SEI047

September 12, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

G. Paul Bollwerk, III, Chairman
Dr. Richard F. Cole,
Dr. Craig M. White

In the Matter of:	)	
	)	
Strata Energy, Inc.	)	Docket No. 40-9091-MLA
	)	ASLBP No. 12-915-01-MLA-BD01
	)	
(Ross In Situ Recovery	)	
Uranium Project)	)	

REBUTTAL TESTIMONY OF RALPH KNODE

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1.0 CONTENTION 1 - ALLEGED FAILURE OF THE FSEIS TO ADEQUATELY CHARACTERIZE BASELINE (I.E. ORIGINAL OR PRE-MINING) GROUNDWATER QUALITY

1.1 Exploration Drilling, ISR Test Operations, and Associated Well Construction Have Not Altered Baseline Conditions

Q.1. In A.18 Dr. Abitz alleges that "SEI will be allowed to contaminate the aquifer prior to baseline development through extensive exploration programs that use oxidizing fluids during drilling operations and the installation of hundreds of wells with rotary-drill techniques that use oxidizing fluids and air-lifting techniques during well development – processes which oxidizes the uranium ore and alter true baseline water quality values" Abitz then references Exhibit JTI009 to support his argument. Have you reviewed Exhibit JTI009?

A.1. Yes. I have reviewed the exhibit. It includes a PowerPoint presentation developed by Dr. Abitz that discusses water quality results at a proposed ISR facility in Texas.

Q.2. Is there anything in the presentation that would lead you to believe that Dr. Abitz's analysis at the Texas site is not relevant to the Ross site?

A.2. Yes. On page 3 of Exhibit JTI009 Dr. Abitz includes a schematic of a monitor well. I assume from the context of this presentation that this is a typical monitor well that Dr. Abitz has analyzed. This monitor well is very different from the production zone monitor wells constructed at the Ross ISR Project. The monitor well in Dr. Abitz's presentation shows that the water level in the well does not rise above the level of the screened interval in the well. In comparison, the monitor wells completed in the Ross ISR Project are confined and the water levels are typically some 200 to 400 feet above the top of the screened interval. Exhibit SEI003 depicts a typical production zone monitor well constructed at the Ross ISR Project. The difference in water level within the well has significant implications for well development. In order to utilize airlift methods to develop the monitor well shown on page 3 of Exhibit JTI009, it would be necessary to inject air within the screened interval. However, as shown on Exhibit SEI003 and described further at A.12 in my initial written testimony (Exhibit SEI001 at 7-8), at Ross air is not injected directly into the screened interval. Rather, air is injected well above the screened interval which induces a vacuum that pulls water from the aquifer through the screened interval and up the wellbore thereby eliminating the opportunity for air to be injected directly into the screened portion of the aquifer.

The last line on page 3 of Exhibit JTI009 states "airlift purge and pump adds O_2". When the example well that Dr. Abitz presents on page 3 of Exhibit JTI009 is pumped, the water level in the well, which is already below the top of the screened interval, is drawn further down into the screened interval. However, as I note in A.13 of my initial testimony (Ex. SEI001 at 8), the pumps in the production zone monitor wells at Ross are set above the screened interval. At Ross it is impossible to draw the water down to the level of the screens because the pumps would run dry before the water level was drawn down. Therefore, Dr. Abitz's allegation that pumping adds O_2 to the aquifer is not applicable to the production zone monitor wells in the Ross ISR Project.

Q.3. During your review of Exhibit JTI009 and Dr. Abitz's initial testimony (Exhibit JTI001) did you find anything that would contradict with his assertion that Strata has "contaminated the aquifer" as he claims in line 15 of A.22 in his initial testimony (JTI001).

A.3. Yes. I find it disconcerting that he claims our well drilling and completion techniques contaminated the aquifer. Yet, it is clear from his testimony that Dr. Abitz believes that, following an initial disturbance, the aquifer will return to reducing conditions (Ex. JTI001 at 17, lines 7-8). This is consistent with my initial testimony (Exhibit SEI001) where I state in A.9 that "Any small amounts of atmospheric air that might have been in the drilling fluid would have a very limited impact on the aquifer, both spatially and in time." This assessment is further reiterated by the NRC in their initial testimony (NRC001) at A.1.8 where they state "Drs. Abitz and Larson's arguments that the well construction and development techniques may have affected water quality may be true to the extent that the impacts are short-term and localized to the vicinity of the well."

In my opinion based on my years of experience with drilling and well construction at ISR facilities Dr. Abitz exaggerates the actual impacts that well drilling and completion will have on the aquifer. His claim that the aquifer will be contaminated by these activities is not well supported. Furthermore, as I reviewed Exhibit JTI009, I noted that Dr. Abitz based his assumptions on data from three sampling events which occurred in April 2008, July 2009, and November 2009. With only three quarters of data it is not possible for Dr. Abitz to rule out the possibility of seasonal variation. Further, in his testimony Dr. Abitz cites the EPA (2009) Unified Guidance which "recommends a minimum of 8 to 10 independent samples be collected before running statistical tests" (Ex. JTI001 at 8 lines 4-5). It appears that Dr. Abitz did not take his own advice in developing Exhibit JTI009.

Q.4. In A.23, of his initial testimony Dr. Abitz, while discussing appropriate well construction methods states that, "An appropriate method would be to use air-rotary drilling (JTI011 at 57) with recirculated nitrogen gas instead of air and a foam surfactant that contains organic constituents to eliminate oxygen" (Ex. JTI001 at 18, lines 14-16). Have you ever been involved with a drilling project that utilizes recirculated nitrogen gas instead of air?

A.4. No. Drilling with recirculated nitrogen gas or air is not standard in the ISR uranium industry. I have never been involved with any projects that have utilized nitrogen gas in combination with air rotary as a drilling media. Furthermore, I would not recommend air rotary drilling for the Ross ISR Project because I would be concerned about hole stability. The ISR industry has used rotary drilling techniques using bentonite based drilling muds (described in A.6 of my initial testimony) that are efficient and do not result in impacts to the aquifer. At the Ross site the drilling mud helps to stabilize the formation and prevent the holes from collapsing. Air drilling at the Ross site would not provide sufficient support to keep the drillhole open given the unconsolidated nature of some of the shallow, alluvial sediments. Finally, I have no experience with the foam surfactants suggested by Dr. Abitz, but in my experience at numerous ISR sites around the world, mud rotary drilling methods and drilling muds are used because their low permeability serves to limit the introduction of fluids into the aquifer and the method is tried and proven.

Q.5. Does the USGS publication (JTI011) that Dr. Abitz cites specifically recommend any instances where nitrogen gas would be used for drilling?

A.5. No. During my review of the publication I could not find any recommendations for the use of nitrogen gas as a drilling media. As a matter of fact, despite Dr. Abitz repeated assertion that the USGS publication provides professional standards for well drilling and installation (see Ex. JTI001 at 16, 17, and 28), I could not find this assertion in the report and would disagree

with the statement.

Q.6. Does the USGS publication (JTI011) that Dr. Abitz cites discuss the use of drilling fluids?
A.6. Yes. The USGS publication states “The hydrostatic head of the drilling fluid maintains pressure on the borehole wall and prevents its collapse. Water-based drilling muds build a filter cake or rind on the borehole wall. This exerts a positive hydrostatic pressure against the borehole wall, preventing inflow of ground water into the borehole. It also helps maintain borehole stability, which helps to prevent invasion of the fluid into the borehole wall” (JTI011 at 45, pdf p.54). In the same section the report further states “With proper control, drilling mud should only penetrate the borehole to 0.25 in. (about 0.64 cm), making subsequent well development relatively easy” (JTI011 at 46, pdf p. 55). The USGS’s descriptive use of drilling fluid closely matches the description I provided in my initial testimony (SEI001 A.7.). The USGS also discusses potential water quality concerns with the following statement, “residues from drilling fluids can alter sample chemistry” (JTI011 at 46, pdf p. 55). Strata has been able to limit the water quality impacts in the aquifer by 1) utilizing an appropriate mud program that limits the invasion of drilling mud into the aquifer and 2) eliminating all fluid residue by properly developing the wells.

1.2 Our Baseline Water Quality is Representative of the Water Quality as it Would Be Used as a Local Water Supply Resource.

Q.7. In their initial testimony at A.1.8, NRC staff state that “because the objective for the site characterization wells is to obtain water quality of the aquifer as it would be used a resource (i.e., as if a typical water supply well were completed in the aquifer), the use of standard well drilling techniques is appropriate” (Ex. NRC001 at 17, end of 2nd ¶). Do you agree with this statement?
A.7. Yes. My initial testimony at A.6 through A.14 describes the well drilling and development techniques that have been used at the Ross ISR Project (Ex. SEI001 at 4-8). These are standard methods used in the ISR industry in the U.S. The ER RAI responses to the NRC included well statement and completion forms from the State Engineer’s Office (SEI017 at 219-375) for private water supply wells within and surrounding the license boundary. Many of these forms describe the drilling methods that were used to construct the private water supply wells in the area and the drilling methods listed on these forms indicate that majority of the wells were constructed using either air or mud rotary methods or some combination thereof. Therefore, it is my belief that our drilling methods are similar to those used to develop the private water supply wells in the area. As stated in A.12 of my initial testimony, no air is introduced directly into the production zone aquifer during well development at the Ross ISR Project using air-lift techniques. Rather, the air is injected above the top of the screened aquifer and a water column is maintained above the screened portion of the ore zone aquifer during development (Ex. SEI001 at 7-8). While I do not know how the private water supply wells within the project area were developed, I am confident that our well development methods result in minimal aquifer impacts that are either less than or similar to those at the private water supply wells in the area.

3.0 CONTENTION 3 - ALLEGED FAILURE TO INCLUDE ADEQUATE HYDROLOGICAL INFORMATION TO DEMONSTRATE SEI'S ABILITY TO CONTAIN GROUNDWATER FLUID MIGRATION

3.1 Sufficient Controls Will Be in Place to Prevent Lack of Confinement Due to Unplugged or Improperly Plugged Exploration Holes

Q.8. Dr. Abitz alleges in his testimony that the FSEIS indicates that "from October 2010 to the FSEIS publication (February 2014), the applicant had not properly plugged a single abandoned exploratory wellhole" (JTI001 at 46 lines 12-14). Can you clarify Strata's efforts to locate and re-abandon the Nubeth exploration drillholes?

A.8. As I describe in A.25 of my initial testimony, Strata has made significant progress in locating historical Nubeth exploration drillholes. As of August 1, 2014, Strata has located and surveyed 1,354 historical Nubeth exploration drillholes (Ex. SEI001 at 12). More importantly, Strata has located 92% of the known exploration drillholes within the estimated mine unit boundaries. As of August 1, 2014, Strata has re-entered and re-abandoned 108 historical exploration holes according to the Wyoming Department of Environmental Quality/Land Quality Division's current strict standards. We have clearly demonstrated that these holes can be located and properly plugged as committed to (and required by) the license (LC 10.12 in Ex. SEI1015 at 9) and the approved license application.

Q.9. Regarding locating the historical drillholes, Dr. Abitz states in A.41 of his initial testimony that these holes "may never be filled because unconsolidated sediments on the surface tend to collapse and fill in the old drillholes and there may be no accurate records available to locate the original drillholes" (Ex. JTI001 at 47 lines 3-5). Has Strata experienced difficulty in locating the historical drillholes due to the collapse of unconsolidated sediments or the lack of accurate records available to locate them?

A.9. No. Strata has not had the same difficulties locating drillholes within the Ross ISR Project as Dr. Abitz describes at the Texas site in his initial testimony (Ex JTI001 at 47). As I described in A.23 of my initial testimony (Ex. SEI001 at 12), "Strata has largely been successful in locating historical exploration holes within the Ross project area. The historical Nubeth exploration drillholes within the project area were capped with a cement plug containing a metal cap that identified the hole via a unique number. We have been able to successfully locate these holes using a metal detector. The hole locations are then surveyed so we can easily find them when it is time to plug them." In addition to installing a metal cap marking to each drillhole location, Nubeth surveyed each drillhole and developed an accurate map with all the drillhole locations depicted. TR Addendum 2.6-B (Exhibit SEI014D pg. 160-212) includes a tabulation of all the drillholes and their locations in the license boundary.

Q.10. In A.74 of his testimony (Exhibit JTI003 at 56) Dr. Larson makes the following statement: "The lack of well plugging and not identifying hundreds of abandoned wells show that Strata and the NRC staff have not adequately demonstrated ability to maintain vertical fluid migrations from the ore zone aquifers. " Is it possible that Strata may have missed hundreds of abandoned "wells" within the Ross license boundary as Dr. Larson claims?

A.10. By the context of his statement I assume that Dr. Larson meant to say exploration drillholes and not abandoned wells. Assuming this is the case, there is no way that we have missed hundreds of drillholes within the Ross license boundary. As I previously explained (A.9),

Strata has very accurate records from Nubeth detailing the location of each drillhole. In A.41 of Dr. Abitz's testimony I see a similar statement (Exhibit JTI001 at 48) where Dr. Abitz states that "…in light of the likelihood that these wells will not all be located…". Again I assume from the context of Dr. Abitz's testimony that he is referring to exploration drillholes. I should clarify that we have survey data on 100% of the Nubeth exploration holes in the Ross license boundary, and as I note in A.8 above, we have already located 1,265 Nubeth holes (92%) that will fall within the estimated mine unit boundaries. Accordingly, there is no possibility that we have missed hundreds of unplugged exploration holes as has been asserted, nor, given the amount of data we have available, is it likely that we will not be able to locate all the Nubeth drillholes.

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AFFIDAVIT OF RALPH KNODE

I declare under penalty of perjury that my statements in prefiled Exhibit Ralph Knode Rebuttal Testimony (SEI047) are true and correct to the best of my knowledge and belief.

Ralph Knode

Executed in Gillette, WY
this 12th day of September, 2014