UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 E. LAMAR BLVD
ARLINGTON TX 76011-4511

November 24, 2015

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

SUBJECT: NRC INSPECTION REPORT 050-00089/15-001, 050-00163/15-001, AND 070-00734/15-001

Dear Ms. Engstrom:

This letter refers to the U.S. Nuclear Regulatory Commission (NRC) inspection conducted from September 8-9, 2015, at your General Atomics facility in San Diego, California. This inspection was an examination of activities conducted under your licenses as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your licenses. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel.

The inspection included a review of site decommissioning activities being conducted at the Mark F reactor facility. As part of the inspection effort, the NRC conducted a confirmatory analysis of six samples collected from the reactor pit floor. These samples were collected by your contractor, and the samples were analyzed at your onsite laboratory. The NRC elected to reanalyze six of the samples at our contract laboratory, Oak Ridge Associated Universities (ORAU). After receipt of the laboratory results from ORAU on October 15, 2015, the NRC inspectors presented the final inspection results to members of your staff by telephone on November 10, 2015.

The enclosed report presents the results of this inspection. In summary, the inspectors determined that you have been conducting site activities in accordance with license and regulatory requirements. No violations were identified, and no response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice and Procedure," a copy of this letter, its enclosure, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's electronic document system (ADAMS), accessible from the NRC's 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 Dr. Robert Evans, Senior Health Physicist, at 817-200-1234 or the undersigned at 817-200-1191.

Sincerely,

/RA/

Ray L. Kellar, P.E., Chief
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Docket: 050-00089, 050-00163, 070-00734
License: R-38, R-67, SNM-696

Enclosure:
NRC Inspection Report 050-00089/15-001,
050-00163/15-001, and 070-00734/15-001

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Letter to C. Engstrom from R. Kellar dated November 24, 2015.

SUBJECT: NRC INSPECTION REPORT 050-00089/15-001, 050-00163/15-001, AND 070-00734/15-001

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Dockets:	050-00089, 050-00163, and 070-00734
Licenses:	R-38, R-67, and SNM-696
Reports:	050-00089/15-001, 050-00163/15-001, and 070-00734/15-001
Licensee:	General Atomics
Facility:	Torrey Pines Mesa Site
Location:	3550 General Atomics Court San Diego, California 92121
Dates:	September 8-9, 2015
Inspectors:	Robert Evans, Ph.D., P.E., C.H.P., Senior Health Physicist Repository and Spent Fuel Safety Branch Division of Nuclear Materials Safety Marlayna G. Vaaler, Project Manager Reactor Decommissioning Branch Division of Decommissioning, Uranium Recovery, and Waste Programs Office of Nuclear Material Safety and Safeguards
Approved By:	Ray L. Kellar, P.E., Chief Repository and Spent Fuel Safety Branch Division of Nuclear Materials Safety
Attachment:	Supplemental Inspection Information

Enclosure

EXECUTIVE SUMMARY

General Atomics
NRC Inspection Report 050-00089/15-001, 050-00163/15-001, and 070-00734/15-001

This inspection was a routine, announced inspection of licensed activities being conducted at the General Atomics facility in San Diego, California. In summary, the licensee was conducting activities in accordance with license and regulatory requirements.

Management Organization and Controls

- The licensee maintained site staffing in accordance with license requirements, and sufficient staff was available for the work in progress. The licensee implemented its audit and review programs in accordance with license, policy, and procedure requirements. The individuals who conducted audits and reviews were found to be trained and qualified. The licensee submitted annual reports to the NRC that included the information required by the reactor licenses. The licensee continued to conduct and document maintenance and surveillance activities as required by the two reactor licenses. (Section 1.2.a)

Work Controls

- The inspectors reviewed two recent complex work activities involving the removal of the surface wall from the reactor pit and fuel transfer canal and collection of eight core samples from within the reactor pit. The licensee and its contractor developed detailed work plans, including health and safety controls. The licensee implemented the work in accordance with Decommissioning Plan and procedural requirements. (Section 1.2.b)

- The NRC independently reanalyzed six core samples, for comparison to the licensee's sample results and to determine the depth of the radioactive contamination. The split sample results indicate that the licensee's sample analysis program was conservative and relatively accurate for the analyzing equipment. The licensee plans to submit license amendment applications to the NRC in the near future, requesting acceptance criteria for surface and soil material located within the perimeter of the licensed boundaries. (Section 1.2.b)

Radiation Protection

- The licensee implemented its radiation protection program in accordance with license and regulatory requirements. The licensee monitored workers for occupational exposures, and no individual exceeded the regulatory limits. The licensee conducted both decommissioning-related and routine surveys in accordance with license requirements. The licensee's instrumentation program was found to be in compliance with site procedures. (Section 1.2.c)

Training

- The licensee implemented its general employee training and indoctrination program in accordance with the appropriate regulatory and license requirements to ensure personnel and facility safety. Training was updated as needed to reflect the current state of

decommissioning and site organization. Refresher training was provided at appropriate intervals. (Section 1.2.d)

Effluent Control and Environmental Monitoring

- The licensee implemented its effluent control and environmental monitoring programs in accordance with license and regulatory requirements. All required samples were collected, and no sample result exceeded any license or regulatory limit. (Section 1.2.e)

Solid Radioactive Waste Management and Transportation

- The licensee conducted transportation activities in accordance with Department of Transportation regulations. (Section 1.2.f)

Report Details

Summary of Plant Status

The licensee constructed the Mark I reactor in 1957 and began operating the reactor in May 1958. This reactor was originally licensed to operate at a power level of 10 kilowatts but was later upgraded to 250 kilowatts. The Mark I reactor was permanently shut down in 1997. The NRC amended the Mark I reactor License R-38 in October 1997 to a possession-only license.

The licensee constructed and began operating the Mark F reactor in 1960. This reactor was rated at 1,500 kilowatts of steady state thermal power. This reactor was permanently shut down in early 1995. In March 1995, the NRC revised the Mark F reactor License R-67 to a possession-only license.

The NRC revised these two licenses in August 1999, authorizing the licensee to decommission the reactor facility in accordance with instructions provided in a decommissioning plan dated July 1999 (ADAMS Accession No. ML13312A675, not publicly available). At the time of this inspection, the licensee continued to decommission the reactor facility in accordance with the NRC-approved decommissioning plan.

Since the previous inspection, conducted in October 2013 (ML13338A864), the licensee's contractor core-drilled through the Mark F reactor pit walls and floor to further delineate the depth and volume of contamination to be remediated. Eight core samples were collected. Sample results indicate that the walls and floor contain measurable quantities of cobalt-60, europium-152, and europium-154.

The licensee plans to collect approximately 12 more core samples in the near future within the Mark F reactor pit and canal. The licensee will use the information gained from the core sampling project to update its decommissioning schedule, previously submitted to the NRC by letter dated June 2, 2011 (ML11158A015).

The Mark I pit walls were previously determined to contain europium contamination. The licensee plans to remediate this contamination in conjunction with the remediation of the Mark F reactor pit.

In September 1996, the NRC amended special nuclear materials (SNM) License SNM-696 to authorize decommissioning activities only. By letter dated March 27, 1997, the NRC notified the licensee that it did not have to renew the SNM license since all licensed activities were associated with decommissioning, and ultimately, site release. In 2003, the licensed possession limit was lowered to less than critical mass quantities. License SNM-696 is currently a possession-only license.

During previous inspections, the NRC staff confirmed that all remaining SNM had been transferred from NRC License SNM-696 to the applicable State of California license (CAL 0145-37). At the time of this inspection, the licensee has not requested termination of the SNM license, and the licensee continued to consider its options for future work that may be conducted under this license.

1 Research and Test Reactor Decommissioning; Decommissioning Inspection Procedure for Materials Licensees (69013 and 87104)

1.1 Inspection Scope

The inspectors reviewed the licensee's control and oversight of site decommissioning activities.

1.2 Observations and Findings

a. Management Organization and Controls

The inspectors reviewed the licensee's organizational structure and staffing levels and compared the current organization to license requirements. The staffing requirements are presented in the technical specifications for the two reactor licenses as well as the quality assurance program document. In summary, the licensee's organizational structure was staffed in accordance with license and quality assurance program requirements, and the licensee had sufficient staff for the work in progress.

The inspectors reviewed the licensee's policies and procedures for internal audits and decommissioning safety reviews to verify compliance with license requirements, and to ensure that significant decommissioning activities were being independently and effectively reviewed. In addition, the inspectors reviewed the licensee's disposition of corrective actions to resolve deficiencies identified during audits. Furthermore, the inspectors discussed the implementation and effectiveness of the audit and review programs with licensee management and technical staff.

The inspectors reviewed a sample of Annual Criticality and Radiation Safety Working Group Audit Reports and As Low As Reasonably Achievable (ALARA) Reviews to evaluate compliance with the licensee's program and technical requirements. The inspectors verified that the licensee had prepared and approved plans that identified the audit scope, focus, and applicable criteria before the initiation of the audit activity. The inspectors confirmed that the audit reports contained a review of the relevant decommissioning activities and associated documentation. Specifically, the audits were used to verify program areas including the environmental program, sealed source leak tests, procedures, emergency response, calibration laboratory adequacy, external dosimetry, nuclear materials accountability program, and air sampling for occupational workers. For audits that resulted in findings, the inspectors verified that the licensee had established a plan for corrective action, the Criticality and Radiation Safety Working Group had reviewed and approved the corrective action, and the working group had verified its satisfactory completion including proper documentation.

Finally, the inspectors reviewed a sample of the training and qualification records for the licensee's auditors and members of the Criticality and Radiation Safety Working Group and confirmed that all personnel had completed the required training and maintained qualification and certification in accordance with policies and procedures. The inspectors verified that audit teams were sufficiently qualified to evaluate areas within the scope of the audit and that members of the Criticality and Radiation Safety Working Group had the necessary knowledge and experience in areas important to decommissioning. In summary, the licensee's Criticality and Radiation Safety Working Group implemented the audit, review, and oversight function in a timely, independent,

and appropriate manner, as required in the Decommissioning Plan, and the working group met the administrative requirements necessary to act as a decommissioning safety committee.

The inspectors also reviewed the status of the annual reports. Both reactor licenses require the licensee to submit annual reports to the NRC. The reports are supposed to summarize decommissioning activities, radiation safety results, and environmental monitoring results for the previous year. The inspectors reviewed the annual reports for 2013 and 2014, submitted to the NRC by letters dated March 4, 2014 (ML14073A171; ML14073A172), and March 17, 2015 (ML15273A059). The inspectors confirmed that the licensee submitted the reports to the NRC in a timely manner, and the reports included the information required by the two licenses.

The inspectors attempted to determine if the licensee conducted surveillance and maintenance activities for the Mark I and Mark F reactor facilities in accordance with the requirements outlined in the reactor licenses. The inspectors interviewed site staff and reviewed selected logs for daily, weekly, and monthly maintenance and surveillance. In summary, the inspectors noted that the licensee continued to perform maintenance and surveillance activities in accordance with license requirements.

b. Work Controls

The licensee is authorized to conduct decommissioning in accordance with the General Atomics TRIGA Reactor Facility Decommissioning Plan dated July 1999. The inspectors discussed the status of decommissioning with licensee representatives and toured the two reactors to observe the work that had been completed. In particular, the inspectors reviewed two work activities that were conducted in 2015 within the Mark F reactor pit and fuel storage canal. The first work activity involved the removal of the epoxy/gunite surfaces from the reactor pit and fuel storage canal, and the second work activity involved the collection of eight core samples from the walls and floor of the reactor pit.

During May 2013, the licensee collected 19 samples from five locations within the Mark F reactor pit and fuel storage canal. The licensee sampled the surface epoxy and gunite material, in an effort to determine the hazardous and radioactive material content of the surface walls at different locations. The sample results indicated that the epoxy and gunite wall layers contained lead, cadmium, cobalt-60, cesium-137, and europium-154 contamination. The combination of lead and cadmium with radioactive contamination suggested that some of these samples may be classified as mixed wastes for disposal purposes. In November 2013, the licensee collected more samples from the Mark F reactor pit area to further delineate the lead and cadmium contamination.

During 2014, the licensee prepared a work order for removal of the epoxy coating and a portion of the gunite surface from the walls and floor of the reactor pit and fuel storage canal. The epoxy/gunite removal work was conducted during April-May 2015. The inspectors reviewed the work packages for this work activity. These work plans included a waste minimization and packaging plan, ALARA plan, task instructions, and radiation work plan. These various documents included the methods necessary to monitor and control worker exposures to both hazardous and radioactive wastes.

The surface removal work resulted in about 75-cubic yards of waste material that had to be disposed. The wastes consisted of a combination of hazardous wastes regulated by

the U.S. Environmental Protection Agency and radioactive wastes regulated by the NRC. As noted earlier, the hazardous materials included cadmium and lead, while the radioactive materials included cobalt-60, cadmium-113, cesium-137, and europium-152. The licensee's contractor segregated the waste material, in accordance with instructions provided in the waste minimization and packaging plan, resulting in one drum of mixed wastes and nine drums of radioactive wastes. The drum containing the mixed wastes was classified, packaged, and shipped to a facility in Florida for processing in July 2015.

The inspectors discussed with site staff the contractor's handling and disposal of mixed wastes. The inspectors noted that the NRC-approved decommissioning plan does not address mixed wastes. However, the inspectors also noted that the decommissioning plan does not provide detailed work instructions for decommissioning. The various work plans provided the detailed instructions for removing, handling, and disposing of the mixed wastes. The inspectors noted that the work instructions included occupational safety controls. The implementation of the work instructions appear to have been effective because no individual received an uptake of either radioactive or hazardous material during the epoxy/gunite surface removal work.

After the surface removal work was completed in May 2015, the licensee's contractor collected core samples from eight locations within the Mark F reactor pit for further analysis. The results from these core samples would allow the licensee to further characterize the depth and type of contamination in the reactor pit walls and floor. The core drilling work was conducted in July-August 2015. The eight cores, four in the floor and four in the wall of the reactor pit, varied in depth based on the thickness of the floor or wall material. Each core boring consisted of a series of cylindrical-shaped plugs. The sampled material included gunite, steel, concrete, and soil.

The NRC elected to reanalyze samples collected from one of eight core holes, to independently ascertain whether the licensee had sufficiently analyzed the samples and to determine the depth of the contamination at that location. The split samples included four concrete samples, one metal sample, and one soil sample from a borehole in the northwest corner of the Mark F reactor pit floor (designated as Hole #1 by the licensee). The samples were submitted to the NRC's contract laboratory, Oak Ridge Associated Universities (ORAU), for independent analysis by gamma spectroscopy. The licensee analyzed its samples at its onsite laboratory. The NRC's contract laboratory submitted the sample results to the NRC by letter dated October 15, 2015 (ML1537A340). The sample results are presented in Table 1 below, in units of picocuries per gram (pCi/g):

Table 1: Spilt Sample Results

Sample Number, depth	Sample Type	Licensee's results, pCi/g		ORAU's results, pCi/g	
1-C-1 1 inch deep	Gunite/concrete	Co-60 Eu-152 Eu-154	1.5 ± 0.3 26 ± 3 1.3 ± 0.5	Co-60 Eu-152 Eu-154	1.048 ± 0.086 16.20 ± 0.90 0.62 ± 0.18
1-C-3 3 inches deep	Gunite/concrete	Co-60 Eu-152 Eu-154	0.6 ± 0.3 13 ± 3 ND	Co-60 Eu-152 Eu-154	0.569 ± 0.070 8.53 ± 0.51 0.28 ± 0.18
1-ST	Steel liner	Co-60	39 ± 3	Co-60	27.7 ± 1.6

3 to 4 inches deep		Eu-152 Eu-154	ND ND	Eu-152 Eu-154	0.05 ± 0.12 0.01 ± 0.27
1-BS-4 4 inches deep	Concrete bioshield	Co-60 Eu-152 Eu-154	1.0 ± 0.5 8 ± 3 ND	Co-60 Eu-152 Eu-154	0.76 ± 0.11 5.59 ± 0.41 0.42 ± 0.23
1-BS-6 6 inches deep	Concrete bioshield	Co-60 Eu-152 Eu-154	0.7 ± 0.3 7 ± 2 0.6 ± 0.4	Co-60 Eu-152 Eu-154	0.414 ± 0.053 5.19 ± 0.32 -0.02 ± 0.14
1-BS-Soil Underneath floor of reactor pit	Soil below floor	Co-60 Eu-152 Eu-154	ND ND ND	Co-60 Eu-152 Eu-154	0.099 ± 0.071 0.373 ± 0.092 -0.69 ± 0.31

Notes: ND-not detected; cesium-137 was not detected by either laboratory

The inspectors discussed the sample results with the licensee's staff. The inspectors noted that ORAU's sample results and associated uncertainties were slightly lower than the licensee's results. Although both the NRC and the licensee staff believe that the two sample sets were comparable, the licensee pointed out to the NRC staff that the differences could be attributed to ORAU's better counting geometry (the laboratory crushed the solid samples) and longer count times. Because the licensee's sample results were slightly higher, the licensee's remedial actions would most likely be conservative because it should remove more material from the walls and floor of the reactor pit based on these higher sample results.

At the time of the onsite inspection, the licensee did not have NRC-approved radiological release criteria for comparison to the sample results. The licensee plans to submit an application to the NRC for each reactor license to allow the use of the same soil, concrete, and asphalt rubble release criteria that were previously approved by the NRC for License SNM-696. Condition S-1 to License SNM-696 references the Site Decommissioning Plan dated October 11 and December 5, 1996 (this document is not in ADAMS). This NRC-approved document allows the licensee to free-release soil and concrete containing residual amounts of gamma-emitting radionuclides.

The following table provides the release criteria for the radionuclides of concern from the Site Decommissioning Plan, Table 6-2, Soil and Concrete/Asphalt Rubble Release Criteria, in units of pCi/g:

Table 2: Soil and Concrete/Asphalt Rubble Release Criteria

Radionuclide	**Release Criteria, pCi/g**
cobalt-60	8
cesium-137	15
europium-152	11
europium-154	10

The inspectors compared the sample results presented in Table 1 to the release criteria presented in Table 2. The data indicate, for this particular borehole location, that the

licensee will have to remediate the first 3 inches of gunite/concrete and the steel liner. The concrete bioshield and soil beneath the steel liner does not exceed the acceptance criteria and may not have to be remediated. In the near future, the licensee plans to drill 12 more holes into the walls and floor of the Mark F reactor pit to further delineate how much volumetric material will need to be remediated and whether structural supports are necessary during these decontamination efforts.

In summary, the inspectors confirmed that the licensee continued to conduct site decommissioning in accordance with the Decommissioning Plan dated July 1999. Based on all available information, the licensee and its contractors conducted the work safely and in accordance with procedural and work instruction requirements.

c. Radiation Protection

The inspectors reviewed the licensee's radiation protection program to verify compliance with 10 CFR Part 20 and license requirements. To begin with, the inspectors reviewed the licensee's occupational exposure records for 2013-2014 to ensure that no individual exceeded the limits specified in 10 CFR 20.1201. The licensee monitored workers for external exposures, not internal exposures. Based on the type of work being conducted, and the results of air sampling, the licensee suspended the internal exposure monitoring and bioassay programs as allowed by 10 CFR 20.1502.

The licensee monitored 40 workers for external radiation exposure who were authorized to work at the TRIGA reactor facilities in 2013. The licensee also monitored 32 workers in 2014. During the 2013-2014 time frame, the highest recorded annual dose for an employee was 0.014 rem, a small fraction of the 5-rem limit specified in 10 CFR 20.1201. Personnel doses were primarily the result of decommissioning-related activities being conducted within the Mark F reactor pit.

The inspectors reviewed the licensee's air sampling results. In particular, the inspectors reviewed the licensee's air sampling records for the epoxy/gunite surface material removal and surface core drilling work conducted within the Mark F reactor pit. The epoxy/gunite removal work was conducted in April-May 2015, while the core drilling work was conducted in July-August 2015. Both of these work activities had the potential to create airborne radiological hazards.

The licensee and its contractors conducted air sampling using one high-volume air sampler and several low-volume lapel air samplers. Within the building housing the Mark F reactor pit, the licensee also operated one continuous air monitor, two air samplers, and one ventilation exhaust sampler. The licensee issued powered air purifying respirators, with a protection factor of 1,000, to certain workers as an added precaution. With an action level of 30-percent of the derived air concentration limit, the highest alpha particulate sample result was approximately 10-percent of the limit. Based on these low sampling results, the inspectors agreed that the licensee did not have to report these results as occupational exposures.

The licensee also monitored worker exposure to cadmium and lead in air during the epoxy/gunite surface removal work. The sample results indicate that cadmium and lead occasionally exceeded the action level during the first week of the epoxy/gunite removal work. After removal of the surface material containing the lead and cadmium, the

potential for airborne hazardous material exposure to these hazardous materials decreased significantly.

The licensee and its contractor conducted routine radiological surveys during these two work activities to monitor for removable alpha and beta-gamma particulate contamination. No sample result exceeded the action level (50,000 disintegrations per minute per 100-square centimeters), suggesting that the licensee and its contractor were effectively controlling contamination. Further, the licensee conducted ambient gamma radiation level measurements in and around the Mark F reactor pit. The highest measurement in the pit was 1.3 millirems per hour with an action level of 10 millirems per hour.

During the epoxy/gunite surface removal work, the licensee and its contractor elected to use electronic dosimeters but subsequently discontinued use of these dosimeters due to low recorded doses. The maximum dose was 0.0022 rem per month with an annual limit of 5 rem. Based on these low measurements, the licensee discontinued the use of electronic dosimeters.

The inspectors reviewed the licensee's equipment release records. The licensee's records indicate that no equipment was released with contamination above the action levels.

In addition to radiological sampling to support decommissioning, the licensee's staff conducted routine sampling of areas containing radioactive material. The routine sampling included monthly swipe surveys for removable contamination and gamma radiation surveys for measuring ambient gamma radiation levels. The inspectors reviewed representative records of sampling conducted since the last inspection. No area within the building exceeded the action levels for removable contamination or ambient gamma radiation levels. The licensee also measured the gamma radiation levels in outdoor areas, and no location at the fence line of the reactor facility exceeded the action level of 2 millirems per hour.

The inspectors reviewed the licensee's maintenance and calibration of radiation detection instrumentation. The inspectors noted that instruments in use were calibrated and had been source checked as required. Also, instruments in use were capable of detecting radiation for the type and at the levels expected for the location of usage. The inspectors reviewed the licensee's records for air sampler calibrations, and the inspectors confirmed that the licensee continued to calibrate air samplers at regular intervals. In summary, the licensee's instrument calibration program was found to be in compliance with site procedures.

The inspectors conducted a site tour to observe the radiation protection controls in place at the time of the inspection. Specifically, the inspectors confirmed that:

- The radiation work permit process provided appropriate information, including recent dose and contamination survey data

- Restricted areas and radioactive materials were posted and labeled in accordance with 10 CFR Part 20, Subpart J requirements

- Access to radioactive materials and contaminated areas was controlled in accordance with 10 CFR Part 20, Subpart I requirements

- Individuals followed requirements of the applicable radiation work permit during the tour and surveyed hands and feet after completion of the tour

In summary, the inspectors concluded that the licensee implemented its radiation protection program in accordance with license and regulatory requirements.

d. Training

The inspectors reviewed the licensee's policies and procedures for training and qualification of personnel to verify that: (1) employee training incorporated the material specified in 10 CFR 19.12 through 19.16, Part 20, facility security requirements, and emergency preparedness actions, as applicable; (2) employee training was updated as needed to reflect the current state of decommissioning at the site; and (3) periodic refresher training was provided to key personnel. In addition, the inspectors discussed the training process with licensee's management and technical staff.

The inspectors verified that the licensee had established and implemented a training and qualification program for all personnel involved in decommissioning activities. Specifically, the Decommissioning Training Matrix showed that TRIGA reactor employee training was tracked and completed at the correct frequency. The training included annual training, work authorization and work permit review, and procedure or guidance update reviews as necessary. The training procedures specified that the extent of indoctrination and training will be commensurate with the scope, complexity, and importance of the activity and the education, experience, and proficiency of the person, and that personnel be indoctrinated and trained prior to assuming full, unsupervised responsibility for their job functions.

e. Effluent Control and Environmental Monitoring

The inspectors reviewed the effluent control and environmental monitoring programs to verify compliance with regulatory and license requirements. In accordance with the NRC-approved Decommissioning Plan, the licensee is required to sample reactor building ventilation system exhausts, environmental airborne effluents, and potentially contaminated liquids. The technical specifications for the two TRIGA reactors require the licensee to maintain records of gaseous and liquid radioactive effluents and offsite environmental monitoring surveys. The technical specifications also require the licensee to summarize the radioactive effluents released and describe any environmental surveys performed outside the facility in the annual reports. In accordance with 10 CFR 70.59, the licensee provided semi-annual effluent reports to the NRC and the State of California.

The licensee collected air samples at six environmental air samplers and from ventilation stacks of buildings containing radioactive material. The licensee collected liquid samples from site sewage for measurement of gross alpha and gross beta radioactivity concentrations. The licensee voluntarily monitored the ambient gamma radiation levels around the reactor facility using passive area dosimeters. The licensee also voluntarily conducted periodic radiation surveys around the perimeter of the reactor facility. The

licensee maintained, but did not operate, five emergency air samplers on the roof of the reactor facility and around the reactor facility perimeter.

The licensee presented the environmental sampling survey program requirements for 2013-2014 in the last two annual reports, submitted to the NRC by letters dated March 4, 2014 (ML14073A171; ML14073A172), and March 17, 2015 (ML15273A059). The inspectors also reviewed the licensee's sample results for the environmental and effluent monitoring program, as presented in the semi-annual effluent reports for 2014-2015 (ML15317A234, ML15069A370; ML15243A265). The inspectors reviewed the licensee's environmental sample results, reviewed the original documentation used in the development of the reports, and discussed the results of the program with licensee staff.

The licensee sampled the reactor facility gaseous effluents for mixed fission products and iodine. The licensee also monitored and reported the gaseous effluent sample results for three other onsite locations including the health physics laboratory room. No sample result exceeded the action levels specified in the applicable health physics procedure. The licensee's records indicate that it did not release radionuclides to the main site sanitary sewer system; thus, there were no sewer samples collected in 2014-2015. The licensee voluntarily monitored the ambient gamma radiation levels within and around the reactor facility using environmental dosimeters, and the licensee voluntarily conducted air sampling at six perimeter stations. The licensee did not present these voluntary sample results in the annual or semi-annual reports.

Based on all available information, the licensee conducted public dose assessments to ensure compliance with the 100-millirem per year dose limit for individual members of the public as specified in 10 CFR 20.1301(a). The licensee's records indicate that the estimated dose to any member of the public was less than 10 millirem for calendar year 2013, and the estimated public dose was 11 millirem for 2014. These calculated doses were less than the annual limit specified in regulations.

The inspectors discussed the environmental and effluent monitoring program requirements with the licensee. In particular, the inspectors discussed the sampling and reporting requirements specified in the two decommissioned reactor licenses and the SNM license. After the conclusion of the onsite inspection, the licensee conducted an audit of the environmental and effluent monitoring collection and reporting requirements as specified in the licensee's NRC and State of California licenses. The licensee concluded that it was implementing the programs as required by the three NRC licenses, and the results were being reported to the NRC in the semi-annual reports. In accordance with the two reactor licenses, in the future, the licensee plans to submit the required effluent and environmental monitoring information to the NRC in the annual reports.

f. Solid Radioactive Waste Management and Transportation

The inspectors reviewed the licensee's handling and shipment of radioactive wastes. Since the previous inspection, conducted in October 2013, the licensee made five separate shipments of wastes:

- Transfer of a sealed source containing curium-244 to a facility in Houston (May 2014)

- Shipment of container with sealed plutonium-239 source to a disposal site in Texas (August 2014)

- Shipment of lead bricks with low levels of cesium-137 contamination to Tennessee for processing and eventual disposal (November 2014)

- Shipment of spent ion exchange resin containing cobalt-60 and cesium-137 to a facility in Tennessee for incineration and shipment of lead/steel containing cobalt-60 contamination to the same facility for compaction (June 2015)

- Shipment of mixed wastes, dry active wastes, filters, and sealed sources to a facility in Tennessee for compaction, or Florida for processing, prior to eventual disposal (July 2015)

The inspectors reviewed the shipment documentation and interviewed staff responsible for the shipments. The inspectors concluded that the licensee conducted the shipments in accordance with Department of Transportation regulations.

1.3 Conclusions

The licensee maintained site staffing in accordance with license requirements, and sufficient staff was available for the work in progress. The licensee implemented its audit and review programs in accordance with license, policy, and procedure requirements. The individuals who conducted audits and reviews were found to be trained and qualified. The licensee submitted annual reports to the NRC that included the information required by the reactor licenses. The licensee continued to conduct and document maintenance and surveillance activities as required by the two reactor licenses.

The inspectors reviewed two recent complex work activities involving the removal of the surface wall from the reactor pit and fuel transfer canal and collection of eight core samples from within the reactor pit. The licensee and its contractor developed detailed work plans, including health and safety controls. The licensee implemented the work in accordance with Decommissioning Plan and procedural requirements.

The NRC independently reanalyzed six core samples, for comparison to the licensee's sample results and to determine the depth of the radioactive contamination. The split sample results indicate that the licensee's sample analysis program was conservative and relatively accurate for the analyzing equipment. The licensee plans to submit license amendment applications to the NRC in the near future, requesting acceptance criteria for surface and soil material located within the perimeter of the licensed boundaries.

The licensee implemented its radiation protection program in accordance with license and regulatory requirements. The licensee monitored workers for occupational exposures, and no individual exceeded the regulatory limits. The licensee conducted both decommissioning-related and routine surveys in accordance with license requirements. The licensee's instrumentation program was found to be in compliance with site procedures.

The licensee implemented its general employee training and indoctrination program in accordance with the appropriate regulatory and license requirements to ensure personnel and facility safety. Training was updated as needed to reflect the current state of decommissioning and site organization. Refresher training was provided at appropriate intervals.

The licensee implemented its effluent control and environmental monitoring programs in accordance with license and regulatory requirements. All required samples were collected, and no sample result exceeded any license or regulatory limit.

The licensee conducted transportation activities in accordance with Department of Transportation regulations.

2 Exit Meeting Summary

The inspectors presented the preliminary inspection results to the licensee's representatives at the conclusion of the onsite inspection on September 9, 2015. The inspectors presented the final inspection results by telephone on November 10, 2015, after receipt of soil sample results from the NRC's contract laboratory on October 15, 2015. The licensee did not identify as proprietary any information provided to or reviewed by the inspectors.

SUPPLEMENTAL INSPECTION INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

K. Asmussen, Director, Licensing, Safety and Nuclear Compliance
R. Chase, Vice President, Environmental Health, Safety and Security
L. Drees, Nuclear Engineer
J. Greenwood, Manager, TRIGA Reactors
P. Pater, Manager, Health Physics
J. Razvi, Chair, Compliance and Radiation Safety Committee

INSPECTION PROCEDURES USED

IP 69013	Status of Decommissioning
IP 87104	Decommissioning Inspection Procedure for Materials Licensees

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access & Management System
ALARA	As Low As Reasonably Achievable
CFR	*Code of Federal Regulations*
IP	Inspection Procedure
NRC	U.S. Nuclear Regulatory Commission
ORAU	Oak Ridge Associated Universities
pCi/g	picocuries per gram
SNM	special nuclear material