sources (10 C.F.R. § 20.1301(a)(1)). Significantly, the phrase "from the licensed operation" appears to serve as a limitation on what is to be included in the TEDE calculation. Because any radiation from the surface spoilage is wholly unrelated to HRI's licensed ISL mining operation, it follows – from the plain regulatory language – that such radiation is not included in the TEDE calculation. See NRC Staff's Response at 20; NRC Staff's Supplemental Brief at 2-3, 6-7.[22]

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[22] I decline to base this decision exclusively on this rationale, because it essentially renders the remaining portion of the regulation – which specifies several categories of radiation dose contributions that are to be excluded from the TEDE calculation (some of which plainly are not related to the licensed operation) – unnecessary. I therefore proceed with an analysis that inquires whether radiation from the surface spoilage is background radiation that is excluded from the TEDE.

A further limitation on the TEDE calculation imposed by section 20.1301(a)(1) is that it does not include "background radiation." The first sentence of the regulatory definition of that term (10 C.F.R. § 20.1003) states that background radiation is radiation from: (1) "cosmic sources"; (2) "naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material)"; and (3) global fallout "from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee." HRI and the NRC Staff argue that the surface spoilage on Section 17 is "naturally occurring radioactive material" whose radiation is background radiation that, pursuant to 10 C.F.R. § 20.1301(a)(1), is excluded from the TEDE calculation. HRI's Response at 19-21; NRC Staff's Response at 20-22. I agree.[23]

Neither the AEA nor Commission regulations define the term "naturally occurring radioactive material." However, the parties have submitted record evidence that, for present purposes, provides an adequate definition of that term.[24]

The term "naturally occurring radioactive material," or NORM, is accorded a broad, commonsensical meaning. It consists of materials that contain primordial radioisotopes (e.g., uranium and its progeny) which are present naturally in rocks, soils, water, and minerals, and that are not regulated by the Commission. See NRC Staff Exh. 6, at 2; NRC Staff Exh. 8, at 3. This broad definition of NORM includes radioactive materials that are undisturbed in nature, as well as radioactive materials that, as a result of human activities, are no longer in their natural state. For example, NORM includes the following industrial wastes that are not regulated by

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[23] My analysis here is limited to surface spoilage on Section 17, because, as explained supra Part III.A.1, the UNC mine is sealed and is not a source of radiological emissions.

[24] Because the term "naturally occurring radioactive material" lacks a statutory or regulatory definition, I construe it in accord with its "'ordinary or natural' meaning" (Smith v. United States, 508 U.S. 223, 228 (1993)), which, as discussed above, is informed by regulatory and industry usage and practice.

the Commission (NRC Staff Exh. 6, at 3 & Attachment 4): uranium mining overburden; phosphate waste; water treatment waste; petroleum production waste; mineral processing waste; and geothermal energy production waste.[25]

Around 1998, as a result of regulatory and industry practice, the subset of NORM whose radionuclides have become concentrated and/or exposed as a result of human activities became known as "technologically enhanced naturally occurring radioactive materials," or TENORM. See NRC Staff Exh. 8, at 3 & n.1. The National Academy of Sciences (NAS) defines TENORM as "any naturally occurring material not subject to regulation under the Atomic Energy Act whose radionuclide concentrations or potential for human exposure have been increased above levels encountered in the natural state by human activities" (id. at 3) (quoting National Research Council of the [NAS] and National Academy of Engineering, "Evaluation of Guidelines for Exposures to [TENORM]" 19 (1999)).

In a June 2000 report to Congress, the United States Environmental Protection Agency (EPA) endorsed NAS's definition of TENORM, and it further described TENORM as follows (NRC Staff Exh. 8, at 2):

> TENORM . . . [is] not subject to regulation under the Atomic Energy Act . . . [and consists of] material containing radionuclides that are present naturally in rocks, soils, water, and minerals and that have become concentrated and/or exposed to the accessible environment as a result of human activities such as manufacturing, water treatment, or [conventional] mining operations.

The surface spoilage on Section 17 plainly falls within the definition of TENORM, because it is "material containing radionuclides that are present naturally in rocks . . . and that have become concentrated and/or exposed to the accessible environment as a result of . . .

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[25] In 1986, the Commission issued a proposed rule that defined "natural background exposure" as "exposure to cosmic and terrestrial sources of [NORM], including technologically enhanced radioactive material, such as plasterboard and fertilizer" (51 Fed. Reg. 1,092 (Jan. 9, 1986)). Although this definition did not appear in the final rule (see 56 Fed. Reg. 23,260 (May 21, 1991)), it illustrates that the Commission long has viewed NORM as including radioactive materials that, as a result of human activities, are no longer in their natural state.

[conventional] mining operations" (NRC Staff Exh. 8, at 2). Because the surface spoilage is TENORM (which is a subset of NORM), its radiation is background radiation that is excluded from the TEDE calculation pursuant to 10 C.F.R. § 20.1301(a)(1).[26]

The Intervenors argue that the surface spoilage is not NORM (or its subset, TENORM), because the surface spoilage is under the control of HRI, and the definition of "background radiation" indicates that background radiation emanates only from material that is "not under the control of the licensee" (Intervenors' Supplemental Brief at 16). The Intervenors are incorrect. The phrase "not under the control of the licensee" was added in 1997 when the Commission amended the definition of "background radiation" to include fallout from past nuclear accidents such as Chernobyl (62 Fed. Reg. 39,058, 39,087 (July 21, 1997)). As the NRC Staff correctly points out (NRC Staff's Supplemental Brief at 13-14), the regulatory history of this amendment indicates that the phrase "not under the control of the licensee" was intended only to apply to Chernobyl-like fallout, not to the antecedent phrase "naturally occurring radioactive materials." See 59 Fed. Reg. 43,200, 43,217 (Aug. 22, 1994).

The Intervenors also argue that, even if the surface spoilage is NORM, the radiation from radon emanating from the surface spoilage must be excluded from background radiation and included in the TEDE calculation. See Intervenors' Supplemental Brief at 6-7. This is so, they assert, because "background radiation" is defined as "[NORM], including radon (*except as a decay product of source or special nuclear material*" (10 C.F.R. § 20.1003) (emphasis added). The NRC Staff argues contrarily that the parenthetical excepts only radon that is a decay product of source and special nuclear materials that are regulated by the Commission, and the

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[26] There is also legislative support for the conclusion that TENORM is a subset of NORM. For example, in a conference report directing EPA to arrange for NAS to conduct a study examining the basis for EPA's guidance on TENORM, the conferees stated that "indoor radon" – which is the result of human activities (i.e., construction) and, thus, constitutes TENORM – is an example of NORM. See NRC Staff Exh. 8 at 4 (quoting H.R. Rep. No. 104-384, at 77 (1995)).

surface spoilage does not fall into that category because it contains source material that is *not* regulated by the Commission. See NRC Staff's Supplemental Brief at 10-13. I am persuaded by the Staff's argument.

The regulatory history of the radon parenthetical indicates that the Commission intended to include "ambient radon levels" within the definition of "background radiation." See 56 Fed. Reg. 23,360, 23,365 (May 21, 1991). To interpret the radon parenthetical as applying to radon from *all* source and special nuclear materials would essentially exclude "all radon" from background radiation (NRC Staff's Supplemental Brief at 13), thus negating the Commission's stated purpose of including radiological emissions from "ambient radon" in background radiation. This I decline to do. Cf. Exxon Nuclear Co. (Nuclear Fuel Recovery and Recycling Center), ALAB-447, 6 NRC 873, 878 (1977) ("[i]t is an elementary canon of construction that we 'cannot interpret federal statutes to negate their own stated purposes'") (quoting New York State Dep't of Soc. Servs. v. Dublino, 413 U.S. 405, 419-20 (1973)). The Intervenors' interpretation is also flawed as a matter of common sense, because it imputes to the Commission an intent to create a schizophrenic rule that simultaneously includes and excludes ambient radon as NORM. Cf. Treadway v. Gateway Chevrolet Oldsmobile Inc., 362 F.3d 971, 976 (7th Cir. 2004) (nonsensical statutory interpretations are disfavored because legislators are unlikely to draft such statutes).[27]

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[27] The NRC Staff correctly observes that the radon parenthetical must be read as "not including all source material. Otherwise, the exception will swallow the rule" (NRC Staff's Supplemental Brief at 11). Rather, the parenthetical establishes that "only radon that is a decay product of NORM is to be considered NORM [and] radon as a decay product of materials that are regulated by the Commission, and thus are not NORM, is to be excepted from . . . background radiation" (id. at 13). Accord NUREG-1736, Consolidated Guidance: 10 C.F.R. Part 20 – Standards for Protection Against Radiation, Final Report at 3-8 (Oct. 2001) (explaining how radon exposure to a licensee's employee from source material that is NORM (e.g., radon emanating from the ground into a workplace basement) is considered background radiation that is not subject to NRC regulation, whereas radon exposure from source material that is regulated by the Commission (e.g., radon emanating from a licensed uranium source stored near

(continued...)

In sum, I conclude that the surface spoilage is NORM (or more precisely, TENORM) that emits background radiation (10 C.F.R. § 20.1003), which is excluded from the TEDE calculation pursuant to 10 C.F.R. § 20.1301(a)(1).[28]

4. Because Radiation From The Surface Spoilage Is Background Radiation That Is Excluded From The TEDE Calculation, The Record Conclusively Establishes That The TEDE For Section 17 Does Not Exceed The Regulatory Limit

The fact that the radiation from the surface spoilage is NORM (or its subset, TENORM) and hence, must be excluded from the TEDE calculation, fatally undercuts the Intervenors' challenge to the TEDE calculation. A critical premise underlying their TEDE challenge is that radiation from the surface spoilage must be included in the TEDE calculation, and that such radiation – by itself – already exceeds regulatory limits. See, e.g., Intervenors' Written Presentation at 18 ("[HRI's license for ISL mining on Section 17 should be revoked because the] existing levels of radiation at Section 17 [from the UNC mine and its spoilage] are currently above regulatory limits"); id. at 21 ("radiation [on Section 17 from extant material associated with the UNC mine], which under NRC regulations must be included in TEDE, exceeds regulatory exposure limits"); ibid. ("[b]ecause existing radiation levels at Section 17 already exceed regulatory limits, HRI's license for Section 17 should be revoked").

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[27](...continued)
the workplace) is subject to NRC regulation.

[28] The Intervenors repeatedly argue that radiation from the surface spoilage cannot be background radiation, because background radiation does not include radiation sources that are the direct or indirect result of human activity (e.g., Intervenors' Written Presentation at 20 n.9, 22 n.11; Intervenors' Supplemental Brief at 5, 6, 7). The manifest fallacy of this argument is evinced by: (1) the regulatory definition of "background radiation," which explicitly includes "global fallout" from the "testing of nuclear explosive devices" and from "nuclear accidents such as Chernobyl" (10 C.F.R. § 20.1003); and (2) the accepted definition of NORM (whose radiation is background radiation (ibid.)), which includes "material containing radionuclides that are present naturally in rocks, soils, water, and minerals and that have become concentrated and/or exposed to the accessible environment as a result of human activities such as manufacturing, water treatment, or [conventional] mining operations" (NRC Staff Exh. 8, at 2). See also supra notes 25-26 and accompanying text.

The Intervenors' argument that the TEDE calculation on Section 17 exceeds the regulatory limits collapses by its own terms once it is determined that radiation from the surface spoilage is background radiation that is not included in the calculation. As HRI's expert, Mr. Pelizza, explains (HRI Exh. A at 12) (emphasis in original):

> The concern over radiological impacts by HRI's operations is unfounded . . . . The only radiological air effluent at [Section 17] during operations would be radon (FEIS at 4-82). The FEIS describes the . . . evaluation of radiological impacts at various boundary receptor points and the closest downwind residence (FEIS Figure 4.5), concluding that: "The calculated exposures and potential concentrations, with emission controls, are a small fraction of the regulatory limit" (FEIS at 4-83), and that: "The proposed project would have negligible effects in terms of health physics and radiological impacts" (FEIS at 4-87).

Moreover, the record shows that the radon emissions controls for Section 17 "reduce the airborne concentration by approximately a factor of 10" (HRI Exh. A at 11-12) (citing FEIS Table 4.24). The resulting radiological exposure levels "at the nearest residence are approximately 0.5 percent and 7.6 percent of the limit, with and without the emissions controls, respectively" (HRI Exh. A at 12) (emphasis in original). "In other words, the FEIS concludes that even without emission controls, at the closest residence the calculated exposures would only be 7.6 percent of the limit" (ibid.). Accord HRI Exh. B at 10-11 (Dr. Chambers declares his agreement with the TEDE calculations in the FEIS, and states that the doses "are inconsequential in comparison to the dose from natural background" and the "gamma dose[s] to nearby residents outside of [the] licensed site 17 operation are extremely small both on [an] absolute basis and by comparison to natural background and of no significance"); NRC Staff Exh. 1, at 13 (Mr. McKenney declares his agreement with the FEIS that the calculated exposures at the nearest residence resulting from HRI's operations at Section 17 "are a small fraction of the regulatory limits").

The Intervenors offer no evidence casting any doubt on the above FEIS determinations. I therefore conclude that HRI has demonstrated by a preponderance of the evidence that the

TEDE for Section 17, including radiological air emissions relating to HRI's licensed operations, does not exceed the regulatory limit.[29]

B. THERE IS NO MERIT TO THE INTERVENORS' CLAIM THAT HRI's APPLICATION IS INADEQUATE WITH REGARD TO RADIOLOGICAL AIR EMISSIONS AT SECTION 17

Introduction: The Intervenors also argue that HRI's license for Section 17 is invalid "because the information HRI submitted with respect to radioactive air emissions at Section 17 is insufficient for the Staff to have made a determination about . . . health and safety impacts" (Intervenors' Written Presentation at 24). Specifically, the Intervenors claim that HRI's license application is deficient in the following respects (ibid.): (1) HRI failed to supply site-specific source term data for radiological air emissions for its proposed operations at Section 17; (2) HRI failed to supply site-specific meteorological information for Section 17; (3) HRI failed to account for nearby family residences at Section 17 when calculating TEDEs for Section 17 receptors; and (4) HRI provided no technical documentation for its pressurized air effluent control system. HRI and the NRC Staff respond that the Intervenors' arguments lack merit. See HRI's Response at 31; NRC Staff's Response at 24-26.

As discussed below, I conclude that the Intervenors' arguments are insubstantial.

1. HRI's Source Term Data Is Adequately Protective Of Public Health And Safety

The Intervenors correctly state that the only significant radiological air emission resulting from HRI's licensed operations at Section 17 will be radon, which will be released from two sources: (1) the ion exchange columns at the satellite facility on Section 8 when the uranium

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[29] The Intervenors observe that the "Navajo Nation Council recently passed the Diné Natural Resources Protection Act," which "bans all uranium mining and processing, including ISL mining, within Navajo Indian Country" (Intervenors' Written Presentation at 23 & n.13). The potential impact of this Act on HRI's ultimate ability to engage in ISL uranium mining in Navajo Indian Country is beyond the scope of this proceeding. Nevertheless, pursuant to the terms of its license, HRI will be required to ensure its operations do not run afoul of this Act prior to commencing operations. See LC 9.14.

oxide is stripped from the resin; and (2) the pressure relief valves on the well field trunk lines at Section 17 that will vent periodically during mining operations. See Intervenors' Written Presentation at 25 (citing FEIS at 4-82 to 4-83). The Intervenors assert, however, that HRI improperly calculated the "[p]rojected doses to individuals exposed to [this] radon" (Intervenors' Written Presentation at 25). To reliably determine the TEDE, argue the Intervenors, HRI should have used site-specific source data – i.e., dissolved radon concentrations in groundwater at Section 17. Instead, HRI relied on dissolved radon concentrations in groundwater from Unit 1, which is approximately 20 miles northeast of Section 17 and which, allegedly, is not representative of the Section 17 groundwater. The Intervenors argue that HRI's failure to use site-specific information renders the TEDE calculations untrustworthy, and, accordingly, its license for Section 17 mining operations is invalid (id. at 25-28) (citing Declaration of Bernd Franke (June 12, 2005) [hereinafter Intervenors' Exh. L]).

HRI responds that it acted reasonably in using radon concentration in groundwater from Unit 1 to calculate the TEDE for Section 17 operations (HRI's Response at 32). HRI's expert, Mr. Pelizza, states that radon emissions "are directly dependent upon the amount of uranium" (HRI Exh. A at 4), and because the concentrations of underground uranium ore at Unit 1 and Section 17 are substantially identical, the radon concentrations in the groundwater at Unit 1 and Section 17 can likewise be predicted to be substantially identical. Mr. Pelizza explains:

> Both Section 17 and Unit 1 are redistributed natural uranium ore (roll fronts) of similar grade/thickness, similar width . . . [and] similar age. . . . [T]here is no technical reason to assume that radon from concentrations of uranium ore at Section 17 will be significantly different than at Unit 1 unless there is a corresponding difference in the quality of uranium in the ore[, and there] is not. . . . [A] review of the average width and the [grade times thickness] of the ore bodies shows that the ore at Unit 1 is about 75% wider than at . . . Section 17 while the grade times thickness (GT) is 33% higher at Section 17 than at Unit 1. One is wider, the other has higher GTs – the difference is irrelevant.

Ibid. (footnote omitted).[30] I find HRI's argument and supporting evidence to be credible and persuasive. I thus conclude that HRI properly used the radon concentration in Unit 1 groundwater as a proxy for the radon concentration in Section 17 groundwater.[31]

The Intervenors' expert, Mr. Franke, nevertheless asserts that "it is likely that dissolved radon concentrations are higher at Section 17 than at Unit 1 because groundwater [at the former] has been exposed to oxidizing conditions in the existing mine shafts" (Intervenors' Exh. L at 9-10). Mr. Franke, however, provides no support for this assertion. HRI's expert, Mr. Pelizza, states that he "know[s] of no reference that suggests that radon dissolution in water is 'likely' or even possibly impacted as [a] result of oxidation" (HRI Exh. A at 5). Rather, radon forms from decay of Radium-226, and "[o]xidation does not affect the rate of radioactive decay" (ibid.). I therefore decline to credit Mr. Franke's groundless assertion.

Mr. Franke also "assum[es]" that radon concentration in the Section 17 groundwater may be twelve times higher than in the Unit 1 groundwater (Intervenors' Exh. L at 10), but he fails to provide any basis for this assumption, which I therefore decline to credit. See NRC Staff Exh. 1, at 10; HRI Exh. A at 5. Moreover, Mr. Franke advances an argument using an incorrect figure from the FEIS. Referring to FEIS Table 4.24, he cites a figure of 8.4×10^{-5} as the radon concentration at receptor CRR 4, and he argues that multiplying this figure by twelve "would result in radon concentrations exceeding the applicable standard" (Intervenors' Exh. L at 10). The figure he uses, however, is the maximum radon concentration for an *unpressurized* ion

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[30] Mr. Pelizza states that an ore's GT – which is derived by multiplying the average percent of uranium of an ore interval by the thickness in feet of that interval – is "an excellent measure of the overall mineralization of the ore over the interval that will be mined" (HRI Exh. A at 4 n.1).

[31] Notably, the predictions in the FEIS regarding radon releases during Section 17 mining operations were based on several highly conservative assumptions (FEIS at 4-83), which will "provide assurances that the actual [radon] releases will be well within the 10 C.F.R. Part 20 limits" (NRC Staff's Response at 25) and, hence, protective of public health and safety.

exchange system, and HRI will be using a *pressurized* ion exchange system for which the maximum radon concentration is 5.7×10^{-6} (NRC Staff Exh. 1, at 11) (citing FEIS Table 4.24). Even if this figure were multiplied by twelve (notwithstanding that, as stated above, the number twelve lacks a basis), it would still result in a radon concentration that is less than 1/10th the regulatory standard. See NRC Staff Exh. 1, at 11; see also HRI Exh. A at 5.

Finally, the Intervenors argue that HRI's license should be invalidated because HRI improperly failed to calculate doses from radiological air emissions attributable to "land application" of radioactive wastewater (Intervenors' Written Presentation at 26-27). "Land application" is a wastewater disposal method that uses agricultural irrigation equipment to apply wastewater over a relatively large land area (FEIS at 2-19). Assuming this argument has not been waived (but see HRI's Response at 32 n.13; NRC Staff's Response at 25), it does not provide a basis for invalidating HRI's license, because the issue is not ripe for adjudication. "HRI's license does not currently authorize waste disposal through land application" (CLI-01-04, 53 NRC at 51). Before HRI may use a land application disposal technique, "it must first submit a plan, in the form of a 'detailed license amendment' application, and receive approval by the NRC" (ibid.). Such an application would be subject to additional environmental review and would have to demonstrate that the proposed disposal method "meets NRC's release limits for radionuclides" (FEIS at 2-18; accord id. at 4-90; CLI-01-04, 53 NRC at 51; LC 11.8). If HRI ultimately chooses to use land application as a disposal technique, the Intervenors will then have the opportunity to raise any appropriate challenges.

2. HRI's Meteorological Data Is Adequately Protective Of Public Health And Safety

The Intervenors claim (Intervenors' Written Presentation at 28) that HRI improperly failed to establish a meteorological station on Section 17 to obtain on-site weather data for its license application. Instead, HRI relied on National Weather Service data for Gallup, New

Mexico, which is about 12 miles southwest of Section 17. This renders HRI's license invalid, argue the Intervenors, because "site-specific meteorological data, and wind data in particular, are critical to accurately determine dispersion of radon at Section 17" (id. at 29). Because the wind data used by HRI – including data showing that the wind generally blows in a southwest to northeast direction – allegedly is not representative of Section 17, the Intervenors assert that HRI's mining operations may pose an unacceptable threat to public health and safety (ibid.) (citing Intervenors' Exh. L).

HRI responds (HRI's Response at 35-36) that its use of local National Weather Service data was appropriate and, indeed, consistent with the NRC's Standard Review Plan for [ISL] Uranium Extraction License Applications, NUREG-1569 (June 2003) [hereinafter NUREG-1569], which requires NRC to review data "collected onsite or at nearby meteorological stations. The data to be reviewed include (1) National Weather Service station data, including locations of all National Weather Service stations within . . . [a 50-mile] radius; . . . [or] (2) On-site meteorological data . . . if National Weather Service data representative of the site are not available" (NUREG-1569 at 2-13). HRI's expert, Mr. Pelizza, states that the National Weather Service data used in this case – which came from a service station only 12 miles southwest of Section 17 and, thus, is well within the 50-mile limit – "is the best available data to be used in the . . . modeling that was performed for the project" (HRI Exh. A at 6). Moreover, HRI also evaluated limited meteorological information obtained from the UNC mill site about "two to three miles north of the Section 17 site which supports the [National Weather Service] information" (ibid.). Accordingly, declares Mr. Pelizza, its meteorological data is more than adequate, because it is representative of the downwind *and* upwind sides of Section 17 (ibid.).

Mr. Pelizza also examined topographical maps that, in his judgment, confirmed what the National Weather Service station data revealed; namely, topographical features cause the wind to move from the southwest to the northeast (HRI Exh. A at 6). Although the Intervenors' wit-

ness, Mr. King – who lives directly east of Section 17 – states that he occasionally observes dust blowing from west to east onto his land (Declaration of Larry J. King at 3 (June 2, 2005) [hereinafter Intervenors' Exh. N]), this does not alter the conclusion that the prevailing wind direction on Section 17 is southwest to northeast. As Mr. Pelizza explained, Mr. King's observation is consistent with the wind rose diagram in FEIS Figure 3.1, "where the annual wind rose includes a due westerly wind component, albeit not the predominant component" (HRI Exh. A at 7).

The NRC Staff agrees with HRI that the meteorological data is representative of Section 17 and is sufficiently protective of public health and safety (NRC Staff's Response at 26). Moreover, the NRC Staff's expert, Mr. McKenney, confirms that the topographical features around Section 17 exhibit a general southwest to northeast trend akin to the prevailing wind direction, which would influence the wind in its already-predominating direction (NRC Staff Exh. 1, at 12).

I find the arguments and supporting evidence submitted by HRI and the NRC Staff to be credible and persuasive. I thus conclude that, contrary to the Intervenors' assertion, the meteorological data used by HRI for its Section 17 operations is appropriate and adequately protective of public health and safety.

3. HRI Properly Accounted For Boundary Receptors On Section 17

The Intervenors further claim that HRI's license should be invalidated, because HRI – when predicting airborne radionuclide concentrations at various receptor locations – "failed to account for three residences [Mr. Larry King and his two sisters and their families] that are close to and downwind from its Section 17 mine site" (Intervenors' Written Presentation at 30) (citing Intervenors' Exhs. L & N).

HRI responds that its selection of boundary receptors was proper and protective of the King family residences. First, HRI's expert, Mr. Pelizza, states that HRI selected boundary receptors in compliance with guidance in NUREG-1569, which provides that Staff should review estimates of radiation doses to individuals at, inter alia, "the nearest residence in the direction of the prevailing wind" (HRI Exh. A at 7) (quoting NUREG-1569 at 7-9). Mr. Pelizza explains that the King residence is nearest to the Section 17 mine site, but it is *not* the residence nearest to the primary emission source (i.e., the processing facility at Section 8), *nor* is it downwind of that source (HRI Exh. A at 7-8). Rather, "the nearest residence [to the primary emission source] in the direction of the prevailing wind" (NUREG-1569, at 7-9) is the residence denominated CRR4 (HRI Exh. A at 7; FEIS Figure 4.5). Because, as the FEIS shows (FEIS Table 4.24), the predicted radiological air emissions at CRR4 are a "small fraction of the regulatory limits" (id. at 4-83), "the King [residence], which is farther . . . from the primary source term at Section 8 and oblique to the prevailing wind . . . will also receive exposure that is at a fraction of the regulatory limits" (HRI Exh. A at 7).

Mr. Pelizza explains that the dose predictions made by HRI at a number of other receptor locations confirm the debility of the Intervenors' concern (HRI Exh. A at 8):

> [The Intervenors' expert] does not address the dose calculations at other receptors shown in FEIS Figure 4.5. His only concern is that the King residence may be closer to the Section 17 well field than Receptor B5, but he does not address the modeling results at receptors B2 and B3, both of which are much closer to the predominant source . . . than the King residence yet they are shown to receive a small fraction of the . . . [regulatory limit]. Given that the King residence is farther away and oblique to the prevailing wind as compared to B2 and B3, a [dose in excess of the regulatory limit] is not feasible.

Mr. Pelizza thus concludes that the Intervenors' assertion that HRI improperly selected boundary receptors is not well founded and must be rejected.

The NRC Staff's expert, Mr. McKenney, agrees with HRI that the Intervenors' concern about selection of boundary receptors is insubstantial. As he explains, the King residences are

to the southeast of the Section 8 processing facility, which contains the ion exchange columns and will be "by far the largest potential source of radon from HRI's [Section 17] operations" (NRC Staff Exh. 1, at 12). The calculated dose to the residence denominated CRR4 (FEIS Table 4.24) – which is about 500 meters from the Section 8 processing facility and in the direction of the prevailing winds – is well below the 10 C.F.R. Part 20 limits and bounds any possible doses to which the King residences may be exposed (NRC Staff Exh. 1, at 12-13).

Mr. McKenney also observes that "any [radon] releases from the Section 17 well fields [due to the venting of pressure relief valves] would likely be blown to the northeast and away from the King family residences" (NRC Staff Exh. 1, at 12). In any event, "such releases would be quite low [and] any radon concentrations at [the King residences] as the result of HRI's ISL operations would be much less than that calculated for CRR4" (id. at 13).

I find the arguments and supporting evidence submitted by HRI and the NRC Staff to be credible and persuasive. I thus conclude that, contrary to the Intervenors' assertion, the boundary receptors selected by HRI for its Section 17 operations were appropriate and adequately protective of public health and safety.

4. HRI Has Provided Adequate Information To Demonstrate That Its Pressurized System Is Based On Proven Technology

The Intervenors argue that HRI failed to provide adequate technical information about its pressurized well field and ion exchange system, which purportedly will keep radon gas in solution in the circulating lixiviant and thereby minimize radon emissions (Intervenors' Written Presentation at 31). The Intervenors characterize HRI's system as "untested" and "unproven" (id. at 34, 35). Because the record allegedly contains "no documentation of [the system's] operational efficacy" (id. at 32), the Intervenors claim that HRI's license to mine Section 17 should be invalidated (id. at 31-35) (citing, e.g., Intervenors' Exh. L; Affidavit of Alan Eggleston (May 14, 2004) [hereinafter Intervenors' Exh. T]).

HRI and the NRC Staff respond that the record contains ample evidence demonstrating that HRI's pressurized system is based on proven technology. See HRI's Response at 39-41; NRC Staff's Response at 26-27). I agree.

Significantly, in Phase I of this proceeding, the former Presiding Officer expressly rejected the identical argument advanced by the Intervenors. There, the Intervenors – in the context of asserting that the FEIS should be supplemented – challenged the adequacy of HRI's radiological assessment for Section 8, arguing that it was based on an untested and unproven system that purportedly would maintain radon gas in solution in a closed, pressurized system (LBP-04-23, 60 NRC at 457-58; see also Intervenors' Exh. T at 4). The Presiding Officer found this argument to be "without merit" (LBP-04-23, 60 NRC at 458). He explained (ibid.):

> As pointed out by Mr. Pelizza, the pressurized downflow ion exchange system that will be used by HRI is not experimental and, in fact, is employed at other ISL sites in Wyoming licensed by the NRC. Further, according to [affiants from HRI and the NRC Staff], the process to be employed by HRI will serve to reduce significantly radon release during the production phase of the facility. . . . [T]he FEIS adequately evaluates the processes to be utilized by HRI to minimize the emission of airborne effluents.

The Commission declined to disturb that decision (CLI-04-39, 60 NRC 657 (2004)).

Here, no one disputes the correctness of the former Presiding Officer's conclusion that the pressurized system HRI will use at Section 8 has been adequately tested and proven (LBP-04-23, 60 NRC at 457-58). Because the system that HRI will use there is identical to the system it will use at Section 17, the former Presiding Officer's well-supported conclusion applies with equal force here. For that reason, I reject the Intervenors' attack on HRI's pressurized system.

Alternatively, I conclude, based on an independent review of the record, that the Intervenors' argument is insubstantial. First, HRI's expert, Mr. Pelizza, states that HRI will "remov[e] vent gas (including radon) [from wastewater] in an intermediate holding tank using a vacuum pump, compressing the gas and returning it to the groundwater on the injection side. . . . This

is a relatively simple concept so there is no standard design plan per se" (HRI Exh. A at 9). The absence of technical documentation in the FEIS regarding this process is thus understandable, because the design simply implements "basic engineering fundamentals" (ibid.).

Second, Mr. Pelizza states that – contrary to the Intervenors' assertion – HRI's "[p]ressurized downflow ion exchange systems are not unusual and are currently in use at the NRC licensed ISL sites in Wyoming and by URI, Inc., HRI's sister company in Texas" (HRI Exh. A at 9). The NRC Staff's expert, Mr. McKenney, confirms that the technology is tested and proven, citing the "successful use of similar technology at the Power Resources, Inc.'s Highland-Smith Ranch ISL facility in Wyoming" (NRC Staff Exh. 1, at 13). Notably, record evidence obtained from monitoring operations at the ISL mining site in Texas shows that the system released "no measured radon" to the atmosphere (HRI Exh. A at 10), which likewise demonstrates the technical efficacy of HRI's proposed system, and which refutes the notion that HRI's proposed system is not based on established technology.

Moreover, HRI will monitor its lixiviant during Section 17 mining operations to ensure that the amount of radon released to the atmosphere does not exceed the figure that HRI used for purposes of predicting radon emissions (HRI Exh. A at 9). Additionally, to ensure compliance with the limits in 10 C.F.R. Part 20, HRI will continuously monitor for gamma and radon emissions upwind of the Section 8 satellite processing facility, downwind of the Section 8 satellite processing facility, and downwind at the nearest residence (LC 10.30; Intervenors' Exh. F at 104, 106; Intervenors' Exh. I at 14-16). Finally, HRI's license requires it to submit a detailed effluent and environmental monitoring program prior to injection of lixiviant at any site (LC 10.30). These requirements will serve to ensure that HRI's radiological air emissions at Section 17 do not exceed regulatory limits and, thus, do not threaten public health and safety.[32]

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[32] Significantly, the FEIS shows that even *without* a closed, pressurized system,
(continued...)

IV. CONCLUSION

For the foregoing reasons, I find – with the concurrence of Special Assistants Dr. Richard Cole and Dr. Robin Brett – that HRI has carried its burden of demonstrating that the Intervenors' challenges relating to radiological air emissions do not provide a basis for invalidating or amending HRI's license to perform ISL uranium mining at Section 17.

Pursuant to 10 C.F.R. §§ 2.786(b) and 2.1253, a party wishing to challenge this decision before the Commission must file a petition for review within fifteen days after service of this decision. Any other party to this proceeding may, within ten days after service of a petition for review, file an answer supporting or opposing Commission review (id. § 2.786(b)(3)). The filing of a petition for review is mandatory for a party seeking to exhaust its administrative remedies before seeking judicial review (id. §§ 2.786(b)(1) and 2.1253). If no party files a petition for review of this decision, and if the Commission does not sua sponte review it, this decision will constitute the final action of the Commission thirty days after its issuance (id. § 2.1251(a)).

It is so ORDERED.

BY THE PRESIDING OFFICER[33]

[Original signed by:]

E. Roy Hawkens
ADMINISTRATIVE JUDGE

Rockville, MD
January 6, 2006

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[32](...continued)
airborne concentrations of radon would be well below the 10 C.F.R. Part 20 limits (FEIS at 4-85; see also NRC Staff Exh. 1, at 14-15).

[33] Copies of this Partial Initial Decision were sent this date by Internet email transmission to counsel for: (1) the applicant, HRI; (2) the Intervenors, Eastern Navajo Diné Against Uranium Mining, the Southwest Research and Information Center, Grace Sam, and Marilyn Morris; and (3) the NRC Staff.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
HYDRO RESOURCES, INC.	)	Docket No. 40-8968-ML
	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB PARTIAL INITIAL DECISION (PHASE II RADIOLOGICAL AIR EMISSIONS CHALLENGES TO IN SITU LEACH URANIUM MINING LICENSE) (LBP-06-01) have been served upon the following persons by U.S. mail, first class, or through NRC internal distribution.

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Dated at Rockville, Maryland,
this 6th day of January 2006