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NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Alan S. Rosenthal, Chairman  
Dr. Paul B. Abramson  
Dr. Richard F. Cole

In the Matter of

U.S. ARMY

(Jefferson Proving Ground Site)

Docket No. 40-8838-MLA

ASLBP No. 00-776-04-MLA

February 28, 2008

INITIAL DECISION

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## INITIAL DECISION

Before this Board is an application of the Department of the Army (Licensee) for the approval of an alternate schedule under 10 C.F.R. § 40.42(g)(2) for the submission of a decommissioning plan for its Jefferson Proving Ground (JPG) site located in Madison, Indiana, on which there is currently amassed a quantity of depleted uranium (DU) munitions.<sup>1</sup> The alternate schedule would provide the Licensee with a period of five years, concluding at the end of 2011, for the completion of a characterization of the JPG site, a condition precedent to the approval by the NRC Staff of a submitted decommissioning plan.

Accompanying the application was a Field Sampling Plan (FSP) that set forth the activities that the Licensee proposed to undertake in conducting the site characterization. The FSP's adequacy to accomplish its intended purpose has been challenged by a local organization, Save the Valley, Inc. (Intervenor). Upon due consideration of the evidence submitted in support of, and in opposition to, that challenge, and for the reasons set forth below, we conclude that the FSP adequately supports the issuance of the requested alternate schedule.

### I. BACKGROUND

Beginning in 1984, the Department of the Army (Licensee) conducted, under the auspices of an NRC materials license (SUB-1435), accuracy testing of depleted uranium (DU) tank penetration rounds at its Jefferson Proving Ground (JPG) site located in Madison, Indiana.<sup>2</sup> In 1994, the Licensee permanently ceased the testing, whereupon it was required by regulation to notify the NRC in writing of that development and, within twelve months thereof, to submit the required decommissioning plan.<sup>3</sup>

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<sup>1</sup> NRC Staff Exh. 13, License No. SUB-1435, Amendment No. 13 (Apr. 26, 2006).

<sup>2</sup> LBP-05-9, 61 NRC 218, 218 (2005).

<sup>3</sup> See 10 C.F.R. § 40.42(d).

It was not, however, until 1999, some five years after cessation of testing, that a decommissioning plan was presented to the Staff and became the subject of a Notice of Opportunity for Hearing.<sup>4</sup> In response to that notice, Save the Valley, Inc. (Intervenor), an organization with members residing in the immediate vicinity of the JPG site, sought a hearing.<sup>5</sup> On a determination that the Intervenor fulfilled the requirements of the then provisions of Subpart L of the Rules of Practice, the Presiding Officer granted the hearing request in March 2000.<sup>6</sup> In accord with the Licensee's unopposed request that "further proceedings be held in abeyance pending the outcome of its anticipated further interaction with the Staff with regard to [that] plan," the proceeding was placed in a state of suspension.<sup>7</sup>

Well over a year later and with the proceeding remaining in a state of suspension, the Licensee submitted to the Staff an entirely new plan in June 2001, which it denominated its "final decommissioning/license termination plan."<sup>8</sup> The Staff determined that this newly furnished and superseding licensing and termination plan needed site-specific sampling and modeling before it could be accepted for full review.<sup>9</sup> The Licensee concluded, however, that obtaining such information would pose a safety threat to the Licensee and contractor personnel because of the presence onsite of unexploded ordnance.<sup>10</sup>

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<sup>4</sup> 64 Fed. Reg. 70,294 (Dec. 16, 1999).

<sup>5</sup> [STV Request for Hearing] (Jan. 13, 2000).

<sup>6</sup> See LBP-00-9, 51 NRC 159 (2000). Prior to the revision of the Rules of Practice in 2004, Subpart L proceedings were assigned to a single Presiding Officer rather than to a three-member Licensing Board.

<sup>7</sup> Id. at 161.

<sup>8</sup> LBP-05-9, 61 NRC at 219.

<sup>9</sup> Id. at 220.

<sup>10</sup> Ibid.

Accordingly, in mid-2003 the Licensee withdrew the license termination plan and put before the Staff a proposal that it be granted a license amendment that would create a five-year, possession-only license (POLA) that would be renewable until such time as it became possible to perform the required site characterization safely. On October 28, 2003, the Staff published a Federal Register notice that indicated that it was considering the POLA request and provided an opportunity to seek a hearing on it.<sup>11</sup> After consultation with the parties, the Presiding Officer entered an order on December 10, 2003 dismissing the proceeding on the license termination plan, without prejudice to the Intervenor (then Petitioner) seeking to revive it should the decommissioning of the site once again receive active NRC consideration at the Licensee's behest.<sup>12</sup> A month later, on January 7, 2004, the Intervenor's timely hearing request regarding the proposed POLA was granted, along with that party's unopposed motion to hold further proceedings in abeyance pending the completion of the Staff's technical review of the POLA.<sup>13</sup>

Thus, by the beginning of 2005, there had yet to be a single filing by any party addressing what disposition was to be made of the amassed DU munitions on the JPG site.<sup>14</sup> On March 31, 2005, the Presiding Officer sent a memorandum to the Commission, noting that the proceeding had dragged on for many years:

[S]ome 11 years have now elapsed since the Licensee terminated testing activities on its JPG site that left behind an accumulation of DU munitions. Perhaps more to the point, this past March 23 was the fifth anniversary of the grant of the hearing request of Petitioner. . . . Over the course of the past 5 1/2 years, the Staff has been favored with one proposed decommissioning plan; then a second one that was so deficient as submitted that the Staff would not commence a technical review of it; and, lastly, a proposal that the Licensee be granted a POLA, to be renewable

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<sup>11</sup> See 68 Fed. Reg. 61,471 (Oct. 28, 2003).

<sup>12</sup> See LBP-03-28, 58 NRC 437 (Dec. 10, 2003).

<sup>13</sup> See Memorandum and Order (Granting Hearing Request and Motion to Hold Further Proceedings in Abeyance) (Jan. 7, 2004) (unpublished).

<sup>14</sup> LBP-05-9, 61 NRC at 219.

until such time, if ever, that the Licensee should conclude that a site characterization can be safely accomplished. Close to 18 months have elapsed since the POLA proposal was accepted for technical review. Nonetheless, not only has the Staff not completed its technical review and issued the required [Environmental Assessment] and [Safety Evaluation Report], but also, we are now informed that it is unable to provide at this time any estimate as to when that might be accomplished. This is said to be because of its endeavor to obtain information from the Licensee that is deemed necessary to complete the review but has not as yet been produced.<sup>15</sup>

The Presiding Officer stated that such a collection of delays “appears to us both to work an injustice upon the Petitioner and its members and to be inconsistent with the Commission's expectation – indeed insistence – that NRC adjudicatory proceedings move forward to conclusion with reasonable expedition.”<sup>16</sup>

On June 20, 2005, the Commission responded to the Board's March 31, 2005 memorandum, acknowledging Intervenor's then five-year wait for a hearing and finding that “[t]his situation hinders public participation, leaves public safety issues unresolved, and thwarts this agency's goal of expeditious adjudication.”<sup>17</sup> Accordingly, the Commission “order[ed] the Staff and the Licensee to report directly to the Commission on what steps [we]re being taken to resolve this matter.”<sup>18</sup>

On July 7, 2005, the Licensee reported that it was now prepared to assume the safety risks associated with site characterization and thus was abandoning the POLA proposal and seeking instead an alternate schedule amendment allowing “one 5 year period for the execution of appropriate site characterization, with the Licensee presenting the NRC a definitive license

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<sup>15</sup> Id. at 221-22.

<sup>16</sup> Id. at 223.

<sup>17</sup> CLI-05-13, 61 NRC 356, 357 (2005).

<sup>18</sup> Ibid.

termination plan at the end of that period.”<sup>19</sup> As previously noted, supra page 1, the application for the alternate schedule was accompanied by a FSP under which the site characterization would be conducted.

The Staff then discontinued review of the 2003 POLA proposal in view of the submission of the “superseding license amendment for an alternate schedule.”<sup>20</sup> The Staff intended to begin instead a new adjudication and accordingly, on June 27, 2005, published in the Federal Register a new notice of opportunity to request a hearing (regarding the alternate schedule request for submittal of a decommissioning plan).<sup>21</sup> On September 12, 2005, the Presiding Officer rejected this approach and, instead, reinstated the conditionally dismissed prior proceeding concerning the decommissioning of the JPG site because “the decommissioning of the JPG site [had] once again receive[d] active NRC consideration at the Licensee's request.”<sup>22</sup> On October 26, 2005, the Commission affirmed the Presiding Officer's decision to reinstate the earlier proceeding, and ordered that Petitioner's standing “shall be considered already established.”<sup>23</sup> The Commission also instructed that the remainder of the adjudication be conducted by a three-member Licensing Board under the informal hearing procedures of the now-revised Subpart L.<sup>24</sup>

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<sup>19</sup> See LBP-05-25, 62 NRC 435, 438 (2005) (citation omitted).

<sup>20</sup> Ibid. (citation omitted). The Licensee then filed a motion seeking to dismiss the POLA proceeding on the ground of mootness. Ibid. The Board dismissed the POLA proceeding in November 2005. See LBP-05-30, 62 NRC 733, 731 (2005).

<sup>21</sup> See 70 Fed. Reg. 36,964 (June 27, 2005).

<sup>22</sup> LBP-05-25, 62 NRC at 435. The Board held the ruling in abeyance pending the Commission's ruling. Id. at 441.

<sup>23</sup> CLI-05-23, 62 NRC 546, 550 (2005).

<sup>24</sup> Id. at 548-50 (discussing how the changes to Subpart L would impact the present Intervenor in any future hearings).

A month later, Intervenor timely filed its petition to intervene and request for hearing addressed to the alternate schedule proposal, in which it advanced a number of contentions challenging the adequacy of the FSP to accomplish its intended purpose.<sup>25</sup> In response, the Licensee asserted that all of the proposed contentions were outside the scope of the alternate schedule proposal;<sup>26</sup> for its part, the Staff acknowledged that at least one contention was admissible.<sup>27</sup>

The newly-established three-member Licensing Board found that the Intervenor had one admissible contention under 10 C.F.R. § 2.309(f)(1).<sup>28</sup> The admitted contention, designated as Contention B-1, stated: “As filed, the FSP is not properly designed to obtain all of the verifiable data required for reliable dose modeling and accurate assessment of the effects on exposure pathways of meteorological, geological, hydrological, animal, and human features specific to the JPG site and its surrounding area.”<sup>29</sup> Because the Intervenor proffered an admissible contention, the Board granted its request for hearing on the Licensee’s proposed alternate schedule.<sup>30</sup>

The Board also granted the Intervenor’s “contemporaneous and unopposed motion to defer a hearing in the matter to await the completion of the NRC Staff’s technical review of the Licensee’s alternate schedule proposal,” and noted that it would allow the Intervenor a period to amend its hearing request to reflect the results of the Staff’s review, if necessary.<sup>31</sup> The Staff

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<sup>25</sup> Petition to Intervene and Request for Hearing of Save the Valley, Inc. (Nov. 23, 2005).

<sup>26</sup> See LBP-06-06, 63 NRC 167, 176-78 (2006).

<sup>27</sup> See id. at 179-81.

<sup>28</sup> Id. at 186.

<sup>29</sup> Id. at 183.

<sup>30</sup> Id. at 186.

<sup>31</sup> Id. at 186-87.

filed its Environmental Assessment, which concluded that the proposed licensing action would have no significant impact on human health and the environment.<sup>32</sup> Then, on April 27, 2006, the Staff made available to the Board and parties its Safety Evaluation Report, together with the notification that, on the basis of its finding in that report of no undue risk from radiation to the public health and safety being posed by the alternate schedule proposal, it had issued the requested license amendment.<sup>33</sup>

Accordingly, the Board reinstated the proceeding on May 1, 2006, and provided the Intervenor with an opportunity to amend its contention or to file new contentions, as deemed necessary, in accordance with the contention filing and admissibility requirements of 10 C.F.R. § 2.309(c), (f)(2).<sup>34</sup> Pursuant to that order, on May 31, 2006, the Intervenor timely filed a motion for leave to withdraw, to amend, and/or supplement contentions<sup>35</sup> and, in a separate document, set forth the nine contentions and supporting bases it would have included in the evidentiary hearing.<sup>36</sup> In its response, the Licensee insisted that the Intervenor's new contentions were inadmissible but conceded that the Intervenor's motion to supplement Contention B-1 bases (m) and (q) should be granted.<sup>37</sup> The Staff maintained that of the Intervenor's newly proffered contentions, one was admissible, but that the Board should deny the Intervenor's request to clarify and to supplement selected bases for Contention B-1.<sup>38</sup> The Intervenor filed a timely

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<sup>32</sup> See 71 Fed. Reg. 13,435 (Mar. 15, 2006).

<sup>33</sup> See NRC Staff Exh. 12, NRC Staff Notification of License Amendment Issuance (Apr. 27, 2006).

<sup>34</sup> Licensing Board Order (Scheduling Further Proceedings) (May 1, 2006) at 3, 5 (unpublished).

<sup>35</sup> See Motion for Leave to Withdraw, Amend, and Supplement Contentions of Save the Valley, Inc. (May 31, 2006).

<sup>36</sup> See Final Contentions of Save the Valley, Inc. (May 31, 2006).

<sup>37</sup> Army's Response to the Motion for Leave To Withdraw, Amend, and Supplement Contentions of Save the Valley, Inc. Filed Herein on May 31, 2006 (June 19, 2006) at 3-7.

<sup>38</sup> See NRC Staff Response to Motion for Leave To Withdraw, Amend and Supplement

reply, reasserting the admissibility of its new contentions and amended bases for Contention B-1.<sup>39</sup>

After a pre-hearing conference in which the parties grappled with the FSP's evolutionary nature,<sup>40</sup> the Board on July 26, 2006 determined that it would be fruitful to suspend the proceeding and to allow the Intervenor and the Licensee (and the Staff, if it so chose) a period of consultation in which to attempt jointly to work out their concerns regarding the FSP.<sup>41</sup>

Following several months of negotiations, on November 9, 2006, the parties advised the Board that they were at an impasse, with the result that "[a]ll matters remain[ed] unresolved and the parties' respective positions remain[ed] unchanged."<sup>42</sup> Given this report, the Board turned to addressing the admissibility of the Intervenor's new and amended contentions that were submitted in its May 31, 2006 motion to amend.

In a December 20, 2006 order, the Board denied the Intervenor's new and amended contentions, finding them inadmissible "except to the extent addressed to the adequacy of the Licensee's proposed site characterization activities."<sup>43</sup> In the order, the Board further defined the scope of the proceeding as follows:

[W]hat the Licensee is here seeking is simply a 5-year period in which to characterize the JPG site, with the expectation that at the end of such time it will submit to the NRC Staff a viable decommissioning plan. During those 5 years it will be permitted only to conduct site characterization activities; no

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Contentions by Save the Valley, Inc. (June 20, 2006) at 1, 5-6.

<sup>39</sup> See Reply in Support of Motion for Leave to Withdraw, Amend and Supplement Contentions of Save the Valley, Inc. (June 30, 2006).

<sup>40</sup> See, e.g., Tr. (July 19, 2006) at 16-18, 26-28.

<sup>41</sup> See Licensing Board Order (Deferring Evidentiary Hearing) (July 26, 2006) at 1-3 (unpublished).

<sup>42</sup> Second Joint Status Report on Settlement Negotiations (Nov. 9, 2006) at 2.

<sup>43</sup> LBP-06-27, 64 NRC 438, 440 (2006).

decommissioning operations may begin until such time as the Licensee submits, and the Staff approves, a decommissioning plan. . . . [T]he scope of this proceeding is limited to whether the Licensee's proposal for characterizing the JPG site during the alternate schedule period – i.e., the next five years – is: (1) “necessary to the effective conduct of decommissioning operations”; (2) will “present[ ] no undue risk from radiation to the public health and safety”; and (3) “is otherwise in the public interest.” 10 C.F.R. § 40.42(g)(2).<sup>44</sup>

The Intervenor's previously admitted Contention B-1 remained viable because it was within the scope of the proceeding as so defined – i.e., the adequacy of the FSP was directly related to the Licensee's ability to characterize adequately the site.<sup>45</sup> The Board held under advisement the acceptability for litigation of the various bases in support of Contention B-1, providing the Licensee and the Staff an opportunity to object upon the Intervenor's submission of its pre-filed testimony.<sup>46</sup>

On February 23, 2007, the Intervenor submitted a motion to admit an additional contention, denominated Contention B-2.<sup>47</sup> Both the Licensee and the Staff filed a timely response to this motion, maintaining that this new contention, together with its supporting bases, was inadmissible because it was directed to the implementation of the FSP rather than the adequacy of the FSP and was therefore outside the scope of the proceeding.<sup>48</sup> The Board denied the Intervenor's motion on May 1, 2007, finding Contention B-2 inadmissible as a challenge to the implementation of the FSP; however, to the extent that it challenged the adequacy of the FSP, the Board found Contention B-2 “subsumed within the context of admitted

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<sup>44</sup> Id. at 447-48.

<sup>45</sup> Id. at 448.

<sup>46</sup> Id. at 447.

<sup>47</sup> See LBP-07-07, 65 NRC 507, 511 (2007).

<sup>48</sup> Ibid.

Contention B-1.”<sup>49</sup> The Board added, “[t]hat being so, the information (including data) cited in support of inadmissible Contention B-2 may be relied upon by Intervenor in the evidentiary hearing to be held on already-admitted Contention B-1 – which, once again, challenges the adequacy of the FSP to accomplish its intended site characterization purpose.”<sup>50</sup>

The parties filed both initial and response testimony in preparation for the hearing.<sup>51</sup> Dr. Diane S. Henshel, Mr. Charles H. Norris, and Mr. James M. Pastorick appeared as witnesses for the Intervenor; Mr. Dale Condra, Dr. Thomas McLaughlin, Mr. Jon M. Peckenpaugh, Dr. A. Christianne Ridge, and Mr. Adam L. Schwartzman appeared as witnesses for the Staff; and Mr. Harold W. Anagnostopoulos, Mr. Michael L. Barta, Mr. Paul D. Cloud, Mr. Todd D. Eaby, Mr. Joseph N. Skibinski, and Mr. Stephen M. Snyder appeared as witnesses for the Licensee. The parties also submitted proposed questions for the Board, in its discretion, to ask the parties’ witnesses at the evidentiary hearing in order to clarify and to address any questions potentially raised by the pre-filed testimony.<sup>52</sup>

On October 22, 2007, the Board held the evidentiary hearing in Madison, Indiana. Prior to its commencement, the Board heard oral argument regarding the legal standards to be

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<sup>49</sup> Id. at 513.

<sup>50</sup> Id. at 514.

<sup>51</sup> See Initial Statement of Position of Intervenor Save the Valley, Inc. (July 13, 2007); Reply of Intervenor Save the Valley, Inc. (Sept. 18, 2007); Surreply of Intervenor Save the Valley, Inc. (Oct. 2, 2007); NRC Staff Initial Statement of Position on Contention B-1 (Aug. 17, 2007); NRC Staff Reply and Sur-Rebuttal (Sept. 25, 2007); Army’s Initial Statement of Position on Save the Valley Contention B-1 (Aug. 17, 2007); Prefiled Written Reply and Sur-Rebuttal Testimony of Joseph N. Skibinski in Response to Prefiled Rebuttal Testimonies of Intervenor of Save the Valley, Inc. (Sept. 24, 2007).

<sup>52</sup> See Proposed Questions of Intervenor Save the Valley, Inc. For the Board to Consider Propounding to Staff and Army Witnesses (Oct. 9, 2007); NRC Staff Proposed Questions for Evidentiary Hearing (Oct. 9, 2007); U.S. Army’s Proposed Questions (Oct. 9, 2007). These questions, originally filed under seal with the Board, will be made public in a separate issuance today in accordance with 10 C.F.R § 2.1207(a)(3)(iii).

applied to the Army's alternate schedule application.<sup>53</sup> Given the number of witnesses and the varied technical issues, the Board divided the witnesses for the evidentiary hearing into the following topical panels: (1) Panel 1: Biota and Air Sampling; (2) Panel 2: Karst Geology (Well Locations, FTA Study, EI Study, unexploded ordnance (UXO) Issues); and (3) Panel 3: Soil, Water, and Sediment Sampling and Sample Analysis Methods.<sup>54</sup> After the conclusion of the hearing, the parties submitted proposed findings of fact and conclusions of law and their respective replies.<sup>55</sup>

## II. STANDARDS FOR THIS PROCEEDING

### A. Legal Standard for this Alternate Schedule

As provided in 10 C.F.R. § 40.42(g)(2), an alternate schedule for the submittal of a decommissioning plan should be approved if it (1) is necessary to the effective conduct of decommissioning operations; (2) presents no undue risk from radiation; and (3) is otherwise in the public interest. The Licensee requested this alternate schedule in order to conduct a site characterization project as outlined in its FSP.<sup>56</sup>

It is evident upon analysis that, for the JPG alternate schedule application to meet the Section 40.42(g)(2) criteria, its FSP, or foreseeable modifications thereof, must be reasonably

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<sup>53</sup> Tr. at 79. Specifically, the parties were asked to address: (1) "[W]hat is it as a matter of law that the Army must accomplish under its alternate schedule?" and (2) "[A]ssuming that the Army is required at the end of the five years to have a site characterization that will support in full measure a decommissioning plan, precisely then what must again in the context of commission regulations, the site characterization include?" Id. at 81.

<sup>54</sup> Licensing Board Order (Oct. 11, 2007) at 2 (unpublished); see also Tr. at 132-33, 221-22, 282.

<sup>55</sup> NRC Staff Proposed Findings of Fact and Conclusions of Law, and Order in the Form of an Initial Decision (Dec. 7, 2007); U.S. Army's Proposed Findings of Fact and Conclusions of Law, and Order in the Form of an Initial Decision (Dec. 7, 2007); Proposed Findings of Fact, Conclusions of Law, and Initial Decision of Intervenor Save the Valley (Dec. 7, 2007) [STV Proposed Findings].

<sup>56</sup> See NRC Staff Exh. 14, Field Sampling Plan (FSP) (May 25, 2005) at Cover Letter and FSP 1-1.

likely to generate the site characterization information needed to support a decommissioning plan to be submitted by 2011. The terms of the alternate schedule license amendment granted to the Licensee tie its issuance directly to the submission of a decommissioning plan by the end of 2011 or earlier.<sup>57</sup> For its part, that decommissioning plan must include an adequate site characterization.<sup>58</sup> In that regard, the Licensee already failed to include adequate site characterization information when it submitted a decommissioning plan in 2001,<sup>59</sup> now the Licensee has applied for five additional years in order to generate that needed information.<sup>60</sup>

As noted above, approval of this alternate schedule request hinges, inter alia, upon a demonstration that prosecution of the alternative schedule as proposed by the Licensee is necessary to the effective conduct of decommissioning operations. Such necessity is clearly lacking, however, unless there is reasonable assurance that the FSP will generate in the allotted five-year period the site characterization information needed to undergird the decommissioning plan. If such reasonable assurance is lacking, the 10 C.F.R. § 40.42(g)(2) criteria perforce are not met.<sup>61</sup>

Additional considerations of history and context support tying together the Licensee's plan for site characterization in the alternate schedule and the eventual site characterization standards of the decommissioning regulations. In determining the scope of the present inquiry, it is appropriate to take into account the extended delay in the submission of a viable decommissioning plan for this site, in that, as the Commission has observed, such delay

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<sup>57</sup> See License No. SUB-1435, Amendment No. 13 (Apr. 26, 2006).

<sup>58</sup> 10 C.F.R § 42.40(g)(4)(i).

<sup>59</sup> See CLI-05-13, 61 NRC at 357.

<sup>60</sup> See NRC Staff Exh. 14, FSP at 1-1.

<sup>61</sup> See also LBP-07-07, 65 NRC at 513 (characterizing the contention as "whether what the Licensee informed the NRC Staff it proposed to do by way of site characterization is, in fact, adequate to accomplish the granted amendment's objective, or whether it must be otherwise modified or conditioned by the Board.").

“hinders public participation, leaves public safety issues unresolved, and thwarts this agency’s goal of expeditious adjudication.”<sup>62</sup> Given that history, the issuance of this license amendment would scarcely have been “in the public interest” or “necessary to the effective conduct of decommissioning operations,” if, five years from now, and seventeen years after site activity ceased, the site characterization is found to be *not* adequate to support an acceptable decommissioning plan.<sup>63</sup>

For its part, the Staff’s insistence that it is currently irrelevant whether the Field Sampling Plan, or a reasonable modification of it, will provide enough information for a decommissioning plan’s site characterization in 2011,<sup>64</sup> ignores this context and the Licensee’s long-overdue decommissioning obligation. Decommissioning plans are not one-size-fits-all; context should be considered and indeed might be dispositive.<sup>65</sup>

#### B. Standards for Site Characterization

Relative to the crafting of an adequate decommissioning plan, this agency regulates a relatively narrow area of concern. The decommissioning plan for this restricted release site will be judged exclusively upon whether it will lead to the following results: residual radioactivity levels as low as is reasonably achievable (ALARA) and off-site human beings receiving a total effective dose equivalent from the site below 25 mrem.<sup>66</sup> There are no requirements for the

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<sup>62</sup> CLI-05-13, 61 NRC at 357.

<sup>63</sup> NRC regulations require that a licensee submit a decommissioning plan within twelve months of permanent cessation of its authorized activity. 10 C.F.R. § 40.42(d).

<sup>64</sup> See Tr. at 88 (Roth).

<sup>65</sup> See, e.g., FMRI, Inc. [Formerly Fansteel, Inc.] (Muskogee, Oklahoma Facility), LBP-04-8, 59 NRC 266, 275 (2004) (holding that, despite the lack of compliance with various agency NUREGs, a decommissioning plan was lawful because it acknowledged the fiscal realities of the licensee’s bankruptcy and was consistent with “the mandate that the plan be completed as soon as practicable and adequately protect the health and safety of workers and the public.”).

<sup>66</sup> See 10 C.F.R. § 20.1403.

decommissioning plan regarding chemical toxicity, the general harm that unexploded ordnance might pose, or even ecological contamination, except as these issues affect radioactivity levels and exposure to humans.<sup>67</sup>

The site characterization information, too, needs only to address possible human exposures to radioactivity.<sup>68</sup> This adjudication then does not, as we have previously noted, “encompass the entire JPG DU site decommissioning process.”<sup>69</sup> For instance, it does not encompass arguments about whether the decommissioning plan environmental impact statement or environmental assessment would require additional ecological information; any discussion regarding the sufficiency of that as of yet unwritten document belongs in a future National Environmental Policy Act (NEPA) challenge to the decommissioning plan’s environmental impact statement or environmental assessment, not in this narrow challenge to the alternative schedule.

For a licensee to provide sufficient assurance that the exposure to off-site persons is below 25 mrem, its decommissioning plan should identify and quantify all of the radioactive contamination’s significant pathways to humans. This is the primary purpose of the site characterization and provides the Board with its key standard. A site characterization plan should “provide sufficient information to allow the NRC to determine the extent and range of expected radioactive contamination.”<sup>70</sup>

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<sup>67</sup> Ibid.

<sup>68</sup> See, e.g., LBP-06-27, 64 NRC at 451 (holding that “Section 40.42(g)(2) makes clear that, in its review of that proposal, the only health-related concern the Staff must evaluate is whether the alternate schedule will ‘present[] . . . undue risk from radiation to the public health and safety’”).

<sup>69</sup> Id. at 448.

<sup>70</sup> Yankee Atomic Electric Company (Yankee Nuclear Power Station), CLI-05-15, 61 NRC 365, 377 (2005).

Other regulations and associated NUREG guidance repeat this standard. NRC regulations require that the decommissioning plan include “a description of the conditions of the site or separate building or outdoor area sufficient to evaluate the acceptability of the plan.”<sup>71</sup> Acceptance of the plan is based upon its conformity to the 25 mrem standard.<sup>72</sup> NUREG-1700, a guidance document for evaluating nuclear power reactor decommissioning plans, states that “[s]ite characterization information is provided to determine the extent and range of radioactive contamination on site, including . . . residues, soils, and surface and ground water.”<sup>73</sup> This guidance document counsels that a site characterization should be evaluated upon its completeness, use of sufficiently sensitive instruments, and proper quality assurance procedures.<sup>74</sup> The more specific indicators of completeness used in the document apply, however, only to reactors and thus not to the water, biota, and air testing controversies at the JPG site.<sup>75</sup> NUREG-1757 specifically provides guidance for restricted release sites like JPG, and states that a decommissioning plan for such a site should “characterize the location and extent of radiological contamination. . . identify the land use, exposure pathways, institutional controls, and critical group for the dose analysis.”<sup>76</sup>

Overall, then, a site characterization must include “sufficient information” so that it can effectively track pathways for significant off-site contamination and estimate the quantity of

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<sup>71</sup> 10 C.F.R. § 42.40(g)(4)(i).

<sup>72</sup> Id. § 42.40(g)(4).

<sup>73</sup> Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans, Rev. 1, NUREG-1700 at 8 (Apr. 2003). The Commission has endorsed the use of this standard review plan in evaluating site characterization plans, writing that “[w]ith respect to an adequate site characterization, it seems reasonable to interpret the regulation as requiring [decommissioning plan] submissions to contain the type of information discussed in the NUREG-1700 acceptance criteria.” Yankee Nuclear Power Station, CLI-05-15, 61 NRC at 377.

<sup>74</sup> See NUREG-1700 at 9.

<sup>75</sup> Id. at 8-10.

<sup>76</sup> Consolidated Decommissioning Guidance, Vol. 1, Rev. 2, NUREG-1757 (2006) at 7-5.

those pathways.<sup>77</sup> What constitutes “sufficient information,” however, depends, “to a large extent, on site-specific conditions,”<sup>78</sup> and the broad guidance in these NUREGs does not provide us with any more specific markers.

C. Standards for the Field Sampling Plan

While it is useful to discuss the standards applied to the site characterization information, this proceeding is concerned with the adequacy of the Licensee’s plan to gather that site characterization information, the FSP. There is, of course, no finite limit to the number and variety of procedures that the Licensee might undertake in the course of its site characterization activities. The adequacy of the FSP therefore cannot be regarded as dependent upon whether it embraces every test and exploration that might conceivably provide some information pertaining to the potential impact of the DU munitions upon the radiological health and safety of the public. Rather, as in any other inquiry of this nature, a rule of reason must be applied. Most specifically, what we are called upon to decide here is whether, as formulated, the FSP provides reasonable assurance that it will accomplish its intended objective. Stated otherwise, does the record establish that, in the absence of the taking of measures not embraced by the FSP, such reasonable assurance is lacking?

In evaluating the Intervenor’s claims of inadequacy, it must also be recognized that an iterative process is central to the FSP. That is to say, the FSP does not, as it could not, set forth all of the measures that will have to be taken in the course of the site characterization activities. Rather, as a matter of virtual certainty, the procedures that are initially performed will suggest the need for additional tests and explorations. For that reason, in the final analysis the question before us is whether the Intervenor has identified measures essential to the success of this

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<sup>77</sup> See Yankee Nuclear Power Station, CLI-05-15, 61 NRC at 377.

<sup>78</sup> Ibid.

enterprise that the Licensee is not reasonably likely to pursue at any point during the course of the overall inquiry.

Finally, it is important to keep in mind that, when ultimately passing judgment upon whatever decommissioning plan the Licensee might present for its approval, this agency will be focusing exclusively upon whether that plan meets the existing regulatory standards for the protection of the radiological health and safety of the public. Given that the site characterization has no purpose beyond providing support for the decommissioning plan, its sufficiency must be assessed accordingly.

### III. DISCUSSION OF THE FIELD SAMPLING PLAN

We now turn to consider the elements of the FSP and the respects in which the Intervenor maintained that the FSP will not provide the information needed to provide a site characterization sufficient to support a decommissioning plan for the JPG site, as well as the Licensee and the Staff's responses to those arguments.

#### A. Biota Sampling

##### 1. The FSP, Completed Actions, and Current Plans Regarding Biota Sampling

The biota sampling component of the FSP was designed in response to the Staff's request for information as to whether humans could be exposed to radiation from DU on the JPG site through consumption of animals hunted near the site.<sup>79</sup> For this purpose, the Licensee selected deer tissue for its biota sampling because deer are the most commonly hunted animals in the area.<sup>80</sup> The Licensee recognized that biota other than deer might be involved in the "uptake and subsequent movement of DU through the . . . food web," and provided that

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<sup>79</sup> NRC Staff Exh. 14, FSP at 6-24.

<sup>80</sup> Ibid.

“sampling of biota other than deer also may occur.”<sup>81</sup> The Licensee further explained, however, that such sampling would occur only if DU was found to be present in the deer tissue samples.<sup>82</sup>

The Licensee completed its deer sampling activities in early 2006; they were conducted according to the terms of the FSP.<sup>83</sup> The Licensee collected ten deer from the DU Impact Area, ten from nearby hunting areas, and ten from background locations (areas the Licensee considered likely not to be exposed to DU) in late 2005 and early 2006.<sup>84</sup> From these collections, it obtained kidney, bone, liver, and muscle tissue for examination.<sup>85</sup>

The specific collection locations for the deer samples were said to be based on a variety of factors including exposure areas (e.g., where exposure would be the greatest), accessibility (e.g., available roads and paths), and safety (e.g., concerning the potential presence of unexploded ordnance).<sup>86</sup> The Licensee used bait to attract the deer to the collection areas to make harvesting them easier.<sup>87</sup>

In an August 2006 report, the Licensee compiled the results of the deer sampling study and compared them with historical deer tissue samples taken in the 1980s and 1990s.<sup>88</sup> The

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<sup>81</sup> Ibid.

<sup>82</sup> Id. at 6-24 to 6-25; Army Exh. 2, Pre-Filed Testimony of Army Witness Michael L. Barta (Aug. 17, 2007) at 5 [Barta Direct].

<sup>83</sup> See Army Exh. 11-A, Deer Tissue Sampling Results (Aug. 2006) at 2-1 to 2-3, 3-1.

<sup>84</sup> Id. at 2-1 to 2-3; see also NRC Staff Exh. 14, FSP at 6-25 to 6-26; NRC Staff Exh. 15, Field Sampling Plan Addendum excluding Appendix B (Nov. 2005) at 2-1 to 2-2.

<sup>85</sup> Army Exh. 11-A, Deer Tissue Sampling Results at 2-3, 3-1; see also NRC Staff Exh. 14, FSP at 6-27 to 6-28.

<sup>86</sup> See NRC Staff Exh. 14, FSP at 6-25 to 6-27; see also Army Exh. 11-A, Deer Tissue Sampling Results at 2-1 (indicating that locations were chosen based on ease of harvesting and potential exposure of deer to DU).

<sup>87</sup> See Army Exh. 11-A, Deer Tissue Sampling Results at 2-1; see also NRC Staff Exh. 14, FSP at 6-28.

<sup>88</sup> Army Exh. 11-A, Deer Tissue Sampling Results at 4-1.

Licensee concluded that the study showed that DU was not present in the deer tissue samples, and thus neither additional verification deer sampling nor the sampling of biota other than deer was currently necessary.<sup>89</sup> For its part, although finding the Licensee's conclusion reasonable, the Staff emphasized that the Staff might nonetheless require additional deer sampling or sampling of other biota in the future to ensure that humans in the vicinity of the JPG site were not at risk of exposure to radiation above NRC regulatory thresholds.<sup>90</sup>

## 2. The Intervenor's Assertions Regarding Biota Sampling

The Intervenor's first criticism of the FSP's biota sampling program related to its exclusion of all other biota besides deer.<sup>91</sup> The debate regarding which biota should be sampled centered upon the purpose of biota sampling, and involved a factual dispute regarding what animals humans consume and in what quantities. The Intervenor asserted that the biota sampling component of the FSP should have focused on species lower on the food chain than deer, and have included at least one each of an airborne, aquatic, and soil-based species.<sup>92</sup> Its expert witness on biota sampling, Henshel, testified that the additional biota needed to be included in the study in order to (1) determine the exposure to all species at the JPG site, including humans; and (2) account for the "uptake and bioaccumulation of DU by the various biota" up the food chain in order to construct a "meaningful fate and transport model" for the movement of DU.<sup>93</sup>

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<sup>89</sup> Army Exh. 2, Barta Direct at 5; Army Exh. 11-A, Deer Tissue Sampling Results at 5-1.

<sup>90</sup> See NRC Staff Exh. 5, Prefiled Testimony of Dale Condra (Aug. 17, 2007) at 4 [Condra Direct]; NRC Staff Exh. 6, Prefiled Sur-rebuttal Testimony of Thomas McLaughlin (Aug. 17, 2007) at 2 [McLaughlin Sur-rebuttal].

<sup>91</sup> Save the Valley (STV) Exh. 2, Prefiled Direct Testimony and Exhibits of Diane S. Henshel, Ph.D. (July 20, 2007) at 12-13 [Henshel Direct].

<sup>92</sup> STV Exh. 2, Henshel Direct at 12-13.

<sup>93</sup> Ibid.

The asserted need for additional biota sampling to determine radiation exposure to the environment, not just exposure to humans, was primarily based on the Intervenor's insistence that the FSP should generate the information necessary to support an environmental impact statement accompanying the Licensee's Decommissioning Plan at the end of the five-year alternate schedule period.<sup>94</sup> Additionally, the Intervenor maintained that further biota sampling was necessary because humans hunted and consumed other animals besides deer found on or near the JPG site, such as turkey, squirrels, mollusks, and crayfish, and could thus be exposed through such consumption.<sup>95</sup>

The Intervenor's second criticism of the biota sampling component of the FSP concerned the methodology of the deer sampling. It would have it that the study was poorly designed and executed, and therefore produced unreliable results that, in turn, gave the Licensee false assurance that no need existed to conduct further sampling of deer or other plants and animals.<sup>96</sup> According to Henshel, specific weaknesses in the study included that there was not enough distinction between DU-exposed deer and deer from background locations, the study's small sample size, and inconsistencies regarding the time of year the deer were collected and the types of data recorded.<sup>97</sup> Henshel also maintained that baiting deer to lure them to the collection area might have had an impact on the measure of uranium detected in the samples because the amount of DU can be affected by the animal's recent diet, further making the results unreliable.<sup>98</sup>

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<sup>94</sup> Tr. at 111-12 (Mullett).

<sup>95</sup> STV Exh. 2, Prefiled Rebuttal Testimony of Diane S. Henshel, Ph.D. (Sept. 18, 2007) at 17-18 [Henshel Rebuttal]; Tr. at 171-74.

<sup>96</sup> STV Exh. 2, Henshel Direct at 14-15; STV Exh. 2, Henshel Rebuttal at 14-16.

<sup>97</sup> STV Exh. 2, Henshel Direct at 20-24; STV Exh. 2, Henshel Rebuttal at 14-18.

<sup>98</sup> STV Exh. 2, Henshel Direct at 14-15.

The Intervenor's third criticism of the biota sampling component of the FSP was one that ran throughout its criticisms of the FSP in general: the Licensee's method of measuring radiation from the samples was not advanced enough to distinguish between background levels of radiation from naturally occurring uranium already in the environment and the presence of DU, thus rendering its results inconclusive.<sup>99</sup> In addition to the Licensee's current technique of alpha spectroscopy, the Intervenor proposed that more advanced techniques for measuring the presence of U-234 and U-238 be employed.<sup>100</sup> With these more advanced techniques, the Intervenor claimed, the Licensee would be able to detect DU at low levels and thereby generate a more meaningful model of potential radiation exposure to humans and the environment.<sup>101</sup>

### 3. The Licensee's Response Regarding Biota Sampling

In response to the Intervenor's view regarding the purpose and scope of the biota sampling, the Licensee emphasized that the objective of the FSP in general, and that of the biota sampling plan in particular, was to determine potential radiation exposure to humans exclusively, not to the total environment as well.<sup>102</sup> As stated by the Licensee's witness, Barta, "the focus of this decommissioning process is the protection of human health."<sup>103</sup> While declaring that NRC regulations do not specifically require the Licensee to conduct biota sampling, Barta nonetheless stressed that it had performed the deer sampling in response to a

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<sup>99</sup> STV Exh. 1, Prefiled Rebuttal Testimony of Charles H. Norris, LPG (Sept. 18, 2007) at 40-44 [Norris Rebuttal]; Tr. at 303-05 (Norris). The Intervenor proposed that the Licensee increase the count time and the mass of uranium being analyzed for each sample and use a combination of alpha spectroscopy and inductively coupled plasma mass spectroscopy to get mass concentrations of the various ratios. See Tr. at 304-5 (Norris); Prefiled Direct Testimony and Exhibits of Charles H. Norris, LPG (July 13, 2007) at 78-79 [Norris Direct].

<sup>100</sup> Tr. at 303-05 (Norris).

<sup>101</sup> STV Exh. 1, Norris Direct at 74-75; Tr. at 303-05 (Norris).

<sup>102</sup> Army Exh. 2, Barta Direct at 5, 26.

<sup>103</sup> Id. at 10.

Staff request for additional information on the effects of human consumption of deer and potential DU exposure.<sup>104</sup>

Further, the Licensee maintained that deer were the most hunted and consumed animals present on the JPG site,<sup>105</sup> and that the Intervenor had not presented sufficient evidence of the consumption of other animals to warrant the broadening of the sampling beyond deer.<sup>106</sup> In addition, the Licensee asserted that additional biota sampling was not necessary at this time because the results of the deer sampling conducted in 2005 and 2006 did not indicate that any DU was present in the samples at all, thus, the Licensee concluded, the potential radiation exposure to humans from consumption of deer was well below regulatory limits.<sup>107</sup> Accordingly, the Licensee maintained that the biota sampling plan in the FSP was sufficient, meeting the regulatory standards for the grant of a five-year alternate schedule.

In response to the Intervenor's criticism of its biota sampling methodology, the Licensee would have it that it "carefully designed and carried out [the biota sampling] . . . [and t]he result is that there is sufficient quantity and quality of data to proceed with the necessary decisions in the decommissioning process."<sup>108</sup> In that regard, Barta testified that the additional calculations required by the Intervenor were not necessary and would likely not change the results of the study.<sup>109</sup> In addition, the Licensee took issue with Henshel's criticism of the use of baits and their potential effect on the ability to measure effectively the amount of uranium in the samples. Although Barta agreed that recent diet might affect the presence of DU in deer tissue, he

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<sup>104</sup> Id. at 16.

<sup>105</sup> See id. at 6.

<sup>106</sup> Id. at 10.

<sup>107</sup> Id. at 5-6.

<sup>108</sup> Id. at 7.

<sup>109</sup> Id. at 18-25.

asserted that “very little, if any, bait was used in the fall sampling event when all of the deer from the DU Impact Area were collected,” and it was unknown whether the deer that were collected consumed any of the bait.<sup>110</sup> He also stated that “[f]oraging on corn for a few days or few weeks would seem unlikely to appreciably affect tissue concentrations of DU.”<sup>111</sup> Accordingly, the Licensee insisted that its testing methodology was sufficient and the results obtained were reliable.<sup>112</sup>

The Licensee’s witness Skibinski responded to the Intervenor’s assertion that the Licensee’s use of alpha spectroscopy to measure radiation was insufficient by stating that it was the best cost-effective method available. The Licensee asserted that although alpha spectroscopy was unable to distinguish DU from background radiation in low levels, the additional use of a more expensive and less commercially available method was impractical and unnecessary.<sup>113</sup> Skibinski emphasized that its method was sufficient for the purposes of complying with NRC regulatory dose limits because “the migration of DU can be reliably identified with existing analytical methods (when the level of total uranium exceeds that expected in the natural background).”<sup>114</sup> He pointed out that its measurements have all been well below these limits, and further, that the radiation measured in the deer tissue samples had not indicated that DU was present, only that percentages of uranium naturally occurring in the environment were present.<sup>115</sup> Therefore, the Licensee asserted, its measurement techniques

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<sup>110</sup> Id. at 20.

<sup>111</sup> Ibid.

<sup>112</sup> Id. at 7-8, 25-26.

<sup>113</sup> See Army Exh. 3, Prefiled Written Reply and Sur-rebuttal Testimony of Joseph N. Skibinski in Response to Prefiled Rebuttal Testimonies of Intervenor of Save the Valley, Inc. (Sept. 24, 2007) at 4 [Skibinski Sur-rebuttal]; see also Tr. at 301-02 (Anagnostopoulos).

<sup>114</sup> Army Exh. 3, Skibinski Sur-rebuttal at 2, 4.

<sup>115</sup> Id. at 2.

were sufficient to ensure public health and safety because they would have detected the presence of DU distinguishable from naturally occurring background levels of uranium – if it existed.<sup>116</sup>

#### 4. The NRC Staff's Response Regarding Biota Sampling

In addressing the Intervenor's concerns, the NRC Staff stressed at the outset that the purpose of the FSP was to provide "site specific information relating to the DU at JPG and specifically how the DU could potentially cause a radiological dose that would be detrimental to human health."<sup>117</sup> As the Staff saw it, the Intervenor was requesting a "much broader" assessment, one "more akin to an EPA-type ecological risk assessment of the site based on the chemical properties of uranium rather than its radiological hazard."<sup>118</sup> In terms of the biota sampling component of the FSP, the Staff considered the Licensee's decision to sample only deer at this time, while possibly not "sufficient for the comprehensive EPA-type ecological assessment of the site proposed by [the Intervenor]," nonetheless "sufficient for the FSP."<sup>119</sup>

In common with the Licensee, the Staff emphasized that the purpose of the deer sampling program was to determine if there existed a risk to humans of DU radiation exposure from eating deer meat.<sup>120</sup> Although acknowledging that other animals on the JPG site, e.g. turkey and squirrels, might be consumed, the Staff opined that "[d]eer are the only significant completed pathway with the potential to cause a radiological dose detrimental to the public health."<sup>121</sup> It maintained that other plants and animals were simply not consumed in significant

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<sup>116</sup> Id. at 2, 4.

<sup>117</sup> NRC Staff Exh. 1, Prefiled Testimony of Thomas McLaughlin (Aug. 17, 2007) at 5 [McLaughlin Direct].

<sup>118</sup> Ibid.

<sup>119</sup> Id. at 9.

<sup>120</sup> Id. at 16.

<sup>121</sup> Id. at 9.

numbers, nor do they provide quantities of meat that would have warranted further testing.<sup>122</sup>

The Staff also found the deer sampling methodology used by the Licensee to be sufficient for the purposes of the Licensee's FSP.<sup>123</sup>

According to the Staff's witness Condra, the levels of radiation in the JPG deer would contribute little or no radiation to the off-site total effective dose equivalent limits. First, based on its analysis of the data obtained from the deer sampling, the Staff concluded that there was no DU present in the deer tissue. Staff witness Condra testified that he saw "no evidence that would lead anyone to conclude that DU has been detected in the deer tissue samples."<sup>124</sup> Additionally, Staff witness Ridge testified that she had calculated that persons replacing all beef and chicken in their diet with JPG deer tissue containing the "maximum measured concentration of uranium detected in the muscle of deer collected from the site" would, at most, receive the committed effective dose equivalent of 0.27 mrem per year.<sup>125</sup> Such a dose was "well below the NRC's decommissioning criteria of [25 mrem] per year."<sup>126</sup> From this she concluded that "consumption of meat from deer at JPG is not expected to pose a radiological health risk to humans from DU."<sup>127</sup>

Given the testimony of its witnesses, the Staff opined that the data from the deer sampling study were "consistent with background levels [of uranium] and do[ ] not indicate that

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<sup>122</sup> Id. at 9-10; NRC Staff Exh. 6, McLaughlin Sur-rebuttal at 2.

<sup>123</sup> See NRC Staff Exh. 1, McLaughlin Direct at 5, 9-10, 16.

<sup>124</sup> NRC Staff Exh. 5, Condra Direct at 4.

<sup>125</sup> NRC Staff Exh. 3, Prefiled Testimony of A. Christianne Ridge (Aug. 17, 2007) at 17 [Ridge Direct].

<sup>126</sup> Id. at 18; see also Tr. at 288-89 (Ridge).

<sup>127</sup> NRC Staff Exh. 3, Ridge Direct at 18.

DU has been detected in the samples that were collected as part of the project.”<sup>128</sup> It thus concluded that “in the absence of evidence that the total uranium concentrations exceed what is expected in background, there would be no additional benefit or requirement to submit the sample for further analysis or evaluation.”<sup>129</sup> Should the need arise, however, the Staff noted that it “reserve[d] the option to request the [Licensee] to sample biota or other media in the future.”<sup>130</sup>

With regard to the Licensee’s ability to distinguish between depleted uranium and naturally occurring background uranium with its current instrumentation, the Staff acknowledged that there were limitations in making this distinction at extremely low levels of radiation, but maintained that these limitations were not unique to alpha spectroscopy.<sup>131</sup> Condra, a Staff witness, testified that, after analysis of the samples, one is able to determine if a sample as a whole contains DU or naturally occurring uranium, but not whether the sample’s radiation is partially from DU and partially from naturally occurring uranium, or in what ratios the two occur.<sup>132</sup> However, in determining that the radiation exposure from deer meat would be at most 0.27 mrem per year (as compared to the 25 mrem per year regulatory limit), Ridge assumed that the measured radiation was entirely due to the presence of DU.<sup>133</sup> Therefore, even with the

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<sup>128</sup> NRC Staff Exh. 5, Condra Direct at 5.

<sup>129</sup> Id. at 4.

<sup>130</sup> NRC Staff Exh. 6, McLaughlin Sur-rebuttal at 2.

<sup>131</sup> See Tr. at 296-99 (Condra).

<sup>132</sup> Id. at 298-99 (Condra).

<sup>133</sup> NRC Staff Exh. 3, Ridge Direct at 17. As discussed above, the Staff maintained that the measured radiation from the deer tissue samples is at low levels that indicate it is due to the presence of naturally occurring uranium, not DU. NRC Staff Exh. 5, Condra Direct at 5. However, Ridge made the conservative assumption that it was DU to show that measured radiation remains well within the regulatory threshold. See NRC Staff Exh. 3, Ridge Direct at 17.

Licensee's current instrumentation, the Staff concluded that consumption of deer hunted in the vicinity of JPG was "not believed to have a significant effect on human health."<sup>134</sup>

#### 5. Board Findings Regarding Biota Sampling

On our appraisal of the evidence before us, we conclude that the biota sampling component of the FSP is sufficient to meet the 10 C.F.R. § 40.42(g)(2) criteria for a five-year alternate schedule.

The intended purpose of this component of the FSP was to enable the Licensee to model adequately the potential pathway of DU from the ground at the JPG site to humans via consumption through the food chain. In this regard, it is important to bear in mind that, as previously noted, what is under consideration here is a plan that is continually evolving, and one that the Licensee is implementing in order to create the site characterization that must be included with the Licensee's submission of its decommissioning plan in 2011.

Contrary to the Intervenor's apparent belief, there is no current requirement that the FSP describe the collection of information needed for the decommissioning plan's environmental assessment or environmental impact statement.<sup>135</sup> Moreover, the FSP need not include any chemical toxicity analysis, as the agency and application's focus is on the potential threat of harm to humans from radiation from the DU projectiles, not any potential threat of harm from DU as a chemical toxin. Accordingly, to the extent they are based on the proposition that the FSP should provide the necessary information to create an environmental report or model the threat of harm from chemical or other non-radiological toxicity, the Intervenor's criticisms must be deemed outside the scope of this proceeding.

For the stated purpose of gathering information to model the potential radiation dose to humans, the Licensee's decision to sample deer exclusively at this time was reasonable given

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<sup>134</sup> NRC Staff Exh. 3, Ridge Direct at 18.

<sup>135</sup> See 10 C.F.R. § 20.1403; see also supra pp. 13-14.

that deer are the most frequently hunted animals in the JPG area and provide by far the largest portion of local meat for human consumption.<sup>136</sup> Barta testified without contradiction that in an area that includes the DU Impact Area (the Big Oaks National Wildlife Refuge), “approximately 400 to 800 deer are harvested per year,” approximately 50 turkey are harvested per year, and the squirrel harvest is limited by the length of the hunting season.<sup>137</sup> Although observing that people living near JPG might consume additional animals, such as mollusks and crayfish,<sup>138</sup> the Intervenor provided insufficient evidence to indicate that any of these animals are consumed, if consumed at all, in quantities approaching that of deer, and thus implicate a risk of exposure to humans beyond that potentially created by consumption of deer meat.<sup>139</sup> Accordingly, the Board finds that the Licensee reasonably designed the biota sampling component of its FSP to sample deer, especially considering the potential for sampling of additional animals should the results of the other sampling components of the FSP indicate the presence of DU or upon the request of the Staff.

We also find it unlikely that a greater sample size or the sampling of deer that were not lured with bait would have materially altered the study’s finding that there was no DU present in the samples. The Licensee’s analysis determined this result;<sup>140</sup> the Staff verified it with its own calculations.<sup>141</sup> Especially compelling in this regard was Ridge’s testimony that she had calculated the yearly radiation dose to humans through consumption of deer meat by assuming

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<sup>136</sup> See NRC Staff Exh. 1, McLaughlin Direct at 9-10.

<sup>137</sup> Army Exh. 2, Barta Direct at 6; see also Army Exh. 3, Skibinski Sur-rebuttal at 2.

<sup>138</sup> See Tr. at 171-74.

<sup>139</sup> Considering that the Licensee has not completed testing of the water, the NRC Staff emphasizes that if the water samples indicate that DU is moving offsite, it will require additional animals (conceivably to include aquatic species) to be tested. NRC Staff Exh. 6, McLaughlin Sur-rebuttal at 2.

<sup>140</sup> See Army Exh. 2, Barta Direct at 19-20.

<sup>141</sup> See NRC Staff Exh. 5, Condra Direct at 4.

(1) a person substitutes all of the beef or chicken regularly consumed in his or her diet with deer meat; (2) the highest level of radiation from uranium recorded in the deer tissue samples is present at the same level in all deer that are consumed; and (3) this level of radiation is attributable totally to DU rather than naturally occurring uranium (although the Licensee disagreed that it is anything but naturally occurring uranium).<sup>142</sup> After making these highly conservative assumptions, Ridge found that the committed effective dose equivalent from consumption of deer meat would be 0.27 mrem per year.<sup>143</sup> Although there is always room for improvement in any study, there is no reason to believe that a somewhat more refined or broader investigation would have changed the fact that the level of dose calculated, even if it were assumed to be due entirely from the DU projectiles on the JPG site, was far below the limit of 25 mrem per year provided in NRC regulations.

Moreover, given the deer sampling results, there appears to be no necessity to invoke a more expensive (and not necessarily more effective)<sup>144</sup> method of analyzing the deer tissue samples to measure radiation and to distinguish between DU (which is at issue in terms of meeting dose limits) and background levels of naturally occurring uranium (which are not).<sup>145</sup>

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<sup>142</sup> NRC Staff Exh. 3, Ridge Direct at 17-18.

<sup>143</sup> Ibid. As discussed above, Ridge testified that the 0.27 mrem per year represents the value for the “committed effective dose equivalent.” Id. at 18. Although the regulatory limit of 25 mrem per year represents the value for the “total effective dose equivalent,” 10 C.F.R. § 20.1403(b), which is defined as the “sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures),” 10 C.F.R. § 20.1003, there is no evidence before the Board of an external dose for this analysis, making the committed effective dose equivalent the sole contribution to the total effective dose equivalent calculation. For the purposes of deer meat consumption, the total effective dose equivalent thus remains well below 25 mrem per year.

<sup>144</sup> See Army Exh. 3, Skibinski Sur-rebuttal at 4. Witnesses for both the NRC Staff and the Licensee testified that, even with the unproven advanced techniques that the Intervenor proposes, it will still be difficult to interpret the relative concentrations of DU and naturally occurring uranium within a single sample. Tr. at 296-97 (Condra), 304-05 (Anagnostopoulos).

<sup>145</sup> See 10 C.F.R. § 20.1403(b) (“The licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the [total effective dose equivalent] from residual radioactivity distinguishable from background to the average member of the critical

Even though the levels of uranium were at the lower limits of the Licensee's instrumentation, at these levels it is immaterial whether the results were attributable to DU or naturally occurring uranium. They are simply too small: assuming that all of the radiation measured in the deer tissue samples is attributable to DU, the committed effective dose equivalent for humans consuming deer meat would be 0.27 mrem per year as compared to the NRC-imposed limit of 25 mrem per year.<sup>146</sup> For the purposes of this proceeding, then, where the Licensee must collect the data necessary for its site characterization and ultimately prove to the Staff that the total effective dose equivalent does not exceed 25 mrem, exploring for extremely low levels of radiation that are already lower than this limit was superfluous.<sup>147</sup>

Further, it is important to note that, in designing the biota sampling component, the Licensee did not foreclose (and the Staff reserved the opportunity to request) the sampling of other animals or plants in the future, should subsequent water and soil sampling – the other

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group will not exceed 25 mrem . . . per year.”) (emphasis added).

<sup>146</sup> See NRC Staff Exh. 3, Ridge Direct at 17-18.

<sup>147</sup> The Intervenor has also asserted that the FSP measurement methodologies for soil, water, and sediment as well as biota should distinguish between natural and depleted uranium in order to properly characterize the site. Tr. at 294-95 (Norris); see also STV Exh. 1, Norris Direct at 74-75; STV Exh. 1, Norris Rebuttal at 26. In order to do this, the Licensee would have to be able to measure uranium in amounts smaller than its current detection limits, approximately 0.02 pCi/g for biota, 2 pCi/g for sediment, and 1 pCi/L for surface water and groundwater samples. NRC Staff Exh. 14, FSP at A.3-3 Table A.3-1; see also Tr. at 156 (Anagnostopoulos).

Given the technical constraints in attempting to distinguish between natural and depleted uranium discussed above, see also Tr. at 292, 305 (Anagnostopoulos), and the small amounts of any uranium involved, this Board finds that no credible case has been made that distinguishing between natural uranium and DU is needed for any of these materials. Even if the entire uranium amount in samples is assumed to be DU, radiation amounts would remain far below regulatory limits; should they increase ten or even fifty-fold over time, it is very likely they would still remain below the regulatory limits. See, e.g., id. at 155, 293 (Anagnostopoulos) (stating that the soil, water, and sediment samples taken outside of the DU Impact Area show total uranium concentrations at the detection limit of the alpha spectroscopy method, with total uranium concentrations at background levels).

major pathways for movement of DU – indicate a need to conduct further biota sampling.<sup>148</sup> As the Licensee acknowledged, if the levels of uranium measured in the samples for soil and water increase above naturally occurring uranium levels, DU is present. In such circumstances, the Licensee would need to conduct additional sampling, possibly to include additional biota sampling, to supplement its DU movement modeling in the site characterization.<sup>149</sup>

Given the foregoing, the Board finds that the biota sampling component of the FSP is sufficient to determine the potential dose from radiation to humans derived from consumption of animals, and therefore is sufficient for the purposes of the Licensee's five-year alternate schedule proposal.

#### B. Air Sampling

##### 1. The FSP, Completed Actions, and Current Plans Regarding Air Sampling

The DU Impact Area is now within the Big Oaks National Wildlife Refuge and, as such, is subject to periodic controlled burns of the area by the U.S. Fish and Wildlife Service.<sup>150</sup>

Because DU potentially could be transported in the air through smoke generated during these controlled burns, a contractor for the Licensee (SAIC) provided a memorandum to the Licensee assessing the risk of potential doses of radiation to humans associated with this activity.<sup>151</sup>

After reviewing the results of prior air sampling conducted at the JPG site between 1984 and 1987, the contractor determined that “[t]here was not any detectable uranium in the

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<sup>148</sup> See Army Exh. 2, Barta Direct at 16; NRC Staff Exh. 6, McLaughlin Sur-rebuttal at 2; NRC Staff Exh. 14, FSP at 6-24.

<sup>149</sup> See NRC Staff Exh. 6, McLaughlin Direct at 2. As previously noted, we have deemed it necessary that the FSP provide enough information for a 2011 decommissioning plan's site characterization, thus any additional sampling necessary to achieve this purpose must be conducted within the five-year alternate schedule period.

<sup>150</sup> NRC Staff Exh. 31, Memorandum from Corrine Shia, SAIC, to Paul Cloud, JPG BRAC Environmental Coordinator, and Joyce Kuykendall, Radiation Safety Officer, APG (Jan. 13, 2005) at 1 [SAIC Memorandum]; see also NRC Staff Exh. 14, FSP at 4-6 to 4-7 (detailing U.S. Fish and Wildlife responsibilities).

<sup>151</sup> NRC Staff Exh. 31, SAIC Memorandum at 1-2.

samples.”<sup>152</sup> Pointing as well to the outcome of studies concerning similar areas where DU was present and controlled burns were conducted, the contractor concluded that the “risks associated with potential transport of DU in the air from controlled burns are negligible.”<sup>153</sup> It recommended that the Licensee not include an air sampling program in the FSP “given the low probability of DU release and transport and the negligible effects on receptors.”<sup>154</sup> On the basis of this recommendation, the Licensee chose not to include sampling of air at JPG in the FSP provisions.<sup>155</sup>

## 2. The Intervenor’s Assertions Regarding Air Sampling

The Intervenor would have it that an air sampling provision should have been included in the FSP. As asserted by Intervenor witness Henshel, “without air sampling associated with the controlled burns at JPG, the Army cannot say with any assurance what that increased dose or resulting increment to health risk will be.”<sup>156</sup> In other words, according to the Intervenor, excluding the air pathway has unacceptably limited the information available to the Licensee when modeling the dose pathway for the purposes of showing that its eventual decommissioning plan will be within NRC regulatory dose limits.<sup>157</sup>

The Intervenor rejected as outdated the studies relied upon by the Licensee for its decision not to include air sampling.<sup>158</sup> Instead, the Intervenor’s witness Henshel pointed to a 2006 Los Alamos National Laboratories (LANL) study conducted after the date of the

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<sup>152</sup> Id. at 2.

<sup>153</sup> Id. at 4.

<sup>154</sup> Ibid.

<sup>155</sup> See NRC Staff Exh. 14, FSP at 4-1, 12-2 (citing NRC Staff Exh. 31, SAIC Memorandum, as the basis for excluding air as a media for investigation in the FSP).

<sup>156</sup> STV Exh. 2, Henshel Direct at 26-27.

<sup>157</sup> Ibid.

<sup>158</sup> Id. at 25.

memorandum produced by the Licensee's contractor that addressed controlled burns in areas where DU was present on LANL property.<sup>159</sup> Henshel noted that the LANL study found "there were significant changes (14% increases on average) in airborne [DU] at the perimeter of the entirety of the LANL property following the prescribed burns."<sup>160</sup>

Comparing the conditions at LANL with the conditions at JPG, Henshel pointed to the similarities and differences between the two locations. She noted that the burned area and the frequency of the controlled burns were greater at JPG than at LANL, which she declared created the potential for greater amounts and movement of airborne DU at JPG than that measured at LANL.<sup>161</sup> She observed that the U.S. Fish and Wildlife Service was planning to conduct burns in the fall in order to mimic natural fires that occur in that drier season, and that the agency expected such fall fires would "burn more of the vegetation more thoroughly, including potentially the trench [(where the majority of the DU projectiles are located),<sup>162</sup>] and potentially more of the trees."<sup>163</sup> She asserted that these more thorough fires could increase the airborne DU at JPG.<sup>164</sup>

Further, Henshel noted that JPG is narrower than LANL. She took this factor to mean that "civilians live very near the boundaries" of JPG, so that likely increases in airborne DU at

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<sup>159</sup> Ibid.; see NRC Staff Exh. 41, Jeffrey J. Whicker, et al., From dust to dose: Effects of forest disturbance on increased inhalation exposure, Science of the Total Environment (2006) [hereinafter LANL Study].

<sup>160</sup> STV Exh. 2, Henshel Direct at 25.

<sup>161</sup> Tr. at 195-98 (Henshel).

<sup>162</sup> Id. at 207-08 (Henshel); NRC Staff Exh. 13, SER at 1-2.

<sup>163</sup> Tr. at 207 (Henshel).

<sup>164</sup> Id. at 207-08.

the boundaries of JPG “could accumulate in these civilians to the point where it could contribute to adverse health conditions.”<sup>165</sup>

On the basis of an asserted uncertainty associated with the potential dose to those “who live, work or hunt on or around JPG,”<sup>166</sup> and the Intervenor’s belief regarding the present significance of the LANL study, the Intervenor asserted that the FSP should have included an air sampling component.<sup>167</sup>

### 3. The Licensee’s Response Regarding Air Sampling

The Licensee disputed the Intervenor’s assertion that air is a significant pathway for the transport of DU at the JPG site.<sup>168</sup> It also disagreed with the Intervenor’s interpretation of the LANL study, maintaining that the study “does not support the assertion that the air pathway [at JPG] is significant.”<sup>169</sup> To the contrary, according to the Licensee, the study highlights the insignificance of the air pathway at JPG.<sup>170</sup>

In support of this assertion, the Licensee’s witness Anagnostopoulos pointed to the differences he deemed to exist between the conditions at LANL and those at JPG. For example, the “dusty, arid environment” at LANL, unlike that at JPG, “optimizes the potential for airborne suspension of DU contaminated dust.”<sup>171</sup> Additionally, Anagnostopoulos disputed the Intervenor’s assertion that the burned area at JPG is greater than at LANL.<sup>172</sup> He testified that

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<sup>165</sup> STV Exh. 2, Henshel Direct at 26; see also Tr. at 198-99 (Henshel).

<sup>166</sup> STV Exh. 2, Henshel Rebuttal at 22.

<sup>167</sup> STV Exh. 2, Henshel Direct at 26-27.

<sup>168</sup> See Army Exh. 1, Pre-filed Testimony of Army Witness Harold W. Anagnostopoulos, CHP (Aug. 17, 2007) at 3-4 [Anagnostopoulos].

<sup>169</sup> Id. at 4.

<sup>170</sup> Id. at 8; see also Tr. at 200-01 (Anagnostopoulos).

<sup>171</sup> Army Exh. 1, Anagnostopoulos Direct at 8.

<sup>172</sup> See Tr. at 221 (Anagnostopoulos).

the burned area at LANL was 30 million square meters, as compared to the entire DU Impact Area of 8.4 million square meters (a smaller portion of which is selected for a single controlled burn).<sup>173</sup> Therefore, more dust would be expected to go airborne at LANL.<sup>174</sup> He further maintained that the DU projectiles at LANL were fired at hard targets, resulting in DU aerosol and shrapnel, while at JPG the projectiles were fired at soft targets and remained intact.<sup>175</sup> As a consequence, it would be more likely that DU would be available for air transport at LANL than at JPG.<sup>176</sup> The Licensee's witness Anagnostopoulos also rejected the Intervenor's argument that the risk to humans at JPG was greater because people lived near the boundaries of JPG; instead he asserted that the nearest resident lived over two miles away from the DU Impact Area at JPG, and because the airborne concentration of DU decreased as it moved away from the DU source, the risk would be negligible.<sup>177</sup>

Moreover, Anagnostopoulos maintained that, even were it to be assumed that the conditions at LANL were comparable to the conditions at JPG, the increased dose to the public from the controlled burns at LANL would be well below the regulatory limits imposed by 10 C.F.R. Part 20.<sup>178</sup> With the view that the LANL study indicates the worst-case scenario for DU exposure through the air, Anagnostopoulos insisted that at its worst, the potential exposure to people living near JPG would be only 0.1 mrem.<sup>179</sup> Anagnostopoulos' conclusion was that the

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<sup>173</sup> Army Exh. 1, Anagnostopoulos Direct at 8.

<sup>174</sup> Ibid.

<sup>175</sup> Ibid.; see also Tr. at 152 (Cloud).

<sup>176</sup> Army Exh. 1, Anagnostopoulos Direct at 8; Army Exh. 1-A, E-mail dated 01/17/07 from Jeff Whicker, Health Physicist, LANL, to Paul Cloud, RSO, JPG (11:50 AM); Tr. at 211-12.

<sup>177</sup> Army Exh. 1, Anagnostopoulos Direct at 11.

<sup>178</sup> Id. at 9.

<sup>179</sup> Id. at 9-10. The Licensee acknowledged that a value of 14 mrem per year was also

LANL study, actual prior sampling at JPG, and a review of other studies that might be more comparable to JPG, indicated that the air pathway was not significant.<sup>180</sup>

4. The NRC Staff's Response Regarding Air Sampling

In common with the Licensee, the Staff insisted that the FSP was sufficient without a dedicated plan for air sampling at JPG. In its view, as expressed by its witness Schwartzman, although "air is a potential exposure pathway to workers and offsite residents," "currently available scientific evidence from studies conducted at both [Aberdeen Proving Ground] and LANL do not support the need for a full-time air sampling program at JPG."<sup>181</sup>

Staff witness Schwartzman testified that the studies reviewed by the Licensee's contractor in its 2005 memorandum showed that the "risks from the mobilization of DU from fires" contributing to adverse health effects were "extremely small."<sup>182</sup> Further, with regard to the 2006 LANL study referenced by the Intervenor, Schwartzman characterized the environment at LANL as "a more arid ecosystem compared to both APG and JPG."<sup>183</sup> He asserted that the 14% average increase of airborne DU after controlled burns conducted at LANL did not represent an actual dose to an individual but rather amounted to a calculated occupational dose of between 0.1 and 14 mrem per year to workers on-site after conservative assumptions were

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calculated, but pointed out that this was based on "occupational workers who occupy the burned areas for 2,000 hours per year." Army Exh. 3, Skibinski Sur-Rebuttal at 6. The Licensee therefore insisted that 14 mrem per year "clearly is not a reasonable assumption for controlled burns of the DU impact area at JPG." Ibid.

<sup>180</sup> Army Exh. 1, Anagnostopoulos Direct at 5, 11-12.

<sup>181</sup> NRC Staff Exh. 4, Prefiled Testimony of Adam L. Schwartzman (Aug. 17, 2007) at 4 [Schwartzman Direct].

<sup>182</sup> Id. at 5.

<sup>183</sup> Id. at 8.

made.<sup>184</sup> Schwartzman noted that these numbers were comparable to natural background levels.<sup>185</sup>

Based on his review of these studies, Schwartzman concluded that “air transport of DU during this license amendment period is not a threat to the public health.”<sup>186</sup> Accordingly, the Staff maintained that the LANL and SAIC-reviewed studies “provide the data necessary to answer the question regarding potential doses to workers and the public at JPG without implementing a full-time, full-scale air sampling program at JPG, which is not necessary at this time.”<sup>187</sup>

#### 5. Board Findings Regarding Air Sampling

As discussed above, the purpose of the FSP is to model the pathways of potentially significant radiation doses to the public to produce a meaningful site characterization by the end of the five-year alternate schedule period in 2011. In this connection, we note again that the Licensee ultimately must be able, with the aid of the site characterization submitted with its decommissioning plan, to establish that it will meet the requirements for restricted release under 10 C.F.R. § 20.1403. Among other things, this will involve a demonstration that the total effective dose equivalent “from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem . . . per year.”<sup>188</sup>

In this setting, we find that the Licensee’s decision not to include air sampling at this time to be reasonable. Contrary to the insistence of the Intervenor that site-specific air sampling at

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<sup>184</sup> Id. at 6-7 (explaining that 0.1 mrem per year estimated for workers from “moderate” controlled burn and 14 mrem per year estimated for workers from “severely burned” site).

<sup>185</sup> Id. at 7.

<sup>186</sup> Ibid.

<sup>187</sup> Id. at 9.

<sup>188</sup> 10 C.F.R. § 20.1403(b).

JPG needs to be conducted to assess the movement of DU,<sup>189</sup> the actual air samples taken at JPG in the 1980s, the studies cited by the Licensee's contractor in the 2005 memorandum, and the 2006 LANL study together suffice as bounding estimates for the potential movement of DU at JPG. Having been gathered from areas that, to varying degrees, provide some relevance to conditions at JPG, all three of these sources of information indicate that the potential radiation dose to the public is minimal.<sup>190</sup> As such, they are sufficient, at this time, to render unnecessary a separate air sampling endeavor during the alternate schedule period.

In particular, the LANL study represents a conservative upper bounding estimate of the potential radiation dose to the public at JPG. Not only was a larger area burned at LANL than is selected for a single controlled burn at JPG,<sup>191</sup> but the environment at LANL is more arid than that at JPG, and the projectiles at LANL were "introduced through high explosives testing" that resulted in aerosol and shrapnel, unlike the intact projectiles at JPG.<sup>192</sup> These conditions make

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<sup>189</sup> The Intervenor has asserted in its testimony, as described in Part B.2 above, and in the summary of its position in its Proposed Findings of Fact and Conclusions of Law that site-specific testing of the DU at JPG is required to "confirm that the current mobilization of DU in smoke is relatively low." STV Proposed Findings at 68. However, in its proposed Board findings, the Intervenor appears to concede this point (and indicates its agreement with this portion of our decision) when it states, "[T]he Army is not required by NRC regulations or guidance to collect site-specific data for every potential source of DU. The available data suggest that the levels of airborne DU resulting from the controlled burns at [JPG] will be episodic and minimal and that a conservative bounding estimate using generic data should suffice for JPG site characterization purposes." *Id.* at 69.

<sup>190</sup> See NRC Staff Exh. 31, SAIC Memorandum at 2, 4; NRC Staff Exh. 41, LANL Study at 519, 523-24, 528.

<sup>191</sup> There is a dispute between the Intervenor and the Licensee as to whether the burn area at LANL is greater than that at JPG, or vice versa. The Intervenor characterized the LANL burn areas as "a relatively small burn compared to the 10,000 acres . . . burned annually . . . at [JPG]." Tr. at 195-96 (Henshel). However, the JPG burn area of 10,000 acres is the total area burned in a single year, not what is actually burned in a single controlled burn event. Further, portions of the JPG DU Impact Area are burned as separate events, which means the relevant burn area for JPG is approximately 2,000 acres, not 10,000 acres, as the Intervenor would have it. See Tr. at 201 (Anagnostopoulos), 203-04 (Schwartzman).

<sup>192</sup> Army Exh. 1-A, E-mail dated 01/17/07 from Jeff Whicker, Health Physicist, LANL, to Paul Cloud, RSO, JPG (11:50 AM); see also Army Exh. 1, Anagnostopoulos Direct at 8; Tr. at 211-12 (Anagnostopoulos).

increases in airborne DU significantly more likely<sup>193</sup> and are distinct from those prevailing at JPG.

The Intervenor relies heavily on data showing that the concentration of airborne DU increased by an average of 14% at the perimeter of burned areas.<sup>194</sup> This number must, however, be placed in its proper context – what the 14% increase means in terms of potential doses to humans. The authors of the study estimated that the potential dose from radiation was 0.1 mrem per year in “moderate” controlled burn areas and 14 mrem per year in “severely burned” areas.<sup>195</sup> Both of these upper and lower estimates are within the 25 mrem per year dose limit for members of the public under NRC regulations.<sup>196</sup>

Moreover, the upper estimate of 14 mrem per year was calculated using a conservative assumption that the exposure would be to an occupational worker spending 2,000 hours per year in the burned areas.<sup>197</sup> In contrast, the closest members of the general public live more than two miles away from the DU Impact Area at JPG. Additionally, the DU Impact Area is not always included in the controlled burn area, thus further increasing the public’s distance from that area.<sup>198</sup> Because the airborne concentration of DU would decrease as one is farther away

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<sup>193</sup> See NRC Staff Exh. 41, LANL Study at 529; NRC Staff Exh. 5, Schwartzman Direct at 8; Army Exh. 1, Anagnostopoulos Direct at 8.

<sup>194</sup> See STV Exh. 2, Henshel Direct at 25.

<sup>195</sup> See NRC Staff Exh. 41, LANL Study at 528; NRC Staff Exh. 5, Schwartzman Direct at 6; Army Exh. 1, Anagnostopoulos Direct at 9.

<sup>196</sup> See 10 C.F.R. § 20.1403(b). These estimates are also within NRC regulatory limits for exposure to occupational workers. See 10 C.F.R. §§ 20.1201, 20.1207.

<sup>197</sup> See NRC Staff Exh. 41, LANL Study at 527; Army Exh. 3, Skibinski Sur-Rebuttal at 6.

<sup>198</sup> See Army Exh. 1, Anagnostopoulos Direct at 12. Although at LANL the increases in airborne DU were measured at the perimeter, this was because the burn areas were located at the western boundary of LANL. See NRC Staff Exh. 41, LANL Study at 521; Tr. at 200 (Anagnostopoulos). Because the burn areas of concern in this case, those that happen to encompass the DU Impact Area in a given burn event, are in the center of the JPG site, the

from the source of the DU,<sup>199</sup> the potential exposure from controlled burns at JPG would likely be less than the LANL upper estimate – and still well within the regulatory requirements.

Given these findings, we conclude that the Licensee has provided reasonable assurance that its decision not to include air sampling in the FSP will not prevent it from meeting its obligation to explore all significant pathways for the potential movement of DU in its site characterization analysis.

C. Monitoring of Possible DU in Ground, Surface, and Cave Water

1. The FSP, Completed Actions, and Current Plans Regarding Water Data

The FSP's analysis of waterways was intended to identify groundwater, possible cave, and surface water paths and to assess the contents of those waters. This information is needed in order to determine if DU is leaching or will leach off the site in quantities significant enough that humans might receive more than 25 mrems of total radioactive exposure from all of the site's pathways.<sup>200</sup> To locate the ways in which water leaves the site, the FSP set out a phased approach that included fracture trace analysis (FTA), an electrical imaging (EI) survey, site selection of well pairs, installation of well pairs, collection of stage data, comparison of groundwater stage, precipitation and surface water flow data to evaluate connectivity of the installed wells, and groundwater chemistry sampling.<sup>201</sup>

The Licensee's goal in conducting the FTA was to identify the vertical and horizontal sedimentary rock fractures that together provide interconnected pathways (or groundwater conduits) for the aquifer and, it is claimed in the FSP, through which a majority of the aquifer

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distance for residents living near JPG is measured from this point. See Army Exh. 1, Anagnostopoulos Direct at 11; NRC Staff Exh. 14, FSP at 2-8; supra note 191 and accompanying text.

<sup>199</sup> See Army Exh. 1, Anagnostopoulos Direct at 11.

<sup>200</sup> See 10 C.F.R. § 20.1403.

<sup>201</sup> NRC Staff Exh. 26, SAIC Well Location Selection Report at 4-1 (2007).

flows.<sup>202</sup> Wells would then be located at places where they would intersect with the groundwater conduits.<sup>203</sup> Based upon the precept that bedrock fracture locations and orientations can be interpreted from linear or semi-linear features representing surface fracture traces visible in aerial photographs,<sup>204</sup> the Licensee identified bedrock fractures by studying aerial photographs and satellite images of the 22 square miles surrounding the JPG DU Impact Area.<sup>205</sup>

The Licensee then used or plans to use EI surveys to determine whether an area is water or bedrock by measuring the area's resistivity (a material's opposition to the flow of electric current).<sup>206</sup> While based in part upon the subsurface information the FTA uncovered,<sup>207</sup> the configuration of EI survey points primarily follow a network of roads surrounding and passing through the DU Impact Area.<sup>208</sup> These roads are safe corridors where UXO has been cleared.<sup>209</sup>

Based on the results of the FTA, the EI survey, and other tests, monitoring wells of four inches in diameter were to be drilled "in areas most likely to be conduits of groundwater flow."<sup>210</sup> The Licensee's selection of a location to position a characterization well would require both a

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<sup>202</sup> NRC Staff Exh. 14, FSP at 5-1.

<sup>203</sup> Ibid.

<sup>204</sup> Ibid.

<sup>205</sup> STV Exh. 1, Norris Direct at 10; Army Exh. 5, Snyder Direct at 3.

<sup>206</sup> Staff Exh. 14, FSP at 6-2.

<sup>207</sup> Ibid.

<sup>208</sup> Army Exh. 5, Snyder Direct at 30-31.

<sup>209</sup> Id. at 49.

<sup>210</sup> NRC Staff Exh. 14, FSP at 6-4.

resistivity anomaly from the EI survey and a mapped fracture trace from the FTA.<sup>211</sup> Generally, the Licensee desired that wells be located in areas of permeable materials, in concentrated zones of fractures, downgradient of the DU Impact Area.<sup>212</sup> During May and June 2007, the Licensee installed wells at six of the ten planned locations.<sup>213</sup> No soil sampling or rock coring activities were planned during well installation.<sup>214</sup> The Licensee intends to determine the connectivity of water pathways by monitoring these wells' water levels and responses to storm events, as well as surface water staging.<sup>215</sup> It might install additional monitoring wells based upon the results of on-going or previous characterization of the site.<sup>216</sup>

The FSP included plans to monitor the flow of surface streams<sup>217</sup> and the Licensee has taken several steps to do so. It has installed surface water gauging stations at ten locations, including seven automatic recording stream gauge stations, two automatic recording cave stream gauging locations, and one manual/visual staff gauge monitoring location.<sup>218</sup> It has not yet analyzed data from these locations.<sup>219</sup> It plans to collect both elevation and flow data from these gauges.<sup>220</sup>

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<sup>211</sup> Army Exh. 5, Snyder Direct at 38; see also Tr. at 275 (Norris).

<sup>212</sup> Army Exh. 5, Snyder Direct at 15-16.

<sup>213</sup> NRC Staff Exh. 2, Peckenpaugh Direct at 18.

<sup>214</sup> NRC Staff Exh. 14, FSP at 6-12.

<sup>215</sup> Army Exh. 4, Eaby Direct at 41.

<sup>216</sup> NRC Staff Exh. 4, Peckenpaugh Direct at 18.

<sup>217</sup> See NRC Staff Exh. 14, FSP at 6-31.

<sup>218</sup> Army Exh. 4, Eaby Direct at 45.

<sup>219</sup> NRC Staff Exh. 2, Peckenpaugh Direct at 6-7.

<sup>220</sup> Tr. at 236 (Snyder).

In order to characterize the site's karst features, described by the Licensee as networks of sinkholes and shallow caves lying in between the site's surface and groundwater, and these networks' interaction with groundwater, surface water, and cave channels, the Licensee proposed to sample cave streams at cave mouths.<sup>221</sup> In September of 2006, the Licensee installed gauges on two springs that flow from caves along Big Creek.<sup>222</sup> The data from these gauges will determine whether the Licensee, at the Staff's direction, conducts any low-flow stream and spring cave measurements.<sup>223</sup>

The Licensee has not yet prepared detailed plans to characterize surface water and sediment transport of DU.<sup>224</sup> It has scheduled this work to occur after well installation, so that concurrent sampling of all media can take place.<sup>225</sup>

## 2. The Intervenor's Assertions Regarding Water Data

The primary argument presented by the Intervenor is that the Licensee's proposed characterization methods cannot adequately capture the networks of karst features existing under the site and flowing into and out of surface streams. The Intervenor asserted that the Licensee's program "has to be able to identify the major conduits, the conduits that are controlling the hydrogeology on that site,"<sup>226</sup> and that "there are several lines of evidence that indicates the possibility and the probability of the karst networks extending below the surface drainage."<sup>227</sup> The Intervenor maintained that the FSP does not adequately characterize these

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<sup>221</sup> Army Exh. 5, Snyder Direct at 16.

<sup>222</sup> Tr. at 242 (Peckenpaugh).

<sup>223</sup> NRC Staff Exh. 2, Peckenpaugh Direct at 6.

<sup>224</sup> Army Exh. 5, Snyder Direct at 51.

<sup>225</sup> Ibid.

<sup>226</sup> Tr. at 251 (Norris).

<sup>227</sup> Id. at 258 (Norris).

possible groundwater conduits and that there must be (1) an expanded network of characterization wells to investigate the potential for and evidence of deeper karst elements that might channel water outside the current monitoring web; (2) seepage runs on Big Creek, Middle Fork Creek and the unnamed tributary of Big Creek that enters the DU Impact Area north of D Road prior to the installation of additional characterization wells; and (3) remote-sensing and on-the-ground geophysical programs designed to delineate in three dimensions major, open karst pathways that would dominate the groundwater flow system into and out of the DU Impact Area.<sup>228</sup>

Intervenor witness Norris testified to the Board that the combination of EI surveys and FTA used by the Licensee to select well locations was inadequate to identify many karst features, including large caves people already had physically visited, because some karst features are not fracture-controlled:

The well locations that they are picking right now are using a combined technology that can't identify the caves that we know really exist there because they're visible and can be gone into. The biggest cave on the JPG system is over 900 feet long. It doesn't show up on their fracture trace. It would never be, even if a road ran across it, would never be something to penetrate with a well because it's invisible to the technology that they're using.<sup>229</sup>

Norris asserted that this technological weakness meant that analogous caves *below* stream level too would be missed.<sup>230</sup> As part of a deep karst network, such caves could be of great importance.<sup>231</sup> To map these non-fracture-controlled karst features, Norris testified that the Licensee's FTA and EI tests should be supplemented with a map of the karst groundwater

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<sup>228</sup> See STV Proposed Findings at 76-77.

<sup>229</sup> Tr. at 251 (Norris), as corrected by Licensing Board Order [Adopting Transcript Corrections] (Nov. 29, 2007) at Appendix A at 3 (unpublished); see also Tr. at 275-76 (Norris); STV Exh. 1, Norris Direct at 20.

<sup>230</sup> Tr. at 252 (Norris).

<sup>231</sup> Id. at 258 (Norris).

conduits significant to the site, developed by running an EI on a grid system and a seismic technique that together “look for entirely different physical properties.”<sup>232</sup> He asserted that, if this was done, the resulting wells would capture information from the non-fracture-controlled karst features.<sup>233</sup>

The Intervenor was also critical of the Licensee’s EI survey procedures. According to Norris, the FSP EI survey method, using a direct current to look for voltage drops between pairs of electrodes measured along a single line, does not create as much useful information as a grid configuration. “The implementation of the EI survey as a series of isolated lines instead of a grid precludes using the EI survey as a tool to map the three-dimensional patterns of resistivity in the DU area.”<sup>234</sup> Norris also faulted the EI survey for having the testing points follow the curves of the road, insisting that “EI results are best when lines are laid out as straight lines.”<sup>235</sup> He asserted that the Licensee’s EI survey process assumed “that zones with high electrical resistivity represent low permeability rocks that are unsaturated and that zones with low electrical resistivity represent high-permeability groundwater conduits,” and that such an assumption is “inappropriately simplistic” for complex karst geology.<sup>236</sup>

The identification of streams whose water is interchanged by karst channels and then runs underground, herein “losing streams,” that cross the DU impact area was, in the Intervenor’s view, fundamentally necessary for characterization of the site.<sup>237</sup> A “seepage run,” (i.e., a longitudinal set of flow measurements taken along a stream during a period of steady

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<sup>232</sup> Id. at 276 (Norris).

<sup>233</sup> Ibid.

<sup>234</sup> STV Exh. 1, Norris Direct at 18.

<sup>235</sup> Ibid.

<sup>236</sup> Id. at 19.

<sup>237</sup> STV Exh. 1, Norris Rebuttal at 33.

flow) could identify “the source areas of stream gains or the discharge points of stream losses” potentially associated with karst features, and should ideally be conducted before well locations or stream gauging locations are located.<sup>238</sup> The Intervenor criticized the Licensee’s decision not to include such a seepage run in the FSP or its addendum,<sup>239</sup> and instead would have the Licensee identify locations where streams lose water and then conduct die trace tests to trace the water’s course.<sup>240</sup> The Intervenor maintained that such seepage runs were critical because they would identify “where active conduits intersect and interact with the surface drainage system.”<sup>241</sup>

In addition to the seepage run studies and EI grid, the Intervenor asserted that the Licensee should have done stream surveys and gauging before installing the initial wells in order to optimize the location of those wells, so that the stream and the groundwater systems were tied together.<sup>242</sup> According to the Intervenor’s witness Norris, by drilling the wells without having done this work, the Licensee missed important opportunities to conduct tests, like hydraulic conductivity measurements, and gather critical data that would better pinpoint the movement of water off the site.<sup>243</sup> The Intervenor characterized the Staff and Licensee’s insistence that the Licensee might simply gather some of this data later should the need arise as “faulty on two levels.”<sup>244</sup>

First, without a plan and pre-identified criteria that would constitute evidence of other karst systems, it requires a high degree of

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<sup>238</sup> Ibid.

<sup>239</sup> Ibid.; see also STV Exh. 1, Norris Surrebuttal at 19.

<sup>240</sup> See Tr. at 262-63 (Norris).

<sup>241</sup> STV Exh. 1, Norris Rebuttal at 25-26.

<sup>242</sup> Tr. at 234-35 (Norris).

<sup>243</sup> Id. at 236-37 (Norris).

<sup>244</sup> STV Proposed Findings at 47.

serendipity and a willingness to consider and accept data that may be indicative of a second or third conduit system. Second, the 5-year expansion period is already two years gone. Without deliberately looking for such additional conduit systems, it is questionable that, were they stumbled upon, they could be characterized in a manner and on a time frame that would fit within the remaining 3 years.<sup>245</sup>

Instead, according to Norris, the FSP should have been designed to gather this information from the beginning, for the reason that “[y]ou have to sequentially go in a program that is designed to identify. . . as quickly as possibl[e] those variety of features that you need to be able [to] characterize.”<sup>246</sup>

### 3. The Licensee’s Response Regarding Water Data

Both the Licensee and the Staff characterized the FSP as a flexible, multi-tiered approach. The Licensee has indicated it will drill initial monitoring wells and position stream and cave gauges, using them to get initial information that will later be supplemented by additional wells and sampling.<sup>247</sup> Then, it will collect data from the initial monitoring wells and cave and stream gauges and make determinations concerning where to locate additional wells and gauges, if necessary.<sup>248</sup>

The Licensee asserted that it is unnecessary to perform the additional site survey activities proposed by the Intervenor because the current well/gauge system will either provide the information or indicate that such information is needed.<sup>249</sup> For instance, with regard to the Intervenor’s criticism of the Licensee’s failure to do stream surveys and gauging as part of the

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<sup>245</sup> Ibid.

<sup>246</sup> Tr. at 240-41 (Norris).

<sup>247</sup> See NRC Staff Exh. 2, Peckenpaugh Direct at 11-12, 22; Army Exh. 4, Eaby Direct at 7, 43-45.

<sup>248</sup> NRC Staff Exh. 2, Peckenpaugh Direct at 8-9, 22; Army Exh. 4, Eaby Direct at 15-16, 43-35.

<sup>249</sup> See, e.g., Army Exh. 4, Eaby Direct at 15-16.

process of installing the initial wells,<sup>250</sup> the Licensee's witness Eaby responded that, as part of its evolving, flexible plan, the ten gauges that had been set up represented only a beginning and that data collection must start somewhere.<sup>251</sup> He rejected Norris's claim that such data collection might be counter-productive, maintaining that "[a]ll of the surface water gauging stations installed as part of this characterization will provide, at a minimum, useful data for developing an understanding of the interaction between precipitation, groundwater, and surface water."<sup>252</sup>

Similarly, the Licensee responded to the Intervenor's criticisms regarding the FSP's lack of a plan to identify losing streams by claiming, (1) the importance given to losing streams by the Intervenor was based upon a highly speculative scenario whereby surface water drops into conduits and then resurfaces at a distance;<sup>253</sup> and, (2) that such identification might be part of the site characterization.<sup>254</sup> The Licensee's witness Snyder also maintained, however, that whether DU might be present in the streams should be determined first and that, if not present, it was not necessary to investigate further the pathway.

MR. SNYDER: We have not determined that there are losing streams. That will be part of our characterization.

JUDGE ABRAMSON: It is part of what you're going to do.

MR. SNYDER: Certainly.

JUDGE ABRAMSON: And when – And if you find losing streams, then what? Is it your plan to figure out where it went?

MR. SNYDER: If it is necessary to characterize the site and the migration of DU, yes.

JUDGE ABRAMSON: And how would you determine whether it's necessary to determine the migration of DU?

MR. SNYDER: The entire program that proves out and develops our site conceptual model starts with DU in the soil. Our program

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<sup>250</sup> Tr. at 234-35 (Norris).

<sup>251</sup> Army Exh. 4, Eaby Direct at 44.

<sup>252</sup> Id. at 45.

<sup>253</sup> Army Exh. 5, Snyder Direct at 36.

<sup>254</sup> Tr. at 263 (Snyder).

looks at the migration of DU through surface water through the soils and into the groundwater through the caves into the surface water over land into the surface water.<sup>255</sup>

If any DU was discovered in the water, Snyder asserted that “the pathway would be investigated further.”<sup>256</sup>

In response to the Intervenor’s assertions that work should be done to identify a possible non-fracture controlled, deep karst network, the Licensee countered that it was unlikely that a deep karst network even existed on the site.<sup>257</sup> Snyder testified that “Mr. Norris expresses concern that there is a DU migration pathway to a remote area (possibly a paleo-karst channel or network) that will go undiscovered and undetected. The geological conditions at the site (flat-lying Silurian-aged siliceous dolomitic limestone) are not likely to host such a condition, and local geological literature makes no reference to such a condition or potential.”<sup>258</sup> The witness further maintained that contamination of such a possible aquifer was unlikely because of its depth below the surface; instead, DU would first contaminate surface and shallow groundwater systems that, in his opinion, had been adequately characterized.<sup>259</sup> With regard to the Intervenor’s claim that some caves cannot be identified with the FTA, the Licensee asserted that such caves are above the water table and not significant pathways.<sup>260</sup>

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<sup>255</sup> Tr. at 263-64.

<sup>256</sup> Army Exh. 5, Snyder Direct at 49.

<sup>257</sup> Ibid.

<sup>258</sup> Ibid.

<sup>259</sup> See id. at 28-29.

<sup>260</sup> Tr. at 253 (Snyder).

The Licensee further represented that it will in fact collect much of the information sought by the Intervenor. For instance, it planned to gather the stream elevation and hydrological information considered by the Intervenor to be “absolutely necessary to characterize the site.”<sup>261</sup>

JUDGE ABRAMSON: [D]o you need to collect both elevation and flow data from your stream gauging, and if so, are you intending to do it. And if not, why is [it] not necessary?

MR. SNYDER: This is Steve Snyder. We are intending to do it. It is valuable to do it. We have stage data. We will survey those stage points and all of that stage data becomes elevation data.<sup>262</sup>

Finally, the Licensee asserted that it was unlikely DU had contaminated or would contaminate the groundwater. Snyder testified that there was currently no evidence of DU having entered the groundwater,<sup>263</sup> and, while the Licensee’s studies regarding DU migration in the soil have not been completed,<sup>264</sup> the 2002 Final Environmental Report indicated that the farthest any DU had migrated in the soil from a projectile was fewer than two feet.<sup>265</sup>

Anagnostopoulos described the projectiles they had found so far as

near surface soils, they have a black oxide layer that's fairly tightly adherent with a yellow oxide layer intermixed between the two, and that when you remove the penetrator and look at the soils, typically that yellow discoloration, the uranium is right there next to the penetrator. In other words, you don't see visually a plume of that yellow oxide in the surrounding soils. It's usually in a very tight layer in that area.<sup>266</sup>

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<sup>261</sup> Tr. at 235-36 (Norris).

<sup>262</sup> Tr. at 236.

<sup>263</sup> Army Exh. 5, Snyder Direct at 49.

<sup>264</sup> See, e.g., Tr. at 310 (Anagnostopoulos) (“We have no idea how those penetrators are corroding right now. We're going to go find out.”).

<sup>265</sup> Army Exh. 8, Environmental Report[:] Jefferson Proving Ground at 3-7 to 3-8 (June 2002).

<sup>266</sup> Tr. at 211 (Anagnostopoulos).

Essentially, the Licensee's witness testified that the examined DU projectiles had not shown signs of having leached extensively into the surrounding soil.<sup>267</sup>

#### 4. The NRC Staff's Response Regarding Water Data

In common with the Licensee, the Staff asserted that the Intervenor's insistence for a widespread understanding of the karst geology and certain additional tests at the outset of characterization ignored the flexibility and probability of success within the Licensee's FSP, which called upon the Licensee to collect data from the initial monitoring wells and cave and stream gauges and then to determine if additional information is needed.<sup>268</sup> For instance, the Staff's witness Peckenpaugh found it appropriate to collect stream gauging data before the karst system became well-understood. As he saw it, "[Intervenor] is concerned about installing the stream and spring cave gauges before the groundwater system is better understood. I disagree because stream gauges have priority."<sup>269</sup>

More generally, Staff witness Peckenpaugh asserted that the Intervenor had "overstated the importance of the FTA in the location of the monitoring well selection" because if the data is not sufficient, the flexibility of the FSP allows for evaluating potential well sites based on other information as well.<sup>270</sup> He described the Intervenor's proposed use of a combination of electrical resistivity surveying and reflection seismic surveying as "repetitive and unnecessary."<sup>271</sup> Similarly, he asserted that conservative assumptions could sufficiently substitute for a number of data points (e.g. hydraulic conductivity values) that Norris had argued were needed.<sup>272</sup>

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<sup>267</sup> See ibid.

<sup>268</sup> NRC Staff Exh. 2, Peckenpaugh Direct at 6, 11-12, 22.

<sup>269</sup> Id. at 16.

<sup>270</sup> Id. at 18.

<sup>271</sup> NRC Staff Exh. 7, Peckenpaugh Rebuttal at 5.

<sup>272</sup> Id. at 2; see also NRC Staff Exh. 6, McLaughlin Rebuttal at 5.

The Staff further maintained that, contrary to the Intervenor's claims, it was not necessary to identify all of the karst features in order to have an adequate characterization of the site.<sup>273</sup> Peckenpaugh testified that the FSP provided an adequate method, conduit well pairing, to determine if a deeper karst system existed.<sup>274</sup> He thought it unlikely, however, that such a system existed because, as the drills had gone deeper, the bedrock had manifested signs of lower permeability, becoming denser and containing more shale.<sup>275</sup>

#### 5. Board Findings Regarding Water Data

The groundwater, surface, and subsurface water monitoring program in the FSP must assess whether DU will reach off-site humans through drinking water or the consumption of animals or plants (that have in turn consumed water from the JPG site) in quantities significant enough that those off-site humans might receive more than 25 mrems of total radioactive exposure from all of JPG's pathways per year.<sup>276</sup> The Licensee has altered its plan significantly over time, both in response to the Intervenor's concerns and to Staff Requests for Additional Information (RAIs).<sup>277</sup> These changes show both the plan's iterative nature and that the Licensee has changed its approach and gathered additional information, like stream gauging data, when necessary.<sup>278</sup>

We understand the Intervenor's fundamental criticism of the plan to relate to timing and the perceived inefficiencies in the Licensee's plan, rather than to a concern that substantive, significant pieces of data will be missing, essentially, the Intervenor would like much of the work,

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<sup>273</sup> NRC Staff Exh. 2, Peckenpaugh Direct at 6.

<sup>274</sup> NRC Staff Exh. 7, Peckenpaugh Rebuttal at 4.

<sup>275</sup> Tr. at 273 (Peckenpaugh).

<sup>276</sup> See 10 C.F.R. § 20.1403.

<sup>277</sup> See NRC Staff Exh. 15, 16, 17 and 18 (FSP addendums); Army Exh. 9, 10 and 13 (responses to RAIs).

<sup>278</sup> See Tr. at 242 (Peckenpaugh).

like stream gauging, to have been done before wells were drilled.<sup>279</sup> The Intervenor's testimony on this subject failed, however, to provide sufficient evidence to outweigh the Licensee's showing that its plan to modify later stages of work as new site-specific data is collected is reasonably likely to result in sufficient site characterization information at the end of the five years. The Intervenor's witness Norris testified that he suspected that such later data "may never be collected."<sup>280</sup> We see no reason to indulge in such conjecture. To the contrary, as now formulated, the FSP leaves us in little doubt that the Licensee will continue to collect the additional site-specific data as needed on the basis of obtained test results.

In its criticisms of the Licensee's chronology, the Intervenor has failed to establish that the Licensee's plan to use the data from its initial wells, stream gauging, and cave stream gauging to drill other wells is not likely to result in a network of wells that effectively monitors any DU leaving the site in significant quantities through the groundwater. As previously noted, the Licensee is employing an iterative approach involving fracture trace analysis (FTA), electrical imaging surveys (EI), site selection and installation of well pairs, collection of stage data, comparison of groundwater stage levels, precipitation and surface water flow data to evaluate connectivity of the installed wells, and groundwater sampling. We are satisfied that this approach will be sufficient to obtain all of the verifiable data required for reliable dose modeling and accurate assessment of the effects, if any, of water-related DU pathways, and thus more than sufficient for site characterization and a decommissioning plan. In implementing such a phased iterative approach, the Licensee will work under the Staff's close oversight. We are confident that the Staff will give effect to the Board's legal standard for this alternative schedule, supra Part II.A, and ensure that any additional sampling necessary to generate the information

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<sup>279</sup> See, e.g., Tr. at 236 (Norris) ("Timing is absolutely critical with the characterization of this site in a five-year period and to acquire the knowledge base you need to know what additional characterizations you then subsequently need to collect."); STV Exh. 1, Norris Surrebuttal at 4-5.

<sup>280</sup> STV Exh. 1, Norris Surrebuttal at 3.

for a decommissioning site characterization, including any sampling needed for any additional models,<sup>281</sup> will be conducted within the five-year alternate schedule period.

As to Intervenor's criticism of using the existing JPG network of roads for locating well sites, the existing road network allows access to the entire perimeter of the DU Impact Area and crosses the DU Impact Area in appropriate intervals and along important hydrogeologic features, such as Big Creek.

As previously discussed, supra page 13-14, a site characterization plan need not assess possible chemical toxicity or even radiological ecological contamination, except to such extent, if any, that these issues might affect the 25 mrem total effective dose equivalent limit from the site.<sup>282</sup> While a full characterization of the site's karst geology might be helpful to a broader ecological assessment of the site, it is only necessary for site characterization to the extent that such karsts represent DU pathways, as the purpose of the karst and site characterization is to develop a satisfactory and conservative dose assessment.

Both the seepage runs and the complete karst system maps requested by the Intervenor are predicated upon the speculation that non-fracture-controlled networks of deep karst leaving the site exist. As of yet, we are unpersuaded that such networks are below the site: while Norris offers some evidence for their existence,<sup>283</sup> the Licensee has effectively countered that the site's particular geology makes such a possibility unlikely.<sup>284</sup> Even if such networks are present, for them to be contaminated by DU presumes that DU has dissolved or will dissolve off the outside of the DU projectiles into the surface and groundwater; however, penetrator soil samples

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<sup>281</sup> See NRC Staff Exh. 7, Peckenpaugh Rebuttal at 2-3 (stating that a model other than RESRAD is likely to be needed later in order to characterize dose estimates of the potential DU where karst features exist).

<sup>282</sup> See 10 C.F.R. § 20.1403.

<sup>283</sup> See Tr. at 258 (Norris).

<sup>284</sup> See also Army Exh. 5, Snyder Direct at 49.

indicate that the uranium did not migrate more than two feet from the penetrators between 1994 and 2002.<sup>285</sup> Moreover, it is very unlikely that such contamination could occur without the conduits above these networks becoming similarly contaminated and the contamination thus detected, particularly if losing streams are monitored.<sup>286</sup> Not only has the Intervenor not presented evidence suggesting that any of the water posed to leave the site contains any amount of DU, but the Licensee has both explained its reasons for not believing such pathways to be particularly significant (or even in existence) and demonstrated that the Licensee has plans to characterize such possible pathways if it is discovered that DU has migrated into the groundwater. At the pre-decommissioning plan stage, we consider this to be sufficient.

#### IV. CONCLUSION

For the foregoing reasons, we conclude that the Intervenor's challenges to the Field Sampling Plan must be rejected with the consequence that the Staff justifiably issued the requested license amendment providing for the alternate schedule.

That said, it does not perforce follow that it is now settled that the decommissioning plan ultimately submitted by the Licensee will be supported by an adequate site characterization. All that we needed to decide, and have decided, in this proceeding is that the FSP provides reasonable assurance that such a characterization will be developed by 2011. As we read the regulation governing the grant of alternate schedules, the Licensee was not obliged to convince us that the FSP provided an absolute guarantee that, at the end of the five-year period sought by the Licensee for the submission of the decommissioning plan, the site will have been characterized to the satisfaction of all concerned, including both the Staff and this Intervenor.

In that regard, it must be kept in mind that, when the Licensee submits its decommissioning plan in connection with yet another application for a termination of its materials license, the Staff will be required to publish a Federal Register notice providing an

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<sup>285</sup> See Army Exhibit 8, Environmental Report at 3-7 to 3-8; Tr. at 211 (Anagnostopoulos).

<sup>286</sup> See Army Exh. 5, Snyder Direct at 28-29.

opportunity for hearing on the application. In response to the notice, any individual or organization with the requisite standing will be entitled to seek a hearing on any aspect of the plan – including the supporting site characterization. For its part, the present Intervenor will be free to challenge the adequacy of the characterization on any grounds that it deems meritorious.<sup>287</sup> It will be of no moment in passing upon any such challenge that the Intervenor's objections to the FSP were not accepted in this entirely distinct proceeding. At that point, the question will not be whether the FSP provided reasonable assurance of providing an adequate site characterization. Rather, at hand will be the entirely different question whether, in actuality, that objective was realized.

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<sup>287</sup> This subject was touched upon at the Oct. 22, 2007 oral argument. In response to the Board's question, the Staff told the Board that the Intervenor "would not at all be foreclosed" from later challenging the decommissioning plan. Tr. at 118.

V. ORDER

For the foregoing reasons, the issues raised by the Intervenor's Contention B-1 are resolved in the Licensee's favor. Accordingly, the grant by the NRC of the requested alternative schedule for the submission of a decommissioning plan must be, and hereby is, affirmed.

This initial decision shall constitute the final decision of the Commission forty (40) days from the date of its issuance, unless, within fifteen (15) days of its service, a petition for review is filed in accordance with 10 C.F.R. § 2.341(b)(1).

It is so ORDERED.

THE ATOMIC SAFETY  
AND LICENSING BOARD<sup>288</sup>

\_\_\_\_\_/RA/\_\_\_\_\_  
Alan S. Rosenthal, Chairman  
ADMINISTRATIVE JUDGE

\_\_\_\_\_/RA/\_\_\_\_\_  
Dr. Richard F. Cole  
ADMINISTRATIVE JUDGE

Rockville, Maryland  
February 28, 2008

The separate opinion of Judge Abramson, concurring in the result but disagreeing with the legal analysis contained in a portion of the majority opinion, is attached.

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<sup>288</sup> Copies of this Memorandum and Order were sent this date by Internet electronic mail transmission to counsel for (1) the Licensee, (2) the NRC Staff, and (3) Intervenor.

## Separate Opinion of Judge Abramson

### Concurring in the Result But Disagreeing in Material Aspects of the Legal Analysis

I concur with the end result of the majority's opinion – because its analysis of the factual situation is substantively correct. However, I find the majority's analysis of the legal standards for this proceeding, which underlies their reasons for admission of these contentions, to be fundamentally flawed because it improperly ignores the plain meaning of section 40.42(g)(2) of our regulations.

Section 40.42(g)(2), as is set out explicitly in the introductory paragraph of section II A of the majority's analysis, is a three-part test for granting or denying a request for an alternate decommissioning schedule. Those parts are that the alternate schedule: (a) "is necessary to the effective conduct of decommissioning operations"; (b) "presents no undue risk from radiation"; and (c) "is otherwise in the public interest."

The majority's analysis of part (a) is that there is imbedded therein some requirement that "the alternate schedule must be reasonably likely to generate the site characterization information needed to support the decommissioning plan. . . ." No such requirement is contained in or implied by clause (a), which on its face simply requires that the requested alternate schedule be necessary to eventual decommissioning. In every instance it is necessary to characterize the site as a precursor to actual decommissioning, and since site characterization has not been yet carried out for the JPG site, a schedule modification to enable these activities to be conducted is manifestly necessary. Nowhere in this regulation is there any hint that the site characterization activities must be satisfactorily completed by the end of the requested five-year extension; in fact, this was so evident that the Staff added a condition to the license amendment granting this extension requiring that result. Furthermore, no law or

precedent is cited by the majority for their proposed rewrite of this clause.<sup>289</sup> Nor do “considerations of the history and context of this case” (as the majority would have it) enter into this simple and straightforward interpretation of this requirement of our regulations; it is plainly a simple requirement that decommissioning cannot be carried out unless the requested extension is granted – and that is clear. For these reasons, I find the majority’s analysis of clause (a) to be erroneous.

The majority’s other principal point in assessing the requirements of Section 40.42(g)(2) focuses upon clause (c), requiring that the requested extension be “in the public interest.” For my part, since there can be no decommissioning without the site characterization, and therefore without the requested extension, and since it is plainly “in the public interest” to decommission the JPG site, it cannot be challenged that the requested extension is “in the public interest.” However, the majority would have us read into this clause that because the Army has taken so long to get to the point where it found the technical methods to perform the characterization of this site (which is laden with unexploded ordnance and therefore hazardous to personnel undertaking such efforts), the “history and context” of this proceeding somehow grant them the liberty to rewrite this plain portion of our statute to add a requirement that complete site characterization must be accomplished within the requested five-year extension.

For the foregoing reasons, I disagree with the majority’s analysis of the legal standards for this proceeding.

So, given the foregoing, one might legitimately inquire why I consented to the initial admission of these contentions and how this Board got to this point. The explanation is not so direct. To be sure, I agree with the Staff that the grant of the requested license extension was entirely warranted and not challengeable – particularly given the nature and character of STV’s

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<sup>289</sup> The majority’s conclusion [at p 12] that there must be reasonable assurance that the FSP will generate the required information within the allotted five year period, and their attempt to bootstrap this requirement upon their own previous analysis, is simply without foundation.

technical challenges to the specific elements of the site characterization plan proposed by the Army. However, it was evident from the beginning of this phase of the dispute between STV and Army that the evolving, iterative nature of the Army's plan to characterize the site was the kernel of the misunderstanding and for potential resolution. For this reason, at the commencement of this phase of the proceeding, this Board required that the parties discuss in depth how the Army's plan-to-develop-a-plan for site characterization (which is what the FSP in fact is) might incorporate STV's concerns. Thus, from the outset, this Board attempted to enable the parties to resolve these highly technical debates over how early gathered data should be used to modify the plan to determine the next data to be gathered, etc., with the goal of maximizing the probability that satisfactory site characterization could indeed be accomplished within the license extension – as required by the express conditions of the granted license amendment. Unfortunately, as the majority has described, those talks broke down, leaving all parties dissatisfied with the situation.

Compounding the matter is the fact that the FSP, being an iterative, evolving process, is extremely difficult to challenge on substance because the answer to every technical challenge is simply something of the order of “if we find that to be necessary as future data is generated, we will address that point.” This is exacerbated by the possibility that permitting a challenge at this early stage in the development of the plan can open a Pandora's box for challenges at each and every step; i.e., each time new data is gathered, there might be a further foundation for a challenge to how the plan should then be modified. Thus, this Board was concerned that whatever proceeding was held at this point not provide such an opening for continuous litigation throughout the requested extension period – a process which would unduly distract the Army and the Staff from the necessary fundamental site characterization effort. This consideration was, however, balanced by STV's serious concerns regarding the need for effective site characterization, and as a result this Board determined it was proper, in furtherance of the Agency's mission to openly engage with its stakeholders in its efforts to protect the public health



UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )  
 )  
U.S. ARMY ) Docket No. 40-8838-MLA  
 )  
 )  
 )  
(Jefferson Proving Ground) )

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB INITIAL DECISION (LBP-08-04) have been served upon the following persons by U.S. mail, first class, or through internal NRC distribution.

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Docket No. 40-8838-MLA  
LB INITIAL DECISION (LBP-08-04)

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Office of the Secretary of the Commission

Dated at Rockville, Maryland,  
this 28<sup>th</sup> day of February 2008