

May 8, 2015

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:)	
)	Docket No. 40-8943
CROW BUTTE RESOURCES, INC.)	
)	ASLBP No. 08-867-02-OLA-BD01
(License Renewal))	

CROW BUTTE RESOURCES' INITIAL STATEMENT OF POSITION

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INTRODUCTION

Pursuant to 10 C.F.R. § 2.1207(a)(1) and the Licensing Board's Order (Setting Schedule through Evidentiary Hearing and Providing Case Management Information), dated March 25, 2015, Crow Butte Resources, Inc. ("Crow Butte" or "Applicant") hereby submits this Initial Statement of Position on all admitted contentions.¹ This Initial Statement of Position is supported by direct testimony from Crow Butte witnesses and the exhibits submitted concurrently. For the reasons set forth below, Crow Butte's license renewal application ("LRA") satisfies the Atomic Energy Act and the Commission's regulations. In addition, the NRC Staff's Environmental Assessment ("EA") satisfies the requirements of the National Environmental Policy Act ("NEPA"). All contentions should be resolved in favor of Crow Butte and the NRC Staff.

PROCEDURAL BACKGROUND

A. License Application

Crow Butte submitted its LRA (Exh. CBR-011) on November 27, 2007. The Crow Butte facility is a uranium in situ recovery ("ISR") facility subject to safety requirements

¹ DTE Electric formerly operated under the name Detroit Edison Company. The name change was effective on January 1, 2013. For simplicity, the name "DTE" will be used throughout this testimony.

found in 10 C.F.R. Part 40. The LRA consisted of a combined technical and environmental report. This renewal request is the second renewal request for this license. The Crow Butte facility has had the commercial license to operate and has operated since 1989. The initial license was issued in 1989 for a 6-year time period, and a 1995 renewal application was approved in 1998 for a 10-year time period. The expiration date for the current license was February 28, 2008. Because Crow Butte submitted a renewal application within the regulatory mandated timeframe, the existing license continues in effect until a decision is made by the NRC on the renewal application.

B. Petitions to Intervene

A notice of opportunity to request a hearing was published in the *Federal Register* with a deadline for filing petitions of July 28, 2008.² Three timely petitions to intervene were filed by: (1) the Oglala Sioux Tribe (“OST”);³ (2) Beatrice Long Visitor Holy Dance, Joe American Horse, Sr., Debra White Plume, Loretta Afraid of Bear Cook, Thomas K. Cook, Dayton O. Hyde, Bruce McIntosh, Afraid of Bear/Cook Tiwahe, American Horse Tiospaye, Owe Aku/Bring Back the Way, and Western Nebraska Resources Council (“Consolidated Intervenors” or “CI”);⁴ and (3) the Oglala Delegation of the Great Sioux Nation Treaty Council (“Treaty Council”).⁵ OST submitted five proposed contentions; the Consolidated Intervenors

² See “Notice of Opportunity for Hearing, Crow Butte Resources, Inc., Crawford, NE, In Situ Leach Recovery Facility, and Order Imposing Procedures for Access to Sensitive Unclassified Non-Safeguards Information (SUNSI) for Contention Preparation,” 73 Fed. Reg. 30426 (May 28, 2008).

³ “Request for Hearing and/or Petition to Intervene,” dated July 28, 2008.

⁴ “Consolidated Request for Hearing and Petition for Leave to Intervene,” dated July 28, 2008 (“Consolidated Petition”).

⁵ “Request for Hearing and Petition for Leave to Intervene,” dated July 28, 2008.

submitted twenty-three proposed contentions; and the Treaty Council submitted six proposed contentions.

The Licensing Board issued its decision on standing and contentions on November 21, 2008. The Board found that OST had standing and admitted all five proposed contentions (Environmental Contentions A through E). The Board granted standing to Consolidated Intervenors and admitted four contentions (or parts of contentions) (Environmental Contention E, Technical Contention F, and Miscellaneous Contentions G and K). The Board denied the petition of the Treaty Council. On December 10, 2008, the Board admitted a late-filed contention filed by Consolidated Intervenors.

In CLI-09-09, dated May 18, 2009, the Commission reversed the Board's decision admitting the OST's Contentions EC-B (cultural resources) and EC-E (waste removal) and Consolidated Petitioners' Contentions EC-E (economic value of environmental benefits), MC-K (foreign ownership), and SC-A (Arsenic). The Commission also granted a motion for summary disposition on MC-G (concealment of foreign ownership). The Commission affirmed admission of the four remaining contentions (Contentions A, C, D, and F).

C. Safety Evaluation Report

In December 2012, the NRC Staff issued its Safety Evaluation Report ("SER") on the license renewal application. The SER documented the safety aspects of the NRC Staff's review of the LRA, as amended, and included an assessment of Crow Butte's compliance with applicable 10 C.F.R. Part 40 requirements, including Appendix A. The NRC Staff subsequently revised and reissued the SER in August 2014 to revise several license conditions and the discussion of them in the SER (Exh. NRC-009).

The SER concludes that the LRA complies with the standards and requirements of the Atomic Energy Act and the Commission's regulations. Based on its review, as documented

in this SER, the NRC Staff found that Crow Butte is qualified by reason of training and experience to use source material for the purpose it requested; and that Crow Butte's proposed equipment and procedures for use at its Crow Butte facility are adequate to protect public health and minimize danger to life or property. In accordance with 10 C.F.R. § 40.32(d), the NRC Staff found that license renewal will not be inimical to the common defense and security or to the health and safety of the public. The intervenors did not file any new or amended contentions based on either version of the SER.

D. Environmental Assessment and Renewed License

The NRC Staff completed its environmental review and issued the final EA on October 27, 2014. The NRC Staff concluded that the impacts from the proposed action would be small for all environmental resource areas. In addition, the NRC Staff concluded that there would be no disproportionately high and adverse impacts to minority and low-income populations during the license renewal period. Based on its review of the proposed action relative to the requirements set in 10 C.F.R. Part 51, the NRC Staff determined that license renewal will not significantly affect the quality of the human environment. Based on that assessment, the NRC concluded that preparation of an Environmental Impact Statement ("EIS") was not necessary and issued a Finding of No Significant Impact ("FONSI"). The NRC subsequently issued the renewed license on November 5, 2014 (Exh. NRC-012)

In their filings, dated January 5, 2015, CI and OST proposed 14 new "joint" contentions, and OST proposed one additional contention, purportedly based on the EA/FONSI. In LBP-15-11, dated March 16, 2015, the Board admitted several new contentions, including Contention 1 (cultural resources), Contentions 6 and 9 relating to restoration, Contention 12, and

Contention 14. The Board also incorporated parts of other contentions into the previously admitted contentions.⁶

APPLICABLE LEGAL STANDARDS

A. National Environmental Policy Act

All or portions of Contentions A, C, D, 1, 6, 9, 12, and 14 raise environmental issues under the National Environmental Policy Act (“NEPA”). NEPA does not mandate substantive results; rather, it imposes procedural restraints on agencies, requiring them to take a “hard look” at (and disclose) the environmental impacts of a proposed action and reasonable alternatives to that action.⁷ This “hard look” is subject to a “rule of reason.”⁸ This means that an “agency’s environmental review, rather than addressing every impact that could possibly result, need only account for those that have some likelihood of occurring or are reasonably foreseeable.”⁹

As the Commission has explained, “NEPA also does not call for certainty or precision, but an *estimate* of anticipated (not unduly speculative) impacts.”¹⁰ When faced with

⁶ The NRC Staff and Crow Butte both filed petition for interlocutory review of this decision. Those petitions remain pending before the Commission.

⁷ *See Louisiana Energy Servs., L.P. (Claiborne Enrichment Ctr.)*, CLI-98-3, 47 NRC 77, 87-88 (1998); *see also Balt. Gas & Elec. Co. v. NRDC*, 462 U.S. 87, 97-98 (1983) (holding that NEPA requires agencies to take a “hard look” at environmental consequences prior to taking major actions).

⁸ *Louisiana Energy Servs. (National Enrichment Facility)*, LBP-06-8, 63 NRC 241, 258-59 (2006) (*citing Long Island Lighting Co. (Shoreham Nuclear Power Station)*, ALAB-156, 6 AEC 831, 836 (1973)); *see also Dep’t of Transp. v. Pub. Citizen*, 541 U.S. 752, 767-69 (2004) (stating that the rule of reason is inherent in NEPA and its implementing regulations).

⁹ *LES*, LBP-06-8, 63 NRC at 258-59 (*citing Shoreham*, ALAB-156, 6 AEC at 836).

¹⁰ *Louisiana Energy Servs. (Nat’l Enrichment Facility)*, CLI-05-20, 62 NRC 523, 536 (2005).

uncertainty, NEPA only requires “reasonable forecasting.”¹¹ There is no NEPA requirement to use the best scientific methodology, and NEPA should be construed in the light of reason if it is not to demand virtually infinite study and resources.¹² A NEPA document is not intended to be a “research document,” reflecting the frontiers of scientific methodology, studies, and data.¹³ Nor must the discussion of the impacts be encyclopedic in scope or detail. Likewise, NEPA analyses often must rely upon imprecise and uncertain information, which should be judged on its reasonableness.¹⁴

The Commission has also stated that the principal goals of the NEPA review are “to force agencies to take a ‘hard look’ at the environmental consequences of a proposed project, and, by making relevant analyses openly available, to permit the public a role in the agency’s decision-making process.”¹⁵ “[I]t is now well settled that NEPA itself does not mandate particular results, but simply prescribes the necessary process.”¹⁶ Thus, the NRC Staff need only include in its NEPA evaluation sufficient information to satisfy one of NEPA’s essential functions — to provide the public and the decision maker with accurate information comparing

¹¹ *Scientists’ Inst. for Pub. Info., Inc. v. AEC*, 481 F.2d 1079, 1092 (D.C. Cir. 1973).

¹² *Entergy Nuclear Generation Co. (Pilgrim Nuclear Power Station)*, CLI-10-11, 71 NRC ___, slip op. at 37 (Mar. 26, 2010) (citations omitted).

¹³ *Id.*

¹⁴ *Louisiana Energy Servs. (Claiborne Enrichment Center)*, LBP-96-25, 44 NRC 331, 355 (1996).

¹⁵ *Louisiana Energy Services (Claiborne Enrichment Center)*, CLI-98-3, 47 NRC 77, 87 (1998).

¹⁶ *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989).

the proposed action and its alternatives.¹⁷ Licensing boards also do not sit to “flyspeck” the EA or to add minor details or nuances to the analysis.¹⁸ It is enough that the EA discusses the significant aspects of the probable environmental impacts of the proposed action.¹⁹

B. Record of Decision

In determining whether the EA should have included additional information, the Board may consider the record as a whole. Commission precedent holds that the adjudicatory record and a licensing board decision become part of the NEPA record of decision.²⁰ In NRC licensing proceedings, “the ultimate NEPA judgments regarding a facility can be made on the basis of the entire record before a presiding officer, such that the [NRC Staff NEPA document] can be deemed amended pro tanto.”²¹ Therefore, the Board may consider the full record before it, including the testimony and exhibits at the hearing, to conclude that “the aggregate is

¹⁷ *Calvert Cliffs 3 Nuclear Project LLC and UniStar Nuclear Operating Services LLC* (Calvert Cliffs Nuclear Power Plant, Unit 3), LBP-10-24, __ NRC __, __ (slip op. at 50) (December 28, 2010).

¹⁸ *Hydro Resources, Inc.* (P.O. Box 15910, Rio Rancho, NM 87174), CLI-01-04, 53 NRC 31, 71 (2001).

¹⁹ *Long Island Lighting Company* (Shoreham Nuclear Power Station), ALAB-156, 6 AEC 831, 836 (1973).

²⁰ *See, e.g., Louisiana Energy Servs.* (National Enrichment Facility), CLI-06-15, 63 NRC 687, 707 n. 91 (“Adjudicatory findings on NEPA issues, including our own in this decision, become part of the environmental ‘record of decision’ and in effect supplement the FEIS.”); *LES*, CLI-98-3, 47 NRC at 89 (“In NRC licensing adjudications . . . it is the Licensing Board that compiles the final environmental ‘record of decision’ The adjudicatory record and Board decision . . . become, in effect, part of the FEIS.”).

²¹ *Louisiana Energy Servs.* (National Enrichment Facility), LBP-05-13, 61 NRC 385, 404 (2005).

sufficient to satisfy the agency's obligation under NEPA" to take a "hard look" at the environmental consequences of issuing the renewed license.²²

C. Atomic Energy Act

Technical contentions raise issues regarding compliance with the Atomic Energy Act ("AEA") and NRC regulations. The NRC must license ISR operations in accordance with NRC regulatory requirements in 10 C.F.R. Part 40 to protect public health and safety from radiological hazards. Under 10 C.F.R. § 40.32, the NRC Staff is required to make the following safety findings when issuing a renewed ISR license:

- The application is for a purpose authorized by the Atomic Energy Act.
- The applicant is qualified by reason of training and experience to use the source material for the purpose requested in such a manner as to protect health and minimize danger to life or property.
- The applicant's proposed equipment, facilities, and procedures are adequate to protect health and minimize danger to life or property.
- The issuance of the license will not be inimical to the common defense and security or to the health and safety of the public.

10 C.F.R. Part 40, Appendix A, sets forth, among other things, the technical criteria for applicants and licensees relating to the siting, operation, decontamination, decommissioning, and reclamation of mills and tailings or waste systems and sites at which such mills and systems are located. Although the Appendix A criteria were developed for conventional uranium milling facilities, they have since been applied in limited fashion to ISR facilities.²³

²² *LES*, LBP-06-8, 63 NRC at 286.

²³ *See Hydro Resources, Inc.* (2929 Coors Road, Suite 101, Albuquerque, NM 87120), CLI-99-22, 50 NRC 3, 8-9 (1999) ("While, as a general matter, Part 40 applies to ISL mining, some of the specific requirements in Part 40, such as many of those found in Appendix A,

D. Burden of Proof

An applicant generally has the burden of proof in a licensing proceeding.²⁴ However, in cases involving NEPA contentions, the burden belongs to the NRC Staff because it, not the applicant, has the responsibility for complying with NEPA.²⁵ However, because the Staff, as a practical matter, relies heavily upon the applicant's ER in preparing the EA, should the applicant become a proponent of a position set forth in the EA, the applicant also has the burden on that matter.²⁶

The NRC in its administrative proceedings has generally relied upon the "preponderance of the evidence"²⁷ standard in reaching the ultimate conclusions after a hearing to resolve a contention.²⁸ Thus, for technical contentions, the Board must consider the evidence and testimony and determine whether Crow Butte has shown by the preponderance of the

address hazards posed only by conventional uranium milling operations, and do not carry over to ISL mining") (internal reference omitted).

²⁴ 10 C.F.R. § 2.325.

²⁵ *See, e.g., Duke Power Co. (Catawba Nuclear Station, Units 1 & 2)*, CLI-83-19, 17 NRC 1041, 1049 (1983).

²⁶ *Louisiana Energy Servs., L.P. (Claiborne Enrichment Center)*, LBP-96-25, 44 NRC 331, 338-39 (1996) (citing *Pub. Serv. Co. of N.H. (Seabrook Station, Units 1 & 2)*, ALAB-471, 7 NRC 477, 489 n.8 (1978)), *rev'd on other grounds*, CLI-97-15, 46 NRC 294 (1997).

²⁷ The definition of "preponderance of the evidence" in Black's Law Dictionary, 6th ed. (p. 1182), is "[e]vidence which is of greater weight or more convincing than the evidence offered in opposition to it; that is, evidence which as a whole shows that the fact sought to be proved is more probable than not."

²⁸ *Advanced Medical Systems, Inc. (One Factory Row, Geneva, Ohio 44041)*, CLI-94-6, 39 NRC 285 (1994), *aff'd*, *Advanced Medical Systems, Inc. v. NRC*, 61 F.3d 903 (6th Cir. 1995); *see also Commonwealth Edison Co. (Zion Station, Units 1 & 2)*, ALAB-616, 12 NRC 419, 421 (1980) (stating that applicants are not held to an absolute standard or required to prove a matter conclusively but rather, consistent with the Administrative Procedure Act, are held to a preponderance standard).

evidence that its LRA satisfies applicable regulatory requirements. And, for environmental contentions, the Board must consider the evidence and testimony and determine whether the NRC Staff and Crow Butte have shown by the preponderance of the evidence that the NRC Staff's review was adequate to comply with NEPA.

APPLICANT WITNESSES

Crow Butte's Initial Written Testimony focuses on four different groups of contentions. Initial testimony on hydrogeology issues (Contentions A, C, D, F, and 14) are presented by Mr. Wade Beins, Mr. Robert Lewis, Mr. Bryan Soliz, Mr. Matt Spurlin, and Mr. Larry Teahon. Initial testimony on restoration issues (Contentions 6 and 9) is presented by Mr. Robert Lewis, Mr. Larry Teahon, and Mr. Doug Pavlick. Initial testimony on cultural resources (Contention 1) is presented by Mr. Larry Teahon. Initial testimony on Contention 12 also is presented by Mr. Larry Teahon. Through the testimony and supporting exhibits, Crow Butte's witnesses demonstrate that that Crow Butte's equipment and procedures for use at its facility are adequate to protect public health and minimize danger to life or property and, with respect to the NRC Staff's EA, that the evaluation is reasonable and reflects a "hard look" at the potential impacts of renewing the license to operate Crow Butte.

A. Wade Beins

Wade Beins is employed as a Senior Geologist at Crow Butte.²⁹ He has approximately 20 years of experience at the Crow Butte site as a geologic technician and geologist. His testimony addresses the issues raised in Contentions A, C, D, F, and 14.

²⁹ A copy of his professional qualifications statement is attached to Exhibit CBR-002.

B. Robert Lewis

Robert Lewis is the owner and Principal Hydrogeologist of AquiferTek LLC, providing specialized hydrogeologic and environmental consulting services.³⁰ He has over 27 years of experience as a groundwater scientist and environmental consultant, and is a registered Professional Geologist in Wyoming. His expertise includes groundwater flow and transport modeling, mine hydrology, soil and groundwater contamination investigation and remediation, fate and transport of organic, inorganic, and radiological constituents, and water resource development. He has authored technical papers, peer-reviewed journal articles, and book chapters concerning mine hydrology and water quality, groundwater modeling, and water resource evaluation. He has served as Associate Editor of *Ground Water* journal, and has been a member of ASTM subcommittees D.18.04 (Determination of Hydrogeological Parameters) and D18.21.10 (Ground Water Modeling). Mr. Lewis' testimony addresses the issues raised in Contentions A, C, D, F, 6, 9, and 14.

C. Bryan Soliz

Bryan Soliz is employed as a Principal Geologist for Cameco Corporation and previously worked as the Director of Exploration and Development for Cameco Resources.³¹ In particular, he is experienced in interpreting regional and site geology. His testimony addresses the issues raised in Contentions A, C, D, F, and 14.

³⁰ A copy of his professional qualifications statement is attached to Exhibit CBR-003.

³¹ A copy of his professional qualifications statement is attached to Exhibit CBR-004.

D. Matt Spurlin

Matt Spurlin is a Senior Hydrogeologist at ARCADIS.³² He has a M.S. in Geology from UCLA and is a registered professional geologist in the State of Texas. He specializes in applying geological, hydrogeological, geophysical and visualization science techniques to provide high quality hydrogeological data interpretation. He has worked for a variety of clients, including the National Science Foundation and state agencies, to provide high-quality hydrogeological and visualization expertise on projects ranging from crustal strain analysis of NASA shuttle radar data to interpretation of complex geologic folding and faulting influences on local and regional hydrogeology. His skills include enhanced 3D visualization and data analysis, high-resolution investigation techniques, downhole geophysics investigations, site conceptual model development, water resource assessment, aquifer testing, design and optimization of remediation strategies, field hydrogeology and data collection. His testimony addresses the issues raised in Contentions A, C, D, F, and 14.

E. Larry Teahon

Larry Teahon is employed by Crow Butte Resources as the Safety, Health, Environment, and Quality (“SHEQ”) Manager at the Crow Butte facility.³³ He oversees radiation protection, health and safety, and environmental programs at the site and ensure compliance with all applicable regulatory requirements. He assists in the development and review of radiological and environmental sampling and analysis procedures and is responsible for routine auditing of the programs. He also has been extensively involved in the identification, protection, and

³² A copy of his professional qualifications statement is attached to Exhibit CBR-005.

³³ A copy of his professional qualifications statement is attached to Exhibit CBR-006.

assessments of cultural resources at the Crow Butte site for many years. His testimony addresses the issues raised in Contentions A, C, D, F, 1, 6, 9, 12, and 14.

F. Doug Pavlick

Doug Pavlick is employed by Cameco Resources as the General Manager for U.S. Operations.³⁴ He has experience in all phases of mine operations. His testimony addresses the issues raised in Contentions 6 and 9 involving site restoration issues.

DISCUSSION OF HYDROGEOLOGY CONTENTIONS

A. Overview of Hydrogeology Contentions

1. Contention A

Contention A is “environmental” contention entitled “[t]here is no evidence based science for [the NRC Staff’s] conclusion that ISL mining has ‘no non radiological health impacts,’ or that non radiological impacts for possible excursions or spills are ‘small.’” OST claims, based on 1989 letter to the NRC and statements by Dr. Hannan LaGarry, that the mined aquifer used by Crow Butte “likely” communicates with aquifers that supply water to the Pine Ridge Indian Reservation and that mining fluid could migrate into the aquifer that supplies drinking water. In effect, the contention challenges Crow Butte’s ability to maintain control over underground mining fluids. In addition, based on claims by Dr. Abitz provided with the initial contention, OST argues that there is no scientific basis for excluding uranium from the monitor well testing and that bi-weekly testing of monitoring wells is insufficient to identify potential contamination.

³⁴ A copy of his professional qualifications statement is attached to Exhibit CBR-009.

2. Contention C

Contention C is a “environmental” contention entitled “[the NRC Staff’s] characterization that the impact of surface waters from an accident is ‘minimal since there are no nearby surface water features,’ does not accurately address the potential for environmental harm to the White River.” OST claims that, because the White River runs through the Pine Ridge Reservation, Crow Butte’s operations could potentially contaminate the White River from surface spills and subsurface migration. OST argues that Crow Butte ignores the White River as a potential surface water that is affected in the event of an accident and claim that the White River alluvium (as a potential pathway) should be evaluated for contamination.

3. Contention D

Contention D is an “environmental” contention entitled “[the NRC Staff] incorrectly states there is no communication among the aquifers, when in fact, the Basal Chadron aquifer, where mining occurs, and the aquifer, [sic] which provides drinking water to the Pine Ridge Indian Reservation, communicate with each other, resulting in the possibility of contamination of the potable water.” Further, based on this potential communication between the aquifers, the contention claims that the EA’s environmental justice analysis, including analysis of cumulative effects, should be expanded to consider potential impacts on the aquifer which provides drinking water to the Pine Ridge Indian Reservation. Based on statements by Dr. LaGarry, OST claims that aquifers in this area are interconnected, and, as a result, there is potential pathway for contamination of the Pine Ridge water supply via faults and fractures, such as the White River Structural Feature.

4. Contention F

Contention F is a “technical” contention entitled “Failure to Include Recent Research.” The contention is based on claims by Dr. LaGarry that Crow Butte (as well as the

NRC and NDEQ) are relying on old data and old research when there is more recent research. In particular, Dr. LaGarry claims that the recent mapping of the geology of northwestern Nebraska has shown that the simplified, “layer cake” concept applied by pre-1990’s workers is incorrect.

5. *Contention 14*

Contention 14 is an “environmental” contention entitled “[t]he EA violates NEPA in its failure to provide an analysis of the impacts on the project from earthquakes; especially as it concerns secondary porosity and adequate confinement.” The only bases for the contention are the claim that the EA omitted two earthquakes near Chadron in 2011 (the LRA was submitted in 2007) and LaGarry’s claim that even small earthquakes can alter the secondary porosity of an aquifer and modify groundwater flow patterns (affecting confinement). In many ways, this contention overlaps with Contention D, which alleges the potential for contamination via faults and fractures (secondary porosity).

B. Assessment of Hydrogeology Contentions

The testimony begins by providing a brief overview of regional geology and hydrogeology to provide background information before focusing in on site-specific geology and hydrogeology. The witnesses then explain the various ways in which Crow Butte successfully demonstrated that the mined aquifer is confined, including borehole log data, laboratory tests of soils and rocks, water level data, water sampling data, aquifer pump tests, and operating experience. The witnesses also describe Crow Butte operations, including the steps taken to control underground mining fluid and the monitoring activities associated with site operations.

1. Confinement

In their testimony, the Crow Butte witnesses summarize the detailed information available regarding the geology at the license area.³⁵ The witnesses explain that the Basal Chadron Sandstone, which is the geologic stratigraphic unit that is host to the uranium mineralization, is bounded above and below by very low permeability strata that form aquicludes (*i.e.*, essentially impermeable rock or sediments that form barriers to groundwater flow). The witnesses explain that the lower confining unit, the Pierre Shale, has a very low hydraulic conductivity (consistent with an impermeable shale) and is regionally continuous. The upper confining units, the overlying Arikaree Group and Lower Brule Formation, form thick, regionally-continuous confining layer.

Crow Butte's witnesses explain that the conclusions in the LRA and EA regarding confinement are based on multiple sources of site-specific data, including correlated borehole logs, laboratory tests of confining zone cores, water quality data, water level data, aquifer pump tests, and operating experience. This data shows that low permeability layers confine the uranium-bearing sandstone both above and below. This isolates the uranium-producing horizon from overlying and underlying aquifers.

For example, borehole logs and laboratory data show the Pierre Shale is an ideal confining bed with measured vertical hydraulic conductivity in the area of review of less than

³⁵ Initial Written Testimony of Crow Butte Resources Witnesses Wade Beins, Bryan Soliz, Robert Lewis, Matt Spurlin, and Larry Teahon on Contentions A, C, D, F, and 14, dated May 1, 2015, at ¶32-¶46 (Exh. CBR-001)

2.0×10^{-9} cm/sec. The upper confinement is impermeable clay with a measured vertical hydraulic conductivity less than 1×10^{-10} cm/sec within the current license area.³⁶

Water level data also support hydrologic isolation of the Basal Chadron Sandstone with respect to the other water-bearing intervals of interest at Crow Butte. The large differences in hydraulic head (generally in excess of 100 feet) between the Basal Chadron Sandstone and the Lower Brule Formation provide an additional line of evidence that adequate hydraulic confinement exists between the two aquifers. In addition, the direction of any vertical groundwater movement would be strongly *downward* given the lower water levels in the production aquifer. The geochemical groundwater characteristics of the Brule Formation and Basal Chadron Sandstone further indicate that the two aquifers are not hydrologically connected.

The witnesses also describe the results of four aquifer pump tests at the Crow Butte site used to evaluate hydraulic characteristics of the Basal Chadron Sandstone, assess the integrity of the confining layer above the mining zone, and comply with requirements outlined in the Underground Injection Control (“UIC”) permit issued by Nebraska.³⁷ Results demonstrate the integrity of the confining layer above the mining zone throughout the license area. The pump tests also confirm proper plugging and abandonment of all exploration, development, and pilot test holes drilled on the site that could act as a secondary conduit between aquifers.

The witnesses also note that, based on more than 20 years of operation at the site, Crow Butte has not identified any information that would undermine the conclusion that the Basal Chadron Sandstone is confined within the license area.

³⁶ As a point of reference, materials with conductivity less than 10^{-6} cm/sec are commonly used as liners in landfills and hazardous waste repositories to protect groundwater from contamination.

³⁷ An aquifer pumping test evaluates aquifer properties by stimulating (or stressing) the aquifer (*e.g.*, via pumping) and observing the aquifer’s response in observation wells.

2. Potential Contamination Pathways

The witnesses directly address the intervenors' concerns regarding the potential for offsite contamination pathways.³⁸ The witnesses explain that Crow Butte relies on detailed, site-specific investigation (*e.g.*, pump tests) to show that no faults or fractures exist at the site that could provide a pathway for contamination of the White River or drinking water at Pine Ridge. The witnesses acknowledge the potential for small faults and fractures or other limited areas of secondary permeability to occur in the sediments overlying the mined aquifer (*i.e.*, the Brule formation). However, the witnesses explain that these features typically only develop in materials having a significant silt and sand percentage, not the claystones that are common in the confining units, which have very low permeability and higher plasticity. The witnesses also note that the sediments overlying the mined aquifer have not undergone complete lithification (the process by which sediments are converted into rock) and some tend to swell rapidly (*i.e.*, higher plasticity) when exposed to water. The witnesses therefore conclude that any minor faults or fractures that did appear would close up quickly.

The witnesses also explain the investigation of the White River Structural Feature. The feature, which at depth offsets the Pierre Formation, manifests at shallower depths as a northeast trending, subsurface fold within the formations of interest near the license areas. The White River structure was evaluated using three-dimensional geologic modeling software utilizing geologic picks from hundreds of geophysical logs. The observed hydraulic heads and gradients in the Basal Chadron Sandstone within the license area further support the conclusion that the White River Structural Feature does not convey water between the Chadron Formation and the Brule Formation.

³⁸ Initial Hydrogeology Testimony at ¶47-¶61 (Exh. CBR-001)

With respect to the potential for secondary porosity from earthquakes, the witnesses first discuss the fact that Crow Butte is located in a region of low seismic hazards. The witnesses note that, based on the site-specific data (pump tests, hydraulic heads, close-spaced drilling, borehole logs, etc.), confinement exists at the site despite the occasional low intensity seismic event. The witnesses further explain that Crow Butte has not observed operational impacts from prior earthquakes within the region.

3. Use of Recent Research

The witnesses also address the intervenors' claim that Crow Butte is using outdated research.³⁹ The witnesses first note that Crow Butte's conclusions regarding confinement were based on detailed, site-specific geological and hydrogeological studies that conclusively demonstrate that the Basal Chadron Sandstone is hydraulically isolated from other aquifers by continuous confining layers of very low permeability in the license area. The witnesses describe the history of stratigraphic nomenclature for the White River Group and acknowledge that it has had various interpretations over time. However, the witnesses explain that, to be consistent with historical permitting and to prevent confusion as to where mining is occurring, Crow Butte continues to use the term "Basal Chadron Sandstone" to describe the mined formation. Ultimately, the witnesses conclude that, stratigraphic nomenclature aside, nothing in the naming conventions for the geologic units in Nebraska or at the Crow Butte facility changes the interpretation of the physical or hydraulic features of the geologic units.

³⁹ Initial Hydrogeology Testimony at ¶¶62-¶¶66 (Exh. CBR-001)

4. Leaks and Spills During Operations

Crow Butte's witnesses also discuss the potential for leaks and spills at the site to result in offsite contamination.⁴⁰ The witnesses explain that spills generally take two forms of subsurface releases such as an excursion, in which process chemicals threaten to migrate beyond the wellfield, or surface spills, such as pond leaks or piping ruptures, that result in a release of waste solutions. At Crow Butte, engineering and administrative controls are in place to prevent both subsurface and surface releases to the environment and also to mitigate the effects should a release occur.

According to witnesses, Crow Butte maintains an extensive water sampling program to identify any potential impacts to water resources in the area. The groundwater monitoring program is used to establish baseline water quality prior to mining at each mine site; detect excursions of lixiviant either horizontally or vertically outside of the production zone; and determine when the production zone aquifer has been adequately restored following mining. The program includes sampling of monitoring wells and private wells within and surrounding the license area to establish pre-mining baseline water quality. The monitoring requirements are established by the Class III permit issued by the State of Nebraska.

The witnesses testify that the primary purpose of the wellfield monitoring program during operation is to detect and correct conditions that could lead to an excursion of lixiviant or detect such an excursion, should one occur. The techniques employed include monitoring of production and injection rates and volumes, wellhead pressure, water levels, and water quality. According to Crow Butte's Class III UIC permit, production zone monitor wells shall be spaced no greater than 300 feet from a mine unit and no greater than 400 feet between

⁴⁰ Initial Hydrogeology Testimony at ¶67-¶91 (Exh. CBR-001)

the wells and located so as to detect excursions. Shallow monitor wells are completed in the first continuous and water-bearing sandstone unit overlying the production zone, with one well for every four acres included in the mine unit. In addition, Crow Butte maintains a production “bleed,” which creates a pressure gradient within the mining area that causes an inflow of groundwater into the production area and prevents loss of mining solution.

In response to the intervenors concerns with the frequency of monitoring and the lack of uranium sampling, the witnesses explain that Crow Butte conducts bi-weekly testing of three “indicator” parameters: chloride, conductivity, and total alkalinity. Uranium is not considered a good excursion indicator because the rate of uranium transport could be slowed by adsorption and precipitation. According to the witnesses, under the conditions encountered at Crow Butte, the total distance uranium could be expected to travel would be 0.5% to 15% of the distance traveled by a conservative parameter (*e.g.*, chloride). For this reason, uranium is not as effective a tool for providing a timely alert regarding an excursion as the parameters used by Crow Butte. The witnesses also note that horizontal flow rates at the edges of the mining area are relatively slow, ranging from 5-15 feet per month. This means that there is more than ample time with biweekly testing to detect a potential excursion and take corrective action prior to there being any movement of mining fluids beyond the permit area.

The witnesses also explain that, if an excursion is verified, Crow Butte undertakes corrective actions. The witnesses acknowledge that there have been several confirmed horizontal excursions in the Basal Chadron sandstone. However, these excursions were quickly detected and recovered through overproduction in the immediate vicinity of the excursion. In no case did excursions threaten the water quality of an underground source of drinking water since the monitor wells are located well within the aquifer exemption area approved by the EPA and

the NDEQ. Crow Butte has never had a vertical excursion of mining solution. According to the witnesses, the total effect of the close proximity of the monitor wells, the low flow rate from the well patterns, and overproduction of leach fluids (production bleed) makes the likelihood of an undetected excursion extremely remote. Offsite environmental monitoring also does not indicate that mining fluid has migrated beyond the mine site.

With respect to surface leaks and spills, the witnesses first describe the operational measures in place to prevent, avoid, and mitigate leaks and spills, including construction and engineering controls. The witnesses note that Crow Butte has never had a spill that was reportable under 10 C.F.R. Part 20. The witnesses also describe measures Crow Butte has taken to affirmatively protect surface water quality in the event of a wellfield accident, including installation and monitoring of protective berms and dams around Squaw Creek and English Creek. The effectiveness of these measures is confirmed by water quality sampling in Squaw and English Creeks, which does not indicate any impacts from Crow Butte's operations. Overall, the witnesses conclude that Crow Butte has taken comprehensive steps to prevent significant impacts to surface water features at the Crow Butte site. In light of the protection measures in place, ongoing monitoring, and requirement to take corrective actions, the witnesses conclude that the risk of contamination of nearby surface water features is minimal.

5. Environmental Justice

The witnesses also address the portion of Contention D alleging that potential contamination outside the immediate vicinity of the site could have environmental justice impacts.⁴¹ The witnesses testify that there is no evidence that Crow Butte's operations have had any effect on water quality outside of the permit area. Based on all of the detailed, site-specific

⁴¹ Initial Hydrogeology Testimony at ¶¶92-¶93 (Exh. CBR-001)

evidence that supports confinement of mining fluids within the mined aquifer, the witnesses conclude that it is highly unlikely that mining operations will impact groundwater or surface water outside the permit area. In the absence of any “off-site” impacts that could contaminate the White River or drinking water supplies at Pine Ridge, there would be no environmental justice impacts from Crow Butte’s operations.

6. *Baseline Water Quality*

Regarding the calculation of baseline water quality, the witnesses note that Crow Butte follows the requirements of its Class III UIC permit for calculating baseline groundwater quality.⁴² The witnesses also describe the processes used to ensure that samples are representative. Wells must be developed to restore the natural hydraulic conductivity and geochemical equilibrium of the aquifer following well construction before baseline water quality samples are taken. The field parameters must be stable at representative formation values before baseline sampling begins. The witnesses also note that no additional wellfields are slated for development within the permit area.

C. Conclusions on Hydrogeology Contentions

Overall, the EA and the record satisfy NEPA with respect to hydrogeology and the impacts of Crow Butte’s operations on groundwater and nearby surface water. The NRC Staff in the EA has taken the requisite hard look at the impacts of renewing Crow Butte’s license on groundwater and surface water. The NRC Staff addressed the significant aspects of the probable environmental impacts of the proposed action. Moreover, each of the issues raised by the intervenors has been considered by Crow Butte in the LRA, addressed by the NRC Staff in the SER and in the EA, and discussed in the testimony of the witnesses.

⁴² Initial Hydrogeology Testimony at ¶¶94-¶¶97 (Exh. CBR-001)

1. Contention A

Regarding Contention A, the witnesses conclude that all of the data and evidence available to Crow Butte indicates that the non-radiological (as well as the radiological) impacts of Crow Butte's operations are small.⁴³ Crow Butte has established through multiple lines of evidence — borehole logs, laboratory tests, water quality, water levels, aquifer pump tests, operational experience — that the Basal Chadron aquifer, where mining occurs, is isolated from overlying aquifers. As the EA recognizes, Crow Butte conducts its operations to maintain hydraulic control over mining fluids and maintains an extensive environmental monitoring network to confirm control over mining fluids. Mining fluid from Crow Butte's operations will not migrate beyond the license area or contaminate the aquifers that supply drinking water to the Pine Ridge Reservation. In addition, Crow Butte has established that parameters other than uranium provide better indications of potential excursions and that biweekly monitoring is adequate to detect potential excursions. Most importantly, Crow Butte's operations have not contaminated the drinking water at the Pine Ridge Reservation, nor has it contaminated any drinking water between the site and the Pine Ridge Reservation. The EA “comes to grips with all important considerations” and nothing more need be done.⁴⁴

For these reasons, Contention A should be resolved in Crow Butte's favor.

2. Contention C

Regarding Contention C, the witnesses conclude that Crow Butte has taken active steps to minimize the potential for either surface or subsurface leaks or spills to cause environmental harm to the White River, including use of berms or dikes to protect these

⁴³ Initial Hydrogeology Testimony at ¶98 (Exh. CBR-001)

⁴⁴ *Systems Energy Resources, Inc.* (Early Site Permit for Grand Gulf Site), CLI-05-4, 61 NRC 10, 13 (2005).

waterbodies.⁴⁵ Regular monitoring of Squaw and English Creeks shows that Crow Butte's operations are not adversely impacting surface waters in the mine area. If leaks and spills were to occur, Crow Butte is required to take immediate corrective actions. Crow Butte maintains an extensive environmental monitoring network that would detect any migration of mining fluids beyond the license area, including testing of water quality in private wells outside the mining area. At bottom, there is no data to indicate any impacts to the White River from Crow Butte's operations, no basis to conclude that should impacts occur corrective actions would not be taken, and no basis for finding the NRC Staff's EA to be inadequate. For these reasons, Contention C should be resolved in Crow Butte's favor.

3. Contention D

Regarding Contention D, the witnesses conclude that Crow Butte has established through multiple lines of evidence — borehole logs, laboratory tests of cores, water quality, water levels, aquifer pump tests, operational experience — that the Basal Chadron aquifer, where mining occurs, is hydraulically isolated from overlying aquifers.⁴⁶ Crow Butte also conducts its operations to maintain hydraulic control over mining fluids and maintains an extensive environmental monitoring network to confirm control. The testing and operational experience to date confirms the absence of faults or fractures that could transmit mining fluid into aquifers that provide drinking water to the Pine Ridge Reservation. Crow Butte's analysis of the White River Structural Feature, as supported by NRC Staff numerical modeling, indicates that it does not create a hydraulic connection between the Basal Chadron Sandstone and the Brule Formation. Because of the absence of any impacts beyond the mining area, much less 30+ miles away at the

⁴⁵ Initial Hydrogeology Testimony at ¶99 (Exh. CBR-001)

⁴⁶ Initial Hydrogeology Testimony at ¶100 (Exh. CBR-001)

Pine Ridge Reservation, there was no need for the NRC Staff to include the Pine Ridge Reservation in the environmental justice analysis. There is no basis for concluding that the EA discussion of confinement or the White River Structural Feature is inadequate. For these reasons, Contention D should be resolved in Crow Butte's favor.

4. Contention F

Regarding Contention F, the witnesses conclude that recent studies proposing new nomenclature for some of the geologic units within the license area do not indicate that any portion of the LRA was inadequate.⁴⁷ In discussing regional geology, Crow Butte, the NRC Staff, and NDEQ continue to use the nomenclature found in the prior license applications for consistency and to facilitate public review and comparison. Most importantly, stratigraphic nomenclature aside, nothing in the naming conventions for the geologic units changes the interpretation of the physical or hydraulic features of the geologic units presented by Crow Butte. For these reasons, Contention F should be resolved in Crow Butte's favor.

5. Contention 14

Regarding Contention 14, the witnesses conclude that Crow Butte considered the potential impacts of earthquakes at the site prior to beginning operations.⁴⁸ Crow Butte recognizes the potential for small faults and fractures to occur in the sediments overlying the mined aquifer as well as the possibility of limited areas of secondary permeability within isolated areas of the Brule Formation. Aquifer pump tests, however, confirmed adequate upper confinement and the absence of any faults or fractures that would permit a preferential permeability pathway for impacted groundwater to migrate into overlying aquifers. And, if there

⁴⁷ Initial Hydrogeology Testimony at ¶101 (Exh. CBR-001)

⁴⁸ Initial Hydrogeology Testimony at ¶102 (Exh. CBR-001)

were any significant changes in hydrogeological conditions (*e.g.*, newly formed fractures or faults), Crow Butte would detect the change in well-field operations and monitoring activities. No such conditions have been observed during operations. Moreover, any minor faults or fractures that did appear would close up quickly (*i.e.*, be essentially self-sealing) due to lithostatic pressure. For these reasons, Contention 14 should be resolved in Crow Butte’s favor.

DISCUSSION OF CULTURAL RESOURCES CONTENTION

A. Overview of Contention 1 (Cultural Resources)

Contention 1, which was merged with Contention 2, is entitled “[w]hether the cultural surveys performed and incorporated into the EA formed a sufficient basis on which to renew Crow Butte’s permit.” According to the Board, Contentions 1 and 2 encompass three admissible issues: (1) whether there was meaningful consultation with the Tribe, (2) whether a class III archaeological study — even if adequate under the NHPA — satisfies the “hard look” requirement under NEPA, and (3) whether the surveys performed and incorporated into the EA formed a sufficient basis on which to renew Crow Butte’s permit. According to the Board, Issues (1) and (2) are “legal” issues that will be addressed on a separate schedule. Only Issue 3 will be addressed at the hearing. For Issue (3), the intervenors contend that the EA lacks an adequate description of either the affected environment or the impacts of the project on archaeological, historical, and traditional cultural resources. Intervenors maintain that surveys from 1982 and 1987 do not provide proper baseline information, and claim that the NRC Staff should have conducted a new survey of the license area.

B. Assessment of Contention 1

Crow Butte’s witness describes the various surveys and reports relating to cultural resources that have been prepared for the Crow Butte site since it was first permitted and

licensed.⁴⁹ Mr. Teahon also describes the steps that Crow Butte has taken, and will continue to take, to protect cultural resources at the Crow Butte site. He also explains the various restrictions on ground disturbance activities associated with Crow Butte’s NRC license and its permit from the State of Nebraska.

Information in the LRA regarding historic and cultural properties comes from several sources, including project-specific field inventories. Crow Butte engaged qualified archeological contractors to conduct a cultural resource survey prior to beginning site operations. Specifically, those contractors performed a Class III inventory, which is the standard for locating and recording archaeological resources having exposed indications. Intensive (100-percent coverage) pedestrian surface surveys for historical and archaeological sites within the Crow Butte license area were conducted in two phases and the results presented in a single report.⁵⁰

The witness explains that all 21 cultural sites identified during the surveys were documented. Six sites, including three Native American locales, were evaluated as being “potentially eligible” for the National Register for Historic Places (“NRHP”). The “potentially eligible” Native American and historic period sites conservatively were treated as “eligible,” pending further determination of their actual eligibility status. The Nebraska State Historic Preservation Officer (“SHPO”) concurred with the findings and recommendations of the Bozell and Pepperl report.

⁴⁹ Initial Written Testimony of Crow Butte Resources Witness Larry Teahon on Contention 1, dated May 1, 2015 (Exh. CBR-007).

⁵⁰ See Bozell and Pepperl, “A Cultural Resources Study of the Crow Butte Uranium Prospect, Dawes County, Nebraska,” Main Report (September 1987) (Exh. CBR-027); see also Bozell and Pepperl, “A Cultural Resources Study of the Crow Butte Uranium Prospect, Dawes County, Nebraska,” Appendices (September 1987) (Exh. CBR-028).

Crow Butte did not conduct additional field studies at the site to support license renewal in 1998 because the results of the prior surveys remain applicable. There were no major changes in site activities or disturbed areas since initial surveys were performed and the site constructed. However, as part of the 1998 initial renewal of the license to continue operation, a consultant conducted a Traditional Cultural Property (“TCP”) study that involved sending letters to Tribal governments, including the Oglala Sioux Tribe, and requesting any information on localities of potential traditional concern or value to Native American groups. No responses were received. During the license renewal process the Deputy SHPO stated that he considered the results of the 1987 survey still to be adequate.

Crow Butte also did not conduct additional field studies at the site to support the current LRA because the results of the prior surveys remain applicable. Again, there were no major changes in site activities or disturbed areas since initial surveys were performed and the site constructed. Two of the Section 106 consulting Tribes, the Crow and Santee Sioux Nations, accepted an offer to visit the Crow Butte project areas. The Tribal field crews determined that additional field inspection of the existing license area for potential places of religious or cultural places beyond those previously identified was not practical. Once again, the SHPO acknowledged the prior Class III field inventory and reiterated that the findings of the original EA in 1988 and the subsequent EA in 1998 remained acceptable.

Regarding potential impacts to cultural resources, the witness explains the six original “potentially eligible sites” were designated for avoidance during construction activities. Only one site is located entirely in an area of potential disturbance, and this property is protected by a fenced perimeter. One of the six potentially eligible archaeological site from the 1987 evaluation received additional evaluative field testing in 2003, when it was found to be in an area

of Crow Butte well-drilling activities. Before the fieldwork commenced, a site testing plan was prepared and sent to the Nebraska SHPO, who concurred with the approach. Based on the findings of the field effort, it was determined that the site was not eligible for listing on the NRHP. Crow Butte has avoided the remaining “potentially eligible” archaeological sites during the construction and operation phases of the project.

Lastly, Crow Butte’s NRC license requires a cultural resource inventory before engaging in any construction activity not previously assessed by NRC. In addition, any work resulting in the discovery of previously unknown cultural artifacts must stop. No further disturbance shall occur until Crow Butte has received authorization from NRC to proceed. A similar condition is included in the UIC permit issued by NDEQ.

C. Conclusions on Contention 1

Crow Butte’s witness concludes that, because the Crow Butte project area has been subjected to intensive cultural resources field surveys for archaeological and historical sites and because the five remaining “potentially eligible” properties are being avoided, there will be no effects to the known and recorded cultural resource sites from license renewal.⁵¹ In addition, the license conditions mandating that Crow Butte stop work upon discovery of new cultural resources ensure that newly-discovered cultural resources will be treated appropriately. As a result, the witness concurs with the NRC Staff’s conclusion in the EA that there will be no effects to the known and recorded cultural resource sites if the operating license is renewed and that overall impacts to historic and cultural resources from the relicensing of the Crow Butte facility would be SMALL.

⁵¹ Initial Cultural Resources Testimony at ¶26 (Exh. CBR-007)

DISCUSSION OF RESTORATION CONTENTIONS

A. Overview of Restoration Contentions

1. *Contention 6*

Contention 6 is entitled “[t]he EA violates NEPA in concluding that the short-term impacts from consumptive ground water use during aquifer restoration are MODERATE.” According to the intervenors, the short-term impact of mine restoration is greater than MODERATE. The Licensing Board admitted Contention 6 based on references to the EA discussion of ground water quantity impacts from consumptive use during restoration. The EA indicates, based on past experience, that restoration of a mine unit will need at least eleven pore volumes and that Crow Butte may need to extract “more than eleven restoration pore volumes for all mine units.” The EA described this short term impact from consumptive ground water use during restoration as a MODERATE impact. The contention asserts that restoration consumptive use is greater than expected by the NRC Staff in the EA. The contention also challenges the NRC Staff conclusion that water levels would eventually recover after aquifer restoration, resulting in an overall SMALL impact from consumptive water use.

2. *Contention 9*

Contention 9 is entitled “the EA violates 10 C.F.R. §§ 51.10, 51.70 and 51.71, and NEPA and implementing regulations by failing to include the required discussion of ground water restoration mitigation measures.” The Board admitted Contention 9 to the extent it alleges that the EA’s discussion of ground water restoration mitigation measures is inadequate. The intervenors specifically allege that the NRC Staff has not justified its assumption that aquifer levels will eventually be restored naturally, and that runoff control procedures and monitoring and mitigation activities for ground water have not been developed. The contention asserts the

need for more explanation and analysis related to restoration of water quality in the aquifer, the relationship to consumptive water use, and monitoring activities.

B. Assessment of Restoration Contentions

1. Contention 6

Crow Butte’s witnesses describe the two stages of groundwater restoration at Crow Butte: restoration and stabilization.⁵² Aquifer restoration activities involve the treatment of ground water using process equipment to return the ground water quality to the ground water protection standards in the affected wellfield area. The goal of restoration is to return ground water contaminants on a mine unit average to the target concentrations. If those concentrations are not achieved, after reasonable efforts based on best practicable technology, alternate concentration limits (“ACLs”) may be established subject to NRC approval. According to the witnesses, restoration of an affected aquifer commences following cessation of ISR operations for a particular mine unit and may include ground water transfer; ground water sweep; ground water treatment; and well field circulation. Restoration is followed by a stabilization stage, which consists of monitoring the wells for a period of time to confirm that levels are stable. Crow Butte’s witnesses describe each step in detail, as well as the current status of each mine unit.

Crow Butte’s witnesses then address the basis for the NRC Staff’s discussion in the ER of consumptive water use during restoration.⁵³ The witnesses highlight recent data from Crow Butte indicating, based on the model-based restoration plan (“MBRP”) now being

⁵² Initial Written Testimony of Crow Butte Resources Witnesses Doug Pavlick, Larry Teahon, and Robert Lewis on Contentions 6 and 9, dated May 1, 2015, at ¶¶22-¶28 (Exh. CBR-008).

⁵³ Initial Restoration Testimony at ¶¶29-¶41 (Exh. CBR-008).

employed at the site,⁵⁴ that restoration of remaining mine units will be completed in approximately eleven pore volumes.⁵⁵ In the EA, the NRC performed a water-balance analysis and, based on the restoration analogues in the most recently approved license application, concluded that restoration of a mine unit will need at least eleven pore volumes to achieve compliance with the ground water protection standards in 10 C.F.R. Part 40, Appendix A, Criterion 5B(5). The NRC Staff also assumed that the restoration schedule may extend beyond the schedule proposed by Crow Butte and may require more than eleven pore volumes for all mine units. The NRC Staff therefore concluded that the short-term impact from consumptive use in restoration may be MODERATE. However, the NRC Staff also concluded that water levels would eventually recover after aquifer restoration, resulting in an overall SMALL impact from consumptive water use.

Crow Butte's witnesses conclude that the NRC Staff's approach is conservative.⁵⁶ Based on application of the MBRP and the results achieved to date, the short term consumptive impacts of restoration will be less than assumed by the Staff and no more than MODERATE. The witnesses also conclude that there will be no long term effects because the Basal Chadron Sandstone aquifer is a highly-pressurized confined aquifer. After uranium production and aquifer restoration are completed and ground water withdrawals are terminated, the ground water levels in the aquifer will recover relatively quickly. The witnesses conclude by noting that the

⁵⁴ The calibrated groundwater model associated with MBRP is used to optimize restoration well locations, injection and extraction rates, and the overall sequence of restoration activities for each mine unit.

⁵⁵ A pore volume is defined as the volume of water contained in the pore space of the aquifer affected by mining and required to be restored. The pore volume is calculated by multiplying the area of the ore zone aquifer by the aquifer thickness and the porosity.

⁵⁶ Initial Restoration Testimony at ¶31, ¶35, ¶40 (Exh. CBR-008).

NRC Staff's conclusions in the EA are comparable to those in the NRC's Generic Environmental Impact Statement for In-Situ Leach Uranium Milling facilities (NUREG-1910), published in May 2009. The GEIS concludes that the impacts of groundwater consumptive use during restoration could range from SMALL to MODERATE.

2. Contention 9

With respect to mitigation of restoration impacts, Crow Butte's witnesses explain the steps taken to improve restoration performance.⁵⁷ For example, Crow Butte may use reductants to improve the restoration performance. Crow Butte also conducted a pilot field study using bioremediation to improve restoration performance in Mine Unit 4. Ultimately, however, the witnesses explain that the MBRP provides the most efficient and effective method for completing restoration of mine units with the lowest consumptive use of groundwater. The effectiveness of the MBRP has been demonstrated for Mine Units 2 and 3. Application of the model will minimize the number of pore volumes necessary for restoration, as well as related impacts on consumptive use.

With respect to groundwater quality, the witnesses explain that Crow Butte must restore groundwater quality to levels that satisfy the conditions set in its NDEQ permit and NRC license. Those restoration standards, which are linked to baseline conditions/background concentrations (NDEQ and NRC), class of use (for NDEQ), the maximum values for groundwater protection in Part 40, Appendix A, Table 5C (for NRC), or ACLs to be established by the NRC by future amendment.⁵⁸ The witnesses conclude that restoration to any of those

⁵⁷ Initial Restoration Testimony at ¶¶32-¶41 (Exh. CBR-008).

⁵⁸ ACLs are only approved after the applicant demonstrates, among other requirements, that the limits are "as low as reasonably achievable" and that the constituent "will not pose a substantial present or future hazard to human health or the environment." Part 40, Appendix A, Criterion 5B(6).

standards — levels that are either consistent with baseline conditions or, by definition, protective of human health and the environment — will result in SMALL environmental impacts.

C. Conclusions on Restoration Contentions

Contentions 6 and 9 do not present any reason that the NRC Staff's EA is inadequate.⁵⁹ The EA addresses consumptive water use during restoration in both the short term and the long term. The EA describes the former as MODERATE and the latter as SMALL. Based on current and future practices, these characterizations are bounding. The EA, as supplemented by witness testimony, also describes the restoration standards, the restoration process, and reasonable measures to mitigate the impacts of consumptive water use (*e.g.*, the MBRP) and to control and mitigate impacts on groundwater water quality (*e.g.*, monitoring, treatment, and standards). The NRC Staff has taken a “hard look” at restoration.

DISCUSSION OF CONTENTION 12

A. Overview of Contention 12

Contention 12 is entitled “[t]he EA omits a discussion of the impact of tornadoes on the license renewal area, and inadequately discusses the potential impacts from land application of ISL mining wastewater.” Contention 12 therefore involves two distinct issues: tornadoes and land application. The intervenors complain that, while the LRA and SER both address the risks associated with tornadoes, the EA itself does not explicitly discuss them. The intervenors also argue that the NRC Staff failed to account for potential impacts from land application of wastewater, including selenium.

⁵⁹ Initial Restoration Testimony at ¶47 (Exh. CBR-008).

B. Assessment of Contention 12

1. *Tornados*

Mr. Teahon explains how Crow Butte assessed tornado hazards in the LRA.⁶⁰ Crow Butte's witness first explains that tornadoes in Dawes County are rare. The annual probability of a Category I tornado at Crow Butte is 4.8×10^{-4} . This probability translates to a 0.048% annual probability or approximately once every 2,083 years. Mr. Teahon also notes that the NRC Staff addressed tornado hazards as part of its safety evaluation. The NRC Staff reviewed the applicant's information on natural events and emergency procedures related to natural disasters at Crow Butte. These procedures identified personnel to contact, decontamination procedures, and area cleanup methods. The NRC Staff found the LRA acceptable on this basis.

Regarding potential environmental impacts, the probability weighted impacts are very small. As noted, the risk of a tornado at the site is very low (0.048% annual probability). The probability that a tornado would occur at the site *and* that it would occur at a particular location on the site where it could cause an actual environmental impact (*e.g.*, damaging a structure containing process fluids) is even lower. Taken together, Mr. Teahon concludes that the very low probability of a tornado at the site and the existence of adequate emergency response procedures in the event of a tornado provide a basis for concluding that the risk of an environmental impact at the site from a tornado is minimal.⁶¹ While the risk posed by tornadoes theoretically exists, it is unduly speculative and not reasonably probable to occur at Crow Butte.

⁶⁰ Initial Written Testimony of Crow Butte Resources Witness Larry Teahon on Contention 12, dated May 1, 2015, at ¶7-¶12 (Exh. CBR-010).

⁶¹ *Id.* at ¶11.

2. Land Application

Mr. Teahon begins his discussion of land application by noting that Crow Butte does not use land application as a wastewater disposal method, has not constructed the necessary facilities for land application disposal of wastewater, and has no plans or intentions to start land application of wastewater in the future.⁶² Mr. Teahon then goes on to describe provisions of Crow Butte's NRC license and NDEQ permit that allow for disposal of wastewater by, among other methods, land application. The NRC approved the current land application provisions in a 1993 license amendment. Among other things, an NRC license amendment allows for land application over two parcels at the site. The NRC Staff evaluated land application in both the 1998 and 2014 SERs, concluding in both cases that land application was acceptable.

An NDEQ permit also authorizes Crow Butte to conduct land application of wastewater, subject to restrictions. The permit contains monitoring and recording requirements, and sets specific water quality limits on various parameters. Limits for other parameters are set by Nebraska regulations, including a limit for selenium of 0.05 mg/L.

According to Mr. Teahon, were Crow Butte to engage in land application, it would have to process the wastewater prior to discharge to remove uranium and radium, adjust pH, and perform reverse osmosis to remove metals and other contaminants, including selenium. Regarding selenium specifically, Mr. Teahon notes that the maximum limit is 0.05 mg/L, but explains that the reverse osmosis equipment is able to reduce selenium concentrations to <0.001 mg/L. To ensure that the impact remains small, Mr. Teahon also explained that water quality is tested prior to any discharge to ensure compliance with the water quality standards. The areas subject to land application are also subject to periodic soil, ground-water, and surface-water

⁶² *Id.* at ¶13-¶23.

testing to monitor potential impacts. In addition, discharge rate for treated water is set at a rate that prevents soil saturation beyond two feet in depth (limiting ground-water impact), while also avoiding surface runoff.

Mr. Teahon also addresses the intervenors' concerns regarding bioaccumulation of selenium.⁶³ At Crow Butte, the maximum level of selenium allowed in wastewater for land application is 0.5 mg/L, which is two to four times lower than that at the site considered in a U.S. Fish & Wildlife Services Report ("FWS Report") cited by intervenors. Further, due to the required processing and treatment of wastewater before land application, the expected level of selenium in discharged wastewater at Crow Butte would be <0.001 mg/L, which is 1000 to 2000 times lower than levels at the FWS Report site. Other conditions at the FWS Report site that increased the impact levels also are not present at Crow Butte. For example, Crow Butte's license and permit already prohibit land application which would result in discharge entering the waters of the state of Nebraska, prohibit discharge if it would result in pooling or runoff, and requires discharge to occur at a rate which will both avoid seepage into ground-waters and prevent runoff.

C. Conclusions on Contention 12

1. *Tornados*

Mr. Teahon concludes that the risk posed by tornadoes is very small.⁶⁴ The probability of a tornado at the site, let alone of a tornado at a particular spot on the site where it could cause an environmental impact, is very low. Further, there are emergency response plans and procedures in place in case of a natural hazards phenomenon, such as a tornado, that would

⁶³ *Id.* at ¶19-¶23.

⁶⁴ *Id.* at ¶24.

mitigate the impact if a tornado did occur at the site. The environmental impacts from a tornado associated with Crow Butte's facilities and operations are therefore remote and speculative or, at most, small.

2. Land Application

Mr. Teahon concludes that, since Crow Butte currently does not use land application, does not have the facilities to do so, and does not have plans to begin land application, there is no current or expected environmental impact.⁶⁵ And, even if Crow Butte were to begin land application of wastewater as provided for in its NRC license and NDEQ permit (and there is no indication this will actually happen), the environmental impact would be minimal. The NRC license and NDEQ permit together impose stringent requirements on land application. Any land application is subject to water quality limits derived from NRC, EPA, and State of Nebraska rules. And, in practice, the pre-discharge processing and treatment results in water quality that is well below those limits. Water must be tested before discharge to ensure compliance with water quality limits, and the land application area is also subject to periodic post-discharge monitoring and testing to ensure that long-term environmental impacts, if any, are small. The rate and manner by which water may be discharged is also designed to prevent both ground-water impacts and surface runoff. Lastly, areas of the site where land application of treated water has been used are included in decommissioning surveys to ensure soil concentration limits are not exceeded. For this reason, Contention 12 should be resolved in favor of Crow Butte and the NRC Staff.

⁶⁵ *Id.* at ¶25.

CONCLUSIONS

For the reasons set forth in this Initial Statement of Position, as supported by the accompanying testimony and evidence, the NRC Staff has taken the requisite “hard look” at potential impacts from license renewal at the Crow Butte site. The NRC Staff evaluated the impacts of Crow Butte operations during the renewal term in the EA and “has come to grips with all important considerations.”⁶⁶ Moreover, to the extent necessary, the EA is augmented by the full record of this proceeding, including the testimony and exhibits, which in the aggregate are more than sufficient to satisfy the agency’s obligation under NEPA.⁶⁷ The Licensing Board therefore should resolve Contentions A, C, D, 1, 6, 9, 12, and 14 in favor of Crow Butte and the NRC Staff.

Crow Butte also has presented information and analysis regarding the technical aspects of licensed activities and demonstrated that its activities comply with 10 C.F.R. Part 40. Regarding the one technical contention, Crow Butte (and the NRC Staff and NDEQ) considered the implications of recent geological research and determined that it did not undermine the conclusion that Crow Butte can and will control mining fluids in manner that is protective of public health and safety. The Board therefore should also resolve Contention F in favor of Crow Butte.

⁶⁶ *Grand Gulf ESP*, CLI-05-4, 61 NRC at 13.

⁶⁷ *LES*, LBP-06-8, 63 NRC at 286.

Respectfully submitted,

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COUNSEL FOR CROW BUTTE
RESOURCES, INC.

Dated at San Francisco, California
this 8th day of May 2015

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of:)	
)	Docket No. 40-8943
CROW BUTTE RESOURCES, INC.)	
)	ASLBP No. 08-867-02-OLA-BD01
(License Renewal))	

CERTIFICATE OF SERVICE

I hereby certify that copies of “CROW BUTTE RESOURCES’ INITIAL STATEMENT OF POSITION” in the captioned proceeding have been served this 8th day of May 2015 via electronic mail to Consolidated Intervenors at davidcoryfrankel@gmail.com, Arm.legal@gmail.com, and harmonicengineering@gmail.com and via the Electronic Information Exchange (“EIE”), which to the best of my knowledge resulted in transmittal of the foregoing to all those on the EIE Service List for the captioned proceeding other than Consolidated Intervenors.

/s/ signed electronically by _____
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