UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

PREFILED TESTIMONY OF THOMAS MCLAUGHLIN

Under penalty of perjury, I, Thomas McLaughlin, declare as follows: I attest that the factual statements herein are true and correct to the best of my knowledge, information, and belief; and the opinions expressed herein are based on my best professional judgment.

Q.1. Please state your name and employment.

A.1. Thomas McLaughlin. I am a Project Manager at the U.S. Nuclear Regulatory Commission in the Division of Waste Management and Environmental Protection.

Q.2 Are there any acronyms or abbreviations in your testimony that should be identified?

A.2. Yes, the following acronyms or short names have the meanings shown:

The “Staff” refers to the NRC Staff;
“DU” refers to depleted uranium;
“EIS” refers to the Environmental Impact Statement the NRC will prepare;
“EPA” refers to the U.S. Environmental Protection Agency;
“ER” refers to the Environmental Report the Army will prepare;
“ERMP” refers to Environmental Radiation Monitoring Plan;
“FSP” refers to the Field Sampling Plan as amended and supplemented by the Army;
“JPG” refers to Jefferson Proving Ground;
“MARLAP” refers to the Multi-Agency Radiation Laboratory Analytical Protocol, the laboratory companion manual to MARSSIM;
“MARSSIM” refers to the Multi-Agency Radiation Survey and Site Investigation Manual;
“MOU” refers to the Memorandum of Understanding between the NRC and U.S. Environmental Protection Agency;
“ORISE” refers to the Oak Ridge Institute for Science and Education;
“RAI” refers to a request for additional information from the NRC to the Army;
“STV” refers to Save the Valley, Inc, the intervenor;
“STV Final Contentions” refers to the Final Contentions of Save the Valley, Inc.

(May 31, 2006).

Q.3. What are your job duties and responsibilities as a Project Manager?

A.3. My responsibilities include the preparation of Environmental Assessments and Safety Evaluation Reports for sites undergoing license termination. I specifically supervise and/or coordinate the work of staff members and contractors in reviewing licensing termination actions.

Q.4. Please provide an example of your work performed as part of your job duties.

A.4. I was the Project Manager for a site in Pennsylvania contaminated with low levels of uranium, thorium, and radium. The licensee had performed a site characterization prior to the start of soil excavation but the amount of soil that was being removed was greater than ten times the original estimate. The licensee requested an alternate decommissioning schedule under 10 CFR 40.42(g)(2) to re-characterize the site and this was granted by NRC. The licensee performed its re-characterization according to a site characterization plan and completed the remaining soil excavation and the license was terminated. I was the Project Manager for a second site in Pennsylvania with similar uranium contamination that also requested an alternate decommissioning schedule to re-characterize its site according to its site characterization plan. The request was granted and the licensee completed a year long re-characterization, and is now actively removing contaminated soil with its license to be terminated in 2008. I am currently the Project Manager for three uranium mill tailing sites that are being decommissioned under restricted release.

Q.5. Please describe your professional qualifications including education, training, work experience, and publications.

A.5. I have a Ph.D. in chemistry with a specialty in spectroscopy. I have completed all of the training and qualifications for Project Management and am a certified Project Manager. I worked at the U.S. Environmental Protection Agency (EPA) and received a Tribute of Appreciation for Development of Risk Assessment Guidelines. Prior to joining NRC, I worked as a contributing author on the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NRC's approved methodology for conducting final status radiation surveys of licensed facilities undergoing decommissioning. For more than two years I worked on multiple chapters of the laboratory companion document to MARSSIM entitled the Multi-Agency Radiation Laboratory Analytical Protocol (MARLAP) manual. While at NRC, I helped to revise NUREG-1757 Volume 2, Revision 1, NRC's most recent compilation of decommissioning guidance. For more than three years I was the Technical Project Manager for the NRC contract with the Oak Ridge Institute of Science and Education (ORISE). ORISE performs all of the radiation confirmatory site surveys and all laboratory analysis for NRC. I helped other Project Managers construct Requests for Technical Assistance, reviewed proposed site radiation confirmatory survey plans, and authorized ORISE to conduct surveys and analyze samples. In my role as the Technical Project Manager, I was involved in technical decisions regarding surveys and sample analysis of almost all of the NRC licensed sites undergoing decommissioning. A copy of my resume with further details of my education, experience, and training is attached.

Q.6. Please describe your involvement and responsibilities regarding the Staff's review of the Jefferson Proving Ground application.

A.6. I was responsible for identifying the appropriate staff to review the Army's request for a license amendment, compiled a request for additional information, and prepared an Environmental Assessment and a Safety Evaluation Report for the licensing action.

Q.7. What was your involvement with the approval of the alternate schedule in the license amendment?

A.7. I coordinated the review of the amendment request to ensure that it met the requirements of 10 C.F.R. 40.42(g)(2), and recommended approval of the amendment.

Q.8. Have you reviewed STV's Final Contentions, the testimonies of Mr. Norris and Dr. Henshel, and the STV Statement of Position?

A.8. I have reviewed STV's Final Contentions, the testimonies of Mr. Norris and Dr. Henshel, and the Initial Statement of Position of the Intervenor Save the Valley, Inc. dated July 13, 2007. In particular, I have analyzed all of the bases raised by STV to support Contention B-1. After performing my analysis of Bases "N" and "O", I have reached conclusions as to their validity for the JPG FSP based on my professional opinion.

Q.9. STV proposes that the FSP is inadequate and more sampling should be done. What is your position as to the purpose of the FSP and the standard for granting the license amendment providing the alternate schedule?

A.9. According to 10 C.F.R. 40.42(g)(2), the alternate schedule can be approved if it (1) is necessary to the effective conduct of decommissioning operations, (2) presents no undue risk from **radiation** to the **public health**, and (3) is otherwise in the public interest. To the extent that STV proposes sample collection and analysis that is not necessary for the effective conduct of decommissioning operations under 10 C.F.R. part 20, subpart E, or to the extent that STV's proposed additions to the FSP examine risks from causes other than radiation to the public health, STV has exceeded the purpose of the FSP in its criticism and proposed modifications. In other words, the amendment was properly approved because the FSP will provide information that is necessary to the effective conduct of decommissioning operations under 10 C.F.R. part 20, subpart E; the 5 year alternative schedule period presents no undue risk from radiation to the public health; and is otherwise in the public interest because this time will allow more specific information to be gathered concerning the condition of the site.

Q.10. STV provides several general statements regarding the scope and purpose of the FSP required by the license amendment. As the Project Manager for the license amendment review, do you agree with their characterization of the purpose of the FSP, and if you disagree, how would you characterize the purpose of the FSP?

A.10. STV mischaracterizes the purpose of the FSP. For example, STV states that, "[t]he biological characterization activities must provide site-specific risk characterization activities for JPG", and that the purpose of the biological characterization in the FSP is to "identify the current and predicted exposure of humans and other potential biotic receptors . . . to the DU introduced into JPG by the testing program." Henshel Testimony at 6, 12. The FSP is designed 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 the public health. Without this site specific data, the Army would be unable to develop an adequate Decommissioning Plan for NRC approval. STV's view of the purpose of the FSP seems to be much broader in that STV is proposing sampling methods and analysis more akin to an EPA-type ecological risk assessment of the site based on the chemical properties of uranium rather than its radiological hazard. This broad view held by STV is clear in its Bases "N" and "O". In order for adequate site characterization which will ultimately lead to an adequate Decommissioning Plan, the NRC does not require an EPA-type ecological risk assessment; rather, the NRC accepts sampling methods and analysis that can be incorporated into models that use bounding and/or conservative values that will ensure the radiological dose to the public does not exceed regulatory limits.

Q.11. Did you analyze Bases "N" and "O" specifically?

A.11. Yes, I analyzed Bases "N" and "O" and used staff input in considering some of the specific technical concepts.

Q.12. Did you review or rely on any specific documents to prepare for or conduct your analysis in your testimony?

A.12. Yes, In addition to the Army's FSP as amended, I have reviewed the following items during the preparation of my testimony:

(1) Bem, H. and Bou-Rabee, F. 2004. "Environmental and health consequences of depleted uranium use in the 1991 Gulf War. Environment International 30 (2004) pages 123-134. (See www.bren.ucsb.edu/academics/courses/595E/Session%207/Bem Env&HealthConseq.pdf);

(2) United Nations Environment Programme. 2003. "Depleted Uranium in Bosnia and Herzegovina-Post Conflict Environmental Assessment." (See http://postconflict.unep.ch/publications/BiH_DU_report.pdf);

(3) NUREG-1757, Volume 2, Revision 1. 2006. "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria." ML063000252;

(4) Memorandum of Understanding Between the Environmental Protection Agency and the Nuclear Regulatory Commission: Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites, October 9, 2002. ML022830208. ("MOU");

(5) Rademacher, *et al*., Experimentally Determined Uranium Isotope Fractionation During Reduction of Hexavalent U by Bacteria and Zero Valent Iron, Environ. Sci. Technol. 2006, **40**, 6943-6948 ("Rademacher");

(6) Glenn W. Suter II, Ecological Risk Assessment, CRC Press, LLC, Boca Raton, FL (2nd ed. 2006);

(7) Glenn W. Suter II, et al, Ecological Risk Assessments for Contaminated Sites, CRC Press, LLC, Boca Raton, FL (2000);

(8) "Training Range Site Characterization and Risk Screening: Regional Range Study, Jefferson Proving Ground, Madison, Indiana." August 31, 2003. ML070170078 ("Training Range Site Characterization");

(9) Safety Evaluation Report for Issuance of Amendment No. 13 to Materials License No. SUB-1435, Department of the Army, Jefferson Proving Ground. April 26, 2006. ML053320014. ("SER"); and

(10) Request for Additional Information to Support NRC's Evaluation of the Proposed Changes to the Environmental Radiation Monitoring Program Plan for Jefferson Proving Ground (License SUB-1435). May 20, 2004. ML041350063. ("RAI for ERMP").

Q.13. Please describe your analysis and state your conclusion for Basis "N" and related issues in Dr. Henshel's testimony in "Section III: Biological Characterization."

A.13. Basis "N" is stated as follows:

> In order to really do a site-specific environmental and human health risk assessment, understanding the fate and transport (F&T) of DU within the JPG ecosystem is critical. In order to develop such a model, standard eco-risk-associated field sampling practices specify samples from different parts of the ecosystem within the same approximate period of time and definitely within the same field season in order to identify the distribution of the contaminant (DU) at that time. Further it is best to take multiple samples from these different locations over time. Thus, to truly model F&T within the JPG ecosystem (which is NOT the Yuma or Aberdeen Proving Ground ecosystem), a particular sample taken at a particular time should include all media and relevant biota and each of these media and biota should be sampled on multiple occasions. Ideally, samples should also be taken under different types of field conditions, as appropriate for the changes that occur at the site of concern. For example, at a site that floods, as JPG does, samples should be taken from all media and biota at high flow (flood season) and low flow. Similarly, in a seasonal environment like JPG, samples should be taken from all media and biota in different seasons. When reproduction is seasonal for the biota of potential concern, seasonal sampling is of special concern. See, e.g., , G.W. Suter II, et aL, Ecological Risk Assessment for Contaminated 15 Sites, CRC Press [Lewis Publishers], Boca Raton, FL (2000), esp. at 77. Thus, the much more limited sampling described in section 6.3 of the FSP is deficient for purposes of adequate site characterization.

To support Basis “N”, STV claims that to do a site-specific environmental and human health risk assessment, understanding the fate and transport of DU within the JPG ecosystem is critical. STV states that eco-risk field sampling practices are required. However, field sampling practices used for determining ecological risk are not used by the NRC to determine radiological doses to humans. The sampling proposed in the FSP is adequate for the purpose of providing the site specific data to model DU contamination effects resulting in radiation doses to the public.

When the Army submits a Decommissioning Plan, the NRC will prepare an Environmental Impact Statement (EIS) using data from an updated Environmental Report (ER) to be submitted by the Army, the Decommissioning Plan, and the best available data. Preparation of the EIS will include characterizing the principal ecological (both terrestrial and aquatic) features of the site and vicinity emphasizing the plant and animal communities that could be affected by the proposed action, and by consulting the U.S. Fish & Wildlife Service to request their concurrence on the determination of effects on federally listed species and their critical habitat from the proposed action. Abiotic sampling (i.e., surface water, sediment and groundwater) will continue to be conducted during the period that any new biota data will collected to be included in the updated ER.

The EPA will review the Army’s Decommissioning Plan under the Memorandum of Understanding (MOU) between the NRC and the EPA. Since the Army has indicated its intent to decommission under restricted conditions, and there is the potential for contamination of groundwater, the NRC Staff will send a letter to the EPA in accordance with the MOU. At that time, the EPA will have the opportunity to review the Decommissioning Plan for compliance with matters within its regulatory jurisdiction (e.g. the Comprehensive Environmental Response, Compensation and Liability Act [CERCLA] and the Resource Conservation and Recovery Act [RCRA]).

Q.14. Please describe your analysis and state your conclusion for Basis "O".

A.14. Basis "O" is stated as follows:

> Although deer are not the most representative biota to sample, they are the only biota proposed for sampling by section 6.3 of the FSP. Nonetheless, when data from samples early and late in DU testing are not combined, it is evident that DU levels in even the deer are increasing. This result in deer clearly mandates sampling other, more representative biota as well. Based on what little data is available, the bioaccumulation factors (BAFs) for vegetation and the aquatic filter feeders such as crayfish (both of which are eaten by higher animals and humans) are relatively high, on the order of 10^2 to 10^3 times as high as the BAFs for persistent, bioaccumulative, and toxic chemicals (PBTs) listed as being of concern by the U.S. EPA and the Persistent Organic Pollutants (POPs) Treaty. Clearly, vegetation and aquatic filter feeders are better indicators of DU migration into the eco-food chain than are deer and they should be sampled. For example, the mean of the two clam data points, when compared to the mean of the surface water data provided in Table 2-1 indicate that the clams bioaccumulation factor (BAF) is approximately 900. This is the highest bioaccumulation rate determinable among the biota listed in Tables 2-1 and 2-2 on page 2-9 of the FSP. Since clams are also eaten by both wildlife (raccoons and wading birds, for example) and humans, clams are thus an important second species to include in the biotic sampling throughout the monitoring period. Additionally, the FSP proposes (and the Staff accepts on page 6 of the April 2006 SER) to sample other biota ONLY IF there is detectable levels of DU in the deer tissue, and will only do this in another sampling year. This proposal is directly contrary to what is considered to be "Best Practices" for sampling biota as part of an ecological assessment. *See, e.g.,* , G.W. Suter II, *et al.,* Ecological Risk Assessment for Contaminated Sites, CRC Press [Lewis Publishers], Boca Raton, FL (2000), esp. at 77.

In Basis "O", STV states that DU has been found in deer and that other biota need to be sampled. STV reiterates the need for an ecological risk assessment. As STV points out in Basis "O", deer are the only biota currently proposed to be sampled. While that may not be sufficient for the comprehensive EPA-type ecological assessment of the site proposed by STV, the proposed sampling was sufficient for the FSP. Deer are the only significant completed pathway with the potential to cause a radiological dose detrimental to the public heath. As explained in the FSP, deer are hunted for human consumption at the JPG site. The FSP includes sampling and analysis of hunted deer. It is important to note, however, that contrary to Basis "O" and Dr. Henshel's claim in her testimony for Answer no. 027, no DU has been detected in the deer samples. Henshel Testimony at 16; see Condra Testimony at 4. DU must be distinguished from uranium. Uranium is a mixture of three isotopes: U-238, U-235, and U-234. Uranium is processed to enhance the isotope U-235, which is used in nuclear reactors and weapons. After processing, the residual is depleted in the isotope U-235 and referred to as DU. Uranium is a natural component of the environment and therefore is present in trace amounts in all media, including soil, air, water, and animals. At JPG, the amount of uranium in the deer is consistent with expected naturally-occurring background levels of uranium; therefore, the uranium in the deer is not from the DU at the site. See Condra Testimony at 4. It should also be noted that the Army mistakenly characterizes the NRC's concern where the FSP states "[a]lthough NRC has acknowledged that DU concentrations in the most recently collected deer samples were low from a human health perspective, there were modest DU increases in kidney and bone compared to background." FSP at 6-24. The FSP refers to a RAI that the NRC issued after the Army submitted its request for a possession only license to delay decommissioning indefinitely in 2003. RAI for ERMP. The Army submitted this request in the form of a revision to its ERMP. The Army subsequently withdrew that request for a possession only license. The NRC's RAI actually asked for "additional information on the apparent trend of increasing **uranium concentration** in deer kidneys and bone" and then stated "[f]rom the perspective of human health protection, the **levels of uranium** in deer remain low." RAI for ERMP at 7 (emphasis added). Mr. Condra's testimony confirms that uranium levels in deer are at background levels and refutes Dr. Henshel's testimony that "[t]he results of the deer tissue studies confirm the likely uptake of penetrator-derived uranium". Condra Testimony at 4; Henshel Testimony at 16.

STV is mistaken in its claim that humans would eat clams that live in streams at JPG because humans are not allowed to harvest clams, crayfish, or fish on the JPG site except from the Old Timbers Lake, an upstream dammed lake east and north of the DU impact area that does not receive water from the DU impact area. In Basis "O", STV mischaracterizes the SER which actually states "[i]f DU is detected in deer samples **or from other abiotic media** such as surface water, the biota such as plants, earthworms, fish, small birds, and small mammals will be sampled for DU." SER at 6 (emphasis added). It is unnecessary to require the Army to collect other biota samples at the present time since the previous and current biota samples show no DU present and no DU has been detected in groundwater, surface water, or sediment outside of the DU impact area, indicating that DU has not migrated outside of the DU impact area. While DU has been detected in soil, lichens, and root wash, these samples were taken from within the DU impact area. Thus it is unnecessary to require additional biota sampling at this time in the FSP to protect against radiological risks to the public health.

Q.15. Can you form an overall conclusion as to Bases "N" and "O"?

A.15. Yes, based on my experience and education and as supported by the Staff's assistance on this project, and explained by my analysis above, I conclude that the STV Bases "N" and "O" do not support Contention B-1 that:

> 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.

Rather, the FSP is designed to produce the site specific data necessary for the Decommissioning Plan for modeling the exposure pathways of DU as a potential source of radiological doses to the public.

<u>Rebuttal to STV's Pre-filed Testimony of Mr. Norris and Dr. Henshel</u>

Q.16. In Answer no. 062, Mr. Norris raises the issue of sample collection and analysis. He states "[t]he sample collection methods for the various media to be sampled are described in general terms in Section 6, Field Activities, of the FSP." He then states on page 70:

> **An addendum to describe these methods in more detail for specific media is planned but has not yet been released. However, my general understanding from past interactions with Army and SAIC personnel is that they expect to follow basically the same methods used in the JPG DU Environmental Radiation Monitoring Program semi-annual sampling activities, except when a specific difference has been identified in the FSP or its addenda.**

What is your analysis regarding this testimony and issues of sample collection and analysis raised by Mr. Norris?

A.16. Mr. Norris is assuming how the Army will collect samples and analyze them, then claims the methods in his assumption are inadequate. The FSP proposed that the details of the sampling would be submitted later, which was acceptable because the FSP is an iterative process, and the Army needed to gather site-specific data before it could determine the sampling details. In the FSP, the Army did submit general principles it would follow in conducting the sampling that were sufficient for the NRC to grant the alternate decommissioning schedule.

Prior to the collection of samples, the Army will submit an addendum to the FSP giving its Data Quality Objectives for sampling and analysis to the NRC for review. Furthermore, the Army is not scheduled to begin sampling the media described by Mr. Norris until 2008. Since the collection and analysis of these samples is a major decision point, the NRC will have a public meeting to discuss the addendum as described in the license amendment granting the alternate decommissioning schedule. Therefore, Mr. Norris' testimony which relies on assumptions does not support the Contention.

Q.17. In Answer no. 074, Mr. Norris raises the issue of fractionation. There he states that unless changes due to fractionation are identified and tracked, one cannot know what isotope ratios in which medium will represent migrating DU. Dr. Henshel also refers to fractionation in her Answer no. 027. What is your analysis regarding this issue and what are the likely impacts it will have, if any, on characterizing DU transport?

A.17. Mr. Norris states

> The FSP provides no task associated with the soil sampling within the DU impact area that will address the potential for fractionation that occurs during projectile weathering and transport, modifying isotope ratios from those observed in intact, metallic DU. Fractionation sufficient to change isotope ratios has been demonstrated as an effect of redox reactions facilitated by micro-organisms (Rademacher, *et al*., Experimentally Determined Uranium Isotope Fractionation During Reduction of Hexavalent U by Bacteria and Zero Valent Iron, Environ. Sci. Technol. 2006, 40, 6943-6948.).

Norris Testimony at 78-79.

The Rademacher paper cited by Mr. Norris is a controlled laboratory experiment that has no current relevance to the determination of the potential migration of DU at JPG. While the controlled laboratory experiment showed that bacteria can affect the U-238 to U-235 ratio, the magnitude of the bacteria's effect is much smaller than the natural variation of the ratio; therefore, this methodology cannot be used in the natural environment. Furthermore, if the uranium source contains any DU, the approach described in the paper cannot be used, and since JPG contains DU, this methodology cannot be used at the site.

The Rademacher paper itself acknowledges the limitations of the methodology: "Further studies are required to determine the range of possible values for $^{238}U/^{235}U$ fractionation factors under a variety of experimental conditions before broad application of these results is possible" and "[i]t should be noted that some U contamination is derived from ^{235}U-enriched or ^{235}U-

depleted material, and accordingly temporal or spatial $^{238}U/^{235}U$ variation in the contaminant sources may render this approach infeasible."

The researchers used an enhanced solution of ^{235}U in their experiment because the precision of measuring the natural ratio (such as found in the environment) is too low:

> The $^{238}U/^{235}U$ (ratio) of natural U is 137.85 ± 0.4. The precision of $^{238}U/^{235}U$ measurement by mass spectrometry is limited by the weaker signal intensity produced by the less abundant ^{235}U. Therefore, we used an enriched U standard, SRMU-500 from the National Institute of Standards and Technology (NIST) as the U source for the experiments. The NBS SRM U-500 contains nearly equal quantities of ^{238}U and ^{235}U and has a $^{238}U/^{235}U$ of 1.0003 ± 0.001.

Rademacher at 6943. Using this enhanced solution and laboratory controlled conditions, the researchers found an enrichment of ^{238}U relative to ^{235}U of -0.031% and -0.034% for two different bacteria.

The fact that an extremely small enrichment was found in the controlled experiment (more than 10 times less than the natural variation of the ratio), that the precision of $^{238}U/^{235}U$ measurement by mass spectrometry is limited in the natural environment, that broad application of the determination of fractionation factors is currently not possible, and determination of fractionation factors from DU is infeasible, all suggest that the licensee should not be required to attempt to determine fractionation factors as part of its site characterization study to determine potential DU transport.

Q.18. In Answer no. 014, Dr. Henshel raises the issue of how biological receptors transport DU. She states "A trespassing hunter might find an intact DU round to be an object of curiosity, pick it up, and remove it to a location remote from JPG, say his home or office." What is your analysis regarding this issue and what are the likely impacts it will have, if any, on characterizing DU transport?

A.18. This scenario proposed by Dr. Henshel is without merit. It is extremely unlikely that there are DU penetrators outside of the DU impact area which is several miles from the fenced-in boundary of JPG. In addition to the extreme risk posed by the large amount of unexploded ordnance in the DU impact area, access is restricted to prevent anyone from trespassing in the area. The U.S. Fish and Wildlife Service monitors the site, which is also controlled with a fence maintained under a memorandum of understanding with the U.S. Air Force.

Q.19. In Answer nos. 018 through 021, Dr. Henshel presents her biological data requirements for a fate and transport model. What is your analysis regarding this issue and what are the likely impacts it will have, if any, on characterizing DU transport?

A.19. Dr. Henshel asserts that a meaningful fate and transport model requires data regarding biota species in the DU impact area, migratory patterns of these biota, food web relationships of the biota inside and outside of the DU impact area, DU bioaccumulation, biotransformation of different chemical species of weathered DU, and biological effects on biota of low level chronic exposure to DU. Henshel Testimony at 11.As stated earlier, STV's view of the purpose of the FSP seems to be much broader in that STV is proposing sampling methods and analysis more akin to an EPA-type environmental assessment of the site based on the chemical properties of uranium rather than its radiological hazard. STV also does not understand the concept of decommissioning under restricted conditions where humans will be kept out of the contaminated area using institutional controls. The Army will be required to update its Environmental Report (which will include the collection of biota samples) when it submits its Decommissioning Plan.

Q.20. In Answer nos. 022 through 032, Dr. Henshel presents her opinions on the adequacy of the deer sampling program of the FSP. What is your analysis regarding this issue and what are the likely impacts it will have, if any, on characterizing DU transport?

A.20. The deer sampling program was suggested by NRC in an RAI to determine if the concentration of total uranium was increasing and might present a health risk to humans eating the deer meat. RAI for ERMP at 7. The Army stated that if it did find evidence of DU in the deer meat that it would also collect additional biota samples to see if DU could be found in other biota. Dr. Henshel is incorrect in her observation that DU was found in the deer samples. *See* Condra Testimony at 4. Dr. Henshel also speculates that the "baiting" of deer with feed could alter the concentration of uranium found in deer bone, liver, muscle or kidney without any substantiation. Dr. Henshel provides no support for this assertion. The feed was placed on roads to attract deer so the deer sample collectors would not be at risk due to unexploded ordnance in areas off the roads. Dr. Henshel also makes reference to the health of the deer sampled and suggests that negative health effects are due to the presence of DU. The fact that no DU was found in the deer samples would suggest that if there are indeed some health problems in deer, they could easily be caused by other factors such as the number of explosive components from the 25 million rounds of ammunition tested at JPG. *See* Training Range Study Site Characterization at 6-9, Table 6-1, "Contaminants of Concern in Groundwater;" 6-10, Table 6-2, "Explosives Analyte List;" and 6-11, Table 6-3 "Metals and Inorganic List" (listing the chemicals tested for at JPG).

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PREFILED TESTIMONY OF THOMAS MCLAUGHLIN

I, Thomas McLaughlin, do declare under penalty of perjury that my statements in the foregoing testimony and my attached statement of professional qualifications are true and correct to the best of my knowledge and belief.

/Original Signed By/
____
Thomas McLaughlin

Executed at Rockville, MD
This 17th day of August, 2007.

THOMAS G. MCLAUGHLIN, PH.D.

U.S. NUCLEAR REGULATORY COMMISSION July 2000 to Present

Project Manager in the Materials Decommissioning Section, Division of Waste Management and Environmental Protection; terminated licenses for two complex decommissioning sites and overseeing decommissioning of five other sites; Technical Project Manager for the Oak Ridge Institute for Science and Education (ORISE) contract which provides radiological surveys and laboratory analysis for NRC; incorporated information about the Multi-Agency Radiation Laboratory Analytical Procedures (MARLAP) into NUREG-1757; member of work group that developed proposed guidance for a power reactor entombment option for decommissioning; member of work group that updated Inspection Manual 610, manual providing guidance for decommissioning inspection reports for material sites and power reactors.

SANFORD COHEN & ASSOCIATES April 1993 to July 2000

Senior Scientist for consulting firm of approximately 150 people; worked on a number of projects dealing with DOE site cleanup; helped prepare sections of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and its companion manual on laboratory analytical procedures (MARLAP); ran fate and transport model (MEPAS) to study the risk of disposing typical environmental restoration waste in four different types of disposal facilities under various climatic conditions; extracted data from DOE's Programmatic Environmental Impact Statement database on type and level of contamination at all DOE facilities; reviewed entire mixed waste inventory at DOE facilities to evaluate RCRA waste streams characterized by process knowledge rather than sampling and analysis; performed air accumulation and transport calculations on amount of hydrogen and volatile organic compounds to be expected from the disposal of TRU mixed waste at the Waste Isolation Pilot Program (WIPP).

CH2M HILL December 1988 to April 1993

Senior scientist for large consulting firm of more than 4,000 people; worked mainly in the area of human health risk assessment performing risk assessments/site investigations for Superfund, RCRA, HAZWRAP, Navy Clean, and private clients; sample manager for more than 50 sites in the U.S., Canada, and Australia; prepared Quality Assurance Project Plans for these sites which detailed the type, number and location of samples to be taken; coordinated sample collection, laboratory processing, and sample data validation/evaluation; member of Risk Assessment Subgroup of EPA's Data Usability Group which produced *Guidance for Data Usability in Risk Assessment*; worked on the scoring for various aspects of the Hazard Ranking System (used to score Superfund sites), particularly the persistence and bioaccumulation factors for the surface water pathway; developed approaches to calculate soil cleanup levels based on potential risk from contaminants leaching to groundwater.

CHEMICAL EXPOSURE ASSESSMENT, INC. March 1985 to December 1988

Senior scientist for small consulting firm; calculated human exposure/risks from pesticides, combustion gases, and other hazardous materials; prepared chemistry sections of documents on hazardous chemicals for the Agency for Toxic Substances and Disease Registry; worked on the *Permit Writers' Guidance Manual for Exposure Information Assessment*, which addresses Section 3019 of RCRA; edited EPA's *Exposure Factors Handbook.*

U.S. ENVIRONMENTAL PROTECTION AGENCY August 1978 to March 1985

Environmental scientist in the Exposure Assessment Group, Office of Health and Environmental Assessment; coordinated scientists from other EPA offices, other government agencies, industry, and universities to develop a compendium of current thinking on exposure assessments and to produce guidelines on how to perform multimedia assessments; created the *Exposure Assessment Handbook*; prepared an extensive review of dermal absorption, emphasizing how to calculate the amount of penetrant that enters the body after a dermal application; member of the Love Canal Oversight Committee; Received Tribute of Appreciation For Development of Risk Assessment Guidelines.

EDUCATION

University of California at San Diego, Ph.D. in Physical Chemistry (GPA 3.97/4.00). Received Gulf General Atomic and National Science Foundation Graduate Fellowships.
California State University at Long Beach, B.S. in Chemistry (GPA 3.49/4.00). Received Outstanding Achievement in Chemistry Award.

TRAINING COMPLETED AT NRC

MARSSIM (H-121), COMPASS (software to assist in MARSSIM calculations), Multimedia Environmental Pollutant Assessment System (MEPAS) modeling, RESRAD (H-410), Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES), Spatial Analysis and Decision Assistance (SADA), Risk Assessment in NMSS (P-400), Probabilistic Risk Assessment (PRA) for Technical Managers (P-107), Radiation Worker Training (H-102), Environmental Monitoring for Radiation (H-111), Gamma Spectroscopy (H-112B), Introduction to Health Physics (H-117), Applied Statistics, Princeton Groundwater Pollution and Hydrology, and Advances in Environmental Site Characterization.