



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-4005

April 13, 2006

Ms. Charlotte Engstrom  
Vice President and General Counsel  
General Atomics  
P.O. Box 85608  
San Diego, California 92186-9784

SUBJECT: NRC INSPECTION REPORT 070-00734/06-001

Dear Ms. Engstrom:

This refers to the inspection conducted on March 13-17, 2006, at the General Atomics facility in San Diego, California. This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. A preliminary exit briefing was held with your staff at the conclusion of the onsite inspection. A final telephonic exit briefing was held with Ms. Laura Gonzales on April 10, 2006, following receipt of NRC's swipe and soil sample results on April 4, 2006. No violations were identified; therefore, no response to this letter is required.

The inspection included confirmatory surveys in Service Corridors B and C of the Laboratory Building 2 and the roof of Building 21. The surveys included measurement of ambient gamma exposure rates, measurement of fixed (total) contamination, and collection of swipe samples for measurement of removable contamination. All survey results were below the NRC-approved release criteria suggesting that the areas had been effectively remediated.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Mr. Robert Evans, Senior Health Physicist, at (817) 860-8234 or the undersigned at (817) 860-8191.

Sincerely,

/RA/

D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle & Decommissioning Branch

Docket No.: 070-00734  
License No.: SNM-696

General Atomics

-2-

Enclosure:  
NRC Inspection Report  
070-00734/06-001

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**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No.: 070-00734

License No.: SNM-696

Report No.: 070-00734/06-001

Licensee: General Atomics

Location: 3550 General Atomics Court  
San Diego, California 92121

Dates: March 13-17, 2006

Inspectors: Robert Evans, P.E., C.H.P., Senior Health Physicist  
Fuel Cycle & Decommissioning Branch  
  
Beth A. Schlapper, Health Physicist  
Fuel Cycle & Decommissioning Branch

Accompanied By: James L. Thompson, Health Physicist  
Nuclear Materials Inspection Branch

Approved by: D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle & Decommissioning Branch

Attachment: Supplemental Inspection Information

## **EXECUTIVE SUMMARY**

General Atomics  
NRC Inspection Report 070-00734/06-001

This routine, announced inspection focused on decommissioning activities including management organization and controls, radiation protection, emergency preparedness, maintenance and surveillance, environmental protection, and closeout inspection and survey. Overall, the licensee was conducting operations in accordance with the requirements of the license and the Site Decommissioning Plan.

### **Decommissioning Inspection Procedure for Materials Licensees**

- The licensee continued to maintain adequate control over the remaining radioactive material. Postings, security, and criticality controls were effectively implemented. Radiological survey results were consistent with area postings (Section 1).

### **Management Organization and Controls**

- The licensee's organization was consistent with the license and the NRC-approved Site Decommissioning Plan. Audits performed by the licensee were comprehensive and provided an appropriate review of the site radiological protection program. The training program for workers had been implemented in accordance with license requirements (Section 2).

### **Radiation Protection**

- The licensee's records indicated that no individual exceeded the regulatory limits for occupational exposures (Section 3).

### **Emergency Preparedness**

- The licensee had an emergency preparedness program, including fire protection, that met the commitments of the Radiological Contingency Plan (Section 4).

### **Maintenance and Surveillance Testing**

- The licensee had an effective program to assure that radiation survey instruments were operable and calibrated (Section 5).

### **Environmental Protection**

- The licensee implemented an environmental and effluent monitoring program as required by the license. All required samples were collected, and no regulatory limit was exceeded. The doses to members of the public were below regulatory and reportability limits (Section 6).

Closeout Inspection and Survey

- The inspectors conducted a confirmatory survey of Service Corridors B & C in Laboratory Building 2 and the roof of Building 21. The survey results were below the NRC-approved release criteria for fixed (total) and removable surface contamination and the licensee's release criteria for ambient gamma exposure rates. The results of the licensee's final status surveys and the NRC's confirmatory survey suggest that the licensee had effectively remediated Service Corridors B & C (Section 7).
- The inspectors conducted a confirmatory survey of the soil excavated during the subsurface remediation of Building 21. The confirmatory survey sample results were below the NRC-approved acceptance criteria for contamination in soil and the licensee's release criteria for ambient gamma exposure rates. The results of the confirmatory survey suggest that the soil could be released for unrestricted use (Section 7).

## **Report Details**

### **Summary of Plant Status**

At the time of the inspection, most areas of the site had been remediated and final surveyed. Limited decommissioning and decontamination activities were still in progress in the vicinity of the former research reactor building. The licensee continued to possess small quantities of special nuclear material (SNM). The licensee plans to transfer these materials to its State of California or NRC research reactor licenses in the near future. The licensee continued to possess additional SNM under its NRC research reactor licenses R-38 and R-67.

## **1      Decommissioning Inspection Procedure for Materials Licensees (87104, 84850, 84900, and 86740)**

### **1.1      Inspection Scope**

The inspectors reviewed facility operations to verify adherence to operational safety requirements as required by the license and site procedures. Within the area of transportation, the licensee had not shipped any radioactive material during 2005; therefore, this program area was not reviewed in detail during the inspection.

### **1.2      Observations and Findings**

A tour was conducted in the areas where the licensee continued to store the remaining SNM. The building was posted as a radiologically restricted area. Area fences, building door locks, and electronic security features were in place. Radiological postings were present in and around the building. The inspectors noted that the licensee continued to maintain seven criticality alarms in the building. The alarms were tested monthly. Alarm operability was confirmed during a recent internal audit, and the alarms appeared fully functional during the site tour.

The inspectors conducted independent radiological surveys during the tour using a Ludlum Model 19 microRoentgen survey meter (NRC No. 15518, calibration due 12/22/06). The exposure rates of the SNM in storage was consistent with the area radiological postings. The licensee maintained survey meters in the room, and meter calibrations were noted to be up to date.

### **1.3      Conclusions**

The licensee continued to maintain adequate control over the remaining radioactive material. Postings, security, and criticality controls were effectively implemented. Radiological survey results were consistent with area postings.

## **2 Management Organization and Controls (88005)**

### **2.1 Inspection Scope**

The inspectors reviewed organization and staffing changes, internal audits, safety committee activities, and quality assurance requirements.

### **2.2 Observations and Findings**

The current site organization was compared to Part II, Section 3, "Organization and Administrative Procedures," of the license and Sections 4.1 and 4.2 of the Site Decommissioning Plan. All management level positions were filled with qualified individuals. During the inspection period, a new corporate manager was being introduced to the licensee's staff. By letter dated March 29, 2005, the licensee formally notified the NRC of the change in vice presidents.

License Condition S-5 specifies the requirements for the Criticality and Radiation Safety Committee (CRSC). The inspectors reviewed the annual CRSC meeting minutes dated December 13, 2004. This meeting was held simultaneously with the Annual As Low As Reasonably Achievable (ALARA) meeting. In addition, the inspectors reviewed the CRSC audit report dated December 6, 2004. The annual audit was a compilation of individual audits for each major program area. Audits were reviewed and found to be comprehensive and detailed. The audits provided a thorough review of the implementation of the site radiological protection program. No adverse findings were identified in the annual audit. The corrective action plans for previous audits were well documented and were being tracked to completion. The inspectors determined that the CRSC continued to function as stipulated by the license.

License Condition S-7 requires that radiation safety training be given to all new employees; License Condition S-8 requires radiation safety and indoctrination training be conducted by the health physics manager or by a similarly qualified individual; and the Site Decommissioning Plan, Section 4.4, "Training," and Section 4.4.1, "Training/Retraining," requires training for all personnel working on decommissioning projects. The facility staff consisted of both permanent and contract workers. The inspectors examined the licensee's records to ensure that the training program had been implemented as required. Five sessions of General Employee Radiation Training and 11 sessions of Radiological Refresher Safety Training were presented to workers.

The licensee had training records on file for each worker. Selected training file records were reviewed for general employee radiological training, radiological worker initial and refresher training, and emergency response training. The training records included the person, date, type of training, test score, and the instructor. Based on observations of work performance by the inspectors, personnel appeared knowledgeable of their job functions and responsibilities.



### 2.3 Conclusions

The licensee's organization was consistent with the license and the NRC-approved Site Decommissioning Plan. Audits performed by the licensee were comprehensive and provided an appropriate review of the site radiological protection program. The training program had been implemented in accordance with license requirements.

## 3 **Radiation Protection (83822)**

### 3.1 Inspection Scope

The purpose of this portion of the inspection was to determine whether the licensee had implemented its radiation protection program in accordance with regulatory requirements and license conditions.

### 3.2 Observations and Findings

Occupational exposures were reviewed to ensure that no individual had exceeded the regulatory limits provided in 10 CFR Part 20. The licensee monitored individuals for external exposures only. Monitoring of internal exposures had been previously discontinued as allowed by 10 CFR 20.1502 because internal exposures were consistently below 10-percent of the applicable limits. The licensee's occupational exposure records for calendar year 2005 were reviewed. The highest exposure to an individual during calendar year 2005 was 90 mrem, an occupational dose well below the 5 rem per year total effective dose equivalent limit specified in 10 CFR 20.1201(a).

### 3.3 Conclusions

The licensee's records indicate that no individual exceeded the regulatory limits for occupational exposures.

## 4 **Emergency Preparedness and Fire Protection (88050, 88055)**

### 4.1 Inspection Scope

The licensee's emergency preparedness program, including the element of fire protection, was reviewed to determine if it was in agreement with license requirements.

### 4.2 Observations and Findings

License Condition S-23 requires the licensee to maintain and execute the response measures as described in the Emergency Plan. The licensee's Emergency Plan, also referred to as the Radiological Contingency Plan, was discussed with site health physics personnel to review response actions expected during an emergency. Site personnel were generally aware of their responsibilities if an emergency situation were to occur. In addition to personnel interviews, an inventory was performed of the licensee's emergency response equipment including the equipment stored in the emergency

response vehicle. All equipment described in the Radiological Contingency Plan was available and, as necessary, properly calibrated.

The licensee's fire protection program was also reviewed during the inspection. A random selection of fire extinguishers in the emergency response vehicle, as well as in areas potentially containing radioactive material, were inspected and found to be in proper working order. All fire extinguishers had been inspected by the Fire Marshall in February 2006 and are due for re-inspection in February 2007.

The Radiological Contingency Plan was revised during January 2005. The revision provided updated names, phone numbers, radiological materials storage areas, and present SNM storage locations. The radiological materials storage areas, including SNM storage locations, were verified during site tours.

#### 4.3 Conclusions

The licensee had an emergency preparedness program, including fire protection, that met the commitments of the Radiological Contingency Plan.

### 5 **Maintenance and Surveillance Testing (88025)**

#### 5.1 Inspection Scope

The licensee's method for controlling and testing radiation survey instruments was reviewed.

#### 5.2 Observations and Findings

Regulation 10 CFR 70.38(j)(2)(ii) states that a licensee is required to specify the survey instruments used as part of the final survey and to certify that each instrument is properly calibrated and tested. Personnel responsible for the use, testing and calibration of radiation survey instruments were interviewed. The inspectors also toured the calibration laboratory. All calibrations had been conducted using sources that were traceable to the National Institute for Standards and Technology.

The monthly list of instruments to be calibrated was reviewed. Most instruments were calibrated at 3- and 6-month intervals depending on frequency of use. Instruments observed in use at the facility appeared fully functional and were current in their calibration intervals. A selection of calibration records were reviewed. These records included the source standard information, calibration range, initial and final instrument readings, efficiency, instrument location, description and serial number. The inspectors also conducted a review of the Radiological Contingency Plan requirements, and instrumentation required by the Plan were accessible to health physics personnel and within calibration intervals.

### 5.3 Conclusions

The licensee had an effective program to assure that radiation survey instruments were operable and calibrated.

## 6 **Environmental Protection (88045)**

### 6.1 Inspection Scope

The licensee's environmental monitoring program was reviewed to determine compliance with the Site Decommissioning Plan and applicable regulations.

### 6.2 Observations and Findings

The environmental monitoring program currently consists of airborne effluent monitoring and sewage sampling. During 2005, airborne effluents were released from two NRC-licensed locations, the non-power reactor rooms and the health physics laboratory. Air samples were collected weekly and analyzed for gross alpha and beta activity as well as iodine and mixed fission products. The inspectors compared the air sample results to the licensee's alert (action) levels. No sample result exceeded the respective alpha, beta or gamma alert levels. The releases were reported to the NRC in semi-annual reports in accordance with the requirements of 10 CFR 70.59.

The licensee committed in Section 6.1 of the license application to estimate the dose due to airborne radioactive emissions to the closest member of the public. Doses greater than 10 millirems per year are reportable to the NRC in accordance with the requirements of 10 CFR 20.1101(d). The licensee conducted the assessment for 2004 during March 2005. Using the NRC-approved COMPLY computer code, the licensee estimated a fence-line dose of 0.037 millirems per year. This calculated dose was well below the reportability limit of 10 millirems per year. The 2005 dose assessment was in progress during the inspection.

The licensee also sampled effluent sewage daily from two locations for gross alpha and gross beta concentrations. No sample result exceeded the procedural alert (action) level of 100 picocuries per liter during 2005. The licensee continued to ensure that the monthly average concentration of liquid releases to sewers did not exceed the limits specified in 10 CFR 20.2003 and 10 CFR Part 20, Appendix B, Table 3.

### 6.3 Conclusions

The licensee implemented an environmental and effluent monitoring program as required by the license. All required samples were collected, and no regulatory limit was exceeded. The doses to members of the public were below regulatory and reportability limits.

## **7 Closeout Inspection and Survey (83890)**

### **7.1 Inspection Scope**

The purpose of this portion of the inspection was to verify if the site had been decontaminated to acceptable radiological levels for unrestricted use and to ensure that the final survey had been performed as approved in the Site Decommissioning Plan.

### **7.2 Observations and Findings**

#### **a. Service Corridors B & C**

A confirmatory survey was conducted in the interior of Service Corridors B & C in Laboratory Building 2 at the main General Atomics site. Building 2 is divided into three sections and has three service corridors. The service corridors contain the utilities and heating, ventilation and air conditioning needed to support the building laboratories. Service Corridor A was confirmatory surveyed by the NRC during the August 29-September 2, 2005, inspection (NRC Inspection Report 070-00734/05-002).

Decommissioning activities were conducted in Building 2 between 1994-2003. Equipment and areas that were decontaminated or disposed included ventilation systems, floor drains, and concrete walls. Contaminated equipment was disposed at an authorized low level radioactive waste disposal site in Nevada.

Service Corridors B & C were each approximately 8 feet wide and 315 (Corridor B) to 375 (Corridor C) feet long. Each corridor consisted of three levels, two readily accessible floor levels and an upper level crawl space. The majority of the upper level was occupied by piping, ventilation ducts, and electrical cables. In addition, there were a number of side rooms connected to the service corridor. The side rooms contained electrical distribution and air conditioning equipment, a maintenance workshop, and elevator machinery. The total floor space for Service Corridor B was about 11,130 ft<sup>2</sup>, while the total floor space for Service Corridor C was about 9,500 ft<sup>2</sup>.

As part of the final survey, the service corridors were divided into three radiological classifications: unaffected, non-suspect affected, and suspect affected. The licensee's minimum survey requirements varied depending on area classification. Most sections of Service Corridors B & C were confirmatory surveyed by the NRC with an emphasis on areas classified as suspect affected, with the exception of inaccessible portions of the upper level and the upper walls of the lower levels.

The inspectors conducted detailed confirmatory surveys which included ambient gamma radiation measurements, surface scans, fixed point measurements, and swipe sampling. The sample results were compared to the NRC-approved release criteria for surfaces as provided in Table 6-1, "Acceptable Surface Contamination Levels," of the Site Decommissioning Plan.

Ambient gamma radiation exposure rates were measured using a Ludlum Model 19 microRoentgen meter (NRC No. 015518, calibration due date of 12/22/06). The

inspectors conducted surface surveys for beta and alpha particle contamination on concrete and metal surfaces using two Eberline E600 survey meters (NRC No. 079977, calibration due date of 05/31/06, and NRC No. 063473, calibration due date of 07/20/06) with SHP380AB alpha-beta probes. The surface surveys included both scan and fixed point surveys. Scan surveys were conducted to locate areas of potential contamination, and fixed point measurements were collected for comparison to the release criteria limits. Swipe surveys were also collected at select locations for measurement of removable contamination. The survey meters were calibration checked by the licensee in the presence of the inspectors before and after the performance of the confirmatory survey.

Prior to conducting the confirmatory survey, the inspectors collected background measurements in Building 13 service corridor, an area that was unimpacted by previous operations using radioactive material. Background measurements were collected on cinder block, concrete, sheet metal, and floor grating surfaces. Depending on the surface, the ambient gamma exposure background measurements ranged from 14-20  $\mu\text{R/hr}$  for the Model 19 microRoentgen meter. The background alpha and beta contamination averaged 6.3 cpm alpha and 330 cpm beta for the Eberline E600 survey meters.

During the confirmatory survey, the inspectors conducted 109 ambient gamma exposure rate measurements for comparison to the licensee's final status survey release criteria limit of 10  $\mu\text{R/hr}$  above background. [The licensee did not propose an indoor exposure rate in its Site Decommissioning Plan; therefore, the NRC did not approve an indoor exposure rate.] The exposure rate measurements in Service Corridors B & C ranged from 5 - 24  $\mu\text{R/hr}$ . No location was measured with exposure rates greater than the licensee's indoor release criteria limit of 10  $\mu\text{R/hr}$  above background (14-20  $\mu\text{R/hr}$ ).

The inspectors conducted scan and fixed point measurements of floor and wall surfaces using the Eberline E600 survey meters. A total of 566 1-minute gross alpha and gross beta measurements were collected on wall and floor surfaces. The highest gross alpha measurement, 84 cpm (817 dpm/100  $\text{cm}^2$ ), was measured in Section C74-C75 of the lower level of Service Corridor C. The highest gross beta measurement, 755 cpm (4,933 dpm/100  $\text{cm}^2$ ), was measured in Section C64-C65 in the lower level of Service Corridor C.

The inspectors compared the fixed point sample results to the release criteria provided in Table 6-1, "Acceptable Surface Contamination Levels," of the Site Decommissioning Plan. Based on isotopic studies conducted by the licensee in 1999, the radionuclides of concern were uranium-235, uranium-238, and cesium-137. [The radionuclide cesium-137 is regulated by the State of California.] The applicable average surface contamination release limit for uranium-235 and uranium-238 is 5,000 dpm/100  $\text{cm}^2$  alpha, while the average surface contamination release limit for cesium-137 is 5,000 dpm/100  $\text{cm}^2$  beta-gamma. Neither the highest alpha sample result (817 dpm/100  $\text{cm}^2$ ) nor the highest beta contamination sample result (4,933 dpm/100  $\text{cm}^2$ ) exceeded the applicable limits.

During the confirmatory survey, 31 swipe samples were collected for measurement of gross alpha and beta contamination levels. The areas swiped were approximately

12-inches in length, an area equivalent to 100 cm<sup>2</sup>. The swipe samples were submitted to Oak Ridge Institute for Science and Education (ORISE) for analysis. All sample results were less than the instrument minimum detectable concentration of 8.9 disintegrations per minute per filter for alpha contamination and 15 disintegrations per minute per filter for beta contamination. The removable contamination limit for both alpha and beta contamination is 1,000 dpm/100 cm<sup>2</sup>. None of the removable contamination sample results exceeded the contamination limits.

Regulation 10 CFR 70.38(j)(2) states that as the final step in decommissioning, the licensee shall conduct a radiation survey of the premises where licensed activities were carried out and to submit a report of the results of this survey to the NRC. The licensee was in the process of preparing the final status survey report during the onsite inspection. The final status survey results were reviewed by the inspectors. In Service Corridors B and C, the licensee collected 866 fixed pointed surveys for beta contamination, 590 fixed point surveys for alpha contamination, 584 swipe samples, and 798 exposure rate measurements.

The highest beta contamination measurement obtained during the final status survey was 1,852 dpm/100 cm<sup>2</sup>, while the highest alpha contamination measurement was 533 dpm/100 cm<sup>2</sup>. The highest ambient gamma radiation measurement was 28 µR/hr. The highest beta contamination swipe sample result was 57 dpm/swipe, while the alpha contamination swipe sample results were below the minimum detectable activity level of the counting equipment. In summary, no sample obtained during the final status survey exceeded the applicable release limit.

As a quality control check, the licensee conducted confirmatory surveys that were independent of the final status surveys. No confirmatory sample result exceeded the approved release criteria. The licensee plans to submit its final status and confirmatory survey reports to the NRC in the near future for review and approval.

b Building 21 Roof

By letter dated February 6, 2006, the licensee requested unrestricted release of the non-reactor portion of the Building 21 roof. Attached to the letter was a final status survey for the 4,102 ft<sup>2</sup> roof area. The final status survey included ambient exposure rate measurements and collection of roofing gravel and tar samples for laboratory analysis. The inspectors conducted a confirmatory survey of the Building 21 roof during the inspection using both an exposure rate meter and a count rate meter.

Prior to conducting the inspection, background measurements were collected on the roof of Building 13, an area that was not impacted by previous operations involving radioactive material. The ambient gamma exposure rates were measured using a Ludlum Model 19 microRoentgen meter (NRC No. 015518, calibration due date of 12/22/06) collected at 1 meter from the roof surface. This survey meter was calibration checked by the licensee just prior to the confirmatory survey and was found to be functioning correctly. The ambient gamma exposure rates were also measured using a Ludlum Model 18 count rate meter (NRC No. 012778, calibration due date of 11/3/06) with a SPA-3 sodium iodide probe. The background measurements ranged from

8-11 R/hr for the Model 19 survey meter and 6,000-9,000 cpm for the Model 18 survey meter.

The inspectors conducted a confirmatory survey of portions of the Building 21 roof. The ambient gamma exposure rates ranged from 11-19  $\mu$ R/hr for the Model 19 survey meter and 8,000-16,000 cpm for the Model 18 survey meter. The highest measurements were collected over an area that housed radioactive SNM.

The inspectors compared the sample results to the licensee's acceptance criteria for ambient exposure rate of 10  $\mu$ R/hr above background. The maximum exposure rate (19  $\mu$ R/hr) was less than 10  $\mu$ R/hr above the average background measurement (9.5  $\mu$ R/hr), including the area that was impacted by SNM in storage in the building. Based on the measurements observed, the inspectors elected not to collect tar and gravel samples for analysis.

The licensee collected 137 exposure rate measurements and 27 tar and gravel samples. None of the exposure rate measurements exceeded the licensee's 10  $\mu$ R/hr above background acceptance criteria. Average SNM radionuclide concentrations in the gravel and tar samples were not discernable from normal background samples. Measurable amounts of cesium-137 and cobalt-60 were observed in some samples, but none of the sample results exceeded the respective release criteria limits. Based on these results, the roof did not require remediation by the licensee. Formal review and approval of the licensee's final status survey report will be documented under different NRC correspondence.

c Room 113 Subsurface Excavation

During the inspection, the licensee was actively remediating Building 21. Within the building, the licensee was excavating potentially contaminated soils from below the building foundation slab in Room 113. Some of the soil that was removed had been relocated outdoors to a nearby fenced storage area. A confirmatory survey was conducted on the soil pile because the licensee was interested in free-releasing the soil. The confirmatory survey included exposure rate measurements and collection of two soil samples.

The ambient gamma exposure rates were measured using a Ludlum Model 19 microRoentgen meter (NRC No. 015518, calibration due date of 12/22/06). This survey meter was calibration checked by the licensee just prior to the confirmatory survey and was found to be functioning correctly. The ambient gamma exposure rates were also measured using a Ludlum Model 18 count rate meter (NRC No. 012778, calibration due date of 11/3/06) with a SPA-3 sodium iodide probe. This count rate meter was used to identify elevated areas for soil sampling.

Prior to conducting the confirmatory survey, the inspectors collected background exposure rate measurements on soil surfaces in a previously unimpacted hillside location near Building 13. The background measurements ranged from 13-17  $\mu$ R/hr for the Model 19 microRoentgen meter and 10,000-12,000 cpm for the Model 18 survey meter.

During the confirmatory survey, the inspectors conducted ambient gamma exposure rate measurements using the Ludlum Model 19 survey meter for comparison to the licensee's acceptance criteria limit of 10  $\mu\text{R/hr}$  above background. The exposure rate measurements of the soil pile ranged from 12-17  $\mu\text{R/hr}$  at 1-meter above the ground. These measurements were comparable to background levels. No location was measured with exposure rates greater than the acceptance criteria limit of 10  $\mu\text{R/hr}$  above background.

Two soil samples were collected and split with the licensee. The inspectors observed the splitting process, the daily operational checks of instruments used to count the soil samples, and the counting of the two split samples. The NRC's samples were submitted to ORISE for analysis. Both sets of samples were analyzed by gamma spectroscopy. The sample results revealed measurable amounts of cesium-137, thorium, and uranium. None of the sample results were corrected for background values. The sample results, and associated acceptance criteria from Table 6-2 of the Site Decommissioning Plan, are provided below:

**Table 1: Cesium-137 Sample Results, in picocuries per gram (pCi/g)**

Sample ID	Cesium-137 (NRC)	Cesium-137 (General Atomics)	Release Criteria for Cesium-137
NRC - 1	$0.06 \pm 0.02$	$< 0.13$	15
NRC - 2	$0.06 \pm 0.03$	$< 0.13$	15

**Table 2: Total Thorium Sample Results (in pCi/g)**

Sample ID	Total Thorium* (NRC)	Total Thorium* (General Atomics)	Release Criteria for Thorium
NRC - 1	$1.71 \pm 0.17$	$2.20 \pm 0.51$	10
NRC - 2	$1.89 \pm 0.21$	$1.93 \pm 0.46$	10

\*Total thorium consists of the combination of thorium-228 by lead-212 and thorium-232 by actinium-228.

The release criteria specified in Table 6-2 of the Site Decommissioning Plan includes natural uranium, depleted uranium, and enriched uranium. The release criteria is 10, 35, and 30 pCi/g, respectively. Both ORISE and the licensee conducted gamma spectroscopy analyses to detect the uranium-238 and uranium-235 concentrations. The sample results were converted to a enriched uranium value for comparison to the 30-Ci/g release criteria, the most applicable of the three uranium release limits:



**Table 3: Enriched Uranium Sample Results (pCi/g)**

Sample ID	Enriched Uranium* (NRC)	Enriched Uranium* (General Atomics)	Release Criteria for Enriched Uranium
NRC - 1	4.79	1.82	30
NRC - 2	2.04	1.36	30

\*Enriched uranium is the sum of uranium-238 + uranium-235 + uranium-234 concentrations. Uranium-235 and uranium-238 concentrations were measured by ORISE and the licensee. Uranium-234 was calculated by multiplying the uranium-235 concentration by the standard ratio of 21.7. The method used to calculate enriched uranium activity was provided by ORISE and agreed with by the licensee.

In summary, all confirmatory soil sample results were below the respective NRC-approved acceptance criteria. In addition, the licensee's sample results were statistically comparable to ORISE's sample results.

### 7.3 Conclusions

The inspectors conducted a confirmatory survey of Service Corridors B & C in Laboratory Building 2 and the roof of Building 21. The survey results were below the NRC-approved release criteria for fixed (total) and removable surface contamination and the licensee's release criteria for ambient gamma exposure rates. The results of the licensee's final status surveys and the NRC's confirmatory survey suggest that the licensee had effectively remediated Service Corridors B & C.

The inspectors conducted a confirmatory survey of the soil excavated during the subsurface remediation of Building 21. The confirmatory survey sample results were below the NRC-approved acceptance criteria for contamination in soil and the licensee's release criteria for ambient gamma exposure rates. The results of the confirmatory survey suggest that the soil could be released for unrestricted use.

## 8 **Exit Meeting Summary**

The inspectors presented the inspection results to the licensee at the exit meeting on March 13, 2006. A final telephonic exit briefing was held with Ms. Laura Gonzales on April 10, 2006, following receipt of swipe and soil sample results on April 4, 2006. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

## **ATTACHMENT**

### **SUPPLEMENTAL INFORMATION**

#### **PARTIAL LIST OF PERSONS CONTACTED**

##### **Licensee**

K. Asmussen, Director, Licensing Safety and Nuclear Compliance  
L. Gonzales, Radiation Safety Officer/Health Physics Manager  
J. Greenwood, Decommissioning Project Manager  
W. LaBonte, Lead Health Physicist, Hot Cell Facility  
M. Monreal, Calibration Laboratory Coordinator  
I. Cruz, Health Physics Senior Scientist  
S. Cowan, Health Physics Technician  
R. Stowell, Senior Health Physicist, Bartlett

#### **INSPECTION PROCEDURES USED**

IP 87104	Decommissioning Inspection Procedure for Materials Licensees
IP 88005	Management Organization and Controls
IP 83822	Radiation Protection
IP 83890	Closeout Inspection and Survey
IP 88055	Fire Protection
IP 88025	Maintenance and Surveillance Testing
IP 84850	Radioactive Waste Management - Waste Generator Requirements
IP 84900	Low-Level Radioactive Waste Storage
IP 86740	Inspection of Transportation Activities
IP 88045	Environmental Protection
IP 88050	Emergency Preparedness

#### **ITEMS OPENED, CLOSED, AND DISCUSSED**

##### **Open**

None

##### **Closed**

None

##### **Discussed**

None

### **LIST OF ACRONYMS USED**

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
CRSC	Criticality and Radiation Safety Committee
cpm	counts per minute
dpm/100 cm <sup>2</sup>	disintegrations per minute per 100 square centimeters
ft <sup>2</sup>	square feet
μR/hr	microRoentgens per hour
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
SNM	special nuclear material