

**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 17, 2014
(Ross In Situ Uranium Recovery Facility)	}	

**STRATA ENERGY, INC'S REPLY TO NRC STAFF'S AND JOINT  
INTERVENORS' 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<sup>1</sup>, the licensee, Strata Energy, Inc. (Strata), hereby submits this Reply to NRC Staff's and Joint Intervenors' (Intervenors) 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. The record of this proceeding supports 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.

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

## **I. INTRODUCTION**

On November 3, 2014, NRC Staff, Intervenors, and Strata submitted proposed findings of fact and conclusions of law on each of the three (3) admitted contentions in this proceeding. In its pleading, NRC Staff argues that the Licensing Board should dismiss Contentions 1-3 and affirm the fact that Strata's NRC License No. SUA-1601 should be upheld and that both NRC Staff and Strata met their burden of demonstrating that the Final Supplemental Environmental Impact Statement ("FSEIS" or NUREG-1910, Supplement 5) adequately satisfies the National Environmental Policy Act (NEPA) and the Commission's environmental review regulations at 10 CFR Part 51. In its pleading, Intervenors argue that the FSEIS is inadequate based on the administrative record under all three (3) admitted contentions and that the record of decision (ROD) should be vacated. Strata's proposed findings of fact and conclusions of law support NRC Staff's pleadings and extensively delineate the factual and legal findings that support upholding Strata's NRC license and the ROD. In accord with Strata's and NRC Staff's November 3, 2014, proposed findings of fact and conclusions of law and for the reasons discussed below, Strata respectfully requests that the Licensing Board find that the FSEIS and the analyses performed and conclusions reached by NRC Staff in the ROD are adequate to satisfy NEPA and 10 CFR Part 51 regulations and that Strata's NRC license should be upheld.

## II. ARGUMENT

### A. REPLY TO PROPOSED CONCLUSIONS OF LAW

#### 1. **NRC STAFF’S PROPOSED CONCLUSIONS OF LAW ARE CONSISTENT WITH EXISTING LAW**

As a general proposition, Strata concurs with NRC Staff’s proposed conclusions of law, as they pertain to Contentions 1-3. For purposes of this reply, Strata will highlight the following conclusions of law proffered by NRC Staff due to their critical importance in this proceeding.

In Paragraph 4.3, NRC Staff cites the legal maxim that “NEPA gives agencies broad discretion to keep their inquiries within appropriate and manageable boundaries.”<sup>2</sup> This maxim is further supported by NRC Staff’s citation to the fact that it “need not address every impact that could possibly result, but rather only those that are reasonably foreseeable or have some likelihood of occurring.”<sup>3</sup> This legal maxim is consistent with the manner in which NRC Staff evaluates ISR projects in the context of 10 CFR Part 40, Appendix A, Criterion 7 “baseline” groundwater quality data gathering and analysis, which embodies the concept that NEPA allows NRC to gather more data but “it must have some discretion to draw the line and move forward with decisionmaking.”<sup>4</sup> This approach to licensing is endorsed by the Commission in several instances including, but not limited to, (1) the *Hydro Resources, Inc.* decision in CLI-06-01, (2) the Commission’s endorsed policy of performance-based licensing, and (3) the Commission’s endorsement of NUREG-1569 for publication as official Commission guidance in Staff Requirements Memorandum (SRM) SECY-02-0204 entitled *Staff Requirements-SECY-02-0204-*

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<sup>2</sup> *Louisiana Energy Services*, CLI-98-3, 47 NRC 77, 103 (1998).

<sup>3</sup> *Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-09-07, 69 NRC 613, 631 (2009).

<sup>4</sup> *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC 287, 315 (2010).

*Update of Uranium Recovery Guidance Documents.*<sup>5</sup> Indeed, with respect to the SRM cited above, then-Commissioner Dicus stated that, as published, NUREG-1569 and its acceptance criteria “are an acceptable means of implementing the Commission’s policy decisions for uranium recovery facilities, *in lieu* of rulemaking.”<sup>6</sup> Thus, NRC Staff’s approach to NEPA in 10 CFR Part 51, as articulated in NUREG-1569, is consistent with Commission-endorsed policies and has the full weight of unanimous Commission approval as guidance.

NRC Staff’s Paragraphs 5.8-5.12 correctly describe the methodology by which Appendix A and NUREG-1569 direct license applicants to gather and analyze Criterion 7 “baseline” groundwater quality data in light of the 10 CFR Part 40.32(e) “construction rule.” Neither NRC Staff nor Strata disagree with the proposition that Criterion 7 requires adequate “baseline” water quality to properly characterize the potentially affected environment in advance of the submission of a license application. It does not, however, mandate the establishment of Criterion 5B(5) “Commission-approved background” (CAB). NUREG-1569, Chapter 2 entitled *Site Characterization* describes all necessary groundwater data that must be gathered and analyzed in a license application to satisfy Criterion 7 “baseline.” On the other hand, NUREG-1569, Chapter 5 entitled *Operations* addressed post-license issuance, pre-operational CAB, which can only be finally established after installation of a complete monitor well network which is prohibited by the Part 40.32(e) “construction rule” prior to the issuance of a license. As correctly stated by NRC Staff in Paragraph 5.14, “Criterion 5B(1) directly connects the license condition-based program required by Criterion 7A to the establishment of the Criterion 5B(5) values: ‘[s]pecified concentration limits are those limits established by the Commission as indicated in paragraph

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<sup>5</sup> United States Nuclear Regulatory Commission, *Staff Requirements-SECY-02-0204-Update of Uranium Recovery Guidance Documents* (May 7, 2003).

<sup>6</sup> *Id.* (Commissioner Comments on SECY-02-0204 at 1 (Commissioner Dicus Comments)).

5B(5) of this criterion.” Thus, Criterion 5B(5) CAB cannot be established until after license issuance.

NRC Staff also cites in Paragraph 5.18 to the FSEIS, Section 3.5.3.3 and Appendix C to demonstrate that it adequately assessed Criterion 7 “baseline” groundwater quality in its 10 CFR Part 51 NEPA environmental review. As limited by the “construction rule,” the FSEIS analyzes the groundwater quality data provided by Strata for more than one (1) year prior to license application submission and, consistent with the Commission’s decision in CLI-06-01, issued license conditions incorporating procedures per NUREG-1569, Chapter 5 proposed by Strata in its license application for gathering groundwater data for establishment of CAB *post-license issuance*.<sup>7</sup> In the *Hydro Resources, Inc.* case cited below (CLI-06-01), the Commission explicitly determined that post-license monitoring and sampling requirements proposed by the licensee as discussed in its final environmental impact statement (FEIS) did not deprive Intervenor of their hearing rights under the AEA. Similarly, such requirements as discussed in Strata’s FSEIS and reflected in License Conditions 10.13, 11.3 and 11.4 do not deprive Intervenor of their right to comment on and evaluate such requirements in NRC’s NEPA/10 CFR Part 51 process for the Ross ISR Project.

The case law cited by NRC Staff and its analysis of the differentiation between Criterion 7 “baseline” groundwater quality pre-license application submission and Criterion 5B(5) CAB in light of the “construction rule,” is consistent with Commission precedent in *Hydro Resources, Inc.* (CLI-06-01) and approved NUREG-1569, Chapters 2 and 5 guidance. Therefore, Strata respectfully submits that the Licensing Board is bound by this precedent and should rule accordingly on these issues in favor of NRC Staff and Strata.

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<sup>7</sup> *Hydro Resources, Inc.* (P.O. Box 777, Crownpoint, New Mexico 87313), CLI-06-01, 63 NRC 1, 5-6 (2006) (footnotes omitted).

Lastly, as noted by NRC Staff, Intervenor's challenges regarding the issues discussed above are essentially limited to challenges to the Commission's regulatory program for ISR licensing actions. NRC Staff cites in its Footnote 71 that "[t]he Intervenor also acknowledge that these concerns are levied at the NRC's licensing process generally, rather than the Staff's review of the Strata Ross application in particular." Tr. at 433-434. Taking this admission into account, it is appropriate to note that the Commission's regulations and its approved guidance at NUREG-1569 as cited above, are not subject to challenge in this proceeding and such challenges should be dismissed. *See* 10 CFR § 2.335.

## **2. JOINT INTERVENORS' PROPOSED LEGAL CONCLUSIONS ARE INCONSISTENT WITH EXISTING LAW**

Contrary to the conclusions of law proposed by NRC Staff, the conclusions of law proposed by Intervenor are inconsistent with existing law and regulations. Intervenor offer very few conclusions of law that are specific to NRC's regulatory process for Strata's license and ROD. Indeed, the primary focus of their proposed conclusions of law is how to interpret what is Criterion 7 "baseline" data. Strata disagrees with Intervenor's Paragraph 44 where they attempt to link their viewpoint on Criterion 7 "baseline" groundwater quality data with the Licensing Board's admission of Contention 1. Intervenor cannot rely on the admission of a contention to a Subpart L administrative proceeding for the legal interpretation of Appendix A Criteria. The standard for an admissible contention is not a merits-based decision nor is it a conclusive legal interpretation of the Commission's regulations. Rather, it is nothing more than an acknowledgement of a potential dispute over the substance of the data gathered and analyzed by a license applicant in a license application and analyzed in a 10 CFR Part 51 environmental document and ROD.

Intervenors also make no attempt to dispute the special weight to be accorded to Commission guidance such as NUREG-1569. In fact, Intervenors only arguments regarding how items such as Criterion 7 “baseline” groundwater quality should be assessed rest on reliance on guidance documents from other agencies that are applicable under other statutory programs such as EPA’s Unified Guidance. *See* Intervenors Proposed Findings at Paragraphs 32-33, 58-59, 64, 79, 94 and 96. Strata has consistently maintained that it has complied with and, in many cases, gone above and beyond NUREG-1569 requirements, and Intervenors has not refuted this point.

In their Paragraph 45, Intervenors’ arguments about 10 CFR Part 40.4’s provisions regarding what level of activity is permissible for “preconstruction monitoring” and the need for “adequate assessments of baseline water quality” do nothing to refute the fact that agencies such as NRC are permitted to determine what level of data and analysis is adequate to satisfy its statutory mandate (e.g., the AEA, as amended) under NEPA. The final judgments regarding “adequate” assessments and a “proper analysis” are left to NRC Staff under NEPA and, to the extent that these judgments and Strata’s submissions comply with NUREG-1569, they should be deemed acceptable for license issuance under Commission precedent.

Intervenors’ explanation in Paragraph 51 of the use of “terminology of ‘baseline’ versus ‘background,’” which they claim the regulations “use interchangeably” is patently incorrect. Intervenors offer no *statutory* or *regulatory* evidence to support this conclusion other than the testimony of NRC Staff’s technical and environmental analysts and project managers, none of whom are legal experts. As noted above, Criterion 7’s reference to “baseline” is not equivalent to Criterion 5B(5)’s reference to “baseline/background” in the form of CAB. While there are other resource areas that are referred to as “baseline” or “background” such as radiation safety

and surface water quality, for purposes of *groundwater quality* under Appendix A, there is a clear distinction between “baseline” and “CAB.”

Intervenors mischaracterize the 10 CFR Part 40, Appendix A, Criterion 5B(5) standards when they state that an ISR operator must “first seek to achieve *primary* groundwater restoration standards, or restoration to baseline quality levels” followed by “*secondary* groundwater restoration standards, or standards that reflect ‘the drinking water limits’ for hazardous constituent.” Intervenors Proposed Findings at 40-41, ¶¶ 106-107 (emphasis added). Criterion 5B(5) makes no distinction between the primary restoration goals of Commission-approved background concentrations or MCLs. It mandates that during groundwater restoration efforts an ISR licensee must restore recovery (ore) zone constituents to either CAB or an MCL, whichever is higher, or an ACL. 10 CFR Part 40, Appendix A, Criterion 5B(5).

Intervenors correctly list two of the requirements that must be satisfied before NRC can approve an ACL, including demonstrating that it is “as low as reasonably achievable [ALARA], after considering practicable [i.e., reasonably achievable] corrective actions, and that the constituent will not pose a substantial present or potential hazard to human health or the environment.” Intervenors Proposed Findings at 41, ¶ 108. To be successful, an ACL application must analyze the nineteen (19) factors listed in 10 CFR Part 40, Appendix A, Criterion 5B(6). Strata Exhibit SEI026 at 16-18, ¶ A.31. A robust demonstration that the ACL is protective of human health and the environment is required, including extensive assessment of the fate and transport of hazardous constituents in groundwater. *Id.* at 18, ¶ A.32.

**B. REPLY TO PROPOSED FINDINGS OF FACT**

**1. NRC STAFF’S PROPOSED FINDINGS OF FACT ARE CONSISTENT WITH THE RECORD OF DECISION AND APPLICATION OF EXISTING LAW TO THE COMMISSION’S ISR REGULATORY PROGRAM**

**a. CONTENTION 1**

Strata has reviewed and supports NRC Staff’s proposed findings of fact on Contention 1. Following are specific examples where Strata supports NRC Staff’s proposed findings of fact and offers additional supporting information from the record.

With respect to EPA’s Unified Guidance that is often cited by Intervenors, Strata agrees that this guidance was developed for implementation of the Resource Conservation and Recovery Act (RCRA) and that “RCRA regulations, and the EPA guidance supporting them, are not directly applicable to the Staff’s NEPA-mandated review of the Ross Project in the FSEIS.” NRC Staff Proposed Findings at 25, ¶ 6.4. Strata adds that source and 11e.(2) byproduct materials are expressly exempt from RCRA, thus Strata is not subject to RCRA protocols. 40 CFR § 261.4(a)(4).

Strata agrees that not all of the guidance for a uranium mill in Regulatory Guide 4.14 is directly applicable to an ISR facility and that upgradient water quality is not necessarily representative of the background water quality in the ISR production zone. NRC Staff Proposed Findings at 28, ¶ 6.10. Strata adds that the 34-70Z well established groundwater quality upgradient from potential wellfields and that upgradient groundwater quality will be established for each wellfield prior to operations since the perimeter monitoring wells will completely surround each wellfield. Strata Exhibit SEI045 at 8, ¶ A.6; see also Tr. at 327, lines 7-9 and 11-15 (Demuth).

Strata agrees that Intervenors “have not established that the impacts of the Nubeth project, if any, cast doubt on the accuracy of the FSEIS’s characterization of the Ross Project groundwater.” NRC Staff Proposed Findings at 30, ¶ 6.13. Further, Strata notes that all of Strata’s regional baseline monitoring wells used to characterize groundwater quality are located upgradient of the Nubeth R&D site due to the cone of depression caused by more than 30 years of pumping for enhanced oil recovery, and therefore these wells could not have been impacted by the Nubeth R&D operations. Strata Exhibit SEI005 at 19, ¶ A.40.

Strata agrees with Staff’s conclusion that the empirical data on groundwater quality “collected by Strata met the requirements of Criterion 7 and was consistent with guidance in Section 2.7 of the Standard Review Plan.” NRC Staff Proposed Findings at 30, ¶ 6.14. Regarding the Standard Review Plan (NUREG-1569), Strata agrees that this is implicitly endorsed by the Commission and therefore entitled to corresponding special weight. *Id.* at 31, ¶ 6.15. Furthermore, Strata notes that NUREG-1569 was, in fact, unanimously approved by the Commission on May 7, 2003. *See* SRM-SECY-02-0204, Commission Voting Record (May 7, 2003).

Strata agrees that the level of analysis of the baseline groundwater quality characterization in the FSEIS is consistent with the approach utilized in the GEIS. NRC Staff Proposed Findings at 33, ¶ 6.19. Strata also agrees with NRC Staff’s conclusion that “Staff analyzed baseline groundwater quality data to the extent required under NEPA.” NRC Staff Proposed Findings at 36, ¶ 6.25. Strata adds that the approach used in the Ross FSEIS is consistent with the approach utilized by NRC Staff in the other four FSEISs tiered from the GEIS. Strata Exhibit SEI026 at 11, ¶ A.21. In fact, the density of monitor wells evaluated in the Ross FSEIS generally is equal to or greater than that in the other four FSEISs tiered from the

GEIS. Strata Exhibit SEI005 at 16, ¶ A.33. Moreover, none of the other FSEISs tiered from the GEIS nor similar EISs prepared by the U.S. Bureau of Land Management (BLM) for oil & gas development and coal mine expansion projects in the Powder River Basin actually provide the specific groundwater quality results, as is done in Appendix C of the Ross FSEIS. Id. at 9, ¶ A.17; see also Strata Exhibit SEI045 at 11, ¶ A.8.

**b. CONTENTION 2**

Strata has reviewed and supports NRC Staff’s proposed findings of fact on Contention 2. Following are specific examples where Strata supports NRC Staff’s proposed findings of fact and offers additional supporting information from the record.

Regarding ACL requirements, Strata agrees that a license amendment will be required and that the Commission must make the determination that the proposed ACL will not pose a substantial present or potential hazard to human health or the environment. NRC Staff Proposed Findings at 42-43, ¶ 6.40. Strata adds that the ACL must also be demonstrated to be ALARA, after considering practicable corrective actions, and the application must address the 19 factors listed in 10 CFR Part 40, Appendix A, Criterion 5B(6). Strata Exhibit SEI026 at 16-18, ¶ A.31.

Regarding groundwater restoration requirements, Strata agrees that both the WDEQ Permit to Mine and the NRC source and byproduct materials license will require groundwater restoration activities and that NRC will require groundwater restoration to Criterion 5B(5) standards. NRC Staff Proposed Findings at 43-44, ¶ 6.42. Additionally, WDEQ will require groundwater restoration within the exempted aquifer to prior class of use, which is more stringent than the EPA UIC regulations requiring that “ground-water protection standards be met only at the aquifer-exemption boundary.” Strata Exhibit SEI009A at 96.

**c. CONTENTION 3**

Strata has reviewed and agrees with NRC Staff's proposed findings of fact submitted on Contention 3. Strata's proposed findings of fact on this contention support and in some cases supplement those proposed by the NRC Staff. The following paragraphs present Strata's reply to NRC Staff's proposed findings of fact on Contention 3.

With respect to mitigation of potential impacts from potential unplugged historical boreholes, the NRC Staff describes how a three-pronged defense has been evaluated, with each prong "embodied by a commitment made by Strata and incorporated as a license condition." NRC Staff Proposed Findings at 45, ¶ 6.46. The three prongs include: 1) significantly reducing the number of unplugged historical boreholes through adherence to License Condition 10.12, which requires Strata to attempt to locate and abandon all historic boreholes within the wellfield perimeter prior to conducting tests for a wellfield data package; 2) detection of vertical excursions through adherence to the excursion monitoring requirements in License Conditions 11.3 and 11.4; and 3) implementing immediate and long-term corrective actions in accordance with License Condition 11.5 if a vertical excursion is detected. *Id.* at 45-46, ¶¶ 6.47-6.49. Strata agrees that these three provisions will significantly reduce the potential impacts from unplugged or improperly plugged boreholes. Further, Strata notes that there are naturally occurring processes that cause historical boreholes to seal off naturally. Tr. at 757-758 (Schiffer); *see also* Strata Exhibit SEI001 at 11, ¶ A.21. Additionally, the higher head in the SM aquifer relative to the OZ aquifer will serve to minimize the potential for vertical migration of ISR solutions upward into the SM aquifer through potential unplugged boreholes. Tr. at 708, lines 11-17 (Dr. Burgess). Finally, it is important to add that most of the historical boreholes do not extend into the underlying (DM) water-bearing interval; this will help minimize the potential for vertical

excursions downward into the DM interval through potential unplugged boreholes. Tr. at 713, lines 19-22 (Dr. Burgess).

With respect to Strata's ability to locate and re-abandon the historical boreholes as required under License Condition 10.12, NRC Staff states that "it is well-established that the NRC does not assume that a licensee will violate its obligations, including the obligations of its license." NRC Staff Proposed Findings at 47, ¶ 6.52. They also acknowledge Strata's success thus far in locating 92% of the boreholes as demonstrating Strata's ability to locate and re-abandon boreholes, and note that "more rigorous techniques will be employed to locate the remaining boreholes." *Id.* Strata agrees with these conclusions and adds that the process of locating historical boreholes has been and will continue to be bolstered by the fact that each of the historical Nubeth exploration boreholes was surveyed and monumented. Strata Exhibit SEI047 at 6, ¶ A.9; *see also* Tr. at 680, lines 9-13 (Knode).

In response to Intervenors' arguments that the pumping tests could not establish adequate hydrological information, NRC Staff concludes that Strata's pumping tests were tailored to provide "adequate and accurate hydrological information about the site." NRC Staff Proposed Findings at 49, ¶ 6.56. Strata supports this conclusion, and adds that in addition to Strata's pumping tests, hydrological information from historical Nubeth pumping tests, data from the 30 years of industrial well pumping, core samples, and potentiometric data also provide valuable hydrological information. Strata Exhibit SEI042 at 8-9, ¶ A.11; *see also* Strata Exhibit SEI026 at 21, ¶ A.39.

NRC Staff concludes the data collected during the 72-hour pumping test conducted at well 12-18OZ demonstrate that there is no direct communication between the overlying and OZ aquifers. NRC Staff Proposed Findings at 50, ¶ 6.59. Strata supports this conclusion and adds

that water level differences between the OZ and the overlying aquifer as well as differences in water quality also demonstrate there is no direct communication between the aquifers. Strata Exhibit SEI005 at 29-30, ¶¶ A.58-A.59.

NRC Staff concludes that Intervenors' argument that uranium should be included as an excursion indicator is unpersuasive. NRC Staff Proposed Findings at 51, ¶ 6.61. Strata agrees with this conclusion and further adds that 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. Strata Exhibit SEI045 at 19-20, ¶ A.17, *citing* Strata Exhibits SEI014C at 239, SEI012B at 27, and SEI011 at 31.

**2. CONTENTION 1: JOINT INTERVENORS' PROPOSED FINDINGS OF FACT ARE INCONSISTENT WITH PHASED GROUNDWATER DATA COLLECTION AS DETAILED IN NRC REGULATIONS AND GUIDANCE**

Intervenors correctly assert that the FSEIS distinguishes between "a 'pre-license site characterization' assessment and a 'post-license pre-operational' assessment." Intervenors Proposed Findings at 18, ¶ 49. However, they improperly refer to the post-license, pre-operational sampling and analysis for individual wellfields as "post license pre-operational *site characterization*." *Id.* (emphasis added). Pre-license groundwater quality data are used to characterize the site in conformance with NUREG-1569 Chapter 2, which is entitled "Site Characterization," while post-license, pre-operational groundwater quality data are used to establish CAB, target restoration values (TRVs) and excursion monitoring upper control limits (UCLs) for each wellfield in conformance with NUREG-1569 Chapter 5, which is entitled "Operations." Strata Exhibit SEI026 at 8, ¶ A.14. NUREG-1569 makes it clear that detailed information for each wellfield will be obtained only *after* licensing:

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.* Therefore, reviewers should ensure that sufficient information is presented to reach only the conclusion necessary for initial licensing. However, reviewers should not expect that information needed to fully describe each aspect of all the operations will be available in the initial application.

Strata Exhibit SEI007 at 40 (emphasis added).

NUREG-1569 also makes it clear that an ISR license applicant is not permitted to install wellfields used to establish CAB, TRVs and UCLs prior to license issuance:

Beginning construction of process facilities, well fields, or other substantial actions that would adversely affect the environment of the site, before the staff has concluded that the appropriate action is to issue the proposed license, is grounds for denial of the application [10 CFR 40.32(e)].

*Id.* at 28.

Intervenors assert that 10 CFR §§ 40.32(e) and 40.4 do not prohibit the installation of “any ‘monitoring wells that are only intended to be used to collect background data or perform background aquifer testing.’” Intervenors Proposed Findings at 16, ¶ 43 (emphasis added), *citing* 76 Fed. Reg. 56951, 56956 (Sept. 15, 2011). However, a full reading of this rulemaking demonstrates that monitoring wells that are part of an *ISR wellfield monitoring network*, which is used to establish CAB, TRVs and UCLs, are not permitted to be installed prior to license issuance:

Installation of monitoring wells that are only intended to be used to collect background data or perform background aquifer testing would be permissible. *However, monitoring wells that are part of an ISR wellfield monitoring network would not be permissible* because such facilities are necessary to ensure the radiological health and safety of the public and that the licensed facility is operating within standards determined by the NRC; therefore, these wells have a reasonable nexus to radiological health and safety and *do not qualify as a site preparation activity.*

76 Fed. Reg. 56956-59657 (Sept. 15, 2011) (emphasis added).

Intervenors focus on the terminology of “baseline” versus “background” and allege that they are distinguished “solely for this project.” Intervenors Proposed Findings at 19, ¶ 51. However, the emphasis in the FSEIS is not whether the term “baseline” or “background” is used, but on “pre-license, site characterization” data versus “post-license, pre-operational” data for CAB in individual wellfields. Tr. at 280, lines 16-18 (Dr. Johnson: “And that’s why we went then to the pre-license site characterization and post-license pre-operational terminology”); *see also* Strata Exhibit SEI009A at 109. The phased approach to gathering and evaluating site characterization groundwater quality data prior to license issuance and later determining wellfield-specific detection monitoring limits and target restoration values is not unique to the Ross ISR Project; it has been used in all five SEISs tiered from the GEIS. Strata Exhibit SEI026 at 11, ¶ A.21. It is also consistent with the Commission’s holding in *Hydro Resources, Inc. In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-06-01, 63 NRC 1 (2006).

Intervenors mischaracterize a statement made by Strata witness Ralph Knode when they allege that, “In other words, ‘an accurate representation’ of baseline water quality will only be established *post-license* and *post-NEPA* review.” Intervenors Proposed Findings at 18, ¶ 49. It is incumbent on a license applicant to demonstrate that it has provided an accurate representation of the groundwater quality in the license application. This is done on a site-wide basis in accordance with guidance in Chapter 2 of NUREG-1569. Strata Exhibit SEI026 at 8, ¶ A.14. What Mr. Knode describes in his testimony was the installation of the perimeter monitor wells that will be used to detect potential horizontal excursions around each wellfield:

MR. KNODE: I thought that Dr. White was asking about the perimeter monitor wells associated with the individual wellfields.

JUDGE WHITE: That is correct.

Tr. at 325.

Having established that these are the perimeter wells that will be used for excursion monitoring, Mr. Knode described the procedures for establishing the UCLs in these wells:

MR. KNODE: Once those wells are installed and developed and can be shown to be an accurate representation of the water in the aquifer, then the sampling starts ...

*Id.*

Thus, when Mr. Knode uses the phrase “accurate representation” he is referring to the requirement to demonstrate that the perimeter wells are properly screened within the ore zone aquifer such that they will effectively detect potential horizontal excursions. Demonstrating that monitor wells are located and screened correctly is one of the criteria in Chapter 5 of NUREG-1569:

Well field hydrologic and water chemistry data are collected before *in situ* leach operations to establish a basis for comparing operational monitoring data. Hydrologic data are used to (i) evaluate whether the well field can be operated safely, (ii) *confirm monitor wells have been located correctly*, and (iii) design aquifer restoration activities.

Strata Exhibit SEI007 at 134 (emphasis added).

Similarly, Intervenors ask the Board to conclude from NRC Staff witness Johari Moore’s testimony that “the water quality data considered in the FSEIS is limited and not sufficient to properly assess baseline conditions in a quantitative manner.” Intervenors Proposed Findings at 19, ¶ 50. However, they mischaracterize Ms. Moore’s testimony. In the cited testimony, Ms. Moore distinguishes between the purpose of the FSEIS, which is “to determine or predict

potential impacts” and detection monitoring data assessed later to detect “actual environmental impacts.” Tr. at 466. This testimony was made in reference to a discussion about EPA’s Unified Guidance and other documents implementing EPA RCRA regulations. Dr. Johnson earlier describes the difference in the purpose between these documents and the FSEIS:

DR. JOHNSON: For the purposes of NEPA and in the SEIS, the important feature was to describe the resource, in other words characterize the resource that could potentially be impacted. And then have sufficient data to characterize the impacts.

Embedded in that was not a purpose to establish remediation goals or restoration targets. That’s not part of the requirement of NEPA and the environmental impact statement.

So the EPA unified guidance and others, the purpose of that often times is more focused toward establishing the remediation goals or restoration targets or what have you. But that’s different than the purpose and the requirements that NEPA has for the environmental impact statement.

Tr. at 464.

**3. CONTENTION 1: JOINT INTERVENORS’ PROPOSED FINDINGS OF FACT AND THE ADMINISTRATIVE RECORD DO NOT DEMONSTRATE THAT BASELINE GROUNDWATER QUALITY WAS NOT ADEQUATELY ASSESSED**

Intervenors ask the Board to conclude that an appropriate definition for “baseline” is “water quality in an aquifer that has not been disturbed by human actions.” Intervenors Proposed Findings at 13, ¶ 32. However, for an ISR license application or FSEIS, “baseline” refers to groundwater quality data that is used to characterize the affected environment as it exists today, or, more specifically, as it existed at the time the license application was submitted to NRC Staff. It is not the pre-industrial groundwater quality that might have existed prior to any anthropogenic influence in the license area such as the Nubeth pilot project or historical exploration drilling. Tr. at 452-453 (Moore); *see also* NRC Staff Exhibit NRC001 at 20, ¶ A.1.8(2).

Intervenors also allege that “[t]here were not a sufficient number of wells and samples to conclude with a stated level of confidence that the groundwater quality exceeds EPA drinking

water MCLs for heavy metals and radionuclides.” Intervenors Proposed Findings at 21, ¶ 57. However, they fail to point to any instances where the FSEIS or license application concludes, with any stated level of emphasis, that the groundwater quality exceeds EPA MCLs. They also fail to point to any regulatory basis requiring such a conclusion. On the contrary, Strata’s aquifer exemption that has been approved by WDEQ and EPA is based on the fact that (i) the exempted aquifer does not currently serve as a source of drinking water, and (ii) it cannot now and would not in the future be classified as a source of drinking water because it is mineral producing; the aquifer exemption is not based on the finding that the groundwater quality exceeds EPA MCLs. Strata Exhibit SEI009A at 2-35; *see also* Strata Exhibit SEI045 at 16, ¶ A.14, *citing* Strata Exhibit SEI034 at 2. Both the license application and FSEIS present the average, minimum and maximum values of the chemical constituents measured in groundwater from wells installed in each aquifer. Strata Exhibit SEI045 at 10, ¶ A.7. Both the license application and FSEIS also compare the groundwater quality results to EPA MCLs, EPA secondary standards, and WDEQ class of use standards as recommended in NUREG-1569, since these standards provide readily identifiable benchmarks for the public and regulators with which to compare the quality of water for a variety of potential uses. Strata Exhibit SEI045 at 16, ¶ A.14. While the groundwater quality often exceeds EPA MCLs or EPA secondary standards, neither the application nor FSEIS attempt to demonstrate that all groundwater in the OZ or other aquifers exceeds these standards.

Intervenors allege that “wells intended to be relied upon to generate monitoring data must be drilled using well-construction methods that ensure *no* oxygen is introduced to the ore zone via drilling fluids and compressed atmospheric air.” Intervenors Proposed Findings at 24-25, ¶ 69 (emphasis added). For support for this claim they cite USGS guidance – which they refer to as “professional standards” – that states, “[t]he primary consideration for selecting well-

installation methods and materials is to *minimize* the effects on the chemical and physical properties of the ground-water sample.” Intervenors Proposed Findings at 24, ¶ 67 (emphasis added), *citing* Intervenors Exhibit JTI011. While Intervenors repeatedly have referred to the USGS guidance document as “professional standards,” this document is not prescriptive, but rather is a compilation of the various well drilling and development methods in use today and compares their relative advantages and disadvantages. NRC Staff Exhibit NRC044-R2 at 13, ¶ A.1.5. Guidance specifying that potential impacts should be “minimize[d]” is not the same as ensuring “no oxygen is introduced to the ore zone.” On the contrary, Strata’s expert witnesses have testified that the industry-standard mud rotary drilling methods and air lift development do not introduce sufficient oxygen into the ore zone to significantly impact baseline groundwater quality. More specifically, Mr. Knode testified about the well-known tendency of the drilling fluids to form a “filter cake” on the borehole wall during mud rotary drilling, which impedes the movement of drilling fluids and any small amount of associated entrained air into the surrounding formation. Strata Exhibit SEI001 at 5, ¶ A.7. The USGS guidance document also describes the phenomenon of forming a filter cake when using drilling fluids. Strata Exhibit SEI047 at 5, ¶ A.6, *citing* Intervenors Exhibit JTI011 at 54. Mr. Knode also describes how during air lift development at the Ross ISR Project, the air is introduced approximately 200 feet above the top of the screened aquifer, which ensures that no air is ever injected directly into the aquifer. Strata Exhibit SEI001 at 7-8, ¶ A.12, *citing* Strata Exhibit SEI003. Additional measures that will be used to minimize the potential impacts to groundwater chemistry from well drilling and development techniques include: (1) use of well casing materials that have no effect on the groundwater quality, (2) setting production well pumps above the screened intervals, which will make it impossible to draw the water level down to the screened interval by pumping, (3)

eliminating fluid residue by properly developing the wells, (4) measuring field water quality parameters during well development to determine geochemical stability, and (5) taking advantage of the hydrostatic head in the OZ aquifer, which is approximately 200 feet above the top of the OZ aquifer and will limit the amount of drilling fluids that could penetrate into the aquifer during drilling. *Id.* at 6-8, ¶¶ A.8, A.11, A.13-A.14; *see also* Strata Exhibit SEI047 at 3, 5, ¶¶ A.2, A.6.

Intervenors allege that Strata did not consider use of “air-rotary drilling with recirculated nitrogen gas instead of air and foam surfactant that contains organic constituents to eliminate oxygen.” Intervenor Proposed Findings at 29, ¶ 80. However, the USGS guidance document often cited by Intervenors does not even mention the use of nitrogen gas for drilling. Strata Exhibit SEI047 at 4-5, ¶ A.5. Moreover, Mr. Knode specifically addresses the disadvantages of air rotary drilling for the Ross ISR Project, citing concerns about hole stability. *Id.* at 4, ¶ A.4. Strata witnesses also testified that in their decades of experience, they are unaware of any instance where the drilling technique proposed by Intervenors has been used in the history of the ISR industry:

MR. DEMUTH: Your Honor, I have never seen a well that’s been installed with nitrogen. I have never heard of a well being proposed to be installed with nitrogen or even discussed in any fashion for an ISR operation in the United States or anywhere within the world.

Tr. at 366 (Demuth); *see also* Strata Exhibit SEI047 at 4, ¶ A.4; *see also* Strata Exhibit SEI049 at 4, ¶ A.3; *see also* Strata Exhibit SEI046 at 5, ¶ A.4.

Intervenors claim that a comparison between the data collected by Strata in 2011 and the data collected in 2010 show that the ore zone was “disturbed and oxidized by well installation and development activities.” Intervenor Proposed Findings at 26-27, ¶ 75. They further claim that “[t]his same striking decrease in uranium” occurred at an ISR facility in Goliad, Texas.

Intervenors Proposed Findings at 28, ¶ 76. However, Strata witnesses show that the graph presented by Dr. Abitz that purportedly presents monitoring results from the Goliad, Texas project is not at all representative of the Ross ISR Project. The Goliad graph shows two data sets with very little overlap, while the Ross ISR Project comparison shows significant overlap between the 2010 and 2011 data sets, with four of six wells showing no decrease or only a very slight decrease (about 20 percent) from 2010 to 2011. Strata Exhibit SEI046 at 4-5, ¶ A.3. Moreover, NRC Staff determined that there was no systematic decline in the range of uranium concentrations during 2010 and 2011, since the ranges of concentrations were “essentially equivalent from March 2010 to October 2011.” NRC Staff Exhibit NRC001 at 18, ¶ A.1.8; *see also* Tr. at 454-459 (Dr. Johnson).

Intervenors used a desktop calculation to support their claim that the uranium concentration in groundwater in the OZ aquifer is over 13 orders of magnitude lower than the EPA MCL of 30 micrograms per liter, or 0.0000000000000238 micrograms per liter. Intervenors Proposed Findings at 25, ¶¶ 70-71. However, NRC Staff addresses this calculation in their prefiled testimony, explaining that it is based on the flawed assumption that there is “a perfect thermodynamic equilibrium between the water quality and the minerals in the aquifer.” NRC Staff Exhibit NRC044-R2 at 15, ¶ A.1.7, *citing* NRC Staff Exhibit NRC046. They also point out that at the Smith Ranch Facility, a study shows that the uranium concentration in wells sampled using methods designed to exclude atmospheric oxygen is 0.11 milligrams per liter (110 micrograms per liter), which is in excess of the EPA MCL and some 5,000 trillion times greater than the concentration alleged by Intervenors using the flawed calculation. *Id.*

Intervenors also claim that there will be “cascading deterioration” in baseline groundwater quality due to phased wellfield development. Intervenors Proposed Findings at 30,

¶ 82. However, 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 inward hydraulic gradient in each operating wellfield. Strata Exhibit SEI015 at 8. Strata also will be required by License Condition 11.5 to perform routine excursion monitoring in each wellfield, which will verify that ISR solutions do not migrate away from the operating wellfields. Strata Exhibit SEI015 at 13-14; *see also* Tr. at 327 (Knode).

Intervenors claim that evidence of “cascading deterioration” in baseline groundwater quality is apparent in 1998 data collected from the Garcia well near the Kingsville Dome ISR facility in South Texas. Intervenors Proposed Findings at 31, ¶ 87. However, this allegation is inconsistent with the determination by the Texas Commission on Environmental Quality (TCEQ) in 2008 that, “[t]he [TCEQ] Executive Director is not aware of a documented case in over 30 years of *in situ* mining of off-site groundwater contamination from *in situ* mining in South Texas.” Strata Exhibit SEI026 at 15, ¶ A.28, *citing* Strata Exhibit SEI038 at 48.

Intervenors continue to misrepresent the screened interval of the regional baseline monitoring wells in the OZ aquifer by claiming that they were “screened only through the part of the ore zone (OZ) water horizon that is in contact with the ore zone.” Intervenors Proposed Findings at 22, ¶ 60. For support they cite a statement in the transcript where Mr. Knode clarifies that production and injection wells used to establish CAB for each wellfield will be screened discretely in the ore zone. *Id.*, *citing* Tr. at 354. It is important to clearly distinguish between the regional baseline cluster wells, which were used to establish pre-license baseline groundwater quality (along with 29 existing water supply wells and historical Nubeth data), and the future ISR production and injection wells, some of which will be used to establish CAB in the production zone of each wellfield. The regional baseline wells were not screened discretely

in the ore zone, but had completion intervals ranging from 3 to 12 times larger than the average mineralized zone thickness. Strata Exhibit SEI045 at 14, ¶ A.10. On the other hand, the future ISR injection and production wells that will be used to establish CAB will be screened discretely in the ore zone. Tr. at 354. There are several disadvantages to screening these wells through the entire ore zone aquifer thickness. First, it would introduce pathways for vertical migration of lixiviant during operations:

MR. KNODE: Okay. If you think of now this area, the enlarged area where the blue lines are coming in, if you think of that now as covering that entire OZ interval, yes, we could collect water from that. Correct. To go back in and only re-screen that red area, which is where we want to mine in, we've created pathways above and below that where our mining solutions now cannot be contained or confined to the area that we want to mine.

That water -- if we're injecting say -- I think that's an easier picture in your mind. If we're injecting that water we're injecting out that screen, it can go anywhere now in that brown interval because we've created a complete underream open face. Whether we go back and screen at the screen interval or not doesn't make any difference because we've created an annulus or open void that would allow all of our injection solutions to go up and down that complete interval.

Tr. at 360-361 (Knode), *referencing* Strata Exhibit SEI003.

Second, CAB is established for the discrete mineralized zone, since that is the zone where ISR and groundwater restoration will take place:

MR. KNODE: But we establish CAB, Commission-approved background, in the ore zone because that's the zone that we are going to affect during mining. And that is the area that -- you know, we are required to restore the areas that we affect during mining. So it would be that same discrete interval that we're mining that we are going to be restoring. So that's the rationale for establishing the CAB in that screened monitor interval.

Tr. at 363.

Also on this subject NRC Staff testified on the vertical anisotropy that minimizes the vertical flare of lixiviant during ISR and helps ensure that impacts are localized within the mineralized zone:

MR. SAXTON: My opinion is it's better to have it in a narrow zone because we're just measuring what the impact is during operations on that zone itself. Typically, a lot of the aquifers that are under ISRs are fluvial in nature and the vertical anisotropy is such that it's on the order of 10 to 100. The horizontal [hydraulic conductivity] is 10 to 100 times that in the vertical direction. And you can calculate what the flare factor would be going to vertical. And it's really minimal at that range. So when we measure the restoration, we want to instead of going throughout the whole interval, we can see exactly what the impact is to the ore zone quite easily and measure that as how far efficient they've restored things.

Tr. at 385-386.

This also brings up the third and most important disadvantage of screening the wells used to establish CAB throughout the entire OZ aquifer thickness rather than the discrete mineralized zone. Establishing CAB for the full aquifer thickness will necessitate assessing restoration success for the same fully screened interval, which will have the effect of diluting the potential impacts from ISR in the samples used to determine restoration success:

MR. KNODE: So now you've established Commission-approved background over the entire interval, as you have correctly asked if we could do. And so now we're going to monitor in this discrete interval, but the compliance point is this fully penetrating well. So when we go back to restore, we've now mined in 10 feet, but we're going to pull our fluids from 100 feet and that's going to severely dilute the water quality at your compliance point. So I think it defeats the purpose when you kind of think it all the way through to its logical end.

Tr. at 362.

Regarding the screening interval of the wells used to establish CAB, Intervenors continue to inappropriately cite guidance from NUREG-1569 as justification for their claim that fully screened wells should be used. Intervenors Proposed Findings at 22-23, ¶¶ 60, 62. They cite a portion of NUREG-1569 Chapter 5 that discusses the screening interval for *perimeter monitor wells* used for excursion monitoring, not injection and production wells that are used to establish CAB. The full quotation from NUREG-1569 makes this clear:

The process for determining the *screened interval of the monitor wells* should be described. Fully screened monitor wells sample the entire thickness of the aquifer. Therefore, excursions could not pass above or below the well screens. However, the concentration of the indicator parameters might be diluted and therefore may not provide timely warning that an excursion is occurring. Partially screened monitor wells only sample the zone of extraction within an aquifer. These wells might miss some excursions, but would suffer less from dilution effects than fully screened wells. *For most situations the staff favors fully screened monitor wells. Fully screened monitor wells would assure that excursions will eventually be detected*, have the advantage of more accurately representing the water quality that a ground-water user is likely to experience, and do not suffer from the uncertainty of predicting the completion intervals of injection and production wells that have not yet been drilled.

Strata Exhibit SEI007 at 139-140 (emphasis added).

As clearly stated in Strata's prefiled testimony, Strata has committed to using fully screened perimeter monitoring wells, which is consistent with this recommendation from NUREG-1569. Strata Exhibit SEI045 at 15, ¶ A.11, *citing* Strata Exhibit SEI014C at 238.

**4. CONTENTION 1: JOINT INTERVENORS' PROPOSED FINDINGS OF FACT DO NOT DEMONSTRATE THAT BASELINE GROUNDWATER QUALITY ASSESSMENT IS NOT CONSISTENT WITH NRC REGULATIONS AND GUIDANCE**

Intervenors misrepresent the amount of baseline groundwater quality data that is presented in the FSEIS. Without any support from testimony or exhibits in the record, they state that "almost all the data collection" will "be established only post-license." Intervenors Proposed Findings at 18, ¶ 49. They also allege that, "The sampling program was too limited, relying on only six well clusters *and some other existing data* in the EIS. *Id.* at 21, ¶ 55 (emphasis added). The FSEIS makes it clear that in addition to installing six regional baseline monitoring well clusters, each consisting of four wells (one each in the SA [surficial aquifer], SM [overlying aquifer], OZ [ore zone aquifer] and DM [underlying water-bearing interval]), Strata sampled 29 existing water supply wells within and adjacent to the project area and presented historical data from the former Nubeth pilot project. Strata Exhibit SEI009A at 182.

Strata also submitted eight (8) quarters of monitoring data from the regional baseline monitoring well clusters and existing water supply wells, which is twice the minimum requirement in 10 CFR Part 40, Appendix A, Criterion 7. Strata Exhibit SEI005 at 16, ¶ A.34. In all, Strata reported results for over 16,000 chemical and radiological parameters from more than 362 groundwater samples, not including samples collected for quality assurance purposes. *Id.* at 9, ¶ A.16. Thus, Intervenors attempt to characterize this as “relying on only six well clusters and some other existing data” grossly misrepresents the amount of data evaluated.

With respect to the number and location of regional baseline monitoring well clusters, Intervenors claim that no justification is provided in Strata’s Technical Report. Intervenors Proposed Findings at 21, ¶ 56. However, as stated by Mr. Schiffer, the number and locations of monitoring well clusters is based on a number of factors including WDEQ guidelines and Regulatory Guide 4.14 guidance. Strata Exhibit SEI005 at 14-15, ¶ A.30; *see also* Exhibit SEI014A at 196.

Intervenors claim that NRC Staff has deferred a “complete and thorough characterization of baseline water quality to the ‘post-licensing, pre-operational’ stage for the Ross Project.” Intervenors Proposed Findings at 37, ¶ 103. For justification, they cite the requirement in 10 CFR Part 40, Appendix A, Criterion 7 to provide “complete baseline data on a milling site and its environs” prior to construction and operation of the facility. Intervenors Proposed Findings at 14, ¶ 34. However, Criterion 7 does not specify the procedures required to provide “complete” baseline data; therefore, it is necessary to consult NRC guidance documents, primarily NUREG-1569, for the appropriate procedures. As explained by NRC Staff, “The Staff expects applicants to characterize the ‘baseline’ of the proposed license area groundwater data in

accordance with guidance in NUREG-1569, Section 2.7.” NRC Staff Exhibit NRC044-R2 at 3, ¶ A.1.1.

Intervenors acknowledge that NUREG-1569 contains guidance on such procedures, including verifying “that a sufficient number of baseline ground-water samples are collected to provide meaningful statistics, that samples are spaced in time sufficiently to capture temporal variations, and that the chemical constituents and water quality parameters are sufficient to establish pre-operational water quality, including class of use.” Intervenors Proposed Findings at 16, ¶ A.39, *citing* Strata Exhibit SEI007 at 60. What they fail to acknowledge, however, is that this quotation is from NUREG-1569 Section 2.7.2 entitled “Review Procedures.” The prescriptive guidance to meet these review procedures is provided subsequently in Section 2.7.3 entitled “Acceptance Criteria.” In terms of providing “meaningful statistics,” Acceptance Criterion 2.7.3(4) specifies that the application should list “[t]he average water quality for each aquifer zone and the range of each indicator in the zone.” Strata Exhibit SEI007 at 64; *see also* Strata Exhibit SEI005 at 17, ¶ A.35. On this subject, Intervenors claim that the “FSEIS ... improperly averages the data that was collected” by “report[ing] average and ranges for each water horizon.” Intervenors Proposed Findings at 23, ¶ 63. However, it is clear from Acceptance Criterion 2.7.3(4) that providing the average water quality and range of parameters for each aquifer zone is precisely what is recommended in NUREG-1569. Strata’s and NRC Staff’s testimony demonstrate that Strata’s license application satisfies all recommendations in NUREG-1569 Section 2.7, including listing the average and range of constituent concentrations in each aquifer zone, collecting samples over a sufficient period of time, demonstrating that samples were collected by acceptable procedures, and analyzing samples for a sufficient number

of parameters. Strata Exhibit SEI005 at 7-16, ¶¶ A.12-A.33; *see also* NRC Staff Exhibit NRC044-R2 at 3, ¶ A.1.1.

Moreover, the actual groundwater quality sampling results from the regional baseline monitoring network and existing water supply wells are quantified in FSEIS Appendix C, something that was not done in the other four FSEISs that have been tiered from the GEIS. Strata Exhibit SEI005 at 9. ¶ A.17, *citing* Strata Exhibit SEI009B at 3-45. Further, the density of monitor wells installed for the purpose of characterizing groundwater quality significantly exceeds the density used for similar NEPA evaluations by the BLM for oil & gas and coal mine expansion projects in the region. Strata Exhibit SEI045 at 11, ¶ A.8. Thus, in response to Intervenor’s statement that baseline groundwater quality “can – and should – be quantified” (Intervenor Proposed Findings at 15, ¶ 36), this has been done in the license application and FSEIS in accordance with NUREG-1569 Chapter 2 guidance.

Intervenor continues to allege that “NRC Regulatory Guid[e] 4.14 notes that at least one well must be hydrologically upgradient to serve as a source for background samples.” Intervenor Proposed Findings at 15, ¶ 37. Initially, it is important to clarify that Regulatory Guide 4.14 is a guidance document; as such, it contains recommendations and not requirements for license applicants. Further, as described by NRC Staff in their rebuttal testimony, Regulatory Guide 4.14 was developed for conventional uranium mills, and not all aspects of this guidance document are applicable to ISR facilities:

Regulatory Guide 4.14 addresses Radiological Effluent and Environmental Monitoring at Uranium Mills. Although some elements of the guidance, such as the sampling of wells and analysis of radiological constituents, can be appropriately applied to ISR facilities, the concept of an upgradient well cannot. A uranium mill as envisioned by Regulatory Guide 4.14 does not include two key features of an ISR facility. First, as noted in A.1.7 of our initial testimony, upgradient water quality is not necessarily representative of the background water quality in the ISR production zone because of the way uranium roll-fronts are formed: The groundwater upgradient of the ore body contains oxygen and is

geochemically distinct from the groundwater in the same horizon through the production zone, which is generally oxygen-deficient. Second, natural hydraulic gradients are not disturbed at a uranium mill in the way that they are disrupted by the recovery wells during ISR operation and aquifer restoration. In fact, as described in Sections 2.1.1.2 and 4.5.1.2 of the FSEIS, the inflow of groundwater into the wellfield, which is a disruption of the natural flow gradient, is required at an ISR facility to reduce the likelihood of excursions out of a wellfield. Therefore, because an upgradient well is not required to establish baseline values at the Ross Project ISR site, the FSEIS does not describe such a well.

NRC Staff Exhibit NRC044-R2 at 9, ¶ A.1.3.

Compliance with regulatory guides is typically addressed in the SER and not the FSEIS. In the case of Regulatory Guide 4.14, the SER describes NRC Staff's determination that certain aspects of Regulatory Guide 4.14 are not applicable to an ISR license application:

Staff agrees that the applicant is not required to follow Regulatory Guide 4.14 groundwater monitoring guidance for tailings impoundments because Strata will not use tailings impoundments ...

Strata Exhibit SEI010 at 113.

Nevertheless, Strata did address all applicable Regulatory Guide 4.14 guidance in its license application. This included analyzing groundwater samples for the parameters recommended in Regulatory Guide 4.14 (dissolved natural uranium, thorium-230, radium-226, polonium-210 and lead-210). Strata Exhibit SEI005 at 11, ¶ A.23, *citing* Strata Exhibit SEI018. It also included sampling each domestic and livestock well within 2 kilometers from the proposed facility, as recommended in Regulatory Guide 4.14. In fact, at least 12 of the 29 private water supply wells that were sampled are farther than 2 kilometers away, demonstrating that Strata exceeded the minimum guidance in Regulatory Guide 4.14. Strata Exhibit SEI005 at 19-22, ¶¶ A.41-A.44. Strata's conformance with Regulatory Guide 4.14 is documented in the FSEIS:

Analytical data and field measurements of selected parameters obtained during the 2009 and 2010 quarterly sampling efforts are provided in the Applicant's ER and TR (Strata, 2011a; Strata, 2011b). Water-quality data from samples collected in 2011 and submitted to WDEQ/LQD are provided in information the NRC subsequently received from the Applicant (Strata, 2012a). All of the ground-water-quality data are presented in Appendix C of this SEIS. *The Applicant adhered to both the WDEQ/LQD's Hydrology, 'Coal and Noncoal,' Guideline No. 8, and the NRC's Regulatory Guide 4.14, Revision 1, during its sampling and analysis efforts, generating the data in Appendix C* (WDEQ/LQD, 2005b; NRC, 1980). The data from 2011 are generally consistent with the 2009 and 2010 data; this consistency indicates a representative characterization of ground-water quality ...

Strata Exhibit SEI009A at 182 (emphasis added).

Finally, although NRC Staff has stated that the recommendation in Regulatory Guide 4.14 to sample an upgradient well is not applicable to ISR facilities, Strata did evaluate the 34-70Z regional baseline monitoring well, which is hydrologically upgradient from all planned wellfield areas. Strata Exhibit SEI045 at 8, ¶ A.6, *citing* Strata Exhibit SEI019. Moreover, the recommendation to sample an upgradient well is a *pre-operational* recommendation in Regulatory Guide 4.14. *Id.* Pre-operational background water quality will be established for areas upgradient of each wellfield prior to operations, since a perimeter monitoring well ring will surround each wellfield. Tr. at 327, lines 7-9 and 11-15 (Demuth).

While Intervenors have failed to demonstrate that the license application fails to satisfy any of the acceptance criteria in NRC guidance documents regarding baseline groundwater quality characterization (especially NUREG-1569), they frequently cite EPA's Unified Guidance – developed for RCRA facilities – in challenges to the adequacy of the license application and FSEIS. Intervenors Proposed Findings at ¶¶ 32-33, 58-59, 64, 79, 94 and 96. However, source and 11e.(2) byproduct materials are expressly exempt from RCRA, thus Strata is not subject to RCRA protocols. Strata Initial Position Statement at 34, footnote 55, *citing* 40 CFR §

261.4(a)(4). Furthermore, from a technical standpoint, the purpose of EPA's Unified Guidance is primarily for detection or compliance monitoring, as stated by Intervenors:

EPA's Unified Guidance also states: "High quality background data is the single most important key to a successful statistical groundwater monitoring program, *especially for detection monitoring.*"

Intervenors Proposed Findings at 14, ¶ 33 (emphasis added).

Compliance monitoring is different than evaluating the affected environment and potential ISR-related impacts in the FSEIS. Tr. at 463-468.

As an example of how EPA's Unified Guidance is misapplied to the Ross ISR Project, Intervenors allege that samples "must be collected from a sufficient number of randomly located wells across the proposed mining area." Intervenors Proposed Findings at 21, ¶ 58. However, EPA's Unified Guidance is related to cleanup and detection monitoring at RCRA facilities, which do not include proposed ISR areas. Further, Intervenors cite guidance documents such as EPA's Unified Guidance to support their claim that "random grid sampling" should have been performed. Intervenors Proposed Findings at 33, ¶ 93. However, as Mr. Saxton explains in the evidentiary hearing, random grid sampling, or "unbiased grid sampling," is not practical to establish CAB for ISR wellfields, since background must be established within the irregularly shaped wellfields, not in a random grid across the project area:

Now we don't do unbiased grid sampling because the well field itself is – it should be pretty close to the uranium ore body. Our goal is to get representative wells that are going to be impacted by the operations and characterize the data before mining or milling

operations. Then once the operation is done, use those same wells to determine the restoration success.

Tr. at 465 (Saxton).

This testimony demonstrates that a practical application of the EPA Unified Guidance is insufficient to establish CAB at the Ross ISR Project or any other ISR project sites.

**5. CONTENTION 2: JOINT INTERVENORS' PROPOSED FINDINGS OF FACT DO NOT DEMONSTRATE THAT THE FSEIS DOES NOT ADEQUATELY ADDRESS GROUNDWATER RESTORATION**

Intervenors would have the Board believe that there is an inconsistency in the description of the groundwater restoration requirements between the DSEIS and FSEIS. Intervenors Proposed Findings at 47-48, ¶¶ 125-127. However, the DSEIS describes the same Criterion 5B(5) standards as those described in the FSEIS:

These standards require that the concentration of a given hazardous constituent must not exceed 1) the NRC-approved background concentration of that constituent in ground water, 2) the respective numeric value in the table included in Paragraph 5C, if the specific constituent is listed in the table and if the background level of the constituent is below the value listed, or 3) an ACL the NRC establishes for the constituent.

NRC Exhibit NRC006B at 39.

[A] aquifer restoration that would be required by the Source and Byproduct Materials License would return these constituent concentrations to each wellfield's respective NRC-approved post-licensing, pre-operational concentrations, numeric water-quality criteria, or specific ACLs as approved by the NRC (NRC, 2014b License Condition 10.6; 10 CFR 40).

Strata Exhibit SEI009A at 311.

Intervenors also are incorrect when they claim that the DSEIS and FSEIS present differing descriptions of where the groundwater restoration requirements will apply. More specifically, they indicate that there is contrasting information between the DSEIS, which states that restoration standards will apply "in the production zone," and the FSEIS. Intervenors

Proposed Findings at 47-48, ¶¶ 125-126. Intervenor cite the following passage from the FSEIS as a potential source of conflicting information:

The purpose of aquifer restoration is to restore the ground-water quality in the wellfield to the ground-water-protection standards specified at 10 CFR Part 40, Appendix A, Criterion 5B(5) (see SEIS Section 2.1.1.2), so as to ensure no hazard to human health or the environment (NRC, 2014b). Water quality is measured at the *point of compliance that coincides with the established boundary of the exempted aquifer*. During uranium recovery operation, the point-of-compliance wells would be those in the perimeter ring as well as those in the overlying-and underlying-aquifers, as required by the ground-water monitoring program (see SEIS Section 6). During aquifer restoration, however, *the group of point-of-compliance wells would be expanded to include the representative wells in the exempted aquifer*.

Intervenor Proposed Findings at 47-48, ¶ 126, *citing* Strata Exhibit SEI009A at 118 (emphasis added).

This FSEIS passage describes how during ISR operations, the operator must ensure that the groundwater quality in the non-exempt portions of the aquifer are not degraded by performing excursion monitoring in perimeter monitoring wells and monitoring wells in the overlying and underlying aquifers. These monitoring wells therefore represent the *points of compliance* during operations. During groundwater restoration, points of compliance wells are in the production zone, since Strata will be required to restore groundwater within the production zone to Criterion 5B(5) standards. The FSEIS makes it clear that these standards will apply within the production zone, and not at the aquifer exemption boundary:

A licensee would be required ... to conduct aquifer-restoration activities to restore *the OZ aquifer* to pre-operational conditions, if possible ...

Strata Exhibit SEI009A at 311 (emphasis added).

Intervenor acknowledge that State standards should be considered in the NEPA evaluation:

Consideration will be given to compliance with *environmental quality standards and requirements that have been imposed by* Federal, State, regional, and local agencies having responsibility for environmental protection, including applicable zoning and land-

use regulations and water pollution limitations or requirements issued or imposed under the Federal Water Pollution Control Act.

Intervenors Proposed Findings at 41-42, ¶ 109, *citing* 10 CFR § 51.71(d) (emphasis added).

However, they fail to consider that the State of Wyoming will impose additional groundwater restoration requirements within the exempted aquifer. Specifically, Strata will be required to restore groundwater within the exempted aquifer to the pre-operational class of use. Tr. at 543 (Saxton). Further, an ACL applicant may use compliance with prior class of use as an additional factor to demonstrate the basis for an ACL that is ALARA. Strata Exhibit SEI026 at 18, ¶ A.31.

Intervenors also mischaracterize EPA’s aquifer exemption approval, stating that “EPA only considered whether the aquifer is currently used for drinking water purposes – not whether the water is of sufficient quality to be used for future drinking water purposes.” Intervenors Proposed Findings at 44, ¶ 117. This ignores the explicit regulatory basis for aquifer exemption approvals, which is that the aquifer cannot currently serve as a source of drinking water and *will not in the future* serve as a source of drinking water:

Before an ISR licensee is allowed to extract uranium, the EPA under 40 CFR Part 146.4 and in accordance with the SDWA must issue an aquifer exemption covering the portion of the aquifer in which the uranium-bearing rock is located. The EPA cannot exempt the portion of the aquifer unless it is found that “it does not currently serve as a source of drinking water” and “*cannot now and will not in the future serve as a source of drinking water.*” Due to these criteria, only impacts outside of the exempted aquifer are evaluated. In most cases, the water in aquifers adjacent to the uranium OZs does not meet drinking water standards. The Commission will not approve an ACL if it will impact any adjacent USDWs. Therefore, the impact of granting an ACL request is SMALL.

Strata Exhibit SEI009A at 715 (emphasis added).

Intervenors allege that NRC Staff’s evaluation in the FSEIS of historical groundwater restoration approvals at other ISR facilities, including Crow Butte Wellfield 1, Smith Ranch-Highland A Wellfield, and Irigaray Mine Units 1-9, is inadequate. Intervenors Proposed

Findings at 49, ¶ 132. Regarding Crow Butte Wellfield 1, Intervenors assert that the NRC Staff initially rejected the Crow Butte restoration report as not being protective of human health and environment, but later reversed their position and approved the restoration even though the uranium concentration did not diminish in subsequent sampling. *Id.* at 50, ¶¶ 135-136. Dr. Johnson addressed Intervenors' misinterpretation of the Crow Butte restoration approval during the evidentiary hearing by describing that it was not the uranium concentrations that caused the NRC Staff initially to reject the restoration, but rather because there was some suggestion in the data that the concentrations had not reached a stable level:

DR. JOHNSON: Thank you, Judge Bollwerk. In the first instance, the finding of not being able to ensure that it was protective was the fact that there was some suggestion that it had not reached, the concentration had not reached, a stable level. So there was some concern that over time the concentrations would slowly increase.

Therefore, the finding of that being protective was not possible because there was concern that it would increase to some unknown level in the future. And then the requirement to address that was some stability monitoring.

And the stability monitoring showed that indeed, that concentration, those concentrations were stable over time. Therefore the analyses could be done to determine if that would be protective outside that exempted aquifer and indeed it was.

Tr. at 615-616.

Intervenors claim that the ACL selected for Crow Butte lacks scientific or empirical basis for assessing restoration performance. Intervenors Proposed Findings at 51, ¶ 138. However, this fails to acknowledge the systematic approach taken by the Commission in 2003 when approving groundwater restoration in Crow Butte Wellfield 1, which was documented in the FSEIS:

Furthermore, rather than the flawed analysis asserted by Drs. Abitz and Larson, the FSEIS documented the systematic approach taken by the Commission in 2003, in which it: (1) assessed concentrations in groundwater after aquifer restoration; (2) ensured the stability of concentrations over time; (3) compared the groundwater concentrations to primary and secondary standards; and (4) applied those standards to arrive at a

determination that the groundwater concentrations presented by Crow Butte for Wellfield 1 were protective of human health and the environment.

NRC Staff Exhibit NRC001 at 37, ¶ A.2.9.

Regardless of what Intervenors may opine about historical groundwater restoration approvals, any ACL process that potentially will be used at Ross will require a rigorous analysis that demonstrates that the concentration is ALARA, considering practicable corrective actions, and demonstrates that it will not pose a substantial present or future hazard to human health or the environment by analyzing the 19 factors listed in 10 CFR Part 40, Appendix A, Criterion 5B(6). Strata Exhibit SEI026 at 16-18 ¶ A.31. Any potential ACL application also will trigger a NEPA evaluation. *Id.* at 18, ¶ A.32. Therefore, it is incorrect to suggest that an ACL will lack a scientific or empirical basis for assessing restoration performance.

With respect to the Smith Ranch-Highland A Wellfield and Irigaray Mine Units 1-9, Intervenors challenge the analyses and decisions previously made by NRC Staff when approving these groundwater restorations. Intervenors Proposed Findings at 51-55, ¶¶ 139-153. However, as explained by NRC Staff during the evidentiary hearing, during preparation of the SEIS they did not attempt to re-evaluate NRC Staff's original findings or the Commission's approval but accepted NRC's previous decisions on restoration. Tr. at 617, lines 11-16 (Dr. Johnson); *see also* NRC Exhibit NRC044-R2 at 20, ¶A.2.5. NRC Staff did not need to reevaluate the Commission's prior approvals to comply with NEPA; they used the best information available that the Commission has historically found to be protective of human health and the environment. Tr. at 510-511 (Monteith).

Intervenors also allege that restoration at the historic Nubeth R&D project was unsuccessful. Intervenors Proposed Findings at 57, ¶ 159. However, their reference to Intervenors Exhibit JTI032 at 14-15 and 87 is not supported by any testimony, and it is

impossible to conclude from the cited exhibit that groundwater restoration was unsuccessful. Moreover, Intervenor's allegation is inconsistent with WDEQ and NRC's determinations that groundwater had been adequately restored in 1983 and NRC's termination of the Nubeth license within 2 years, which validated that not only groundwater restoration but full site decontamination and decommissioning were completed. Strata Exhibit SEI005 at 18, ¶ A.37, *citing* Strata Exhibit SEI014D. NRC Staff concludes 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. NRC Staff Exhibit NRC001 at 21, ¶ A.1.8(2).

Also regarding the Nubeth R&D project, Intervenor is incorrect that "the Nubeth Project used only a single injection well." Intervenor Proposed Findings at 57, ¶ 161. The Nubeth R&D project consisted of a 5-spot pattern, which included four injection wells surrounding a single production well. Strata Exhibit SEI005 at 18, ¶ A.37.

Intervenor further alleges that based on historical Nubeth restoration experience, the FSEIS underestimates the time necessary to restore groundwater. Intervenor Proposed Findings at 57 ¶ 160. However, the Nubeth R&D project was operated at a time when recovery of uranium through ISR methods was a relatively new process in the uranium recovery industry; the license application and FSEIS describe technological advancements that will improve groundwater restoration efficiency, including use of reverse osmosis (RO) treatment, pH control, injection solution chemistry control, and improved filtration. Strata Exhibit SEI001 at 9-10, ¶¶ A.18-A.19; *see also* Strata Exhibit SEI005 at 28, ¶ A.55.

Intervenor alleges that no ISR facility has ever returned groundwater concentrations to primary or secondary standards. Intervenor Proposed Findings at 58, ¶ 163. However, until

March 2005, the Wyoming Class 1 domestic groundwater standard for uranium was 5 mg/L and, in the case of Crow Butte Wellfield 1, Smith Ranch-Highland Wellfield A, and Irigaray Mine Units 1-9, the uranium concentrations exceeded post licensing, pre-operational values but did not exceed the Class 1 domestic use standard of 5 mg/L. NRC Staff Exhibit NRC044-R2 at 19, ¶ A.2.5. Therefore, they were able to return groundwater concentrations to primary (post-license, pre-operational values) or secondary (class of use) standards applicable at the time.

Intervenors continue to discuss groundwater restoration at Christensen Ranch and the Smith Ranch-Highland B Wellfield, insinuating that the NRC Staff's analysis is incomplete because it does not consider data from these sites. Intervenors Proposed Findings at 58-67, ¶¶ 164-174, 180-185, 187. However, data from these facilities are not useful for the purposes of determining what a Commission-approved ACL for the Ross ISR Project will look like because these facilities have not yet received Commission approval for restoration. NRC Staff Exhibit NRC044-R2 at 20, 22, ¶¶ A.2.6-A.2.7.

Intervenors incorrectly state that the FSEIS describes a five-step restoration process that includes: 1) groundwater sweep, 2) reverse osmosis treatment with permeate injection, 3) recirculation, 4) chemical treatment, and 5) stability monitoring. Intervenors Proposed Findings at 43, ¶ 113. However, Strata did not propose chemical treatment in its license application but did propose groundwater transfer, as shown by the following statement in the FSEIS:

The aquifer-restoration activities proposed for the Ross Project are the same as those methods described in GEIS Section 2.5: 1) ground-water transfer, 2) ground-water sweep, 3) RO treatment with permeate injection, 4) ground-water recirculation, and 5) stabilization monitoring (Strata, 2011a; NRC, 2009b).

Strata Exhibit SEI009A at 119.

Intervenors also claim that one of the purposes of the stability monitoring stage of the restoration process is to confirm that "water quality parameters of concern are not migrating

beyond the permit boundary.” Intervenor Proposed Findings at 43, ¶113. This statement is also incorrect. Stability monitoring, as required by License Condition 10.6, includes monitoring water quality in selected production zone wells within the exempted aquifer. The purpose of stability monitoring is to demonstrate that, for all parameters monitored, there is no statistically significant increasing trend, which could lead to an exceedance of the relevant standards in Criterion 5B(5). Strata Exhibit SEI015 at 8.

Intervenor also continue to mischaracterize the cost of groundwater restoration at ISR facilities as “typically 40% of the *entire project budget*.” Intervenor Proposed Findings at 44, ¶ 116 (emphasis added), *citing* Intervenor Exhibit JTI029 at 55. The cited reference makes it clear that groundwater restoration typically represents 40% of the *decommissioning cost* of groundwater restoration, not 40% of the *entire project budget*:

“For nonconventional facilities [including ISR facilities], the average [decommissioning cost] is \$7 million. *Of this amount, 40 percent is for groundwater restoration....*”

Intervenor Exhibit JTI029 at 55 (emphasis added).

**6. CONTENTION 2: JOINT INTERVENORS’ PROPOSED FINDINGS OF FACT DO NOT DEMONSTRATE THAT THE FSEIS DOES NOT ADEQUATELY ADDRESS THE POTENTIAL ENVIRONMENTAL IMPACTS WITHIN THE EXEMPTED AQUIFER**

Intervenor claim that the FSEIS inadequately evaluates the potential environmental impacts within the exempted aquifer, yet they concede that there are stringent regulatory requirements that will be imposed, including:

- (1) Groundwater within the production zone will be required to be restored to Criterion 5B(5) standards, including Commission-approved background, MCLs or an ACL. Intervenor Proposed Findings at 40-41, ¶¶ 105-108.
- (2) If an ACL application is submitted, it must demonstrate that the concentration is ALARA, after considering practicable corrective actions, and that the constituent will not pose a substantial present or potential hazard to human health or the environment. *Id.* at 41, ¶ 108.

- (3) An ACL “can’t be just any number.” It must be demonstrated to be protective “at the boundary of the exempted aquifer.” *Id.* at 46, ¶ 122, *citing* Tr. at 559-561 (Dr. Johnson).

Further, there are additional groundwater protection measures described in the FSEIS that support NRC Staff’s determination that potential groundwater quality impacts within the exempted aquifer will be small:

- (1) “Based upon the NRC staff’s review of the Applicant’s commitments in the license application coupled with Condition No. 10.6 in the Draft Source and Byproduct Materials License pertaining to ground-water restoration, the NRC staff is reasonably assured that the Applicant would restore ground water to the ground-water-protection standards of 10 CFR Part 40, Appendix A, Criterion 5B(5) and would provide the information for the NRC’s determination required per 10 CFR Part 40, Appendix A, Criterion 5D ...” Strata Exhibit SEI009A at 119.
- (2) In accordance with the requirements of 40 CFR Part 146.4, “the exempted aquifer does not currently serve as a source of drinking water and cannot now and would not in the future be classified as a source of drinking water.” *Id.*
- (3) The ore zone targeted for lixiviant injection must be within “that portion of the aquifer that has been permanently exempted by [EPA] as an underground source of drinking water per the Safe Drinking Water Act.” *Id.* at 29.
- (4) “Outside of the aquifer-exemption boundary, the aquifer is still protected as a source of drinking water because the governing regulations regarding underground injection found at 40 CFR Part 144.12 prohibit the movement of any contaminant into the underground source of drinking water which is located outside the aquifer-exemption boundary.” *Id.* at 96.
- (5) “In these [UIC] regulations, a ‘contaminant’ is defined broadly to include ‘any physical, chemical, biological, or radiological substance or matter in water.’ Therefore, groundwater at the aquifer-exemption boundary must meet 10 CFR Part 40, Appendix A, Criterion 5B(5) water-quality requirements.” Strata Exhibit SEI009A at 96.
- (6) “Wyoming’s rules for ‘in situ mining’ require that the exempted aquifer be restored to its premining class of use after operations are complete,” which is more stringent than the EPA requirement that “ground-water protection standards be met only at the aquifer-exemption boundary.”

*Id.*

NRC Staff's conclusion that potential impacts within the exempted aquifer will be small is also supported by their analysis of historical groundwater restoration experiences at Crow Butte Wellfield 1, Smith Ranch-Highland A Wellfield, and Irigaray Mine Units 1-9. NRC Staff Exhibit NRC001 at 31-35, ¶¶ A.2.6-A.2.8.

Intervenors continue to allege that the FSEIS is flawed because it lacks a "risk or dose calculation" on potentially elevated constituent concentrations within the exempted aquifer. Intervenors Proposed Findings at 49, ¶ 133. However, as explained by NRC Staff in their initial testimony, to determine whether a potential ACL "will pose a present or potential hazard to human health or the environment, the NRC will assess the risks of the hazards associated with the constituents, exposure pathways and corrective actions" as part of the ACL application review process. NRC Staff Exhibit NRC001 at 30, ¶ A.2.4. Moreover, in order to approve the ACL application, NRC must determine that the concentration will not pose a substantial present or potential hazard to human health or the environment. Intervenors Proposed Findings at 41, ¶ 108. The potential risk to human health and the environment will be small, since uranium ISR will only take place within an aquifer that has been permanently exempted from protection as a drinking water supply; EPA and WDEQ determined that the aquifer does not now, and will not in the future serve as a drinking water source; there are no drinking water wells in the entire license area; Strata will be required by license condition 10.6 to comply with Criterion 5B(5) restoration standards within the production zone; and Strata will be required to meet federal standards protective of human health and the environment at the aquifer exemption boundary. Tr. at 599-606. Although Intervenors acknowledge that there are no drinking water wells within the exempted aquifer, and it is not anticipated there will be any drinking water wells in the future, they fail to describe during the evidentiary hearing where a dose could occur:

JUDGE COLE: But there are no drinking water wells within the exempted aquifer, and drinking water wells will not be permitted in the exempted aquifer. Am I correct?

DR. LARSON: That is my understanding.

JUDGE COLE: Now, where would the dose of radium 226 and uranium in groundwater occur?

DR. LARSON: Your Honor, this -- this gets into a larger issue with respect to potentially some of this stuff moving off site. That would probably be more associated with fluid migration. That is Contention 3.

Tr. at 606.

Thus there is abundant evidence that sufficient regulatory and operational controls will be in place to ensure that the potential impacts to groundwater quality within and surrounding the exempted aquifer will be small. There is no justification or support provided for Intervenors' claim that groundwater quality degradation will be "clearly noticeable and sufficient to destabilize important attributes of the resource considered." Intervenors Proposed Findings at 49, 57, ¶¶ 132, 162.

**7. CONTENTION 3: JOINT INTERVENORS' PROPOSED FINDINGS OF FACT DO NOT DEMONSTRATE THAT HISTORICAL UNPLUGGED OR IMPROPERLY PLUGGED BOREHOLES WILL RESULT IN FLUID MIGRATION**

Intervenors allege that the FSEIS fails to adequately address the potential for vertical migration of fluids with respect to unplugged boreholes. Intervenors Proposed Findings at 86, ¶ 242. However, Intervenors overstate the potential impacts from unplugged boreholes and fail to consider that physical, engineering and regulatory controls in place under Strata's NRC license will limit the potential for vertical migration of fluids due to unplugged boreholes. The first line of defense that will limit the potential for vertical migration of fluids from potential unplugged or improperly plugged boreholes is the commitment in Strata's license application, 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.” Strata Exhibit SEI015 at 9.

Intervenors use an example from an ISR facility in Texas to attempt to cast doubt on Strata’s ability to locate the historical boreholes. Intervenors Proposed Findings at 77, ¶ 215. However, Intervenors have failed to demonstrate that the conditions encountered at Texas are directly applicable to Strata’s Ross site. At Ross, each historical Nubeth exploration drillhole was surveyed and capped with a cement plug containing a metal cap with a unique identifying number. Strata Exhibit SEI047 at 6, ¶ A.9. As of August 1, 2014, Strata has been able to locate 92 percent of the known exploration drillholes within the estimated mine unit boundaries. *Id.* at 6, ¶ A.8. The care with which historical boreholes were marked and surveyed and Strata’s success thus far in locating historical boreholes suggests that Strata will be able to successfully locate and re-abandon the boreholes within each perimeter monitor well ring. Intervenors also assert that no timetable for re-abandoning the boreholes is available. Intervenors Proposed Findings at 77, ¶ 216 and 87, ¶ 245. However, License Condition 10.12 requires Strata to re-abandon the boreholes prior to completing pumping tests for each wellfield data package. Strata Exhibit SEI015 at 9.

License Condition 10.12 is a conservative license condition that assumes the historical boreholes, by default, act as potential conduits for vertical flow between water-bearing zones. However, prior to operating each wellfield, Strata will be required to conduct wellfield-scale pumping tests to demonstrate lack of communication with overlying and underlying monitor wells. Tr. at 349-350 (Schiffer); *see also* Tr. at 689 (Demuth). If a wellfield-scale pumping test demonstrates hydrologic communication between the OZ and an underlying or overlying aquifer (such as through an improperly plugged borehole), Strata will have to address the potential connection to the satisfaction of WDEQ and NRC before operations in that wellfield may begin.

Strata Exhibit SEI048 at 5, ¶¶ A.5-A.6. Moreover, borehole abandonment efforts completed to date demonstrate that the holes have self-sealed to some extent over time. Tr. at 757-758 (Schiffer). Even if an historical borehole were to remain open, it may not necessarily mean that there will be a vertical excursion. Currently, the piezometric head in the SM aquifer is on the order of 100 feet higher than in the OZ aquifer. Tr. at 708 Lines 11-17 (Dr. Burgess). Therefore, a significant amount of head will be induced into the OZ aquifer if there is an unplugged borehole, which will limit the potential for a vertical excursion upward into the SM aquifer. Further, most of the Nubeth boreholes do not penetrate the underlying DM water-bearing unit. Tr. at 713, lines 19-22 (Dr. Burgess). This limits the potential for a vertical excursion due to an unplugged borehole downward into the DM water-bearing interval. Strata's license conditions impose operating controls that will further limit the potential for impacts in the event of an excursion. In the event a vertical excursion is detected, 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. Strata Exhibit SEI015 at 14; *see also* Tr. at 767, lines 1-5 (Griffin). License Condition 11.5 also requires immediate corrective actions in the event that a horizontal excursion is detected. Strata Exhibit SEI015 at 13-14.

Intervenors assert that Strata's commitment to only re-abandon the boreholes within the perimeter monitoring well ring may allow mining fluids to migrate via boreholes outside of the monitoring well ring. Intervenors Proposed Findings at 77, ¶ 213. However, both natural hydrologic conditions and Strata's license conditions minimize the potential for fluid migration in boreholes outside of the monitoring well ring. Fluid migration beyond the monitor well ring would be a horizontal excursion, which requires immediate corrective action in accordance with

License Condition 11.5. Strata Exhibit SEI015 at 13-14. Further, License Condition 10.7 requires Strata to maintain a net inward hydraulic gradient in each wellfield starting when lixiviant is first injected and continuing until the initiation of stabilization monitoring following groundwater restoration. Strata Exhibit SEI015 at 8. This inward hydraulic gradient is a primary defense against horizontal excursions, which will have to occur if fluid is to migrate beyond the perimeter monitor well ring. Tr. at 707, lines 22-23 (Dr. Burgess). The inward hydraulic gradient maintained by Strata will slightly decrease the water levels within the OZ aquifer, which are already some 100 feet below the water levels in the overlying SM aquifer. Tr. at 708, lines 11-17 (Dr. Burgess). Therefore, in the unlikely event that mining fluids were to migrate outside of the monitor well ring, hydrological conditions will limit the vertical migration of the fluids from the ore zone. In addition, the density of drilling is substantially less outside of the mineralized areas, which will minimize the potential for vertical migration of mining fluids via boreholes outside of the monitor well ring. Tr. at 674, lines 6-11 (Schiffer); *see also* Tr. at 679-680 (Knode). Given the physical, operational and regulatory controls to prevent potential impacts from historical boreholes, Intervenors' assertion that the number of boreholes in the Ross ISR Project leaves an "alarming" potential for uranium bearing lixiviant to migrate to overlying or underlying aquifers via boreholes is without merit. Intervenors Proposed Findings at 78, ¶ 217.

**8. CONTENTION 3: JOINT INTERVENORS' PROPOSED FINDINGS OF FACT DO NOT DEMONSTRATE THAT THERE IS NOT ADEQUATE CONFINEMENT AT THE ROSS ISR PROJECT SITE**

Intervenors assert that the pumping tests performed by Strata are not sufficient to provide adequate hydrological information for the Ross site. Intervenors Proposed Findings at 78, ¶ 219. However, they have failed to acknowledge that in addition to the pumping tests conducted

specifically for the license application, Strata has utilized results from two historical pumping tests conducted in 1977 and 1978 in the license application. Strata Exhibit SEI048 at 3-4, ¶ A.2; *see also* Strata Exhibit SEI042 at 7, ¶ A.8. The license application also evaluates data from industrial well pumping in the Nubeth R&D project area in support of the oilfield water flood project, which has been ongoing for over 30 years and has resulted in a 30-year aquifer test. Strata Exhibit SEI026 at 21, ¶ A.40; *see also* Strata Exhibit SEI042 at 8-9, ¶ A.11. Evidence of confinement also has been demonstrated in the water level differences between the OZ aquifer, SM aquifer and DM water-bearing unit and water quality differences between aquifers. Strata Exhibit SEI005 at 29-30, ¶¶ A.58-A.59. The determination in the FSEIS that there is adequate confinement to safely conduct ISR also relies on geologic cross sections demonstrating that the OZ aquifer is geologically confined throughout the entire license area. *Id.*

Intervenors assert that in order to properly understand the hydrology of the Ross site, additional pumping tests will be required. Intervenors Proposed Findings at 79, ¶ 222. This mischaracterizes the purpose of the pumping tests that are required for each wellfield by License Condition 10.13. These are not site-characterization pumping tests used to understand site hydrology, but wellfield-specific pumping tests that will be required to demonstrate that the production zone of each wellfield is hydraulically isolated from overlying and underlying aquifer and that the perimeter wells are in communication with the ore zone wells. NRC Staff Exhibit NRC001 at 76, ¶ A.3.2.11.

Intervenors incorrectly assert that an excursion “impacts water in aquifers outside of the EPA exempted aquifer, either vertically or horizontally.” Intervenors Proposed Findings at 79, ¶ 225. NRC does not define an excursion as contamination that moves into an underground source of drinking water; it is only an early indicator of wellfield imbalance based on nonhazardous

indicator parameters that provide early warning that corrective action is needed to prevent groundwater contamination outside of the exempted aquifer. Strata Exhibit SEI026 at 14, ¶ A.28, *citing* Strata Exhibit SEI036 at 479. The approved, nonhazardous 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 natural concentration of chloride in the DM interval. Strata Exhibit SEI005 at 32, ¶ A.63; *see also* *Tr.* at 695-697 and 702 (Schiffer).

Intervenors allege that the excursion detection approach may lead to uranium excursions because uranium may travel *faster* than the approved excursion indicator parameters. Intervenors Proposed Findings at 82, ¶ 234 and at 87, ¶ 246. There is absolutely no evidence in the record to support this claim; the issue discussed at length during the evidentiary hearing was whether uranium could travel *as fast* as the other indicator parameters. *Tr.* at 780, lines 9-12 (Dr. Abitz: “If the logic is that sulfate and chloride can still be used, then that logic applies to uranium, too.”). Intervenors are correct that the introduction of lixiviant will enhance the mobility of the uranium in the groundwater within the production zone. Intervenors Proposed Findings at 82, ¶ 234. If this were not the case, uranium ISR could never take place. However, outside of the production zone (i.e., between the production zone and the monitoring wells where the excursion would be detected), naturally reducing conditions of the aquifer will not have been altered by the injection of lixiviant, and the uranium concentrations will be reduced through natural attenuation. NRC Staff Exhibit NRC044-R2 at 29-30, ¶ A.3.4; *see also* *Tr.* at 491-492 (Dr. Johnson). This view is further supported by NUREG-1569, which does not recommend using uranium as an excursion indicator, since “it may be retarded by reducing conditions in the aquifer.” Strata Exhibit SEI005 at 32, ¶ A.63, *citing* Strata Exhibit SEI007 at 138. NUREG/CR-

3709 also does not recommend using uranium as an excursion indicator, noting that “the redox-sensitive elements ... 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...” Strata Exhibit SEI005 at 32, ¶ A.63, *citing* NRC Staff Exhibit NRC050 at 15.

Intervenors incorrectly assert that there is nothing different about the Ross ISR Project that will minimize excursions compared to historical ISR facilities. Intervenors Proposed Findings at 84, ¶ 237. However, there are many site-specific conditions and license requirements that will minimize the potential for excursions. The FSEIS documents the NRC Staff’s determination that the upper and lower confining units provide adequate natural containment of the proposed ISR fluids and the potential for vertical excursions is low because the confining units at the Ross site are bounded by similar units to or better than those evaluated in the GEIS. NRC Exhibit NRC001 at 43, ¶ A.3.1.1, *citing* Strata Exhibit SEI009A at 178, 181 & 316. Further, the hydraulic head difference between the SM and OZ aquifers would limit the potential for vertical excursions into the overlying SM interval. Tr. at 708, lines 11-17 (Dr. Burgess). In addition, Strata will significantly reduce the number of unplugged or improperly plugged historical boreholes through adherence to License Condition 10.12, which requires Strata to attempt to locate and abandon all historic boreholes within the wellfield perimeter prior to completing tests for a wellfield data package. Strata Exhibit SEI015 at 9. Strata has already demonstrated success in locating 92% of the historical boreholes within the potential perimeter monitoring well rings based on only an initial investigation using summer interns. Tr. at 692, lines 13-20 (Knode). Other license requirements that are more stringent than those for historical ISR projects include the requirement to conduct more frequent mechanical integrity testing

(MIT) on all wells. Strata Exhibit SEI039 at 6, ¶ A.10, *citing* Strata Exhibit SEI015 at 7 [License Condition 10.5].

Intervenors are incorrect that the record does not support NRC Staff's assumption that excursions can be remediated. Intervenors Proposed Findings at 84, ¶ 238. Strata personnel have direct experience in recovering a vertical excursion from an injection well 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 (NDEQ) and NRC. Strata Exhibit SEI039 at 4-5, ¶¶ A.7-A.9. Strata personnel also have direct experience in recovering horizontal excursions by adjusting the pumping and injection rates in the immediate vicinity of the wells, which draws the ISR solutions away from the monitor well and back into the production zone. Strata Exhibit SEI001 at 13, ¶ A.27. The FSEIS also documents how horizontal excursions are typically retrieved using this method. Strata Exhibit SEI009A at 116. The numerical model also demonstrates the ability to identify and recover a horizontal excursion. Strata Exhibit SEI042 at 8, ¶ A.10.

### III. CONCLUSION

For the reasons discussed above and based on the November 3, 2014, proposed findings of fact and conclusions of law submitted by Strata and NRC Staff, Strata respectfully requests that the Licensing Board find that the FSEIS and the analyses performed and conclusions reached by NRC Staff in the ROD are adequate to satisfy NEPA and 10 CFR Part 51 regulations and that Strata's NRC license should be upheld.

Respectfully Submitted,

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

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Anthony J. Thompson, Esq.  
Christopher S. Pugsley, Esq.  
Thompson & Pugsley, PLLC  
1225 19<sup>th</sup> Street, NW  
Suite 300  
Washington, DC 20036  
COUNSEL TO STRATA ENERGY, INC.

Dated: November 17, 2014

**UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION**

**BEFORE THE ATOMIC SAFETY AND LICENSING BOARD**

In the Matter of: )  
STRATA ENERGY, INC. ) Docket No.: 40-9091-MLA  
(Ross In Situ Uranium Recovery Facility) ) Date: November 17, 2014  
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**CERTIFICATE OF SERVICE**

I hereby certify that copies of the foregoing "**STRATA ENERGY, INC.'S REPLY TO NRC STAFF'S AND JOINT INTERVENORS' PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW**" in the above captioned proceeding have been served via the Electronic Information Exchange (EIE) this 17th 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)/  
Christopher S. Pugsley, Esq.**

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Anthony J. Thompson, Esq.  
Christopher S. Pugsley, Esq.  
Thompson & Pugsley, PLLC  
1225 19<sup>th</sup> Street, NW  
Suite 300  
Washington, DC 20036  
COUNSEL TO STRATA ENERGY, INC.

Dated: November 17, 2014