

U.S. Environmental Protection Agency
Science Advisory Board
Radiation Advisory Committee (RAC)
Augmented for Uranium In-Situ ISL/ISR Advisory
Summary Minutes of Public Conference Call Meeting
October 5, 2011

Committee: U.S. Environmental Protection Agency's (EPA's) Science Advisory Board (SAB) Radiation Advisory Committee (RAC) augmented for advisory review of EPA's draft report "*Considerations Related to Post-Closure Monitoring of Uranium In-Situ Leach/In-Situ Recovery (ISL/ISR) Sites,*" June 2011. (See Roster. Please note that the superscript numbers here and elsewhere in the text refer to the Materials Cited on the last page of these minutes)¹.

Date and Time: Wednesday, October 5, 2011 from 1:00 p.m. to 4:00 p.m. Eastern Daylight Time (See Federal Register Notice)².

Location: This is a conference call with no location announced. All participants were connected via the conference lines.

Purpose: The purpose of this public conference call meeting¹ is for the Augmented Radiation Advisory Committee (RAC. See Roster)¹ to discuss the augmented RAC's working draft advisory dated September 30, 2011 related to uranium in-situ leach recovery and post-closure stability monitoring³. The request for the advisory and the charge questions is contained in the June 2, 2011 memorandum request⁴ from Michael P. Flynn, Director, EPA's Office of Radiation and Indoor Air (ORIA) to Dr. Vanessa Vu, Director of the Science Advisory Board (SAB) Staff Office. As the discussion summary below indicates, the RAC focused on review of their September 30, 2011 public draft advisory.

Participating RAC Augmented Members: Dr. Bernd Kahn, RAC Chair, Dr. Susan M. Bailey, Dr. Thomas B. Borak, Dr. Thomas Borch, Dr. Shih-Yew Chen, Dr. June T. Fabryka-Martin, Dr. R. William Field, Dr. Thomas E. Johnson, Dr. Jonathan M. Links, Dr. William F. Morgan, Dr. Brian A. Powell, and Dr. Daniel O. Stram. Not Present (due to travel or scheduling conflicts): Dr. Thomas B. Borak, Dr. Douglas B. Chambers, Dr. Faith G. Davis, Dr. R. William Field, Mr. Bruce A. Napier, and Dr. Dale L. Preston.

SAB Staff Office: Dr. K. Jack Kooyoomjian, Designated Federal Officer (DFO) for the RAC Augmented for this activity.

EPA Staff Attendees: Members of the EPA Office of Radiation and Indoor Air (ORIA) Washington, DC Staff Office included Ms. Valentine Anoma, Ms. Andrea K. Cherepy, Dr. Mary

¹ See the July 12, 2011 conference call meeting minutes, the minutes for the July 18 & 19, 2011 face-to-face meeting, as well as the September 6, 2011 conference call meeting minutes which preceded this October 5, 2011 conference call meeting.

E. Clark, Mr. Kenneth S. Czycinski, Mr. Thomas Peake, and Dr. Daniel Schultheisz. Also in attendance was Ms. Marilyn H. Ginsberg from the U.S. EPA's Office of Ground Water and Drinking Water (OGWDW).

Other Public Attendees: The members of the public who identified themselves as being on the line included the following: Dr. Richard J. Abitz, Principal Geochemist with Geochemical Consulting Services, Inc and also Geochemist and Technology Program Manager at the Savannah River National Laboratory in Aiken, SC; Mr. John Cash, Vice President Regulatory Affairs, Exploration & Geology, Ur-Energy (USA), Inc, Casper, Wyoming; Mr. Steve Cohen, Team Leader Licensing, U.S. NRC, Rockville, MD; Mr. Gary Comfort, US NRC, Rockville, MD; Ms. Dawn C. Kolkman, Neutron Energy, Inc., Wyoming; Mr. Thomas Lancaster, US NRC, Rockville, MD; Mr. Matthew Meyer, US NRC, Rockville, MD; Mr. Michael Neumann, Vice President, Environment for Neutron Energy, Inc., Wyoming; Mr. Oscar Paulson, Facility Supervisor, Kennecott Uranium Co., Rawlins Wyoming; Mr. John L. Saxton, Hydrogeologist, Uranium Recovery Licensing Branch, US NRC, Rockville, MD; Ms. Venice Scheurich, Conservation Chair, Coastal Bend Sierra Club, Corpus Christi, TX; Mr. John Schmilz (Affiliation not provided); Dr. Elise A. Striz, Hydrogeologist, Uranium Recovery Licensing Branch, US NRC, Rockville, MD; Ms. Kate Sweeney, National Mining Association (NMA), Washington, DC; Mr. Michael Welling, Director, Radioactive Materials Program, Virginia Department of Health, Richmond, VA; Mr. Michael Widdop, Project Manager, S.M. Stoller Corp. (Contractor to the U.S. Dept. of Energy, Office of Legacy Management), Grand Junction, CO [Also present were 3 or 4 additional persons from the S.M. Stoller Corp. who were not identified during the conference call]; and Mr. John Winter, Uranium 1 Corp.

Meeting Summary: The meeting followed the issues and general timing as presented in the meeting agenda⁵, except as noted in these minutes with modest time adjustments. Written public comments were provided to the augmented RAC for this October 5, 2011 conference call meeting. Written comments were also provided for the July 12 and July 18 and 19, 2011 meetings on this topic, and were posted onto the SAB Website (<http://www.epa.gov/sab>).⁶⁻¹⁰ Verbal comments were provided by the public at this and all of the previous meetings (see text below for a summary of the written and verbal comments and discussion). The RAC discussed explicit changes and needed additions to the current draft text of the advisory and chose to engage in and reference to page and line number edits at this stage of the process, since they viewed this as a closure discussion on the topic in preparation of a Quality Review Draft for final review by the SAB's Charter Board.

Welcome and Introductions: Dr. K. Jack Kooyoomjian opened the meeting at 1:00 p.m. with identification of the participants logging into the call, opening remarks, and an introduction of himself as the Designated Federal Officer (DFO) for the Radiation Advisory Committee (RAC) augmented for the advisory review of EPA's draft technical document entitled "*Considerations Related to Post-Closure Monitoring of Uranium In-Situ Leach/In-Situ Recovery (ISL/ISR) Sites.*" June 2011. He explained the purpose of this conference call is to discuss and seek clarification of draft text of the RAC's advisory, dated September 30, 2011, as well as to receive public commentary.

Dr. Kooyoomjian advised the participants that the SAB operates under the requirements of the Federal Advisory Committee Act (FACA) and conducts business under the auspices of the chartered SAB. Consistent with FACA and with EPA policy, the deliberations of the augmented RAC are conducted in public meetings, for which advance notice is given, and where he is present as DFO to ensure that the requirements of FACA are met, including the requirements for open meetings, for maintaining records of deliberations of the augmented RAC, and making available the public summaries of meetings, as well as providing opportunities for public comment.

Dr. Kooyoomjian also noted that the members of the augmented RAC were in compliance with Federal ethics and conflict-of-interest laws that apply to them. Dr. Kooyoomjian further noted that Ethics Training was completed by the RAC and all augmented participants and is on file at the SAB, that there is no need for disclosure at this time, other than the individual participants to briefly introduce themselves as present at this public conference call meeting. He advised that there is no particular matter that may pose a potential conflict of interest, that each participant had disclosed relations and experiences to the issues pertaining to the advisory discussions that have thus far taken place and will occur today. Prior to the discussions, all RAC participants identified themselves as present as the DFO announced the roster. Other participants, including the Agency staff and the public identified themselves as present, and their affiliation.

Dr. Bernd Kahn, Chair of the augmented RAC, provided some brief introductory remarks at 1:16 p.m. and thanked everyone for their inputs into revising the August 25, 2011 working draft advisory, which was discussed at the public conference call of September 6, 2011, and resulted in the revised working draft advisory dated September 30, 2011. It is this draft which is the subject of the present meeting. He reflected upon the fact that the licensing and regulation of mining is the responsibility of the NRC and the Agreement States. He reflected upon the request by the EPA to the SAB/RAC to provide advice as the Agency considers whether and how to revise 40 CFR Part 192. He recognized that revised standards should clearly be protective of the environment as well as human health.

At 1:26 p.m., Dr. Kahn invited Dr. Mary Clark, Assistant Director for Science in the Agency's Office of Radiation and Indoor Air (ORIA), to offer some remarks from EPA. Dr. Clark thanked the RAC for the rapid turn-around from the September 6, 2011 public meeting, and observed that the 2nd draft dated September 30, 2011 is significantly detailed compared to the August 25th draft. She looks forward to today's dialogue with the RAC and the public.

Dr. Kahn highlighted that the latest draft has a few changes in the introduction, and clarified EPA responsibilities and the NRC and Agreement States' roles and responsibilities for licensing and regulating the mining facilities. He thought it is helpful to have made clear the distinction to Part 264 of the Resource Conservation and Recovery Act (RCRA) being applied by EPA to treatment, storage and disposal facilities, and the distinction to the In-Situ ISL process. Dr. Kahn further noted that the introduction within the Sept. 30th working draft advisory is totally focused on ground water ground water (GW) monitoring. It is conceivable that there will be

other sources of contamination to be considered by the responsible Agency, whether the NRC, the Agreement States, or by EPA.

Dr June Fabryka-Martin suggested an edit on page 3 of the introduction, line #39 to change “insoluble” to “immobile.” Dr. Brian Powell countered that just because U(IV), the tetravalent form of Uranium is present, does not mean that it is insoluble. There was additional discussion on this point. For instance, Dr. Thomas Borch suggested that the tetravalent form of uranium is not insoluble, and that we need to be really careful about the valence state and form of uranium, such as in a complex form. After additional discussion, Dr. June Fabryka-Martin suggested the term “less-mobile form” may be more appropriate. Edits were further discussed and consensus was reached on how to clarify this portion of the draft text.

Dr. June Fabryka-Martin addressed edits to Section 2.3 of the Introduction pertaining to the Agency’s draft technical report.

Ms. Marilyn Ginsberg, of the U.S. EPA’s OGWDW interjected brief comments encouraging the Agency to provide more details as well as more clarity in their draft report being reviewed by the SAB/RAC. She thought that various phases of the mining operation, including pre-operational assessments, monitoring during mining operations, as well as monitoring during restoration could be improved in technical details and specificity.

The Committee had further discussions on page four of the Introduction of their working draft advisory. The discussion covered the topic of locating wells within and beyond the boundary area. Discussion took place regarding the situation where an aquifer is above the mixed area, but within the footprint of the boundary area, as well as other situations that might be encountered.

Dr. S.Y. Chen commented on Section 4.6, page 21 (entitled Modeling) of the Agency Draft Technical Report which called for modeling to reduce uncertainty for spatial and temporal behavior. In his view, this text is very short and cryptic and lacks specific context. Dr. Kahn recognized that this Section of the Agency’s Draft Technical Report, as well as other areas need to be enhanced with more specific and helpful content. He encouraged the RAC to bring these suggestions forward.

Dr. June Fabryka-Martin cited the brevity of Section 2.4, page 4 of the RAC’s draft Advisory. Dr. Kahn encouraged the RACC participants to think about their response to this and other sections of their latest draft advisory.

Public Comments:

Previously supplied written public comments were received from Mr. Donovan Porterfield of the National Nuclear Security Administration, as well as Dr. Richard J. Abitz, Principal Geochemist with Geochemical Consulting Services, Inc and also Geochemist and Technology Program Manager at the Savannah River National Laboratory in Aiken, SC. These written comments are available on the SAB Website for the July 18 and 19, 2011 meeting. Mr.

Porterfield's written comments are also posted with the initial July 12, 2011 conference call on this advisory topic. Verbal public comments were made at the previous meetings and are summarized in the minutes of these meetings. For the September 6, 2011 public conference call, there were no written public comments. The public commenters for this teleconference provided written comments, which were posted onto the SAB Website for this meeting (see the following Dr. Richard J. Abitz,^{6,7,8} Mr. John Cash,⁹ Ms. Venice Scheurich,^{10,11}) as well as verbal comments, which are briefly summarized below.

At 1:45 p.m. Dr. Kooyoomjian, the RAC DFO opened the floor to public comments. Ms. Venice Scheurich, Conservation Chair with the Coastal Bend Sierra Club in Corpus Christi, Texas requested to speak. Also, Dr. Richard J. Abitz, Ph.D. Principal Geochemist with Geochemical Consulting Services, Inc. requested the opportunity to provide verbal comments. Additionally, Mr. Oscar Paulson, Facility Supervisor for Kennecott Uranium Company, Sweetwater Uranium Project in Rawlins, Wyoming requested the opportunity to provide verbal comments. Mr. John Cash, Vice President Regulatory Affairs, Exploration and Geology with Ur-Energy USA, Inc. of Casper, Wyoming provided written comments on In-Situ ISL sites in the United States, and he also provided verbal clarifying comments to his previously submitted written comments.

Ms. Venice Scheurich clarified that her organization is a local environmental organization, and not the National Sierra Club. She called attention to the need to establish post GW quality monitoring and assessment to be as rigorous as pre-GW quality monitoring and assessment. In her view, this has failed. She was interested in how restoration standards were derived from actual data sets, and would like to see more information in this area to be available and accessible in the public arena. It is her contention that the locations of baseline wells to establish baseline background values within the area to be mined, as well as to establish background levels were not selected at some sites on a statistical basis. Rather, she believes that some sites have had point estimates taken as a mean value for the site, rather than as a point estimate. It is her contention that sample mean values will highly skew the values so derived to the upper end, with severe outliers being included in the mean value to create a standard deviation 5 to 6 times higher than the mean. She doesn't think that such approaches clarify and make clear the GW quality condition from what appear to be skewed results from such well samples. She was pleased to see that the Committee's recommendations in the latest draft more objectively characterize the baseline GW quality conditions and specify the constituents that should be monitored.

Ms. Scheurich thought that the matter of well locations has been overlooked in the Agency's June 2011 Draft Technical Report, especially for proper placement of baseline wells by the licensee when applying to the NRC or the Agreement State for a license. The latest advice being provided by the SAB/RAC has provided useful specific information to properly address baseline well location and GW quality monitoring to better characterize GW quality condition. She specifically cited Section 4.2 (Establishing Baseline Conditions) in the Agency's June 2011 Draft Technical Report as needing enhancement of this section to include a protocol for obtaining a representative sample for baseline wells. In her view, it seems that this could be easily done. Also, she thought that the RAC's current working draft advisory dated September

30, 2011, in Section 5.2 could perhaps provide criteria for characterization and specific advice on monitoring data. Dr. Kahn drew her attention to another portion of the RAC's working draft advisory, namely Section 6.1 entitled "Design of Well Placement and Sampling Program" where the RAC attempted to make this advice explicit as a stand-alone topic.

At 1:56 p.m., Dr. Richard J. Abitz commented, noting that it is very difficult to collect representative samples in the aquifer. He remarked that as Ms. Scheurich of the Coastal Bend Sierra Club stated, a study is needed on obtaining a representative sample. He suggested that enough is known at mid-point in a typical mining operation (for In-Situ ISL uranium mining) to obtain representative samples. One needs to drill with non-oxidizing (i.e., reducing) conditions, so that the ore is not oxidized. That is, we do not want to put the ore into solution. Simply put, if we do not have a proper baseline measurement and assessment of GW quality, then we are restoring to invalid numbers.

Dr. Abitz thought that the excursion parameters can be set near the ore ring. The lixiviant clearly can allow low-levels of contaminant to pass the monitoring ring. However, there is a need to use data from monitoring around the ring and not just from the ore zone area.

Dr. June Fabryka-Martin asked "...Where this sort of data might be found?"... (i.e., "Is it with the licensee? ...or with the Agreement State?"). She noted, for instance with the Texas Commission on Environmental Quality (TCEQ) regulation, the State of Texas adds 5 mg/l to the highest value.

At 2:00 p.m., Mr. Oscar Paulson from Kennecott Uranium Company offered some comments. He noted that In-Situ Uranium recovery occurs in the statutorily exempted portions of an aquifer, and this activity is and can be carried out in perpetuity. He suggested that the real focus of understanding should be protecting GW quality outside the exempted area, as well as restoration activity outside of the exempted production zone. The second point he made is that background conditions at uranium mining sites are highly variable in the natural environment (e.g., Lost Creek in Wyoming). Since background values are highly variable, there is a need to properly account for variability in GW quality standards.

Mr. John Cash, Ur-Energy, Inc, Casper, Wyoming provided the SAB/RAC with a list of sites where the In-Situ ISL process is applicable in the United States. The list provided sites where the site might have a pilot project, or the site is in the process of being licensed, but is not yet in production. Mr. Cash provided a brief commentary to the RAC, observing that there are a lot of sites in Texas. His list also has many sites that have been restored. He advised that Dr. Smith is aware of the mines that have been restored, such as Smith Ranch Highlands mine and the Crow Butte mine in Nebraska. Dr. Susan Hall documented this for the U.S. Geological Survey (USGS). Some sites have been restored via natural attenuation, especially in compliance with the Uranium Mill Tailings Radiation Control Act (UMTRCA) Title 1 Sites. He believes that Title 1 of UMTRCA has recently allowed natural GW flow as a remediation alternative. He thought that there is a need to consider attenuation in the definition for remediation.

Mr. Oscar Paulson suggested that the RAC might wish to consider a definition of what

constitutes elevated readings which are expected in the exempted area, because it is statutorily exempted.

There being no additional comments, the public comment period ended at 2:08 p.m.

Continued Discussion of September 30, 2011 Draft Advisory:

Dr. Jonathan Links believed that he or others on the RAC need to do more to explain the Nyquist Theorem in Charge Question (CQ) #1 pertaining to designing and implementing a monitoring network. He commented on aspects of the current September 30th draft, touching on the letter to the Administrator, the Executive Summary, and Section 3.3.3 entitled “Spatial and Temporal Extent of Sampling Requirements.” Dr. Links touched on what the sampling rate might be, noting that the Nyquist Theorem simply calls for twice the sampling rate.

Dr. Links observed that there is an extrinsic spatial distribution. If it is observed that there is repeatability in the space in which the distribution frequency exists, then the wells do not have to be spaced as closely together. However, if the distribution is rapidly varying, then the wells need to be more closely spaced together.

He noted that one public comment touched on the scenario of a regularly spaced grid. Grid spacing changes, depending on the underlying distribution of space and time constituent-by-constituent. The point he was making was that the Agency has not dealt with the various grid patterns sufficiently and there is a need for a more rigorous approach toward different frequency patterns in space and time. Also the draft advisory needs to reference the Nyquist Theorem.

Dr. Kahn commented that the Uranium distribution variability is best defined in the actual field exploration phase on a site. Dr. Links offered that it is an incredible paradox and it tends to over-sample the site. He believes that it would not be very productive to over-sample the wells. He thought that modeling could be used for data to compute the required sampling and sample spacing of the wells.

Dr. Kahn agreed that the argument for modeling could assist understanding. Dr. June Fabryka-Martin observed that the modeling venue is needed outside the well, and more importantly, outside the facility to assess post-restoration stability. She noted that the GW inside the facility is exempted. She clarified that the U.S. EPA does not have jurisdiction in the ring, which is the exempted area.

Dr. Links suggested that evidence plus models which show homogeneity in space should lead to the low density scenario of sampling wells from approximately 100 feet to perhaps every 1,000 feet.

Dr. Kahn advised that there is a need to distinguish between the Resource Conservation and Recovery Act (RCRA) part of the standard and the pre- and post-operational off-site contamination. He noted that for the site, it would be helpful if the pre- and post- conditions were mutually in agreement or alignment. Dr. Kahn thought that it would be helpful to have a

reference to the Nyquist theorem, as well as more detailed recommendations in Section 2 (Introduction).

Dr. June Fabryka-Martin suggested reorganizing Section 2.5 (The RAC Response) and Section 7 (Response to other Issues Beyond the Charge).

There were no comments at this time on page #5.

For page 6, Dr. Thomas Johnson, thought that the draft should outline more clearly the collaboration necessary between the parties to assemble data. For instance, the NRC staff has extensive experience and both EPA and the NRC should coordinate sufficiently to prevent a duplication of efforts. He thought that probably the RAC should say something about the goal of using modeling to protect public health and the environment, and not necessarily just to ascertain what might be going on within the ore body.

Dr. June Fabryka-Martin recognized the necessity to explicitly state the rationale for data needs, decision tools, DQOs, where the monitoring comes into play, and exactly what we want the monitoring to achieve. Thus, we need to define the objectives and the decisions the Agency and others are trying to make. There was some discussion on reorganizing portions of the draft text. For instance, it was thought that Section 4.2 (Objectives of Background Characterization) on pages 13 & 14 could be moved into Section 3.2 (Recommendations).

Dr. June Fabryka-Martin recognized that there are multiple DQOs, and it appears that we are looking at the tools without looking first at the objectives of the tasks. There was a sense that this observation may be correct, and we will need to advise the Agency to focus on the DQOs.

Regarding page 7, Dr. Links and Dr. Stram thought some edits were needed to the current text. Dr. Stram suggested at approximately page 7, line 14, that we could add a new paragraph pertaining to the topics of wells and baseline conditions, sample size calculations, and the need for overall assessment of the aquifer. Also, information is needed on the number of monitoring wells required to determine adequate baseline conditions, and the need to address the charge. He thought it would be helpful to relate to predictive modeling and tie this into the monitoring framework. He recognized the need to also provide more guidance regarding the topic of spatial variability.

Dr. Morgan asked ...”Who will take lead on the modeling topic?” Drs. Brian Powell and Daniel Stram thought they could assist Dr. June Fabryka-Martin on this. Dr. S.Y. Chen cautioned that we should not over promise what modeling should do. However, he suggested that we could prepare a “wish list” because in his view, modeling by itself may not accomplish all of this. He recognized that acquiring relevant field data can enhance modeling capabilities.

Dr. June Fabryka-Martin cited page 27, Section 7.5 which recognizes that modeling is a complementary activity, and noted that it may or may not be used. She thought that we could also make a case for the absence of modeling. Dr. Links agreed with Dr. June Fabryka-Martin. He absolutely believes that modeling shouldn't be required.

Dr. S.Y. Chen agrees with the need for clear DQOs. He believes that application of both modeling and monitoring builds knowledge for improving predictive purposes. Dr. Morgan noted that a model has to be “testable.” He doesn’t think that modeling necessarily will move the state-of-the art forward. Dr. Links agreed that if you can’t at least partially validate the model, then it would not be very useful.

Dr. Stram recognized that modeling and monitoring are needs just to get started, and the process of building a monitoring system involves empirical monitoring. He observed that our public commenters noted intense variability for uranium.

Dr. June Fabryka-Martin thought that the emphasis on modeling in the current draft is misplaced, and that we should recommend only bringing in modeling when the site has not been restored to the goals, whatever that may be. Why do we lack confidence? She challenged us to see if modeling can better inform the decision-makers.

Dr. S.Y. Chen recognized that it is two sides of the same coin to gain confidence about the site. It could be empirical or theoretical. In any case, we need to monitor the site to verify. Also, we need to exercise good judgement to see which tool(s) might be useful to inform the regulatory decision-making. The DQOs need to capture the appropriate objectives and what you are trying to accomplish.

Page 10 of the Draft in Section 3.3.4 (Role of Hydrogeochemical Modeling). Dr. Brian Powell recognized that modeling is one of the “tools in the bag.” He observed that on page 10, we lay out the ideal case for the role of modeling. He agreed with others that modeling should not be a part of the regulatory requirement.

Dr. June Fabryka-Martin thought that perhaps EPA should couple models and place their modeling tools on the Agency’s Models Knowledge Base (MKB). Dr. S.Y. Chen cautioned that we should avoid telling the Agency exactly how to do this, but cite the need and the challenges. For instance on page 17, Section 4.6 (Standardized Data Collection), regarding optimizing monitoring via well spacing, we could also comment on the specific period of monitoring. He observed that this current text is too cursory and needs expansion. Dr. Kahn also suggested that Dr. S.Y. Chen might look to expand our document and bring this forward as a Section 3.4.

Dr. Stram suggested on pages 8 and 9, Section 3.3.3 (Spatial and Temporal Extent of Sampling Requirement) that seasonality appears to be a non-issue for mining. If that is the case, he recommended that it should be explicitly acknowledged in our advisory.

The RAC discussed Section 4 (Response to Charge Question 2: Pre-Operational Monitoring), beginning on page 13.

Dr. June Fabryka-Martin thought that Section 4.2 (Objectives of Background Characterization) could be re-cast to the DQO process. Dr. Kahn thought it would be best to leave the text here, but use it in the DQO approach.

Dr. Stram suggested that some of the CQ #1 and CQ #2 material needs to be merged in the current draft. Dr. June Fabryka-Martin agreed. Dr. Stram thought that as the RAC re-states what EPA has asked of us, it follows that we need to cover what specific analytes are needed and useful for monitoring. Dr. June Fabryka-Martin thought that maybe we need a sub-section on Network Design, and then to cross-reference this in the section on the data requirements and use.

Dr. Kahn moved to page 14, Section 4.3 (Monitoring Analyte List). He asked ...”Do we sayOKAY, use the RCRA list” ..or do we say ...”Set up a list of analytes specific for uranium mining?”

Dr. June Fabryka-Martin observed that sulfate, chloride, or whatever is needed for geochemical monitoring needs to be explicitly listed. Also, we should provide information on indicator species that need to be monitored.

Dr. Kahn observed that some standards have specific lists of items. De we want to pin this down for the regulator and require the licensees to do the monitoring for the analyte list, where monitoring for some of the analytes might not be necessary for some circumstances? Should we consider to recommend such a list?

Dr. Brian Powell observed that in Section 4.3 (Monitoring Analyte List), page 15, we actually put a list of radionuclides, trace metals, major ions and water quality parameters together that should be seriously considered by the Agency. This list includes, for instance, re-dox speciation of the analytes. He likes the analyte list as is, but he recognizes that there are practical difficulties for the post-monitoring period after closing the site. He recognized that RCRA does not specify speciation of an analyte, and that RCRA only specifies concentration. He recommends that the list on page 15 of our current working draft advisory stay there.

Dr. June Fabryka-Martin recognized that by having the list this way, it is making a statement that monitoring for these constituents provides some confidence that the area is approaching stability.

Page 16 through page 19 (Sections 4.4, 4.5, 4.6; Section 5 (response to CQ #3: Post-Operational Monitoring and Restoration). No comments.

Page 20, Section 5.3.2 (Criteria for Collection and Analysis of Monitoring Data). There is a sub-bullet on temporal trends. We may need a number, such as Section 5.3.2 (Criteria for Collection and Analysis of Monitoring Data) to spell out the temporal discussion (Dr. Brian Powell is the Scribe, along with Dr. Field, and Dr. Douglas Chambers is Lead) for CQ #3. They will clean up edits here.

Page 21 & 22, which deals with Sections 5.3.3 (Grouping Constituents for Monitoring Activities), and Section 5.3.4 (Risk Weighting Scheme). Drs. Chambers (Lead), Field and Powell (Scribe) wrote both sections. Dr. Powell indicated that their group had a discussion on contaminants in the earlier face-to-face meeting. He asked ...”Whether it matters if carbonate or

sodium are at or below the level of interest?” He referenced a “primary” and a “secondary” list of analytes. His thinking is that the secondary list would be a judgement call by the regulator.

Dr. June Fabryka-Martin offered that there is a “hazard quotient” (e.g., cancer risk) for each constituent above the level of concern. It is then incumbent on the evaluator to determine what are predominant contributors to the calculation. Dr. Powell thought about this and offered that perhaps we could recommend the listings and provide them to EPA for the Agency to decide.

Dr. Kahn advised that the NRC incorporates such information as concentrations of various radionuclides to estimate the hazard or total dose. Dr. June Fabryka-Martin observed that DOE also does this. Dr. Powell observed that with uranium, we are essentially regulating it also as a chemical toxin on the basis of other measures, such as toxicity, as well as by the traditional total dose on a mass basis. Dr. Kahn suggested that the committee might wish to think about this as they ponder another approach in the advisory.

Page 23 (Section 6 – response to Charge Question #4: Statistics, Data Requirements, and Use). Dr. Stram (Lead) advised that he had added a couple of sentences to the opening paragraph of Section 6.1 (Design of Well Placement and Sampling Program). He advised that the monitoring system must identify systems to provide adequate coverage to most affected aquifer conditions. In all cases in monitoring, there must be an avoidance of “cherry-picking” of the monitoring wells. He advised that this text was added specifically in response to the Sierra Club public comments.

Page 27 (Section 7 –Response to Other Issues Beyond the Charge). Dr. June Fabryka-Martin is interested in reactions from the RAC, as they are seeing some of this draft text for the first time. Dr. Stram observed that the text is focused on waters affected by the mining operation. He thought that it would be impossible to make a comprehensive list of everything that could or might go wrong in a mining situation.

Dr. Kahn wrote Section 7.1 and the text indicates that other things happen beyond the concern for GW. He observed that June Fabryka-Martin correctly identified other regulatory programs and was helpful in regard to the DQOs.

Dr. Stram observed that we are being asked to focus on the particular issue of GW condition (i.e., quality) under the mining activity. Dr. Kahn acknowledged that, but remarked that the SAB advisory activity gives us an opportunity to comment on other things that the Agency didn’t ask us about, but which we think are of concern or that merit a comment. He asked that if anyone thinks these other issues are diversions which should not be mentioned, that is something to think about.

Dr. June Fabryka-Martin asked for clarification on how these items could or might be best addressed. She cited the DQO process in Section 7.2 of the RAC’s draft advisory, and proposed an option of moving this to Section 3 of the draft advisory. Dr. Kahn thought we should keep Section 7.3 which discussed the “roadmap” to inform the regulatory review and

decisions.

Dr. June Fabryka-Martin thought that it was helpful in Section 7.4 on page 27 to suggest that the uranium in-situ regulatory activity should be integrated into the long-established and well-documented requirements and Agency guidance from the other programs, notably RCRA. She also observed that modeling is treated as a stand-alone issue in Section 7.5 and is not tied into ISL. Dr. Kahn thought we should keep it in this section. He also thought that each subsection needs an appropriate heading title.

Dr. June Fabryka-Martin highlighted Section 7.6 which provided the observation of the need for a more effective collaborative working relationship between the EPA and the NRC staff pertaining specifically to the ISL activity and how this translated into the Agency's current draft technical report with its' significant lack of operational details and delineation of present-day guidelines for monitoring. There was some discussion to move this text to the "roadmap" discussion area.

Dr. Jonathan Links provided a re-write of Section 3.3.3 on specific recommendations for the response to CQ #1. Also, Figure 1 on page 30 should have utility, but it needs to be cited in the text. Dr. June Fabryka-Martin thought that she could fit the figure into the DQO process discussion.

A discussion followed on moving and merging text into the appropriate topical areas. There also was a discussion to drop Appendix A dealing with specific editorial comments on the Agency's draft report. Appendix B (the Charge to the RAC) would become Appendix A. There was a brief discussion on the Appendix C acronyms, symbols and abbreviations., which now would be moved up front in the beginning of the text. Appendix B would now be reserved for the water quality parameters for groundwater monitoring at ISL uranium mining sites.

Summary and Action Items:

At 3:40 pm Dr. Kahn offered a brief summary of the action items and the next steps to prepare the Quality Review Draft. He advised the participants of the following, including a suggested schedule to prepare the Quality Review Draft for approval by the RAC and for forwarding to the SAB Charter Board for their final review before forwarding it to the EPA Administrator:

- 1) Dr. Kahn advised that the RAC needs to revise the current draft advisory with a view toward clarifying how we say things. He encouraged everyone to strive toward clarity in our logic, findings and recommendations, and he suggested the following schedule:
- 2) Comments are due to the RAC DFO, Dr. Kooyoomjian by Wednesday, October 12, 2011;
- 3) Drs. Kahn, Fabryka-Martin & Kooyoomjian will send the re-edited draft advisory

for review and concurrence by the Committee on Wednesday, November 2, 2011. It is anticipated that it will be a one-week turn-around from the Committee, and

- 4) The Quality Review Draft will be prepared in November for distribution by the DFO to the SAB Charter Board, Dr. Angela Nugent, for their quality review exercise, whenever that gets scheduled (likely sometime in December).

In the closing remarks, Dr. S.Y. Chen remarked that the RAC is a fascinating committee, and he appreciates being involved in this technical advisory activity. Dr. Mary Clark of ORIA had one question pertaining to the content and the general timing of the next draft advisory and what would this draft (the Wednesday, October 19th draft advisory) be. Dr. Kahn clarified that he anticipates the next (October 19th draft advisory) will be circulated to the RAC and will incorporate all comments and corrections received thus far. Dr. Kooyoomjian clarified that this October 19th draft should be considered as the **Pre** Quality Review Draft Advisory, since the RAC's subsequent review, and concurrence is anticipated to contain numerous polishing edits for preparing the Quality Review Draft Advisory to be submitted to the SAB Charter Board in November.

ADJOURN: After having summarized the action items, there being no additional items to discuss, Dr. Kahn thanked the participants and adjourned the meeting at 3:50 pm.

Respectfully Submitted:

Certified as Accurate:

_____/S/
K. Jack Kooyoomjian, Ph.D.
Designated Federal Official
Radiation Advisory Committee (RAC)
Augmented for Uranium In-Situ ISL/ISR
Advisory

_____/S/
Dr. Bernd Kahn, Chair
Radiation Advisory Committee (RAC)
Augmented for Uranium In-Situ ISL/ISR
Advisory

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by Panel members during the course of deliberations within the meeting. Such ideas, suggestions and deliberations do not necessarily reflect consensus advice from Panel members. The reader is cautioned not to rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters or reports prepared and transmitted to the EPA Administrator following the public meetings.

MATERIALS CITED

The following materials can be accessed through the SAB Website at (www.epa.gov/sab) at the following hotlink:

<http://yosemite.epa.gov/sab/sabproduct.nsf/MeetingCal/D95E6CB37D41FF55852578E7004262BA?OpenDocument>

¹ Roster of Radiation Advisory Committee (RAC) Augmented for Uranium In-Situ ISL/ISR Advisory;

² Federal Register Notice Announcing the Meeting (FR Vol 76, No. 158,P.50728, Tuesday, August 16, 2011);

³ Working Review Draft Advisory Pertaining to Agency's Technical Draft Document entitled "***Considerations Related to Post-Closure Monitoring of Uranium In-Situ leach/In-Situ Recovery (ISL/ISR) Sites,***" September 30, 2011

⁴ Request for "Advisory Review of the Draft Technical Report: *Considerations Related to Post-Closure Monitoring of Uranium In-Situ Leach/In-Situ Recovery (IS/ISR) Sites;*" June 2, 2011 memo from Michael P. Flynn, Director Office of Radiation and Indoor Air to Vanessa Vu, Director, Science Advisory Board;

⁵ Meeting Agenda, Radiation Advisory Committee, Tuesday, October 5, 2011;

⁶ Public comment from Dr. Richard J. Abitz on Radiological Hazards Associated with Uranium ISL Industry, Dr. Richard J. Abitz, 10/03/2011;

⁷ Forwarded public input on regulations to establish standards for human health and environment from radiological hazards associated with uranium ISL industry (Richard J. Abitz 10/4/2011);

⁸ Public Comment from Dr. Richard J. Abitz Follow-up to Oct 5, 2011 Conf. Call, Dr. Richard J. Abitz, ,10/06/2011;

⁹ Public Comment from Mr. John Cash Ur-Energy USA, Inc. Providing List of U.S. in-Situ Facilities, Sept. 7, 2011;

¹⁰ Public Comments from Ms. Venice Scheurich of Coastal Bend Sierra Club. Forwarded to SAB Staff Office by Mr. Tony Nesky of U.S. EPA ORIA, September 13, 2011 (Transmitted by Mr. Nesky on September 15, 2011).

¹¹ Ms. Venice Schurich Oct 5, 2011 Public Comments Pertaining to Amended Groundwater October 10, 2011