UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	Docket No.: 40-9091-MLA
STRATA ENERGY, INC.	Date: November 3, 2014
(Ross In Situ Uranium Recovery Facility)	

STRATA ENERGY, INC'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

Pursuant to 10 CFR § 2.1209, the Atomic Safety and Licensing Board's (Licensing Board) Memorandum and Order dated August 7, 2014, and the directive issued by the Licensing Board during the evidentiary hearing[1], the licensee Strata Energy, Inc. (Strata) hereby submits these proposed findings of fact and conclusions of law in the above-captioned proceeding. This proceeding involves three (3) admitted contentions related to potential concerns associated with groundwater at Strata's United States Nuclear Regulatory Commission (NRC)-licensed Ross *in situ* leach uranium recovery (ISR) project near Oshoto in the State of Wyoming. These proposed findings support NRC Staff's issuance of Strata's requested license and its accompanying record of decision (ROD) under 10 CFR Parts 40 and 51 and other applicable regulations, criteria, and guidance and construction and operation of the Ross ISR Project.

[1] *Strata Energy, Inc.* (Ross ISR Project), Evidentiary Hearing Transcript (Tr. at 787-788) (September 30-October 1, 2014.

I. INTRODUCTION

1.1. These findings and conclusions address the license application submitted by Strata and NRC Staff's ROD authorizing the construction and operation of the Ross ISR Project in the State of Wyoming.

1.2. For the reasons set forth below, Strata supports NRC Staff's issuance of a source and byproduct materials license under the Atomic Energy Act of 1954, as amended by the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) (collectively the "AEA"), and asserts that none of the admitted contentions in this proceeding provides adequate evidence to warrant modification of the ROD or its associated decision documents.

II. BACKGROUND

2.1. Under the AEA and the Commission's implementing regulations at 10 CFR Part 40 and Appendix A Criteria, an entity seeking to construct and operate a source material (uranium) recovery project, such as an ISR facility, is required to submit an application for an initial operating license to possess and use such source material and 11e.(2) byproduct material. Under NRC regulations, these combined source and 11e.(2) byproduct material licenses are valid for a period of ten (10) years and, at that time, must be renewed.

2.2. NRC regulations at 10 CFR Part 40 and Appendix A Criteria require the submission of a detailed technical report (TR) addressing resource areas related to potential health and safety issues at facilities allowing possession and use of source and/or 11e.(2) byproduct material. NRC regulations at 10 CFR Part 51 require that these license applications also contain a detailed environmental report (ER) addressing resource areas related to potential impacts to the environment pursuant to the National Environmental Policy Act of 1969 (NEPA).

2.3. NRC Staff's interpretation of these regulations addressing compliance with applicable safety and environmental requirements are contained in multiple guidance documents,

including most notably, NUREG-1569 entitled *Standard Review Plan for In Situ Leach Uranium Extraction License Applications* (NUREG-1569)[2]. The acceptance criteria in NUREG-1569 are intended to apply to both safety and environmental requirements under the aforementioned regulations.

2.4. NRC Staff interpretation of the format and resource areas for an appropriate ER is contained at NUREG-1748 entitled *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs* (NUREG-1748)[3].

2.5. Pursuant to 10 CFR § 51.20(b)(8), NRC Staff is required to evaluate the potential environmental impacts for a proposed ISR project, such as Strata's Ross ISR Project, with an environmental impact statement (EIS) or supplemental environmental impact statement (SEIS).

2.6. For new ISR operating license applications, NRC Staff has created a programmatic or generic environmental impact statement (GEIS) in NUREG-1910 entitled *Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities*[4]. This GEIS is intended to serve as a programmatic document off of which site-specific SEISs will be tiered. To date, NRC Staff has prepared and finalized five (5) site-specific SEISs or supplements to the GEIS.

2.7. Pursuant to this regulatory program, Strata submitted a license application to NRC for its review and approval on January 4, 2011. This license application contained a detailed TR addressing potential safety issues and an ER addressing potential environmental issues for the Ross ISR Project[5].

[2] Strata Exhibit SEI007.
[3] NRC Staff Exhibit NRC013.
[4] NRC Staff Exhibit NRC0007-008.
[5] ADAMS Accession No. ML110120063 (Package).

2.8. On June 28, 2011, NRC Staff completed its acceptance review of and formally docketed Strata's license application for detailed technical and environmental review[6]. On July 13, 2011, NRC issued a Federal Register Notice (76 Fed. Reg. 41308) providing the public with sixty (60) days to request an administrative hearing under 10 CFR Part 2.

2.9. On October 27, 2011, the Natural Resources Defense Council and the Powder River Basin Resource Council (hereinafter "Intervenors") filed a hearing request, including arguments on legal standing for a hearing and admissible contentions. Intervenors' hearing request included a proffering of five (5) potential environmental contentions. On December 5, 2011, Strata and NRC Staff filed responses challenging Intervenors' legal standing and the admissibility of their proffered contentions.

2.10. On December 20, 2011, the Licensing Board held oral argument and, by Order dated February 10, 2012, the Licensing Board granted Intervenors' hearing request finding that they possessed legal standing for an NRC administrative hearing and that four (4) of the proffered contentions were admissible.[7] All four admissible contentions were classified as environmental contentions.

2.11. On February 25, 2012, NRC Staff issued requests for additional information (RAI) related to safety and environmental issues associated with the Ross ISR Project license application. Strata responded to the ER and TR RAIs on March 30, 2012 (ML121030406 & ML121030465), and April 6, 2012 (ML121020357 & ML121020361), respectively. Intervenors did not attempt to amend the existing admissible contentions or to admit new contentions based on these RAI responses.

[6] ADAMS Accession No. ML111721948.
[7] *See Strata Energy, Inc.* (Ross ISR Project), *Ruling on Standing and Contention Admissibility* (February 10, 2012).

2.12. On February 28, 2013, NRC Staff finalized and issued its Safety Evaluation Report (SER) for the Ross ISR Project and concluded that Strata's license application satisfies appropriate safety-related regulations at 10 CFR Parts 20 and 40. On Page 6-7 of this Final SER, NRC Staff concluded that:

> "The NRC staff finds that the application for the Ross Project material license complies with the standards and requirements of the [Atomic Energy] Act and the Commission's regulations, and based on its review as documented in this SER, staff concludes that the proposed facility meets applicable requirements for a license issuance in 10 CFR Parts 20 and 40. More specifically, the staff finds that Strata is qualified by reasons of training and experience to use source material for its requested purpose, and that Strata's proposed equipment and procedures at its Ross Project facility are adequate to protect public health and minimize danger to life or property in accordance with 10 CFR [Part] 40.32(b)-(c). Therefore, pursuant to 10 CFR [Part] 40.32(d), the staff finds that issuance of a license to Strata for the Ross Project will not be inimical to the common defense and security or to the health and safety of the public."

United States Nuclear Regulatory Commission, *Safety Evaluation Report for the Strata Energy, Inc. Ross ISR Project, Crook County, Wyoming, Materials License No. SUA-1601,* Docket No. 040-09091 at 6-7 (February, 2013).

At no point during this proceeding have Intervenors attempted to submit new or to amend its existing admitted contentions based on information in the SER. Thus, the SER and its conclusions within the ROD are not subject to challenge in this proceeding.

2.13. On March 21, 2013, NRC Staff issued its draft SEIS (DSEIS) for the Ross ISR Project for a period of forty-five (45) days for public comment. On May 6, 2013, Intervenors submitted a pleading requesting that its existing admitted contentions migrate to the DSEIS and that one additional contention be admitted. Strata and NRC Staff submitted responses in opposition to this pleading on June 3, 2013. By Order dated July 26, 2013, the Licensing Board allowed three (3) contentions (Contentions 1, 2 and 3) to migrate to the DSEIS, declined to allow

Contention 4/5A to migrate to the DSEIS and declined the admission of an additional contention (Contention 6).[8]

2.14. On February 28, 2014, NRC Staff finalized its 10 CFR Part 51 environmental review and issued the final SEIS (FSEIS) for the Ross ISR Project. The FSEIS concluded that there were no issues identified in its environmental review that should prevent issuance of Strata's requested license.

2.15. On March 31, 2014, Intervenors submitted a request to migrate or amend their existing contentions to the FSEIS and to admit two new contentions NRC Staff and Strata filed responses in opposition to this request on April 14 and April 23, 2014, respectively. By Order dated May 23, 2014, the Licensing Board allowed three (3) contentions to migrate to the FSEIS and declined to migrate Contention 4/5A or to admit any new contentions. Thus, only four (4) contentions (Contentions 1, 2, 3, and 4/5A) remained to be litigated.[9]

2.16. On April 24, 2014, NRC Staff completed its license review process and issued to Strata NRC License No. SUA-1601 and a final ROD demonstrating that Strata's requested license is adequately protective of public health and safety and the environment. The ROD contains a detailed memorandum discussing the license review process, Strata's license application, including the ER and revised TR, as well as NRC Staff decision documents in the form of the final SER, FSEIS, and final license conditions.

2.17. On June 13, 2014, Strata and NRC Staff filed motions for summary disposition of Contention 4/5A, arguing that there were no genuine issues of material fact to be litigated as this contention did not migrate from Strata's license application to any of NRC Staff's decision

[8] *See Strata Energy, Inc.* (Ross ISR Project), *Ruling on Motion to Resubmit Contentions and to Admit a New Contention* (July 26, 2013).
[9] *See Strata Energy, Inc.* (Ross ISR Project), *Ruling on Motion to Migrate/Amend Existing Contentions and Admit New Contentions Regarding Final Supplement to Generic Environmental Impact Statement* (May 23, 2014).

documents or the ROD itself. Intervenors submitted a response in opposition to these motions on July 2, 2014. In an Order dated July 25, 2014, the Licensing Board granted Strata's and NRC Staff's motions for summary disposition and Contention 4/5A was summarily dismissed.[10] Based on this Order, three (3) contentions (Contentions 1, 2, and 3) remained to be litigated.

2.18. On June 13, 2014, Intervenors submitted a motion for summary disposition of Contention 1 arguing that there were no genuine issues of material fact remaining within the scope of Contention 1. Strata and NRC Staff filed in opposition to this motion on July 3, 2014. In an Order dated July 25, 2014, the Licensing Board denied Intervenors' motion.[11] Thus, at the conclusion of all summary disposition motions, three (3) contentions (Contentions 1, 2, and 3) remained to be litigated.

2.19. On August 25, 2014, all parties submitted initial statements of position, initial pre-filed testimony, and supporting exhibits. Strata offered the testimony of six (6) expert witnesses on the three (3) admitted contentions (Strata Exhibits SEI-001, SEI005, SEI026, SEI039, and SEI042) and 67 supporting exhibits. NRC Staff offered the testimony of four (4) expert witnesses (NRC Staff Exhibit NRC001) and 43 supporting exhibits. Intervenors offered the testimony of two (2) expert witnesses (Intervenors Exhibits JTI001-R and JTI003-R) and 48 supporting exhibits.

2.20. On September 5, 2014, all parties submitted proposed cross-examination questions on initial pre-filed testimony *in camera* for the Licensing Board's consideration. No motions for direct cross-examination were filed by the parties.

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[10] *See Strata Energy, Inc.* (Ross ISR Project), *Ruling on Summary Disposition Motion Regarding Environmental Contention 4/5A* (July 25, 2014).
[11] *See Strata Energy, Inc.* (Ross ISR Project), *Ruling on Summary Disposition Motion Regarding Environmental Contention 1* (August 12, 2014).

2.21. On September 12, 2014, all parties submitted rebuttal statements of position, rebuttal pre-filed testimony, and supporting exhibits. Strata offered the rebuttal testimony of six (6) expert witnesses on the three (3) admitted contentions (Strata Exhibits SEI045-049) and four (4) additional supporting exhibits. NRC Staff offered the rebuttal testimony of four (4) expert witnesses (NRC Staff Exhibit NRC044-R2) and seven (7) additional supporting exhibits. Intervenors offered the rebuttal testimony of two (2) expert witnesses (Intervenors' Exhibits JTI051-R and JTI052-R) and ten (10) additional supporting exhibits.

2.22. On September 18, 2014, all parties submitted proposed rebuttal cross-examination questions on rebuttal pre-filed testimony *in camera* for the Licensing Board's consideration.

2.23. On September 30 and October 1, 2014, the Licensing Board held an evidentiary hearing in the city of Gillette, Wyoming on each of the three (3) admitted contentions. All pre-filed exhibits were read for identification for admission as evidence into the administrative record on a per contention basis (SEI001, SEI002, SEI003, SEI004A, SEI004B, SEI005, SEI006, SEI007, SEI008, SEI009A, SEI009B, SEI010, SEI011, SEI012A, SEI012B, SEI013, SEI014A, SEI014B, SEI014C, SEI014D, SEI014E, SEI014F, SEI014G, SEI014H, SEI014I, SEI014J, SEI014K, SEI014L, SEI014M, SEI014N, SEI014O, SEI014P, SEI015, SEI016A, SEI016B, SEI016C, SEI016D, SEI016E, SEI017, SEI018, SEI019, SEI020A, SEI020B, SEI020C, SEI020D, SEI020E, SEI020F, SEI020G, SEI021, SEI022, SEI023, SEI024, SEI025, SEI026, SEI027, SEI028, SEI09, SEI030, SEI031, SEI032, SEI033, SEI034, SEI035, SEI036, SEI037, SEI038, SEI039, SEI040, SEI041, SEI042, SEI043, SEI044, SEI045, SEI046, SEI047, SEI048, SEI049, SEI050, SEI051, SEI052, and SEI053; NRC001, NRC002, NRC003, NRC004, NRC005, NRC006A, NRC006B, NRC007, NRC008, NRC009, NRC010, NRC011, NRC012, NRC013, NRC014, NRC015, NRC017, NRC018, NRC019, NRC020, NRC021, NRC022,

NRC023, NRC024, NRC025, NRC026, NRC027, NRC028, NRC029, NRC030, NRC031, NRC032, NRC033, NRC034, NRC035, NRC036, NRC037, NRC038, NRC039, NRC040, NRC041, NRC042, NRC043, NRC044-R2, NRC045, NRC046, NRC047, NRC048, NRC049, NRC050, and NRC051; and JTI001-R, JTI002, JTI003-R, JTI004, JTI006, JTI007, JTI008, JTI009, JTI010, JTI011, JTI012, JTI013, JTI014, JTI015, JTI016, JTI017, JTI018, JTI019, JTI020, JTI021, JTI022, JTI023, JTI024, JTI025-R, JTI026, JTI027, JTI028, JTI029, JTI030, JTI031, JTI032, JTI033, JTI034, JTI035, JTI036, JTI037, JTI038, JTI039, JTI040, JTI041, JTI042, JTI043, JTI044, JTI045, JTI046, JTI047, JTI048, JTI049, JTI050, JTI051-R, JTI052-R, JTI053, JTI054, JTI056, JTI057, JTI058, JTI059, JTI060, JTI061, JTI062). In addition, additional exhibits were identified for admission as evidence into the administrative record (i.e., NRC016-R, NRC052, JTI005A-R2, JTI005B-R2, and JTI055-R).

2.24. At the evidentiary hearing, each party offered opening statements, after which the Licensing Board took direct oral testimony from panels of witnesses from each party on a per contention basis, beginning with Contention 1, then Contention 2, and finally Contention 3. The Licensing Board also heard oral argument on Strata's motion to strike from the administrative record and/or amend Exhibit JTI003-R. At the conclusion of this oral argument, the Licensing Board allowed JTI003-R to remain in the record and ordered Intervenors to amend JTI005A-R2 and JTI005B-R2 to reflect removal of identified URL website addresses. On October 1, 2014, the Licensing Board adjourned the evidentiary hearing after all witnesses' oral testimony on each admitted contention.

2.25. On October 16, 2014, all parties jointly filed proposed transcript corrections for the evidentiary hearing. On October 28, 2014, the Licensing Board adopted the proposed

transcript corrections listed in Appendix A of its Order, and the Licensing Board officially closed the evidentiary record.

III. STANDARDS OF LAW

A. HEARING RIGHTS

3.1. An NRC licensing action gives rise to hearing rights if it can be considered one of the circumstances specifically described in Section 189 of the AEA. Section 189a.(1)(A) states:

> "In any proceeding under this Act, for the granting, suspending, revoking, or amending of any license or construction permit, or application to transfer control, and in any proceedings for the issuance or modification of rules and regulations dealing with the activities of licensees, and in any proceeding for the payment of compensation, an award, or royalties under section 153, 157, 186c., or 188, the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding."

Given that the licensing action in dispute here is the grant of Strata's combined source and 11e.(2) byproduct material license, AEA hearing rights attach to licensing actions such as the instant case.

3.2. On January 4, 2011, Strata submitted a license application for a combined source and 11e.(2) byproduct material license under the AEA. On July 13, 2011, when NRC Staff formally docketed Strata's license application, AEA hearing rights attached to the license application.

B. ADMINISTRATIVE HEARING REGULATIONS

4.1. The applicable hearing regulations pursuant to the July 13, 2011, Federal Register Notice are found at 10 CFR Part 2, Subparts C and L. Under 10 CFR § 2.1206 & 2.1207, administrative hearings are to be conducted with an oral evidentiary hearing. 10 CFR § 2.1206 permits any party to request concurrence from all other parties to conduct the administrative

evidentiary hearing solely through written pleadings, testimony, and evidence. No such requests were proffered by the parties in the course of this proceeding.

4.2 Under NRC regulations, an applicant generally has the burden of proof in a licensing

proceeding. *See* 10 CFR § 2.325. In cases such as the instant proceeding involving only environmental contentions, NRC Staff bears the burden because it is the entity with the ultimate responsibility for NEPA compliance. *See e.g., Duke Power Co.* (Catawba Nuclear Station, Units 1 & 2), CLI-83-19, 17 NRC 1041, 1049 (1983). The applicant also may serve as a proponent of a particular position set forth in an EIS and, as a proponent, also has the burden on that matter. *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).

4.3 The showing necessary to meet the burden of proof is the "preponderance of the evidence" standard.[12] The Licensing Board therefore must consider the evidence and testimony and determine whether NRC Staff and Strata have shown by a preponderance of the evidence that NRC Staff complied with NEPA in the SEIS and ROD. To the extent that an SEIS does not address an issue or does not adequately address a topic, the information presented at the hearing can be relied upon to satisfy NRC's NEPA obligation. *Louisiana Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-06-08, 63 NRC 241, 285-286 (2006); *see also Hydro Resources, Inc.* (P.O. Box 15910, Rio Rancho, NM 87174), CLI-01-04, 53 NRC 31, 53 (2001) ("[I]n an

[12] 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."

adjudicatory hearing, to the extent that any environmental findings by the Presiding Officer (or the Commission) differ from those in the FEIS, the FEIS is deemed modified by the decision.").

4.4. 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 [SEIS] can be deemed to be amended *pro tanto*."[13] Therefore, the Board may consider the full record before it, including the testimony and exhibits at the hearing, to conclude that "the aggregate is sufficient to satisfy the agency's obligation under NEPA" to take a "hard look" at the potential environmental consequences of issuing a license.[14]

C. ISR OPERATING LICENSE APPLICATIONS: LAW AND REGULATIONS

1. General NRC ISR Regulatory Provisions

5.1. NRC Staff has been delegated the authority to interpret the Commission's AEA regulations *inter alia* at 10 CFR Part 40 and Appendix A, as well as other regulations applicable to Strata's requested and currently effective NRC combined source and 11e.(2) byproduct material license pursuant to 10 CFR § 1.41(b)(18 & 19).

5.2. 10 CFR Part 40 regulations and its Appendix A Criteria govern the requests for and grants of combined source and 11e.(2) byproduct material licenses for construction and operation of ISR facilities and the possession and use of such materials. Specifically, 10 CFR §§ 40.31 and 40.32 govern the application for and issuance of a specific license for the possession and use of source and 11e.(2) byproduct material at ISR facilities. These regulations and Criteria govern the safety review of ISR operating license applications.

[13] *Louisiana Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-05-13, 61 NRC 385, 404 (2005) (emphasis in original).
[14] *Louisiana Energy Servs., L.P.*, LBP-06-08, 63 NRC at 286.

5.3. 10 CFR § 40.32(e) governs the activities that can be undertaken towards constructing an ISR project site prior to the issuance of an NRC combined source and 11e.(2) byproduct material operating license. Part 40.32(e), otherwise known as the "construction rule," does not permit commencement of "construction" activities as defined in § 40.4 prior to license issuance.

5.4. 10 CFR § 40.4 includes in the definition of construction "the installation of wells associated with radiological operations (e.g., production, injection, or monitoring well networks associated with in-situ recovery or other facilities)," which are required for the acquisition of ISR wellfield-specific baseline groundwater quality and hydrogeological data gathering and analysis.

5.5. 10 CFR Part 51 regulations represent the Commission's interpretation of Council on Environmental Quality (CEQ) regulations under NEPA. As an independent regulatory agency, the Commission is not required to comply with portions of CEQ regulations that have some substantive impact on the manner in which the Commission performs its primary regulatory responsibilities. 10 CFR § 51.20(b)(8) specifically requires that source material milling operating licenses be subject to EIS-level environmental reviews, requiring either an EIS or SEIS.

5.6. NRC Staff has prepared, issued for public comment, and finalized a programmatic or GEIS for ISR facilities that is intended to have SEISs tiered off of its programmatic findings. It is this GEIS that serves as the primary, programmatic basis for the Ross ISR Project SEIS. To date, five (5) SEISs have been prepared and finalized for ISR projects since the development of the GEIS, including the Ross ISR Project.

5.7. For environmental reviews, NRC Staff is required to take a "hard look" at the potential environmental impacts of a proposed action under NEPA. This "hard look"

requirement is tempered by a "rule of reason" that requires agencies to address only impacts that are reasonably foreseeable—not remote or speculative.

5.8. If an admitted contention alleges that an environmental review document such as an SEIS is inadequate, "the 'rule of reason' by which NEPA is to be interpreted provides that agencies need not consider 'remote and speculative' risks or 'events whose probabilities they believe to be inconsequentially small.'"[15]

5.9. NEPA analyses often must rely upon imprecise and uncertain data, particularly when forecasting future technological developments, which should be judged on their reasonableness. When faced with uncertainty, NEPA only requires "reasonable forecasting." In short, NEPA allows agencies "to select their own methodology as long as that methodology is reasonable."[16]

5.10. NRC Staff's environmental review is deemed to be adequate unless NRC Staff "has failed to take a 'hard look' at significant environmental questions –i.e., the Staff has unduly ignored or minimized pertinent environmental effects."[17] NEPA provides no guarantee that federally approved projects will not *have* adverse environmental impacts, nor does NEPA require agencies to select the most environmentally advantageous or benign option available."[18]

[15] *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station, ALAB-919, 30 NRC 29, 44 (1989) (citation omitted).
[16] *See The Lands Council v. McNair*, 537 F.3d 981, 1003 (9th Cir. 2008) (finding that an EIS need not be based on the "best scientific methodology available").
[17] *See Duke Energy Corp.* (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-03-17, 58 NRC 419, 431 (2003) (discussing what an intervenor must allege, with adequate support, to litigate a NEPA claim).
[18] *See Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-06-29, 64 NRC 417, 429 (2006).

5.11. Intervenors are not permitted to challenge the Commission's ISR regulations in this proceeding. *See* 10 CFR § 2.335.[19]

5.12. The Commission does not presume that a licensee will violate its license or its license conditions. *See Private Fuel Storage* (Independent Spent Fuel Storage Installation), 53 NRC 232, 235-36 (2001); *see also GPU Nuclear Inc.* (Oyster Creek Nuclear Generating Station), CLI-00-06, 51 NRC 193, 207 (2000).

2. Specific NRC ISR Regulatory Provisions and Criteria

6.1. There are two phases of data gathering envisioned by the Commission under its 10 CFR Part 40, Appendix A Criteria and its Commission-endorsed performance-based licensing program. Criterion 7 envisions gathering and analysis of "baseline" groundwater quality data sufficient to obtain an NRC license under the AEA. "Baseline" data gathering applies to groundwater in that a license applicant is required to gather sufficient groundwater quality data to *characterize* the affected environment. This interpretation of Criterion 7 is supported by language in NUREG-1569 when it states:

> "Reviewers should keep in mind that the development and initial licensing of an in situ leach facility is not based on comprehensive information. This is because in situ leach facilities obtain enough information *to generally locate the ore body and understand the natural systems involved.* More detailed information is developed as each area is brought into production….[R]eviewers should ensure that sufficient information is presented to reach only the conclusion necessary for initial licensing."

Strata Exhibit SEI007 at 40 (emphasis added); *see also id.* at 36

6.2. The second phase of data gathering envisioned by the Commission under its 10 CFR Part 40, Appendix A Criteria and its Commission-endorsed performance-based licensing program is Criterion 5B(5) "Commission-approved background" (CAB) groundwater quality

[19] A challenge to "the basic structure of the Commission's regulatory process or is an attack on the regulations" is not permitted in this proceeding. *See Philadelphia Electric Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-216), 8 AEC 13, 20-21 (1974).

standard, which is designed to set appropriate site-specific groundwater standards against which operational groundwater and restoration goals are set.

6.3. "Commission-approved background" cannot be determined until after an NRC ISR license is issued. This is consistent with the current 10 CFR § 40.32(e) "construction" rule which prohibits the installation of a complete wellfield, including monitor well network. *See* 10 CFR § 40.4 (definition of "construction," "means the installation of wells associated with radiological operations (e.g., production, injection, or monitoring well networks associated with in-situ recovery or other facilities)…."). Violation of this provision would serve as grounds for NRC Staff to deny an ISR license application.[20]

6.4. NRC Staff has previously considered an industry request to translate 10 CFR Part 52 limited work authorization (LWA) site development activities to ISR project sites as preconstruction activities. In Regulatory Issue Summary (RIS) 2009-12, NRC Staff stated that they could not translate such requirements to 10 CFR Part 40 ISR project sites and that 10 CFR Part 40.14 specific exemptions were the proper route. However, this RIS also noted that NRC Staff *would not* consider issuance of a specific exemption for "wellfield monitoring network installation." *See* United States Nuclear Regulatory Commission, RIS-2009-12, *Uranium*

[20] Part 40.32(e)'s provisions specifically state that:

> "In the case of an application for a license for a uranium enrichment facility, or for a license to possess and use source and byproduct material for uranium milling, production of uranium hexafluoride, or for the conduct of any other activity which the NRC determines will significantly affect the quality of the environment, the Director, Office of Federal and State Materials and Environmental Management Programs or his/her designee, before commencement of construction, on the basis of information filed and evaluations made pursuant to subpart A of part 51 of this chapter, has concluded, after weighing the environmental, economic, technical and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. ***Commencement of construction prior to this conclusion is grounds for denial of a license to possess and use source and byproduct material in the plant or facility***."

10 CFR § 40.32(e) (emphasis added).

Recovery Policy Regarding Site Preparation Activities at Proposed, Unlicensed Uranium Recovery Facilities (September 23, 2009).

6.5. This phased approach to groundwater data gathering and analysis is consistent with the Commission's holding in *Hydro Resources, Inc.* (CLI-06-01)[21] and the Licensing Board is bound by this decision. CLI-06-01 specifically addresses the development of upper control limits (UCL) and wellfield packages, including "Commission-approved background" post-license issuance.

3. Alternate Concentration Limits

7.1. 10 CFR Part 40, Appendix A, Criterion 5B(5) identifies three (3) permissible groundwater protection standards for uranium recovery facilities such as ISR facilities: (1) "Commission-approved background" or (2) a maximum contaminant level (MCL), *whichever is higher*, or (3) an alternate concentration limit (ACL).

7.2. ACLs are Commission-approved *alternative* groundwater quality standards originating with the United States Environmental Protection Agency's (EPA) Resource Conservation and Recovery Act of 1976 (RCRA) regulations, which were promulgated through a full rulemaking, including notice and public comment. EPA's RCRA regulations at 40 CFR Part 264, Subpart F prescribe groundwater protection standards for RCRA facilities, including Part 264.94(a)(3) which discusses ACLs.

7.3. EPA's 40 CFR Part 192 rulemaking pursuant to its UMTRCA responsibility to develop *generally applicable standards* for uranium mill tailings facilities including Part 192.32 specifically incorporates the aforementioned RCRA groundwater standards, including ACLs.

7.4. NRC's conforming 10 CFR Part 40 rulemaking to comply with UMTRCA's requirement that NRC conform its regulations to EPA's *generally applicable standards* for

[21] *In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-06-01, 63 NRC 1, (2006).

possession and use of source and 11e.(2) byproduct material incorporate 40 CFR § 192.32's groundwater corrective action standards into the Commission's regulations (e.g., 10 CFR Part 40, Appendix A, Criterion 5B(5)).

7.5. An ACL is a site-specific, constituent-specific, risk-based human health standard that requires a detailed technical and environmental justification through NRC license amendment to demonstrate that restoration to that level is adequately protective of human health and the environment. In order for ACLs to be granted, an ISR operator must submit a license amendment application consistent with Criterion 5B(6) and applicable guidance, and *all* ACL applications require a complete safety review consistent with 10 CFR Part 40 regulations and Appendix A Criteria and a complete 10 CFR Part 51 environmental review with, at a minimum, an environmental assessment (EA) with a findings of no significant impact (FONSI pursuant to NUREG-1748).[22]

7.6. 10 CFR Part 40, Appendix A, Criterion 5B(6) sets forth the Commission's requirements for ACLs. Criterion 5B(6) sets forth a series of nineteen (19) factors the Commission will consider during the evaluation of an ACL application.

7.7. While originally promulgated for conventional uranium mills, beginning in 2009, Criterion 5B(6) requirements and applicable guidance for ACLs have been applied as a matter of law to ISR facilities.[23] "Prior class of use" for groundwater quality at ISR wellfields currently can be considered applied as an additional factor when evaluating ACL applications, thus

[22] NUREG-1748 at 1-2 (stating that an EA with a FONSI, at a minimum, is required if no categorical exclusion applies).

[23] *See* United States Nuclear Regulatory Commission, Regulatory Issue Summary 2009-05, *Uranium Recovery Policy Regarding: (1) The Process for Scheduling Licensing Reviews of Applications for New Uranium Recovery Facilities and (2) The Restoration of Groundwater at Licensed Uranium In Situ Recovery Facilities* (April 29, 2009) ("Accordingly, the requirements in Criterion 5B of Appendix A apply to restoration of groundwater at uranium ISR facilities").

demonstrating that there have been no irrevocable impacts to such groundwater resources. *See* Strata Exhibit SEI044 at 2.

7.8. Based on these Criteria, it is well-understood that an ISR licensee cannot even apply for an ACL until it has demonstrated that its efforts to complete groundwater restoration to the primary or secondary standard satisfies the as low as reasonably achievable (ALARA) standard.

7.9. Since a license amendment application necessary for a specific ACL is not before NRC at this time, there is no need for a purely speculative NEPA evaluation in the FSEIS. *See Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2); Catawba Nuclear Station, Units 1 and 2), CLI-02-14, 55 NRC 278, 293 (2002) (denying a National Environmental Policy Act (NEPA) "segmentation" contention because it involved inchoate plans of the licensee and explaining that, to bring NEPA into play, a possible future action must constitute a "proposal" pending before the agency).

D. ISR OPERATING LICENSES: NRC GUIDANCE

8.1. NRC Staff has prepared several guidance documents associated with AEA-licensed ISR combined source and 11e.(2) byproduct material licenses for the possession and use of such materials. As discussed above, NRC Staff's review of ISR operating license applications, such as that proffered by Strata, including detailed TRs and ERs, is required to address potential impacts in resource areas to public health and safety and the environment.

8.2. NUREG-1569 sets forth the acceptance criteria for safety and environmental reviews of ISR operating license applications.

8.3. NUREG-1569 includes Table 1 which contains a comparison chart listing all sections of its guidance, including acceptance criteria, and identifying which sections apply

directly to 10 CFR Part 40 *et al* safety reviews and 10 CFR Part 51 environmental reviews. *See* Strata Exhibit SEI007 at 29-31. This Table 1 shows that all acceptance criteria associated with evaluations of ISR facilities associated with potential groundwater impacts in NUREG-1569 comply with both safety and environmental review requirements.

8.4. NUREG-1569 was issued for public comment in October of 1997 and, again, in February of 2002 and was finalized as formal Commission guidance in June of 2003 specifically to identify a permissible licensing approach for new ISR operating license applications.

8.5. NUREG-1748 sets forth the formatting and content requirements for environmental reports and EIS-level documents.

8.6. While they are not binding on the Licensing Board, the Commission has stated in its decisions in *Seabrook* and *Private Fuel Storage* that Commission guidance documents are nonetheless entitled to special weight. *See Nextera Energy Seabrook, LLC* (Seabrook Station, Unit 1), CLI-12-05, 75 NRC 301, 314, n.78 (2012); *see also In the Matter of Private Fuel Storage* (Independent Spent Fuel Storage Installation), CLI-01-22, 54 NRC 255, 264 (2001). In its 2005 *Yankee* decision, the Commission further elaborated on the role of NRC Staff guidance with respect to regulatory compliance:

> "We recognize, of course, that guidance documents do not have the force and effect of law. Nonetheless, guidance is at least implicitly endorsed by the Commission and therefore is entitled to correspondingly special weight."

Yankee Atomic Electric Co. (Yankee Nuclear Power Station), CLI-05-15, 61 NRC 365, 375, n.26 (2005); *see also Consumers Power Co.* (Big Rock Point Nuclear Plant), ALAB-725, 17 NRC 562, 568 & n.10 (1983) (finding that NUREGs are entitled to considerable prima facie or special weight).

8.7. The Commission has indicated that conformance with regulatory guides is likely to result in compliance with specific regulatory requirements, though nonconformance with such guides does not mean noncompliance with the regulations. *See Petition for Emergency & Remedial Action*, CLI-78-6, 7 NRC 400, 406-407 (1978). Thus, in the absence of other evidence, adherence to guidance may be sufficient to demonstrate compliance with the regulatory requirements. *Metropolitan Edison Co.* (Three Mile Island Nuclear Station, Unit 1), ALAB-698, 16 NRC 1290, 1299 (1982), *rev'd in part on other grounds*, CLI-83-22, 18 NRC 299 (1983).

8.8. NUREG-1569's Response to Comments provides evidence that its guidance is an acceptable pathway to obtaining an ISR operating license. In the Notice of Availability of NUREG-1569, NRC states:

> "The review plan provides general guidance on acceptable methods for compliance with the existing regulatory framework.[24] As described in an NRC white paper on risk-informed, performance-based regulation (SECY-98-144), however, the applicant has flexibility to propose other methods as long as it demonstrates how it will meet regulatory requirements."[25]

Strata Exhibit SEI007 at 3.

This portion of NUREG-1569 states that it prescribes "standard practices that have been found acceptable in demonstrating compliance at *in situ* leach uranium extraction facilities have been placed in the standard review plan as one approach that the staff may use in determining compliance." *Id.* at 64. NUREG-1569 also is an official NRC document created after multiple ISR Licensing Board/Commission decisions in the *Hydro Resources, Inc.* Subpart L proceeding

[24] *See Gulf States Utilities Co.* (River Bend Station, Units 1 and 2), ALAB-444, 6 NRC 760 (1977).
[25] To this point, NUREG-1569 also states "the Commission directed the staff to update its regulatory guidance related to *in situ* leach uranium extraction facilities, and in doing so, to provide guidance on use of risk-informed, performance-based regulatory philosophies. NUREG-1569 incorporates this direction from the Commission." NUREG-1569, *Notice of Availability of a Standard Review Plan (NUREG-1569) for Staff Reviews for In Situ Leach Uranium Extraction License Applications* at 4.

(*e.g.*, LBP-99-30, CLI-00-12)[26] regarding license conditions that "will allow particular determinations to be made post-licensing" prior to operations in a wellfield) to provide clarity to the ISR licensing process in light of the *Hydro Resources, Inc.* proceeding.[27]

8.9. NUREG-1569 should be accorded special weight when addressing Strata's and NRC Staff's compliance with NRC regulations for ISR facilities in this proceeding.

8.10. NUREG-1569 is divided into two distinct sections (Chapter 2 entitled *Site Characterization* and Chapter 5 entitled *Operations*) separating the two phases of data gathering and analysis contemplated by NRC Staff prior to and after issuance of an ISR operating license and envisioned in light of the 10 CFR § 40.32(e) "construction" rule.

8.11. As stated in the NUREG-1569 Response to Comments regarding a comment on construction of ISR facilities prior to license issuance lest the applicant run the risk of having its requested license denied, "NRC considers this statement to be consistent with the requirements of 10 CFR 40.32(e) and believes it to be appropriate for the agency's responsibilities to protect public health and safety and the environment." Strata Exhibit SEI007 at 7.

8.12. Chapter 2 of NUREG-1569 addresses the sections of *license applications* related to site-specific groundwater conditions, including the development of pre-license issuance, "baseline" groundwater quality as mandated by 10 CFR Part 40, Appendix A, Criterion 7.

8.13. Chapter 5 of NUREG-1569 entitled *Operations* addresses ISR operations, including the development of Criterion 5 "Commission-approved background," which is the

[26] *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-00-12, 52 NRC 1 (2000); *In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), LBP-99-30, 50 NRC 77 (1999).

[27] It is also worth noting that Phase II of the *Hydro Resources, Inc.* Subpart L proceeding was briefed and decided after finalization of NUREG-1569 in 2003 and affirmed by the Commission. Thus, many of the resource areas discussed in NUREG-1569 are representative of this line of cases and should be considered binding as Commission precedent.

foundation for development of all other operational and restoration standards for groundwater at a *licensed* ISR site.

8.14. Chapters 2 and 5 are representative of the Phases I and II *Hydro Resources, Inc.* line of cases (*Compare In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-06-01, 63 NRC 1, (2006)), and the Licensing Board should be bound by the Commission precedent articulated in those cases.

E. MISCELLANEOUS LEGAL DOCTRINE

9.1. Source and 11e.(2) byproduct material are expressly exempt from RCRA, thus Strata is not subject to RCRA protocols. *See* 40 CFR § 261.4(a)(4). NRC licensees are not subject to RCRA protocols.

9.2. AEA-licensed facilities such as ISR facilities are exempt from the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as the express language of CERCLA exempts releases from such sites. *See* 42 U.S.C. § 2210 & 9601.

IV. FINDINGS OF FACT

A. CONTENTION 1

1. Phased Acquisition of Baseline Groundwater Quality Data

10.1. NUREG-1569 recognizes that certain site-wide data are required prior to license issuance in accordance with NUREG-1569 Chapter 2, while additional information will be obtained for each wellfield prior to operations in accordance with NUREG-1569 Chapter 5. *See* SEI Initial Position Statement at 16-17; *see also* Strata Exhibit SEI026 at 8, ¶ A.14 *see also* Strata Exhibit SEI005 at 17, ¶ A.34, *citing* Strata Exhibit SEI007 at 36).

10.2. Strata's procedures for developing Commission-approved background (CAB) groundwater quality data within each wellfield and establishing target restoration values (TRVs) within the ore zone aquifer and upper control limits (UCLs) for excursion monitoring wells are

described in Section 5.7.8.2 of the Technical Report, which is part of the approved license application. *See* Strata Exhibit SEI005 at 5, ¶ A.7, *citing* Strata Exhibit SEI014C at 234-248).

10.3. These procedures for establishing wellfield-specific CAB, TRVs and UCLs are also described in the FSEIS and in the SER. *See id* at 5-7, ¶ A.8 and ¶ A.10; *citing* Strata Exhibit SEI009A at 472-473; Strata Exhibit SEI010 at 285-286.

10.4. The procedures for establishing wellfield-specific CAB, TRVs and UCLs are enforceable through license conditions 10.13, 11.3 and 11.4. *See* Strata Exhibit SEI026 at 10, ¶ A.19, *citing* Strata Exhibit SEI015 at 9, 12-13 [License Conditions 10.13, 11.3 and 11.4]); *see also* Tr. at 313, Lines 9-12, 14-18 (Demuth).

10.5. With the exception of the potential impacts to baseline groundwater quality from well drilling and development methods, which is addressed in ¶¶ 10.40-10.46, and the screened interval of wells used to establish CAB and TRVs for the ore zone, which is addressed in ¶¶ 10.50-10.54. Intervenors have not challenged the procedures for establishing CAB, TRVs and UCLs for each wellfield. *See* Strata Exhibit SEI045 at 13, ¶ A.9.

10.6. The same phased process for baseline data acquisition has been used throughout the U.S. uranium ISR industry in the past 10 years or more. *See* Strata Exhibit 046 at 3, ¶ A.1; *see also* Tr. at 467, lines 1-6 (Demuth).

10.7. NRC staff's well-documented position is that pre-license construction of a wellfield monitoring network necessary to establish CAB, TRVs and UCLs is prohibited under 10 CFR 40.32(e). *See* Strata Exhibit SEI026 at 11, ¶ A.20, *citing* Strata Exhibit SEI033 at 1; *see also* SEI Initial Position Statement at 16.

10.8. Phased wellfield development will not result in degradation of baseline groundwater quality in undeveloped wellfields, since Strata will be required by license condition

10.7 to maintain a net bleed in each operating wellfield, which will form an inward hydraulic gradient. Further, excursion monitoring required by License Condition 11.5 will be used to verify that ISR solutions do not migrate away from the operating wellfields. *See* Strata Exhibit SEI026 at 11, ¶ A.22; *see also* Strata Exhibit SEI046 at 7, ¶ A.7, *citing* Strata Exhibit SEI015 at 8 [License Condition 10.7]; s*ee also* Tr. at 327, lines 16-19 (Knode).

2. Satisfaction of NUREG-1569, Acceptance Criteria 10

10.9. NUREG-1569 serves as NRC staff's interpretation of its 10 CFR Part 40 regulations and Appendix A Criteria as applied to ISR license applications. *See* SEI Initial Position Statement at 15. Strata has provided legal citations to Commission precedent demonstrating that guidance such as NUREG-1569 is to be accorded special weight and treatment when evaluating the adequacy of NRC-approved licensing actions. *See* SEI Rebuttal Position Statement at 4 (citing *Yankee Atomic Electric Co.*, CLI-05-15); *see also* Tr. at 285, lines 1-9 (Pugsley); Tr. at 292, lines 6-11 (Monteith).

10.10. NUREG-1569 Chapter 2 contains acceptance criteria for site-wide baseline groundwater quality characterization that is performed as part of the license application. Specifically, Section 2.7.1(4) and acceptance criteria 2.7.3(4) apply to pre-license data gathering and evaluation. *See* Strata Exhibit SEI005 at 7, ¶ A.12; *see also* NRC Staff Exhibit NRC001 at 12-14, ¶ A.1.6.

10.11. NUREG-1569 Section 2.7.1(4) specifies that license applications should contain an assessment of available groundwater quality within the proposed license boundary and adjacent properties, including quantitative description of the chemical and radiological characteristics of the groundwater and potential changes in water quality likely to be caused by operations. *See* Strata Exhibit SEI005 at 7, ¶ A.13, *citing* Strata Exhibit SEI007 at 59). The

FSEIS documents that Strata's license application satisfies these criteria by describing the construction and sampling of a regional baseline monitoring well network within the license boundary, providing sampling results from 29 existing water supply wells within and adjacent to the proposed license boundary and describing potential changes in water quality likely to be caused by operations. Further, the FSEIS provides a quantitative summary of chemical and radiological constituents in Appendix C. *See id* at 9-10, ¶¶ A.17 and A.19, *citing* Strata Exhibits SEI009A at 181-190 & 310-317 and SEI009B at 3-45).

10.12. NUREG-1569 Acceptance Criterion 2.7.3(4) specifies that a license application should contain reasonably comprehensive chemical and radiochemical analyses of water samples. *See* Strata Exhibit SEI005 at 10, ¶ A.20, *citing* Strata Exhibit SEI007 at 62). NUREG-1569 Table 2.7.3-1 lists thirty four (34) parameters that are "accepted by the NRC for *in situ* leach facilities." *See id* at 10, ¶ A.21, *citing* Strata Exhibit SEI007 at 64). As part of the pre-license baseline groundwater quality characterization, Strata analyzed all parameters in NUREG-1569 Table 2.7.3-1 except for two minor variations to comply with Wyoming guidelines (nitrate plus nitrite was analyzed instead of nitrate alone, and total manganese was analyzed rather than dissolved manganese). *See id* at 11, ¶ A.23 (citing Ex. SEI018). In fact, Strata analyzed 16 parameters beyond those listed in NUREG-1569 Table 2.7.3-1. *See id* at 11, ¶ A.24.

10.13. NUREG-1569 Acceptance Criterion 2.7.3(4) also specifies that a license application should present water samples "obtained within and at locations away from the mineralized zone." *See* Strata Exhibit SEI005 at 10, ¶ A.20, *citing* Strata Exhibit SEI007 at 62. Strata satisfied this criterion by sampling regional baseline wells within and outside of the mineralized zones. *See id* at A.25, *citing* Strata Exhibit SEI019. Strata also sampled existing water supply wells inside and adjacent to the proposed license boundary. *See id* at 8, ¶ A.15.

10.14. NUREG-1569 Acceptance Criterion 2.7.3(4) also specifies that water samples be collected "by acceptable sampling procedures, such as American Society for Testing and Materials D4448." *See* Strata Exhibit SEI005 at 10, ¶ A.20, *citing* Strata Exhibit SEI007 at 62. The FSEIS documents NRC Staff's determination that water quality samples were collected in accordance with applicable guidelines including American Society for Testing and Materials (ASTM) D4448. *See id* at 13, ¶ A.29, *citing* Strata Exhibit SEI009A at 162).

10.15. The NRC Staff's determination that the license application complies with NUREG-1569 Section 2.7.3 acceptance criteria is documented in the SER. *See id* at 14, ¶ A.29, *citing* Strata Exhibit SEI010 at 87-88).

10.16. There is no regulatory basis in NUREG-1569 Section 2.7.3 to require a detailed statistical analysis of the site-wide baseline groundwater quality characterization data. *See* Strata Exhibit SEI045 at 9, ¶ A.7; *see also* NRC Staff Exhibit NRC001 at 21-22, ¶ A.1.8(3).

3. Satisfaction of NEPA Requirements

10.17. 10 CFR Part 51 requires an SEIS to succinctly describe the environment to be affected by the proposed action, with data and analyses in the statement to be described at a level of detail commensurate with the importance of the potential impact. *See* NRC Staff Exhibit NRC001 at 9, ¶ A.1.5; *see also* Tr. at 464, lines 2-6 (Dr. Johnson).

10.18. Two NRC guidance documents that the NRC Staff uses when preparing an SEIS for an ISR facility are NUREG-1748 and NUREG-1569. *See* SEI Initial Statement of Position at 12-17. NUREG-1748 states that an SEIS should include a description of site-specific and regional data on the characteristics of groundwater quality in sufficient detail to provide the necessary data for other reviews dealing with water resources. *See* NRC Staff Exhibit NRC001 at 9, ¶ A.1.5.

10.19. NUREG-1569 Table 1 identifies which sections apply to NRC's safety review of a license application and which sections apply to the 10 CFR Part 51 environmental review. *See* Strata Exhibit SEI005 at 7, ¶ A.13, *citing* Strata Exhibit SEI007 at 28 and 30-31); *see also* SEI Initial Position Statement at 15-16. In addition, NUREG-1569 Section 2.7.3 explains how a license applicant can comply with 10 CFR § 51.45(b), which requires submittal of an ER that includes a description of the affected environment. *See* NRC Staff Exhibit NRC001 at 12-13, ¶ A.1.6. The FSEIS and SER document NRC Staff's conclusion that the license application complies with NUREG-1569 Section 2.7.3 acceptance criteria. *See* Strata Exhibit SEI005 at 13-14, ¶ A.29, *citing* Strata Exhibit SEI009A at 162, 182 & Strata Exhibit SEI010 at 87-88); *see also* Strata Exhibit SEI045 at 3, ¶ A.1.

10.20 NRC Staff also found that Strata's water quality data sets that are generated following 10 CFR Part 40, Appendix A, Criterion 7 and Regulatory Guide 4.14 are sufficient to meet the requirements of NEPA, which requires a description of the water that could be affected by the proposed action, specifically providing the mean, range and temporal and spatial variations in water quality. *See* NRC Staff Exhibit NRC001 at 8, ¶ A.1.4.

10.21. Site characterization groundwater quality data from Strata's regional baseline monitoring well network and existing water supply wells are provided in full in FSEIS Appendix C. *See id* at 7, ¶ A.1.4. No other supplement to the GEIS presents the complete sample results on a well-by-well, parameter-by-parameter basis. *See* Strata Exhibit SEI005 at 9, ¶ A.17, *citing* Strata Exhibit SEI009B at 3-45.

10.22. Strata's license application provides a representative, quantitative description of the baseline groundwater quality within and adjacent to the license boundary, including sample results for over 16,000 chemical and radiological parameters from more than 362 groundwater

samples. *See id* at 9, ¶ A.16. Strata's baseline groundwater quality data collection efforts meet or exceed the minimum criteria in NRC guidance, including NUREG-1569 and Regulatory Guide 4.14. *See id* at 15, ¶ A.31.

10.23. The density of monitor wells installed for pre-license baseline groundwater quality characterization significantly exceeds the density used for similar NEPA evaluations conducted by the United States Bureau of Land Management (BLM) for oil & gas and coal mine expansion projects in the Wyoming Powder River Basin. *See* Strata Exhibit SEI045 at 11, ¶ A.8.

10.24. Neither the FSEISs recently issued by NRC Staff that tiered from the GEIS nor EISs recently prepared for oil & gas development and coal mine expansion projects in Wyoming provide detailed statistical evaluation of the site-wide, baseline groundwater quality in all potentially affected aquifers. *See id* at 10-11, ¶ A.7.

4. Applicability of RCRA and CERCLA Requirements and Guidance

10.25. Groundwater monitoring typically is implemented after an environmental problem has been identified for a RCRA or CERCLA site. This is not the case for the Ross ISR Project, where groundwater quality was sampled in order to satisfy applicable NRC regulatory requirements for characterization of the affected environment as it exists today. *See* Strata Exhibit SEI046 at 5-6, ¶ A.5; *see also* Tr. at 465-466 (Moore); Tr. at 467-468 (Demuth).

10.26. The focus of the EPA Unified Guidance (Intervenors Exhibit JTI006) is to establish remediation goals or restoration targets, which is not a requirement of NEPA for evaluation of the affected environment prior to ISR operations. *See* Tr. at 463-464 (Dr. Johnson).

10.27. The CERCLA process is a compliance process, not a permitting process, and therefore it is not directly applicable to an ISR license application. *See* Tr. at 467, Lines 21-24 (Demuth).

10.28. Although a RCRA-based upgradient/downgradient monitoring approach is not directly applicable to an ISR facility, pre-operational background water quality will be established for areas upgradient, downgradient and side-gradient to each ISR wellfield prior to operations, since a perimeter monitoring well ring will surround each wellfield. *See* Tr. at 327, Lines 7-9 and 11-15 (Demuth). *See also* Strata Exhibit SEI045 at 7, ¶ A.5.

10.29. Unbiased grid sampling is not specified in NRC guidance documents for baseline groundwater quality evaluation in each ISR wellfield, since the goal is to obtain representative samples from the uranium ore bodies. *See* Tr. at 465, Lines 6-13 (Saxton).

5. Nubeth R&D Site

10.30. The affected environment required to be evaluated in an SEIS is the environment that exists just prior to the license applicant submitting its application, not the pre-industrial baseline groundwater quality that might have existed prior to any anthropogenic influence in the license area. *See* Tr. at 452-453 (Moore).

10.31. The Nubeth R&D site covered an area less than one half of one percent (0.5%) of the total Ross license area and consisted of one 5-spot test pattern comprised of a single recovery well and four injection wells. *See* Ex. SEI005 at 18, ¶ A.38. *See also* Tr. at 323, Line 4 (Schiffer).

10.32. In April 1983 State of Wyoming Department of Environmental Quality/Land Quality Division (WDEQ-LQD) concluded that restoration of the aquifer after the Nubeth R&D operations was complete in accordance with applicable standards. *See* Strata Exhibit SEI005 at 18, ¶ A.37, *citing* Strata Exhibit SEI014D at 10). NRC concurred that groundwater had been adequately restored by letter dated June 9, 1983. *See id.*, *citing* Strata Exhibit SEI014D at 12-1).

10.33. Within 2 years of WDEQ-LQD's and NRC's determinations that the aquifer had been restored following Nubeth R&D operations, the NRC terminated the license, which validated that not only groundwater restoration but full site decontamination and decommissioning were complete. *See id*.

10.34. Prior to termination of the NRC license, Nubeth turned over ownership of the production well and project water supply well to an oil company who withdrew water from the wells and, to enhance oil recovery, injected it into the Minnelusa Formation some 6,000 feet below ground surface. *See* Strata Exhibit SEI005 at 19, ¶ A.39. Between 1979 and 2010 approximately 1,167,252,000 gallons of water were withdrawn from the OZ aquifer and injected into the Minnelusa in the immediate vicinity of the Nubeth R&D site. Given the large volume of water it is unrealistic to assume that any water from the Nubeth R&D site existed within the aquifer during site characterization efforts. The resulting anthropogenic induced drawdown around the site also has eliminated the possibility that any water from the Nubeth site has left the immediate vicinity. *See* Strata Exhibit SEI042 at 11, ¶ A.14; *see* also Strata Exhibit SEI005 at 19, ¶ A.39.

10.35. Due to the cone of depression caused by more than 30 years of pumping by the oil company for enhanced oil recovery, all of Strata's regional baseline monitoring wells are located upgradient of the Nubeth research and development (R&D) site, so it is impossible that any of the baseline monitor wells could have been affected by restored groundwater from the Nubeth R&D operations. *See id* at 19, ¶ A.40; *see also* Tr. at 322-323 (Schiffer).

10.36. The FSEIS concludes that that data presented in FSEIS Tables 3.6 and 3.7 suggest that the current water quality in the ore zone aquifer is the same as it was during Nubeth's pre-

operational sampling. *See* Strata Exhibit SEI005 at 25-26, ¶ A.50, *citing* Strata Exhibit SEI009A at 429.

10.37. NRC Staff concluded in Section 5.7.2 of the FSEIS that no evidence of the Nubeth R&D project can be observed in the pre-license site characterization groundwater quality collected for the Ross Project. *See* NRC Staff Exhibit NRC001 at 21, ¶ A.1.8(2).

6. Applicability of EPA MCLs

10.38. It is not necessary to conclude that the groundwater quality in the production zone exceeds EPA MCLs in order to permit or license the Ross ISR Project. *See* Tr. at 465, lines 14-18 (Saxton). EPA's aquifer exemption approval was granted on the basis that the groundwater within the exempted aquifer does not currently serve as a source of drinking water and contains minerals (uranium) in a quantity that is expected to be commercially producible. *See* Strata Exhibit SEI026 at 12-13, ¶ A.26; *see also* Strata Exhibit SEI045 at 16, ¶ A.13. Furthermore, calculation methods for determining CAB in the production zone and UCLs for excursion monitoring do not consider whether the baseline groundwater quality is above or below EPA MCLs. *See* Strata Exhibit SEI026 at 13, ¶ A.27.

10.39. Nevertheless, both the license application and FSEIS compare the measurements of water quality from the regional baseline monitor wells and private water supply wells against EPA MCLs, EPA secondary standards, and WDEQ class of use standards in accordance with guidance in NUREG-1569. *See* Strata Exhibit SEI045 at 16, ¶ A.14. The results of the comparisons show that some of the water samples from some of the regional baseline monitor wells and private water supply wells exceeded EPA MCLs for various parameters such as uranium, radium-226 and gross alpha. *See id* at 10, ¶ A.7 & 16-17, ¶ A.15; *see also* NRC Staff Exhibit NRC001 at 26-27, ¶ A.1.11.

7. Well Drilling and Development Techniques

10.40. The mud rotary drilling techniques utilized by Strata are designed to limit impacts to the aquifer. The drilling process utilizes drilling fluids consisting of a water and bentonite mixture. The drilling fluids produce a thin, impermeable layer of mud that coats the outside diameter of the drillhole. This thin, impermeable layer of mud limits the horizontal movement of fluids into or out of the drillhole thereby limiting impacts to the aquifer. *See* Strata Exhibit SEI001 at 4-5, ¶¶ A.6-A.7.

10.41. Strata's mud rotary well drilling techniques limit the introduction of atmospheric air into the borehole which could alter the groundwater chemistry. During the drilling process only drilling fluid is introduced into the borehole and no air other than that entrained within the drilling fluid is injected into the borehole. *See id* at 6, ¶ A.8.

10.42. Strata's well development techniques at the Ross ISR Project limit introduction of air into screened intervals. During air lifting operations the air is injected into the wellbore significantly above the screened portion of the aquifer. This process induces a vacuum in the screened interval that removes water from the aquifer, thereby limiting the opportunity for air to be injected into the aquifer. *See* Strata Exhibit SEI001 at 7-8, ¶ A.12, *citing* Strata Exhibit SEI003; *see also* Ex. SEI047 at 3, ¶ A.2; Tr. at 422, Lines 4-11 and 16-17 (Judge White).

10.43. Pumping the wells at the Ross ISR Project will not introduce air into the aquifer because the submersible pumps installed in the monitor wells are typically set at an elevation well above the screened aquifer, making it impossible to draw the water level in the well below the screened interval and introduce air into the aquifer. *See* Strata Exhibit SEI001 at 8, ¶ A.13.

10.44. Drilling with recirculated nitrogen gas is not standard in the uranium ISR industry. *See* Strata Exhibit SEI047 at 4, ¶ A.4; *see also* Ex. SEI049 at 4, ¶ A.3, Ex. SEI046 at 5,

¶ A.4, & Tr. at 366, Lines 15-20 (Demuth). The mud rotary drilling technique utilized in the ISR industry today is a state-of-the-art technique that is efficient and effective. *See* Strata Exhibit SEI046 at 5, ¶ A.4.

10.45. The lack of impacts from drilling has been demonstrated at wellfields where monitor wells have been installed and then later production wells were installed immediately adjacent to the monitor wells. During installation of the production wells no impacts to water quality in the monitor wells were observed from drilling adjacent production wells. *See* Tr. at 344, Lines 11-25 (Knode); *see also* Strata Exhibit SEI001 at 6, ¶ A.9.

10.46. The drilling process does not induce sufficient oxygen in a small diameter borehole to impact the geochemistry of an entire aquifer system. *See id.*; *see also* Tr. at 345, Lines 10-13 (Demuth).

8. Screened Interval for Regional Baseline Monitor Wells

10.47. The screened interval in the six ore zone (OZ) aquifer regional baseline monitor wells (i.e., cluster wells) ranged from 30 to 110 feet and averaged 72 feet. *See* Strata Exhibit SEI045 at 14, ¶ A.10, *citing* Strata Exhibit SEI014A at 251-252). These screened intervals are approximately 3 to 12 times larger than the average mineralized zone thickness of 8.9 feet. *See id.*

10.48. Since the screened intervals of the regional baseline monitor wells in the OZ aquifer were larger than the average mineralized thickness, they are anticipated to represent water quality from a larger interval than future production and injection wells, which will be screened discretely in the mineralized zone, and therefore there was no attempt to bias the measured concentrations of uranium or radium to high values in the OZ regional baseline monitor wells. *See id* at 14-15, ¶¶ A.10-A.11.

9. Screened Interval for Perimeter Monitor Wells

10.49. Strata has committed to installing perimeter monitor wells that are fully screened through the ore zone aquifer, which is consistent with guidance in NUREG-1569 Chapter 5, which states that NRC Staff generally favor fully screened monitor wells to help ensure that excursions will be detected. *See id* at 14-15, ¶ A.11 (citing Ex. SEI007 at 140).

10. Screened Interval for Future Wells Used to Establish CAB and TRVs

10.50. Strata has committed to screening injection and production wells that will be used to obtain CAB and determine TRVs for the ore zone discretely within the mineralized horizon within the ore zone aquifer. *See* Strata Exhibit SEI045 at 14-15, ¶¶ A.10-A.11; *see also* Tr. at 338-339 (Schiffer).

10.51. Obtaining CAB and determining TRVs for the entire ore zone aquifer thickness would not be representative of the groundwater quality in the discrete mineralized zone that will be subject to ISR operations and aquifer restoration. *See* Tr. at 339-340 (Schiffer); *see also* Tr. at 341-342 and 363, Lines 3-13 (Knode).

10.52. The vertical anisotropy in the ore zone is such that the horizontal hydraulic conductivity is typically 10 to 100 times the vertical hydraulic conductivity, which minimizes the vertical flare of lixiviant above and below the mineralized zone. *See* Tr. at 385-386 (Saxton). Strata's requirement to maintain an operational bleed (extracting more water from the wellfield than is reinjected) also will form an inward hydraulic gradient that will further minimize the spread of lixiviant away from the mineralized zone. *See* Strata Exhibit SEI026 at 11, ¶ A.22.

10.53. Installing monitor wells within the wellfield pattern area that fully penetrate the ore zone aquifer would require underreaming the full sand thickness, which could create a

pathway for potential vertical migration of fluids outside of the discrete mineralized zone. *See* Tr. at 361, Lines 9-17 (Knode).

10.54. If CAB and TRVs were established for the entire ore zone aquifer thickness, then monitoring to determine compliance with the TRVs would also be conducted over the entire ore zone aquifer thickness. This would dilute the groundwater quality used to assess restoration success and result in a lower threshold (less conservative) for groundwater restoration. *See* Tr. at 361-362 (Knode).

B. CONTENTION 2

1. Criteria for Successful Groundwater Restoration

10.55. It is not necessary to restore every groundwater parameter to Commission-approved background concentrations in order for groundwater restoration to be deemed successful. License condition 10.6 requires groundwater restoration to 10 CFR Part 40, Appendix A, Criterion 5B(5) standards. *See* Strata Exhibit SEI026 at 15-16, ¶ A.29; *see also* Ex. SEI005 at 23, ¶ A.47, *citing* Strata Exhibit SEI015 at 7-8 [License Condition 10.6] & Ex. SEI009A at 119, 314-315; Strata NRC Staff Exhibit NRC044-R2 at 17, ¶ A.2.1.

10.56. The FSEIS describes the criteria for aquifer restoration in the Executive Summary, Section 2.1.1.3, Section 4.5.1.3, responses to comments in Appendix B, and Appendix B1. *See* NRC Staff Exhibit NRC001 at 29, ¶ A.2.3, *citing* Strata Exhibit SEI009A.

10.57. Strata is further required by its WDEQ permit to restore groundwater within the exempted aquifer to the pre-operational class of use. *See* NRC Staff Exhibit NRC044-R2 at 12, ¶ A.1.4; *see also* Ex. SEI009A at 96; Tr. at 543, lines 9-12 (Saxton).

2. Evaluation of Proposed Groundwater Restoration Techniques

10.58. The groundwater restoration methods proposed in Strata's approved license application are described in FSEIS Sec. 2.1.1.3 and include reverse osmosis (RO) treatment with reinjection of the permeate, groundwater sweep, groundwater transfer, groundwater recirculation, and stability monitoring. *See* Strata Exhibit SEI005 at 22, ¶ A.45, *citing* Strata Exhibit SEI009A at 118-121).

10.59. The FSEIS and SER document NRC Staff's evaluation of the effectiveness of Strata's proposed groundwater restoration methods and the determination that the proposed methods will be adequate to meet 10 CFR Part 40, Appendix A, Criterion 5B(5) standards. *See id* at 23-24, ¶ A.47, *citing* Strata Exhibit SEI010 at 311-312 & Ex. SEI009A at 119, 314-315).

10.60. License Condition 10.6 requires groundwater restoration to Criterion 5B(5) standards. *See id*, *citing* Strata Exhibit SEI015 at 7-8 [License Condition 10.6]).

3. Advances in Groundwater Restoration Techniques

10.61. Groundwater restoration at uranium ISR facilities has advanced from the most earliest facilities, which largely used groundwater sweep, to modern ISR facilities, which rely on RO water treatment to remove contaminants. The use of RO requires less groundwater consumption and has proven to be an effective way to accelerate restoration compared to groundwater sweep alone. *See* Strata Exhibit SEI001 at 9-10, ¶ A.18.

10.62. Compared to the Nubeth R&D project, use of RO treatment, pH control, injection solution chemistry control, and improved filtration are all identified as advancements that have the potential to improve groundwater restoration efficiency. Bioremediation may also be a viable technology for use in groundwater restoration, but would not be conducted without a license amendment. *See id* at 10, ¶ A.19; *see also* Strata Exhibit SEI005 at 28, ¶ A.55.

10.63. Adequate effluent management capacity also affects groundwater restoration efficiency. The SER documents NRC Staff's determination that Strata's deep well disposal plans for effluent management are acceptable. *See id.*

10.64. As described in ¶ 10.32, both WDEQ-LQD and NRC determined that groundwater restoration was successfully restored to applicable regulatory requirements at the Nubeth R&D site.

10.65. By 1989 groundwater restoration technology had advanced sufficiently that a representative of the NRC wrote that, "Based upon the accumulation of operational data and information, it has become apparent that ISL operations pose no significant environmental impacts." *See* Strata Exhibit SEI005 at 24, ¶ A.47, *citing* Strata Exhibit SEI035 at 5.

4. Historical Groundwater Restoration Successes

10.66. The FSEIS specifically evaluates the effectiveness of aquifer restoration at historically and currently operated ISR facilities. *See* Ex. SEI005 at 23-24, ¶ A.47 (citing Ex. SEI009A at 624). *See also id* at 25-26, ¶ A.50 (citing Ex. SEI009A at 322).

10.67. There are three commercial ISR facilities that have received the Commission's approval for aquifer restoration activities, including Crow Butte Wellfield 1, Smith Ranch-Highland A Wellfield and Irigaray Mine Units 1-9. In the approval of groundwater restoration for these three facilities, the Commission found the concentrations of hazardous constituents to be protective of human health and the environment at the aquifer exemption boundary of each ISR production zone. *See* NRC Staff Exhibit NRC001 at 32, ¶ A.2.6, *citing* Strata Exhibits SEI004A & SEI004B.

10.68. NRC Staff did not present data on groundwater restoration at Christensen Ranch Mine Units 2-6 in the FSEIS (currently part of the Willow Creek Project), since the Commission

has not yet approved groundwater restoration for this facility. *See* NRC Staff Exhibit NRC044-R2 at 20-21, ¶ A.2.6; *see also id* at 22, ¶ A.2.7; Strata Exhibit SEI045 at 18, ¶ A.16; Tr. at 631, Lines 23-25 (Dr. Johnson).

10.69. At the time NUREG-1569 was issued, NRC Staff used restoration to prior to class of use as one of the groundwater restoration alternatives. *See* Tr. at 555, lines 3-6 (Saxton). At the time the Crow Butte Wellfield 1, Smith Ranch-Highland A Wellfield, and Irigaray Mine Units 1-9 were restored, the Class I domestic groundwater standard for uranium was 5 mg/L. *See* NRC Staff Exhibit NRC044-R2 at 19, ¶ A.2.5, *citing* NRC Staff Exhibits NRC048 & NRC049. Although the approved restoration concentrations for uranium concentrations at these sites exceeded post-licensing, pre-operational values, they did not exceed the Class I domestic use standard of 5 mg/L. *See id*; *see also* Strata Exhibit SEI005 at 23-24, ¶ A.47, *citing* Strata Exhibit SEI009A at 624; Tr. at 620, Lines 12-18 (Dr. Johnson).

5. ALARA Requirement

10.70. An ACL application must demonstrate that the concentration of the constituent is ALARA, considering practicable corrective actions. *See* Strata Exhibit SEI026 at 16-18, ¶¶ A.31-A.32; *see also* Tr. at 528, Lines 22-24 (Lawrence); NRC Staff Exhibit NRC001 at 11, ¶ A.1.5. This is enforced by license condition 10.6, which requires Strata to show that it has first made practicable effort to restore the specified hazardous constituents to the background or maximum contaminant levels (whichever is greater) prior to requesting approval of an ACL application. *See* Strata Exhibit SEI045 at 6, ¶ A.2, *citing* Strata Exhibit SEI015 at 7, License Condition 10.6.

10.71. NUREG-1620, Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978

(NUREG-1620), provides guidance on how NRC Staff assess compliance with the ALARA requirement in an ACL application. *See* Tr. at 537, lines 7-17 (Saxton); *see also* Tr. at 538, lines 7-10 (Harper), *citing* NRC Staff Exhibit NRC021.

10.72. NRC Staff evaluate a licensee's attempts at restoring groundwater to background or an MCL to ensure that a good-faith effort has been made prior to accepting an ACL. *See* Tr. at 556-557 (Saxton).

6. Other ACL Requirements

10.73. The FSEIS describes the process by which ACLs would be approved in Section 4.5.1.3 and in Appendix B1. In addition, the FSEIS discusses the process for ACLs in Appendix B, in the responses to comments RP032-004, RP032-020, RP032-36, RP032-041 and RP041-006. *See* NRC Staff Exhibit NRC001 at 29, ¶ A.2.4.

10.74. An ACL application must demonstrate that the concentration will not pose a substantial present or potential hazard to human health or the environment at the aquifer exemption boundary. *See* Tr. at 538-539 (Dr. Johnson); *see also* NRC Staff Exhibit NRC001 at 35, ¶ A.2.8.

10.75. An ACL application must analyze the nineteen (19) factors listed in 10 CFR Part 40, Appendix A, Criterion 5B(6). *See* Strata Exhibit SEI026 at 17, ¶ A.31; *see also* NRC Staff Exhibit NRC001 at 30, ¶ A.2.4.

10.76. Prior class of use may be considered when preparing and evaluating an ACL application. Restoring groundwater quality within the exempted aquifer to prior class of use means that it will be suitable for the same uses after groundwater restoration as before ISR operations. *See* Strata Exhibit SEI005 at 24, ¶ A.47; *see also* Strata Exhibit SEI026 at 18, ¶ A.31, *citing* Strata Exhibit SEI044 at 2).

10.77. To request Commission approval of a proposed ACL, the licensee must submit an application for a license amendment. *See* NRC Staff Exhibit NRC001 at 30, ¶ A.2.4; *see also* Strata Exhibit SEI026 at 18, ¶ A.32.

7. NEPA Evaluation of Potential ACL Application

10.78. An ACL application requires a complete 10 CFR Part 51 environmental analysis (in the form of an EA) and safety review for requested ACLs. *See id*.; *see also* SEI Initial Position Statement at 45-46; Strata Exhibit SEI046 at 6, ¶ A.6.

10.79. NUREG-1748, Chapter 2, *Preparation and Use of Categorical Exclusions*, does not include ACLs under the 10 CFR Part 51 activities that may result in categorical exclusions. *See* SEI Initial Position Statement at 46. *See also* NRC Staff Exhibit NRC013 at 28 *et seq.*

8. Potential Impacts within the Aquifer Exemption Boundary

10.80. The aquifer exemption granted by EPA and WDEQ permanently exempts groundwater within the ISR wellfields as an underground source of drinking water (USDW). *See* Strata Exhibit SEI026 at 13, ¶ A.26, *citing* Strata Exhibit SEI009A at 96; *see also* Ex. SEI045 at 18, ¶ A.16; Tr. at 600, lines 2-10 (Judge Cole/Dr. Larson).

10.81. The aquifer exemption boundary extends 100 feet beyond the perimeter monitor well ring; this distance is a site-specific calculation based on groundwater velocity in the ore zone aquifer. *See* Tr. at 368-369 (Schiffer); *see also* Strata Exhibit SEI026 at 14, *citing* Strata Exhibit SEI034 at 1.

10.82. EPA has concurred with the WDEQ's conclusion that the groundwater within the aquifer exemption boundary does not currently serve as a source of drinking water. *See* Strata Exhibit SEI045 at 16, ¶ A.13.

10.83. No domestic (drinking water) wells are located within the entire license boundary. *See* Strata Exhibit SEI005 at 8, ¶ A.14.

10.84. In order to approve an ACL application, the NRC must determine that the concentration at the aquifer exemption boundary will not result in movement of any contaminant into the USDW which is located outside the aquifer exemption boundary. *See* Strata Exhibit SEI026 at 18, ¶ A.32; *see also* Tr. at 560, Lines 4-9 (Dr. Johnson); Tr. at 538-539 (Dr. Johnson).

9. Potential Impacts Outside the Aquifer Exemption Boundary

10.85. The "small" groundwater impact determination in the FSEIS follows the methodology in the GEIS and is based on the fact that the licensee will have to restore groundwater to meet the requirements of 10 CFR Part 40, Appendix A, Criterion 5B(5), which determines that it will pose no significant hazard to human health or the environment. *See* Tr. at 547-549 (Moore); *see also* Tr. at 559-560 (Dr. Johnson).

10.86. When the NRC Staff prepared the Moore Ranch FSEIS in August 2010, they concluded that to date no excursion from an NRC-licensed facility has contaminated a USDW. *See* Strata Exhibit SEI026 at 14, ¶ A.28, *citing* Strata Exhibit SEI036 at 479.

10.87. In a July 10, 2009, memorandum from NRC Staff to the Commissioners, they concluded that none of the excursions at NRC-licensed facilities had resulted in environmental impacts. *See* Strata Exhibit SEI026 at 14-15, ¶ A.28, *citing* Strata Exhibit SEI004A at 1-2. The report accompanying the memorandum states that Staff is unaware of any situation where the groundwater quality at a nearby well has been degraded, the use of a water supply well has been discontinued, or a well has been relocated because of impacts attributed to an ISR facility. *See* Strata Exhibit SEI001 at 9, ¶ A.17, *citing* Strata Exhibit SEI004B at 5.

10.88. The Texas Commission on Environmental Quality (TCEQ) has stated that they are not aware of a documented case in over 30 years of *in situ* mining where offsite groundwater contamination has resulted from in situ uranium mining in South Texas. *See* Strata Exhibit SEI026 at 15, ¶ A.28, *citing* Strata Exhibit SEI038 at 48.

10. Prediction of Future ACL Parameters and Concentrations

10.89. The ACL application process requires a number of analyses and evaluations that cannot be performed during the license application process. These include a corrective actions assessment, which evaluates the groundwater restoration actions that were performed prior to preparing the ACL application, an ALARA evaluation, and an analysis of potential alternative corrective actions. Therefore, it is not possible to predict what constituents may require a future ACL application or at what concentrations during the license application process. *See* Tr. at 528-529 (Lawrence).

10.90. For each of the three commercial ISR facilities for which the Commission has approved groundwater restoration, the FSEIS describes the proportion of constituents that were restored to post-licensing, pre-operational concentrations, to the Wyoming Class I Domestic Use standards, or to EPA's drinking water MCLs. *See* NRC Staff Exhibit NRC001 at 32, ¶ A.2.6, *citing* Strata Exhibit SEI009A at 320.

C. CONTENTION 3

1. Locating and Plugging Historical Exploration Holes

10.91. Most operating ISR projects in the States of Wyoming, Nebraska and Texas contain hundreds or thousands of exploration drill holes. *See* Strata Exhibit SEI026 at 18, ¶ A.33; *see also* Strata Exhibit SEI001 at 11, ¶ A.21.

10.92. Based on Petrotek Engineering Corporation's experience in conducting over 40 pump tests for ISR wellfields, it is not typical that historical exploration drill holes create a problem. *See* Tr. at 767, lines 7-13 (Demuth).

10.93. Strata committed in its license application that prior to ISR uranium recovery, all historic exploration and delineation drillholes that can be located within the perimeter monitor well ring and beneath the central plant area will be plugged and abandoned by today's standards. *See* Strata Exhibit SEI001 at 11, ¶ A.22, *citing* Strata Exhibit SEI016B at 402); *see also* Strata Exhibit SEI045 at 21, ¶ A.18, *citing* Strata Exhibit SEI014C at 40-42, 239).

10.94. This commitment is enforced by license condition 10.12, which requires Strata to "attempt to locate and abandon all historic drill holes located within the perimeter well ring" prior to conducting pump tests for each wellfield data package. *See id.*; *see also* Strata Exhibit SEI001 at 12-13, ¶ A.26, *citing* Strata Exhibit SEI015 at 9 [License Condition 10.12]); Strata Exhibit SEI005 at 30-31, ¶¶ A.60-A.61.

10.95. Inside the Ross permit area, Strata has records of 1,483 historical Nubeth exploration holes, of which Strata has located and surveyed 1,354 as of August 1, 2014. Strata estimates that 1,382 of the historical exploration holes are within the proposed perimeter monitor well rings, of which 1,265 (92%) have been located and re-surveyed. *See* Tr. at 679-680 (Knode); *see also* Strata Exhibit SEI001 at 12, ¶¶ A.23 and A.25.

10.96. Strata employed summer interns that used metal detectors to find the 92% of the historical exploration holes that have been located and surveyed. Strata has not yet implemented a more rigorous search, which will be done before performing the pump tests for each wellfield. *See* Tr. at 692-693 (Knode).

10.97. Holes that have been located and surveyed have cement caps with metal plugs that make them readily identifiable and easily locatable. *See* Strata Exhibit SEI047 at 6, ¶ A.9; *see also* Tr. at 680, lines 9-13 (Knode). Nubeth also surveyed each drillhole and developed a map depicting all drillhole location. *See* Strata Exhibit SEI047 at 6, ¶ A.9. This is not the case at many ISR facilities, where it may be necessary to scrape the topsoil from the ground surface to find evidence of historical boreholes. *See* Tr. at 691-692 (Demuth).

10.98. Strata's approved Class I underground injection control permit (UIC) permit application documents that oil and gas test holes within the license area have been plugged and abandoned with cement. *See* Tr. at 681-682 (Schiffer); *see also* Tr. at 682-683 (Demuth).

10.99. WDEQ/LQD Non-Coal Rules and Regulations, Chapter 8 describes the State of Wyoming standards for plugging and abandoning exploration holes. Strata committed in its license application to use of either high-density bentonite grout or neat cement, which exceeds current State of Wyoming plugging requirements. *See* Strata Exhibit SEI001 at 11, ¶ A.22; *see also* Tr. at 758-759 (Schiffer). Hole plugging procedures are described in the FSEIS. *See* Tr. at 762 (Dr. Burgess), *citing* Strata Exhibit SEI009A at 316).

10.100. To date, Strata has re-entered and re-abandoned 108 historical exploration holes according to current WDEQ/LQD standards within the license area, demonstrating that these holes can be properly abandoned consistent with the approved license application. *See* Strata Exhibit SEI001 at 12, ¶ A.25; *see also* SEI047 at 6, ¶ A.8.; Tr. at 679, Lines 21-23 (Knode).

10.101. Of the 108 historical exploration holes that Strata has re-entered and re-abandoned, 55 surround the 12-18 regional baseline monitoring well cluster. Following re-entering and re-abandoning these 55 holes with cement, two pump tests at his well cluster were

conducted over a combined 97-hour duration and showed no response in either the overlying SM interval or underlying DM interval. *See* Strata Exhibit SEI045 at 21, ¶ A.18, *citing* Strata Ex. SEI014G at 148; *see also* Tr. at 734, Lines 14-18 (Saxton).

10.102. During the plugging and abandonment of the 55 historical exploration holes near the 12-18 well cluster, it was necessary to drill down to reach the total depth of the holes, demonstrating that the holes had self-sealed to some extent over time. *See* Tr. at 757-758 (Schiffer). The presence of swelling clay and shale zones that tend to self-seal open boreholes is common to geologically young sedimentary formations commonly targeted by ISR facilities. *See* Strata Exhibit SEI001 at 11, ¶ A.21; *see also* Ex. SEI026 at 18, ¶ A.33.

10.103. Strata has committed in its license application to recording the details of the plugging of each borehole on an abandonment record that will be maintained at its field office and included in the respective wellfield data package. *See* Strata Exhibit SEI014C at 41-42; *see also* Tr. at 754-755 (Chairman Bollwerk/Dr. Abitz). This commitment is documented in the FSEIS. *See* Strata Exhibit SEI005 at 31, ¶ A.61, *citing* Strata Exhibit SEI009A at 110. Examples of abandonment records are provided in TR Addendum 2.7-F. *See id., citing* TR Addendum 2.7-F [Ex. SEI014G at 274-393]); *see also* Tr. at 753-754 (Chairman Bollwerk/Dr. Abitz).

10.104. NRC Staff will review Strata's attempt to locate and plug all historical boreholes within the perimeter monitor well ring of each wellfield as documented in the wellfield packages and will require a good faith effort. *See* Tr. at 764, lines 2-14 (Saxton). *See also* Tr. at 735-739 (Saxton).

10.105. NRC Staff will not concur on the wellfield package if sufficient efforts are not made to properly abandon the boreholes, and Strata would be in violation of its license if

operations began prior to NRC Staff concurrence. *See* NRC Staff Exhibit NRC001 at 50, ¶ A.3.1.9.

10.106. When assessing the potential environmental impacts of the project, the FSEIS does not assume that all historical exploration boreholes will be plugged by Strata and that there will be no excursions. *See* Tr. at 768, lines 2-9 (Moore); *see also* Tr. at 772, Lines 18-21 (Dr. Burgess).

2. Site Characterization Pumping Tests

10.107. Strata performed seven pumping tests (six 24-hour tests and one 73-hour test) at six well clusters for site characterization purposes. *See* Strata Exhibit SEI048 at 3, ¶ A.1., *citing* Strata Exhibit SEI014G at 147-148). In addition to these pumping tests conducted specifically for the license application, Strata also summarized results from two historical pumping tests conducted in 1977 and 1978 in the license application. *See id* at 3-4, ¶ A.2.; *see also* Strata Exhibit SEI042 at 7, ¶ A.8.

10.108. The goals of the site characterization pumping tests were to determine the aquifer hydraulic parameters and evaluate potential leakage between the OZ and the overlying (SM) and underlying (DM) monitoring intervals. Sufficient data were collected during the pumping tests to determine the aquifer hydraulic parameters and to demonstrate confinement over the local area of influence from the wells. *See* Strata Exhibit SEI042 at 5-6, ¶ A.8.; *see also* Strata Exhibit SEI048 at 4, ¶ A.3.

10.109. The pumping tests performed at Strata's Ross ISR Project are consistent with those of more than forty (40) pumping tests conducted by Petrotek Engineering Corporation at other uranium ISR facilities in States of Texas, Wyoming and Nebraska. *See* Strata Exhibit SEI026 at 19, ¶ A.35.

10.110. Pumping from the industrial wells in the Nubeth R&D Project area in support of the oilfield water flood project has been ongoing for 30 years and has resulted in a 30-year aquifer test. *See* Strata Exhibit SEI026 at 21, ¶ A.40.; *see also* Strata Exhibit SEI042 at 8-9, ¶ A.11.

10.111. Additional wellfield-scale pumping tests will be conducted prior to ISR operations in order to further demonstrate aquifer confinement. These tests will monitor multiple wells throughout the wellfield to verify the integrity of the confining intervals. *See* Strata Exhibit SEI026 at 19, ¶ A.35, *citing* Strata Exhibit SEI009A at 316, License Condition 10.13); *see also* Strata Exhibit SEI042 at 6, ¶ A.8.; *see also* Tr. at 684-685 (Schiffer); Tr. at 685, Lines 12-18 (Moores).

3. Evidence of Hydrologic Confinement

10.112. Strata's site characterization pumping tests demonstrate hydrologic confinement within the vicinity of the monitor well clusters. No response within the overlying (SM) aquifer or underlying (DM) water bearing unit was observed in four of six well clusters, including 12-18 (at which exploration boreholes were re-entered and re-abandoned), 34-7, 12-19 and 42-19. A small response in the DM water bearing unit at the 34-18 and 14-18 well clusters is attributed to improperly plugged exploration boreholes. *See* Strata Exhibit SEI042 at 6, ¶ A.8.; *see also* Tr. at 699, Lines 21-24 (Demuth).

10.113. Static water levels measured at wells completed in the surficial aquifer (SA), SM aquifer, OZ aquifer and DM water bearing unit show several to tens of feet of difference in water level between the water bearing units. These water level differences demonstrate that the water bearing units are hydrologically isolated. *See* Strata Exhibit SEI005

at 30, ¶ A.58, *citing* Strata Exhibit SEI016A at 373-378); *see also* Ex. NRC044-R2 at 33, ¶ A.3.7; Tr. at 708, Lines 11-17 (Dr. Burgess); Tr. at 767, lines 14-20 (Demuth).

10.114. Most of the Nubeth boreholes did not penetrate the underlying DM water bearing unit. *See* Tr at 713, Lines 19-22 (Dr. Burgess).

10.115. The OZ aquifer is geologically confined throughout the entire license area by a very fine-grained shale underlying confining unit that is approximately 50 feet thick and by an overlying shale that varies in thickness from approximately 20 to 80 feet. *See* Strata Exhibit SEI005 at 29, ¶ A.58.

10.116. Piper diagrams comparing the major ion chemistry between aquifers demonstrate that the water quality characteristics in the SA aquifer, SM aquifer, OZ aquifer and DM water bearing unit are unique, indicating that these water bearing intervals are hydrologically isolated from one another. *See* Strata Exhibit SEI005 at 30, ¶ A.59, *citing* Strata Exhibit SEI016A at 385-390; *see also* Strata Exhibit SEI045 at 20-21, ¶ A.18.

10.117. The 22X-19 well is screened through the OZ and DM intervals and not in the SM interval. *See* Strata Exhibit SEI005 at 21, ¶ A.18.

10.118. The numerical groundwater model demonstrates the ability to control groundwater flow over the license area. *See* Strata Exhibit SEI048 at 4, ¶ A.4.

4. Adequacy of Numerical Model

10.119. The modeling software (MODFLOW) used by Strata has become the standard in the industry. The modeling approach used to develop the groundwater model for the Ross ISR Project followed standard modeling protocol. *See* Strata Exhibit SEI026 at 20, ¶ A.38.

10.120. The groundwater model prepared for the Ross ISR project utilized over 30 years of actual pumping data from the industrial wells to calibrate the model. The resulting

drawdowns from pumping were simulated during model verification to ensure that assumed hydraulic parameters input into the model were reasonable. The area over which drawdowns were observed (1-mile radius) was relatively large as compared to the drawdown that would be observed during a short-term pumping test, which allowed the model to be calibrated to a much larger area. *See* Strata Exhibit SEI042 at 8-9, ¶ A.11.

10.121. Pumping rates and drawdown data from the industrial pumping in the Nubeth R&D project over 30 years were used to provide a greater degree of confidence in the model's ability to provide predictive simulations *See* Strata Exhibit SEI026 at 21, ¶ A.40; *see also* Strata Exhibit SEI042 at 8-10, ¶¶ A.11 and A.13.

10.122. The numerical groundwater model consists of a compilation of all available background hydrologic data in one place, including measured hydrologic parameters throughout the project area, pre-1980 and present day water levels, data from the industrial wells, and geologic interpretations garnered from some 2,000 boreholes. Based on the amount of site-specific information incorporated into the model, it provides the best current estimate of project impacts. *See id* at 9-10 ¶¶ A.11-A.12; *see also* Strata Exhibit SEI026 at 20-21, ¶ A.39.

10.123. NRC Staff determined that Strata's numerical groundwater modeling efforts were appropriate for the data quality objectives. *See* Strata Exhibit SEI042 at 10, ¶ A.12, *citing* Strata Exhibit SEI010 at 92; *see also* NRC Staff Ex. NRC001 at 64-65, ¶ A.3.2.5.

5. Wellfield-Scale Pumping Tests

10.124. Additional wellfield-scale pumping tests will be required in accordance with Strata's License Condition 10.13 prior to the start of lixiviant injection in each wellfield. *See* Ex. NRC Staff NRC001 at 64, ¶ A.3.2.4, *citing* License Condition 10.13. Wellfield-scale pumping tests will be required to demonstrate that the OZ aquifer is isolated from the overlying

and underlying aquifers and that the perimeter monitoring wells are in communication with the ore zone wells. *See id* at 76, ¶ A.3.2.11, *citing* Strata Exhibit SEI010 at 291; *see also id.* at 59, ¶ A.3.2.1.; Strata Exhibit SEI005 at 30-31, ¶ A.60, *citing* License Condition 10.13); Strata Exhibit SEI026 at 19, ¶ A.35, *citing* Strata Exhibit SEI009A at 316; Strata Exhibit SEI042 at 6-7, ¶ A.8; Strata Exhibit SEI048 at 5, ¶ A.5.

10.125. The wellfield-scale pumping tests will be more rigorous than the pumping tests carried out for site characterization in that multiple monitor wells will be monitored during the wellfield-scale pumping tests, including the perimeter ring wells and the overlying and underlying monitor wells (installed at a minimum density of one well per 4 acres in overlying and underlying water bearing units). This will allow Strata to demonstrate with a higher level of certainty that the confining intervals are intact. *See* Strata Exhibit SEI042 at 6, ¶ A.8; *see also* Tr. at 685, Lines 12-18 (Moores).

10.126. It will be necessary during the wellfield-scale pumping tests to demonstrate a response in each perimeter monitor well and lack of communication with overlying and underlying monitor wells. *See* Tr. at 348-349 (Schiffer); *see also* Tr. at 684, Lines 15-23 (Schiffer).

10.127. If a wellfield-scale pumping test demonstrates hydrologic communication between the OZ and an underlying or overlying aquifer, Strata will have to address the potential connection to the satisfaction of WDEQ and NRC. *See* Strata Exhibit SEI048 at 5, ¶¶ A.5-A.6. In this case diagnostic methods such as triangulation commonly are used to evaluate the drawdown at distance and direction to determine the most likely location of the potential problem. *See* Tr. at 690-691 (Demuth).

10.128. In approximately 4 of at least 40 wellfield and regional pumping tests that Petrotek Engineering Corporation has conducted for ISR operations, responses were observed that indicated communication between the ore zone and an overlying or underlying zone. In most cases when a pumping test identified a problem, it was remediated by plugging the leaky borehole or well, and the test was repeated until adequate hydrologic isolation could be demonstrated to conduct ISR safely in accordance with NRC regulations, guidance and license requirements. *See* Strata Exhibit SEI046 at 7 ¶ A.8; *see also* Tr. at 689-690 (Demuth).

10.129. Prior to conducting ISR operations in a new wellfield, License Condition 10.13 requires that wellfield data packages will be submitted to the NRC for review or review and verification. *See* NRC Staff Exhibit NRC001 at 47-48, ¶ A.3.1.5 and A.3.1.7, *citing* Strata Exhibit SEI015 at 9 [License Condition 10.13]; *see also* Tr. at 663, Lines 12-15 (Monteith); Tr. at 761, Lines 11-18 (Schiffer).

10.130. If Strata is unable to demonstrate through wellfield-scale pumping tests that they can safely operate each wellfield, operation of that wellfield will not be allowed by NRC Staff or WDEQ. *See* Strata Exhibit SEI046 at 7, ¶ A.7; *see also* Ex. NRC001 at 50, ¶ A.3.1.9; Strata Exhibit SEI048 at 5, ¶ A.6.

10.131. NRC Staff's well-documented position is that pre-license construction of a wellfield monitoring network necessary to establish CAB, TRVs and UCLs is prohibited under 10 CFR 40.32(e). Thus the wellfield packages and associated wellfield-scale pumping tests cannot be completed until after a license is issued. *See* Strata Exhibit SEI026 at 11, ¶ A.20, *citing* Strata Exhibit SEI033 at 1; *see also* SEI Initial Position Statement at 16-17.

6. Excursion Indicators

10.132. The approved excursion indicators for the perimeter monitoring wells and monitoring wells in the overlying (SM) interval include chloride, electrical conductivity, and total alkalinity. For the underlying (DM) interval, sulfate will be used instead of chloride due to the relatively high concentration of chloride in the DM interval. *See* Strata Exhibit SEI005 at 32, ¶ A.63; *see also* Tr. at 311, lines 4-8 (Schiffer); Tr. at 364-365 (Schiffer); Tr. at 695-696 (Schiffer).

10.133. NUREG-1569 does not recommend using uranium as an excursion indicator, since "it may be retarded by reducing conditions in the aquifer." *See* Strata Exhibit SEI005 at 32, ¶ A.63, *citing* Strata Exhibit SEI007 at 138.

10.134. NUREG/CR-3709 also does not recommend using uranium as an excursion indicator, noting that, "the redox-sensitive elements and the major cations are too reactive with the sediments to be reliable indicators. The major anions (chloride and sulfate) were determined to be less reactive and may be effective indicators, providing that their concentrations in the leaching solution are significantly above that in the ground water." *See* Strata Exhibit SEI005 at 32, ¶ A.63, *citing* NRC Staff Exhibit NRC050 at 15). Despite the fact that the concentration of uranium may be orders of magnitude higher in the lixiviant compared to the monitor wells, uranium is not recommended as an excursions indicator, "because the U(VI) could be reduced to U(IV), which forms relatively insoluble compounds under reducing conditions. This would lower the dissolved uranium concentration, perhaps back to the original groundwater concentration." *See id.* at 36.

10.135. There are a variety of processes that may reduce the uranium concentration between the wellfield and the perimeter monitoring ring, including adsorption, precipitation, co-precipitation and advective flow. *See* Tr. at 694-695 (Lawrence).

10.136. According to Ex. JTI058, the degree of how much uranium remains in solution versus how much is adsorbed on different media, primarily quartz and iron hydroxide, are variable, but the range never goes to zero percent adsorption. *See* Tr. at 722-724 (Dr. Johnson).

10.137. Chloride is considered to be the closest thing to a real conservative excursion indicator. *See* Tr. at 730, lines 1-3 (Johnson).

10.138. Both iron hydroxide and quartz, two of the key media for uranium adsorption, are present in the ore zone aquifer. *See* Tr. at 776 (Dr. Johnson). The sandstone in the ore zone consists of 60 percent quartz. *See* Strata Exhibit SEI009A at 160.

10.139. Ex. NRC037 presents monitoring data from the Smith Ranch Highland Uranium Project and concludes that "the very low concentrations of target species (U and Ra) at the two monitoring wells indicate that natural attenuation is likely to play a major role at immobilizing residual (after remediation) concentrations of U(VI) species, thus preventing them from moving outside mined area." *See* Tr. at 625 (Dr. Johnson, citing Ex. NRC037 at 9).

10.140. Documents supporting natural attenuation of uranium include NUREG/CR-3136, NRC Staff Exhibit NRC037, and NRC Staff Exhibit NRC052. *See* Tr. at 489, lines 6-10 (Knode).

10.141. Although the groundwater chemistry within the injection and production wellfield pattern area changes significantly during ISR, following groundwater restoration the natural groundwater flow direction will resume and the carbonate concentrations will decline as

the groundwater flows away from the wellfield, since that area has not been impacted by lixiviant injection. It is this area between the wellfield and perimeter monitor well ring that is critical for natural attenuation of uranium. *See* Tr. at 491-492 (Dr. Johnson). *See also* Strata Exhibit SEI045 at 19, ¶ A.17; *see also* NRC Staff Ex. NRC044-R2 at 25-26 ¶ A.3.2.

10.142. Strata has committed to analyzing background uranium concentrations in every monitoring well. In the event that an excursion is not controlled within 30 days, Strata's WDEQ/LQD Permit to Mine will require Strata to analyze uranium in the monitoring well. *See* Strata Exhibit SEI045 at 19-20, ¶ A.17, *citing* Strata Exhibits SEI014C at 239, SEI012B at 27, & SEI011 at 31; *see also* Tr. at 319-320 (Schiffer); Tr. at 782-783 (Griffin).

10.143. In addition to water quality excursion indicator parameters, changing water levels will be used to provide early warning of a potential excursion, since water levels typically change prior to the arrival of any excursion indicator parameters. *See* Tr. at 700-701 (Lawrence); *see also* Tr. at 702, Lines 5-14 (Schiffer); Strata Exhibit SEI026 at 12, ¶ A.23; *Id* at 19, ¶ A.34, *citing* Strata Exhibit SEI009A at 317).

7. Excursion Frequency

10.144. Excursions are not indicators of environmental impacts; they are the detection of non-hazardous indicator parameters at a monitor well that provide early warning that corrective actions are needed to prevent groundwater contamination outside of the exempted aquifer. *See* Strata Exhibit SEI026 at 14, ¶ A.28, *citing* Strata Exhibit SEI036 at 479).

10.145. Ex. SEI004A documents NRC Staff's review of excursions at NRC-licensed ISR facilities and their conclusion that "None had resulted in environmental impacts." *See id* at 14-15, ¶ A.28, *citing* Strata Exhibit SEI004A at 1-2).

10.146. Similarly, Strata Exhibit SEI037 documents the finding that no off-site impacts have resulted from excursions for U.S. uranium ISR facilities reviewed for the report. *See id* at 15, ¶ A.28, *citing* Strata Exhibit SEI037 at 83).

10.147. Similarly, Strata Exhibit SEI038 documents the TCEQ's determination that decades of ISR in Texas have not resulted in off-site groundwater contamination. *See id.*; *citing* Strata Exhibit SEI038 at 48).

10.148. Strata Exhibit SEI004B, which is the supporting data used to prepare the July 9, 2009, NRC Staff memorandum to the Commission on groundwater impacts from previously licensed ISR facilities (Strata Exhibit SEI004A), describes how the Irigaray/Christensen Ranch Facility (currently the Willow Creek Project) had thirty one (31) excursions, the Smith Ranch Highland Uranium Project had 12 excursions, and the Crowe Butte Project had 20 excursions. This demonstrates that excursions are infrequent occurrences. *See* Tr. at 782 (Griffin).

10.149. NUREG/CR-3967 (NRC Staff Exhibit NRC020) was prepared in 1986, prior to the requirement to perform a mechanical integrity test (MIT) of a well that had undergone maintenance activities that could damage the casing. Strata's license condition 10.5 requires an MIT to be performed after well maintenance activities that could damage the well casing. *See* Strata Exhibit SEI039 at 6, ¶ A.10, *citing* Strata Exhibit SEI015 at 7 [License Condition 10.5].

10.150. Vertical excursions do not occur routinely at modern ISR operations. *See* Strata Exhibit SEI049 at 3, ¶ A.2.

10.151. The FSEIS documents the NRC Staff's determination that the upper and lower confining units provide adequate containment of the proposed ISR fluids and that the

potential for vertical excursions is low because the properties of the confining units at the Ross site are bounded by similar units to or better than those evaluated in the GEIS. *See* NRC Staff Exhibit NRC001 at 43, ¶ A.3.1.1, *citing* Strata Exhibit SEI009A at 178, 181, & 316; NRC Staff Exhibit NRC007 at 537.

10.152. The hydraulic head difference between the SM and OZ aquifers would limit the potential for vertical excursions into the overlying SM interval. Currently, the piezometric head in the SM aquifer is on the order of 100 feet higher than in the ore zone, so if there were an unplugged borehole it would induce a higher head in the ore zone. *See* Tr. at 708, Lines 11-17 (Dr. Burgess). Under conditions as they exist currently, the SM would feed water into the OZ aquifer if there were an improperly abandoned borehole. *See* Tr. at 711, Lines 2-6 (Dr. Burgess).

10.153. In order for an improperly abandoned historical exploration borehole to potentially lead to a vertical excursion, all of the following conditions would have to be met: (1) the historical borehole would have to be located within the area circumscribed by the perimeter monitoring well ring, (2) the hydraulic conductivity of the material within the well bore would have to be significantly higher than that in the confining unit, (3) lixiviant would have to be present at the borehole location in the OZ aquifer, and (4) the piezometric head in the OZ aquifer would have to be above that in the overlying and/or underlying aquifer with which the borehole is connected. Many of the historical boreholes would fail to meet all of these criteria, and thus would not be a potential vertical excursions pathway. *See* NRC Staff Ex. NRC044-R2 at 32-33, ¶ A.3.7.; *see also* NRC Staff Exhibit NRC001 at 51-52, ¶ A.3.1.11.

8. Horizontal Excursion Recovery

10.154. Most horizontal excursions are corrected by adjusting the pumping and injection rates of ISR wells in the immediate vicinity of the excursion. *See* Strata Exhibit SEI001 at 13, ¶ A.27.; *see also* Strata Exhibit SEI005 at 26, ¶ A.51.; SEI026 at 14-15, ¶ A.28; Strata Exhibit SEI009A at 116.

10.155. A primary defense against horizontal excursions is the maintenance of wellfield bleed, which is done by extracting more water from the wellfield than is reinjected. License condition 10.7 requires Strata to maintain a net bleed in each wellfield starting when lixiviant is first injected and continuing until the initiation of stabilization monitoring following groundwater restoration. *See* Strata Exhibit SEI026 at 11, ¶ A.22.; *see also id* at 18-19, ¶ A.34.; Strata Exhibit SEI045 at 18, ¶ A.16, item #6.; Strata Exhibit SEI046 at 7, ¶ A.7.; Tr. at 707, Lines 22-23 (Dr. Burgess).

10.156. Bleed is verified by monitoring the water levels in the perimeter monitoring wells and comparing the levels to pre-operational levels to ensure that an inward hydraulic gradient is maintained within each wellfield. *See* Strata Exhibit SEI026 at 12, ¶ A.23.

10.157. License Condition 11.5 requires Strata to implement immediate corrective actions in the event that an excursion is detected. *See* Strata Exhibit SEI049 at 3, ¶ A.2., *citing* Strata Exhibit SEI015 at 13-14 [License Condition 11.5].

10.158. The numerical model was used to demonstrate the ability to identify and recover a horizontal excursion. *See* Strata Exhibit SEI042 at 8, ¶ A.10.; *see also* NRC Staff Exhibit NRC001 at 64, ¶ A.3.2.4.; Tr. at 346-347 (Schiffer); Tr. at 658, lines 10-17 (Pugsley, *citing* Strata Exhibit SEI014H at 142-160); Tr. at 675-676 (Schiffer).

10.159. The concept of preferential groundwater flow paths potentially leading to horizontal excursions was addressed by NRC Staff in the SER. *See* Tr. at 661, Lines 9-15 (Pugsley, *citing* Strata Exhibit SEI010 at 86-87).

10.160. License condition 10.13 requires Strata to define groundwater flow paths, demonstrate the lateral continuity of the OZ aquifer, and provide an evaluation of the heterogeneities within the ore zone prior to operating each wellfield. *See* Strata Exhibit SEI026 at 19, *citing* Strata Exhibit SEI009A at 316; *see also* Strata Exhibit SEI015 at 9-10 (License Condition 10.13); NRC Staff Exhibit NRC001 at 76, ¶ A.3.2.11, *citing* Strata Exhibit SEI010 at 291.

9. Vertical Excursion Recovery

10.161. With respect to vertical excursions, license condition 11.5 requires Strata to cease injection into the production area surrounding the monitoring well until it demonstrates to the satisfaction of NRC that the vertical excursion is not attributed to leakage through any abandoned drill hole. *See* Strata Exhibit SEI039 at 6, ¶ A.10, *citing* Strata Exhibit SEI009A at 115; *see also* Strata Exhibit SEI049 at 3, ¶ A.2, *citing* Strata Exhibit SEI015 at 14 [License Condition 11.5]); Tr. at 767, Lines 1-5 (Griffin).

10.162. The FSEIS states that cessation of injection is advisable if the probable cause for a vertical excursion is a failed casing in a nearby injection well. Strata will be required to determine the cause of a vertical excursion before resuming injection in the production area surrounding the monitoring well. *See* Strata Exhibit SEI039 at 6, ¶ A.10, *citing* Strata Exhibit SEI009A at 625.

10.163. An excursion that lasts longer than 60 days is required to undergo corrective actions to meet the drinking water protection standards in 10 CFR Part 40, Appendix

A, Criterion 5B(5). *See* Strata Exhibit SEI026 at 14, ¶ A.28, *citing* Strata Exhibit SEI036 at 479; *see also* Strata Exhibit SEI015 at 14 (License Condition 11.5).

10.164. Strata personnel have direct experience in recovering a vertical excursion from injection well I-196-5 at Cameco's Crow Butte ISR facility through a "pump and treat" groundwater remediation method. Successful recovery was documented by the Nebraska Department of Environmental Quality and NRC. *See* Strata Exhibit SEI039 at 4-5, ¶¶ A.7-A.9, *citing* Strata Exhibits SEI041 & SEI004B at 9; *see also* Strata Exhibit SEI049 at 3, ¶ A.1.

10.165. The I-196-5 excursion was caused by a casing coupler failure attributed to a workover rig. At the time, licensees were not required to perform an MIT on wells that had undergone maintenance that could damage the well casing. NRC License No. SUA-1601, License Condition 10.5 requires that Strata perform an MIT after a well has been serviced with equipment or procedures that could damage the well casing, in addition to the routine five (5)-year MIT requirement for each well. This control will reduce the potential for vertical excursions. *See* Strata Exhibit SEI039 at 6, ¶ A.10, *citing* Strata Exhibit SEI015 at 7 [License Condition 10.5]).

V. CONCLUSIONS OF LAW

11.1. NRC Staff has met its burden of proof of "preponderance of the evidence" with respect to compliance with NEPA and 10 CFR Part 51 environmental review regulations through its FSEIS and ROD.

11.2. As a proponent of the ROD and NRC Staff's position on NEPA and 10 CFR Part 51 compliance, Strata has met its burden of demonstrating that it should have been issued NRC License No. SUA-1601.

11.3. The Licensing Board should affirm issuance of Strata's NRC License No. SUA-1601 and NRC Staff's compliance with NEPA and 10 CFR Part 51 environmental review regulations and should not modify the FSEIS or the ROD.

Respectfully Submitted,

/Executed (electronically) by and in accord with 10 C.F.R. § 2.304(d)/
Christopher S. Pugsley, Esq.

_____

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Dated: November 3, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of: STRATA ENERGY, INC. (Ross In Situ Uranium Recovery Facility)	)	Docket No.: 40-9091-MLA Date: November 3, 2014

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "**STRATA ENERGY, INC.'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW**" in the above captioned proceeding have been served via the Electronic Information Exchange (EIE) this 3rd day of November, 2014, which to the best of my knowledge resulted in transmittal of the foregoing to those on the EIE Service List for the above-captioned proceeding.

Respectfully Submitted,

/Executed (electronically) by and in accord with 10 C.F.R. § 2.304(d)/
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