

SAFETY EVALUATION REPORT  
APPROVAL OF DEPARTMENT OF THE NAVY DECOMMISSIONING PLAN  
DAHLGREN LABORATORY  
DOCKET 03029462

## 1.0 Executive Summary

This Safety Evaluation Report (SER) supports a license amendment to Materials License No. 45-23645-01NA. This license is held by the Department of the Navy (Navy). This is a Master Materials License (MML) and covers many sites around the country, and allows the Navy to issue permits and perform inspections of those permits. Decommissioning responsibilities are shared between the NRC and the Navy. The Navy submits decommissioning plans (DPs) to the NRC for approval.

The Navy is in the process of decommissioning Building 200, Bay 4 and adjacent outdoor areas at the Dahlgren Laboratory, with the intent to terminate Navy Radioactive Materials Permit (NRMP) No. 45-00178-S1NP. Test firing of depleted uranium (DU) rounds at the facility began in the early 1970s under NRC Materials License No. SMB-1145. The Navy issued Navy Radioactive Materials Permit (NRMP) No. 45-00178-S1NP authorizing the test firing of depleted uranium rounds at the Facility in 1987 when the MML was issued to the Navy. The Navy initiated decommissioning of the facility in 1993 and work is ongoing. In January 2002, the permit was converted to decommissioning permit, NRMP No. 45-00178-Y1NP. The Navy has submitted a DP which includes site-specific derived concentration guidelines (DCGLs) to allow unrestricted release of the Facility.

## 2.0 Facility Operating History

NRC staff has reviewed the information in the "Facility Operating History" section of the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 16.2 (Facility Operating History). Based on this review, NRC staff has determined that the Navy has provided sufficient information to aid NRC staff in evaluating the Navy's determination of the radiological status of the Facility and the Navy's planned decommissioning activities, to ensure that the decommissioning can be conducted in accordance with NRC requirements.

## 3.0 Facility Description

The Facility is the largest tenant at the Naval Support Facility Dahlgren (NSFD) which is located in King George County, Virginia, approximately 40 miles south of Washington, D.C., and 25 miles east of Fredericksburg, Virginia. NSFD encompasses approximately 4,300 acres on the western bank of the Potomac River. The region surrounding NSFD is sparsely populated. Bay 4 in Building 200 consists of the target bay and gun bay. The target bay is 14.5 feet wide, 9 feet high, and 106 feet in length, and the gun bay is 14.5 feet wide, 9 feet high, and 138 feet in length. Building 200, Bay 4 is an indoor firing range where single shot tests on 20-40 millimeter DU and tungsten energy penetrators were fired. It is estimated that 2,000 to 3,000 DU rounds were fired in Bay 4.

#### 4.0 Radiological Status of the Facility

NRC staff has reviewed the information in the “Facility Radiological Status” section of the DP for the Facility according to Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 16.4 (Radiological Status of the Facility). Based on this review, NRC staff has determined that the Navy has described the types and activity of radioactive material contamination in the facility sufficiently to allow the NRC staff to evaluate the potential safety issues associated with the Facility, whether the remediation activities and radiation control measures proposed by the Navy are appropriate for the type of radioactive material present at the facility, whether the Navy’s waste management practices are appropriate, and whether the Navy’s cost estimates are plausible given the amount of contaminated material that will need to be removed or remediated.

#### 5.0 Unrestricted Release Criteria

The staff has reviewed the dose modeling analysis for the site-specific DCGLs as part of the review of the Navy’s DP, using the Consolidated Decommissioning Guidance, Volume 2, Revision 1, Section 5.2 (Unrestricted Release Using Site-Specific Information). The staff concludes that the dose modeling is reasonable and is appropriate for the exposure scenarios under consideration. In addition, the dose estimate provides reasonable assurance that the dose to the average member of the critical group is not likely to exceed the 0.25 mSv (25 mrem) annual dose criterion in 10 CFR 20.1402. This conclusion is based on the modeling effort performed by the Navy and the independent analysis performed by the staff.

The Navy calculated a DCGL for DU on building surfaces of 1150 disintegrations per minute gross alpha per 100 square-centimeter area (dpm/100 cm<sup>2</sup>). The DU DCGL was calculated using the formula for gross activity DCGL found in MARSSIM Equation 4-4, and the DandD code Version 2.1 with its default building occupancy scenario. This resulted in a DCGL for DU of 81 dpm/100 cm<sup>2</sup> (42 dpm/100 cm<sup>2</sup> of U-238 + 39 dpm/100 cm<sup>2</sup> of U-234). The contribution of U-235 to the DU DCGL is less than 1 dpm/100 cm<sup>2</sup>. The Navy then calculated an adjustment factor of 14.2 for the resuspension factor by comparing the recommended value of  $1 \times 10^{-6}$  found in draft NUREG-1720 “Re-evaluation of the Indoor Resuspension Factor for the Screening Analysis of the Building Occupancy Scenario for NRC’s License Termination Rule” to the  $1.42 \times 10^{-5}$  value used in DandD Version 2.1. The DCGL of 81 dpm/100 cm<sup>2</sup> was multiplied by the adjustment factor to arrive at an adjusted gross alpha DCGL of 1150 dpm/100 cm<sup>2</sup>.

Because the Navy’s scoping surveys revealed that it was more efficient to measure beta radiation than alpha radiation, the Navy calculated a gross beta DCGL. The Navy determined that two beta particles are emitted for every disintegration of U-238, considering the U-238 decay chain down to U-234. The Navy stated that because U-235, U-234 and their progeny are removed to negligible amounts during the enrichment process, U-234 and its progeny can be ignored in the calculation of beta particles produced. Therefore the gross beta DCGL was calculated by multiplying the U-238 gross alpha DCGL of 42 dpm/100 cm<sup>2</sup> by 14.2 to adjust for the revised resuspension factor from NUREG-1720 and then multiplying that by 2 to account for the number of beta particles produced during decay. The result is a gross beta of 1150 dpm/100 cm<sup>2</sup>.

The licensee’s statement that U-234 is removed to a negligible amount is not entirely correct because even though it only makes up .005% of the fraction by weight, it

accounts for 47.84% of the total activity. However, since U-234 does not emit a beta particle, the Navy's method for calculating the gross beta DCGL is acceptable.

The screening value for DU (U-238) for soil (14 pCi/g) that will be used by the Navy at the Facility was published in the Federal register on December 7, 1999 (Volume 64, Number 234, Pages 68395 – 68396).

## 6.0 Planned Decommissioning Activities

The NRC staff has reviewed the decommissioning activities described in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.1 (Planned Decommissioning Activities). Based on this review the NRC staff has determined that the Navy has provided sufficient information to allow the NRC staff to evaluate the Navy's planned decommissioning activities to ensure that the decommissioning can be conducted in accordance with NRC requirements.

## 7.0 Project Management and Organization

The NRC staff has reviewed the description of the decommissioning project management organization, position descriptions, management and safety position requirements and the manner in which the Navy will use contractors during the decommissioning of the facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.2 (Project Management and Organization). Based on this review, the NRC staff has determined that the Navy has provided sufficient information to allow the NRC staff to evaluate the Navy's decommissioning project management organization and structure to determine if the decommissioning can be conducted safely and in accordance with NRC requirements.

## 8.0 Radiation Safety and Health Program

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.3 (Radiation Safety and Health Program During Decommissioning). Based on this review, the NRC staff has determined that Navy has provided sufficient information to allow the NRC staff to conclude that the Navy's radiation safety and health program during decommissioning will comply with 10 CFR Parts 19 and 20.

## 9.0 Environmental Monitoring and Control Program

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.4 (Environmental Monitoring and Control Program). Based on this review, the NRC staff has determined that Navy has provided sufficient information to allow the NRC staff to conclude that the Navy's radiation safety and health program during decommissioning will comply with 10 CFR Part 20.

## 10. Radioactive Waste Management Program

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.5 (Environmental Monitoring and Control Program). Based on this review, the NRC staff

has determined that Navy's program for the management of radioactive waste generated during decommissioning operations ensures that the waste will be managed in accordance with NRC requirements and in a manner that is protective of the public health and safety.

#### 11.0 Quality Assurance Program

The NRC staff has reviewed the Quality Assurance Program for the Facility according to the Consolidated Decommissioning Guidance, Volume 1, Revision 2, Section 17.6 (Quality Assurance Program). Based on this review, the NRC staff has determined that the Navy's QA program is sufficient to ensure that information submitted to support the decommissioning of the Facility should be of sufficient quality to allow the staff to determine if the Navy's planned decommissioning activities were conducted in accordance with NRC requirements.

#### 12.0 Facility Radiation Surveys

The NRC staff has reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 2, Revision 1, Section 4.2 (Scoping and Characterization Surveys). This review has determined that the radiological characterization of the Facility is adequate to permit planning for a remediation that will be effective and will not endanger the remediation workers, to demonstrate that it is unlikely that significant quantities of residual radioactivity have not gone undetected, and to provide information that will be used to design the final status survey.

The NRC staff also reviewed the information in the DP for the Facility according to the Consolidated Decommissioning Guidance, Volume 2, Revision 1, Section 4.4 (Final Status Survey Design). Based on this review, the NRC staff has determined that the Navy's final status survey design is adequate to demonstrate compliance with radiological criteria for permit termination.

#### 13.0 Financial Assurance

The NRC staff has reviewed the cost estimate for the Facility according to the Consolidated Decommissioning Guidance, Volume 3, Section 4.1 (Cost Estimate (As Contained in a Decommissioning Funding Plan or Decommissioning Plan)). Based on this review, the NRC staff has determined that the cost estimate submitted by the Navy adequately reflects the costs to carry out all required decommissioning activities prior to the permit amendment releasing Building 200, Bay 4 and adjacent outdoor areas for unrestricted use.

The NRC staff also reviewed the financial assurance mechanism for the Navy according to the Consolidated Decommissioning Guidance, Volume 3, Section 4.3 (Financial Assurance Mechanisms). Based on this review, the NRC staff has determined that the financial assurance mechanism submitted by the Navy is adequate to ensure that sufficient funds will be available to carry out all the required decommissioning activities prior to the permit amendment releasing Building 200, Bay 4 and adjacent outdoor areas for unrestricted use.