ENCLOSURE 4

North of the Firing Line
Unexploded Ordnance (UXO) Response
Standing Operating Procedure

1. **PURPOSE**: To establish procedures to support emergency management/disposition of UXO items in the Firing Range area at Jefferson Proving Ground (JPG).

2. **OBJECTIVE**: To prescribe an explicit course of action for the safe and efficient management of situations involving UXOs in the Firing Range area at JPG.

3. **POLICY**:

a. The Senior Explosive Ordnance Disposal (EOD) technician assumes primary responsibility for command and control of operations at the scene of a UXO.

b. Only EOD technicians may attempt to perform render-safe procedures (RSP) on UXO.

4. **UXO OPERATIONAL PROCEDURES**:

a. If the FWS or Air Force discovers UXO, which poses an imminent and substantial hazard to Refuge or Bombing Range operations (e.g., UXO has migrated to the surface of a roadway), the FWS or Air Force will immediately:

(1) Restrict access to the UXO site,

(2) Cease all work, mark location of the item,

(3) Move all personnel away,

(4) Ensure that no one uses a two-way radio, and

(5) Notify the Army JPG Site Management Team if present at 812-273-2522/2551/6075. If the JPG Site Management Team is not available, notify the Commander, Newport Chemical Depot at 765-245-4317.

b. Upon verification by the Commander, Newport Chemical Depot or the JPG Site Management Team that the UXO poses an imminent and substantial hazard to Refuge or Bombing Range operations, the Army shall notify the Fort Knox 703rd EOD Ordnance Company at 502-624-5631, and request disposal of the UXO item[1].

c. EOD personnel shall coordinate their activities and gain access to areas in the Firing Range area by contacting the Commander, Newport Chemical Depot at 765-245-4317 and Army JPG Site Management Team at 812-273-2522/2551/6075.

d. The Senior EOD Technician shall determine if the UXO item is inert. If an inert verification is not possible the munition shall be blown in place. If detonation in place is not possible, the Senior EOD Technician will determine whether it is appropriate to attempt a RSP or use other approved means to move the item to a more suitable location for safe disposal.

e. Until the item is disposed of, the Army at its discretion may impose additional access restrictions to the Firing Range area.

5. REVIEW: This SOP shall be reviewed annually. Any revisions/updates shall be provided to the FWS, Air Force, the 703rd Fort Knox EOD Ordnance Company, the Real Estate Division of the Louisville Corps of Engineers, and Newport Chemical Depot Commander or the Army JPG Site Management Team.

[1] The Army will not be required to remove UXO that the JPG Site Management Team determines does not pose an imminent and substantial hazard to Refuge or Bombing Range operations.

ENCLOSURE 5

FWS/Air Force Infrastructure Maintenance Responsibilities

AIR FORCE

1. Air Force shall maintain all roads, road shoulders and low water crossings, as well as associated bridges and culverts, which are shaded in green on the map at Tab A. in accordance with Army Regulation 420-72.

2. The perimeter fence shall be patrolled and inspected weekly. Inspections shall be documented to include: 1) the date of inspection, 2) the name of the inspector(s), 3) a description of any damage observed, and 4) the location of the damage. Holes in the fence large enough to permit human access, damaged gates and missing "windchimes" of the creek barriers will be repaired within 72 hours of being documented. For every incident of damage a record shall be maintained documenting the action taken to make repairs. In extraordinary circumstances when a repair will take more than 72 hours to complete (e.g. storm damage), the Air Force shall notify the Army in writing and milestones shall be given for completion of the repair. The Air Force shall take action to remove tress that fall into/onto the fence. Grass and other vegetation, located between the perimeter fence and perimeter road, shall be mowed or otherwise controlled to assure capability for visual inspection of the perimeter fence from the perimeter road; such mowing shall be done twice annually, usually in the April-June and September-October timeframes.

3. All roads approaching the DU area shall be barricaded and marked with radiation warning signs. In addition the Air Force will maintain warning signs around the entire perimeter of the firing range as well as around the submunitions area west of Machine Gun Road and the former Open Detonation area.

4. The Air Force shall maintain the cultural resource properties of the Firing Range (i.e., four stone-arch bridges as well as the Old Timbers Lodge) in accordance with the Cultural Resources Management Plan (reference maintenance standards in Table III-1 at Tab B). A complete copy of the Cultural Resources Management Plan was mailed to the Air Force (i.e. Mr. Masse) in March, 2000.

FWS

1. The FWS shall maintain all buildings, roads, road shoulders, bridges, low water crossings, and culverts, not maintained by the Air Force, which are required for Refuge operations. The FWS shall maintain such facilities in accordance with Army Regulation 420-72. Prior to the start date of the Real Estate permit, the FWS will provide a map with clear identification of the roads, road shoulders, buildings, bridges, low water crossings and culverts that it shall maintain under terms of the real estate permit. This map will be updated annually by the FWS to reflect their maintenance commitment for the next year. No later than December 1, 2000, the FWS will close all bridges in the Refuge footprint that are not required for Refuge operations or not maintained by the Air Force. The FWS shall provide access control signs on the east perimeter road between Gate I B and K Road, as well as the minefield area on L Road.

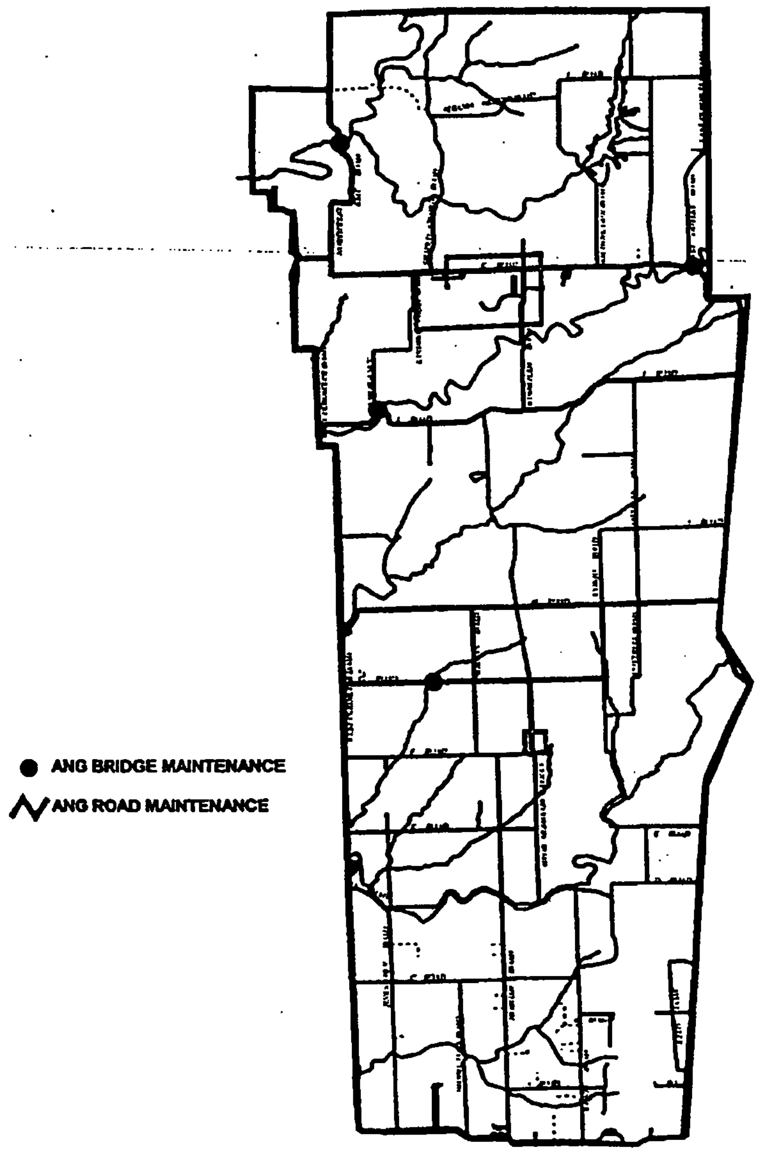
2. FWS shall provide road maintenance sufficient for 4 x 4 vehicle access to the DU monitoring wells identified at Tab C.

3. FWS shall provide or negotiate and/or fund fire suppression, emergency medical response and local law enforcement agreements. Note that three different counties (i.e. Jefferson, Ripley, and Jennings) have different jurisdiction footprints in the firing range property.

4. The FWS shall pay a pro-rated share of the rent charged to the Army for the use of Building 125 and associated utilities beginning with the start date the real estate permit.

Table III-1
Standards for Treatment of Significant Architectural Resources
after the Secretary's Standards and Guidelines for Archeology and Historic Preservation [48 FR 44716]

AIR NATIONAL GUARD
ROAD & BRIDGE MAINTENANCE



ANG BRIDGE MAINTENANCE
ANG ROAD MAINTENANCE

Preservation is defined as the act of process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other coed-required work to make properties functional is appropriate within a preservation project.

Standards for Preservation

1. A property shall be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property shall be protected and, if necessary, stabilized until additional work may be undertaken.
2. The historic character of a property shall be retained anti preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a properly shall be avoided.
3. Each property shall be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features shall be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.
4. Changes to a property that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
6. The existing condition of historic features shall be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material shall match the old in composition, design, color, and texture.
7. Chemical or physical treatments, if appropriate, shall be undertaken using the gentlest means possible. Treatments that cause damage to historic materials shall not be used.
8. Archeological resources shall be protected and preserved in place. If such resources must be disturbed, mitigation measures shall be undertaken.

Rehabilitation is defined as the act or process of making possible on efficient compatible use for a property through repair, alternations, and additions while preserving those portions of features that convey its historical, cultural, or architectural values.

Standards for Rehabilitation

1. A property shall be used as it was historically or be given a new use that requires minimal change to its distinctive features, spaces, and spatial relationships.
2. The historic character of a property shall be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property shall be avoided.
3. Each properly shall be recognized as a physical record of its time, place, and use. Changes that create a false lease of historical development, such as adding conjectural features or elements from other historical properties, shall not be undertaken.
4. Changes to a property that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and, where possible, materials. Replacement of missing features shall be substantiated by documentary and physical evidence.
7. Chemical or physical treatments, if appropriate, shall be undertaken using the gentlest means possible. Treatments that cause damage to historic materials shall not be used.
8. Archeological resources shall be protected and preserved in place. If such sources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and shall be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Restoration is defined as the act or process of accurately depicting the form, features, and character of a property as is appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code required work to make properties functional is appropriate within a restoration project.

Standards for Restoration

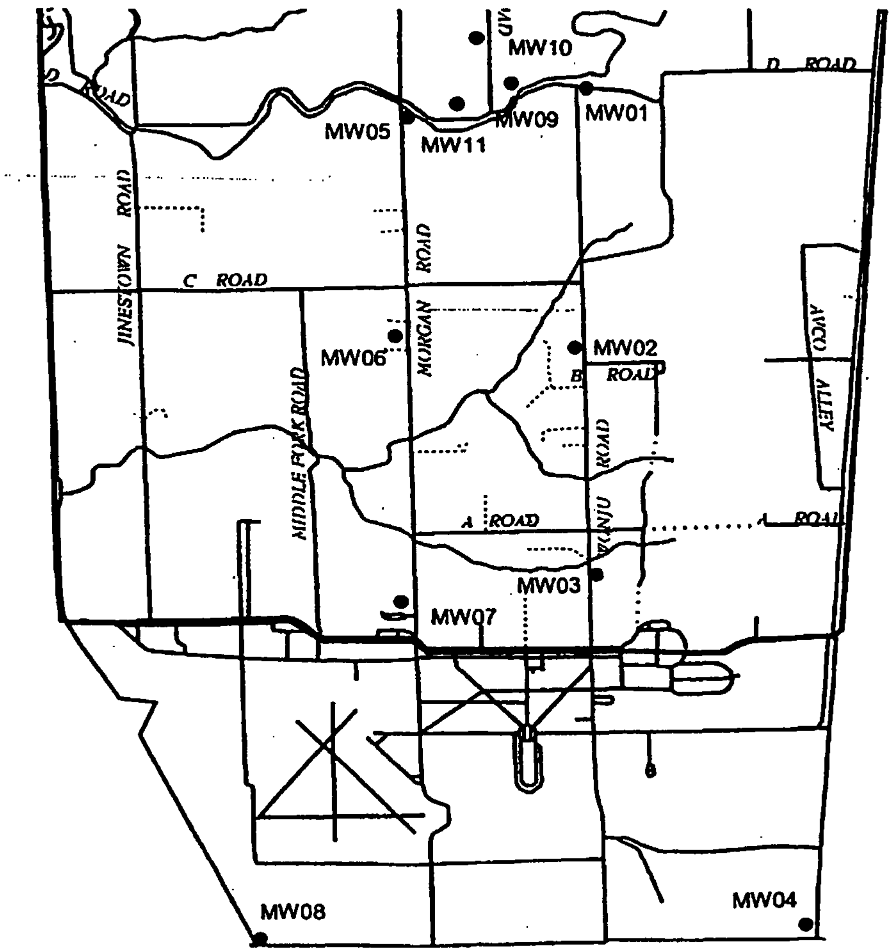
1. A property shall be used as it was historically or be given a new use, which interprets the property and its restoration period.
2. Materials and features from the restoration period shall be retained and preserved. The removal of materials or alteration of features, spaces, and spatial relationships that characterize the period shall not be undertaken..
3. Each property shall be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve materials and features from the restoration period shall be physically and visually compatible, identifiable upon close inspection, and property documented for future research.
4. Materials, features, spaces, and finishes that characterize other historical periods shall be documented prior to their alteration or removal.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize the restoration period shall be preserved.
6. Deteriorated features from the restoration period shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and, where possible, materials.
7. Replacement of missing features from the restoration period shall be substantiated by documentary and physical evidence. A false sense of history shall not be created by adding conjectural features, features from other properties, or by combining features that never existed together historically.
8. Chemical or physical treatments, if appropriate, shall be undertaken using the gentlest means possible. Treatments that cause damage to historic materials shall not be used.
9. Archeological resources shall be protected and preserved in place. If such resources must be disturbed, mitigation measures shall be undertaken.
10. Designs that were never executed historically shall not be constructed.

Reconstruction is defined as the act of process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object of the purpose of replicating its appearance at a specific period of time and in its historic location.

Standards for Reconstruction

1. Reconstruction shall be used to depict vanished or non-surviving portions of a property when documentary and physical evidence is available to permit accurate reconstruction with minimal conjecture, and such reconstruction is essential to the public understanding of the property.
2. Reconstruction of a landscape, building, structure, or object in its historic location shall be preceded by a thorough archeological investigation to identify and evaluate those features and artifacts, which are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures shall be undertaken.
3. Reconstruction shall include measures to preserve any remaining historic materials, features, and spatial relationships.
4. Reconstruction shall be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather than on conjectural designs or the availability of different features from other historic properties. A reconstructed property shall re-create the appearance of the non-surviving historic property in materials, design, color, and texture.
5. A reconstruction shall be clearly identified as a contemporary re-creation.
6. Designs that were never executed historically shall not be constructed.

JEFFERSON PROVING GROUND: DU SAMPLING
GROUNDWATER MONITORING WELLS



ENCLOSURE 6

DEPARTMENT OF ARMY PERMIT TO FISH AND WILDLIFE SERVICE TO USE PROPERTY LOCATED ON JEFFERSON PROVING GROUND, MADISON, INDIANA

DEPARTMENT OF THE ARMY
PERMIT TO FISH AND WILDLIFE SERVICE
TO USE PROPERTY LOCATED ON
JEFFERSON PROVING GROUND
MADISON, INDIANA

THE SECRETARY OF THE ARMY, hereinafter referred to as the Secretary, hereby grants to the United States Fish and Wildlife Service (USFWS), hereinafter referred to as the Grantee, a permit for the establishment of a National Wildlife refuge at Jefferson Proving Ground (JPG), Indiana, over, across, in and upon the lands identified in Exhibit "A", attached hereto and made a part hereof, hereinafter referred to as the premises. The Secretary and the Grantee are collectively hereinafter referred to as the "Parties".

THIS PERMIT is granted subject to the following conditions.

1. This permit is hereby granted for a term of twenty-five (25) years, beginning 1 July 2000 and ending 30 June 2025, with renewable ten (10) year periods upon mutual agreement of the Parties. This permit may be terminated earlier, by either the Secretary or Grantee, by providing one hundred eighty (180) days' written notice.

2. The consideration given by the Grantee is the management of the premises as a National Wildlife Refuge as well as the care and maintenance of the premises as specified in the Memorandum of Agreement (MOA) attached hereto as Exhibit "B" and made a part hereof.

3. All correspondence and notices to be given pursuant to this permit shall be addressed, if to the Grantee, to USFWS, Bishop Henry Whipple Federal Building, 1 Federal Drive, Ft. Snelling, Minnesota 55111 (Attn: Mr. John Christian) and, if to the Secretary, to the District Engineer, Louisville District, P.O. Box 59, Louisville, Kentucky 40201 (Attn: CELRL-RE-C), with a copy furnished to the Jefferson Proving Ground (JPG) Commander, Newport Chemical Depot, P.O. Box 160, Newport, Indiana 47966-0160, or as may from time to time otherwise be directed by the parties. Notice shall be deemed to have been duly given if and when enclosed in a properly sealed envelope or wrapper addressed as aforesaid

and deposited, postage prepaid, in a post office regularly maintained by the United States Postal Service.

4. The use and occupation of the premises shall be without cost or expense to the Department of the Army and under the general supervision of the JPG Commander and in accordance with the terms and conditions of the MOA. In the event of a conflict between the MOA and this permit, the MOA shall be the controlling instrument.

5. The Grantee acknowledges that it has inspected the premises, knows its condition, and understands that same is granted without any representations or warranties whatsoever and without obligation on the part of the Department of the Army, except as provided in the MOA.

6. In accordance with the MOA, the Grantee shall, at its own expense and without cost or expense to the Department of the Army, maintain and keep the premises at a level sufficient to support Refuge operations and in accordance with the tasks in Enclosure 5 of the MOA.

7. The Department of the Army shall not be responsible for providing utilities to the Grantee and it shall be the Grantee's responsibility for obtaining any utilities necessary for its use and occupation of the premises at no expense to the Department of the Army.

8. No additions or alterations of the premises shall be made without the prior written approval of the District Engineer.

9. On or before the expiration of this permit or the termination by either party, in accordance with paragraph one (1), the Grantee shall vacate the premises, remove its property therefrom and restore the premises to a condition satisfactory to the District Engineer, ordinary wear and tear and damage beyond the control of the Grantee excepted.

10. The Grantee shall comply with all applicable Federal, state, interstate, and local laws and regulations wherein the premises are located.

11. The Army will provide the Grantee with baseline information concerning the environmental condition of the premises in accordance with paragraph III 1(a) of the MOA documenting the known history of the property with regard to storage, release or disposal of hazardous substances

on the property. Upon expiration or termination of this permit, the Grantee shall, at its own expense and without cost or expense to the Department of the Army, document any storage, release or disposal of hazardous substances in excess of 40 CFR Part 373 reportable quantities and any petroleum products in excess of 55 gallons. A comparison of the two assessments will assist the Army in determining any environmental restoration requirements of the Grantee. Any such requirements will be completed by the Grantee in accordance with the Environmental Remediation provisions in the MOA and paragraph nine (9) of this permit.

12. It is understood that the requirements of this permit pertaining to maintenance, repair, protection, and restoration of the premises and providing utilities and other services shall be effective only insofar as they do not conflict with the MOA or any other agreement pertaining to such matters made between local representatives of the Army and Grantee in accordance with existing regulations.

13. Access to and use of JPG shall be controlled in accordance with the Grantee's Interim Public Access Plan for the Proposed Big Oaks National Wildlife Refuge included in the MOA and attached hereto as Exhibit "C". The Army must first approve any variation from this Plan and a revised Site Access Plan shall be made a part of this permit.

14. The Grantee shall not use the premises for the storage, treatment or disposal of non-Department of Defense owned hazardous or toxic materials as defined in 10 U.S.C. 2692, unless authorized under 10 U.S.C. and properly approved by the Government.

15. The Grantee is hereby informed and does acknowledge that all buildings on the premises, which were constructed or rehabilitated prior to 1978, are presumed to contain lead-based paint. For those buildings the Grantee uses and occupies, it shall comply with all applicable Federal, state and local laws and regulations pertaining to lead-based paint and/or lead-based paint hazards. The Grantee shall restrict access (e.g., secure buildings to the extent practical, post warning signs, etc.) to all unoccupied buildings except those buildings located in UXO Restricted Areas (see Site Map at MOA Enclosure 1). The Grantee shall restrict access to the UXO Restricted Areas in accordance with the Site Access Plan. The Grantee shall not permit the use of any of the buildings or structures on the premises for residential habitation. Residential habitation does not include use of the Old Timbers

Lodge for conference purposes including overnight visits on a non-permanent basis. The Grantee assumes all lead-based paint related liability arising from its use of the premises.

16. The Grantee is hereby informed and does acknowledge that friable and non-friable asbestos or asbestos containing materials (ACM) has been found on the premises. The Grantee acknowledges that it will inspect any building it proposes to occupy as to its asbestos content and condition and any hazardous or environmental conditions relating thereto. The Grantee shall restrict access (e.g., secure buildings to the extent practical, post warning signs, etc.) to all unoccupied buildings except those buildings located in UXO Restricted Areas (see Site Map at MOA Enclosure 1). The Grantee shall restrict access to UXO Restricted Areas in accordance with the Site Access Plan. The Grantee shall be deemed to have relied on its own judgment in assessing the condition of the premises with respect to any asbestos hazards or concerns. The Grantee covenants and agrees that its use and occupancy of a building will be in compliance with all applicable laws relating to asbestos. The Grantee assumes all asbestos related liability arising from its use of the premises.

17. The Grantee does not plan to occupy any buildings this fiscal year; however, Exhibit "D" attached hereto identifies Road & Bridge Maintenance Commitments for FY 2000. This information will be updated at least annually by the Grantee.

THIS PERMIT is not subject to Title 10, United States Code, Section 2662, as amended.

IN WITNESS whereof, I have hereunto set my hand by authority of the Secretary of the Army this 30th day of June 2000.

Michael G. Barter

MICHAEL G. BARTER
Chief, Real Estate Division
Louisville District, Corps of Engineers
Louisville, Kentucky

NO. DACA27-4-u0-087

This permit is also executed by the Grantee this 27 day of June 2000.

U.S. FISH AND WILDLIFE SERVICE

By: John Christian

Title: Assistant Regional Director Indiana/Michigan/Ohio and Wisconsin

ENCLOSURE 7

DEPARTMENT OF ARMY PERMIT TO DEPARTMENT OF THE AIR FORCE TO USE PROPERTY LOCATED ON JEFFERSON PROVING GROUND, MADISON, INDIANA

DEPARTMENT OF THE ARMY
PERMIT TO
DEPARTMENT OF THE AIR FORCE
TO USE PROPERTY LOCATED ON
JEFFERSON PROVING GROUND
MADISON, INDIANA

THE SECRETARY OF THE ARMY, hereinafter referred to as the Secretary, hereby grants to the Department of the Air Force, hereinafter referred to as the Grantee, a permit for the continued use of a Bombing Range at Jefferson Proving Ground (JPG), Indiana, over, across, in and upon the lands and structures identified in Exhibit "A", attached hereto and made a part hereof, hereinafter referred to as the premises. The Secretary and the Grantee are collectively hereinafter referred to as the "Parties".

THIS PERMIT is granted subject to the following conditions.

1. This permit is hereby granted for a term of twenty-five (25) years, beginning 1 July 2000 and ending 30 June 2025, with renewable ten (10) year periods upon mutual agreement of the Parties. This permit may be terminated earlier, by either the Secretary or Grantee, by providing one hundred eighty (180) days' written notice.

2. The Grantee agrees to the care and maintenance of the premises as specified in the Memorandum of Agreement (MOA) attached hereto as Exhibit "B" and made a part hereof.

3. All correspondence and notices to be given pursuant to this permit shall be addressed, if to the Grantee, to Department of the Air Force, Director, Air Force Real Estate Agency, AFREA/DR, 112 Luke Avenue, Room 104, Bolling AFB, Washington, D.C. 20332-8020, and, if to the Secretary, to the District Engineer, Louisville District, P.O. Box 59, Louisville, Kentucky 40201

(Attn: CELRL-RE-C), with a copy furnished to the Jefferson Proving Ground (JPG) Commander, Newport Chemical Depot, P.O. Box 160, Newport, Indiana 47966-0160, or as may from time to time otherwise be directed by the parties. Notice shall be deemed to have been duly given if and when enclosed in a properly sealed envelope or wrapper addressed as aforesaid and deposited, postage prepaid, in a post office regularly maintained by the United States Postal Service.

4. The use and occupation of the premises shall be without cost or expense to the Department of the Army and under the general supervision of the JPG Commander and in accordance with the terms and conditions of the MOA. In the event of a conflict between the MOA and this permit, the MOA shall be the controlling instrument.

5. The Grantee acknowledges that it has inspected the premises, knows its condition, and understands that same is granted without any representations or warranties whatsoever and without obligation on the part of the Department of the Army, except as provided in the MOA.

6. In accordance with the MOA, the Grantee shall, at its own expense and without cost or expense to the Department of the Army, maintain and keep the premises at a level sufficient to support Bombing Range operations and in accordance with the tasks in Enclosure 5 of the MOA.

7. The Department of the Army shall not be responsible for providing utilities to the Grantee and it shall be the Grantee's responsibility for obtaining any utilities necessary for its use and occupation of the premises at no expense to the Department of the Army.

8. No additions or alterations of the premises shall be made without the prior written approval of the District Engineer.

9. On or before the expiration of this permit or the termination by either party, in accordance with paragraph one (1), the Grantee shall vacate the premises, remove its property therefrom and restore the premises to a condition satisfactory to the District Engineer, ordinary wear and tear and damage beyond the control of the Grantee excepted.

10. The Grantee shall comply with all applicable Federal, state, interstate, and local laws and regulations wherein the premises are located.

11. The Army will provide the Grantee with baseline information concerning the environmental condition of the premises in accordance with paragraph III 1(a) of the MOA documenting the known history of the property with regard to storage, release or disposal of hazardous substances on the property. Upon expiration or termination of this permit, the Grantee shall, at its own expense and without cost or expense to the Department of the Army, document any storage, release or disposal of hazardous substances in excess of 40 CFR Part 373 reportable quantities and any petroleum products in excess of 55 gallons. A comparison of the two assessments will assist the Army in determining any environmental restoration requirements of the Grantee. Any such requirements will be completed by the Grantee in accordance with the Environmental Remediation provisions in the MOA and paragraph nine (9) of this permit.

12. It is understood that the requirements of this permit pertaining to maintenance, repair, protection, and restoration of the premises and providing utilities and other services shall be effective only insofar as they do not conflict with the MOA.

13. Access to and use of JPG shall be controlled in accordance with the Grantee's Jefferson Range Access Plan included in the MOA and attached hereto as Exhibit "C". The Army must first approve any variation from this Plan and a revised Site Access Plan shall be made a part of this permit.

14. The Grantee shall not use the premises for the storage, treatment or disposal of non-Department of Defense owned hazardous or toxic materials as defined in 10 U.S.C. 2692, unless authorized under 10 U.S.C. and properly approved by the Government.

15. The Grantee may grant a license to the Indiana Air National Guard to exercise its rights to use the premises subject to the terms of this permit.

16. The Grantee is hereby informed and does acknowledge that all buildings on the property, which were constructed or rehabilitated prior to 1978, are presumed to contain lead-based paint. For those buildings the Grantee uses and occupies, it shall comply with all applicable Federal, state and local laws and regulations pertaining to lead-based paint and/or lead-based paint hazards. The Grantee shall restrict access (e.g., secure buildings to the extent practical, post warning signs, etc.) to all unoccupied buildings except those buildings located in UXO Restricted Areas (see Site Map at MOA Enclosure 1). The Grantee shall restrict access to the UXO Restricted Areas in accordance with the Site Access Plan. The Grantee shall not permit the use of any of the buildings or structures on the premises for residential habitation. Residential habitation does not include use of the Old Timbers Lodge for conference purposes including overnight visits on a non-permanent basis. The Grantee assumes all lead-based paint related liability arising from its use of the property.

17. The Grantee is hereby informed and does acknowledge that friable and non-friable asbestos or asbestos containing materials (ACM) has been found on the property. The Grantee acknowledges that it will inspect any building it proposes to occupy as to its asbestos content and condition and any hazardous or environmental conditions relating thereto. The Grantee shall restrict access (e.g., secure buildings to the extent practical, post warning signs, etc.) to all unoccupied buildings except those buildings located in UXO Restricted Areas (see Site Map at MOA Enclosure 1). The Grantee shall restrict access to UXO Restricted Areas in accordance with the Site Access Plan. The Grantee shall be deemed to have relied on its own

judgment in assessing the condition of the premises with respect to any asbestos hazards or concerns. The Grantee covenants and agrees that its use and occupancy of a building will be in compliance with all applicable laws relating to asbestos. The Grantee assumes all asbestos related liability arising from its use of the premises.

18. This permit supersedes Permit No. DACA27-4-83-03 dated 23 July 1982, as amended. Said Permit No. DACA27-4-83-03 is hereby terminated, effective the date of execution of this permit.

THIS PERMIT is not subject to Title 10, United States Code, Section 2662, as amended.

IN WITNESS whereof, I have hereunto set my hand by authority of the Secretary of the Army this 30th day of Nov 2000.

Michael G. Barter
MICHAEL G. BARTER
Chief, Real Estate Division
Louisville District, Corps of Engineers
Louisville, Kentucky

This permit is also executed by the Grantee this 22nd day of November 2000.

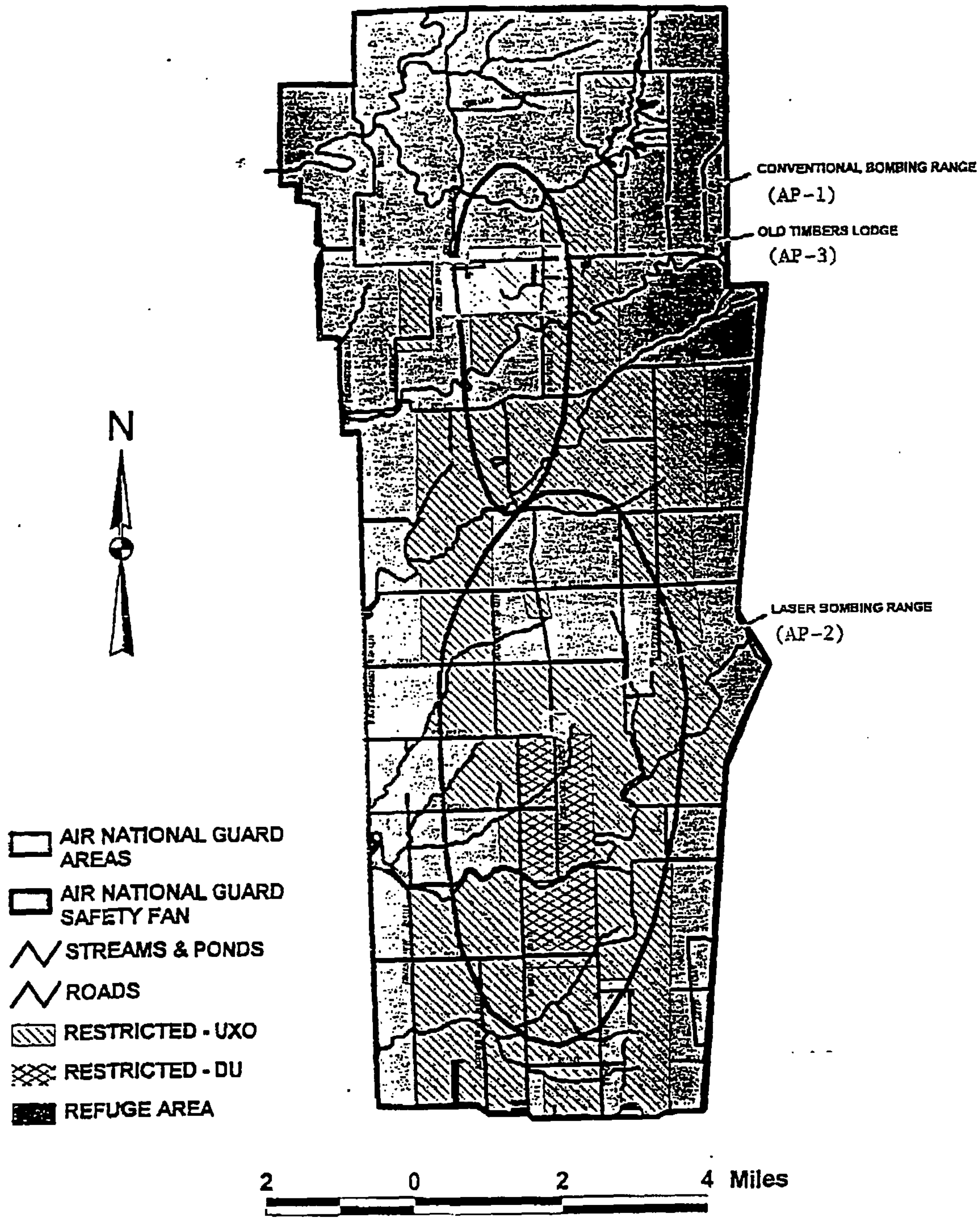
U.S. DEPARTMENT OF THE AIR FORCE

Jimmy G. Dishner
JIMMY G. DISHNER
Deputy Assistant Secretary of the Air Force
(Installations)

ENCLOSURE 8

MAPS OF PERMITTED AREAS

JEFFERSON PROVING GROUND
SITE MAP



PERMIT AREA NO. AP-1
FOR U.S. AIR FORCE

JEFFERSON PROVING GROUND
MILITARY RESERVATION
JEFFERSON COUNTY, INDIANA

PERMIT DESCRIPTION

Situate in the State of Indiana, County of Ripley, Township of Shelby, Township 6 North, Range 10 East, in parts of Sections 4 and 5, and Township 7 North, Range 10 East, in parts of Sections 32 and 33, in the Jefferson Proving Ground reservation, and more particularly described with referenced to the attached map showing coordinates based on the Universal Transverse Mercator (UTM) Metric Grid Coordinate System (NAD 27), Zone 16S, as follows:

Beginning at a point having an approximate UTM value of FU634749E/4318620N, said point being in the center of 'K' Road at the eastern boundary of the County of Ripley, and being at or near the west quarter corner of said Section 32; thence

North 88 degrees 13 minutes 20 seconds East 741.36 meters to a point having an approximate UTM value of FU635490E/4318643N; thence

North 00 degrees 32 minutes 51 seconds West 314.01 meters to a point having an approximate UTM value of FU635487E/4318957N; thence

East 2,118.00 meters to a point having an approximate UTM value of FU637605E/4318957N; thence

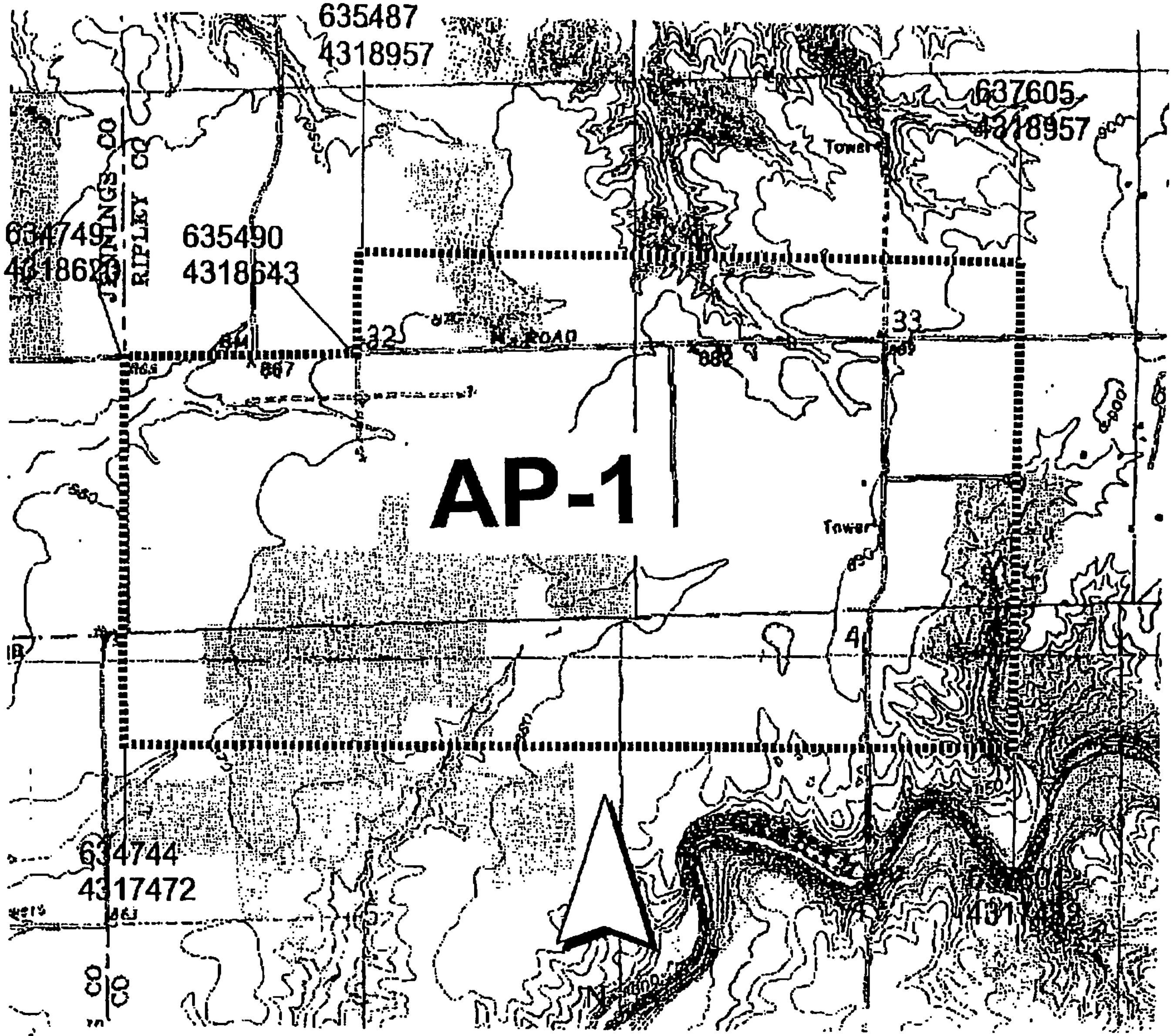
South 00 degrees 09 minutes 19 seconds West 1475.01 meters to a point having an approximate UTM value of FU637601E/4317482N; thence

South 89 degrees 47 minutes 58 seconds West 2,857.02 meters to a point having an approximate UTM value of FU634744E/4317472N; thence

North 00 degrees 14 minutes 58 seconds East 1,148.01 meters to the point of beginning, containing 398.611 hectares (984.967 acres), more or less.

15 June 2000, BLB; Rev 23 June 2000, BLB (3,4)

ANG Jefferson Range Area



PERMIT AREA NO. AP-2
FOR U.S. AIR FORCE

JEFFERSON PROVING GROUND
MILITARY RESERVATION
JEFFERSON COUNTY, INDIANA

PERMIT DESCRIPTION

Situate in the State of Indiana, County of Ripley, Township of Shelby, Township 6 North, Range 10 East, in part of Section 33, in the Jefferson Proving Ground reservation, and more particularly described with referenced to the attached map showing coordinates based on the Universal Transverse Mercator (UTM) Metric Grid Coordinate System(NAD 27), Zone 16S, as follows:

Beginning at a point having an approximate UTM value of FU637038E/4308284N, said point being 205 meters west of Center Recovery Road and 90 meters north of 'F' Road; thence

North 00 degrees 46 minutes 21 seconds West 445.04 meters to a point having an approximate UTM value of FU637032E/4308729N; thence

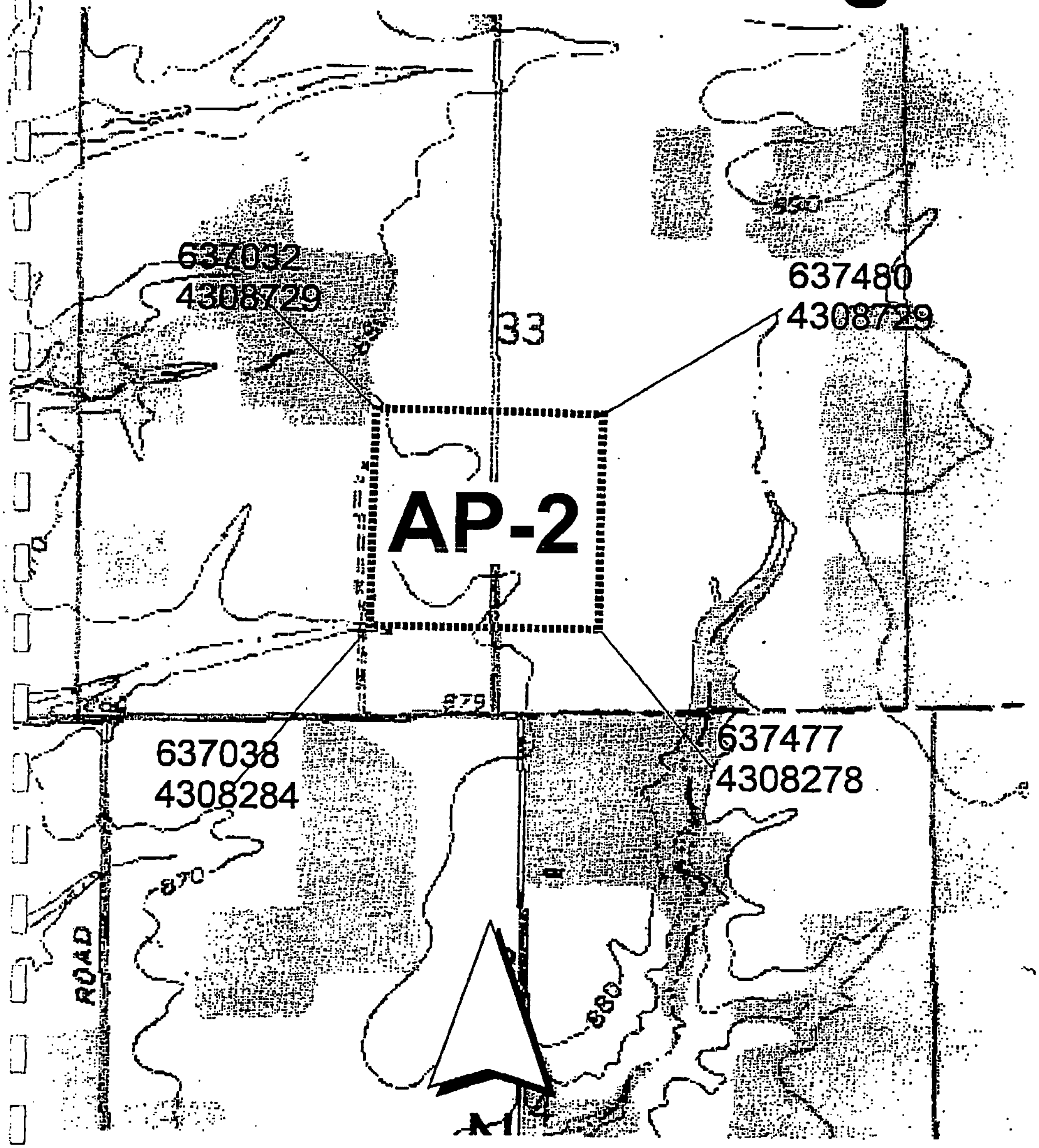
East 448.00 meters to a point having an approximate UTM value of FU637480E/4308729N; thence

South 00 degrees 22 minutes 52 seconds East 451.01 meters to a point having an approximate UTM value of FU637477E/4308278N; thence

North 89 degrees 13 minutes 01 seconds West 439.04 meters to the point of beginning, containing 19.869 hectares (49.096 acres), more or less.

15 June 2000, BLB; Rev 23 June 2000, BLB (3,4)

50-acre PGM Target



PERMIT AREA NO. AP-3
FOR U.S. AIR FORCE

JEFFERSON PROVING GROUND
MILITARY RESERVATION
JEFFERSON COUNTY, INDIANA

PERMIT DESCRIPTION

Situate in the State of Indiana, County of Ripley, Township of Shelby, Township 7 North, Range 10 East, in part of Section 34, in the Jefferson Proving Ground reservation, and more particularly described with referenced to the attached map showing coordinates based on the Universal Transverse Mercator (UTM) Metric Grid Coordinate System (NAD 27), Zone 16S, as follows:

Beginning at a point having an approximate UTM value of FU63947E/431876N, said point being 4731.5 meters east of the intersection of 'K' Road with the eastern boundary of the County of Ripley, and being at or near the west quarter corner of Section 32; thence

East 30.0 meters to a point having an approximate UTM value of FU63950E/431876N; thence

South 250.0 meters to a point having an approximate UTM value of FU63950E/431851N; thence

South 84 degrees 17 minutes 22 seconds West 100.5 meters to a point having an approximate UTM value of FU63940E/431850N; thence

South 210 meters to a point having an approximate UTM value of FU63940E/431829N; thence

West 70 meters to a point having an approximate UTM value of FU63933E/431829N; thence

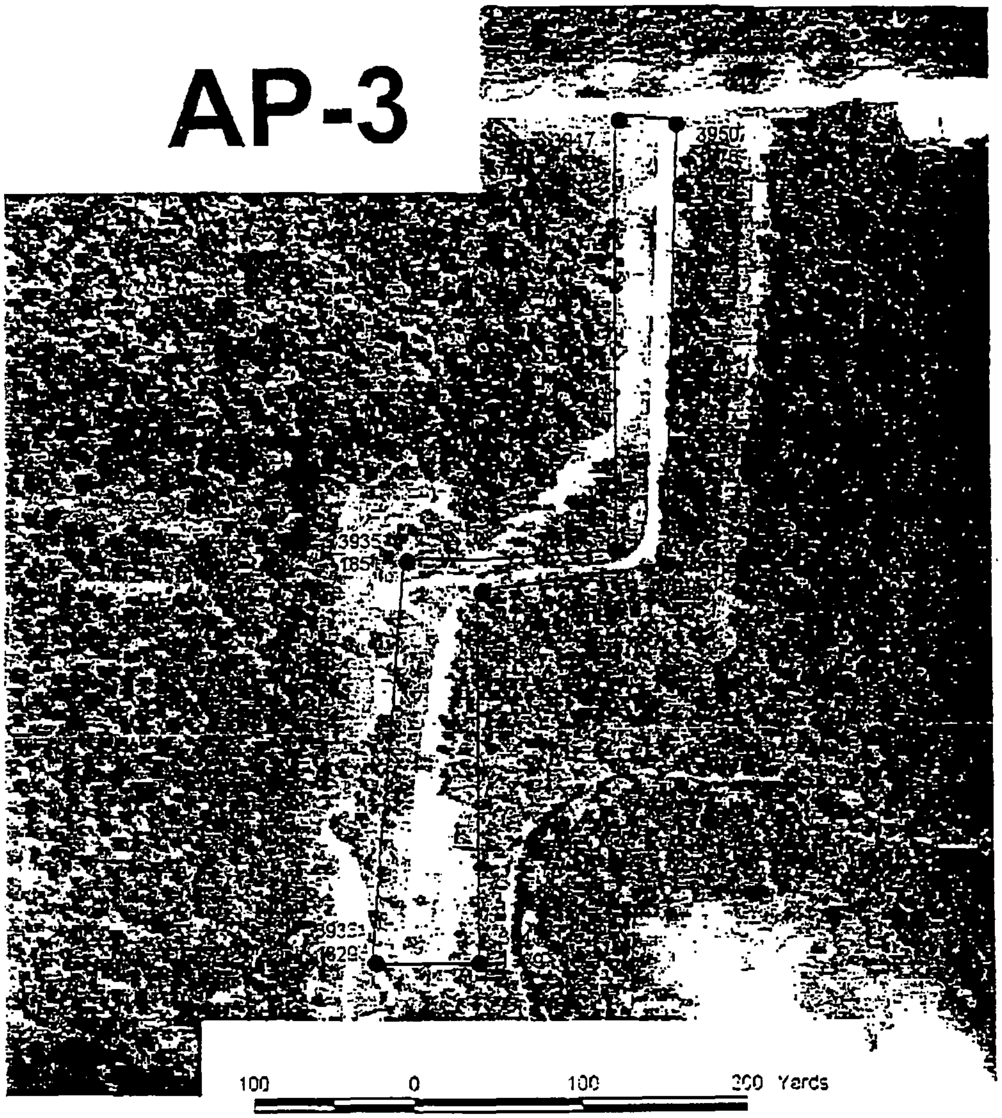
North 05 degrees 11 minutes 40 seconds East 220.9 meters to a point having an approximate UTM value of FU63935E/431851N; thence

North 85 degrees 14 minutes 11 seconds East 120.4 meters to a point having an approximate UTM value of FU63947E/431852N; thence

North 240.0 meters to the point of beginning, containing 2.18 hectares (5.388 acres), more or less.

15 June 2000, BLB

AP-3



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APPENDIX C

RESIDUAL DOSE MODELING

Depleted Uranium Impact Area
Jefferson Proving Ground, Madison, Indiana

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LIST OF ACRONYMS AND ABBREVIATIONS

ac	Acre
ALARA	As Low as Reasonably Achievable
ANL	Argonne National Laboratory
BGS	Below Ground Surface
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
cm	Centimeter
CSM	Conceptual Site Model
DCGL	Derived Concentration Guideline Level
DU	Depleted Uranium
Eh	Redox Potential
EOD	Explosive Ordnance Disposal
ERM	Environmental Radiation Monitoring
FSP	Field Sampling Plan
ft	Feet
FWS	U.S. Fish and Wildlife Service
g/cm^3	Gram per Cubic Centimeter
g/y	Gram per Year
$gal/day/ft^2$	Gallon per Day per Square Foot
gpm	Gallon per Minute
in	Inch
INANG	Indiana Air National Guard
JPG	Jefferson Proving Ground
K_d	Distribution Coefficient
kg	Kilogram
kg/y	Kilogram per Year
kg/day	Kilogram per Day
kg/m^2	Kilogram per Square Meter
km	Kilometer
km^2	Square Kilometer
L/y	Liter per Year
lb	Pound
µg/L	Microgram per Liter
µR/hr	MicroRoentgen per Hour
m	Meter
m/sec	Meter per Second
m^2	Square Meter
MCL	Maximum Contaminant Level
mg/kg	Milligram per Kilogram
MOA	Memorandum of Agreement
mrem	Millirem
mrem/y	Millirem per Year
mSv	MilliSievert
NRC	U.S. Nuclear Regulatory Commission
NUREG	U.S. Nuclear Regulatory Commission Regulation
NWR	National Wildlife Refuge
pCi/g	Picocurie per Gram
pCi/L	Picocurie per Liter
PCZ	Primary Contamination Zone
Pu-239/240	Plutonium-239/240

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

QA	Quality Assurance
QC	Quality Control
RESRAD	Residual Radioactivity
SCZ	Secondary Contamination Zone
SDWA	Safe Drinking Water Act
SI	Sensitivity Index
SOP	Standard Operating Procedure
STAR	Strategic Toxic Air Reduction
Tc-99	Technetium-99
TEDE	Total Effective Dose Equivalent
TOC	Total Organic Carbon
U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
y	Year

1. INTRODUCTION

Jefferson Proving Ground (JPG), Indiana, was used by the Army as one of several locations for testing conventional munitions used in combat (Figure 1-1). One of the activities at JPG was production line, lot-acceptance testing of depleted uranium (DU) penetrator munitions. Testing of DU munitions began on 18 March 1984 and concluded on 2 May 1994 in the DU Impact Area (Figure 1-2). Under the Base Realignment and Closure (BRAC) Act of 1988 (Public Law 100-526, U.S. Public Law 1988) that closed JPG after the end of September 1994, the Army had 1 year to administratively close JPG, which was done on 30 September 1995. As part of base closure, the Army identified those areas south of the firing line that would be made available for private or public reuse, as appropriate. Sections of JPG south of the former firing line have been and are continuing to be transferred to private ownership after extensive removal of hazardous components (environmental contamination and unexploded ordnance [UXO]) left over from previous missions. To date, 2,485 acres (ac) (10.0 square kilometers [km^2]) have been transferred from Army control. An additional 1,212 ac (4.9 km^2) are planned to be transferred. All of the transferred and transferring property is located in the southern portion of JPG.

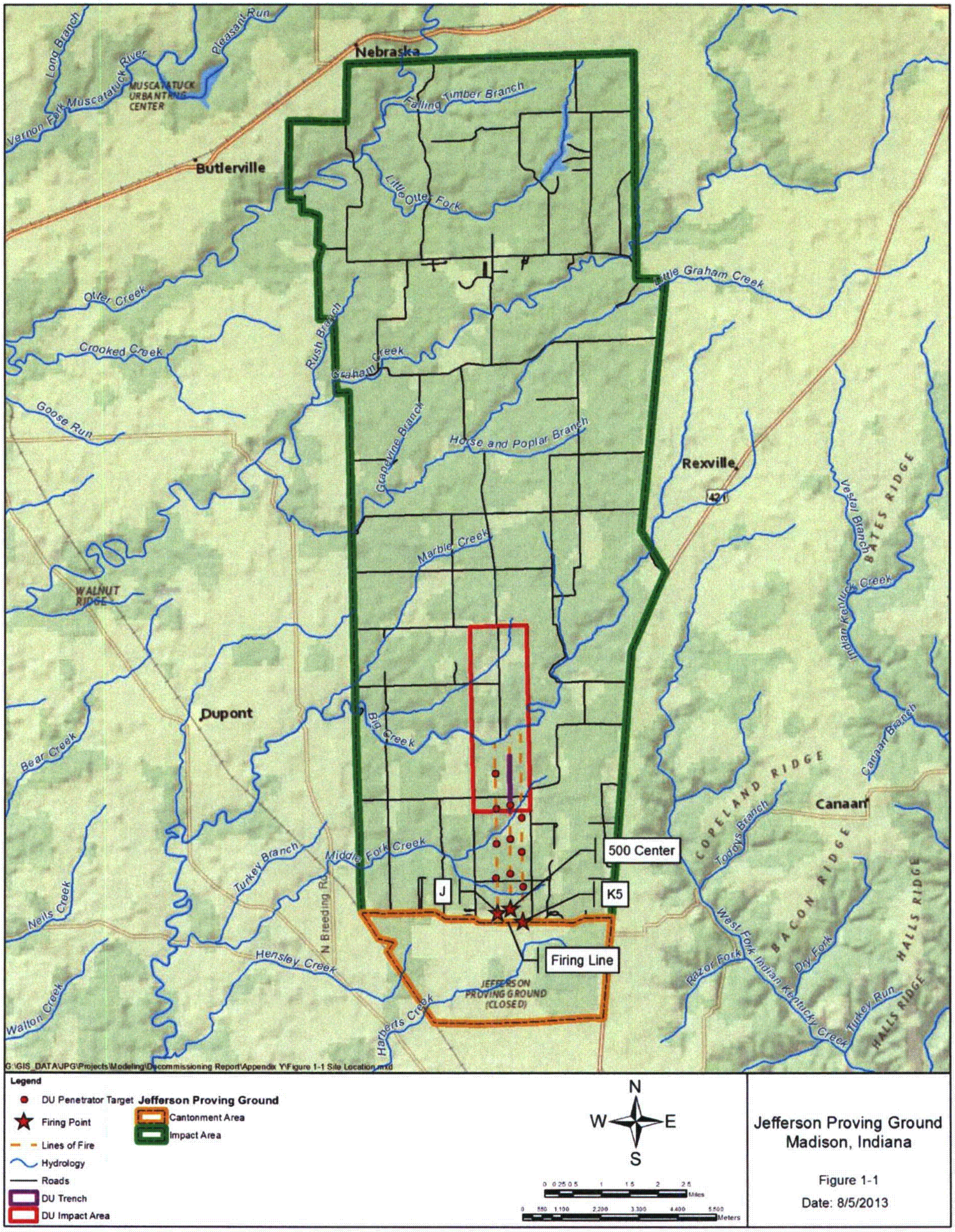
Transfer of lands north of the firing line, however, cannot be as easily completed because of significant hazards that include not only the DU Impact Area but also because of the estimated 1.5 million high-explosive UXO rounds and another 3 to 5 million estimated rounds with live detonators, primers, fuzes or spotting charges that did not detonate upon impact and remain either on or beneath the ground surface (U.S. Army 1995). Consistent with the JPG "Disposal and Reuse Environmental Statement Record of Decision" (ROD) (U.S. Army 1996a), the Army will retain title to the DU Impact Area property and the surrounding area "in caretaker status until transfer by encumbered title is feasible." In accordance with the Memorandum of Agreement (MOA) signed by the Army, U.S. Air Force (USAF), and U.S. Fish and Wildlife Service (FWS) in May 2000 (U.S. Army 2000), 50,950 ac (206 km^2) of JPG property north of the firing line have been used to create the Big Oaks National Wildlife Refuge (NWR) administered by FWS, while the remaining 1,038 ac (4.2 km^2) are being used by the Indiana Air National Guard (INANG) for air-to-ground training on operational ranges by various air National Guard units. Access to the area north of the firing line at JPG is controlled through locked gates and barricades with public access to only certain areas for fishing (Old Timbers Lake only) or hunting. Currently, the DU Impact Area and the areas immediately adjacent to the DU Impact Area are restricted access with no public access with locked barricades on all roads leading into the DU Impact Area including radiation warning signs posted around the entire perimeter of this portion of JPG north of the firing line. Under the MOA, the installation will remain fenced with a 6-foot (ft) (1.8-m) chain link fence topped with barbed wire. Approximately 55 miles (mi) (88 kilometers [km]) of fencing surrounds the installation (U.S. Army 2000, INANG 2013). Security warning signs (e.g., No Trespassing) are placed around the property to caution persons not to enter the property.

In this section, the purpose, objectives, scope, and problem definition are discussed. Section 2 provides background information on the environmental monitoring program and previous dose assessments. The dose estimation methodology and results are presented in Section 3 and provide the basis for conclusions addressed in Section 4. References are detailed in Section 5.

1.1 PURPOSE AND OBJECTIVES

The Army is seeking a termination of JPG's U.S. Nuclear Regulatory Commission (NRC) Materials License SUB-1435 and, concurrently, to release the DU Impact Area for restricted use with institutional controls in accordance with Title 10 Code of Federal Regulations (CFR) Part 20, Section 1403 (10 CFR 20.1403). This report provides an analysis of the potential exposure of site users to residual DU (i.e., penetrators, fragments, and corrosion products) under a variety of land use scenarios. The assessment approach and the data used for the assessment also are documented in this report. Specifically, the following objectives are addressed in this report:

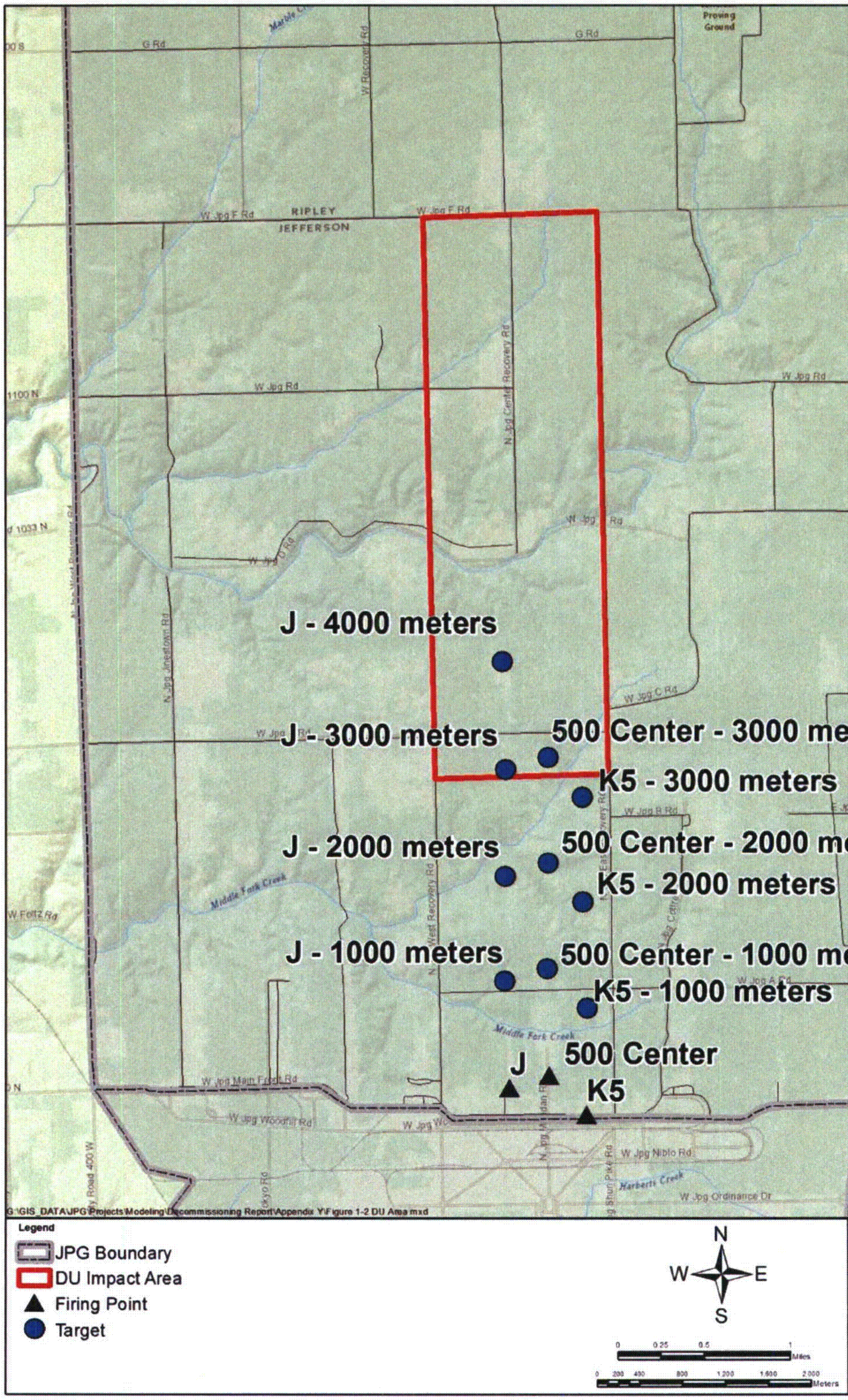
- Estimate potential doses from residual DU in the soil to humans in a critical group defined by the exposure scenario



Jefferson Proving Ground
Madison, Indiana

Figure 1-1

Date: 8/5/2013



DU Impact Area Layout

Figure 1-2

Date: 8/6/2013

- Determine if the projected total effective dose equivalent (TEDE) from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 millirems per year (mrem/y) if institutional controls are in place, and if there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable (ALARA) and would not exceed 100 mrem/y if the institutional controls were no longer in place (10 CFR 20.1403).

1.2 SCOPE AND PROBLEM DEFINITION

The purpose of the analyses presented in this report is to evaluate potential doses to users of the DU Impact Area after the Army has submitted sufficient information to NRC in the form of the Decommissioning Plan and Environmental Report, and the NRC has agreed to the release of the site under the requirements of 10 CFR 20.1403 for restricted access with durable institutional controls in place.

There are two dose criteria applicable to license termination under restricted conditions. First, "the licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group do not exceed 25 mrem (0.25 mSv) per year." The second dose limit is applicable in the event of loss of institutional controls and stipulates that "Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is ALARA and would not exceed either (1) 100 mrem (1 mSv) per year;" or, subject to additional requirements, 500 millirems (mrem) (5 milliSieverts [mSv]) per year (10 CFR 20.1403). The TEDEs associated with various scenarios are developed and compared to both limits to identify both the applicable critical groups and the TEDEs, distinguishable from background, to the average member of the critical group dose. License termination under restricted conditions is recommended if TEDEs are compliant with the cited criteria in 10 CFR 20.1403.

Uncertainties in estimating the doses to members of critical groups include data such as the amount and distribution of DU in the soils in the DU Impact Area. These uncertainties are addressed using a combination of site-specific data and conservative default values or estimates for many of the dose model input parameters required by the dose modeling program.

2. BACKGROUND ENVIRONMENTAL MONITORING AND RISK ASSESSMENT AT JPG

Environmental monitoring data are reviewed in Section 2.1. Previous dose assessments are summarized in Section 2.2.

2.1 ENVIRONMENTAL MONITORING DATA

A comprehensive Environmental Radiation Monitoring (ERM) program commenced at JPG in 1983, prior to the initiation of DU testing, has been employed semiannually through the present and will continue until NRC Materials License SUB-1435 is terminated. In 2005, the Army submitted the tiered, time-phased Field Sampling Plan (FSP) (SAIC 2005) for site characterization that allowed for decisions at intermediate milestones regarding the need for collecting additional site data. Subsequent tasks and associated activities were planned and detailed as addenda to the FSP (SAIC 2006a,b; 2007a,b; 2008a,b,c; 2009). The FSP and related addenda described numerous activities including four consecutive quarters of groundwater, surface water, and sediment sampling. Extensive soil sampling was completed in October 2008, December 2009, and March 2012.

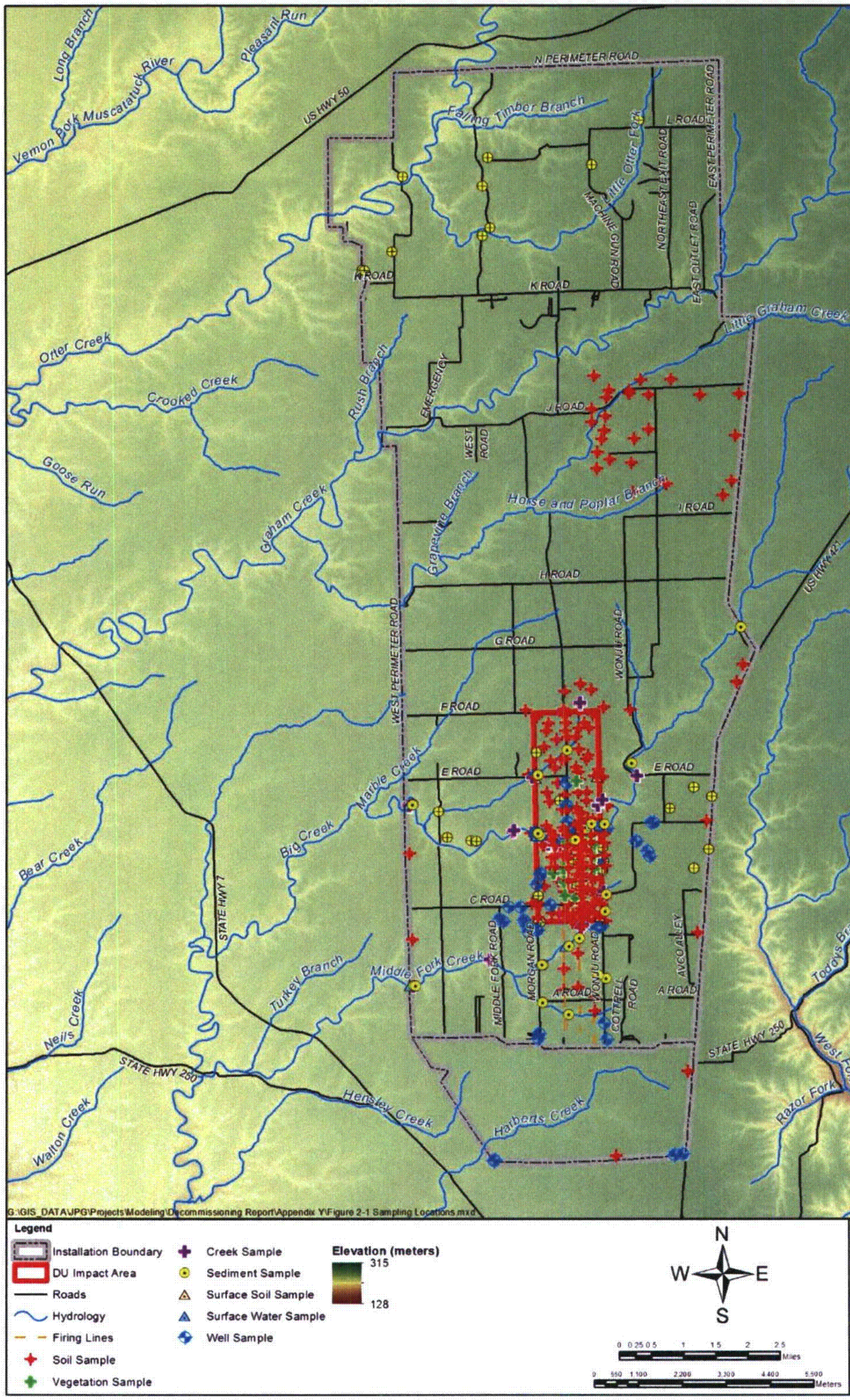
Section 2.1.1 summarizes results of ERM sampling, and Section 2.1.2 summarizes environmental monitoring data from the site characterization. Figure 2-1 shows the locations of all sampling locations. Additional information regarding environmental monitoring data summarized below is presented in Section 6.1 of the Environmental Report (U.S. Army 2013a).

2.1.1 Summary of ERM Sampling Results

The initial monitoring plan developed for the DU Impact Area in 1984 guided sample collection and analysis through 1995 and was updated in 1996 (U.S. Army 1996b) and again in 2000 (U.S. Army 2000). Samples were collected and analyzed semiannually for total uranium and, often, the isotopic composition of uranium in samples. Concentration data for the DU Impact Area from 1984 to 2000 for groundwater, surface water, sediment, and surface soil are shown in Table 2-1. Groundwater and surface water samples are unfiltered in field, but are filtered in lab prior to analysis (U.S. Army 2000). The soil and sediment samples indicate that the concentrations of uranium in samples collected between 1984 and 2000 were generally significantly less than the derived concentration guideline of 35 picocuries per gram (pCi/g) for uranium in surface soil, which has commonly been employed in the United States in the past. In addition, uranium activities contained in surface water and groundwater samples are a small percentage of the applicable 150 picocuries per liter (pCi/L) action level (i.e., 50 percent of the water effluent standards specified in 10 CFR 20, Appendix B [U.S. Army 1996b]).

In March 2000, the Army published the Standard Operating Procedure (SOP) entitled "Depleted Uranium Sampling Program, Environmental Radiation Monitoring Program SOP Number OHP 40-2" (U.S. Army 2000), which specifies the protocol for the collection and analysis of 11 groundwater, 8 surface water, 8 sediment, and 4 soil samples (with appropriate duplicates) in and around the DU Impact Area. This semiannual plan, which was approved by NRC, continues to fulfill the Army's responsibilities for monitoring under NRC Materials License SUB-1435.

An assessment of historical trends for ERM program data was first provided in the April 2006 Radiation Monitoring Report (U.S. Army 2006). That assessment focused on available sampling data for groundwater, surface water, sediment, and soil collected since 1998. Quality assurance/quality control (QA/QC) records for data collected prior to 1998 were not available to support the trend analyses. In addition, there were changes to analytical methods that were implemented beginning in December 2004. Therefore, although historical data are reported beginning in 1998, trend analyses included in the ERM reports addresses the time period from December 2004 to the present. In addition, surface water and groundwater results for the April 2004 sampling event were not trended as the results were provided in



JPG Sampling Locations

Figure 2-1

Date: 8/5/2013

Table 2-1. Descriptive Statistics of DU Concentrations in ERM Samples (1984-2000) Jefferson Proving Ground, Madison, Indiana

Statistic	Soil (pCi/g)	Groundwater (pCi/L)	Surface Water (pCi/L)
Mean	19	2.7	1.6
Median	1.5	1.3	0.26
Standard Deviation	200	5.6	5.6
Minimum	-0.8	-0.1	-1.2
Maximum	3,900	81	49
Number of Samples	388	365	312

Measurement data are rounded to two significant digits.
Source: Ebinger and Hansen 1996a,b
pCi/g = picocuries per gram
pCi/L = picocuries per liter
Negative values denote activity concentrations at levels below mean background.

mass units rather than radiological units, and information was not available with respect to accurate unit conversions. Table 2-2 and the following bullets summarize ERM results for samples collected from December 2004 through October 2012.

Table 2-2. Summary of JPG ERM Data From December 2004 Through October 2012 Jefferson Proving Ground, Madison, Indiana

Environmental Medium	Data Points	Range of Total Uranium*	Mean and Standard Deviation of Total Uranium*
Groundwater	202	0.11-5.7	1.4 ± 1.2
Surface Water	145	0.04-19	0.88 ± 2.4
Sediment	151	0.19-2.4	0.97 ± 0.49
Surface Soil	91	0.36-2.2	1.5 ± 0.31

* Data rounded to two significant digits and presented in units of pCi/L for groundwater and surface water sample results and pCi/g for sediment and surface soil results.

- For 202 discrete samples (inclusive of duplicates) available from 11 monitoring wells (MW-DU-001 to MW-DU-011), the average total uranium activity-concentration is 1.4 pCi/L, the standard deviation is 1.2 pCi/L, and the maximum detected activity-concentration is 5.7 ± 0.6 pCi/L.
- For 145 discrete samples (inclusive of duplicates) available from 8 surface water sampling locations (SW-DU-001 to SW-DU-008), the average total uranium activity-concentration is 0.88 pCi/L, the standard deviation is 2.4 pCi/L, and the maximum detected activity-concentration is 19 ± 2 pCi/L.
- For 151 discrete samples (inclusive of duplicates) available from 8 sediment sampling locations (SD01 to SD08), the average total uranium activity-concentration is 0.97 pCi/g, the standard deviation is 0.49 pCi/g, and the maximum detected activity-concentration is 2.4 ± 0.4 pCi/g.
- For 91 discrete samples (inclusive of duplicates) available from 4 surface soil sampling locations (SS01 to SS04), the average total uranium activity-concentration is 1.5 pCi/g, the standard deviation is 0.3 pCi/g, and the maximum detected activity-concentration is 2.2 ± 0.5 pCi/g.
- The activity-concentrations for all surface water sampling locations and groundwater monitoring wells exhibit average concentrations that are significantly less than both the U.S. Environmental Protection Agency (USEPA) uranium drinking water standard of 30 μg/L and

the 150 pCi/L action level for groundwater (i.e., 50 percent of the water effluent concentration limit for uranium prescribed in 10 CFR 20, Appendix B).

- The activity-concentrations for all sediment and surface soil location are well below the 35 pCi/g action level, which has historically served as a common Derived Concentration Guideline Levels (DCGLs) for uranium in surface soils. Note that DCGLs for sediments are typically much higher than the value used for surface soils.

2.1.2 Summary of Site Characterization Sampling Results

Sampling conducted in April 2008, July 2008, October 2008, and February 2009 at and around the DU Impact Area included collecting 328 groundwater samples from 42 wells, 80 surface water samples from 20 locations, and 80 sediment samples from 20 locations. The following bullets summarize results for groundwater, surface water, and sediment samples collected in 2008 and 2009 for site characterization.

- Samples were collected from 42 groundwater monitoring wells including 11 ERM wells, 5 wells installed in the soil overburden, 9 wells installed in shallow/weathered bedrock, 9 wells installed in deep bedrock, and 8 range study wells. Some groundwater samples could not be collected from some locations since wells were dry when sampling occurred. Samples were collected using bailers (for ERM sampling), micro-purge/low-flow sampling (where possible) for site characterization, and discrete interval sampler (HydraSleeve®) in wells that had very low yields for sample collection without purging the water column in the well. When not restricted by limited water volumes available for sampling, filtered and unfiltered samples were collected. Samples were analyzed for total and isotopic uranium, alkalinity, anions, cations, aluminum, iron, manganese, silicon, and total organic carbon (TOC). Total uranium concentrations ranged from 0.027 ± 0.14 to 47 ± 7.7 pCi/L, with an overall mean concentration of 2.1 pCi/L. Only one groundwater environmental monitoring sample, MW-DU-001 for the October 2008 sampling event, exhibited a uranium-238/uranium-234 (U-238/U-234) ratio exceeding 2; thus, groundwater results did not generally reflect the presence of DU (see Section 2 of the conceptual site model [CSM]).

- Eighty surface water samples (plus 10 duplicates) were collected from 20 locations, which were selected based on a February 2008 stream survey when a hydrologist looked for mixing zones, caves, and seeps along Big Creek, Middle Fork Creek, and the northern tributary of Big Creek. Samples from seven locations were relocated since they were dry when sampling occurred. Samples were analyzed for total and isotopic uranium, alkalinity, anions, cations, aluminum, iron, manganese, silicon, and TOC. Filtered and unfiltered samples were collected. Total uranium concentrations ranged from 0.032 ± 0.14 to 22 ± 4.4 pCi/L, with an overall mean concentration of 1.2 pCi/L. Some evidence of DU was suspected in 12 samples (based on U-238/U-234 ratios exceeding 2). Most concentrations were low with respect to potential radiological doses when surface water is used as a drinking water source. Results from four samples exceeded USEPA's 30 micrograms per liter (μg/L) (9 pCi/L) Safe Drinking Water Act (SDWA) maximum contaminant level (MCL). Results for the following four samples collected from JP-W-05 exceeded the MCL: July 2008 at 22 ± 4.4 (filtered) and 20 ± 4.1 (filtered) pCi/L and October 2008 at 18 ± 3.5 (filtered) and 20 ± 3.8 (filtered) pCi/L. Samples collected from location JP-W-05 were collected from a point in the vicinity where overland flow from 500 Center trench intersects with Big Creek. These samples were collected from standing pools of water (i.e., limited or no water flow).

- Eighty sediment samples (plus 10 duplicates) were collected from 20 locations, which were selected based on a February 2008 stream survey when a hydrologist looked for areas with deposition of finer grain sediments based on channel widths, water depths/directions, changes in slope, and flow velocities along Big Creek, Middle Fork Creek, and the northern tributary of Big Creek. Samples were collected from the same locations regardless of whether or not they

were dry when sampling occurred. Samples were analyzed for total and isotopic uranium. Total uranium concentrations ranged from 0.25 ± 0.13 to 7.4 ± 1.6 pCi/g (0.70 to 21 milligrams per kilogram [mg/kg]) for Big Creek sediment samples, 0.51 ± 0.20 to 2.0 ± 0.55 pCi/g (1.4 to 5.6 mg/kg) for Middle Fork Creek sediment samples, and 0.96 ± 0.16 to 1.7 ± 0.38 pCi/g (0.97 to 4.7 mg/kg) for North Tributary sediment samples, with overall mean concentrations of 1.3, 1.2, and 1.3 pCi/g (3.6, 3.4, and 3.6 mg/kg) for Big Creek, Middle Fork Creek, and North Tributary, respectively. All concentrations are low with respect to potential radiological dose (35 pCi/g). The highest concentrations were observed where runoff is expected to enter Big Creek from the 500 Center trench. Evidence of DU was observed in eight sediment samples collected from five locations based on elevated U-238/U-234 ratios (i.e., exceeding 3.0) during one or more of the quarterly site characterization sampling events or semi-annual ERM sampling events. Isotopic ratios (U-238/U-234) exceeded 3.0 in the following samples: JP-D-05 (4.7 ± 2.9 in April 2008, 4.4 ± 2.9 in July 2008, 5.1 ± 1.7 in October 2008, and 4.5 ± 1.5 in February 2009) and JP-D-14 (4.2 ± 2.7 in April 2008, 5.2 ± 2.5 in July 2008, 5.2 ± 1.8 in October 2008, and 1.7 ± 0.6 in February 2009). All sediment samples with elevated isotopic ratios were collected from Big Creek in close proximity to the trench associated with the 500 Center line of fire. All concentrations were detected well below the 35 pCi/g action level for ERM sampling, which has historically served as a common DCGL for uranium in surface soils.

Soil sampling in October 2008, December 2009, and March 2012 included the collection of 767 soil samples from 140 locations. Background sampling (127 samples) and sampling under penetrators (107 samples) were collected and identified based on their respective soil type groupings: Avonburg/Cobbsfork, Cincinnati/Rossmoyne, and Grayford/Ryker. The remaining 395 samples were collected from various locations in and around the DU Impact Area: Category 1 – outside DU Impact Area perimeter, Category 2 – immediately inside DU Impact Area, Category 3 – midway to DU Impact Area trenches, Category 4 – immediately outside DU Impact Area trenches, Category 5 – other nature and extent samples, and Category 6 – trench locations. Except where sampling with hand augers was limited due to auger refusal (e.g., roots, stones), samples were collected from the following depth intervals:

- For October 2008 sampling, the following sample groups were collected from depths of 0 to 0.5, 0.5 to 1, 1 to 2, and 2 to 4 ft below ground surface (BGS): background samples; samples collected in Categories 1, 2, and 5; and samples collected from under penetrators.
- For October 2008 sampling, samples collected in Categories 3, 4, and 6 were collected from depths of 0 to 0.5, 0.5 to 1, 1 to 2, 2 to 4, and 4 to 6 ft BGS.
- For March/April 2012, samples were collected from 0 to 4 ft BGS to address concerns raised by NRC (2011).

Table 2-3 summarizes results for soil samples collected in October 2012.

Table 2-3. Summary of October 2008 Soil Sampling Jefferson Proving Ground, Madison, Indiana

Sample Group	Number of Samples	Minimum	Maximum	Mean	SD
Background Soil					
Avonburg and Cobbsfork	45	0.16	1.8	1.3	0.54
Cincinnati and Rossmoyne	45	0.16	2.1	1.4	0.57
Grayford and Ryker	37	0.20	3.8	1.7	0.59
Background Soil					
1 – Outside DU Impact Area Perimeter	45	1.3	2.1	1.6	0.18
2 – Immediately Inside DU Impact Area	48	1.00	2.3	1.6	0.25
3 – Midway to DU Impact Area Trenches	58	1.2	19	1.9	2.3
4 – Immediately Outside DU Impact Area Trenches	58	1.1	2.1	1.5	0.18
5 – Other Nature and Extent Samples	127	0.71	2.6	1.6	0.27
6 – Trench Locations	64	-3.2	142	8.5	25
Glacial Till Soil Samples					
Glacial Till Samples	12	0.16	2.2	0.76	0.62

Table 2-3. Summary of October 2008 Soil Sampling Jefferson Proving Ground, Madison, Indiana (Continued)

Sample Group	Number of Samples	Minimum	Maximum	Mean	SD
Soil Over/Under Penetrators					
Avonburg and Cobbsfork	46	23	40,693	6,831	10,355
Cincinnati and Rossmoyne	42	22	27,253	3,956	5,578
Grayford and Ryker	20	-1.5	27,469	3,620	7,178
SD = standard deviation					

2.2 FACTORS FROM PREVIOUS DOSE ASSESSMENTS

Several dose estimates for the potential effects of DU on members of appropriate critical groups have been conducted at JPG (Ebinger and Hansen 1994, 1996a,b, and 1998). The predicted doses depended largely on the assumptions made about exposure pathways. In the earliest assessments, it was projected that drinking water would constitute the largest contributor to the overall dose to humans. Since the first estimates were completed, however, refinements have been made concerning DU transport to groundwater and surface water, and more realistic exposure scenarios have been developed. The most recent assessment assumed that the soil and geologic media that control groundwater recharge and DU transport were characterized well enough to use as modeling scenarios. The approach adopted herein models the transport of DU at JPG relying on site-specific data to the maximum extent possible.

Refinements in the distribution and concentration of DU in the DU Impact Area were made in 1995 and 1996 (SEG 1995, 1996a,b). These reports show that the size of the affected area could be more reliably estimated after radiological surveys were completed along a grid through the DU Impact Area. These survey data were used to map projected soil concentrations (i.e., the historical derived concentration guideline level of 35 pCi/g) based on 14.4 microRoentgen per hour (μR/hr) equating to a soil concentration of 35 pCi/g. The size of the contamination zone set up for this assessment was designed to encompass the majority of areas projecting potential increased soil concentrations based upon this survey. The assumed contamination zone was reduced in size but assumed 100 percent of the site DU in the source term as a conservative approach.

The current source terms for DU applied in this dose assessment, particulate and dissolved DU corrosion products, are calculated based upon the concentration of DU penetrators per specific area from the DU penetrator distribution study and the depth penetrator corrosion products could reach in the average amount of time it takes for a penetrator to fully corrode. This approach was used because all dose pathways, with the exception of external gamma, require the source term to be mobile in the environment for the pathway to be complete. Corrosion of DU penetrators and subsequent dissolution of the corrosion products is the primary mechanism for introducing DU into the soil and for subsequent transport to other media (e.g., surface runoff to surface water and sediment). The rates of corrosion and dissolution were determined based on laboratory testing and field observations for conditions similar to those experienced by the DU penetrators at the DU Impact Area. Based on this information, the most likely time to complete corrosion and dissolution of a JPG penetrator was calculated to be approximately 107 years. Thus, while Residual Radioactivity (RESRAD)-OFFSITE assumes 100 percent of the DU is available for transport, in reality, a much smaller percentage is available for transport on a yearly basis. Calculation of source term concentrations is presented in Section 3.4. Uncertainty associated with this approach is presented in Section 3.9.

3. DOSE ESTIMATION METHODOLOGY

The dose estimation methodology is described in Sections 3.1 through 3.9. The RESRAD results are detailed in Section 3.10.

3.1 HISTORICAL SITE ASSESSMENT

Historical information relevant to the restricted release termination of the current JPG DU license includes the facility operating history, characterization of radioactive material used at the facility, characterization of support facilities, and monitoring of radioactive material in the environment. The following paragraphs summarize these sources of information. The facility operating history is described in more detail in Section 2.

3.2 DEFINITIONS: "ONSITE," "OFFSITE," "CONTAMINATED ZONE," AND "DU IMPACT AREA"

Four terms used in the following dose estimation assessments refer to specific sections of the JPG area. The area under institutional control is that area north of the former firing line fence comprising 50,950 ac (206 km^2) and enclosed within the current JPG boundary on the north, east, and west perimeter fences, which is depicted in Figures 1-1 and 1-2. The DU Impact Area, which comprises 2,080 ac (8.4 km^2), lies within the area under institutional control. Currently, the DU Impact Area is marked with radiation contamination signs as a specific hazard area, with all roads leading into the DU Impact Area having locked metal barricades and no public access. The approximate 4,314-ac (17.5-km^2) area south of the firing line does not contain DU test areas and was released from radiological controls as announced by NRC on 13 May 1996 (NRC 1996). Contaminants from portions of this area have been removed and applicable lands and facilities have been transferred to others for productive use. In the following descriptions of the potential exposure scenarios, "onsite" refers to being within the area under institutional control; "offsite" refers to areas outside the perimeter fence; "DU Impact Area" refers to the area within the part of JPG north of the firing line where DU munitions impacted the ground (Figures 1-1 and 1-2); and the "contaminated zone" is the area of highest concentration of DU from within the DU Impact Area (Figure 3-1). Appropriate interpretation of the conclusions of the following exposure modeling effort depends on these definitions.

3.3 JPG CONCEPTUAL MODEL

A site description is provided in Section 3.3.1. This discussion is followed by a presentation of the CSM in Section 3.3.2. The CSM presented in this appendix is abbreviated from the in-depth CSM presented in Appendix C of the Environmental Report (U.S. Army 2013a).

3.3.1 Site Description

The area around JPG is considered ideal farming land because of the favorable temperature during the growing season, a relatively long growing season, and adequate moisture to grow a variety of crops without added irrigation and without danger, in most years, of crop loss from drought (USDA 1997). The JPG area is now forested with various hardwoods, herbaceous cover, and grasses, and supports a large population of game animals, nongame mammals, aquatic life, and reptiles. Between the late 1800s and 1941, JPG lands were cleared of timber and farmed extensively, but returned to a forest ecosystem after the U.S. Government assumed control of the area just prior to the start of World War II. In May 1941, the first round was fired at JPG under Army ownership. The JPG reservation is cut from east to west by several streams, notably Big Creek that flows through the DU Impact Area. Trenches were carved from south to north by DU penetrator impacts that removed trees. The trenches are downrange from the firing points and generally in a line formed by the firing points and the soft target locations.

DU Impact Area
Primary and Secondary
Contaminated Zones

Figure 3-1

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The DU Impact Area is within the Muscatatuck Plateau physiographic region and is characterized by broad uplands covered by glacial till with entrenched valleys (Gray 2001). The glacial deposits overlie Paleozoic bedrock consisting of interbedded limestone, dolomite, and shale, and overburden thicknesses based on previously installed monitoring wells range from 10 to greater than 65 ft thick (SAIC 2002). According to Franzmeier et al. (2004), the glacial till is Pre-Wisconsinan age and thought to be Illinoian age or older and is covered with a thick (>6-ft-thick) mantle of Wisconsinan age loess, or wind deposited silt.

The DU Impact Area is a broad loess-covered till plain incised by two streams, Middle Fork Creek and Big Creek and associated tributaries. Soils that encompass the DU Impact Area are described as "moderately thick loess over weathered loamy glacial till" (USDA NRCS 1999). Measurements indicate that the majority (>40 percent) of soil mapped is the poorly drained Cobbsfork series. Loess derived soils extend to depths of 9 to 12 ft and are characterized by moderate to poorly drained, fine- to very fine-grained loams. Three principal hydrostratigraphic layers have been identified in the DU Impact Area and consist of the "overburden" or saturated till, "shallow" bedrock consisting of the upper 40 to 60 ft of bedrock, and "deep" bedrock below depths of 40 to 60 ft.

- The overburden hydrostratigraphic layer ranges in thickness from several feet to 72 ft in one location in the DU Impact Area, with an average thickness of 25 ft in the interstream divides. The till is variably saturated in the lower 10 to 20 ft above bedrock, with wells completed in the till typically having low yield (less than 1 to 2 gallons per minute [gpm]). Permeability testing of several overburden wells indicated till hydraulic conductivities were moderate, in the range from 0.00093 to 5.7 gallons per day per square foot (gal/day/ft^2), for an average of 3.27 gal/day/ft^2 (SAIC 2010). Groundwater flow directions in the till generally follow surface topography with groundwater flow in the DU Impact Area off of the interstream divides toward Big Creek and Middle Fork Creek under hydraulic gradients in the range of 0.005 to 0.04 (SAIC 2010).
- The shallow bedrock zone consists of the top 40 to 60 ft of the carbonate bedrock. Generally, the bedrock encountered consisted of nearly horizontally bedded limestone, shaley interbedded limestone, dolostone, and shaley interbedded dolostone. Karst features have been observed at JPG in the shallow bedrock hydrostratigraphic layer only and specifically within the DU Impact Area consisting of surface expressions of sinkholes, caves along Big Creek, and weathered jointing (fracturing) of bedrock observed at outcrops along Big Creek. Karst development and the presence of a karst controlled groundwater flow network appears to be limited to within the narrow erosional plain along Big Creek and offsite along lower sections of Middle Fork Creek. Permeability testing of shallow bedrock wells resulted in calculated hydraulic conductivities on the order of 3.7 to 23.2 gal/day/ft^2 for an average of 6.0 gal/day/ft^2. These hydraulic conductivities indicate the shallow bedrock is slightly more permeable than the till, yet in the low range for karst carbonate terrain (Freeze 1979).
- The deep bedrock zone consists of the bedrock below the permeability observed in the shallow bedrock zone, below 40 to 60 ft BGS. The bedrock in the deep zone consisted generally of the same bedrock types of the shallow bedrock zone. Within the deep zone the fractures observed were extremely limited and fresh (e.g., practically nonexistent weathering). No evidence of solution features were observed within the deep zone. After several months, a number of the deep bedrock wells were still recovering from pumping that occurred during the well development activities. Deeper bedrock permeability is clearly lower than overburden or shallow bedrock, although remains unquantified due to the incomplete recovery of wells following development or incomplete recovery following installation of the data logger transducer/slug the night before testing. These traits have led to a qualitative estimate of permeability for the deep bedrock of 0.02 gal/day/ft^2, which is at the low end of published values for limestone (Freeze and Cherry 1979).

The quantitative annual water budget for the DU Impact Area developed for detailed surface and groundwater flow modeling (SAIC 2008d) indicates that the majority of the average annual 49 inches (in) of precipitation at JPG either is lost through evapotranspiration (26 in or 56 percent) or runoff (18 in or 36 percent) to local streams, leaving only approximately 4 in or 8 percent available to infiltrate the groundwater in the overburden and shallow bedrock.

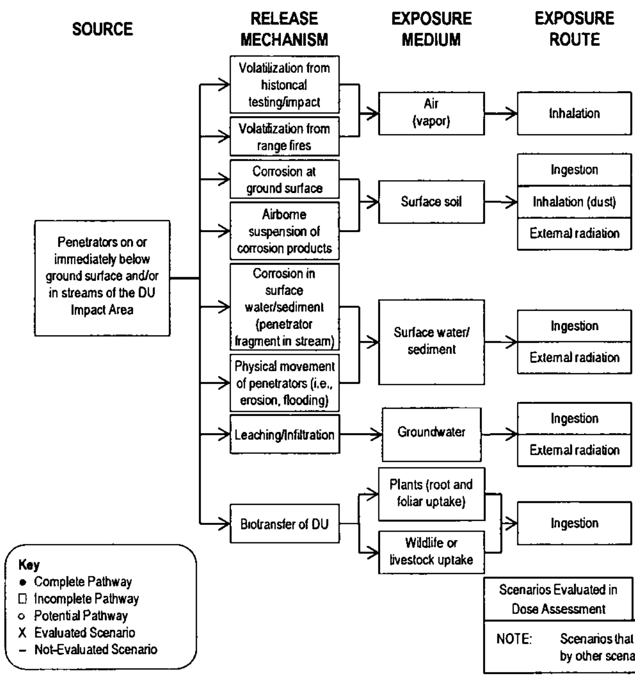
DU that had been distributed on or immediately below the ground surface and/or within the surface water (streams) of the DU Impact Area as a result of the testing may be transported throughout the environment by several different processes. DU in the soil or surface water can be subject to physical movement by erosion (during floods and high runoff events), and these processes may cause migration and transport of DU penetrators along the ground surface and along the surface water drainageways. Migration and transport of intact DU penetrators and/or fragments is less likely to occur as compared to corrosion of DU because the residual DU is expected to be mostly located in the subsurface due to prior surface penetrator retrieval twice a year from the DU Impact Area when the facility was active. Corrosion of the DU in the surface water or soil could enable soluble forms of DU to be absorbed by plants and incorporated within the plant matter for uptake by wildlife. Although vegetation may be burned as part of an FWS management effort or unintended fires (e.g., from lightning), the levels of DU carried in smoke associated with natural vegetation (such as the FWS-controlled burns at JPG) are not likely significant (Williams et al. 1998, U.S. Army 2001). Leached DU from the penetrators and/or fragments in the surface water potentially could be transported to groundwater and surface water, which, in turn, could migrate to drinking water sources and be ingested by humans, livestock, and wildlife.

3.3.2 Conceptual Site Model

The CSM presented in this appendix is abbreviated from the in-depth CSM presented in Appendix C of the Environmental Report (U.S. Army 2013a).

As previously indicated, JPG is undergoing reforestation after approximately 50 years of intense munitions testing and prior agricultural activities. The maturing woodland supports a variety of terrestrial and aquatic wildlife, and previous munitions testing at JPG has clearly resulted in deposition of large amounts of intact DU penetrators and DU fragments totaling approximately 162,040 pounds (lb) (73,500 kilograms [kg]). Potential exposures to DU of the many resources within the DU Impact Area can occur by several pathways. Figure 3-2 is a summary of the processes that control DU transport and migration at JPG and a list of potential exposure pathways.

In principal, DU transports and migrates by a variety of processes after deposition in soil (Figure 3-2). DU can dissolve within the soil and leach into the groundwater; the dissolved DU can react with soil minerals or could be precipitated under (seasonably) low redox potential (Eh) conditions that slow its transport to groundwater; and soluble DU can be taken up by plant roots and incorporated into various plants. Since plants grow in the soils that are contaminated, ingestion of plants by animals necessarily includes incidental ingestion of DU-contaminated soil. In addition, soils also are susceptible to wind and water erosion and transport (Whicker et al. 2002); thus, DU could be transported through the air or moved into surface waters by various runoff or erosion processes, and Williams et al. (1998) discuss transport of DU contaminants by smoke from fires. A detailed evaluation of transport of DU contaminants by smoke from fires is provided in Section 3.7.1. Finally, DU may transport with groundwater to drinking water supplies or be used as well-derived irrigation water. Thus, irrigation water is a mechanism by which some of the transported DU is recycled to the soil as well as a source for DU to plants that are irrigated. Doses to humans and ecosystem receptors can come from any number of exposure pathways beginning when the munitions are tested and lasting until DU is removed from the system. Thus, the dose to humans from DU must be assessed for a variety of pathways and for a relatively long time due to a lengthy corrosion process and slow transport through soils.



HUMAN RECEPTORS

Exposure Medium	Exposure Route	Exposure Scenarios with Institutional Controls in Place												Exposure Scenarios with Loss of Institutional Controls							
		Onsite Recreationist	Onsite Hunter	Onsite Fisherman	Offsite Resident Farmer	Offsite Boundary Recreationist	Offsite Boundary Recreationist (Hunter)	Offsite Boundary Recreationist (Fisherman)	Offsite Part-Time Resident	Offsite Part- Time Resident, Mod. 1	Offsite Industrial Worker	City Resident	Downwind Resident Farmer	Resident Farmer, Without Irrigation[a]	Resident Farmer, With Irrigation[a,b]	Onsite Hunter	Onsite Fisherman	Domestic[a]	Part-Time Domestic[a]	Onsite Industrial Worker	Onsite Sportsman/ Recreationalist
Air (vapor)	Inhalation	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Surface soil	Ingestion	•	•	□	•	□	•	•	□	□	□	□	•	•	•	•	•	•	•	•	•
Surface soil	Inhalation (dust)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Surface soil	External radiation	•	•	•	•	•	•	•	•	•	•	□	•	•	•	•	•	•	•	•	•
Surface water/ sediment	Ingestion	□	□	□	•	•	○	○	•	•	•	•	□	□	□	•	•	○	□	□	•
Surface water/ sediment	External radiation	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Groundwater	Ingestion	□	□	□	□	□	□	□	□	□	□	□	□	•	•	□	□	•	□	□	□
Groundwater	External radiation	□	□	□	□	□	□	□	□	□	□	□	□	•	•	□	□	•	□	□	□
Plants (root and foliar uptake) / Wildlife or livestock uptake	Ingestion	□	•	○	•	•	•	•	□	•	□	□	•	•	•	•	•	•	•	□	•
	Scenarios Evaluated in Dose Assessment	–	–	–	X	–	–	–	–	–	–	–	–	–	X	–	–	–	–	X	X

NOTE: Scenarios that were not evaluated in the Dose Assessment, including those with potential pathways, were bounded by other scenarios that were evaluated (reference dose assessment section).

Figure 3-2. Conceptual Model of DU Transport Through Environmental Compartments to Humans

3.4 SOURCE TERM CHARACTERIZATION

Source term characterization is addressed in this section. Sections 3.4.1 through 3.4.3 present the contaminated zone, DU soil concentrations, and the source term for onsite and offsite exposure estimates, respectively.

3.4.1 Contaminated Zone Delineation

The contaminated zone at JPG is the area where DU remains in the environment from prior DU firing activities. A DU penetrator distribution study, which is summarized in Figure 3-3 and presented in greater detail in Section 3 of this report, was conducted to determine the approximate area and location of residual DU mass at JPG. The DU Impact Area is located in the south-central part of the JPG reservation and covers approximately 2,080 ac (8.4 km^2) (Figure 1-1). The DU penetrator distribution study indicates that approximately 50 percent of the residual DU is concentrated over 37.6 ac (1.5×10^5 m^2) and the remaining DU is distributed over approximately 4,000 ac with most of the residual DU being located in the DU Impact Area. The results of the penetrator distribution study agree with and support previous scoping and characterization survey data (SEG 1995; 1996a,b). The highest concentration of penetrators is located in a 25-meter (m)-wide by 1,000-m-long path over the 500 Center line of fire corridor from 1,700 to 2,700 m north of C Road, constituting an area of 6.4 ac (2.6×10^4 square meters [m^2]) containing 29,980 lb (13,599 kg) of DU. Field observations from 1984 through 2013 also indicate that DU contamination is restricted mainly to the three DU firing corridors (i.e., DU penetrators were fired from three positions along the firing line: 500 Center, J Firing Position, and K5 Firing Position) and areas surrounding the trenches that formed on the three firing points as a result of DU testing. During DU munitions testing (1984 through 1994), penetrators were retrieved twice a year with explosive ordnance disposal (EOD) trained technicians due to the high concentration (estimated at 85 high explosive rounds per acre) of high UXO from the DU Impact Area. Penetrator retrieval was conducted primarily in the firing corridors (trench areas) from the surface of the soil as excavation at depth was not allowed due to potential UXO hazards and the inability to locate subsurface penetrators with the beta/gamma Geiger-Mueller detectors used.

For the dose assessment, two contaminated zones were delineated. These zones included a primary contamination zone (PCZ) 25 m wide by 1,000 m long placed 1,700 to 2,700 m north of C Road to represent the area of highest DU penetrator concentration from the DU penetrator distribution study, and a secondary contamination zone (SCZ) 800 m wide by 2,500 m long placed from 200 to 2,700 m north of C Road and including the area between the J line of fire trench and the K5 line of fire trench as a conservative representation of the area containing the remaining DU from the DU penetrator distribution study. The PCZ is estimated to contain 1.4×10^4 kg of DU and the SCZ is estimated to contain 6.0×10^4 kg of DU. The SCZ excludes the area and DU contained in the PCZ. Both the PCZ and SCZ contribute dose to the receptor. For the dose assessment, the SCZ was reduced in size from approximately 4,000 ac to 494 ac but contained the same mass of DU to establish a conservative source term for the SCZ. The area of the smaller yet conservative SCZ is based on a width between the J line of fire trench and the K5 line of fire trench. The length of the SCZ, 2,500 m, is based on the results of the radiological survey (SEG 1995, 1996a,b). This width and length ensure the SCZ area contains the majority of the areas where increased DU soil concentrations are suspected based upon the radiological survey (SEG 1995, 1996a,b).

For the loss of institutional control scenarios, the receptors were located onsite within the area of primary contamination. RESRAD-OFFSITE (Yu 2010), a computer modeling code used for calculating doses from exposure to radioactively contaminated soils, was used to estimate residual radiation dose to receptors from both the PCZ and SCZ. RESRAD-OFFSITE can be used to calculate residual radiation doses to receptors located on or away from the contaminated soils. The SCZ was established with one-half of the area on the right side adjacent to the PCZ and the other half on the left side adjacent to the PCZ (Figure 3-1). The farmer scenario also considered two 0.25-ac (1,000-m^2) gardens, two 2.5-ac (10,000-m^2) fields for livestock feed (grain and pasture/silage growing areas), as well as a 0.25-ac (1,000-m^2)

Surface Danger Zone Model to Represent Spatial Distribution of DU Penetrators

Figure 3-3

Date: 8/15/2013

dwelling site. All scenarios included a surface water body located as a dammed area of Big Creek. Figure 3-1 shows the farm areas in conjunction with the PCZ and SCZ. As shown in Figure 3-1, the farm was placed directly onto the 500 Center firing line which corresponds to the highest density of DU penetrators (Figure 3-3). This density is consistent with 89 percent of the penetrators fired from the 500 Center firing position. The elongated, thin farm, which covers a large portion of the area of highest DU penetrator concentration (Figure 3-3), while physically possible is unlikely to exist in the future in the event that institutional controls fail. Rather, it would be more reasonable to assume one farm that is much wider that covers large portions of the high density area (Figures 3-1 and 3-3) or a number of square farms that cover much smaller sections of the high density area. In either case, receptor exposure would be less in these more realistic farm configuration because the source term would be decreased. Likewise, the farm site may cover a small fraction or none of the PCZ thereby significantly reducing or eliminating exposure potential. Given the myriad possibilities of farm configuration and placement within the DU Impact Area, and the uncertainty associated with the surface danger zone model, the Army decided to place the farm in a conservative configuration and location within the DU Impact Area. In this respect, RESRAD-OFFSITE does not underestimate residual radiological dose to a resident farmer as the average member of the critical group.

Since RESRAD-OFFSITE modeled radiological dose to the receptor from the PCZ, the left side of the SCZ and the right side of the SCZ, three RESRAD-OFFSITE runs were conducted and the mean of the peak dose from the three runs were summed for a total dose to the receptor. The offsite farmer was not located on the PCZ or SCZ; therefore, the offsite farmer only required modeling of the primary and a single SCZ.

According to the 2002 JPG Decommissioning Plan, DU penetrators may have contained trace amounts of plutonium-239/240 (Pu-239/240) and technetium-99 (Tc-99) at concentrations less than 3 and 400 pCi/g, respectively. If Pu-239/240 and Tc-99 are present at these concentrations in the DU at JPG, the dose for the onsite farmer with the loss of institutional controls exposure scenario would increase by less than 0.4 percent, a negligible increase. A deterministic dose assessment for the loss of institutional controls residential farmer scenario using RESRAD-OFFSITE resulted in a dose from Tc-99 of less than 0.1 mrem/y and a dose from Pu-239/240 of less than 0.001 mrem/y. As such, the dose potentially associated with these radionuclides is an insignificant dose contributor and was, therefore, excluded. The RESRAD-OFFSITE input and output files associated with this dose assessment are provided electronically.

3.4.2 DU Concentration in Soil

The source term for RESRAD simulations is assumed to be located in a specific area within a given depth of soil and is of a homogenous uniform concentration throughout the area. However, DU at JPG is most likely distributed non-uniformly throughout the DU Impact Area at various soil depths and concentrations depending on the firing corridor, penetrator model, target distance, and reworking of soils after deposition. The source term also is assumed to be immediately available for transport in the environment. Given the size of the DU Impact Area (2,080 ac [8.4 km^2]), direct and indirect exposure to all remaining penetrators simultaneously is extremely unlikely. However, to meet the homogenous source term requirements, the source term was calculated so that all remaining penetrators contributed to the final concentration. This is the equivalent of each receptor being exposed to every penetrator at the DU Impact Area. This was done as a modeling convenience but also to represent an upper bound on the dose estimates.

As the DU penetrators have not completely corroded and are not fully available for transport in the environment (although for modeling purposes full availability is assumed), site-specific soil sample results cannot be used as an accurate representation of the initial source term soil concentrations for the uranium isotopes. Therefore, a conservative range of soil concentrations was calculated based upon the range of contamination zone thicknesses and associated mass of DU for the specific contamination zone area. Uncertainty associated with this approach is discussed in Section 3.9.

An appropriate soil concentration source term to be used in RESRAD must be based on the volume and mass of the source term. Since the area of the source term was based upon the results of the DU distribution study (Section 3.4.1), the volume of the source term is then calculated by multiplying the source term area by the depth. The depth of the source term must be based upon a combination of the depth at which the penetrators initially came to rest as well as corrosion and dissolution rates of DU penetrators and the distances that DU penetrator corrosion products will travel in soils before the entire penetrators are completely corroded. For a reasonable source term concentration to be developed, the following factors must be considered:

- The source term for RESRAD simulations is assumed to be immediately available for transport in the environment
- The current source term consists of mostly intact penetrators that have been corroding in the environment between 19 and 29 years, for an assumed average of 25 years (e.g., 1984 to 1994 to the present)
- The penetrator corrosion study determined that it takes an average of at least 100 years for a penetrator to fully corrode and become completely available for transport in the environment
- All pathways except external gamma require the source term to be available for transport in the environment to be a complete pathway
- DU corrosion/dissolution products have been detected in soil samples at depths of up to 4.5 ft (1.4 m) below corroding penetrators
- The distance DU corrosion products can travel in the soil from the initial penetrator before the penetrator is completely corroded depends on the hydrologic conditions of the soil.

RESRAD-OFFSITE calculates the average velocity of contaminants in soil using the following equation:

$$V_c = V_m \times \frac{\theta_m}{\theta_t + (\rho_b \times K_d)}$$

Where:

V_c (m/y)	=	velocity of contaminants in soil
V_m (m/y)	=	velocity of water flowing through mobile pores (hydraulic conductivity)
θ_m	=	effective porosity
θ_t	=	total porosity
ρ_b (g/cm^3)	=	soil bulk density
K_d (cm^3/g)	=	distribution coefficient

The distance the source term travels vertically in soil over a given time period is calculated by multiplying V_c by time. Using the unsaturated zone deterministic parameters selected for RESRAD (i.e., 39.42 m/y hydraulic conductivity; 0.383 effective porosity; 0.45 total porosity; 1.41 grams per cubic centimeter (g/cm^3) density; and 354 cm^3/g distribution coefficient) and a time period of 25 years (the average time since DU firing commenced and ended), the distance the source term will travel in soil is 2.5 ft. This value is consistent with soil sampling data where DU corrosion products have been detected at depths of up to 4.5 ft (1.4 m) below corroding penetrators. Justification for the selected values is provided in Table 3-1. Hydraulic conductivity and the distribution coefficient are the parameters that have a wide range of potential values (i.e., 2.2 to 435 m/y [SAIC 2007b] and 189 to 591 cm^3/g [U.S. Army 2013a, Appendix D], respectively) and were, therefore, used to evaluate a range of source term depths. Although the other parameters also have ranges, they are comparatively small and do not greatly affect the depth calculation. Using the ranges for hydraulic conductivity and K_d, the source term depth ranges from 0.1 ft to greater than 50 ft. Because sampling data have detected DU corrosion products at

**Table 3-1. Potential Exposure Scenarios With Institutional Controls in Place
Jefferson Proving Ground, Madison, Indiana**

Scenario Number	Scenario Name	Description and Identification of Potential Critical Group	Exposure Pathways	Analyzed in DP?	Justification If Not Analyzed
1	Onsite Recreationist	The potential critical group spends up to 4 days each month onsite for hiking, hunting, or other outdoor activities.	<u>External exposure</u>: DU in soil. <u>Inhalation</u>: DU-containing dust. <u>Ingestion</u>: 1) incidental ingestion of DU-containing soil; and 2) no pathways from drinking water, crops, or livestock.	No	Bounded by Scenario #8 (Table 3-3); Receptor dose from Scenario #8 (Table 3-3) is less than 25 mrem/y.
2	Onsite Hunter	The potential critical group spends a limited amount of time onsite for hunting. Hunting period is two 1-week periods per year, and game consumed replaces all dietary meat each year. Game is either deer or turkey.[a]	<u>External exposure</u>: DU in soil. <u>Inhalation</u>: DU-containing dust. <u>Ingestion</u>: 1) Consumption (offsite) of game animals that feed in contaminated area; 2) incidental ingestion of DU-containing soil; and 3) no pathways from drinking water, crops, or livestock.	No	Bounded by Scenario #8 (Table 3-3); Receptor dose from Scenario #8 (Table 3-3) is less than 25 mrem/y.
3	Onsite Fisherman	The potential critical group spends a limited amount of time onsite for fishing. Fishing period is 32 hours per month (4 days) for 3 months, or 12 days each year. Fish taken onsite in Old Timbers Lake will replace all dietary fish.	<u>External exposure</u>: DU in soil. <u>Inhalation:</u> DU-containing dust.	No	Bounded by Scenario #8 (Table 3-3); Receptor dose from Scenario #8 (Table 3-3) is less than 25 mrem/y.
4	Offsite Resident Farmer	The critical group is a family that lives on a farm at the institutional boundary of JPG. This farm is approximately 3.0 km (1.9 mi) from the DU Impact Area. Family raises all crops and livestock for consumption with minimal sources of commercial food products. Family lives near Big Creek and drinks water from a surface water body downstream from JPG.	<u>External exposure</u>: DU in soil deposited from flooding. <u>Inhalation</u>: DU-containing dust blowing in from JPG. <u>Ingestion</u>: 1) Crops, meat, and milk from livestock raised on soils contaminated by dust deposition; 2) fish from stream or pond contaminated by DU leaching through soil and transporting from JPG; 3) incidental ingestion of DU-contaminated soil; and 4) use of drinking water that contains DU from JPG.	Yes	

Table 3-1. Potential Exposure Scenarios With Institutional Controls in Place
Jefferson Proving Ground, Madison, Indiana (Continued)

Scenario Number	Scenario Name	Description and Identification of Potential Critical Group	Exposure Pathways	Analyzed in DP?	Justification If Not Analyzed
5	Offsite Boundary Recreationist	The potential critical group spends a limited amount of time at the JPG boundary but remains offsite. Activities could include hiking, camping, hunting, or other outdoor activities. Recreationists would not have access to JPG area under institutional control.	_External exposure_: DU in soil deposited from flooding. _Inhalation_: DU-containing dust blowing in from JPG. _Ingestion_: 1) Consumption of game animals or fish that grazed, browsed, or lived in contaminated area at JPG; 2) incidental ingestion of DU-containing soil deposited from flooding; and 3) no pathways from drinking water, crops, or livestock.	No	Scenarios 2 and 4 (Hunting and Fishing) bound this exposure scenario if ingestion pathways are included. Scenario 1 bounds this exposure scenario if ingestion pathways are not included.
6	Offsite Boundary Recreationist (Hunter)	The potential critical group spends a limited amount of time near the site boundary for hunting. Hunting period is two 1-week periods per year, and game consumed replaces all dietary meat each year. Game is either deer or turkey. Game assumed contaminated by grazing onsite and migrating offsite.	_External exposure_: DU in soil. _Inhalation_: DU-containing dust. _Ingestion_: 1) Consumption (offsite) of game animals that grazed from contaminated area; 2) incidental ingestion of DU-containing soil; and 3) no pathways from drinking water, crops, or livestock.	No	Exposure to this group already bounded by exposures evaluated in Scenario #2.
7	Offsite Boundary Recreationist (Fisherman)	The potential critical group spends a limited amount of time near site for fishing. Fishing period is 32 hours per month (4 days) for 3 months, or 12 days total. Fish taken onsite will replace all dietary fish. Fish are assumed to have spent part of lifetime in contaminated water onsite.	_External exposure_: DU in soil. _Inhalation_: DU-containing dust. _Ingestion_: 1) Consumption (offsite) of fish obtained from contaminated stream or pond; 2) incidental ingestion of DU-containing soil; and 3) no pathways from drinking water, crops, or livestock.	No	Exposure to this group already bounded by exposures evaluated in Scenario #3.
8	Offsite Part-Time Resident	The potential critical group lives in a cabin or vacation home up to 50 percent of the year. All food comes from offsite and is, therefore, assumed uncontaminated; drinking water from municipal source.	_External exposure_: DU in soil deposited by floods. _Inhalation_: DU-containing dust blown in from JPG. _Ingestion_: Incidental ingestion of DU-contaminated soil deposited by floods.	No	Bounded by Scenario #9.

Table 3-1. Potential Exposure Scenarios With Institutional Controls in Place Jefferson Proving Ground, Madison, Indiana (Continued)

Scenario Number	Scenario Name	Description and Identification of Potential Critical Group	Exposure Pathways	Analyzed in DP?	Justification If Not Analyzed
9	Offsite Part-Time Resident, Mod. 1	The potential critical group visits a home site periodically each year and lives in a cabin or vacation home up to 4 months each year. All food assumed uncontaminated and comes from offsite; drinking water from municipal source. Residents grow vegetables in small garden that is irrigated with water from a surface water body containing DU Impact Area runoff approximately 3.2 km (2.0 mi) from DU-contaminated area.	*External exposure*: DU in soil. *Inhalation*: DU-containing dust. *Ingestion*: 1) Incidental ingestion of DU-contaminated soil and 2) irrigated vegetable crops in season.	No	Bounded by Scenario #6 (Table 3-3).
10	Offsite Industrial Worker	The potential critical group works indoors in a building at the site boundary. Drinking water supplied by a well that could be affected by contaminated zone leaching. Work ranges from office jobs to heavy industrial jobs. Scenario covers exposure to FWS personnel or other administrators; drinking water from municipal source.	*External exposure*: DU in soil deposited by floods. *Inhalation*: DU-containing dust blown in from JPG. *Ingestion*: Incidental ingestion of DU-contaminated soil deposited by floods.	No	Bounded by Scenario #7 (Table 3-3)
11	Offsite Industrial Worker	This receptor consists of people who work indoors at the site boundary (e.g., in the cantonment area) at JPG. Work ranges from office jobs to heavy industrial jobs. Drinking water from municipal well located 5 mi from JPG.	*External exposure*: DU in soil deposited by floods. *Inhalation*: DU-containing dust blown in from JPG. *Ingestion*: Incidental ingestion of DU-contaminated soil deposited by floods.	No	Bounded by Scenario #7 (Table 3-3)
12	City Resident	People who live in Madison or other surrounding communities all year, such as housing in the cantonment area, at JPG. Drinking water from municipal source.	*External exposure*: DU in soil deposited by floods. *Inhalation*: DU-containing dust blown in from JPG. *Ingestion*: Incidental ingestion of DU-contaminated soil deposited by floods.	No	Bounded by Scenario #4.

Table 3-1. Potential Exposure Scenarios With Institutional Controls in Place Jefferson Proving Ground, Madison, Indiana (Continued)

Scenario Number	Scenario Name	Description and Identification of Potential Critical Group	Exposure Pathways	Analyzed in DP?	Justification If Not Analyzed
13	Downwind Resident Farmer	Should there be a resident farmer (east side) who sees airborne deposition from burns and other processes but is upgradient hydraulically?	_External exposure:_ DU in soil deposited from flooding. _Inhalation:_ DU-containing dust blowing in from JPG; DU in smoke from burning vegetation. _Ingestion:_ 1) Crops, meat, and milk from livestock raised on soils contaminated by sediment deposition and from dust; 2) fish from stream or pond contaminated by DU leaching through soil and transporting from JPG; 3) incidental ingestion of DU-contaminated soil; and 4) use of drinking water that contains DU from JPG.	No	Bounded by Scenario #4; also, see discussion in Section C.5 about incremental doses from fire smoke.

[a] Replacement of meat with game follows Ferenbaugh et al. (2002).
Note: Dose limit is 25 mrem/y.

DP = Decommissioning Plan
DU = Depleted Uranium
FWS = U.S. Fish and Wildlife Service
JPG = Jefferson Proving Ground

depths of up to 4.5 ft (1.4 m) below corroding penetrators, a conservative range of 0.3 to 1 m was selected as the probabilistic RESRAD range for the contaminated zone depth because it leads to higher calculated source term concentration ranges and subsequently higher doses.

Since the source term soil concentration is based upon mass and volume of the source term and volume is based upon depth, a range of soil concentrations was calculated for both the PCZ and SCZ. This range was used as a probabilistic RESRAD input and was correlated to the contaminated zone depth (e.g., if a smaller depth was selected, RESRAD would select a higher concentration). The calculation for soil concentration is:

$$Conc_{nuc}(pCi/g) = \frac{Mass_{DU}(kg) \times \%Weight_{nuc} \times Specific\ Activity_{nuc}(pCi/g) \times 10^3(g/kg)}{Volume(m^3) \times 10^6(cm^3/m^3) \times Density\ (g/cm^3)}$$

Where:

$Mass_{DU}$ (PCZ)	=	13,599 kg
$Mass_{DU}$ (SCZ)	=	59,901 kg
$\%Weight_{U\text{-}234}$	=	0.001%
$\%Weight_{U\text{-}235}$	=	0.2%
$\%Weight_{U\text{-}238}$	=	99.799%
$Specific\ Activity_{U\text{-}234}$	=	6.22×10^{-3} Ci/g * 10^{12} pCi/Ci = 6.22×10^{9} pCi/g
$Specific\ Activity_{U\text{-}235}$	=	2.16×10^{-6} Ci/g * 10^{12} pCi/Ci = 2.16×10^{6} pCi/g
$Specific\ Activity_{U\text{-}238}$	=	3.36×10^{-7} Ci/g * 10^{12} pCi/Ci = 3.36×10^{5} pCi/g
$Volume_{PCZ}$	=	25,000 m^2 * depth (m)
$Volume_{SCZ}$	=	2,000,000 m^2 * depth (m)
Depth	=	0.3 m to 1 m
Density	=	1.46 g/cm^3
PCZ	=	primary contamination zone
SCZ	=	secondary contamination zone

This calculation results in a range of soil concentrations listed in Table 3-2. These soil concentrations ranges were selected for the probabilistic RESRAD assessment.

Table 3-2. Primary and Secondary Zone Depleted Uranium Concentrations Jefferson Proving Ground, Madison, Indiana

Nuclide	PCZ	SCZ
	pCi/g	
U-234	23.2 to 77.2	1.3 to 4.3
U-235	1.6 to 5.4	0.1 to 0.3
U-238	124.9 to 416.4	6.9 to 22.9

3.4.3 Source Term for Offsite Exposure Estimates

The initial source term, as previously defined, was used in conjunction with RESRAD-OFFSITE, and transport of this source material via wind, surface water (i.e., sediment deposition during flooding), and groundwater to offsite locations was considered for offsite exposures. Sediment eroded from the contaminated zone can be transported by surface water (e.g., Big Creek), which is then used by an offsite receptor for human and animal drinking water as well as irrigation. Water use by receptors from a surface water body resulted in higher doses to the offsite receptors than from doses due to well water use. Therefore, for the offsite receptors, the water use was assumed to be from the surface water body.

3.5 ENVIRONMENTAL PATHWAYS

The CSM (Figure 3-2) shows the processes that control DU transport and migration from soil to groundwater, surface water, and different biotic receptors. Figure 3-4 shows specific environmental pathways from DU source to humans. Exposure can occur through external radiation; by inhalation of respirable, airborne, DU-containing dust; by ingestion of DU via the human food chain; and from drinking water.

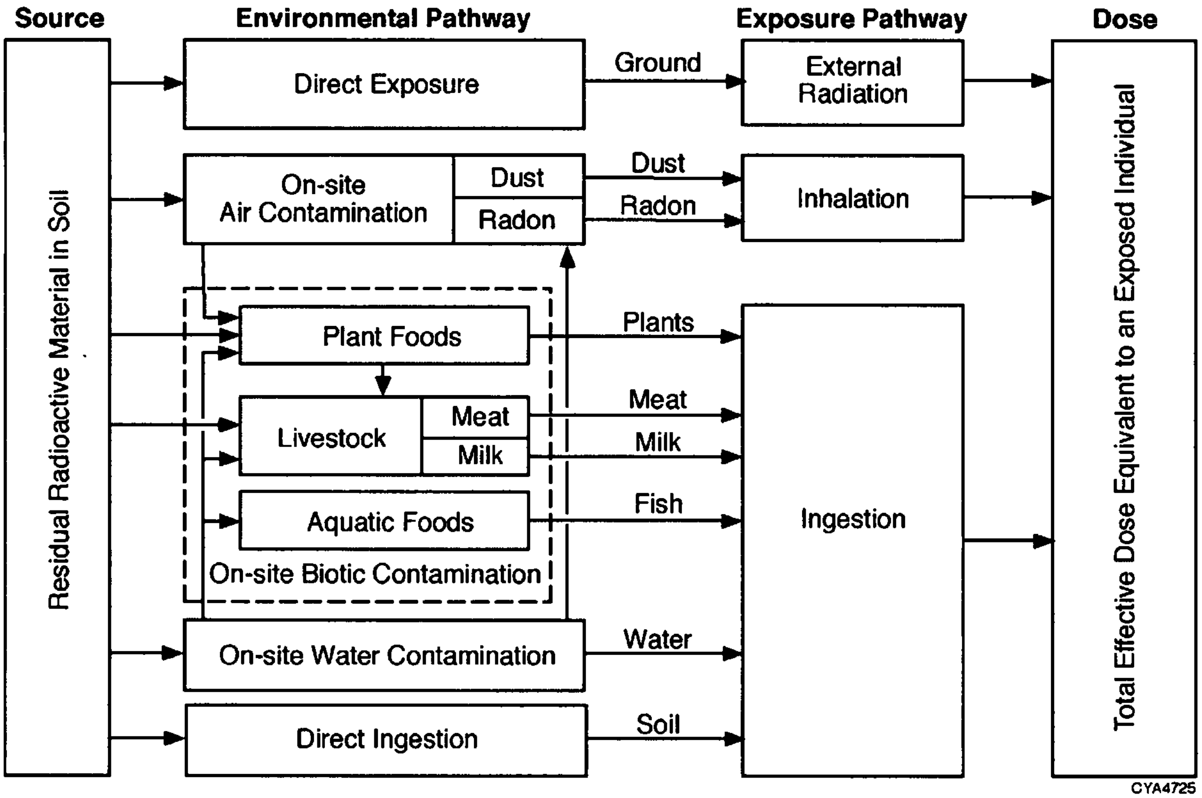


Figure 3-4. Schematic Diagram of RESRAD Program Illustration of Environmental Exposure Pathways

Direct exposure results from radiation received via residual DU in the soil as the uranium isotopes and daughter products decay to stable isotopes (Schleien 1992). Much of the radiation is absorbed by soil minerals, soil water, and within the media through which the decay products travel. The small fraction of radiation that reaches human receptors can be absorbed by the body and results in external and/or internal doses to humans. Inhalation of DU can occur when DU-containing soil becomes airborne and is of a particle size such that it can be taken into the lungs of a receptor. For this environmental pathway to be effective, the receptors also must be close enough to the contaminated zone during the time when DU-containing dust is airborne. In addition, as the dose is proportional to the distance from the source, the larger dose is expected from onsite exposure than from offsite exposure. As such, although both external exposure and exposure from inhalation affect onsite and offsite receptors, the magnitude of such exposures depends on the time spent at the source area and the distance from the source area. As such, onsite receptors will tend to be more affected than offsite receptors by these pathways.

Ingestion of DU can occur through a variety of environmental pathways (Figure 3-4). Uptake by plants through roots and foliar deposition are the main mechanisms of transfer to plant material. Contaminated plants can be eaten by wildlife (e.g., deer, turkey) or fed to livestock as fodder, then

beef/wildlife, poultry, or dairy products can be consumed by humans. In addition, contaminated plants, such as vegetables from a summer garden or from a subsistence farm, can be directly consumed by humans. Thus, the DU source-plant-livestock/wildlife-human and DU source-plant-human pathways are important to consider in dose estimates. These pathways are particularly important to the farming and domestic scenario described below.

Soil ingestion also can be a significant environmental pathway with regard to dose estimates. Humans can be exposed by this pathway directly by incidental ingestion of DU-containing soil on vegetables or other food products that contact contaminated soil. Indirectly, contaminated soil can be ingested by livestock/wildlife and passed to humans via poultry, beef, deer, turkey, and dairy product consumption. Because of the potentially large contribution to total dose from direct and indirect soil ingestion, these pathways are modeled below.

Contamination of drinking water by DU leaching through soil to aquifers is an environmental pathway that could affect offsite and onsite humans for considerable periods. DU transport by physical means, such as erosion of soils accompanied by their movement downstream and subsequent deposition, is another pathway considered. Dissolution of DU and its transport via water through soil to aquifers used for irrigation, drinking water, or both, also is considered. Dose from this pathway could show up early in the dose estimations or many years in the future depending on the hydrologic characteristics of the soils of the contaminated zone and underlying geology. The contaminated groundwater direct pathways include ingestion of water by humans as well as ingestion of water by livestock and wildlife, and the transfer of DU to humans through beef, deer, turkey, poultry, and dairy products. Both types of environmental pathways are included in the dose modeling below. While the drinking water pathway is included in the dose modeling, the poor quality of water from shallow groundwater wells was not considered. Some data (Rust 1994, 1998) indicate that the quality of water is below drinking water standards because of sediment or other contaminants not related to DU, and these low-quality waters occur at the depths included in the modeling. Low-quality water would mean that deeper wells are required, and this would also decrease the amount of DU in drinking water and decrease the potential dose to receptors at JPG. Due to the low production of groundwater wells at JPG and their slow recovery, deeper wells would also be necessary to generate a potential usable quantity of drinking water.

Surface water also can be exposed to erosion such that the water is contaminated by DU. Such potentially contaminated groundwater may then be subject to transport downstream where it may flow into ponds or other downstream water bodies that are used by humans. Contaminated surface water can enter the human food chain indirectly as livestock/wildlife drinking water or directly through the drinking water supply as discussed above for groundwater. In addition, fish raised in ponds that contain contaminated water represent an additional pathway to humans. The DU to surface water to fish to human pathway also is included in the dose modeling presented below.

The drinking water at JPG is obtained from the city of Madison Municipal Supply Systems and the Canaan Deposits in the Ohio River Valley, approximately 5 mi (8 km) from JPG (MWH 2002). Surface water is not used as a domestic drinking water supply in the vicinity of JPG. Rather, its primary use is for recreation and livestock watering (MWH 2002). The groundwater under JPG generally is of poor quality and low yield, thus it is not used for drinking purposes or for other purposes in any significant capacity.

Environmental pathways for onsite and offsite receptors differ mainly in the source term that is used for the assessment. Onsite receptors are assumed to be in proximity to the contaminated zone, either occasionally as hikers, hunters, or fisherman, or daily as resident farmers. Offsite receptors are exposed to similar environmental pathways as onsite receptors, but because the source term has been reduced by transport processes (Figures 3-2 and 3-4), the magnitude of the expected doses will be proportionally less. Thus, the amount of DU contamination in the external, inhalation, and ingestion pathways would be considerably less than would be encountered for the same pathways for onsite exposures.

3.6 CRITICAL GROUPS

The various human receptors previously mentioned depend on exposure of the average member of the hypothetical critical group. For this report, the critical group is defined as a group of individuals that is expected to receive the largest exposure to DU within the DU Impact Area. The average member of that group is a person expected to receive the dose from an ordinary use of the site based on the exposure scenario. Since each scenario presented is different and the critical group for a particular scenario varies accordingly, a more specific average member of the critical group is given in the scenario descriptions. For example, the average member of the critical group might be an individual worker who spends half of his or her work days onsite and the other half inside a building, or the average member of the critical group might be the farmer who is involved in the daily operations of a working subsistence farm located within the contaminated zone. Each critical group, then, is defined for each scenario, and the average member, to which the dose estimates apply, is specified in the description tables. Based upon dose assessment results, the critical group when institutional controls remain in place is the Industrial Worker working on JPG (i.e., FWS worker) and the critical group with loss of institutional controls is the subsistence farmer.

3.7 EXPOSURE SCENARIOS FOR JPG DOSE ESTIMATES

The risk of adverse effects to human health from inhalation, ingestion, or external radiation from residual DU depends on credible exposure scenarios from the DU source through the environment to human receptors. Several potential exposure scenarios were considered, and from these a subset was developed to simulate the most reasonable exposures of humans using the lands surrounding and affected by the DU firing at JPG. Two sets of scenarios are presented: 1) those in effect while institutional controls are in place (Section 3.7.1), and 2) those in effect if institutional controls fail (Section 3.7.2). Two radiation dose limits are also in effect for these types of scenarios: 25 mrem/y is imposed in 10 CFR 20.1403 when institutional controls are in place (Scenario 1), whereas the dose limit is 100 mrem/y if institutional controls fail (Scenario 2). These dose limits do not replace the ALARA (i.e., that radiation exposure will be kept ALARA and will be no more than the specified dose limit). Potential exposure scenarios are listed in Table 3-1 (institutional controls in place) and Table 3-3 (institutional controls failed), and each is considered for inclusion in the set of scenarios selected for analysis.

3.7.1 Exposure When Institutional Controls Are in Effect

Institutional controls are methods to restrict access to specific areas. Physical controls planned for JPG consist of a high-security, 8-ft-high, chain link fence with "No Trespassing" signs and topped with barbed wire around the perimeter of the facility north of the former firing line encompassing all of the approximate 50,950 ac (206 km^2); and locked gates on the perimeter fence. In addition to these physical controls, no trespassing signs on the perimeter fencing identify the area as access controlled/restricted area U.S. government property laden with UXO, and administrative access controls will be maintained and enforced by FWS personnel in charge of the Big Oaks NWR, INANG in accordance with the MOA (U.S. Army 2000), and the continued Army ownership of the JPG property north of the firing line. Physical controls will minimize the amount of contact the general public has with JPG lands, whereas the administrative controls will provide the forum needed to address safety and health issues related to site use. The scenarios described below are consistent with this concept of institutional controls at JPG.

The main characteristics of the exposure scenarios when institutional controls are in place are that exposures are limited because site use and site access are limited. Based on the nature and duration of potential exposures, it was determined that FWS employees supporting the national wildlife refuge and members of the public entering JPG for recreational purposes (e.g., hunting and bird watching) were two potential critical groups. Given limited access beyond the site boundary (i.e., the fence that encloses the

Table 3-3. Potential Exposure Scenarios Following Loss of Institutional Control Jefferson Proving Ground, Madison, Indiana

Scenario Number	Scenario Name	Description and Critical Group Identification	Exposure Pathways	Analyzed in DP?	Justification If Not Analyzed
1	Resident Farmer, Without Irrigation[a]	Critical group is a family who moves onto site after institutional controls fail. They construct a home onsite and raise crops and livestock for family consumption. This scenario represents the maximum likely exposure to the person outside the most, often tending the farm.	_External exposure:_ DU in soil. _Inhalation:_ DU-containing dust. _Ingestion:_ 1) Crops, meat, and milk from livestock raised on DU contaminated soil; 2) fish from stream or pond contaminated by DU leaching through soil; 3) incidental ingestion of DU-contaminated soil; and 4) drinking water that contains DU.	No	Bounded by Scenario #2 (Table 3-3).
2	Resident Farmer, With Irrigation[a,b]	Scenario is same as #1, but the crops require irrigation.	_External exposure:_ DU in soil. _Inhalation:_ DU-containing dust _Ingestion:_ 1) Crops, meat, and milk from livestock raised on DU contaminated soil; 2) fish from stream or pond contaminated by DU leaching through soil; 3) incidental ingestion of DU-contaminated soil; 4) drinking water that contains DU; and 5) crops, meat, and milk depend on contaminated irrigation water.	Yes	
3	Onsite Hunter	People who spend a limited amount of time onsite for hunting. Hunting period is two 1-week periods per year, and game consumed replaces 50 percent of dietary meat each year. Game is either deer or turkey. Assume hunting occurs in DU Impact Area.	_External exposure:_ DU in soil. _Inhalation:_ DU-containing dust. _Ingestion:_ 1) Consumption (offsite) of game animals obtained from contaminated area; 2) incidental ingestion of DU-containing soil; and 3) no pathways from drinking water, crops, or livestock.	No	Exposure identical with Scenario #2 (Table 3-1). Bounded by Scenario #8 (Table 3-3).
4	Onsite Fisherman	People who spend a limited amount of time onsite for fishing. Fishing period is 32 hours per month (4 days) for three months, or 12 days total. Fish taken onsite will replace all dietary fish. Assumes fishing occurs in DU Impact Area,	_External exposure:_ DU in soil. _Inhalation:_ DU-containing dust _Ingestion:_ 1) Consumption (offsite) of fish obtained from contaminated stream or pond; 2) incidental ingestion of DU-containing soil; and 3) no pathways from drinking water, crops, or livestock.	No	Exposure identical with Scenario 2 (Table 3-1). Bounded by Scenario #8 (Table 3-3).

Table 3-3. Potential Exposure Scenarios Following Loss of Institutional Control Jefferson Proving Ground, Madison, Indiana (Continued)

Scenario Number	Scenario Name	Description and Critical Group Identification	Exposure Pathways	Analyzed in DP?	Justification If Not Analyzed
5	Domestic[a]	Critical group lives in houses within DU Impact Area and grows vegetables for home consumption in summers. Water from well located at DU-contaminated area boundary.	*External exposure:* DU in soil. *Inhalation:* DU-containing dust. *Ingestion:* 1) Consumption of fish obtained from contaminated stream or pond, 2) incidental ingestion of DU-containing soil, 3) drinking water and vegetables, and 4) no pathway from livestock.	No	Bounded by Scenario #2 (Table 3-3).
6	Part-Time Domestic[a]	The critical group visits a home site periodically each year and lives in a cabin or vacation home up to 4 months each year. All food assumed uncontaminated and comes from offsite; drinking water from municipal source. Residents grow vegetables in small garden that is irrigated with water from a well at the site boundary or approximately 3.2 km (2.0 mi) from DU-contaminated area.	*External exposure:* DU in soil. *Inhalation:* DU-containing dust. *Ingestion:* 1) Incidental ingestion of DU-contaminated soil, and 2) irrigated vegetable crops in season.	No	Bounded by Scenario #2 (Table 3-3).
7	Onsite Industrial Worker	Critical group works outdoors (2,000 hours per year) in DU Impact Area in the PCZ. Scenario covers exposure to FWS personnel. Drinking water from municipal source.	*External exposure:* DU in soil deposited by floods. *Inhalation:* DU-containing dust blown in from JPG. *Ingestion:* Incidental ingestion of DU-contaminated soil deposited by floods.	Yes	
8	Onsite Sportsman/ Recreationalist	Critical group includes the onsite hunter, onsite fisherman, and onsite recreationist who spend the entire time available (i.e., each of the 103 days per year that the Big Oaks NWR is accessible to the public). Assume hunting, fishing, and all other activities occur in DU Impact Area in the PCZ.	*External exposure:* DU in soil. *Inhalation:* DU-containing dust. *Ingestion:* 1) Consumption (offsite) of game animals obtained from contaminated area, 2) incidental ingestion of DU-containing soil, 3) incidental ingestion of drinking water from surface water body, and 4) game animals drink water from surface water body and eat plants from DU Impact Area.	Yes	

[a] Scenario is unlikely because of significant risk of injury to farmer/resident from UXO.
[b] Irrigation of farms in southern Indiana is rare (U.S. Department of Agriculture Statistics) but is included in this scenario for completeness.
Note: Dose limit is 100 mrem/y.

DP = Decommissioning Plan
DU = Depleted Uranium
NWR = National Wildlife Refuge
FWS = U.S. Fish and Wildlife Service

area and remains under Army control), exposure scenarios were developed and are described below. These scenarios include:

- Periodic hunting of deer and/or turkey within the JPG-controlled area and then consuming these game animals
- Periodic fishing with consumption of the fish
- Exposure of hikers, bicyclists, bird watchers, and other participants in outdoor activities.

Deer and turkey hunting are currently allowed onsite twice each year, and a similar arrangement for fishing is not unreasonable. However fishing is only allowed in Old Timbers Lake (9 mi from the DU Impact Area) where the only potential exposure pathway is from windblown DU ingested by fish. Dose due to fish ingestion with controls in place would be indistinguishable from background and is therefore not a plausible pathway (e.g., dose from fish consumption by the offsite farmer less than 2 mi from the DU Impact Area [where fish are exposed to windblown DU and DU corrosion/dissolution products carried downstream in Big Creek] is less than 0.01 mrem/y). Exposures when institutional controls are in place could also include exposures to farmers and homeowners who live at the site boundary and are considered technically offsite.

The scenarios listed in Tables 3-1 and 3-3, while representative of a wide range of potential exposures, are somewhat repetitive. For example, Scenario 2 (Table 3-1) onsite hunter covers consumption of deer from the contaminated area, and Scenario 8 (Table 3-3) onsite sportsman/recreationalist covers consumption of deer from the contaminated area as well as consumption of fish from the contaminated area and external gamma while in the PCZ. In this case, Scenario 2 (Table 3-1) was eliminated from quantitative analysis in RESRAD-OFFSITE because the dose is already covered by Scenario 8 (Table 3-3).

The only scenario included for analysis in the RESRAD-OFFSITE simulations while institutional controls are in place is Scenario 4, offsite resident farmer. All other scenarios while institutional controls are in place were bounded by another scenario from Tables 3-1 or 3-3. Table 3-1 shows the potential exposures that could affect the critical group of each scenario and the environmental pathways by which these exposures could occur.

There are concerns about DU transport in the smoke that occurs during controlled burning at JPG and subsequent doses to receptors via this pathway. The RESRAD modeling program does not specifically address inhalation of DU-containing smoke as an environmental pathway. Nonetheless, such a pathway is approximated via the inhaled dust pathway and altering the mass loading for foliar deposition. This approach is accompanied by an increase in the uncertainty in the estimated doses. As a preface to such modifications and to evaluate if the added uncertainty was justified, technical literature relative to exposure to radionuclides (including DU in smoke from fires) was reviewed. There is some evidence that DU and other natural and anthropogenic radionuclides could transport considerable distances and result in small doses to receptors as a result of physical disturbances (Kerekes et al. 2001; Royal Society 2002a,b). Total radioactivity increased in smoke from fires related to battle (Royal Society 2002b), controlled burns, and wildfires (Williams et al. 1998; Johansen et al. 2001; Kraig et al. 2001a,b), but the increased radionuclide concentrations did not result in significant doses to receptors. For example, Kraig et al. (2001a,b) showed that estimated doses to firefighters at the scene of a fire that lasted several days was approximately 0.2 mrem, whereas to people away from the fire scene, the estimated dose was approximately 0.06 mrem. These small increases in doses to various receptors were dominated by naturally occurring radioactive materials such as uranium in soils and/or worldwide fallout (Kerekes et al. 2001, Kraig et al. 2001a, Royal Society 2002b). In addition, the NRC's Atomic Safety and Licensing Board (Docket 40-8838-MLA) found that potential radiation dose to the public from airborne contamination (including smoke from controlled burns of DU-contaminated areas) at JPG is minimal. While transport by smoke is a possible mechanism of DU transport, the small increase in expected dose to humans and the uncertainty introduced from modifications to the modeling program to account for this pathway do not justify including this pathway in the present dose assessment. Thus, dose from DU

transported by smoke during fires was not specifically evaluated; however, DU transport through the inhaled dust pathway was considered and should adequately include smoke from controlled burns of DU-contaminated areas as a source.

3.7.2 Scenarios: Loss of Institutional Controls

Loss of institutional control implies failure of physical and administrative access control to the JPG lands north of the former firing line. Site characteristics are such that the land could be farmed, developed, or used as habitat for wildlife or to support outdoor activities similar to those permitted at JPG, as previously discussed. However, even though institutional controls are assumed to fail, removal of UXO scattered throughout the JPG lands is not assumed. Thus, risks involved with using the JPG lands must include potential exposure to residual DU as well as potential injury and death from UXO-related encounters. The risks associated with exposure to DU have been estimated in this report, but those associated with UXO are beyond the scope of this work except as they apply to ALARA analyses.

Because of the presence of an estimated 1.5 million rounds of UXO at JPG, and given the cost and technical considerations involved with UXO removal, intense activities, such as farming or development for residential homes or industry, although plausible, are not likely future land uses. However, farming and development are considered as potential DU exposure pathways and are included in the tested scenarios. Transport of DU by groundwater, surface water, airborne dust, soil erosion, and uptake by plants and animals is similar to that previously discussed when institutional controls are in place. The main difference in the scenarios considered if institutional controls fail, besides probable exposure to UXO, is the proximity to the DU Impact Area where farming, residential development, or recreational use can take place. The farming scenarios described below assume that a resident farmer lives all year in a house built on the DU Impact Area in the PCZ and supports a family on produce and livestock onsite. Part-time residential scenarios assume that residents live part of the year in houses built on the DU Impact Area and grow vegetables during the summer (4 months) for consumption at home. Recreational uses of the lands are similar to those previously listed (Table 3-1) except that the DU Impact Area is accessible. In addition, as a conservative approach although highly implausible, a scenario was established for an industrial worker (e.g., FWS worker) who spends an entire work year (2,000 hours) outdoors on the DU Impact Area in the PCZ and a scenario was established for a sportsman/recreationalist (i.e., hunter/fisherman/recreationalist) who spends 103 days per year (i.e., the amount of time annually Big Oaks NWR is open to the public) on the DU Impact Area in the PCZ. The pathways for the FWS worker include external radiation, inhalation, and incidental soil ingestion. The pathways for the sportsman/member of the public include external radiation, inhalation, incidental soil and water ingestion, meat ingestion, and fish ingestion. These two scenarios were established because they bound many of the other scenarios (inclusive of both those with while institutional controls are in place and in the event of loss of institutional controls). The probabilistic peak of the mean TEDE complies with both with institutional controls in place and in the event of loss of institutional controls. As such, these scenarios are obviously compliant with the 25 and 100 mrem/y TEDE mandated in 10 CFR 20.1403 for restricted release. Table 3-3 lists the scenarios, potential exposure pathways, and if the scenario is included in dose estimates; or if not, why the scenario was eliminated from the dose estimates.

Scenarios selected for analysis when institutional controls fail are listed in Table 3-3. The scenarios included for RESRAD-OFFSITE analysis because they represent potential exposure to humans under scenarios not included when institutional controls are in place consisted of the resident farmer with irrigated crops, the conservative FWS worker, and the conservative sportsman/member of the public (Scenarios 2, 7, and 8, respectively [Table 3-3]).

Developing the entire list of scenarios, then screening the list for the unique cases, simplified the RESRAD-OFFSITE modeling process considerably. In addition, applying the RESRAD-OFFSITE probabilistic approach provided an upper bound of potential exposure for the two dose limits so that release of the JPG site for restricted use can be evaluated.

3.8 METHODOLOGY

In this section, the methodology is discussed. Sections 3.8.1 through 3.8.3 address RESRAD-OFFSITE codes and applications, general and scenario-specific parameter values, and common properties.

3.8.1 RESRAD Codes and Applications

RESRAD-OFFSITE has been selected as the tool to model environmental transport of DU contaminants, radiological decay and ingrowth of decay products, direct and indirect exposure pathways, and the estimated radiological dose to potential human receptors. RESRAD-OFFSITE is an extension of the RESRAD code, including the addition of a three-dimensional groundwater flow and radionuclide transport model, the Gaussian plume model for atmospheric dispersion, and the deposition model used to estimate the accumulation of radionuclides in offsite locations and in food (Yu et al. 2007). The offsite code includes deterministic and probabilistic modules and associated default input parameters.

The RESRAD-OFFSITE code is a computer code that evaluates the radiological dose and excess cancer risk to an individual who is exposed while residing and/or working in or near an area where the soil is contaminated by radionuclides. It is an extension of the RESRAD (onsite) code, which was originally designed for evaluation of radiological doses to an onsite receptor. The RESRAD-OFFSITE code couples an atmospheric dispersion model, groundwater transport model, and offsite accumulation model with the RESRAD (onsite) code to permit calculation of doses to persons located beyond the boundary of the contaminated site. It calculates radiation dose to a chronically exposed onsite/offsite resident for different land use and exposure scenarios. The code focuses on radioactive contaminants in soil and their transport in air, water, and biological media to a single receptor. Nine exposure pathways are considered in RESRAD-OFFSITE: direct exposure; inhalation of particulates and radon; and ingestion of plant foods, meat, milk, aquatic foods, water, and soil. RESRAD-OFFSITE uses a pathway analysis approach in which the concentrations in environmental media that connect the source to the receptor are computed at a series of times. These concentrations are used to compute the TEDE. Radiation doses, soil guidelines, and media concentrations of radionuclides are calculated at a series of user-specified times. The source is adjusted over time to account for radioactive decay and ingrowth, leaching, erosion, and mixing. The user can construct exposure scenarios based on exposure pathways and input parameters.

RESRAD-OFFSITE version 2.6 (Yu 2010) was used to simulate exposure to receptors at sites located both inside and outside the area of institutional control. RESRAD-OFFSITE simulates exposures by the same types of environmental pathways as in RESRAD, but transport from the source term and distance from the contaminated area are factored in for exposures to receptors located outside the contaminated zone.

RESRAD-OFFSITE simulates transport of DU (or other radionuclides) through soils and air to various crops and plants for use by a farmer, to groundwater or a surface water body used for drinking, and can account for external exposure of receptors (Figure 3-4). The program requires input concentrations of radionuclides in the soil of the affected area. The soil concentration of DU, or source term, is assumed to be uniformly distributed over a defined affected area and is diminished only by radioactive decay; leaching; wind and water erosion; and uptake from soils, water, and air. The leaching model depends on several soil properties, including permeability, texture, and the distribution coefficient between soluble (i.e., mobile) DU and insoluble DU that remains in the soil and is not leached. Groundwater flow depends on the permeability of the geologic strata through which it flows as well as the structure of the underlying bedrock. The depth through which the DU migrates depends, again, on the underlying geologic formations and the depth of the water table. In general, DU and other contaminants evaluated using RESRAD-OFFSITE move more quickly in saturated, porous materials that are relatively thin in depth, whereas transport is slowed when the materials are less porous, deeper, react with the contaminant, or a combination of these factors.

3.8.2 Parameter Values for RESRAD-OFFSITE Simulations

The RESRAD-OFFSITE program requires values for more than 200 parameters to simulate contaminant flow from the source through the unsaturated and saturated media to groundwater or surface water. A general set of default parameters is built into RESRAD-OFFSITE (Yu et al. 2007, NRC 1998) based on "average" agricultural characteristics reported in the technical literature, or on accepted default values (e.g., NRC 1998). For this dose assessment, parameter inputs are selected based on a hierarchy to maximize use of site-specific data. The hierarchy for dose modeling input parameter value selection is as follows:

- Empirical site-specific data (e.g., from Final Phase 2 RI (MWH 2002), Well Location Construction Report [SAIC 2007b], etc.)
- Literature values based on site-specific conditions (e.g., density and porosity for silt loam [loess] from U.S. Nuclear Regulatory Commission Regulation [NUREG]/CR-6697 tables, Carsel and Parrish, 1988, etc.)
- Calculated values from data presented in NUREG/CR-6697 and NUREG/CR-6937
- Most likely or expected values from NUREG/CR-6697 and NUREG/CR-6937
- Literature values and professional judgment (e.g., sportsman's onsite occupancy).

When site-specific or literature-based inputs are not available, RESRAD-OFFSITE probabilistic defaults are used as defined in NUREG/CR-6937 and NUREG/CR-6697, though most often as deterministic inputs. This is accomplished by selecting, from the default distributions, the mean or most likely values. A simple example is the soil ingestion rate, represented as a triangular distribution with a most likely value of 18.3 g/y (this rate is entered as a deterministic parameter given a site-specific rate is not available). This approach is consistent with NRC guidance and with the objective of the probabilistic module: to produce results based on the most probable rather than the most conservative exposure conditions. In many cases, the default deterministic value is identical to the probabilistic most likely or mean value. The default probabilistic parameter is sometimes represented as a non–site-specific continuous distribution. In these cases, the "expected value" is calculated and entered as a deterministic value. An example is the outdoor fraction described in terms of a cumulative frequency in NUREG/CR-6937 (ANL 2000) Appendix B. Calculated expected values typically fall in the 75th to 90th percentile range. The overall objective in selecting deterministic most likely and expected values is to represent the "average member of the critical group" as described in the *Consolidated Decommissioning Guidance* (NRC 2006). Where receptor- or medium-specific defaults are unavailable, USEPA's *Exposure Factors Handbook* (USEPA 2011) and Argonne National Laboratory's (ANL's) *Data Collection Handbook* (ANL 1993) serve as the primary resources.

In some cases, NUREG guidance does not provide receptor-specific information that matches the CSM. In these cases, the input is defined based on professional judgment. An example is the sportsman's onsite occupancy and game meat consumption rate. The proposed occupancy is based on the total time a member of the public has access to Big Oaks NWR on an annual basis (e.g., 103 days, including squirrel hunting, 14 days for deer hunting, and 12 days for turkey hunting), and the consumption rate is defined assuming the hunter eats 100 lb of meat per year [e.g., two 50-lb (average-sized) deer or a combination of deer, turkey, and squirrel]. Table 3-3 presents additional supporting details.

3.8.3 Sensitive Parameter Analysis and Probabilistic Distributions

In dose modeling, the sensitivity analysis is conducted to identify input parameters that can have a significant impact on dose. These parameters are defined in NUREG/CR-6697 (ANL 2000) Appendix B, Table 4.2 as Priority 1 (most sensitive) and Priority 2 (medium sensitivity). The least sensitive (Priority 3) parameters are not considered in this sensitivity analysis. The RESRAD-OFFSITE authors

have not yet addressed the sensitivity of RESRAD-OFFSITE parameters, though the air dispersion portion of the model is considered, at least qualitatively, in the following subsection.

For JPG dose modeling, quantitative sensitivity analyses were limited to parameters for which there are actual site-specific data. That is, the sensitivities of parameters described by default or general literature-based inputs are generally less relevant than parameters definable by site-specific inputs. For example, the "depth of roots" and "transfer factors for plants" are Priority 1 parameters, although there are no site-specific data especially for a *hypothetical* farming scenario. That is, the default value will be used whether or not the sensitivity analysis demonstrates it to be more or less sensitive than other parameters. Of the ten Priority 1 parameters listed in NUREG/CR-6697 (ANL 2000) Appendix B, Table 4.2, seven had site-specific data. These seven parameters include distribution coefficient, density of contaminated zone, density of saturated zone, saturated zone total porosity, saturated zone effective porosity, saturated zone hydraulic conductivity, and unsaturated zone thickness. In addition, one Priority 2 parameter (thickness of contaminated zone) was selected for the sensitivity analysis.

The sensitivity analysis was conducted to determine the impact of site-specific data on the TEDE. For each site-specific parameter, the evaluation identified upper and lower values as listed in NUREG/CR-6697 tables, Carsel and Parrish (1998), or the JPG Well Location Selection Report (SAIC 2007b). The RESRAD sensitivity utility then was used to calculate the sensitivity index (SI) for the site-specific Priority 1 and 2 parameters identified above.

The utility operates by reducing and increasing the selected input parameter by a common factor. The dose was calculated for each perturbed parameter value keeping all other parameter values the same. The output, including dose with the parameter unperturbed, dose with parameter reduced, and dose with parameter increased, was graphically displayed with time as the independent variable. The SI was calculated at the year when the maximum dose occurred by using the following formula:

$$SI = 1 - (f(p)_{min} / f(p)_{max})$$

Where: f(p) is the maximum dose associated with the upper and lower parameter values.

A positive value of the SI indicates that the dose is directly proportional to the parameter of interest, whereas a negative value indicates the dose is inversely proportional to the parameter of interest. A value less than 0.01 indicates that the dose is independent of the parameter. The further the value of SI is from zero (0), the more sensitive the parameter is. For a value of 0.01 to 0.15, the parameter was considered moderately sensitive, and for values greater than 0.15, the parameter was considered highly sensitive.

During the sensitivity analyses, the common factor was selected in such a way that the maximum and minimum value related to the parameter included the upper and/or lower value associated with the parameter. For parameters for which there is no upper and lower value available, a common factor of two was used. The results of the sensitivity analysis are summarized in Table 3-4.

Table 3-4. SIs for Site-Specific Parameters
Jefferson Proving Ground, Madison, Indiana

Parameter	Units	Limit	Value	Dose	SI	Additional Comments
Thickness of contaminated zone	m	Upper	2	16.5	0.36	Highly sensitive[a]
		Lower	0.5	10.5		
Unsaturated zone thicknesses	m	Upper	2.6	14	0	Not sensitive
		Lower	0.65	14		
Density of contaminated zone	g/cm^3	Upper	2.2	14	0	Not sensitive
		Lower	1.0	14		
Distribution coefficient (contaminated zone)	cm^3/g	Upper	708	14	0	Not sensitive
		Lower	177	14		
Distribution coefficient (unsaturated zone 1)	cm^3/g	Upper	4,332	14	0	Not sensitive
		Lower	1,058	14		

Table 3-4. SIs for Site-Specific Parameters
Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Units	Limit	Value	Dose	SI	Additional Comments
Distribution coefficient (unsaturated zone 2)	cm^3/g	Upper	2,052	14	0	Not sensitive
		Lower	513	14		
Saturated zone total porosity	–	Upper	0.2	14	0	Not sensitive
		Lower	0.05	14		
Saturated zone effective porosity	–	Upper	0.05	14	0	Not sensitive
		Lower	0.013	14		
Saturated zone hydraulic conductivity	m/y	Upper	172.2	14	0	Not sensitive
		Lower	43.1	14		
Density of saturated zone	g/cm^3	Upper	3.8	14	0	Not sensitive
		Lower	1.7	14		

[a] Unlike in the dose calculations presented in Section 3.10, in the sensitivity calculations, the uranium concentration was not correlated with the contaminated zone thickness, but remained constant. Therefore, the radionuclide inventory in the soil increased as the contaminated zone thickness increased.

The results of the sensitivity analyses demonstrate that the thickness of the contaminated zone is the most sensitive parameter affecting the total dose. The results also indicate that the other physical site parameters are not sensitive in their effects on the total dose.

It should be noted that the radionuclide concentration and contaminated zone thickness were not correlated in the sensitivity analysis. Thus, increasing the contaminated zone thickness increased the total radionuclide inventory in the soil. This likely accounted for the direct relationship between contaminated zone thickness and calculated dose. Had the contaminated zone thickness and radionuclide concentration been inversely correlated, as in the dose analysis discussed in the remainder of this appendix, it is likely that the dose would have remained nearly the same or decreased as the contaminated zone thickness was increased (and the radionuclide concentration decreased).

As the thickness of the contaminated zone is the most sensitive parameter and the source term concentration is highly dependent on the contaminated zone thickness and other parameters (Section 3.4.2) such as hydraulic conductivity and distribution coefficient, the parameters selected for probabilistic analysis included the following:

- Contaminated zone thickness
- Unsaturated zone thickness
- Concentration of U-234
- Concentration of Uranium-235 (U-235)
- Concentration of U-238
- Contaminated zone and unsaturated zone distribution coefficients
- Contaminated zone and unsaturated zone hydraulic conductivity.

In a letter to NRC (U.S. Army 2005), the Army identified four parameters for which site-specific data would enhance the accuracy and reliability of the dose assessment model. These four parameters were:

- Extent and concentration of DU
- Thickness of the contaminated zone
- Distribution coefficient
- Solubility and dissolution rates of DU penetrators.

A penetrator distribution study (U.S. Army 2013a, Appendix C) was conducted to determine the extent and concentration of DU penetrators. A penetrator corrosion study was conducted to determine the

corrosion, solubility, and dissolution rates of DU penetrators (U.S. Army 2013a, Appendix C). A distribution coefficient (K_d) study was conducted to more accurately determine how DU penetrator corrosion products transport through site-specific soil types (U.S. Army 2013a, Appendix D). The results of these studies were used in establishing the probabilistic distribution ranges. These ranges and the rationale used to determine them are listed in Table 3-5.

3.9 SENSITIVITY AND UNCERTAINTY ANALYSES

Uncertainty analysis is a means by which the distribution of output values is estimated (i.e., the degree of error in estimated values is established). Uncertainty analysis uses distributions of parameter values for each parameter in the analysis. A value for each parameter is selected at random from the distribution and the dose is calculated for that set of parameter values; then the process is reiterated. Value selection can either be completely at random from the distribution, or selected at random from individual segments of the entire distribution. The latter method is the Latin hypercube sampling method (McKay, Conover, and Beckman 1979; Inman, Helton, and Campbell 1981; Helton and Inman 1982) and forces sampling of the tails of the parameter distribution. This method tends to increase the mean value of the distribution and ensures that the largest and smallest values of a distribution are included in the analysis. Three hundred iterations of the model are run during an uncertainty analysis, so each distribution is sampled 300 times (i.e., 3 repetitions of each of 100 observations) (Yu et al. 1993; Yu et al. 2001, Attachment M; Kamboj et al. 2000; LePoire et al. 2000). In this way, a set of 300 output values is derived that can be described statistically. For all PCZ model runs, 100 observations and 3 repetitions were selected. The number of repetitions is the number of times the analysis needs to be repeated to obtain a measure of the accuracy of the probabilistic predictions (Yu et al. 2007). The repeated results of the primary contamination model run for the residential farmer scenario with loss of institutional controls showed that the three repetitions produced results with a high degree of precision given that they were within 0.16 percent. Given the high degree of precision, all SCZ model runs used the smallest number of observations allowed by RESRAD-OFFSITE (i.e., 37 observations and 1 repetition) in uncertainty analysis modeling.

Uncertainty analysis using all of the parameters in the RESRAD model for each scenario is a large task that is extremely inefficient given that the contributions of all of the parameters would be included for each estimated dose for each scenario. However, the set of parameters to include in the analysis can be refined by using the information from the sensitivity analysis above. Using the sensitivity information, the thicknesses of the contaminated zone and unsaturated zones; the distribution coefficients for the contaminated zone and unsaturated zones; the hydraulic conductivity of the contaminated zone and unsaturated zones; and the concentrations of U-234, U-235, and U-238 were incorporated into the uncertainty analysis.

Selecting probability distributions for the parameters used for the uncertainty analysis was relatively difficult and is the source of uncertainty in the analysis. Clearly, variation in source term concentrations, area of the contaminated zone, and depth of the contamination are directly related to the input values: an increase in one results in a proportional increase in the estimated dose. Instead of including a distribution for the area of the contaminated zone, a set area of 25 by 1,000 m was used for the PCZ. This area represents the area within the DU Impact Area with the highest concentration of DU penetrators as determined by the DU distribution study, which also established a DU mass associated with the area. In addition, an SCZ was established with an area of 800 by 2,500 m with one-half of the zone adjacent to the east of the PCZ and the other half adjacent to the west side. For the dose assessment, the SCZ was reduced in size from approximately 4,000 to 494 ac but contained the same mass of DU. The area of the smaller yet conservative SCZ is based on a width between the J line of fire trench and the K5 line of fire trench. The length of the SCZ, 2,500 m, is based on the results of the radiological survey (SEG 1995, 1996a,b). This width and length ensure the SCZ area contains the majority of the areas where increased DU soil concentrations are suspected based upon the radiological survey (SEG 1995, 1996a,b). This area conservatively contains the remainder of the source term mass as it is a much smaller area and located closer to the receptor than the actual concentration of DU penetrators as determined by

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Exposure duration (y)	All	---	3.00E+01	Relevant for carcinogenic risk calculations
Basic radiation dose limit (mrem/y)	All	---	2.50E+01	Basic radiation dose limit per 10 CFR 20 with controls in place
	FMR/SPT	---	1.00E+02	Radiation dose limit for uncontrolled release of site
Initial Principal Radionuclide (pCi/g): Uranium Isotopes				
U-234	All (PCZ)	**23.2 to 77.2, uniform**	**23.2**	Calculated value (See Section 3.4.2), (-0.99) RCC to CZ thickness
	All (SCZ)	**1.3 to 4.3, uniform**	**1.3**	Calculated value (See Section 3.4.2), (-0.99) RCC to CZ thickness
U-235	All (PCZ)	**1.6 to 5.4, uniform**	**1.6**	Calculated value (See Section 3.4.2), (-0.99) RCC to CZ thickness
	All (SCZ)	**0.1 to 0.3, uniform**	**0.1**	Calculated value (See Section 3.4.2), (-0.99) RCC to CZ thickness
U-238	All (PCZ)	**124.9 to 416.4, uniform**	**124.9**	Calculated value (See Section 3.4.2), (-0.99) RCC to CZ thickness
	All (SCZ)	**6.9 to 22.9, uniform**	**6.9**	Calculated value (See Section 3.4.2), (-0.99) RCC to CZ thickness
Deposition velocity for uranium isotopes (m/s)	All	---	1.00E-03	Midpoint of default uniform distribution centered at value
Distribution Coefficients for Uranium Isotopes				
CZ (cm^3/g)	All	**354, 204, 189, 591, bounded normal**	**3.54E+02**	JPG K_d Study; 354 (mean), 204 (standard deviation), 189 (minimum), 591 (maximum) bounded normal distribution
UZ 1 (cm^3/g)	All	**2116, 410, normal**	**2.12E+03**	JPG K_d Study; 2,116 (mean), 410 (standard deviation) normal distribution
UZ 2 (cm^3/g)	All	**1026, 1018, 0.93, 4470, bounded normal**	**6.36E+00**	JPG K_d Study; 1,026 (mean), 1,018 (standard deviation), 0.93 (minimum), 4,470 (maximum) bounded normal distribution
SZ (cm^3/g)	All	---	**6.36E+00**	JPG K_d Study
Sediment in SWB (cm^3/g)	All	**2116, 410, normal**	**2.12E+03**	JPG K_d Study; 2,116 (mean), 410 (standard deviation) normal distribution

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Agricultural areas 1-4 (cm³/g)	All	**354, 204, 189, 591, bounded normal**	**3.54E+02**	JPG K_d Study; 354 (mean), 204 (standard deviation), 189 (minimum), 591 (maximum) bounded normal distribution
Offsite dwelling (cm³/g)	All	**354, 204, 189, 591, bounded normal**	**1.89E+02**	JPG K_d Study; 354 (mean), 204 (standard deviation), 189 (minimum), 591 (maximum) bounded normal distribution
Leach rate (1/y)	All	---	0.00E+00	Use distribution coefficient option
Solubility constant	All	---	0.00E+00	Use distribution coefficient option
Storage Times of Cont. Foodstuffs (Days)				
Surface water	FMR only	---	**1.00E+00**	Midpoint of default uniform distribution centered at value
Well water	FMR only	---	**1.00E+00**	Midpoint of default uniform distribution centered at value
Fruits, nonleafy vegetables, and grain	FMR only	---	**1.40E+01**	Midpoint of default uniform distribution centered at value
Leafy vegetables	FMR only	---	**1.00E+00**	Midpoint of default uniform distribution centered at value
Livestock feed – pasture or silage	FMR only	---	**1.00E+00**	Midpoint of default uniform distribution centered at value
Livestock feed – grain	FMR only	---	**4.50E+01**	Midpoint of default uniform distribution centered at value
Meat and poultry	FMR/SPT	---	**2.00E+01**	Midpoint of default uniform distribution centered at value
Milk	FMR only	---	**1.00E+00**	Midpoint of default uniform distribution centered at value
Fish	FMR/SPT	---	**7.00E+00**	Midpoint of default uniform distribution centered at value
Crustacea and mollusks	All	---	**7.00E+00**	Midpoint of default uniform distribution centered at value
Physical and Hydrological Parameters				
Precipitation (m/y)	All	---	**1.19E+00**	SAIC 2008d (Section 3.3.1) at 47 inches per year
Average annual wind speed (m/sec)	All	---	**4.30E+00**	RESRAD-OFFSITE calculated value based on meteorological Strategic Toxic Air Reduction (STAR) File for Indianapolis, Indiana
Contamination Zone and Cover Parameters				
Area of PCZ (m**2)	All	---	**2.50E+04**	DU trench is estimated to be approximately 1,000 by 25 m
Length parallel to aquifer flow (m)	All	---	8.00E+00	Conservative value selected to maximize groundwater concentration and ensure that volumetric groundwater flow rate under the CZ exceeds or meets the recharge volumetric rate through the CZ
Depth of soil mixing layer (m)	FMR	---	**1.50E-01**	Most probable value of default triangular distribution
	SPT/FWS	---	5.00E-02	Shallower depth (5 cm) assumed for nonagricultural scenarios
Deposition velocity of dust (m)	All	---	**1.00E-03**	Midpoint of default log uniform distribution – low dose dependence
Irrigation (m/y)	FMR only	---	**2.00E-01**	Midpoint of default uniform distribution spanning value

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Evapotranspiration coefficient of CZ	All	---	**5.60E-01**	SAIC (2008d) based on Thornewaite calculation (Section 3.3.1)
Runoff coefficient of CZ	All	---	**3.60E-01**	SAIC (2008d) from base flow data (16.7 in as surface water runoff or 36 percent of total 47 in of total precipitation; Section 3.3.3)
Rainfall erosion index	All	---	**2.15E+02**	EV from NUREG/CR-6937 Att. B Table 2.3-1 default
Slope-length-steepness factor of CZ	All	---	**6.10E-01**	EV from NUREG/CR-6937 Att. B Equations (2.5-3) and (2.5-4) using site-specific slope data • $LS=(\lambda/72.6)^m * (65.41\sin^2\theta + 4.56\sin\theta + 0.065)$ • λ = the field slope length (ft) =1,000 ft • m = 0.3 for slopes of 1 to 3 percent • θ = angle of slope = $\tan^{-1}$ (slope percent/100) = 1.83 • slope percent = 3.2% (JPG site-specific)
Cropping-management factor of prim. cont.	All	---	**1.94E-01**	EV from NUREG/CR-6937 Att. B Table 2.6-1 default
Conservation practice factor of prim. cont.	All	---	**9.70E-01**	EV from NUREG/CR-6937 Att. B Table 2.7-1 default
Thickness of CZ (m)	All	---	1.00E+00	Estimated conservative value based on distance contaminant travels before penetrator is completely corroded and entirely available for transport in the environment
	All	**0.3 - 1.0, uniform**		EV from NUREG/CR-6937 Section 3.2.1.10. Calculation based on distance contaminant will travel in soil over 100 years (time for complete corrosion of penetrator and dissolution of corrosion products) before 100 percent of the source term is available for transport in the environment using deterministic values for K_d, total porosity, and effective porosity and a probabilistic range for hydraulic conductivity. (Note: the maximum depth was limited to 1 m as a conservative approach).
CZ total porosity	All	---	**4.50E-01**	Carsel and Parrish (1998) and NUREG/CR-6697 Att. C Table 3.2-1 for silt loam (loess)
Computed erosion rate of CZ material (m/y)	All	---	1.23E-03	RESRAD-OFFSITE calculated value
Density of CZ (g/cm^3)	All	---	**1.46E+00**	NUREG/CR-6697 Att. C Table 3.1-1 for silt loam (loess)
Soil erodibility factor of CZ (tons/ac)	All	---	**3.26E-01**	EV from NUREG/CR-6937 Att. B Table 2.4-1 default
CZ field capacity	All	---	**3.00E-01**	Calculated per Meyer and Gee (1999)
CZ b parameter	All	---	**1.41E+00**	Carsel and Parrish (1998) for silt loam (loess)

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
CZ hydraulic conductivity (m/y)	All	---	**3.94E+01**	Carsel and Parrish (1998) – 39.42 m/y (mean)
		2.2 – 445, bounded lognormal-N		Carsel and Parrish (1998) – 39.42 m/y (mean), 107.75 m/y (standard deviation); SAIC (2007b) Well Location Selection Report – range of 2.2 to 445 m/y; (0.99) RCC to CZ thickness
Cover depth (m)	All	---	0.00E+00	No cover assumed for all receptors
Total porosity of the cover material	All	---	not used	No cover assumed for all receptors
Computed erosion rate of cover material (m/y)	All	---	not used	No cover assumed for all receptors
Density of cover material (g/cm^3)	All	---	not used	No cover assumed for all receptors
Soil erodibility factor of cover (tons/ac)	All	---	not used	No cover assumed for all receptors
Volumetric water content of the cover material	All	---	not used	No cover assumed for all receptors
Agricultural and Livestock Feed Growing Area Parameters				
Areal extent of agricultural Area 1 (m^2)	All	---	1.00E+03	Deterministic default used for hypothetical farm
Areal extent of agricultural Area 2 (m^2)	All	---	1.00E+03	Deterministic default used for hypothetical farm
Areal extent of agricultural Area 3 (m^2)	All	---	1.00E+04	Deterministic default used for hypothetical farm
Areal extent of agricultural Area 4 (m^2)	All	---	1.00E+04	Deterministic default used for hypothetical farm
Fraction of agricultural Areas 1-2 directly over the CZ	All	---	0 to 1	Fraction = 1 for onsite receptors; fraction = 0 for offsite receptors
Fraction of agricultural Areas 3-4 directly over the CZ	All	---	0	Fraction = 0 for offsite receptors
PCZ	All	---	**0.25**	Fraction for onsite receptors; 25% is on PCZ and 75% is on SCZ
SCZ	All	---	**0.75**	Fraction for onsite receptors; 25% is on PCZ and 75% is on SCZ
Irrigation applied per year for Areas 1-4 (m/y)	FMR only	---	**2.00E-01**	Midpoint of default uniform distribution spanning value
Evapotranspiration coefficient in agricultural Areas 1-4	All	---	**5.60E-01**	SAIC (2008d) based on Thornewaite calculation (Section 3.3.1)
Runoff coefficient in agricultural Areas 1-4	All	---	**3.60E-01**	SAIC (2008d) from base flow data (16.7 in as surface water runoff or 36 percent of total 47 in of total precipitation; Section 3.3.3)
Mixing depth/plow layer of agricultural Areas 1-4 (m)	FMR	---	**1.50E-01**	Most probable value per NUREG/CR-6697 Att. C Figure 3.12-1
	FWS/SPT	---	5.00E-02	Shallower depth (5 cm) assumed for nonfarming scenarios
Volumetric water content in agricultural Areas 1-4	All	---	**2.52E-01**	Mean from NUREG/CR-6937 Att. B Table 2.1-2 for silt loam
Dry bulk density of soil in agricultural Areas 1-4 (g/cm^3)	All	---	**1.46E+00**	NUREG/CR-6697 Att. C Table 3.1-1 for silt loam (loess)
Soil erodibility factor of agricultural Areas 1-4 (tons/ac)	All	---	**3.26E-01**	EV from NUREG/CR-6937 Att. B Table 2.4-1 default
Slope-length-steepness factor, agricultural Areas 1-4	All	---	**6.10E-01**	Site-specific calculation; see CZ slope-length-steepness factor
Cropping-management factor of agricultural Areas 1-4	All	---	**1.94E-01**	EV from NUREG/CR-6937 Att. B Table 2.6-1 default

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Conservation practice factor of agricultural Areas 1-4	All	---	**9.70E-01**	EV from NUREG/CR-6937 Att. B Table 2.7-1 default
Offsite Dwelling Area Parameters				
Irrigation applied per year for dwelling site (m/y)	All	---	**2.00E-01**	Midpoint of default uniform distribution spanning value
Evapotranspiration coefficient in dwelling offsite	All	---	**5.60E-01**	SAIC (2008d) based on Thornewaite calculation (Section 3.3.1)
Runoff coefficient in offsite dwelling site	All	---	**3.60E-01**	SAIC (2008d) from base flow data (16.7 in as surface water runoff or 36 percent of total 47 in of total precipitation; Section 3.3.3)
Mixing depth of offsite dwelling site (m)	All	---	5.00E-02	Shallower depth assumed (i.e., no agricultural at dwelling location)
Volumetric water content in offsite dwelling	All	---	**2.52E-01**	Mean from NUREG/CR-6937 Att. B Table 2.1-2 for silt loam
Dry bulk density of soil in offsite dwelling site (g/cm³)	All	---	**1.46E+00**	NUREG/CR-6697 Att. C Table 3.1-1 for silt loam (loess)
Soil erodibility factor of soil in dwelling site (tons/ac)	All	---	0.00E+00	Deterministic default assuming no significant erosion at dwelling site
Slope-length-steepness factor of dwelling site	All	---	**6.10E-01**	Site-specific calculation; see CZ Slope-length-steepness factor
Cropping-management factor of dwelling site	All	---	**1.94E-01**	EV from NUREG/CR-6937 Att. B Table 2.6-1 default
Conservation practice factor of offsite dwelling	All	---	**9.70E-01**	EV from NUREG/CR-6937 Att. B Table 2.7-1 default
Atmospheric Transport Parameters				
Dispersion coefficients; 1 = Pasquill-Gifford	All	---	1	Pasquill-Gifford best suited for ground-level releases (NUREG/CR-6937)
Population zone; 1 = rural	All	---	1	Assumed mostly open farmland or woodlands
Release height (m)	All	---	1.00E-01	Ground-level release; minimum value allowed by code
Heat flux for buoyant plume (cal/s)	All	---	0.00E+00	Ambient conditions assumed (source not heated producing plume rise)
Anemometer height (m)	All	---	**6.10E+00**	Indianapolis results based on 1990-1994 data: from http://www.in.gov/idem/programs/air/modeling/policy.html
Absolute temperature (Kelvin)	All	---	**2.87E+02**	Average temperature in the southern portion of the state per http://www.city-data.com/states/Indiana-Climate.html
AM atmospheric mixing height (m)	All	---	4.00E+02	Deterministic default; no site-specific data available
PM atmospheric mixing height (m)	All	---	1.60E+03	Deterministic default; no site-specific data available
Elevation of agricultural Areas 1-4 above PCZ	All	---	0.00E+00	Relatively flat terrain assumed
Elevation of dwelling site relative to PCZ	All	---	0.00E+00	Relatively flat terrain assumed
Elevation of SWB relative to PCZ	All	---	0.00E+00	Relatively flat terrain assumed
Spacing of points used for areal integration (m)	All	---	1.00E+01	Deterministic default; no site-specific data available
Stability class and wind direction (met) data	All	---	à	Use existing RESRAD-OFFSITE STAR file for Indianapolis, Indiana

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Joint Frequency Meteorological Data				
Upper limit for windspeed class 1 (m/s)	All	---	8.90E-01	Deterministic default; no site-specific data available
Upper limit for windspeed class 2 (m/s)	All	---	2.46E+00	Deterministic default; no site-specific data available
Upper limit for windspeed class 3 (m/s)	All	---	4.47E+00	Deterministic default; no site-specific data available
Upper limit for windspeed class 4 (m/s)	All	---	6.93E+00	Deterministic default; no site-specific data available
Upper limit for windspeed class 5 (m/s)	All	---	9.61E+00	Deterministic default; no site-specific data available
Upper limit for windspeed class 6 (m/s)	All	---	1.25E+01	Deterministic default; no site-specific data available
Fractional accuracy desired - convergence criteria	All	---	1.00E-03	Deterministic default; no site-specific data available
Unsaturated Zone Hydrology Parameters				
Number of main sub zones in SZ stratum	All	---	1	Progeny not significant factors for DU (see NUREG/CR-6937 pg A-67)
Number of main sub zones in each UZ stratum	All	---	1	Progeny not significant factors for DU (see NUREG/CR-6937 pg A-67)
Number of UZ strata	All	---	2	Glacial till and loess (SAIC 2008d)
UZ 1 thickness (m)	All	---	**1.30E+00**	Average loess thickness is 7.5 ft (2.3 m) (SAIC 2007b)
	All	1.3 - 2.0, uniform		Average loess thickness is 7.5 ft (2.3 m) (SAIC 2007b), CZ thickness + UZ 1 thickness = 2.3 m; 0.3 to 1 m - CZ thickness range; (-0.99) RCC to CZ thickness
UZ 2 thickness (m)	All	---	**1.05E+00**	SAIC (2007b, 2008d) reports for overburden; average depth to groundwater
UZ 1 soil density (g/cm^3)	All	---	**1.46E+00**	NUREG/CR-6697 Att. C Table 3.1-1 for silt loam (loess)
UZ 2 soil density (g/cm^3)	All	---	**1.51E+00**	NUREG/CR-6697 Att. C Table 3.1-1 for silty clay loam (till)
UZ 1 total porosity	All	---	**4.50E-01**	Carsel and Parrish (1998) and NUREG/CR-6697 Att. C Table 3.2-1 for silt loam (loess)
UZ 2 total porosity	All	---	**4.30E-01**	Carsel and Parrish (1998) and NUREG/CR-6697 Att. C Table 3.2-1 for silty clay loam (till)
UZ 1 effective porosity	All	---	**3.83E-01**	Carsel and Parrish (1998) and NUREG/CR-6697 Att. C Table 3.3-1 for silt loam (loess)
UZ 2 effective porosity	All	---	**3.42E-01**	Carsel and Parrish (1998) and NUREG/CR-6697 Att. C Table 3.3-1 for silty clay loam (till)
UZ 1 field capacity	All	---	**3.00E-01**	Calculated per Meyer and Gee (1999)
UZ 2 field capacity	All	---	**3.00E-01**	Calculated per Meyer and Gee (1999)

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
UZ 1 hydraulic conductivity (m/y)	All	---	**3.94E+01**	Carsel and Parrish (1998)
	All	**2.2 – 445, bounded lognormal-N**		Carsel and Parrish (1998) – 39.42 m/y (mean), 107.75 m/y (standard deviation); SAIC (2007b) Well Location Selection Report – range of 2.2 to 445 m/y; (-0.99) RCC to CZ thickness
UZ 2 hydraulic conductivity (m/y)	All	---	**3.94E+01**	Carsel and Parrish (1998)
UZ 1 soil-specific b parameter	All	---	**1.41E+00**	Carsel and Parrish (1998) for silt loam (loess)
UZ 2 soil-specific b parameter	All	---	**1.23E+00**	Carsel and Parrish (1998) for silt clay loam (overburden)
UZ 1 longitudinal dispersivity (m)	All	---	**1.68E-01**	Common rule of thumb – dispersivity is a function of migration distance, we discussed 1/20th of the distance so in our case we should have 11/20 or 0.55 ft or 0.167 m as the longitudinal dispersivity
UZ 2 longitudinal dispersivity (m)	All	---	**1.68E-01**	Common rule of thumb – dispersivity is a function of migration distance, we discussed 1/20th of the distance so in our case we should have 11/20 or 0.55 ft or 0.167 m as the longitudinal dispersivity
Saturated Zone Hydrology Parameters				
Thickness of SZ (m)	All	---	**1.54E+01**	Bottom of UZ to bottom of upper bedrock (avg. 50 ft bgs; SAIC 2008d)
Density of SZ (g/cm^3)	All	---	**2.50E+00**	WKU (2006) for limestone (shallow) bedrock in karst areas
SZ total porosity	All	---	**1.00E-01**	Wilson (2001) and Domenico and Schwartz (1990), avg for karst limestone
SZ effective porosity	All	---	**2.50E-02**	Domenico and Schwartz (1990), avg for karst limestone
SZ hydraulic conductivity (m/y)	All	---	**8.610E+01**	SAIC (2010), Slug Testing Report Section 3
SZ hydraulic gradient to well and SWB	All	---	**3.00E-03**	MWH (2002); pg 2-13
Depth of aquifer contributing to well and SWB (m)	All	---	**1.54E+01**	From bottom of UZ to bottom of upper bedrock (avg. 50 ft; SAIC 2008d)
Longitudinal dispersivity to well and SWB (m)	All	---	**4.20E+01**	EV from NUREG/CR-6937 Att. B Table 2.2-2 default
Lateral (horizontal) dispersivity to well and SWB (m)	All	---	**5.20E+00**	EV from NUREG/CR-6937 Att. B Table 2.2-3 default
Lateral (vertical) dispersivity to well and SWB (m)	All	---	**2.60E-01**	EV from NUREG/CR-6937 Att. B Table 2.2-4 default
Irrigation rate over aquifer to well (m/y)	All	---	not used	Disburse vertically option used; parameters not applicable unless "Do Not Disperse Vertically" option used
Irrigation rate over aquifer to SWB (m/y)	All	---	not used	
Evapotranspiration coefficient over aquifer to well	All	---	not used	
Evapotranspiration coefficient over aquifer to SWB	All	---	not used	
Runoff coefficient over aquifer to well	All	---	not used	
Runoff coefficient over aquifer to SWB	All	---	not used	

**Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations
Jefferson Proving Ground, Madison, Indiana (Continued)**

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Water Use Parameters				
Drinking water intake (L/y)	FMR	---	**5.10E+02**	Mean adult value per USEPA (1997); more than NUREG/CR-6697 recommended mean (probabilistic) rate of 409.5 L/y
	FWS	---	0	Current water supply is public water; FWS employee drinks public water supply or bottled water while in the CZ
	SPT	---	4.97E+00	Assumes incidental ingestion of 1 oz. (0.02957 L) SW per hour in CZ
Household use of water (L/day)	FMR only	---	**2.50E+02**	Rounded mean per capita value of lognormal distribution per NUREG/CR-6937 calculated as exp^5.51 (see Figure 5.1-1); consistent with values listed in Tables 5.1-1 and 5.1-2
Livestock water intake for meat (L/day)	FMR/SPT	---	**5.00E+01**	Midpoint of default uniform distribution spanning value
Livestock water intake for milk (L/day)	FMR only	---	**1.60E+02**	Midpoint of uniform distribution centered at value
Irrigation rate in agricultural Areas 1-4 (m/y)	FMR only	---	**2.00E-01**	Midpoint of default uniform distribution spanning value
Irrigation rate in offsite dwelling site (m/y)	FMR only	---	**2.00E-01**	Midpoint of default uniform distribution spanning value
Fraction of water from SW (all uses including irrigation)	All except FMR Offsite	---	1.00E+00	All water from groundwater well; drinking water pathway from well water resulted in higher dose than from surface water body
Fraction of drinking water from well water (all uses including irrigation)	FMR Offsite	---	1.00E+00	Drinking water pathway from surface water body resulted in higher dose than from well water
Well pumping rate (m^3/y)	FMR only	---	**5.121E+03**	RESRAD-OFFSITE calculated value to support specified use
Surface Water Body Parameters				
Sediment delivery ratio (PCZ)	All	---	1.00E+00	Estimate based on % of area where runoff goes to Big Creek
Sediment delivery ratio (SCZ)	All	---	1.00E+00	Estimate based on % of area where runoff goes to Big Creek
Volume of SWB (m^3)	All	---	7.5E+04	Estimated volume; assumes 3-m depth * area
Mean residence time of water in SWB (y)	All except FMR Offsite	---	**3.1E-03**	NUREG/CR-6697, App A, Section 4.2.1; value obtained by dividing the volume of the surface water body by the quantity of water that flows into it each year; annual flow = upgradient watershed area (14,100 ac or 5.7E+07 m^2) * annual rainfall (1.19 m) * runoff coefficient (0.36)
Mean residence time of water in SWB (y)	FMR Offsite	---	**2.2E-03**	NUREG/CR-6697, App A, Section 4.2.1; value obtained by dividing the volume of the surface water body by the quantity of water that flows into it each year; annual flow = upgradient watershed area (19,600 ac or 7.9E+07 m^2) * annual rainfall (1.19 m) * runoff coefficient (0.36)
Surface area of water in SWB (m^2)	All	---	2.5E+04	Estimated area if Big Creek were dammed; 50-m width by 500-m length
Ingestion Rate Parameters				

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Fish consumption (kg/y)	FMR/SPT	---	**2.92E+00**	Recommended mean for freshwater finfish at 8 g/day (USEPA 1997; pg 10-26)
Fraction of fish from affected area	FMR/SPT	---	**3.90E-01**	Most probable value per NUREG/CR-6697, Att. C, Figure 5.5-1
Other aquatic food consumption (kg/y)	All	---	0.00E+00	Only freshwater finfish considered in the aquatic food category
Fraction of aquatic food from affected area	All	---	0.00E+00	Only freshwater finfish considered in the aquatic food category
Non-leafy vegetables consumption (kg/y)	FMR only	---	**1.78E+02**	Most probable value per NUREG/CR-6697 Att. C, Figure 5.4-1
Fraction of nonleafy vegetable from affected area	FMR only	---	**5.00E-01**	Midpoint of default uniform distribution centered at value
Leafy vegetable consumption (kg/y)	FMR only	---	**1.40E+01**	Midpoint of default uniform distribution centered at value
Fraction of leafy vegetable from affected area	FMR only	---	**5.00E-01**	Midpoint of default uniform distribution centered at value
Meat consumption (kg/y)	FMR/SPT	---	**6.30E+01**	Midpoint of default uniform distribution centered at value
Fraction of meat from affected area	FMT	---	1.00E+00	Conservatively assumes all meat and poultry potentially impacted
	SPT	---	**7.20E-01**	Two 50-lb deer from impacted area; similar to testimony from Ridge (2007) suggesting 107 lb/y as worst-case value
	FWS	---	0.00E+00	Meat consumption only by farmer (livestock) and sportsmen (game)
Milk consumption (L/y)	FMR	---	**1.02E+02**	Most probable value per NUREG/CR-6697 Att. C, Figure 5.3-1
	SPT/FWS	---	0.00E+00	Site-impacted milk consumption assumed for farmer only
Fraction of milk from affected area	FMR	---	1.00E+00	Conservatively assumes all milk potentially impacted
	SPT/FWS	---	0.00E+00	Site-impacted milk consumption assumed for farmer only
Soil ingestion rate (g/y)	All	---	**1.83E+01**	Most probable value per NUREG/CR-6697 Att. C, Figure 5.6-1
Livestock Intake Parameters				
Water intake by livestock (L/y)	FRM/SPT	---	**5.00E+01**	Midpoint of default uniform distribution centered at value
Water intake by dairy cow (L/y)	FMR only	---	**1.60E+02**	Midpoint of default uniform distribution centered at value
Pasture and silage intake by livestock (kg/day)	FRM/SPT	---	**1.40E+01**	Midpoint of default uniform distribution centered at value
Pasture and silage intake by dairy cow (kg/day)	FRM only	---	**4.40E+01**	Midpoint of default uniform distribution centered at value
Grain intake by livestock (kg/day)	FRM/SPT	---	**5.40E+01**	Midpoint of default uniform distribution centered at value
Grain intake by dairy cow (kg/day)	FRM only	---	**1.10E+01**	Midpoint of default uniform distribution centered at value
Soil from pasture and silage by livestock (kg/day)	FRM/SPT	---	**1.00E-01**	Midpoint of default uniform distribution centered at value
Soil from pasture and silage by dairy cow (kg/day)	FRM only	---	**4.00E-01**	Midpoint of default uniform distribution centered at value
Soil from grain by livestock (kg/day)	FRM/SPT	---	**4.00E-01**	Midpoint of default uniform distribution centered at value
Soil from grain by dairy cow (kg/day)	FRM only	---	**1.00E-01**	Midpoint of default uniform distribution centered at value
Livestock Feed and Plant Factors				

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Wet weight crop yield for pasture (kg/m^2)	FRM/SPT	---	1.10E+00	Midpoint of default uniform distribution centered at value
Wet weight crop yield for grain (kg/m^2)	FRM/SPT	---	7.00E-01	Midpoint of default uniform distribution centered at value
Wet weight crop yield for nonleafy (kg/m^2)	FMR only	---	5.60E-01	Mean value of truncated lognormal-n distribution per NUREG/CR-6697
Wet weight crop yield for leafy (kg/m^2)	FMR only	---	1.50E+00	Midpoint of default uniform distribution centered at value
Growing season for pasture (y)	FRM/SPT	---	8.22E-02	Most probable value per NUREG/CR-6937 (30 days)
Growing season for grain (y)	FRM/SPT	---	3.29E-01	Most probable value per NUREG/CR-6937 (120 days)
Growing season for nonleafy (y)	FMR only	---	2.88E-01	Most probable value per NUREG/CR-6937 (105 days)
Growing season for leafy (y)	FMR only	---	2.05E-01	Most probable value per NUREG/CR-6937 (105 days)
Translocation factor for pasture	FRM/SPT	---	1.00E+00	Midpoint of default uniform distribution centered at value
Translocation factor for grain	FRM/SPT	---	1.00E-01	Midpoint of default uniform distribution centered at value
Translocation factor for nonleafy	FMR only	---	1.00E-01	Midpoint of default uniform distribution centered at value
Translocation factor for leafy	FMR only	---	1.00E+00	Midpoint of default uniform distribution centered at value
Weathering removal constant for pasture (1/y)	FRM/SPT	---	1.80E+01	Most probable value per NUREG/CR-6697
Weathering removal constant for grain (1/y)	FRM/SPT	---	1.80E+01	Most probable value per NUREG/CR-6697
Weathering removal constant for nonleafy (1/y)	FMR only	---	1.80E+01	Most probable value per NUREG/CR-6697
Weathering removal constant for leafy (1/y)	FMR only	---	1.80E+01	Most probable value per NUREG/CR-6697
Foliar interception fraction for dust pasture	FRM/SPT	---	2.50E-01	Midpoint of default uniform distribution centered at value
Foliar interception fraction for dust grain	FRM/SPT	---	2.50E-01	Midpoint of default uniform distribution centered at value
Foliar interception fraction for dust nonleafy	FMR only	---	2.50E-01	Midpoint of default uniform distribution centered at value
Foliar interception fraction for dust leafy	FMR only	---	2.50E-01	Midpoint of default uniform distribution centered at value
Foliar interception fraction for irrigation pasture	FRM/SPT	---	2.50E-01	Midpoint of default uniform distribution centered at value
Foliar interception fraction for irrigation grain	FRM/SPT	---	2.50E-01	Midpoint of default uniform distribution centered at value
Foliar interception fraction for irrigation nonleafy	FMR only	---	2.50E-01	Midpoint of default uniform distribution centered at value
Foliar interception fraction for irrigation leafy	FMR only	---	2.50E-01	Midpoint of default uniform distribution centered at value
Depth of roots for pasture (m)	FRM/SPT	---	1.95E+00	Midpoint of default uniform distribution range (0.3-3.6)
Depth of roots for grain (m)	FRM/SPT	---	1.45E+00	Midpoint of default uniform distribution range (0.5-2.4)
Depth of roots for nonleafy (m)	FMR only	---	1.35E+00	Midpoint of default uniform distribution range (0.3-2.4)
Depth of roots for leafy(m)	FMR only	---	6.00E-01	Midpoint default uniform distribution range (0.3-0.9)

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
Inhalation and External Gamma Parameters				
Inhalation rate (m^3/y)	FMR	---	**8.40E+03**	Most probable value for combination of indoor and outdoor activities plus gardening; NUREG/CR-6697 Att. C Figure 5.1-1
	FWS	---	**1.14E+04**	1.3 m^3/hr for outdoor activities; NUREG/CR-6697 Att. C Table 5.1-2
	SPT	---	**1.14E+04**	1.3 m^3/hr for outdoor activities; NUREG/CR-6697 Att. C Table 5.1-3
Mass loading above PCZ (g/m^3)	All	---	**1.30E-05**	EV from NUREG/CR-6937 Att. B Table 3.1-1 default
Mass loading for inhalation (g/m^3)	All	---	**1.30E-05**	EV from NUREG/CR-6937 Att. B Table 3.1-1 default
Indoor dust filtration factor, inhalation	FMR/FWS	---	**5.50E-01**	Median value of default uniform distribution range (0.15-0.95)
Shielding factor, external gamma	FMR/FWS	---	**5.10E-01**	NUREG/CR-6697 Table 7-10.1 for partial basement construction; mean of default distribution is less conservative at ~ 0.27 (73% shielding)
Occupancy Parameters				
Fraction of time spent onsite	FMR	---	**8.47E-01**	EV based on NUREG/CR-6937 Table 5.2.2 (Att. B) and NUREG 6697-Table 7.6-1; based on the distribution values the farmer spends 72.2% of the year indoors and 12.5% outdoors; as a conservative approach, the total time onsite remained the same; however, the time spent outdoors was increased to 30% (~ 95th percentile of outdoor distribution)
Fraction of time spent indoors on CZ	FMR Offsite	---	0.00E+00	WSC: no onsite exposure for farmer
	FMR (PCZ)	---	**5.47E-01**	LOC: EV based on NUREG/CR-6937, Table 5.2.2 (Att. B) and NUREG 6697, Table 7.6-1; based on the distribution values the farmer spends 72.2% of the year indoors and 12.5% outdoors; as a conservative approach, the total time onsite remained the same; however, the time spent outdoors was increased to 30% (~ 95th percentile of outdoor distribution)
	FMR (SCZ)	---	0.00E+00	Farmer spends indoor time on PCZ
	FWS	---	0.00E+00	100% outdoor exposure scenario with or without controls
	SPT	---	0.00E+00	100% outdoor exposure scenario with or without controls
Fraction of time spent outdoors on CZ	FMR Offsite	---	0.00E+00	WSC: no onsite exposure for farmer
	FMR (PCZ)	---	**3.00E-01**	LOC: EV based on NUREG/CR-6937, Table 5.2.2 (Att. B) and NUREG 6697, Table 7.6-1; based on the distribution values the farmer spends 72.2% of the year indoors and 12.5% outdoors; as a conservative approach, the total time onsite remained the same; however, the time spent outdoors was increased to 30% (~ 95th percentile of outdoor distribution)
	FMR (SCZ)	---	0.00E+00	Farmer spends outdoor time on PCZ

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References
	FWS	---	2.29E-01	Assumes the worker visits impacted regions of the site ~2,000 hrs/year
	SPT	---	1.20E-01	LOC: The Big Oaks NWR allows public use on the refuge ~ 103 days per year for 8.5 to 14.5 hours per day depending on the activity allowed. The total annual hours an individual could spend on site is 1,036.5 or 12%
Fraction of time spent indoors in offsite dwelling	FMR Offsite (PCZ and SCZ)	---	**5.47E-01**	WSC: EV based on NUREG/CR-6937, Table 5.2.2 (Att. B) and NUREG 6697, Table 7.6-1; based on the distribution values the farmer spends 72.2% of the year indoors and 12.5% outdoors; as a conservative approach, the total time onsite remained the same; however, the time spent outdoors was increased to 30% (~ 95th percentile of outdoor distribution)
	FMR	---	0.00E+00	LOC: farmer assumed to spend time on CZ (not offsite)
	FWS	---	0.00E+00	100% outdoor exposure scenario with or without controls
	SPT	---	0.00E+00	100% outdoor exposure scenario with or without controls
Fraction of time spent outdoors in offsite dwelling	FMR Offsite (PCZ and SCZ)	---	**3.00E-01**	WSC: EV based on NUREG/CR-6937, Table 5.2.2 (Att. B) and NUREG 6697, Table 7.6-1; based on the distribution values the farmer spends 72.2% of the year indoors and 12.5% outdoors; as a conservative approach, the total time onsite remained the same; however, the time spent outdoors was increased to 30% (~ 95th percentile of outdoor distribution)
	FMR	---	0.00E+00	LOC: farmer assumed to spend time on CZ (not offsite)
	FWS	---	0.00E+00	100% outdoor exposure scenario with or without controls
	SPT	---	0.00E+00	LOC: *all exposures assumed to be on CZ*
Fraction of time spent outdoors in Agricultural Areas 1-4	FMR (PCZ and SCZ)	---	**1.65E-02**	EV based on NUREG/CR-6937, Table 5.2.2 (Att. B); 1/4 of total time in agricultural areas; fraction applied to each area; with or without controls
Fraction of time spent outdoors in Agricultural Areas 1-4	FWS/SPT	---	0.00E+00	Farmer is only agricultural scenario though sportsperson's game are assumed to graze in Area 3

Agricultural Area 1 = fruits, grain, and nonleafy vegetable plot
Agricultural Area 2 = leafy vegetable plot
Agricultural Area 3 = pasture and silage growing area
Agricultural Area 4 = livestock grain fields

Color coding:
Red = empirical/site-specific data
Blue = calculated values – see worksheets and references
Green = from literature – see reference
Violet = Most likely from NUREG/CR-6937 or NUREG/CR-6697
Black = assumed value

Table 3-5. Default and Selected Values for Various Parameters Used in RESRAD-OFFSITE Simulations Jefferson Proving Ground, Madison, Indiana (Continued)

Parameter	Receptor	Prob.	Determ.	Description, Rationale, and References

--- = parameter does not have a probabilistic distribution for this assessment
bgs = below ground surface
CZ = contaminated zone
Determ. = value used in deterministic runs
DU = depleted uranium
EV = expected value
FMR = farmer scenario with loss of institutional controls
FMR Offsite = farmer scenario with institutional controls
FWS = Fish and Wildlife Service worker scenario
GW = groundwater
LOC = loss of institutional controls
Prob. = statistics for probabilistic runs
PCZ = primary contamination zone
RCC = rank correlation coefficient
SCZ = secondary contamination zone
SPT = sportsman/member of the public scenario
SW = surface water
SWB = surface water body
SZ = saturated zone
UZ = unsaturated zone

Some parameter values are assigned independent of receptor and may not impact exposure estimates. For example, the distribution coefficient in the nonleafy vegetable plot is entered but not used by a nonfarming resident. Therefore, for example, receptor "All" means the parameter is entered but not necessarily used in dose calculations.
Calculations for estimated values based upon distributions are provided in Attachment A. RESRAD-OFFSITE screen shots of input parameters are provided in Attachment B.

the DU distribution study. The contamination zone thickness distribution range was established by calculating the range of distances the contaminant could travel over the 100-year period based upon hydrological characteristics of site soil and a range of site-specific hydraulic conductivity values. This resulted in a contaminated zone thickness range of 1 ft (0.3 m) to greater than 200 ft (60 m). As the thickness of the contaminated zone was based upon a set timeframe of 100 years (average time for a penetrator to fully corrode and become completely available for transport in the environment), the maximum contamination zone thickness value was set at 1 m to account for variation in corrosion rate and transport in soil. If more time is required for a penetrator to fully corrode, or if the corrosion product moved more quickly through the soil, then the source term would be more spread out and result in a lower dose. Limiting the contamination zone thickness to a maximum of 3.3 ft (1 m) conservatively increases the dose estimate. As the DU penetrators are not completely corroded and available fully for transport in the environment, site-specific soil sample results do not accurately represent the initial source term soil concentrations for the uranium isotopes. Therefore, a range of soil concentrations was calculated based upon the range of contamination zone thicknesses and associated mass of DU for the specific contamination zone area. To minimize over- and under-estimation of dose, the soil concentration for all uranium isotopes and the thickness of the unsaturated zone 1 were correlated to contaminated zone thickness with a rank correlation coefficient of (-0.99) (i.e., if a small contaminated zone thickness is selected then a higher concentration and larger unsaturated zone thickness are selected). The hydraulic conductivity of the contaminated zone was correlated to contaminated zone thickness with a rank correlation coefficient of 0.99 (i.e., if a small contaminated zone thickness is selected, then a small contaminated zone hydraulic conductivity is selected because the range of contaminated thickness is derived primarily from the range of hydraulic conductivity [see Section 3.4.2]) (Figure 3-5).

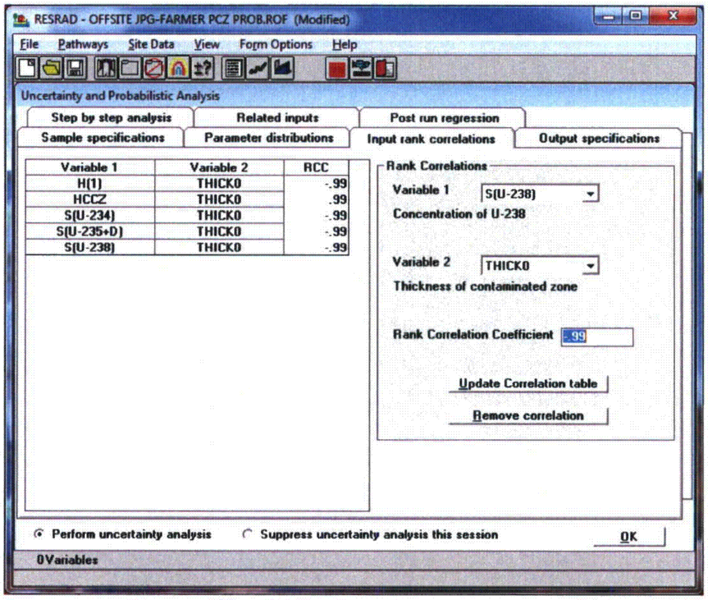


Figure 3-5. Probabilistic Parameter Correlations

Although the actual current condition of the source term is a mixture of DU corrosion products and DU penetrators that are not fully corroded, the probabilistic RESRAD-OFFSITE runs assume that the initial source term is immediately available for transport in the environment. Since external gamma is the only pathway that does not rely upon the source term to be transportable in the environment, a deterministic RESRAD-OFFSITE run was conducted for the resident farmer with loss of institutional controls scenario, contaminated zone thickness of 1 ft (0.3 m), source term concentrations associated with a 0.3-m thickness, and the DU mass of the PCZ area. The deterministic TEDE, 19 mrem/y, was less than the probabilistic result of 25 mrem/y for the same area indicating that the probabilistic result is

conservative. There is some uncertainty introduced with the assumption that the current penetrators are uniformly mixed at depth from the surface to 1 ft (0.3 m) as penetrators are not likely to be uniformly distributed prior to being fully corroded and may be distributed in a thickness less than 1 ft (0.3 m). In addition, the source term density used is that which applies for soil and not DU. As DU is denser than soil, the self-shielding property of penetrators would tend to reduce the external gamma dose; however, a distribution of penetrators closer to the surface than 1 ft (0.3 m) would tend to increase external gamma dose.

Finally, some simplifying assumptions were made, not because they were a model requirement but to ensure the modeling was adequately, if not overly, conservative. A few of these major assumptions included assuming that land use scenarios involve frequencies for receptor activities well above current levels; assuming a surface water pond was created by damming part of Big Creek to increase surface water yields; and assuming an adequate water supply is available onsite even though shallow groundwater yields are too low to sustain water needs on a yearly basis. More specifically, due to overly conservative assumptions about groundwater use in the future at the DU Impact Area, seven test holes were drilled into the carbonate bedrock during initial development of the installation, but groundwater was not located in sufficient quantities to support facility operations. Even if adequate yield could be located, the groundwater under JPG is generally of poor quality (presence of sodium, sulfate, and dissolved solids) and is not used for drinking purposes or for other purposes in any significant capacity.

3.10 RESRAD RESULTS

Results of the probabilistic dose estimates are presented in Table 3-6 for all evaluated scenarios. Figures 3-6 through 3-9 provide graphical representation of the probabilistic mean dose over 1,000 years from the PCZ and SCZ for each of the scenarios.

The RESRAD-OFFSITE input and output files associated with this dose assessment are provided electronically.

A resident farmer is a prohibited scenario in the event that institutional controls are in place within the DU Impact Area. As shown in Table 3-7, the probabilistic peak of the mean TEDE for the resident farmer equates to about 26.3 mrem/y in the event of loss of institutional controls. This TEDE is essentially indistinguishable from the 25 mrem/y limit applicable to restricted release with institutional controls in place and is about one-fourth of the dose with time for the resident farmer TEDE of 100 mrem/y applicable in the event of loss of institutional controls. The largest peak dose (26.3 mrem/y) is estimated for the residential farmer with loss of controls, with the majority of impact due to external exposure and plant ingestion at the beginning of the analysis period (i.e., at year zero). For the offsite residential farmer, the peak dose from drinking water and plant ingestion also is observed in the early years.

Table 3-6. Results from RESRAD Simulations of All Scenarios
Jefferson Proving Ground, Madison, Indiana

Receptor	PCZ	SCZ Left	SCZ Right	Total[a]
	Peak of the Mean Dose (mrem/y)			
Onsite Residential Farmer (Loss of Controls)	24.76	0.7077	0.8716	**26.3**
FWS Worker (Loss of Controls or With Institutional Controls)[b]	5.328	0.2767	0.2758	**5.9**
Sportsman/Recreationalist (Loss of Controls or With Institutional Controls)[b]	2.924	0.1797	0.2109	**3.3**
Offsite Residential Farmer (With Institutional Controls)	9.52E-02	1.872[c]		**2.0**

[a] Total peak of the mean dose is the sum of the dose from the PCZ and all SCZs.
[b] As the TEDEs for these receptors equate to only 5.9 and 3.3 mrem/y, respectively, in the event of loss of institutional controls, the TEDEs with controls in place would be much lower than these values.
[c] Only one SCZ was established with an area of 800 m by 2,500 m since the receptor was located off of the PCZ.

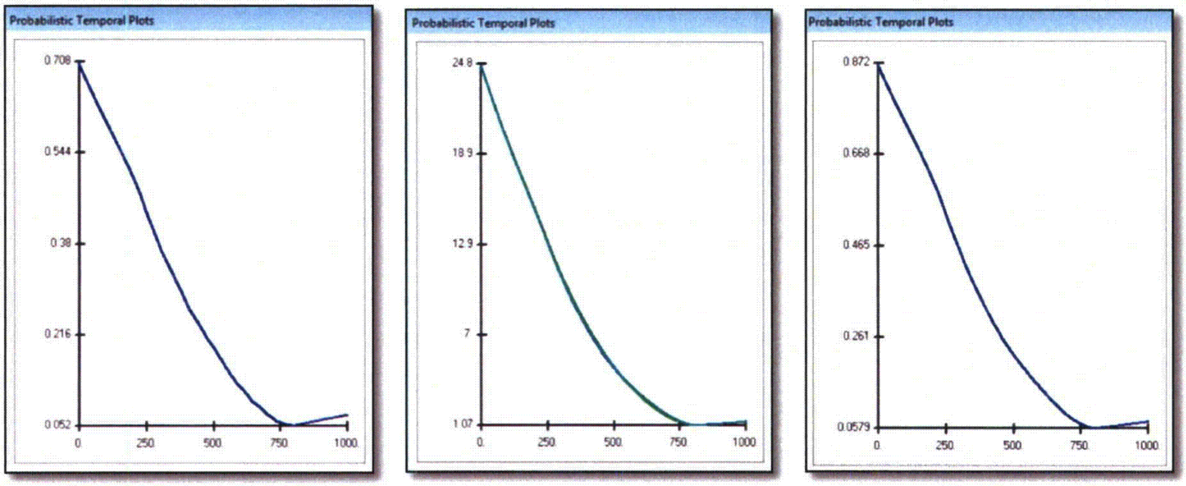


Figure 3-6. Peak of the Mean Dose (mrem/y): Residential Farmer (Loss of Controls) From Left SCZ, PCZ, and Right SCZ

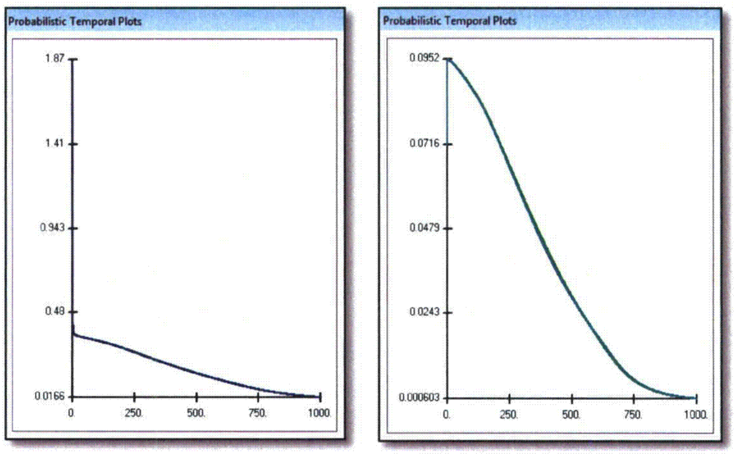


Figure 3-7. Peak of the Mean Dose (mrem/y): Offsite Residential Farmer (With Institutional Controls) From SCZ and PCZ

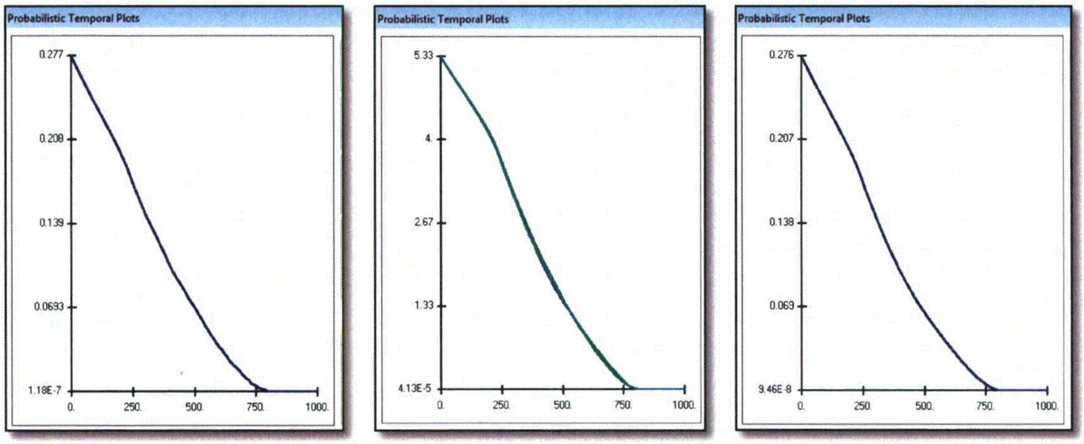


Figure 3-8. Peak of the Mean Dose (mrem/y): FWS Industrial Worker (Loss of Controls) From Left SCZ, PCZ, and Right SCZ

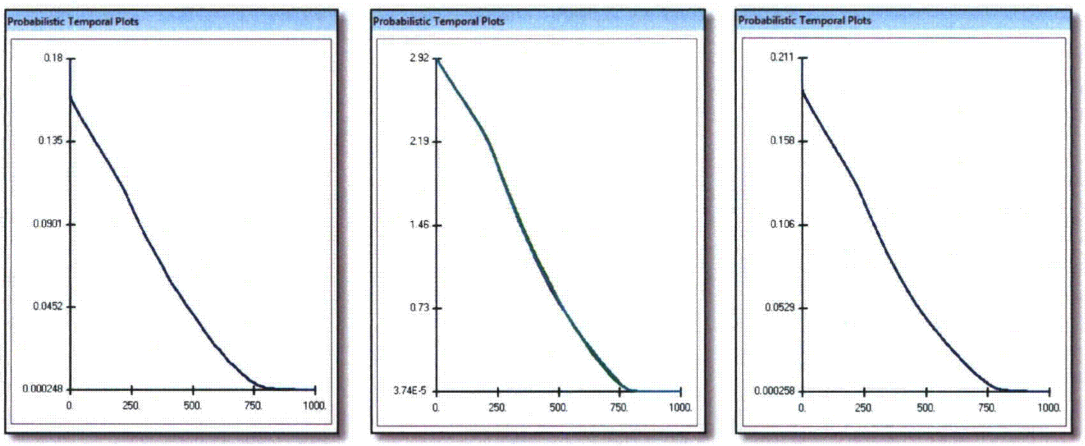


Figure 3-9. Peak of the Mean Dose (mrem/y): Sportsman/Recreationalist (Loss of Controls) From Left SCZ, PCZ, and Right SCZ

Table 3-7. Pathway Analysis for Offsite Resident Farmer With Institutional Controls Jefferson Proving Ground, Madison, Indiana

Pathway	TEDE [a]	Percent of TEDE	Relevant Assumptions
Water Ingestion [b]	1.22	62.0	• Due to limited water availability in groundwater and surface water, Big Creek is assumed to be dammed such that it provides needed volumes of water for drinking water, crop irrigation, and livestock consumption. Water is used directly from the creek without prior treatment. • Probabilistic RESRAD assessments assume that initial source term is immediately available for transport whereas many of the DU penetrators have not fully corroded. Thus, DU is not currently available for migration.
Ingestion of Vegetation [b]	0.52	26.2	
Milk Ingestion [b]	0.18	9.1	
Other Pathways	0.05	2.7	
Total	**2.0**	**100**	

[a] Peak of the mean dose over the period from the first year to year 1,000.
[b] Water release.
The peak dose occurs in the first year for each scenario.

Other scenarios exhibited TEDEs of less than 25 mrem/y irrespective of whether institutional controls were in place and were, therefore, compliant with limits applicable to both restricted release and unrestricted release. The TEDEs for the offsite farmer, FWS (industrial) worker, and sportsman/recreationalist are 2.0, 5.9, and 3.3 mrem/y, respectively, without institutional controls being in effect. As such, these scenarios are compliant with 10 CFR 20, Subpart E, irrespective of the existence of institutional controls. In the offsite residential farmer scenario, where a farm is located at the JPG boundary 3 km from the DU Impact Area, all water use (i.e., drinking water, water for beef and dairy cattle, fish, and crop irrigation) is assumed to originate from Big Creek, and 100 percent of the contaminated zone runoff/sediment is in that water. This scenario considers the entire upgradient watershed area for Big Creek and average annual rainfall to determine the concentration in the water and the resultant dose to the receptor. This is the upper bound of dose to members of the public outside of JPG with institutional controls in place in that an individual who does not use water from Big Creek for drinking, irrigation of gardens or fields, or watering livestock will receive significantly less dose than 0.3 mrem/y.

The FWS/industrial worker scenario with loss of institutional controls can be considered the upper bound of dose for workers since the dose for this scenario is well below 25 mrem/y; however, the actual dose to a FWS/industrial worker would actually be significantly less than 5.9 mrem/y. The sportsman/recreationalist scenario with loss of controls represents an upper bound of the TEDE for the sportsman/recreationalist and is representative of the TEDE to a member of the public accessing JPG for any reason (e.g., hunting, fishing, bird watching) because the dose for this scenario is well below 25 mrem/y and the loss of controls scenario assumes that the receptor spends 1,036 hours per year (the maximum time a member of the public can access Big Oaks NWR) on the most contaminated area of the DU Impact Area and eats game (e.g., deer, turkey, squirrel, etc.) and fish from within that area. With institutional controls in place, members of the public are not allowed in the DU Impact Area and would therefore receive significantly less dose than 3.3 mrem/y, regardless of their activity. The closest a member of the public is allowed near the DU Impact Area is approximately 400 m west of JPG West Recovery Road and north of Big Creek in Hunting Area 52.

The only modeled peak dose for offsite receptors is 2 mrem/y and represents the TEDE for the offsite subsistence farmer controls. The peak dose to the offsite residential farmer is from drinking water and ingesting plants (Table 3-7) and is observed in the early years. Because the sportsman/recreationalist and industrial worker (i.e., FWS/INANG worker) scenarios with loss of controls were less than 25 mrem/y, one reasonably concludes that the same scenarios with institutional controls in place (i.e., FWS/INANG worker or sportsman/recreationalist located outside the contaminated area) also would meet the 25 mrem/y (i.e., the unrestricted release criterion) because they have less exposure to the contaminated zone. In these situations where the TEDEs would clearly be less in the restricted scenario compared to the unrestricted scenario, the actual TEDEs were not calculated. The industrial worker represents the critical group with institutional controls in place. For example, as the TEDE for this receptor equates to only 5.9 mrem/y in the event of loss of institutional controls, the TEDE with controls in place would be much lower than this value. The TEDEs for these receptors are primarily the result of external exposure (Tables 3-8 and 3-9).

The largest modeled peak dose is 26.3 mrem/y and represents the TEDE for the onsite residential farmer, the critical group in the event of loss of institutional controls. The TEDE for this receptor is primarily the result of external exposure and plant ingestion (Table 3-10) at the beginning of the analysis period (i.e., the first hundred years). The residential farmer with loss of controls is the only scenario where the estimated dose exceeded 25 mrem/y (i.e., the unrestricted release criterion from 10 CFR 20.1403[b]).

Table 3-8. Pathway Analysis for FWS/INANG Worker With and Without Institutional Controls Jefferson Proving Ground, Madison, Indiana

Pathway	TEDE [a]	Percent of TEDE	Relevant Assumptions
Ground/External Exposure [b]	5.39	91.7	• Probabilistic RESRAD assessments assume that initial source term is immediately available for transport whereas many of the DU penetrators have not fully corroded. Thus, DU is not currently available for migration. • Although institutional controls minimize time onsite, dose assessment assumes worker is onsite for 1,036 hours per year (i.e., the total time that the Big Oaks NWR is open) and that worker is constantly present at location with highest exposure rate. As institutional controls severely limit time spent in the DU Impact Area by FWS/INANG industrial workers, actual TEDE with institutional controls in place would be a small percentage of doses specified herein. This is particularly true given the inability to access most areas due to the presence of UXO.
Soil Ingestion [b]	0.38	6.4	
Inhalation	0.11	1.9	
Total	**5.9**	**100**	

[a] Peak of the mean dose over the period from the first year to year 1,000.
[b] Direct and air.
The peak dose occurs in the first year for each scenario.

Table 3-9. Pathway Analysis for Sportsman With and Without Institutional Controls Jefferson Proving Ground, Madison, Indiana

Pathway	TEDE [a]	Percent of TEDE	Relevant Assumptions
Ground/External Exposure [b]	2.77	83.5	• Probabilistic RESRAD assessments assume that initial source term is immediately available for transport whereas many of the DU penetrators have not fully corroded. Thus, some DU is not currently available for migration. • Assumes individual is present onsite for 103 days per year and that hunting and fishing and all other activities occur in the primary contamination zone. • Under conditions such that institutional controls are in place, sportsmen are prohibited from entering the DU Impact Area and adjacent areas that contain UXO. As such, actual TEDEs with institutional controls in place would be a small percentage of the doses specified herein.
Soil Ingestion [b]	0.22	6.8	
Meat Ingestion	0.19	5.8	
Other Pathways	0.13	3.9	
Total	**3.3**	100	

[a] Peak of the mean dose over the period from the first year to year 1,000.
[b] Direct and air.
The peak dose occurs in the first year for each scenario.

Table 3-10. Pathway Analysis for Onsite Resident Farmer With Loss of Institutional Controls Jefferson Proving Ground, Madison, Indiana

Pathway	TEDE [a]	Percent of TEDE	Relevant Assumptions
Ground/External Exposure [b]	13.3	50.5	• Sensitivity analysis reflected that thickness of the contaminated zone was a sensitive parameter. Probabilistic modeling computed TEDEs based on 0.3 and 1 m thicknesses of contaminated zone. • Probabilistic RESRAD assessments assume that initial source term is immediately available for transport whereas many of the DU penetrators have not fully corroded. Thus, DU is not currently available for migration. • Residence and subsistence farms are assumed to be present in an area with large quantities of UXO and in the areas with the highest DU concentrations. • Construction of residence and farm occurs in the forested DU Impact Area rather than available open areas with less or no DU contamination. • Assumes groundwater well located on DU Impact area used as drinking water source, crop irrigation, and livestock consumption. Water used without prior treatment and irrespective of insufficient yield and limited quality due to the presence of sodium, sulfate, and dissolved solids.
Ingestion of Vegetation [b]	10.2	38.9	
Soil Ingestion [b]	1.36	5.2	
Other Pathways	1.45	5.5	
Total	**26.3**	**100**	

[a] Peak of the mean dose over the period from the first year to year 1,000.
[b] Direct and Air.
TEDE decreases nonlinearly over time from 26.3 mrem/y in year zero to 1.4 mrem/y at year 1,000 with a concurrent change in relevant pathways and their associated doses. The peak dose occurs in the first year for each scenario.

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4. CONCLUSIONS

The doses to average members of specific critical groups using JPG lands were calculated with the RESRAD-OFFSITE program for a variety of exposure scenarios. The probabilistic peak of the mean doses for all predictions were less than the TEDE for restricted release when institutional controls were in place (25 mrem/y) or in the event of loss of institutional controls (100 mrem/y). These dose estimates are based on a combination of site-specific parameter values and literature values, which could include default values that are required to run the program. While the dose modeling relies on a number of default or estimated values, site-specific data were used for the most sensitive parameters. In addition, some simplifying assumptions were made to make the modeling adequately conservative. These major assumptions included assuming all DU is currently available for transport; an adequate water supply is available onsite even though shallow groundwater yields are too low to sustain water needs on a yearly basis and a surface water pond was created by damming part of Big Creek to increase surface water yields; and that land use scenarios involve frequencies for receptor activities well above current levels.

Sensitivity analyses on many of the parameters indicate that changing the thickness of the contaminated zone resulted in a change of 15 percent or more in the predicted doses, whereas variations in other parameters did not result in significant changes in the predicted doses. The peak of the mean TEDE were calculated by probabilistic methods integrated into the RESRAD-OFFSITE program. None of the predicted TEDEs for the various scenarios exceeded the applicable limits prescribed in 10 CFR 20.1403 for restricted release.

Overall, the results suggest that TEDEs associated with exposures to residual DU at JPG are well below the dose limits of 25 mrem/y or 100 mrem/y established for restricted release when institutional controls are in place and in the event of loss of institutional controls. This dose estimate does not, however, address the risk of injury or death to the members of the critical groups due to UXO accidents, which are potentially much greater than the potential radiological hazards within the DU Impact Area.

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ATTACHMENT A

EXPECTED VALUE CALCULATIONS FOR RESRAD-OFFSITE INPUT PARAMETERS

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Expected Occupancy Time Fractions Worksheet for JPG Receptors

Percentile	Probability	Time Outside Home[a] Time (day^{-1})	Time Outside Home[a] Product	Time on Farm Field[a] Time (day^{-1})	Time on Farm Field[a] Product	Outdoors at Work[a] Time (day^{-1})	Outdoors at Work[a] Product	Time Inside Home[b] Time (day^{-1})	Time Inside Home[b] Product
0	0.00E+00	1.00E-03	0.00E+00	1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5	5.00E-02	3.47E-03	1.74E-04	3.00E-03	1.50E-04	0.00E+00	0.00E+00	3.75E-01	1.88E-02
25	2.00E-01	2.08E-02	4.16E-03	1.40E-02	2.80E-03	0.00E+00	0.00E+00	5.21E-01	1.04E-01
50	2.50E-01	6.25E-02	1.56E-02	4.00E-02	1.00E-02	0.00E+00	0.00E+00	6.25E-01	1.56E-01
75	2.50E-01	1.25E-01	3.13E-02	8.70E-02	2.18E-02	0.00E+00	0.00E+00	8.09E-01	2.02E-01
90	1.50E-01	2.26E-01	3.39E-02	1.10E-01	1.65E-02	0.00E+00	0.00E+00	9.38E-01	1.41E-01
95	5.00E-02	3.02E-01	1.51E-02	1.35E-01	6.75E-03	1.00E-03	5.00E-05	9.92E-01	4.96E-02
98	3.00E-02	3.96E-01	1.19E-02	1.62E-01	4.86E-03	2.10E-02	6.30E-04	1.00E+00	3.00E-02
99	1.00E-02	4.97E-01	4.97E-03	1.66E-01	1.66E-03	3.50E-02	3.50E-04	1.00E+00	1.00E-02
100	1.00E-02	7.50E-01	7.50E-03	1.66E-01	1.66E-03	3.50E-02	3.50E-04	1.00E+00	1.00E-02
Variables:	P	To	P × To	Tf	P × Tf	Tw	P × Tw	Tw	P × Tw
			1.25E-01						
Expected fractions (sum of products):					6.61E-02		**1.38E-03**		**7.22E-01**
Fraction in each of 4 agricultural areas:					**1.65E-02**				

	7.22E-01	
Fraction indoors for farmer [c]:		**5.47E-01**
	1.25E-01	
Fraction outdoors for farmer [c]:		**3.00E-01**
Total fraction on farm for farmer [c]:	**8.47E-01**	**8.47E-01**
Fraction in each of 4 agricultural areas:	**1.65E-02**	
Fraction indoors for Fish and Wildlife Services worker:	**2.29E-01**	
Fraction outdoors by sportsperson:	**1.18E-01**	

[a] Source of fractions and time: NUREG/CR-6937, Appendix B, Table 5.2-2 which references USEPA (1997) (ages 16-64)

[b] Source of fractions and time: NUREG/CR-6697, Appendix C, Table 7.6-1 (Time Indoors)

[c] As a conservative approach, the farmer was assumed to spend 30% of total time outdoors (~ 95th percentile of outdoor distribution)

P = probability time fraction falls within the percentile range

Expected values (fractions) = $\Sigma P_j \times Value_j$

Fraction indoors for FWS = (251 day/y * 8 hrs/day) / 8,760 hrs/y

Fraction outdoors for sportsperson = 1036 hrs/y (hunting/fishing/recreation) / 8,760 hrs/y

Expected Values for Dispersivity

Cumu.		Long. Disp (SZ)		Horiz. Disp (SZ)		Vert. Disp (SZ)	
Probability	**Probability**	**Meters**	**Product**	**Meters**	**Product**	**Meters**	**Product**
0.00	0.00E+00	1.00E-01	0.00E+00	1.25E-02	0.00E+00	1.00E-02	0.00E+00
0.10	1.00E-01	1.22E+00	1.22E-01	1.53E-01	1.53E-02	1.00E-02	1.00E-03
0.25	1.50E-01	3.62E+00	5.43E-01	4.52E-01	6.78E-02	2.26E-02	3.39E-03
0.50	2.50E-01	8.96E+00	2.24E+00	1.12E+00	2.80E-01	5.60E-02	1.40E-02
0.75	2.50E-01	2.54E+01	6.35E+00	3.17E+00	7.93E-01	1.58E-01	3.95E-02
0.80	5.00E-02	4.32E+01	2.16E+00	5.40E+00	2.70E-01	2.70E-01	1.35E-02
0.85	5.00E-02	6.53E+01	3.27E+00	8.16E+00	4.08E-01	4.08E-01	2.04E-02
0.90	5.00E-02	9.21E+01	4.61E+00	1.15E+01	5.75E-01	5.76E-01	2.88E-02
0.95	5.00E-02	1.35E+02	6.75E+00	1.69E+01	8.45E-01	8.45E-01	4.22E-02
1.00	5.00E-02	3.18E+02	1.59E+01	3.97E+01	1.99E+00	1.99E+00	9.95E-02
Variables:	P	LDuz	P × LDsz	LDsz	P × HDsz	Dh	P xVDsz
Expected values (sum of products):			**4.2E+01**		**5.2E+00**		**2.6E-01**

From NUREG/CR-6937, Appendix B, Tables 2.2-2, 2.2-3, and 2.2-4

Soil Erodibility Factor

Cumu.		Factor (unitless)	
Probability	**Probability**	**Value**	**Product**
1.99E-06	1.99E-06	0.01	1.99E-08
4.95E-03	4.95E-03	0.08	3.96E-04
0.107	1.02E-01	0.15	1.53E-02
0.364	2.57E-01	0.25	6.43E-02
0.869	5.05E-01	0.37	1.87E-01
0.961	9.20E-02	0.43	3.96E-02
0.996	3.50E-02	0.49	1.72E-02
1.000	4.00E-03	0.64	2.56E-03
Variables:	P	SEF	P × SEF
Expected value (sum of products):			**3.26E-01**

From NUREG/CR-6937, Appendix B, Table 2.4-1

Cover and Management Factor

Cumu.		Factor (unitless)	
Probability	**Probability**	**Value**	**Product**
0.00	0.00E+00	0.00001	0.00E+00
0.327	3.27E-01	0.020	6.54E-03
0.421	9.40E-02	0.085	7.99E-03
0.519	9.80E-02	0.149	1.46E-02
0.845	3.26E-01	0.284	9.26E-02
0.961	1.16E-01	0.400	4.64E-02
0.991	3.00E-02	0.550	1.65E-02
1.000	9.00E-03	1.00	9.00E-03
Variables:	P	CMF	P × CMF
Expected value (sum of products):			**1.94E-01**

From NUREG/CR-6937, Appendix B, Table 2.6-1

Support Practice Factor

Cumu.		Factor (unitless)	
Probability	**Probability**	**Value**	**Product**
0.00170	1.70E-03	0.25	4.25E-04
0.00821	6.51E-03	0.45	2.93E-03
0.0379	2.97E-02	0.55	1.63E-02
0.0604	2.25E-02	0.60	1.35E-02
0.0715	1.11E-02	0.75	8.32E-03
0.0782	6.70E-03	0.99	6.63E-03
1.000	9.22E-01	1.00	9.22E-01
Variables:	P	SPF	P × SPF
Expected value (sum of products):			**9.70E-01**

From NUREG/CR-6937, Appendix B, Table 2.7-1

Mass Loading for Inhalation			
Cumu.		Factor (µg/m**3)	
Probability	Probability	Value	Product
0.00E+00	0.00E+00	0	0.00E+00
1.00E-04	1.00E-04	1	1.00E-04
5.00E-04	4.00E-04	2	8.00E-04
2.40E-03	1.90E-03	3	5.70E-03
9.20E-03	6.80E-03	4	2.72E-02
2.37E-02	1.45E-02	5	7.25E-02
4.93E-02	2.56E-02	6	1.54E-01
8.70E-02	3.77E-02	7	2.64E-01
1.34E-01	4.73E-02	8	3.78E-01
1.95E-01	6.03E-02	9	5.43E-01
2.73E-01	7.79E-02	10	7.79E-01
3.67E-01	9.41E-02	11	1.04E+00
4.72E-01	1.05E-01	12	1.26E+00
5.82E-01	1.10E-01	13	1.42E+00
6.90E-01	1.08E-01	14	1.51E+00
7.93E-01	1.03E-01	15	1.55E+00
8.75E-01	8.21E-02	16	1.31E+00
9.22E-01	4.73E-02	17	8.04E-01
9.51E-01	2.91E-02	18	5.24E-01
9.66E-01	1.50E-02	19	2.85E-01
9.74E-01	7.90E-03	20	1.58E-01
9.80E-01	5.80E-03	21	1.22E-01
9.84E-01	4.10E-03	22	9.02E-02
9.88E-01	3.40E-03	23	7.82E-02
9.90E-01	2.30E-03	24	5.52E-02
9.92E-01	2.50E-03	25	6.25E-02
9.94E-01	1.60E-03	26	4.16E-02
9.95E-01	1.00E-03	27	2.70E-02
9.96E-01	9.00E-04	28	2.52E-02
9.97E-01	6.00E-04	29	1.74E-02
9.97E-01	2.00E-04	30	6.00E-03
9.97E-01	7.00E-04	31	2.17E-02
9.98E-01	6.00E-04	32	1.92E-02
9.98E-01	3.00E-04	33	9.90E-03
9.99E-01	2.00E-04	34	6.80E-03
9.99E-01	1.00E-04	35	3.50E-03
9.99E-01	3.00E-04	36	1.08E-02
9.99E-01	0.00E+00	37	0.00E+00
9.99E-01	1.00E-04	38	3.80E-03
1.00E+00	1.00E-03	39	3.90E-02
Variables:	P	SEF	P × SEF
Expected value (sum of products):			**1.3E+01**

From Appendix B, Table 3.1-1

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ATTACHMENT B

RESRAD-OFFSITE INPUT PARAMETER SCREEN SHOTS

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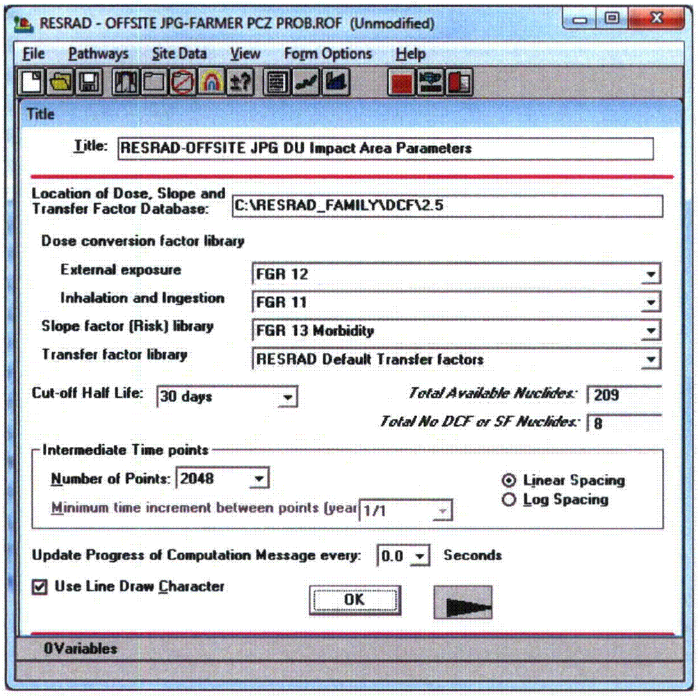
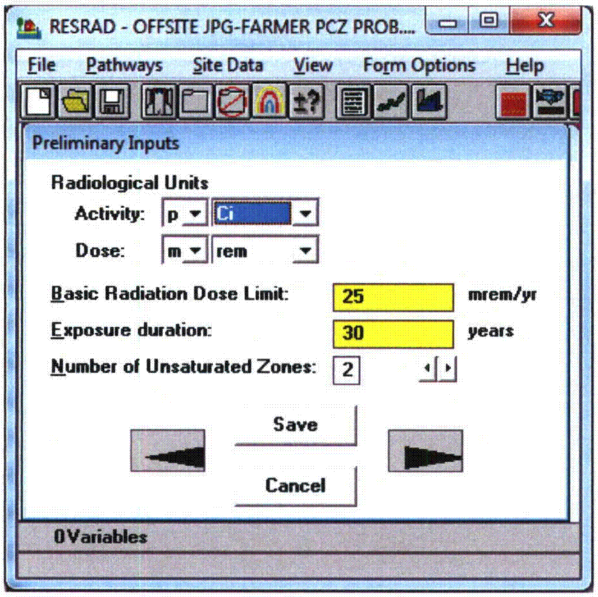
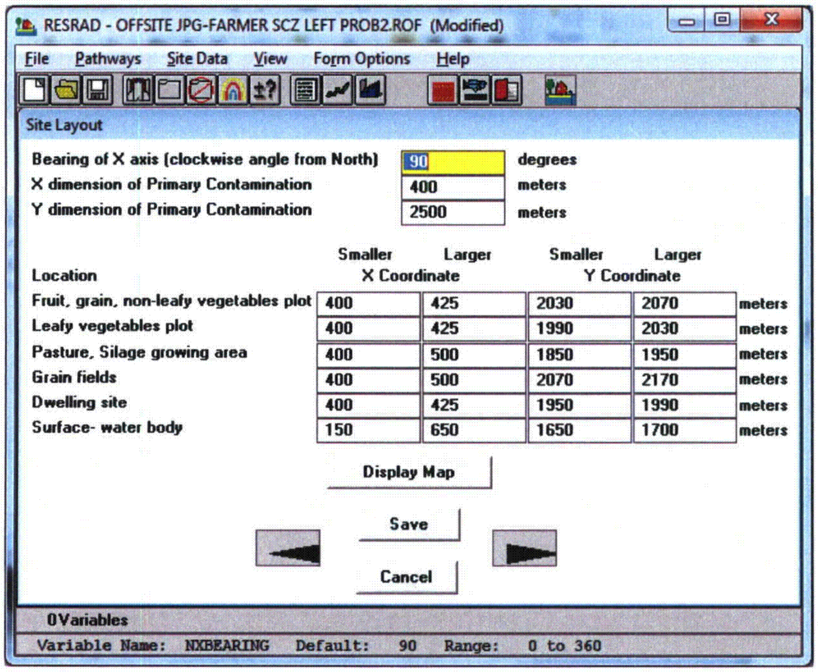


Title Page (All Scenarios)

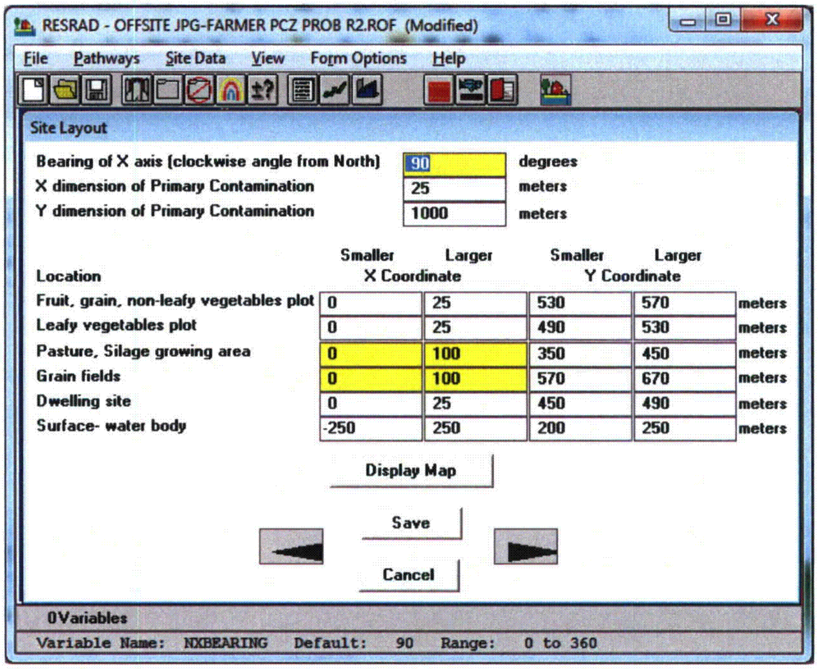


Preliminary Inputs (All Scenarios)

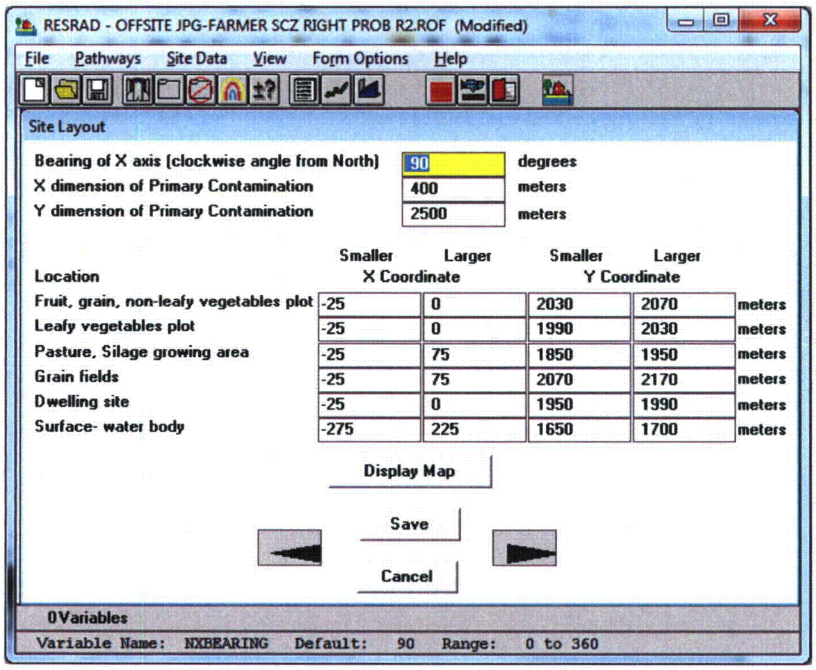
Pathways: Farmer, Industrial Worker, Sportsman/Recreationalist



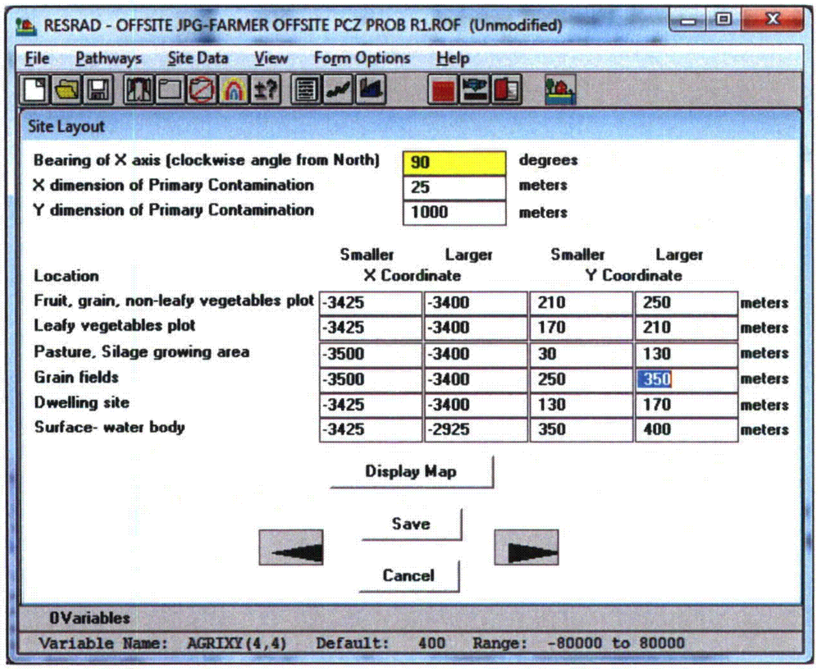
Site Layout All Onsite Scenarios: Secondary Contamination Zone Left Side



Site Layout All Onsite Scenarios: Primary Contamination Zone



Site Layout All Onsite Scenarios: Secondary Contamination Zone Right Side



RESRAD - OFFSITE JPG-FARMER OFFSITE PCZ PROB R1.ROF (Unmodified)

File Pathways Site Data View Form Options Help

Site Layout

Bearing of X axis (clockwise angle from North) 90 degrees
X dimension of Primary Contamination 25 meters
Y dimension of Primary Contamination 1000 meters

Location	Smaller X Coordinate	Larger X Coordinate	Smaller Y Coordinate	Larger Y Coordinate	
Fruit, grain, non-leafy vegetables plot	-3425	-3400	210	250	meters
Leafy vegetables plot	-3425	-3400	170	210	meters
Pasture, Silage growing area	-3500	-3400	30	130	meters
Grain fields	-3500	-3400	250	350	meters
Dwelling site	-3425	-3400	130	170	meters
Surface- water body	-3425	-2925	350	400	meters

Display Map

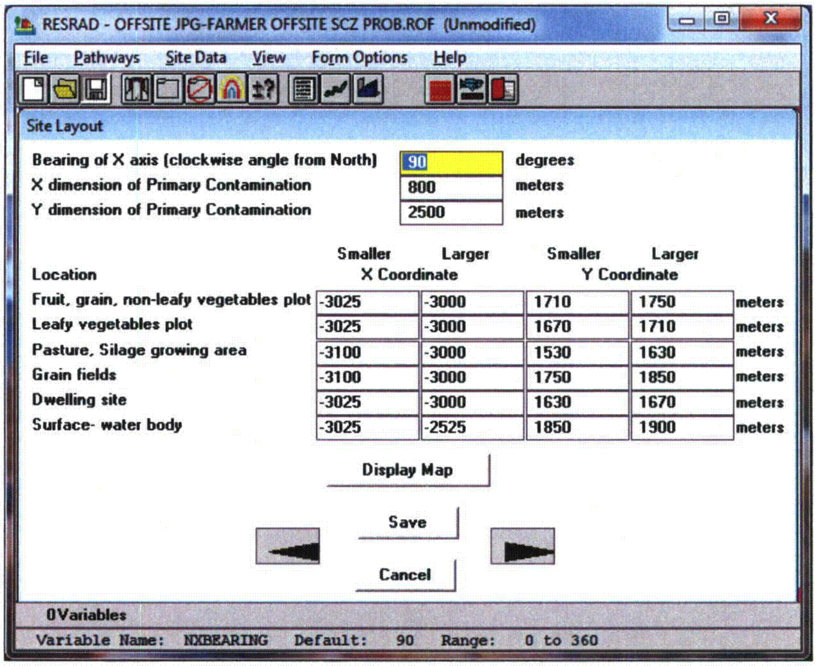
Save

Cancel

0 Variables

Variable Name: AGRIXY(4,4) Default: 400 Range: -80000 to 80000

Site Layout Offsite Farmer Scenario: Primary Contamination Zone



RESRAD - OFFSITE JPG-FARMER OFFSITE SCZ PROB.ROF (Unmodified)

File Pathways Site Data View Form Options Help

Site Layout

Bearing of X axis (clockwise angle from North) 90 degrees
X dimension of Primary Contamination 800 meters
Y dimension of Primary Contamination 2500 meters

Location	Smaller X Coordinate	Larger X Coordinate	Smaller Y Coordinate	Larger Y Coordinate	
Fruit, grain, non-leafy vegetables plot	-3025	-3000	1710	1750	meters
Leafy vegetables plot	-3025	-3000	1670	1710	meters
Pasture, Silage growing area	-3100	-3000	1530	1630	meters
Grain fields	-3100	-3000	1750	1850	meters
Dwelling site	-3025	-3000	1630	1670	meters
Surface- water body	-3025	-2525	1850	1900	meters

Display Map

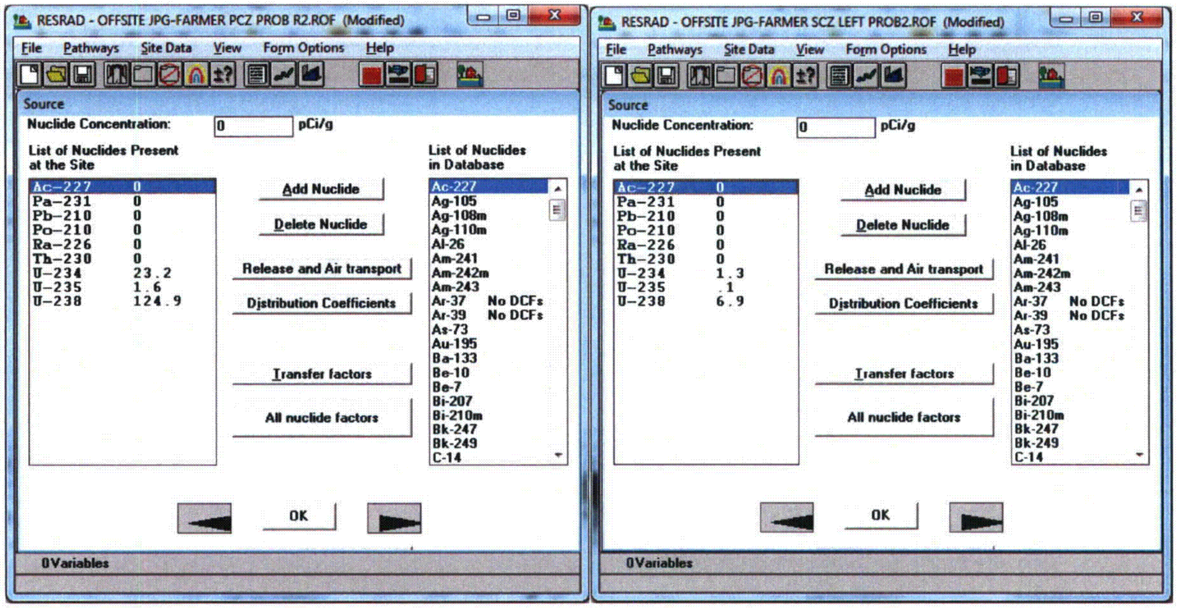
Save

Cancel

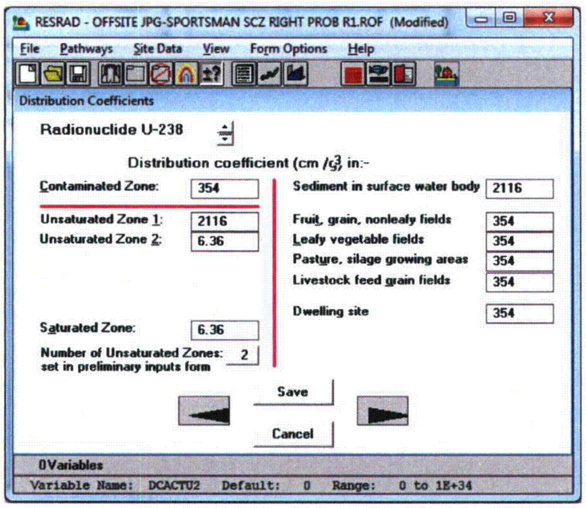
0 Variables

Variable Name: NXBEARING Default: 90 Range: 0 to 360

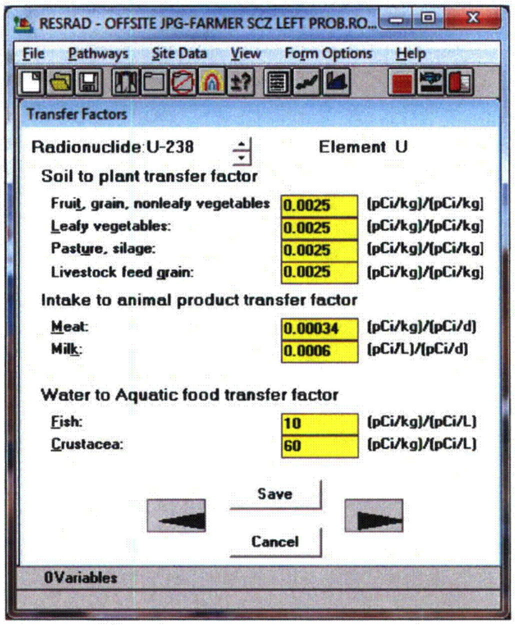
Site Layout Offsite Farmer Scenario: Secondary Contamination Zone



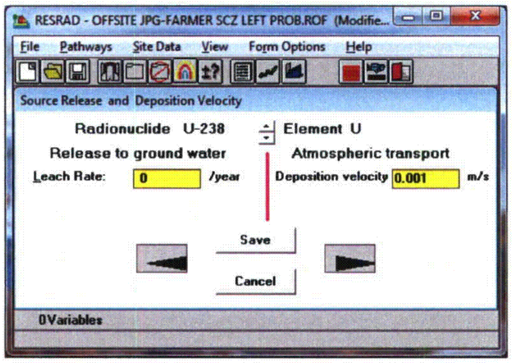
Soil Concentrations: Primary Contamination Zone, Secondary Contamination Zone



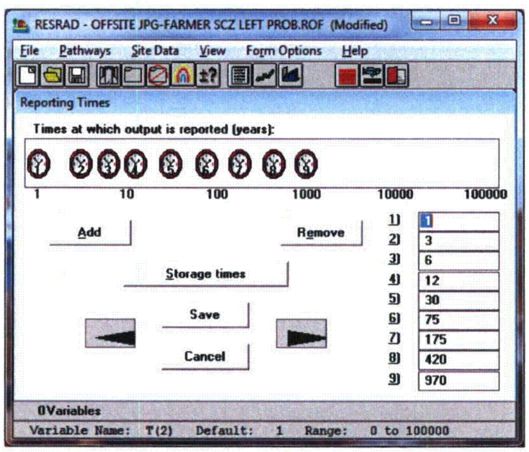
Distribution Coefficients U-234, U-235, U-238: All Scenarios and All Contamination Zones



Transfer Factors: All Scenarios and All Contamination Zones

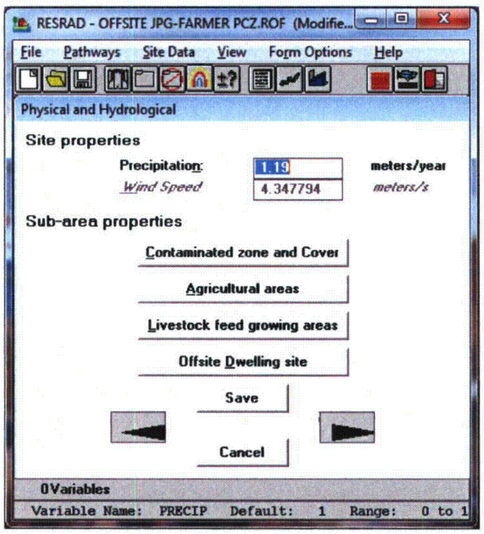


Release and Air Transport: All Scenarios and All Contamination Zones

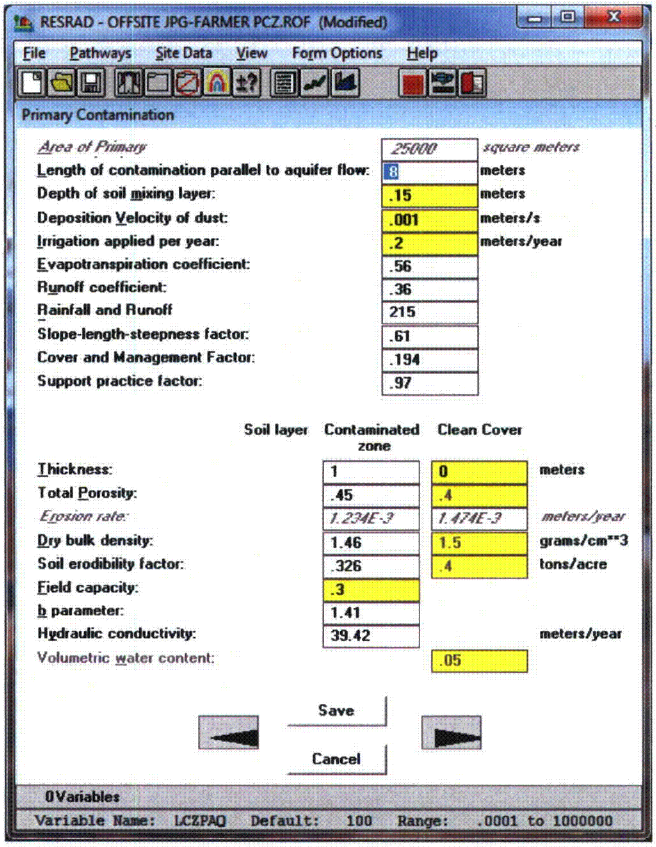


Reporting Times: All Scenarios and All Contamination Zones

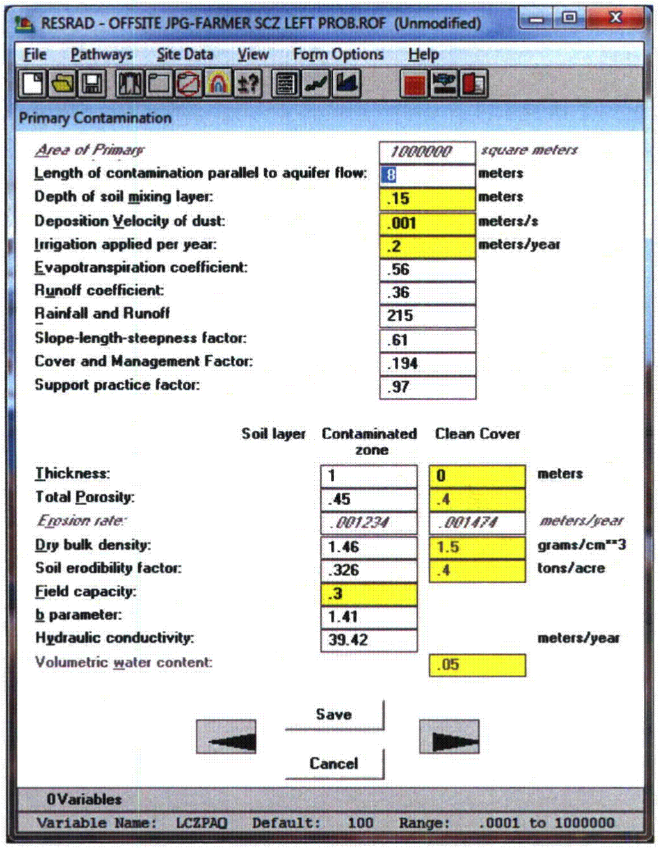
Storage Times: All Scenarios and All Contamination Zones



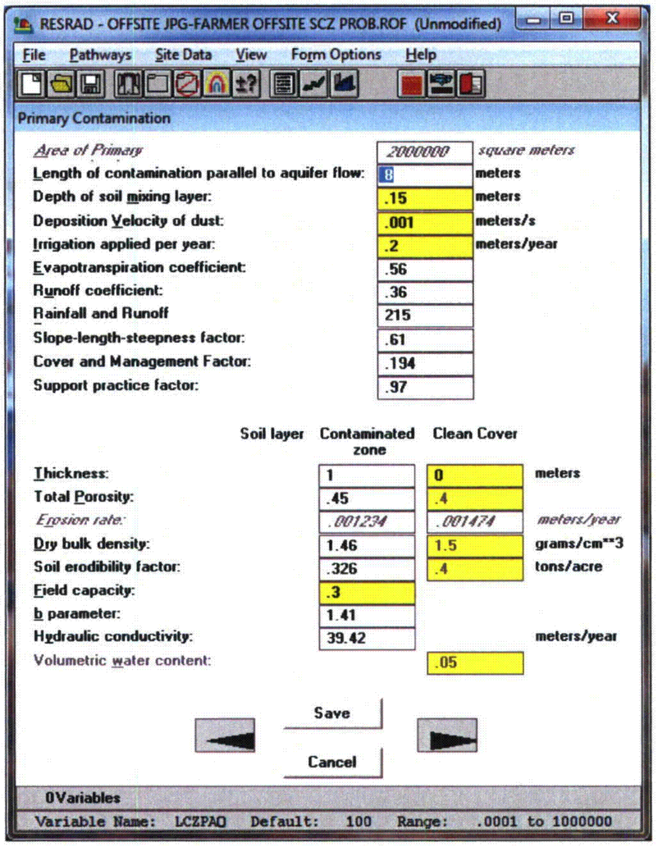
Physical and Hydrological: All Scenarios and All Contamination Zones



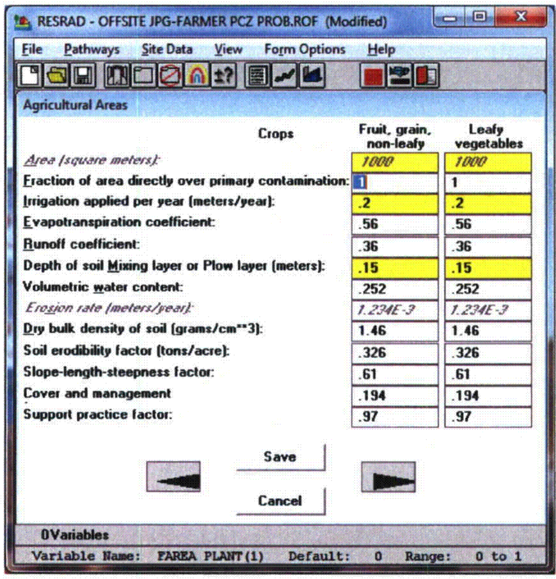
Contaminated Zone and Cover: Primary Contamination Zone, All Onsite and Offsite Scenarios

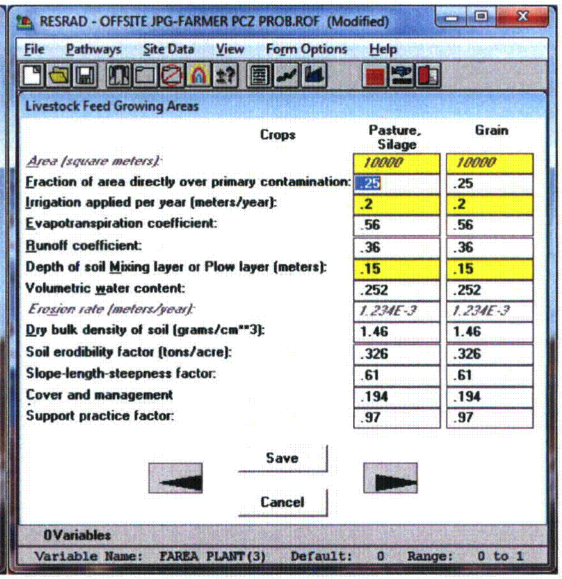


Contaminated Zone and Cover: Left and Right Secondary Contamination Zones, All Onsite Scenarios

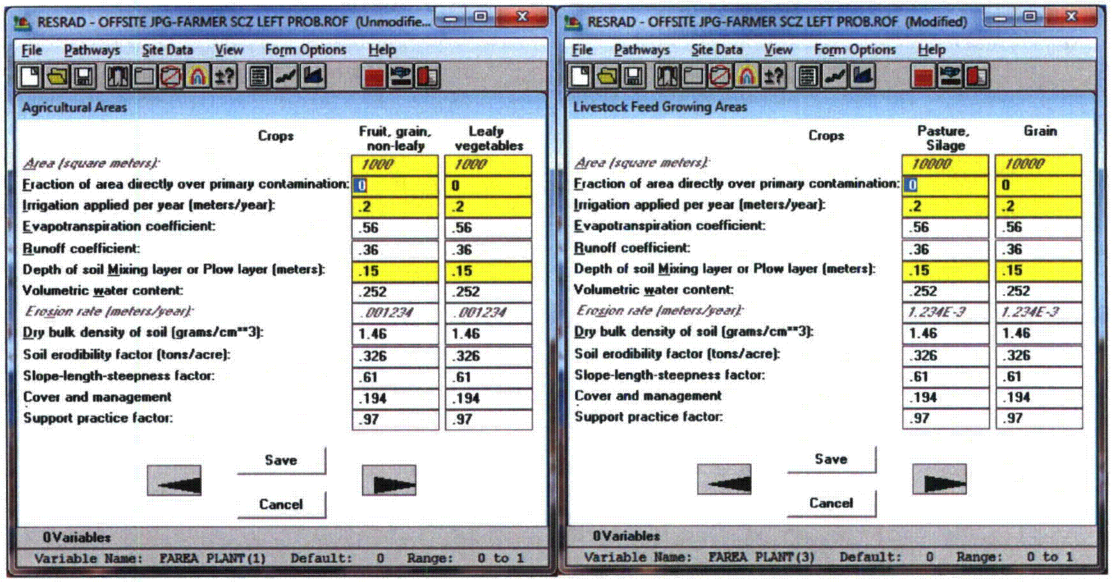


Contaminated Zone and Cover: Secondary Contamination Zone for Farmer Offsite Scenario

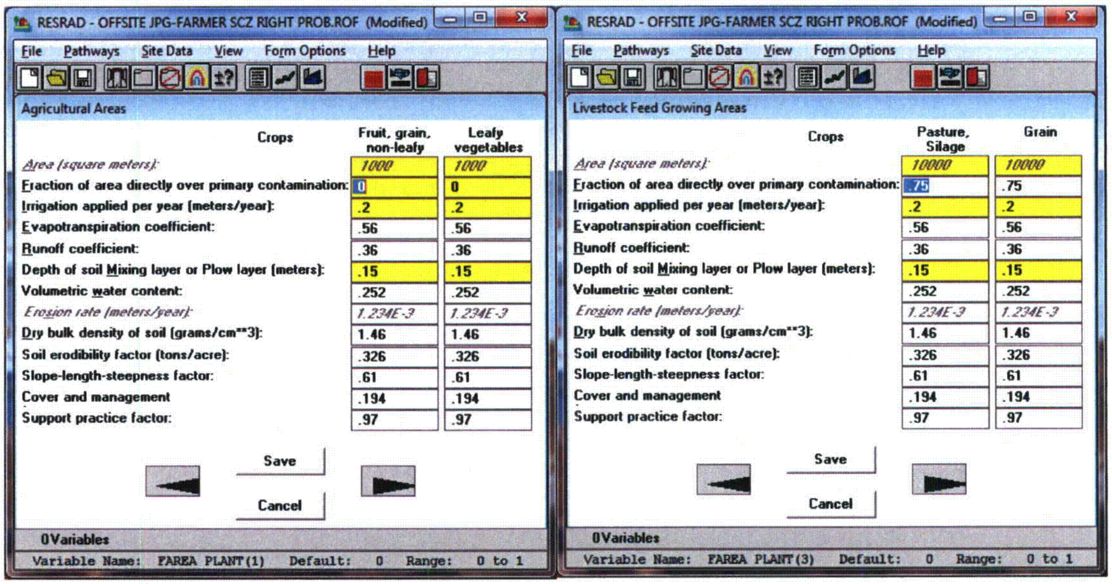




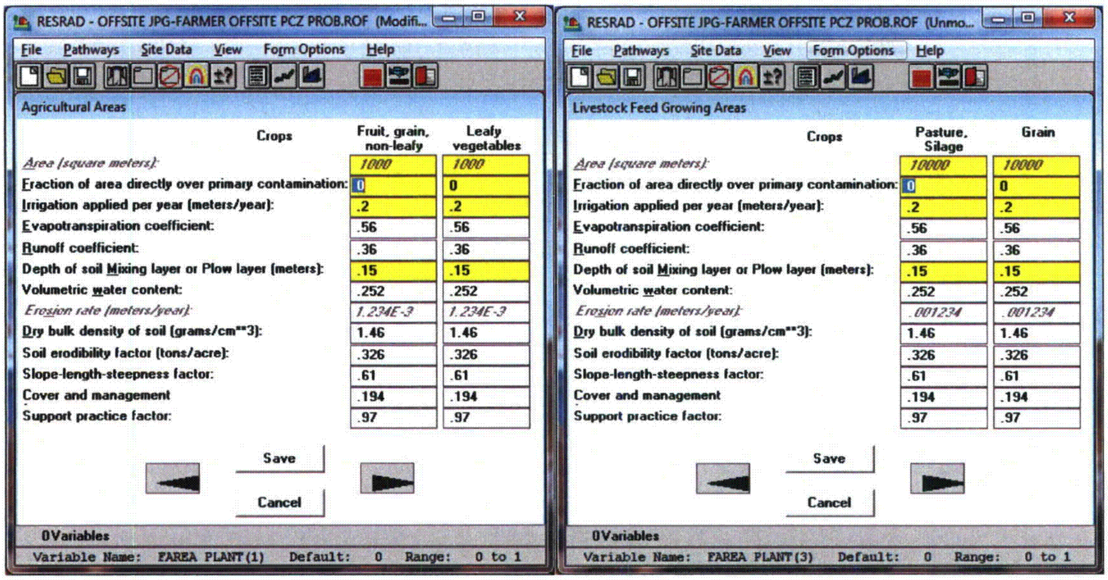
Agricultural and Livestock Feed Areas: Primary Contamination Zone, All Onsite Scenarios



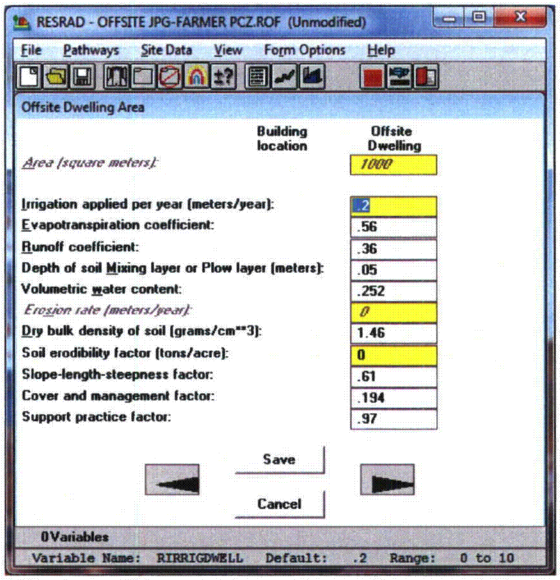
Agricultural and Livestock Feed Areas: Secondary Contamination Zone Left Side, All Onsite Scenarios



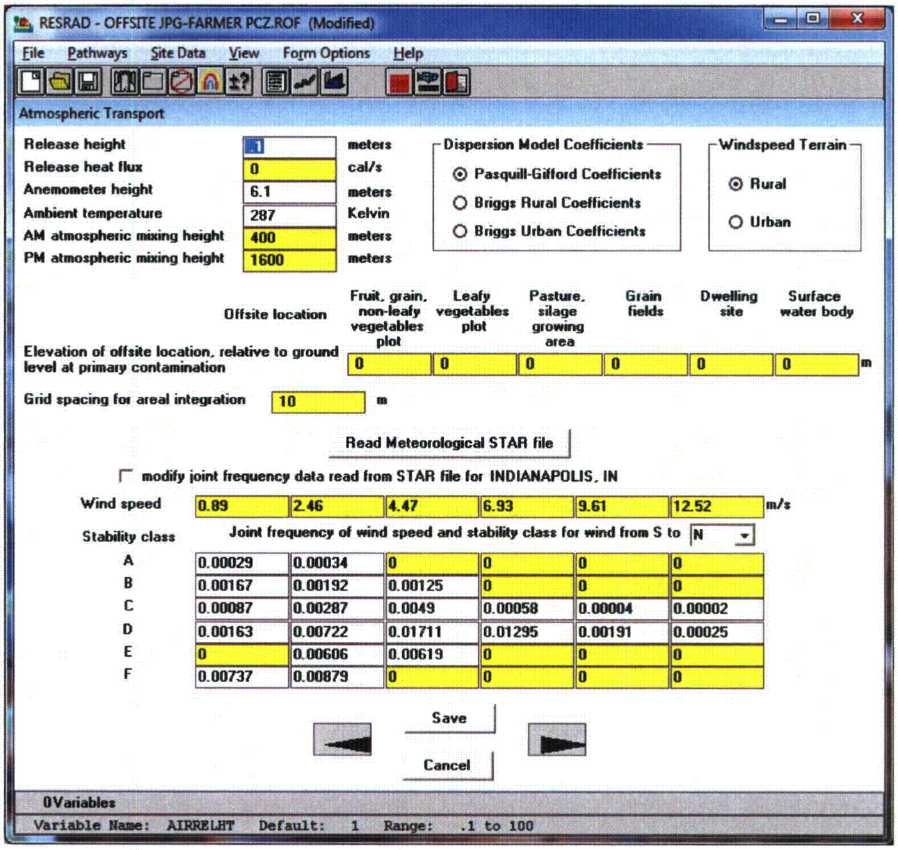
Agricultural and Livestock Feed Areas: Secondary Contamination Zone Right Side, All Onsite Scenarios



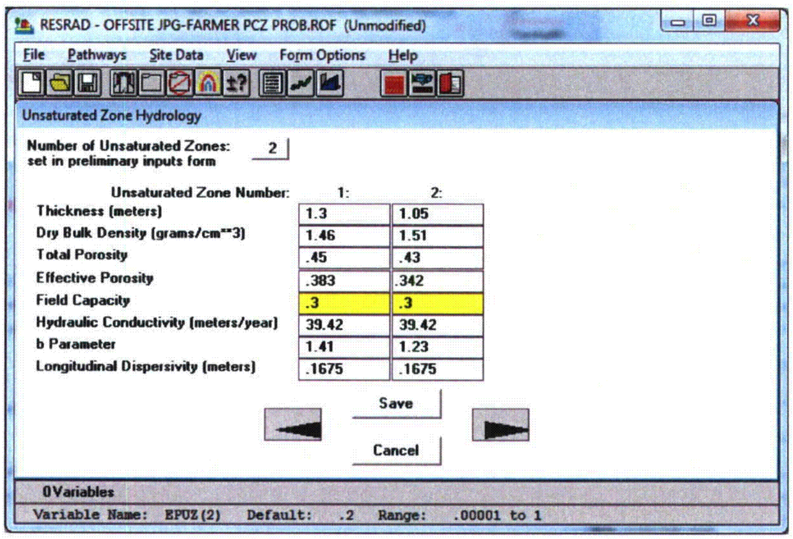
Agricultural and Livestock Feed Areas: All Contamination Zones, Offsite Farmer Scenario



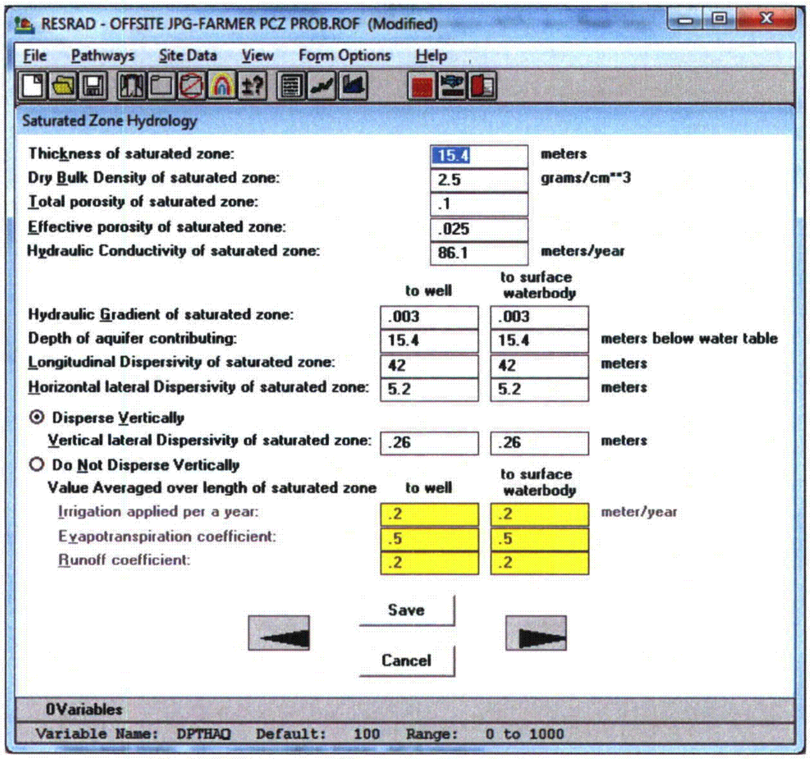
Dwelling Areas: All Contamination Zones, All Scenarios



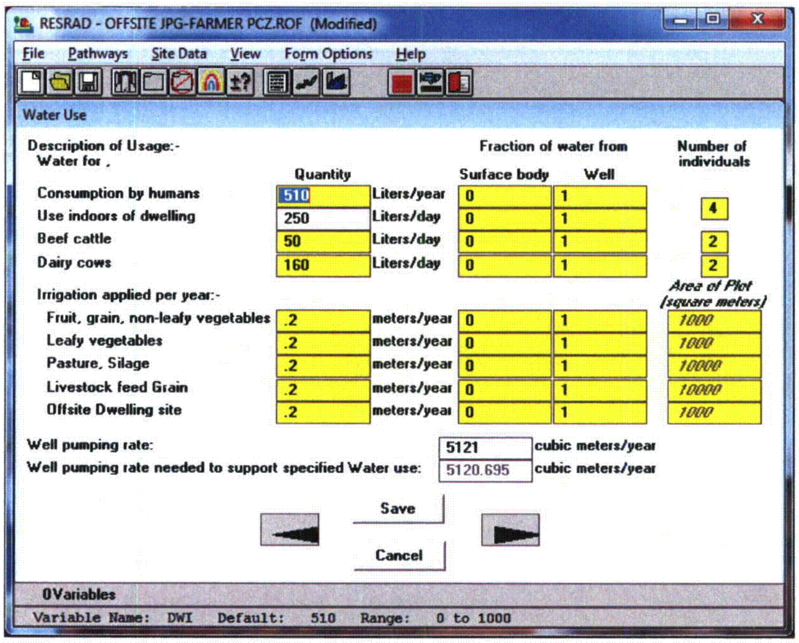
Atmospheric Transport: All Contamination Zones, All Scenarios



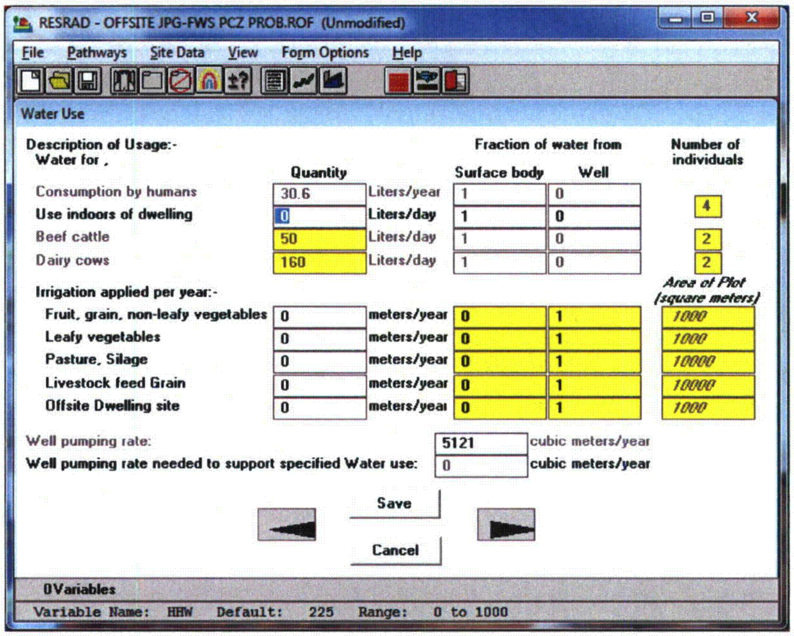
Unsaturated Zone: All Contamination Zones, All Scenarios



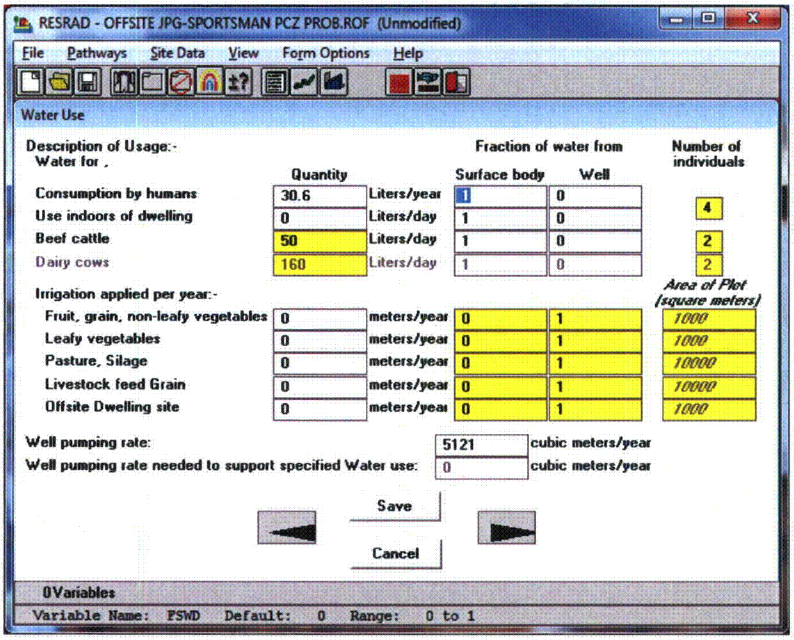
Saturated Zone: All Contamination Zones, All Scenarios



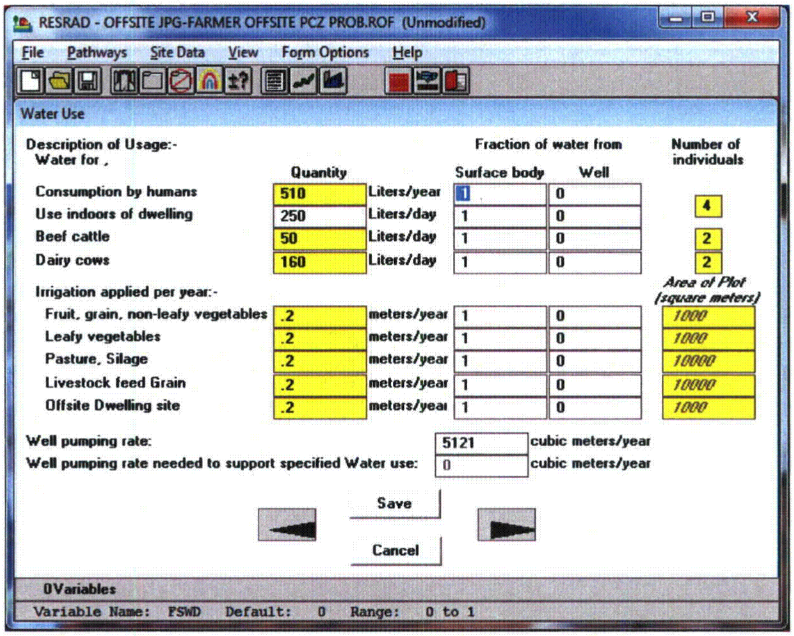
Water Use: Primary and Secondary Contamination Zones, Onsite Farmer Scenario



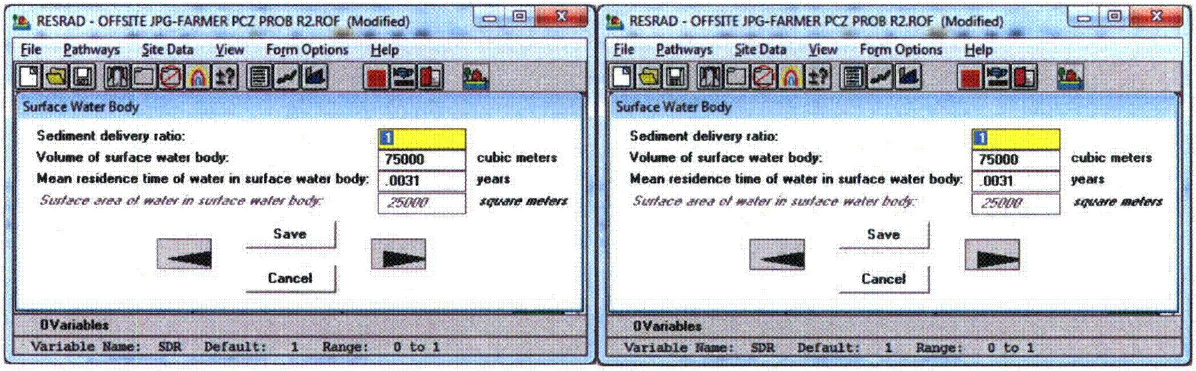
Water Use: Primary and Secondary Contamination Zones, Onsite Industrial Worker Scenario



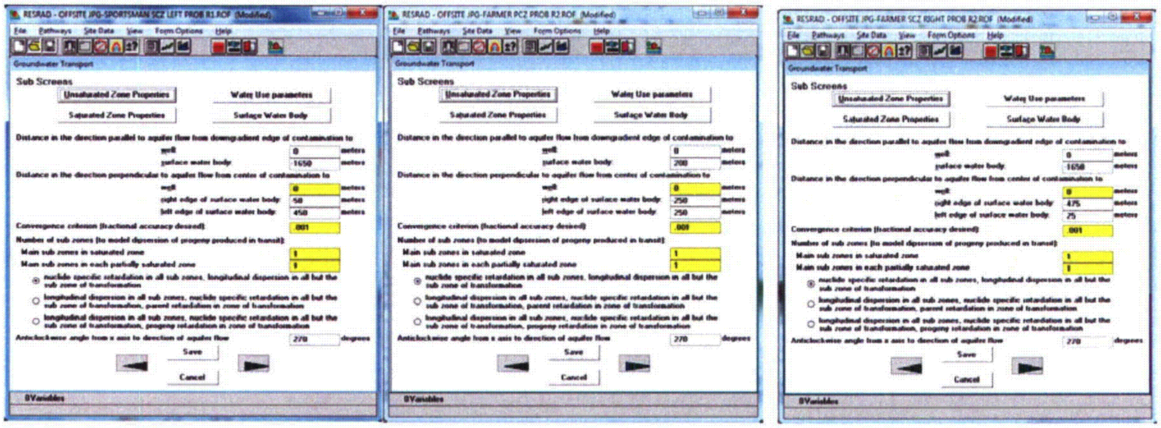
Water Use: Primary and Secondary Contamination Zones, Onsite Sportsman/Recreationalist Scenario



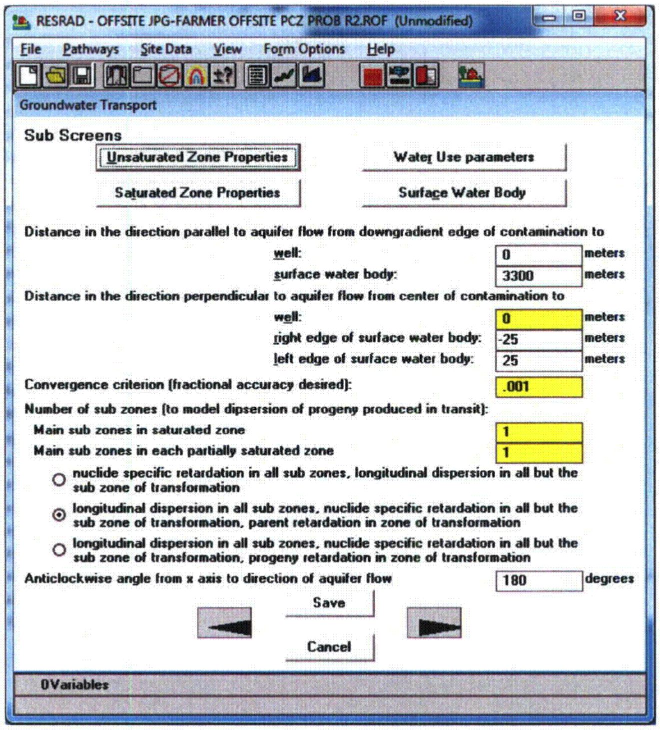
Water Use: Primary and Secondary Contamination Zones, Offsite Farmer Scenario



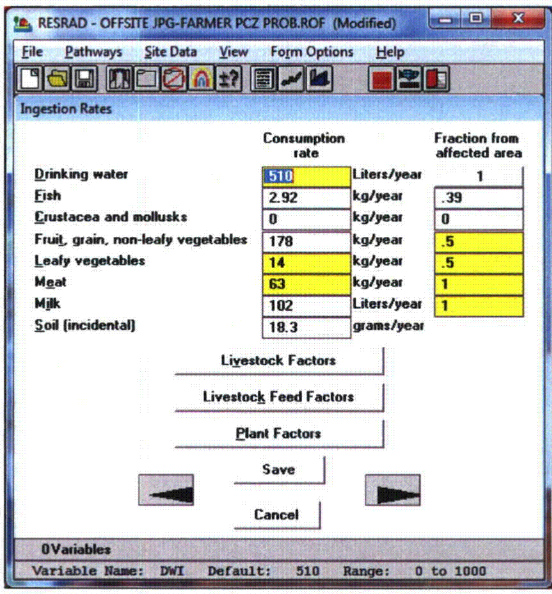
Surface Water Body All Contamination Zones: Onsite Scenarios, Offsite Scenario

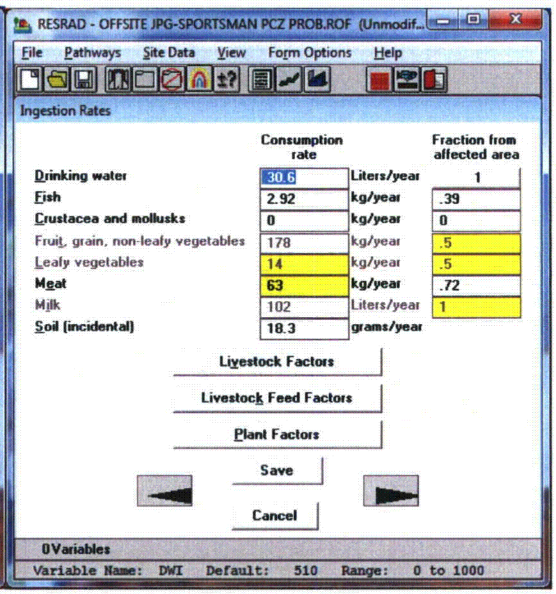


Groundwater Transport: All Onsite Scenarios, Secondary Contamination Zone Left, Primary Contamination Zone, Secondary Contamination Zone Right



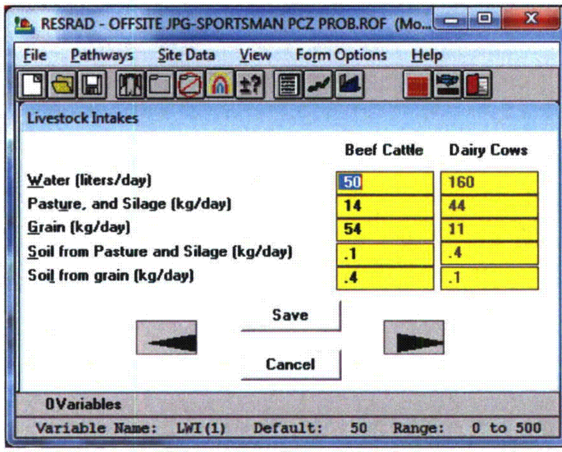
Groundwater Transport: All Contamination Zones, All Offsite Scenarios

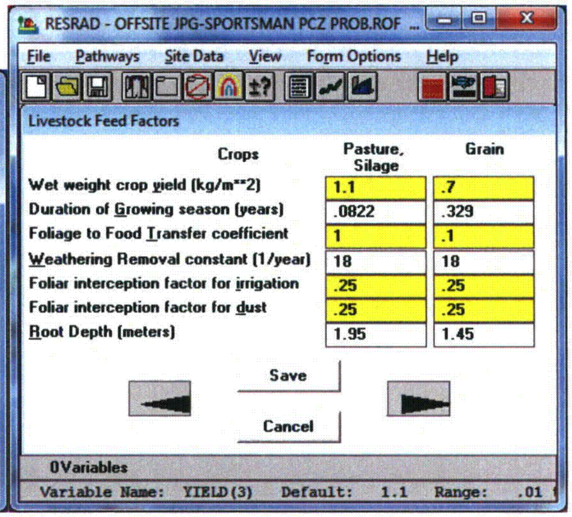




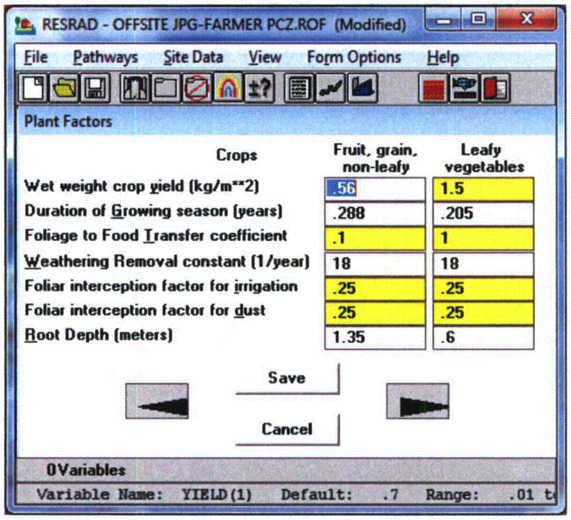
Ingestion Rates All Contamination Zones: Onsite and Offsite Farmer (left), Sportsman and Industrial Worker (right)

Note: The only active ingestion pathway for the industrial worker is incidental soil ingestion.

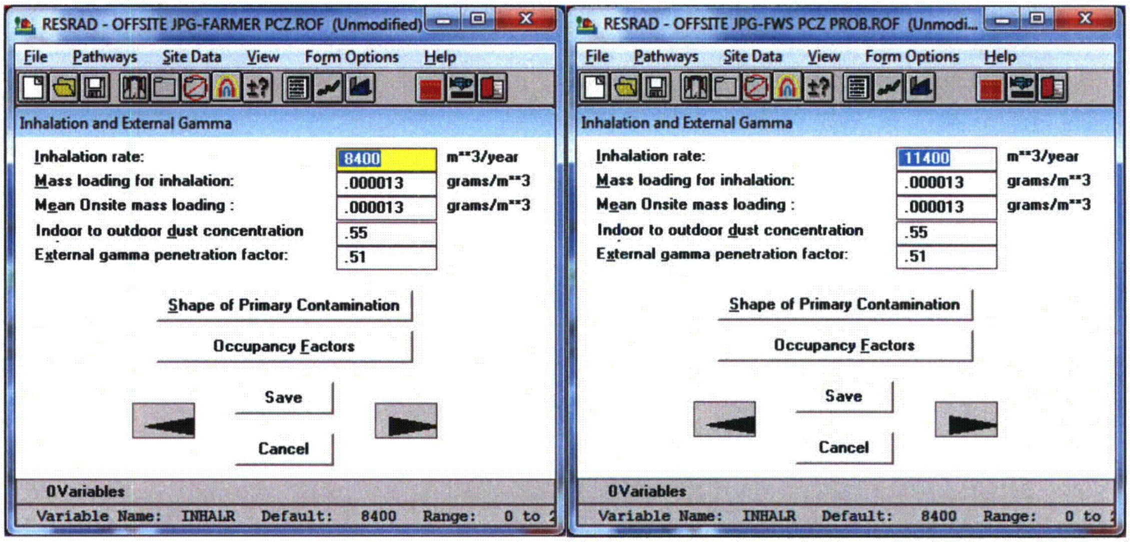




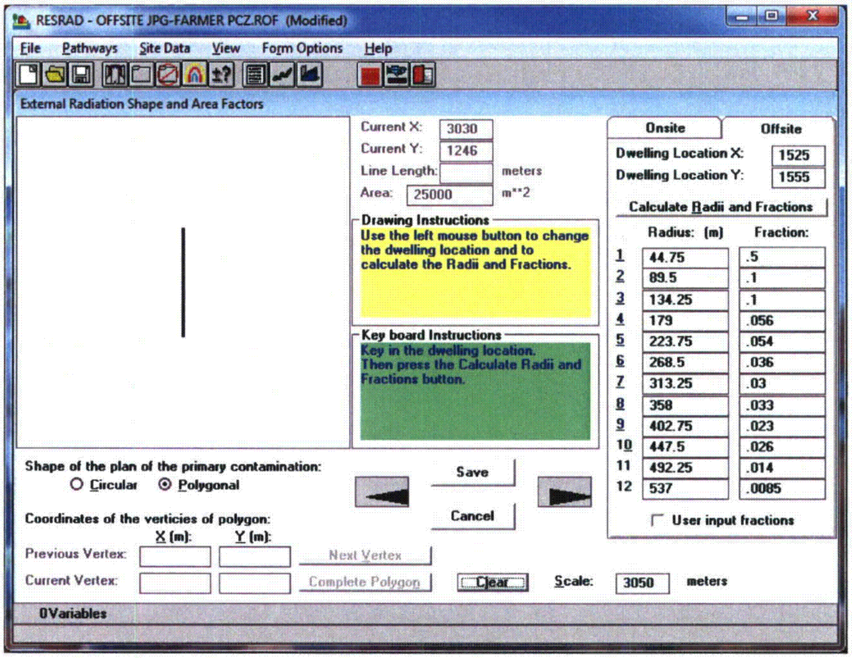
Livestock Intake and Feed Factors: All Scenarios, All Contamination Zones



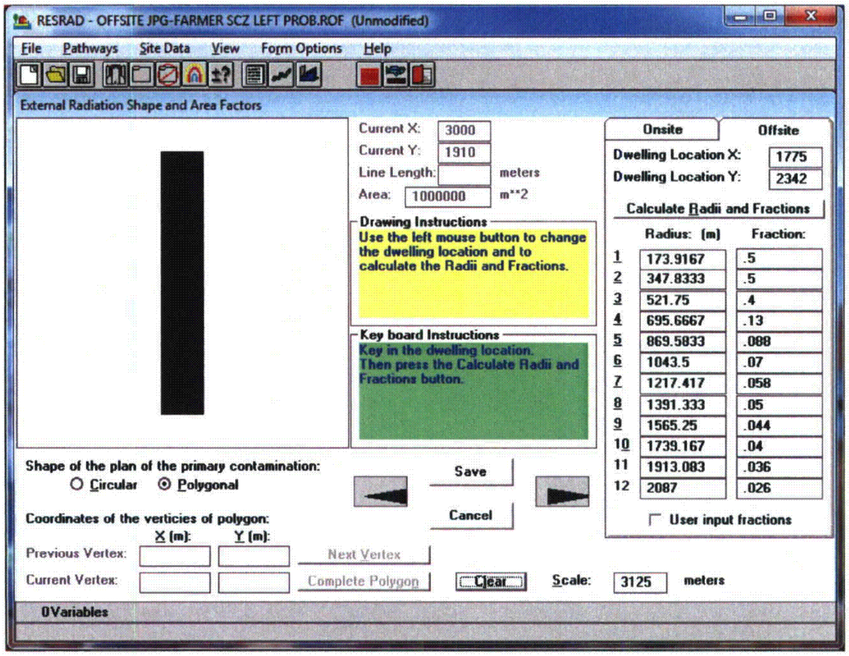
Livestock Intake and Feed Factors: All Scenarios, All Contamination Zones



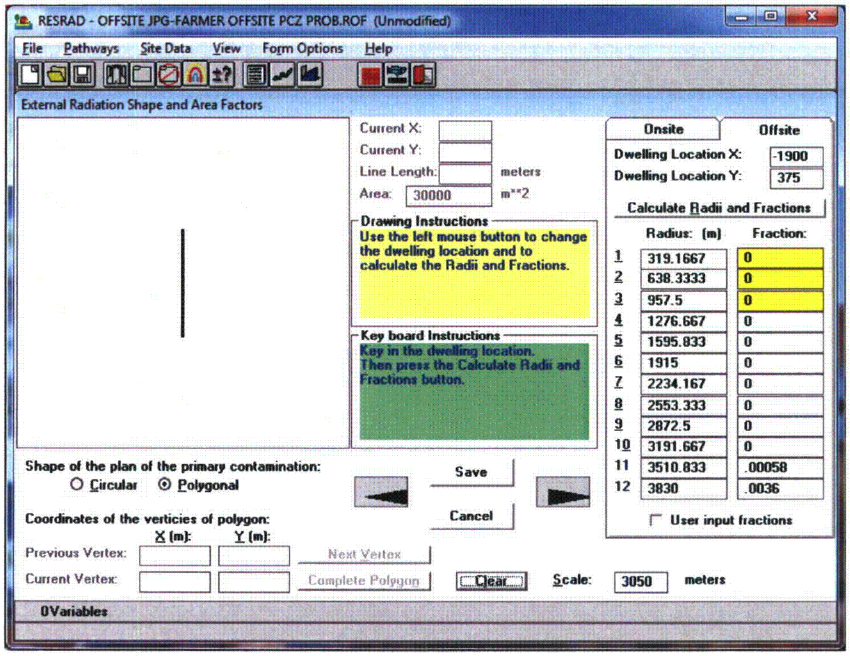
Inhalation and External Gamma All Contamination Zones: Farmer Scenarios, Sportsman and Industrial Worker



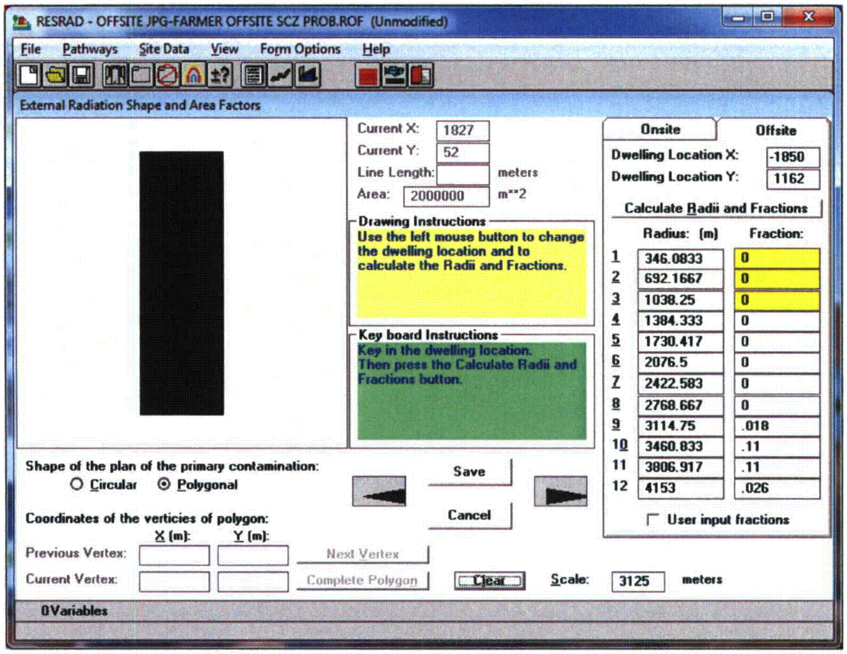
External Radiation Shape and Area Factors: Primary Contamination Zone, Onsite Scenarios



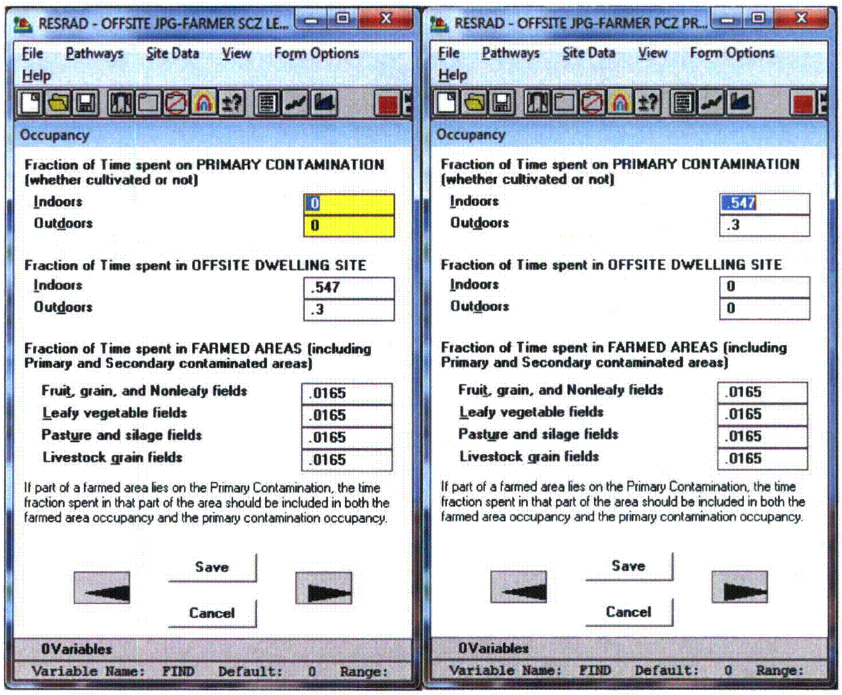
External Radiation Shape and Area Factors: Secondary Contamination Zones, Onsite Scenarios



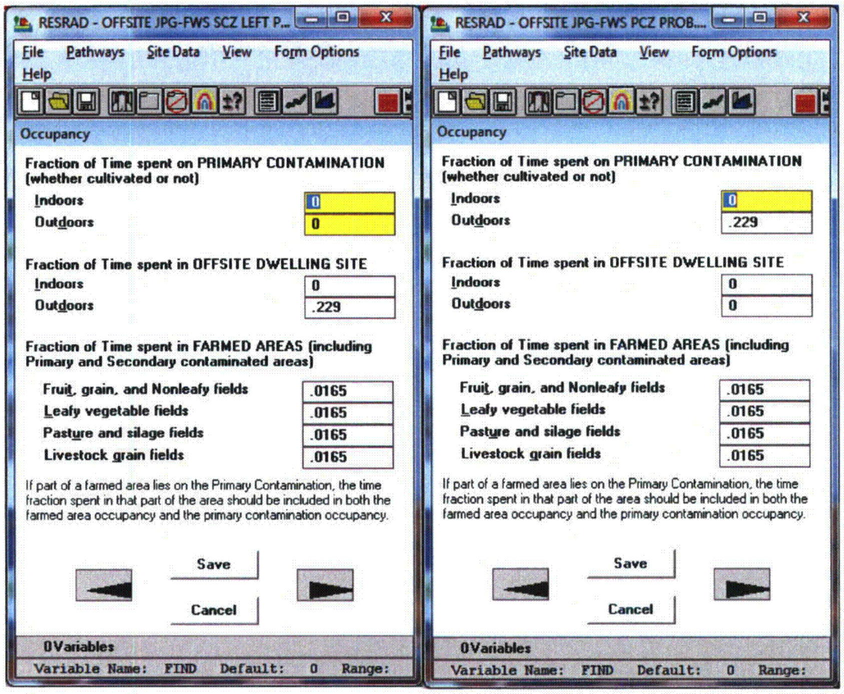
External Radiation Shape and Area Factors: Primary Contamination Zone, Offsite Scenario



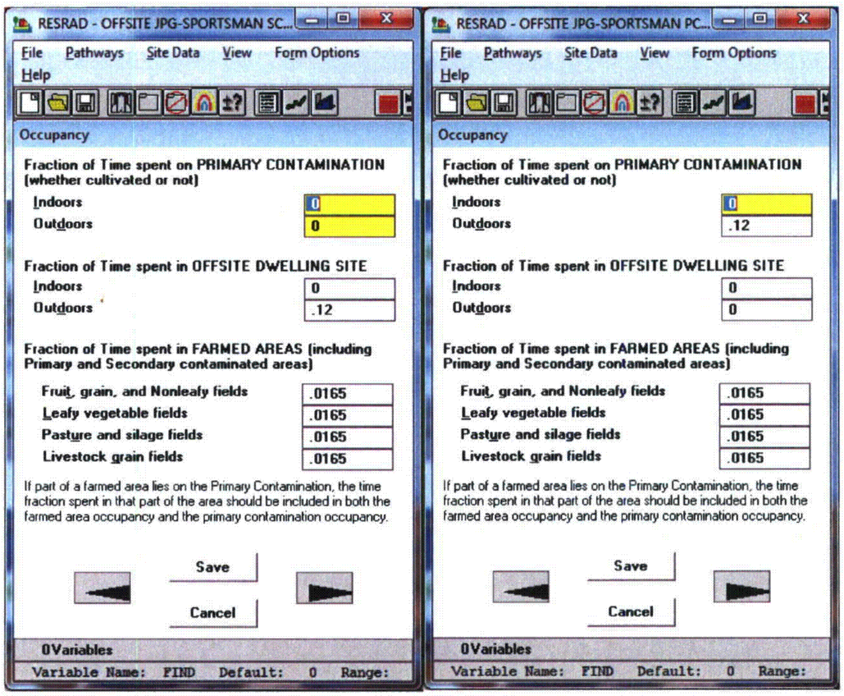
External Radiation Shape and Area Factors: Secondary Contamination Zone, Offsite Scenario



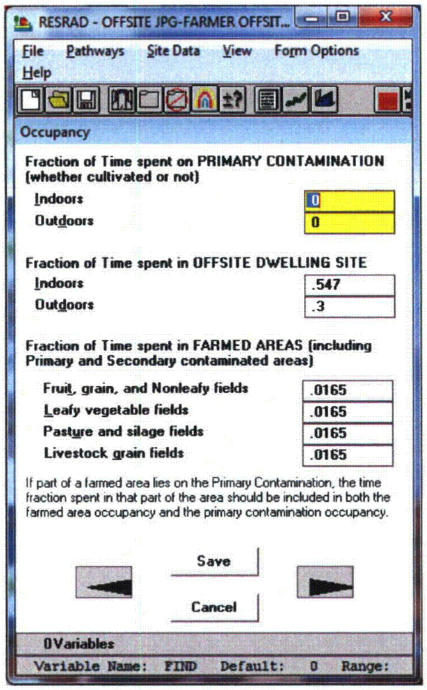
Occupancy Onsite Farmer Scenario: Secondary Contamination Zones, Primary Contamination Zone



Occupancy Industrial Worker Scenario: Secondary Contamination Zones, Primary Contamination Zone

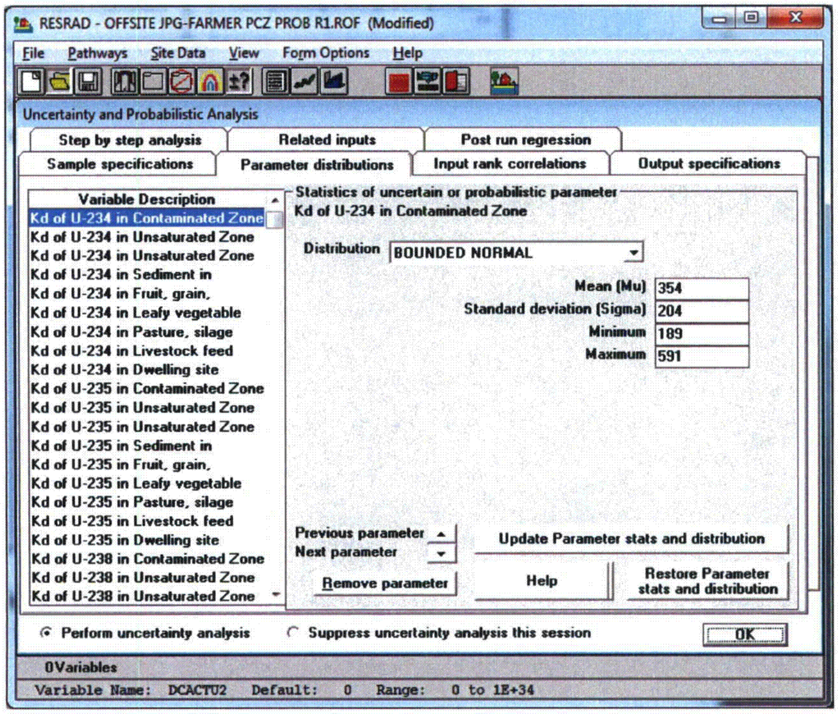


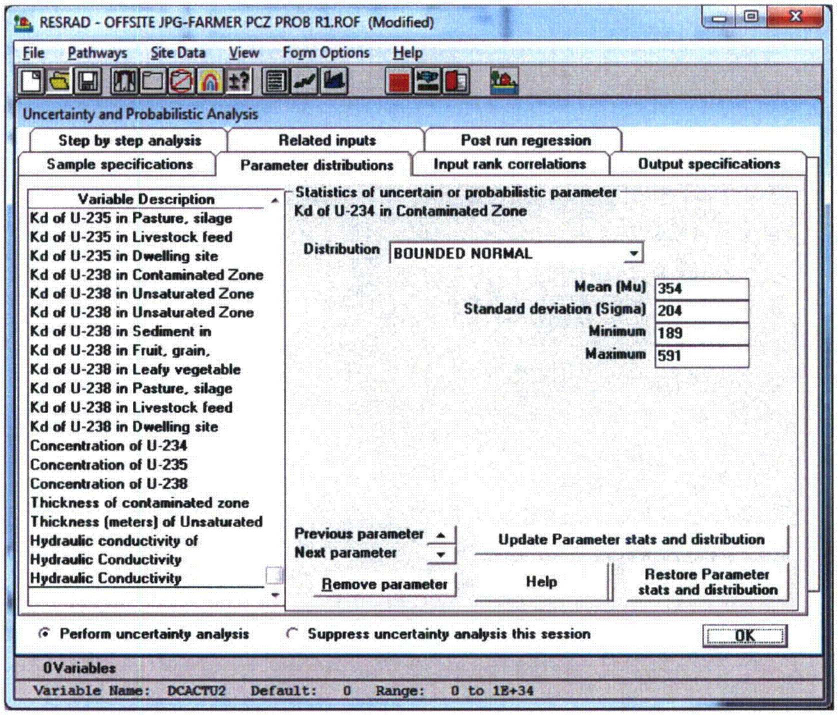
Occupancy Sportsman/Recreationalist Scenario: Secondary Contamination Zones, Primary Contamination Zone



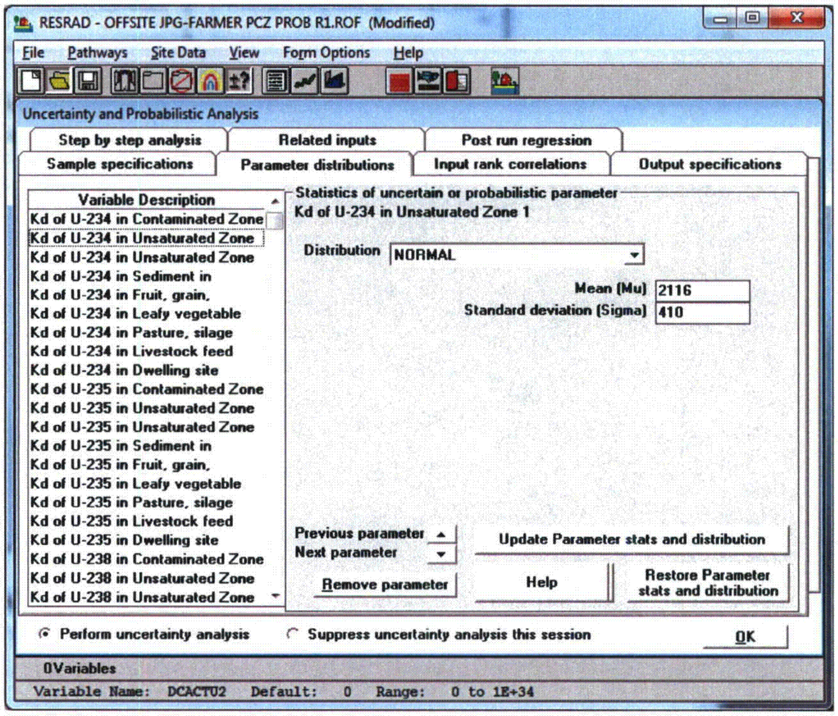
Occupancy Offsite Farmer Scenario: Primary and Secondary Contamination Zones

Probabilistic Parameter Distributions:

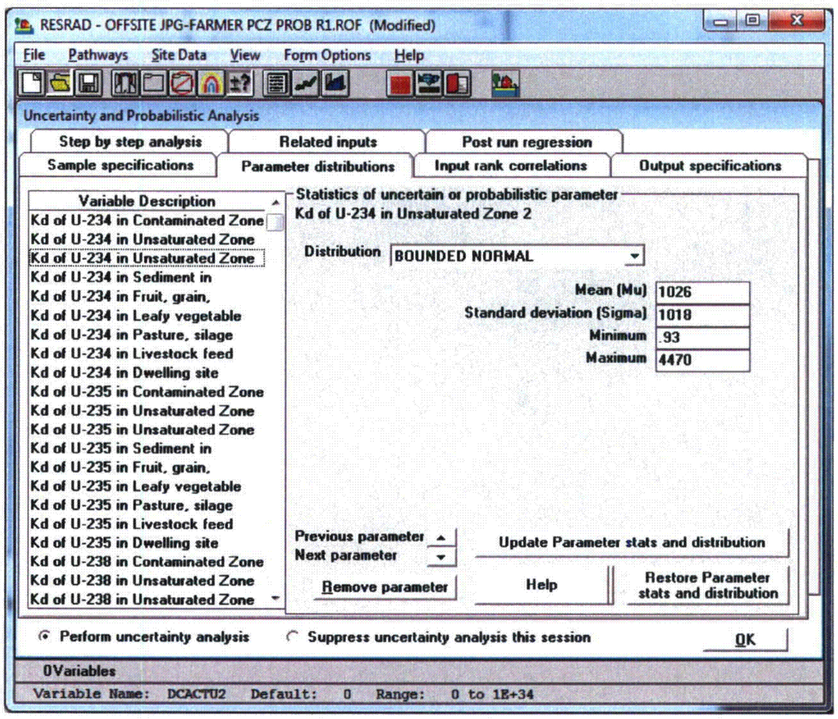




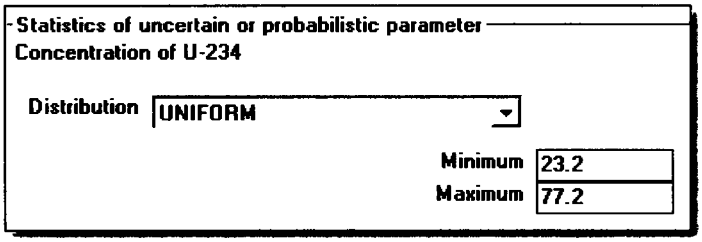
- All U-234, U-235, and U-238 K_d Values for Contaminated Zone; Fruit, Grain, Nonleafy Fields; Leafy Vegetable Fields; Pasture, Silage Growing Areas; Livestock feed Grain Fields; and Dwelling sites set at 354 (Mean), 204 (Standard Deviation), 189 (Minimum), and 591 (Maximum) for a Bounded Normal Distribution



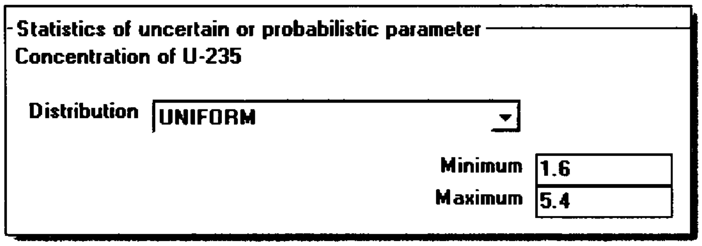
- All U-234, U-235, and U-238 K_d Values for Unsaturated Zone 1 and Sediment in Surface Water Body Set at 2116 (Mean) and 410 (Standard Deviation) for a Normal Distribution



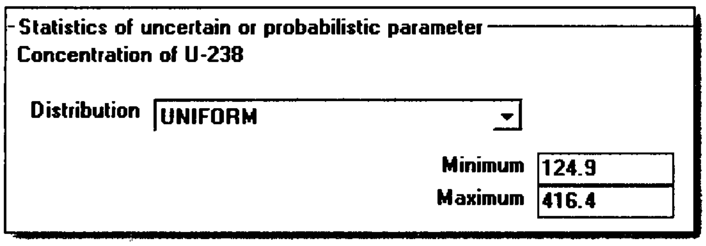
- All U-234, U-235, and U-238 K_d Values for Unsaturated Zone 2 Set at 1026 (Mean), 1018 (Standard Deviation), 0.93 (Minimum), and 4470 (Maximum) for a Bounded Normal Distribution



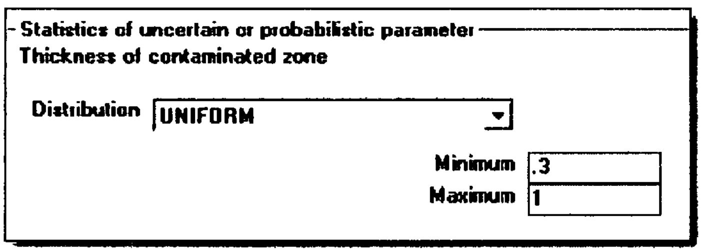
- Concentration of U-234: Uniform Distribution from 23.7 to 79.1



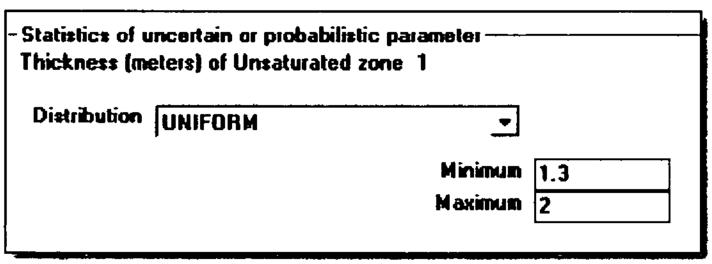
- Concentration of U-235: Uniform Distribution from 1.6 to 5.5



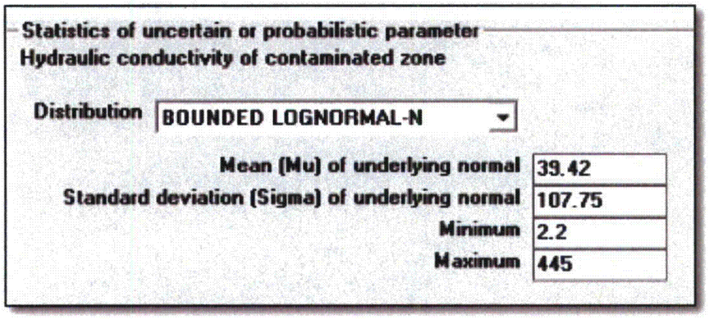
- Concentration of U-238: Uniform Distribution from 23.7 to 79.1



- Thickness of Contaminated Zone: Uniform Distribution from 0.3 to 1

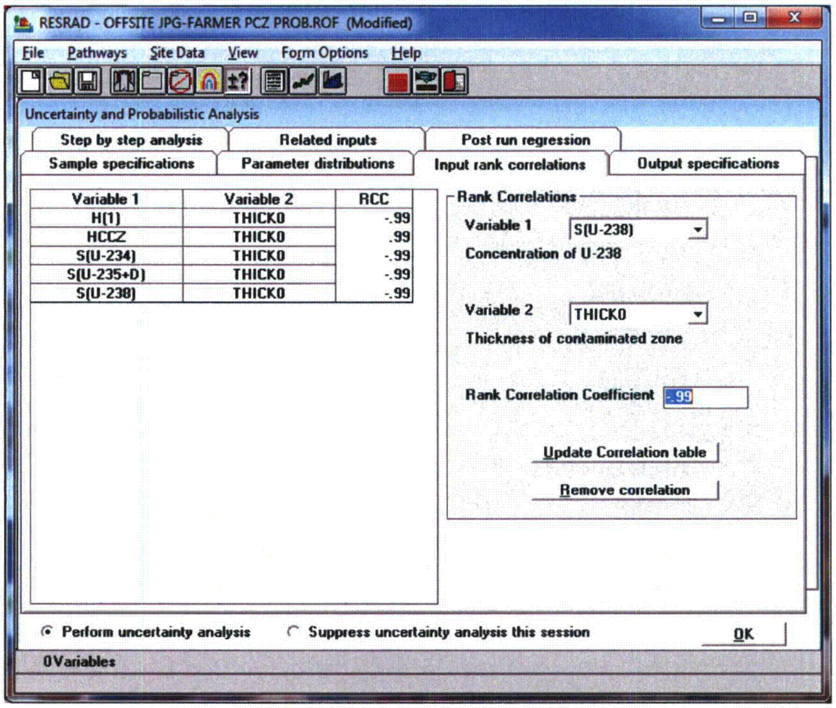


- Thickness of Unsaturated Zone 1: Uniform Distribution from 1.3 to 2



- Hydraulic Conductivity of Contaminated Zone and Unsaturated Zones 1 and 2: Bounded Lognormal-N Distribution from 2.2 to 445, 39.42 (Mean) and 107.75 (Standard Deviation)

Probabilistic Parameter Distributions and Correlations:

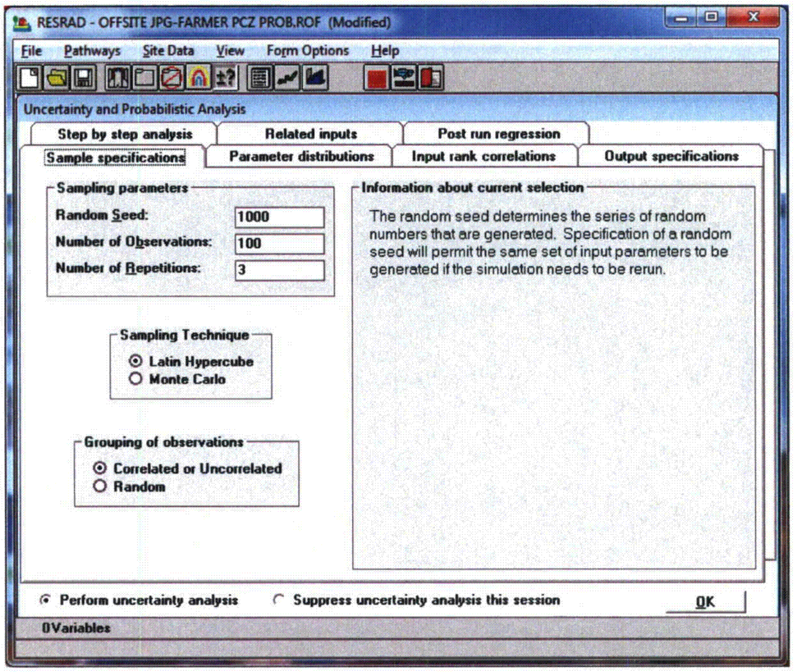


- Thickness of the Unsaturated Zone 1 (H1) Has a (-0.99) Correlation with Contaminated Zone Thickness

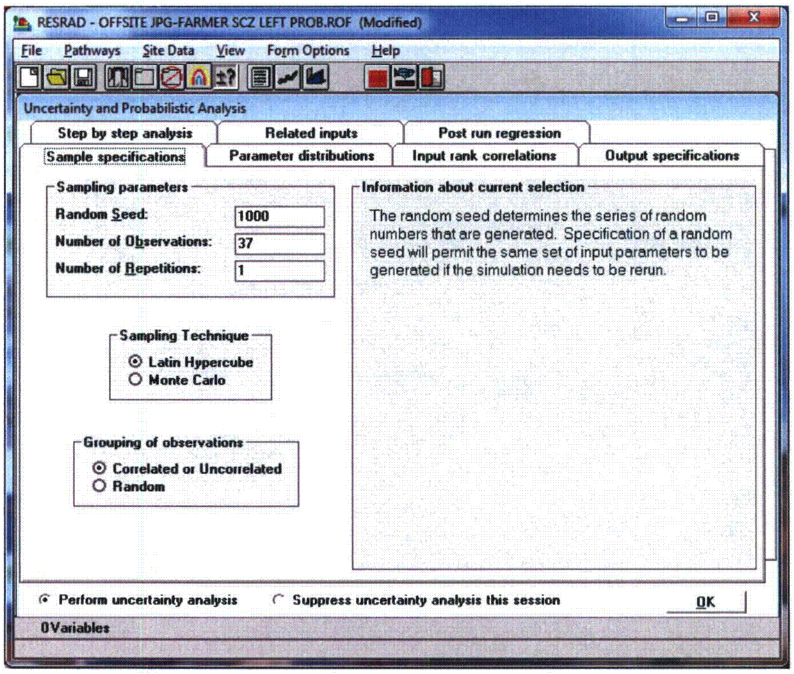
- Hydraulic Conductivity of the Contaminated Zone (HCCZ) Has a (0.99) Correlation with Contaminated Zone Thickness

- Concentrations of U-234, U-235, and U-238 [S(U-234), S(U-235+D), and S(U-238)] Have a (-0.99) Correlation with Contaminated Zone Thickness

Probabilistic Sample Specifications:



Sample Specifications for Primary Contamination Zone Runs



Sample Specifications for Secondary Contamination Zone Runs

APPENDIX D

STATEMENT OF INTENT AND CERTIFICATION OF FINANCIAL ASSURANCE

Depleted Uranium Impact Area
Jefferson Proving Ground, Madison, Indiana

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DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
US ARMY GARRISON-ROCK ISLAND ARSENAL
1 ROCK ISLAND ARSENAL
ROCK ISLAND, ILLINOIS 61299-5000

REPLY TO
ATTENTION OF:

Office of the Garrison Commander

Dr. Tom McLaughlin,
Office of Federal and State Materials and
Environmental Management Programs (FSME)
Division of Waste Management and Environmental Protection (DWMEP)
Decommissioning and Uranium Recovery Licensing Directorate (DURLD)
Materials Decommissioning Branch (MDB)
Mail Stop T-7E18
US Nuclear Regulatory Commission
Washington, DC 20555-0001

STATEMENT OF INTENT

As Garrison Commander for US Army Garrison-Rock Island Arsenal and certifying official for licensee the US Department of the Army, I exercise express authority and responsibility to request from the licensee funds for decommissioning activities associated operations authorized by US Nuclear Regulatory Commission Material License No. SUB-1435. This authority is established by Section 2-5. b. (4) (b) of Army Regulation 600-20, Army Command Policy, dated 18 March 2008 RAR 20 September 2012. Within this authority, I intend to request that funds be made available when necessary and in the required amount to decommission Jefferson Proving Ground in Madison, Indiana. It is estimated that the Army will incur costs of approximately $268,000 annually for implementing institutional control at JPG as detailed in Appendix D to the Army's Decommissioning Plan for License SUB-1435. I intend to request and obtain these funds sufficiently in advance of decommissioning activities to prevent delay of required activities.

However, any requirement for the payment or obligation of funds established by the decommissioning plan shall be subject to the availability funds, and no provision herein shall be interpreted to require payment or obligation of funds in violation of the Anti-Deficiency Act, 31 United States Code (USC) section 1341.

A copy of my Assumption of Command pursuant to Army Regulation 600-20, Section 2-5. b. (4) (b), is attached as evidence that I am authorized to represent the US Department of the Army in this transaction.

Elmer Speights, Jr.
Colonel, AR
Garrison Commander
AUG 28 2013

Enclosure

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
US ARMY GARRISON-ROCK ISLAND ARSENAL
1 ROCK ISLAND ARSENAL
ROCK ISLAND, ILLINOIS 61299-5000

REPLY TO
ATTENTION OF:
Office of the Garrison Commander

Dr. Tom McLaughlin,
Office of Federal and State Materials and
Environmental Management Programs (FSME)
Division of Waste Management and Environmental Protection (DWMEP)
Decommissioning and Uranium Recovery Licensing Directorate (DURLD)
Materials Decommissioning Branch (MDB)
Mail Stop T-7E18
US Nuclear Regulatory Commission
Washington, DC 20555-0001

CERTIFICATION OF FINANCIAL ASSURANCE

Principal: US Army Garrison–Rock Island Arsenal, 1 Rock Island Arsenal, Rock Island, IL 61299-5000
NRC License Number SUB-1435, Jefferson Proving Ground, Madison, IN 47250

Issued to: US Nuclear Regulatory Commission

I certify that US Army Garrison–Rock Island Arsenal is licensed to possess the following type of source material in a readily dispersible form under 10 CFR Part 40 in the following amount:

Type of Material	Amount of Material
Depleted Uranium	80,000 kilograms

I also certify that financial assurance in the amount of $268,000 will be requested annually for the purpose of implementing and maintaining institutional controls consistent with the requirements of 10 CFR Part 40 and 10 CFR Part 20, Subpart E.

Elmer Speights, Jr.
Colonel, AR
Garrison Commander
AUG 28 2013

APPENDIX E

SUPPORTING COST DATA FOR ALARA ANALYSIS

Depleted Uranium Impact Area
Jefferson Proving Ground, Madison, Indiana

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ALARA Analysis – Partial UXO Surface and Subsurface Clearance Cost with Mark-ups	
Low end scenario – 5 acres cleared of UXO	**Costs**
Direct Costs from RACER	$526,776.04
Profit (8%)	$42,142
Contingency (35%)	$184,372
Total	$753,290
Cost per acre for low end scenario	**$150,657.95**
High end scenario – 500 acres cleared of UXO	**Costs**
Direct costs from RACER	$9,513,809.25
Profit (8%)	$761,105
Contingency (35%)	$3,329,833
Total	$13,604,747
Cost per acre for high end scenario	**$27,209.49**

ALARA Analysis - Non-radiological Transportation Risk ($Cost_{TF}$)

$$Cost_{TF} = \$3{,}000{,}000 * \frac{V_A}{V_{Ship}} * F_T * D_T$$

Input Factors	**Value**	**Units**	**Definition and Assumptions**
Monetary value of a fatality equivalent to $2,000 person rem	$3,000,000	dollars	--
V_{Amin}	647	cubic meters (m^3)	Minimum volume of material from low-end scenario
V_{Amax}	9,807,031	cubic meters (m^3)	Maximum volume of material from high-end scenario
V_{Ship}	1,100	cubic meters (m^3)	Volume of the vehicle shipment. Assumes 20 rail cars per shipment at capacity of 55 m^3 per rail car.
D_T	2,816.35	kilometers	Distance travelled from JPG to the disposal facility
F_T	6.3×10^{-7}	per kilometers	Transportation fatality rate for railway cars
Cost $_{TF\ min}$	**$3,131**	**Dollars**	
Cost $_{TF\ max}$	**$47,456,237**	**Dollars**	

ALARA Analysis - Worker Dose ($Cost_{WDose}$)			
$$Cost_{WDose} = \$2{,}000 * D_R * T$$			
Input Factors	**Value**	**Units**	**Definition and Assumptions**
Dollars/person-rem	$2,000	dollars	Parameter from Appendix N, NUREG 1757 (NRC 2006)
D_R	0.000013044	rems	Convert factor from 15 mircroR/hour to rems
$Volume_{min}$	647	cubic meters (m^3)	Minimum volume of material from low-end scenario
$Volume_{max}$	9,807,031	cubic meters (m^3)	Maximum volume of material from high-end scenario
	1.62	person-hour/m^3	Parameter from Table N.2 for excavation, monitoring, packaging, and handling of soil (NRC 2006)
T_{min}	1,047.83	person-hour	Minimum worker time required for remediation
T_{max}	15,887,390.22	person-hour	Maximum worker time required for remediation
Cost $_{WDose\ min}$	**$27**	**Dollars**	
Cost $_{WDose\ max}$	**$414,470**	**Dollars**	

ALARA Analysis - Non-radiological Workplace Accidents ($Cost_{ACC}$)			
$$Cost_{ACC} = \$3{,}000{,}000 * F_{W*}\, T_A$$			
Input Factors	**Value**	**Units**	**Definition and Assumptions**
Monetary value of a fatality equivalent to $2,000 person rem	$3,000,000	dollars	--
F_W	4.20E-08	rems	Workplace accident fatality rate given in Table N.2, Appendix N, NUREG 1757 (NRC 2006)
$Volume_{min}$	647	cubic meters (m^3)	Minimum volume of material from low-end scenario
$Volume_{max}$	9,807,031	cubic meters (m^3)	Maximum volume of material from high-end scenario
Excavation, monitoring, packaging, and handling of soil	1.62	person-hour/m^3	Parameter from Table N.2, Appendix N, NUREG 1757 (NRC 2006)
$T_{A\ min}$	1,047.83	person-hour	Minimum worker time required for remediation
T_{Amax}	15,887,390.22	person-hour	Maximum worker time required for remediation
Cost $_{ACC\ min}$	**$132**	**Dollars**	
Cost $_{ACC\ max}$	**$2,001,811**	**Dollars**	

Phase Technology Cost Detail Report

System:

RACER Version: RACER™ Version 11.1.12.0
Database Location: C:\Documents and Settings\johnsonr6\My Documents\RACER 11.1\Racer.mdb

Folder:

Folder Name: Jefferson Proving Ground

Project:

ID: Jefferson Proving Ground
Name: Jefferson Proving Ground (JPG)
Category: None

Location
State / Country: INDIANA
City: JEFFERSON PROVING GROUND

Location Modifier	Default	User	Reason for changes
	0.920	0.920	

Options
Database: System Costs
Cost Database Date: 2013
Report Option: Fiscal

Description RACER was used to develop general costs for UXO removal of two scenarios - a low end (5 acres) and a high end (500 acres).

Figure E-1. RACER Output for Low-Cost Scenario (page 1 of 8)

Site:

ID: JPG
Name: Jefferson Proving Ground
Type: None

Media/Waste Type
Primary: Ordnance (not residual)
Secondary: Soil

Contaminant
Primary: Ordnance (not residual)
Secondary: Radioactive (Low Level)

Phase Names

Pre-Study ☐
Study ☐
Design ☐
Removal/Interim Action ☐
Remedial Action ☑
Operations & Maintenance ☑
Long Term Monitoring ☐
Site Closeout ☐

Documentation
Description: dsdasd
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate
References: Documentation of reference sources used in the preparation of the estimate

Estimator Information
Estimator Name: Jamie Johnson
Estimator Title: Environmental Engineer
Agency/Org./Office: SAIC

Figure E-2. RACER Output for Low-Cost Scenario (page 2 of 8)

Business Address: 8301 Greensboro Drive
McLean, VA 22101
Telephone Number: 703-676-7360
Email Address: johnsonr6@saic.com
Estimate Prepared Date: 04/15/2013

Estimator Signature: ______________________ Date: ______________

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed: 04/15/2013

Reviewer Signature: ______________________ Date: ______________

Figure E-3. RACER Output for Low-Cost Scenario (page 3 of 8)

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial Removal of UXO - 5 acres
Description: This alternative provides a rough estimate of costs for UXO removal. Uses the minimum remediation quantities of 5 acres.

Approach: Ordnance Removal
Start Date: August, 2014
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MEC Removal Action	True	100	0

Total Marked-up Cost: $717,873.18

Technologies:

Technology: MEC Removal Action

Element: Site Visit

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	3	DAY	0.00	0.00	0.00	49.04	$147.11	False

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Figure E-4. RACER Output for Low-Cost Scenario (page 4 of 8)

Technology: MEC Removal Action

33010202	Per Diem (per person)	9	DAY	0.00	0.00	0.00	123.00	$1,107.00	True
33040921	Senior UXO Supervisor (SUXOS)	40	HR	0.00	44.21	0.00	0.00	$1,768.31	False
33040923	UXO Project Manager	40	HR	0.00	65.04	0.00	0.00	$2,601.41	False
33040925	UXO Staff Engineer	40	HR	0.00	41.47	0.00	0.00	$1,658.81	False
33041101	Airfare	3	LS	0.00	0.00	0.00	750.00	$2,250.00	True
33240101	Other Direct Costs	1	LS	500.00	0.00	0.00	0.00	$500.00	True

Total Element Cost: $10,032.64

Element: Surveying

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	123.00	$123.00	True
33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1	MO	2,198.80	0.00	0.00	0.00	$2,198.80	False
33040935	UXO Technician III (UXO Supervisor)	10	HR	0.00	35.95	0.00	0.00	$359.53	False
33041101	Airfare	1	LS	0.00	0.00	0.00	750.00	$750.00	True
33220213	Surveying - 3-man Crew	1	DAY	0.00	1,259.62	13.03	0.00	$1,272.64	False
33240101	Other Direct Costs	1	LS	141.12	0.00	0.00	0.00	$141.12	True

Total Element Cost: $4,845.09

Element: UXO Mapping

			Unit of	Material	Labor Unit	Equipment	Sub Bid		Cost

Figure E-5. RACER Output for Low-Cost Scenario (page 5 of 8)

Technology: MEC Removal Action

Phase	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
33010202	Per Diem (per person)	145	DAY	0.00	0.00	0.00	123.00	$17,835.00	True
33021530	Differential GPS Unit Rental	2	MO	183.23	0.00	0.00	0.00	$366.47	False
33040210	Geonics EM-61 Metal Locator, Towed (Weekly Rental)	1	WK	0.00	0.00	0.00	409.09	$409.09	False
33040223	Ordnance Locator, Schoenstedt Model GA-72CD, weekly rental	21	WK	0.00	0.00	0.00	82.80	$1,738.80	False
33040230	Geonics EM-61 Metal Locator, Hand Held (Weekly Rental)	1	WK	0.00	0.00	0.00	342.79	$342.79	False
33040651	4 X 4 Truck- Rental Lease	44	DAY	0.00	0.00	65.22	0.00	$2,869.51	False
33040653	All Terrain Vehicle (ATV) - Rental Lease	1	DAY	0.00	0.00	0.00	165.60	$165.60	False
33040934	UXO Technician II	600	HR	0.00	30.58	0.00	0.00	$18,345.33	False
33040935	UXO Technician III (UXO Supervisor)	150	HR	0.00	35.95	0.00	0.00	$5,392.89	False
33040936	Geophysicist (UXO)	20	HR	0.00	58.63	0.00	0.00	$1,172.60	False
33041101	Airfare	10	LS	0.00	0.00	0.00	750.00	$7,500.00	True
33240101	Other Direct Costs	1	LS	1,915.15	0.00	0.00	0.00	$1,915.15	True

Total Element Cost: $58,053.24

Element: UXO Removal

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	448	DAY	0.00	0.00	0.00	123.00	$55,104.00	True
33040223	Ordnance Locator, Schoenstedt Model GA-72CD, weekly rental	32	WK	0.00	0.00	0.00	82.80	$2,649.60	False

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Figure E-6. RACER Output for Low-Cost Scenario (page 6 of 8)

Technology MEC Removal Action

33040230	Geonics EM-61 Metal Locator, Hand Held (Weekly Rental)	4	WK	0.00	0.00	0.00	342.79	$1,371.17	False
33040646	Backhoe - Rental Lease	55	DAY	0.00	0.00	233.01	0.00	$12,815.81	False
33040651	4 X 4 Truck- Rental Lease	132	DAY	0.00	0.00	65.22	0.00	$8,608.54	False
33040934	UXO Technician II	1,860	HR	0.00	30.58	0.00	0.00	$56,870.54	False
33040935	UXO Technician III (UXO Supervisor)	440	HR	0.00	35.95	0.00	0.00	$15,819.14	False
33040936	Geophysicist (UXO)	260	HR	0.00	58.63	0.00	0.00	$15,243.74	False
33041001	16oz Standard TNT Booster	500	EA	0.36	0.00	0.00	0.00	$179.40	False
33041002	50 gr.ft Det -Cord (1000 ft roll)	75	EA	446.20	0.00	0.00	0.00	$33,465.00	False
33041004	12 ft Lead Primadet Non- Electric Detonators	250	EA	5.35	0.00	0.00	0.00	$1,338.60	False
33240101	Other Direct Costs	1	LS	7,418.08	0.00	0.00	0.00	$7,418.08	True

Total Element Cost: $210,883.61

Element. Site Management

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	420	DAY	0.00	0.00	0.00	123.00	$51,660.00	True
33040651	4 X 4 Truck- Rental Lease	420	DAY	0.00	0.00	65.22	0.00	$27,390.81	False
33040921	Senior UXO Supervisor (SUXOS)	600	HR	0.00	44.21	0.00	0.00	$26,524.65	False
33040923	UXO Project Manager	600	HR	0.00	65.04	0.00	0.00	$39,021.10	False
33040930	UXO QC Specialist	600	HR	0.00	40.58	0.00	0.00	$24,349.88	False
33040931	UXO Safety Officer	600	HR	0.00	41.21	0.00	0.00	$24,726.51	False
33041101	Airfare	4	LS	0.00	0.00	0.00	750.00	$3,000.00	True

Figure E-7. RACER Output for Low-Cost Scenario (page 7 of 8)

Technology: MEC Removal Action

Total Element Cost:	$196,672.95

Element: Stakeholder Involvement

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33040923	UXO Project Manager	6	HR	0.00	65.04	0.00	0.00	$390.21	False
33040935	UXO Technician III (UXO Supervisor)	6	HR	0.00	35.95	0.00	0.00	$215.72	False
33041302	Site Specific Workplan (Moderate Complexity)	1	EA	78.20	14,265.83	0.00	0.00	$14,344.03	False
33041305	Explosive Safety Submission (Moderate Complexity)	1	EA	156.40	6,484.81	0.00	0.00	$6,641.21	False
33041315	UXO Removal Report (High Complexity)	1	EA	234.60	24,462.75	0.00	0.00	$24,697.35	False

Total Element Cost:	$46,288.51
Total 1st Year Tech Cost:	$526,776.04
Total Phase Element Cost	**$526,776.04**

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Figure E-8. RACER Output for Low-Cost Scenario (page 8 of 8)

Phase Technology Cost Detail Report

System:

RACER Version: RACER™ Version 11.1.12.0
Database Location: C:\Documents and Settings\johnsonr\My Documents\RACER 11.1\Racer.mdb

Folder:

Folder Name: Jefferson Proving Ground

Project:

ID: Jefferson Proving Ground
Name: Jefferson Proving Ground (JPG)
Category: None

Location
State / Country: INDIANA
City: JEFFERSON PROVING GROUND

Location Modifier	Default	User	Reason for changes
	0.920	0.920	

Options
Database: System Costs
Cost Database Date: 2013
Report Option: Fiscal

Description RACER was used to develop general costs for UXO removal of two scenarios - a low end (5 acres) and a high end (500 acres).

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Figure E-9. RACER Output for High-Cost Scenario (page 1 of 8)

Site:

ID: JPG
Name: Jefferson Proving Ground
Type: None

Media/Waste Type
Primary: Ordnance (not residual)
Secondary: Soil

Contaminant
Primary: Ordnance (not residual)
Secondary: Radioactive (Low Level)

Phase Names

Pre-Study ☐
Study ☐
Design ☐
Removal/Interim Action ☐
Remedial Action ☑
Operations & Maintenance ☑
Long Term Monitoring ☐
Site Closeout ☐

Documentation
Description: dsdsoasd
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate
References: Documentation of reference sources used in the preparation of the estimate

Estimator Information
Estimator Name: Jamie Johnson
Estimator Title: Environmental Engineer
Agency/Org./Office: SAIC

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Figure E-10. RACER Output for High-Cost Scenario (page 2 of 8)

Business Address: 8301 Greensboro Drive
McLean, VA 22101
Telephone Number: 703-676-7360
Email Address: johnsonjr6@saic.com
Estimate Prepared Date: 04/15/2013

Estimator Signature: ______________________ **Date:** ______________

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed: 04/15/2013

Reviewer Signature: ______________________ **Date:** ______________

Figure E-11. RACER Output for High-Cost Scenario (page 3 of 8)

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial Removal of UXO - 500 acres
Description: This alternative provides a rough estimate of costs for UXO removal. Uses the minimum remediation quantities of 500 acres to 4 feet.
Approach: Ordnance Removal
Start Date: August, 2014
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MEC Removal Action	True	100	0

Total Marked-up Cost: $12,649,143 18

Technologies:

Technology MEC Removal Action

Element Site Visit

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	3	DAY	0 00	0 00	0 00	49.04	$147.11	False

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Figure E-12. RACER Output for High-Cost Scenario (page 4 of 8)

Technology: MEC Removal Action

33010202	Per Diem (per person)	9	DAY	0.00	0.00	0.00	123.00	$1,107.00	True
33040921	Senior UXO Supervisor (SUXOS)	40	HR	0.00	44.21	0.00	0.00	$1,768.31	False
33040923	UXO Project Manager	40	HR	0.00	65.04	0.00	0.00	$2,601.41	False
33040925	UXO Staff Engineer	40	HR	0.00	41.47	0.00	0.00	$1,658.81	False
33041101	Airfare	3	LS	0.00	0.00	0.00	750.00	$2,250.00	True
33240101	Other Direct Costs	1	LS	500.00	0.00	0.00	0.00	$500.00	True

Total Element Cost: $10,032.64

Element: Surveying

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	56	DAY	0.00	0.00	0.00	123.00	$6,888.00	True
33040671	Portable GPS Set with Mapping, 5 cm Accuracy	2	MO	2,198.80	0.00	0.00	0.00	$4,397.60	False
33040935	UXO Technician III (UXO Supervisor)	320	HR	0.00	35.95	0.00	0.00	$11,504.83	False
33041101	Airfare	1	LS	0.00	0.00	0.00	750.00	$750.00	True
33220213	Surveying - 3-man Crew	32	DAY	0.00	1,259.62	13.03	0.00	$40,724.59	False
33240101	Other Direct Costs	1	LS	1,927.95	0.00	0.00	0.00	$1,927.95	True

Total Element Cost: $66,192.96

Element: UXO Mapping

			Unit of	Material	Labor Unit	Equipment	Sub Bid		Cost

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Figure E-13. RACER Output for High-Cost Scenario (page 5 of 8)

Technology: MEC Removal Action

Phase	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
33010202	Per Diem (per person)	14 875	DAY	0.00	0.00	0.00	123 00	$1,829.625 00	True
33021530	Differential GPS Unit Rental	31	MO	183 23	0.00	0 00	0 00	$5,680 23	False
33040210	Geonics EM-61 Metal Locator, Towed (Weekly Rental)	10	WK	0 00	0.00	0 00	409 09	$4 090 93	False
33040223	Ordnance Locator, Schoenstedt Model GA-72CD, weekly rental	1,750	WK	0 00	0 00	0 00	82 80	$144,900 00	False
33040230	Geonics EM-61 Metal Locator, Hand Held (Weekly Rental)	15	WK	0 00	0.00	0.00	342 79	$5,141 88	False
33040651	4 X 4 Truck- Rental Lease	4,375	DAY	0 00	0 00	65.22	0 00	$285,320 99	False
33040653	All Terrain Vehicle (ATV) - Rental Lease	41	DAY	0 00	0 00	0 00	165 60	$6,789 60	False
33040934	UXO Technician II	60 000	HR	0.00	30 58	0 00	0 00	$1,834,533 39	False
33040935	UXO Technician III (UXO Supervisor)	15,000	HR	0 00	35 95	0.00	0 00	$539,288 83	False
33040936	Geophysicist (UXO)	1,300	HR	0.00	58.63	0 00	0.00	$76,218.69	False
33041101	Airfare	50	LS	0 00	0 00	0 00	750 00	$37,500 00	True
33240101	Other Direct Costs	1	LS	146,973.23	0 00	0 00	0 00	$146,973.23	True

Total Element Cost. $4,916,062.77

Element. UXO Removal

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	6,639	DAY	0 00	0.00	0.00	123 00	$816,597.00	True
33040223	Ordnance Locator, Schoenstedt, Model GA-72CD, weekly rental	480	WK	0.00	0.00	0 00	82.80	$39,744.00	False

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Figure E-14. RACER Output for High-Cost Scenario (page 6 of 8)

Technology: MEC Removal Action

33040230	Geonics EM-61 Metal Locator, Hand Held (Weekly Rental)	45	WK	0.00	0.00	0.00	342.79	$15,425.64	False
33040646	Backhoe - Rental/Lease	326	DAY	0.00	0.00	233.01	0.00	$75,962.78	False
33040651	4 X 4 Truck- Rental/Lease	1,943	DAY	0.00	0.00	65.22	0.00	$126,715.13	False
33040934	UXO Technician II	27,900	HR	0.00	30.58	0.00	0.00	$853,058.03	False
33040935	UXO Technician III (UXO Supervisor)	6,450	HR	0.00	35.95	0.00	0.00	$231,894.20	False
33040936	Geophysicist (UXO)	3,600	HR	0.00	58.63	0.00	0.00	$211,067.14	False
33041001	16oz Standard TNT Booster	7,200	EA	0.36	0.00	0.00	0.00	$2,583.36	False
33041002	50 gr/ft Det -Cord (1000 ft roll)	1,080	EA	446.20	0.00	0.00	0.00	$481,896.01	False
33041004	12 ft Lead Primadet Non- Electric Detonators	3,600	EA	5.35	0.00	0.00	0.00	$19,275.84	False
33240101	Other Direct Costs	1	LS	102,881.11	0.00	0.00	0.00	$102,881.11	True

Total Element Cost: $2,977,100.23

Element: Site Management

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	3,224	DAY	0.00	0.00	0.00	123.00	$396,552.00	True
33040651	4 X 4 Truck- Rental/Lease	3,227	DAY	0.00	0.00	65.22	0.00	$210,452.76	False
33040921	Senior UXO Supervisor (SUXOS)	4,610	HR	0.00	44.21	0.00	0.00	$203,797.72	False
33040923	UXO Project Manager	4,610	HR	0.00	65.04	0.00	0.00	$299,812.13	False
33040930	UXO QC Specialist	4,610	HR	0.00	40.58	0.00	0.00	$187,088.24	False
33040931	UXO Safety Officer	4,610	HR	0.00	41.21	0.00	0.00	$189,982.01	False
33041101	Airfare	4	LS	0.00	0.00	0.00	750.00	$3,000.00	True

Figure E-15. RACER Output for High-Cost Scenario (page 7 of 8)

Technology: MEC Removal Action

	Total Element Cost:	$1,490,684.87

Element: Stakeholder Involvement

Phase	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33040923	UXO Project Manager	8	HR	0.00	65.04	0.00	0.00	$520.28	False
33040935	UXO Technician III (UXO Supervisor)	8	HR	0.00	35.95	0.00	0.00	$287.62	False
33041303	Site Specific Workplan (High Complexity)	1	EA	78.20	18,390.35	0.00	0.00	$18,468.55	False
33041306	Explosive Safety Submission (High Complexity)	1	EA	156.40	9,605.59	0.00	0.00	$9,761.99	False
33041315	UXO Removal Report (High Complexity)	1	EA	234.60	24,462.75	0.00	0.00	$24,697.35	False

Total Element Cost:	$53,735.79
Total 1st Year Tech Cost:	$9,513,809.25
Total Phase Element Cost	**$9,513,809.25**

Figure E-16. RACER Output for High-Cost Scenario (page 8 of 8)

APPENDIX F

INSTITUTIONAL CONTROLS COST ESTIMATE

Depleted Uranium Impact Area
Jefferson Proving Ground, Madison, Indiana

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Estimated Annual Institutional Control Costs
Jefferson Proving Ground, Madison, Indiana

Task/Activity/Component	Unit	Quantity	Total	Annual Cost ($)	Assumptions	References
Road Maintenance					**Assumes 1,200 ft^2 require concrete resurfacing annually**	
8" Concrete Pavement, Formed, 2 Lanes	SY	133.33	48.69	$6,491.84	includes material, labor, and equipment	Rate was obtained from RACER 11.1 (AECOM 2012)
Project Manager	Hour	10	$76.43	$764.30	10 hours of oversight, project management	Rate was obtained from RACER 11.1 (AECOM 2012)
Project Engineer	Hour	16	$63.83	$1,021.28	16 hours of oversight, project management	Rate was obtained from RACER 11.1 (AECOM 2012)
Field Technician	Hour	24	$35.22	$845.28	10 hour day with prep time (3), post (3), report preparation (8).	Rate was obtained from RACER 11.1 (AECOM 2012)
Personal Vehicle Usage	Mile	130	$0.57	$74.10	120 miles round trip plus 10 for supplies	Rate was obtained from RACER 11.1 (AECOM 2012)
Per Diem (per person)	Day	1	$143.00	$143.00	1 day of per diem per person	Rate was obtained from RACER 11.1 (AECOM 2012)
Subtotal multiplied by 3 repair visits				$28,019.39	3 repair visits in one year	
Road Maintenance Subtotal				**$28,019.39**		
Perimeter Mowing					**Assumes mowing 2 times a year and the mowing is completed over 8 feet surrounding the 55 miles of perimeter fence**	
Mowing	Acre	54	$239.51	$12,933.54	includes materials, labor, and equipment	Rate was obtained from RACER 11.1 (AECOM 2012)
Subtotal multipled by 2 mowing events				$25,867.08	2 mowing events a year	
Perimeter Mowing Subtotal				**$25,867.08**		
Perimeter Fence Inspection					**Assumes biweekly perimeter fence inspection conducted by 2 staff for 1-day, 60-mile trip on way.**	
Project Manager	Hour	6	$76.43	$458.58	6 hours of oversight, project management, report review	Rate was obtained from RACER 11.1 (AECOM 2012)
Project Engineer	Hour	3	$63.83	$191.49	3 hours of oversight, project management, report review	Rate was obtained from RACER 11.1 (AECOM 2012)
Staff Scientist	Hour	24	$40.88	$981.12	10 hour day with prep time (3), post (3), report preparation (8)	Rate was obtained from RACER 11.1 (AECOM 2012)
Field Technician	Hour	24	$35.22	$845.28	10 hour day with prep time (3), post (3), report preparation (8).	Rate was obtained from RACER 11.1 (AECOM 2012)
All Terrain Vehicle (ATV) - Rental	Day	2	$165.00	$330.00	the daily rate of two ATVs	Rate was obtained from RACER 11.1 (AECOM 2012)
Personal Vehicle Usage	Mile	130	$0.57	$74.10	120 miles round trip plus 10 for supplies	Rate was obtained from RACER 11.1 (AECOM 2012)
Per Diem (per person)	Day	2	$143.00	$286.00	1 day of per diem per person	Rate was obtained from RACER 11.1 (AECOM 2012)
Word Processing/Clerical	Hour	10	$38.12	$381.20	10 hours of word processing and clerical assistance	Rate was obtained from RACER 11.1 (AECOM 2012)
Subtotal multiplied by 26 site visits				$92,242.02	26 visits in one year	
Perimeter Fence Inspection Subtotal				**$92,242.02**		
Fence Repair					**Assumes 200 linear feet are repaired each year**	
Secutiry Fence, 10' Galvanized with 3' strands of barbed wire	LF	200	$44.53	$8,906.00	includes materials, labor, and equipment	Rate was obtained from RACER 11.1 (AECOM 2012)
Hazardous Waste Signing	Each	1	$62.30	$62.30	includes materials, labor, and equipment	Rate was obtained from RACER 11.1 (AECOM 2012)
Project Manager	Hour	2	$76.43	$152.86	2 hours of oversight, project management, report review	Rate was obtained from RACER 11.1 (AECOM 2012)
Project Engineer	Hour	3	$63.83	$191.49	1 hours of oversight, project management, report review	Rate was obtained from RACER 11.1 (AECOM 2012)
Field Technician	Hour	24	$35.22	$845.28	10 hour day with prep time (3), post (3), report preparation (8).	Rate was obtained from RACER 11.1 (AECOM 2012)
All Terrain Vehicle (ATV) - Rental	Day	1	$165.00	$165.00	the daily rate of one ATVs	Rate was obtained from RACER 11.1 (AECOM 2012)
Personal Vehicle Usage	Mile	130	$0.57	$74.10	120 miles round trip plus 10 for supplies	Rate was obtained from RACER 11.1 (AECOM 2012)
Per Diem (per person)	Day	1	$143.00	$143.00	1 day of per diem per person	Rate was obtained from RACER 11.1 (AECOM 2012)
Subtotal multiplied by 3 repair visits				$31,620.09	3 repair visits in one year	
Fence Repair Subtotal				**$31,620.09**		
Fence Sign Monitor/Replace					**Assumes 3 signs needs to be replaced 2 times annually**	
Sign Installation	Each	3	$250.00	$750	includes installation of fiberglass sign and other materials	vendor quote from a similar project
Project Manager	Hour	2	$76.43	$152.86	2 hours of oversight, project management	Rate was obtained from RACER 11.1 (AECOM 2012)
Project Engineer	Hour	3	$63.83	$191.49	1 hours of oversight, project management	Rate was obtained from RACER 11.1 (AECOM 2012)
Field Technician	Hour	14	$35.22	$493.08	8 hour day with prep time (3), post (3)	Rate was obtained from RACER 11.1 (AECOM 2012)
Staff Scientist	Hour	14	$40.88	$572.32	8 hour day with prep time (3), post (3)	Rate was obtained from RACER 11.1 (AECOM 2012)
All Terrain Vehicle (ATV) - Rental	Day	2	$165.00	$330.00	the daily rate of one ATVs	Rate was obtained from RACER 11.1 (AECOM 2012)
Personal Vehicle Usage	Mile	130	$0.57	$74.10	120 miles round trip plus 10 for supplies	Rate was obtained from RACER 11.1 (AECOM 2012)
Per Diem (per person)	Day	2	$143.00	$286.00	1 day of per diem per person	Rate was obtained from RACER 11.1 (AECOM 2012)
Subtotal multipled by 2 events				**$5,699.70**	**2 sign replacement events a year**	
Fence Sign Monitor/ Replace Subtotal				**$5,699.70**		
Overall Subtotal				**183,400**		
Mark-Up (11%)				**20,200**		
Contingency (35%)				**64,200**		
Total				**268,000**		

Note: These costs are assumed to be sufficient to allow an independent third party to assume responsibility for the institutional controls and associated maintenance activities at JPG.

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APPENDIX G

PUBLIC INPUT

Depleted Uranium Impact Area
Jefferson Proving Ground, Madison, Indiana

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In accordance with Nuclear Regulatory Commission (NRC) requirements found at 10 CFR 1043 (d), the Army conducted a Public availability session for the public to provide input into potential institutional controls that may be utilized when the Jefferson Proving Ground NRC depleted uranium license is terminated. The meeting was held at the Madison-Jefferson County Public Library, 420 East Main Street, Madison, IN at 7:00 P.M. on October 28th, 2008.

OPENING STATEMENTS BY MR. PAUL CLOUD:

Okay. Good evening. I'd like to get started. For those of you who don't know me, which it doesn't appear that anyone doesn't, my name is Paul Cloud. I worked for the United States Army and for this meeting one (1) of my job titles is the Army's Radiation Safety Officer for Jefferson Proving Ground.

Ah the intent of the meeting tonight is to comply with a requirement under the Nuclear Regulatory Commission statutes and requirements for a licensee when they're in the process of terminating a license that they have with the NRC and they're pursuing a particular license termination process. In this case specifically refers to restricted release which means that the licensee will not clean up the affected area to a certain unrestricted standard. Ah so the intent of the meeting tonight, I have a

short presentation that I will go through that will show you the actual specific standard or criteria that the NRC requires of a licensee when they propose to conduct a restricted release, a license termination, and then go over some of the history of the DU operations at the Proving Ground, what we're currently doing to address the actual license termination to learn more about the site and then what we project as the time line for eventual license termination. At the end of that period the actual meat of the meeting is for the public to provide any insight, questions or comments they might have either orally or in writing to us so that we can demonstrate to the NRC that we have afforded that opportunity to the public and that at a later date we will respond to those. It is not the Army's intent tonight to respond to any specific questions in either a discussion or a debate. It's the Army's intent to get all those questions recorded down and then when we have reached the point where we're ready to write the actual document to submit to the NRC then we will provide not only the verbatim questions or comments, input that we've gotten from the public, but also our responses and then we'll go through the NRC's process subsequent to that submittal. So tonight ah this is our basic agenda. The first section is just the regulatory requirements, it's the first half a dozen or so flags that's verbatim right out of the Code of Federal

Regulations that talk about what a licensee is required to go do if they're proposing a restricted release license termination.

Ah the next section talks about past operations the Army did at the Proving Ground when they were conducting DU operations. The next section talks about the site characterization using those activities we've completed or planned field activities in the future. And then a future schedule and lastly ah there's an opportunity for public input. However if there are any questions as we go along, any comments or input that you have feel free to ask them then or you can wait until the end, whichever is more convenient. But again we're not going to be in a position to respond tonight. Our basic mode is to accumulate all your inputs so that we can respond to it at a later date. But everything will be recorded down verbatim whether it's oral or written.

Okay, I won't read all of this to you. It is somewhat complex and convoluted but it is the actual verbatim criteria out of the Code of Federal Regulations 20.1403(d). What it basically says is that if a licensee is going to propose a restrictive release license termination that they will afford the potentially affected public an opportunity to provide input to the licensee as to what their questions, comments, concerns are regarding that termination and how it

might affect them and how any proposed or possible institutional control that might be proposed, whether they agree, disagree or they'd like to see different ones, additional ones, or whatever. And I'll get into that in a moment. But that's what these next half a dozen slides basically talk about. If you have any specifics on those you can voice them either now or at a later date but again it's basic, you know, it's a verbatim copy right out of the Regulations, the statute, as to what is required if you're proposing to do a restrictive release license termination.

Now having gone through those first several slides what the Army is currently evaluating, but no decisions have been made, as far as potential institutional controls once we get to the point where the Army is going to submit the restrictive release license termination plan to the NRC would be such things as continued Army ownership of the property north of the firing line. And that would be into perpetuity, basically forever. Another consideration we're looking at would be to maintain the fence that goes all the way around the perimeter of the area north of the firing line. That's the eight (8) foot tall chain link fence with the barbed wire on top. Another consideration we're evaluating are the road barricades that are on the roads north of the firing lines and keep those locked. Another one (1) would be controlled access north of the firing line.

Right now there is some access afforded to the public in certain areas but it's still controlled. And we're considering keeping that in place. Restricted access to the depleted uranium area, that's another consideration that's currently in effect. And if the NRC accepts that when the plan is finalized and completed then that would go forever. And then lastly maintenance of the radiological finds that are around the DU area that identify where that area is.

Now this map basically just shows you the State of Indiana where Jefferson Proving Ground basically is within the State, although it's a little high, and then within the Proving Ground where the DU area is north of the firing line, approximately two thousand (2,000) acre area rectangular in shape. To give you some additional prospective this is the area of the Proving Ground and these particular - this particular slide shows what is the estimated unexploded ordnance concentration north of the firing line. This is one (1) of the reasons why the Army is pursuing a restricted release license termination. If we were to go north of the firing line and try and clean up the DU area, remove the DU penetrators to a level for unrestricted release, it's right in the middle of the area where we have - estimate the highest concentration of unexploded ordnance is and that number is approximately eighty-five (85) high explosive rounds per acre. So if you multiply eighty-five (85) times

two thousand (2,000) you start getting a lot of rounds that could go off at any time. But that's only one (1) reason why the Army is pursuing that but it gives you some visual prospective as to why it's dangerous out there.

Okay. Some past operations: Back in 1983 before the Army started firing DU they did a baseline environmental survey. That was to get what the background was, to get some understanding of what was there before the Army started firing the penetrators.

From 1984 to 1994 the Army fired DU rounds. There were two (2) types of rounds, they were tank rounds, the 105 millimeter and the 120 millimeter. Those are the only two (2) types of rounds that were fired there.

The last bullet talks about just what was done as far as testing. There's basically two (2) types of testing that can be done in generic terms: One (1) is soft target and one (1) is hard target. The only testing that was done at Jefferson was soft target and that is basically at thousand (1000) meter intervals they erected telephone poles and strung either plywood boards or cloth targets and they fired the penetrators through that. And it was basically to see if the round flew flat and straight, which is what they're designed to go do. If there had been hard target testing then the penetrators would have impacted against armor plate and that creates a whole different set of

possible conditions and impacts on things that we would have to address. But since we didn't do that they are not applicable to us here.

From 1984 until the present our current license which requires us to sample semi-annually the ground and surface water, the ground water and the surface water, the soil and the sediments to see if there is any movement of the depleted uranium out of the DU area and/or off of the Proving Ground. That requirement will stay in effect until the license is terminated.

Okay in May of 2005 the Army under the NRC regulations requested an alternate decommissioning schedule so that we could go out and obtain a lot of site specific information on the area north of the firing line since we had never really studied the area north of the firing line from a - an impact or potential impact to the environment and to the people that surround the Proving Ground.

Part of that process under the NRC regulation allows for members of the public, and/or groups, if they can establish the right criteria standing to request a hearing. On February of 2006 Save the Valley did - did apply for and was granted a hearing on one (1) of the issues that they raised and they were basically challenging some of the basic contentions of the Army's request. Later that year the NRC staff granted the alternate schedule but the hearing was

still conducted here last year in October right downtown at City Hall and it lasted one (1) day. Subsequent to that hearing the three (3) Judge Administrative Law panel that conducted that hearing reviewed all the material, all the expert testimony and the testimony that was given at the hearing and at the end of February of this year they came out with a preliminary or initial decision that supported the Army and the NRC staff's position that what we were doing and how we were proposing to go do it was valid and that they basically denied Save the Valley's request. Later this year or later in May of this year the NRC Commissioners, who are the ultimate authority at NRC, had the opportunity to review and review or change that decision. They declined to go do that and so the decision became final in May of this year.

Okay all of the documents that the Army submits to the NRC are put up on their public information website and the second bullet down at the bottom shows you what that website address is. If you get on the internet and you type in that last line on that last bullet exactly as it's written you will get to their what's called Adams website. And then when you get to the appropriate section of it you can type in Jefferson Proving Ground and you can either ask for a specific set of dates or a particular topic and it will recall anything that's in their system. And they have copies of everything we submit to them.

Now this is a penetrator that is basically just shown for information. I skipped one (1) here. This is another view of what the penetrators look like and the tanks that fired them. These are the two (2) rounds that were fired at the Proving Ground, the 105 and the 120 millimeter rounds. And that penetrator there in flight, what happens once the - the canister with the explosive is detonated this particular device leaves the gun tube and then the supporting structure on it breaks away and it's basically a big, hard sharp dart that goes through and it's designed to impact onto armor plate on tanks or other armored vehicles and to destroy them. Very effective.

This photo shows you the DU trench area in the impact area. It's right in the center of the DU impact area. The reason we refer to it as a trench is you can see on either side of the gentleman in that picture, who was a former Army employee that used to work at Jefferson, is that the area basically is clear of any trees or brush. All the trees and brush that were there were knocked down by the penetrators as they flew through. This picture was taken sometime in the early 1990's. If you go to that area today the vegetation and the trees are slowly growing back in and it's getting harder and harder to see it, although you still can. Probably in the next ten (10) to twenty (20) years it will probably be almost indistinguishable from any of the

other surrounding areas.

This is a photo of the same area from the overhead, again early 1990's. And you can see clearly the trench. And here in the foreground these are the telephone poles that were erected at thousand (1000) meter intervals about three thousand (3000) feet that suspended those soft targets that were fired at.

Okay the document that the Army submitted to the NRC in May of 2005 was a Field Sampling Plan that was attached to the request for the alternate schedule. It laid out what we proposed to do to go get some site specific information so we could document them with details, specific numbers at JPG that in the next thousand (1000) years as is the NRC requirement the affected, potentially affected public outside of the Proving Ground, would not exceed an exposure limit for radiation because of the DU there. So we laid that out in detail for the first two (2) years and the subsequent years of that five (5) year period were in outline form and we would then periodically meet with the NRC and/or provide them with addendums to the Field Sampling Plan for specific field activity. And the next slide will discuss some of those specific addendums.

This slide and the next slide identify the seven (7) addendums that we have submitted to the NRC for various things. Like we went out initially and obtained a

number of samples from deer. We harvested thirty (30) deer, ten (10) in the DU area, ten (10) in the area surrounding the DU area and then ten (10) way up in the background area north of K Road. And then once we did that we sampled and analyzed them to see if they had any DU in them and there's a slide later on that I'll show you that gives you the results of that.

The next couple of addendums were for some of the geology and the hydrology where the water flowed through the Proving Ground. And there were efforts to identify those areas where we would install a number of additional ground water sampling wells, monitoring wells, to see if the DU was getting into the ground water and if it was what the levels were and where they were going and what the concentrations were. We have completed all of these first four (4) addendums.

The next two (2) addendums talk about efforts regarding the actual sampling analysis of the ground water, surface water, soil and sediment and that's an ongoing effort. We're continuing to get data on quarterly every three (3) month type basis.

The last bullet here, addendum seven (7), we have contracted with the U.S. Geological Service to do some additional specialized testing to check the what's basically called the age of the groundwater. And they can determine

based on - on the age and certain specific testing that they do whether this groundwater is moving or not. And if it is does that pose a potential problem because of the age of the water, whether or not the public could be affected at certain times if there is DU in the water?

Okay this last addendum we're going out and we're collecting soil and actually retrieving a number of penetrators in the Proving Ground in the impact area. We're going to do some analysis on those penetrators in the soil with rain water we've collected to see if in fact they do corrode and erode and then potentially can get into the soil with the water to spread it potentially eventually exposing the public to a level that is unacceptable. That would violate the license termination number that you saw on the first few slides. And that effort is just starting. We just finished it today as far as the collection and then over the next few months they will start that analysis process.

I talked about the deer samples. We did sample the deer, just talked about the number, what we sampled for, the fact that there were no detections of uranium or DU in the deer above background and the NRC did concur with those results. And that was discussed fairly heavily at the hearing last October.

This map shows on the Proving Ground where the individual deer were taken when we did that effort. Again

there were thirty (30) of them. You can see in and around the DU area down here at the bottom and then up above K Road we took another ten (10).

Okay one (1) of the efforts we're checking on is the water. Water is a - has a potential to move depleted uranium or any other material off of the impact area within the Proving Ground and then possibly eventually off the Proving Ground. If it gets off the Proving Ground then it has the potential to expose the public. So we're checking to see if in fact that's happening and if so at what levels or rate. And this gives you some information as to how that's being done with recorders we've installed in the streams and how frequently we're monitoring them.

What this slide basically tells you is we're also collecting precipitation data. The center bullet there talks about a weather station that the U.S. Fish and Wildlife Service has on the Proving Ground on the - basically the intersection of Highway 421 and Old Michigan Road, that little section of the Proving Ground right there on the eastern boundary. We're using the data from that weather station to assist us in - as to how much rain fall falls on the Proving Ground as part of this data collection activity to find out specifics to the things that might impact or cause the depleted uranium to move from the Proving Ground to the exposed - to the general public.

Okay this slide shows you some pictures of the Stream and Cave gauges. You can see here this is the two (2) where the detector is. It comes down in here. This is a cave back in here and we actually constructed marine plywood here with a "V" notch on it, backs the water up and then it flows when there is a flowing stream and then we're measuring that stream flow. The picture up at the top is actually one (1) of the stream gauges that's in Big Creek. I believe that's the one (1) up just north of the bridge on D Road. And the bullets on the left basically describe you know the number of gauges, the fact that they're continuous, they monitor at a certain frequency, twenty-four seven (24/7) around the clock and then either monthly or quarterly, depending on when we were collecting the data, my contractor would go out with his laptop and he would connect his laptop into those concourse and download all that data. That data is being collected and some of it has already been provided to the NRC and if you want to see it it's up on their website again.

Okay. The ground around and in the Proving Ground has a potential for what they call Karst or cracks in the ground for various reasons. And that has the potential to redirect water, either surface water or groundwater, in ways that are not clearly visible on the surface and that might prove to be a pathway or a mechanism by which the

depleted uranium if it were to leave the Proving Ground to eventually expose the public to the material and then exceed an exposure limit. These various bullets basically talk about some of the efforts we have conducted to try and identify if there are any of those pathways so that we can monitor them to see if in fact we're going to have a problem.

This is a slide that shows picture of the actual drilling rig that we had out there drilling those twenty-three (23) wells about a year and a half (1 ½) ago. When that rig was out there before he was allowed to bring his machinery out north of the firing line and to start drilling in the ground we had those areas swept for unexploded ordnance by a qualified explosive ordnance disposal technician. And they did in fact have to move a number of items or dispose of them, blow them up, before we allowed them to start drilling. And then when they started drilling, until they reached the bedrock which was solid rock, every four (4) feet they would stop, pull up their drilling rig probes and we would stick down the ordnance or metal detector to make sure that there wasn't anything that they were coming up against. And it's about a four (4) foot sensitivity. So every four (4) foot interval we would stop the rig, pull it out and check it until they reached bedrock.

Okay, this - this slide right here shows you the location of the groundwater monitoring wells. They're a

little dot. You have to look at the legend over there on the left hand column and then coordinate that with the - the dots that are on the Proving Ground. And they - all those locations were determined based on the activities we had done in some of the other slides with the fracture trace analysis and the electrical imaging to try and put those wells at the best spot possible where it would be the most likely that if there was any depleted uranium getting into the groundwater that we would detect it.

These show you some of the borings of the well drilling machine and as we went down - and you can see from the top one (1) which is closer to the surface how fractured and broken up the bedrock is. And as you get down deeper how solid and non-fractured it is. And that was somewhat of a surprise to us as we were digging these wells. The further down we basically drilled the tighter the bedrock actually became.

Okay. We're sampling four (4) quarters of the groundwater. We're going to analyze them for uranium and depleted uranium. The specific method is alpha spectrometry. It's a universally accepted method that the NRC recognizes. We're also doing the sediment and the surface water, again analyzing them for uranium. And then right now this three hundred and eighty (380) soil samples is part of the field effort that we've just completed. So we've got a lot of dirt

that we picked up in and around the DU area, the background area, in the trenches to see just what is in the soil.

Okay. This is some of our activity that we're just slowly starting right now. The Kd or absorption study is a process whereby you analyze to see if in fact the penetrators are - the material from the penetrators are getting into the material and if they are where - how far they're moving. The associated part of that is if the penetrators are corroding then they have the potential to move either in the soil or the water. So we're going to do a corrosion analysis. That's why we picked up these twenty-four (24) penetrators, and we've got three (3) different soil types that are out in the Proving Ground in the impact area, to place them in along with some rainwater we have collected to see over the next several months whether or not the penetrators actually corrode. And if they do what the corrosion rate is and if that corrosion rate accelerates, stops or what. And that would give us a lot of site specific data that we can plug into some of these models, which are all computer models down at the bottom, to predict over the thousand (1000) year time span that the NRC requires whether or not this material has a potential to expose the public to an unacceptable level of radioactivity.

Okay. These are just a couple of the other addendums that we have submitted to the NRC. They talk about

the groundwater and the USGS work which I mentioned previously.

This is the USGS work and basically what they're looking for when - when you say groundwater age dating, they're looking to see if the groundwater has basically stayed in place for an extended period of time. We're talking years or decades. If that is the case then the potential for the groundwater to move and therefore if there was DU in it to expose the public would be greater. If - so if it's a young groundwater then there's a greater potential for the public to be exposed. If it's determined by their analysis that it's old groundwater then the potential is much less.

In accordance with the Army's permit with the NRC we are required to meet with them annually and/or prior to major decisions that we undertake, field efforts that we undertake on the site characterization to obtain these statuses. The last meeting we had with them was in July of this year and we're scheduling some next year already. We're looking at when we'll have some additional information and/or the next steps in our - in our process.

What we look for in the future is we will continue the site characterization and we will develop the restricted release license termination plan and along with that licensee is required to submit to the NRC an

Environmental Report which is something the NRC will use to support their Environmental Impact Statement that they will have to generate when they go through their process, which I'll talk about in another slide or so.

Right now we're required and we're on schedule to submit those two (2) documents, the Termination Plan and the Environmental Report, by the end of December of 2011. And that's what our license requires right now.

Once that has happened what the Army anticipates will be the future schedule would be that on 2012 to 2014 the NRC goes through an Administrative and then a Technical Review of the documents we have submitted to them. Once they have done that they will then, somewhat in parallel, do their Environmental Impact Statement and they will - there's a whole formalized process that they will do that under. And they will come out into the community and have public sessions like this to allow the public to provide their input. In the meantime while we're going through that process the Army will continue their semi-annual environmental monitoring in accordance with the current license until the license is terminated and again we're looking at 2015-2016 before that period is - is reached.

As part of this process once the NRC has accepted the documents after their Administrative Review the NRC will publish in the Federal Register an opportunity for

anyone, whether it's an individual or group, to request a hearing on any of the documents we have submitted: the License Termination Plan, Restricted Release, or the Environmental Report. We would expect that probably sometime in 2012 but that's the NRC's responsibility and I can't speak to what their specific time line would be.

Now this opportunity that we're providing tonight, we're looking at whether or not we're going to do this as a one (1) time only or if there is significant public involvement and participation, whether or not we would do that at six (6) month intervals. That's something we'll have to look at after tonight, tomorrow night and Thursday night.

The last slot. Public's opportunity now for any comments, questions they would like to provide so that we will just be kind of in a sponge mode now. We'll just absorb everything you have to say and then when we submit the documents we will have any responses to those questions or comments that you might have. So now is your opportunity.

MR. PAUL CLOUD:

Mary?

MS. MARY CLASHMAN:

The depleted uranium, if I understand it, is inside some kind of cartridge, right? Well you show it here.

MR. PAUL CLOUD:

Yeah.

MS. MARY CLASHMAN:

Yeah right there. All right. Now you've got a cartridge, right? I mean it's not on the outside of that penetrator, right?

MR. PAUL CLOUD:

This is what it's inside of (indicating). You can see the very tip of it there but it's inside this and this is what has the explosive then to propel it out.

MS. MARY CLASHMAN:

And you're talking about the possible corrosion of that --

MR. PAUL CLOUD:

Of the penetrator.

MS. MARY CLASHMAN:

And - and as time goes on how it corrodes. So would it not be more likely that if the depleted uranium is present, and it must be if there is - I don't know how many fired and not exploded, if it's present inside the cartridge

and the cartridge is slowly eroding and corroding and rusting away it would seem likely that the depleted uranium would be present more in say fifty (50) years than now.

MR. ROBERT HUDSON:

Explain it to her Paul.

MS. MARY CLASHMAN:

Yeah explain it to me.

MR. PAUL CLOUD:

After the meeting I'll be glad to. Our intent right now is just to absorb everything you're going to say. The official response will be when we submit the documents to the NRC. After the meeting I can explain a little more of the technicalities.

MS. MARY CLASHMAN:

When you submit the documents to the NRC by 2012?

MR. PAUL CLOUD:

Yes ma'am. It is fairly simplistic and straight forward.

MS. MARY CLASHMAN:

A lot of these very simplistic and straight forward things turn out to be a real problem.

MR. ROBERT HUDSON:

But your concept is now and then how it gets in caves and then how it gets exposed and what part of the exposed part of the DU and the whole thing is DU.

MS. MARY CLASHMAN:

So it's all exposed now?

MR. ROBERT HUDSON:

Got fired and exposed.

MS. MARY CLASHMAN:

Then on the other?

MR. ROBERT HUDSON:

Got fired and exposed and it'll stay that way as well.

MS. MARY CLASHMAN:

Well then for the record I assume that stuff is used in war, right?

MR. PAUL CLOUD:

Yes ma'am.

MS. MARY CLASHMAN:

And so our soldiers are running around all over the world, wherever they're fighting, using these kind of things. Does anybody worry about the exposure of un - of depleted uranium say in Afghanistan or Iraq or wherever they happen to be fighting at the moment?

MR. ROBERT HUDSON:

He's shaking his head yes.

MS. MARY CLASHMAN:

Yes or no?

MR. PAUL CLOUD:

We're just absorbing everything. We're not responding to any specific questions.

MS. MARY CLASHMAN:

Well I mean I just think that's an interesting question.

MR. PAUL CLOUD:

I think it is too.

MS. MARY CLASHMAN:

Because we're part of the world. And - and we're not going to be able to go off on some other planet just because Iraq or Afghanistan or any - any of the other numerous places where we've been fighting.

MR. KEN KNOUF:

Put your question in the form of a statement. See if that works.

MS. MARY CLASHMAN:

I - I just you know - I'm concerned about that. And I'm concerned about it being here in Jefferson County and I opposed it before they put it in but of course nobody was listening or if they were listening they were ignoring it. So --

MR. ROBERT HUDSON:

It wasn't me.

MS. MARY CLASHMAN:

Oh there were many more people ignoring than

are here tonight. Many more. Many more.

MR. KEN KNOUF:

Paul?

MR. PAUL CLOUD:

Mr. Knouf.

MR. KEN KNOUF:

I have a comment in terms of the 10 Code of Federal Regulations. We talked about this being enforceable for a thousand (1000) years and yet if a license is terminated NRC seems to be kind of out of the picture and it's not clear within the Army who is going to be doing the enforcing. So I would - I would just voice some comment or concern that it would be interesting to see long range who the enforcers are in this kind of thing. And it seems the big fish do more sampling and monitoring being done in perpetuity and I don't know whether - it was always my understanding that there wasn't going to be that kind of thing done but now it almost looks like there has to be. So I would just raise that as a comment.

MR. PAUL CLOUD:

Thank you. Any other comments, questions or

something that a member of the public would like to express? Nothing else? Well we're officially done.

* * * * *

CONCLUSION OF HEARING

C E R T I F I C A T E

STATE OF INDIANA)
) SS:
COUNTY OF JEFFERSON)

I, Sharon Shields, do hereby certify that I am a Notary Public in and for the County of Jefferson, State of Indiana, duly authorized and qualified to administer oaths; That the foregoing public hearing was taken by me in shorthand and on a tape recorder on October 28, 2008 at the Madison-Jefferson County Public Library, 420 West Main Street, Madison, IN; That this public hearing was taken on behalf of the Jefferson Proving Ground pursuant to agreement for taking at this time and place; That the testimony of the witnesses was reduced to typewriting by me and contains a complete and accurate transcript of the said testimony.

I further certify that pursuant to stipulation by and between the respective parties, this testimony has been transcribed and submitted to the Jefferson Proving Ground.

WITNESS my hand and notarial seal this 18th day of November, 2008.

Sharon Shields, Notary Public
Jefferson County, State of Indiana

My Commission Expires:

July 2, 2007

FIRST PAGE FOR ASCII

In accordance with Nuclear Regulatory Commission (NRC) requirements found at 10 CFR 1043 (d), the Army conducted a Public availability session for the public to provide input into potential institutional controls that may be utilized when the Jefferson Proving Ground NRC depleted uranium license is terminated. The meeting was held at the South Ripley Elementary School, Versailles, IN at 7:00 P.M. on October 29th, 2008.

OPENING STATEMENTS BY MR. PAUL CLOUD:

I'd like to get started. This is Wednesday, October 29th, 2008. My name is Paul Cloud. I'm the Radiation Safety Officer for the Jefferson Proving Ground.

It's the Army's intent to hold these meetings pursuant to the NRC's requirements for licensees who are intending to pursue a restricted release termination license in accordance with the requirement found at 10 Code of Federal Regulations 20.1403(d) to afford the public an opportunity to ask questions, voice concerns, give input along the lines of that restrictive release.

Please let the record show it's now seven thirty-five (7:35) P.M., Wednesday, the 29th of October and no one (1) has shown up. So we are going to terminate this meeting and the record will show, as one (1) of the requirements for our restricted release termination license

plan when we submit this all together, that on this date for this meeting we had no public attend the meeting.

And with that I will close the meeting. Thank you very much.

* * * * *

CONCLUSION OF HEARING

C E R T I F I C A T E

STATE OF INDIANA)
) SS:
COUNTY OF JEFFERSON)

I, Sharon Shields, do hereby certify that I am a Notary Public in and for the County of Jefferson, State of Indiana, duly authorized and qualified to administer oaths; That the foregoing public hearing was taken by me in shorthand and on a tape recorder on October 29, 2008 at the South Ripley Elementary School, Versailles, IN; That this public hearing was taken on behalf of the Jefferson Proving Ground pursuant to agreement pursuant to agreement for taking at this time and place; That the testimony of the witnesses was reduced to typewriting by me and contains a complete and accurate transcript of the said testimony.

I further certify that pursuant to stipulation by and between the respective parties, this testimony has been transcribed and submitted to the Jefferson Proving Ground.

WITNESS my hand and notarial seal this 18th day of November, 2008.

Sharon Shields, Notary Public
Jefferson County, State of Indiana

My Commission Expires:

July 2, 2015

FIRST PAGE FOR ASCII

In accordance with Nuclear Regulatory Commission (NRC) requirements found at 10 CFR 1043 (d), the Army conducted a Public availability session for the public to provide input into potential institutional controls that may be utilized when the Jefferson Proving Ground NRC depleted uranium license is terminated. The meeting was held at the Jennings County Library, North Vernon, IN at 7:00 P.M. on October 30th, 2008.

OPENING STATEMENTS BY MR. PAUL CLOUD:

Okay. Good evening. I'd like to introduce myself. My name is Paul Cloud. I work for the United States Army and am Radiation Safety Officer for the Jefferson Proving Ground. And the purpose of tonight's meeting is to comply with the Nuclear Regulatory Commission's standards for licensees that are proposing to submit a restricted release license termination to the NRC at a further date in accordance with their regulations. The licensee is required to seek public input as to what their questions or concerns are. Our intention tonight is to give a short presentation and then at the end of that if there is any input from the public then we will take that down verbatim. We have a Court Reporter here and she will be recording that verbatim and then at a later date when we're getting ready to submit the paper work to the NRC we will respond to any input that we

receive tonight. It is not our intent to respond to anything tonight because it may be premature because there's still a whole lot of data on the Proving Ground and we don't have all the details on what we're going to do and how we will use it. So with that we'll go through this presentation. There are copies of it back there if anyone doesn't have them. But basically the agenda for tonight is we'll go over the Nuclear Regulatory Commission requirements, and as I just mentioned our past operations of what we're doing out there and what we're planning on doing as far as getting information, future schedule and then the last part is for any public input.

The next two (2) slides are an actual copy out of the Federal Regulations that require a licensee who is proposing to submit a restricted release license termination to the NRC of what they're supposed to do. And I won't bore you with reading everything. The bottom line is that the licensee, if they're going for their restricted release license termination they're required to seek public input as to what possible crucial controls might be proposed by the licensee as part of that restricted release license termination and then any public input regarding that. This goes on for a couple more slides and like I said it's right out of the Federal Regulations 10C of 20.1403(d).

And some of the potential institutional controls that we are considering, although like I say the

decision hasn't been made yet and probably won't be made for some time yet, would be such things as Army ownership of the property north of the firing line and that would be in perpetuity forever. Maintenance of the fence around the area north of the firing line. Currently there's an eight (8) foot tall chain link fence with barbed wire on the top that goes around the Proving Ground. We have blocked road barricades in the road north of the firing line and we also have controlled access north of the firing line. Restricted access to the DU area, only certain people can even go in that area. And then lastly one (1) of the things we're looking at would be maintenance of the radiological signs that identify the area inside the Proving Ground. But those are some potential. We don't know if we'll add or subtract from that but that's one (1) of the reasons why we're having this meeting tonight.

Okay. And this particular slide just shows you know the Proving Ground where it's basically located in Indiana and then within the Proving Ground where the DU site is. The Proving Ground is approximately fifty-one thousand (51,000) acres total north of the firing line, it's about fifty-one thousand (51,000) acres and that little red triangle that identifies the DU area is approximately two thousand (2,000) acres. On the DU area this slide shows what the estimated concentration of unexploded ordnance is north

of the firing line. If you look at this slide and then you compare it to the slide you just saw and superimpose this DU area, the DU area is right - the area highest in the unexploded ordnance concentration about eighty-five (85) unexploded rounds per acre.

We - the Army did a baseline environmental survey back in 1983 before we started shooting the DU penetrators and that was to get a baseline for what the conditions were out on the site. And then we fired the DU penetrators from March of '84 until May of '94 and we only shot two (2) types of rounds. They were tank rounds, 105 or 120 millimeter shells. And there are two (2) basic types of testing you can do with those types of rounds. There are soft target testing or you can shoot them against hard target armor plate. The only thing we shot again at JPG was soft targets and they were approximately one thousand (1,000) meter intervals. The DU rounds are very flat trajectory, very high speed, high energy weapon and basically designed just to penetrate the armor and then when it hits the side of a tank it stays in the tank. It's been used in both wars in Iraq and it was very effective.

From '84 until the present we go out every six (6) months and we sample the groundwater, the surface water, soil and sediment to see if in fact there's any movement of the depleted uranium. That will continue until the license

is terminated.

In May of 2005 we submitted a request to the NRC for alternate decommissioning schedule and with that what was called a Field Sampling Plan to go out north of the firing line and actually obtain a lot of very site specific data on groundwater, surface water, soil and sediments to see if in fact over the thousand (1000) year period that the NRC regulates or the license is terminated, whether or not this material would pose a radiological exposure problem to the public.

Okay. In February of 2006 an Administrative Hearing was granted to a local environmental activist, Save The Valley. They raised a question that was deemed appropriate so they were granted a hearing on that date. Later in April of 2006 the NRC did grant us our alternate schedule and then in October of last year, the actual hearing of Save The Valley was granted and conducted in Madison. It was a one (1) day event and there was expert testimony from Save The Valley, NRC and the Army regarding issues that Save The Valley had brought up.

February of this year the ah licensing board came out with their Draft of Initial Decisions and they denied Save The Valley's contention. Later on in this year in May all those decisions that are subject to the NRC Commissioner's review, they declined to review it and that

made the decision final. So the contention that Save The Valley had raised was denied and the Army is continuing on with the actions that they proposed. All the documents that we supplied to the NRC are put up on their public page available on the website and if you look at that second bullet in the last line you can access that line and enter that connection. If you type in JPG and you will find any documents we've given them over the last fifteen (15), twenty (20) years.

Okay. This slide here shows you an outline of the two (2) rounds that were fired out at JPG, two (2) tank rounds, the 105 and the 120 millimeter. And just to give you some idea what happens there's casing around it and you fill it with propellant and ignite it and it pushes out this penetrator. This is a very typical penetrator here. It flies out at very high speed several thousand feet per second.

And this is what it looks like in flight right after it's left the gun barrel of the tank. And what happens is this sabot or this casing around the penetrator breaks away after it leaves the tube and this is the actual penetrator here. Very sharp, very high density and when it hits the intended targets it will go right through armor plate.

This is a picture of what we refer to as the

trench at ground level. This area right here, if you look on either side of the open area, you see all the heavy trees. The trees that used to be in that area have cleared out and the penetrator was fired through there and it mowed down most of the trees like a big lawnmower. This picture was taken probably about fifteen (15) to seventeen (17) years ago and that area is slowly starting to refill with vegetation. In another ten (10) years you won't be able to see it.

This is an overhead view of the same area. Again it was taken early 1990's.

Okay. In the Field Sampling Plan that was sent to the NRC in May of 2005 we laid out what we proposed to go do and it was a five (5) year initiative. The first two (2) years were detailed and subsequent years were laid out in outline form because they were going to build on the information we obtained and as we went out and got more information that might require us to some change things, adjust things, add things, delete things depending on what we found.

And how we modified that Field Sampling Plan is we presented an addendum to the NRC. As of today we have presented seven (7). And this slide and the next slide will discuss what those various addendums did.

The first one (1) was for taking sample of deer. There was concern that the deer on the Proving Ground

were eating foliage and the foliage had picked up some DU that had corroded or eroded and that the meat of the deer may be contaminated.

The second one (1) is a soil verification and fracture trace analysis. We used that and the third addendum helped us locate where we actually put the wells down here on the fourth addendum. We actually installed another twenty-three (23) wells north of the firing line to monitor and check the groundwater to see if any of the DU was getting into the groundwater and then potentially off the site.

The fifth addendum has to do with some additional groundwater, soil and sediment analysis and the sixth addendum is an effort that the U.S. Geological Service is doing for us again checking the groundwater to see if it's moving. If it's not moving then even if the DU were getting in the groundwater it won't pose a problem because no one (1) would be getting exposed to it.

The last addendum here is addendum seven (7) and we were out here all basically this month getting the soil samples and picking up the penetrators and doing a lot of preparatory work for some modeling that's going to be done in the next six (6) - well six (6) months to a year.

Now we go back to the deer sampling. We went out and actually sampled thirty (30) deer in three (3) different locations: ten (10) deer inside the DU area, ten

(10) deer in the area immediately adjacent to the DU area and then ten (10) deer considerably north, back there by the background area on the Proving Ground. As this slide shows there were no detections of DU and the NRC agreed with that and as a result of that we went out and sampled the other animals for the vegetation on the Proving Ground.

This slide shows you a map of the Proving Ground and where the various deer that were sampled were taken from. And so again ten (10) within the DU area, ten (10) in an area immediately surrounding the DU area and then ten (10) up here in the background area many miles north of the DU area.

Now one (1) of the other things we're doing is to monitor caves, streams and surface water to see if in fact DU is getting into any of the water by ultimately leaving the Proving Ground and then exposing the public. So we've got some instrumentation that we've installed to do that and that's what this slide talks about. We've monitored for almost two (2) years now and we're collecting all that data.

The next slide shows the location of where those surface water gauging station locations are and they're in and around the DU area in streams and in some of the caves that run through the DU area.

This next slide talks more about you know the specifics there. It also identifies the website for the Fish

and Wildlife Service weather station located on the Proving Ground that we collect weather data: rainfall and temperature, humidity and those type things. All that data is being utilized for the actual eventual submittal of the license termination plan.

This next slide shows you a couple of pictures of where we've actually installed the gauges. The top one (1) is a stream gauge that actually goes into Big Creek. Big Creek goes right through the DU area and down here this is a cave in the background and we have the tube with the instrumentation coming here. And we actually used some marine grade plywood and cut a "V" notch in it, stood that up so the water that came out of the stream or the cave and then monitored that flow to see just what kind of flow we're getting out of that stream from the cave.

Now again we're continuing to monitor the groundwater. This slide talks about the various steps we took to identify the location. The bottom bullet here are the additional twenty-three (23) wells. All of these steps were utilized to accumulate information about the various geology of the area so that we picked the best places where if there was any movement of the depleted uranium into the groundwater these groundwater monitoring wells would pick it up.

This is slide thirty (30). This shows drilling

rig that was used when we drilled these wells. Before the drilling rig was allowed to go north of the firing line and set up we had an unexploded ordnance technician to come out and swept and clear the area of ordnance and they did find quite a bit. And we had to take care of that before we were allowed to have the equipment come out. Then as they drilled until they got down to bedrock every four (4) feet they would stick their probe in the drilling hole and check to see if there was anything within the next four (4) feet. And we did that every four (4) feet until we got down to bedrock. And once you got to bedrock, removed the probe and they were allowed to drill continuously.

The picture on the right shows the core of the actual drilling rig and you can see this is fairly close to the surface and how the bedrock is somewhat fractured there. We have another slide here. This is - this is the location. This map shows the location of where the monitoring wells are. Again they're in and around the DU area and there are an additional twenty-three (23) of them that we have installed.

And this slide here if you look at the top one (1) like the bottom one (1), the top one (1) is fairly close to the surface eighteen (18) to twenty-seven (27) feet whereas you get down deeper, sixty-four (64) to seventy-three (73) feet, the rock is much more solidified and can't

fracture so it's much tighter there, which somewhat surprised us.

Okay. We're conducting at least four (4) quarters of groundwater sampling and analysis and then we're also doing the same for sediment and surface water and we just went out and obtained a number of soil samples from a number of locations and we're going to be analyzing that to see if there's any depleted uranium in the soil around the DU area.

Some additional studies we're going to be doing is the absorption study or the potential for the DU to get into the soil, corrosion analysis of the DU penetrators and also to check on the various oxides of the metal when it corrodes. There are various different phases of corroding and depending on what type of oxide it is it may have more potential to move off the Proving Ground and expose the public. Once we have all that information we will put it into some of these models that are identified down here on the last bullet. These are all computer models that are used to provide an estimate over the thousand (1000) year time span of whether or not there would be a potential for migration of the depleted uranium off the Proving Ground at a level that would expose the public that would exceed an exposure level and that's what we have to satisfy.

Okay. The Army is continuing with their site

characterization. As I said we - we have submitted these addendums. Some of them are still in the Field Sampling Plan, some of these are still work in progress at the USGS Work sampling the groundwater and they're doing an age dating process. If the groundwater was very old there that means that the groundwater is not leaving. If it's young groundwater that means it's moving and if it's moving then it has potential if there is depleted uranium in the groundwater it might get off the Proving Ground. And if somebody would access the groundwater off the site they might be exposed. So we're looking at how old the groundwater is in the areas where we drilled the wells.

And under our current license with the NRC we're required to meet with them at least annually and prior if there are any major decisions that we are proposing from the Field Sampling Plan to get all this data. We had a meeting back in July of this year and we're looking at scheduling the next one (1) next year now.

For the future we're just going to continue with the site characterization and development of restricted release license termination plan and the Environmental Report that will go with it. Our license currently requires us to submit that material to the NRC by the end of December of 2011 at the latest. That is a legal requirement. Once that is done that will not end the process. That starts a whole

new process with the NRC and they will be doing these actions. They will be doing an Administrative Review and a Technical Review of the documents. They will conduct an Environmental Impact Statement that will come out to the public and ask the public input as required by the Environmental Impact Statement. And we will continue to do semi-annual monitoring until the license is terminated. Right now we estimate license termination 2015 to 2016 time frame.

Okay. When we have submitted the materials to the NRC by the end of December of 2011 probably sometime in 2012 the NRC will publish a notice in the Federal Registrar that allows a person or an organization to request a public hearing on the materials that we may have submitted. And if they satisfy the hearing criteria they are granted a hearing and at some later date we will do the same thing we did last year.

Lastly, if warranted, we will hold additional meetings like we are tonight if there is sufficient public input and questions. But if not, then this will be it.

And then lastly that's our last slide. Public input. If there's anyone here who would like to voice any questions or concerns now is the time.

MS. BECKY THOMPS:

I understood in the articles from the paper that I could ask but you wouldn't answer?

MR. PAUL CLOUD:

Correct. What - what the purpose of this meeting is for is not to get into a debate as though it were a Q & A type session. We are seeking to obtain your concerns or your questions so that when we're at a point where we have all the information we feel is necessary then we will respond to them in writing just as the Court Reporter is taking down everything we say tonight verbatim. We may not have not sufficient information to address a particular question or concern right now. So it would be premature to - if you asked question A, my response being premature and it might be completely inaccurate. So I don't want to provide you with a misleading or inaccurate or incorrect response at this time and we're not prepared to answer that. So our - our goal is to get your comments, your questions, your input so that when we are doing this it may lead us to think of something that we hadn't thought of before and we may end up doing something that we hadn't thought of. That's the whole point of this type thing. And again it just focuses around the whole.

MS. BECKY THOMPS:

How do you rid yourself of depleted uranium? What do you finally do with it?

MR. PAUL CLOUD:

Any other questions?

MR. DANIEL PHOLE:

Not necessarily a question but you mentioned these soft targets and hard targets. Are you willing to describe what a soft target is?

MR. PAUL CLOUD:

The soft targets were basically, and I can go back, let me go back here.

MR. DANIEL PHOLE:

Were they mounds of dirt, that type thing?

MR. PAUL CLOUD:

Let me go back. It's in one (1) of these.

MR. DANIEL PHOLE:

I mean obviously they were testing them.

MR. PAUL CLOUD

Basically what it was is it's a little hard to see them there but here in this one (1) you can see in slide eighteen (18). If you look real close on that one (1) towards the bottom down here, you see two (2) telephone poles. And from those telephone poles were strung either plywood or soft targets. And those were placed at thousand (1000) meter intervals and then we fired through the cloth ones. That was the soft targets. If it was a hard target it was made of plywood.

MR. DANIEL POHLE:

Which leads me to believe or to interpret that you were probably doing an accuracy study?

MR. PAUL CLOUD:

That's exactly right.

MR. DANIEL POHLE:

Instead of penetrator testing?

MR. PAUL CLOUD:

Exactly.

MR. DANIEL POHLE:

Is there data available of how many of the rounds penetrated the targets seen out on Big Creek? That would be my concern. Did the projectiles all pass Big Creek?

MR. PAUL CLOUD:

Thank you.

MR. DANIEL POHLE:

And I would like an answer to this question. And I understand that it was an accuracy test but even with that amount of mass when you start shooting through trees or forests you may have some deflection.

MR. PAUL CLOUD:

Ma'am, any other questions?

MS. BECKY THOMPS:

Lots of them but --

MR. PAUL CLOUD:

We have another hour and a half (1 ½).

MS. BECKY THOMPS:

But since there's no answer forthcoming.

MR. PAUL CLOUD:

You can ask.

MS. DEBBIE POHLE:

If we ask when will the answers be provided?

MR. PAUL CLOUD:

The answers will be supplied when we respond to the NRC. All the questions we have taken down today will be put in an enclosure to the license termination plan and it will be like question one (1) and we will have a response for question one (1). And then question two (2), response to two (2) and so on and so forth. Then there will be an opportunity - say you don't agree with that and that's fine. When the NRC publishes their notice for a hearing you can say I was at this meeting in 2008 and I had this question and I'd like to get a response. I don't agree with this for whatever reason, I want a hearing on that and if it meets a certain criteria you'll be granted a hearing. That's how the process works. It's not the Army's problem, it's the NRC's.

MR. DANIEL POHLE:

And it was the Army that was actually conducting the tests?

MR. PAUL CLOUD:

Yes we fired the penetrators.

MR. DANIEL POHLE:

And you fired them from - what was the weapon?

MR. PAUL CLOUD:

There's a slide here. Let's go back to the slide.

MR. DANIEL PHOLE:

I mean you're sure that the projectile - because the projective was fired and from what type of weapon was it fired? I missed that I guess.

MR. PAUL CLOUD:

I will see if I can find that (indicating).

MR. SKIBINSKI:

It's in the other one (1).

MR. PAUL CLOUD:

Yeah. (Indicating)

MR. DANIEL POHLE:

Okay. They were from tanks?

MR. PAUL CLOUD:

Yep.

MR. DANIEL POHLE:

Ma'am?

MS. DEBBIE POHLE:

I thought I heard you talking about groundwater. Did you have any results on your - any unexploded ordnance in the groundwater? Have you finished your groundwater testing? I didn't hear you say there were any results. Were they all negative or are they still in question?

MR. PAUL CLOUD:

I won't answer that question. We haven't found out.

MS DEBBIE POHLE:

You didn't see any DU in the deer?

MR. PAUL CLOUD:

We haven't found anything in the groundwater either.

MR. DANIEL POHLE:

From my standpoint, and I don't remember, did you say you did sediment sampling in the groundwater in this testing?

MR. PAUL CLOUD:

Ma'am?

MS. BECKY THOMPS:

If you didn't find anything in the groundwater why not state it in your report?

MR. PAUL CLOUD:

We haven't written it yet. When you do groundwater sampling you take a minimum of four quarters in a calendar year. We just did the third quarter so the fourth quarter is coming up in January. We have to do one (1) minimum of calendar year of data and we do all the time at the present.

MS. BECKY THOMPS:

Did you do that last year?

MR. PAUL CLOUD:

We started this year.

MS. BECKY THOMPS:

How long ago has it been since you've done it?

MR. PAUL CLOUD:

We just did the third round this quarter. I mean today, this week.

MS. BECKY THOMPS:

But I mean you did testing this year but did you do any testing five (5) years ago?

MR. PAUL CLOUD:

Yes. Well there's certain things we're doing. We're doing site characterization which is specific to terminating the license. That's why we drilled these additional twenty-three (23) wells. What we have done since 1984, since we have another eleven (11) wells out there, and we have been sampling them every six (6) months since 1984.

MS. BECKY THOMPS:

And you found no contaminates?

MR. PAUL CLOUD:

No.

MR. DANIEL POHLE:

This has nothing to do with the DU license but how many cartridges were fired at the targets during the testing?

MR. PAUL CLOUD:

Maybe three (3,000) or four thousand (4,000) cartridges.

MR. DANIEL POHLE:

And that was for accuracy testing?

MR. PAUL CLOUD:

Yes. I didn't get involved with any of that.

MR. DANIEL POHLE:

I would like to know what kind of trajectories they were firing?

MR. PAUL CLOUD:

Anything else ma'am?

MS. BECKY THOMPS:

I've never been to a meeting where if I asked a question there wasn't an answer or I'll get back with you.

MR. DANIEL POHLE:

And are they going to be responded to?

MR. PAUL CLOUD:

Well that's why you're on the mailing list and also so that when the Army submits their plan you can be notified where you can access it on the website and you will see whatever response was given to the questions or concerns.

MR. DANIEL POHLE:

Like if I left my card and e-mail address would I get it?

MR. PAUL CLOUD:

Well if you're on the mailing list and we have any other additional meetings or anything else is done we will mail out a notice and we will put a notice in the paper.

MR. DANIEL POHLE:

Have you got any other concerns in that area?

MR. PAUL CLOUD:

This is specifically for DU.

MR. DANIEL POHLE:

No other concerns?

MR. PAUL CLOUD:

No.

MS. DEBBIE POHLE:

Not for radiation?

MR. PAUL CLOUD:

No.

MS. DEBBIE POHLE:

Have they tested?

MR. PAUL CLOUD:

That is a different issue not germane to this meeting. Any other questions ma'am? Any other thing - concerns you might have?

MS. BECKY THOMPS:

No thank you.

MR. PAUL CLOUD:

I would like to conclude the meeting now. Thank you for coming. And we will continue from there.

* * * * *

CONDLUSION OF HEARING

C E R T I F I C A T E

STATE OF INDIANA)
) SS:
COUNTY OF JEFFERSON)

I, Sharon Shields, do hereby certify that I am a Notary Public in and for the County of Jefferson, State of Indiana, duly authorized and qualified to administer oaths; That the foregoing public hearing was taken by me in shorthand and on a tape recorder on October 30, 2008 at Jennings County Library, North Vernon, IN; That this public hearing was taken on behalf of the Jefferson Proving Ground pursuant to agreement for taking at this time and place; That the testimony of the witnesses was reduced to typewriting by me and contains a complete and accurate transcript of the said testimony.

I further certify that pursuant to stipulation by and between the respective parties, this testimony has been transcribed and submitted to the Jefferson Proving Ground.

WITNESS my hand and notarial seal this 18th day of November, 2008.

Sharon Shields, Notary Public
Jefferson County, State of Indiana

My Commission Expires:

July 2, 2015

JEFFERSON PROVING GROUND

ORIGINAL

DATE:	June 23, 2009
TIME:	7:00 P.M.
PLACE:	Jennings County Library North Vernon, IN 47265
PRESENT:	Paul Cloud, Army
	Audience Members
	Sharon Shields, Reporter

FIRST PAGE FOR ASCII

A public hearing of the Jefferson Proving Ground Restoration Advisory Board meeting was held at the Jennings County Library, North Vernon, Madison, IN at 7:00 P.M. on June 23, 2009.

OPENING STATEMENTS BY MR. PAUL CLOUD:

Okay. Good evening. My name is Paul Cloud. I work for the United States Army. My project is Jefferson Proving Ground. I do see some familiar faces in the audience.

And ah the meeting tonight is to discuss potential institutional controls that would be considered for the termination of the depleted uranium mines that the Army holds for Jefferson Proving Ground through the Nuclear Regulatory Commission. And that is a specific requirement based on the type of termination that the Army is seeking there which I will now discuss.

Here's our agenda. We'll talk about some regulatory requirements. This is straight out of the Code of Federal Regulations. It's fairly administrative, very dry, bland, boring type reading but after you've seen the first few slides that have that verbatim requirement then the next item is what does this mean? That's in layman's English as to what exactly that language means so that you have a better understanding and then we'll talk a little bit about

the past operations that require us to have this license. And then we'll have a slide that shows what the Army is currently considering as potential institutional control. And then lastly is the meat of the meeting which will allow the public their input as to what they think should be considered as an institutional control for the Restricted Release Termination. Okay.

Under the Nuclear Regulatory Commission's requirement 10 Code of Federal Regulations 20.1402(d) if a licensee, it doesn't matter who it is whether it's the Army or anyone, and you can be a licensee under the NRC if you have - you would be licensed if you have radiological materials. When the Army came to JPG we fired depleted uranium projectiles, 105 millimeter and 120 millimeter rounds out there. They did not impact anything other than dirt. They were soft target testing for accuracy. The trajectories were very flat projecting type of munitions and that's what they tested at JPG. At other facilities they did test against armor plate but that's a whole different issue and we didn't do that at JPG. Anyway under the NRC requirements if you are no longer performing the function for which you got the license for you have to terminate that license or cancel it, close it out as it were. Also under their requirements there are only two (2) mechanisms or two (2) methods by which a license can be closed out or

terminated. One (1) is called Restricted Release and the other is called Unrestricted Release.

Now under Unrestricted Release the licensee would go in and clean up the area that had the radiological material in it to a level such that anybody that walked out there, lived out there, grew plants, drank the water, was exposed twenty-four seven (24/7) would not exceed a radiological limit in a year's time. That would be Unrestricted Release. The area would be released from radiological control. Now we did do that south of the firing line where we stored the penetrators at one (1) time. The license was modified after the NRC verified our surveys and that area was released from radiological control many years ago.

The area we're talking about now at JPG is north of the firing line in the DU Impact Area which is a two thousand (2,000) acre rectangle north of the firing line in the Impact Area where all the UXO was involved. Under the Restricted Release criteria if a licensee can demonstrate to the NRC that over their thousand year (1,000) regulatory time frame that the material is not moving, will not expose the general public to a level that would exceed a radiological exposure limit, then they can apply for a Restricted Release and the material can stay in its current location.

For a number of reasons the Army has decided to seek a Restricted Release at JPG. It has to do with a number of things. One (1) is cost, two (2) is safety and three (3) is ecological damage. Because it's in the middle of the Impact Area that area has, we estimate, up to eighty (80) rounds of high explosive unexploded ordnance per acre. So if you multiply that by two thousand (2,000) you can see there's a lot of high explosive unexploded ordnance up there on the site of DU.

We have an endangered species out there, the Indiana bat. If we were to go clean up this area we would probably have to bulldoze that whole two thousand (2,000) acres. Fish and Wildlife Service is the regulator of record for endangered species. They would probably not be too enthusiastic about that. I can't speak for them nor would I even attempt to but at a minimum we would have to coordinate with them and they might put some restriction for conditions on that exposure that the Army may not be comfortable with.

But one (1) the other more important items is that because there was is much high explosive ordnance out there there's no doubt that anybody that went out there to go clean that stuff up would set off some of these rounds. And even if they were in Army equipment there is a danger that they could be immediately injured or killed. So there's

very immediate potential for those individuals to be hurt. So for those reasons and some others, the Army has decided to seek this Restricted Release Termination.

And this slide, and the next several, will give you the chapter and verse that says that the licensee shall document in the License Termination Plan, that's what LTP stands for, or the Decommissioning Plan, how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, following you know meetings like this where we have afforded the community an opportunity to discuss what they think might be appropriate institutional controls. Again this goes into some additional details of why some of the things that need to be considered for institutional control that would be proposed by us and then submitted to the NRC.

Okay (A) willing to provide reasonable assurance that the TEDE, which is total exposure dose equivalent, that's the radiological exposure to the radioactive material, for residual radioactivity distinguishable from background not to exceed this 25 mrem. That's a level of radiological exposure. (B) is it enforceable and (C) will it not impose undue burdens on the local community or other affected parties. (ii) whether the licensee has provided sufficient financial assurance that

they are - they will do this, either through the government or through an independent third party.

Then it talks about in seeking that advice, you know what the licensee shall provide. And again it talks about the community and having them be provided with an opportunity for comprehensive, collective discussion on the issues by the - by the participants represented. And a publicly available summary of the results. We will provide all of that when we submit the documentation to the NRC.

I have my contractor here that's doing that work for the Army and I have a Court Reporter here that's doing a verbatim dictation for these meetings, the meeting here tonight, the meeting tomorrow night at Versailles and the meeting Thursday night in Madison at the Public Library. All of that will be incorporated into an enclosure of the documents that we submit to the NRC and our responses to anyone who has any suggestions regarding suggestions for potential institution control.

This is what all that previous slide really means. If the Army is successful in demonstrating that the depleted uranium at the Jefferson Proving Ground will not cause an exceedance for human radiological exposure, then the approximately 75,000 kilograms of DU will remain at JPG forever with certain institutional controls in effect. That's what all of that previous language really means as

far as requirements. And the requirement before the community, their opportunity for input.

Our past operations back in 1983 and 1984 we started shooting DU. We did a Baseline Environmental Survey. That was to get you know what it was before we started shooting DU. In 1984 to 1994 they tested the DU rounds, the 105 and 120 mm shells. Again it was soft target accuracy against targets at one thousand (1,000) meter intervals. Then the projectiles would impact in the soil.

Okay. From 1984 to the present, that's actually today, under our current license we have to do semi-annual environmental monitoring of ground water and surface water, soil and sediments. We've never gotten a hit that - in those media that we take the material is moving anyplace.

In May of 2005 we submitted an alternate request for a schedule decommission permit with the NRC. They approved that schedule and all the material that we have sent to them is up on the NRC's website. This is - if you want to access it you can type this in on the internet and it's typed in JPG or Jefferson Proving Ground and you can call up all the documentation, all the reports, all the media, anything that we have done with the NRC over the last several years going all the way back to 1984. Anything they have they put on their website, everything that's publicly

available.

This is what a DU penetrator looks like in flight. It's accurate leveling the barrel of the tank. You can see what happens when the sabine breaks away and it's basically the long shark like item. It's very hard and that's one (1) of its attributes and why it's shooting in there. A kinetic energy weapon. It impacts hard and it slices right through armor and it's a stable test. It works very well in Desert Storm actions.

This is a picture of the DU trench area at ground level and it's inside the DU Impact Area. This gentleman over on your left he is Radiation Safety Officer. He used to work for me back on the Proving Ground. He has since retired and I am the Radiation Safety Officer now. This area does not look like this now. This was taken about probably fifteen (15) to twenty (20) years ago. That area, because we're no longer firing in there, is starting to fill back in with vegetation. All this area you see is cleared. There are trees up here. This area was basically cleared by the DU just going through and knocking everything down. It's starting to fill back in now. It's much - it's getting much harder to find.

This is what it looks like or looked like around 1990 from overhead. And again if you took a similar shot today it would be much different. Again it's starting

to fill back in. Another twenty (20) years and you probably won't even be able to tell the difference.

These are the potential institutional controls that at present the Army is considering. The Army will continue to own the property north of the firing line. That's a fairly significant issue because as the NRC has even acknowledged publicly, the Army is what is called an enduring entity. It's going to be here basically forever. It belongs to the Federal Government. If the Federal Government goes away we're going to have bigger problems than having DU out at JPG. So we will continue to own the property forever.

Maintenance of the fencing around the area north of the firing line. If you go up along the perimeter of the Proving Ground now you will see the eight (8) foot tall chain link fence with barbed wire on top.

North of the firing life we have locked road barricades that goes into the interior of the Proving Ground. In fact there's a double set of them, not only on the perimeter, but on the inside so that during the hunting season we allow the Fish and Wildlife Service to unlock perimeter ones but we keep the inside ones locked that would give you access to the DU. There is still no access to the DU. So there's also those.

We have controlled access north of the firing line through Fish and Wildlife Service because they have

what's called an overlay refuge, National Wildlife Refuge, administered by them, and an overlay on Army owned property and they control the access. But their control plan is approved by the Army. So we have control access to anywhere north of the firing line and we have restricted access to the DU area. Only certain people are allowed to go in there, not the general public.

And we also are considering leaving the radiological signs up around the DU area. We have in that two thousand (2,000) acre rectangle we have a number of signs that identifies where that area starts and stops. So those are currently the items that we're considering.

Now I will shut up and allow the public their opportunity to discuss institutional control.

MR. RICHARD HILL:

I guess I'll go first. I don't hear anybody jumping in.

For the record my name is Richard Hill. I'm President of Save The Valley, I live in Madison, Indiana. I'm not going to be able to attend Thursday night in Madison because of some work conflict. So I decided to come up here to North Vernon tonight. As you - most people here know we've been involved ah in the DU issue, we'll call it that, since ah it started pretty much but ah - and ah so we've

been following it very closely. Let's just put it at that. Now I just kind of want to mention a couple of concerns, two (2) or three (3) things, that I think are related. Ah the - I believe that the sampling program that's going on right now ah is to cease probably in 2011.

MR. PAUL CLOUD:

No.

MR. RICHARD HILL:

No?

MR. PAUL CLOUD:

That's incorrect.

MR. RICHARD HILL:

Okay.

MR. PAUL CLOUD:

Bi-annual sampling cannot cease until the license --

MR. RICHARD HILL:

Until the license is terminated. Okay. Okay. Now I understand what you're saying exactly. Okay. But there

is the five (5) year plan that the NRC requires - required you to do, the sampling?

MR. PAUL CLOUD:

The one (1) that - the Site Characterization.

MR. RICHARD HILL:

The Site Characterization.

MR. PAUL CLOUD:

That you submitted that they approved?

MR. RICHARD HILL:

Yeah. I'm sorry I got that mixed up.

MR. PAUL CLOUD:

That's all right.

MR. RICHARD HILL:

Okay. And so is that to be over around 2011?

MR. PAUL CLOUD:

Right now if you look at I believe it's Amendment Thirteen (13) to our license.

MR. RICHARD HILL:

Un-huh (yes).

MR. PAUL CLOUD:

It requires the Army to submit a License Termination Plan and an Environmental Report by the end of December 2011.

MR. RICHARD HILL:

Okay that's where I got it.

MR. PAUL CLOUD:

But the only thing that happens then.

MR. RICHARD HILL:

Un-huh (yes).

MR. PAUL CLOUD:

What will happen subsequent to that is that the NRC will then do what is called an Enhanced Administrative Review of those documents.

MR. RICHARD HILL:

Right.

MR. PAUL CLOUD:

Usually that takes sixty (60) to ninety (90) days, maybe a little longer. I don't know what their current criteria is but it's in that ball park.

MR. RICHARD HILL:

Un-huh (yes).

MR. PAUL CLOUD:

If it passes that check then they will issue a Federal Register Notice saying that they have received these documents from the Army, they have successfully passed the Enhanced Administrative Review, the NRC is now commencing their Detail Technical Review and commencing their NEPA exercise for their EIS which they have to conduct. At that time they will also, in that Federal Register Notice, allow the application of any interested parties to request a hearing on those documents and make those documents available.

MR. RICHARD HILL:

Un-huh (yes).

MR. PAUL CLOUD:

To my understanding. And that's what will

happen. Probably assuming this passes the Administrative Review and we submit them the end of December of 2011 by early summer 2012, that Federal Register Notice will go out, the opportunity to request a hearing, documents will be made available so on and so forth and there will be some time frame for the parties to request a hearing. They'll have to document a concern or contention that is ah deemed acceptable and be granted a hearing formally. And also the NRC will, like I said, commence their Detailed Technical Review which will probably last anywhere from a year and a half (1 ½) to three (3) years and their Environmental Impact Statement which will be done parallel which will probably take you know one and a half (1 ½) to three (3) years also. And during their Environmental Impact Statement exercise they will also conduct public hearings in all the counties.

MR. RICHARD HILL:

Un-huh (yes).

MR. PAUL CLOUD:

To allow for public input.

MR. RICHARD HILL:

Okay.

MR. PAUL CLOUD:

And that's what will happen.

MR. RICHARD HILL:

Okay. That helps explain a lot of that. I'm glad you refreshed my memory. I knew a lot of that at one (1) time. But I've been away from it for a while.

So even so it would be possible that the license could be terminated sometime in the neighborhood of 2013, 20-- whatever?

MR. PAUL CLOUD:

Right now I think we're projecting somewhere between 2014 and 2016.

MR. RICHARD HILL:

2014, okay.

MR. PAUL CLOUD:

It depends on how long it takes the NRC to do their thing which is the Detailed Technical Review, how long it takes them to do the EIS, whether there's a hearing that's requested and granted.

MR. RICHARD HILL:

Right. Exactly.

MR. PAUL CLOUD:

What the significance and magnitude of any accepted contentions are and how long that all takes.

MR. RICHARD HILL:

Right.

MR. PAUL CLOUD:

That's why right now we're looking at 2014 to 2016.

MR. RICHARD HILL:

Right. Okay. That makes - that makes sense to me. Okay. So what I'm trying to get at here okay so let's say 2014 just to pick a number, pick a year, and they ceased the firing of the DU in 1994 okay, yeah somewhere around there, so that comes out to be about twenty (20) years of sampling, ah monitoring, whatever you want to call it. And so one (1) of our concerns of course is that that's not long enough. That is the termination - License Termination is totally over and granted at that time, that we are of the opinion that it does need monitoring after that.

Now I do understand it's not in the regulations and maybe that's something that needs to be changed and maybe that's something that we could be working on. But I just wanted to get that - that out there. Ah I believe back maybe around 1999 or in that neighborhood ah Dr. Ebinger, is that right Dr. Ebinger?

MR. PAUL CLOUD:

Yes.

MR. RICHARD HILL:

Okay. He did some reports for the Army. And it seemed like, and I didn't get a chance to look this up recently, it's been a long time since I looked at it, that some of his calculations, if you want to call them that, indicated that this - that the activity there may peak in about a hundred (100) years. A hundred (100) years sticks in my mind.

MR. PAUL CLOUD:

I don't recall the specifics.

MR. RICHARD HILL:

Okay I don't recall the specifics either. So I'm going to go back and look this up for next year. But

anyway ah it seems to me that it would be more appropriate, and I understand it's not on the regulations that you would have to do this, but I'm just telling you what I think is - what we think is more appropriate that it be monitored for a longer period of time than just twenty (20) years to see if it is ah migrating off the site. Because we haven't yet - if that's true it has not yet hit its peak of activity until that point then it should be monitored at least up until then. And of course I think that's a very reasonable approach.

The ah - it's going to be around a whole lot longer than that and I'm not in any way proposing that the Army monitor this for a million (1,000,000) years or you know anything like that. But that's - that's just what our position would be.

Another - another point is that you did point out that the DU, Delta Impact Area, is a two thousand (2,000) acre area but we're also of the belief that probably ninety (90) percent of the DU fell in a probably two hundred (200) acre area within that and ninety-nine (99) percent of it within possibly even a twenty (20) acre area. Now those are just general figures. Ah but most of them - most of the projectiles did go down the trenches, there were three (3) trenches that you showed us example of here. So - and there were some that would have gone out into other areas, but you

know I would think that at least ninety (90) percent of them would probably be in that area.

Ah so we would not in any way propose that the whole two thousand (2,000) acres, we would not urge that the whole two thousand (2,000) acres be cleaned up although that's kind of what the editorial of the Madison Courier sounded like tonight. But I didn't write that editorial. Ah but I don't think it would be necessarily unreasonable to at least consider you know cleaning up the very most concentrated parts.

MR. PAUL CLOUD:

For the record - for the record let me interject for the record.

MR. RICHARD HILL:

Sure.

MR. PAUL CLOUD:

For the record clean up is beyond the scope of this meeting because it's not an institutional control.

MR. RICHARD HILL:

All right.

MR. PAUL CLOUD:

You're fully well entitled to state your quote opinion but it is not institutional control.

MR. RICHARD HILL:

I understand that too.

MR. PAUL CLOUD:

Okay.

MR. RICHARD HILL:

Okay that's fine. Ah and just to end that point I realize that it's effective but it's not impossible to do.

Ah institutional controls, that's - that's what we're really here about. Ah that's something that ah I think we need to look more into and I'm not really prepared to give a lot of - a lot of opinion about that right now. Ah it's going to have to be controlled for a very long time as has already been pointed out and so I think that a more ah thorough examination and dynamics you know. As things change, as the years go by it's going to have to be looked at off and on for a very long time. So somehow or another there has to be ah a process in place to insure that that gets done. To - to insure that the controls are there and

are adequate.

Ah there have been ground water and surface water samples that do exhibit evidence of the presence of DU. I'm not going to argue with Paul that - I'm not going to say that there's migrating off the site because I - I'm not aware that they are. I believe him when he says that there's no evidence that they're not migrating off the site yet. So ah I think that that - you know I think I made about three (3) main points there and that the institutional controls is something that we need to study a little more carefully and - and keep pursuing as time goes on. So that will be somebody's responsibility long after we're gone.

Let me see if I have any other quick notes that I jotted down here. (Looking) No. I think that's - that's the main thing I wanted to say. Thank you.

MR. KEN KNOUF:

Paul I've got a - my name is Ken Knouf and I am the Army employee in Jefferson Proving Ground. This may be related to what Richard said.

Will the decommissioning plan specify who will enforce this and then also if we are going to maintain the warning signs down there in the area will it specify who will be responsible for doing that work because we know that the Army presence probably will be pretty minimal down the

road?

MR. PAUL CLOUD:

Because the Army's physical presence may change over the years because it's a closed facility as long as the Army owns the property they will be responsible and they will have to assign someone to that specific duty, whether it's a named person or office or whatever. But that will have to be so designated. It hasn't been at this particular time. That may be something that comes out in the negotiations with the NRC. That's unclear. But as long as the Army owns it the Army by definition will be responsible. You can always get ahold of the Secretary of the Army, the head man. He holds ultimate responsibility.

MR. KEN KNOUF:

Let's just hope it never has to go that far but ah stranger things have happened.

MR. PAUL CLOUD:

We've had the Army's Secretary in this issue for a long time. I have three (3) Deputy Assistant Secretary's of the Army at the Pentagon.

Any other questions? Mayor?

MR. HAROLD CAMPBELL:

Well when I decided to be Mayor ah the platform I ran on was to search for water and I feel like we're somewhat downstream in this, not in an area I'm looking for water in. But I feel pretty confident that the ah - when I was involved in some of the - when I was a Councilman may years ago ah said it probably would not leave the grounds, ah but if it does I'd like to see an active presence there on the lot. I'll just read here what you have that ah - what this independent third party whatever, I think that would be something. Like I say I would like to see the next Mayor, or our children or somebody down the road that nothing else is going to come of this.

MR. PAUL CLOUD:

One (1) of the things that Richard pointed out, which is accurate, is that there is a conundrum, and a regulatory conundrum, not anything that the Army or any other licensee had anything to do with. It is the NRC's regulations.

What that conundrum is is the fact that if you have a license, say if you have a license to perform a certain function, it's an active license - currently our license is in transition from active because we used to fire the DU and now we're not. And it's in transition from that

active status to closed. Once you cease performing a function for which you were given the license for you have to close the license. That is their requirement. Richard accurately denoted it.

The issue is that if you close the license you cannot have active monitoring. If you have active monitoring you have to have active licensing. Our five (5) year study is the study of ground water, and the surface water, and the soil and sediments and a number of other things. It's demonstrated over their thousand (1,000) year time span they regulate the migration movement of radiological material, soil, sediments, ground water and surface water will not move far enough from where it is now on the Proving Ground so that anyone in the potentially affected public would exceed those radiological limits. If we're successful in that then according to their regulations that they wrote, then they can terminate the license on a restricted basis and the material will stay there. Now can they change the regulations? Yes they can. But it's all done by a very formalized lengthy process. And that's up to them to go propose that. It's not something for us to, or any other licensee, but they would have to go change that. We are complying with their requirements, not something that the Army dreamed up.

MR. KEN KNOUF:

Is there a requirement that you will not have monitoring or cannot have monitoring?

MR. PAUL CLOUD:

You can't have monitoring and have a closed license because there's no mechanism for the NRC to be involved in it. You have to have an active license. But an active license to perform a specific function.

Our function was to shoot penetrators. We are not longer shooting penetrators. We have closed that license. That's what we're doing. We're complying with their requirements but we're also demonstrating to them that we think the material is not going to pose any radiological hazards. And if we're successful in that then they'll grant us a Restricted Release Termination with the institutional controls.

We continue to own the property, the fence will stay up, the signs would stay up, there will be controlled access and so on and so forth or anything else that is you know required/negotiated between the Army and the NRC after we submit documents and they do their Administrative Review and a Detailed Technical Review and they hold their Environmental Impact Statement Hearing and so on and so forth. That's several years from now. This is

in preparation for submitting those documents by the end of December 2011, which is our current requirement. So we're again complying with the NRC's regulations and actually this is the second time we've held these meetings.

We held meetings like this back last fall and we didn't get - we got one (1) member of the potentially affected public in - in all three (3) meetings. So we have already exceeded that tonight.

MR. RICHARD HILL:

I was in Indianapolis. I couldn't come last year.

DR. JOE ROBB:

Paul?

MR. PAUL CLOUD:

Dr. Robb?

DR. JOE ROBB:

I have three (3) things. One (1) is this last thing you said.

Typically institutions need a license to hold radiological materials and since it's in your possession and it's on your land could the NRC decision be required to

terminate one (1) license and require you to have another license to hold? Typically you can't just walk away from not having possession of radiological --

MR. PAUL CLOUD:

That's a gray area. We don't know that. One (1) of the things that is also unique about the whole situation to the best of my knowledge there has never been a Restricted Release License Termination where material has been left in an area whether it's the ground or building or whatever, that would potentially exceed exposure. I mean just because like in the - in the buildings that we used to store the DU without them firing, you could go in there with certain laboratory, scientific equipment, and you might be able to detect one (1) or two (2) atoms or a very, very minute amount of DU there. But it is so minute that it would never cause you to exceed any radiological limits. But it's still there. But because it didn't exceed those limits they released that from their radiological controls.

And again it's their requirements that if we can demonstrate that the material is not going to migrate to expose potentially affected public around the Proving Ground, since they would exceed radiological limits, they can terminate that license. And that's the extent of what their regulations currently address. That would close that

license and the Army is done with the exception of assuring that the institutional control stay in effect.

DR. JOE ROBB:

Number two (2) since we're involved with a very extensive prescribed fire program and occasionally I get questions from contractors or someone from NRC asking about our fire program, I have always had concerns that we're using the best information, best science possible during those prescribed fires in the Depleted Uranium Area. That would be looked at as a possible pathway for stock to leave the DU area.

I'm just concerned that I want to be - the Fish and Wildlife Service wants to be environmentally on the right side of this in history. Is that - I'm sure that would be looked at, be a part of the Environmental Impact Statement?

MR. PAUL CLOUD:

What is and what is not part of the Environmental Impact Statement will be up to the NRC. The Army has in fact addressed that specific issue fairly extensively as Richard well knows. It was actually something that was very heavily discussed during the Administrative Hearing process.

Not only the Army but the NRC staff concluded that the airborne pathway was insignificant for a number of reasons. And because of that at the current time any further investigation of that pathway is not warranted.

DR. JOE ROBB:

And the third thing I was talking to a contractor, the folks in the field there, and it was brought to my attention that potentially DU fragments or parts of DU rounds in the Big Creek water shed potentially moved some. I don't know if that is - of course I haven't seen the report and haven't seen anything about that. Would there be possible another institutional control to address that?

MR. PAUL CLOUD:

Such as?

DR. JOE ROBB:

I don't know. It could - it could be a catch basin. I don't know what - lots of things that could happen to it for institutional control. But I don't - I haven't seen any information. I don't know how much they've moved or what.

MR. PAUL CLOUD:

To the best of our knowledge nothing has moved any significant distance. Again that which you have to remember is that depleted uranium is in fact depleted from certain radiological isotopes. It is actually forty (40) to sixty (60) percent less radioactive than naturally occurring uranium. So if you had an equal amount of naturally occurring uranium in one (1) hand and depleted uranium in the other you're going to get forty (40) to sixty (60) percent less exposure from the DU than you would from naturally occurring uranium. So you're going to need forty (40) to sixty (60) percent more DU just to get what you would get from things like potash or fertilizer that has uranium in it.

The whole issue comes down to regardless if it's going to move or not is enough of it going to move far enough so that it would cause an exceedance in human exposure that it would exceed that 25 mrem per year. If we can demonstrate that by this five (5) year exercise collecting all this data, using the NRC approved model they use for this calculation over that thousand (1,000) year time span, then we would, in our opinion, satisfy that requirement. And after the NRC review if they agree they would grant Restricted Release Termination.

It all comes down to how much is being moved

and would it cause an exceedance? I mean the area - the distance from a boundary of the DU area to the nearest perimeter of JPG is one and a half (1 ½) to two (2) miles. So enough of the material would have to move over that distance to cause an exceedance. We haven't received any indication that any of the material is moving that kind of distances at all.

Any other questions? Any other suggestions or comments on potential institutional controls? This is your opportunity. This is what the meeting is all about is to seek out public input on what they think might be a relevant, applicable institutional control, either a modification of what we're currently considering or something completely different, but clearly an institutional control.

DR. JOE ROBB:

The fence is an institutional control, is that correct?

MR. PAUL CLOUD:

It's a barrier.

DR. JOE ROBB:

Okay. And the Army would remain responsible

for maintenance of that fence?

MR. PAUL CLOUD:

The Army as the landowner is responsible for the fence. Currently as you know under the Memorandum of Agreement that the Fish and Wildlife Service is a party to, that specific function has been assigned to the Air Force which has designated or delegated to the Indiana Air Guard. And as you know their contractor inspects the fence and makes - keeps detailed records on that. In fact that was just inspected last summer by the NRC inspector and he was very impressed with the level of his record keeping.

Any other comments, questions, institutional control suggestions.

Richard, anything else?

MR. RICHARD HILL:

No I don't think so. Thank you though.

MR. KEN KNOUF:

Just a comment for Dr. Robb that you finally did get your Visitor's Center. This will be an interesting subject to interpret at your Visitor's Center won't it?

DR. JOE ROBB:

Absolutely.

MR. PAUL CLOUD:

If your Visitor's Center were to be constructed within the confines of the Proving Ground that would be something that we would have to address before we submit the documents to the NRC.

One (1) of the benefits of the current location that you're currently considering is that it is to the northeast of the DU area. All indications we have is that any migration would potential - specifically the ground water and surface water, is just southwest. So it's definitely in a different direction. But we would still be required under due diligence to address that issue. But that's assuming your Visitor's Center gets built.

DR. JOE ROBB:

Can we bring that up during scoping of the EIS?

MR. PAUL CLOUD:

As you well know the Army's position on the construction of that facility and what it's going to require.

DR. JOE ROBB:

Yes.

MR. PAUL CLOUD:

Mayor do you have any other comments?

MR. HAROLD CAMPBELL:

You're doing a wonderful job. I was very interested to hear the comments.

But I just ah - maybe it's the level of confidence in it that I always liked to have a human hand on the switch and not have anybody walk off and have it unattended.

But in our search for water, that's a thought down there, but it's really out of reach for our city. The city has a very small reservoir and a water - water shed but ah we - several of us wondered about the safety issue was well addressed and I feel like it is.

MR. PAUL CLOUD:

We have found - we dug an additional twenty-two (22) monitoring wells in and around the DU area in the last couple of years as part as the Site Characterization Study. One (1) of the things that we have verified because we knew it's south of the firing line, but one (1) of the

things we have verified north of the firing line in these additional wells, and they go down as deep as a hundred and thirty (130), a hundred and forty (140) feet, that the recharge rate is very, very low. So the potential to utilize something like that for drinking water is almost nonexistent. And that's just a fact of nature.

We had the same problem south of the firing line. We have a number of monitoring wells down there for ground water contamination that has solvents in it, did some parts cleaning in a couple of the buildings down there and that's regulated by IDEM. They have agreed with our method and they're monitoring that, and we're doing everything we're supposed to do over that.

It's only moved like a hundred (100) yards in forty (40) years. And there's no dry rot because nobody's sucking on the ground water so it just sits there and the biological bugs is slowing bringing it down. Another twenty (20) to thirty (30) years it'll be gone. But that's south of the firing line. The DU is a different issue. But it's still not moving anywhere.

Any other comments, questions, suggestions on institutional control someone that would like to suggest or discuss?

I would like to thank everyone for coming. I hope everyone has signed in so - because we will use these

attendance sheets as part of our documentation in our submittal to the NRC along with the copies of the verbatim report that our Court Reporter is providing not only tonight, but tomorrow night and Thursday night. And then we'll have all our written responses and it will all ultimately be put up on the NRC website which you have that you can access that now. All the information that we have talked about, you can see all the things that went on during the Administrative Hearing process. There will be a stack about this high (indicating). It's - it's - there's mountains of stuff.

MR. RICHARD HILL:

Yeah.

MR. PAUL CLOUD:

It will bore you to tears but it's very informative.

If no one has any further comments or questions I'd like to conclude the meeting and thank you for coming and I thank you for your input.

* * * * *

CONCLUSION OF HEARING

C E R T I F I C A T E

STATE OF INDIANA)
) SS:
COUNTY OF JEFFERSON)

I, Sharon Shields, do hereby certify that I am a Notary Public in and for the County of Jefferson, State of Indiana, duly authorized and qualified to administer oaths; That the foregoing public hearing was taken by me in shorthand and on a tape recorder on June 23, 2009 at the Jennings County Library, North Vernon, IN; That this public hearing was taken on behalf of the Jefferson Proving Ground Restoration Advisory Board pursuant to agreement for taking at this time and place; That the testimony of the witnesses was reduced to typewriting by me and contains a complete and accurate transcript of the said testimony.

I further certify that pursuant to stipulation by and between the respective parties, this testimony has been transcribed and submitted to the Jefferson Proving Ground Restoration Advisory Board.

WITNESS my hand and notarial seal this 21st day of July, 2009.

Sharon Shields

Sharon Shields, Notary Public
Jefferson County, State of Indiana

My Commission Expires:

July 2, 2015

JEFFERSON PROVING GROUND

ORIGINAL

DATE: June 24, 2009

TIME: 7:00 P.M.

PLACE: South Ripley Elementary School
Versailles, IN 47042

PRESENT: Paul Cloud, Army

Audience Members

Sharon Shields, Reporter

FIRST PAGE FOR ASCII

A public hearing of the Jefferson Proving Ground Restoration Advisory Board meeting was held at the South Ripley Elementary School Cafeteria, Versailles, IN at 7:00 P.M. on June 24, 2009.

OPENING STATEMENTS BY MR. PAUL CLOUD:

Okay. Good evening. For any of you that don't know me my name is Paul Cloud, I work for the United States Army. Ah in this capacity I am the Radiation Safety Officer for Jefferson Proving Ground and I represent the Army on radiological issues. The meeting we have tonight is to discuss the potential institutional controls that are being considered for the termination of the Depleted Uranium License at Jefferson Proving Ground.

To give you a little background on the types of license terminations or closures that are allowed by the Nuclear Regulatory Commission, they are the regulators of radiological material in the United States. If you are a licensee that has radiological material, it doesn't matter if you're the Army or you're a private company or whatever, once you get that license to utilize the radiological material for a valid purpose that is all well and good. Once you cease to utilize that material for that purpose the NRC's regulations require that you close that license out. You cannot have a license for material that you are no longer using.

Since the Proving Ground is closed and we're no longer firing depleted uranium projectiles the Army is required to close or terminate that license. There are two (2) recognized methods by which a license can be terminated. One (1) is called Unrestricted Release and the other is called Restricted Release. And the difference, the basic difference between those two (2), is that under Unrestricted Release the licensee would clean up the area where that radiological material is to a certain level such that when they did surveys and at a later date and those surveys were confirmed by the NRC then the area would be released from radiological controls because it would no longer present a hazard to the populous, the people in the area and there would be no potential for them to exceed a radiation exposure limit.

Now we did that at the Proving Ground for the area south of the firing line where we stored the projectiles at one (1) time. And we did clean up there, we surveyed the buildings, we gathered all that information to the NRC back in the mid 90's and then they came in and confirmed it and they released that area south of the firing line from radiological control. That was an Unrestricted Release for that area. But that was a very small area and was isolated to a very small number of buildings. North of the firing line is what is currently regulated under the license that the Army

has and it's a two thousand (2,000) acre area in the Impact Area where the Army fired the tank penetrators, the 105 millimeter and the 120 millimeter DU projectiles.

As you may know the testing that we did there was what we soft target testing. They erected telephone poles at thousand (1,000) meter intervals and they strung either plywood or cloth target at the thousand (1,000) meter intervals and then they fired the penetrators through them and it was basically a trajectory accuracy testing. The DU projectile is a very high velocity, very flat pro - trajectory type of munition. And then they would check to verify that it was being fired correctly and it performed properly and then when it came to an end those projectiles would impact into the ground and they would stay there.

What the Restricted License Termination allows a licensee is if they can document to the NRC that over the thousand (1,000) year period that the NRC regulates these issues that the material is not migrating such that it would pose a radiological exposure hazard to the population that they might exceed an exposure limit then you can leave the material there. However, one (1) of the other criteria is that you have to have the licensee, in this case that would be the Army, the licensee has to have certain institutional control in place to ensure that there is minimum contact where this material is. In this case it would be the DU area

north of the firing line at JPG. And as we get into the slide presentation, and please take a copy of it there, they are identical to what you'll see up on the screen, we'll go through some of this and then at the end you will see the second to last slide has a listing of some of the current proposed institutional controls that we are considering.

Under the NRC regulations when a licensee is proposing to terminate or close their license by a Restricted Release License Termination they have to afford - he's my contractor. He knows all about this. Under a Restricted Release Termination criteria the NRC requires a licensee to afford the potentially affected public an opportunity to discuss and to provide input on what they think might be applicable, relevant institutional controls for this Restricted Release Termination.

So that's what this meeting is here tonight. We will go through the slides. We'll discuss the actual regulations. You will see the first four (4) or five (5) slides. It is a verbatim copy out of the Code of Federal Regulations which is a formal document and it's real confusing but it's a verbatim copy right out of the Regulations. And I'll go through that and then the slide immediately after that is the layman's explanation, this is what this really means.

Okay. And then we'll talk a little bit about

what we've done in the past and show you a copy of pictures of the DU trench and then like I said the second to last slide shows you the current potential institutional controls that we currently are considering.

And then the last one (1) is for the public to provide input. And I have a Court Reporter here to take a verbatim transcript of this meeting just like she did last night and then she'll do tomorrow night. What will happen when we get done with all three (3) of these meetings is we will take these minutes and my contractor will assist the Army in providing responses to anything that we get at these three (3) meetings. And then ultimately when we submit these documents to the NRC for this Restricted Release License Termination, which is currently scheduled to be provided by the end of December 2011, we will have all of this material in there in an enclosure with all the minutes from these meetings and our responses to any questions or any suggestions for institutional controls and it'll be all up on the NRC's website. And one (1) of the slides you will see here has the NRC's website address. You can go there now and if you get to that address on the internet and you type in Jefferson Proving Ground, you'll find all the documents we have already provided them. And basically if you stack all those documents up, if they were printed out, it would probably be about this high (indicating). I mean it's - it's

a lot of paper. But - and we've given them a lot of information and we're going to give them a lot more.

Right now we are doing a - we're in the middle of a five (5) year Site Characterization to document to the NRC technically that the material is not moving anywhere. It's staying within this two thousand (2,000) acre area. And over their thousand (1,000) year regulatory time frame it will not leave the Proving Ground such that will not pose an exposure hazard to the population. If we are successful in that then after the NRC gets done with reviewing our paper work they would grant us the License Termination or the restricted conditions with certain institutional controls. But I will go into that in more detail as we get through the slides.

Now this is the agenda for tonight. As I said the first few slides are a verbatim copy of what the Regulation says from the NRC and the Code of Federal Regulations.

The next slide after those first few is the layman's explanation, what does this really mean. Okay. And then I have a couple of slides that talk about past operations when we started firing penetrators until the time in 2005 in May that we submitted the request to the NRC to go perform this sequence of events.

And then you have the second to last slide as I

mentioned, the potential institutional control. And then the last one (1) is the public input portion of the meeting.

Now as I said this is fairly administratively burdensome. It is not in plain English. But basically what it tells you is that the licensee has submitted a decommissioning plan or License Termination Plan to the Commission indicating the the licensee's intent to decommission in accordance with any of these sections by restricting the use of the site. Restricting the use of the site means that they're not going to clean it up. That they're going to leave that radiological material there. In the document the licensee is required to show how they obtained the advice of the institutions and the individuals in the community who may be affected by the decommissioning.

Again this basically says the same thing. It's all just an actual verbatim copy right out of the Code of Federal Regulations. And this is actually at the top of the slide this is - if you go into the Code of Federal Regulations and you type in 10CFR20.1403(d) that's what you - this is what you would come up with. This is exactly what it says. Basically this section here says that the institutional controls whatever they are would provide reasonable assurance that the TEDE, which is a total equivalent dose equivalent, total exposure dose equivalent.

Basically what that means is the general

population would not exceed this radiation level in a year. That radiation level is roughly equivalent to an x-ray, a chest x-ray. But also it requires that the institutional controls are enforceable and they will not impose an undue burden on the local community or the affected parties.

Another requirement is that the licensee, in this case the Army, has to provide sufficient financial assurance to enable an independent third party, including a governmental custodian, you know reasonable assurance that they're going to have enough money to insure that these institutional controls are going to stay in effect for the duration of the thousand (1,000) year time span.

And then go back down here again and again it's seeking the advice of the issues identified the licensee shall provide participation by representatives of a broad cross section of the community interests who may be affected by the decommissioning. That's why we put those notices in all the papers, the local papers and the three (3) metropolitan papers: Indianapolis, Cincinnati and Louisville papers and also in the Versailles and the North Vernon and the Madison paper. And then we had the mailing list that we've had since the Restoration Advisory Board.

Okay. Again it's an opportunity for a comprehensive, collective discussion on the issues by the participants represented. Again this is to discuss the

institutional controls for the Restricted Release Termination closure of the DU license at JPG.

Now this is the slide that in layman's terms explains what this really means. It says if the Army is successful in demonstrating that the depleted uranium at Jefferson Proving Ground will not cause an exceedance for human radiological exposure, then the approximate 75,000 kilograms of DU will remain at JPG forever with certain institutional controls in effect. However we could have all the institutional controls in the world in effect and they would not be satisfactory if we cannot demonstrate to the NRC that the material is not moving. If the material is moving and it poses a radiological hazard we're going to have to take other action. But if it's not moving then we have the opportunity to leave the material there and do the Restricted Release Termination.

Now for past operations back in 1983 before we started firing DU penetrators we did a Baseline Environment Survey. That kind of gave us a before snapshot of what the environmental conditions were out in the DU Impact Area so we knew what it was before we started shooting DU. We started firing in 1984 and finished firing in May of 1994. Again we fired 105 and 120 millimeter rounds. The last bullet there again we just did soft target testing.

At other proving grounds, Aberdeen and Yuma,

they have done what we call hard target testing where the penetrators impacted on armor plate. Now that's a significant difference because when the DU penetrator hits an armored plate typically it will slice right through it like a butter to - or a knife to butter. But it also causes the DU to what we call aerialize. It's called aerialization. And it forms a - part of the DU penetrator will be transformed into a fine mist of DU.

That did not happen at JPG. What we had at JPG is the impact penetrators or big portions of penetrators or chunks of penetrators. We don't have that fine mist. That is significant because during the prescribed burns that the Fish and Wildlife Service do or the Army used to do, even though they're short duration and low intensity, if there were a fine mist there there would be a greater potential for a fire to transport that material. We have examined that exhaustively and we have discussed it with the NRC.

In fact we had a hearing, an Administrative Law Hearing, a year and a half (1 ½) ago in Madison that Save The Valley was granted and the three (3) judge panel ruled against their request for additional information and additional sampling for their sampling when they did fires. But that is the reason why. There is almost zero (0) potential at JPG for an airborne issue because of prescribed burns.

Okay from 1984 to the present we are doing semi-annual environmental monitoring of the surface water, the soil, the ground water and sediments. And that will continue until the license is terminated. That is a license requirement. And as I mentioned earlier in May of 2005 the Army submitted a formal request in accordance with the NRC regulations for what's called an alternate decommissioning schedule. And with that we submitted what's called a Field Sampling Plan. That outlines this five (5) year period where we're going to get all this information to document that the material is not going anywhere, it's not going anywhere in the surface water, the ground water, the soil or the sediments. It's staying within the two thousand (2,000) acre area. The NRC agreed with that and they issued us a License Amendment. It's Amendment Number Thirteen (13). And that Amendment basically says that by the end of December 2011 the Army needs to submit to the NRC a License Termination Plan and an Environmental Report. And that's our current schedule.

All the documents we submit to the NRC become public knowledge. They're publically available, they're on the NRC's ADAMS website and this is their address right here. If you type that in on any web browser you will go there and all you have to do is type in JPG's name and you'll get more information than you'll ever want to know on this subject.

So for those of you who haven't seen a

penetrator in flight this is what it looks like after it's been fired out of a tank. It looks like a big dart.

Now this - this gentleman used to work for me when the Proving Ground was open and he was the Radiation Safety Officer. Richard has since retired and I get to do this job.

This is the DU trench and this area here as you can see from side to side doesn't look like this now for those of you who may have been taken out there on a tour. But as you can see this area is clear of trees and vegetation. Those trees and vegetation were just knocked down by the DU penetrators. It has been fifteen (15) years since we fired the last DU penetrator. That area is getting more and more filled in. Within the next fifteen (15) years you won't even be able to tell it. You might be able to see it from an overhead shot like this but this was taken fifteen (15) to twenty (20) years ago and it's very clearly shown here. Here is some of those poles I was telling about. You can see the string or the rope right here that used to suspend the cloth targets. These were at thousand (1,000) meter intervals.

Now the second to last slide is a representation of what the Army is currently considering as institutional control. Again this is assuming that after we have done this Site Characterization if the Army feels that there is sufficient technical knowledge and information that

supports our position that the material will not move far enough to cause a radiological exposure issue or exceedance. So what would happen is if the Army would propose continued Army ownership of the property north of the firing line, that's the entire fifty-one thousand (52,000) acres.

We would maintain the fence in the area north of the firing line. That's a chain link eight (8) foot tall with a barbed wire on top.

There are locked road barricades. As you probably well know on the east and west perimeter all the barricades are locked with the exception of during the hunting season. And we have a second set that are locked inside that go around the DU area so we have actually a double set and the only time we have a single set is during the hunting season.

So there's controlled access north of the firing line but there's restricted access to the DU area. It's even tighter to get in there.

And then lastly we would look at keeping the radiological signs around the DU area. Right now around that two thousand (2,000) acre area we have radiological plaque signs that identify that this is a radiological area. You have to keep out.

So those right now are some of the things that we're considering. I'm not going to guarantee to anyone that

all of those will remain. And they may get modified a little bit, some of them might fall out, some of them might be added but some of the key ones are obviously - the Army is going to continue to own the property. And the NRC in writing has very clearly stated that because we're part of the Federal Government we are what they call an enduring entity. We're not ma and pa inc. We're not going to file bankruptcy tomorrow and go to South America. If we do that there's going to be a lot bigger problem than leaving some DU someplace. But because we are an enduring entity if we say we're going to keep ownership of the property then that's a very substantial statement because now they have a liable part.

So now we're at the point of the meeting where public's opportunity to talk about institutional control. So if anybody would like to say anything now is your time.

MR. PAUL CLOUD:

Please speak up.

MS. DIANE CARSON:

We've lived out along 421. We went through all the bombings and the shakings of the house and things like that. And then no one (1) was ever told that there was ever going to be any uranium used on Jefferson Proving Ground. No one (1) was ever informed of that.

MR. PAUL CLOUD:

Actually that --

MS. DIANE CARSON:

Until years afterwards.

MR. PAUL CLOUD:

That's not correct because the Army was required to - and I have copies of the documentation and the newspaper articles.

MS. DIANE CARSON:

To the people living on the road?

MR. PAUL CLOUD:

They were all notified that the Army was getting the license. There were articles in the Madison Courier. I have copies of them. There was a very active discussion with Save The Valley at the time. This was in 1983.

MS. DIANE CARSON:

A lot of people living out through there are dead by now.

MR. PAUL CLOUD:

But the Army was required and they did comply with the criteria for notification. But it was done.

MS. DIANE CARSON:

Okay.

MR. PAUL CLOUD:

Go ahead.

MS. DIANE CARSON:

In the likelihood people understood just like well if they're going to be bombing or building and they didn't make it clear you know.

MR. PAUL CLOUD:

No, it was very clear. I've seen pictures from the Madison Courier at that time that showed the Commander holding a simulator DU round in his hand.

MS. DIANE CARSON:

Okay. Because I know that his grandparents lived out there before - before the Proving Ground was moved - got that big. And no one (1) went to town and got a paper. I don't even know if they had a paper.

His grandparents agreed to live there. Well they were on a special deal that they were paid a check monthly until they died and then the property would be sold. But that was pretty well I think with the Army kind of agreement.

MR. PAUL CLOUD:

I don't know anything about that.

MS. DIANE CARSON:

I know they were plenty close to the edge. I know they're not close to the - 421 is not close to the bombing area, right?

MR. PAUL CLOUD:

The DU area is essentially in the center of the Impact Area. The closest distance of any boundary of the DU area is to a publicly acceptable area outside the fence is at least one and a half (1 ½) to two (2) miles.

MS. DIANE CARSON:

Okay. Another question on that is there is no possibility that any of this is leaking out because I know there's a number of lakes on the property?

MR. PAUL CLOUD:

Un-huh (yes). There are --

MS. DIANE CARSON:

And they're not going into any body of water and then going out to the streams?

MR. PAUL CLOUD:

There are DU penetrators in Big Creek.

MS. DIANE CARSON:

Okay.

MR. PAUL CLOUD:

But there is no indication that the penetrators are either moving or that the material is eroding or corroding off since that downstream we can detect it.

MS. DIANE CARSON:

Okay.

MR. PAUL CLOUD:

As I said we've been sampling since 1984. And we sample those streams, we sample the ground water, we sample sediments and we sample the soil. And we haven't

gotten any hits saying this stuff is moving anyway. It's basically staying right there.

MS. DIANE CARSON:

And none of these came in by planes? It was all out of tanks?

MR. PAUL CLOUD:

It was all out of tanks. This 105 and 120 millimeters, no aircraft.

MS. DIANE CARSON:

Because a lot of that was not - I don't think they used to let the planes go over the Proving Ground?

MR. PAUL CLOUD:

Well there are planes and there are in the - in the military inventory there are munitions of different type aircraft like the 810, the work hog fired a DU penetrator but it's a much shorter round.

MS. DIANE CARSON:

Un-huh (yes).

MR. PAUL CLOUD:

None of those were ever fired at JPG.

MS. DIANE CARSON:

I know a lot of things went on that no one (1) ever knew about where it - where things were stored or what was going on. It was private pretty well you know because it does that. I don't think the public was really asking because they knew that they were doing a service to the Army just to let them be there in their area.

But I was just wondering because the things have changed in the number of years now. We're used to the television. We're used to everything instantly, all the information instantly. And if you want anything you go to .com, you know the computers, where back then they went out to talk to their neighbors if they were lucky. But they didn't go to town every day. Like I say that's just changed in a lot of years. So now we're just wanting to know if we're safe living there.

MR. PAUL CLOUD:

I wouldn't have any hesitation on living where you live.

MS. DIANE CARSON:

Okay. Thank you.

MR. PAUL CLOUD:

Specifically the DU. You could hold DU in your hand. If you don't have a cut or an open wound in your hand it could stay there basically forever and the radiation level you're going to get is insignificant.

It's an internal issue. If it gets inside your body. And it's not only a radiological hazard then but it's also a heavy metal hazard. So if you stuck it in your mouth and sucked on it it could be a problem. But that's a heavy metal issue, toxic.

MS. DIANE CARSON:

Right.

MR. PAUL CLOUD:

But if you held - if I held it in my hand and my hand is not cut your radiation exposure is negligible. And you're a mile and a half (1 ½) to two (2) miles away. We've got the fence up, we've got the signs up, we've got restricted access, we've got controlled access, we've got Army ownership, we're going to keep the signs there. Those are the things that we are considering.

MS. DIANE CARSON:

Un-huh (yes).

MR. PAUL CLOUD:

And like I said what the purpose of the meetings last night, tonight and tomorrow night are for is to see if there are any other suggestions from the public regarding institutional control. But it's focused on that issue.

MS. DIANE CARSON:

Un-huh (yes).

MR. PAUL CLOUD:

You know last night one (1) of the individuals talked about you know continued monitoring or possibly clean up. Those are beyond the scope.

MS. DIANE CARSON:

Un-huh (yes).

MR. PAUL CLOUD:

They are not institutional controls. And while that person, that individual, was allowed to make their statement I followed it up by asking the record to show that

those are not institutional controls and they're beyond the scope.

MS. DIANE CARSON:

Okay.

MR. PAUL CLOUD:

But that's what we're here for is to provide that opportunity to the potentially, key word, potentially affected public and it's only because you're in the immediately surrounding area.

MS. DIANE CARSON:

Okay. We also belong to the Big Oaks Refuge.

MR. PAUL CLOUD:

Un-huh (yes).

MS. DIANE CARSON:

Will that continue being the Big Oaks Refuge?

MR. PAUL CLOUD:

Right now the MOA, and I was on the Army's negotiating team for that MOA.

MS. DIANE CARSON:

Un-huh (yes).

MR. PAUL CLOUD:

It's only in the ninth year. It has minimum of twenty-five (25) with ten (10) year renewables. There is nothing that I know of that is going to change that.

MS. DIANE CARSON:

Okay.

MR. PAUL CLOUD:

But there is an option in the MOA for any party at any time to submit their six (6) months notice that they are going to leave but that's up to the individual agencies, the Air Force, Fish and Wildlife Service, as well as the Army.

MS. DIANE CARSON:

Thank you.

MR. PAUL CLOUD:

Any other comments or questions regarding institutional control?

MR. ED SCHAEFER:

Well I've been down here quite a bit and I know for a fact that you have really tested everything that you possibly could with the soil and the water. I've seen contractors coming in and out of there you know by the dozen. You just can't believe the testing that's been done there. You know I think it's really a great thing.

But the - the monitoring is the only thing that I was wondering about like in the future.

MR. PAUL CLOUD:

Un-huh (yes).

MR. ED SCHAEFER:

Will you be - you know you already answered that you don't know I guess?

MR. PAUL CLOUD:

Well we will continue to monitor until such time as the license is terminated. In accordance with the NRC regulations that NRC wrote and published and had out for public comment many years ago when they came out, once a license is terminated they cannot have a closed license and active monitoring. But you have to close the license so therefore you don't have monitoring anymore. That's why you

have institutional controls but even before then you have demonstrated by all the testing and the sampling that you've eluded to that the material is not going to move in that thousand (1,000) years to create that exposure hazard.

MR. ED SCHAEFER:

Okay.

MR. PAUL CLOUD:

Yes sir?

MR. JIM WRIGHT:

I have a question about Fernald. Are you familiar with Fernald?

MR. PAUL CLOUD:

I am aware of it to a certain extent.

MR. JIM WRIGHT:

They deal with that uranium and stuff too and there's a lot of people that had cancer from - that lived around that area.

MR. PAUL CLOUD:

That's an entirely different issue.

MR. JIM WRIGHT:

Different than that?

MR. PAUL CLOUD:

That's enriched uranium. That's weapon grade that's ah nuclear reactor type stuff.

MR. JIM WRIGHT:

It will escape from the ground won't it?

MR. PAUL CLOUD:

It depends. Uranium is a very unique substance when it comes to what they call oxidation potentials and how it erodes and corrodes.

In fact my contractor is in the process of doing a study on that very thing right now to see giving a soil sample that we took from the DU Impact Area and rain water that we collected out there. We collected a bunch of DU penetrators that were actually fired out there. And they're going to do an erosion and corrosion test to see just how fast this stuff erodes and corrodes and how it does that and what type of oxidation state to see how mobile it might be. This is all part of that five (5) year study.

Depending on that information will go a long way in hopefully helping us prove to the NRC that even if it

is eroding and corroding it's doing so in a manner that is not going to be mobile. You know it's surface water, the soil, the sediment and the ground water. One (1) of the advantages of the soil at JPG, and I'm sure that you've noticed it here on your property, is that there's a very high clay content in the soil.

MR. JIM WRIGHT:

Right.

MR. PAUL CLOUD:

Clay is very, very good for our purposes because it's very permeable. It keeps things where they are. Things don't migrate through them. So for our case in this particular instance that's a good sign.

Any other issues, questions, comments, suggestions on institutional control? Nothing else?

MR. ED SCHAEFER:

Get to go home early.

MR. PAUL CLOUD:

I'm not going home until Friday morning.

MS. DIANE CARSON:

Well say Big Oaks has one (1) part of the refuge?

MR. PAUL CLOUD:

They utilize - they utilize approximately fifty thousand (50,000) acres but the Army still owns it.

MS. DIANE CARSON:

And Ford farms and controls buildings in it.

MR. PAUL CLOUD:

That's south of the firing line.

MS. DIANE CARSON:

And can somebody else say come in with a garbage disposal and say I want part of this land for the garbage disposal in the future?

MR. PAUL CLOUD:

Only - only on that portion of the property that the Army has disposed of which is this property that we're selling to Mr. Ford. The other property that we disposed of that constitute the two (2) parks, you know Krueger Lake area and the Western Wooded Parcel over by the

airfield?

MS. DIANE CARSON:

Right.

MR. PAUL CLOUD:

Because they were transferred under what is called Public Benefit Conveyances there are only certain uses allowed by those. And that type of operation they have to be for public benefit. Park is a classic one (1). So the short answer is on those parcels, no.

MS. DIANE CARSON:

Okay.

MR. PAUL CLOUD:

On the parcels, approximate four thousand (4,000) acres that the Army is selling to Mr. Ford once he owns that property, and he currently owns about twenty-eight hundred (2800) acres, and I'm working on the last document now to transfer the last twelve hundred (1200) to him, but once he owns property there he's like any other landowner.

He can - if somebody comes in and wants to do something like that if they meet the you know requirements, whether they're county, city, state, whatever, then you know

they can build houses, they can have theoretically a garbage dump, whatever. But that would be regulated by the community and the state as necessary.

He would have to have the required permits. But that's no different than anyplace else. The Army would have no involvement in that. It would not - no longer be our property. The only thing the Army would be involved in is that when we transfer the property to Mr. Ford there may be some restrictions on the property.

What I mean by that is that in some of the property that we sold to Mr. Ford there was a potential for unexploded ordnance. The Army did a UXO clearance of those areas down to four (4) feet below the surface. So on those areas where we did that clearance there is a Deed Restriction that says you cannot dig below four (4) feet. If you want to do that, whether it's Mr. Ford or anybody that Mr. Ford sells that property to, they have to go get the explosive ordnance disposal expertise, come up with a plan, have the Army approve it, go clear out below four (4) feet to whatever depth, six (6), eight (8), ten (10) feet, whatever it is, show us the results and if we're happy then the Army will modify that restriction.

There's also a restriction on some of the property for ground water use for drinking water. That's not a real imposition because as you know you really can't pump

the ground water out here to drink because the recharge rate is basically zero (0). But because there is some ground water contamination in some of the areas, because the Army did solvents parts cleaning in some of the buildings and the solvent just used to run out a tube in the building into a solvent pit back in the 70's which was entirely legal at that time, because nobody knew any better. We dug out those pits, we've got monitoring wells all around them, and the bugs, the natural bugs in the soil are slowly breaking down that stuff. But until those levels are down at a certain acceptable level no one (1) will be able to use the ground water for drinking water. That's another restriction. And that runs with the land until such time as that situation no longer exists so it makes no difference who owns the property. But those are basically the only restrictions on the property.

Any other questions or comments, suggestions on institutional control for the Restricted Release License Termination that the Army is proposing and hopefully will be successful?

Now just for your information I mentioned that the Army is currently scheduled to submit our documents to the NRC by the end of December 2011. What will happen after that is a fairly long and complicated sequence. What the NRC does is take those documents and they do what's called an Administrative Review of the documents and it's basically

like a page check to make sure you've got your name and your address and they have a check off sheet. It takes some sixty (60) to ninety (90) days to do that. If it passes that Administrative check, and I believe it's actually called an Enhanced Administrative Review, if it passes that then they will issue a notice in the Federal Register and it's a public document. It comes out every day. And they will say that the Army for Jefferson Proving Ground has submitted these documents, the NRC has done an Enhanced Administrative Review and passed that. We are now commencing a Detailed Technical Review and we are also going to be commencing an Environmental Impact Statement under the National Environmental Policy Act, NEPA. That's the NRC's. They have to do that. That will take probably a year and a half (1 ½) to two (2) years. But they will also at that same time in that notice afford the public an opportunity so that if they want to request a hearing, a formal, legal, Administrative Hearing on this topic, then they can request that hearing from the NRC.

They have to establish what we call standing. They have to live in the area, they have to have - they have to prove that they are being potentially affected by this action. And if they live in Chicago and they try to do it the NRC would probably turn them down.

MS. DIANE CARSON:

Right.

MR. PAUL CLOUD:

But that's their call. So once they have established standing if they are able to identify an issue, what we call a contention, with these documents then they would be granted a hearing.

And Save The Valley did this about two and a half (2 ½), three (3) years ago. We went through a convoluted ah very burdensome exercise that was finally decided about a year and a half (1 ½) ago. And basically everything that Save The Valley was asking for the three (3) judge panel denied.

MS. DIANE CARSON:

Un-huh (yes).

MR. PAUL CLOUD:

But that opportunity will present itself again once we submit these documents. And right now we're looking at somewhere between 2014 and 2016 before the license will be terminated, somewhere in that ballpark right in there.

MS. DIANE CARSON:

But if you don't own the land?

MR. PAUL CLOUD:

We do own the land.

MS. DIANE CARSON:

Right now.

MR. PAUL CLOUD:

We own the fifty-one thousand (51,000) acres.

MS. DIANE CARSON:

But I mean if you just keep selling it off to different people?

MR. PAUL CLOUD:

No. That fifty-one thousand (51,000) acres that makes up the refuge and thousand (1,000) acres that the Air Guard uses will always stay in Army ownership.

MS. DIANE CARSON:

Will the National Guard will still be able to use it?

MR. PAUL CLOUD:

They're using the thousand (1,000) acres as an air to ground training. But they're firing inerts, not

explosive rounds.

MS. DIANE CARSON:

Right.

MR. PAUL CLOUD:

And only in those two (2) areas. And they're part of the MOA also. The Army owns the property. They will always own the property.

MS. DIANE CARSON:

And always be some protection until you walk away?

MR. PAUL CLOUD:

There's going to be - you know like I said those institutional controls.

MS. DIANE CARSON:

Yeah.

MR. PAUL CLOUD:

Those institutional controls are what we are currently considering. It has - when we submit the documents.

MS. DIANE CARSON:

Yeah.

MR. PAUL CLOUD:

They will be formally proposed to the NRC.

MS. DIANE CARSON:

That sounds good. Thank you.

MR. PAUL CLOUD:

And so that's what we're currently - like I say I'm not going to guarantee you that that's exactly what they're going to say but those are the ones that we feel are reasonable, relevant and applicable.

MS. DIANE CARSON:

Right.

MR. PAUL CLOUD:

And they provide an enhanced level of security and they also protect the Army's liability.

MS. DIANE CARSON:

Thank you.

MR. PAUL CLOUD:

Any other comments or questions? Okay I guess we're done. Thank you very much.

* * * * *

CONCLUSION OF HEARING

C E R T I F I C A T E

STATE OF INDIANA)
) SS:
COUNTY OF JEFFERSON)

I, Sharon Shields, do hereby certify that I am a Notary Public in and for the County of Jefferson, State of Indiana, duly authorized and qualified to administer oaths; That the foregoing public hearing was taken by me in shorthand and on a tape recorder on June 24, 2009 at the South Ripley Elementary School Cafeteria, Versailles, IN; That this public hearing was taken on behalf of the Jefferson Proving Ground Restoration Advisory Board pursuant to agreement for taking at this time and place; That the testimony of the witnesses was reduced to typewriting by me and contains a complete and accurate transcript of the said testimony.

I further certify that pursuant to stipulation by and between the respective parties, this testimony has been transcribed and submitted to the Jefferson Proving Ground Restoration Advisory Board.

WITNESS my hand and notarial seal this 21st day of July, 2009.

Sharon Shields

Sharon Shields, Notary Public
Jefferson County, State of Indiana

My Commission Expires:

July 2, 2015

JEFFERSON PROVING GROUND

ORIGINAL

DATE:	June 25, 2009
TIME:	7:00 P.M.
PLACE:	Madison-Jefferson County Library Madison, IN 47265
PRESENT:	Paul Cloud, Army
	Audience Members
	Sharon Shields, Reporter

FIRST PAGE FOR ASCII

A public hearing of the Jefferson Proving Ground Restoration Advisory Board meeting was held at the Madison-Jefferson County Public Library, 420 West Main Street, Madison, IN at 7:00 P.M. on June 25, 2009.

OPENING STATEMENTS BY MR. PAUL CLOUD:

Good evening. My name is Paul Cloud. I work for the United States Army and I am the Radiation Safety Officer for Jefferson Proving Ground among other functions that I perform.

The meeting tonight has the cover page on slide presentations indicating we're going to talk about institutional controls for the termination of the Depleted Uranium License that the Army currently holds at JPG. Let me give you a little background on that issue before we get into the - the slide presentation itself.

For an agency or a business to have radiological material, something that's licensed by the Nuclear Regulatory Commission or the NRC, they are required to have a license to perform whatever legitimate function they're going to use it for. Hospitals have it for some of the radiological equipment and material they have. The Army had it at Jefferson Proving Ground because the Army fired depleted uranium tank projectiles there, the 105 and the 120 millimeter shells. And we were in possession of that material

after it was fired so the Army had to have this license for the possession of that material. Now as long as the Army was active at Jefferson Proving Ground that license just continues on and a part of the license requirement was that the Army had to sample and analyze soil, the sediment, the ground water and the surface water every six (6) months and report the results to the NRC to see if the material was moving off the Proving Ground and thereby possibly creating an exposure hazard to the surrounding population.

The Proving Ground as you all know has been closed since 1995. There is a requirement in the NRC regulations that say once you cease to perform the function for which you were granted your license you have to close out or terminate that license. There are currently only two (2) ways you can terminate or close an NRC license. One (1) is called Unrestricted Release and the other is called Restricted Release. The basic difference between those two (2) options are for Unrestricted Release the licensee goes into whatever area is currently licensed and cleans up that area to a level that the residual radia - radioactive material and radiation exposure levels are so low that there is no possibility that if someone was out there living, growing food, drinking the water, whatever would exceed the current radiation exposure limit. That's Unrestricted Release.

Restricted Release is the other option. That option allows the licensee the opportunity if they can demonstrate to the NRC that the material is not moving within the thousand (1,000) year time span that the NRC regulates this material then with certain institutional controls, and that's what we're talking about tonight, with the addition of those institutional controls then the license is allowed to be terminated in a restricted sense and the material can stay where it is.

One (1) of the fundamental differences also between a restricted and unrestricted as it applies to Jefferson Proving Ground is that the Depleted Uranium Impact Area at JPG is obviously north of the firing line in the Impact Area. But it is also in the center of the unexploded ordnance area. In that particular area we estimate there are on average at least eighty (80) rounds of high exploded - unexploded ordnance per acre. So when you multiply that by the two thousand (2,000) acres in the DU area you can see that there is probably a lot of high explosive unexploded ordnance out there.

For that and a number of other reasons personnel safety, endangered species and cost, the Army has selected the Restricted Release option to terminate the license here at JPG. Under NRC regulations if a licensee selects the Restricted Release Termination option one (1) of

the requirements is that that licensee provide to the potentially affected public an opportunity to provide input on institutional controls that the licensee is considering that will be subsequently submitted to the NRC for approval. And that's what this meeting is here tonight. Last night we had a meeting in Versailles at the elementary school and the night before that we had one (1) in the library in North Vernon. Now we did this last fall but it was in a somewhat different format and we didn't have anywhere near this attendance. And we had some problems with soliciting input because we didn't really enter into any kind of dialogue. While we reviewed that and considered and said you know I think we're going to try it a little differently this time and we're actually going to show some of the institutional controls that we're currently considering and enter into more of a one (1) on one (1) dialogue with the population if they so choose to.

So that's the intention tonight and that's the reason we're here. We do like I say have a Court Reporter for a verbatim transcript. As you go through the slides what you will see is we talk about the regulatory requirements. The first several slides are a verbatim copy right out of the Code of Federal Regulations that specify why we're here tonight for this particular meeting.

Because we, as the Army licensee for the

depleted uranium, and we're seeing a Restricted Release License Termination providing the potentially affected public with an opportunity to provide input on the issue of institutional control. That will take four (4), five (5), or six (6) slides. When you see that not only on the screen but if you have a copy of the slide it is fairly dry, fairly legalistic wording. What I have after that is one (1) slide in layman's terms, plain English. Basically it says what does this really mean and that's what that slide will tell you.

After that we have a few slides on our past operations from 1983 before we started firing DU penetrators until the present. And then the second to last slide will show you the - some potential institutional controls that the Army is currently considering. And then the last slide basically is public input.

Now if you have a question at any time feel free to raise your hand and I can - we can do it then or if you want to wait until the end we'll wait until the end. It makes no difference. It's your convenience.

Okay again the next several slides are just a verbatim repeat back of what the regulations specify of a licensee for public input if they're seeking a Restricted Release License Termination and telling them how and what they have to do regarding the issue of institutional controls. I won't read all this to you because it's kind of

boring but the bottom line is that if a licensee is in fact seeking to have a Restricted Release License Termination they are required to provide an opportunity and seek out public input for discussion on possible potential institutional controls. And when we get to the second to last slide you'll see some of the ones we're considering and that'll give you a better idea of what institutional controls really are.

MR. KEVIN HERRON

Paul?

MR. PAUL CLOUD:

Yes sir?

MR. KEVIN HERRON:

On mine and everybody else's the print out is not here.

MR. PAUL CLOUD:

Put your name on the - you know put an asterisk by your name on the attendance sheet and we'll make sure you get a copy. If anyone else has it, the same thing. I haven't seen that on many of the others but it may just be a fluke on yours.

MR. KEVIN HERRON:

Are they going to be available on the website?

MR. PAUL CLOUD:

Ultimately they will be but it will be on the NRC's website and that's one (1) of the things you will see in the presentation is that we are giving the website address for the NRC publicly acceptable data base. And if you address - if you access that website and you type in the name Jefferson Proving Ground you will see hundreds of items listed. And if you printed out every one (1) of those you better go buy a lot of paper because it will probably be fifteen (15) or twenty (20) feet tall, literally. Because we have provided them with a lot of information.

MR. KEVIN HERRON:

Paul page nine (9), the page what does this mean?

MR. PAUL CLOUD:

Yes sir?

MR. KEVIN HERRON:

Who - who made it - who did this the Army or who?

MR. PAUL CLOUD:

I wrote that. I wrote that.

MR. KEVIN HERRON:

You wrote that?

MR. PAUL CLOUD:

I was trying to put it into just layman's words as to what that means.

MR. KEVIN HERRON:

Okay.

MR. PAUL CLOUD:

Again here's some of the criteria that institutional controls have to satisfy. You can't have the population exceed 25 mrem per year. Twenty-five (25) mrem may be one (1) or two (2) chest x-rays equivalent per year. That's kind of an equivalent exposure rate. That gives you kind of a feel for the exposure that we're talking about. You can't exceed that.

Any institutional control has to be enforceable and it cannot impose an undue burden on the local population. So those are some thoughts to keep in mind as we go through the presentation. And then when we get to the point where you

have an opportunity to discuss this institutional control and you see some of the ones that Army is currently considering then we can you know talk about it at your convenience.

Again this is just more of the specific language that is in the Code of Federal Regulations. If you go to any web browser and you type in 10 Code of Federal Regulations 20.1403(d) you will get exactly this. This is a verbatim copy of what that regulation is.

Again an opportunity for a comprehensive, collective discussion on the issues by the participants represented: a publicly available summary of the results of all such discussions, including a description of the individual viewpoints. When we get done you will have a verbatim transcript not only of this meeting but the two (2) meetings we had in the last two (2) nights. My contractor will take those, we will analyze those responses and those questions or dialogue and we will respond to them. And when we submit the paper work to the NRC requesting this License Termination that will be either an enclosure or an appendix but it will be part of that document.

We will submit that to the NRC and they will post that on their website and you will be able to see everything that occurred as a result of this meeting, not only any questions or dialogue, discussion we had here, but our responses to those questions and dialogue. And I'll get

into a little bit more about what happens after we submit the documents to the NRC just before I open it up for the more formal public input.

Okay. This kind of is like Kevin, Mr. Herron, from the Indiana Department of Environmental Management just asked, this is kind of a layman's term plain English about what all that formal language means. Bottom line if the Army is successful in demonstrating that the depleted uranium at Jefferson Proving Ground will not cause an exceedance for human radiological exposure than the approximate (75,000) kilograms of DU will remain at JPG forever with certain institutional controls in effect.

The past operations at the Proving Ground back in 1983 before they started firing depleted uranium projectiles they did a Baseline Environmental Study. That's a snapshot of the environmental condition of the area where they fired the DU to see what it was like before there was any radiological material out there.

Subsequent to that from '84 to '94 they fired tank penetrators, initially the 105 and then later in a modification to the tank a 120 millimeter round. But those were the only two (2) types of DU that were ever fired out at JPG.

This other point right here is a fairly significant point. Soft target testing. You will see a

picture later on of the DU trench and in that picture you will see in the very front of it two (2) telephone poles that are erected that are maybe a hundred (100) feet across or apart. And there's a rope stretched between them. The Army hung from that rope either cloth or plywood targets and DU would fly through that. These targets were spaced at thousand (1,000) meter intervals.

The testing that the Army did there at - here at JPG is called accuracy, trajectory accuracy testing. DU penetrators are very flat trajectory. It doesn't arch up and then come down when it's fired from a tank. It's very fast and very flat. The testing that JPG did here was that type to verify that trajectory would stay flat.

There is another type of testing, was not performed here, was performed at Aberdeen Proving Ground and they performed it at Yuma called hard target testing. The hard targets is when they fire the DU penetrator and it hits armor plate. The significant different being that when you fire a DU penetrator against armor plate it will go right through it. However, it will also cause a fine mist of DU to be generated. We call it aerialization.

If you have aerialization and you also have spiders in your area, like prescribed burns like the Army used to do or like the Fish and Wildlife Service does not at JPG, there is a potential for the material because it is much

smaller and lighter to become airborne and transported someplace where you might not want it to be. That is not the case here because we didn't do hard target testing. What you have at JPG is impact penetrators, large portions of penetrators or chunks of penetrators. The one (1) thing you need to be aware of is that DU is twice as dense as lead. It is very heavy. So for a given amount of DU it's twice as heavy as lead. If you've ever picked up a brick of lead and held it in your hand it's like forty (40), fifty (50) pounds. If you have a brick of DU in your other hand it's going to weigh over a hundred (100). So it's very heavy.

Okay. From 1984 when we started the penetrators until the present under a requirement on our license the Army sampled every six (6) months and they analyzed the ground and surface water and the soil and the sediment. To date we have not received any indication that the material is moving anywhere.

In May of 2005 the Army submitted, in accordance with NRC regulations, a request for what's called an alternate decommissioning schedule. And with that request we submitted what was called the Field Sampling Plan. That was a proposal to do a five (5) year Site Characterization Study, a very in depth technical analysis of the area in and around the DU area, the ground water, the surface water, the soil and the sediments and anything else.

We sampled deer. We took biological samples of thirty (30) deer and analyzed them for DU uptakes. That was one (1) of the things that were in that - that Site Characterization. At the end of that Site Characterization if we have enough information and we still believe, as we do today, that the material is not migrating or moving out since that - over that thousand (1,000) year time span that the NRC regulates, that it will not cause the population here to exceed a radiological exposure limit the Army will in fact submit that to the NRC for a License Termination under Restricted Release conditions. But we will also as I said have in there the institutional controls that we're going to propose in addition to that. And I'll get into that in a minute.

Okay. Everything that we have submitted to the NRC is publicly available knowledge. There is nothing classified about it. It's all readily available. You can go to this website right here, the last line, type that into your web browser, you'll come up with a screen, type in Jefferson Proving Ground and you will see literally hundreds of hits. If you want to get more sophisticated and specific you can type in Site Characterization, Field Sampling Study or addendums or a lot - the Administrative Hearing that we had a year and a half (1 ½) ago and you'll see all those hits. Again if you want to print out all that stuff get a lot

of paper. I mean literally it will be fifteen (15) to twenty (20) feet high.

This is what the penetrator looks in flight after it's been fired from a tank. And essentially it's a big dart. And when you see them, if you saw them out in the DU area which I have, they basically look like rebar about that big around (indicating) maybe about half (½), three-quarters (¾) of an inch in diameter. Very hard, very dense.

This is the DU trench from ground level. This is basically around C Road looking north. This gentlemen is Richard Herring. He used to work at the Proving Ground. He used to be the RSO. In fact Richard is here tonight. But what this picture really wants - is intended to show you is that this open area here didn't use to be open. It's open because when the penetrators flew through there they were like a big lawnmower and they just knocked all the vegetation and all the trees down. You go out there now just fifteen (15) years after we fired the last penetrator it looks nothing like this. Another fifteen (15) years it will look like it does on the left and the right side because it's filling back in.

This is what the trench looked like from overhead. And this was almost twenty (20) years ago around 1990. Again fifteen (15) or twenty (20) years from now even the overhead shot you might not be able to tell.

And here, down here at the bottom of the slide,

there are the telephone poles I was mentioning before, the ropes, and that's where the targets, the soft targets were strung and they were spaced at thousand (1,000) meter intervals and the tank rounds would fly through those and they would check with - to see if the trajectory was staying flat as it's designed to. Say your name please.

MR. RICK REUSS:

Yeah. How - how far a flight is that? How wide is that map right there?

MR. PAUL CLOUD:

You mean the DU trench?

MR. RICK REUSS:

Un-huh (yes).

MR. PAUL CLOUD:

Probably what, fifty (50) to a hundred (100) feet.

MR. RICK REUSS:

So it's - the two thousand (2,000) acres, is that trench?

MR. PAUL CLOUD:

That's around it. That trench is approximately in the middle of that. That's five hundred (500) center firing position or as the result of DU rounds that were fired from the five hundred (500) center firing position at the firing line.

MR. RICK REUSS:

How far is two thousand (2,000) acres in that picture, can you tell?

MR. PAUL CLOUD:

This is - like I said this is - well it goes up. This is probably C Road right in here somewhere (indicating). The DU area goes all the way up to F Road, two (2) or three (3) miles up the way. If you really want to see a prospective of it come out to the Proving Ground, we'll give you a USGS map and it's got the DU outline on it and it'll show you just exactly where it is and how big it is. All you have to do is see Mr. Ken Knouf.

MR. RICK REUSS:

I'm a city kid.

MR. PAUL CLOUD:

Say again.

MR. RICK REUSS:

I'm a city kid. Acres never mean that much to me.

MR. PAUL CLOUD:

Well the two thousand (2,000) acres that the DU area is comprised of and what the NRC regulates is a subset or a part of the fifty-one thousand (51,000) acres that makes up the impact range.

MR. JOSEPH SKIBINSKI:

It's roughly one (1) mile wide by three (3) miles long and the trench is roughly one (1) mile long.

MR. RICK REUSS:

Okay.

MR. PAUL CLOUD:

It's also - if you go to the perimeter of the DU area, north, east, south, west the minimum distance from the perimeter of the DU area to the perimeter of the adjacent area of the Proving Ground like this 421 or the west side or

at the firing line it's a minimum of one and a half (1 ½), two (2) miles. That's how far it is into the Impact Area. Does that answer your question?

MR. RICK REUSS:

Yes sir.

MR. PAUL CLOUD:

Okay. Second to last slide. I won't put up the last slide because the last slide just says public input.

These are some of the potential institutional controls that the Army is currently considering. The top one (1) is a very significant one (1). Continued Army ownership of the area north of the firing line. The NRC has come on record, and it's in the public record if you dig deep enough, and they have identified the Army as what they call and define it as an enduring entity. That means we're going to be around basically forever. We're part of the Federal Government. If the Federal Government goes away there's going to be a lot more problems than some DU or UXO or anything else. So they define us as an enduring entity. So that's a very significant and important thing.

The Army would continue to own all the property north of the firing line. Maintain the fence around the area north of the firing line. That's the chain link fence you see

along 421 with the barbed wire on top with the signs on it.

We have locked road barricades. If you ever travel 421 you will see that a lot of the roads run parallel east to west and there are locked barricades there. The only time those barricades are unlocked is during the hunting season for deer and turkey season. And those allow a certain number of the populous to go in and hunt but we have another set of those barricades inside the surrounding DU area that are never unlocked. So we actually have two (2) sets of locks, locked barricades on the road so you can't drive to the DU area unless you're working for the Army or you're Army contractor and you have specific permission to get into the DU area.

So we have locked road barricades, controlled access north of the firing line anywhere. If any of you have ever gone out to the Proving Ground to visit the refuge you know that you have to see the safety video. You have to sign an acknowledgement of danger form. You have to go through their access points to control where you go, when and when you come back and they check you in and out. It's a very controlled situation. You just can't go anywhere and do anything.

And then there is restricted access for the DU area. We're also looking at around the DU area we have radiological notification signs that say this is a

radiological area and they surround the perimeter of the DU area.

So these are the potential institutional controls that the Army is currently considering. Now I can't guarantee you that when the documents are submitted to NRC that when you get to that section of the document that they - the institutional controls that we have up here are going to read exactly like that. But that's what we think is reasonable and it ensures an enhanced level of safety and a prevention of exposure to the general public that would cause an excess - an excessive radiological exposure.

Before I open it up for questions let me just give you a little information on the schedule of what happens after the Army submits the documents to the NRC. Right now we're required to submit the Termination Plan and the Environmental Report that goes along with it. It will be two (2) documents by the end of December 2011. If we stay on that schedule, which right now it appears we will, then the NRC will get the documents, they will perform a sixty (60) to ninety (90) day Enhanced Administrative Review of the document. That usually takes sixty (60) to ninety (90) days. So sometime late spring or early summer of 2012 if the documents pass that Administrative Review they will issue a Federal Register Notice in the Federal Register that comes out every day, every work day, and they will basically say

the following. We have received these documents from the Army for the Restricted Release License Termination of the Depleted Uranium License in the Jefferson Proving Ground. It has passed the Enhanced Administrative Review, we are now commencing our Detailed Technical Review and our Environmental Impact Statement exercise. They have to do those. That exercise, both of those, take about a year and a half (1 ½), two (2) years.

At the same time they will make an announcement that they are now affording the general public and the potentially affected public an opportunity to request an Administrative Hearing on these documents. They afford the public an opportunity to say okay we've gotten these documents, we looked at them, we don't like them. We don't like them for this reason whatever that reason or reasons may be. They would send a letter to the NRC stating we want a hearing. There's two (2) things they have to do. They have to establish what's called standing.

Standing means that you can't live in Chicago and have no association here and request a hearing. You have to be potentially, directly affected. So if you live in Chicago and you want a hearing it's going to probably get denied. Let's say you live around here, you request a hearing and then you've established standing that you could be potentially affected if the material gets off the Proving

Ground and you are exposed to a level that would have caused an exceedance, greater than that 25 mrem per year. Then you have to identify a problem with the document. The math is wrong or we didn't sample enough of this or we didn't sample this at all, whatever. If the NRC believes that that is a valid contention, and that's what it's called, they will grant you a hearing.

We had such a hearing about a year and a half (1 ½) ago. Save The Valley had a hearing granted on the actual Field Sampling Plan and a request for the alternate decommissioning schedule which went through a long period of discussions with them, finally ended up having a hearing down at City Hall and there was a three (3) judge panel from the NRC. They ruled last year and their ruling was that position of the Army and the NRC, who supported the Army's position, was valid and the request from Save The Valley was denied. But it is still an opportunity for the public to do that should they so seek.

So right now we're looking at probably sometime in the time span of 2014 to 2016 before the NRC would be in a position to say whether or not they're going to terminate the license under Restricted Release conditions assuming we have provided them with sufficient technical information that demonstrates that over their thousand (1,000) year regulatory time span the material is not going to move to cause an

exceedance of exposure to the general public and we have satisfactory institutional controls in effect.

So with that I'd like to open it up to the public for a discussion about institutional controls. Yes ma'am could you wait until the lady gets over there with the mic?

MS. CHRISTI RISK:

Hi, my name is Christi Risk. I am not an expert on DU whatsoever. I just learned about this recently so I'm not going to pretend that I am. But I do have concerns. And one (1) of my concerns is that I don't see anything there about the Army's continuing to test the area around the DU area in the Jefferson County Proving Ground. This stays in - the way I understand it this stays in the environment for billions of years.

MR. PAUL CLOUD:

That's correct.

MS. CHRISTI RISK:

So I don't know why ten (10) years of testing proves anything.

MR. PAUL CLOUD:

What it shows is, and the NRC has mathematical models that they put this and that they have utilized for a long time. They put the data in there and it will project over that time span based on the analytical results you get from the soil, the sediments, the ground water, the surface water, the amount and types of soil that you have, the movement of the water, so on and so forth. And the erosion and the corrosion rate of the depleted uranium. You factor all that in and then they can look at it and see whether or not it does have the potential to move outside the boundaries that you're controlling.

MS. CHRISTI RISK:

Okay. There's been an extensive study of just how DU moves?

MR. PAUL CLOUD:

That - not only have there been but we are conducting some of those right now. That's part of the Site Characterization.

MS. CHRISTI RISK:

They are being conducted right now?

MR. PAUL CLOUD:

Yes ma'am.

MS. CHRISTI RISK:

So we don't have a large history of DU and how this travels?

MR. PAUL CLOUD:

We have some - the international community has some - if you click on to depleted uranium you will see a number of studies in Europe, Great Britain, the United Nations has studies, and there are also a number of studies in the United States. So we are also - we are doing the studies here that are specific to the conditions here.

You may have information of studies out someplace else. Like I say you had a study for Yuma Proving Ground. Well the soil out there is very sandy and porous, very different from here. So you can do a study out there for transport or migration of movement of the DU in that soil, there's no relevance here. So you have to do it for a specific site.

MS. CHRISTI RISK:

What I've read is - is I understand this is actually being outlawed in some countries, DU.

MR. PAUL CLOUD:

I have no information on that.

MS. CHRISTI RISK:

Okay. This is something I've read and I just want to know. I think it's just an educated guess what we think that it's not going to go anywhere or that it's going to stay where it's at. We're not going to do any more testing. I just - I have a concern with that.

MR. PAUL CLOUD:

I appreciate that. One (1) of the things that you should be aware of the current state of the NRC regulations are the following: if you close a license, you know once you stop performing the function for which you got the license for, you have to close the license. Once that license is closed you can't have active monitoring because they're diametrically opposed. To have active monitoring you have to have an active license. That's the NRC regulations. It's not anything that the Army requested or asked for, generated or influenced. That is how they wrote their regulations. Yes ma'am? Just a second.

MS. SHARON RICHARDS-WEISER:

Your name again sir is what?

MR. PAUL CLOUD:

Paul Cloud.

MS. SHARON RICHARDS-WEISER:

Okay Paul. My name is Sharon Richards-Weiser. And I was born and raised here. I lived here until August of 1976 and moved to Indianapolis and now I live in Columbus, Ohio. However I'm back this week to visit my family and I may move back here. And now it looks like I have another reason to move back here.

My biggest concern is this. The original Environmental Baseline Study is based on the premise that there was no radiological activity occurring at Jefferson County Proving Ground prior to 1983. Is that correct?

MR. PAUL CLOUD:

It was - it was not based on that. It was performed to get a snapshot of what the radiological levels were prior to firing the DU. It wasn't based on any premise.

MS. SHARON RICHARDS-WEISER:

Okay. So that was not an element or premise for that. So in terms of other areas in Indiana in 1983 that had not been a proving ground area was it comparable in background radiation is my first question?

MR. PAUL CLOUD:

To the best of my recollection the answer is yes. However, one (1) of the things you need to understand that uranium is a naturally occurring element in nature.

MS. SHARON RICHARDS-WEISER:

And we understand that.

MR. PAUL CLOUD:

And is also commonly occurring in potash and fertilizer. And just so that you understand some of the dynamics of the Proving Ground we have copies of studies that the Fish and Wildlife Service have done on some of the streams that go through the Proving Ground.

One (1) of the streams goes right through the DU area. And they did their study to look at the quality of the water and the fish habitat, okay? What they found was something that we had always suspected but we couldn't point to a - a scientific document and say this proves it. Well their document proves it. And what they proved basically is that the Proving Ground basically acts as a filter. Anything that comes in from the northeast via the stream gets filtered out within the Proving Ground so that the water is actually much better coming out. But even the water inside the Proving Ground is of very, very good quality.

MS. SHARON RICHARDS-WEISER:

So in other words as far as most locations in Indiana it wouldn't be much different?

MR. PAUL CLOUD:

Should not be.

MS. SHARON RICHARDS-WEISER:

Of the base line?

MR. PAUL CLOUD:

Should not be. But it depends on the specifics. I won't --

MS. SHARON RICHARDS-WEISER:

Right.

MR. PAUL CLOUD:

I won't even begin to guess.

MS. SHARON RICHARDS-WEISER:

Because uranium occurs in things like granite and some variety of other things and so you can't say specifically, no it's going to be just exactly like everything else because there's natural variations.

MR. PAUL CLOUD:

Un-huh (yes).

MS. SHARON RICHARDS-WEISER:

Based on the geological formations in the underlying soil layers. So that's not a concern but my concern is this.

Potential institutional control provision talk about continued Army ownership of the property north of the firing line. You yourself said that an area around the DU trench area for one and a half (1 ½) to two (2) miles should be inclusive of that area that is sort of controlled in order to maintain safety, is that correct?

MR. PAUL CLOUD:

That's not what I said at all.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

What I said was that is --

MS. SHARON RICHARDS-WEISER:

Certify it if you please?

MR. PAUL CLOUD:

If you see a copy of the map that I referenced to the gentleman before, the USGS map, very long and tall.

MS. SHARON RICHARDS-WEISER:

Right.

MR. PAUL CLOUD:

You can come out to the Proving Ground and get a copy too if you'd like. We have hundreds.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

In that map it shows the outline of the entire facility, the whole fifty-five thousand (55,000) acres, and that's not only the fifty-one thousand (51,000) acres north of the firing line but it also includes the four thousand (4,000) acres south in the Cantonment Area that we're disposing of okay? Within that fifty-one thousand (51,000) acres there is a rectangle as Mr. Skibinski so indicated about one (1) mile wide by about three (3) miles long.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

What I said was if you go to the perimeter of any of the sites of that rectangle that it's one and a half (1 ½) to two (2) miles from that site, which is the boundary of the DU area to the perimeter of the Proving Ground where the general public has access to, unrestricted.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

That's all I said.

MS. SHARON RICHARDS-WEISER:

My - my concern is right now if they would grant you this Restricted --

MR. PAUL CLOUD:

Release.

MS. SHARON RICHARDS-WEISER:

Release that what is on the ownership going to

consist of? Is it going to be active duty Army personnel who are going to guard this site? I believe that there is a need for active duty personnel to guard that site twenty-four seven (24/7), ad infinitum, for a thousand (1,000) years or more because we now have circumstances occurring in our country where we have people who are moving in from other parts of the world and they are integrating, supposedly integrating into our culture. Some of those people do not have the same goals as the majority of the citizens do. Instead they've come over here to figure out a way how to tear everything up a little bit at a time.

Rather than to go into great detail at this point in time, because I don't want to come across as being someone who ah has hard feelings against any particular culture or ethnicity, I have discovered just from living in Columbus, Ohio that there are terrorist operations there that's come to light, including people doing foolish things like trying to blow up the local mall and also use access to nuclear technology for perhaps things that are not peaceful operation. And that in another generation, maybe in as few as ten (10) years because they now have second and third generation children living here who are American citizens but who are still tied to their parents and grandparents homeland, who have goals that are not in line with the normal citizenry and would possibly represent a threat and therefore

the Army would need to keep a detail of personnel on active duty twenty-four seven (24/7) for a very long time because these people would be interested in obtaining depleted uranium for a variety of purposes, none of which would be peaceful.

MR. PAUL CLOUD:

Thank you. I'll respond only in generalities because I can't tell you what the Army will decide regarding your specific suggestion about continued Army presidency - presence in guard there.

But in general one (1) of the reasons or one (1) of the conditions that exists at JPG is self-evident. It's a closed facility. Okay. The Army and the Federal Government, the Department of Defense's purpose in closing it was to close it and not continue to spend money there.

As you - as a lot of people know the Army entered into a Memorandum of Agreement with the Fish and Wildlife Service and the Air Force. The Fish and Wildlife Service have an overlay refuge, Big Oaks National Wildlife Refuge on top of the Army property north of the firing line approximately fifty thousand (50,000) acres. The Indiana Air Guard through the Air Force utilizes the other thousand (1,000) acres for air to ground training range. Okay, they don't fire anything explosive.

Having said all that one (1) of the main purposes of that Memorandum of Agreement was to alleviate the Army from certain what we call infrastructure costs of an annual basis at the Proving Ground because it is closed. Between the Fish and Wildlife Service and the Air Guard they probably spend somewhere in the neighborhood of two hundred ($200,000) to four hundred thousand ($400,000) dollars a year on fence maintenance, road maintenance, signage and things of that nature. So as an indication of what the Army's thinking may be on that subject about having either active duty military or some armed guards there, you might get an indication of what the Army would be thinking about as they respond to your suggestion. I won't tell you what the formal response is yet because that's something that we would have to discuss before we come up with a formal response.

But to let you know you are the first. On the three (3) meetings we've had you are the first one (1) to come up with a suggestion for an additional or alternate institutional control. So that's - that's pretty important. Thank you.

Any other comments? Yes sir. Just a second.

MR. RANDALL MORTON:

Randall Morton. I've lived here ah most of my life. The ah - ah this is - these are Javelins low trajectory

coming in.

MR. PAUL CLOUD:

They're about this long (indicating).

MR. RANDALL MORTON:

And they're coated with --

MR. PAUL CLOUD:

No, they're solid.

MR. RANDALL MORTON:

Solid?

MR. PAUL CLOUD:

They're a combination of depleted uranium and tungsten.

MR. RANDALL MORTON:

You can see them from --

MR. PAUL CLOUD:

Tungsten and carbide alloy.

MR. RANDALL MORTON:

You can see them from space.

MR. PAUL CLOUD:

No.

MR. RANDALL MORTON:

We should be able to map things.

MR. PAUL CLOUD:

No.

MR. RANDALL MORTON:

We should know where they are.

MR. PAUL CLOUD:

No. The only way you can find them once they have been fired out there and they're in the ground is you have to have a radiological meter that's designed to pick up radiation and you have to be probably as far as you are from me right now.

MR. RANDALL MORTON:

Maybe we can't do it now.

MR. PAUL CLOUD:

You can't - really won't be able to see them.

MR. RANDALL MORTON:

Maybe we will be able to.

MR. PAUL CLOUD:

They don't glow in the dark.

MR. RANDALL MORTON:

Right. But when they come in at a high speed at a low - at a low angle they're probably not where - I mean it's like a heat thing. It's like an M-16 bullet. Where do - do they crumble, do they go - how deep do they penetrate?

MR. PAUL CLOUD:

They can go anywhere from the surface to maybe fifteen (15) or twenty (20) feet. It depends on where they hit.

MR. RANDALL MORTON:

But nothing ever --

MR. PAUL CLOUD:

And the condition of the soil at the time. But

that's why one (1) of the - one (1) of the things we have done and we're continuing to do on this Site Characterization, we went out and dug twenty-two (22) additional ground water wells in and around the DU area. We had unexploded ordnance people there as they dug that well. They would go down - they would sweep the area first to make sure it was clear and the drill rig would start and they would dig two (2) feet, they would pull the drill rig out and the guy would put his probe down and see if there was any ordnance there. If it was clear they would go down a couple more feet and they did that like that until they hit bedrock. And then we continued through the bedrock until we got to the ground water. So that's one (1) of the things we're doing to see if in fact the material is getting down to the ground water.

MR. RANDALL MORTON:

But we have unmanned things that can fire unexploded ordnance in Iraq and what not. Is there a way that we can like concrete this thing over and forget about it?

MR. PAUL CLOUD:

If you go to the Army's website, and I can give you the address, there is a what we call an Administrative Record. In that Administrative Record there is a copy of what

we refer to as the Mason and Hangar Study. This was a study done back in the early 90's. I think it was 1992 or 1993. At that time, this was almost twenty (20) years ago, the estimated cost to go clean up the area north of the firing line was seven ($7) to nine billion ($9,000,000,000). You could probably double that number now. That was for Unrestricted Release. That's one (1) document you can look at.

If you go to the NRC's website that I put up there or to our website and look for the Environmental Impact Statement that the Army did in 19 - well if you look at the one (1), the Environmental Impact Statement for 1995 in there there is a color graph, a color chart, picture, map of JPG. And earlier in the discussion I talked about the eighty (80) plus rounds of high exploded ordnance per acre in the DU area. There is that color coded chart in there on the map and it will show you the different concentrations of estimate high explosive ordnance per acre in the various areas north of the firing line.

Also on the NRC's website back in 2002 we submitted documents to the NRC that estimated the cost for an Unrestricted Release License Termination, this is in 2002 dollars, so that's seven (7) years ago, at that time we estimated somewhere between two ($200,000,000) and three hundred million ($300,000,000) dollars. Now this is a

reminder. The Army gets its money, it's on the taxpayer.

Just a minute. Wait until we get a mic. Yes ma'am?

MS. GLORIA DONOVAN:

I'm Gloria Donovan. And I don't know anything about this. All I know is that that should be part of the cost of you being able to use our fifty-one thousand (51,000) acres of ground for sixty (60) years to do whatever you wanted. I shouldn't have to be smart enough to find holes in your argument in order for you to know that you owe us that.

(APPLAUSE)

MR. PAUL CLOUD:

Any other comments or questions on institutional control? Mary?

MS. MARY CLASHMAN:

I'm Mary Clashman. I opposed the granting of your license in this very room in the 1980's and I have opposed it ever since.

But I would like to ask you: it says here on your number page nine (9) (reading) it says the approximate 75,000 kilograms about a hundred and sixty-five thousand

(165,000) pounds of DU will remain at the JPG forever with certain institutional controls in effect. What institutional controls in effect?

MR. PAUL CLOUD:

Go to that page (indicating), the second to last page. Those are some of the institutional controls that the Army is currently considering. They haven't been finalized yet but I would suspect that everything up there is going to be an institutional control that the Army will commit to.

MS. MARY CLASHMAN:

Are you going to continue to monitor the wells?

MR. PAUL CLOUD:

As discussed previously under the NRC regulations you cannot have a closed license and active monitoring. They are diametrically opposed. And we are required by the NRC regulations to close the license. So the short answer is no.

MS. MARY CLASHMAN:

Well the long answer is that it - when you were seeking the license and I was here then, you didn't say well

we may close our license and walk away. You said we will be responsible for this forever.

MR. PAUL CLOUD:

That hasn't changed. The Army will always be responsible for the material out there. That has not changed.

Yes ma'am?

MS. SHARON RICHARDS-WEISER:

Hi. I'm Sharon Richards-Weiser. I ran into this myself once.

I have a couple of pieces of paper that I'd like to hand you and have submitted. And it says essentially just some information about depleted uranium that I found on the ah World Health Organization site and it refers to their long study that came out from Geneva in April of 2001. And I would like you to, if you have not already read the entire study, to familiarize yourself with it because one (1) of the things that it talks about is how much exposure a human being should have.

MR. PAUL CLOUD:

Un-huh.

MS. SHARON RICHARDS-WEISER:

To radiation during the year. And it does not match what you have in your report. It comes out to be a smaller amount than that. And because of that I have a concern about what level of radiation is safe for background level for average population members. And if we could have some additional information provided ah from the Army and the Nuclear Regulatory Commission, is that what they're calling themselves these days?

MR. PAUL CLOUD:

Yes ma'am.

MS. SHARON RICHARDS-WEISER:

Oh good, they went back. Ah so that we could have a great insight into ah what the actual toxicity of the site is in terms of all spectrum of radiation emitted by the DU and in addition the radiation emitted by the additional ah AU supportage per acre. That way we can get a clearer picture of over the lifetime. And we're talking quite a few hundreds of thousands of years before the half life is even effectively reached.

And I understand from what I have read that the depleted uranium is in effect an equivalent of about sixty (60) percent of a similar amount of pure uranium.

MR. PAUL CLOUD:

Natural uranium.

MS. SHARON RICHARDS-WEISER:

Natural uranium that has not necessarily been enriched.

MR. PAUL CLOUD:

That's correct. It's not enriched. Depleted. There's a difference.

MS. SHARON RICHARDS-WEISER:

Right. And it acts like it would be - if there were a hundred (100) percent you would take away forty (40) percent and you would have that amount of the depleted uranium so we're talking quite a bit of radiation even though it's mostly in place. A lot of it is buried. It's not necessarily accessible but one (1) of the problems that hasn't even been addressed is, and so I will bring this point up, what if this place is attacked? We now have people who are so - they do not have any respect for the United States of America as any kind of a concept, an institution or an organization. They believe that whatever they can manage to do they will do. And that they will become educated enough within the next fifteen (15) to twenty (20) years to be able

to seek out new goals and missions and visit the vulnerability in the United States that is right in the heart land and it constitutes a circumstance where ah it's going to need an elevated level of protection and an elevated level of consideration for other reasons that go just beyond the immediate possible toxicity to the indigenous populations and ah the environment itself.

My concern is that this be taken to some other level because you're looking at it like we are an all superior, eternal country and we may not be that. And I don't like the thought of that. That's terrifying to me and I'm sure it frightens other people as well. But it is a circumstance where we need to think about this for the true long term, which is far longer than any of us will be here, and humanity has only emerged in - for the last one hundred and fifty thousand (150,000) years. This stuff will be still lethal two hundred and forty-two thousand (242,000) years from now when it reaches the beginning of the end of its first half life and it will be dangerous for so much more longer than that that I can't even begin to conceive of those kinds of time periods and neither can any of the rest of us in a realistic sense of the word. So we need to look at this on a more serious basis of oh we'll take care of it because it's not going to happen that way and we all know that.

So we need to go well gosh it's going to cost

like eighteen billion dollars ($18,000,000,000), well actually it'll cost twenty-seven billion ($27,000,000,000) by the time it's done to take care of this. But it really shouldn't have happened in the first place that way.

And so I submit to you that this kind of thing never happen again and if the NRC says oh well it's a closed license so you can't have monitoring we will work to change that. And we need to have the citizenry, not just as a few citizens, but as a group of people who understand we have to have a sense of stewardship towards our planet and future generations of humanity because right now I don't think that the potential institutional control provision is going to be sufficient to pass.

And therefore active monitoring I suggest that it - actually I implore and urge you to consider going to the NRC and saying hey you know we just realized there's some other problems here. And it needs to be taken care of. You need to actively monitor this for a very long time.

From what I've read and from what I've come across, and I'm not trying to be unreasonable. But it represents a danger that will not only accrue but actually increase somewhat over time so that it becomes a little bit more dangerous over time instead of a little bit less dangerous over time for a variety of reasons.

And that's a concern that is not just for

myself or for my own family or just for the people of Jefferson County and Jennings and Switzerland or Scott or any other regional areas, but for this entire part of the United States because it poses a huge danger.

This is bigger than Fernald and you guys are making out like it's just a little tiny place. It's just a little ditch. My goodness you need to like dig three (3) more ditches and go enny, meny, miny, mo which one (1) really is it so that nobody really knows where it is and there's a bunch more of them out there. Or you're going to have somebody figuring it out. That's all I've got to say.

(APPLAUSE)

MR. PAUL CLOUD:

Thank you. Two (2) things I'd like to say in response.

One (1), and this is not meant to be either argumentative or confrontational.

MS. SHARON RICHARDS-WEISER:

Can I --

MR. PAUL CLOUD:

But I need to have the record show that while

the Army appreciates your statement it is beyond the scope of what the meeting and the requirement for this meeting is, which is to discuss specific institutional control.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

Regarding your statement on NRC's license criteria and whether or not there is to be future monitoring and your suggestion that the population get involved with the NRC on that. That is an excellent statement and I agree with that wholeheartedly. That is the process that needs to be done if the regulations are going to be changed. You have to contact the NRC and say we have this concern, we need you to reconsider the criteria here. But until that is done the Army, like any other licensee, it doesn't matter if it's the Army or mom and pop inc. or anything else, has to comply with the legal standard and that's what it is right now.

Okay. Thank you. I'll take that and we'll make sure it's included in the minutes and I'll get a copy to my contractor. And if you want to see me after the meeting I can put you in touch with some information on depleted uranium, some more information.

MS. SHARON RICHARDS-WEISER:

Okay thank you.

MR. PAUL CLOUD:

Yes sir?

MR. COREY MURPHY:

All right my name is Corey Murphy and if I may ask a follow up question to your last comment.

MR. PAUL CLOUD:

That's fine.

MR. COREY MURPHY:

Are those administrative regulations or would that be able to changed to the legislative process?

MR. PAUL CLOUD:

Both.

MR. COREY MURPHY:

Both?

MR. PAUL CLOUD:

I mean as a - this is as I understand it and

I'm not an attorney.

MR. COREY MURPHY:

Sure.

MR. PAUL CLOUD:

But as I understand it Congress can force a federal agency to change their regulations by mandating that they do so.

MR. COREY MURPHY:

Okay.

MR. PAUL CLOUD:

Also if there is sufficient public interest or need, whatever that need is for an agency to change their regulations, then through the normal regulatory process they would propose a change, it would come out in the Federal Register, it would be available for the public to comment on and they would do basically the same thing that we're doing here. We're getting your input and comments and we'll respond to them formally in writing and it will be in the public records so you will see who said what or what groups said what and how the agency responded to that and if or not they decided to make a change.

But bottom line to answer your question basically both as I understand it.

MR. COREY MURPHY:

Could we count on the Army's support in requesting the change?

MR. PAUL CLOUD:

I can't speak for the Army in a policy matter. I am not high enough up in the hierarchy for that.

MR. COREY MURPHY:

Okay thank you.

I also would like to read and then present for the official record Resolution Number 2009-01. It's a Resolution of the Board of Commissioners for Jefferson County, Indiana, regarding the depleted uranium at the former Jefferson Proving Ground.

WHEREAS, the Board of Commissioners of Jefferson County, Indiana understand that the Department of the U.S. Army is requesting a License Termination from the Nuclear Regulatory Commission will result in over a hundred and fifty thousand (150,000) pounds of depleted uranium being left buried in the ground only secured by a fence and warning signs.

And WHEREAS, the Board of Commissioners of Jefferson County, Indiana are concerned about the impact of buried depleted uranium on the health and welfare of Jefferson County residents.

And WHEREAS, the Board of Commissioners are concerned about the real and perceived impact of depleted uranium on the future development of nearby property located in the Cantonment Area.

NOW, THEREFORE BE IT RESOLVED by the Board of Commissioners of Jefferson County, Indiana that the Department of the U.S. Army improve its plan for mitigating the risk of the depleted uranium to the county residents by removing it from the ground and properly disposing of it or at minimum agree to monitor the site.

DULY ADOPTED by the Board of Commissioners of Jefferson County, Indiana this 25th day of June, 2009, signed by Tom Pietrykowski, member; Mark Cash, member; Julie Berry, attested by the Auditor, Sandra Shelton.

I present this to you on behalf of the Board of Commissioners. There was a conflict. They actually had a meeting tonight and couldn't be here. And I ah noticed the newspaper article and some public comment at a meeting earlier today and asked them to act upon that. And I want to thank them for - for approving that Resolution.

On a personal note you know the Federal

Government in its wisdom, or lack of, based an eight hundred and some odd billion ($800,000,000,000) dollar stimulus package. I think this would be a marvelous project. It would put people to work in a short time frame. You would achieve a project that normally wouldn't be able to be done with your budget constraints. And it would allow that land to revert back maybe to some productive use, ah maybe just for safe recreation enjoyment, but also maybe the Army could sell it and it would go back on the tax roles.

And so I - I know that's maybe outside the scope but I was personally against the stimulus package because it's deficit spending and we're borrowing from China and - to pay all that. But they did it so now let's put it to good use. So I would just make that suggestion and thanks for the opportunity.

MR. PAUL CLOUD:

Thank you. Again I'll say in response just the fact, and you've already clearly identified it, that at least part of what you are suggesting is beyond the scope of institutional controls which is the purpose of this meeting. But I appreciate your input and it will be made a part of the record and we will respond to it formally in writing.

Yes sir?

MR. CHAD GRAY:

Yeah my name is Chad Gray. I've lived in the area my whole life and there's just a couple of things that I was going to say.

I'm against the termination of the license because I think that a study done within three (3) decades of the firing of a hundred and sixty-five thousand (165,000) pounds of DU as you say, I think that's somewhat irrelevant. I don't think it really showed, even though the NRC has done calculations on what the DUs may be in a thousand (1,000) years, I don't think they could be accurate.

As you stated studies that have been done let's say in Yuma or other areas are somewhat irrelevant as well because the soil and water and everything is different. And ah this study would be the first of its kind and in fact really after five (5) years after sixteen (16) - a five (5) year study you say, right?

MR. PAUL CLOUD:

That's correct.

MR. CHAD GRAY:

I think after within two (2) decades and then by the third decade cancelation of the license and you guys or the Army not mont - monitoring ah the site is ah I guess

you would say ah premature I would say anyway. So I would say at the least monitoring the site needs to ah be expanded and I'm against termination of the license.

MR. PAUL CLOUD:

Thank you. Again ah under the - under the law, under the legal requirements that licensees, and again it doesn't matter if it's the Army or anyone else, any licensee under the law it is legally mandated that the licensee close their license, terminate it when they stop doing the function for which they got the material in the first place. So legally it is mandated that we do that.

One (1) of the suggestions that you may have heard from the audience a little bit earlier was to contact the NRC to see if the regulations can be changed. That is a possible solution. But until they are the Army is legally required to follow those requirements. So they have to terminate the license. They have to.

Yes ma'am?

MS. CHRISTI RISK:

Again my name is Christi Risk and I just want to go on the record. Do you consider yourself to be a DU expert? I think I heard you say that you do consider yourself one (1), correct?

MR. PAUL CLOUD:

Depending on your definition of expert. I have experience in radiological issues. I have a degree in Mechanical Engineering with Nuclear Concentration. And I'm a former Navy Nuclear Propulsion Plant Operator and I was qualified on two (2) different reactor plants under Admiral Rickover's program as a civilian. So I know a little about it, yes.

MS. CHRISTI RISK:

It sounds like you do. I would just like to go on the record with the Madison Courier being here and this being on record for the United States Army and the way I understand it the general public.

I would like for you to state the facts of what would happen if we were, the general population, exposed to any DU. Just the plain facts.

MR. PAUL CLOUD:

As I understand it if I had a DU penetrator in my hand right now and handed it to you and you had no open wound or cut on your hand there would be almost zero (0) exposure because of the type of radiation that comes from DU will not penetrate your skin. It has to get internal to your body for the most part, not all but for the most part.

Also if you got it internal to your body depleted uranium or uranium in general is what we call a heavy metal. Heavy metals are toxic in and of themselves regardless if they're radiological. So that could do as much or more damage to you if it got inside your body.

To answer your question a different way I used to live here when the Proving Ground was open. If I were to come back and move here and live here when I retire I would have no reservations on living on the Cantonment Area or along 421 or on the west side with the provision that on the Site Characterization Study that we're currently conducting, we have sufficient information to prove to the NRC that the material is not going to move to an extent that outside the boundaries of the Proving Ground it's going to pose a radiological issue. I would have no problem with that at all.

Did that answer your question?

MS. CHRISTI RISK:

Well I guess what I wanted to hear from you is EU causes cancer. It causes birth defects. I guess, I'm not an expert, I don't - I know I'm not. I - I have researched this. I guess in Iraq where we have dropped this in multiple places I guess there are babies being born, mutilated beyond belief, and they are blaming a lot of this on EU. I understand we're not - or DU. I understand we're not being

exposed at that level but long term exposure of DU has been proven to alter the DNA of humans.

MR. PAUL CLOUD:

One (1) of the things I think you need to add to that information that may not have been in some of those articles is that radiological exposure has two (2) consequences. They're called sematics and genetic effects.

Sematic means that if you're exposed to enough radiation you can have an immediate effect on yourself, your person. And if you get enough you will die. And there are some numbers that the NRC has come up with that the Federal Government regulates that if you get to certain levels, you will - one (1) gets sick, but you'll recover.

Then you'll get to the, I think it's - it's been a long time since - I think it's thirty-fifty (30/50) or twenty-fifty (20/50) level. If you get that amount of radiation that twenty (20) percent will die within or fifty (50) percent will die within twenty (20) days or whatever. Then you get to another level and you all will die at a certain level. Okay?

Then you have genetic effects. Genetic effects is you're exposed to DU or radiation in general, it doesn't matter. You can get an x-ray. You get a dental x-ray, you get a chest x-ray, whatever. You break your arm, you go in, the

doctor examines your arm, shoots an x-ray, that's radiation exposure. There is on any radiation exposure some genetic effects. If you get enough it won't affect you directly but it might affect your offspring. That's a genetic effect.

In the cases of Iraq and things like that there has not been a long enough exposure for genetic effects. So these children that are being born with these deformities may be as a result of toxic level but not the radiation. Or they could be something completely different.

Let me make one (1) announcement before we go much farther. It's now almost a quarter after eight (8). We can be here until maybe five (5) minutes before nine (9). We will be done by nine o'clock (9:00) because the Library closes and there's no mechanism for us to keep the Library open.

But if you have additional comments for institutional control suggestions that you don't get an opportunity to give us verbally, you can see me at the end of the meeting and I will give you my e-mail address and my mailing address or you can come out to the Proving Ground and see Mr. Knouf, who is an Army representative, and we will take it from you that way.

So if you have something that you don't get an opportunity to say to tonight there are other means to get your input in.

MS. SHARON RICHARDS-WEISER:

Hi. Sharon Richards-Weiser again. I have a question for you. You mentioned that you were trained by Admiral Rickover.

MR. PAUL CLOUD:

Admiral Rickover's program, not Admiral Rickover personally.

MS. SHARON RICHARDS-WEISER:

Okay. But I take it that his mode of operation and his concepts and his philosophies were followed strictly to the letter, is that correct?

MR. PAUL CLOUD:

It's called verbatim compliance, yes ma'am.

MS. SHARON RICHARDS-WEISER:

Okay. And so you understood what his general concept of radioactivity was?

MR. PAUL CLOUD:

I understood his requirements intimately.

MS. SHARON RICHARDS-WEISER:

Okay. So you have a different prospective than most people do because of what his understanding of the function of radioactivity, how it functions, operated? So you have a greater insight into how much danger the DU and the unexploded ordnance actually represents based on having done mathematical models of how the radiation is actually working?

MR. PAUL CLOUD:

No.

MS. SHARON RICHARDS-WEISER:

You don't know that?

MR. PAUL CLOUD:

Not by mathematical. I know it by education and training.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

But the education did not include probably the mathematical models that you're supposedly eluding to. I know some mathematical formulas that talk about reactors and the

operation of reactors and what makes them produce power and how they do that, and the operation of that. But when you get into some of the exposure.

MS. SHARON RICHARDS-WEISER:

Un-huh.

MR. PAUL CLOUD:

Scenarios mathematically, no. I'm not trained in that area. I do know about radiological exposure and its effects on the human body and the types of radiation out there and how it can affect you, the different types: the alpha, the beta, the gamma.

MS. SHARON RICHARDS-WEISER:

All right.

MR. PAUL CLOUD:

Yes ma'am.

MS. SHARON RICHARDS-WEISER:

Well that was one (1) of the things that I was concerned about was what your level of understanding was about how radiation works on things or in the vicinity so that we would have a better understanding of whether or not

you could stand up there and defend a circumstance with complete confidence and personal belief so that you would feel like you were doing the right thing based on your own conscience.

MR. PAUL CLOUD:

To answer your question before you go any further short answer is yes.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

And I think I demonstrated that when I - when I responded and discussed this issue with the young lady on the other side of the aisle there. I would have no problem if after our study we can demonstrate that it's not moving with having my family move back here.

MS. SHARON RICHARDS-WEISER:

Okay. Ah that sounds reasonable to me and what you have told us from what I can understand at this point is that you can't change the law but those of us who go through correct channels either by appealing to the President of the United States to issue a Memorandum to the NRC, or by going

to our legislators and asking them to pass legislation to change the way that closing a license works so that continued active monitoring would go onward even if a license is closed once someone has ever had a license in the first place we could have that as an option if we choose to take legal action to do so because there's --

MR. PAUL CLOUD:

And that which -- excuse me. I'm not quite sure what you mean by legal action.

MS. SHARON RICHARDS-WEISER:

What you said - okay. In terms of legal action just going through the process of legislation or going making an appeal to the people who are able to issue memorandums such as the President.

MR. PAUL CLOUD:

Let me interrupt again.

Ah it is my understanding, and again I am not a lawyer, but as I understand the legislative regulatory process the President can do certain things. But as I understand it, and I may be wrong, but as I understand it the President does not have the authority to change the law. That's Congress' function.

MS. SHARON RICHARDS-WEISER:

Okay.

MR. PAUL CLOUD:

They would pass the legislation and if he supports it and signs it then it becomes law. And it could be a law that specifies something that you're addressing right now or it could just be a direction to the NRC to go change it with that additional criteria that you're seeking.

MS. SHARON RICHARDS-WEISER:

Okay. That - that clarifies the issue to a very good level and thank you.

MR. PAUL CLOUD:

Yeah. Yes sir?

MR. RICK REUSS:

Just a quick one (1). I think you've done a good job laying it out tonight.

Ah how many people in here are with Save The Valley? (Hands up).

MR. PAUL CLOUD:

Two (2), three (3), four (4)?

MR. RICK REUSS:

Okay. One (1) of the things I did look up was under the Clinton administration January 20th, 2001 there was an article as far as the 1999 ran - review of literature on depleted uranium and natural uranium between - a causable link between exposure of these substances - illness. They found a negligible response to that.

MR. PAUL CLOUD:

I'm familiar with that.

MR. RICK REUSS:

I'd like to enter that into the record as well.

MR. PAUL CLOUD:

I am familiar with that study. Thank you.

We have a gentlemen over here on the front row who's been patiently waiting. Yes sir?

MR. JERRY MASSIE:

Yes my name is Jerry Massie. And the tests that have been performed so far as far as movement of DU what - what tests have been performed so far?

MR. PAUL CLOUD:

We have - as I said one (1) of the things we did is we went out and drilled an additional twenty-two (22) wells in and around the DU area where we - before we dug those wells and identified the location we did some additional study that highlighted those areas as having the greatest potential for the ground - for the material to get into the ground water. And if it got into the ground water then it might move someplace outside the DU area and/or off of the Proving Ground. So we identified those areas based on their potential as a higher potential for if the material got there then we would be able to detect it. We've done that.

We're in the process - one (1) of the other things that we did, I think I mentioned this before, is we went out and sampled thirty (30) deer at the Proving Ground. We shot ten (10) deer in the DU area. We contracted with the Fish and Wildlife Service and we had DOT people out there, my contractor, I was out there and they - they took samples of ten (10) different deer inside the DU area. They sampled and analyzed the liver, kidneys, muscle ah the forelegs and analyzed it for DU. And the reason why we collected deer is because deer from a biological uptake for human consumption has the greatest potential if deer are getting DU into them for it to be an exposure to humans.

Now I know there's turkey hunting out there

also. But to compare the amount of turkeys and the weight of a turkey to the number of deer and the weight of a deer, the deer are over the magnitude being higher as a potential source.

We also took ten (10) deer from the areas immediately around the DU area and then we went way up north above K Road and took ten (10) more deer as a back route. When we got all done and analyzed all those samples it came back almost undetectable.

When we had the hearing here back in October of 2007 at City Hall with the three (3) judge panel one (1) of NRC scientists discussed this for information to the panel because that issue came up. And what she basically told the judges is that if the general public ate deer at the highest concentration that we detected in the deer and substitute all that - all the meat they consumed in a year, for deer meat with that level of DU in them, and we're talking hundreds and hundreds of pounds, that the amount of additional exposure that you would get was one one-thousandth (1/1000) of the limit. And when the judges heard that, and this is in the record, one (1) of the judges said if that's true what are we doing here? It was insignificant.

We are also in the process of doing erosion and corrosion studies on the penetrators. We have collected a number of penetrators from the DU area. My contractor is

going to be performing those studies to see how fast the penetrators erode and corrode because if they do erode and corrode there is a potential that they might get into the soil and then from the soil get into the ground water or get into the surface water and there might be runoff.

But one (1) of the advantages of the soil here at JPG and the surrounding area, I'm sure you probably experience this if you've dug into your property, it has a very high clay content. Clay is very nonporous, not porous, and it acts as a great barrier. And what we're finding is that below six (6) inches to a foot or so on average, and there may be some exceptions if the penetrator is right on or near the surface, there's nothing there. It's nondetectable.

But those are some of the things that we are continuing to do and we are - we are required to meet annually with the NRC during this five (5) year period to discuss what we've found, provide them with that information, discuss that, see if what we're proposing to do in addition makes sense or we need to change that. And that's an ongoing process but we by our permit are required to meet with them at least once a year to discuss that. And we have numerous conference calls and whatever. And I've had them come out, their technical experts, their project managers, their management of all that. I've given them a tour of the entire facility, not just the DU area. So they have firsthand

knowledge. We've had them out here when we were drilling the wells in fact so they can see what was going on and how we were sampling the wells, those types of things. So that's just a rough overview of a number of things that we're doing.

Did that - hopefully that answered your question.

MR. JERRY MASSIE:

The thing I want to know is that when you say we I'm assuming that you're saying the Army is drilling these wells?

MR. PAUL CLOUD:

Well --

MR. JERRY MASSIE:

Or your - or your contractor?

MR. PAUL CLOUD:

The contractor. The Army is contracting. We've committed --

MR. JERRY MASSIE:

So he's simply working for the Army?

MR. PAUL CLOUD:

Yes sir.

MR. JERRY MASSIE:

And doing these tests and everything? Are there any independent tests going on?

MR. PAUL CLOUD:

What do you mean by independent tests?

MR. JERRY MASSIE:

Somebody other than the government.

MR. PAUL CLOUD:

The tests that are being done are verified by independent laboratories and then they are reviewed by the NRC and the NRC actually gets what they call split samples. We draw the water out, give it to them and they go analyze it by themselves with a different lab to verify our results. So yes we do have independent laboratory checks.

MR. JERRY MASSIE:

But you're furnishing the material to them?

MR. PAUL CLOUD:

And they're there to collect it when we do. So if they have a problem with how we're collecting it they can identify it at that time. We don't just get the water and give it to them. They're there when we get it so they know how it's being done. And I was here when they did that last year.

Did that answer your question?

MR. JERRY MASSIE:

Yeah.

MS. SHARON RICHARDS-WEISER:

Hi there. Sharon Richards-Weiser again. I have one (1) quick question.

Were the lungs of the deer ever tested? I understand that in studying the effects of uranium upon populations that have been subjected to DU that testing the kidneys and the lungs were important features and you didn't mention the lungs when you talked about the parts of the deer that were tested for radiological damage.

MR. PAUL CLOUD:

We did not test the lungs. And the reason we did not test the lungs is the lungs of the deer are not

typically consumed by the human population. We tested those areas where the human population was likely to consume it.

Because what the NRC regulates is not the exposure to the plant or the birds or the bunnies or the deer. What they regulate is the exposure to human beings. But you can get that exposure by direct exposure, by holding the DU penetrator in your hand or by eating plants or by eating deer.

MS. SHARON RICHARDS-WEISER:

Un-huh.

MR. PAUL CLOUD:

And because deer was the greatest potential for DU that's why we sampled them. But also the greatest source from the deer is their meat.

MS. SHARON RICHARDS-WEISER:

So you kept it restricted to the parts of the deer that people would be likely to consume?

MR. PAUL CLOUD:

Yes ma'am.

MS. SHARON RICHARDS-WEISER:

Okay. That - that takes care of that. But it doesn't answer the issue of whether or not the deer's lungs were affected by it if there were ah - if there was particulate matter in the soil that was of very small nature and I know that you said the testing was soft target testing.

MR. PAUL CLOUD:

Yes ma'am.

MS. SHARON RICHARDS-WEISER:

So therefore it probably wouldn't have created a lot of small splinters. But that that could still be a concern in some respects as it was going through things like trees and other stuff that are of harder material.

And I realize it's not armor plate but is it going to cause any kind of dust to come off of the --

MR. PAUL CLOUD:

The only - the only way that particles will be generated from the testing that was done at JPG is during the erosion/corrosion process after the penetrator is out in the soil. Okay?

MS. SHARON RICHARDS-WEISER:

For a long time?

MR. PAUL CLOUD:

For a very long time. Or if it hits something that's as hard or harder than the DU like a piece of granite or something. And that's going to be a one (1) of kind of situation.

MS. SHARON RICHARDS-WEISER:

That's not going - that's not going to be a typical thing?

MR. PAUL CLOUD:

No it's not.

MS. SHARON RICHARDS-WEISER:

Because it's not necessarily heavy and where the glaciers started to recede, at least not very moving?

MR. PAUL CLOUD:

As I understand it that's correct.

MS. SHARON RICHARDS-WEISER:

Okay. That's different ones, different

latitudes? Okay.

MR. PAUL CLOUD:

Kevin did you have a question or comment?

MR. KEVIN HERRON:

Yes. I'm Kevin Herron with the Indiana Department of Environmental Management. And Paul knows this but you all might not.

But the State is, specifically in the regulation, is exempted from regulating or any - have any say so or regulation over any radiological issues. So we have no regulatory authority at the current standpoint. And that's straight in the regulations.

MR. PAUL CLOUD:

Before you go on Kevin let me explain that.

The State can get that authority. It's called Decomming an Agreement State. And it's similar to the EPA's regulations if the State wants to take over the EPA's authority for hazardous waste. But the State has to go to the NRC and make formal application to become an agreement state. And they have to prove to the NRC that at a minimum they can enforce the NRC's regulations as a minimum. They can increase the standards but they can't go below it. That is the State's

decision. The Army or any other licensee has nothing to do with whether or not a State wants to or does become an agreement State. That is strictly a State issue.

Go ahead Kevin.

MR. KEVIN HERRON:

I have to deal with you on other issues at Jefferson Proving Ground from another regulation that I do have - get to express myself very well. And I think I have in the past.

MR. PAUL CLOUD:

And I listen to him.

MR. KEVIN HERRON:

We have to do what's called a - if we leave contamination in place under this regulation and we leave contamination in place that allows - that requires restricted use or restricted access in any manner the Army is going to be required every five (5) years to come back and show and have proof that the remedy to protect human health and environment is actually still functioning as when it was put in place.

What I'm hearing, and I've not heard anything else, is that once your license is terminated that is not the

case with the NRC.

MR. PAUL CLOUD:

That's not - not as I understand it.

To be completely honest I have not researched that part of the NRC regulations. But my understanding is let's assume that the Army is granted a Restricted Release License Termination with certain institutional controls in effect. We'll just use those that's up on that slide right now.

My understanding is, and I can't verify this by pointing you to the exact regulations, but my understanding is the NRC has a similar policy. They would come out periodically and verify that your institutional controls are still in effect and they would do that until such time as the institutional controls are no longer in effect.

MRS. MARY CLASHMAN:

Which is when?

MR. PAUL CLOUD:

Right now it's basically forever.

MRS. MARY CLASHMAN:

That's what you said before.

MR. PAUL CLOUD:

Yes ma'am. Go ahead Kevin.

MR. KEVIN HERRON:

Okay. And in reality the NRC is going to have requirements in the future to come out and actually speak to these people and hear from them directly?

MR. PAUL CLOUD:

When - and that's a good point. I should have brought that up.

After we submit the documents, and right now let's assume that we're on schedule, we submit them the end of 2011, sometime in the summer of 2012 assuming again that passes the Administrative Review and they put out their Federal Register Notice and then they say they're starting their Detailed Technical Review and their Environmental Impact Statement, under the Environmental Impact Statement, the NEPA regulations, they will have to come out to the community and seek the community's input from an environmental prospective. And they will come out to Jefferson County, Ripley County, Jennings County and they've already made it known that they expect the Army to be here. We may not respond to things in a formal official manner but they will definitely be seeking your input and we will be

here to discuss issues but not make a commitment. But they will in fact come to you as is a requirement under that law to seek input. And that will help them make a final decision. So you will have some input to them on the final decision on whether or not the license request is granted at that time.

Thank you Kevin go ahead.

MR. KEVIN HERRON:

And that time frame based on what you're saying here earlier when you were discussing the schedule you have until the end of 2011 to submit your --

MR. PAUL CLOUD:

Right now. Unless for some reason, and here's a theoretical or hypothetical. Between now and then in our annual meetings with the NRC if we identify or they request something additional to be analyzed and studied and reported on that would take us beyond being able to submit the documents by 2011 we would have to go back to them and say okay we agree. We will go do that whatever that is. But it's going to take this amount of time and that amount of time takes us past December of 2011. We need a formal license amendment that says you agree that we don't have to submit the documents until this date and that can be 2012, 2013, 2014, whatever it is. That would have to be a formal

officially issued license amendment. And then we would have that new date.

MR. KEVIN HERRON:

But the point that I'm getting to is that this is for everyone to understand that it is very likely going to be after 2011, December of 2011 before those meetings would occur.

MR. PAUL CLOUD:

At a minimum it will probably not be until at least sometime 2012. I cannot speak for the NRC and their scheduling and resource allocation as to when they would hold those meetings. Typically an Environmental Impact Statement study takes a year to two (2) years at a minimum. But part of that process would require them to at the beginning some part to come out and hold those meetings. But it would be no sooner than the summer or the fall of 2012, it could be 2013. But that's up to them. That's their responsibility. I can't speak for them.

MR. KEVIN HERRON:

And you - the gentleman up front asked you about what type of specifications you've undertaking over the last five (5) years. You've actually been - there's actually

been monitoring wells that have been installed and have been sampled for much longer than that. And how many of those can you speak of?

MR. PAUL CLOUD:

Those are - there are eleven (11) wells that were installed back in the 1984 and 1985 time frame. Those wells are the wells that we, under the license requirement, we sample every six (6) months. And we will continue to sample until the license is terminated. That is a license requirement.

The Site Characterization became a license requirement when the NRC agreed to it after we requested it.

MR. KEVIN HERRON:

And was the ground water the only thing sampled? Did you do any other?

MR. PAUL CLOUD:

No we sampled sediments, surface water and soil every six (6) months always from various locations. We even had two (2) background wells south of the firing line in the Cantonment Area in the southwest and the southeast corner. And even though we're transferring that property to Mr. Ford there is a Deed Restriction that those wells cannot be

affected until we no longer need them. So if we need them until 2016 or 2020 or beyond, whatever the regulatory requirement is, we will still have access to those wells no matter who owns the property.

MR. KEVIN HERRON:

Okay Sharon it's still me obviously.

You've got up here your institutional controls and the requirement. Obviously you're going to maintain some kind of ownership in some manner.

You've got the maintenance of the fencing. You indicated that the U.S. Fish and Wildlife and the Air Guard is responsible for that and for the maintenance of the roads, right?

MR. PAUL CLOUD:

Actually under the MOA the Air Force and the Air Guard through the Air Force are responsible for the maintenance of the fence completely around the facility from the firing line north, not anything in the Cantonment Area.

For your information the NRC did an inspection last summer, they had an inspector come out and do an inspection and he inspected the Air Guard's record. The Air Guard has a contractor that patrols that fence every week and inspects it for any holes or any damage and it's repaired

within thirty (30) to sixty (60) days. The inspector was exceptionally impressed with the level of document that the Air Guard had. And we've had no violations of any NRC requirement.

MR. KEVIN HERRON:

Well is there some kind of financial assurance or financial responsibility, i.e. you're still talking about government budgeting, that the money was - or their funding would be available to make sure that those things continue? I know you've got it - it's up there mandated but is there something in line that is going to get attached to that to show that there is financial assurance that those things are going to continue and be budgeted?

MR. PAUL CLOUD:

As you may have seen in one (1) of the previous slides there is a requirement by the NRC for the licensee to make a financial assurance statement. The Army has done that periodically over the years. Now it is illegal for a federal agency or an employee of the Federal Government to commit funds that have not been authorized by Congress. So I cannot stand here and say right now that the Army will absolutely guarantee that in the year 2020 we will have this amount of money. I can't do that. It's illegal. I could go to jail.

What we can do, and what every agency does do, is basically use the language to that. We know the requirement is there. We will every year make the request and obtain to the best of our ability the Congressional authority to spend that money. You cannot spend money that you don't have. That's against the law. So we document that. We identify the level of money that we need whatever it is.

Go ahead Kevin.

MR. KEVIN HERRON:

One (1) last thing Paul. Who is the new contact for JPG on this issue.

MR. PAUL CLOUD:

I'll give you her name. Her name is Yolande Norman.

MR. KEVIN HERRON:

I think it's relevant that everyone here knows it more than me because again I don't have regulatory authority. I can act as you all. I have no more say so or authority than - than any other person in this room. But I want - but I think you all need to be diligent, you need to - because it's going to be a while and that's why I wanted to bring up the point on the scheduling and how long it was

going to take on this, is you're going to have to maintain some diligence on this and maintain some activity on this and maintain - try to continue to know who the contact person is and continue to check on the NRC's website.

Because the thing that can happen is that complacency can set in and you can get lost in the shuffle. And when they - their requirements, and I know from my regulation, their requirements is they may put a little point four (.4) font thing in the paper that indicates that there's going to be a meeting or something occur. And if you're not diligently looking in the paper, looking in the right places, you can miss it. And Mary knows about this to some extent too.

So you have to maintain your diligence and continue. Because it's going to - it's a long - there's a long road here. And so you have to continue to check and keep up on it.

I'm done. I'm sorry for taking up so much time.

MR. PAUL CLOUD:

Before we go any further I just want to note that it's approximately twenty (20) minutes to nine (9). We have about sixteen (16) minutes left before we're going to have to stop. Again if you haven't had an opportunity I can see you after the meeting, we can go outside, I'll give you

my contact information, you can come and see Mr. Knouf at the Proving Ground, you can provide it there. My contractor is here. He can give you his contact information and you can provide it to him.

So having said that go ahead whoever is next. Oh the NRC's point of contact's name is Yolande Norman. Y-o-l-a-n-d-e Norman, N-o-r-m-a-n. and I'll give you her phone number. I have to pull up my cell phone and give it to you or you can just go on the NRC's website and go into their employee directory and it has their phone number right there and you can call her direct. But it's not a toll free number. If you call me at Aberdeen where I work I have a toll free number and you can call me.

Anything else? Yes ma'am?

MS. LIBBY RICHARDS:

This is a question. I just wanted to know if we could get a transcript of tonight's meeting?

MR. PAUL CLOUD:

I don't see any reason why not. It will probably be several weeks before we have them. But if you're still interested --

MS. LIBBY RICHARDS:

Do we contact you?

MR. PAUL CLOUD:

Yes, contact me and I'll give you my contact information.

MS. LIBBY RICHARDS:

Thank you.

MR. PAUL CLOUD:

Again a verbatim transcript of this meeting will be submitted to the NRC and our responses also. So when that happens you will also see it there. And that's not only for this meeting but the meeting we had last night up in Versailles and the meeting Tuesday night at North Vernon.

MS. LIBBY RICHARDS:

Okay.

MR. PAUL CLOUD:

Anything else? Anyone else that would like to talk about institutional controls?

If there's nothing else then I would like to thank you all for coming. This is probably one (1) of the

more highly attended meetings we've had in quite a while for JPG and I appreciate your participation and the expression of your statements.

With that I would like to conclude the meeting and if anyone wants to talk with me afterwards I'll be around until whenever. I'm not flying out until tomorrow morning.

Thank you.

* * * * *

CONCLUSION OF HEARING

C E R T I F I C A T E

STATE OF INDIANA)
) SS:
COUNTY OF JEFFERSON)

I, Sharon Shields, do hereby certify that I am a Notary Public in and for the County of Jefferson, State of Indiana, duly authorized and qualified to administer oaths; That the foregoing public hearing was taken by me in shorthand and on a tape recorder on June 25, 2009 at 420 West Main Street, Madison, IN; That this public hearing was taken on behalf of the Jefferson Proving Ground Restoration Advisory Board pursuant to agreement for taking at this time and place; That the testimony of the witnesses was reduced to typewriting by me and contains a complete and accurate transcript of the said testimony.

I further certify that pursuant to stipulation by and between the respective parties, this testimony has been transcribed and submitted to the Jefferson Proving Ground Restoration Advisory Board.

WITNESS my hand and notarial seal this 21st day of July, 2009.

Sharon Shields

Sharon Shields, Notary Public
Jefferson County, State of Indiana

My Commission Expires:

July 2, 2015