March 27, 1997 SECY-97-068

FOR: The Commissioners

FROM: L. Joseph Callan /s/
Executive Director for Operations

SUBJECT: REMOVAL OF THE DEPARTMENT OF THE ARMY ABERDEEN PROVING GROUND, MARYLAND SITE FROM THE SITE DECOMMISSIONING MANAGEMENT PLAN

PURPOSE:

To inform the Commission that the staff plans to remove the Department of the Army Aberdeen Proving Ground (APG), Maryland site from the Site Decommissioning Management Plan (SDMP) list within ten days of the date of this paper.

BACKGROUND:

In SECY-90-121, the original SDMP, and in subsequent revisions to the SDMP (SECY-91-096, 92-200, 93-179, 94-213, 95-209, and 96-207), the staff identified approximately 50 sites that, because they met specific criteria, e.g., presence of large amounts of contaminated soil and potential contamination of groundwater or other environmental impacts, warranted Nuclear Regulatory Commission special oversight to ensure timely and safe remediation of residual radioactive material in excess of the current NRC criteria for release for unrestricted use. One of these sites is the Department of the Army APG, Maryland facility.

APG is an active Department of Defense test facility. APG was designated as a permanent military post in 1917. One of numerous missions carried out at APG is planning and conducting development tests and initial production tests of ammunition for the various

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weapons systems within the Army inventory. The Army began using licensed material at APG in the late 1950s (see Attachment 1 for Site History). APG was included in the SDMP list because of the identification of DU-contaminated soil in the outdoor target areas located on the site and concerns about potential impacts on the environment. The contaminated areas resulted from firing live rounds containing DU during testing of kinetic energy penetrators.

A total of 130,000 kilograms of DU have been fired in the outdoor target ranges. In addition to radioactive contamination, unexploded ordnance is also a concern. The facility is currently in use, and the Army plans to use it for munitions testing for the foreseeable future. Therefore, there is currently no plan to remediate the contaminated area to unrestricted release criteria.

Before 1990, most penetrators were fired at a trench, with penetrator impacts occurring within about 500 meters of the firing axis. The penetrators would typically strike the ground, trees, and wetlands after hitting soft targets (cloth and plywood) and come to rest in the impact area. Before 1990, approximately 100,000 kg of DU were fired into the open range.

During the fall and winter of 1989-1990, sand-filled catch boxes were constructed behind the targets in each of the two firing ranges, to expedite the trapping and recovery of expended penetrators and to eliminate additional DU in the environment. Each box consists of sand as a stop, surrounded on both sides and the rear by a wood frame and earth berms. The catchboxes capture approximately 95 percent of the penetrators fired in these ranges.

In 1990, the licensee began recovering DU penetrators from the firing range. Retrieval was slow because of the additional hazard of unexploded ordnance in the impact areas. Eventually, approximately 20% of the penetrators were recovered. In 1992, retrieval operations were suspended for safety reasons. Currently, the Army periodically removes some of the sand from inside the catch boxes and replaces it with fresh sand. The DU mixed with the sand is removed from the catch boxes and recycled.

The Army has been conducting environmental monitoring since 1980 (see Attachment 2 for characterization and recovery activities). No significant DU has been detected in environmental samples of air, soil, surface water, groundwater, fauna, sediment, and vegetation. DU typically migrates vertically in soils because of precipitation. The
rainfall at APG can transport soluble corrosion products from DU fragments through soil to depths of at least 20 cm.

In a study entitled "Long Term Fate of Depleted Uranium at Aberdeen and Yuma Proving Grounds, Phase II: Human Health and Ecological Risk Assessments," Los Alamos National Laboratory (LANL) evaluated the long-term fate of DU in the APG environment. The study examined the possible effects of residual DU on the ecosystems and assessed any potential adverse effects of DU on the APG environment, including effects of continued DU testing. The study also estimated potential adverse human health effects caused by ingestion of DU via harvested animals at APG.

Preliminary estimates of soil, sediment, surface water, and groundwater concentrations were provided by utilizing the sampling data collected from the ongoing environmental radiation monitoring (ERM) program by the Department of the Army. The ecosystems were qualitatively inventoried and evaluated to better understand the animal and plant communities of interest.

Furthermore, preliminary pathway models were developed for the aquatic and terrestrial food chains as well as potential routes of DU transport. Refinement of the assessment models and uncertainty reduction required additional sampling. This included sampling of soils, water, sediment, vegetation, and aquatic and terrestrial animals.

The LANL study concluded that the amount of DU entering the soil system would depend on the corrosion rate of the DU fragments. The data collected from the ERM program indicated that DU corrodes slowly. LANL studies have indicated that the organic material in the impact areas reduces the DU to an insoluble form or binds with DU material, thereby making it immobile in the impact areas. Evidence of DU immobilization is demonstrated by the fact that DU has not been detected in the groundwater at APG. In addition, test firing against hard targets (armor) is performed within enclosures to control the potential spread of aerosolized DU and to reduce the chances of human exposure and environmental impacts. Therefore, the inventory of DU in the soils would remain unavailable, over a long time period, for plants uptake and animal ingestion. Based on these analyses, LANL ascertained that dose impacts through plants and meat ingestion pathways were insignificant.

In summary, the study predicted that the potential radiological dose to an offsite person would be in the range of a few millirems per year or less. In addition, the data suggested that there would be no adverse effects, elevated risks, or damages to the ecosystem due to DU.

DISCUSSION:

The staff has regularly (at least annually) inspected the site, reviewed the results of soil, water, vegetation, and sediment environmental sampling conducted to date, and also reviewed the environmental radiological monitoring (ERM) program conducted by the licensee. Because the environmental monitoring data will provide longer-term information, continued analysis will provide evidence of trends demonstrating the presence or absence of significant ecological impact due to DU testing. Therefore, the Army has committed to NRC that environmental radiation monitoring will continue in the future.

The staff evaluated the LANL study discussed above. Based on a review of this information, the staff concludes:

1. The existing DU in the environment poses minimal risk.

2. Continued use of DU is acceptable.

3. APG is a controlled military base with an active NRC license and no plans to terminate the license.

4. The ERM program, which is a condition of the APG license, is adequate to detect environmental migration of DU.

Thus, there is low risk and low dose impacts to the public (based on the LANL study), there are insignificant ecological and environmental impacts (based on staff review of the current environmental monitoring data and the ERM program), the Army has committed to long-term and continued environmental monitoring, and the Army plans to continue possessing an active license

for DU testing and use of the facility. In addition, the original basis for including APG on the SDMP list (potential environmental impacts from the DU-contaminated soil) has been shown not to be present. Although the usual conditions for removal of a site from the SDMP list (remediation to release criteria as specified in The Action Plan To Ensure Timely Cleanup of SDMP Site, 57 FR 13389-13892, April 16, 1992; termination of the license) are not present, staff is convinced APG should be removed from the SDMP list.

The staff placed a notice in the Federal Register (61 FR 36586, July 11, 1996) stating that NRC intends to remove the site from the SDMP. No comments have been received.

RECOMMENDATION:

It is the staff's intention, unless otherwise directed by the Commission, within ten days from the date of this paper, to send a letter to the Army, (Attachment 3), stating that the Department of the Army APG, Maryland, site has been removed from the SDMP list. We will continue to monitor and oversee licensee performance during routine inspections to ensure compliance with the license and the requirements of the ERM.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

The staff has notified the Environmental Protection Agency and the State of Maryland of NRC's intent to remove the site from the SDMP list.

L. Joseph Callan
Executive Director
for Operations

Attachments:
1. Site History
2. Characterization Plan
3. Draft letter to Department of the Army

SITE HISTORY

THE DEPARTMENT OF THE ARMY ABERDEEN PROVING GROUND, MARYLAND SITE

The Department of Army Aberdeen Proving Ground (APG) Maryland site, is an active test facility for the Department of Defense. APG is located in southeastern Harford County, Maryland, about 48 km (30 miles) northeast of Baltimore on two peninsulas near the head of the Chesapeake Bay. APG was designated as a permanent military post in 1917. APG consists of two administratively controlled areas: the Aberdeen area and the Edgewood area. Only the Aberdeen area of APG is involved in this matter.

One of a number of missions carried out at APG is planning and conducting development tests and initial production tests of ammunition for the various weapons systems within the Army inventory. There have been tests of munitions containing DU at various ranges on APG, since the late 1960s, under a Nuclear Regulatory Commission (then Atomic Energy Commission) license. Aberdeen Test Center (then called the Materials Test Directorate) began testing DU penetrators against soft targets (cloth and plywood), in the early 1970s, at an area known as the Outdoor Testing Range. Hard-target (armor) testing was originally performed in the open air at a facility located at Ford's Farm (southwest corner of APG). An enclosure was constructed, at Ford's Farm, in the late 1970s, that was designed to contain aerosolization of the penetrator, upon impact with a hard target.

An additional enclosure for DU testing was put into operation in 1984 at the Bomb Throwing Device (BTD) Area. Testing at Ford's Farm decreased. The enclosure at Ford's Farm was rebuilt in 1991 to accommodate target disassembly operations. An armor reclamation facility at the BTD Area began operation in 1990. Used armor plate contaminated with DU from testing is placed in recycling containers and temporarily stored until it is shipped to a Department of Energy recycling facility. The Army reviewed the need for covered storage for the contaminated armor and has been storing this material in the new enclosed facility at Ford's Farm.

DU penetrators are test-fired for accuracy and performance, at soft targets positioned vertically and extending about 10 meters (33 feet) above the ground, on the Outdoor Testing Range. The penetrators do not fragment as they pass through the targets. When the penetrators impact with the ground, they skip along the surface, and ultimately stop on the surface or burrow into the ground. A sand-filled catch box was constructed behind the targets in each of the two outdoor firing ranges in 1989-1990, to trap and allow recovery of expended penetrators, thereby limiting the amount of DU added to the environment. Each box consists of sand as a stop, surrounded on both sides and the rear by a wood frame and earth berms. The catchbox is 12 meters (40 feet) long, by 12 meters (40 feet) wide, by 9 meters (30 feet) high, filled with sand. The catch box captures 95 percent of the DU penetrators fired. The average ratio of DU to sand in each catchbox is 1 kilogram (2.2 lbs) of DU per 28,000 cm^3 (1 cubic foot) of sand. Air sampling is performed in the area surrounding the catchboxes. No increase in DU has been detected on the

air samples. The Army currently replaces some of the sand in the catchboxes with fresh, unused, sand, during grading operations. The removed sand is sifted and the DU is segregated for recycling purposes.

The Army also periodically conducts tests of some of the DU penetrators in a separate outdoor range, where no catchboxes are present. These tests involve penetrators being fired at laser guided targets. No recovery of these penetrators is being attempted at this time because of the hazards of unexploded ordnance.

The Army has collected soil samples near the catch boxes on the Outdoor Testing Range, at locations near the Ford's Farm facility, at the BTD facility, and at the outdoor range where no catchbox has been constructed. The Army's sample results show no evidence of DU migration in soil or water.

CHARACTERIZATION AND RECOVERY ACTIVITIES

THE DEPARTMENT OF THE ARMY ABERDEEN PROVING GROUND, MARYLAND SITE

CHARACTERIZATION

The Department of the Army currently uses the Aberdeen Proving Ground (APG) site and plans to continue to use this site, for munitions testing, for the foreseeable future. Therefore, there is currently no plan to remediate the contaminated area to unrestricted use criteria. However, because of concerns about the environmental impact of continued depleted uranium (DU) testing in the Outdoor Testing Area, the Army has performed various characterization activities.

Since 1979, samples of soil, water, vegetation, and sediment have been collected at numerous sampling points in areas immediately adjacent to the firing ranges, where spent DU penetrators are most likely to be found. The environmental radiological monitoring (ERM) program was initiated based on pathway analysis for risks of radionuclides of interest, to determine any environmental effects. The ERM program includes air, soil, surface-water, ground-water, fauna, sediment, and vegetation sampling in the areas surrounding the catchboxes and storage sites, and inside the impact area. Alpha spectrometry and mass spectroscopy are used to perform isotope-specific analyses of samples, for U-238 and U-234, to differentiate between the presence of DU and natural uranium.

In 1989, Battelle Pacific Northwest Laboratories was contracted to perform and evaluate a study (Phase I) of the sampling procedures and results. This evaluation was submitted to the Army in October 1989 and used to revise the ERM program. Also in 1989, Los Alamos National Laboratory (LANL) began a study (Phase II) to determine the environmental effects, if any, of DU munitions in the outdoor firing ranges at Aberdeen and Yuma Proving Grounds. The Phase I report of this study was issued in June 1990 and the Phase II report was issued in December 1995. Based on the results of the Phase I study, the Army provided an extensive revision of its ERM plan, with its license renewal application submitted to the U.S. Nuclear Regulatory Commission in December 1990.

In 1990, preliminary NRC review of the ERM plan indicated it was improved over the initial ERM. The licensee implemented the plan late in 1991, pending additional review by the staff and request for modification by NRC. In December, 1995, a study entitled "Long-Term Fate of Depleted Uranium at Aberdeen and Yuma Proving Grounds, Phase II: Human Health and Ecological Risk Assessments," was completed by LANL, which concluded that little risk exists presently and in the future from ingestion of DU at the Department of Army (APG), Maryland, site. In addition, the study recommended that environmental sampling be continued and that the data be incorporated into an assessment model to periodically evaluate ecosystem risk, with the newest data. Therefore, the Department of the Army is continuing the ERM program implemented in 1991, and this program is part of the APG license.

To confirm the analysis as provided by the Army, the staff analyzed the data provided in the study and used the RESRAD code to perform an independent dose assessment for APG. Where available, the staff used site-specific parameters. Where site-specific data were not available, the staff used the default values, which are the most conservative values in running the RESRAD code.

Using the worst-case scenario (family-farm scenario), all significant exposure pathways for the critical population group were considered. The critical population group (i.e., a family that establishes residence on a site after the site has been released for use without restrictions), is a relatively small, homogeneous group that represents those individuals in the population expected to potentially receive the largest radiation dose. The pathways considered included: (a) exposure to external radiation; (b) internal dose from inhalation (including radon progeny); (c) internal dose from ingestion of plant foods, meat, milk, fish, and contaminated soil; and, (d) drinking water from a contaminated well. In addition, it was assumed that the uranium contamination was soluble. Even with these conservative assumptions, the dose to the critical population group was less than 15 mrem/year.

RECOVERY

Recovery operations for DU penetrators were begun in the 1989-1990 time-frame. More than 14,000 kg (31,000 lbs.) were recovered, up to 1992, when the operation was suspended because of the danger of unexploded ordnance. With the installation of the catch boxes, recovery operations have been re-initiated. Presently, 95 percent of the DU fired in these ranges are captured by the catch boxes. Firing at armor plate, performed in the hard-target enclosure at the Bomb Throwing Device, results in a too-low-to-be-measured release because of air filtration and recovery operations.

The Department of the Army provided an extensive revision of its ERM plan, with the renewal application submitted to NRC in December 1990. As noted above, no site remediation is planned at this time. No significant environmental migration of DU has been found, although environmental monitoring will continue as required by the license.

NRC will continue to assess and monitor licensee performance by routine annual inspection activities, regarding the active license.

Colonel Richard O. Bailer
Commander
U. S. Army Aberdeen Test Center
ATTN: STEAC-CO
Aberdeen Proving Ground, MD 21005-5059

SUBJECT: REMOVAL OF THE DEPARTMENT OF THE ARMY ABERDEEN PROVING GROUND, MARYLAND FACILITY FROM THE NUCLEAR REGULATORY COMMISSION SITE DECOMMISSIONING MANAGEMENT PLAN LIST

Dear Colonel Bailer:

I am responding to your letter dated July 6, 1996, requesting that the Nuclear Regulatory Commission remove the Department of the Army, Aberdeen Proving Ground (APG), Maryland site from the Site Decommissioning Management Plan (SDMP) list. We have reviewed your "Long-Term Fate of Depleted Uranium at Aberdeen and Yuma Proving Grounds, Phase II: Human Health and Ecological Risk Assessments," and have concluded that firing of the depleted uranium (DU) penetrators at APG has minimal risk, if any, to human beings and the ecosystems. Therefore, considering that APG is an active military installation where the affected areas are restricted from human intrusion, you may continue licensed material use in accordance with your NRC materials license.

In accordance with your request, and based on our evaluation of the minimal potential consequences, to public health and safety, of continued use of APG for DU testing, we are removing the APG, Maryland site from the SDMP list. Remedial action is not required at this time.

If it becomes necessary for your site to be decommissioned or the license terminated, the Commission will apply the appropriate guidance and criteria in place at that time to determine the appropriate levels of decontamination applicable to your facility.

Thank you for your cooperation in this matter. If you have any questions about our action, please contact Anthony Dimitriadis, of my staff, at (610) 337-6953, or me, at (610) 337-5200.

I trust that this reply responds to your request.

Sincerely,

Ronald R. Bellamy, Chief
Decommissioning and Laboratory Branch
Division of Nuclear Materials Safety

License No. SUB-834
Docket No. 040-07354

cc: State of Maryland
EPA, Region III

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