

# Alcatel-Lucent

## Murray Hill Facility Decommissioning Plan Volume 1 of 2

600 Mountain Avenue  
Murray Hill, NJ 07974

NRC License Numbers:  
29-00170-03, SMB-1260  
NJ DEP License Number:  
NJSL-10078/01/21

Rev. 0  
May 2008

Prepared by:



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Bell Laboratories  
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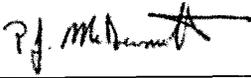
# Alcatel-Lucent Murray Hill Facility Decommissioning Plan

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**ACRONYM LIST**

AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
CATX	Categorical Exclusion
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DAW	Dry Active Waste
DCGL <sub>EMC</sub>	Derived Concentration Guideline Level – Elevated Measurement Comparison
DCGL <sub>W</sub>	Derived Concentration Guideline Level – Wilcoxon Rank Sum
DWP	Decommissioning Work Plan
DQA	Data Quality Assessment
DQO	Data Quality Objective
DSV	Default Screening Value
DU	Depleted Uranium
EA	Environmental Assessment
EIS	Environmental Impact Statement
FONSI	Finding of No Significant Impact
FSSR	Final Status Survey Report
GEIS	Generic Environmental Impact Statement
GSF	Gross Square Feet
HEPA	High Efficiency Particulate Air

HSA	Historical Site Assessment
HVAC	Heating , Ventilation, Air Conditioning
LBGR	Lower Bound of the Gray Region
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
NARM	naturally occurring and accelerator-produced radioactive materials
NJDEP	New Jersey Department of Environmental Protection
NRC	U.S. Nuclear Regulatory Commission
NIST	National Institute of Standards and Technology
PSPC	Position Sensitive Proportional Counter
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
R&D	Research and Development
RPG	Radiation Protection Group
RSC	Radiation Safety Committee
RSO	Radiation Safety Officer
TEDE	Total Effective Dose Equivalent

## 1.0 Executive Summary

Alcatel-Lucent (Lucent) has decided to cease licensed activities and terminate two of three US Nuclear Regulatory Commission (NRC) licenses<sup>1</sup> at their facility located at 600 Mountain Avenue, Murray Hill, NJ 07974. The facility will be decommissioned for unrestricted use (with the exception of irradiator operations) and maintained by Lucent. Lucent desires to terminate Byproduct Materials license number 29-00170-03 and Source Materials license number SMB-1260. Lucent will maintain the irradiator license number 29-00170-08.

The facility consists of 15 buildings with ~1.9 million square feet of floor area and a footprint of ~400,000 square feet on 196 acres of property bounded by Mountain Road, Interstate-78, Diamond Hill Road and Glenside Road. The facility is 15 miles west of Newark, NJ and approximately 28 miles west of New York City in a commercial and residential area of Murray Hill and New Providence, Union County, NJ. See Appendix A for a site plan and satellite photo.

Radioactive materials used at the facility consisted of a variety of radionuclides for research and spanned the chart of the nuclides. These included beta emitters, positron emitters, alpha emitters, gamma emitters and hard-to-detect low energy beta-gamma emitters. An accelerator was historically used as part of a Free Electron Laser and was removed in the early 1990's. Some of the nuclides of concern are not supported by DandD software, so site-specific DCGLs were determined using RESRAD-BUILD version 3.4. Because site-specific DCGLs are being established, Lucent expects that the NRC will categorize this decommissioning effort as Group 4.

Residual radioactivity at the site may consist of surface contaminated building structures and contaminated internal surfaces of building systems. Activated structural materials from accelerator operations have been shown in previous decommissioning surveys to have decayed to levels that meet the facility release criteria. The site has undergone several decommissioning projects in the past and is expected to meet release criteria without decontamination. However, minor decontamination is expected for ALARA purposes.

Lucent has procured Chase Environmental Group (Chase) to perform all decommissioning activities. Decommissioning will be conducted under the provisions of the Lucent Byproduct radioactive materials license number 29-00170-03 and in accordance with this Decommissioning Plan (DP). On-site decommissioning activities are expected to occur within one month of NRC

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<sup>1</sup> Lucent also plans to terminate their NJ Department of Environmental Protection (NJDEP) license number NJSL-10078/01/21. Materials possessed under NRC licenses and under the NJ License are considered in aggregate in this Decommissioning Plan.

approval of this Plan and issuance of a license amendment authorizing decommissioning activities. On-site decommissioning activities are expected to take less than one month.

Chase performed a Historical Site Assessment (HSA) during several site visits from May to August, 2007. Information obtained from the HSA was used to develop this Plan. This plan was developed using the guidance provided in NUREG 1757, "Consolidated NMSS Decommissioning Guidance"; and NUREG 1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM). It provides the approach, methods, and techniques for the radiological decommissioning of impacted areas of the facility. Final status surveys are designed to implement the protocols and guidance provided in MARSSIM to demonstrate compliance with the site-specific Derived Concentration Guideline Levels (DGGLs) generated using RESRAD-BUILD version 3.4. These methods ensure technically defensible data are generated to aid in determining whether or not the facility meets the release criteria for unrestricted use specified in 10 CFR 20 Subpart E. Additionally, ALARA goals are designed to demonstrate compliance with the New Jersey release criterion of 15 mrem/year.

Lucent requests that Byproduct Radioactive Materials License number 29-00170-03 be amended to incorporate this Decommissioning Plan and authorize decommissioning activities. Additionally, Lucent requests exemption from 10CFR20 to implement the ICRP-72 dose conversion factor library of RESRAD-BUILD version 3.4.

## **2.0 Facility Operating History**

Chase performed a Historical Site Assessment (HSA) from May to August, 2007. The purpose of the HSA was to determine the current status of the site including potential, likely, or known sources of radioactive contamination by gathering data from various sources. This data included physical characteristics and location of the site as well as information found in site operating records, including radiological surveys. The HSA consisted of a records review, scoping surveys, site inspection and personnel interviews. The records review included radioactive materials licenses, license applications, amendment requests, Radiation Safety Committee (RSC) meeting minutes, radiological surveys, radionuclide receipt and distribution records, incident reports, decommissioning records, facility renovation records, blueprints, plans and design specifications. Personnel interviews included radiation safety, maintenance, operations, and facilities personnel. The interviewees' presence at the facility spanned the continuous period of facility operations from the early 1970's to present.

Construction of the facility began in the 1940's and radioactive materials usage commenced upon occupancy. The facility was operated under an Atomic Energy

Commission authorization until the license was transferred to the NRC in the early 1970's. License records from 1940 to 1966 could not be found, but it is known that the facility used dispersible materials during this period.

The facility currently operates under three separate NRC licenses, two of which are within the scope of this Decommissioning Plan<sup>2</sup>: Broad Scope Byproduct license number 29-00170-03 and Source Material license number SMB-1260. Materials under both licenses were received and used at the facility. Both licenses historically authorized activities at multiple sites. All sites other than the Murray Hill facility have been removed from the licenses via NRC-approved license amendments. The facility also operates under New Jersey License # NJSL-10078/01/21 authorizing the use of naturally occurring and accelerator produced radioactive materials (NARM) for research and development, and a Co-57 sealed source for Lead Paint Analyzer XK3.

The facility was previously licensed under Special Nuclear Material license number SNM-203 and Calibration license number 29-28260-01. These licenses were terminated – see section 2.3 for details.

Historical operations involved a variety of radionuclides for research. An overwhelming majority of the activity possessed at the site was confined to a very small footprint. Small amounts (microcurie to millicurie quantities) of dispersible materials and reagents containing source materials were distributed to other laboratory areas for low level research activities. Research areas were routinely surveyed and maintained at low levels of residual surface activity (Regulatory Guide 1.86 limits). Starting in 1990, Lucent has drastically reduced the use of radioactive materials and conducted decommissioning activities (remediation and/or surveys) in areas of heavy usage. These decommissioning activities provide a high degree of confidence in the radiological status of impacted areas. The last receipt of radioactive materials was in 1999. All radioactive materials and wastes have been disposed, except for small quantities of source materials (high value crystals) that will be retained under a general license per the provisions of 10CFR40.22. Two small areas of residual activity on a floor surface will be remediated during decommissioning.

## **2.1 License Number/Status/Authorized Activities**

### **2.1.1 NRC License Number 29-00170-03**

Lucent is currently operating under Amendment 69 of Byproduct materials License Number 29-00170-03, issued May 23, 2005 with an expiration date of September 30, 2011. A copy of the current license is provided in Appendix B.

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<sup>2</sup> The third license is irradiator license number 29-00170-08 that is being maintained.

Amendment 69 possession limits and authorized uses are summarized in Table 2-1.

**Table 2-1 – License 29-00170-03 Possession Limits and Uses**

Isotope	Physical Form	Possession Limit	Use
Byproduct Material 1-83	Any	1 Ci each nuclide 100 Ci total	R&D (10CFR30.4)
Hydrogen-3	Any	150 Ci	R&D (10CFR30.4)
Cobalt-60	Any	12 Ci	R&D (10CFR30.4)
Krypton-85	Any	11 Ci	R&D (10CFR30.4)
Tellurium-123m	Any	3 Ci	R&D (10CFR30.4)
Iodine-125	Any	500 mCi	R&D (10CFR30.4)
Iodine-129	Any	1 mCi	R&D (10CFR30.4)
Iodine-131	Any	100 mCi	R&D (10CFR30.4)
Samarium-151	Any	5 Ci	R&D (10CFR30.4)
Tungsten-181	Any	10 Ci	R&D (10CFR30.4)
Byproduct >83	Any	1 mCi each nuclide, 10 mCi total	R&D (10CFR30.4)
Americium-241	Any	200 mCi	R&D (10CFR30.4)
Americium-241	Foiled or Sealed Sources	1750 mCi	R&D (10CFR30.4)
Polonium-210	Foiled or Sealed Sources	1 Ci	R&D (10CFR30.4)
<p><b>Note 1:</b>            Licensed material may be used or stored only at the licensee's facilities located at 600 Mountain Avenue, Murray Hill, New Jersey.</p> <p><b>Note 2:</b>            By license condition, quantities are limited to less than 10 CFR 30.72 emergency plan limits at any single location.</p> <p><b>Note 3:</b>            Sealed source leak tests are required every 6 months (every 3 months for alpha emitters). Sealed sources need not be leak tested if: 1) they contain only H-3; 2) they contain only a gas; 3) half-life <math>\leq 30</math> days; 4) <math>&lt; 100\mu\text{Ci}</math> beta and /or gamma emitting material; 5) <math>&lt; 10\mu\text{Ci}</math> alpha emitting material; 6) they are in storage and are not being used, however they shall be tested prior to use or transfer, and shall not be stored for more than 10 years without being tested for leakage and/or contamination.</p> <p><b>Note 4:</b>            Sealed sources shall be physically inventoried every 6 months.</p> <p><b>Note 5:</b>            Decay-in-Storage authorized for nuclides with half-lives <math>\leq 120</math> days.</p>			

**2.1.2 NRC License Number SMB-1260**

Lucent is currently operating under Amendment 13 of source materials license number SMB-1260, issued May 23, 2005 with an expiration date of June 30, 2012. A copy of the current license is provided in Appendix B. Amendment 13 possession limits and authorized uses are summarized in Table 2-2.

**Table 2-2 – License SMB-1260 Possession Limits and Uses**

Isotope	Physical Form	Possession Limit	Use
Uranium (Natural)	Any	20 Kg	R&D as defined in 10CFR30.4
Uranium (Depleted)	Any	20 Kg	R&D as defined 10CFR30.4
Thorium	Any	70 Kg	R&D as defined 10CFR30.4
Uranium (Depleted)	Plated Metal	300 Kg	Shielding Material

**Note 1:** Licensed materials may be used or stored only at the licensee's facilities located at 600 Mountain Avenue, Murray Hill, New Jersey

**2.1.3 New Jersey License Number NJSL-10078/01/21**

Operations involving accelerator-produced materials were conducted under State of New Jersey license # NJSL-10078/01/21 issued by New Jersey Department of Environmental Protection (NJDEP), Bureau of Environmental Radiation. The license, issued to Bell Laboratories, Division of Lucent Technologies, Inc., is currently on Amendment 21 issued March 20, 2007 with an expiration date of March 31, 2012 issued to accommodate decommissioning activities only. The license previously authorized the use of naturally occurring and accelerator produced radioactive materials (NARM) with mass numbers 5-238 for research and development. The maximum possession limit was 10 Ci in any form, not to exceed 500 mCi for each nuclide. The license also authorized a 10 mCi Co-57 sealed source for a PGT Lead Paint Analyzer XK3.

**2.2 License History**

Radioactive materials license files were reviewed to identify nuclides used, quantities used and historical operations affecting the Murray Hill facility. Essentially, licensed operations for research and development did not change significantly over the history of the license. Amendments typically made administrative changes such as changes to procedures or Radiation Safety Officers (RSO) and minor changes in authorized materials and quantities. Because most of the historical operations were conducted under the broad scope license as controlled by the Radiation Safety Committee (RSC), RSC minutes and radioactive materials receipt and distribution records offered the most insight regarding potential nuclides of concern, usage locations, operations performed and quantities used.

The source materials license was originally issued on December 2, 1975 and did not include the Murray Hill facility. The license authorized up to 40 pounds of natural or depleted uranium and up to 70 pounds of thorium. The Murray Hill facility was added as a location of usage in Amendment 2 dated October 13, 1981 to allow possession of depleted uranium (DU) metal shielding for the Free Electron Laser. A small quantity (4 kg) of DU shielding was acquired in May 1976, used intact, and then disposed as waste in October 1992. Operations conducted under the source materials license included using thorium oxide in solid crucibles for crystal growing experiments. Crucibles typically contained a few pounds of thorium used strictly for heat insulation. Crucibles were not altered chemically or physically. Thorium oxide was also used as flux in the crystal growing process. In this process, the flux was dissolved and the solution collected in plastic bottles and controlled as radioactive waste. Small quantities of thorium (on the order of grams) were used in each process. General chemical and metallurgical experiments were occasionally carried out that used reagents containing uranium and thorium compounds. Small quantities of source materials (on the order of grams) were used to make special metal alloys with unique physical properties. A cylinder of UF<sub>6</sub> containing 2.2 kilograms of uranium was received at the facility in the 1970s. The cylinder was never opened, was stored in the 1G storeroom and was subsequently shipped off-site to Martin Marietta Energy Systems (Portsmouth Gaseous Diffusion Plant) in Piketon, OH on June 12, 1992.

For this type of facility, reagents and other materials containing uranium and thorium are typically possessed under a general license (in quantities < 15 pounds at any time and < 150 pounds per year) and are exempt from 10CFR Parts 19, 20 and 21, including decommissioning regulations. However, this exemption does not apply if the facility also has a source materials license. Therefore, because the Lucent facility has a Source Materials License, uranium and thorium compounds contained in reagents must be considered for decommissioning.

Materials possessed under New Jersey License Number NJSL-10078/01/21 included an accelerator, activated components and materials produced by the accelerator, sealed sources, and dispersible nuclides for research. These materials (other than activated building structural components) were tracked in the radionuclide tracking system along with materials possessed under the broad scope and source materials license.

License files and amendments for all current and previous licenses were reviewed in order to determine activities that could impact decommissioning. Most activities were conducted under the broad scope license where licensing documents are not specific regarding activities conducted. RSC meeting minutes and personnel interviews provided some insight regarding specific activities

conducted. However, radionuclide receipt and distribution records provided the most insight regarding nuclides, quantities and locations.

All radioactive materials received at the facility from January 1966 to present, regardless of the license they were used under, were tracked under the radionuclide receipt and distribution tracking system, including reagents containing thorium and uranium<sup>3</sup>. Each receipt or transfer of radioactive material was recorded on a standard form ("Form E – Record of Radioactive Source") that specified the date, nuclide, quantity, location of usage and form. The information included on Form E remained essentially unchanged over the years. Example Form E's from 1969 and 1999 are provided in Appendix C. These records were complete and provided a high degree of confidence that material usage throughout the facility could be accurately determined. During the HSA, Chase recorded each of the individual radionuclide receipts and the room of receipt. The results are provided in Appendix D. A summary of all radionuclides received at the facility is presented in Table 2-3.

**Table 2-3 - Nuclides Possessed at the Murray Hill Facility**

<b>Nuclide</b>	<b>Half-life (years)</b>	<b>Emission Type</b>	<b>Supported by DandD ?</b>
Ac-227	2.2E+01	Alpha/Beta/Gamma	YES
Ag-110m	6.8E-01	Beta/Gamma	YES
Am-241	4.3E+02	Alpha/Weak Gamma	YES
As-73	2.2E-01	Weak Gamma	NO
Ba-133	1.1E+01	Gamma	NO
Be-7	1.5E-01	Gamma	NO
Bi-207	3.3E+01	Gamma	NO
C-14	5.7E+03	Weak Beta	YES
Ca-45	4.5E-01	Beta	YES
Cd-109	1.3E+00	Gamma	YES
Cf-252	2.6E+00	Alpha/Beta/Gamma/Neutron	YES
Cl-36	3.0E+05	Beta	YES
Cm-244	1.8E+01	Alpha	YES
Co-57	7.4E-01	Gamma	YES
Co-58	1.9E-01	Positron/Gamma	YES
Co-60	5.3E+00	Beta/Gamma	YES
Cr-51	7.6E-02	Gamma	YES
Cs-137	3.0E+01	Beta/Gamma	YES
Eu-152	1.4E+01	Beta/Gamma	YES

<sup>3</sup> Initially, reagents and materials containing thorium and uranium were possessed under a general license. Upon activation of SMB-1260, these materials were possessed under the source materials license. Lucent included these materials in the tracking system from the onset, regardless of whether or not they were possessed under a source materials or general license.

Nuclide	Half-life (years)	Emission Type	Supported by DandD ?
Eu-149	2.5E-01	Beta/Gamma	NO
Eu-154	8.8E+00	Beta/Gamma	YES
Eu-155	5.0E+00	Beta/Gamma	YES
Fe-55	2.7E+00	Weak Gamma	YES
Fe-59	1.2E-01	Beta/Gamma	YES
Gd-153	6.6E-01	Weak Gamma	YES
Ge-68	7.9E-01	Positron/Weak Gamma	NO
H-3	1.2E+01	Weak Beta	YES
Hf-181	1.2E-01	Beta/Gamma	NO
Hg-203	1.3E-01	Beta/Gamma	YES
I-125	1.6E-01	Weak Gamma	YES
K-40	1.3E+09	Beta/Gamma	YES
K-42	1.4E-03	Beta/Gamma	NO
Kr-85	1.1E+01	Beta	NO
Lu-177m	4.4E-01	Beta/Gamma	NO
Mn-54	8.6E-01	Beta/Gamma	YES
Na-22	2.6E+00	Positron/Gamma	YES
Nb-94	2.0E+04	Beta/Gamma	YES
Ni-63	1.0E+02	Weak Beta	YES
Np-239	6.4E-03	Alpha/Beta/Gamma	YES
P-32	3.9E-02	Beta	YES
P-33	7.0E-02	Beta	YES
Pa-231	3.3E+04	Alpha/Beta/Gamma	YES
Pm-145	1.8E+01	Weak Gamma	NO
Pm-147	2.6E+00	Beta	YES
Po-210	3.8E-01	Alpha	YES
Pu-238	8.8E+01	Alpha	YES
Pu-239	2.4E+04	Alpha	YES
Ra-226	1.6E+03	Alpha/Beta/Gamma	YES
Rb-86	5.1E-02	Beta/Gamma	NO
S-35	2.4E-01	Beta	YES
Sb-124	1.6E-01	Beta/Gamma	YES
Sb-125	2.8E+00	Beta/Gamma	YES
Si-31	3.0E-04	Beta	NO
Sm-145	9.3E-01	Beta/Gamma	NO
Sm-151	9.0E+01	Weak Beta	YES
Sm-153	5.3E-03	Beta/Weak Gamma	YES
Sn-113	3.2E-01	Gamma	NO
Sn-119m	8.0E-01	Weak Gamma	YES
Sr-82	6.8E-02	Positron/Gamma	NO

Nuclide	Half-life (years)	Emission Type	Supported by DandD ?
Sr-85	1.8E-01	Gamma	YES
Sr-90	2.9E+01	Beta	YES
Ta-182	3.1E-01	Beta/Gamma	NO
Tb-161	1.9E-02	Beta/Gamma	NO
Te-125m	1.6E-01	Weak Gamma	YES
Te-129m	9.2E-02	Beta/Gamma	NO
Te-132	8.9E-03	Beta/Gamma	YES
Th-232	1.4E+10	Alpha/Beta/Gamma	YES
Th-234	6.6E-02	Alpha/Beta/Gamma	YES
Tl-204	3.8E+00	Beta	NO
Tm-170	3.5E-01	Beta	NO
U-235	7.0E+08	Alpha/Beta/Gamma	YES
U-238	4.5E+09	Alpha/Beta/Gamma	YES
W-181	3.3E-01	Weak Gamma	YES
W-185	2.1E-01	Beta	YES
Y-88	2.9E-01	Gamma	NO
Zn-65	6.7E-01	Gamma	YES

### 2.3 Previous Decommissioning Activities

Over the years, Lucent has conducted decommissioning of sites, facilities, buildings and individual laboratories (lab closeouts). These decommissionings were conducted by the Lucent Radiation Protection Group (RPG) as well as by outside contractors.

#### 2.3.1 Site and Facility Closures

Several sites and facilities were decommissioned and released for unrestricted use by the NRC:

##### Reading, PA

License 29-00170-03, Amendment 68, dated February 18, 2005 removed the facility located in Reading, PA for unrestricted use.

##### Allentown, PA

License 29-00170-03, Amendment 68, dated February 18, 2005 removed the facility located in Allentown, PA for unrestricted use.

##### Whippany, NJ

License 29-00170-03, Amendment 68, dated February 18, 2005 removed the facility located in Whippany, NJ for unrestricted use.

License SMB-1260, Amendment 12 dated February 18, 2005 removed the facility located in Whippany, NJ for unrestricted use.

**Holmdel, NJ**

License 29-00170-03, Amendment 68, dated February 18, 2005 removed the facility located in Holmdel, NJ for unrestricted use.

License SMB-1260, Amendment 12 dated February 18, 2005 removed the facility located in Holmdel, NJ for unrestricted use.

**Hopewell Township, NJ**

License 29-00170-03, Amendment 65, dated December 18, 2000 removed the facility located in Hopewell Township, NJ for unrestricted use.

**Chester, PA**

License 29-00170-03, Amendment 65, dated December 18, 2000 removed the facility located in Chester, NJ for unrestricted use.

**Building 16, Murray Hill, NJ**

License 29-00170-03, Amendment 62, dated May 6, 1998 removed the Murray Hill Building 16 site for unrestricted use. A closeout survey of Building 16 conducted in March 1995 identified soil contamination around the building. Later in 1995, the building was demolished, soils were excavated, and a 550 gallon fuel oil tank and associated piping were removed. The facility was released by the NRC and NJDEP. Building 16 is within the currently licensed Murray Hill site and no licensed activities were conducted subsequent to NRC release. A copy of the amendment transmittal letter releasing the Building 16 site is included in Appendix E.

**2.3.2 Laboratory Closeouts Performed by Lucent Staff**

Records indicate that many labs were closed out over the years. Closeout surveys either do not meet decommissioning data quality objectives or insufficient information exists to determine the data quality (i.e. measurement MDCs). According to personal interviews the laboratory closeout criteria were:

- The lab had not been used for activities involving significant quantities of unsealed radioactive materials.
- There was no detectable activity on a pancake GM probe and/or Eberline AC-3 alpha scintillation detector if alpha emitters were used.
- There was no detectable removable activity ( $< 25$  dpm/100cm<sup>2</sup> beta-gamma and  $< 1$  dpm/100cm<sup>2</sup> alpha).
- Residual radioactivity met Regulatory Guide 1.86 Table I criteria.

Facility rooms are designated by numbers indicating the building, wing and elevation in the following format: BW-ENN, where B is the building number, W is the wing, E is the elevation, and NN is the unique room number. For example, 1E-422 is in Building 1, E wing, 4<sup>th</sup> floor. Building wings are denoted on the site map in Appendix A. Closeout surveys are described in Appendix F for historical perspective and are not meant to support license termination.

### 2.3.3 Laboratory Decommissioning Performed by Contractors

#### Decommissioning of 1G Rad Lab Area by ENSR, 1998

In July 1998, ENSR performed final status surveys of the 1G Underground Radiation Laboratory Complex. The radiation laboratory was used to support all work associated with the NRC broad scope license. Operations included the use of by-product materials in all forms (gaseous, liquid, and solid), special nuclear materials, source materials, neutron activation materials and the use of a neutron generator. The complex consisted of eleven rooms that housed laboratory equipment, fume hoods and machinery.

The specific rooms surveyed were 1G-014 (office), 1G-018B (count room), 1G-018A (radiochemistry laboratory), 1G-018C (neutron generator room), and 1G-026 (liquid waste room). Other areas that were to remain licensed and controlled were 1G-018 (clean up room), 1G-018D (radiochemistry laboratory), 1G-018G (machine shop), 1G-018F (radioactive storage room), 1G-018E (calibration room), 1G-017 (cobalt 60 gamma cell room) and 1G-002 (air exhaust filter room). As part of the decommissioning activities, all laboratory materials and equipment were decontaminated as required, surveyed and released, or disposed as radioactive materials. Based on the knowledge of the RSO at that time, the contaminants of concern for the surveys were: Na-22, Ac-227, Ra-226, Cs-137, H-3 and Co-60. The release criteria were that of Regulatory Guide 1.86 and Policy and Guidance Directive FC 83-23, "Termination of Byproduct, Source, and Special Nuclear Materials Licenses". Instruments were calibrated to either Cs-137 or Th-230, using NIST-traceable standards. Instrument operational and background checks were performed at least once per shift. Survey planning and procedures were conducted in accordance with the "Manual for Conducting Radiological Surveys in Support of License Termination", NUREG/CR 5849 (1-meter grid spacing). The complex was divided into the following affected and unaffected areas.

#### **Affected Areas:**

- 1G-018 (entry and exit access for labs)
- 1G-018A (contained 5 fume hoods)

- Interior Corridor (connected to 6 affected areas)
- 1G-018D (contained 2 fume hoods)
- 1G-018G (contained shop equipment)
- 1G-018B (used for sample counting)
- 1G-018C (contained tritium and activated materials)
- 1G-026 (contained 2 drain tanks and pumping equipment)
- 1G-014 (adjacent to affected areas)
- 1G-018E (affected, but not completely surveyed due to interference from stored materials)
- 1G-018F (affected, but not completely surveyed due to interference from stored materials)

**Unaffected Areas:**

- 1G-002 Air Exhaust Filter Room (secondary HEPA filters)
- 1G Corridor (access corridor)

Surface scans of 100% of accessible surfaces in the affected areas were performed. Unaffected areas were not scanned<sup>4</sup>. Scans were conducted for alpha, beta, and gamma activity. Also a windowless gas flow proportional detector was used to scan areas where tritium was used. Scanning speeds were one detector width per second. However, when using the windowless gas flow proportional detector, it was necessary for the detector to purge with every movement; therefore the scanning speed was essentially one detector width per thirty seconds. Static measurements for alpha, beta and gamma activity were performed at selected locations. In every grid (1 square meter), a direct measurement was taken at any location where scanning identified areas of elevated activity (~twice background). If scanning did not identify an area of elevated activity, then a direct measurement was taken in the center of the grid. A disc smear for removable alpha and beta contamination were performed at each direct measurement location, and at the following locations:

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<sup>4</sup> Under NUREG 5849, unaffected areas require some level of survey effort similar to a MARSSIM Class 3 area. Based on the report, it seems that unaffected areas were not surveyed and the term "unaffected" may have been inappropriately used to identify non-impacted areas.

- Ventilation ductwork above the drop ceiling
- Air filtration room (final HEPA)
- Space above drop ceiling of the labs (inlet air plenum)
- Inside drain lines

Gamma exposure rates were taken at one foot intervals in the interior of all accessible drain lines, and in the neutron generator pit.

Sediment samples were taken from the bottom of liquid waste tanks 1 and 2 prior to the treatment, cleaning and discharge of the liquid.

Smear samples for tritium were performed at the following locations:

- Surfaces of all neutron generator components
- Each grid within the neutron generator room
- Ventilation ducts above the drop ceiling
- Supply air plenum above the drop ceiling
- Air filtration room (final HEPA)
- Areas adjacent to the neutron generator room
- Random locations throughout the other labs

Background levels were determined in unaffected areas with the same material, age and location. Background levels varied due to ongoing usage of radioactive materials in adjacent labs (sources in the irradiator and storage rooms).

Smears and swabs for removable contamination were analyzed for gross alpha and gross beta activity. Smears for tritium were sent off-site to a contract laboratory for liquid scintillation counting analysis. Selected smears were analyzed by gamma spectrometry for nuclide identification.

Scan results for alpha and beta-gamma contamination using a Ludlum 2221 with a 43-89 alpha/beta scintillation probe indicated the following rooms were less than or equal to the Minimum Detectable Activity (MDA): 18G, 18B, 18D, 18A, Interior Corridor, 14, 18C, 26. All elevated scan levels were determined to be due to radon daughter products by gamma spectroscopy analysis.

All surface activity measurements for removable alpha, beta-gamma, and tritium contamination were less than MDA with the exception of the following: 18A – 2.3 dpm/100cm<sup>2</sup> alpha (south wall) and 376 dpm/100cm<sup>2</sup> beta-gamma (west wall).

Residual activity in the Neutron Generator Pit was determined to be Co-60 ~2uCi, at approximately 10 feet deep. The source, a steel outer pipe, is encapsulated with concrete and a second inner pipe. The dose to individuals were determined to be inconsequential (1-2 µR/hr at a depth of 10 feet inside of a 2 foot diameter pipe not meant for human occupancy). Additionally, nearly two half-lives have elapsed since measurements were performed.

This area was renovated – see Appendix G for floor plans (before and after).

#### **Decommissioning of Rad Lab 1F-101F by GTS Duratek, 1999**

In May 1999, GTS Duratek decommissioned the 1F-101F lab for release for unrestricted use. At the beginning of the project, the 600 square foot laboratory was fully equipped and contained three fume hoods, numerous laboratory benches, a sink, water purification system, storage cabinets, shelves, a shielded storage safe, equipment and supplies, and a large number of radioactive items and sources that had accumulated over the years. The scope of work was expanded to include the disposal of two contaminated fume hoods and ventilation ducts that were accessible from within the laboratory, the disposal of radioactive wastes stored in other areas of the facility, identification and disposal of numerous radioactive materials and sources, and a characterization survey of remaining ventilation ducts after exiting the laboratory.

In preparation for the final status survey, all items except permanent structures were removed. Items that were known to be radioactively contaminated and those that could not be surveyed were disposed as radioactive waste. Since numerous radionuclides were used within the laboratory, items to be free released were surveyed for total alpha activity, total beta activity, removable alpha activity, removable beta activity, removable H-3 activity and removable C-14 activity. Only those items that exhibited “no detectable activity” were released. The concept of no detectable activity was interpreted to mean no activity in excess of the critical level (L<sub>c</sub>).

Based on previous surveys performed in the area, little residual activity was expected. However, during the final status survey, contamination was identified in one of the hoods. Upon further investigation and after removal of the rear baffles, additional contamination was identified on the internals of all three hoods and in the ventilation exhaust ducts. Two hoods and all ventilation ducts within the room were disposed as radioactive waste. The third hood was successfully decontaminated. Following removal, remediation and disposal of the

contaminated hoods and ventilation, the final status survey was again initiated. All surveys that had previously been performed were repeated.

At the completion of the final status survey, the ventilation ducting exiting the laboratory was surveyed for total beta activity. This identified localized contamination within the ventilation ducting. A limited characterization survey of the remaining ventilation followed. Measurements for total beta activity were performed at accessible areas in the ventilation system and contamination was identified on the internal surfaces of the ducts. The ventilation ductwork was left in place for future remediation. Although the ventilation system was characterized, only total beta measurements were performed because there was local HEPA filtration at the top of the hood and the only non-particulate operations performed involved only C-14.

Radionuclides of concern for the final status survey were: H-3, C-14, Na-22, Co-57, Co-60, Sr-90, Cs-137, Ra-226, Th-232, U-235, U-238 and Am-241. Assumed radionuclide distribution for the site specific guideline level was: H-3(.02), C-14(.02), Na-22(.3), Co-60(.3), Cs-137(.3), Ra-226(.02), U-238(.02), and Th-232(.02). No basis was provided to support the nuclide distribution. The criterion for free release was established as no detectable activity.

The Ludlum Model 2350 Data Logger and various detectors were used for surface contamination and exposure rate measurements. Detectors included NaI(Tl) gamma scintillation detectors, gas-flow proportional detectors, GM detectors and ZnS alpha scintillation detectors. For direct surface activity measurements, gas-flow proportional counters were normally used, and NaI was used for all exposure rate measurements. An in-situ gamma spectroscopy unit was utilized for the analysis and quantification of gamma emitting nuclides, and the Eberline SAC-4 and BC-4 were used for removable alpha and beta activity. Smears for H-3 and C-14 were analyzed off-site using a Liquid Scintillation Counter. All instruments were calibrated with NIST-traceable sources and response checked daily. Scans for total alpha and beta activity were performed at a rate not to exceed one detector width per second at a distance no greater than 0.5 inches from the surface being scanned. Guideline values were based on Regulatory Guide 1.86 limits.

For the final status survey, the area was divided into Class 1 and Class 2 impacted areas as defined by MARSSIM. Class 1 areas consisted of the fume hoods, sink, permanently installed benches and cabinets, and facility surfaces < 2 meters. Class 2 areas consisted of facility surfaces > 2 meters. Scans were performed for 100% of accessible surfaces in Class 1 areas, and 25% of accessible surfaces in Class 2 areas. Elevated areas identified during the scans were marked for further investigation. Direct measurements for total alpha and total beta were performed at a frequency of one every two meters for Class 1 areas, and one every four meters for Class 2 areas. A direct measurement was taken at all elevated areas identified during the scans. A minimum of 30 measurements were taken in each

survey unit. Smears for removable alpha, beta, H-3 and C-14 were taken at each direct measurement location.

The only area identified with residual activity was the shielded safe, which had fixed contamination on its internal surfaces approaching the established guideline levels. The safe was removed.

#### **Decommissioning of 1F-101F Rad Lab by IEM, 2005**

In May 2005, Integrated Environmental Management, Inc. (IEM) performed a final status survey of the 1F-101F laboratory. The purpose of the survey was to release the area for unrestricted use. The area of concern for the final status survey was the 1F-101F laboratory and a smaller adjacent "back room". Since 2000, only short-lived nuclides (half-lives less than 60 days) had been used. The exhaust ventilation system from the room was also investigated at access panels on the first and fifth floors. Work with radioactive materials had recently ceased and the lab was decontaminated. Routine contamination surveys since decontamination had shown no detectable contamination. At the time of the survey, the area was considered to be free of radioactive contamination. Lucent performed research and development activities with H-3 and C-14. Process knowledge indicated that lab grade uranyl nitrate may have also been used. Therefore the contaminants of concern were H-3, C-14 and U-238.

There was one fume hood in each room, with the hood in the back room used for activities involving radioactive materials. The back room hood was connected to a filtered ventilation system that provided general exhaust ventilation for the entire area. The ventilation exited through the south wall, passed through several offices, and then turned upward towards the roof in a caged area on the first floor. Access panels for the ventilation were available on the first and fifth floors. The floors of the labs were covered in vinyl composition tile. The main room also contained an 8 foot lab bench and several bookcases on the walls. The back room contained a shelf, a shielded storage cabinet, and a lab bench with a sink that was disconnected from the drain system (piping removed).

For the purpose of the final status survey, the derived concentration guideline level (DCGL) was established at the published DSVs ( $1.2E8$  dpm/100cm<sup>2</sup> for H-3, and  $3.7E6$  dpm/100cm<sup>2</sup> for C-14). Removable activity was limited to <10% of the total activity. Surveys were conducted to achieve MDCs <10% of the DCGL. Records do not indicate any release criteria being established for U-238.

The surveyor used a 126cm<sup>2</sup> gas flow proportional detector (Ludlum 43-68) for direct measurements. Stationary counts were also conducted in several locations utilizing a windowless gas flow proportional detector (Ludlum 44-110) to determine the levels of H-3 present on lab surfaces. Analysis for removable low-energy beta activity was performed using an offsite Liquid Scintillation Counter. Instruments were calibrated at least annually using a NIST-traceable source and

response checked daily. Scans for total beta activity were performed of 100% of the accessible surfaces for Class 1 (the floors and lower walls < 2 meters), and 50% of accessible surfaces for Class 2 (upper walls and overhead ceiling areas) using a Ludlum 43-68 at no greater than one detector width per second and no greater than one centimeter from the surface being scanned. Although the report indicates that scans for total alpha activity were performed at random locations in the hoods, sink, countertop and floor; records do not indicate alpha survey results. Total activity measurements were taken at locations determined in accordance with MARSSIM protocols. Smears for removable activity were taken at 28 locations and analyzed by liquid scintillation counting. All measurement results were less than the applicable DCGL.

There is no evidence that any scans, directs or removable measurements were performed for the shielded storage. Also, there are no indications, with the exception of the verbiage in the report, that U-238 activity was ever evaluated.

#### **Characterization Survey of 1F-101F Ventilation by Envirocare in 2005**

In October 2005, Envirocare Field Services, LLC (Envirocare) characterized the ventilation system from room 1F-101F. The ventilation was surveyed for total beta activity, gross removable beta activity and H-3/C-14 removable activity. The survey consisted of eleven measurements taken in accessible areas of the ventilation system. Total activity measurement results ranged from <MDC to 16,087 dpm/100cm<sup>2</sup> in the fan room damper. All results for removable H-3 and C-14 by off-site liquid scintillation analysis were <MDC (39dpm/100cm<sup>2</sup> and 20dpm/100cm<sup>2</sup> respectively). Portions of the ventilation system were removed by Philotechnics in 2006 as described below.

#### **Site Characterization and Decommissioning Funding Plan for the 1G Rad Lab and Accelerator Facility by Energy Solutions in 2006**

In December 2005 and January 2006, Energy Solutions, LLC performed a radiological assessment of the Murray Hill facility. Additional follow up activities were performed in June 2006. The assessment included a survey of the 1G Underground Radiation Laboratory. The survey consisted of measurements of total beta-gamma activity, gross removable beta-gamma activity and gamma exposure rate.

Area classifications, based on MARSSIM protocols, were as follows: The only Class 1 area was the Accelerator Room 1G-009 (a total of 165 measurements were taken). Class 2 areas were: 1G-018 (15 measurements), 1G-018D (15 measurements), 1G-018E (10 measurements), 1G-018F (3 measurements due to the high background from sources in the area), and 1G-018G (9 measurements). Class 3 areas were: 1G-009B (10 measurements), 1G-017 (11 measurements), 1G-019 (12 measurements), 1G-021 (15 measurements), 1G-021A (10 measurements), and 1G-026 (15 measurements).

The average total beta-gamma surface concentration results for all areas were <MDC<sup>5</sup>. A subset of measurements on the Accelerator Room concrete shield blocks (5 measurements) had a maximum average activity concentration was 1,597 dpm/100cm<sup>2</sup>.

Gamma exposure rates, performed to detect activated structural materials in the accelerator room, varied up to 7 µR/hr above background.

Concrete core sampling of walls up to a 6" depth was conducted in the Accelerator Room. A total of seven concrete core samples were collected and analyzed by a contract laboratory for Fe-55, Ni-63, H-3, C-14 and gamma spectroscopy. There was no evidence of activation in any concrete sample. The only reportable activity was from naturally-occurring nuclides.

One water sample was collected from the waste water tank in 1G-026. The sample showed 370 +/- 240 pCi/L tritium. This concentration was slightly greater than the MDC of 360 pCi/L, but less than the reporting level of 500 pCi/L. A duplicate analysis resulted in 140 pCi/L which was less than the MDC of the analysis. All other activities for Nickel-63, Cobalt-60, Europium-152 and Cesium-137 were reported as <MDC.

The Accelerator Room and the Target Room (at the western end of the Accelerator Room) were dismantled in January 2006.

One removable beta-gamma measurement in the 1G-018F fume hood was greater than the MDC and had elevated alpha activity (96 cpm). The report indicated that this was likely due to radon decay daughters on the surface of the fume hood. However there was no documented evidence to support this. The fume hood was subsequently identified by Lucent staff as being contaminated behind the baffles. Interior portions of the hood were removed for disposal as radioactive waste by Chase in 2007 as described below.

The report states that surveyors used instrumentation capable of measuring both beta and alpha activity simultaneously. However, data for alpha surface contamination were not recorded. It was also noted that the instrument has different audible tones for alpha and beta. The surveyors noted that there were no audible instrument responses that indicated the presence of alpha activity.

#### **Rad Lab 1F-101F Exhaust Ductwork Remediation by Philotechnics in 2006**

In May 2006, Philotechnics, Ltd. removed the exhaust ventilation from lab 1F-101F. The ventilation system contained approximately 159 feet of 16-gauge galvanized steel ductwork. The ductwork exited the fume hood in room 1F-101F, and continued through room 1F-101G, through bathrooms and into the caged

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<sup>5</sup> The highest MDC for any survey unit was 371 dpm/100cm<sup>2</sup>.

mechanical space on the first floor. It then turned toward the roof, and continued through the ventilation shaft from the first floor to a fan room on the fifth floor. It then exited into room 1E-519, continued above other ventilation in the hallway and into room 1E-520 where it turned vertically into the doghouse which contains the stack for the exhaust. Work areas were roped off to prevent un-authorized access and lined with plastic for contamination control. Low impact techniques were used to disassemble the ductwork. The ductwork within the chase was inaccessible between the first floor and the fifth floor. The access areas on the first floor and fifth floor were secured with bolted panels. Records do not indicate any surveys for these areas, but personnel involved in the project have personal memories that surveys were performed for total and removable beta activity with results less than MDC. The areas were also surveyed with a portable gamma-ray spectrometer for nuclide identification, no gamma emitting nuclides were identified. The ductwork was not surveyed for alpha activity or H-3/C-14 removable activity, based on the characterization survey performed by Envirocare. The HEPA assembly and the ductwork on the first floor to the vertical chase section and ductwork on the fifth floor, the fans and dampers, and the vertical section through the doghouse and stacks were removed, and the associated areas surveyed. Additionally, the drain tank from the lab was sampled for radionuclides and chemicals by a contract laboratory with radioactivity results less than the minimum detectable levels.

#### **Rad Lab 1F-018F Fume Hood, Filter Housing and Ductwork Remediation by Chase in 2007**

In August 2007, Chase remediated known contamination inside the 1G-018F fume hood, exhaust duct and filter housing. This remediation was conducted to remediate known areas of contamination to accommodate a radioactive waste shipment in preparation for decommissioning. Chase also consolidated all known contaminated items that had been placed in storage in 1G-018F. Surveys conducted by the licensee identified contamination on the rear working surface of the hood and extending behind the baffles. The fume hood baffles and interior surfaces were completely removed and either decontaminated or disposed as waste. The filter housing located directly above the hood was removed after removing the roughing filter and HEPA filter. Surveys performed inside the remaining duct were <MDC.

#### **2.4 Spills**

There is no history of major spills or uncontrolled releases. On occasion, researchers would spill small quantities of materials within the confines of a single laboratory, usually within a hood or on a benchtop. These spills were responded to by Radiation Protection personnel, decontaminated and surveyed to ensure residual radioactivity met facility operating limits. These small spills and other instances of elevated activity are summarized below:

### **Room 1F-101A**

In 1993 there was a spill in 1F-101A of Be-7 as indicated by a 478 KeV peak by gamma spectroscopy. All activities in the area were ceased and the area was decontaminated and re-surveyed. The survey results showed no detectable alpha or beta-gamma removable contamination. In February 2007, the room was surveyed for closure. During free release surveys of furnishings, Cs-137 contamination was identified on a cabinet top and inside one of its drawers. The cabinet top was decontaminated and the drawer was transferred to IG-018G for storage pending the next radioactive waste shipment.

### **Room 1F-101F**

During routine quarterly removable contamination surveys conducted in late 1992 and early 1993, elevated levels of contamination were indicated in room 1F-101F. During both occurrences, the areas were immediately decontaminated and re-surveyed until levels were not detectable.

During routine floor cleaning operations in 1995, rinse water from the IF-101F laboratory indicated elevated levels of Na-22, Co-60 and Cs-137. Surveys of the area for gross removable contamination indicated no detectable contamination.

During routine floor cleaning operations in November 1996, rinse water from the IF-101F laboratory area indicated elevated levels of Na-22 and Cs-137. Removable contamination surveys of the area indicated no detectable activity.

Elevated levels of removable contamination were identified on the work benches and storage cabinet in room 1F-101F during a routine survey in April 1996. Further investigation identified the nuclides for the work benches were Cs-137 and C-14, and the nuclide for the storage cabinet was U-238. It was noted in the record that several unsealed Uranium materials were used in the 1F-101F. The laboratory areas were decontaminated and surveyed to levels not detectable.

### **1G Complex**

Routine surveys in 1993 showed removable Na-22 contamination on the floor in room 1G-018F. The area was decontaminated to non-detectable levels and resurveyed.

In 1993 there was a flood in the 1G lab area. An investigation concluded that there were no radioactive materials involved, and that the flood was from groundwater penetrating the walls due to an outside excavation.

In November 1996, rinse water from floor cleaning of the 1G lab area showed elevated levels of Na-22 and Cs-137. Surveys indicated no detectable levels of gross removable activity.

On May 5, 1975, quarterly routine surveys of the radiochemistry laboratory indicated elevated removable contamination. The area was decontaminated and resurveyed to non-detectable levels.

In 1983, a leaking Ra-226 source was identified and disposed via the RPG.

**Lab 1A-329**

On December 14, 1987, a spill occurred in lab 1A-329 that was contained in a hood. Surveys of the area indicated that no removable contamination was spread beyond the confines of the hood. The area was decontaminated and surveyed to levels not detectable.

**Lab 7F-217**

On April 16, 1991 removable contamination was indicated in lab 7F-217 due to the improper handling of Uranyl Acetate. Contamination was contained in the hood and on items in the immediate vicinity of the hood. The areas were decontaminated and surveyed to levels not detectable.

**Lab 1D-205**

On June 16, 1995 a box labeled radioactive materials was discovered in laboratory 1D-205. The RPG removed the box and placed it into a controlled area, the area was then surveyed to levels not detectable.

**Lab 1E-450**

In 1975, a leaking Am-241 source was identified in lab 1E-450 and disposed via the RPG.

**2.5 Prior Onsite Burials**

There is no history of on-site burials of radioactive materials for disposal purposes. However, there was a subsurface sealed pipe located behind Building 16 that was used for waste-staging in preparation for shipment. The pipe was removed by US Ecology in the early 1990's and the area was included in the Building 16 facility release in the late 1990's.

### 3.0 Facility Description

#### 3.1 Site Location and Description

The Lucent Technologies campus is located at 600 Mountain Avenue, Murray Hill, Union County, New Jersey, 07974 on a 196 acre property bounded by Mountain Road, Interstate-78, **Diamond Hill Road** and **Glenside Road** in a commercial and residential area of Murray Hill and New Providence, Union County, NJ. The facility consists of ~1.9 million square feet of floor area within 15 buildings with a footprint ~400,000 ft<sup>2</sup>. Facility construction began in 1940 with Building 1 and other buildings were added over the years. A summary of all buildings is provided in Table 3-1 below.

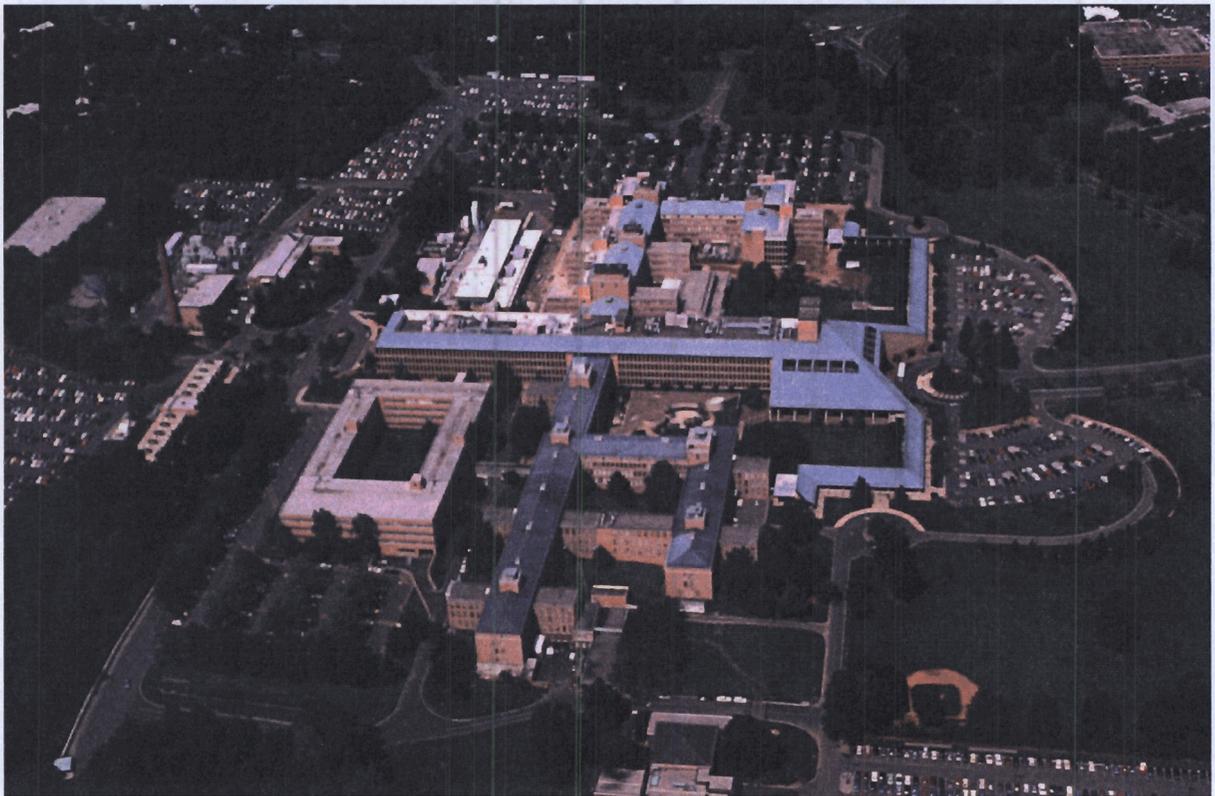


Figure 3-1 Murray Hill Site Photo (Looking East)

Table 3-1 - Buildings Matrix<sup>o</sup>

Bldg. No.	Year Built	Main Use	Structure	Gross Area (ft <sup>2</sup> )
1	1940 <sup>7</sup>	Office/R&D	6 Story Concrete/Steel	491,230
2	1949	Office/R&D	6 Story Concrete/Steel	537,577
3	1958	Office	4 Story Concrete/Steel	270,415
4	1947	R&D	2 Story	63,273
5	1956	Office	1 Story Wood-frame	39,586
6	1972	Mixed	6 Story Concrete/Steel	250,000
7	1972	Office/R&D	5 Story Concrete/Steel	206,481
12	1956	Special	1 Story Metal	2,500
13	1964	Special	1 Story Metal	12,000
13A	1993	Special	1 Story Metal	30,000
14	1941	Office/Garage	2 Story Brick	7,023
15	1941	Offices/Electronics R&D	2 Story Concrete/Steel	10,500
16	1940's	Radiochemistry (Released by NRC/NJDEP and Demolished in 1996)	1 Story Metal	500
25	1981	Storage	1 Story Brick	8,000
26	1985	Special	1 Story Metal	20,000
27	2000	Storage	1 Story Brick	2,500
28	1995	Lab Waste Treatment	1 Story Brick	50,000
29	1998	Fire House	1 Story Brick	10,000

Initially, most of the facility radioactive materials usage (by activity) was conducted in Building 16. In the mid 1970s, Lucent (Bell Laboratories at the time), completed the 1G underground radiation laboratory complex designed to replace Building 16 as the center of radiological operations for the facility. Detailed descriptions of the laboratories are provided below.

#### 1F Radiation Laboratory Complex

The 1F Radiation Laboratory Complex is approximately 2500 ft<sup>2</sup> with vinyl-tiled concrete floors and sheet rock walls. The complex was initially designed to house the Radiation Protection Group and laboratory facilities in support of operations conducted in 1G laboratories. Access to the area is via a set of glass doors on the northwestern side, or through an entrance at the southeastern end from the 1G

<sup>6</sup> Radioactive materials were used in shaded building

<sup>7</sup> The areas of heaviest radioactive materials usage, 1G and 1F, were additions/renovations that were completed in the 1970's

underground laboratory complex (the 1F complex is located above ground and adjacent to the 1G Laboratory Complex). The area consists of eight rooms, which were previously office and records areas for the Radiation Protection Group (in which no licensed operations occurred), room 1F-101A (previously contained the sample counting room), and 1F-101F (previously the radiochemistry/radiation laboratory). Both 1F-101A and 1F-101F, the only areas of the 1F Complex that used licensed materials, have undergone previous decommissioning/laboratory closure activities. 1F-101F used much lower levels of radioactive materials than the 1G complex, was operated under negative ventilation and received one level of HEPA filtration. Room 1F-101A was originally dedicated to office space and record storage. A portion of the room was established as the count room when the 1G-018B counting room was renovated. The counting area was designated by taping off a portion of the floor on the east end of the room. Only securely sealed materials in liquid scintillation vials, calibration sources and gamma spectroscopy containers were allowed in the counting area. Laboratory drains from 1F-101F (2) and 1F-101G<sup>8</sup> (1) drain to a holding tank in the sub-basement below. The holding tank contents can then be transferred to the common house chemical waste drain line in the upper basement. All liquid waste was transferred to closed containers for disposal through a waste broker. No liquid waste was ever introduced into the lab waste lines.

Room 1F-101F is approximately a 600 square foot room with 10 foot ceilings. It previously was a fully equipped radiochemistry laboratory containing three (3) fume hoods, laboratory benches, a sink, water purification system, storage cabinets, shelves, a shielded storage safe, and two drain lines. The laboratory was used for analytical chemistry, radiochemistry, and radioactive materials operations. In August 1994, 1F-101F was rearranged to provide two separate office spaces in a portion of the room. The portion of the room that was to become offices was an area containing desks and bench tops, in which no licensed activities were known to have occurred. As part of the rearrangement process, the Radiation Protection Group performed a closure survey of the area to be used as office space. See Appendix G for floor plans before and after renovation. The drain system for lab 1F-101F incorporates two drain lines which run to the sub basement below and release into a holding tank.

The laboratory area has been completely renovated, and now contains two office areas and a portion that contains computer controls, computer equipment and software where no radioactive materials are used. Fume hoods, exhaust ventilation, exhaust fans, and exhaust stacks for the previous 1F-101F laboratory have been removed and disposed. The floor drains and the holding tank (both below grade) and the vertical ductwork remaining in the chase between the first

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<sup>8</sup> 1F-101G never contained radioactive materials. The lab was only used for non-ionizing radiation.

and fifth floors are the only remaining ventilation and drain system components associated with the 1F-101F laboratory.

### **1G Radiation Laboratory Complex**

The 1G Radiation Laboratory is an underground complex constructed in the mid 1970's to consolidate the use of all licensed radioactive materials within a single area. A floor plan of the original design is presented in Appendix H. Building 16 (a Quonset hut) was decommissioned and operations were moved to 1G. The complex has solid concrete walls and ceilings designed as radiation shielding. The area is approximately 5,000 square feet with vinyl tiled concrete floors, and concrete block or poured concrete interior walls. Access to the area is via an entrance from the first floor 1F Radiation Laboratory area at the west end, or from the 1D first floor on the east end. The area consisted of 20 rooms, of which 11 were considered the radiation complex used to support licensed operations. This included the use of by-product material in all forms (gaseous, liquid, and solid), the use of special nuclear materials, the use of source materials, the use of radioactively contaminated materials, the use of activated materials, the use of a neutron generator, and the use of self-shielded irradiators. The remaining rooms were used for accelerator operations.

The 1G Radiation Lab was designed to contain all unsealed licensed materials and to detect/alarm if radioactivity in any area exceeded normal levels. Work with those materials and contamination controls were monitored with a constant air monitor for airborne particulates. General radiation levels were constantly logged by a computer-based Area Monitor system. Detectors for this system were situated in all areas likely to show elevated radiation levels above background due to normal and emergency conditions: store room (-018F), calibration room (-018E), radiochemistry labs (-018A/D), main exhaust ducts, HEPA filter room (-002), and liquid waste room (-026). These systems were supplemented by a portal monitor and a frisking station that were situated at the main entry/egress point.

The rooms were under negative ventilation, and continuous air monitoring of all areas where work with unsealed licensed radioactive materials was performed. Area monitors were equipped with alarms, and to the knowledge of the site personnel interviewed, there was never an alarm, nor was there ever an alarm of the downstream air monitor for the HEPA ventilation system. Exhausts were double HEPA-filtered. HEPA filters were installed locally at the exhaust of each fume hood and the combined exhausts were filtered through the secondary HEPA bank consisting of 12 filters in the Air Filter Room 1G-002. Secondary HEPA filters were changed periodically as needed to maintain optimal air flow. Prior to disposal as normal lab trash, 100% of each filter surface was scanned to confirm that the primary HEPA filters located atop each hood had trapped all radioactive particulates. This scan supplemented continual monitoring of the activity on the HEPA filters by the Lab Area Monitor System. No activity was ever detected

(after decay of radon daughters) in the secondary filter bank during filter replacement.

The complex received filtered and conditioned supply air from a separate system. A liquid waste collection system in 1G-026 consists of two storage tanks and associated piping and controls. All drains from 1G were collected by this system. All liquid waste was transferred to closed containers for disposal through a waste broker. No liquid waste was ever introduced into the lab waste lines. The storage tanks were for emergency use only to serve as a temporary holding for fire suppression. They were never used for this purpose. All liquids in the tanks originated from routine (non-radioactive/non-decontaminating) housekeeping. This was regularly confirmed prior to all discharges; each tank was sampled and analyzed to meet effluent discharge criteria. Quarterly routine surveys were performed and personnel contamination monitoring was performed by a hand/foot frisk followed by portal monitoring. Descriptions of rooms included in the original design are provided below:

- 1G-001 was the Mechanical Room (no licensed operations occurred)
- 1G-002 was the Filter Bank Room, which contains the secondary HEPA filter bank to further treat fume hood exhausts that were HEPA-filtered locally at each hood
- 1G-009 was the entrance to the accelerator
- 1G-009A&B contained the accelerator
- 1G-014 was previously office and records areas for the Radiation Protection Group (in which no licensed operations occurred),
- 1G-017 contains the Co-60 irradiator gamma-cell
- 1G-018 previously was the access for all 1G-018 controlled areas. It is currently the access room for the Cs-137 irradiator
- 1G-018A previously was a radiochemistry laboratory
- 1G-018B (previously the count room), currently the access for 1G-018A and 1G-018C
- 1G-018C previously was the neutron generator room
- 1G-018D was previously radiochemistry laboratory and currently houses the Cs-137 irradiator

- 1G-018E was previously a calibration lab and ion implant lab.
- 1G-018F was previously the materials receipt and storage room.
- 1G-018G was previously machine shop, currently the access to the controlled area and frisk station.
- 1G-026 Liquid Waste room

The 1G area was remodeled in 2000 after the areas were decommissioned for unrestricted use in 1998 by ENSR. The hallway access between the materials receipt and storage room 1G-018F and the 1G-018/1G-018D labs were blocked with concrete walls to shield the Cs-137 irradiator source that was to be used in the area. Prior to the remodeling 1G-018F, the concrete floor was painted. During the remodeling phases, the floor was surveyed, the paint removed and seamless vinyl flooring installed. In order to provide access to the newly bounded controlled area, a door was installed, and the 1G-018G machine shop was converted to provide access, a clean up area and a frisking area. A floor plan of the remodeled area is presented in Appendix H.

During the decommissioning project, Rooms 1G-018A, 1G-018B, 1G-018C and 1G-026 were released from the controlled area. The only rooms that remained controlled after renovation were 1G-017, 1G-018, 1G-018D, 1G-018E, 1G-018F and 1G-018G, along with the Air Exhaust Filter Room 1G-002.

#### **Other Radionuclide Use Labs**

Tracer quantities ( $\mu\text{Ci}$  quantities) of radionuclides were used in other areas of the facility. No historical survey data was available for rooms, but nuclide receipts were tracked using Form E.

Laboratory areas outside of 1G (including 1F) were in concrete buildings that had steel partition walls and tile floors. These partitions and floors were intended to be readily moved/replaced as R&D requirements changed over time. Renovations involved total removal of the partitions and floor coverings in addition to the lab furniture, plumbing and chemical exhaust hoods to the concrete substrate before rebuilding new areas.

Building 2C, 6E and 6F have been completely remodeled for use as office space. All tile, sheetrock, materials, structures, and equipment were completely removed and disposed of, and all new carpet and furnishings have been installed.

Building 1A- 1, 2, and 3; and 1B- 1, 2, 3, and 4 are currently being renovated. At the time of the Historical Site Assessment, the tile had been completely removed, the sheet rock walls had been completely removed, and all materials, structures and equipment had been removed. All of the items and materials removed from

the areas had been disposed of. New furnishings were being installed in the new office areas.

**3.2 Population Distribution**

Not Applicable – all impacted areas indoors.

**3.3 Current/Future Land Use**

Not applicable – all impacted areas indoors.

**3.4 Meteorology and Climatology**

Not applicable – all impacted areas indoors.

**3.5 Geology and Seismology**

Not applicable – all impacted areas indoors.

**3.6 Surface Water Hydrology**

Not applicable – all impacted areas indoors.

**3.7 Ground Water Hydrology**

Not applicable – all impacted areas indoors.

**3.8 Natural Resources**

Not applicable – all impacted areas indoors.

**4.0 Radiological Status of Facilities**

The radiological status of the facility has been determined by reviewing historical survey records, interviewing Radiation Safety personnel and performing scoping surveys. The facility has routinely been maintained  $<220$  dpm/100cm<sup>2</sup> removable beta surface contamination and  $<20$  dpm/100cm<sup>2</sup> removable alpha surface contamination. There have been several areas of elevated residual radioactivity – the fume hood in 1G-018F, drawers, tables, etc. identified by free release and scoping surveys in preparation for decommissioning. Routine periodic surveys were performed by researchers and Radiation Safety personnel. Laboratory closeout procedures were used when researchers completed experiments involving radioactive materials. All known areas of residual radioactivity have been remediated except for two small areas on the floor in 1G-018F. Based on a review of historical survey results and the results of scoping surveys, it is expected that the facility meets the release criteria for unrestricted use (if the elevated measurement comparison were used) and will only require final status surveys to confirm this assumption. However, it is expected that areas of elevated activity will be remediated for ALARA purposes.

## 4.1 Historical Survey Results

### 4.1.1 Routine Surveys

During the historical review, only survey records from 1974 through 1996 were readily available. Three volumes of records prior to 1974 are believed to have been archived. Record reviews and personnel interviews indicate that routine removable contamination surveys were performed only in laboratories and areas where operations using licensed materials were being performed at the time of the survey. It was common practice to not survey areas and laboratories where operations involved what Lucent believed to be generally licensed materials (uranium and thorium compounds), unless there was an incident requiring investigation. Therefore, many of the areas and laboratories that used these compounds did not receive laboratory closeout surveys. Although both alpha and beta removable activity surveys were performed, it was normal to record only one or the other based on the current operations in the area surveyed (i.e. if only beta emitters were used, alpha activity was measured, but not recorded unless there was notable contamination present in the sample). Routine surveys only included working surfaces where materials were physically handled and not in surrounding areas. Removable contamination was measured using a Tennelec LB5100 low background alpha/beta counter. MDC values for the instrument ranged over time from 0.3 dpm/100cm<sup>2</sup> to 2dpm/100cm<sup>2</sup> alpha and 7.2 dpm/100cm<sup>2</sup> to 25 dpm/100cm<sup>2</sup> beta. The RPG tracked survey information on a quarterly basis and indicated variances (significant increases or decreases in removable contamination levels). Any significant removable contamination (flagged at levels >220 dpm/100cm<sup>2</sup> beta or >10 dpm/100cm<sup>2</sup> alpha) was investigated and remediated to levels not detectable.

During the 1970's, the Radiation Protection Group used an Eberline Alpha Air Monitoring system, calibrated to Uranium, to monitor activities using dispersible alpha emitters. Records had no indications of incidents or elevated airborne radioactivity. It was noted that during the period of January 16 to 22, 1979 that air sampling was performed in lab 1C-211 with all results at background levels.

### 4.1.2 Decommissioning Surveys

Surveys for equipment, materials and building structural surfaces were performed during decommissioning activities described in Section 2.3.

### 4.1.3 Surveys for Polonium 210

On March 1, 1988, the Nuclear Regulatory Commission (NRC) reported several incidents of 3M Po-210 static eliminators leaking at various sites. Procedures were implemented to survey all static eliminators upon receipt, annually, prior to return to the supplier and if damaged. Records indicate that no elevated activity associated with the static eliminators was ever encountered.

#### 4.1.4 Surveys for Incidents

Surveys were performed in response to incidents (mostly small spills or identification of unexpected contamination) as described in Section 2.4.

#### 4.1.5 Scoping Surveys

Scoping surveys were performed by Chase concurrently with the HSA from 5/13/07 to 5/18/07 and on 8/10/07. The information gained from the onset of the HSA was used to design scoping survey protocols to sample areas with the highest potential for residual radioactivity from historical operations.

Protocols for the surveys performed the week of 5/13/07 consisted of:

- Scans for total beta and alpha activity in laboratory rooms including 1G Radiation Complex storage room and access points (rooms 1G-018E, F and G).
- Scans for total beta and alpha activity in the previously documented contaminated drawer from the 1F-101A count room laboratory.
- Scans and direct measurements for isotopic identification using an Exploranium GR135 portable gamma spectroscopy instrument at areas of elevated activity identified during scans.
- Total beta and total alpha activity static measurements and removable beta and alpha activity measurements at areas of elevated activities as identified during scans.
- Large area Masslinn wipes to identify areas of elevated removable contamination. Areas identified as having elevated activity were then surveyed for removable contamination using 100 cm<sup>2</sup> disc smears.
- Judgmental beta-gamma and alpha scans on interior surfaces of drawers, hoods and casework.
- Judgmental beta-gamma and alpha static measurements and smears at areas of elevated activity identified during scans in room 1F-101A.

Removable contamination measurements were analyzed using a Ludlum 2929 (Dual Scaler) with a Ludlum 43-10-1 probe. The smears were originally counted using a one minute background and a one minute count time. Many of the samples were recounted using a longer (sixty minute) background and longer (fifteen minute) count time in order to lower the MDC.

On August 10, 2007 surveys were conducted in areas where radioactive materials were historically used (predominantly reagents containing uranium and thorium) and that have not undergone complete renovation. The purpose of these surveys was to provide a basis for classification of these laboratories and to support non-impacted classification of similar laboratories in areas that have been completely renovated. Protocols consisted of:

- Judgmental beta and alpha scans and smears on structural surfaces less than a two-meter height.
- Large area Masslinn wipes counted for beta and alpha activity.
- Walkthrough survey with a 2" x 2" Sodium Iodide detector.

### **Scoping Survey Results**

#### **Scans**

Areas of elevated beta-gamma and alpha activity were identified during scans of the 1G Radiation Laboratory Complex structures. Each area received a static measurement and a smear at the location of the highest activity. Tc-99 and Th-230 efficiencies were used to calculate activity concentrations. Areas of elevated activity identified during the scans are summarized below:

- An approximately 10 ft<sup>2</sup> area encompassing most of the 1G-018F fume hood interior surfaces had distributed alpha and beta contamination up to 285 dpm/100cm<sup>2</sup> alpha and 600,396 dpm/100cm<sup>2</sup> beta. Measurements taken using the Exploranium GR135 Portable Gamma Spectroscopy Instrument identified Co-60.
- An approximately 2 ft<sup>2</sup> area on the floor in front of the 1G-018F fume hood had distributed alpha contamination up to 222 dpm/100cm<sup>2</sup>.
- Benchtop and drawers in 1G-018F had distributed alpha contamination up to 1,696 dpm/100cm<sup>2</sup>.
- An area approximately 2 ft<sup>2</sup> area on the floor in front of the 1G-018F benchtop had distributed beta-gamma contamination up to 278,541 dpm/100cm<sup>2</sup>.
- A drawer from 1F-101A, stored in 1G-018F, had distributed beta contamination up to 128,018 dpm/100cm<sup>2</sup>. The drawer was discovered during a release survey of 1F-101A and was transferred to 1G-018F for storage.

- An approximately 4 ft<sup>2</sup> area on the 1G-018F freestanding benchtop (not a permanent structure) had distributed beta-gamma contamination up to 327,283 dpm/100cm<sup>2</sup>.

#### Removable Contamination Measurements

Disc smears were taken on floors, benchtop, and casework interior/exterior surfaces. Tc-99 and Th-230 efficiencies were used to calculate activity concentrations. Areas of elevated activity are summarized below:

- The highest disc smear beta-gamma result was 10,750 dpm/100cm<sup>2</sup> in the 1G-018F benchtop drawers
- The highest disc smear alpha result was 129 dpm/100cm<sup>2</sup> on the benchtop in 1G-018F. This smear was sent to Teledyne Brown for gamma and alpha spectroscopy analysis for nuclide identification. The results were inconclusive.

#### **4.2 Contaminated Structures**

Many of the structures identified above have been remediated or removed and disposed as radioactive waste. The only remaining structures with known elevated radioactivity are two locations on the floor in Room 1G-018F described above.

#### **4.3 Contaminated Systems and Equipment**

There are no known contaminated systems or equipment.

#### **4.4 Surface Soil Contamination**

Not applicable – all impacted areas indoors.

#### **4.5 Subsurface Soil Contamination**

Not applicable – all impacted areas indoors.

#### **4.6 Surface Water**

Not applicable – all impacted areas indoors.

#### **4.7 Ground Water**

Not applicable – all impacted areas indoors.

## 5.0 Dose Modeling

Dose modeling was performed to develop site-specific DCGLs for unrestricted release of building structural surfaces. There are no impacted outdoor areas. RESRAD-BUILD, Version 3.4 together with the building occupancy scenario of NUREG/CR-5512 were used to calculate site-specific DCGLs. Most default parameter values of the scenario were accepted. However, site-specific parameter values were used for some critical parameters where there are compelling reasons to justify a site-specific value. DCGLs derived based on the highest 90<sup>th</sup> percentile dose from the probability distributions of each of the evaluation times.

### 5.1 Unrestricted Release Using Site-Specific Information

The radiological release criteria of NRC 10CFR20 Subpart E for unrestricted use are used for decommissioning this facility. Specifically, the facility will be surveyed in accordance with the guidance contained in MARSSIM to demonstrate compliance with the criteria of 10CFR20.1402, "Radiological Criteria for Unrestricted Use." The criteria is that residual radioactivity results in a TEDE to an average member of the critical group that does not exceed 25 mrem per year and that the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA)<sup>9</sup>.

### 5.2 Determination of Nuclides of Concern<sup>10</sup>

Nuclides of concern and impacted rooms were determined by the following process (a brief overview is provided below, followed by a detailed description):

- Record each nuclide receipt in each room.
- Exclude receipts of non-dispersible and gaseous forms.
- Exclude receipts in areas that have been completely renovated.
- Decay-correct each receipt.
- Assume 1% of the decay-corrected activity is evenly distributed across one square meter of surface.
- Determine the resulting surface activity concentration in dpm/100cm<sup>2</sup>.
- Determine the fraction of the filtering criterion.<sup>11</sup>
- Determine the sum of fractions for all receipts of all nuclides in each room.

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<sup>9</sup> The State of New Jersey has established 15 mrem/yr as the unrestricted release criteria (NJAC 7:28-12). Therefore, 15 mrem/yr will be used as an ALARA goal to satisfy both State and Federal requirements. DCGLs will be used as maximum concentrations vs. average concentrations to simplify the survey design and to ensure the ALARA goal is easily met.

<sup>10</sup> The chemical forms of the nuclides of concern are impossible to determine and are not relevant to contaminant transport mechanisms in the building occupancy scenario. The chemical form (lung clearance class) resulting the highest dose conversion factor is assumed for dose modeling.

<sup>11</sup> The filtering criterion was set to the DSV determined from DandD version 2.1 or 1 dpm/100cm<sup>2</sup> for nuclides not supported by the DandD code.

- Exclude receipts in rooms where the sum of fractions is less than one. These rooms are classified as nonimpacted.
- Determine site-specific DCGLs using RESRAD-BUILD version 3.4 for all receipts not excluded during the filtering process.
- Repeat the filtering process using the site-specific DCGL for each nuclide in place of the filtering criterion.
- Classify rooms not excluded in the filtering process using the site-specific DCGL as impacted areas and evaluate for nuclides of concern.

#### Filtering Criterion Determination

A total of 75 different nuclides were received at the facility. A filtering process was developed to minimize the number of nuclides for which a site-specific DCGL was determined. Because it is known that the DandD code is much more conservative than RESRAD-BUILD, the DandD model was used to generate filtering criteria to preclude a site-specific analysis of some nuclides. However, the DandD model does not support some nuclides received at the facility, so an alternate filtering criterion of 1 dpm/100cm<sup>2</sup> was chosen for unsupported nuclides. The filtering criteria determination is described below:

- **Nuclides Supported by DandD, Version 2.1:** Default screening values were derived using the building occupancy scenario together with default parameter values. Screening values were selected such that the 0.9 quantile of projected doses was less than or equal to 25 mrem/year (i.e., when probabilistic dose assessment calculations were performed, there was a 90% probability the calculated dose would be less than 25 mrem/year). All alpha-emitting nuclides used at the facility were supported by the DandD code, but many beta- and gamma-emitting radionuclides were not supported. DandD output reports for nuclides supported by DandD are provided in Volume 2 of this Plan.
- **Beta- and Gamma-Emitting Nuclides Not Listed in DandD:** For those beta-gamma emitters not supported by DandD, an extremely conservative value of 1 dpm/100cm<sup>2</sup> was used to ensure each nuclide was adequately considered. It should be noted that many of these unsupported nuclides have short half-lives and were received at the facility more than 30 years ago. The nuclides not supported by DandD are: As-73, Ba-133, Be-7, Bi-207, Eu-149, Ge-68, Hf-181, K-42, Kr-85, Lu-177m, Pm-145, Rb-86, Si-31, Sm-145, Sn-113, Sr-82, Ta-182, Tb-161, Te-129m, Tl-204, Tm-170, and Y-88.

Filtering criteria are provided in Table 5-1:

**Table 5-1 – Filtering Criteria Summary**

<b>Nuclide</b>	<b>DandD Result (mrem/yr per dpm/100cm<sup>2</sup>)</b>	<b>Filtering Criterion (dpm/100cm<sup>2</sup>)</b>
Ac-227	1.38E+01	1.8E+00
Ag-110m	2.45E-03	1.0E+04
Am-241	9.31E-01	2.7E+01
As-73	Not Listed	1
Ba-133	Not Listed	1
Be-7	Not Listed	1
Bi-207	Not Listed	1
C-14	6.80E-06	3.7E+06
Ca-45	8.92E-06	2.8E+06
Cd-109	2.20E-04	1.1E+05
Cf-252	5.80E-01	4.3E+01
Cl-36	5.03E-05	5.0E+05
Cm-244	5.10E-01	4.9E+01
Co-57	1.18E-04	2.1E+05
Co-58	3.69E-04	6.8E+04
Co-60	3.55E-03	7.0E+03
Cr-51	4.82E-06	5.2E+06
Cs-137	8.93E-04	2.8E+04
Eu-152	1.97E-03	1.3E+04
Eu-149	Not Listed	1
Eu-154	2.18E-03	1.1E+04
Eu-155	1.60E-04	1.6E+05
Fe-55	5.57E-06	4.5E+06
Fe-59	2.83E-04	8.8E+04
Gd-153	1.24E-04	2.0E+05
Ge-68	Not Listed	1
H-3	2.02E-07	1.2E+08
Hf-181	Not Listed	1
Hg-203	6.48E-05	3.9E+05
I-125	3.63E-05	6.9E+05
K-40	2.52E-04	9.9E+04
K-42	Not Listed	1
Kr-85	Not Listed	1
Lu-177m	Not Listed	1
Mn-54	7.93E-04	3.2E+04
Na-22	2.62E-03	9.5E+03
Nb-94	3.02E-03	8.3E+03

Nuclide	DandD Result (mrem/yr per dpm/100cm <sup>2</sup> )	Filtering Criterion (dpm/100cm <sup>2</sup> )
Ni-63	1.38E-05	1.8E+06
Np-239	2.46E-06	1.0E+07
P-32	2.63E-06	9.5E+06
P-33	5.99E-07	4.2E+07
Pa-231	2.92E+00	8.6E+00
Pm-145	Not Listed	1
Pm-147	7.31E-05	3.4E+05
Po-210	1.00E-02	2.5E+03
Pu-238	8.20E-01	3.0E+01
Pu-239	9.01E-01	2.8E+01
Ra-226	2.24E-02	1.1E+03
Rb-86	Not Listed	1
S-35	1.97E-06	1.3E+07
Sb-124	5.78E-04	4.3E+04
Sb-125	5.64E-04	4.4E+04
Si-31	Not Listed	1
Sm-145	Not Listed	1
Sm-151	6.28E-05	4.0E+05
Sm-153	7.30E-07	3.4E+07
Sn-113	Not Listed	1
Sn-119m	1.96E-05	1.3E+06
Sr-82	Not Listed	1
Sr-85	1.79E-04	1.4E+05
Sr-90	2.88E-03	8.7E+03
Ta-182	Not Listed	1
Tb-161	Not Listed	1
Te-125m	1.59E-05	1.6E+06
Te-129m	Not Listed	1
Te-132	4.45E-05	5.6E+05
Th-232	3.43E+00	7.3E+00
Th-234	1.22E-05	2.0E+06
Tl-204	Not Listed	1
Tm-170	Not Listed	1
U-235	2.57E-01	9.7E+01
U-238	2.48E-01	1.0E+02
W-181	2.34E-05	1.1E+06
W-185	1.18E-06	2.1E+07
Y-88	Not Listed	1
Zn-65	5.20E-04	4.8E+04

#### Nuclide of Concern Determination

Potential contaminants were determined from nuclide receipt and distribution records as described in Section 2.2. Several nuclides were changed from the original records due to suspected transcription errors. Where changes were made, conservatism was applied.

- It seems that several nuclides were used in metastable state, but the “m” was not recorded on the sheet: Lu-177, Sn-119, Te-129, Te-125. Where it is logical and conservative, the metastable state was assumed.
- Assumed transcription errors: Sm-150 is listed and is stable, so the Sm isotope with the lowest DSV was assumed (Sm-151).
- What appears to be Sm-157 (8 minute half-life) is considered an interpretation error due to handwriting style and is assumed to be Sm-151.
- If the receipt date was not recorded or not legible, the disposal date was conservatively used to perform decay corrections.
- Where receipts were recorded for a researcher’s office, the receipt was assigned to the researcher’s laboratories as well as their offices. According to personnel interviews, nuclides were delivered only to laboratories and not to offices, but it was not uncommon in the early years for researchers to list their office on the Form E. This reconciliation was not performed in areas that had undergone complete renovation.

All radionuclide receipts were organized on a spreadsheet and sorted by nuclide and then by room. Individual receipts were excluded under the following conditions:

- The radionuclide was used in a non-dispersible form (foil, metal or sealed source with no history of leakage).
- The physical form of the radionuclide was an inert gas (Kr-85).
- The room has undergone complete renovation in which all fixtures and exposed structural surfaces were removed and disposed.<sup>12</sup> The basis for this is that any potentially contaminated surface would have been removed. Additionally, historical records indicate that the facility was maintained at very low levels of removable contamination (<220

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<sup>12</sup> Buildings are large metal-frame buildings with non-load-bearing interior walls. Renovations involved removing all interior walls, drop ceilings, floor coverings and ventilation components. Essentially, entire elevations were gutted and stripped to the substrate and then rebuilt as office areas. Drain lines were typically removed to the vertical chase and capped. Drain lines from these areas will be surveyed for final status.

dpm/100cm<sup>2</sup> beta-gamma and <20 dpm/100cm<sup>2</sup> alpha) such that there is not a significant potential for cross-contamination of underlying structural surfaces during dismantlement. Furthermore, areas with similar operational histories that have not been renovated will be surveyed as impacted areas to verify this assumption.

The decay-corrected activity was determined for each receipt based on the quantity received, date of receipt and the half-life. One percent<sup>13</sup> of the decay-corrected activity was then assumed to be evenly distributed across a one square meter area. The resultant surface activity concentration was determined in dpm/100cm<sup>2</sup> and then expressed as a fraction of the filtering criterion. The sum of fractions was then determined for all radionuclides received in each room (i.e., all the receipts of C-14, U-238, Co-60 and any other nuclides received in a particular room). If the sum of the fractions for all receipts of all nuclides in a room was less than one, the room was classified as nonimpacted. After determination of site-specific DCGLs for nuclides passing initial filtering, the filtering process was repeated using the site-specific DCGLs in place of the filtering criteria. Determination of the site-specific DCGLs is explained in Section 5.3.

### 5.3 DCGL Development

The DCGL is the radionuclide-specific surface activity concentration that could result in a dose equal to the release criterion. DCGL<sub>w</sub> is the concentration limit if the residual activity is evenly distributed over a large area. In the case of non-uniform contamination, MARSSIM allows for evaluation of higher levels of activity over small areas using the DCGL<sub>EMC</sub>. Due to the radiological cleanliness of the facility relative to the DCGLs, the desire to maintain simplicity of the FSS, and to assist in achieving ALARA goals, the DCGL<sub>w</sub> is used as a maximum value and small areas of elevated activity are not considered in this survey design.

Site-specific dose modeling was performed, not because of the complexity of the site, but because nuclides were received that are not supported by the DandD dose model and because of excessive conservatism in the DandD model for some alpha emitters. As such, the building occupancy scenario was modeled using RESRAD-BUILD, Version 3.4 to determine site-specific DCGLs. The goal was to develop a simple, conservative model for ease of review and implementation. Higher criteria could be obtained by refining critical parameters, but the effort required for justification would not be worthwhile. Some critical parameters have a significant amount of uncertainty. This uncertainty is offset by conservatism of the site conceptual model. Accepting extra conservatism has little impact on schedule or budget due to cleanliness of site. Conservatism is a common theme throughout

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<sup>13</sup> The assumption that 1% of all activity received was spilled is ridiculously conservative considering the material controls that were in place for research activities. The purpose of this extreme conservatism is to ensure that each room that used radioactive materials is adequately investigated in regards to the potential for residual radioactivity.

selection of site-specific parameter values and development of DCGLs. This conservatism is used frequently to offset uncertainty such that qualitative statements may be used to justify site-specific parameter values.

### 5.3.1 Scenario Justification

The generic building occupancy scenario of NUREG/CR-5512 is used with certain site-specific parameters. The assumptions of the building occupancy scenario would result in higher exposures than plausible future use scenarios and bounds the potential doses to future occupants from residual radioactivity.

Impacted areas are primarily research laboratories. Research laboratories are designed to control the buildup of contaminants in the ambient air and the spread of contaminants to adjacent rooms. Laboratory ventilation systems are designed as once-through systems in which air is not recirculated and is exhausted directly to the outside via stacks at high turnover rates. Typically, fume hoods are designed to exhaust most, if not all, room air. Laboratory areas are maintained at negative pressures relative to office and common areas to ensure that if contaminants are spilled or otherwise released within the laboratories, that they would not be spread to adjacent areas via ventilation flow. This inherent design is very effective at removal of contaminants and limiting personal exposures.

Potential residual radioactivity at the site consists of low-level (non-detectable in most instances), homogeneously distributed, tightly bound surficial contamination on building structural surfaces and, potentially, less tightly bound surficial contamination on the interior surfaces of building systems, such as ventilation ducts and drain piping. The facility has undergone several decommissioning projects throughout its history and impacted areas received frequent routine cleaning due to research activity cleanliness requirements. Much data are available to demonstrate the facility had very low levels of removable contamination over its history. Residual activity on building structural surfaces, if any, is expected to be fixed contamination from low level buildup over many years of operation with frequent cleaning. Contamination is expected to be tightly bound in pores or chemically bound in the structural surface matrix and would require heavy force to accomplish removal vs. the light contact expected in the building occupancy scenario.

Because impacted areas are primarily laboratories fitted with casework, benchtops, fume hoods and other laboratory fixtures, it is expected that laboratory-type work would be performed in these areas, occupancy would only involve adults, and activities would not include heavy work that would cause significant abrasion or mechanical disturbance of structural surfaces. Walking on floors is expected to be the highest probability task that could cause mechanical abrasion of structural surfaces. Also, laboratory cleanliness protocols, including personal protective equipment (PPE), would be expected to be employed, further

limiting personnel exposures to radioactive materials. This probable use scenario is bounded by the assumptions of the building occupancy scenario. Any other reasonable use of impacted areas (except storage that would reduce occupancy time) would require complete renovation of existing rooms to include removal of fixtures, removal of existing floor and/or wall coverings, and applying new floor and/or wall coverings. This would effectively remove or encapsulate the source term. Because internal exposure pathways dominate the dose model for areas with surficial contamination, removing or covering structural surfaces would preclude any credible exposure pathway to future occupants.

Upon release of the facility, Lucent plans to maintain control of the impacted areas and does not plan to sell or lease these areas. In fact, the irradiator license is being maintained to continue operations in the 1G Complex, the area with the history of heaviest radioactive materials usage. However, business objectives often change and other uses by Lucent or sale/lease of the facility are plausible future scenarios. As discussed above, any usage involving occupancy other than as chemistry laboratories would require complete renovation.

Since residual activity is surficial and tightly bound (not volumetric), a renovation scenario is not limiting. Renovation workers would remove laboratory fixtures and structural surface coverings such as sheetrock, ceiling panels, floor tiles, etc. Because residual radioactivity would be largely fixed, this would not result in significant spread of residual radioactivity. Floor surfaces and concrete wall surfaces would be painted or otherwise covered during renovation. Nuisance dusts would be controlled and workers would use PPE as necessary. Occupancy time would be minimal considering the small footprint of impacted areas. Furthermore, impacted areas are not contiguous, so it is unlikely that all areas would be renovated at the same time by the same individuals.

### **5.3.2 Critical Group Justification**

The NUREG-5512 building occupancy scenario default critical group (full-time adult males in light industry) is accepted as the critical group for this site-specific scenario. Extensive renovation of impacted areas would be required to make any other critical group plausible. Renovation would effectively eliminate inhalation and ingestion pathways, the predominant exposure pathways to future occupants, and would more than offset any potential increase in dose due to future occupancy, activity or age factors.

Considering infants and children have higher dose conversion factors than adults, it is appropriate to specifically address the plausibility of future uses involving occupancy by infants or children. Adapting impacted areas for uses in which children would be occupants, such as a child care center, would necessitate renovations that would require essentially gutting impacted areas and rebuilding them, further limiting or preventing exposures from residual radioactivity. The

State of New Jersey has rigorous permitting requirements for childcare centers such that the historical usage of the facility would more than likely preclude permitting as a child care center. NJ regulations (Chapter 122, Manual of Requirements for Child Care Centers) make the site particularly inappropriate for a child care center. Chapter 122 states, in part: “a center shall not be located near or adjacent to areas determined by the Bureau to be hazardous to the physical health or safety of the children.” It further states that the Bureau may require a center in a co-located multi-use building to “...meet any other physical, plant, staffing, program or other operational requirements that are deemed necessary to protect the children from serious risk of harm stemming from the co-location.”

### **5.3.3 Dose Model Parameter Inputs**

Input parameter values were selected to correspond with the building occupancy scenario in NUREG/CR-5512. For the most part, parameter values match NUREG/CR-5512 values. Because the building occupancy scenario is used in DandD, has much supporting data in NUREG/CR-5512 to support the value selection, and has been widely accepted by the NRC, little justification is provided for most parameters that match the building occupancy scenario. Where site-specific parameter values are chosen, additional justification is provided. A summary of the parameter values is provided in Table 5-2 and Table 5-3. Detailed descriptions are provided after the tables.

**Table 5-2 - Dose Model Parameter Value Summary**

Parameter	Symbol	Type <sup>14</sup>	Value	Distribution	Comments
Dose/Risk Library	N/A	D	ICRP 72 (Adult)	N/A	Site-Specific
<b>Time Parameters</b>					
Exposure Duration (days)	TTIME	D	365.25	N/A	NUREG-5512 Default
Indoor Fraction	FTIN	P	Per CDF described below	Continuous Linear	Adjusted NUREG-5512 Default
Evaluation Times (years)	DOSE_TIME	D	0, 1, 3, 5, 10, 20, 26.4	N/A	Source lifetime is 27.4 Years (10,000 days)
Time Integration Max #of Points for Dose/Risk	POINT	N/A	257	N/A	RESRAD-BUILD Default is 17
<b>Building Parameters</b>					
Number of Rooms	NROOM	N/A	1	N/A	
Deposition Velocity (m/s)	UD	P	2.7E-6 (min.) 2.7E-3 (max.)	Loguniform	RESRAD-BUILD Default
Resuspension Rate (1/s)	DKSUS	P	2.8E-10 (minimum) 1.4 E-5 (maximum)	Loguniform	RESRAD-BUILD Default
Building Exchange Rate (1/hr)	LAMBDAT	D	6	N/A	Site-Specific, Based on Actual Conditions
Area (m <sup>2</sup> )	AREA	D	64	N/A	Site-Specific, Based on Actual Conditions
Height (m)	H	D	3.0	N/A	Site-Specific, Based on Actual Conditions

<sup>14</sup> D = Deterministic, P= Probabilistic

Parameter	Symbol	Type <sup>14</sup>	Value	Distribution	Comments
<b>Receptor Parameters</b>					
Receptor #	ND	N/A	1	N/A	
Room #	DLVL	N/A	1	N/A	
Time Fraction	TWGHT	D	1	N/A	
Breathing Rate (m <sup>3</sup> /d)	BRTRATE	P	12 (min.) 33.6 (mode) 46 (max.)	Triangular	NUREG-5512 Default Value, RESRAD-BUILD default distribution
(Indirect) Ingestion Rate (m <sup>2</sup> /hr)	INGE2	P	2.8 E-5 (min.) 2.9 E-4 (max.)	Loguniform	NUREG-5512 Default
Location (x,y,z in meters)	DX	D	4, 4, 1	N/A	Center of Room, Midpoint of Receptor
<b>Source Parameters</b>					
Source #	NS	N/A	1	N/A	
Room	SLVL	N/A	1	N/A	
Type	STYPE	N/A	Area	N/A	
Direction	SDIR	N/A	Z	N/A	
Location (x,y,z in meters)	SX	D	4, 4, 0	N/A	Center of Room on Floor
Source Geometry		N/A	Rectangular	N/A	Rectangular Room
Source Length Y (m)	Used to Calculate Source Area (SAREA)	D	11.3	N/A	SQRT of Floor and Wall Area
Source Length Z (m)		D	11.3	N/A	SQRT of Floor and Wall Area
Air Fraction	AIRFR	P	1E-5 (min.) 0.357 (mode) 1 (max.)	Triangular	NUREG-5512 Default
Direct Ingestion (1/hr)	INGE1	D	3.06E-6	N/A	NUREG-5512 Default
Removable Fraction	RMVFR	D	0.01	N/A	Site-Specific
Lifetime	RF0	P	1,000 (min.)	Triangular	NUREG-5512

Parameter	Symbol	Type <sup>14</sup>	Value	Distribution	Comments
(days)			10,000 (mode) 100,000 (max.)		Default Value,
Radon Release Fraction	N/A	D	0.2	N/A	RESRAD-BUILD Default Emanation Rate

**Table 5-3 - Uncertainty Analysis Input Summary**

Random Seed	1000
Number of Observations	100
Number of Repetitions	3
Sampling Technique	Latin Hypercube
Grouping of Observations	Random

**Dose Conversion Factors (ICRP 72 Adult Library)**

The default parameter sets for DandD and RESRAD-BUILD are based on EPA Federal Guidance Reports (FGR) No. 11 and No. 12. The internal dose conversion factors for inhalation and ingestion are those developed by EPA and published in Federal Guidance Report No. 11 (EPA, 1988). The external dose conversion factors are published in Federal Guidance Report No. 12 (EPA, 1993). These dose factors were selected by the NRC to ensure consistency with 10 CFR Part 20. However, other dose conversion factors may be used with NRC approval. NUREG-1757, Appendix I, I.5.3.2 states: "Licensees may request an exemption from Part 20 to use the latest dose conversion factors (e.g., ICRP 72). Scenarios and critical group assumptions should be revisited to look at age-based considerations. Licensees may not "pick and choose" dosimetry methods for radionuclides (e.g., Federal Guidance Report No.11 for six radionuclides and current international dose conversion factors for three radionuclides)."

FGR 11 DCFs are based on two superseded ICRP reports: 1) ICRP 26 provided guidance for assessing dose to workers, and 2) ICRP 30 recommended biokinetic and dosimetric models. Guidance and models underlying FGR 11 were designed for application to occupational exposure. In 1977, ICRP published ICRP 26 that established risk factors for different tissues. In 1990, ICRP 26 was superseded by ICRP 60 which revised & extended the list of tissue weighting factors. In ICRP 26, dose equivalent is defined as a point kernel quantity that is useful for micro-dosimetry assessments of localized skin or wound contamination, where it isn't appropriate to average dose over a whole tissue or organ. In ICRP 60, equivalent dose is defined as a tissue or organ quantity where the dose, averaged over a tissue or organ, is corrected by a weighting factor. ICRP 30 was superseded by ICRP 68 which substantially changed biokinetic models (especially the respiratory model) and gastrointestinal absorption fractions. Compared with the

ICRP 30 model, the ICRP 68 model predicts much different rates of absorption from the respiratory tract to blood. Differences in the biokinetic & dosimetric properties of the two respiratory models often lead to substantially different estimates of lung dose. It is generally believed that NRC dose factors based on ICRP 26 are overly conservative and the NRC has previously approved exemptions from 10CFR20 to allow licensees to use the updated dosimetry models.

The ICRP 72 Adult library was selected to use the most up to date information available. As such, Lucent requests exemption from 10 CFR 20 (via a license amendment incorporating this Plan) to use these dose factors. The library consists of ingestion and inhalation dose factors for adults from ICRP 72, slope factors from FGR 13 Morbidity, and external dose conversion factors from FGR 12. Selection of adult conversion factors is consistent with the critical group as discussed above.

**Exposure Duration (365.25 days)**

The exposure duration was selected to assess an annual dose and to match the length of the occupancy period of the building occupancy scenario in NUREG/CR-5512. This parameter was not selected for probabilistic analysis because only exposure durations of one year are useful for demonstrating compliance with the release criteria.

**Indoor Fraction (Probabilistic)**

The indoor fraction was selected to match the 97.5 days/year (2340 hours) assumption of the building occupancy scenario in NUREG/CR-5512. This factor is conservative, considering that laboratory workers generally spend a portion of their time in a nearby office performing administrative tasks and planning/documenting experiments.

For probabilistic analysis, the default distribution from RESRAD-BUILD (continuous linear) was used with modification. NUREG 5512 uses the fraction based on a 24-hr day while RESRAD-BUILD default probabilistic distribution is based on fraction of a workday. As such, the cumulative distribution function is maintained, but the corresponding values have been adjusted to represent the 45 hour work week, 52 weeks per year assumed in NUREG/CR-5512. Each value in the distribution has been corrected by the factor 0.267/0.365 such that the NUREG/CR-5512 default indoor fraction of 0.267 represents the 50<sup>th</sup> percentile of the distribution. The results of this correction are presented in Table 5-4.

**Table 5-4 - Indoor Fraction Cumulative Distribution Function**

<b>RESRAD-BUILD Default Value</b>	<b>Adjusted Value for Site-Specific Analysis<sup>15</sup></b>	<b>Cumulative Distribution Function</b>
0.003	0.002	0
0.0347	0.025	0.05
0.306	0.224	0.25
0.365	0.267	0.5
0.403	0.295	0.75
0.469	0.343	0.9
0.542	0.396	0.98
0.692	0.506	1

**Evaluation Times (0, 1, 3, 5, 10, 20, and 26.4 years)**

Evaluation times were set at various times during the default source lifetime of the building occupancy scenario in NUREG/CR-5512 to evaluate trends. This parameter is not available for probabilistic analysis.

**Time Integration (257)**

The maximum number of points used in integrating the dose rate over the exposure duration to achieve convergence criteria is set at 257 (the maximum allowed by the code). This parameter is not available for probabilistic analysis.

**Number of Rooms (1)**

Only one room is modeled because the receptor is expected to occupy the room in which the source is located. Airflow models of RESRAD-BUILD involving multiple rooms with air exchange between rooms are not useful for this scenario. This parameter is not available for probabilistic analysis.

**Deposition Velocity (Probabilistic)**

The probabilistic distribution and range are RESRAD-BUILD defaults based on a variety of studies involving various particle sizes and environmental properties as presented in ANL/EAD/03-1, Table J.5.

As a matter of convenience, the same deposition velocity is used for all nuclides. Tritium could exist as a vapor and would have different deposition dynamics. However, tritium is such a small contributor to dose that the dose consequences due to differences in deposition for tritium in this model are insignificant and are not considered.

<sup>15</sup> Each value was adjusted by the factor 0.267/0.365.

### Resuspension Rate (Probabilistic)

The RESRAD-BUILD default resuspension rate probability distribution is conservative and corresponds well with the default value of the resuspension factor recommended by the NRC for the DandD code in NUREG 1720. Therefore, the default loguniform distribution, with a minimum of 2.8E-10/sec and maximum of 1.4E-5/sec, is accepted.

Most studies involving measurement or estimation of resuspension rates concentrated on outdoor resuspension rates from particles deposited on soils and grasses. Particle size plays a significant role in resuspension rates and larger particles are more susceptible to resuspension, resulting in a large fraction of resuspended contaminants being nonrespirable. Surface adherence of particles is also related to resuspension. Most studies used freshly deposited, loosely adhered particles to perform measurements, sometimes using resuspension forces that would not be reasonable for the building occupancy scenario. Residual radioactivity at this site is expected to be tightly bound as a result of material controls and routine cleaning over the years. From ANL/EAD/03-1: "Those buildings with more frequent cleaning schedules are expected to have lower resuspension factors/rates than those sporadically cleaned, because the more loosely bound material from deposition is maintained at lower levels." The assumption that any residual activity is tightly bound and less likely to be resuspended than particles in the studies used to generate resuspension rate data is supported by routine survey results, scoping survey results and data from surveys where residual radioactivity has been identified on structural surfaces.

Data from most studies use the resuspension factor (1/m). Conversion from a resuspension factor to a resuspension rate requires information regarding air flow and particle properties. It is possible to estimate resuspension factors from resuspension rates based on the source lifetime. However, in the building occupancy scenario, the source lifetime is based on the time before building renovation and not on the time it would take to erode the source term to extinction. However, Table J.8 of ANL/EAD/03-1 summarizes studies in which the resuspension factor was determined and the resuspension rate estimated<sup>16</sup>. Data from these studies, excluding data for particle sizes >10 µm (nonrespirable), are provided in Table 5-5.

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<sup>16</sup> These studies are considered to overestimate the resuspension rate.

Table 5-5 - Resuspension Data from Previous Studies<sup>17</sup>

Estimated Resuspension Rate <sup>18, 19</sup> (1/s)		Resuspension Factor (1/m)	Description
Min.	Max.		
7.70E-07	1.10E-06	1.20E-04	Brunskill (1967), 4-6 people walking in change room, 1-3% removed by smears
1.10E-10	1.10E-07	3.90E-05	Fish (1967) vigorous walking, ZnS tracers
3.30E-08	2.20E-07	4.00E-06	Ikezawa (1980), Pu cleanup
3.30E-08	2.20E-07	2.00E-05	Ikezawa (1980), Pu cleanup
4.80E-07	6.10E-07	5.00E-05	Jones and Pond (1967), 36 steps/min
3.70E-06	4.30E-06	2.20E-04	Khvostov and Kostiakov (1969), alpha, floors scrubbed with cotton
2.40E-09	2.40E-06	9.00E-04	Shapiro, 1970, Ba <sup>35</sup> SO <sub>4</sub> , loose material, banging on floor
1.40E-06	2.00E-06	2.20E-04	Tagg (1966), personal air samplers, 100 steps/min, contaminated floor,
2.80E-10	N/A	1.40E-06	Thatcher and Layrton (1995), 0.3-0.5 μm particles, four residents normal activities, 0.3/hr air exchange
1.20E-10	N/A	6.00E-07	Thatcher and Layton (1995), 0.5-1 μm particles, four residents normal activities, 0.3/hr air exchange
5.00E-09	N/A	9.40E-06	Thatcher and Layton (1995), 1-5 μm particles, four residents normal activities, 0.3/hr air exchange
2.30E-08	N/A	2.00E-05	Thatcher and Layton (1995), 5-10 μm particles, four residents normal activities, 0.3/hr air exchange

**Radiological Units (dpm)**

Units of dpm were chosen to be consistent with standard surface contamination units.

**Dose (mrem)**

Units of mrem were chosen to be consistent with NRC-published dose-based release criteria.

<sup>17</sup> Studies with RF results within a factor of 10 of the recommended default RF in NUREG-1720 (RFs from 1E-5 to 1E-7) are highlighted to show estimated resuspension rates associated with RFs near the NRC-recommended default.

<sup>18</sup> The resuspension rates were estimated from the resuspension factors.

<sup>19</sup> The RESRAD-BUILD default resuspension rate for a deterministic analysis is 5E-7/s.

**Building Exchange Rate (6 per hour)**

The building exchange rate<sup>20</sup> is based on actual site conditions. The exchange rate for impacted rooms has been determined from facility drawings and ventilation flow balance data as summarized in Table 5-6. Because the exchange rate has been accurately determined and actual exchange rates are higher than that used in the dose model, this parameter has not been selected for probabilistic analysis.

**Table 5-6 - Impacted Room Exchange Rates**

Room	Area (ft <sup>2</sup> )	Height (ft)	Volume (ft <sup>3</sup> )	Exhaust Flow (cfm)	Exchange Rate (/hr)
15-215 (203)	646	10	6,460	845	8
1C-211	648	10	6,480	N/D <sup>21</sup>	N/D
1C-231	306	10	3,060	690	14
1D-208	483	10	4,830	N/D	N/D
1D-255	104	10	1,040	N/D	N/D
1D-408	486	10	4,860	N/D	N/D
1D-414	512	10	5,120	3500	41
1D-522	210	10	2,100	600	17
1E-406	486	10	4,860	N/D	N/D
1G-018	235	10	2,350	270	7
1G-018A	692	10	6,920	4090	35
1G-018B	161	10	1,610	1355	50
1G-018C	174	10	1,740	400	14
1G-018D	315	10	3,150	995	19
1G-018E	525	10	5,250	1055	12
1G-018F	309	10	3,090	800	16
1G-018G	188	10	1,880	750	24

Residences and office buildings are generally designed for about one air change per hour. Air exchange rates in a laboratory setting are expected to be much larger. Laboratory design standards are recommended by professional organizations and governed by local building codes and facility-specific policies. The standard over the years has been to design ventilation systems in laboratories containing chemicals at six to twelve air changes per hour. These higher air exchange rates serve to directly reduce inhalation doses. the predominant

<sup>20</sup> Because the model uses a single room, the building exchange rate is equal to the room exchange rate

<sup>21</sup> N/D = Not Determined.

exposure pathway for the model. Current exchange rates are expected to be maintained after decommissioning to support a laboratory future use scenario.

#### **Room Area (64 square meters)**

The Room Area is based on actual site conditions. The maximum floor area of any impacted room is 65 m<sup>2</sup>, so 64 m<sup>2</sup> was selected to emulate a square room of 8 meters by 8 meters. This is conservative because it overestimates the source term in most survey units. If impacted rooms are discovered that are larger than the model room size, then model adjustments will be made.

#### **Room Height (3.0 meters)**

The Room Height is based on actual site conditions. The ceiling height is 12 ft. However, many rooms have drop ceilings at a 10 ft. height. Suspended ceilings serve to effectively constrain the room volume available for dilution of resuspended particles, so 10 ft. (3.0 meters) was chosen because it is conservative.

#### **Receptor, Room and Time Fraction (1)**

The Receptor, Room, and Time Fraction are all set to one because the model consists of one receptor in one room.

#### **Receptor Inhalation Rate (Probabilistic)**

The inhalation rate distribution was set to match the 1.4 m<sup>3</sup>/hour breathing rates of the building occupancy scenario in NUREG/CR-5512. The site model is expected to be more conservative than most applications of the building occupancy scenario because the scenario assumes more strenuous activity than would be expected to be performed in a laboratory environment. The RESRAD-BUILD default probabilistic distribution is triangular with a minimum of 12, mode of 33.6 and maximum of 46 m<sup>3</sup>/day.

#### **Receptor Indirect Ingestion Rate (Probabilistic)**

The indirect ingestion rate distribution is the RESRAD-BUILD default and bounds the deterministic default value of 1.12E-4 m<sup>2</sup>/hr set to match the mean value from the distribution in NUREG/CR-5512, Volume 3, Figure 5.6 (mean ingestion rate = 0.50 mg/day, 90% probability) for the building occupancy scenario. The probabilistic distribution is loguniform with a minimum of 2.8E-5 and maximum of 2.9E-4 m<sup>2</sup>/hr.

The secondary ingestion rate is conservative because laboratory workers (the most probable future occupants of impacted areas) would be expected to follow standard laboratory PPE and hygiene procedures.

#### **Receptor Location (4 meters, 4 meters, 1 meter)**

The receptor was placed to calculate the dose in the center of the modeled 8-meter x 8-meter room at a height midpoint on the receptor.

### Shielding Thickness (0)

The shielding thickness was set to **zero** because it is assumed that no shielding exists between the occupant and the surface contaminated layer.

### Source Number and Room Number (1)

The Source Number and Room Number were set to one because only one source in one room is modeled. The decision to model the source as a single source on the floor vs. five sources to model the floors and lower walls was made to simplify the model. Because the **dominant** dose pathways are internal, the total area of the source and volume of the room are important to determining doses. Only the external pathway is affected (slightly) by this simplification. To quantify the effect, Co-60, the nuclide with the highest percentage of external dose was modeled both ways. The dose modeling **reports** are **provided** in Volume 2 of this Plan and the results are **presented** in Table 5-7.

**Table 5-7 - Co-60 3D Source Modeling Results**

Source	90 <sup>th</sup> Percentile Dose (mrem/year)	
	Year 0	Year 1
Source 1 (floor)	1.14E-03	9.99E-04
Source 2 (wall)	9.22E-05	8.07E-05
Source 3 (wall)	9.22E-05	8.07E-05
Source 4 (wall)	9.22E-05	8.07E-05
Source 5 (wall)	9.22E-05	8.07E-05
Total	1.51E-03	1.32E-03
Single Source Model Fraction <sup>22</sup>	0.92	1.05

The single source model maximum result of **1.39E-3 mrem/year** occurred in the first year (year 0). As can be **seen** from the results above, the single source **model** slightly underestimates the **dose** in the first year. However, it is extremely unlikely that the facility **would** be returned to public use within the first year. For subsequent years, the single source model overestimates the doses. The differences between the single source model and multiple source models are considered insignificant and the single source model is used for simplicity and convenience.

### Source Type (Area)

The Source Type was set to "Area" because the source consists of surficial contamination on building **structural** surfaces.

<sup>22</sup> The single source model **fraction** is the **result** of the single source model simplification divided by the sum of the multiple source **model results**.

**Source Direction (Z)**

The source direction was set to "Z" because the source is modeled as surficial contamination on the floor.

**Source Location (4 meters, 4 meters, 0 meter)**

The source location was set to the floor in the center of the room.

**Geometry (Rectangle)**

The source is modeled as a rectangle to emulate the site room configuration.

**Length Along X and Y (11.3)**

The source is modeled as a square that covers the floor and includes the lower 2-meters of wall surface (8-meters for the floor and 4 meters for the walls). This adds source term to account for surficial contamination on the lower walls as well as the floors. These are based on actual site conditions and are not selected for probabilistic analysis. If impacted rooms are discovered that are larger than the model room size, then model adjustments will be made.

**Air Release Fraction (Probabilistic)**

The RESRAD-BUILD default distribution is used, except that the mode of 0.07 has been replaced with the default deterministic value from NUREG/CR-5512. The probabilistic distribution is triangular with a minimum of  $1E-6$ , mode of 0.357 and maximum of 1.

**Direct Ingestion Rate (3.06E-6 per hour)**

The default deterministic value of NUREG/CR-5512 is used. The direct ingestion rate is conservative because laboratory workers (the most probable future use of impacted areas that would not require significant renovation) would be expected to follow standard laboratory PPE and hygiene procedures. Additionally, it is an insensitive parameter in this model and no information exists to estimate a reasonable probability distribution, so a deterministic value is used. As noted in ANL/EAD/03-1, the direct ingestion rate is normally set to 0 for most calculations (the DandD dose model does not consider direct ingestion as an exposure pathway).

**Removable Fraction (0.01)**

The NUREG/CR-5512 building occupancy scenario default removable fraction is 10%. Site history shows very low contamination levels. This parameter can be measured in the field with smears to verify the assumptions of the dose model. As such, a deterministic value of 1% is used and will be verified by field measurements during the FSS.

**Time for Source Removal or Source Lifetime (Probabilistic)**

The RESRAD-BUILD default distribution is used because it corresponds with the default deterministic value of 10,000 days in the NUREG/CR-5512 building occupancy scenario. The probabilistic distribution is triangular with a minimum of 1000, mode of 10,000 and maximum of 100,000 days.

**Radon Removal Fraction (0.2)**

The radon removal fraction is comprised of the radon emanation rate and the radon diffusion rate. The RESRAD-BUILD default deterministic radon emanation rate of 0.2 is used. For an area source, diffusion is neglected because the source consists of a thin surface layer of material. This factor is only used in the model for Pu-238, Th-232, and U-238.

The results from RESRAD-BUILD dose modeling are presented in Table 5-8.

**Table 5-8 - RESRAD-BUILD Dose Modeling DCGLs**

Nuclide	RESRAD-BUILD Result (mrem/yr per dpm/100cm <sup>2</sup> )	DCGL (dpm/100cm <sup>2</sup> )
Ac-227	3.0E-03	8.3E+03
Am-241	5.0E-04	5.0E+04
Bi-207	9.4E-04	2.7E+04
Co-60	1.4E-03	1.8E+04
Cs-137	3.7E-04	6.8E+04
Eu-152	7.0E-04	3.6E+04
Eu-154	7.4E-04	3.4E+04
H-3	8.0E-08	3.1E+08
Na-22	1.2E-03	2.1E+04
Ni-63	2.9E-07	8.6E+07
Pm-145	2.0E-04	1.3E+05
Pu-238	5.3E-04	4.7E+04
Sm-151	2.0E-07	1.3E+08
Th-232	1.3E-02	1.9E+03
Tl-204	3.1E-06	8.1E+06
U-235	4.8E-03	5.2E+03
U-238	4.8E-03	5.2E+03

Impacted rooms and nuclides of concern determined from the above analysis are summarized in Table 5-9.

**Table 5-9 - Impacted Rooms and Nuclides of Concern**

Room	Floor Area (m <sup>2</sup> )	Alpha Emitters	Beta-Gamma Emitters
15-215	60	Th-232, U-238	None
1C-211	60	Th-232, U-238	None
1C-231	42	Th-232	None
1D-208	45	Th-232, U-235	None
1D-255	10	U-238	None
1D-408	45	Th-232	None
1D-414	45	Th-232	None
1D-522	26	Th-232	None
1E-406	15	None	Eu-152
1F-101F	37	U-238	Na-22
1G-018 Complex (most activity received in 1G-018F, and then distributed to other areas)	38 (1G-018) 65 (1G-018A) 13 (1G-018B) 13 (1G-018C) 27 (1G-018D) 46 (1G-018E) 24 (1G-018F) 20 (1G-018G) 32 (1G-002)	Ac-227 Am-241 Pu-238 Th-232 U-238	Co-60 Cs-137 Eu-154 H-3 Na-22

#### 5.3.4 Gross DCGLs

Because a variety of nuclides were used at the facility and, in some survey units, different field measurement techniques are required to measure all nuclides, gross alpha and gross beta measurements will be performed and unity applied in order to demonstrate compliance with the release criteria. Due to the variety of nuclides used and lack of consistent operations, fixed ratios do not exist, so the limiting nuclide method is used to establish gross DCGLs for each category of radionuclide (i.e., the nuclide with the lowest DCGL for each category of gross measurement is used to determine the gross DCGL). DCGLs have been determined for total and removable contamination for each category of emission – alpha and beta.

#### 5.3.5 Gross Alpha DCGLs

Alpha emitters involve decay chains that emit a variety of different types of radiation. It is important to understand the equilibrium state of the chain in order to convert from activity of the parent to gross alpha activity (the number of alphas per decay). Certain conservative assumptions have been made regarding equilibrium as discussed below.

### 5.3.6 Equilibrium State Assumptions

In order to properly apply the gross alpha methodology, assumptions regarding the equilibrium state at the time after chemical separation must be made in order to determine the number of alpha particle emissions per decay of the parent nuclide. The alpha emitters of concern are Ac-227, Am-241, Pu-238, Th-232, U-235 and U-238 and. Equilibrium state assumptions used in developing DCGLs are presented below.

#### Ac-227 Equilibrium State Assumptions

Ac-227, with a half-life of 21.77 years, decays to Tl-207 via a series of alpha and beta decays with progeny of a relatively short half-life (the longest lived daughter has a half-life of 18.72 days). Therefore secular equilibrium is rapidly established (in the first year after chemical separation) such that each daughter is at an activity equal to the Ac-227 activity. Radon is produced after two alpha emissions and is assumed to escape because it is a gas and is not contained if Ac-227 exists as surface contamination. Therefore, the decay chain is assumed to emit two alpha particles per decay of Ac-227.

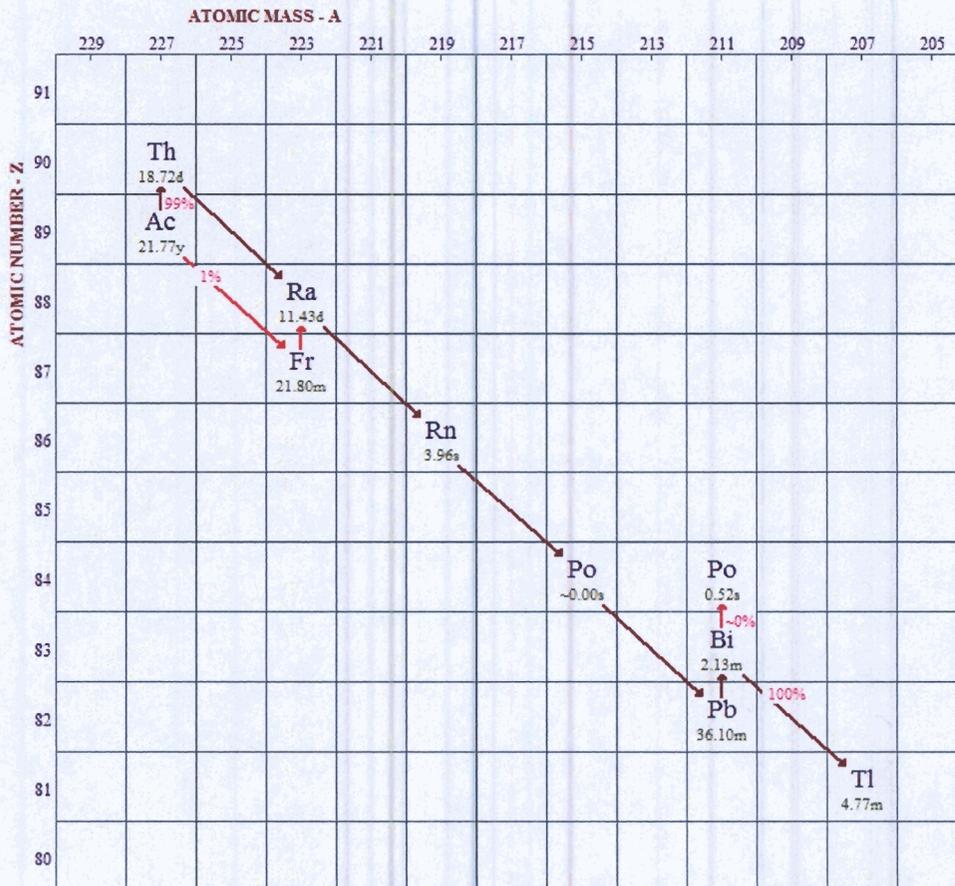


Figure 5-1 - Ac-227 Decay Chain

Am-241 Equilibrium State Assumptions

Am-241, with a half-life of 432 years decays by alpha emission to Np-237 with a half life of 2.1 million years. Due to the extremely long half-life of the daughter, only the Am-241 alpha emission is assumed to be present. Therefore, the decay chain is assumed to emit one alpha particle per decay of Am-241.

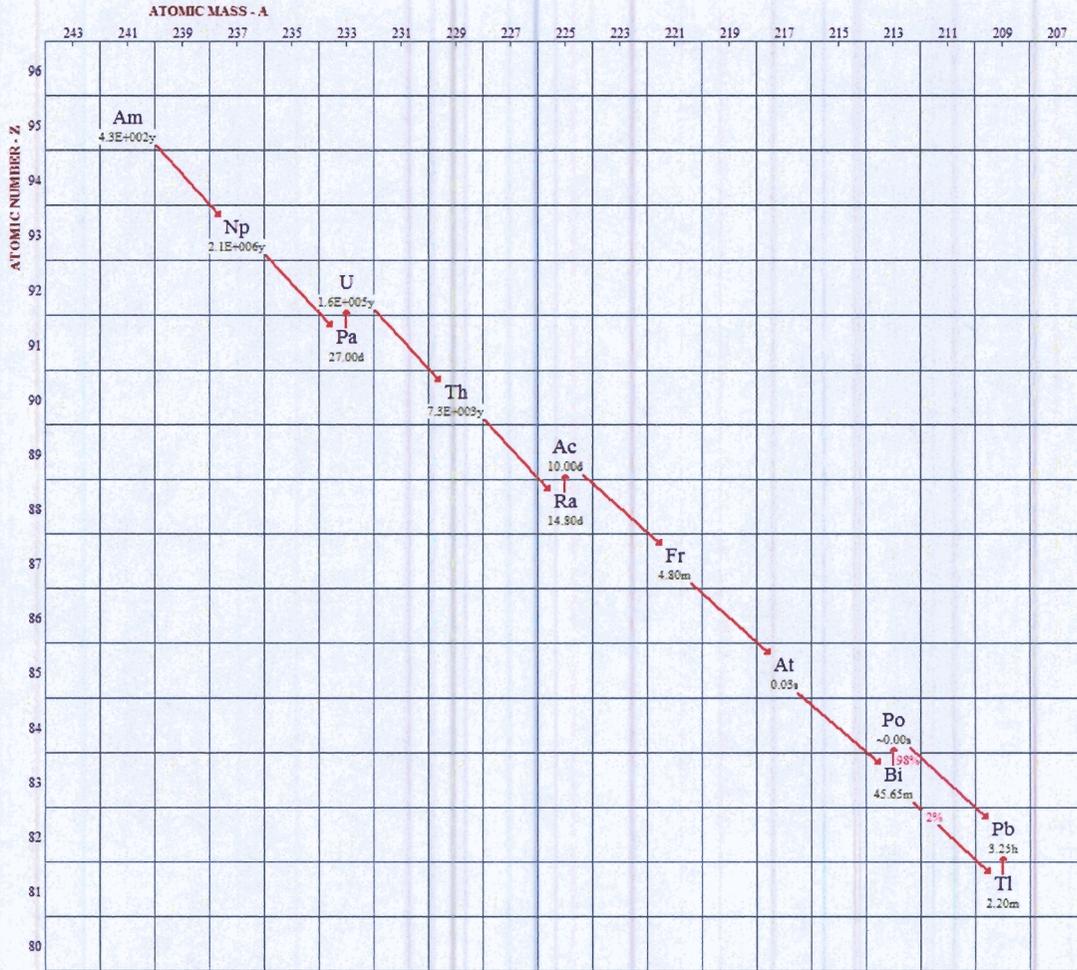


Figure 5-2 - Am-241 Decay Chain

Pu-238 Equilibrium State Assumptions

Pu-238, with a half-life of 87.75 years, decays by alpha emission to U-234 with a half life of 240,000 years. Due to the extremely long half-life of the daughter, only the Pu-238 alpha emission is assumed to be present. Therefore, the decay chain is assumed to emit one alpha particle per decay of Pu-238.

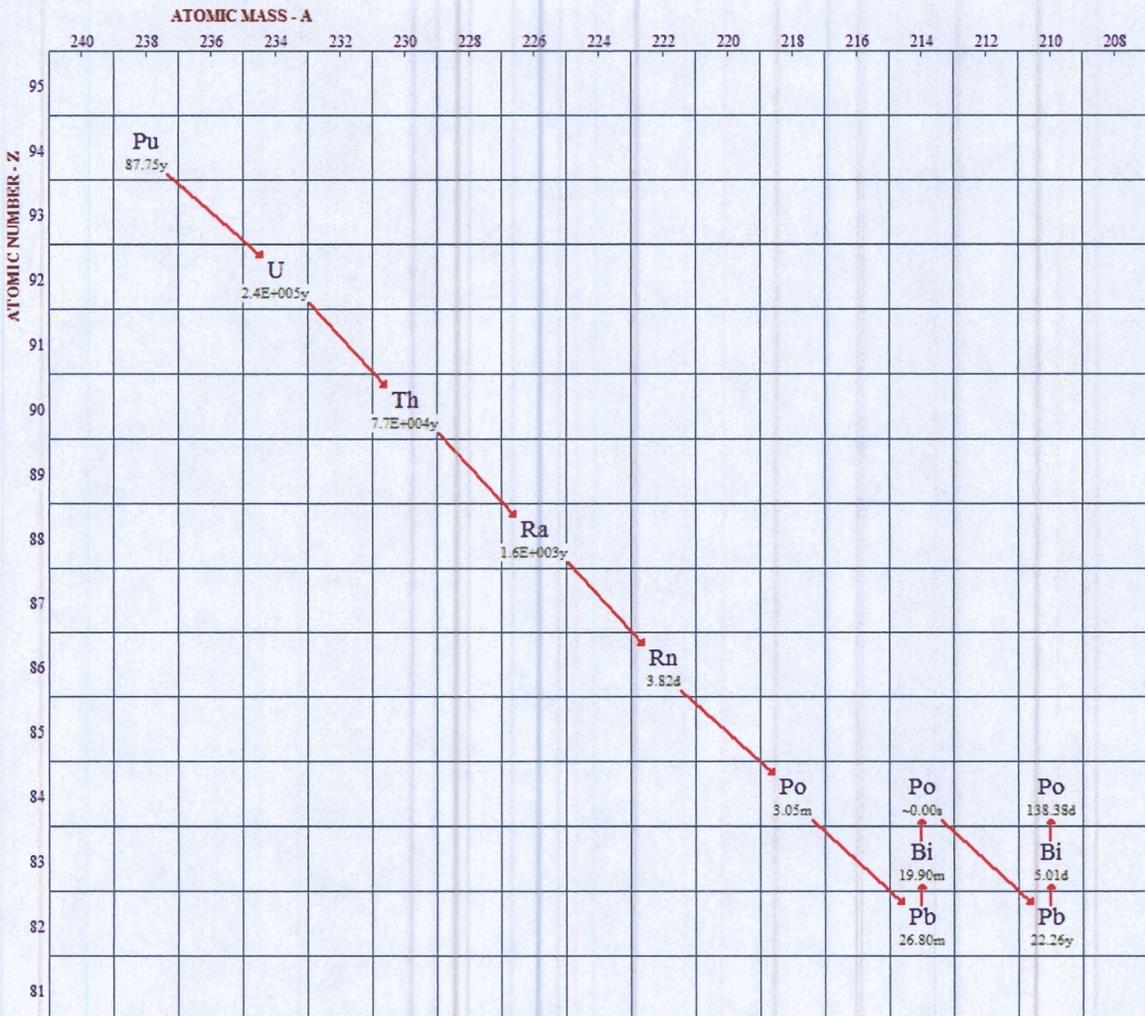


Figure 5-3 - Pu-238 Decay Chain

### Th-232 Equilibrium State Assumptions

Th-232, with a half-life of 14 billion years as a long decay chain with ten daughters. The half-lives are all relatively short, the longest being Ra-228 (~6 yrs). Th-228, which exists in equilibrium with Th-232 in thorium which is either unseparated or freshly separated from other materials in the series, has a half-life of 1.9 years..

When thorium is separated from other isotopes in the decay series, the thorium fraction has only a slight alpha activity. However, the activity from the Th-228 side of the chain is quickly re-established. A first equilibrium state is reached in about 36 days (10 half-lives of Ra-224). Activity then declines, as Th-228 decays faster than it is replenished by decaying Ac-228. About 3 years after separation, the alpha activity (~3 alphas/decay) is lower than at any other time except immediately after separation. From this point, activity increases until the second equilibrium state is reached in about 60 years. Therefore, the decay chain is assumed to emit three alpha particles per decay of Th-232.

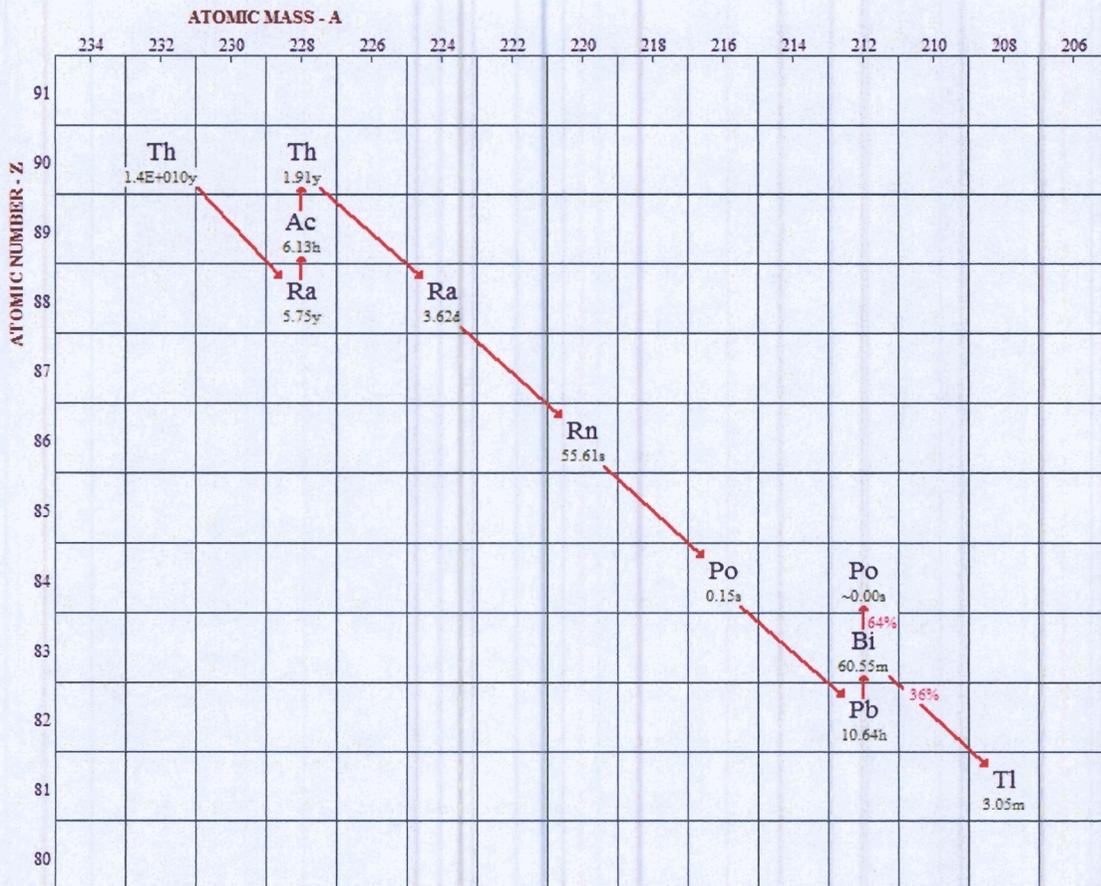


Figure 5-4 - Th-232 Decay Chain

U-235 Equilibrium State Assumptions

U-235, with a half-life of 700 million years, decays by alpha emission to Th-231 that rapidly decays to the alpha emitter Pa-231 with a half-life of 33,000 years. The decay chain is conservatively assumed to emit only one alpha particle per decay of U-235.

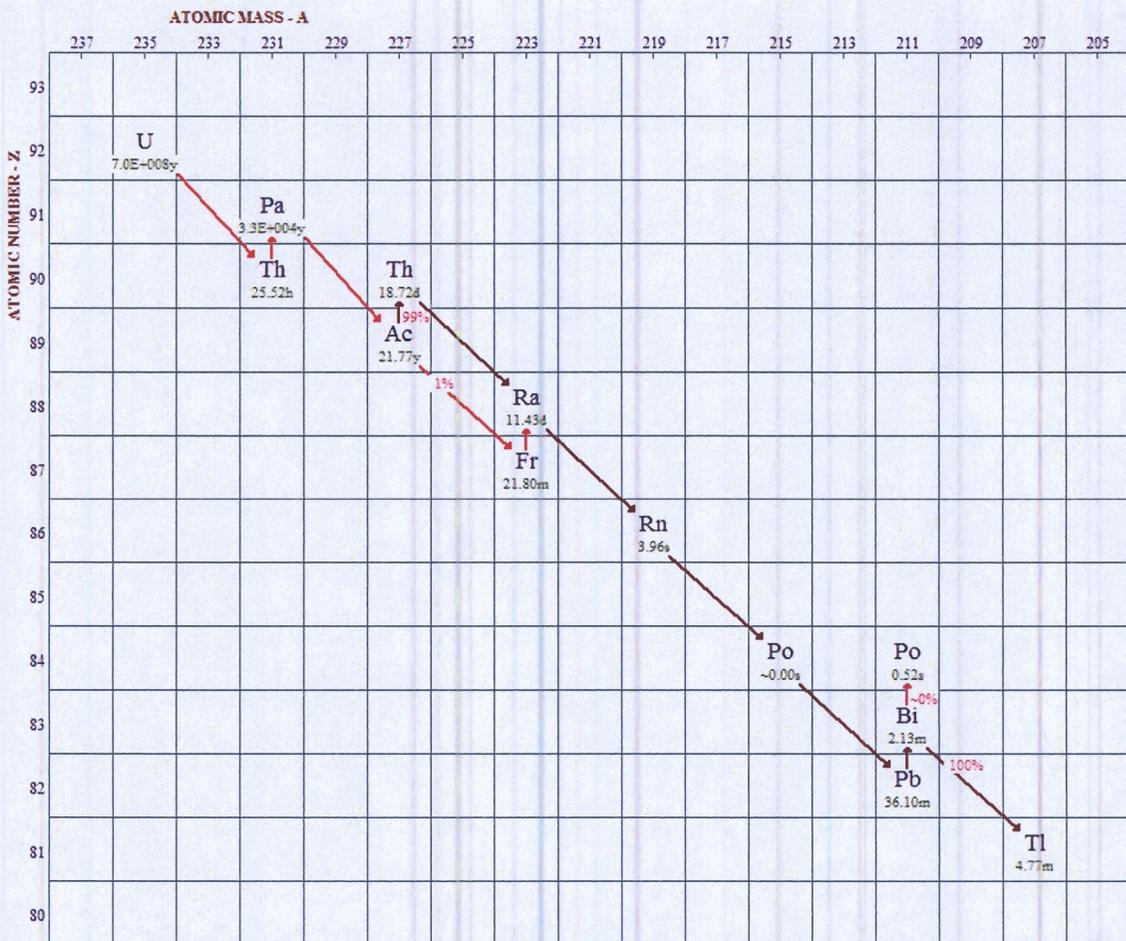


Figure 5-5 - U-235 Decay Chain

**U-238 Equilibrium State Assumptions**

U-238, with a half-life of 4.5 billion years, has a long decay chain with thirteen daughters. After isolation of U-238, the equilibrium activity from Th-234 and Pa-234 is re-established in less than 1 year. At this stage of equilibrium, there are two alpha and two beta particles emitted per U-238 disintegration. Therefore, the decay chain is assumed to emit two alpha particles per decay of U-238.



Figure 5-6 - U-238 Decay Chain

**Table 5-10 –Gross Alpha DCGL Determination**

Nuclide	DCGL (dpm/100cm <sup>2</sup> )	Alphas per Decay	Gross Alpha DCGL <sup>23</sup> (dpm/100cm <sup>2</sup> )	
			Total	Removable
Ac-227	8.3E3	2	1.7E4	1.7E2
Am-241	5.0E4	1	5.0E4	5.0E2
Pu-238	4.7E4	1	4.7E4	4.7E2
Th-232	1.9E3	3	5.7E3	5.7E1
U-235	5.2E3	1	5.2E3	5.2E1
U-238	5.2E3	2	1.0E4	1.0E2
<b>Minimum:</b>			<b>5,200</b>	<b>52</b>

The most limiting gross alpha DCGL is that of U-235 and will be applied to all survey units where alpha emitters were used.

**5.3.7 Gross Beta DCGLs**

The limiting nuclide method is used to determine the gross beta DCGL for each survey unit. The DCGL of the beta-emitting nuclide that results in the lowest gross beta measurement (cpm) is used.

**Table 5-11 –Gross Beta DCGL Determination**

Nuclide	DCGL (dpm/100cm <sup>2</sup> )	
	Total	Removable
Co-60	1.8E4	1.8E2
Cs-137	6.8E4	6.8E2
Eu-152	3.6E4	3.6E2
H-3	3.1E8	3.1E6
Na-22	2.1E4	2.1E2
<b>Minimum:</b>	<b>18,000</b>	<b>180</b>

The most limiting beta DCGL is that of Co-60 and will be applied to all survey units, except those that have a history of only using alpha emitters.

A summary of gross DCGLs is presented in Table 5-12.

<sup>23</sup> The gross alpha DCGL for each nuclide is the product of the DCGL and the number of alpha emissions per decay based on the equilibrium state assumptions. The removable DCGL is 1% of the total DCGL to be consistent with the assumptions of the dose model.

Table 5-12 - Gross DCGLs

Type	DCGL (dpm/100cm <sup>2</sup> )	
	Total	Removable
Gross Alpha	5,200	52
Gross Beta	18,000	180

### 5.3.8 Hard-to-Detect Nuclides

Hard-to-detect nuclides (H-3) cannot be adequately surveyed using direct field measurements and are typically evaluated by removable activity only as analyzed by liquid scintillation counting (LSC). Considering that there is adequate justification to exclude H-3 as a nuclide of concern based on the DCGL relative to historical survey records, and that a unique analytical method must be employed that is not available on site, tritium is not be considered in this survey design.

### 5.3.9 Unity Calculations

Unity will be applied to each sample location using the following equation to determine compliance.

Equation 5-1

$$\frac{C_{Alpha}}{DCGL_{Alpha}} + \frac{C_{Beta}}{DCGL_{Beta}} < 1$$

Where:

$$\begin{aligned} C_{Alpha} &= \text{Gross alpha result in dpm/100cm}^2 \\ C_{Beta} &= \text{Gross beta result in dpm/100cm}^2 \\ DCGL_{Alpha} &= \text{Gross alpha DCGL in dpm/100cm}^2 \\ DCGL_{Beta} &= \text{Gross beta DCGL in dpm/100cm}^2 \end{aligned}$$

## 6.0 Environmental Information

The requested licensing action (license termination) is not eligible for a categorical exclusion (CATX) under 10 CFR 51.22, therefore NRC staff must prepare an Environmental Assessment (EA) according to 10 CFR 51.21. It is expected that the EA will support a Finding of No Significant Impact (FONSI). The basis for this conclusion is that the project is designed to demonstrate that the radiological condition of the facility is consistent with the radiological criteria for unrestricted use specified in 10 CFR Part 20, Subpart E.

It is expected that NRC staff will conclude that radiological environmental impacts are bounded by the "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities" (NUREG-1496) (GEIS). No non-radiological or cumulative impacts are identified. Therefore, the proposed action will not have a significant effect on the quality of the human environment and an environmental impact statement is not required.

The no-action alternative is not expected to be acceptable because it is inconsistent with 10 CFR 30.36, which requires licensees who have ceased licensed activities to begin decommissioning activities or submit a decommissioning plan, which upon approval, will be used to conduct decommissioning activities. This alternative would impose an unnecessary regulatory burden in controlling access to the facility, and limit potential benefits from the future use.

The proposed action will not affect listed species or critical habitats under Section 7 of the Endangered Species Act and is not a type of activity that has potential to cause effect on historic properties, therefore consultation under Section 106 of the National Historic Preservation Act is not required.

## 7.0 ALARA Analysis

Due to the low doses associated with residual radioactivity at the facility, a quantitative ALARA analysis is not expected to be required. A reasonable effort shall be made to decontaminate any detectable contamination in support of the ALARA principle. If simple hand wipe/scrub techniques are unsuccessful at removal of the residual contamination, then a cost vs. risk analysis will be conducted prior to implementing aggressive decontamination methods. Additionally, an ALARA goal of 15 mrem/year is established to meet the State of New Jersey decommissioning criteria.

NUREG 1757, Volume 2, Appendix N states in part: "For ALARA during decommissioning, all licensees should use typical good-practice efforts such as

floor and wall washing, removal of readily removable radioactivity in buildings or in soil areas, and other good housekeeping practices. In addition, licensees should provide a description in the FSSR of how these practices were employed to achieve the final activity levels. In light of the conservatism in the building surface and surface soil generic screening levels developed by NRC, NRC staff presumes, absent information to the contrary, that licensees who remediate building surfaces or soil to the generic screening levels do not need to provide analyses to demonstrate that these screening levels are ALARA. In addition, if residual radioactivity cannot be detected, it may be assumed that it has been reduced to levels that are ALARA. Therefore, the licensee may not need to conduct an explicit analysis to meet the ALARA requirement.”

## **8.0 Planned Decommissioning Activities**

Project activities are expected to consist mainly of radiological surveys. Lucent expects that the facility meets the release criteria and would not require remediation if the elevated measurement comparison were used. However, Lucent intends to remediate two areas of elevated activity on the floor in Room 1G-018F for ALARA purposes. Other areas may be identified during decommissioning surveys. Consequently, this DP allows for remediation of low levels of residual radioactivity. Remediation methods that may be used include simple decontamination, removal of contaminated material by dismantling systems and structures, cutting contaminated sections from material, and concrete surface removal by scabbling or scarifying. HEPA-filtered vacuums may be used to remove loose material from surfaces during remediation activities. All remediation activities will be conducted to control the spread of contamination and to maintain personnel exposures ALARA.

### **8.1 Contaminated Structures**

Remediation methods that may be used include simple decontamination (i.e. wet wiping, scrubbing or scouring with a mild detergent) and removal of contaminated material by dismantling systems and structures and/or cutting contaminated sections from material, and concrete surface removal by scabbling or scarifying. Cutting may be performed using reciprocating saws, band saws, high leverage shears, electric snips, tin snips and/or ratcheting cable cutters. HEPA-filtered vacuums may be used to remove loose dry material from surfaces during remediation activities. If it is likely that radioactive materials have migrated to inaccessible areas, such as under casework, dismantlement will be required to assess the activity levels.

### **8.2 Contaminated Systems and Equipment**

Ventilation and drain systems may be removed using saws, snips, etc. to a point where contamination levels are below ALARA goals. In limited cases, such as short runs of ventilation ducts, decontamination of system internals may be

performed. Controls will be put in place to prevent the spread of contamination during cutting and removal operations.

### **8.3 Soil**

Not applicable – all impacted areas indoors.

### **8.4 Surface and Ground Water**

Not applicable – all impacted areas indoors.

### **8.5 Schedules**

On-site decommissioning activities at the Murray Hill site are expected to occur within one month of NRC approval of this DP and are expected to take less than one month.

Lucent is confident that the radiological status of the facility is well known and that minimal remediation will be necessary. However, it is common for circumstances to change during decommissioning and Lucent will notify the NRC if emergent conditions arise that would cause the scope of work or schedule to change.

## **9.0 Project Management and Organization**

### **9.1 Decommissioning Management Organization**

Due to the limited scope of remedial actions and the relative simplicity of the final status survey design, a complex management organization is not required. Decommissioning operations will be conducted under the same Lucent management structure as current licensed activities. Chase Environmental Group, Inc. (Chase), a licensed D&D services provider, has been contracted to perform all decommissioning activities. A Lucent Project Manager will be assigned to coordinate activities between Chase and Lucent management. A Chase Project Manager will be assigned and will interface with the Lucent Project Manager and Radiation Safety Officer. Chase will operate under the direction of the Lucent RSC and RSO. Additional Lucent oversight will be provided in the areas of Industrial Safety and Industrial Hygiene.

### **9.2 Decommissioning Task Management**

Decommissioning will be conducted under the provisions of the Lucent Broad Scope Byproduct radioactive materials license and in accordance with this Decommissioning Plan (DP). All contractor activities will be approved by the Lucent RSC and overseen by the Lucent Project Manager and RSO to ensure compliance with the facility radioactive materials license. Decommissioning tasks will be performed according to written plans and procedures approved by Lucent

management to ensure they provide adequate worker protection and comply with the facility radioactive materials license.

Radiation Work Permits (RWPs) will be used to accomplish remediation activities. RWPs will be prepared, reviewed and authorized (by Chase and Lucent RSC) in accordance the Chase mobile decommissioning license Radiation Protection Program and shall be the controlling documents for remediation work. The RWP contains the location and description of the task to be performed, expected contamination and radiation levels, posting requirements, radiological monitoring requirements, personal protective equipment requirements, and special work instructions necessary to complete the work in a safe and compliant manner.

Survey packages will be developed for each survey unit that contain specific survey instructions. Characterization and final status surveys will be conducted under independent packages. Survey package preparation and completion will be approved by the Project Manager to ensure all survey requirements and DQOs are met. Each survey package will contain, at a minimum:

- Survey unit number
- Maps of the survey unit surfaces
- Overview maps detailing survey locations and placement methodology
- General survey requirements
- Instrument requirements with associated MDCs, count times and scan rates
- Survey Instruction Sheets
- Percentage of surface requiring scan surveys
- Number of measurements required
- Additional specific survey instruction
- Survey Data Sheets
- Signature of Preparer, Surveyor and Reviewer

### **9.3 Training**

Lucent will provide all contractors with radiation worker training required by the facility radioactive materials license. Chase will provide training for D&D-specific programs, plans and procedures. Individuals performing D&D tasks will be trained on all project procedures and plans. Training will be documented on training attendance sheets and signed by the instructor and each individual that attended the training.

### **9.4 Contractor Support**

Lucent has procured Chase Environmental Group, Inc. (Chase) to perform all decommissioning activities.

## 10.0 Health and Safety Program

A comprehensive project-specific Health and Safety Plan (HASP) that addresses all project activities and all radiological and industrial hazards at the site will be used for decommissioning activities. The HASP will be applicable to all workers and visitors to the site and will be approved by Chase and Lucent management. At a minimum, the HASP will address the following:

- Names of key personnel and alternates responsible for site safety.
- Description of the risks associated with each on-site task to be performed.
- Training requirements for all site personnel.
- Description of protective clothing to be utilized for the project.
- Description of the Respiratory Protection Program.
- Description of medical surveillance program including pre- and post-project physicals and bioassay programs.
- Radiation exposure monitoring, control and tracking methods and ALARA considerations.
- Description of the types and frequency of radiological surveys of waste containers, personnel, work areas and support areas.
- Description of action to be taken to minimize/eliminate site hazards.
- Description (including map) of the site layout, and buildings including all support and storage areas.
- Description of entry/exit procedures and equipment for both routine and emergency conditions.
- Description of portable instrumentation to be used.
- Site emergency and contingency planning.
- Records Management and Retention requirements.

The project-specific HASP will complement the project Quality Assurance Program Plan (QAPP) and this DP. The HASP for this project will be developed using the following documents (at a minimum). In case of a conflict, the more stringent criteria will apply.

- Code of Federal Regulations, Titles 10, 29, 40 and 49.
- US NRC Regulatory Guides.
- Chase Corporate Health and Safety Program.
- Chase Radiation Protection Program
- Lucent Radiation Protection Program.
- Lucent Corporate Health and Safety Program.

## **11.0 Environmental Monitoring and Control Program**

The environmental monitoring program for decommissioning activities will be the current program under Lucent's NRC license. Decommissioning activities do not present an elevated risk of environmental releases above normal operations. All decommissioning activities will be conducted indoors and under controlled conditions.

## **12.0 Radioactive Waste Management Program**

Any waste generated will be packaged in DOT-approved shipping containers for shipment to licensed facilities. Some waste may require sizing for packaging in the appropriate shipping containers. All waste will be stored in approved storage areas at the facility until shipment off-site. Radioactive waste will be subdivided into categories based on types of material and processing methods. Radioactive subdivisions may include metals, DAW/Combustible, asbestos, and mixed wastes. All radioactive waste will be transported via DOT-approved carriers and manifested by qualified waste shippers and/or brokers to licensed waste processors and/or disposal sites. No chemicals or reagents shall be used that will cause a radioactive waste to become a mixed waste.

## **13.0 Quality Assurance Program**

Chase will be required to submit a project-specific Quality Assurance Project Plan (QAPP) utilizing the guidelines of MARSSIM Section 9. The QAPP will be reviewed and approved by Lucent management prior to commencing decommissioning operations. The QAPP will incorporate at a minimum, the following:

- Description of the Quality Assurance and Quality Control goals, Data Quality Objectives (DQO), procedures, and plans to be implemented for all decommissioning activities.
- Description of the methodology to ensure that all radiological survey data meet the 95% confidence level.
- Description of the sampling and analysis requirements, and on-site waste packaging and storage location, for each waste stream on site.

The QAPP will be developed and organized with emphasis given to maximizing worker safety, eliminating off-site releases and minimizing overall project costs.

## **14.0 Facility Radiation Surveys**

### **14.1 Release Criteria**

The radiological release criteria of NRC 10CFR20 Subpart E for unrestricted use are used for decommissioning this facility. Specifically, the facility will be surveyed in accordance with the guidance contained in MARSSIM to demonstrate compliance with the criteria of 10CFR20.1402, "Radiological Criteria for Unrestricted Use." The criteria are that residual radioactivity results in a TEDE to an average member of the critical group that does not exceed 25 mrem per year and that the residual radioactivity has been released to levels that are as low as reasonably achievable (ALARA).

### **14.2 Characterization Surveys**

The survey protocol for building surfaces will consist of performing the scanning portion of the final status survey protocol, with judgmental smears and static measurements on the highest probability areas for residual radioactivity. Characterization surveys will be designed to meet the same data quality objectives as final status surveys such that data may be used as final status data where possible.

The purpose of scanning is to identify locations of elevated activity. Where elevated activity is identified, the boundary of the elevated area will be marked to aid in locating the area for remedial actions and a static measurement and smear will be taken at the location of highest activity identified during the scan.

The survey protocol for building system surveys will consist of performing removable contamination measurements of internal surfaces of ventilation and drain systems. The percentage of systems surveyed will be consistent with the final status survey protocols contained in this plan.

If the initial characterization survey results indicate that contamination is not present in excess of the release criteria, then data from the survey may be used as part of the final status survey. For areas that are partially contaminated, the characterization survey data may be used as part of the final status survey measurements provided that 1) the data used is only from areas with contamination levels below the release criteria, and 2) decontamination work is controlled such that the survey location could not have become cross-contaminated.

### **14.3 In-Process Surveys (Remedial Action Surveys)**

Remediation will be conducted to control the spread of contamination and keep personnel exposures ALARA. Remedial action surveys are conducted in support

of remediation activities to help determine when an area is ready for a final status survey and to provide updated estimates for final status survey planning. Remedial action surveys serve to monitor the effectiveness of decontamination efforts and ensure that surrounding areas are not cross-contaminated during remediation actions.

Remedial action surveys will consist of scan surveys, static measurements and removable contamination measurements. These will be conducted following remediation activities to establish the success or failure of decontamination efforts. Results of the survey will be the decision basis for continued remediation or conduct of final status surveys.

Remedial action surveys will be designed to meet the objectives of the final status surveys. To the extent allowed by MARSSIM, the results of the remedial action surveys will be used to supplement the final status survey.

#### **14.4 Final Status Survey Design**

Final status surveys are performed to demonstrate that residual radioactivity in each survey unit satisfies the predetermined criteria for release for unrestricted use. The final status survey will be conducted using the Data Quality Objective (DQO) process. Characterization and remedial action survey data will be used as final status survey data to the maximum extent possible.

Final status surveys will be conducted by performing required scan surveys, static measurements and removable contamination measurements as discussed further in this section. All survey data shall be documented on survey maps and data sheets.

##### **14.4.1 Background Determination**

The use of reference background areas or paired background comparisons is not necessary for the purposes of this plan. Material and ambient background values are not expected to be present at a significant level in comparison to the DCGLs. Ambient background will be determined for each survey, subtracted from gross measurements, and used to calculate the actual survey MDCs and associated count errors. The Sign Test will be used to demonstrate compliance with the release criteria.

##### **14.4.2 Data Quality Objectives (DQO)**

The Data Quality Objective process as described in MARSSIM is used throughout the design and implementation of final status surveys. The following is a list of the major DQOs for the survey design described in this plan:

- Static measurements will be taken to achieve an  $MDC_{static}$  of less than 50% of the DCGL.

- Scanning will be conducted at a rate to achieve an  $MDC_{scan}$  of less than 50% of the DCGL.
- Removable contamination measurements will be counted to an  $MDC_{smear}$  of less than 50% of the removable DCGL.
- Individual measurements will be made to a 95% confidence interval.
- Decision error probability rates will be set at 0.05 for both  $\alpha$  and  $\beta$ .
- The null hypothesis ( $H_0$ ) and alternate null hypothesis ( $H_A$ ) are that of NUREG 1505 scenario A:
  - $H_0$  is that the survey unit does not meet the release criteria
  - $H_A$  is that the survey unit meets the release criteria
- A minimum of 5% duplication of final status surveys will be performed for Quality Assurance.
- Characterization and remedial action support surveys will be conducted under the same quality assurance criteria as final status surveys such that the data may be used as final status survey data to the maximum extent possible.

#### 14.4.3 Area Classifications

Based on the historical site assessment and previous survey results, facility areas have been classified as impacted areas or non-impacted areas.

##### 14.4.3.1 Non-Impacted Area

Non-impacted areas are areas without residual radioactivity from licensed activities and are not surveyed during final status surveys. The following areas are classified as non-impacted:

- Structural surfaces above a two meter height
- Building exterior surfaces
- Surface and subsurface soils of outside grounds
- Internal surfaces of positive pressure systems
- Facilities previously released by the NRC
- Areas that have undergone complete renovation involving removal of all surfaces down to the building substrate.

Based on historical operations, a potential exists for residual contamination from spills or tracking on surfaces less than two meters in height. Thorough surveys of entrances/exits and ventilation exhausts will be conducted during characterization and will provide adequate assurance that any residual contamination is contained within impacted areas and the building structure.

##### 14.4.3.2 Impacted Areas

Impacted areas are those areas that have potential residual radioactivity from licensed activities. Impacted areas are subdivided into Class 1, Class 2 or Class 3 areas. Class 1 areas have the greatest potential for contamination and therefore

receive the highest degree of survey effort for the final status survey using a graded approach, followed by Class 2, and then by Class 3. Impacted sub-classifications are defined, for the purposes of this plan, as follows:

#### 14.4.3.3 Class 1 Area

Areas with the highest potential for contamination, and meet the following criteria: (1) impacted; (2) potential for delivering a dose above the release criterion; (3) potential for small areas of elevated activity; and (4) insufficient evidence to support classification as Class 2 or Class 3.

#### 14.4.3.4 Class 2 Area

Areas that meet the following criteria: (1) impacted; (2) low potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

#### 14.4.3.5 Class 3 Area

Areas that meet the following criteria: (1) impacted; (2) little or no potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

### 14.4.4 Survey Units

A survey unit is a geographical area of specified size and shape for which a separate decision will be made whether or not that area meets the release criteria. A survey unit is normally a portion of a building or site that is surveyed, evaluated, and released as a single unit. Areas of similar construction and composition will be grouped together as survey units and tested individually against the DCGLs and the null hypothesis to show compliance with the release criteria. Survey units will be homogeneous in construction, contamination potential, and contamination distribution.

The number of discrete sampling locations needed to determine if a uniform level of residual radioactivity exists within a survey unit does not depend on the survey unit size. However, the sampling density should reflect the potential for small elevated areas of residual radioactivity. Survey units will be sized according to the potential for small elevated areas of residual radioactivity. Recommended maximum survey unit sizes for building structures, based on floor area, is Class 1: up to 100 m<sup>2</sup>, Class 2: 100 m<sup>2</sup> to 1000 m<sup>2</sup> and Class 3: no limit.

Survey unit classifications and designations have been determined from the HSA and are listed in tabular format in Table 14-1. Survey unit designations for final status surveys may be modified to facilitate mapping and determination of sample locations. Changes to survey unit designations shall be identified and explained in the final status report. Survey unit classifications may not be downgraded.

**Table 14-1 - Building Structural Survey Units**

Room	Class	Alpha Emitters	Beta-Gamma Emitters <sup>24</sup>
15-215	3	Yes	No
1C-211	3	Yes	No
1C-231	3	Yes	No
1D-208	3	Yes	No
1D-255	3	Yes	No
1D-408	3	Yes	No
1D-414	3	Yes	No
1D-522	3	Yes	No
1E-406	2	No	Yes
1F-101A <sup>25</sup>	2	Yes	Yes
1F-101F	2	Yes	Yes
1G-018 and Hallway except E, F and G	3	Yes	Yes
1G-018 E and G	2	Yes	Yes
1G-018F	1	Yes	Yes

**14.4.5 Surface Scans**

Scanning is used to identify locations within the survey unit that exceed the investigation level. These locations are marked and receive additional investigations to determine the extent and magnitude of the contamination. For Class 1 areas, scanning surveys are designed to detect small areas of elevated activity that are not detected by the measurements using the systematic pattern. Table 14-2 summarizes the percentage of accessible building structural surfaces to be scanned based on classification.

**Table 14-2 - Scan Survey Coverage by Classification**

Structure	Class 1	Class 2	Class 3
Floors	100%	50%	20%
Other Structures	100%	50%	10%

<sup>24</sup> For some areas located in 1G (the accelerator and gamma cell areas), previous decommissioning surveys for beta-gamma emitters were performed that meet final status survey DQOs. Because the results were a small fraction of the release criteria, these areas are classified as non-impacted for the purposes of this Plan. Nonetheless, doses associated with these historical surveys will be calculated and presented in the Final Status Report.

<sup>25</sup> 1F-101A was judgmentally selected as an impacted area.

The percentage of area scanned may be increased based on suspected elevated activity. For Class 2 and Class 3 areas, the surfaces to be scanned will be those with the highest potential for residual contamination.

If elevated activity is detected during the scan surveys, then the location shall be marked and total and removable surface activity measurements will be taken to quantify the activity. However, these measurements are in addition to the measurements required for the Sign Test.

#### 14.4.6 Total Surface Activity Measurements

Static measurements will be taken on building surfaces and system internals to the extent practical in impacted areas utilizing instrumentation of the best geometry based on the surface at the survey location. Additionally, locations of elevated activity identified and marked during the scan survey will require direct survey measurements.

##### 14.4.6.1 Determining the Number of Samples

A minimum number of samples are needed to obtain sufficient statistical confidence that the conclusions drawn from the samples are correct. The number of samples will depend on the Relative Shift (the ratio of the concentration to be measured relative to the statistical variability of the contaminant concentration).

The minimum number of samples is obtained from MARSSIM tables or calculated using equations in Section 5 of MARSSIM.

##### 14.4.6.2 Determination of the Relative Shift

The number of required samples will depend on the ratio involving the activity level to be measured relative to the variability in the concentration. The ratio to be used is called the Relative Shift,  $\Delta/\sigma_s$  and is defined in MARSSIM as:

Equation 14-1

$$\Delta/\sigma_s = \frac{DCGL - LBGR}{\sigma_s}$$

Where:

- DCGL = derived concentration guideline level
- LBGR = concentration at the lower bound of the gray region. The LBGR is the average concentration to which the survey unit should be cleaned in order to have an acceptable probability of passing the test
- $\sigma_s$  = an estimate of the standard deviation of the residual radioactivity in the survey unit

#### 14.4.6.3 Determination of Acceptable Decision Errors

A decision error is the probability of making an error in the decision on a survey unit by failing a unit that should pass ( $\beta$  decision error) or passing a unit that should fail ( $\alpha$  decision error). MARSSIM uses the terminology  $\alpha$  and  $\beta$  decision errors; this is the same as the more common terminology of Type I and Type II errors, respectively. The decision errors are 0.05 for Type I errors and 0.05 for Type II errors.

#### 14.4.6.4 Determination of Number of Data Points (Sign Test)

The number of direct measurements for a particular survey unit, employing the Sign Test, is determined from MARSSIM Table 5.5, which is based on the following equation (MARSSIM equation 5-2):

**Equation 14-2**

$$N = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(\text{Sign}P - 0.5)^2}$$

Where:

- N = number of samples needed in the survey unit
- $Z_{1-\alpha}$  = percentile represented by the decision error  $\alpha$
- $Z_{1-\beta}$  = percentile represented by the decision error  $\beta$
- SignP* = estimated probability that a random measurement will be less than the DCGL when the survey unit median is actually at the LBGR

*Note: SignP is determined from MARSSIM Table 5.4*

MARSSIM recommends increasing the calculated number of measurements by 20% to ensure sufficient power of the statistical tests and to allow for possible data losses. MARSSIM Table 5.5 values include an increase of 20% of the calculated value.

The calculations for the number of samples for each survey unit is presented below:

$$\Delta / \sigma_s = \frac{1 - 0.4}{0.2} = 3$$

$$N = \frac{(1.645 + 1.645)^2}{4(0.998650 - 0.5)^2} = 11$$

$Z_{1-\alpha}$  and  $Z_{1-\beta}$  are equal to 1.645 using the error rate of 0.05 from MARSSIM Table 5.2. SignP is equal to 0.998650 from MARSSIM Table 5.4. Adding an additional 20% to account for data losses resulted in a value of 14.

Therefore, the determined number of structural surface samples for planning purposes is 14.

#### 14.4.6.5 Determination of Sample Locations

Determination of Class 1 survey unit sample locations is accomplished by first determining sample spacing and then systematically plotting the sample locations from a randomly generated start location. The random starting point of the grid provides an unbiased method for obtaining measurement locations to be used in the statistical tests. Class 1 survey units have the highest potential for small areas of elevated activity, so the areas between measurement locations may be adjusted to ensure that these areas can be detected by scanning techniques.

Similar systematic spacing methods are used for Class 2 survey units because there is an increased probability of small areas of elevated activity. The use of a systematic grid allows the decision-maker to draw conclusions about the size of the potential areas of elevated activity based on the area between measurement locations.

Class 3 survey locations are determined from computer selected randomly generated x and y coordinates. Survey protocols for all areas are summarized in Table 14-3.

**Table 14-3 - Survey Sample Placement Overview**

Survey Unit Classification		DCGL <sub>w</sub> Comparison	Elevated Measurement Comparison	Measurement Locations
Impacted	Class 1	Yes	N/A	Systematic Random
	Class 2	Yes	N/A	Systematic Random
	Class 3	Yes	N/A	Random
Non-Impacted		None	None	None

In laboratory areas, permanent counter tops and other horizontal surfaces that block floor surfaces will be included as a replacement to the blocked floor surface. Likewise, fixed cabinetry faces and other permanent equipment will replace blocked wall surfaces. Internal surfaces of permanent furnishings (i.e., drawer or cabinetry interior surfaces) are not included in the systematic

measurement location placement. However, these surfaces will be included in the scan surveys and judgmental measurements may be taken. Additional total surface activity measurements will be collected at each area of elevated activity identified during the scan surveys.

#### *14.4.6.5.1 Determining Class 1 and Class 2 Sample Locations*

In Class 1 survey units, the sampling locations are established in a unique pattern beginning with the random start location and the determined sample spacing. After determining the number of samples needed in the survey unit, sample spacing is determined from MARSSIM equation 5-8:

**Equation 14-3**

$$L = \sqrt{\frac{A}{N}} \text{ for a square grid}$$

Where:

- L = sample spacing interval
- A = the survey unit area
- N = number of samples needed in the survey unit

Maps will be generated of the survey unit's permanent surfaces included in the statistical tests (floors, walls, ceilings, fixed cabinetry, etc.) and folded out in a 2-dimensional view. A random starting point is determined using computer-generated random numbers coinciding with the x and y coordinates of the total survey unit. A grid is plotted across the survey unit surfaces based on the random start point and the determined sample spacing. A measurement location is plotted at each intersection of the grid plot.

#### *14.4.6.5.2 Determining Class 3 Sample Locations*

For Class 3 areas, maps will be generated of the survey unit's permanent surfaces included in the statistical tests (floors, walls, ceilings, fixed cabinetry, etc.) and folded out in a 2-dimensional view. Sample locations are determined using computer generated random x and y coordinates for each sample location. Each location is plotted on the applicable survey map.

### **14.4.7 Removable Contamination Measurements**

Removable contamination measurements (smears) will be collected on building structural surfaces at each sample location. Additionally, removable contamination measurements will be collected for building system internals. An area of approximately 100cm<sup>2</sup> will be wiped if possible. To achieve adequate sensitivity for removable gross alpha measurements, an area of more than 100cm<sup>2</sup> (up to 1,000 cm<sup>2</sup>) may be wiped. If an area of more or less than 100cm<sup>2</sup> is wiped,

a comment will be added to the survey data sheet estimating the surface area wiped to allow for area correction of the results. Swabs may be used when system or component access points are not large enough to allow for a 100cm<sup>2</sup> wipe.

#### 14.4.8 Surveys of Building Mechanical System Internals

Surveys of various building system components will be performed. Survey design for these systems is out of the scope of MARSSIM. For the purposes of identifying potential residual contamination within these systems, a survey protocol has been established and is presented in the following sections. The structural surfaces DCGLs will be applied to these systems.

##### 14.4.8.1 Ventilation Systems

Surveys of building ventilation and fume hood ventilation will consist of scan surveys, total activity measurements and removable contamination measurements of accessible ventilation exhaust points and at locations of potential collection or buildup. The frequency of the survey effort will depend on the classification of the surrounding area. Ventilation system initial survey requirements are summarized in Table 14-4.

**Table 14-4 - Ventilation System Survey Requirements**

Component(s)	Classification of Area in Which Components Exist	Survey Requirements		
		Scan Surveys	Static (Total Activity) Measurements	Removable Contamination Measurements
General ventilation and fume hood exhaust ducts	Class 1	100% scan survey of accessible <sup>26</sup> internal surfaces of all existing exhaust ducts	At least one static measurement taken on the internal surfaces of 100% of existing exhaust duct openings	One smear taken at each static measurement location
	Class 2	100% scan survey of accessible internal surfaces of at least 50% of existing exhaust ducts	At least one static measurement taken on the internal surfaces 50% of existing exhaust duct openings	One smear taken at each static measurement location
	Class 3	100% scan survey of accessible internal surfaces of at least 10% of the existing exhaust ducts	At least one static measurement taken on the internal surfaces of 10% of the existing exhaust duct openings	One smear taken at each static measurement location
Collection points within ventilation fan and filter units	All	100% scan survey of accessible internal surfaces of all applicable ventilation fan units	At least one static measurement taken on each internal surface of each accessible opening on the units	One smear taken at each static measurement location

<sup>26</sup> Within reach of duct or component opening.

### 14.4.8.2 Drain Systems

Surveys of building drain system internals will consist of surveys of accessible sink drains, sink drain traps, floor drains and collection points such as tanks, sumps and outfalls. Removable contamination surveys of sink drains, sink drain traps and floor drains will be collected; scan surveys and static measurements are not practical due to their small geometry. The frequency of the survey effort will be dependent on the classification of the surrounding area. Drain system initial survey requirements are summarized in Table 14-5.

**Table 14-5 - Drain System Survey Requirements**

Component(s)	Classification of Area in Which Components Exist	Survey Requirements	
		Scan Surveys and Static (Total Activity) Measurements	Removable Contamination Measurements
Drain system inlets	Class 1	N/A <sup>27</sup>	At least one smear on the internal surfaces of 100% of the existing sink drains, sink drain traps and floor drains.
	Class 2	N/A	At least one smear on the internal surfaces of 50% of the existing sink drains, sink drain traps and floor drains.
	Class 3	N/A	At least one smear on the internal surfaces of 10% of the existing sink drains, sink drain traps and floor drains.
Drain system collection points such as accumulator tanks, sumps and outfalls	All	Scan surveys, total surface activity measurements and removable contamination measurements will be collected in tanks, sumps and at drain system outfalls as applicable.	

The mechanical system survey frequencies described above are the minimum survey requirements. Additional surveys may be necessary to adequately assess internal contamination levels. If additional survey locations are determined to be necessary, the survey package instructions will provide guidance.

If contamination is detected during the previous survey schemes, then additional surveys or removal of components may be required. This may require disassembly of components downstream of the affected location. Additional instruction will be provided in the survey package instructions.

Remaining portions of drain systems in buildings that have been renovated will be surveyed at the cleanouts.

<sup>27</sup> Scan surveys and static measurements are not practical for these locations due to the small geometry of the drain system components.

#### 14.4.9 Survey Investigation Levels

Investigation levels are used to flag locations that require special attention and further investigation to ensure areas are properly classified and adequate surveys are performed. These locations are marked and receive additional investigations to determine the concentration, area, and extent of the contamination. The survey investigation level for each type of measurement is listed by classification in Table 14-6.

**Table 14-6 - Survey Investigation Levels**

Survey Unit Classification	Flag Direct Measurement Result When:	Flag Scanning Measurement Result When:	Flag Removable Measurement Result When:
1 or 2	>60% of DCGL <sup>28</sup>	>MDC	>MDC
3	>MDC	>MDC	>MDC

#### 14.4.10 Survey Documentation

A survey package will be developed for each survey unit containing the following:

- Survey Instruction Sheets
- General survey requirements
- Instrument requirements with associated MDCs, count times and scan rates
- Survey Maps
- Overview maps detailing survey locations and placement methodology
- Survey Data Sheets
- Signature of Preparer, Surveyor and Reviewer

#### 14.4.11 Data Validation

Field data will be reviewed and validated to ensure:

- Completeness of forms
- The correct type of survey has been assigned to the survey unit
- The MDCs for measurements meet the established data quality objectives; independent calculations will be performed for a representative sample of data sheets and survey areas.
- Instrument calibrations and daily functional checks have been performed accurately and at the required frequency.

#### 14.4.12 Sample Chain-of-Custody

The sample chain-of-custody maintains the integrity of the sample; that is, there is an accurate record of sample collection, transport, analysis, and disposal. This ensures that samples are neither lost nor tampered with, and that the sample

<sup>28</sup> The Investigation Level is based on 15 mrem/yr.

analyzed in the laboratory is actually and verifiably the sample taken from a specific location in the field. Samples sent off-site for analysis will use an approved Chain of Custody Procedure.

#### 14.5 Final Status Survey Report

At the completion of final status surveys, a final status survey report (FSSR) will be developed. The FSSR shall be reviewed for technical content by Chase personnel, an independent technical person, and the Lucent RSO prior to finalizing and submitting the NRC. The following content must be included in the FSSR:

- An overview of the results of the final status survey
- A discussion of any changes that were made in the final status survey from what was proposed in the DP or other prior submittals
- A description of the method by which the number of samples was determined for each survey unit
- A summary of the values used to determine the number of samples and a justification for these values
- The survey results for each survey unit include:
  - The number of samples taken for the survey unit;
  - A description of the survey unit, including (a) a map or drawing of the survey unit showing the reference system and random start systematic sample locations for Class 1 and 2 survey units and random locations shown for Class 3 survey units and reference areas, and (b) a discussion of remedial actions and unique features;
  - The measured sample concentrations in units that are comparable to the DCGL;
  - The statistical evaluation of the measured concentrations;
  - Judgmental and miscellaneous sample data sets reported separately from those samples collected for performing the statistical evaluation;
  - A discussion of anomalous data, including any areas of elevated direct radiation detected during scanning that exceeded the investigation level or measurement locations in excess of DCGL<sub>w</sub>; and
  - A statement that a given survey unit satisfies the DCGL<sub>w</sub> and the elevated measurement comparison if any sample points exceeded the DCGL<sub>w</sub>.
- A description of any changes in initial survey unit assumptions relative to the extent of residual radioactivity (e.g., material not accounted in this Plan)
- A description of how ALARA practices were employed to achieve final activity levels

- If a survey unit fails, a description of the investigation conducted to ascertain the reason for the failure and a discussion of the impact that the failure has on the conclusion that the facility is ready for final radiological surveys and that it satisfies the release criteria
- If a survey unit fails, a discussion of the impact that the reason for the failure has on other survey unit information

## **15.0 Financial Assurance**

Lucent has determined the decommissioning cost by conducting a competitive bid process with qualified decommissioning vendors. The radiological status of the facility is well known and remediation is expected to be minimal, resulting in decommissioning largely being a survey effort. The cost of decommissioning is low (<\$100,000) relative to Lucent's operating budget and funding will be provided from Lucent's operating capital.

A current financial assurance bond in the amount of \$1.4M is adequate to provide for all stages of this decommissioning. The initial on-site evaluation for this bond was made by US Ecology in 1994 after an extensive study of all impacted labs and buildings. This estimate was updated in 2006 after another detailed site characterization and decommissioning cost estimate was performed by EnergySolutions. Because of radioactive decay and extensive reductions in the inventory of radioactive materials, the current estimate by EnergySolutions is \$188,000. However, due to the present D&D effort and the anticipated intricacies of revising the bond, Lucent Technologies voluntarily chooses to retain the current bond in its current amount of \$1.4M until such time as financial assurance is no longer required for these licenses.

### **15.1 Cost Estimate**

Not applicable.

### **15.2 Certification Statement**

Not applicable.

### **15.3 Financial Mechanism**

Not applicable.

## **16.0 Restricted Use/Alternate Criteria**

Not applicable.

## 17.0 Survey Instrumentation

### 17.1 Instrument Calibration

Laboratory and portable field instruments will be calibrated at least annually with National Institute of Standards and Technology (NIST) traceable sources, where feasible, and to radiation emission types and energies that will provide detection capabilities similar to the nuclides of concern. Records of instrument calibration shall be included with the final status report.

### 17.2 Functional Checks

Functional checks will be performed at least daily when in use. The background, source check, and field measurement count times for radiation detection instrumentation will be specified by procedure to ensure measurements are statistically valid. Background readings will be taken as part of the daily instrument check and compared with the acceptance range for instrument and site conditions. If an instrument fails a functional check, all data obtained with the instrument since the last satisfactory check will be evaluated for usability by the Project Manager and unusable data discarded.

### 17.3 Determination of Counting Times and Minimum Detectable Concentrations

Minimum counting times for background determinations and measurement of total and removable contamination will be chosen to provide a minimum detectable concentration (MDC) that meets the criteria specified in this Plan. MARSSIM equations relative to building surfaces have been modified to convert to units of dpm/100cm<sup>2</sup>. Count times and scanning rates are determined using the following equations:

#### 17.3.1 Static Counting

Static counting Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation, which is an expansion of NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", Table 3.1 (Strom & Stansbury, 1992):

Equation 17-1

$$MDC_{static} = \frac{3 + 3.29 \sqrt{B_r \cdot t_s \cdot \left(1 + \frac{t_s}{t_b}\right)}}{t_s \cdot E_{tot} \cdot \frac{A}{100cm^2}}$$

Where:

- $MDC_{static}$  = minimum detectable concentration level in dpm/100cm<sup>2</sup>  
 $B_r$  = background count rate in counts per minute  
 $t_b$  = background count time in minutes  
 $t_s$  = sample count time in minutes  
 $E_{tot}$  = total detector efficiency for radionuclide emission of interest  
(includes combination of instrument efficiency and surface efficiency)  
 $A$  = detector probe area in cm<sup>2</sup>

### 17.3.2 Beta/Gamma Ratemeter Scanning

Scanning Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation, which is a combination of MARSSIM equations 6-8, 6-9, and 6-10:

Equation 17-2

$$MDC_{scan} = \frac{d' \sqrt{b_i} \left( \frac{60}{i} \right)}{\sqrt{p} \cdot E_{tot} \cdot \frac{A}{100cm^2}}$$

Where:

- $MDC_{scan}$  = minimum detectable concentration level in dpm/100 cm<sup>2</sup>  
 $d'$  = desired performance variable (1.38)  
 $b_i$  = background counts during the residence interval  
 $i$  = residence interval  
 $p$  = surveyor efficiency (0.5)  
 $E_{tot}$  = total detector efficiency for radionuclide emission of interest (includes combination of instrument efficiency and surface efficiency)  
 $A$  = detector probe area in cm<sup>2</sup>

### 17.3.3 Alpha Ratemeter Scanning

Per MARSSIM section 6.7.2.2, it is not practical to determine a fixed MDC for alpha scanning. It is more useful to determine the probability of detecting an area of contamination at a predetermined DCGL for given scan rates. MARSSIM provides derivations, formulas and probability concepts for alpha scanning in Appendix J. Alpha scan rates were selected from the probability charts in Appendix J to achieve a 95% probability of detecting 1000 dpm/100cm<sup>2</sup>.

### 17.3.4 Smear Counting

Smear counting Minimum Detectable Concentration at a 95% confidence level is calculated using the following equation, which is NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", Table 3.1 (Strom & Stansbury, 1992):

Equation 3

$$MDC_{smear} = \frac{3 + 3.29 \sqrt{B_r \cdot t_s \cdot \left(1 + \frac{t_s}{t_b}\right)}}{t_s \cdot E}$$

Where:

- $MDC_{smear}$  = minimum detectable concentration level in dpm/smear
- $B_r$  = background count rate in counts per minute
- $t_b$  = background count time in minutes
- $t_s$  = sample count time in minutes
- $E$  = instrument efficiency for radionuclide emission of interest

Smears will be analyzed using a Ludlum Model 2929. The total efficiency will be determined from the reported emission rate on the calibration trace form for the source and the surface efficiency set to approximate dirt loading on the smear paper. Most smears will be from "clean" surfaces due to the cleanliness of the facility and the routine cleaning schedule. Per McFarland's data for filter paper, alpha particle counting efficiency is lowered by approximately 15% from dirt loading of 5 mg on filter paper. "Clean" surfaces typically contain 1-3 mg of dirt. However, ISO 7503-1 recommends that a conservative surface efficiency of 0.25 be used for alpha emitters. Therefore, the ISO 7503-1 efficiency is used.

### 17.4 Instrumentation Specifications

The instrumentation used for decommissioning surveys are summarized in Table 17-1 and Table 17-2. Table 17-1 lists the standard features of each instrument such as probe size and efficiency. Table 17-2 lists the typical operational parameters such as scan rate, count time, and the associated Minimum Detectable Concentrations (MDC). Alternate or additional instrumentation with similar detection capabilities may be utilized as needed for survey requirements with RSO approval.

**Table 17-1 - Instrumentation Specifications**

Detector Model	Detector Type	Detector Area	Meter Model	Window Thickness	Typical Total Efficiency
Ludlum 43-68	Gas Flow Proportional	126 cm <sup>2</sup>	Ludlum 2221	0.8 mg/cm <sup>2</sup>	10% (Th-230) 12% (Tc-99)
Ludlum 43-37 Floor Monitor	Gas Flow Proportional	582 cm <sup>2</sup>	Ludlum 2221	0.8 mg/cm <sup>2</sup>	10% (Th-230) 12% (Tc-99)
Ludlum 43-10-1	Phoswich	32 cm <sup>2</sup>	Ludlum 2929	0.4 mg/cm <sup>2</sup>	10% (Th-230) 20% (Tc-99)

**Table 17-2 - Typical Instrument Operating Parameters and Sensitivities**

Measurement Type	Detector Model	Scan Rate	Count Time	Background (cpm)	MDC (dpm/100cm <sup>2</sup> )
Gross Alpha Surface Scans	Ludlum 43-68	1 in./sec.	N/A	1	1000
Gross Alpha Surface Scans	Ludlum 43-37	2 in./sec.	N/A	5	1000
Gross Beta Surface Scans	Ludlum 43-68	5 in./sec.	N/A	500	2484
Gross Beta Surface Scans	Ludlum 43-37	5 in./sec.	N/A	1000	617
Gross Alpha Total Surface Activity	Ludlum 43-68	60 sec.	60 sec.	1	61
Gross Beta Total Surface Activity	Ludlum 43-68	N/A	60 sec.	500	708
Gross Removable Activity	Ludlum 2929	N/A	300 sec.	1 (alpha) 70 (beta) 60 min. count	21 (gross alpha) 79 (gross beta)

## 18.0 Data Quality Assessment (DQA) and Interpretation of Survey Results

The statistical guidance contained in Section 8 of MARSSIM will be used to determine if areas are acceptable for unrestricted release, and whether additional surveys or sample measurements are needed.

### 18.1 Preliminary Data Review

A preliminary data review will be performed for each survey unit to identify any patterns, relationships or potential anomalies. Additionally, measurement data will be reviewed and compared with the DCGLs and investigation levels to identify areas of elevated activity and confirm the correct classification of survey

units. If an area is misclassified with a less restrictive classification, the area will be upgraded and surveyed accordingly.

The following preliminary data reviews will be performed for each survey unit:

- Calculations of the survey unit mean, median, maximum, minimum, and standard deviation for each type of reading.
- Comparison of the actual standard deviation to the assumed standard deviation used for calculating the number of measurements. If the actual standard deviation is greater than estimated, the minimum number of samples shall be calculated using the actual standard deviation to ensure a sufficient number of samples have been obtained.
- Comparison of survey data with applicable investigation levels.

## 18.2 Determining Compliance

For Class 1 areas, if it is determined that all total activity results are less than the applicable DCGL, then no further statistical tests are required. If any of the total activity measurements are greater than the  $DCGL_w$ , then the survey unit fails and the null hypothesis is not rejected.

The Sign test is used to determine the minimum number of sample locations. However, the Sign test is not performed in this survey design because the total activity DCGL is used as a maximum. If all measurements are less than the DCGL, performance of the Sign test is not necessary because the survey unit will pass the Sign test.

For Class 2 and Class 3 areas, data results are initially compared to the investigation levels. These investigation levels are provided to help ensure that survey units have been properly classified. If all data results in Class 2 or 3 areas are less than the investigation levels, then the survey unit is determined to meet the release criterion. If these investigation levels are exceeded, then an investigation is performed to verify the initial assumptions for classification and determine the appropriate resolution (e.g., additional scans, reclassification, or no action if significantly below the DCGL).

Removable contamination measurements will be compared directly to the applicable DCGL. No contingency is established for elevated removable contamination. Therefore, if any removable contamination is detected which exceeds the removable contamination DCGL, then the survey unit is determined not to meet the release criterion. However, if all removable contamination measurements are less than the removable contamination DCGL, then compliance shall be determined based on total activity measurements.

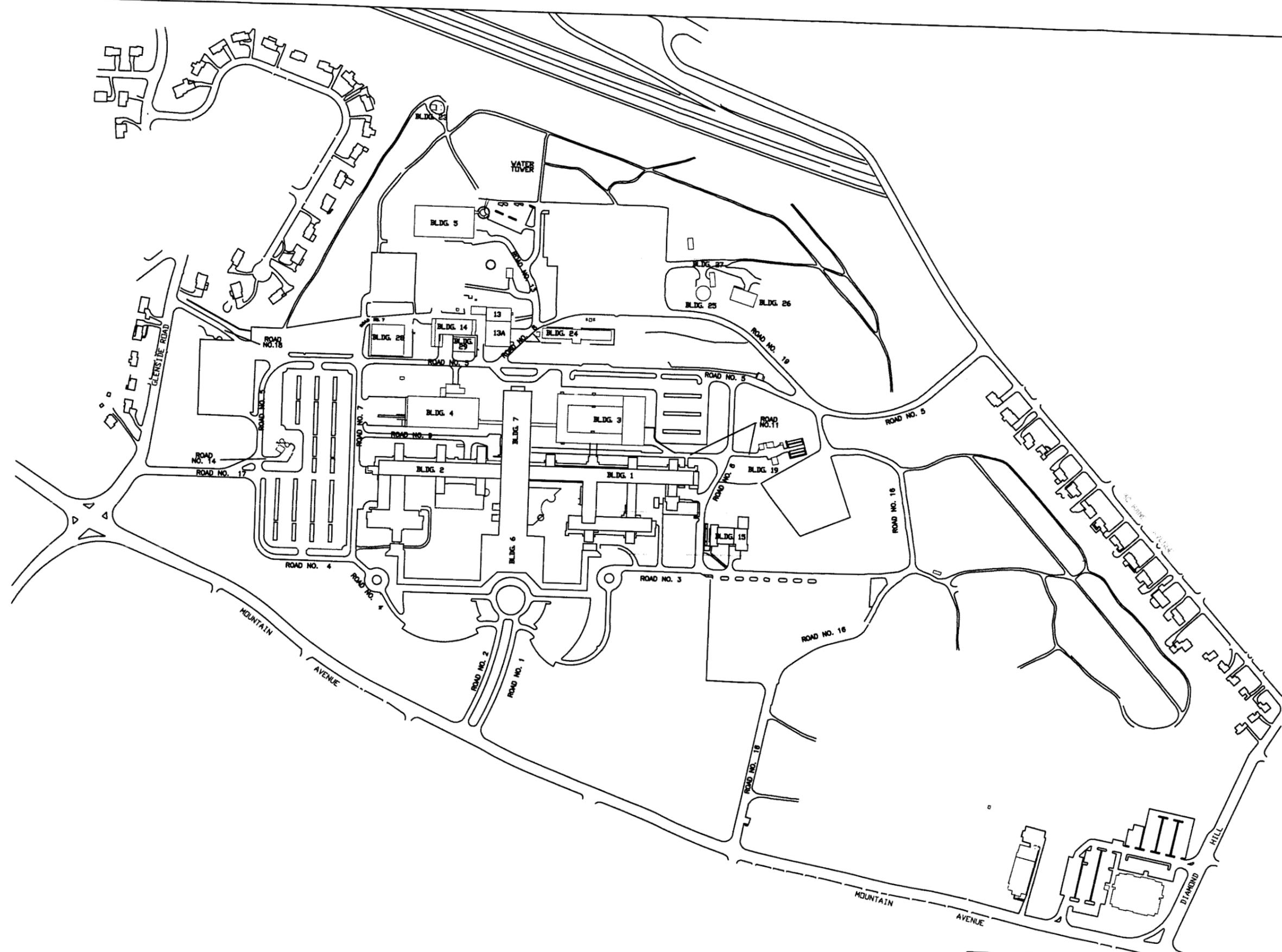
### 18.3 Mechanical System Survey Data Analysis

Results of mechanical system surveys will be compared directly with the DCGL. This comparison will consider the applicable DCGL as a maximum value, rather than an average. If any measurement exceeds the applicable DCGL, then the survey unit does not meet the release criterion and is considered contaminated. Remediation or removal of the affected system components may be required. If all measurements are less than the applicable DCGL, then the system meets the release criterion and is considered releasable.

### 19.0 References

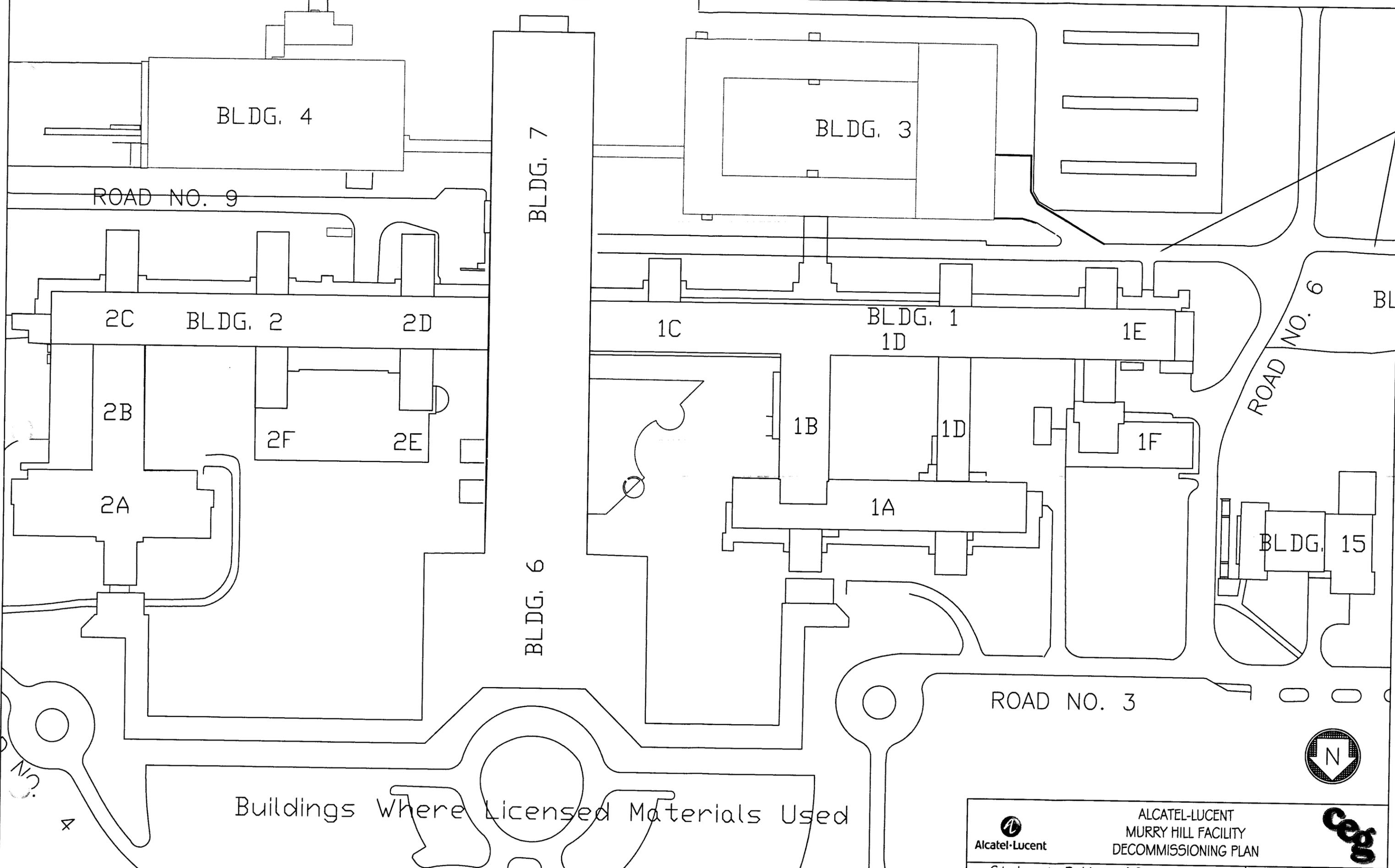
- NRC Regulations 10 CFR 20 Subpart E
- NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM)
- NUREG-1505, Revision 1, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Decommissioning Surveys," June 1998
- NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions," June 1998
- NUREG-1757, Volume 1, Rev. 1 "Consolidated NMSS Decommissioning Guidance: Decommissioning Process for Materials Licensees," September, 2003
- NUREG-1757, Volume 2 "Consolidated NMSS Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria," September, 2003
- NUREG-1757, Volume 3 "Consolidated NMSS Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness," September, 2003
- NUREG-1757, Supplement 1 "Consolidated NMSS Decommissioning Guidance: Updates to Implement the License Termination Rule Analysis," September, 2005
- NUREG/CR-5512, "Residual Radioactivity from Decommissioning: Parameter Analysis," August 1999.
- NUREG-1549, "Decision Methods for Dose Assessment to Comply with Radiological Criteria for License Termination," July 1998
- ISO-7503-1, "Evaluation of Surface Contamination -Part 1: Beta Emitters (Maximum Beta Energy Greater Than 0.15 Mev) and Alpha Emitters", First Edition 1988-08-01.
- ANL/EAD/03-1 "User's Manual for RESRAD-BUILD Version 3," June 2003
- ICRP Publication 72, "Age-Dependent Doses to Members of the Public from Intake of Radionuclides Part 5, Compilation of Ingestion and Inhalation Coefficients"
- "Decommissioning Health Physics, A Handbook for MARSSIM Users," 2001
- "Handbook of Health Physics and Radiological Health", 3<sup>rd</sup> Edition, 1998

- NUREG-1720 “Re-evaluation of the Indoor Resuspension Factor for the Screening Analysis of the Building Occupancy Scenario for NRC’s License Termination Rule,” 2002
- Federal Guidance Report No. 11 (EPA-5201/1-88-020), “Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion,” 1988
- Federal Guidance Report No. 12 (EPA-402-R-93-081), “External Exposure to Radionuclides in Air, Water, and Soil,” September 1993
- Federal Guidance Report No. 13 (EPA-402-R-99-001), “Cancer Risk Coefficients for Environmental Exposure to Radionuclides,” September 1999
- Regulatory Guide 1.86, “Termination of Operating License for Nuclear Reactors”, U.S. Nuclear Regulatory Commission, Washington, DC, June, 1974
- FC 83-23, “Guidelines for the Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Byproduct, Source, or Special Nuclear Material Licenses.”
- NUREG/CR- 5849, “Manual for Conducting Radiological Surveys in Support of License Termination,” June 1992
- Lucent NRC Radioactive Materials License Numbers 29-00170-03 and SMB-1260
- Lucent NJDEP Radioactive Materials License Numbers NJSL-10078/01/21.



ALCATEL-LUCENT  
MURRY HILL FACILITY  
DECOMMISSIONING PLAN





Buildings Where Licensed Materials Used

	ALCATEL-LUCENT MURRY HILL FACILITY DECOMMISSIONING PLAN	
Site Layout - Buildings of Concern Shaded		Page: A.2 of A.3



Glenside Road

40°41'N, 74°24'W

Interstate 78

Mountain Avenue

Diamond Hill Road

**MATERIALS LICENSE**

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

<p style="text-align: center;">Licensee</p> <p>1. Bell Laboratories A Division of Lucent Technologies Inc.</p> <p>2. 600 Mountain Avenue Murray Hill, New Jersey 07974-0636</p>	<p>In accordance with letter dated May 3, 2005,</p> <p>3. License number 29-00170-03 is amended in its entirety to read as follows:</p> <hr/> <p>4. Expiration date September 30, 2011</p> <hr/> <p>5. Docket No. 030-05224 Reference No.</p>
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6. Byproduct, source, and/or special nuclear material	Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Any byproduct material with Atomic Number 1 through 83	A. Any	A. 1 curie per radionuclide and 100 curies total
B. Hydrogen 3	B. Any	B. 150 curies
C. Cobalt 60	C. Any	C. 12 curies
D. Krypton 85	D. Any	D. 11 curies
E. Tellurium 123m	E. Any	E. 3 curies
F. Iodine 125	F. Any	F. 500 millicuries
G. Iodine 129	G. Any	G. 1 millicurie
H. Iodine 131	H. Any	H. 100 millicuries
I. Samarium 151	I. Any	I. 5 curies
J. Tungsten 181	J. Any	J. 10 curies
K. Any byproduct material with Atomic Number greater than 83.	K. Any	K. 1 millicurie per radionuclide and 10 millicuries total
L. Americium 241	L. Any	L. 200 millicuries
M. Americium 241	M. Foils or sealed sources	M. 1750 millicuries
N. Polonium 210	N. Foils or sealed sources	N. 1 curie

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**License Number  
29-00170-03Docket or Reference Number  
030-05224

Amendment No. 69

## 9. Authorized use:

A. through N. Research and development as defined in 10 CFR 30.4.

## CONDITIONS

10. Licensed material may be used or stored only at the licensee's facilities located at the licensee's facilities located at 600 Mountain Avenue, Murray Hill, New Jersey.
11. A. Licensed material shall only be used by, or under the supervision of, individuals designated, in writing, by the Radiation Safety Committee.
- B. The Radiation Safety Officer for this license is Richard Quick, CIH, CHP.
12. In addition to the possession limits in Item 8, the licensee shall further restrict the possession of licensed material at a single location to quantities below the limits specified in 10 CFR 30.72 which require consideration of the need for an emergency plan for responding to a release of licensed material.
13. Licensed material shall not be used in or on human beings.
14. The licensee shall not use licensed material in field applications where activity is released except as provided otherwise by specific condition of this license.
15. A. Sealed sources shall be tested for leakage and/or contamination at intervals not to exceed the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or under equivalent regulations of an Agreement State.
- B. Notwithstanding Paragraph A of this Condition, sealed sources designed to primarily emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.
- C. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.
- D. In the absence of a certificate from a transferor indicating that a leak test has been made within the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or under equivalent regulations of an Agreement State, prior to the transfer, a sealed source received from another person shall not be put into use until tested and the test results received.
- E. Sealed sources need not be tested if they contain only hydrogen-3; or they contain only a radioactive gas; or the half-life of the isotope is 30 days or less; or they contain not more than 100 microcuries of beta- and/or gamma-emitting material or not more than 10 microcuries of alpha-emitting material.

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**License Number  
29-00170-03Docket or Reference Number  
030-05224

Amendment No. 69

- F. Sealed sources need not be tested if they are in storage and are not being used; however, when they are removed from storage for use or transferred to another person and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.
- G. The leak test shall be capable of detecting the presence of 0.005 microcurie (185 becquerels) of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie (185 becquerels) or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 30.50(c)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations.
- H. Tests for leakage and/or contamination, including leak test sample collection and analysis, shall be performed by the licensee or by other persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.
16. The licensee shall conduct a physical inventory every six months, or at other interval approved by the U.S. Nuclear Regulatory Commission, to account for all sealed sources and/or devices received and possessed under the license.
17. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.
18. Maintenance, repair, cleaning, replacement, and disposal of foils contained in detector cells shall be performed only by the device manufacturer or other persons specifically authorized by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.
19. A. Detector cells containing a titanium tritide foil or a scandium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents the foil temperatures from exceeding that specified in the certificate of registration referred to in 10 CFR 32.210.
- B. When in use, detector cells containing a titanium tritide foil or a scandium tritide foil shall be vented to the outside.

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**

License Number  
29-00170-03

Docket or Reference Number  
030-05224

Amendment No. 69

20. The licensee is authorized to hold radioactive material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal in ordinary trash, provided:
- A. Waste to be disposed of in this manner shall be held for decay a minimum of ten half-lives.
  - B. Before disposal as ordinary trash, the waste shall be surveyed at the container surface with the appropriate survey instrument set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.
  - C. A record of each such disposal permitted under this License Condition shall be retained for three years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.
21. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
22. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Application dated August 20, 2001 (ML012420340)
  - B. Letter dated February 18, 2005 (ML051010387)
  - C. Letter dated May 3, 2005

For the U.S. Nuclear Regulatory Commission

*Original signed by Elizabeth Ullrich*

Date May 23, 2005

By

Elizabeth Ullrich  
Commercial and R&D Branch  
Region I  
King of Prussia, Pennsylvania 19406

NRC FORM 374

U.S. NUCLEAR REGULATORY COMMISSION

PAGE 1 OF 2 PAGES  
Amendment No. 13

**MATERIALS LICENSE**

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter 1, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 103 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

<p style="text-align: center;">Licensee</p> <p>1. Bell Laboratories A Division of Lucent Technologies Inc.</p> <p>2. 600 Mountain Avenue Murray Hill, New Jersey 07974-0636</p>	<p>In accordance with the letter dated May 3, 2005,</p> <p>3. License number SMB-1260 is amended in its entirety to read as follows:</p> <hr/> <p>4. Expiration date June 30, 2012</p> <hr/> <p>5. Docket No. 04008478 Reference No.</p>
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<p>6. Byproduct, source, and/or special nuclear material</p> <p>A. Uranium (Natural)</p> <p>B. Uranium (Depleted)</p> <p>C. Thorium</p> <p>D. Uranium (Depleted)</p>	<p>7. Chemical and/or physical form</p> <p>A. Any</p> <p>B. Any</p> <p>C. Any</p> <p>D. Plated metal</p>	<p>8. Maximum amount that licensee may possess at any one time under this license</p> <p>A. 20 kilograms</p> <p>B. 20 kilograms</p> <p>C. 70 kilograms</p> <p>D. 300 kilograms</p>
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9. Authorized use:

A. through C.	Research and development as defined in 10 CFR 30.4.
D.	Shielding material.

**CONDITIONS**

- 10. Licensed material may be used or stored only at the licensee's facilities located at 600 Mountain Avenue, Murray Hill, New Jersey.
- 11. Licensed material shall only be used by, or under the supervision of, individuals designated, in writing, by the Radiation Safety Committee.
- 12. The Radiation Safety Officer for this license is Richard Quick, CIH, CSP.

NRC FORM 374A

U.S. NUCLEAR REGULATORY COMMISSION

PAGE 2 of 2 PAGES

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**

License Number

SMB-1260

Docket or Reference Number

04008478

Amendment No. 13

13. The licensee shall not use licensed material in or on human beings.
14. The licensee shall not use licensed material in field applications where it is released except as provided otherwise by specific condition of this license.
15. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
16. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Application dated May 30, 2002 (ML021550052)  
B. Letter dated February 18, 2005 (ML051010387)  
C. Letter dated May 3, 2005

For the U.S. Nuclear Regulatory Commission

Date May 23, 2005

By

*Elizabeth Ullrich*  
Elizabeth Ullrich  
Commercial and R&D Branch  
Division of Nuclear Materials Safety  
Region I  
King of Prussia, Pennsylvania 19406

732088

**MATERIALS LICENSE**

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

<p>Licensee</p> <p>1. Bell Laboratories Division of Lucent Technologies</p> <p>2. 600 - 700 Mountain Avenue Murray Hill, New Jersey 07974</p>	<p>In accordance with the letter dated March 8, 2006,</p> <p>3. License number 29-00170-08 is amended in its entirety to read as follows:</p> <p>4. Expiration date June 30, 2007</p> <p>5. Docket No. 03036894 Reference No. 29-00170-06</p>	
<p>6. Byproduct, source, and/or special nuclear material</p> <p>A. Cobalt 60</p> <p>B. Cesium 137</p>	<p>7. Chemical and/or physical form</p> <p>A. Sealed Sources (AECL Model C-198 MDS Nordion Model C-198)</p> <p>B. Sealed Sources (J. L. Shepherd Model 6810)</p>	<p>8. Maximum amount that licensee may possess at any one time under this license</p> <p>A. No single source to exceed the maximum activity specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission or an Agreement State</p> <p>B. No single source to exceed the maximum activity specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission or an Agreement State</p>
<p>9. Authorized use:</p> <p>A. and B. For irradiation of materials in self-shielded irradiator devices that have been registered either with the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or with an Agreement State and which have been distributed in accordance with a Commission or Agreement State specific license authorizing distribution to persons specifically authorized by a Commission or Agreement State license to receive, possess, and use the devices.</p>		

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**License Number  
29-00170-08Docket or Reference Number  
03036894  
29-00170-06

Amendment No. 02

## CONDITIONS

10. Licensed material may be used or stored only at the licensee's facilities located at 600 Mountain Avenue, Murray Hill, New Jersey.
11. Licensed material shall be used by, or under the supervision of individuals who have received the training described in the facsimile dated June 3, 2005 and have been designated, in writing, by the Radiation Safety Officer. The licensee shall maintain records of individuals designated as users for 3 years following the last use of licensed material by the individual.
12. The Radiation Safety Officer for this license is Richard Quick.
13. A. Sealed sources shall be tested for leakage and/or contamination at intervals not to exceed six months or at the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or under equivalent regulations of an Agreement State.
- B. In the absence of a certificate from a transfer indicating that a leak test has been made within the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or under equivalent regulations of an Agreement State, prior to the transfer, a sealed source received from another person shall not be put into use until tested and the test results received.
- C. Sealed sources need not be tested if they are in storage and are not being used; however, when they are removed from storage for use or transferred to another person and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.
- D. The leak test shall be capable of detecting the presence of 0.005 microcurie (185 becquerels) of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie (185 becquerels) or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 30.50(c)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations.
- E. Tests for leakage and/or contamination, including leak test sample collection and analysis, shall be performed by the licensee or by other persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.
- F. Records of leak test results shall be kept in units of microcuries and shall be maintained for 5 years.

Sealed sources containing licensed material shall not be opened or sources removed from source holders by the licensee.

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**

License Number  
29-00170-08

Docket or Reference Number  
03036894  
29-00170-06

Amendment No. 02

15. The licensee shall conduct a physical inventory every six months, or at other intervals approved by the U.S. Nuclear Regulatory Commission, to account for all sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 5 years from the date of each inventory and shall include the radionuclides, quantities, manufacturer's name and model numbers, and the date of the inventory.
16. The licensee shall not repair, remove, replace, or alter any of the following: electrical and mechanical systems that control source or shielding movement, the irradiator's shielding or sealed source, safety interlocks, or any component that may affect safe operation of the irradiator. These activities shall be performed by a person specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.
17. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
18. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Facsimile dated June 2, 2005 (ML054600453)
- B. Facsimile dated June 20, 2005 (ML051780522)

For the U.S. Nuclear Regulatory Commission

ate March 22, 2006

By

*Original signed by Sattar Lodhi, Ph.D.*

Sattar Lodhi, Ph.D.  
Materials Security and Industrial Branch  
Division of Nuclear Materials Safety  
Region I  
King of Prussia, Pennsylvania 19406  
Wednesday, March 22, 2006 12:54:46 PM

## Form E—Record of Radioactive Source

## FORM E

BTL RF-E

See instructions on back  
before filling out this form

## RECORD OF RADIOACTIVE SOURCE

1. Source No. 14-0002
2. Assigned to S. S. Voris
3. Location of use MH HOMOCK
4. Received from \_\_\_\_\_ Date 1-14-69

5. Description of source CS-137  
Irradiated components or materials  Sealed source  Unsealed source   
139mCi

6. Names of persons using this source

Name	Dept.	Location
S. S. Voris	8435	MH 1c-444

7. Record of initial leak test on sealed source.

8. Record of radiation level of source

9. Record of transfer to others

to R Ladson 975 MH 1G-018

10. Record of waste disposal

Disposed 5/2/64  
Item #22

Submitted by: G. G. Turner  
Date: May 17, 1971

\*

(over)

**BTL RF-E**

**INSTRUCTIONS**

This form shall be completed by the RSO or RPR upon receipt of radioactive materials, in accordance with paragraph 9.3 of Section I.

**1. Source No.**

List Source No. assigned by Radiological Safety Officer.

**2. Assigned to**

List name of person to whom source was assigned by Radiological Safety Officer.

**3. Location of use**

Self-explanatory

**4. Received from--Date**

List name of person or organization from whom source was received and date of receipt.

**5. Description of source**

Indicate in box nature of source.

If irradiated components or materials, indicate type of component or material, the approximate amount of radioactive material in millicuries and the radioisotopes present. If sealed source, indicate manufacturer, model number, radioisotope and quantity in millicuries. If unsealed source, indicate radioisotope quantity in millicuries and physical form (gas, liquid, solid).

**6. Names of persons using this source**

Self-explanatory

**7. Record of initial leak test on sealed source**

Indicate date of test and results in microcuries.

**8. Record of radiation level of source**

Record the radiation level of unsealed sources when measured at 2" from the source. For irradiated devices record radiation level when measured at contact.

**9. Record of transfer to others**

No transfers shall be made prior to notification of the Radiological Safety Officer.

If entire source is transferred, list date of transfer and name and location of person to whom transferred. Send copy of Form RF-E to Radiological Safety Officer and transfer original Form RF-E to transferee.

If only part of source is transferred, the Radiological Safety Officer will assign a new source number to the portion transferred, and a new Form RF-E shall be completed and issued to the transferee.

**10. Record of waste disposal**

List date of disposal and how disposed. Any waste material showing radiation levels above background must be considered radioactive waste and must not be treated as regular waste. Consult Radiological Safety Officer for disposal instructions.

### FORM E Record of Radioactive Source

- 1. Source No.: 14-2286-U
- 2. Assigned to: R.S. Raghavan  
Emp # \_\_\_\_\_
- 3. Location of use: IF101F
- 4. Received from: NEN Life Sciences  
Date 9/1/99
- 5. Condition of Shipment: Intact

Surface cont. level: <25 dpm/100 cm<sup>2</sup> (LBS100 )  
 Surface rad. level: 16 mR/h TI: 0.4 (Ludbm 3 )

6. Description of source  
 Irradiated components or materials      Sealed source      Unsealed source  
 0.1 mL Fe-59 Liquid 1mL

\_\_\_\_\_ alpha    X beta/gamma

7. Names of persons using this source

Name	Dept.	Emp. #	Location
R.S. Raghavan			

- 8. Initial leak or wipe test on source. <25 dpm/100 cm<sup>2</sup>
- 9. Initial Radiation level of source. 70 mR/hr
- 10. Record of transfer to others.

11. Record of waste disposal.

Submitted by: Ala Das  
 Date: 9/1/99

INSTRUCTIONS

This form shall be completed by the RSO or RPR upon receipt of radioactive materials, in accordance with Part 17 of Section 1.

1. **Source No.**  
List Source No. assigned by Radiological Safety Officer.
2. **Assigned to**  
List name of person to whom source was assigned by Radiological Safety Officer.
3. **Location of use**  
Self-explanatory.
4. **Received from-Date**  
List name of person or organization from whom source was received and date of receipt.
5. **Condition of Shipment**  
State whether shipping container was *intact*. State whether there was any detectable contamination on or inside the package. Record instruments used in measurement.
6. **Description of Source**  
Indicate in box nature of source. If irradiated components or materials, indicate type of component or material, the approximate amount of radioactive material in millicuries and the radioisotopes present. If sealed source, indicate manufacturer, model number, radioisotope and quantity in millicuries. If unsealed source, indicate radioisotope quantity in millicuries and physical form (gas, liquid, solid).
7. **Names of persons using this source**  
Self-explanatory.
8. **Record of initial leak or wipe test on source**  
Indicate date of test and results in microcuries.
9. **Record of radiation level of source**  
Record the radiation level at contact.
10. **Record of transfer to others**  
No transfers shall be made prior to notification of the Radiological Safety Officer.  
If entire source is transferred, list date of transfer and name and location of person to whom transferred. Send copy of Form-E to Radiological Safety Officer and transfer original Form-E to transferee. If only part of source is transferred, the Radiological Safety Officer will assign a new source number to the portion transferred, and a new Form-E shall be completed and issued to the transferee.
11. **11. Record of waste disposal**  
List date of disposal and how disposed. Any waste material showing radiation levels above background must be considered radioactive waste and must not be treated as regular waste. Consult Radiological Safety Officer for disposal instructions.

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
15-215	Fe-55	100	Apr-84	No Record	None	2.70E+00	0.2	Yes	4.47E+01	4.49E+06	4.49E+06	No	0%	No	---	0.0%	No
15-215	Th-232	11	Mar-84	No Record	Thorium Nitrate	1.40E+10	11.0	Yes	2.44E+03	7.29E+00	7.29E+00	No	33504%	Yes	1.92E+03	127.0%	Yes
15-215	U-238	2.33	May-82	No Record	None	4.46E+09	2.3	Yes	5.17E+02	1.01E+02	1.01E+02	No	513%	Yes	5.21E+03	9.9%	No
<b>15-215 Total</b>													34017%	Yes		136.9%	Yes
1A-132	Am-241	1	Nov-71	No Record	Disc source-Also used in room 1F-101F	4.32E+02	0.9	No	2.09E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1A-132	Am-241	1330000	Nov-71	No Record	Also used in room 1G-018F	4.32E+02	1254250.6	Yes	2.78E+08	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
<b>1A-132 Total</b>													0%	No		0.0%	No
1A-141	Na-22	200	Dec-96	No Record	None	2.60E+00	9.3	Yes	2.07E+03	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
1A-141	Na-22	7	Dec-96	No Record	None	2.60E+00	0.3	Yes	7.24E+01	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
1A-141	Na-22	10	Sep-95	No Record	None	2.60E+00	0.3	Yes	7.41E+01	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
<b>1A-141 Total</b>													0%	No		0.0%	No
1A-144	H-3	460	Mar-77	No Record	None	1.23E+01	79.0	Yes	1.75E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1A-144	H-3	900	Mar-77	No Record	None	1.23E+01	154.5	Yes	3.43E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
<b>1A-144 Total</b>													0%	No		0.0%	No
1A-148	U-238	27.57	Mar-70	Jun-89	Uranium Sulfide-Also used in room 6F-202	4.46E+09	27.6	Yes	6.12E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1A-148	U-238	140	Aug-70	Jun-89	Also used in room 6F-202	4.46E+09	140.0	Yes	3.11E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1A-148	U-238	70	Sep-71	Nov-88	Uranium Oxide 200g-Also used in room 6F-202	4.46E+09	70.0	Yes	1.55E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1A-148	U-238	52	Mar-72	Jun-89	Uranium Tetrafluoride-Also used in room 6F-202	4.46E+09	52.0	Yes	1.15E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1A-148	U-238	3.3	Feb-73	Jun-89	Tetrachloride Anhydrous-Also used in room 6F-202	4.46E+09	3.3	Yes	7.33E+02	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1A-148 Total</b>													0%	No		0.0%	No
1A-152	Th-232	0.8	Jul-87	No Record	None	1.40E+10	0.8	Yes	1.78E+02	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>1A-152 Total</b>													0%	No		0.0%	No
1A-170	Th-232	25	Feb-69	May-94	Thorium Nitrate-Also used in room 1G-018F	1.40E+10	25.0	Yes	5.55E+03	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1A-170	Th-234	45.3	Sep-71	May-94	Thorium Fluoride-Also used in room 1G-018F	6.60E-02	0.0	Yes	3.65E-164	2.05E+06	2.05E+06	Yes	0%	No	---	0.0%	No
<b>1A-170 Total</b>													0%	No		0.0%	No
1A-176	Th-232	1.1	Dec-90	No Record	Crystal Bar	1.40E+10	1.1	No	2.44E+02	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1A-176	U-238	10	Dec-90	No Record	Depleted	4.46E+09	10.0	Yes	2.22E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1A-176 Total</b>													0%	No		0.0%	No
1A-180	Sb-124	150	Sep-90	Sep-96	None	1.65E-01	0.0	Yes	1.30E-28	4.33E+04	4.33E+04	Yes	0%	No	---	0.0%	No
<b>1A-180 Total</b>													0%	No		0.0%	No
1A-206	U-238	1.7	May-80	No Record	Uranium Chloride Powder	4.46E+09	1.7	Yes	3.77E+02	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1A-206 Total</b>													0%	No		0.0%	No
1A-207	Na-22	100	Aug-89	No Record	None	2.60E+00	0.7	Yes	1.46E+02	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
1A-207	U-238	0.4	Jul-91	No Record	None	4.46E+09	0.4	Yes	8.88E+01	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1A-207 Total</b>													0%	No		0.0%	No
1A-208	Co-57	1000	Mar-69	Jan-87	None	7.42E-01	0.0	Yes	2.61E-11	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
<b>1A-208 Total</b>													0%	No		0.0%	No
1A-232	Th-232	27	Sep-81	Apr-88	Thorium Chloride 250g	1.40E+10	27.0	Yes	5.99E+03	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1A-232	Th-232	30	Jun-82	Apr-88	Thorium Chloride 250g	1.40E+10	30.0	Yes	6.66E+03	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1A-232	U-238	33	Sep-81	Apr-88	Uranium Chloride 100g	4.46E+09	33.0	Yes	7.33E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1A-232 Total</b>													0%	No		0.0%	No
1A-302	Bi-207	5	Feb-72	No Record	None	3.34E+01	2.4	Yes	5.22E+02	Not Listed	1.00E+00	Yes	0%	No	2.66E+04	0.0%	No
1A-302	Cd-109	1000	May-73	Dec-85	None	1.27E+00	0.0	Yes	1.08E-03	1.14E+05	1.14E+05	Yes	0%	No	---	0.0%	No
1A-302	Co-60	2000	Jan-75	No Record	None	5.27E+00	24.6	Yes	5.47E+03	7.04E+03	7.04E+03	Yes	0%	No	1.79E+04	0.0%	No
1A-302	Fe-59	2000	Jan-75	Jan-79	None	1.22E-01	0.0	Yes	2.18E-77	8.83E+04	8.83E+04	Yes	0%	No	---	0.0%	No
1A-302	Mn-54	500	May-73	Sep-78	None	8.57E-01	0.0	Yes	5.13E-08	3.15E+04	3.15E+04	Yes	0%	No	---	0.0%	No
1A-302	Na-22	5	Feb-72	Feb-72	None	2.60E+00	0.0	Yes	6.86E-02	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
1A-302	Sb-125	10	Feb-72	Feb-72	None	2.80E+00	0.0	Yes	2.74E-01	4.43E+04	4.43E+04	Yes	0%	No	---	0.0%	No
1A-302	Sb-125	1000	May-73	Dec-85	None	2.80E+00	0.2	Yes	3.73E+01	4.43E+04	4.43E+04	Yes	0%	No	---	0.0%	No
1A-302	Y-88	5	Feb-72	Feb-72	None	2.92E-01	0.0	Yes	3.78E-35	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
<b>1A-302 Total</b>																	
1A-329	Am-241	40	Jan-69	Apr-87	None	4.32E+02	37.5	Yes	8.34E+03	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
<b>1A-329 Total</b>																	
1B-118	U-238	0.083	May-80	No Record	Oxide Powder	4.46E+09	0.1	Yes	1.84E+01	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1B-118 Total</b>																	
1B-122	U-238	330	Sep-84	No Record	2"x1"metal disc	4.46E+09	330.0	No	7.33E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1B-122 Total</b>																	
1B-221	Th-232	300	Nov-67	No record	None	1.40E+10	300.0	Yes	6.66E+04	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1B-221	Th-232	50	May-71	Oct-92	Thorium Acetate Kerr McGee-Also used in room 1G-018F	1.40E+10	50.0	Yes	1.11E+04	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1B-221	Th-232	1000	Dec-72	No record	None	1.40E+10	1000.0	Yes	2.22E+05	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>1B-221 Total</b>																	
1B-222	Th-232	1000	Oct-72	May-94	20lbs Oxide-Also used in room 1G-018F	1.40E+10	1000.0	Yes	2.22E+05	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1B-222	Th-232	1000	Dec-72	No Record	None	1.40E+10	1000.0	Yes	2.22E+05	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>1B-222 Total</b>																	
1B-311	U-238	17.5	Mar-89	No Record	Uranium Chloride powder	4.46E+09	17.5	Yes	3.88E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1B-311 Total</b>																	
1B-314	Th-232	2.2	Apr-87	No Record	Crucibles	1.40E+10	2.2	No	4.88E+02	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1B-314	Th-232	80	Nov-87	No Record	Crucibles	1.40E+10	80.0	No	1.78E+04	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>1B-314 Total</b>																	
1B-402	Co-57	27000	Feb-75	Jun-83	None	7.42E-01	0.0	Yes	1.79E-07	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-402	Co-57	27500	Mar-79	No Record	None	7.42E-01	0.0	Yes	8.21E-06	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-402	Co-57	25000	Jul-80	No Record	None	7.42E-01	0.0	Yes	2.60E-05	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-402	Co-57	25000	Nov-82	No Record	None	7.42E-01	0.0	Yes	2.31E-04	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-402	Co-57	24800	Sep-86	No Record	None	7.42E-01	0.0	Yes	8.23E-03	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-402	Co-57	49500	Mar-88	No Record	None	7.42E-01	0.0	Yes	6.66E-02	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-402	W-181	7000	Sep-73	Jun-78	None	3.32E-01	0.0	Yes	4.17E-26	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	60000	Jun-76	Sep-80	None	3.32E-01	0.0	Yes	1.13E-22	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	60000	Jun-76	Sep-80	None	3.32E-01	0.0	Yes	1.13E-22	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	25000	Jun-78	No Record	None	3.32E-01	0.0	Yes	3.07E-21	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	25000	Jun-78	No Record	None	3.32E-01	0.0	Yes	3.07E-21	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	20000	Jul-78	Sep-80	None	3.32E-01	0.0	Yes	2.92E-21	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	20000	Jul-78	Sep-80	None	3.32E-01	0.0	Yes	2.92E-21	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	20000	Jul-78	Sep-80	None	3.32E-01	0.0	Yes	2.92E-21	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-402	W-181	200000	Nov-83	No Record	None	3.32E-01	0.0	Yes	2.06E-15	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
<b>1B-402 Total</b>																	
1B-404	Co-57	10000	Mar-68	No Record	None	7.42E-01	0.0	Yes	1.03E-10	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-404	Tb-161	6000	Jul-68	Sep-80	None	1.86E-02	0.0	Yes	0.00E+00	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1B-404	U-238	17	Oct-79	Oct-79	Uranium Trichloride	4.46E+09	17.0	Yes	3.77E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1B-404 Total</b>																	
1B-406	Co-57	27000	Sep-77	No Record	None	7.42E-01	0.0	Yes	1.99E-06	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-406	Sn-119m	15000	Jun-78	Jan-84	None	8.03E-01	0.0	Yes	1.85E-05	1.28E+06	1.28E+06	Yes	0%	No	---	0.0%	No
1B-406	W-181	50000	Dec-77	Apr-80	None	3.32E-01	0.0	Yes	2.17E-21	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
<b>1B-406 Total</b>																	
1B-409	C-14	1000	Jun-73	Sep-78	None	5.73E+03	995.8	Yes	2.21E+05	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1B-409	C-14	50	Jan-79	Jan-79	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1B-409	Cr-51	2000	Jun-75	Sep-78	None	7.59E-02	0.0	Yes	4.70E-126	5.19E+06	5.19E+06	Yes	0%	No	---	0.0%	No
1B-409	H-3	1	May-78	No Record	None	1.23E+01	0.2	Yes	4.07E+01	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1B-409	U-238	94	Jun-74	Apr-92	Uranyl Acetate-Also used in room 1G-018F	4.46E+09	94.0	Yes	2.09E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1B-409 Total</b>																	
1B-410	Co-57	3000	Jan-70	Nov-77	None	7.42E-01	0.0	Yes	1.71E-10	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-410	Co-57	10000	Aug-75	1,84	None	7.42E-01	0.0	Yes	1.05E-07	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-410	Co-57	10000	Nov-75	Jan-84	None	7.42E-01	0.0	Yes	1.33E-07	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-410	Co-57	5000	Aug-76	Jan-84	None	7.42E-01	0.0	Yes	1.34E-07	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1B-410	Co-57	25000	May-80	Jan-84	None	7.42E-01	0.0	Yes	2.23E-05	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-410	Co-57	25000	Jun-81	Jan-84	None	7.42E-01	0.0	Yes	6.13E-05	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-410	Co-57	25000	Jun-81	Jan-84	None	7.42E-01	0.0	Yes	6.13E-05	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1B-410	Co-60	10	Feb-76	No Record	None	5.27E+00	0.1	Yes	3.15E+01	7.04E+03	7.04E+03	Yes	0%	No	1.79E+04	0.0%	No
1B-410	Eu-149	16000	May-69	Jan-84	None	2.47E-01	0.0	Yes	7.25E-42	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1B-410	Eu-155	1000	Jul-79	Jul-79	None	4.96E+00	17.5	Yes	3.89E+03	1.56E+05	1.56E+05	Yes	0%	No	---	0.0%	No
1B-410	Sm-151	1600000	Jan-71	Jan-84	None	9.00E+01	1199240.2	Yes	2.66E+08	3.98E+05	3.98E+05	Yes	0%	No	1.25E+08	0.0%	No
1B-410	Sn-119m	5000	Mar-70	Jul-87	None	8.03E-01	0.0	Yes	4.93E-09	1.28E+06	1.28E+06	Yes	0%	No	---	0.0%	No
1B-410	Sn-119m	10000	Jul-71	No Record	None	8.03E-01	0.0	Yes	3.12E-08	1.28E+06	1.28E+06	Yes	0%	No	---	0.0%	No
1B-410	Sn-119m	15000	Nov-75	Jan-84	None	8.03E-01	0.0	Yes	1.98E-06	1.28E+06	1.28E+06	Yes	0%	No	---	0.0%	No
1B-410	Sn-119m	1000	Mar-79	Jan-84	None	8.03E-01	0.0	Yes	2.35E-06	1.28E+06	1.28E+06	Yes	0%	No	---	0.0%	No
1B-410	W-181	41000	Aug-80	No Record	None	3.32E-01	0.0	Yes	4.71E-19	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-410	W-181	100000	Feb-82	Jun-82	None	3.32E-01	0.0	Yes	2.66E-17	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
1B-410	W-181	100000	Feb-82	Jun-82	None	3.32E-01	0.0	Yes	2.66E-17	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
<b>1B-410 Total</b>													0%	No		0.0%	No
1B-414	Co-57	20000	Feb-68	May-94	None	7.42E-01	0.0	Yes	1.91E-10	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
<b>1B-414 Total</b>													0%	No		0.0%	No
1B-421	C-14	100	Nov-70	Sep-82	None	5.73E+03	99.5	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1B-421	C-14	500	Nov-70	Apr-92	None	5.73E+03	497.7	Yes	1.10E+05	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1B-421	C-14	0.5	May-71	Sep-82	None	5.73E+03	0.5	Yes	1.11E+02	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1B-421	C-14	500	Oct-75	Sep-82	None	5.73E+03	498.0	Yes	1.11E+05	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
<b>1B-421 Total</b>													0%	No		0.0%	No
1B-422	H-3	250	Jan-81	Jul-97	None	1.23E+01	53.3	Yes	1.18E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1B-422	H-3	1000	Jan-81	Jul-97	None	1.23E+01	213.2	Yes	4.73E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1B-422	H-3	1000	Mar-82	Dec-82	None	1.23E+01	227.6	Yes	5.05E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1B-422	P-32	5000	Jan-81	Jul-84	None	3.92E-02	0.0	Yes	2.01E-205	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
<b>1B-422 Total</b>													0%	No		0.0%	No
1C-211	Th-232	17.7	Sep-71	No record	200g-Also used in room 1C-242	1.40E+10	17.7	Yes	3.93E+03	7.29E+00	7.29E+00	No	53911%	Yes	1.92E+03	204.3%	Yes
1C-211	Th-232	100	Mar-75	Oct-76	Oxide	1.40E+10	100.0	Yes	2.22E+04	7.29E+00	7.29E+00	No	304584%	Yes	1.92E+03	1154.4%	Yes
1C-211	Th-232	24	Jan-78	Jul-78	Oxide powder	1.40E+10	24.0	Yes	5.33E+03	7.29E+00	7.29E+00	No	73100%	Yes	1.92E+03	277.1%	Yes
1C-211	Th-232	24	Jan-78	Jul-78	Oxide Powder	1.40E+10	24.0	Yes	5.33E+03	7.29E+00	7.29E+00	No	73100%	Yes	1.92E+03	277.1%	Yes
1C-211	Th-232	100	Nov-78	Oct-79	Oxide powder	1.40E+10	100.0	Yes	2.22E+04	7.29E+00	7.29E+00	No	304584%	Yes	1.92E+03	1154.4%	Yes
1C-211	Th-232	110	Jun-79	No record	Oxide powder	1.40E+10	110.0	Yes	2.44E+04	7.29E+00	7.29E+00	No	335042%	Yes	1.92E+03	1269.8%	Yes
1C-211	U-238	70	Sep-71	No record	Uranium Oxide 200g-Also used in room 1C-242	4.46E+09	70.0	Yes	1.55E+04	1.01E+02	1.01E+02	No	15416%	Yes	5.21E+03	298.4%	Yes
1C-211	U-238	700	Feb-76	No record	Oxide 1000g	4.46E+09	700.0	Yes	1.55E+05	1.01E+02	1.01E+02	No	154157%	Yes	5.21E+03	2983.7%	Yes
1C-211	U-238	39.18	May-76	No record	Oxide 635g	4.46E+09	39.2	Yes	8.70E+03	1.01E+02	1.01E+02	No	8628%	Yes	5.21E+03	167.0%	Yes
1C-211	U-238	60	Feb-79	Oct-79	Uranium Sulfate 200g	4.46E+09	60.0	Yes	1.33E+04	1.01E+02	1.01E+02	No	13213%	Yes	5.21E+03	255.7%	Yes
1C-211	U-238	6.66	Mar-85	No record	200g wire	4.46E+09	6.7	No	1.48E+03	1.01E+02	1.01E+02	No	0%	No	5.21E+03	0.0%	No
<b>1C-211 Total</b>													1335736%	Yes		8041.9%	Yes
1C-231	Th-232	20	Apr-81	No record	Oxide Powder	1.40E+10	20.0	Yes	4.44E+03	7.29E+00	7.29E+00	No	60917%	Yes	1.92E+03	230.9%	Yes
1C-231	U-238	0.1	Apr-89	No record	Alloy	4.46E+09	0.1	No	2.22E+01	1.01E+02	1.01E+02	No	0%	No	5.21E+03	0.0%	No
<b>1C-231 Total</b>													60917%	Yes		230.9%	Yes
1C-242	Th-232	17.7	Sep-71	No record	200g-Also used in room 1C-211	1.40E+10	17.7	Yes	3.93E+03	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1C-242	U-238	70	Sep-71	No record	Uranium Oxide 200g-Also used in room 1C-211	4.46E+09	70.0	Yes	1.55E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1C-242 Total</b>													0%	No		0.0%	No
1C-307	U-238	5.5	Apr-81	No record	Uranyl Formate	4.46E+09	5.5	Yes	1.22E+03	1.01E+02	1.01E+02	No	1211%	Yes	5.21E+03	23.4%	No
<b>1C-307 Total</b>													1211%	Yes		23.4%	No
1C-308	Fe-55	100	Mar-86	No record	None	2.70E+00	0.3	Yes	7.31E+01	4.49E+06	4.49E+06	No	0%	No	---	0.0%	No
<b>1C-308 Total</b>													0%	No		0.0%	No
1C-321	Co-58	33000	Mar-77	Oct-79	None	1.94E-01	0.0	Yes	2.55E-42	6.78E+04	6.78E+04	No	0%	No	---	0.0%	No
<b>1C-321 Total</b>													0%	No		0.0%	No
1C-349	Kr-85	5.1	Nov-72	Apr-92	None	1.07E+01	0.5	Yes	1.13E+02	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1C-349	Ra-226	400	Jun-68	Nov-86	None	1.60E+03	393.1	Yes	8.73E+04	1.12E+03	1.12E+03	Yes	0%	No	---	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
<b>1C-349 Total</b>													0%	No		0.0%	No
1C-424	C-14	1000	Sep-82	Apr-82	None	5.73E+03	996.9	Yes	2.21E+05	3.68E+06	3.68E+06	No	6%	No	---	0.0%	No
1C-424	H-3	1800	Sep-82	Apr-82	None	1.23E+01	421.5	Yes	9.36E+04	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
<b>1C-424 Total</b>													6%	No		0.0%	No
1C-429	Co-57	10000	Feb-68	No Record	None	7.42E-01	0.0	Yes	9.53E-11	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1C-429	Co-57	2670	Mar-69	Apr-82	None	7.42E-01	0.0	Yes	6.97E-11	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1C-429	Co-57	25000	Jan-70	No Record	None	7.42E-01	0.0	Yes	1.43E-09	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
<b>1C-429 Total</b>													0%	No		0.0%	No
1C-432	C-14	50	Jul-73	Sep-74	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-432	C-14	50	Jan-74	Apr-80	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-432	C-14	50	Apr-80	Apr-80	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-432	C-14	50	Apr-80	Apr-80	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-432	C-14	50	Apr-80	Oct-73	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-432	H-3	10	Jul-73	Apr-80	None	1.23E+01	1.4	Yes	3.10E+02	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
<b>1C-432 Total</b>													0%	No		0.0%	No
1C-433	S-35	10000	Feb-71	No Record	None	2.40E-01	0.0	Yes	2.58E-41	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
<b>1C-433 Total</b>													0%	No		0.0%	No
1C-435	Cf-252	2.1	Dec-69	No Record	Also used in room 1F-101A	2.60E+00	0.0	Yes	1.62E-02	4.31E+01	4.31E+01	Yes	0%	No	---	0.0%	No
1C-435	Cf-252	2.1	Dec-69	Aug-91	None	2.60E+00	0.0	Yes	1.62E-02	4.31E+01	4.31E+01	Yes	0%	No	---	0.0%	No
<b>1C-435 Total</b>													0%	No		0.0%	No
1C-441	Co-57	6.9	Jan-66	No Record	None	7.42E-01	0.0	Yes	9.38E-15	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1C-441	Cs-137	1.05	Mar-66	Oct-79	None	3.02E+01	0.4	Yes	8.83E+01	2.80E+04	2.80E+04	Yes	0%	No	6.76E+04	0.0%	No
1C-441	Pm-147	4000000	Jan-66	May-69	None	2.62E+00	53.2	Yes	1.18E+04	3.42E+05	3.42E+05	Yes	0%	No	---	0.0%	No
<b>1C-441 Total</b>													0%	No		0.0%	No
1C-442	C-14	50	Dec-74	Apr-80	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	Aug-75	Apr-80	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	Aug-75	Apr-80	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	200	Jan-76	Mar-77	None	5.73E+03	199.2	Yes	4.42E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	250	Apr-76	Mar-83	None	5.73E+03	249.0	Yes	5.53E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	Mar-77	Feb-81	None	5.73E+03	99.6	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	250	May-77	Oct-79	None	5.73E+03	249.1	Yes	5.53E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	May-78	Jul-78	None	5.73E+03	99.6	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	May-78	Jul-78	None	5.73E+03	99.6	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	May-78	Jul-78	None	5.73E+03	99.6	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	May-78	Jul-78	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	May-78	Jul-78	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	May-78	Jul-78	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	Jul-78	Jul-78	None	5.73E+03	99.6	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	Mar-79	No Record	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	10	Mar-79	No Record	None	5.73E+03	10.0	Yes	2.21E+03	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	1000	Jan-80	No Record	None	5.73E+03	996.6	Yes	2.21E+05	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	1	Feb-80	No Record	None	5.73E+03	1.0	Yes	2.21E+02	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	1	Feb-80	No Record	None	5.73E+03	1.0	Yes	2.21E+02	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	1	Feb-80	No Record	None	5.73E+03	1.0	Yes	2.21E+02	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	1	Feb-80	No Record	None	5.73E+03	1.0	Yes	2.21E+02	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	Sep-82	Dec-82	None	5.73E+03	99.7	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	1000	Sep-82	Dec-82	None	5.73E+03	996.9	Yes	2.21E+05	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	Jan-83	Dec-82	None	5.73E+03	99.7	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	Apr-83	No Record	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	50	May-83	No Record	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	C-14	100	Jul-83	No Record	None	5.73E+03	99.7	Yes	2.21E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-442	H-3	2000	Sep-75	Apr-80	None	1.23E+01	315.6	Yes	7.01E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	2000	Sep-75	Apr-80	None	1.23E+01	315.6	Yes	7.01E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Nov-75	Apr-80	None	1.23E+01	159.3	Yes	3.54E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	May-76	No Record	None	1.23E+01	163.8	Yes	3.64E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Aug-76	No Record	None	1.23E+01	166.2	Yes	3.69E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	250	Mar-77	Oct-80	None	1.23E+01	42.9	Yes	9.53E+03	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	13000	Aug-77	No Record	None	1.23E+01	2285.3	Yes	5.07E+05	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1C-442	H-3	1000	May-78	Jul-78	None	1.23E+01	183.4	Yes	4.07E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	250	Oct-78	No Record	None	1.23E+01	46.9	Yes	1.04E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	250	Oct-78	No Record	None	1.23E+01	46.9	Yes	1.04E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	250	Nov-78	No Record	None	1.23E+01	47.2	Yes	1.05E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	May-79	No Record	None	1.23E+01	194.0	Yes	4.31E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	May-79	No Record	None	1.23E+01	194.0	Yes	4.31E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Jun-79	No Record	None	1.23E+01	194.9	Yes	4.33E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Jan-80	No Record	None	1.23E+01	201.5	Yes	4.47E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Jan-80	No Record	None	1.23E+01	201.5	Yes	4.47E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1	Feb-80	No Record	None	1.23E+01	0.2	Yes	4.49E+01	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Aug-81	No Record	None	1.23E+01	220.3	Yes	4.89E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Aug-81	No Record	None	1.23E+01	220.3	Yes	4.89E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Dec-81	No Record	None	1.23E+01	224.5	Yes	4.98E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	May-82	Dec-82	None	1.23E+01	229.8	Yes	5.10E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Jul-82	No Record	None	1.23E+01	231.9	Yes	5.15E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Aug-82	No Record	None	1.23E+01	233.0	Yes	5.17E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Sep-82	No Record	None	1.23E+01	234.2	Yes	5.20E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Sep-82	Dec-82	None	1.23E+01	234.2	Yes	5.20E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	2000	Nov-82	Dec-82	None	1.23E+01	472.7	Yes	1.05E+05	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Dec-82	Dec-82	None	1.23E+01	237.5	Yes	5.27E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Jan-83	Dec-82	None	1.23E+01	238.6	Yes	5.30E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	250	Jul-83	No Record	None	1.23E+01	61.3	Yes	1.36E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	H-3	1000	Feb-86	No Record	None	1.23E+01	284.0	Yes	6.30E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-442	I-125	50	Mar-84	Jul-84	None	1.65E-01	0.0	Yes	5.21E-41	6.89E+05	6.89E+05	Yes	0%	No	---	0.0%	No
1C-442	P-32	2000	Feb-76	No Record	None	3.92E-02	0.0	Yes	1.25E-243	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	1000	Apr-76	No Record	None	3.92E-02	0.0	Yes	1.15E-242	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	1000	Jul-76	No Record	None	3.92E-02	0.0	Yes	9.45E-241	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	100	Oct-76	Apr-78	None	3.92E-02	0.0	Yes	8.17E-240	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	100	Dec-76	No Record	None	3.92E-02	0.0	Yes	1.57E-238	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	100	Jan-77	Apr-78	None	3.92E-02	0.0	Yes	7.06E-238	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	100	Apr-78	Jul-78	None	3.92E-02	0.0	Yes	2.67E-228	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	100	Jun-78	Jul-79	None	3.92E-02	0.0	Yes	5.14E-227	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	100	Aug-78	Jul-79	None	3.92E-02	0.0	Yes	9.89E-226	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	1000	Nov-79	Nov-79	None	3.92E-02	0.0	Yes	4.13E-215	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	1000	Nov-79	Nov-79	None	3.92E-02	0.0	Yes	4.13E-215	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	1000	Jul-80	No Record	None	3.92E-02	0.0	Yes	5.38E-210	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	1000	Jan-82	Jun-82	None	3.92E-02	0.0	Yes	1.94E-198	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	500	Feb-83	Jan-84	None	3.92E-02	0.0	Yes	2.10E-190	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	500	Aug-83	Jan-84	None	3.92E-02	0.0	Yes	1.36E-186	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	P-32	500	Aug-83	Jan-84	None	3.92E-02	0.0	Yes	1.36E-186	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-442	S-35	1000	Jan-81	No Record	None	2.40E-01	0.0	Yes	7.61E-30	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
1C-442	S-35	2000	Apr-83	Jan-84	None	2.40E-01	0.0	Yes	1.01E-26	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
1C-442	S-35	2000	Apr-83	Jan-84	None	2.40E-01	0.0	Yes	1.01E-26	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
1C-442	S-35	2000	Jul-83	Jan-84	None	2.40E-01	0.0	Yes	2.08E-26	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
1C-442	S-35	500	Aug-83	Jan-84	None	2.40E-01	0.0	Yes	6.66E-27	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
1C-442	S-35	500	Aug-83	Jan-84	None	2.40E-01	0.0	Yes	6.66E-27	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
1C-442	S-35	1000	May-86	No Record	None	2.40E-01	0.0	Yes	3.81E-23	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
<b>1C-442 Total</b>													0%	No		0.0%	No
1C-444	Am-241	375	Jun-71	Aug-91	Foil-Also used in room 1F-101F	4.32E+02	353.4	No	7.85E+04	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1C-444	Am-241	3	Jun-71	No Record	Foil	4.32E+02	2.8	No	6.28E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1C-444	Ba-133	130	Dec-68	Nov-86	Non-Dispersible Source	1.05E+01	9.6	No	2.13E+03	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1C-444	Bi-207	10	Sep-72	Nov-77	None	3.34E+01	4.8	Yes	1.06E+03	Not Listed	1.00E+00	Yes	0%	No	2.66E+04	0.0%	No
1C-444	C-14	0.2	Dec-68	Aug-91	None	5.73E+03	0.2	Yes	4.42E+01	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-444	C-14	0.2	Dec-68	Aug-91	None	5.73E+03	0.2	Yes	4.42E+01	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-444	C-14	0.2	Dec-68	Aug-91	None	5.73E+03	0.2	Yes	4.42E+01	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-444	Co-60	270	Dec-68	May-94	None	5.27E+00	1.5	Yes	3.31E+02	7.04E+03	7.04E+03	Yes	0%	No	1.79E+04	0.0%	No
1C-444	Cs-137	10	Dec-68	Oct-79	None	3.02E+01	4.0	Yes	8.96E+02	2.80E+04	2.80E+04	Yes	0%	No	6.76E+04	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1C-444	Cs-137	139	Jan-69	May-94	Non-Dispersible Source	3.02E+01	56.2	No	1.25E+04	2.80E+04	2.80E+04	Yes	0%	No	6.76E+04	0.0%	No
1C-444	Cs-137	1	Mar-69	Oct-79	None	3.02E+01	0.4	Yes	9.01E+01	2.80E+04	2.80E+04	Yes	0%	No	6.76E+04	0.0%	No
1C-444	Fe-55	250	Apr-74	Jan-79	None	2.70E+00	0.0	Yes	8.57E+00	4.49E+06	4.49E+06	Yes	0%	No	---	0.0%	No
1C-444	Fe-59	2000	Nov-71	No Record	None	1.22E-01	0.0	Yes	3.42E-85	8.83E+04	8.83E+04	Yes	0%	No	---	0.0%	No
1C-444	Ge-68	100	Apr-75	Jun-83	None	7.89E-01	0.0	Yes	4.85E-09	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1C-444	H-3	1	Feb-68	Apr-90	None	1.23E+01	0.1	Yes	2.28E+01	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-444	H-3	34000	Dec-68	No Record	None	1.23E+01	3666.5	Yes	8.14E+05	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-444	H-3	250	Jan-70	Oct-79	None	1.23E+01	28.7	Yes	6.36E+03	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-444	H-3	2	Mar-70	Oct-79	None	1.23E+01	0.2	Yes	5.14E+01	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-444	Hg-203	1000	Oct-73	No Record	None	1.28E-01	0.0	Yes	3.67E-77	3.86E+05	3.86E+05	Yes	0%	No	---	0.0%	No
1C-444	Mn-54	1000	Mar-73	Oct-73	None	8.57E-01	0.0	Yes	8.97E-08	3.15E+04	3.15E+04	Yes	0%	No	---	0.0%	No
1C-444	Ni-63	2000	Feb-69	Apr-90	None	1.00E+02	1523.0	Yes	3.38E+05	1.81E+06	1.81E+06	Yes	0%	No	8.62E+07	0.0%	No
1C-444	Ni-63	2000	Feb-69	Apr-90	None	1.00E+02	1523.0	Yes	3.38E+05	1.81E+06	1.81E+06	Yes	0%	No	8.62E+07	0.0%	No
1C-444	Po-210	50	Jul-72	No Record	Also used in room 1G-018F	3.79E-01	0.0	Yes	3.80E-25	2.50E+03	2.50E+03	Yes	0%	No	---	0.0%	No
1C-444	Po-210	50	Jul-72	No Record	None	3.79E-01	0.0	Yes	3.80E-25	2.50E+03	2.50E+03	Yes	0%	No	---	0.0%	No
1C-444	Pu-238	1000	Mar-74	No Record	Also used in room 1G-018F	8.78E+01	763.3	Yes	1.69E+05	3.05E+01	3.05E+01	Yes	0%	No	4.72E+04	0.0%	No
1C-444	Pu-239	0.0003	May-70	No Record	X-fer to Jack Riley-Also used in room 1F101A	2.41E+04	0.0	Yes	6.65E-02	2.77E+01	2.77E+01	Yes	0%	No	---	0.0%	No
1C-444	Pu-239	0.003	May-70	No Record	X-fer to Jack Riley-Also used in room 1F101A	2.41E+04	0.0	Yes	6.65E-01	2.77E+01	2.77E+01	Yes	0%	No	---	0.0%	No
1C-444	Pu-239	0.0003	May-70	No Record	X-fer to Jack Riley-Also used in room 1F101A	2.41E+04	0.0	Yes	6.65E-02	2.77E+01	2.77E+01	Yes	0%	No	---	0.0%	No
1C-444	S-35	1000	Aug-73	Nov-77	None	2.40E-01	0.0	Yes	3.56E-39	1.27E+07	1.27E+07	Yes	0%	No	---	0.0%	No
1C-444	Sm-151	500000	Feb-71	Sep-80	None	9.00E+01	375007.8	Yes	8.33E+07	3.98E+05	3.98E+05	Yes	0%	No	1.25E+08	0.0%	No
1C-444	Sr-90	104000	Dec-68	Dec-87	None	2.86E+01	39907.9	Yes	8.86E+06	8.68E+03	8.68E+03	Yes	0%	No	---	0.0%	No
1C-444	Sr-90	67000	Dec-68	Dec-87	None	2.86E+01	25709.9	Yes	5.71E+06	8.68E+03	8.68E+03	Yes	0%	No	---	0.0%	No
1C-444	Sr-90	100	Jul-69	Aug-89	None	2.86E+01	38.9	Yes	8.64E+03	8.68E+03	8.68E+03	Yes	0%	No	---	0.0%	No
1C-444	Te-129m	250	Dec-68	Nov-77	None	9.21E-02	0.0	Yes	3.22E-125	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1C-444	Th-232	0.025	Feb-71	Apr-90	Thorium Nitrate .25lb	1.40E+10	0.0	Yes	5.55E+00	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1C-444	U-238	100	Dec-68	No Record	Also used in room 1G-018F	4.46E+09	100.0	Yes	2.22E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1C-444	U-238	3	Mar-78	Oct-79	Uranium Chloride Powder	4.46E+09	3.0	Yes	6.66E+02	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1C-444 Total</b>													0%	No		0.0%	No
1C-445	As-73	1000	Oct-74	No Record	None	2.20E-01	0.0	Yes	1.80E-41	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1C-445	As-73	700	Sep-79	Feb-81	None	2.20E-01	0.0	Yes	6.80E-35	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1C-445	Co-57	25000	Mar-70	Jun-78	None	7.42E-01	0.0	Yes	1.66E-09	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1C-445	Co-57	60000	Dec-70	No Record	None	7.42E-01	0.0	Yes	8.06E-09	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1C-445	W-181	100	Jun-77	Jul-78	None	3.32E-01	0.0	Yes	1.52E-24	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
<b>1C-445 Total</b>													0%	No		0.0%	No
1C-447	C-14	50	Mar-77	Apr-80	None	5.73E+03	49.8	Yes	1.11E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
1C-447	H-3	1000	Mar-77	Oct-79	None	1.23E+01	171.7	Yes	3.81E+04	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
1C-447	P-32	500	Sep-77	Oct-79	None	3.92E-02	0.0	Yes	4.60E-232	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
1C-447	P-32	500	Sep-77	Oct-79	None	3.92E-02	0.0	Yes	4.60E-232	9.51E+06	9.51E+06	Yes	0%	No	---	0.0%	No
<b>1C-447 Total</b>													0%	No		0.0%	No
1C-456	Am-241	10	Jan-69	No Record	Also used in room 1F-101A	4.32E+02	9.4	Yes	2.08E+03	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1C-456	Pa-231	0.005	Dec-71	No Record	Cal Source-X-fer to J.Riley-Also used in room 1F-101A	3.28E+04	0.0	No	1.11E+00	8.56E+00	8.56E+00	Yes	0%	No	---	0.0%	No
1C-456	Ra-226	5	Dec-68	Mar-94	Also used in room 1F-101A	1.60E+03	4.9	Yes	1.09E+03	1.12E+03	1.12E+03	Yes	0%	No	---	0.0%	No
1C-456	U-238	0.012	Feb-69	May-89	Alpha Calibration-Also used in room 1F-101A	4.46E+09	0.0	No	2.66E+00	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1C-456 Total</b>													0%	No		0.0%	No
1D-205	C-14	200	Jun-95	No Record	None	5.73E+03	199.7	Yes	4.43E+04	3.68E+06	3.68E+06	Yes	0%	No	---	0.0%	No
<b>1D-205 Total</b>													0%	No		0.0%	No
1D-206	H-3	30000	Sep-71	Sep-78	None	1.23E+01	3777.6	Yes	8.39E+05	1.24E+08	1.24E+08	No	1%	No	3.13E+08	0.0%	No
1D-206	H-3	450000	Jan-72	Sep-78	None	1.23E+01	57741.5	Yes	1.28E+07	1.24E+08	1.24E+08	No	10%	No	3.13E+08	0.0%	No
1D-206	H-3	30000	Sep-72	Sep-78	None	1.23E+01	3997.2	Yes	8.87E+05	1.24E+08	1.24E+08	No	1%	No	3.13E+08	0.0%	No
<b>1D-206 Total</b>													12%	No		0.0%	No
1D-208	Co-58	11	May-77	Feb-81	None	1.94E-01	0.0	Yes	1.55E-45	6.78E+04	6.78E+04	No	0%	No	---	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1D-208	Co-60	3.5	May-77	No Record	None	5.27E+00	0.1	Yes	1.30E+01	7.04E+03	7.04E+03	No	0%	No	1.79E+04	0.0%	No
1D-208	Co-60	4	May-77	No Record	None	5.27E+00	0.1	Yes	1.49E+01	7.04E+03	7.04E+03	No	0%	No	1.79E+04	0.0%	No
1D-208	Mn-54	64	May-77	Feb-81	None	8.57E-01	0.0	Yes	1.68E-07	3.15E+04	3.15E+04	No	0%	No	---	0.0%	No
1D-208	Mn-54	1000	May-77	No Record	None	8.57E-01	0.0	Yes	2.62E-06	3.15E+04	3.15E+04	No	0%	No	---	0.0%	No
1D-208	Th-232	10	Jul-77	No Record	None	1.40E+10	10.0	Yes	2.22E+03	7.29E+00	7.29E+00	No	30458%	Yes	1.92E+03	115.4%	Yes
1D-208	Tm-170	10	Oct-76	Sep-80	None	3.52E-01	0.0	Yes	1.89E-24	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1D-208	U-235	57	Mar-80	No Record	None	7.04E+08	57.0	Yes	1.27E+04	9.73E+01	9.73E+01	No	13008%	Yes	5.21E+03	243.0%	Yes
1D-208 Total													43467%	Yes		358.4%	Yes
1D-255	U-238	330	Jun-77	Oct-79	Uranium Tetrachloride	4.46E+09	330.0	Yes	7.33E+04	1.01E+02	1.01E+02	No	72674%	Yes	5.21E+03	1406.6%	Yes
1D-255	U-238	17	Aug-77	Oct-79	Uranium Tetrachloride	4.46E+09	17.0	Yes	3.77E+03	1.01E+02	1.01E+02	No	3744%	Yes	5.21E+03	72.5%	No
1D-255 Total													76418%	Yes		1479.1%	Yes
1D-321	Co-58	100000	May-77	Jun-79	None	1.94E-01	0.0	Yes	1.40E-41	6.78E+04	6.78E+04	No	0%	No	---	0.0%	No
1D-321	Co-58	46000	Jul-77	Oct-79	None	1.94E-01	0.0	Yes	1.17E-41	6.78E+04	6.78E+04	No	0%	No	---	0.0%	No
1D-321	Co-58	200000	Apr-78	Oct-79	None	1.94E-01	0.0	Yes	7.43E-40	6.78E+04	6.78E+04	No	0%	No	---	0.0%	No
1D-321	Co-58	125000	Feb-79	Oct-79	None	1.94E-01	0.0	Yes	9.25E-39	6.78E+04	6.78E+04	No	0%	No	---	0.0%	No
1D-321	Ge-68	17.7	Jun-76	No Record	None	7.89E-01	0.0	Yes	2.40E-09	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1D-321	Ge-68	17.7	Jun-76	No Record	None	7.89E-01	0.0	Yes	2.40E-09	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1D-321	Ge-68	17.7	Jun-76	No Record	None	7.89E-01	0.0	Yes	2.40E-09	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1D-321 Total													0%	No		0.0%	No
1A-340	U-238	16.7	Nov-78	No record	Uranyl Acetate	4.46E+09	16.7	Yes	3.71E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1A-340 Total													0%	No		0.0%	No
1D-364	Th-232	0.11	Feb-85	No Record	Metal	1.40E+10	0.1	No	2.44E+01	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
1D-364	U-238	75	Oct-84	No Record	1"x2"x.2"sheet	4.46E+09	75.0	No	1.66E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1D-364	U-238	1.7	Jun-86	No Record	None	4.46E+09	1.7	Yes	3.77E+02	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1D-364	U-238	17	Jul-86	No Record	Metal Rod	4.46E+09	17.0	No	3.77E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1D-364 Total													0%	No		0.0%	No
1D-408	Th-232	5.5	Oct-87	No Record	None	1.40E+10	5.5	Yes	1.22E+03	7.29E+00	7.29E+00	No	16752%	Yes	1.92E+03	63.5%	No
1D-408	Th-232	27.25	Oct-87	No Record	None	1.40E+10	27.2	Yes	6.05E+03	7.29E+00	7.29E+00	No	82999%	Yes	1.92E+03	314.6%	Yes
1D-408 Total													99751%	Yes		378.1%	Yes
1D-414	Th-232	10	Mar-79	No Record	Thorium Chloride Powder	1.40E+10	10.0	Yes	2.22E+03	7.29E+00	7.29E+00	No	30458%	Yes	1.92E+03	115.4%	Yes
1D-414	Th-232	100	Apr-79	No Record	Thorium Chloride Powder	1.40E+10	100.0	Yes	2.22E+04	7.29E+00	7.29E+00	No	304584%	Yes	1.92E+03	1154.4%	Yes
1D-414	Th-232	640	Jun-80	No Record	Oxide Powder	1.40E+10	640.0	Yes	1.42E+05	7.29E+00	7.29E+00	No	1949338%	Yes	1.92E+03	7388.2%	Yes
1D-414	Th-232	600	Jul-80	Sep-82	Oxide Powder	1.40E+10	600.0	Yes	1.33E+05	7.29E+00	7.29E+00	No	1827504%	Yes	1.92E+03	6926.4%	Yes
1D-414	Th-232	30	Sep-80	Sep-82	Oxide Powder	1.40E+10	30.0	Yes	6.66E+03	7.29E+00	7.29E+00	No	91375%	Yes	1.92E+03	346.3%	Yes
1D-414	Th-232	30	Sep-80	Sep-82	Oxide Powder	1.40E+10	30.0	Yes	6.66E+03	7.29E+00	7.29E+00	No	91375%	Yes	1.92E+03	346.3%	Yes
1D-414	Th-232	30	Sep-80	Sep-82	Oxide Powder	1.40E+10	30.0	Yes	6.66E+03	7.29E+00	7.29E+00	No	91375%	Yes	1.92E+03	346.3%	Yes
1D-414	Th-232	30	Mar-82	Sep-82	Oxide Powder	1.40E+10	30.0	Yes	6.66E+03	7.29E+00	7.29E+00	No	16752%	Yes	1.92E+03	63.5%	No
1D-414	Th-232	5.5	No Record	Thorium Chloride Powder	1.40E+10	5.5	Yes	1.22E+03	7.29E+00	7.29E+00	No	16752%	Yes	1.92E+03	63.5%	No	
1D-414 Total													4402762%	Yes		16686.9%	Yes
1D-429	Am-241	1.2	Jan-69	Oct-78	Foil	4.32E+02	1.1	No	2.50E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1D-429	Am-241	1	Jul-70	Jun-78	None	4.32E+02	0.9	Yes	2.09E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1D-429	U-238	35	Jul-69	Jul-78	Natural Uranium	4.46E+09	35.0	Yes	7.77E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1D-429 Total													0%	No		0.0%	No
1D-447	Cf-252	1	Jan-69	Jul-97	Also used in room 1G-018F	2.60E+00	0.0	Yes	6.04E-03	4.31E+01	4.31E+01	Yes	0%	No	---	0.0%	No
1D-447 Total													0%	No		0.0%	No
1D-448	Co-57	2000	Jan-69	Apr-92	None	7.42E-01	0.0	Yes	4.49E-11	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
1D-448	Eu-149	16000	Feb-70	Jan-84	None	2.47E-01	0.0	Yes	6.06E-41	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1D-448	Mn-54	7	Jan-69	No Record	None	8.57E-01	0.0	Yes	2.16E-11	3.15E+04	3.15E+04	Yes	0%	No	---	0.0%	No
1D-448	Sm-151	16000	Mar-70	Jan-84	None	9.00E+01	11915.2	Yes	2.65E+06	3.98E+05	3.98E+05	Yes	0%	No	1.25E+08	0.0%	No
1D-448 Total													0%	No		0.0%	No
1D-522	Fe-55	20	Sep-68	Jan-81	None	2.70E+00	0.0	Yes	1.63E-01	4.49E+06	4.49E+06	No	0%	No	---	0.0%	No
1D-522	Th-232	25	Sep-69	No record	None	1.40E+10	25.0	Yes	5.55E+03	7.29E+00	7.29E+00	No	76146%	Yes	1.92E+03	288.6%	Yes
1D-522 Total													76146%	Yes		288.6%	Yes
1E-256	Am-241	0.1	Aug-69	Aug-91	Also used in rooms 1E-463 and 2C-444	4.32E+02	0.1	Yes	2.09E+01	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-256	Am-241	50	Mar-72	Aug-91	Also used in room 1E-458	4.32E+02	47.2	Yes	1.05E+04	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-256 Total													0%	No		0.0%	No
1E-307	Th-232	2.39	Sep-86	No Record	None	1.40E+10	2.4	Yes	5.31E+02	7.29E+00	7.29E+00	No	7280%	Yes	1.92E+03	27.6%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
<b>1E-307 Total</b>													7280%	Yes		27.6%	No
1E-310	Na-22	1000	May-74	Mar-95	None	2.60E+00	0.1	Yes	2.50E+01	9.54E+03	9.54E+03	No	0%	No	2.08E+04	0.0%	No
<b>1E-310 Total</b>													0%	No		0.0%	No
1E-341	U-238	15.3	Jun-89	No Record	Tubes	4.46E+09	15.3	No	3.40E+03	1.01E+02	1.01E+02	No	0%	No	5.21E+03	0.0%	No
1E-341	U-238	17.6	Jul-90	No Record	Metal	4.46E+09	17.6	No	3.91E+03	1.01E+02	1.01E+02	No	0%	No	5.21E+03	0.0%	No
<b>1E-341 Total</b>													0%	No		0.0%	No
1E-341 Total								No	0.00E+00	#N/A	#N/A	No	0%	No	#N/A	0.0%	No
<b>E-341 Total Total</b>													0%	No		0.0%	No
1E-352	U-238	33.45	Dec-73	No Record	Natural Uranium	4.46E+09	33.4	Yes	7.43E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1E-352 Total</b>													0%	No		0.0%	No
1E-361	Pm-147	600	Aug-74	Oct-80	None	2.62E+00	0.1	Yes	1.72E+01	3.42E+05	3.42E+05	No	0%	No	---	0.0%	No
<b>1E-361 Total</b>													0%	No		0.0%	No
1E-402	W-181	20000	May-79	No Record	None	3.32E-01	0.0	Yes	1.67E-20	1.07E+06	1.07E+06	Yes	0%	No	---	0.0%	No
<b>1E-402 Total</b>													0%	No		0.0%	No
1E-406	Eu-152	5000	May-70	No Record	None	1.36E+01	717.0	Yes	1.59E+05	1.27E+04	1.27E+04	No	1254%	Yes	3.57E+04	445.7%	Yes
1E-406	Sm-151	5000	Oct-67	Jan-84	None	9.00E+01	3654.9	Yes	8.11E+05	3.98E+05	3.98E+05	No	204%	Yes	1.25E+08	0.6%	No
1E-406	Sm-151	2200	Aug-67	Aug-67	None	9.00E+01	1606.1	Yes	3.57E+05	3.98E+05	3.98E+05	No	90%	No	1.25E+08	0.0%	No
1E-406	Sn-119m	2200	Aug-67	Aug-67	None	8.03E-01	0.0	Yes	2.33E-10	1.28E+06	1.28E+06	No	0%	No	---	0.0%	No
<b>1E-406 Total</b>													1548%	Yes		446.3%	Yes
1E-424	Zn-65	4.6	Dec-71	No Record	None	6.70E-01	0.0	Yes	3.89E-14	4.81E+04	4.81E+04	No	0%	No	---	0.0%	No
<b>1E-424 Total</b>													0%	No		0.0%	No
1E-426	Ba-133	1000	Apr-70	Mar-83	Non-Dispersible Source	1.05E+01	80.6	No	1.79E+04	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1E-426	Bi-207	50	Nov-70	No Record	None	3.34E+01	22.9	Yes	5.09E+03	Not Listed	1.00E+00	No	508644%	Yes	2.66E+04	19.1%	No
1E-426	Fe-55	5000	Nov-75	Jun-87	None	2.70E+00	1.2	Yes	2.57E+02	4.49E+06	4.49E+06	No	0%	No	---	0.0%	No
1E-426	Lu-177m	3	Dec-76	No Record	None	4.39E-01	0.0	Yes	1.57E-19	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
<b>1E-426 Total</b>													508644%	Yes		19.1%	No
1E-430	Co-57	60000	Jan-74	Jun-83	None	7.42E-01	0.0	Yes	1.44E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
<b>1E-430 Total</b>													0%	No		0.0%	No
1E-432	Lu-177m	5	Feb-77	No record	None	4.39E-01	0.0	Yes	3.41E-19	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
<b>1E-432 Total</b>													0%	No		0.0%	No
1E-434	Po-210	2000	Jan-73	No Record	Isotopic X-ray generator	3.79E-01	0.0	No	3.32E-23	2.50E+03	2.50E+03	No	0%	No	---	0.0%	No
<b>1E-434 Total</b>													0%	No		0.0%	No
1E-455	Am-241	50	Oct-68	Nov-77	None	4.32E+02	46.9	Yes	1.04E+04	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-455	Am-241	1	Oct-68	No Record	Also used in room 1E-463 and 1F-101A	4.32E+02	0.9	Yes	2.08E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-455	Am-241	1	Oct-68	Aug-91	Also used in room 1E-463 and 1F-101A (Foil)	4.32E+02	0.9	No	2.08E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
<b>1E-455 Total</b>													0%	No		0.0%	No
1E-456	Am-241	0.1	Mar-71	Aug-91	Also used in room 1F-101A	4.32E+02	0.1	Yes	2.09E+01	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
<b>1E-456 Total</b>													0%	No		0.0%	No
1E-457	Am-241	0.0743	Aug-69	No Record	None	4.32E+02	0.1	Yes	1.55E+01	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
<b>1E-457 Total</b>													0%	No		0.0%	No
1E-458	Am-241	50	Mar-72	Aug-91	Also used in room 1E-256	4.32E+02	47.2	Yes	1.05E+04	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-458	Ba-133	1	Jun-69	Mar-94	Non-Dispersible Source	1.05E+01	0.1	No	1.69E+01	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
<b>1E-458 Total</b>													0%	No		0.0%	No
1E-463	Am-241	1	Oct-68	No Record	Also used in room 1E-455 and 1F-101A	4.32E+02	0.9	Yes	2.08E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-463	Am-241	1	Oct-68	Aug-91	Also used in room 1E-455 and 1F-101A (Foil)	4.32E+02	0.9	Yes	2.08E+02	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-463	Am-241	0.1	Aug-69	Aug-91	Also used in rooms 1E-256 and 2C-444	4.32E+02	0.1	Yes	2.09E+01	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
1E-463	Ge-68	180	Feb-75	No Record	None	7.89E-01	0.0	Yes	7.57E-09	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1E-463	Ge-68	180	Feb-75	No Record	None	7.89E-01	0.0	Yes	7.57E-09	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
1E-463	H-3	2000000	Apr-70	No Record	Ti Metal Disk	1.23E+01	232483.4	Yes	5.16E+07	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
<b>1E-463 Total</b>													0%	No		0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1F-101A	Am-241	1	Oct-68	No Record	Also used in room 1E-463 and 1E-455	4.32E+02	0.9	Yes	2.08E+02	2.69E+01	2.69E+01	No	776%	Yes	5.00E+04	0.4%	No
1F-101A	Am-241	1	Oct-68	Aug-91	Also used in room 1E-463 and 1E-455 (Foil)	4.32E+02	0.9	No	2.08E+02	2.69E+01	2.69E+01	No	0%	No	5.00E+04	0.0%	No
1F-101A	Am-241	10	Jan-69	No Record	Also used in room 1C-456	4.32E+02	9.4	Yes	2.08E+03	2.69E+01	2.69E+01	No	7761%	Yes	5.00E+04	4.2%	No
1F-101A	Am-241	0.1	Mar-71	Aug-91	Also used in room 1E-456	4.32E+02	0.1	Yes	2.09E+01	2.69E+01	2.69E+01	No	78%	No	5.00E+04	0.0%	No
1F-101A	C-14	1000	Jul-97	No Record	None	5.73E+03	998.7	Yes	2.22E+05	3.68E+06	3.68E+06	No	6%	No	---	0.0%	No
1F-101A	Cf-252	2.1	Dec-69	No Record	Also used in room 1C-435	2.60E+00	0.0	Yes	1.62E-02	4.31E+01	4.31E+01	No	0%	No	---	0.0%	No
1F-101A	Co-60	0.02	Dec-68	Mar-94	None	5.27E+00	0.0	Yes	2.45E-02	7.04E+03	7.04E+03	No	0%	No	1.79E+04	0.0%	No
1F-101A	Co-60	0.1	Dec-68	Aug-91	None	5.27E+00	0.0	Yes	1.23E-01	7.04E+03	7.04E+03	No	0%	No	1.79E+04	0.0%	No
1F-101A	Co-60	5	Dec-90	No Record	None	5.27E+00	0.5	Yes	1.11E+02	7.04E+03	7.04E+03	No	2%	No	1.79E+04	0.0%	No
1F-101A	Cs-137	0.2	Dec-68	Aug-91	None	3.02E+01	0.1	Yes	1.79E+01	2.80E+04	2.80E+04	No	0%	No	6.76E+04	0.0%	No
1F-101A	H-3	1000	Jul-97	No Record	None	1.23E+01	540.4	Yes	1.20E+05	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
1F-101A	Kr-85	104000	Dec-68	No Record	None	1.07E+01	8077.0	No	1.79E+06	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1F-101A	Pa-231	0.005	Dec-71	No Record	None	3.28E+04	0.0	Yes	1.11E+00	8.56E+00	8.56E+00	No	13%	No	---	0.0%	No
1F-101A	Pa-231	0.005	Dec-71	No Record	Cal Source-X-fer to J.Riley-Also used in room 1c-456	3.28E+04	0.0	No	1.11E+00	8.56E+00	8.56E+00	No	0%	No	---	0.0%	No
1F-101A	Pu-239	0.0003	May-70	No Record	X-fer to Jack Riley-Also used in room 1C-444	2.41E+04	0.0	Yes	6.65E-02	2.77E+01	2.77E+01	No	0%	No	---	0.0%	No
1F-101A	Pu-239	0.003	May-70	No Record	X-fer to Jack Riley-Also used in room 1C-444	2.41E+04	0.0	Yes	6.65E-01	2.77E+01	2.77E+01	No	2%	No	---	0.0%	No
1F-101A	Pu-239	0.0003	May-70	No Record	X-fer to Jack Riley-Also used in room 1C-444	2.41E+04	0.0	Yes	6.65E-02	2.77E+01	2.77E+01	No	0%	No	---	0.0%	No
1F-101A	Ra-226	5	Dec-68	Mar-94	Also used in room 1C-456	1.60E+03	4.9	Yes	1.09E+03	1.12E+03	1.12E+03	No	98%	No	---	0.0%	No
1F-101A	Ra-226	1	Nov-81	No Record	5 ml solution in glass ampoule	1.60E+03	1.0	Yes	2.19E+02	1.12E+03	1.12E+03	No	20%	No	---	0.0%	No
1F-101A	U-238	0.012	Feb-69	May-89	Alpha Calibration-Also used in room 1C-456	4.46E+09	0.0	No	2.66E+00	1.01E+02	1.01E+02	No	0%	No	5.21E+03	0.0%	No
1F-101A	U-238	4	Aug-88	No Record	None	4.46E+09	4.0	Yes	8.88E+02	1.01E+02	1.01E+02	No	881%	Yes	5.21E+03	17.0%	No
<b>1F-101A Total</b>													9637%	Yes		21.6%	No
1F-101F	Ag-110m	3000	Aug-81	No Record	None	6.85E-01	0.0	Yes	1.05E-06	1.02E+04	1.02E+04	No	0%	No	---	0.0%	No
1F-101F	Ag-110m	3000	Aug-81	No Record	None	6.85E-01	0.0	Yes	1.05E-06	1.02E+04	1.02E+04	No	0%	No	---	0.0%	No
1F-101F	Ag-110m	3000	Aug-81	No Record	None	6.85E-01	0.0	Yes	1.05E-06	1.02E+04	1.02E+04	No	0%	No	---	0.0%	No
1F-101F	Ag-110m	3000	Aug-81	No Record	None	6.85E-01	0.0	Yes	1.05E-06	1.02E+04	1.02E+04	No	0%	No	---	0.0%	No
1F-101F	Am-241	375	Jun-71	Aug-91	Foil-Also used in room 1C-444	4.32E+02	353.4		7.85E+04	2.69E+01	2.69E+01	No	0%	No	5.00E+04	0.0%	No
1F-101F	Am-241	1	Nov-71	No Record	Disc source-Also used in room 1A-132	4.32E+02	0.9	No	2.09E+02	2.69E+01	2.69E+01	No	0%	No	5.00E+04	0.0%	No
1F-101F	C-14	4000	Jan-79	No Record	None	5.73E+03	3985.8	Yes	8.85E+05	3.68E+06	3.68E+06	No	24%	No	---	0.0%	No
1F-101F	C-14	1000	Jul-83	No Record	None	5.73E+03	997.0	Yes	2.21E+05	3.68E+06	3.68E+06	No	6%	No	---	0.0%	No
1F-101F	C-14	50	Aug-88	No Record	None	5.73E+03	49.9	Yes	1.11E+04	3.68E+06	3.68E+06	No	0%	No	---	0.0%	No
1F-101F	Cd-109	10000	Sep-71	Jan-87	None	1.27E+00	0.0	Yes	4.36E-03	1.14E+05	1.14E+05	No	0%	No	---	0.0%	No
1F-101F	Cl-36	1000	Apr-77	Jul-77	None	3.01E+05	999.9	Yes	2.22E+05	4.97E+05	4.97E+05	No	45%	No	---	0.0%	No
1F-101F	Co-57	1	Jul-69	Oct-84	None	7.42E-01	0.0	Yes	3.57E-14	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1F-101F	Co-57	10000	Mar-70	Nov-87	None	7.42E-01	0.0	Yes	6.65E-10	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1F-101F	Co-57	21000	Aug-72	Jun-83	None	7.42E-01	0.0	Yes	1.34E-08	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1F-101F	Co-57	25000	Apr-76	Jun-83	None	7.42E-01	0.0	Yes	4.91E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1F-101F	Cr-51	2000	Jun-75	Sep-77	None	7.59E-02	0.0	Yes	4.70E-126	5.19E+06	5.19E+06	No	0%	No	---	0.0%	No
1F-101F	Fe-59	100	Sep-99	No Record	None	1.22E-01	0.0	Yes	6.35E-18	8.83E+04	8.83E+04	No	0%	No	---	0.0%	No
1F-101F	H-3	1000	Jun-81	No Record	None	1.23E+01	218.2	Yes	4.84E+04	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
1F-101F	H-3	1000	Jan-82	Dec-82	None	1.23E+01	225.5	Yes	5.01E+04	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
1F-101F	H-3	1000	Feb-82	Dec-82	None	1.23E+01	226.6	Yes	5.03E+04	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
1F-101F	H-3	2000	Apr-82	Dec-82	None	1.23E+01	457.4	Yes	1.02E+05	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
1F-101F	H-3	9	Sep-88	No Record	None	1.23E+01	3.0	Yes	6.56E+02	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
1F-101F	I-125	100	Oct-73	Oct-84	None	1.65E-01	0.0	Yes	9.48E-60	6.89E+05	6.89E+05	No	0%	No	---	0.0%	No
1F-101F	I-125	375	Jun-86	No Record	None	1.65E-01	0.0	Yes	5.09E-36	6.89E+05	6.89E+05	No	0%	No	---	0.0%	No
1F-101F	Na-22	100	May-79	No Record	None	2.60E+00	0.0	Yes	9.48E+00	9.54E+03	9.54E+03	No	0%	No	2.08E+04	0.0%	No
1F-101F	Na-22	1000	Aug-79	No Record	None	2.60E+00	0.5	Yes	1.01E+02	9.54E+03	9.54E+03	No	1%	No	2.08E+04	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1G-018/1G-018F	As-73	10000	Jul-75	No Record	None	2.20E-01	0.0	Yes	1.90E-39	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	As-73	100	Feb-77	No Record	None	2.20E-01	0.0	Yes	2.86E-39	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	As-73	22100	Aug-79	Feb-81	None	2.20E-01	0.0	Yes	1.64E-33	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	As-73	103000	Aug-80	No Record	None	2.20E-01	0.0	Yes	1.80E-31	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	As-73	20000	Jun-81	No Record	None	2.20E-01	0.0	Yes	4.83E-31	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Be-7	1000	Apr-77	No Record	None	1.45E-01	0.0	Yes	6.61E-60	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Be-7	5	Mar-92	No Record	None	1.45E-01	0.0	Yes	2.54E-31	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Be-7	14	Apr-92	No Record	None	1.45E-01	0.0	Yes	1.07E-30	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Be-7	2	Jul-92	No Record	None	1.45E-01	0.0	Yes	4.99E-31	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Be-7	5	Jul-92	No Record	None	1.45E-01	0.0	Yes	1.25E-30	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	C-14	1000	Oct-83	No Record	None	5.73E+03	997.0	Yes	2.21E+05	3.68E+06	3.68E+06	No	6%	No	---	0.0%	No
1G-018/1G-018F	Ca-45	1000	Feb-72	Aug-91	None	4.46E-01	0.0	Yes	6.28E-20	2.80E+06	2.80E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cd-109	1000	May-73	May-94	None	1.27E+00	0.0	Yes	1.08E-03	1.14E+05	1.14E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cd-109	750	May-80	No Record	None	1.27E+00	0.0	Yes	3.69E-02	1.14E+05	1.14E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cd-109	500	Jan-89	No Record	None	1.27E+00	0.0	Yes	2.79E+00	1.14E+05	1.14E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cf-252	1	Jan-69	Jul-97	Also used in room 1D-447	2.60E+00	0.0	Yes	6.04E-03	4.31E+01	4.31E+01	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cl-36	26	Jan-66	Oct-78	5 vials at 5.2 each	3.01E+05	26.0	Yes	5.77E+03	4.97E+05	4.97E+05	No	1%	No	---	0.0%	No
1G-018/1G-018F	Cl-36	500	Feb-77	No Record	None	3.01E+05	500.0	Yes	1.11E+05	4.97E+05	4.97E+05	No	22%	No	---	0.0%	No
1G-018/1G-018F	Cl-36	1000	Apr-77	Apr-78	None	3.01E+05	999.9	Yes	2.22E+05	4.97E+05	4.97E+05	No	45%	No	---	0.0%	No
1G-018/1G-018F	Cl-36	1000	Mar-78	Jun-82	None	3.01E+05	999.9	Yes	2.22E+05	4.97E+05	4.97E+05	No	45%	No	---	0.0%	No
1G-018/1G-018F	Co-57	10	Oct-73	Oct-84	None	7.42E-01	0.0	Yes	1.90E-11	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-57	10000	Mar-76	No Record	None	7.42E-01	0.0	Yes	1.81E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-57	10000	Apr-76	Jan-84	None	7.42E-01	0.0	Yes	1.96E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-57	10000	Apr-76	Jan-84	None	7.42E-01	0.0	Yes	1.96E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-57	5000	Apr-77	No Record	None	7.42E-01	0.0	Yes	2.50E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-57	10000	Jun-77	Jul-77	None	7.42E-01	0.0	Yes	5.84E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-57	10000	Jun-77	Jul-77	None	7.42E-01	0.0	Yes	5.84E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-57	10000	Dec-77	Jan-84	None	7.42E-01	0.0	Yes	9.32E-07	2.12E+05	2.12E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Co-60	270	Dec-68	May-94	None	5.27E+00	1.5	Yes	3.31E+02	7.04E+03	7.04E+03	No	5%	No	1.79E+04	0.0%	No
1G-018/1G-018F	Co-60	1000	Mar-71	Feb-93	None	5.27E+00	7.4	Yes	1.65E+03	7.04E+03	7.04E+03	No	23%	No	1.79E+04	0.0%	No
1G-018/1G-018F	Co-60	1000	Feb-72	No Record	None	5.27E+00	8.4	Yes	1.86E+03	7.04E+03	7.04E+03	No	26%	No	1.79E+04	0.0%	No
1G-018/1G-018F	Co-60	1000	Dec-74	Jul-97	None	5.27E+00	12.2	Yes	2.70E+03	7.04E+03	7.04E+03	No	38%	No	1.79E+04	0.0%	No
1G-018/1G-018F	Co-60	2000	Jan-75	No Record	None	5.27E+00	24.6	Yes	5.47E+03	7.04E+03	7.04E+03	No	78%	No	1.79E+04	0.0%	No
1G-018/1G-018F	Co-60	2000	Feb-83	Apr-91	None	5.27E+00	71.4	Yes	1.58E+04	7.04E+03	7.04E+03	No	225%	Yes	1.79E+04	88.7%	No
1G-018/1G-018F	Co-60	5	Mar-89	May-90	None	5.27E+00	0.4	Yes	8.81E+01	7.04E+03	7.04E+03	No	1%	No	1.79E+04	0.0%	No
1G-018/1G-018F	Cr-51	2000	Jun-75	Sep-78	None	7.59E-02	0.0	Yes	4.70E-126	5.19E+06	5.19E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cr-51	10000	Jun-76	Dec-85	None	7.59E-02	0.0	Yes	2.23E-121	5.19E+06	5.19E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cr-51	10000	Jul-76	No Record	None	7.59E-02	0.0	Yes	4.73E-121	5.19E+06	5.19E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cr-51	10000	Mar-77	No Record	None	7.59E-02	0.0	Yes	2.07E-118	5.19E+06	5.19E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cr-51	10000	Mar-77	No Record	None	7.59E-02	0.0	Yes	2.07E-118	5.19E+06	5.19E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Cs-137	2000	Apr-74	Oct-75	None	3.02E+01	912.6	Yes	2.03E+05	2.80E+04	2.80E+04	No	724%	Yes	6.76E+04	299.8%	Yes
1G-018/1G-018F	Cs-137	50000	Jul-74	Apr-86	None	3.02E+01	22945.1	Yes	5.09E+06	2.80E+04	2.80E+04	No	18195%	Yes	6.76E+04	7538.8%	Yes
1G-018/1G-018F	Eu-154	1000	Sep-72	Dec-85	None	8.80E+00	59.8	Yes	1.33E+04	1.15E+04	1.15E+04	No	116%	Yes	3.38E+04	39.3%	No
1G-018/1G-018F	Fe-55	1	May-71	Oct-85	None	2.70E+00	0.0	Yes	1.62E-02	4.49E+06	4.49E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-55	1000	Jul-79	No Record	None	2.70E+00	0.6	Yes	1.32E+02	4.49E+06	4.49E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-55	1000	Sep-96	No Record	None	2.70E+00	49.0	Yes	1.09E+04	4.49E+06	4.49E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-59	23000	Jul-75	Sep-77	None	1.22E-01	0.0	Yes	4.16E-75	8.83E+04	8.83E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-59	5000	Jun-76	Jun-89	None	1.22E-01	0.0	Yes	1.67E-73	8.83E+04	8.83E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-59	5000	Jul-76	Sep-77	None	1.22E-01	0.0	Yes	2.66E-73	8.83E+04	8.83E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-59	2000	Mar-77	No Record	None	1.22E-01	0.0	Yes	4.64E-72	8.83E+04	8.83E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-59	1000	Jan-83	No Record	None	1.22E-01	0.0	Yes	5.57E-58	8.83E+04	8.83E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Fe-59	1000	Jan-83	No Record	None	1.22E-01	0.0	Yes	5.57E-58	8.83E+04	8.83E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Gd-153	100	Jan-89	No Record	None	6.62E-01	0.0	Yes	3.26E-05	2.02E+05	2.02E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Ge-68	200	Oct-75	Oct-79	None	7.89E-01	0.0	Yes	1.51E-08	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Ge-68	1000	Feb-76	No Record	None	7.89E-01	0.0	Yes	1.01E-07	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Ge-68	100	Jun-85	No Record	None	7.89E-01	0.0	Yes	3.69E-05	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	H-3	1000000	May-71	Jul-97	None	1.23E+01	123551.4	Yes	2.74E+07	1.24E+08	1.24E+08	No	22%	No	3.13E+08	0.0%	No
1G-018/1G-018F	H-3	1000000	Feb-72	Dec-85	None	1.23E+01	128930.0	Yes	2.86E+07	1.24E+08	1.24E+08	No	23%	No	3.13E+08	0.0%	No
1G-018/1G-018F	H-3	200000	Feb-72	May-94	None	1.23E+01	25786.0	Yes	5.72E+06	1.24E+08	1.24E+08	No	5%	No	3.13E+08	0.0%	No
1G-018/1G-018F	H-3	200000	Jan-73	May-94	None	1.23E+01	27154.8	Yes	6.03E+06	1.24E+08	1.24E+08	No	5%	No	3.13E+08	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1G-018/1G-018F	H-3	1000000	Dec-79	Mar-83	None	1.23E+01	200503.8	Yes	4.45E+07	1.24E+08	1.24E+08	No	36%	No	3.13E+08	0.0%	No
1G-018/1G-018F	H-3	5000000	May-80	No Record	None	1.23E+01	1026324.3	Yes	2.28E+08	1.24E+08	1.24E+08	No	184%	Yes	3.13E+08	72.9%	No
1G-018/1G-018F	H-3	1000	Apr-83	No Record	None	1.23E+01	241.9	Yes	5.37E+04	1.24E+08	1.24E+08	No	0%	No	3.13E+08	0.0%	No
1G-018/1G-018F	H-3	1.5E+07	Jul-99	Jul-99	None	1.23E+01	9073397.1	Yes	2.01E+09	1.24E+08	1.24E+08	No	1628%	Yes	3.13E+08	644.6%	Yes
1G-018/1G-018F	H-3	4000000	Jul-99	Jul-99	None	1.23E+01	2419572.6	Yes	5.37E+08	1.24E+08	1.24E+08	No	434%	Yes	3.13E+08	171.9%	Yes
1G-018/1G-018F	Hf-181	6000	Apr-77	No Record	None	1.16E-01	0.0	Yes	2.07E-75	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Hf-181	15000	Aug-77	No Record	None	1.16E-01	0.0	Yes	3.79E-74	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Hf-181	60000	Feb-79	No Record	None	1.16E-01	0.0	Yes	1.20E-69	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Hg-203	2000	Jul-76	Jun-89	None	1.28E-01	0.0	Yes	2.24E-70	3.86E+05	3.86E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Hg-203	0	Jul-92	No Record	None	1.28E-01	0.0	Yes	0.00E+00	3.86E+05	3.86E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	I-125	2000	May-75	Dec-85	None	1.65E-01	0.0	Yes	1.47E-55	6.89E+05	6.89E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	I-125	500	Mar-77	Jul-77	None	1.65E-01	0.0	Yes	8.27E-53	6.89E+05	6.89E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	I-125	2000	May-77	Aug-77	None	1.65E-01	0.0	Yes	6.68E-52	6.89E+05	6.89E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	I-125	50	Aug-77	No Record	None	1.65E-01	0.0	Yes	4.83E-53	6.89E+05	6.89E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	K-40	100	Feb-72	Dec-83	None	1.27E+09	100.0	Yes	2.22E+04	9.92E+04	9.92E+04	No	22%	No	---	0.0%	No
1G-018/1G-018F	K-42	0	Dec-92	No Record	None	1.41E-03	0.0	Yes	0.00E+00	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Kr-85	800000	Jan-69	Dec-91	None	1.07E+01	62473.0	No	1.39E+07	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Kr-85	1000000	Mar-79	Oct-79	None	1.07E+01	150697.8	No	3.35E+07	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Kr-85	118000	Jul-99	Jul-99	None	1.07E+01	66280.0	No	1.47E+07	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Lu-177m	17000	Feb-78	Sep-96	None	4.39E-01	0.0	Yes	5.64E-15	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Lu-177m	17000	Feb-78	Sep-96	None	4.39E-01	0.0	Yes	5.64E-15	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Mn-54	500	May-73	Jun-89	None	8.57E-01	0.0	Yes	5.13E-08	3.15E+04	3.15E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Mn-54	1000	Apr-77	No Record	None	8.57E-01	0.0	Yes	2.45E-06	3.15E+04	3.15E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Na-22	500	Jun-73	Aug-91	None	2.60E+00	0.0	Yes	9.79E+00	9.54E+03	9.54E+03	No	0%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	100	May-76	Feb-81	None	2.60E+00	0.0	Yes	4.26E+00	9.54E+03	9.54E+03	No	0%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	100	May-76	Feb-81	None	2.60E+00	0.0	Yes	4.26E+00	9.54E+03	9.54E+03	No	0%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	2560	Jun-76	No Record	None	2.60E+00	0.5	Yes	1.12E+02	9.54E+03	9.54E+03	No	1%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	2000	Jan-77	Feb-81	None	2.60E+00	0.5	Yes	1.02E+02	9.54E+03	9.54E+03	No	1%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	1000	Jun-77	No Record	None	2.60E+00	0.3	Yes	5.69E+01	9.54E+03	9.54E+03	No	1%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	1000	Jan-78	Jul-78	None	2.60E+00	0.3	Yes	6.65E+01	9.54E+03	9.54E+03	No	1%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	1000	Jun-78	Oct-79	None	2.60E+00	0.3	Yes	7.43E+01	9.54E+03	9.54E+03	No	1%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	1000	Apr-84	No Record	None	2.60E+00	1.6	Yes	3.52E+02	9.54E+03	9.54E+03	No	4%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	2000	Apr-85	No Record	None	2.60E+00	4.1	Yes	9.20E+02	9.54E+03	9.54E+03	No	10%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	500	Jul-85	Jul-97	None	2.60E+00	1.1	Yes	2.46E+02	9.54E+03	9.54E+03	No	3%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	2000	Mar-86	No Record	None	2.60E+00	5.3	Yes	1.17E+03	9.54E+03	9.54E+03	No	12%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	50000	Nov-86	No Record	None	2.60E+00	158.1	Yes	3.51E+04	9.54E+03	9.54E+03	No	368%	Yes	2.08E+04	168.5%	Yes
1G-018/1G-018F	Na-22	1000	Mar-87	Jan-91	None	2.60E+00	3.5	Yes	7.66E+02	9.54E+03	9.54E+03	No	8%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	150000	Nov-88	No Record	None	2.60E+00	809.2	Yes	1.80E+05	9.54E+03	9.54E+03	No	1883%	Yes	2.08E+04	862.3%	Yes
1G-018/1G-018F	Na-22	1000	Mar-92	No Record	None	2.60E+00	13.1	Yes	2.91E+03	9.54E+03	9.54E+03	No	31%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Na-22	1000	Sep-95	No Record	None	2.60E+00	33.4	Yes	7.41E+03	9.54E+03	9.54E+03	No	78%	No	2.08E+04	0.0%	No
1G-018/1G-018F	Nb-94	5	Apr-77	No Record	None	2.03E+04	5.0	Yes	1.11E+03	8.28E+03	8.28E+03	No	13%	No	---	0.0%	No
1G-018/1G-018F	Ni-63	40000	Jan-86	Jul-97	None	1.00E+02	34247.0	Yes	7.60E+06	1.81E+06	1.81E+06	No	420%	Yes	8.62E+07	8.8%	No
1G-018/1G-018F	Ni-63	150	Feb-86	No Record	None	1.00E+02	128.5	Yes	2.85E+04	1.81E+06	1.81E+06	No	2%	No	8.62E+07	0.0%	No
1G-018/1G-018F	Np-239	1	May-92	No Record	None	6.44E-03	0.0	Yes	0.00E+00	1.02E+07	1.02E+07	No	0%	No	---	0.0%	No
1G-018/1G-018F	P-32	2000	Feb-76	Mar-77	None	3.92E-02	0.0	Yes	1.25E-243	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	P-32	5000	Feb-82	Aug-82	None	3.92E-02	0.0	Yes	4.36E-197	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	P-33	5000	May-82	No Record	None	6.96E-02	0.0	Yes	1.40E-107	4.17E+07	4.17E+07	No	0%	No	---	0.0%	No
1G-018/1G-018F	Pm-145	1	Nov-71	Jul-97	None	1.77E+01	0.2	Yes	5.29E+01	Not Listed	1.00E+00	No	5295%	Yes	1.25E+05	0.0%	No
1G-018/1G-018F	Po-210	50	Jul-72	No Record	Also used in room 1C-444	3.79E-01	0.0	Yes	3.80E-25	2.50E+03	2.50E+03	No	0%	No	---	0.0%	No
1G-018/1G-018F	Po-210	10	Oct-89	No Record	None	3.79E-01	0.0	Yes	3.74E-12	2.50E+03	2.50E+03	No	0%	No	---	0.0%	No
1G-018/1G-018F	Pu-238	1000	Mar-74	No Record	Also used in room 1C-444	8.78E+01	763.3	Yes	1.69E+05	3.05E+01	3.05E+01	No	555803%	Yes	4.72E+04	359.2%	Yes
1G-018/1G-018F	Pu-238	30000	Jan-84	No Record	XRF Probe	8.78E+01	24740.9	No	5.49E+06	3.05E+01	3.05E+01	No	0%	No	4.72E+04	0.0%	No
1G-018/1G-018F	Sb-125	1000	May-73	Dec-85	None	2.80E+00	0.2	Yes	3.73E+01	4.43E+04	4.43E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Si-31	2500	Jun-94	No Record	None	2.99E-04	0.0	Yes	0.00E+00	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Sm-145	1	Nov-71	Jul-97	None	9.32E-01	0.0	Yes	3.29E-10	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Sn-113	250	Feb-69	No Record	None	3.15E-01	0.0	Yes	1.51E-33	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Sn-113	2000	Nov-76	No Record	None	3.15E-01	0.0	Yes	3.05E-25	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Sn-119m	1	Nov-71	Oct-84	None	8.03E-01	0.0	Yes	4.17E-12	1.28E+06	1.28E+06	No	0%	No	---	0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1F-101F	Na-22	500	Jul-99	No Record	None	2.60E+00	46.4	Yes	1.03E+04	9.54E+03	9.54E+03	No	108%	Yes	2.08E+04	49.4%	No
1F-101F	P-32	2000	Oct-76	No Record	None	3.92E-02	0.0	Yes	1.63E-238	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	2000	Jul-85	No Record	None	3.92E-02	0.0	Yes	2.96E-171	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	2000	May-86	No Record	None	3.92E-02	0.0	Yes	7.42E-165	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	2100	Aug-88	Oct-88	None	3.92E-02	0.0	Yes	1.65E-147	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	2100	Aug-88	Oct-88	None	3.92E-02	0.0	Yes	1.65E-147	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	5000	Apr-89	Aug-91	None	3.92E-02	0.0	Yes	5.12E-142	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	5000	May-89	Aug-91	None	3.92E-02	0.0	Yes	2.19E-141	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	5000	Jun-89	Aug-91	None	3.92E-02	0.0	Yes	9.84E-141	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	5000	Jun-89	Aug-91	None	3.92E-02	0.0	Yes	9.84E-141	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Nov-89	Aug-91	None	3.92E-02	0.0	Yes	3.27E-138	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Dec-89	Aug-91	None	3.92E-02	0.0	Yes	1.40E-137	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Dec-89	Aug-91	None	3.92E-02	0.0	Yes	1.40E-137	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Jan-90	Aug-91	None	3.92E-02	0.0	Yes	6.30E-137	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Feb-90	Aug-91	None	3.92E-02	0.0	Yes	2.83E-136	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Feb-90	Aug-91	None	3.92E-02	0.0	Yes	2.83E-136	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Mar-90	Aug-91	None	3.92E-02	0.0	Yes	1.10E-135	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	1000	Mar-90	Aug-91	None	3.92E-02	0.0	Yes	2.75E-136	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Mar-90	Aug-91	None	3.92E-02	0.0	Yes	1.23E-135	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Apr-90	Aug-91	None	3.92E-02	0.0	Yes	1.23E-135	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Apr-90	Aug-91	None	3.92E-02	0.0	Yes	1.23E-135	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Jul-90	Aug-91	None	3.92E-02	0.0	Yes	1.02E-133	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Aug-90	Aug-91	None	3.92E-02	0.0	Yes	4.57E-133	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Aug-90	Aug-91	None	3.92E-02	0.0	Yes	4.57E-133	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Sep-90	Aug-91	None	3.92E-02	0.0	Yes	2.05E-132	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Oct-90	Aug-91	None	3.92E-02	0.0	Yes	8.79E-132	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Oct-90	Aug-91	None	3.92E-02	0.0	Yes	8.79E-132	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Oct-90	Aug-91	None	3.92E-02	0.0	Yes	8.79E-132	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	P-32	250	Dec-90	Aug-91	None	3.92E-02	0.0	Yes	1.69E-130	9.51E+06	9.51E+06	No	0%	No	---	0.0%	No
1F-101F	Rb-86	2000	Aug-79	Oct-79	None	5.11E-02	0.0	Yes	5.94E-165	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1F-101F	Rb-86	2000	Jul-81	No Record	None	5.11E-02	0.0	Yes	1.16E-153	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1F-101F	S-35	10000	Jun-79	Dec-82	None	2.40E-01	0.0	Yes	7.67E-31	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	S-35	1000	Jul-85	No Record	None	2.40E-01	0.0	Yes	3.42E-24	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	S-35	2000	Nov-87	No Record	None	2.40E-01	0.0	Yes	5.92E-21	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	S-35	2000	Jan-87	No Record	None	2.40E-01	0.0	Yes	5.31E-22	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	S-35	5000	Jul-89	Aug-91	None	2.40E-01	0.0	Yes	1.83E-18	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	S-35	5000	Jul-89	Aug-91	None	2.40E-01	0.0	Yes	1.83E-18	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	S-35	250	Oct-89	Aug-91	None	2.40E-01	0.0	Yes	1.90E-19	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	S-35	250	Oct-89	Aug-91	None	2.40E-01	0.0	Yes	1.90E-19	1.27E+07	1.27E+07	No	0%	No	---	0.0%	No
1F-101F	U-238	500	Jun-84	No Record	3lbs metal-Also used in room 1G-018F	4.46E+09	500.0	No	1.11E+05	1.01E+02	1.01E+02	No	0%	No	5.21E+03	0.0%	No
1F-101F	U-238	18	Sep-91	No Record	None	4.46E+09	18.0	Yes	4.00E+03	1.01E+02	1.01E+02	No	3964%	Yes	5.21E+03	76.7%	No
<b>1F-101F Total</b>													4148%	Yes		126.1%	Yes
1G-009	U-238	17.3	Sep-89	No Record	Depleted Uranium	4.46E+09	17.3	No	3.84E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
1G-009	U-238	0.11	Sep-89	Jun-90	foil	4.46E+09	0.1	No	2.44E+01	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>1G-009 Total</b>													0%	No		0.0%	No
1G-017	Cm-244	13.7	Feb-91	Jul-97	Electroplated	1.81E+01	7.1	No	1.57E+03	4.90E+01	4.90E+01	Yes	0%	No	---	0.0%	No
1G-017	Co-58	15000	Dec-87	No Record	None	1.94E-01	0.0	Yes	5.47E-26	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
1G-017	Co-60	5000	Dec-87	No Record	None	5.27E+00	336.8	Yes	7.48E+04	7.04E+03	7.04E+03	Yes	0%	No	1.79E+04	0.0%	No
1G-017	Na-22	86600	Jul-88	Mar-89	None	2.60E+00	427.0	Yes	9.48E+04	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
1G-017	Na-22	100000	Aug-90	Dec-97	None	2.60E+00	859.7	Yes	1.91E+05	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
<b>1G-017 Total</b>													6749253%	Yes	8.33E+03	1467.2%	Yes
1G-018/1G-018F	Ac-227	1000	Aug-89	No Record	None	2.18E+01	550.8	Yes	1.22E+05	1.81E+00	1.81E+00	No	173728%	Yes	8.33E+03	37.8%	No
1G-018/1G-018F	Ac-227	25	Aug-90	No Record	None	2.18E+01	14.2	Yes	3.15E+03	1.81E+00	1.81E+00	No	7235750%	Yes	8.33E+03	1573.0%	Yes
1G-018/1G-018F	Ac-227	1000	Nov-91	No Record	None	2.18E+01	590.5	Yes	1.31E+05	1.81E+00	1.81E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Ag-110m	10000	Apr-81	No Record	None	6.85E-01	0.0	Yes	2.49E-06	1.02E+04	1.02E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Ag-110m	10000	Apr-81	No Record	None	6.85E-01	0.0	Yes	2.49E-06	1.02E+04	1.02E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Am-241	1330000	Nov-71	No Record	Also used in room 1A-132	4.32E+02	1254250.6	Yes	2.78E+08	2.69E+01	2.69E+01	No	1036924096%	Yes	5.00E+04	556887.3%	Yes

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
1G-018/1G-018F	Sn-119m	15000	May-74	May-89	None	8.03E-01	0.0	Yes	5.41E-07	1.28E+06	1.28E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Sr-85	2000	Feb-76	Sep-82	None	1.78E-01	0.0	Yes	6.28E-50	1.40E+05	1.40E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Sr-85	500	Jul-85	No Record	None	1.78E-01	0.0	Yes	1.47E-34	1.40E+05	1.40E+05	No	0%	No	---	0.0%	No
1G-018/1G-018F	Sr-90	2	Jan-66	May-94	5 vials at .46 each	2.86E+01	0.7	Yes	1.59E+02	8.68E+03	8.68E+03	No	2%	No	---	0.0%	No
1G-018/1G-018F	Ta-182	2000	May-77	No Record	None	3.14E-01	0.0	Yes	7.15E-25	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Ta-182	12000	Feb-81	No Record	None	3.14E-01	0.0	Yes	1.71E-20	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Te-129m	5000	Feb-69	Sep-96	None	9.21E-02	0.0	Yes	2.31E-123	Not Listed	1.00E+00	No	0%	No	---	0.0%	No
1G-018/1G-018F	Th-232	12	May-66	May-94	None	1.40E+10	12.0	Yes	2.66E+03	7.29E+00	7.29E+00	No	36550%	Yes	1.92E+03	138.5%	Yes
1G-018/1G-018F	Th-232	5000	May-66	May-94	None	1.40E+10	5000.0	Yes	1.11E+06	7.29E+00	7.29E+00	No	15229200%	Yes	1.92E+03	57720.0%	Yes
1G-018/1G-018F	Th-232	25	Feb-69	May-94	Thorium Nitrate-Also used in room 1A-170	1.40E+10	25.0	Yes	5.55E+03	7.29E+00	7.29E+00	No	76146%	Yes	1.92E+03	288.6%	Yes
1G-018/1G-018F	Th-232	50	May-71	Oct-92	Thorium Acetate Kerr McGee-Also used in room 1B-221	1.40E+10	50.0	Yes	1.11E+04	7.29E+00	7.29E+00	No	152292%	Yes	1.92E+03	577.2%	Yes
1G-018/1G-018F	Th-232	1000	Oct-72	May-94	20lbs Oxide-Also used in room 1B-222	1.40E+10	1000.0	Yes	2.22E+05	7.29E+00	7.29E+00	No	3045840%	Yes	1.92E+03	11544.0%	Yes
1G-018/1G-018F	Th-232	11	Feb-77	No record	Thorium Flouride-Also used in room 6B-326	1.40E+10	11.0	Yes	2.44E+03	7.29E+00	7.29E+00	No	33504%	Yes	1.92E+03	127.0%	Yes
1G-018/1G-018F	Th-232	5	Jul-89	No Record	None	1.40E+10	5.0	Yes	1.11E+03	7.29E+00	7.29E+00	No	15229%	Yes	1.92E+03	57.7%	No
1G-018/1G-018F	Th-234	45.3	Sep-71	May-94	Thorium Flouride-Also used in room 1A-170	6.60E-02	0.0	Yes	3.65E-164	2.05E+06	2.05E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Tl-204	1000	May-73	Dec-85	None	3.78E+00	1.6	Yes	3.55E+02	Not Listed	1.00E+00	No	35542%	Yes	8.06E+06	0.0%	No
1G-018/1G-018F	Tl-204	10000	May-78	Jul-78	None	3.78E+00	40.1	Yes	8.90E+03	Not Listed	1.00E+00	No	889515%	Yes	8.06E+06	0.1%	No
1G-018/1G-018F	U-238	100	Dec-68	No Record	Also used in room 1C-444	4.46E+09	100.0	Yes	2.22E+04	1.01E+02	1.01E+02	No	22022%	Yes	5.21E+03	426.2%	Yes
1G-018/1G-018F	U-238	94	Jun-74	Apr-92	Uranyl Acetate-Also used in room 1B-409	4.46E+09	94.0	Yes	2.09E+04	1.01E+02	1.01E+02	No	20701%	Yes	5.21E+03	400.7%	Yes
1G-018/1G-018F	U-238	20	Mar-81	No Record	None	4.46E+09	20.0	Yes	4.44E+03	1.01E+02	1.01E+02	No	4404%	Yes	5.21E+03	85.2%	No
1G-018/1G-018F	U-238	11	Mar-81	No Record	None	4.46E+09	11.0	Yes	2.44E+03	1.01E+02	1.01E+02	No	2422%	Yes	5.21E+03	46.9%	No
1G-018/1G-018F	U-238	2	Jan-84	Jul-97	foil	4.46E+09	2.0	Yes	4.44E+02	1.01E+02	1.01E+02	No	440%	Yes	5.21E+03	8.5%	No
1G-018/1G-018F	U-238	500	Jun-84	No Record	3lbs metal - also used in room 1F-101F	4.46E+09	500.0	No	1.11E+05	1.01E+02	1.01E+02	No	0%	No	5.21E+03	0.0%	No
1G-018/1G-018F	U-238	8.325	Apr-87	No Record	None	4.46E+09	8.3	Yes	1.85E+03	1.01E+02	1.01E+02	No	1833%	Yes	5.21E+03	35.5%	No
1G-018/1G-018F	U-238	0.333	Apr-87	No Record	None	4.46E+09	0.3	Yes	7.39E+01	1.01E+02	1.01E+02	No	73%	No	5.21E+03	0.0%	No
1G-018/1G-018F	U-238	0.333	Apr-87	No Record	None	4.46E+09	0.3	Yes	7.39E+01	1.01E+02	1.01E+02	No	73%	No	5.21E+03	0.0%	No
1G-018/1G-018F	U-238	1.68	May-89	No Record	Oxide Powder	4.46E+09	1.7	Yes	3.73E+02	1.01E+02	1.01E+02	No	370%	Yes	5.21E+03	7.2%	No
1G-018/1G-018F	W-181	1000000	Jan-76	Sep-77	None	3.32E-01	0.0	Yes	7.86E-22	1.07E+06	1.07E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	W-181	5000	Feb-79	Oct-79	None	3.32E-01	0.0	Yes	2.50E-21	1.07E+06	1.07E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	W-181	31000	Aug-79	Feb-81	None	3.32E-01	0.0	Yes	4.37E-20	1.07E+06	1.07E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	W-181	130000	Oct-79	No Record	None	3.32E-01	0.0	Yes	2.60E-19	1.07E+06	1.07E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	W-181	600000	Apr-82	No Record	None	3.32E-01	0.0	Yes	2.24E-16	1.07E+06	1.07E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	W-181	600000	Apr-82	No Record	None	3.32E-01	0.0	Yes	2.24E-16	1.07E+06	1.07E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	W-181	500000	Oct-85	No Record	None	3.32E-01	0.0	Yes	2.84E-13	1.07E+06	1.07E+06	No	0%	No	---	0.0%	No
1G-018/1G-018F	Zn-65	2000	Jul-76	Jun-89	None	6.70E-01	0.0	Yes	1.95E-09	4.81E+04	4.81E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Zn-65	2000	Jul-76	Jun-89	None	6.70E-01	0.0	Yes	1.95E-09	4.81E+04	4.81E+04	No	0%	No	---	0.0%	No
1G-018/1G-018F	Zn-65	10000	Mar-77	No Record	None	6.70E-01	0.0	Yes	1.94E-08	4.81E+04	4.81E+04	No	0%	No	---	0.0%	No
<b>018/1G-018F Total</b>													1071234828%	Yes		641683.6%	Yes
2A-302	H-3	200000	Jan-73	May-94	None	1.23E+01	27154.8	Yes	6.03E+06	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
<b>2A-302 Total</b>													0%	No		0.0%	No
2C-138	Co-60	5	Jul-89	May-90	None	5.27E+00	0.4	Yes	9.21E+01	7.04E+03	7.04E+03	Yes	0%	No	1.79E+04	0.0%	No
<b>2C-138 Total</b>													0%	No		0.0%	No
2C-206	Th-232	24	Jan-74	Sep-77	Natural Thorium Powder 200g	1.40E+10	24.0	Yes	5.33E+03	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>2C-206 Total</b>													0%	No		0.0%	No
2C-437	Cl-36	500	Oct-70	Nov-77	None	3.01E+05	500.0	Yes	1.11E+05	4.97E+05	4.97E+05	Yes	0%	No	---	0.0%	No
2C-437	H-3	200000	Aug-76	Jan-84	None	1.23E+01	33231.5	Yes	7.38E+06	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
2C-437	Sn-113	250	Feb-69	Sep-96	None	3.15E-01	0.0	Yes	1.51E-33	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
<b>2C-437 Total</b>													0%	No		0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
2C-444	Am-241	0.1	Aug-69	Aug-91	Also used in rooms 1E-256 and 1E-463	4.32E+02	0.1	Yes	2.09E+01	2.69E+01	2.69E+01	Yes	0%	No	5.00E+04	0.0%	No
<b>2C-444 Total</b>													0%	No		0.0%	No
2D-164	H-3	200000	Jan-73	May-94	None	1.23E+01	27154.8	Yes	6.03E+06	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
<b>2D-164 Total</b>													0%	No		0.0%	No
2D-221	Po-210	200	Dec-69	No record	Static Master Brush	3.79E-01	0.0	No	1.25E-26	2.50E+03	2.50E+03	Yes	0%	No	---	0.0%	No
2D-221	Po-210	200	Dec-69	No record	Static Master Brush	3.79E-01	0.0	No	1.25E-26	2.50E+03	2.50E+03	Yes	0%	No	---	0.0%	No
2D-221	Po-210	200	Dec-69	No record	Static Master Brush	3.79E-01	0.0	No	1.25E-26	2.50E+03	2.50E+03	Yes	0%	No	---	0.0%	No
<b>2D-221 Total</b>													0%	No		0.0%	No
2D-312	Co-57	25000	Apr-71	May-74	None	7.42E-01	0.0	Yes	4.58E-09	2.12E+05	2.12E+05	Yes	0%	No	---	0.0%	No
<b>2D-312 Total</b>													0%	No		0.0%	No
2D-437	H-3	200000	Aug-76	Jan-84	None	1.23E+01	33231.5	Yes	7.38E+06	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
<b>2D-437 Total</b>													0%	No		0.0%	No
6B-326	Th-232	11	Feb-77	No record	Thorium Flouride-Also used in room 1G-018F	1.40E+10	11.0	Yes	2.44E+03	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>6B-326 Total</b>													0%	No		0.0%	No
6D-314	Th-232	1000	Oct-78	Oct-78	Thorium Sulfate Solution	1.40E+10	1000.0	Yes	2.22E+05	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
6D-314	Th-232	1000	Jan-90	Jan-90	Thorium Sulfate Solution-Also in room 6D-324	1.40E+10	1000.0	Yes	2.22E+05	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>6D-314 Total</b>													0%	No		0.0%	No
6D-324	Th-232	1000	Jan-90	Jan-90	Thorium Sulfate Solution-Also in room 6D-314	1.40E+10	1000.0	Yes	2.22E+05	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>6D-324 Total</b>													0%	No		0.0%	No
6E-414	Th-232	0.8	Jul-87	No Record	None	1.40E+10	0.8	Yes	1.78E+02	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>6E-414 Total</b>													0%	No		0.0%	No
6F-002	Co-58	100000	Nov-79	No Record	None	1.94E-01	0.0	Yes	1.07E-37	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	199000	Apr-80	No Record	None	1.94E-01	0.0	Yes	9.39E-37	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	30000	Dec-80	Feb-81	None	1.94E-01	0.0	Yes	1.54E-36	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	30000	Dec-80	Feb-81	None	1.94E-01	0.0	Yes	1.54E-36	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	395000	May-81	No Record	None	1.94E-01	0.0	Yes	8.86E-35	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	376000	Nov-81	No Record	None	1.94E-01	0.0	Yes	5.10E-34	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	326000	Dec-82	No Record	None	1.94E-01	0.0	Yes	2.10E-32	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	565000	Apr-83	No Record	None	1.94E-01	0.0	Yes	1.19E-31	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	437000	Jul-83	No Record	None	1.94E-01	0.0	Yes	2.24E-31	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	313000	Apr-84	Mar-85	None	1.94E-01	0.0	Yes	2.36E-30	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Co-58	431000	Dec-84	Dec-86	None	1.94E-01	0.0	Yes	3.53E-29	6.78E+04	6.78E+04	Yes	0%	No	---	0.0%	No
6F-002	Fe-55	2000	Aug-86	No Record	None	2.70E+00	7.3	Yes	1.63E+03	4.49E+06	4.49E+06	Yes	0%	No	---	0.0%	No
6F-002	Na-22	2000	Jan-77	No Record	None	2.60E+00	0.5	Yes	1.02E+02	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
6F-002	Na-22	1500	Oct-77	No Record	None	2.60E+00	0.4	Yes	9.33E+01	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
6F-002	Na-22	2000	Mar-86	No Record	None	2.60E+00	5.3	Yes	1.17E+03	9.54E+03	9.54E+03	Yes	0%	No	2.08E+04	0.0%	No
6F-002	Sr-82	30000	Aug-86	No Record	None	6.85E-02	0.0	Yes	6.59E-90	Not Listed	1.00E+00	Yes	0%	No	---	0.0%	No
<b>6F-002 Total</b>													0%	No		0.0%	No
6F-014	Th-232	42	Apr-81	Jul-84	Thorium Flouride 500g	1.40E+10	42.0	Yes	9.32E+03	7.29E+00	7.29E+00	Yes	0%	No	1.92E+03	0.0%	No
<b>6F-014 Total</b>													0%	No		0.0%	No
6F-202	U-238	27.57	Mar-70	Jun-89	Uranium Sulfide-Also used in room 1A-148	4.46E+09	27.6	Yes	6.12E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
6F-202	U-238	140	Aug-70	Jun-89	Also used in room 1A-148	4.46E+09	140.0	Yes	3.11E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
6F-202	U-238	70	Sep-71	Nov-88	Uranium Oxide 200g-Also used in room 1A-148	4.46E+09	70.0	Yes	1.55E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
6F-202	U-238	52	Mar-72	Jun-89	Uranium Tetrafluoride-Also used in room 1A-148	4.46E+09	52.0	Yes	1.15E+04	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
6F-202	U-238	3.3	Feb-73	Jun-89	Tetrachloride Anhydrous-Also used in room 1A-148	4.46E+09	3.3	Yes	7.33E+02	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>6F-202 Total</b>													0%	No		0.0%	No
7D-218	Tl-204	50	Apr-75	Jun-92	Betascope Source	3.78E+00	0.1	No	2.53E+01	Not Listed	1.00E+00	Yes	0%	No	8.06E+06	0.0%	No
<b>7D-218 Total</b>													0%	No		0.0%	No

Decay Date: 5/30/2008

Room	Nuclide	Quantity (µCi)	Date Received	Disposal	Comments	Half-life (yrs)	Corrected (µCi)	Dispersible?	1%/m <sup>2</sup> (dpm/100cm <sup>2</sup> )	DSV (dpm/100cm <sup>2</sup> )	Filter Level (dpm/100cm <sup>2</sup> )	Renovated?	% of Filter Level	Passed Filter?	DCGL (dpm/100cm <sup>2</sup> )	% of DCGL	>DCGL?
7F-212	H-3	5000	Feb-84	No record	None	1.23E+01	1268.3	Yes	2.82E+05	1.24E+08	1.24E+08	Yes	0%	No	3.13E+08	0.0%	No
<b>7F-212 Total</b>													0%	No		0.0%	No
7F-217	U-238	19	Mar-91	No record	Uranium Acetate 100g	4.46E+09	19.0	Yes	4.22E+03	1.01E+02	1.01E+02	Yes	0%	No	5.21E+03	0.0%	No
<b>7F-217 Total</b>													0%	No		0.0%	No



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

May 6, 1998

Docket No. 030-05224  
Control No. 125386

License No. 29-00170-03

John E. Riley, Jr.  
Radiation Safety Officer  
Bell Laboratories  
A Division of Lucent Technologies Inc.  
600 Mountain Avenue  
Murray Hill, NJ 07974-0636

Dear Mr. Riley:

This refers to your July 1997 license amendment request and your letter providing updated information dated February 24, 1998. Enclosed with this letter is the amended license. Based on the July 1997, Remedial Action Report and the NRC inspection conducted on January 29, 1998 (NRC Inspection Report No. 29-00170-03/98-001), we have no objection to the release of the Murray Hill Building 16 site for unrestricted use. However, since this site is encompassed within a location of use currently listed in condition 10 of your license, you are still permitted to use licensed material there. If licensed material is used at the site in the future, remedial actions may be necessary again.

Please review the enclosed document carefully and be sure that you understand and fully implement all the conditions incorporated into the amended license. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I Office, Licensing Assistance Team, (610) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Thank you for your cooperation.

Sincerely,

A handwritten signature in black ink, appearing to read "John D. Kinneman".

John D. Kinneman, Chief  
Nuclear Materials Safety Branch 2  
Division of Nuclear Materials Safety

Enclosure:  
Amendment No. 62

## LABORATORY CLOSEOUTS PERFORMED BY LUCENT STAFF

### 1E-422

On December 2, 1981, radiochemistry laboratory 1E-422 was decontaminated and surveyed for closure. The lab was surveyed for total activity using both an Eberline and a Victoreen instrument by static measurements and surface scans. The lab was also surveyed for gross removable contamination. All results were less than MDC.

### 2C-435A

On May 9, 1986, radiochemistry laboratory 2C-435A was decontaminated and surveyed for closure. The highest activity present, according to the survey record was 10.7 pCi/100cm<sup>2</sup> beta removable contamination (the action level was 10 pCi/100cm<sup>2</sup> alpha and 100 pCi/100cm<sup>2</sup> beta).

### 1C-211

On June 9, 1986, radiochemistry laboratory 1C-211 was decontaminated and surveyed for closure. The room predominantly used Th-232 and U-238. Survey results indicated the highest level of gross removable contamination at 7.1 pCi/100cm<sup>2</sup> alpha (the action level was 10pCi/100cm<sup>2</sup> alpha and 100 pCi/100cm<sup>2</sup> beta); however, the survey results do not indicate total surface contamination.

### 6F-014

On March 24, 1988, radiochemistry laboratory 6F-014 was decommissioned. All radioactive materials and equipment were surveyed and removed for disposal by the RPG. Records indicate that the area was surveyed for removable gross alpha and gross beta contamination, in easily accessible and working surfaces, to a level of <1.8 dpm/100cm<sup>2</sup> alpha and <7.2 dpm/100cm<sup>2</sup> beta based on Th-232. Records do not indicate that all accessible areas were surveyed, nor do they confirm any total activity measurements.

### 2C-138

On June 12, 1990, all materials and equipment were surveyed and removed for disposal from lab 2C-138 by the RPG. The lab was decontaminated and surveyed to levels <16.8 dpm/100cm<sup>2</sup> removable gross beta contamination. According to the records provided, there were no indications of any operations involving dispersible alpha in the lab. The RPG also surveyed the area using an Eberline ESP-2 and a SPA-3.

### 1A-180

On February 13, 1991, all materials and equipment were surveyed and removed for disposal from lab 1A-180 by the RPG. The lab was then decontaminated and surveyed to levels not detectable. Insufficient information is available to determine the survey sensitivity.

### 1E-307

On June 23, 1994, radiochemistry laboratory 1E-307 was decommissioned. The area predominantly used melted and polished U-238. Surfaces were scanned for total alpha and beta activity using a Ludlum instrument with a 44-9 probe, an Eberline RM-14 with a shielded HP-210 probe and an Eberline ESP-II with a shielded AC-3 Alpha Scintillation probe. The area was also surveyed for removable gross alpha and gross beta contamination. All results were less than the minimum detectable concentrations. Insufficient information exists to determine the survey sensitivity.

### 1F-101F

On July 15, 1994, work began in radiochemistry laboratory 1F-101F to rearrange the laboratory and convert a portion of the lab into two offices. The portion of the room that became offices was an uncontrolled area where desks and benches had been located. During the cleanout of that portion of the room, all furniture and equipment was surveyed using a Ludlum Model 2 with a thin window pancake probe. Removable contamination measurements were also taken and counted for alpha and beta using a Tennelec LB5100 low background gas flow proportional counter. MDC values for this instrument ranged from 0.3 dpm/100cm<sup>2</sup> to 2dpm/100cm<sup>2</sup> alpha and 7.2 dpm/100cm<sup>2</sup> to 25 dpm/100cm<sup>2</sup> beta. Various pieces of equipment and laboratory benches were found to contain residual internal contamination and moved to the 1G Underground Radiation Laboratory Complex for storage. One of the benches was well above the release limits (2,729 dpm/100cm<sup>2</sup> removable alpha and 277,541 dpm/100cm<sup>2</sup> removable beta) (gamma spectroscopy analysis identified Cs-137). A separate report indicating precautions and actions to be taken on that particular bench were noted in a memo dated August 3, 1994. All other survey results, including those for a separate glove box, indicated levels below the release criteria. On August 8th and 9th, 117 floor tiles in the area that would be converted to office space were wipe tested and surveyed with an Eberline RM-14 survey meter with a shielded pancake probe and found to be contaminated. The floor was decontaminated with Radiac Wash and resurveyed for gross removable contamination, this process was continued until surveys indicated no removable contamination could be detected. There were no records indicating the area or extent of contamination, nor the total activity levels after decontamination.

### 1E-456

On December 7, 1995, radiochemistry laboratory 1E-456 was decommissioned by the RPG. The predominant nuclides used were Ac-227 and Na-22. All materials and equipment were surveyed and transferred to MH1F-101F for storage and subsequent use. The lab was scanned using a Ludlum instrument with a 44-9 probe; however, records indicate that only easily accessible areas and working surfaces were scanned. The lab was released based on results of <20 dpm/100cm<sup>2</sup>

total alpha, <1000 dpm/100cm<sup>2</sup> total beta, <1 dpm/100cm<sup>2</sup> removable alpha, and <25 dpm/100cm<sup>2</sup> removable beta activity.

**1A-207**

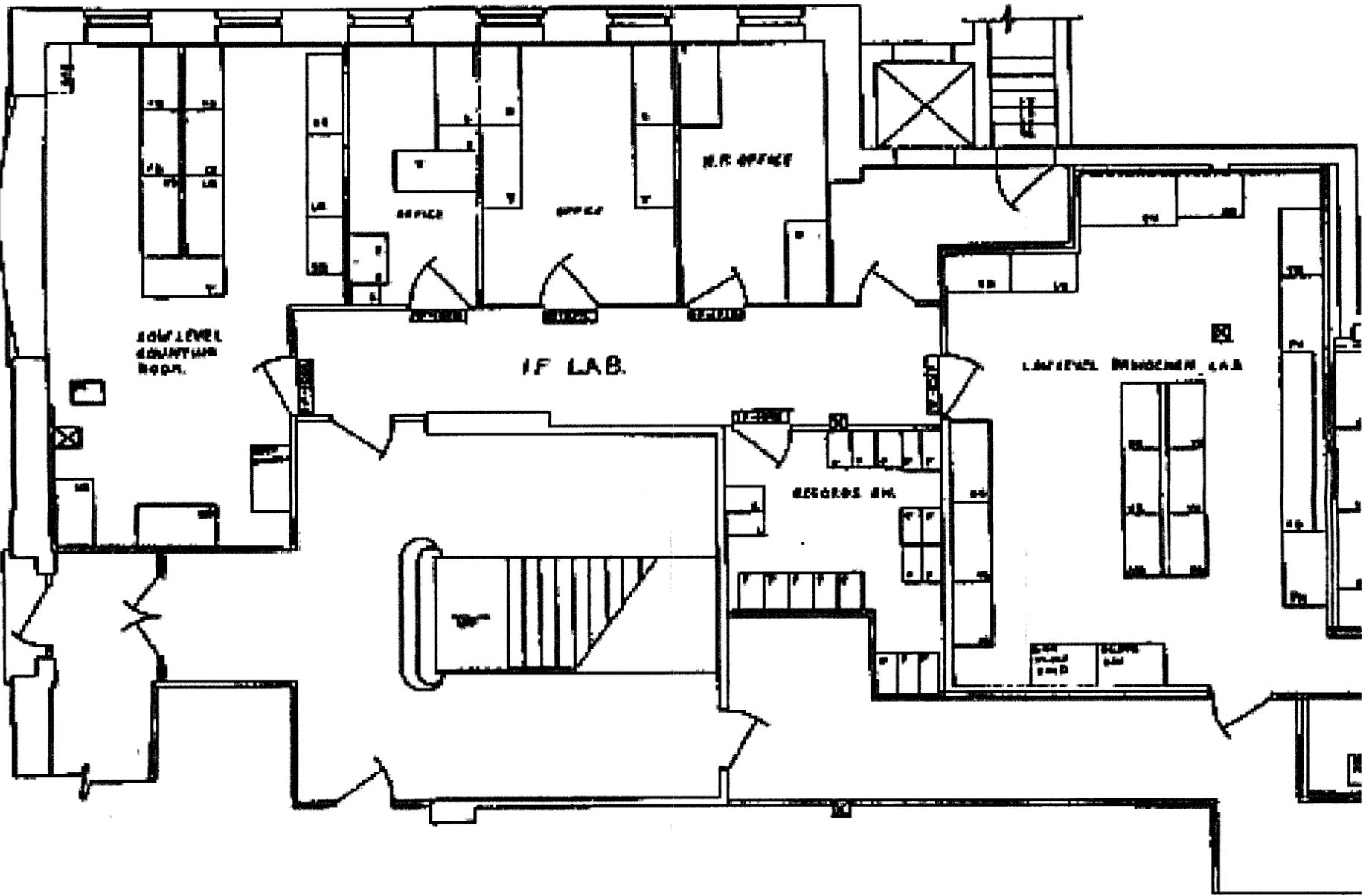
On February 20, 1996, an attempt to decommission radiochemistry laboratory 1A-207 failed. This failure was attributed to the many inaccessible areas due to materials and equipment remaining in the area. Records also indicate that the final survey was to be re-performed; however, further records review and interviews of the RPG could not confirm that a final survey for this lab was ever performed.

**1C-436**

On November 22, 1996, radiochemistry lab 1C-436 was decommissioned by the RPG. Operations in the lab used H-3, C-14, and Cf-252 for low level biological experiments. The room was scanned using a Ludlum instrument with a 44-9 probe. The room was also surveyed for removable alpha and beta contamination. Smears were counted using the Tennelec LB5100 and all results were less the minimum detectable concentration of 1 dpm/100cm<sup>2</sup> alpha and 25 dpm/100cm<sup>2</sup> beta. However, there was no record of liquid scintillation counting for H-3 and C-14.

**1F-101A**

On February 15, 2007 analytical/countroom 1F-101A was surveyed for decommissioning. All equipment and materials were surveyed; however, most of the furnishings remain. The count lab was surveyed for total activity by static measurement and scan using a Ludlum Model 2 with a 44-9 probe. The counting area was also surveyed for removable alpha and beta contamination using a Ludlum 3030 alpha/beta system. Survey results indicated detectable contamination in an empty drawer in Bench 2 on the west wall. The drawer was removed and stored in 1G-018F for disposal.



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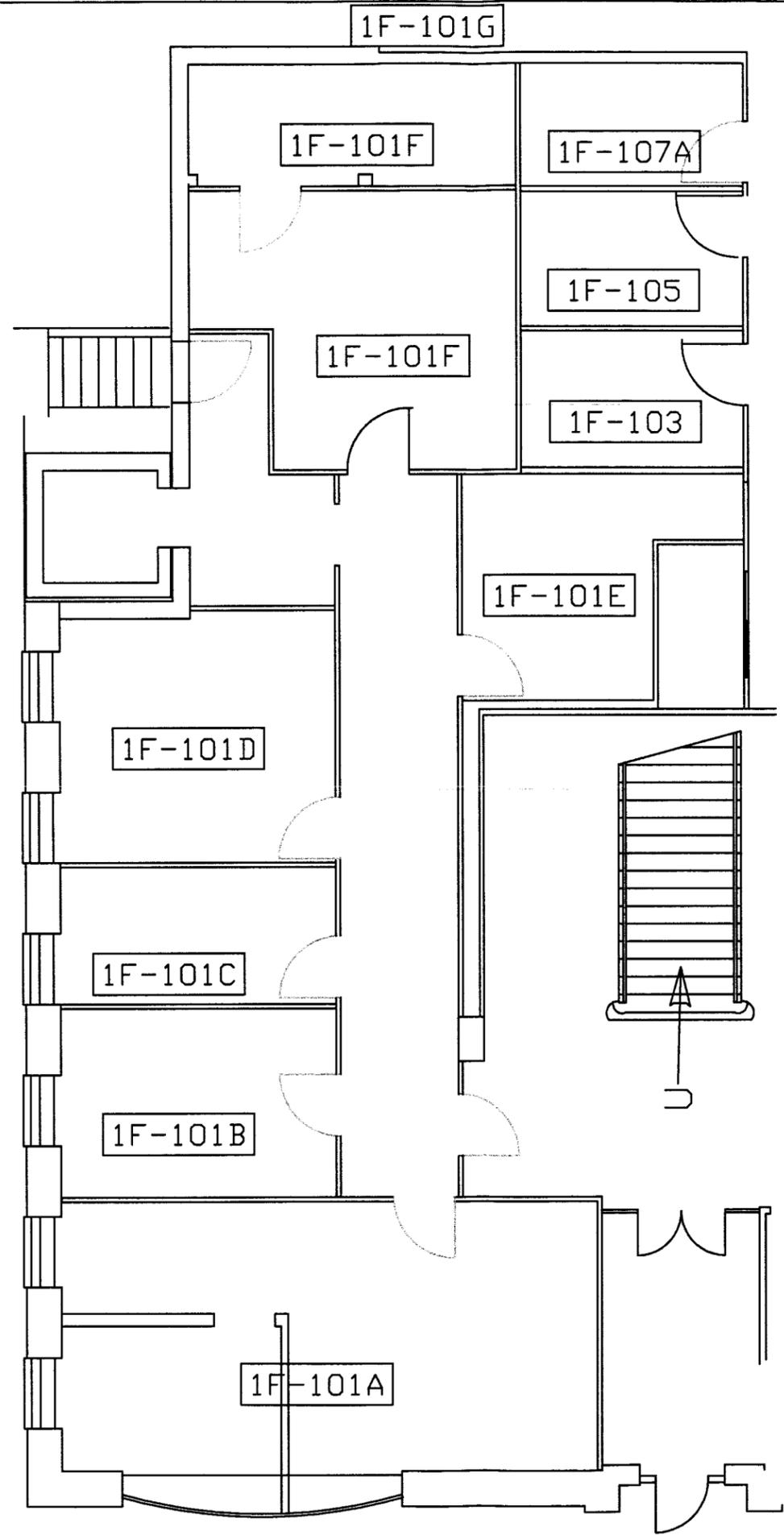


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1F Original Floor Plan

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