NIST
NRC License SNM – 362
Renewal
Application
2023

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LIST OF FIGURES AND TABLES

ENCLOSURES

List of Acronyms

ALARA	As Low As Reasonably Achievable
ARM	Area Radiation Monitor
BOCA	Building Officials and Codes Administrators
CAA	Controlled Access Area
CAAS	Criticality Accident Alarm System
CFR	Code of Federal Regulations
CSE	Criticality Safety Evaluation
CSO	Chief Safety Officer
DCE	Decommissioning Cost Estimate
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPM	Disintegration Per Minute
ESB	Emergency Safety Button
HEPA	High Efficiency Particulate Air
IAEA	International Atomic Energy Agency
ICA	Item Control Area
IRSC	Ionizing Radiation Safety Committee
LC	License Condition
LLEA	Local Law Enforcement Agency
LMO	Last Man Out button
LRA	License Renewal Application
LSS	Low Strategic Significance
MSS	Moderate Strategic Significance
NCNR	NIST Center for Neutron Research
NCS	Nuclear Criticality Safety
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NMAA	Nuclear Material Accountability Assistant
NMMSS	Nuclear Materials Management Safeguards System
NRC	U.S. Nuclear Regulatory Commission
NUREG	NRC Nuclear Regulatory Guidance
NVLAP	National Voluntary Laboratory Accreditation Program
OIC	Officer-in-Command
OSHA	Occupational Safety & Health Administration
OSHE	Office of Safety Health and Environment
OUO-SRI	Official Use Only – Security Related Information
PSG	Police Services Group
RAM	Radioactive Material
RRPT	Registered Radiation Protection Technologist
RSD	Gaithersburg Radiation Safety Division
RSI	Request for Supplemental Information
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
SNM	Special Nuclear Material
SSD	Sealed Source Device

TEDE	Total Effective Dose Equivalent
TL	Tower light
TR-5	NCNR NRC Test Reactor License

1. GENERAL INFORMATION

Applicants Name and Contact Information

The federal agency is the U.S. Department of Commerce, National Institute of Standards and Technology (NIST). All inquiries regarding this application should be directed to the NIST Gaithersburg Radiation Safety Officer (RSO):

National Institute of Standards and Technology
Attn: Manuel Mejias, Registered Radiation Protection Technologist (RRPT)
Radiation Safety Officer
100 Bureau Drive, Mail Stop 1731
Gaithersburg, MD 20899-1731
(301) 975-5022

1.1. Location and Address of Material Use

National Institute of Standards and Technology
100 Bureau Drive
Gaithersburg, MD 20899

Any location on the NIST Gaithersburg campus may be approved by the Radiation Safety Division (RSD) and the Ionizing Radiation Safety Committee (IRSC) for the use, possession, and/or storage of radioactive material (RAM). Such approval shall be based on the hazard assessment described in Section 2.3.4 of this application. Buildings 235 and 245 are the primary buildings where RAM is used, possessed, stored, and/or consolidated for radioactive waste shipments.

Building 235 houses Radiation Facilities (primarily RAM laboratories) and the NIST Center for Neutron Research (NCNR), a research reactor facility operated under the Test Reactor License (TR-5) license issued by the U.S. Nuclear Regulatory Commission (NRC). Building 245 houses Radiation Facilities as described in Section 2.3.

1.2. Activities for which the Material Is Requested

NIST's primary mission is as a measurement science, standards, and technology laboratory. This license authorizes use of radiation sources for research and development, calibration and testing, and training activities. Authorized uses are primarily activities associated with the development and maintenance of radiation measurement standards, radioactivity assessment, the provision of radiation measurement services, and the study of radiation interactions and processes in materials. Activities involving the 10 Code of Federal Regulations (CFR) Part 36 program are detailed in Enclosure 3.

There shall be no authorizations for intentional administration of radiopharmaceuticals or intentional direct exposures of human or live animal subjects, i.e., no medical 10 CFR 35 or veterinary use. This condition does not in any way modify or limit the ability of NIST

staff to consensually monitor and track any individuals who have received uptakes or medical administrations under other licenses.

1.3. Period of Time for which the License Is Requested

This license is requested for a period of ten (10) years following from the date of acceptance by NRC of this license renewal application.

1.4. Radioactive Material for which the License is Requested

Refer to Enclosure 4.

1.5. Facility Description and Process Overview

Section 2.3 describes the equipment and facilities which will be utilized to protect health and minimize danger to life or property.

1.6. Organization and Administration

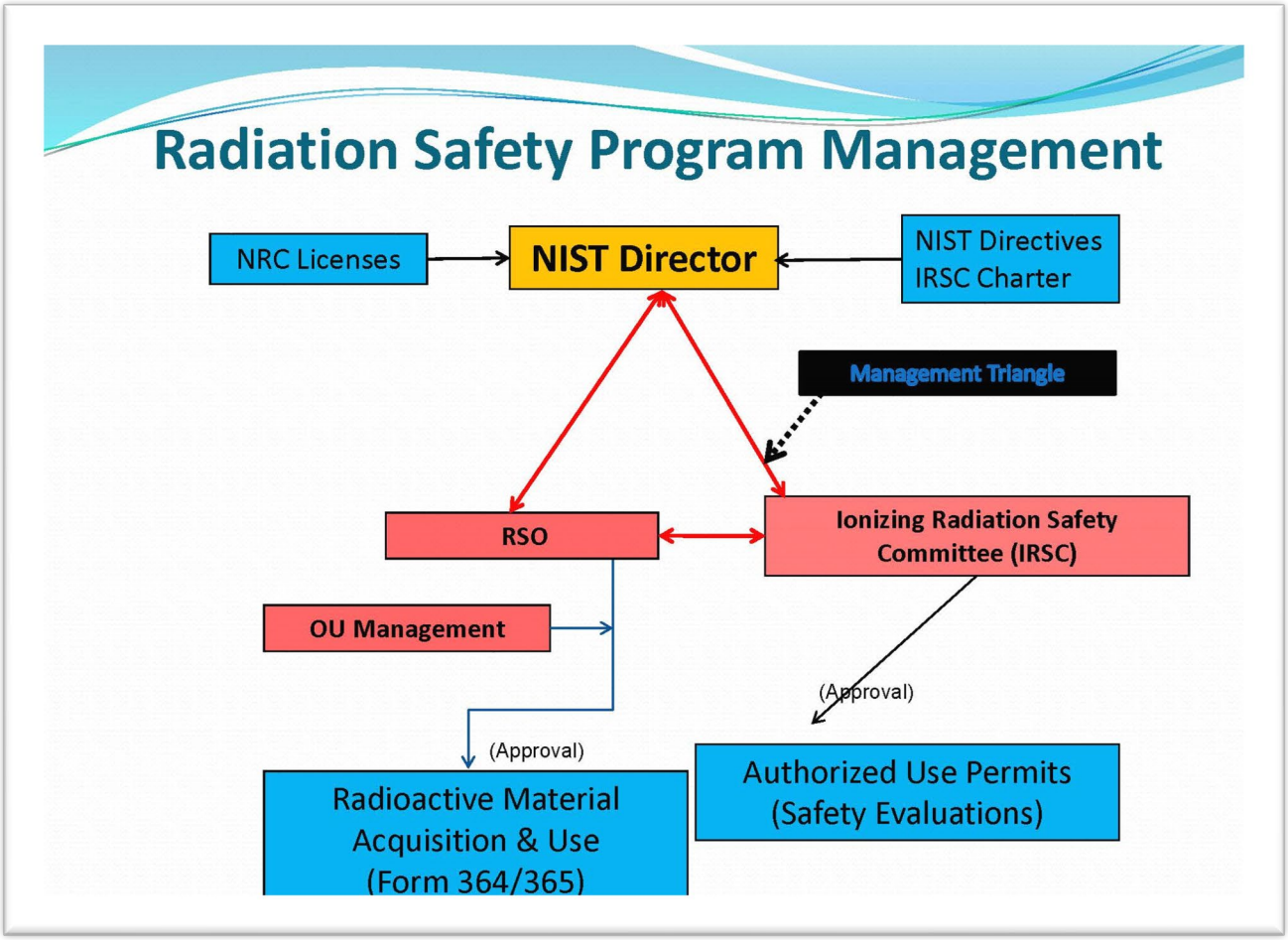

Figure 1. Radiation Safety Management

1.6.1. Executive Management

The NIST Director has the ultimate responsibility for ensuring the establishment and maintenance the ionizing radiation safety program at NIST and provides executive leadership on issues involving compliance with regulatory requirements and the conditions of the license.

The NIST Director is responsible for:

1) Ensuring the establishment and maintenance of an effective ionizing radiation safety program;

2) Appointing members of the IRSC, subject to NRC license requirements;

3) Providing direction to the Chief Safety Officer (CSO) and IRSC, as necessary;

4) Providing executive leadership on issues involving the status of the Gaithersburg site with regard to worker safety, regulatory compliance, and environmental impacts; and

5) Reviewing IRSC recommendations and directing action on those recommendations as necessary to ensure radiation safety and regulatory compliance.

1.6.2. NIST CSO

1) Serving as Executive Management representative on the IRSC.

2) Overseeing the establishment, implementation, and maintenance of ionizing radiation safety program at NIST supporting the SNM-362 NRC license;

3) Submitting applications for renewals of and amendments to NRC License Number SNM-362 pursuant to IRSC review and approval; and

4) Reviewing audits and annual reviews of the SNM-362 NRC license.

1.6.3. Ionizing Radiation Safety Committee

1.6.3.1. Duties and Responsibilities

The IRSC is responsible for the oversight of the operations and activities of NIST's ionizing radiation safety programs except for those operations and activities conducted under the NRC TR-5.

Duties include but are not limited to:

1) Providing the RSO and the NIST Director with independent advice and oversight for the ionizing radiation safety program at NIST Gaithersburg;

2) Approving or rejecting requests for individuals to serve as Source Custodians and Source Users;

3) Approving or rejecting requests for use (and changes in use) of RAM specified in Safety Evaluations which include safe use protocols, emergency response, list of approved Source Users, Source Custodians, and use and storage locations (i.e., Radiation Facilities); and

4) Reviewing and approving or rejecting proposed NRC license SNM-362 amendments.

1.6.3.2. IRSC Membership and Organization

The Director of NIST shall appoint the IRSC Chair and Vice Chair for indefinite terms at their discretion. Members of RSD staff shall not serve as Chair. The Director of NIST shall appoint all members and their designated alternates to the committee for an indefinite term to be served at the Director's discretion. Members and alternates shall be selected on their ability to provide independent judgment and to ensure that the IRSC as a whole has a broad spectrum of expertise in the use of ionizing radiation sources.

The IRSC shall comprise a minimum of five (5) appointed members or their designated alternates and four (4) positions voting ex officio members:

1) CSO;

2) Director, NCNR;

3) Chief, Radiation Physics Division, Physical Measurement Laboratory; and

4) RSO.

The NIST Director may appoint additional members and alternates at the recommendation of, or in consultation with, the IRSC Chair, based on subject matter expertise needed for broad representation of the kinds of ionizing radiation research performed at NIST.

Members with full voting rights must be NIST employees. Members of the IRSC shall have, at a minimum, a Bachelor of Science degree or equivalent professional training in their respective fields of expertise, and at least two years of relevant experience.

The committee may invite other NIST employees or associates to participate in committee discussions and subcommittee work, but only as non-voting members. The Chair may also invite additional “non-voting” representatives of various stakeholders to participate in committee discussions.

A quorum shall consist of the Chair and Vice Chair, the NIST RSO, and one-half of the remaining assigned members of the committee or their authorized alternates. In the case of the absence of a member and the member’s alternate, the member may elect to authorize another member of the committee to vote for them in proxy, thereby satisfying the quorum requirements.

The IRSC shall meet the requirements of 10 CFR 33.13(c) including the review, approval, and recording of safety evaluations of all proposed new uses of byproduct material prior to use of the byproduct material. The IRSC shall have a procedure to assess and authorize new users.

1.6.3.3. License Flexibility

The RSO together with the IRSC may approve or reject proposed program changes and revisions to procedures previously approved by the NRC, without amendment of the license, in the areas listed below, provided that the changes are in accordance with regulatory requirements, will not change license conditions, and will not decrease the effectiveness of the program. Any such changes or revisions shall be documented and shall state the reason for the change and summarize the radiation safety matters that were considered prior to approval of the change.

The IRSC shall review and approve any major program and procedural changes proposed under license flexibility and will audit operations to verify adequacy of implementation and to audit compliance. The IRSC shall also ensure that appropriate actions are taken when noncompliance is identified, including analysis of the cause(s), and development and implementation of corrective actions to prevent recurrence.

1) Training Program for Individuals Working in or Frequenting Restricted Areas (US Nuclear Regulatory Commission Regulation (NUREG)-1556, Volume 11 rev 1, Section 8.8)

2) Audit and Review of Program (NUREG-1556, Volume. 11 rev 1, Section 8.10.1)

3) Radiation Monitoring Instruments (NUREG-1556, Volume. 11 rev 1, Section 8.10.2)

4) Material Receipt and Accountability (NUREG-1556, Volume. 11 rev 1, Section 8.10.3)

5) Occupational Dose (NUREG-1556, Volume. 11 rev 1, Section 8.10.4)

6) Safe Use of Radionuclides and Emergency Procedures (NUREG-1556, Volume. 11 rev 1, Section 8.10.6)

7) Surveys and Leak Tests (NUREG-1556, Volume. 11 rev 1, Section 8.10.7)

Review of the NIST-Gaithersburg Radiation Safety program content and implementation annually to evaluate the effectiveness of the program. The review may be performed by individuals internal or external to NIST, as designated and approved by the IRSC.

2. RADIATION PROTECTION

2.1. Organizational and Personnel Qualifications

This section is intended to provide the technical qualifications for key staff members and managers. Sufficient description is provided to convey training and experience, as well as organizational relationships among the positions of the staff. This also includes administrative procedures and management policies and qualifications of key personnel and how these will provide reasonable assurance that the health, safety, and environmental functions will be effective.

2.1.1. Organizational Management

As discussed in Section 1.7.1, the NIST Director (who also serves as the Under Secretary of Commerce for Standards and Technology and reports to the Secretary of Commerce) has the ultimate responsibility for ensuring the establishment and maintenance of the ionizing radiation safety program at NIST and provides executive leadership on issues involving compliance with regulatory requirements and the conditions of the license.

Description of the organizational structure as it applies to the radiation protection program is provided in Section 1.7. Qualifications of the CSO and IRSC members are provided in Sections 1.7.2 and 1.7.3.2, respectively.

2.1.2. Radiation Safety Officer

The NIST RSO for the SNM-362 NRC license is Manuel Mejias. Mr. Mejias was approved as the NIST RSO by the NRC in Amendment 8 of the SNM-362 NRC license on 5/12/2017 (ML17109A118) and Amendment 11 (ML21126A114) with the commissioning of the new Part 36 Irradiator Facility.

The NIST Gaithersburg RSO must have the following qualifications and training:

1) At a minimum, a college degree at the bachelor level or equivalent training and experience in physical, chemical, biological sciences, or engineering;

2) Training and experience commensurate with the types, forms, and quantities of RAM authorized on the license;

3) Training and experience sufficient to identify and control anticipated radiation hazards associated with the use, in research and development, of RAM authorized on the license; and

4) Experience in applying knowledge of the regulatory requirements applicable to licensed activities.

When a decision is made regarding a change in RSO, NIST shall provide the NRC:

1) A description of the training and experience for the proposed RSO that demonstrates that the individual is qualified to perform the duties required under the license; and

2) A RSO Delegation of Authority signed by the licensee's executive management.

The RSO shall, in coordination with executive management and the IRSC, serve as the SNM-362 NRC license manager and as the point of contact with the NRC. The RSO is responsible for managing the radiation safety program and all aspects of the utilization of ionizing radiation sources.

The RSO, or designee, has the authority (Enclosure 5), as delegated by the NIST Director, necessary to meet their responsibilities and to immediately stop any operations that may:

1) Compromise the health or safety of NIST employees and non-NIST personnel;

2) Have an adverse impact on the environment or public; or

3) Result in non-compliance with NRC, State, or local requirements.

The RSO responsibilities include:

1) Establishing and maintaining an effective radiation safety program that allows for the safe and regulatorily compliant use of ionizing radiation sources in a manner that conforms with As Low As Reasonably Achievable (ALARA) principles and applicable Federal, State, and local regulations and NIST policy;

2) Establishing and maintaining a system for hazard analysis, mitigation planning, and emergency response planning integrated into ionizing radiation source use protocols and Radiation Facility authorizations;

3) Performing, or designating a member of RSD to perform, hazard assessments on requests for the acquisition and use, or for changes in use, of RAM; transmitting requests that present a significant level of risk, e.g., a potential for adverse safety and health or regulatory compliance issues to the IRSC for review;

4) Providing advice and assistance on radiological safety matters to individuals whose assigned duties involve the use of or exposure to ionizing radiation sources and working closely with the IRSC and NIST executive management in implementing the radiation safety program;

5) Identifying radiation safety issues and initiating, recommending, providing, and verifying implementation of corrective actions;

6) Assisting the IRSC in the performance of its duties, including providing timely information to the IRSC on issues and incidents with potentially significant adverse impact on radiation safety or regulatory compliance;

7) Documenting and reporting metrics indicating the status of the radiation safety program to the IRSC, NIST management, and regulators as required;

8) Establishing and updating guidance, procedures, instructions, and other requirements to promote radiation safety and regulatory compliance;

9) Maintaining records of source acquisition, utilization, transfers, and disposal;

10) Maintaining written records documenting IRSC activities; and

11) Developing and implementing a program for the protection of RAM.

2.1.3. Authorized Users

Source Custodians and Source Users (equivalent to Authorized Users in other broad scope licenses) are individuals whose primary responsibility is to ensure that RAM is used safely and in accordance with regulatory requirements. These individuals must receive instruction commensurate with their duties and responsibilities which is described in applicable parts of Section 2.1.4.

A Source Custodian is an individual whose training and experience has been reviewed and approved by the IRSC to be responsible for the primary control and accountability of RAM.

Source Custodian responsibilities, with respect to material accountability include:

1) Coordinating with RSD any transfers of custodianship, changes in utilization, shipments of sources to off-site entities, or disposal of waste;

2) Maintaining source inventory records of utilization, transfer, and disposal; and

3) Performing physical inventory verifications and reconciling documentary records as necessary.

A Source User is an individual whose training and experience has been reviewed and approved by the IRSC to materially control, use, or otherwise manipulate RAM. With respect to material accountability, their responsibilities include using only RAM for which they are approved according to the current utilization approvals.

Pursuant to 10 CFR 33.17(b), the material possessed by NIST may only be used by, or under the direct supervision of, individuals approved by the IRSC (Source Users and Source Custodians).

2.1.4. Radiation Safety Training

NIST requires appropriate training be provided to all individuals who are likely to receive more than 100 millirem (mrem) of occupational exposures in a year (i.e., source users, sources custodians, and ancillary workers). This training shall be done in accordance with 10 CFR 19.12. The training shall be commensurate with their duties, responsibilities, and access to sources of ionizing radiation prior to receiving approval to work independently with RAM or other sources of ionizing radiation.

Such individuals shall receive training in topics such as those listed below. The extent of these instructions shall be commensurate with the potential radiological health protection issues associated with the specific workplaces and personnel duties involved.

1) Types of ionizing radiation sources and emissions;

2) Biological risks associated with exposure to RAM or sources of ionizing radiation;

3) ALARA principles, tools, and practices to minimize exposure, including time, distance, shielding, and contamination control;

4) Purposes, functions, and uses of protective devices, including engineered facilities and equipment (e.g., ventilation controls, shielding, interlocks, area radiation monitors, personnel contamination monitors), and personal protective equipment;

5) Basic radiation and contamination monitoring equipment and practices;

6) Procedures and requirements for control, security, storage, transfer, disposal, and use of RAM at their workplaces;

7) Agency and other rules and regulations and conditions of licenses, and responsibilities for observing and complying with these to the extent under the worker's control;

8) Duties and responsibilities of management (e.g., Group Leaders and Division Chiefs), Source Custodians, Source Users, and RSD staff;

9) Requirements for reporting to supervisors and the RSO any condition that may lead to or cause a violation of the rules, regulations, or conditions of licenses or an unnecessary exposure to radiation or RAM;

10) Reporting rights and responsibilities per 10 CFR 19 – NRC Form 3: Notice to Employees;

11) Appropriate responses to warnings given in the event of any unusual occurrence or malfunction that may result in or involve excessive radiation or RAM exposure;

12) Fire and other non-radiological safety and emergency response procedures, including emergency reporting, egress, and personnel accountability;

13) Principles and practices of personnel dosimetry, including the availability of radiation exposure reports; and

14) Hands-on use of RAM.

RSD review of an individual's prior work experience and training in radiological safety may show that previous training or experience can be substituted for parts of the fundamental physics aspects of the training described above. Evaluation of an individual's understanding shall be by methods such as direct testing of knowledge, performance observations, personal interviews, prior work experience, and dosimetry reviews. RSD shall maintain documentation of the training program records. All individuals authorized to work independently with licensed RAM shall receive refresher training biennially; and irradiator workers (Part 36) receive facility specific annual refresher training.

2.1.4.1. Transportation Training

All individuals whose normal duties may include packaging, labeling, and manifests of sources for shipment regulated by U.S. Department of Transportation (DOT) shall receive appropriate biennial training. The shipping and receiving training material is developed to satisfy the requirements of 49 CFR 171-173, and Parts 20, 71, and 73 of Title 10 of the CFR.

2.1.4.2. Security Training

Training requirements for individuals who need unescorted access to category 1 and 2 materials or SNM-Low Strategic Significance (LSS), access to security related information, individuals who are program implementers, Police Services Group (PSG) and Dispatchers, and Reviewing Officials maintain compliance with the requirements specified in 10 CFR part 37.43(c) and Part 73. The content and scope of training specifically reflects the duties and responsibilities of the trainee.

Refresher training to those individuals implementing and participating in the Part 37 security program or Part 73 licensed activities is provided annually, or at an earlier time when significant changes have been made to the security program.

The training for the protection of RAM covers the requirements of Parts 20, 37, and 73. Training content varies based upon the job requirements of the audience. This shall include but is not limited to:

1) Federal and NIST security requirements;

2) NIST's security procedures and SNM-362 NRC license Security Plan to secure RAM Security Zones and the general purposes and functions of the security measures employed;

3) The responsibility to report promptly to the RSO, their line management and security any condition that causes or may cause a violation of NRC requirements or security policies (e.g., escorting);

4) The responsibility to report promptly to Office of Security (OSY) PSG any actual or attempted theft, sabotage, or diversion of category 1 or category 2 quantities of RAM or SNM-LSS, or suspicious activities;

5) Incident and emergency response procedures for RAM Security Zones including, but not limited to, the appropriate response to security alarms: and

6) NIST Initial Part 37 Information Protection Training.

2.1.4.3. Part 36 Training

All individuals approved to work with irradiators (meeting 10 CFR 36 criteria) shall receive facility specific training annually. Training activities involving the 10 CFR Part 36 program are detailed in Enclosure 3 of this license renewal application (LRA).

2.2. Radiation Protection Program

For activities conducted under this license, the following time interval definitions apply:

1) Biennially: at least once every two (2) years with an interval not to exceed two (2) and one-half (1/2) years.

2) Annually: at least once each year with an interval not to exceed fifteen (15) months.

3) Semiannually: at least two (2) times per year with an interval not to exceed seven (7) and one-half (1/2) months.

4) Quarterly: at least four (4) times per year with an interval not to exceed four (4) months.

5) Monthly: at least eleven (11) times per year with an interval not to exceed six (6) weeks.

6) Weekly: at least fifty-five (51) times per year with an interval not to exceed fourteen (14) days.

7) Daily: One time during each working day (does not include Federal holidays or weekends or times when the facility is closed).

2.2.1. ALARA Program

It is NIST policy and practice to maintain doses to individuals ALARA commensurate with the beneficial application of ionizing radiation technologies.

All radiological activities conducted under the SNM-362 NRC license undergo assessment by the RSD staff to evaluate key ALARA concepts such as time, distance, and shielding. NIST, to the extent practical, uses procedures and engineering controls to achieve occupational doses and doses to the members of the public that are ALARA. All individuals likely to exceed ten (10) percent of the applicable occupational exposure limits shall have their dose monitored. Dosimetry results shall be reviewed by RSD as part of the ALARA program. The IRSC will monitor and report ALARA status as part of the annual report to the NIST Director. The RSO will have primary responsibility to ensure ALARA practices are incorporated into all safety evaluations.

2.2.2. Occupational Dose

NIST shall maintain, for inspection by the NRC, documentation demonstrating that unmonitored individuals are not likely to receive a radiation dose in excess of the limits in 10 CFR 20.1502. Results exceeding 100 mrem in a year are reported to the monitored individual(s).

2.2.2.1. External Dose Monitoring:

RSD shall comply with 10 CFR 20.1502(a).

RSD shall conduct a personnel external dosimetry program, using devices requiring processing and meeting quality assurance criteria as required by 10 CFR 20.1501, Subpart F, Surveys and Monitoring; personnel dosimetry from a provider that is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP Accreditation).

In addition to the dosimetry processed by a NVLAP accredited laboratory, where applicable, secondary direct reading dosimetry may be used for operations likely to exceed ten (10) percent of the limits and where direct or immediate monitoring results may aid in maintaining doses ALARA.

Dosimeters shall be processed and reviewed quarterly. Any result greater than ten (10) percent of the regulatory limit shall be reviewed by RSD and the IRSC and reported to appropriate NIST management.

2.2.2.2. Internal Dose Monitoring:

RSD shall comply with 10 CFR 20.1502(b).

Analysis of significant positive bioassay results shall be used to assign values to the individual’s dose of record. Any result greater than ten (10) percent of the regulatory limit shall be reviewed by RSD and the IRSC and reported to appropriate NIST management.

2.2.2.3. Direct or Area Monitoring:

In lieu of specific personnel dosimetry (external or internal), direct area monitoring, sampling, or source term analysis may be performed and combined with occupancy, time and motion, or similar calculation-based methods to assign the dose of record.

2.2.2.4. Personnel Contamination Monitoring:

Personnel contamination monitoring shall be performed as indicated in the hazard analysis associated with a source specific protocol and when exiting contamination control zones. Any detectable skin contamination shall require initiation of decontamination procedures. Personnel decontamination efforts shall be discontinued if there is indication that continued efforts could result in damage to the skin and possible higher risks due to uptakes of material.

2.2.3. Public Dose

Licensed material at NIST will be used, transported, stored, and disposed in such a way that the total effective dose equivalent (TEDE) to any member of the public will not exceed more than 100 mrem in one year, and the dose in any unrestricted area will not exceed two (2) mrem in any one hour. RSD shall comply with the regulations set forth in 10 CFR 20.1301, 20.1302 and 20.2107.

2.2.4. Minimization of Contamination

The NIST ALARA program considers work processes to minimize the spread of contamination. When practical, NIST incorporates appropriate dose reduction features into its processes and facilities as those are designed and/or commissioned. In the laboratory areas in building 245 and 235, where radiochemistry operations warrant it, there are personnel contamination monitors and continuous air monitors as well as a robust survey protection program. The design and layout of the facilities with radiochemistry operations are intended to minimize the area of operations when practicable and it also has maximization of surveillance activities, including post-experiment checks by the Source Users and weekly surveys by RSD personnel. The area in 245 also has a dedicated decontamination room and waste retention tanks. The labs have ventilated enclosures (e.g., chemical fume hoods) to prevent spread of material and nonporous floor and bench materials.

2.2.5. Ventilation and Respiratory Protection

Section 2.3.4 states that hazard assessments are conducted for all work involving RAM at NIST. In addition to radiation considerations, such as dose rate and contamination, ventilation controls are evaluated as necessary, e.g., where work with unsealed material might be used. In these types of examples, consideration for room or local ventilation is evaluated, as well as filtration. NIST primarily uses engineering controls to limit airborne exposure and has not historically performed work requiring respiratory protection as a means of

controlling exposure to airborne RAM. Most radiochemistry laboratories are equipped with chemical fume hoods or other forms of local exhaust ventilation. The hoods may be configured with High Efficiency Particulate Air (HEPA) filters as required when source term analysis or measurement indicates the need for filtration to ensure effluent control. Chemical fume hoods are monitored quarterly to ensure face velocities remain at a minimum of eighty (80) linear feet/minute. Hoods which fail to meet the required face velocity are taken out of service and operations suspended until corrective action is taken. NISTs respiratory control commitments are thereby meeting the requirements of 10 CFR 20.1701.

2.2.6. Waste Management

Radioactive waste shall be disposed of in a manner that protects the health and safety of NIST staff, members of the public, and the environment by applying the ALARA policy both for the short-term handling phases and long-term storage or disposal phases of waste management. Radioactive waste is transferred to areas within buildings 235 or 245 where it is characterized and packaged for disposal. The primary radioactive waste streams are as follows:

Dry Active Low-Level Wastes including:

1) Gloves, wipes, paper, and miscellaneous containers and tools used during handling of licensed material or clean-up of contaminated objects;

2) Glassware, vials, dried filters, and other expendable chemistry equipment;

3) Components and equipment contaminated or activated during use; and

4) Activated sample materials or sample containers.

Liquid Wastes including:

1) Liquid scintillation materials;

2) Aqueous solutions of acids or bases used during chemistry processes; and

3) Water or cleaning liquids used during decontamination processes.

RSD shall train individuals who generate waste to ensure appropriate collection of all waste materials that could contain radioactivity. Wastes are segregated and collected in accordance with written procedures, documenting the source term, activity, physical and chemical state, and any other information necessary to ensure safety of the handlers and compliance with processor and disposal facility contractual and license requirements. On request from the individual, RSD collects the waste for packaging and shipment. The wastes shall be disposed of

either by transfer to a licensed waste processing contractor or by shipping directly to a licensed disposal site.

If a contractor is used, the waste shall be packaged according to the contractor's instructions and in compliance with the appropriate shipping regulations. If the shipment is direct to a licensed disposal site, then all applicable waste-form regulations and restrictions on packaging shall be followed. If appropriate, wastes may be compacted on-site with a commercial compactor as part of the packaging process. Wastes that cannot be accommodated in drums are packaged in DOT compliant shipping containers as specified by the contractor.

2.2.6.1. Decay-In-Storage

NIST may utilize decay-in-storage prior to disposal as provided in 10 CFR 20.2001(a)(2) and in accordance with the following conditions:

1) Isotopes must have a half-life of less than 120 days;

2) Radioactive wastes shall be in stable chemical and physical forms prior to placement in storage.

3) Incompatible materials shall not be stored together;

4) Wastes shall be maintained in segregated storage for at least ten (10) half-lives;

5) Following the decay period, wastes shall be monitored at the surface with an appropriate survey meter on the most sensitive scale (or an equivalently sensitive monitoring device) with no intervening shielding material, in a low background area;

6) If monitoring results are indistinguishable from background, all RAM labels shall be removed or defaced and the material may be disposed of without regard to the radiological concerns (this does not release NIST from regulatory compliance regarding chemical or other physical waste disposal hazards); and

7) If the monitoring detects additional activity above background, the waste shall be analyzed to identify longer half-life impurities and evaluated for disposal as radioactive waste.

2.2.6.2. Radioeffluents

Releases of liquid and gaseous radioeffluents shall be verified to comply with the public dose limits specified in 10 CFR 20.1301 and in accordance with the requirements of 10 CFR 20.1302.

Radioeffluent releases into the air or water shall be assessed by sampling, direct measurement of the source terms, and/or calculation methods to ensure compliance with the release criteria. Records shall be maintained to document annual effluents and verify regulatory compliance.

In Buildings 235 and 245, some drains from specific radiochemistry laboratories and other areas are directed to a set of waste tanks. These tanks are sampled, analyzed, and released to the sanitary sewer in accordance with written procedures in compliance with 10 CFR 20.2003.

Bulk liquid wastes shall be collected and transferred to RSD. RSD shall determine the disposition of the waste, which may include release via the waste tanks or disposal by transfer to contracted processing brokers.

2.2.6.3. Incineration and On-site Burial

No on-site incineration or on-site burial of radioactive wastes shall be performed.

2.2.7. Audit Program

The IRSC shall ensure that representatives, other than RSD staff, audit/assess the radiation safety program annually, reviewing performance, quality of operations, and targeted aspects of protocols and procedures. The audit/assessment results shall be reported to the IRSC. The IRSC shall report any findings to appropriate NIST management.

RSD shall review and document program actions, surveillance monitoring, dosimetry trends, and other program metrics for each calendar year as the data required by the report become available. This information is submitted to the IRSC in routine meetings.

2.2.7.1. Security Program

RSD shall review the security program content and implementation in compliance with applicable requirements found in 10 CFR 37 Subpart C annually. The program also covers requirements of 10 CFR 73 as described in section 9.

RSD shall review the access authorization program content for the continuing effectiveness and to confirm compliance with the applicable requirements found in 10 CFR 37 Subpart B annually. Each licensee shall ensure that access authorization programs are reviewed to confirm compliance with the requirements of this subpart and that comprehensive actions are taken to correct any noncompliance that is identified. A copy

of the results and action plans (if applicable) is submitted to the IRSC in routine meetings.

2.2.7.2. Radiation Facilities Quarterly Audit

RSD shall conduct quarterly audits of those Radiation Facilities approved and posted for use or storage of licensed radiation sources that have significant potential for radiation exposures or effluent releases in excess of ten (10) percent of the applicable limits. Audits shall include an assessment of radiological conditions and a review of security, posting, and labeling. Where feasible, such audits include observation and discussion of work practices with Source Custodians and/or Source Users. Results of these audits shall be documented and any identified needs for corrective action found during the audits shall be transmitted to Source Custodians and/or other appropriate individuals.

2.2.7.3. Radiation Facilities Annual Audit

RSD shall conduct annual audits of those Radiation Facilities approved and posted for use or storage of licensed radiation sources that do not have significant potential for radiation exposures or releases in excess of ten (10) percent of the applicable limits. Audits shall include an assessment of radiological conditions and a review of security, posting, and labeling. Where feasible, such audits include observation and discussion of work practices with Source Custodians and/or Source Users. Results of these audits shall be documented and any identified needs for corrective action found during the audits shall be transmitted to Source Custodians and/or other appropriate individuals.

2.3. Facilities and Equipment

NIST has commissioned facilities and equipment adequate to protect health and minimize danger to life or property, and also to maintain radiation doses ALARA. The facilities and equipment meet two main objectives: keep radioactive sources physically secured and ensure safe use of RAM. The equipment and procedures are intended to minimize, to the extent practicable, contamination of the facility and the environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste.

RSD health physicists actively participate in the planning and design of new facilities and in the review of facilities/laboratories proposed for use in performing licensed activities. The consideration for selection of facilities includes minimizing the potential dose to co-located workers who are not involved with radiological work. Facility layout is integral to efficient operations and an effective ALARA program.

Building 245 houses the majority of operations involving use of licensed materials at NIST which include: panoramic beam and self-shielded irradiators; facilities containing

primary beta/gamma standard sources for instrument and secondary source cross calibrations; californium and other neutron sources; instrument calibration facilities; radiochemistry laboratories for standard source production; charged particle accelerators; and x-ray device facilities. Other buildings (e.g., Buildings 215, 217, 227, 235) also contain Radiation Facilities (e.g., RAM laboratories).

2.3.1. Radiation Monitoring Instruments

The individuals who use radiation monitoring instrumentation as part of their work are qualified and well trained in the operating characteristics of the instrumentation as well as in the techniques and procedures of instrument calibration.

Calibrated and functional survey instrumentation shall be maintained to support monitoring needs in each Radiation Facility where external dose rates are likely to reach the criteria for a radiation area as defined in 10 CFR 20 or where surface contamination control limits, as defined in Section 2.3.3, are likely to be exceeded. Survey instrumentation shall be available to support required monitoring activities.

Calibration of instruments is either performed by a vendor licensed by the NRC or by NIST. RSD's calibration procedures apply the model procedures published in Appendix H of NUREG 1556 Volume 11, Rev 1.

All "in-service" instruments used for health and safety, or regulatory compliance monitoring shall be routinely evaluated for functionality via a calibration and testing program which is based on guidance such as that found in relevant voluntary consensus standards and manufacturer's recommendations. Calibrations shall be performed using sources traceable to NIST primary standards. Any instrument that does not meet the calibration and testing requirements is considered to be "out-of-service".

Portable survey instruments used for dose rate measurements shall be calibrated annually or after repairs or modifications that could affect response.

Portable survey instruments used for contamination monitoring shall be calibrated electronically and source response checked annually or after repairs or modifications that could affect response.

Portable survey instruments shall be calibrated in accordance with recommendations from the manufacturers or written procedures. In general, instruments shall be evaluated at approximately twenty (20) percent and eighty (80) percent of each scale or decade as practicable. Instruments shall be removed from service if they cannot be adjusted to within twenty (20) percent of the expected value.

Records of calibrations and instrument quality assurance shall be retained for inspection for a minimum of three (3) years. “In-service” portable instrumentation shall be labeled to verify calibration.

Table 1 below describes the typical radiation detecting instruments available and their characteristics. Equivalent substitutions or alternative instruments are acceptable as long as there is no degradation of the radiation monitoring program. An inventory of instrumentation is available in numbers commensurate with license activities.

Table 1. TYPICAL NIST INSTRUMENTATION

Portable Instruments Used for Contamination and Ambient Radiation Surveys			
Detectors	Radiation	Energy Range	Efficiency
Exposure Rate Meters	Gamma, X-ray	MicroRoentgen per hour (μR/hr)- 1 R/hr	N/A
Count Rate Meters			
Geiger-Mueller (GM)	Alpha	All energies (dependent on window thickness)	Moderate
	Beta	All energies (dependent on window thickness)	Moderate
	Gamma	All energies	< 1%
Sodium Iodide (NaI) Scintillator	Gamma	All energies (dependent on crystal thickness)	Moderate
Zinc sulfide (ZnS), Proportional	Alpha	All energies (dependent on crystal thickness)	Moderate
Plastic Scintillator	Beta	All energies (dependent on window thickness)	Moderate
Centronic boron trifluoride (BF_3), helium-3 (3He) proportional tube	Neutron	Fast and Thermal Neutron	High
Stationary Instruments Used to Measure Wipe, Bioassay, and Effluent Samples			
Detectors	Radiation	Energy Range	Efficiency
Liquid Scintillation Counter (LSC)	Alpha	All energies	High
	Beta	All energies	High
	Gamma	All energies	Moderate
Gamma Counter, high-purity germanium (HPGe)	Gamma	All energies	High
Gas Proportional	Alpha	All energies	High
	Beta	All energies	Moderate
	Gamma	All energies	<1%

2.3.2. Leak Tests

RSDs leak test procedures apply the model procedures published in Appendix M of NUREG 1556 Volume 11, Rev 1; unless otherwise specified by the sources respective Sealed Source Device (SSD) Registration Certificate. Each sealed source containing more than 100 microcuries of beta and/or gamma emitting material or more than (ten) 10 microcuries of alpha emitting material, other than tritium (3H), with a half-life greater than thirty (30) days and in any form other than gas, shall be tested for leakage and/or contamination semi-annually.

In the absence of a certificate from a transferor indicating that a test has been made within six (6) months prior to the transfer, a sealed source received from another entity shall not be put into use until tested for leakage.

The semi-annual leak test interval required by this section does not apply to sealed sources that are stored and not being used. However, any sealed source in storage must be leak tested prior to usage or removal from storage. This leak testing shall be performed no more than six (6) months prior to the date of use or transfer. No sealed source shall be stored for a period of more than ten (10) years without being tested for leakage and/or contamination.

The leak test shall be capable of detecting the presence of 0.005 microcuries of RAM on the test sample. The sample shall be taken from the sealed source or appropriate accessible surfaces of the container or from the device where the sealed source is mounted or stored in which one might expect contamination to accumulate. Records of leak test results shall be maintained for inspection by the NRC in accordance with regulatory requirements.

If the test reveals the presence of 0.005 microcuries or more of removable contamination due to the sealed source radionuclide, NIST shall immediately withdraw the sealed source from use and shall cause it to be contained or decontaminated and repaired by a person licensed to make such repairs, or to be disposed of in accordance with NRC requirements.

If tests indicate leakage from a source that was distributed or acquired in accordance with requirements of the sealed source registry or that was designed, manufactured, and tested in accordance with special form requirements, within five (5) days after determining that the source has leaked, NIST shall file a report with the NRC describing the source, test results, extent of contamination, apparent or suspected cause of source failure, and corrective action taken.

2.3.3. Surveys

NIST shall perform and document routine surveys of posted radiation facilities to ensure health and safety and regulatory compliance. RSD’s survey procedures apply the guidance published in Appendix L of NUREG 1556 Volume 11, Rev 1 and Appendix F of NUREG 2212: and take into consideration other modifying

factors such as source activity, physical form, containment, utilization, process knowledge, and operational history.

NIST performs ambient radiation surveys and contamination surveys. Dose-rate surveys and monitoring, at a minimum, are conducted in locations where individuals are exposed to radiation levels that might result in radiation doses in excess of ten (10) percent of the occupational dose limits in 10 CFR 20.1201; are conducted in locations where members of the public could receive a total effective dose equivalent of one (1) millisievert (mSv) (100 mrem) in a year, or the dose in any unrestricted area from external sources could exceed 0.02 mSv (2 mrem) in any one (1) hour (see 10 CFR 20.1301(a)(2)); and done in a manner and frequency that is representative of the use of RAM. At a minimum, these surveys should be done weekly in areas of RAM use, where exposures to workers could reasonably occur, (e.g., generator storage or elution and dose preparation stations). Other areas where radiological conditions are not expected to change appreciably from day to day should be surveyed quarterly (e.g., radioactive waste storage areas).

NIST also performs contamination surveys sufficient to identify areas of contamination that might result in unacceptable levels of exposure to workers or to the public. Combined removable and fixed contamination should be surveyed using appropriate radiation detection equipment. Removable contamination can be detected and measured through wipe tests, which should be analyzed using an appropriate counting instrument. Fixed contamination may be measured directly at the surface of the contamination with the appropriate instrument detector in accordance with manufacturer instructions.

The frequency of routine surveys depends on the nature, quantity, and use of RAM, as well as the specific protective facilities, equipment, and procedures that are designed to protect the worker from external and internal exposure. Typical actions and surveillance frequencies are provided in Table 2 but may be modified by the RSO based on process knowledge, utilization and monitoring history, and levels of research activity.

Table 2. RADIATION FACILITY SURVEYS: FREQUENCY AND TYPE

Facility Description	**Survey Type**	**Frequency**
Facilities with dose rates greater than 5 mrem per hour at 30 centimeter (cm) from a surface, with active source transfers and/or utilization of sources.	Dose Rate Survey	Weekly
Facilities with dose rates greater than 5 mrem per hour with sources in storage or infrequent source transfers or utilization.	Dose Rate Survey	Quarterly
Facilities with active unsealed source utilization greater than 10 CFR 20, Appendix C quantities.	Contamination Survey (direct count rate and smear)	Weekly
Facilities with active unsealed source utilization less than 10 CFR 20, Appendix C quantities.	Contamination Survey (direct count rate and smear)	Quarterly
All other posted facilities.	Dose Rate Survey, if applicable Contamination Survey (direct count rate and smear), if applicable	Annually

Contamination control levels and resulting actions are defined in Table 3. Items and materials to be released for unrestricted use shall be processed in accordance with the clearance levels provided in Table 4. Decontamination efforts shall be made to achieve the goal of no detectable removable activity being present in any unrestricted area or on any equipment or materials released for unrestricted use.

Table 3. CONTAMINATION CONTROL ACTION LEVELS

Contamination Type/Level	**Action**
For alpha contaminants, greater than 200 disintegrations per minute (dpm) per 100 cm^2 (removable)	Post as “Contamination Control Area” Restrict entry and use to as necessary and practicable. Consider appropriate contamination mitigation measures. Monitor upon exit.
For unknown beta/gamma contaminants or for known beta/gamma contaminants other than carbon-14 (^{14}C) or ^{3}H, greater than 2,000 dpm/100 cm^2 (removable)	Post as “Contamination Control Area” Restrict entry and use to as necessary and practicable. Consider appropriate contamination mitigation measures. Monitor upon exit.
For ^{14}C, greater than 20,000 dpm/100 cm^2 (removable)	Post as “Contamination Control Area” Restrict entry and use to as necessary and practicable. Consider appropriate contamination mitigation measures. Monitor upon exit.
For ^{3}H, greater than 200,000 dpm/100 cm^2 (removable)	Post as “Contamination Control Area” Restrict entry and use to as necessary and practicable. Consider mitigation measures. Monitor upon exit.

Table 4. ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclide[1]	**Average[2, 3]**	**Maximum[2, 4]**	**Removable[2, 5]**
U-nat, U-235, U-238, and associated decay products	83.3 becquerel (Bq) pe 100 cm^2 (5,000 dpm/100 $cm^{2)}$	250 Bq/100 cm^2 (15,000 dpm/100 cm^2)	16.7 Bq/100 cm^2 (1,000 dpm/100 cm^2)
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	1.7 Bq/100 cm^2 (100 dpm/100 cm^2)	5.0 Bq/100 cm^2 (300 dpm/100 cm^2)	0.3 Bq/100 cm^2 (20 dpm/100 cm^2)
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	16.7 Bq/100 cm^2 (1,000 dpm/100 cm^2)	50.0 Bq/100 cm^2 (3,000 dpm/100 cm^2)	3.3 Bq/100 cm^2 (200 dpm/100 cm^2)
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	83.3 Bq/100 cm^2 (5,000 dpm/100 cm^2)	250 Bq/100 cm^2 (15,000 dpm /100 cm^2)	16.7 Bq/100 cm^2 (1,000 dpm/100 cm^2)

Notes:

(1) Where surface contamination by both alpha and beta-gamma emitting nuclides exist, the limits established for alpha and beta-gamma nuclides should apply independently.

(2) As used in this table, dpm means the rate of emission by RAM as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrument.

(3) Measurements of average contamination should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

(4) The maximum contamination level applies to an area of not more than 100 cm^2.

(5) The amount of removable RAM per 100 cm^2 of surface area should be determined by wiping that area with filter or soft absorbent paper, applying moderate pressure, and assessing the amount of RAM on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally, and the entire surface should be wiped.

Environmental and Unrestricted Area Monitoring shall be conducted and documented by RSD monitoring at appropriate locations within the NIST grounds and facilities as part of the documentation for demonstrating compliance with dose and dose rate limitations for members of the public.

2.3.4. Hazard Assessment

Prior to the use of RAM, a Hazard Assessment shall be performed. The Hazard Assessment shall consider issues such as:

1) Doses and dose rates to individuals in posted areas of a Radiation Facility;

2) Doses and dose rates to members of the public;

3) Doses and dose rates in un-posted areas (hallways, adjacent areas, or areas outside of buildings);

4) Contamination or dispersion of the material outside of a Radiation Facility;

5) Contamination or dispersion of the material within a Radiation Facility;

6) Personnel contamination or uptake; and

7) Effluent release (airborne or liquid) of the material.

2.3.5. Hazard Control and Monitoring

The Hazard Controls shall consider issues such as:

1) Shielding – both local and structural;

2) Source utilization - limitations on source activity, physical manipulations, chemical processes, containment, spill control, and storage conditions;

3) Ventilation controls - room ventilation, local ventilation, hoods, filtration;

4) Radiological monitoring systems - installed and portable;

5) Contamination control practices and monitoring systems;

6) Posting and labeling requirements;

7) Installed control systems - source shutters and interlocks;

8) Incident or emergency control and mitigation systems - communications, fire detectors and other alarms, spill containment, and sinks and wash down systems; and

9) Physical security monitoring and access control.

The Hazard Assessment may be based on experience from previous similar operations and the methodologies of facility classifications, radionuclide toxicity classification, and the modifying factors such as those discussed in the International Atomic Energy Agency (IAEA) Safety Series, the Handbook of Health Physics and Radiological Health and other National Council on Radiation Protection references.

Hazard Assessments of Radiation Facilities shall be performed at the time of initial requests for use of the facility, during general use protocol reviews, and may be supplemented by additional reviews at the time of acquisition of sources. Radiation Facility conditions shall be reviewed by RSD staff during regular internal audit and surveillance activities.

2.3.6. Sealed Source Radiation Facilities

Sealed Source Radiation Facilities include a 10 CFR 36 vertical beam irradiator. NIST also utilizes beam calibration ranges, and self-contained irradiators.

NIST utilizes neutron instrument calibration Radiation Facilities using Cf-252, AmBe, PuBe, or RaBe sealed sources, or neutron generators. NIST also utilizes neutron source calibration Radiation Facilities (e.g., manganese sulfate baths) and an ion chamber calibration range. A variety of other specialized Radiation Facilities, including those for the calibration of brachytherapy seeds, and gamma, x-ray, beta, and alpha spectroscopy, are also utilized.

2.3.7. Unsealed Source Radiation Facilities

Laboratories approved for use of unsealed RAM having activities above those listed in 10 CFR 20 Appendix C criteria shall, at a minimum, meet the requirements of a Type I laboratory (See Handbook of Health Physics and Radiological Health, Third Edition, 1999, Chapter 11). Most laboratories authorized for unsealed source work qualify as Type II laboratories.

Most radiochemistry laboratories are equipped with chemical fume hoods or other forms of local exhaust ventilation. The hoods may be configured with HEPA filters as required when source term analysis or measurement indicates the need for filtration to ensure effluent control. Hoods approved to be used for radioiodine standards preparation may be configured with activated charcoal filters for the duration of the batch operations when source term analysis or measurement indicates the need for filtration to ensure effluent control. Certain specialty hoods designed for significant use of acids are provided with scrubber wash down

systems. Chemical fume hoods required to be used for control of radiological operations shall be monitored quarterly for flow velocity. Any chemical fume hood failing to meet the required average minimum face velocity of eighty (80) linear feet per minute shall be taken out of service and operations suspended until appropriate corrective action is taken.

Any laboratory operations determined to have significant potential for exceeding ten (10) percent of the 10 CFR 20, Appendix B, Table 2, release limitations shall be monitored on an as needed basis.

NIST building 245 is equipped with holding tanks that collect liquids from specific sinks and floor drains in some radiochemistry laboratories. Liquid from these tanks shall be sampled and analyzed to ensure compliance with effluent release limitations in 10 CFR 20, Appendix B, Table 3, prior to any release to the sanitary sewer.

Personnel contamination monitors (e.g., hand and foot monitors) are placed in the near vicinity of some unsealed source Radiation Facilities. Survey instruments are available at key locations for use in unsealed source Radiation Facilities. Personnel contamination monitoring or hand-held detectors shall be required following work with moderate and/or high-level unsealed radioactive sources.

2.4. Commitment to Written Procedures

RSD has implemented and maintains a process for procedure generation, modification, authorization, distribution, and training, such that changes are effectively communicated in a prompt manner. The written procedures provide reasonable assurance that only appropriately trained personnel will handle and use licensed material without undue hazard to workers or members of the public. The IRSC is responsible for reviewing any new requests or changes in use of RAM. The IRSC will review and approve proposed program changes and revisions to procedures that are within the scope of the license. Hazard assessments are performed on requests for the acquisition and use of RAM. These hazard assessments review proposals and evaluate them for workable reductions in exposure through the application of ALARA concepts. Use of new material or new procedures is reviewed and approved by the IRSC once the hazard assessment has been completed and reviewed and approved by the RSO. The procedures which provide the necessary controls to protect health and to minimize danger to life or property are adequate and in accordance with 10 CFR 20.1101(b) and 10 CFR 70.23(a)(4).

The RSO, or RSO designated alternate, approves all Radiation Work Permits (RWPs). The RWPs define the authorized activities, the level of approval required, information requirements, period of validity, expiration and termination times, and recordkeeping requirements.

2.5. Operating and Emergency Procedures

RSD maintains operating and emergency procedures that provide instructions on the following elements:

1) Contamination controls; including the use of protective clothing and equipment;

2) Personnel and area monitoring, including frequency, limits, and instructions for keeping doses ALARA;

3) Reporting and recording requirements; including how to respond and whom to contact when an emergency occurs and identifying and reporting defects and noncompliance to the NRC as required; and

4) Waste disposal practices, including instructions for conducting operations to minimize the introduction of residual radioactivity and the proper storing and disposal of radioactive waste.

RSD staff are provided regular training and instruction on these elements to ensure the safe day-to-day use and handling of materials. Instructions for responding to spills or personnel contamination incidents are compatible with the procedures for the safe use of radionuclides and emergencies as published in Appendix K of NUREG–1556, Volume 11, Revision 1, 'Consolidated Guidance About Materials Licenses: Program-Specific Guidance About Licenses of Broad Scope.

Authorized users are provided with copies of operating and emergency procedures which provide instructions in the case of an emergency, including immediate action best practices for preventing the release of RAM or further contamination of workspaces and personnel, as practical without further endangerment.

2.6. Transportation

NIST has established a transportation program to ensure adequate protection of workers and members of the public from unnecessary exposures to radiation during the transportation of the material and verify compliance with NRC and DOT regulations. The program includes personnel training as discussed in section 2.1.4. The program includes procedures for the activities to receive RAM and shipping of materials and waste. Transportation activities of sources meeting the criteria of Nuclear Materials Management Safeguards System (NMMSS) and National Source Tracking System (NSTS) are handled in accordance with the NRC guidance and regulations in 10 CFR 20, 10 CFR 71, 10 CFR 37, and 10 CFR 73.

As discussed in section 9 of this LRA, NIST has developed a program to meet the requirements in 10 CFR 73.67 (a) and (g) regarding physical protection of Special Nuclear Material (SNM) in transit. All transportation of RAM to and from the use location (NIST) shall be conducted in accordance with all applicable DOT requirements.

3. NUCLEAR CRITICALITY SAFETY (NCS)

The work performed with SNM is in support of measurement science and does not include fuel enrichment activities. This work includes production of SNM standard reference materials; measurements, characterization, calibration of reference materials; and development and use of measurement devices that detect or incorporate SNM (such as fission chambers). Historically, most discrete SNM sources have been below the NMMSS reporting mass. Under this license, there is no provision for the assembly or testing of critical or sub-critical assemblies.

NIST has policies and procedures in place to describe the overall NCS program strategy and effect its implementation. Source Users and Source Custodians (Authorized Users) are required to follow IRSC approved protocols involving the use of RAM including SNM.

RSD manages criticality safety by possessing low quantities of SNM and ensuring aggregation above safety limits does not occur. The SNM inventory is additionally housed in Controlled Access Areas (CAAs) and/or Item Control Areas (ICAs) located in distinctly separated areas further mitigating any potential risks.

Existing criticality safety processes ensure subcritical conditions by performing and documenting criticality safety evaluations (CSEs) for new or changed experimental proposals. Establishing, as practicable, double contingency protection and defense-in-depth measures and ensuring sufficient margins of safety and subcriticality to provide additional assurance that the likelihood of criticality will be acceptably low.

NIST has procedures in place that track and segregate SNM such that those that exceed a preset safety limit are segregated into several reporting areas. The source acquisition approval process includes checks to verify and limit SNM inventories and use locations such that the aggregate value in any one location is subcritical in all credible configurations. This ensures no single location can aggregate a critical mass of SNM.

As described in Section 2 of the LRA, NIST has a robust type A broad-scope radiation safety program. RSD staff and Source Users (authorized users) are trained in the safe use of RAM including the NCS Program. Each discrete SNM source that is added to the NIST RAM inventory is assigned a unique identifying number and a unique Source Custodian who is aware of their responsibilities involving the storage and use of the material. When a procedurally defined trigger level is met during source acquisition or change of use, an NCS review is performed by RSD to verify that SNM totals are under prescribed safety limits. The IRSC reviews proposed new uses of RAM as well as changes to the approved uses. Audits and other types of periodic assessments of SNM operations and controls important to monitoring criticality safety are conducted as needed or as prescribed in procedures.

3.1. Use of Industry Standards

The administration of RSD's NSC program uses Regulatory Guide 3.71 rev. 3, "Nuclear Criticality Safety Standards for Nuclear Materials Outside Reactor Cores" as technical guidance.

3.2. Criticality Accident Alarm System

The license limits stated in Enclosure 4 allow for the possession and use of special nuclear material in quantities meeting the definition of critical mass as specified in 10 CFR 70.4. NIST is requesting continued exemption from the 10 CFR 70.24 requirements [as provided in 10 CFR 70.17(a)] and previously granted by NRC (ML13207A265). A summary of license exemption requests is provided in Enclosure 2.

3.3. Emergency Planning and Response

NIST is not subject to the requirement for an Emergency Plan under 10 CFR 70.22(i)(1)(ii) as discussed in Section 10 of this LRA.

3.4. Subcriticality and Double Contingency Principle

NIST uses criticality controls to meet the requirements of 10 CFR 70.22(a)(8), which mandates procedures to avoid and mitigate accidental criticality events to protect health and minimize danger to life or property. Discrete sources that exceed the NMMSS reporting mass are segregated into three reporting areas in three separate buildings. The source acquisition approval process includes checks to verify and limit source inventories and use locations. This ensures no single location can aggregate a critical mass of SNM. NIST is committed to practices to ensure that, by applying the sum of the fractions rule, no combination of fissile uranium and plutonium exceeding eighty (80) percent of a critical mass, as specified in 10 CFR 70.4, shall be used, or stored at any single location. These practices provide adequate assurance that the requirements of 10 CFR 70.22(a)(8) are met. Inventory management databases are used to maintain up-to-date totals for SNM and are also used to evaluate proposals for moving SNM between locations.

3.5. Organization and Administration of the NCS Program

NIST has established an NCS program to meet the regulatory requirements in 10 CFR Part 70 and to ensure adequate protection against the occurrence of accidental criticality. The primary means of doing this is prevention (i.e., processes that ensure that uses and use locations will be subcritical under normal and credible abnormal conditions). The program has a graded approach that is commensurate with the complexity and scope of proposed uses. Proposals for acquisition of SNM when in reportable quantities (i.e., NMMSS) are handled as described in this section, NIST has established procedures to provide guidance, and establish procedural requirements for maintaining accurate, current, and reliable information on, and for confirming the quantities and locations of SNM. These procedures establish the roles of a Nuclear Material Accountability Assistant (NMAA) and ICA Custodian who are responsible for inventories of SNM, and SNM transaction control.

NIST has historically been granted an exemption from the requirement to maintain a Criticality Accident Alarm System (CAAS) and the associated response procedures due to the administrative controls mentioned in the previous sections. A request is being submitted with this application for continued exemption from the 10 CFR 70.24 CAAS requirements as discussed in Enclosure 2 of this LRA.

3.6. Nuclear Criticality Safety Program Management Measures

Technical qualifications, including training and experience of management, support staff, and staff who engage in the NCS program are described in Section 2 and are commensurate with NCS program activities.

New or revised procedures that have an impact upon criticality safety are reviewed by the health physicists that work with SNM control and accountability and require RSO review and approval. New processes are reviewed to ensure the entire process will be subcritical for both normal and credible abnormal conditions. Changes to processes will be reviewed to determine that the change is compatible with the NCS program. RSD staff review the equipment, activities and process involved to determine the control parameters necessary for NCS and establish requirements and conditions documented in the CSEs.

NIST is committed to conducting and documenting periodic assessments that follow a graded approach and focus on the implementation of criticality controls in applicable use and storage areas to verify compliance. The NCS program is audited internally and externally on a periodic basis.

3.7. Technical Practices for NCS

The technical practices are centered in SNM inventory management and use/storage areas segregation. The researchers and health physicists periodically review the basis for SNM use requirements designed to ensure criticality safety including, review of normal conditions, credible abnormal conditions, controls, and limits.

These practices provide adequate assurance that the requirements of 10 CFR 70.22(a)(8) are met. Inventory management databases are used to maintain up-to-date totals for SNM and are also used to evaluate proposals for moving SNM between locations.

3.8. Calculational Method Validation

As discussed in Section 3.4, the NCS program is committed to maintaining a preestablished subcritical level. Calculations for criticality are based on summation of SNM in each predefined location. Instances where acquisition of SNM or location changes of existing SNM in NMMSS reportable quantities will prompt an automatic review by the NMAA. SNM gram totals are calculated to ensure that they remain below the preestablished critical level in each predefined location. These calculations are then

reviewed by an independent verifier. The results are then approved by the RSO prior to action taken.

3.9. Criticality Safety Evaluations (CSEs)

NIST follows the guidance from American National Standards Institute/American National Standard ANSI/ANS-8.19-2014 “Administrative Practices for Nuclear Criticality Safety” as endorsed by Reg Guide 3.71 Rev. 3, “Nuclear Criticality Safety Standards for Nuclear Materials Outside Reactor Cores”. Once a proposed use of SNM is presented or before an operation with SNM material is changed, it shall be determined and documented that the entire process will be subcritical for both normal and credible abnormal conditions. The initial hazards analysis is performed by RSD. This initial evaluation may include direct observation of the proposed use locations and equipment. The CSEs are documented with sufficient detail to allow the IRSC sufficient judgement to review and approve.

The safety evaluations for the NCS program are in line with the hazard assessments described in Section 2.3.4.

3.10. Evaluation and Implementation of Controlled Parameters

Periodic audits, at least annually, evaluate the effectiveness of implementation and control parameters. This is done to verify that procedures are being followed and that process conditions have not been altered in such way to affect the CSEs. These reviews shall be conducted, in consultation with researchers, by individuals who are knowledgeable in criticality safety, and not immediately responsible for the operation.

3.11. Additional NCS Program Commitments

Not applicable. The NCS program is audited as part of the overall radiation safety program annual review. RSD has a robust corrective action program that analyzes deficiencies and documents actions taken. Facility changes that impact NCS are reviewed and approved by the IRSC.

3.12. Emergency Plan

NIST is not subject to the requirement for an Emergency Plan under 10 CFR 70.22(i)(1)(ii) as discussed in Section 10 of this LRA.

4. CHEMICAL SAFETY

NIST has policies and procedures in place that govern cradle-to-grave use and management of hazardous chemicals, including any licensed material with inherent chemical hazards as well as (non-radioactive) chemicals associated with approved uses of licensed materials, described in Section 2.3. Approved uses of licensed materials include, e.g., chemical analyses to measure radioisotopes, preparation of isotopic standards or calibration solutions.

Policies governing the use and management of hazardous chemicals at NIST are generally designed to meet both the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200) and the OSHA Occupational Exposure to Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450, i.e., "Lab Standard"). Most of the work at NIST with licensed materials that involves chemical hazards meets the OSHA definition of "laboratory use of hazardous chemicals" and falls under the Lab Standard. By OSHA definition, laboratory scale operations are limited to amounts that can be easily and safely manipulated by one person.

NIST must also implement the Hazard Communication Standard because NIST work also includes production and distribution of samples and reference materials to external parties. In accordance, NIST has both a written hazard communication program and a chemical management program, the latter of which serves as NIST's chemical hygiene plan. Together, these programs specify the contents of chemical labels and safety data sheets used to communicate relevant information on material hazards, storage conditions, and protective and emergency response measures; the requirements for acquisition, storage, handling, and disposal of chemicals; and the hazard mitigation strategies specific to the hazards for materials used. All NIST staff who work with chemicals are required to be trained on NIST's chemical hygiene plan and on OSHA's hazard communication requirements. These staff must ensure chemicals are properly labeled, maintain chemical inventories, and use appropriate controls to eliminate, mitigate or minimize the potential for exposure to chemical hazards.

Controls to minimize chemical exposures include consideration of less hazardous alternative chemicals, administrative controls such as training on safety data sheets and hazard classes, proper labeling of chemicals and following safe operating practices or procedures. Based on the specific hazards and use scenarios, safe use protocols must specify when engineering controls, e.g., chemical fume hoods or glove boxes, are needed, and the type of personal protective equipment required, e.g., gloves, lab coats, eye protection. Typically, a combination of controls is required to work safely. Required controls are specified in the procedures that describe the conduct of work and are part of the safety evaluation.

The IRSC reviews and authorizes all uses of licensed material as part of the safety evaluation. This includes ensuring adequate review of the detailed procedures or Standard Operating Procedures used to conduct the work, including any chemicals to be used, e.g., research analyses, preparation of radioactive standards or calibration solutions. The IRSC review process takes into consideration all hazards associated with the work, including chemical hazards. Approval by the IRSC indicates that the procedures adequately specify controls to protect the user from exposure to chemical hazards and minimize the potential for property damage.

The IRSC reviews and approves all source users. This process requires review of the user's technical qualifications to ensure that sources users have adequate education and experience to work with RAM. To obtain approval to perform specific procedures, the source user must be approved by their supervisor and be named in the Safety Evaluation for each

procedure they perform. Supervisor approval on the Safety Evaluation indicates that the named source user has completed the required training and possesses the knowledge, skills, and abilities to perform the specific work safely and correctly.

RSD reviews the specific facilities listed in the safety evaluation for adequacy for the proposed use. Work with unsealed licensed material that involves hazardous chemicals is typically conducted in laboratories equipped with chemical fume hoods that provide protection against both chemical and radiological exposures. Furthermore, eyewashes and safety showers are available in work areas in accordance with regulatory requirements. When additional safety equipment is required to help prevent chemical exposures to hazardous chemicals, e.g., glove boxes or other equipment, users must verify that the equipment is functional prior to use.

All NIST chemical users must ensure storage, use, and waste containers are compatible with the chemicals they contain and follow proper disposal procedures when chemicals are no longer needed. Chemical waste that contains licensed material must be disposed according to radioactive waste procedures specified by the radiation safety program and implemented by RSD and is not permitted to be disposed of via the standard chemical waste stream at NIST. Two groups at NIST, the Fire Protection Group (Emergency Services Office) and the Environmental Management Group (Office of Safety Health and Environment) have trained hazardous materials responders who work with RSD as necessary to respond to spills and other incidents involving hazardous chemicals.

5. FIRE PROTECTION

5.1. Facility Design

Building 245 was originally constructed in 1964 and is a noncombustible Type II-B building per the 2015 edition of the International Building Code. The new H-Wing is separated from the existing building by back-to-back 2-hour fire rated barriers. Type II-B constructed buildings do not have a requirement for fire rated floors, but a 1-hour rated floor is provided. The Gamma IR lab, which contains an irradiator, is separated from the rest of the building with 2-hour fire rated construction including 90-minute fire rated doors.

The new H-Wing and subsequent renovation was designed and constructed to the following codes and standards:

1) 2015 International Code Council suite of codes;

2) 2016 National Fire Protection Association (NFPA) 13, Standard for the Installation of Sprinkler Systems;

3) 2016 NFPA 14, Standard for the Installation of Standpipe and Hose Systems;

4) 2013 NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection;

5) 2016 NFPA 24, Standard for the Installation of Private Fire Service Mains and their Appurtenances;

6) 2015 NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals

7) 2014 NFPA 70, National Electrical Code (NEC);

8) 2016 NFPA 72, National Fire Alarm and Signaling Code;

9) 2015 NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids;

10) 2015 NFPA 101, Life Safety Code; and

11) 2014 NFPA 801, Standard for Fire Protection for Facilities Handling Radioactive Materials.

Building 235 was originally constructed in 1966 with an office wing and guide hall expansion more recently. The building is classified as Type II-B non-combustible construction with materials mainly concrete and steel. The building is divided up into wings (A, B, B', C, D, E, G and K) with no fire walls between the wings. It is assumed that the building was built under the 1960 edition of the Building Officials and Codes Administrators codes.

All building construction, renovations, and building operations are reviewed by the Fire and Facilities Safety Group. This group includes 8 licensed Professional Engineers. 6 Fire Protection Engineers, 1 Mechanical Engineer/Commissioning agent, and 1 Electrical Safety Engineer. Additionally, the group also has a fire alarm system administrator who is cross trained in sprinkler systems and the Life Safety Code.

5.2. Fire Protection

5.2.1. Fire Protection Systems

NIST utilizes fire protection systems which provide required protection against fires and explosions in the areas in which material covered under this license is present. Building 245 is equipped with emergency power via an emergency generator that was designed and installed per the NEC, emergency lighting in accordance with NFPA 101, egress systems in accordance with NFPA 101, a fire alarm system per NFPA 72 and a fire suppression system. Building 235 is similarly equipped with emergency power via an emergency generator, emergency lighting and a fire alarm system per the NFPA codes listed above. The egress systems are assumed to have been code compliant at the time of construction. A life safety study performed in 2021 based on the most current

edition of NFPA 101 shows that the only improvements to egress noted were additional exit signs. An analysis of the exit signage requirements in the 1960 edition of Building Officials and Codes Administrators and the current edition of NFPA 101 has not been performed.

NIST facilities are equipped with centrally monitored fire detection and alarm systems which are monitored at the on-site Fire Station. The fire alarm system is a class A supervised addressable, and intelligent system. In-building mass notification system requirements, per NFPA 72, were designed for audibility and intelligibility requirements throughout the building and areas surrounding the building. Speakers and strobes provide audible and visual notification respectively. Double action manual pull stations, duct detectors, and where required, heat and smoke detectors initiate the fire alarm system. These systems are maintained and tested in accordance with NFPA 72. Building 235 Guide Hall is equipped with an early warning air aspirating smoke detection system.

Building 245 is equipped with a fire suppression system in accordance with NFPA 13. All renovated portions of the building are fully sprinklered. Building 235 is partially sprinklered but equipped with a full detection system in areas that are not sprinklered. An underground fire main supplies the fire protection water via a NIST campus connection to Washington Suburban Sanitary Commission. The new irradiator facility is equipped with a fire extinguishing system that was designed with a separate double interlock pre-action system activated by separate heat and smoke detectors. A dedicated shut-off valve is provided for this system to control flooding of the facility and surrounding spaces. This system is designed to Extra-Hazard Group 1 density with K-factor 11.2 quick response sprinkler heads. Additionally, fire extinguishers are located throughout the facility in accordance with NFPA 10, “Standard for Portable Fire Extinguishers.” Building stairwells have standpipe connections; fire hydrants are located at various positions on the exterior of buildings. Fire protection systems are maintained by NIST’s Office of Facilities and Property Management in accordance with applicable NFPA codes.

5.2.2. Employee Training

Training is discussed in Section 2. Training regarding incident and emergency response follow the general topics found in NUREG 1556, Volume 11, Rev. 1, Appendix K. These include but are not limited to minor and major fires.

5.2.3. Emergency Response

The NIST Fire Department conducts fire drills and shelter in-place drills annually for all buildings on the NIST Gaithersburg campus and also has a mutual aid agreement with Montgomery County, Maryland. The NIST Fire Department staffs a minimum of five full-time Federal employee firefighters on site per day who are provided with two class A engine pumpers which both carry 1000 gallons of water. The pumpers have a 1250 and 2000 gallon per minute pump. All NIST

firefighters are certified Emergency Medical Technicians, Firefighter 2, Hazmat Materials Technicians, and Confined Space Technicians. Also, each NIST firefighter is a certified fire inspector which enables the monthly fire inspection of each building on the NIST campus. Additionally, all NIST firefighting staff are provided with radiation safety training.

As mentioned above, the NIST operates an on-site Fire Station. Fire prevention, inspection, testing, and maintenance of fire protection systems, and the qualification, drills, and training of facility personnel are in accordance with applicable NFPA codes and standards.

The NIST on-site emergency dispatcher maintains an emergency contact list which includes RSD staff.

Emergency response personnel (e.g., the NIST Fire Department) shall receive in-service training by RSD biennially on how to respond to security, fire, or other monitored alarm situations involving nuclear material.

All buildings on site are broken down to wings and different entrances. For building 245, the alarm and/or emergency will dictate what entrance is used. The Officer-in-Command (OIC) will take the command unit to the front side of building 245; obtain the building keys in Knoxbox, or equivalent system (located at the Bldg. 245 entrance); and serve as the point of contact for building evacuation coordination. Depending on time of incident, RSD will be notified if not on site already. Every NIST firefighter knows to use the RSD Call Down List that is located in the fire house as well as in the command unit. Depending on the incident, the NIST Fire Department may not operate without having contact with an RSD representative. If and/or when Montgomery County is called for assistance: Montgomery County units come thru A-gate and get escorted to an assigned area or staging area. The Montgomery County Chief Officer will meet up with the NIST OIC and a joint command will be set up. The county units will work with the NIST firefighters at that time.

5.3. Process Fire Safety

Fire safety at NIST follows compliance with NFPA 30, 45, and 55. Chemicals are entered and tracked in a Chemical Inventory Management System managed by Office of Safety Health and Environments (OSHE's) Chemical Hygiene Officer. Flammable and combustible liquid containers are limited in size, and quantities above the allowable limit are stored in flammable liquid cabinets. Use and storage of all chemicals are analyzed in a hazard review process which includes safety professionals from various fields relevant to the process. All lab renovations and new projects are reviewed by OSHE's licensed professional Fire Protection Engineers who reside in the Fire and Facilities Safety Group. Prior to use of new or renovated facilities, safety evaluations must be reviewed and approved by the IRSC. Any Hot Work that takes place needs to meet the requirements of NIST's Fire Prevention During Welding, Cutting, and Other

Hot Works Program. Users and their managers must complete in-house training and the activity is reviewed during a permitting process for safe practice by the Fire and Facilities Safety Group. Operation of Cranes or other activity that requires impairment of a fire safety system such as sprinklers, fire alarm or means of egress is permitted through the requirements of NIST's Impairment of Fire Protection and Life Safety Systems Program, to ensure there are other means of protection or that the activity has safeguards such as a fire watch to ensure fire safety. Activities such as construction modifications or new science activities are coordinated through organizational safety professionals who ensure the proper Subject Matter Experts are included in reviews.

5.4. Combustible Loading and Potential Fire Scenarios

Combustible loading within buildings at NIST is maintained in several ways. All chemicals are entered and tracked in a Chemical Inventory Management System. NIST complies with NFPA 30, 45 and 55 for storage of chemicals, compressed gases, and cryogenic fluids. Storage of combustible items is maintained and limited through regulation, inspection, and maintenance. NIST's Inspection, Testing, and Maintenance of Fire Protection and Life Safety Systems Program regulates what is permitted to be stored in corridors. NIST has a Workplace Inspection Program where OSHE inspectors are allowed access to buildings to ensure general safety measures are followed. Any deviation is cited for Organizational Unit correction. A contracted janitorial service ensures that trash is collected and disposed of weekly from labs and offices. Beyond the measures listed above, each building is equipped with either a sprinkler system or a full detection system. Control areas and noncombustible construction further demonstrate that the facility is reasonably protected from fires and explosions that would be expected to spread or be uncontrolled. The on-campus Fire Department ensures a quick response in the event of an emergency.

5.5. References

10 CFR 70.23(a)(3) and (4) provide the regulatory basis for the fire safety review. Additional regulatory requirements for fire protection at panoramic irradiators can be found in 10 CFR 36.27(a) and (b).

6. NATIONAL ENVIRONMENTAL POLICY ACT

6.1. Classification of Licensing and Regulatory Actions

Facilities authorized to use and possess critical mass quantities of SNM (also known as greater than critical mass facilities), which use SNM for research and development purposes, are categorically excluded under 10 CFR 51.22(c)(14)(v). Therefore, NIST activities under the SNM-362 NRC license are not subject to the requirements to prepare environmental assessments under 10 CFR 51.20 or 10 CFR 51.21.
Gaseous and liquid effluents, if any, will be within 10 CFR Part 20 limits and will be subject to appropriate effluent monitoring and controls. For example, any laboratory operations determined to have significant potential for exceeding 10% of the 10 CFR 20, Appendix B, Table 2, release limitations shall be monitored on an as needed basis, and

liquid effluents collected in holding tanks will be sampled to assure compliance with 10 CFR Part 20, Appendix B, limits prior to any release to the sanitary sewer.

7. MATERIAL CONTROL AND ACCOUNTING

The SNM – 362 license allows for the possession of SNM and is subject to the requirements of 10 CFR 74 Subparts B and C with respect to its license limits. It also allows for byproduct and source material. Source acquisition of licensed material pursuant to 10 CFR 30.41, 10 CFR 40.51, and/or 10 CFR 70.42, shall conform with the IRSC approved safety evaluations and be reviewed by the RSO or designee and approved by the IRSC through the following process.

Proposals to acquire sources shall be reviewed and approved, or rejected based upon evaluation of:

1) License limits and conditions;

2) Intended RAM utilization and protocols;

3) Facility and equipment compatibility;

4) Source Custodian training, and skills;

5) Source User training, and skills;

6) Hazard analysis and control safety requirements;

7) Dosimetry and monitoring requirements; and

8) Inventory control, transfer, waste disposal, and effluent or disposition considerations.

Sources received by NIST shall be entered into an inventory management system in which the RSO is an integral part of the approval process. Incoming RAM shipments are surveyed in accordance with 10 CFR 20.1906. Shipments of licensed RAM or devices containing licensed sources shall be coordinated with RSD to document proper packaging, labeling, and inventory control in accordance with applicable DOT and NRC regulations.

License to license transfer of RAM to individuals or entities shall be made in accordance with appropriate DOT regulations and NRC licenses, NRC Agreement State and/or U.S. Department of Energy (DOE) authorizations, or in the case of international transfers, in accordance with requirements of 10 CFR 110. The transfer of RAM for research purposes to individuals or entities who are not required to possess a specific or broad scope NRC license, shall meet the requirements of 10 CFR 30.71 Schedule B and similar exemptions.

7.1. Reports of Loss or Theft or Attempted Theft of SNM

RSD has established procedures which identify the methods for the reporting, investigation, and resolution of missing SNM, including instances arising from errors. NIST will provide notification to the NRC Operations Center, as per 10 CFR 74.11, within one (1) hour of discovery of an event of any lost, stolen, or unlawfully diverted SNM, including attempts. The NIST shall notify the NRC of events as they are specified in RSD procedures and applicable sections of 10 CFR 70 & 74.

7.2. Material Status Reports

RSD shall maintain the SNM accountability office for this license and administer the accountability system. RSD prepares material status reports, including the beginning and ending inventory balances, activities such as shipment, and receipts involving other facilities, decay, transmutation, and production calculations. RSD reports SNM materials transactions and balances to the NMMSS database system for each Reporting Identification Symbol, in accordance with the provisions of 10 CFR 70 & 74 and NUREG/BR-0007. RSD procedures ensure that reports are made and filed within the required time periods to NMMSS, NSTS and requirements applicable for DOE-reporting. NIST maintains SNM inventory and reporting requirements in accordance with 10 CFR 74.11,10 CFR 74.13, 74.15 and 74.19.

7.3. Nuclear Material Transaction Reports

RSD tracks licensed materials from “receipt to disposal” to ensure accurate accounting records. Physical transfers of nuclear materials between facilities and other onsite transactions such as inventory corrections are reported to NMMSS as required by 10 CFR 74 and NUREG/BR-0006.

7.4. Recordkeeping

NIST is not subject to 10 CFR 74.31, 74.33, 74.43, or 74.59 and therefore not exempt from the recordkeeping requirements in 10 CFR 74.19(a)(1)-(4). NIST is exempt from 10 CFR 74.19 (b)-(d).

7.5. Written Material, Control, & Accounting Procedures

SNM – 362 license limits do not exceed one effective kilogram as defined in 10 CFR 74.4 and therefore regulations under 10 CFR 74.19(b) are not applicable.

NIST pursuant to 10 CFR Parts 20, 30, 33, 40, and 70 has developed, implemented, and maintains written procedures for the following:

1) Purchasing and receipt of RAM;

2) Safely receiving and opening packages;

3) Ensuring control and accountability of licensed material at all times;

4) Maintaining records of receipt, transfer, and disposal of licensed material;

5) Updating transactions in the NSTS, including performing annual inventory reconciliation, if applicable;

6) Use of the NRC's license verification system before transferring aggregated Category 1 or Category 2 quantities of RAM listed in Appendix A to 10 CFR Part 37, to verify that the recipient licensee is authorized to possess the RAM; and

7) Preplanning, coordinating, and providing advance notification of shipment of Category 1 quantities of RAM and coordinating shipment of Category 2 quantities of RAM listed in Appendix A to 10 CFR Part 37.

7.6. Physical Inventories

RSD maintains procedures that provide guidance on the planning, conducting, assessing, and reporting of physical inventories of SNM. SNM physical inventory reports are submitted in accordance with 10 CFR 74.13.

Source Custodians shall maintain inventory records of, and conduct an annual physical inventory for, all sealed and unsealed licensed sources under their responsibility. Source Custodians shall also comply with applicable shipment, transfer, and waste disposal requirements for all sealed and unsealed licensed sources under their responsibility.

7.7. Records Access and Storage

NIST maintains adequate safeguards against tampering and loss by storing records in an access-controlled facility. Records are legible and maintained for the minimum time period specified by the applicable sections of 10 CFR 74 and license conditions. RSD shall maintain inventory records under applicable provisions in 10 CFR 74.19 as well as for unsealed licensed sources with activity greater than or equal to 10 CFR 20, Appendix C quantities and all sealed sources requiring leak testing. If a retention period is not otherwise specified by regulation or license condition, the RSD shall retain the record until the NRC terminates the SNM – 362 license that authorizes the activity subject to the recordkeeping requirement.

8. DECOMMISSIONING AND FINANCIAL ASSURANCE

8.1. Financial Assurance and Decommissioning Funding Plan

NIST shall submit evidence of financial assurance following the guidance of NUREG–1757, Volume 3, Revision 1, "Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping and Timeliness" when required to do so under applicable regulations.

On September 27, 2022, NIST submitted its Statement of Intent (ML22293A269) to NRC in accordance with 10 CFR 30.35(e) and 10 CFR 70.25(e). On December 17, 2022, NIST received a Request for Supplemental Information (RSI) (ML22348A170) from NRC staff to complete their acceptance review.

On January 24, 2023, NIST provided supplemental information (ML23060A262) to NRC and informed them that NIST was actively engaged in a procurement effort to have a new Decommissioning Cost Estimate (DCE) completed in April 2023. Based on this reevaluation, the NRC opted to pause their technical review until the new DCE could be submitted in April. On May 16, 2023, NIST formally submitted its RSI response by providing the new DCE and thus, met the requirements specified in 10 CFR 30.35(e)(1) and 10 CFR 70.25(e)(1).

On June 14, 2023, the NRC staff via letter (ML23157A267) indicated completion of their review of the May 16, 2023, submittal (ML23136B285) and determined that NIST provided sufficient information to proceed with the full technical review of the September 27, 2022, updated Decommissioning Funding Plan and supplemental information to satisfy the requirements described in NUREG-1757, Volume 3, Rev.1.

8.2. Recordkeeping

NIST maintains records important to decommissioning as stated in 10 CFR 30.35(g) and 10 CFR 70.25(g). The records include written descriptions of the specific locations or room numbers where SNM is used or stored and any records of spills in or around the licensee's facilities or information relevant to damaged devices or leak tests of radioactive sources. NIST is responsible for maintaining these records until the license is terminated. When the license is terminated, these records shall be transferred to the NRC.

9. PHYSICAL SECURITY

Refer to Enclosure 6.

10. EMERGENCY MANAGEMENT

An emergency plan is not required.

While the activities requested in this application exceed the values listed in 10 CFR 70.22(i)(1) and 10 CFR 30.72, an emergency plan is not required because a NIST evaluation, which was based on our possession limits at that time, indicated that the maximum dose to a person offsite due to release of RAM would not exceed one (1) rem TEDE, five (5) rem to the thyroid or an intake of two (2) milligrams of soluble uranium in accordance with the requirements in 10 CFR 70.22(i)(1)(i) and 10 CFR 30.32(i)(1)(i). The NRC approved this evaluation on July 30, 2013 (ML13212A132). A review of this evaluation indicated no significant change in offsite dose with the possession limits proposed in this application.