



Army Installation Management Command  
Pacific Region  
132 Yamanaga Street  
Fort Shafter, Hawaii 96858-5520

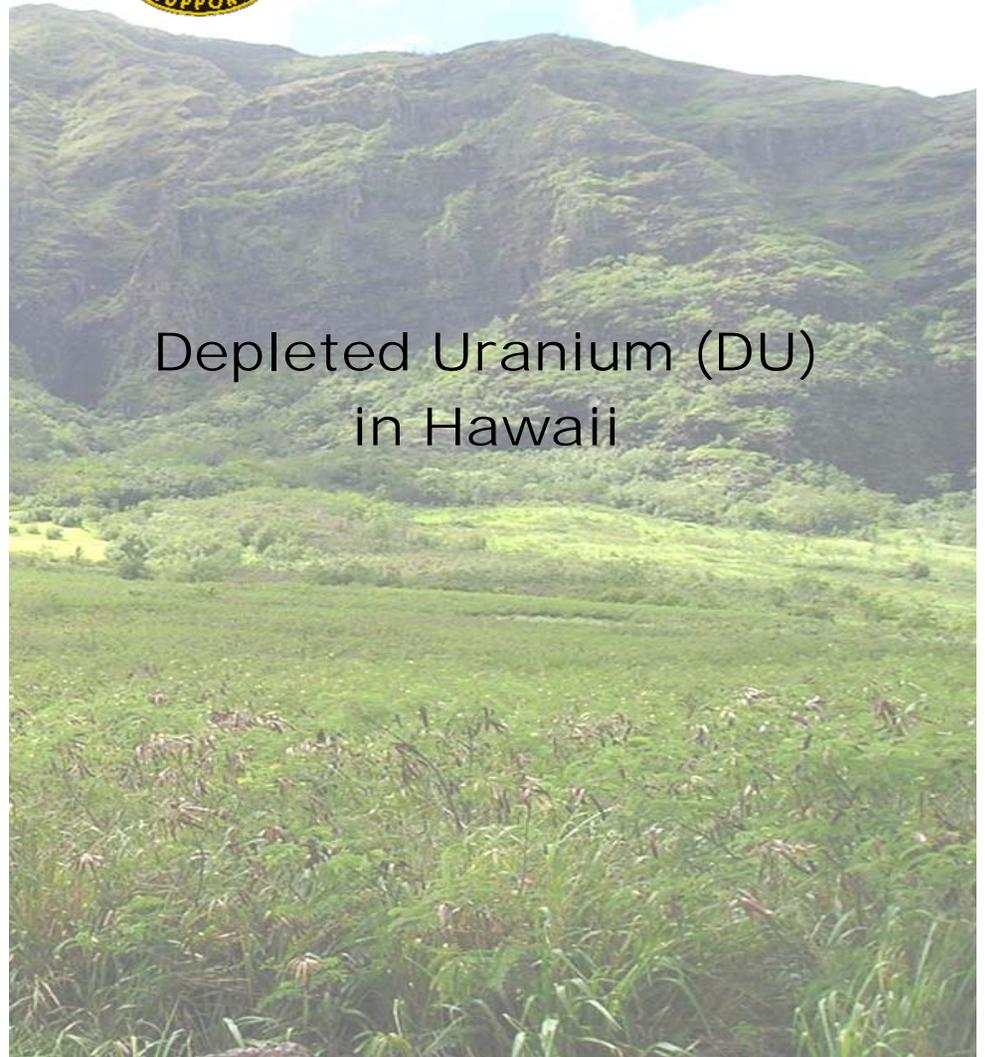
Phone: (808) 438-0650  
Fax: (808) 438-1188

Email: [imcom-pacific-du@hawaii.army.mil](mailto:imcom-pacific-du@hawaii.army.mil)



INFORMATION BOOKLET

## Depleted Uranium (DU) in Hawaii



Department of the Army



Dear Citizen:

The Department of the Army has developed this booklet about Depleted Uranium (DU) for Hawaii as a means of meeting our commitment to transparency. This booklet informs the public about the discovery of DU on our operational ranges at Schofield Barracks, on the island of Oahu, and Pohakuloa Training Area, on the island of Hawaii. Although we have not been able to establish whether DU was used at the Makua Military Reservation, we suspect that it may have been, and we continue our efforts to determine the facts.

As you are aware, Hawaii has played a vital role in our national defense since 1913. During World War II, the military conducted extensive training to prepare our Nation's forces for combat and to protect Hawaii from outside attacks. This role continues even today. Key to meeting this national defense role has been the military's conduct of live-fire training and testing with military munitions. Between 1960 and 1968, the military used the M101 spotting round in training. The M101 was a small (about 8 inches in length and 1-inch diameter) low speed projectile weighing about one pound and containing about 6.7 ounces of DU-alloy. Unlike modern DU penetrators that may generate a cloud of DU dust upon impact with a target, use of the M101 resulted in DU being deposited in large fragments.

We believe that providing information to the public about DU will help address your questions and concerns. We hope you find this material helpful. Should you have any questions or concerns, please contact my Assistant for Munitions and Chemical Matters, Mr. J. C. King, at (703) 697-5564; [jc.king@us.army.mil](mailto:jc.king@us.army.mil).

Sincerely,

A handwritten signature in black ink that reads "TAD D. DAVIS, IV".

Tad D. Davis, IV  
Deputy Assistant Secretary of the Army  
(Environment, Safety and Occupational Health)

## DU INFORMATION RESOURCES

**Department of Health & Human Services, Agency for Toxic Substances & Disease Registry (ATSDR) Uranium Toxicological Profile & Public Health Statement**

<http://www.atsdr.cdc.gov/toxprofiles/tp150.html>

**Deployment Health Support Directorate**

<http://fhp.osd.mil/du/index.jsp>

**Deployment Health Clinical Center**

<http://www.pdhealth.mil/du.asp>

**US Army Center for Health Promotion and Preventive Medicine**

<http://chppm-www.apgea.army.mil/hp/>

**Depleted Uranium, Health Physics Society Fact Sheet**

<http://hps.org/documents/dufactsheet.pdf>

**Fact Sheet, US Army Capstone Depleted Uranium Aerosols Study & Human Health Risk Assessment for Service Members and Their Families, March 10, 2005**

[http://deploymenthealthlibrary.fhp.osd.mil/products/US%20Army%20Capstone%20Depleted%20Uranium%20Aerosols%20Study%20&%20Human%20Health%20Risk%20Assessment%20\(88\).pdf](http://deploymenthealthlibrary.fhp.osd.mil/products/US%20Army%20Capstone%20Depleted%20Uranium%20Aerosols%20Study%20&%20Human%20Health%20Risk%20Assessment%20(88).pdf)

**DoD Force Health Protection & Readiness (Deployment Health Support Directorate's DeploymentLINK**

<http://fhp.osd.mil/du/>

**World Health Organization.**

[http://www.who.int/ionizing\\_radiation/en/Recommend\\_Med\\_Officers\\_final.pdf](http://www.who.int/ionizing_radiation/en/Recommend_Med_Officers_final.pdf)  
<[http://www.who.int/ionizing\\_radiation/en/Recommend%20\\_Med\\_Officers\\_final.pdf](http://www.who.int/ionizing_radiation/en/Recommend%20_Med_Officers_final.pdf)> .

**Health Surveillance of Gulf War I Veterans Exposed to Depleted Uranium: Updating the Cohort, by Dr. M. A. McDiarmid**

[http://www.pdhealth.mil/downloads/health\\_surveillance\\_GWI\\_vets\\_exposed\\_to\\_DU.pdf](http://www.pdhealth.mil/downloads/health_surveillance_GWI_vets_exposed_to_DU.pdf)

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This information booklet is a compilation of information provided by the Department of Defense Health Affairs, Center for Disease Control, Agency for Toxic Substances and Disease Registry, Office of Public Health and Environmental Hazards, and Department of Veterans Affairs, and is provided by:

Army Installation Management Command-Pacific  
Fort Shafter, Hawaii

## BACKGROUND

In August 2005, while conducting range clearance activities to modernize ranges at Schofield Barracks, an Army contractor discovered 15 tail assemblies from the M101 spotting round, a component of the Davy Crockett weapon system.

By early 2006, a scoping survey confirmed the presence of DU fragments from the M101 on a portion of Schofield Barracks' impact area. After confirming the presence of DU, the Army disclosed that information to the public.

The Davy Crockett was the name given to the M28 and M29 series of recoilless guns. This weapon system, which was produced from 1960 until 1968, was used in training until 1968. Although it could use several types of munitions, the munition of interest is the M101 spotting round that contained depleted uranium (DU). Unlike modern munitions that use DU as penetrators to defeat enemy armor, the DU in the M101 was used to provide weight sufficient for the spotting round to mimic the trajectory of the Davy Crockett's nuclear warhead. The M101 was a small (about 8 inches in length and 1-inch diameter), low-speed projectile that contained 6.7 ounces of a DU-alloy.

When the Davy Crockett was used, it was a classified weapon system and information concerning its deployment to Schofield and associated training activities was closely guarded.

Some speculate that DU used in penetrators is linked to Gulf War illnesses; however, medical screening and tests do not support this speculation.

The Army is committed to transparency on environmental issues and will provide information it discovers about the presence of DU on its ranges to the State of Hawaii, Department of Health, federal regulators and the public as it becomes available.

Army Photo



Tail assemblies belonging to the M101 spotting round (above) found by contractors clearing the impact area at Schofield Barracks.

**Isn't uranium highly radioactive and therefore dangerous to humans and the environment?** Uranium is a naturally occurring metal that is mildly radioactive. Humans and animals have always ingested particles of this naturally occurring substance from the air, water and soil. Studies conducted through 2005 consistently indicate that the health risks associated with DU exposures are low.

There have been 16 epidemiological studies of some 30,000 workers in U.S. radiation industries. Some of these workers, particularly in the early days of the industry, had very significant exposures to uranium particles. According to scientists in the field, there have been no recorded cases of illness among these workers as a result of their exposure to uranium. Natural uranium and DU have not been linked to any health effects.

**Can exposure to DU cause cancer?** Cancer rates in almost 19,000 highly exposed uranium industry workers who worked at Oak Ridge National Laboratory between 1943 and 1947 have been examined, with no excess cancer rates observed through 1974. Other epidemiological studies of lung cancer in uranium mill and metal processing plant workers have either found no excess cancer rates or attributed them to known carcinogens, such as radon, rather than uranium.

**Can DU cause kidney damage?** Recent studies have examined possible health effects from exposure to DU from chemical heavy-metal effects, unrelated to radiation. The best understood of these potential health risks, as determined by high-dose animal experiments, is kidney damage. These studies indicate, however, that acute kidney damage would require an amount of uranium in the human body at levels much higher than those of soldiers who were inside vehicles actually struck by DU munitions.

Hawaii Department of Health officials can and are encouraged to observe sampling and independently analyze the collected samples to ensure accuracy and independence of data and conclusions.

**What kind of isotopes make up the DU we have encountered?** DU encountered in Hawaii is comprised of the same three uranium isotopes in natural uranium found in the earth: U-238, U-235, and U-234. DU is formed as a byproduct of the enrichment of natural uranium. The enrichment process removes the lighter isotopes from natural uranium, so that the remaining material is "depleted" in U-235 content and is called DU. The lighter isotopes, U-235 and U-234, are more radioactive than U-238. Because the remaining material contains more U-238 and less of the more radioactive isotopes, DU is 40 percent less radioactive than the naturally occurring uranium that is found in the food, water, and air that you consume daily. Munitions containing DU are not and may not be used in Hawaii.

**PTA is an anti-armor, live-fire training range. Live-fire is using real and lethal ammunition.** Army and DoD policy prohibit the use of military munitions that contain DU in training.

**The community is concerned that DU from live-fire training drifts on the trade winds over our communities. Can DU from the M101 contaminate our water and soil?** It is highly unlikely that DU will migrate out of the impact area. DU is approximately twice as dense as lead. Studies have determined that DU tends to remain in the immediate area that it was deposited. Re-suspension is primarily due to particle size rather than particle density or chemical form. We believe that the primary reason for immobilization is due to the large particle size of the uranium and the fact that the uranium primarily exists as large metal fragments. DU has not been detected outside of the impact areas at either Schofield Barracks or Pohakuloa. The Army is committed to long-term monitoring of the air and water to screen for DU.

**The military's talking points are about the solid form of DU, the military never addresses Hawai'i residents' concerns about the ballistic form of DU.** To the best of our knowledge, DU has never been used in ballistic form in Hawaii. The DU fragments discovered were from the tail assemblies of the M101 spotting rounds used with the Davy Crockett weapons system. Unlike modern DU penetrators that upon impact with a target—depending on the munitions, the nature of the impact, and the target—may generate a cloud of DU dust, use of the M101 spotting round would have resulted in the 6.7 ounces of DU being deposited in large fragments without burning. The DU used in the tail assemblies was ballast and not ballistic material.

## WHAT IS DEPLETED URANIUM?

DU is a processed form of uranium. Uranium is a weakly radioactive heavy metal that occurs naturally in the environment. Rocks, soil, surface, water, air, plants, and animals all contain varying amounts of uranium. Because it is found everywhere on earth, we eat, drink and breathe a small amount every day. People have been mining uranium and using it in various applications for over 60 years, so there is a great deal of information available on uranium.

DU is the uranium left over from the process that enriches uranium for commercial and military uses. Enrichment is a process where a portion of the most radioactive forms of uranium are removed from naturally occurring uranium. DU is nearly twice as dense as lead, with 40% less radioactivity than natural uranium.

Under certain circumstances and at very high temperatures, DU can aerosolize. Research by military and non-military agencies confirm that this does not occur during brush fires. Re-suspension is primarily due to particle size rather than particle density or chemical form. We believe that the primary reason for immobilization is due to the large particle size of the uranium and the fact that the uranium primarily exists as large metal fragments. Among other factors, the soil types on Hawaii's ranges also serve to limit DU migration from the impact area. Although it is highly unlikely that DU will move off the impact area due to military live-fire training, air monitoring and sampling will be conducted to ensure that migration is not occurring.



Army Photo

**DU fragment.** Most DU found in the Schofield impact area is in the form of flecks and grains. Because DU is heavier than lead, it does not migrate far from where it was deposited.

## WHAT IS DU USED FOR?

DU is currently used by the armed forces as armor on tanks and in commercial applications that require the use of a very dense material. These include: ballast and counterweights in airplanes and ships, radiation shielding and collimation in medicine, radiation therapy and industry.

DU is currently used by the armed forces as armor to protect Army tanks, and as penetrators in military munitions to destroy enemy armored vehicles.

DU's ability to protect our Soldiers is unsurpassed. First, DU provides protection for the Abrams tank and its crew against enemy anti-tank munitions. DU armor is designed to cause rounds to function prematurely or bounce off the exterior of a tank. Second, when used in armor-piercing projectiles, DU

provides unmatched capability to engage and penetrate enemy armor at distances out of the range of the enemy's weapons systems.

## SHOULD I BE CONCERNED?

The Army takes very seriously all issues and public concerns arising from DU. The community's health and safety, on post and off, is the top priority. As such, the Army is taking appropriate, proactive measures to assess the overall situation and to develop a comprehensive, transparent, full-disclosure strategy. This principled approach relies on federal and international scientific methods and protocols in consultation with state and federal officials to ensure public health and safety.

Based on data gathered and careful analysis of the current situation, there is no immediate or imminent health risk to people who work at Schofield Barracks or Pohakuloa Training Area (PTA) or live in communities adjacent to these military facilities from the DU present in the impact areas. A comprehensive risk assessment will be completed in early 2008.

Any DU residue present is limited to impact areas well within the perimeter of operational ranges. These areas are not publicly accessible. Very few range and safety personnel access the impact areas of our operational ranges. Those people that work in these areas are trained to recognize potential hazards associated with military munitions.

The migration of DU off the military installation is highly unlikely. Studies have shown that DU transport is limited and that it is unlikely to move from the range under most conditions. Studies also have shown that the DU fragment size and the environmental conditions at the ranges in Hawaii serve to prevent migration, including by air. The Army will, however, monitor these ranges to determine whether migration occurs.

Studies conducted by numerous non-military agencies, including the World Health Organization and the Department of Health and Human Services, have not found credible evidence linking DU to radiation-induced illnesses.

The Nuclear Regulatory Commission (NRC), which has been advised of the situation and is participating in the survey process, is provided updates on actions being taken to address the presence of DU on Hawaii's ranges. If appropriate, the NRC will license ranges for long-term environmental monitoring or clean up. The State of Hawaii Department of Health and Department of Defense are collaborating on this process. Additionally, the Army is in constant communication and coordination with a wide array of DOD and non-DOD federal agencies. Together we will plan the "way-ahead" to address the DU present on Schofield Barracks and PTA.

be able to detect DU in the air miles from the DU. Additionally, the meter responds to other radiation sources and not solely DU.

**What is the half-life and why does it matter?** Half-life is the time it takes for one-half of the atoms of a radioactive element to change (transform) into another element. Uranium 238, the primary component of DU, has a half-life of over 4.5 billion years. Half-life is important because it tells us how long an element will be around and is an indicator of how radioactive it is. DU has a relatively long half-life which means it will exist for a relatively long period of time, but it also means it does not produce as many radioactive emissions in a period of time that a person might be exposed to it.

**Are there elevated radiation readings around our ranges?** No. Neither DU nor elevated radiation readings have been detected outside of the impact areas at either Schofield Barracks or Pohakuloa.

**The public is concerned about contamination of streams that feed into Kaukonahua stream.** Schofield Barracks is collecting air and water samples to determine if DU particles are transported off the ranges. Surface water samples collected to date have not detected DU. This sampling will continue for the foreseeable future.

**Will the Army test employees exposed to DU on our ranges?** Yes, if the employees have the potential to have ingested or inhaled DU. The potential for exposure is very small since DU is confined to Schofield Barracks' and PTA's impact areas and access to the impact areas is generally prohibited due to the hazard from unexploded ordnance. DU has not been detected outside either of these impact areas.

**Local groups want the military to be more forthcoming and to cooperate in testing. They say at the very least the state should be involved. Has the state participated?** The Army is working in full partnership and disclosure with representatives from the State Department of Health and other state and federal agencies. These agencies include, but are not limited to, the U.S. Nuclear Regulatory Commission, Department of Geology and Geophysics, University of Hawaii at Manoa, Centers for Disease Control and Prevention, the Environmental Protection Agency and various Army commands and agencies.

**Community members have stated, "We don't have any confidence in their (the Army's) assessment that it's safe or that public health has been protected." How is the Army addressing the public's call for an independent analysis and oversight?** The State Department of Health is working with the State of Pennsylvania, Bureau of Radiation Protection, and Department of Environmental Protection to provide analysis and oversight. Further, the State of

a target—depending on the munitions, the nature of the impact, and the target—may generate a cloud of DU dust, use of the M101 spotting round would have resulted in the 6.7 ounces of DU used in the round being deposited in large fragments in the immediate vicinity of the point of impact without burning.

**Can DU, once vaporized, spread off the range? Could fire aerosolize the DU?** DU only aerosolizes at a very high temperature, much higher than temperatures produced by brush fires. No DU was detected in air during prescribed burns. DU has not been detected outside of the impact areas at Schofield Barracks or PTA, and it is highly unlikely that it will migrate off the impact area. Nevertheless, the Army will monitor these ranges for DU releases for some time into the future.

**How much DU gets kicked into the air when they do live-fire exercises?** Very little DU is believed to be kicked up because vehicles and personnel, which are the most likely to disturb the DU, are restricted from entering impact areas where the DU is present. Live-fire impacts may further fragment M101 remnants, but would be unlikely to cause particles small enough to be transported outside the impact areas. Ongoing air testing will provide information to determine whether DU dust is transported outside the impact areas.

**Community concerns regarding aerosolized DU included, “Was DU present in the smoke that drifted over downwind communities during this “prescribed burn”?** To date, the air samples taken during prescribed range burns have not detected DU. Sampling protocols were vetted with the State Department of Health and the Environmental Protection Agency. A formal report that provides the data collected will be made available to the public once finalized.

**Residents of South Kona said they used a Geiger counter to test on April 21 downwind from Pohakuloa, 35 miles from the range, and got a radiation reading of 93 counts per minute. A typical radiation background reading is up to 20 counts per minute, they said.** Residents used a Gamma Scout Geiger counter that can only detect DU at a distance of a few inches. Out of concern for the public, the State’s 93rd Weapons of Mass Destruction Civil Support Team was deployed to take additional radiation readings using the proper counters and procedures. State Adjutant General/Hawaii Army National Guard, Major General Bob Lee, stated, “I’m in charge of homeland security, and so it’s of enormous concern to me; they have the best equipment on the Islands and could find nothing above background radiation.”

**Can the Gamma Scout Geiger counter detect DU?**

Yes, but you must be within a few inches of an item to detect DU. It would not

The Army’s two-month survey at Schofield Barracks and PTA covered over 425 acres and resulted in over 1,400 air, vegetation, and soil samples being sent to independent labs on the mainland for testing and analysis. A comprehensive risk assessment is expected in early 2008.

**The bottom line: There is no imminent or immediate threat to human health from the DU present on Hawaii’s ranges, and the Army is working in concert with state and federal agencies to thoroughly assess the risk and determine the actions required to address the DU present on Hawaii’s ranges.**

## CURRENT RESPONSE INITIATIVES

The M101 tail assemblies found at Schofield Barracks were removed and properly disposed of following NRC permit procedures and in close coordination with the state of Hawaii’s Department of Health.

The Army conducted air and water sampling at Schofield Barracks to determine if DU is migrating off the range. The sampling to date does not indicate the presence of DU. The Army will continue this sampling for the foreseeable future.

The Army initiated the following four-point plan to assure transparency:

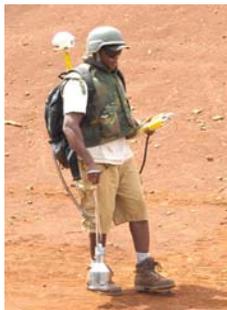
1. All information obtained will be provided in a timely manner to the Hawaii State Department of Health.
2. The state will be a partner in the planning and execution of a survey and monitoring efforts to address Schofield Barracks, Makua Military Reservation, and PTA.
3. The state will be a partner in the planning and execution of mutually agreed upon response actions.
4. The Army will provide any necessary training to state participants.

In August 2007, U.S. Army Materiel Command’s Joint Munitions Command (JMC) established a contract to survey the ranges at Schofield Barracks, Makua Military Reservation, and PTA. JMC provides low-level radioactive waste disposal for the Army.

The survey determined the extent to which DU is present at Schofield Barracks and confirmed that DU is present at PTA. Due to vegetation growth and explosive hazards, we were unable to determine whether DU is present at Makua. Once the survey is completed, a decision on how to address any DU present can be made. Response options include, but may not be limited to continuous

or periodic monitoring of the ranges, limited removal of visible fragments, or remediation. Collectively, these actions will further limit the risk of possible DU exposure to individuals that are authorized access to impact area.

Army Photo



A team member surveys the impact area at Schofield Barracks for DU. Several teams recently completed a comprehensive and careful survey at Schofield Barracks to determine how much and where DU is located in the impact area.

## Frequently Asked Questions and Comments

**Why are residents and visitors alike "kept in the dark" about military contamination in Hawai'i?** The Army takes very seriously all issues and public concerns arising from DU. The community's health, on post and off, is a top priority. The Army, in consultation with the state and federal officials, is taking appropriate, proactive measures to assess the overall situation and to develop a comprehensive, transparent, full-disclosure strategy to ensure public safety.

This handout and numerous meetings with state and federal agencies and the public are examples of our efforts to inform the public.

**The Army asserted that no DU weapons were used at Schofield. Why did you mislead the public?** The Army did not intend to mislead the public. Until the discovery of fragments from the 1960's era M101 spotting round in 2005, Army officials were not aware of such use.

Over 40 years ago, the Davy Crockett was a Department of Defense classified weapons system. Information about where the Davy Crockett was deployed and what units received training on this weapon was closely guarded. When the Davy Crockett was removed from the inventory, local records were also

removed and stored in various locations on the mainland.

After the discovery at Schofield, the Army conducted research to determine the extent to which the Davy Crockett was used in Hawaii. The Army determined that portions of PTA and Makua could have been used for this training. This is why these installations are included in the reviews and assessments.

**Spent DU spotting rounds were found at Schofield Barracks, (An Army base and live-fire training range on O'ahu), in August 2005. This discovery was not disclosed by the military but through a Freedom of Information Act (FOIA) initiated by concerned residents of Hawaii.** Although some may believe there was a delay in public notification, the Army believed it needed to confirm its initial findings prior to disclosing the discovery. The Army disclosed the discovery of the presence of DU in its impact area in a January 2006 press release following soil sampling and scientific confirmation.

**Does the Stryker fire weapons in Hawaii that contain DU?** No. Army and DOD regulations prohibit the use of munitions that contain DU in training. As such, Stryker vehicles training in Hawaii are prohibited from such use.

**Will Strykers drive in areas contaminated with DU?** No. DU is confined to Schofield Barracks' and PTA's impact areas. DU has not been detected outside of the impact areas at either Schofield Barracks or Pohakuloa. Due to a safety hazard from unexploded ordnance, personnel and vehicles, including Strykers conducting training, are prohibited from entering the impact area.

**Is the Army still using DU munitions in Hawaii?** No, Army and DOD Regulations strictly prohibit the use of military munitions that contain DU in training.

**Are Army units, training at Schofield Barracks or PTA, being contaminated with DU and spreading that through the community?** No. DU is confined to the impact area at PTA and Schofield Barracks and has not been detected outside of the impact area. The impact area has restricted access and is not open for use by Soldiers or the public.

**The real danger with DU comes with the vaporized or aerosolized form, which occurs on impact. Is that occurring on our training ranges?** Because Army and DOD Regulations prohibit use of DU in training, the Army does not use munitions that contain DU on its training ranges in Hawaii. Separately, the Army has conducted testing during prescribed burns and there was no indication that DU was present in the air. The M101 spotting rounds used in Hawaii were not designed like today's DU penetrators as kinetic energy munitions, but rather to mimic the flight trajectory of the Davy Crockett's nuclear warhead and mark the point of impact. Unlike modern DU penetrators that upon impact with