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August 25, 2000 696/CAL-3266

VIA EXPRESS MAIL SERVICE

Ms. Mary Adams Licensing Section 1/Licensing Branch Division of Fuel Cycle Safety and Safeguards, NMSS U.S. Nuclear Regulatory Commission Washington, DC 20555

Subject: Docket No. 70-734; SNM-696: Request to Release Certain Portions of General Atomics' Facilities to Unrestricted Use and Delete them from License (Building 2 laboratories - Group 13)

and

ATTN: Mr. David Wesley (in Duplicate) State of California Department of Health Services Radiologic Health Branch Mail Stop 178 601 North 7th Street Sacramento, CA 95814-0208

Subject: Radioactive Materials License No. 0145-37: Request to Release Certain Portions of General Atomics' Facilities to Unrestricted Use and Delete them from License (Building 2 laboratories - Group 13)

Dear Ms. Adams and Mr. Wesley:

As you are aware, General Atomics (GA) is in the process of decontaminating, and obtaining the release to unrestricted use, certain of its facilities (i.e., facilities for which GA has no plans for conducting future activities involving the use of radioactive materials). For example, to date, eleven (11) groups of laboratories in GA's Building 2 (also known as the Science Laboratories Building or "L" Building) have been decontaminated, surveyed and released to unrestricted use and deleted from GA's license. The release of a twelfth group is pending.

Most recently, GA completed the decontamination and final surveys of six (6) more laboratories in Building 2. These six (6) labs are the last of the total of 142 laboratories that comprise Building 2 and for which GA has been seeking release. Thus, these six labs constitute "Group 13" and comprise the last group of labs, and the only labs left in Building 2, that have not yet been released to unrestricted use.

The six laboratories which comprise "group 13" are: labs 218, 411, 413, 415, 619 and 621; all labs except 218 have mezzanines associated with them. The total area associated with the "Group 13" labs and mezzanines is ~ 3,471 ft² (~325 m²). Characterization surveys showed that the primary contaminants in these labs were Cs-137 and/or uranium.



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Following decontamination, as needed, the results of GA's extensive and comprehensive final radiation and contamination surveys, sampling and analyses demonstrate that the "Group 13" laboratories meet the NRC- and State-approved criteria for release to unrestricted use. These results are summarized in the enclosed report titled, "Decontamination of Selected General Atomics' Science Laboratories for Release to Unrestricted Use - Group 13" dated August 2000.

Accordingly, GA hereby requests that its "Group 13" laboratories and associated mezzanines and offices be released to unrestricted use and deleted from its NRC and State radioactive material licenses. Because of the history of use of enriched uranium in these labs, and consistent with the recent GA/NRC/State coordination meeting, it is GA's understanding that the NRC will take the lead in coordinating this release; including regulatory agency confirmatory surveys.

Please note that GA has an immediate need to occupy the subject laboratories and associated offices. It is therefore, once again, of the utmost importance to GA to obtain the release of these laboratories to unrestricted use as soon as possible.

If you should have any questions regarding this information, please contact Mr. Paul R. Maschka at (858) 455-2959, Laura Q. Gonzales at (858) 455-2758, or me at (858) 455-2823. Your assistance in responding to our request is very much appreciated.

Very truly yours,

Keith E. Os

Keith E. Asmussen, Ph.D., Director Licensing, Safety and Nuclear Compliance

Enclosure: Report titled "Decontamination of Selected General Atomics' Science Laboratories for Release to Unrestricted Use - Group 13" dated August 2000.

cc: Mr. Wayne L. Britz, Fuel Cycle Inspector, NRC Region IV Mr. Emilio Garcia, Fuel Cycle Inspector, NRC Region IV Ms. Kathleen Henner, State, Brea, CA Dr. Ron Rogus, State, Sacramento, CA



FINAL RADIOLOGICAL SURVEYS OF SELECTED BUILDING 2 LABORATORIES

FOR RELEASE TO UNRESTRICTED USE

"GROUP 13"

Prepared by: Paul R. Maschka, Richard Stowell Steve Finchum, and Laura Gonzales

August 2000

Building 2 Group 13

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INTRODUCTION

General Atomics (GA) is continuing its efforts directed at decontaminating, as appropriate, and obtaining the release to unrestricted use of selected laboratories and associated offices in GA's Building 2. The building was built in 1958 for purposes of conducting research and development activities. There are a total of 142 laboratories in Building 2. Of these, 132 labs have been released to unrestricted use ("Groups 1 - 11"). Four (4) additional labs have been decontaminated and a request for the release those labs ("Group 12") is currently pending with the NRC and the State of California.

GA has recently decontaminated and surveyed the last six (6) labs in Building 2. These labs are designated as "Group 13". This report summarizes the surveys completed for the "Group 13" labs which consist of labs 218, 411, 413, 415, 619/ 621, the mezzanine above labs 409, 411, 413, and 415 (accessible through lab 411) and the mezzanine above labs 619 and 621. The total area of the "Group 13" labs is 3,471 ft² or ~ 325 m².

Characterization surveys detected radioactive contamination in all of the Group 13 labs; but nothing was detected in any of the associated mezzanines. The major contaminants were Cs-137 and/or uranium. These labs were decontaminated and re-surveyed until the radiation levels were below the release criteria for unrestricted use.

GA currently has no plans for conducting any future activities involving radioactive materials in these laboratories. (The offices across the hall from these laboratories have never been used for work involving radioactive materials). This report documents the results of extensive and comprehensive measurements completed in the Building 2 "Group 13" Laboratories to demonstrate that these laboratories meet the approved criteria for release to unrestricted use. Accordingly, GA is requesting that these laboratories and their associated offices be released to unrestricted use.

SITE DESCRIPTION

GA's Main Site and Sorrento Valley Site are shown in Figure 1. A layout of Building 2 (on GA's Main Site) and the "Group 13" laboratories are shown in Figure 2. The labs comprising "Group 13" are summarized below:

"Group 13" Labs					
Lab	ft²	m²			
218	~337	~31			
411	~448	~41			
413	~342	~32			
415	~343	~32			

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409, 411, 413, 415 mezzanine	~882	~82
619/621	~684	~64
619/621 mezzanine	~464	~43
Totals	~3471	~325

PREVIOUS ACTIVITIES (HISTORY OF USE) AND CLASSIFICATION

GA's Work Authorization logs were researched in order to review the previous activities conducted in each lab and to identify the potential radionuclides of concern. Labs 411 and 413 had a fairly extensive history of use of radioactive materials. Samples of concrete removed from the floor were analyzed by gamma ray spectroscopy and the radioactive isotope was determined to be uranium and Cs-137.

No records of authorized use of radioactive materials were found for Labs 218, 415, and 619/621; however, characterization surveys revealed several areas of contamination on the floor in each of these labs. Samples of the concrete were removed and analyzed by gamma ray spectroscopy and the radioactive isotope was determined to be Cs-137. The following is a brief summary of the activities performed in each lab and the classification of each lab based on its history.

LABS	History Summary of Group 13 Labs
218	No records of authorized use of radioactive materials were found for this lab. However, the characterization survey revealed several areas of contamination on the floor and along one wall. Gamma ray isotopic analysis determined that the radioactive contaminant was Cs-137.
411 and 413	Projects Performed: From 1974 through 1982, enriched uranium, thorium, natural uranium, depleted uranium, and mixed fission and mixed activation products were authorized to be used in these labs. Chemical and Spectro-Graphic analyses were performed on various types of nuclear fuels. Dissolution and radiochemistry was performed on samples. Also performed chemical and instrument analysis. These labs were also used to manufacture thermionics fuel for the Department of Energy in the 1980's. The fuel used ~20% enriched uranium.
415	No records of authorized use of radioactive materials were found for this lab. However, the characterization survey revealed several areas of contamination on the floor, a wall, and inside the floor drain. Gamma ray isotopic analysis determined that the radioactive contaminants in the drain line were Cs-137, Co-60, thorium, uranium, and enriched uranium.

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LABS	History Summary of Group 13 Labs
Mezzanine 409, 411, 413, and 415	No records of authorized use of radioactive materials were found for this mezzanine. No radioactive contaminations were detected during the Characterization or Final Surveys performed on the mezzanine.
619/621	No records of authorized use of radioactive materials were found for this lab. However, the characterization survey revealed several areas of contamination on the tile covering the floor. Gamma ray isotopic analysis determined that the radioactive isotope was Cs-137.
Mezzanine 619/621	No records of authorized use of radioactive materials were found for this mezzanine. No radioactive contaminations were detected during the Characterization or Final Surveys performed on the mezzanine.

Based on the history and the preliminary surveys, all of the labs were classified as Suspect Affected Areas. The two mezzanine areas were classified as Unaffected Areas.

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Facilities and Equipment

U.S. NRC's and State of California's criteria for releasing facilities and equipment to unrestricted use are shown in Tables 1 and 2, respectively. Based on the characterization surveys, the primary contaminants of concern are Cs-137, uranium (high enriched uranium, low enriched uranium, and depleted uranium) and thorium. The applicable guidelines for residual surface activity levels for these contaminants are:

<u>Uranium and Gamma/Beta Emitters (i.e., Cs-137)</u> 5,000 dpm α/100cm², averaged over a 1 m² area 15,000 dpm α/100cm², maximum in a 100 cm² area if the average over 1 m² is met. 1,000 dpm α/100cm², removable activity

Thorium

1,000 dpm/100cm², averaged over a 1 m² area 3,000 dpm/100cm², maximum in a 100 cm² area if the average over 1 m² is met 200 dpm/100cm², removable activity

As interpreted by the NRC, the average 1,000 dpm/100cm² and the maximum 3,000 dpm/100cm² should apply to both alpha and beta measurements, independently, for surface contamination involving natural thorium. ("Interpretation of Thorium Surface Decontamination Limits," U.S. Nuclear Regulatory Commission, February 9, 1992). Thorium emits alpha radiation and beta radiation in a 1:0.67 ratio; therefore, *if beta radiation measurements are used to demonstrate*

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compliance with the release criteria, the corresponding average and maximum beta activity guidelines are 670 dpm/100cm² and 2000 dpm/100cm², respectively.

Exposure Rate Guideline

The guideline value for exposure rates measured at 1 m above the surface, is 10 μ R/hr above background levels.

Soil Release Criteria

The soil release criteria, which also apply to concrete rubble, asphalt rubble and gravel, are provided below. The release criteria (which are concentrations above background levels) for radionuclides detected in the "Group 13" Labs are as follows:

Thorium (Th-228 and Th-232)	10 pCi/g
Enriched Uranium (U-234 and U-235)	30 pCi/g
Depleted Uranium	35 pCi/g
Cs-137	15 pCi/g
Co-60	8 pCi/g

(The U-235 concentrations determined by gamma spectroscopy will be used to ensure that concentrations of enriched uranium are below the given limit. The ratio of U-234 to U-235 is thirty to one (30:1) for these Labs.)

If more than one radionuclide is detected, the sum of the fractions of the concentrations, calculated as follows, must be less than or equal to one (1):

$$\sum_{i=1}^{n} \frac{C_i}{L_i} < 1$$

Where:

 $C_i = The average soil concentration of radionuclide i$ $L_i = The maximum soil limit for i (pCi/g).$

INSTRUMENTATION

Table 3 lists the instruments used during the radiological surveys. The table includes: (1) a description of the instrument, the model and serial numbers, (2) a description of the detector (If applicable) and its serial number, (3) instrument ranges, (4) calibration due dates and efficiencies and (5) typical background count rates. All instruments used were calibrated semiannually and after repair except for exposure rate meters which were calibrated quarterly.

BACKGROUND MEASUREMENTS

Instrument Background Measurements

Building 13 on GA's main site was used for conducting background measurements on most instruments used for the final survey because: (1) there is no history of use or storage of radioactive materials in Building 13, (2) the various surfaces found in the Group 13 labs could also be found in Building 13, and (3) the age of the building approximates the age of Building 2.

Background measurements are provided in Tables 3 and 4. The mean and standard deviation of measurements made for each surface surveyed with the 100 cm² beta detector, 50 cm² alpha detector and/or 15 cm² geiger counter were calculated using equations 8-11 and 8-12 from NUREG/CR-5849 as shown below:

Equation (8-11):
$$\bar{x} = \frac{1}{n_s} \sum_{i=1}^{n_s} x_i$$

Equation (8-12):
$$s_x = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n-1}}$$

Background measurements and minimum detectable activities (MDA's) for each type of surface and for various counting times are also provided in Table 4. Minimum detectable activities (MDA's) for each type of surface, were calculated using equation (5-2) from NUREG/CR-5849 as shown below:

Equation (5-2): $MDA = \frac{2.71 + 4.65\sqrt{B_R \times t}}{t \times E \times \frac{A}{100}} (dpm/100 cm^2)$

Where: B_R =background rate (cpm) t = count time (min) E = efficiencyA = area of the detector (cm²)

Background Soil Concentrations

Typical background concentrations in soil near the GA site have been measured by gamma spectroscopy (at the 95% confidence level) and are provided in Table 7 along with a description of the locations where these samples were taken.

Exposure Rate Background

Typical exposure rate background is about 15 µR/hr measured at 1 m from the surface. This value

can be measured south of Building 15 (an office building on the eastern portion of the GA site). Measurements taken offsite in 10 different locations over a period of a year also gave an average of about 15 μ R/hr measured at 1 m from the surface.

SURVEY PLANS

Survey plans which documented the types of surveys to be performed and the locations were developed based upon the physical characteristics of the labs, the radioactive material used, the potential for contamination, and the results of the characterization surveys. The physical characteristics of the labs include the consideration of vents, ducts, floor drains, whether surfaces are painted or unpainted, overhead structures, floor coverings, etc. Types of surveys performed include scanning, exposure rate measurements and survey measurements (wipes and fixed measurements). In areas where elevated readings were detected, additional surveys were taken.

The first surveys performed were surveys of the tile or floor covering. Contaminated tiles were found in Labs 218, 413, 415, and 619/621. The contaminated tiles were removed and disposed of as low level radioactive waste before the non-contaminated tiles were removed. The floor coverings in lab 411 and the mezzanines were not contaminated, i.e., radiation levels were at or near background levels. All floor coverings, mastic, and glue were removed before the final surveys were conducted.

RESULTS OF THE INITIAL SURVEYS

Scanning

Scan of Tile

In each area where tile was present, the tile was scanned for alpha and beta/gamma radiation over 100% of the surface using floor monitors having a 434 cm^2 gas-flow proportional detector. Some contaminated tiles were detected. The contaminated tiles were removed and disposed of as radioactive waste, the clean tiles were then removed prior to the final survey.

Initial Survey

After the tile was removed, 100% of the floors, 100% of the lower walls (below 2m), and 10% of the upper walls (above 2m) were scanned for beta/gamma radiations using floor monitors with 434 $\rm cm^2$ gas-flow proportional detectors whenever possible. The floors were also scanned 100% with an alpha 434 $\rm cm^2$ detector. In areas where the large area detectors could not be used, e.g., overhead structures, scanning was conducted using 15 $\rm cm^2$ GM pancake detectors, a 100 $\rm cm^2$ beta detector, and/or 50 $\rm cm^2$ alpha detectors. Initial scans in the labs showed elevated radiation levels on portions of the floors and on the lower walls, no radioactive contaminations was detected on the upper walls. The mezzanines were surveyed in the same manner and no contamination was detected.

DECONTAMINATION

Contamination was found on portions of the concrete floors and on the lower walls in labs 218, 413, 415, and 619/621 during scanning using the floor monitors. The maximum contamination level on the floor measured 14,000 cpm on the 434 cm² beta detector in lab 619. The maximum contamination level found on the walls (below 2m) measured 4,362 dpm/100 cm² on the 100 cm² beta detector in lab 415. Samples of contaminated concrete and drywall from the labs were collected and analyzed by gamma ray spectroscopy. The contaminants were identified as Cs-137and uranium. Decontamination was accomplished by use of a needle gun and a scabbler, and some of the contaminated concrete was removed by cutting it out with a saw. The contaminated wallboard was removed and disposed of as radioactive waste. No contamination was detected on the upper walls or on any of the overhead fixtures.

The floor drains in labs 411, 413, and 415 were found to be contaminated. The concrete floor was cut and removed and the drain line, which was immediately under the concrete, was removed and disposed of as radioactive waste. Soil samples were collected from the bottom of each trench. The soil sample results as shown in Table 6 were below the approved release criteria.

In order to decontaminate the floor in Lab 619/621 a small section of concrete was removed all the way to the soil. Soil samples were collected and the results, as shown in Table 6, were below the approved release criteria.

FINAL SURVEYS

Objectives and Responsibilities

The objectives of the final survey plans were: (1) to demonstrate that the average surface contamination levels for each survey unit were below the approved release criteria, (2) to show that the maximum residual activity did not exceed three times the approval release criteria for average surface contamination value in an area up to 100 cm^2 , (3) to demonstrate that the soil sample results were well below GA's approved release criteria for unrestricted use, (4) to show that the exposure rate measurements taken in these labs measured at 1 meter above the surface are less than 10μ R/hr above background.

Final Survey Plans

A Final Survey Plan which specified the types of surveys to be performed and the locations where surveys were to be performed was developed based upon the physical characteristics of the area, the radioactive materials used, and the potential for contamination. The plan followed the requirements stated in GA's approved Site Decommissioning Plan. The surveys completed include α , β , and γ scanning, collection and analyses (by gross alpha/beta counting) of smears, the taking of fixed α and β measurements on the floor and wall surfaces, exposure rate measurements (μ R/hr), and the sampling and isotopic analyses (by gamma spectroscopy) of soil exposed during drain line and contaminated concrete removal. A copy of the Final Survey Plan is provided in Appendix A.

Gridding

The floors in the labs were gridded into 1 m x 1 m grids in order to: (1) facilitate systematic selection of radiological measurement and soil sampling locations, (2) provide a means for referencing a measurement back to a specific location and (3) establish a uniform and distinct identification system. The X axis of the grid was delineated by numerical characters and the Y axis by alphabetical characters. This established unique grids of easily identifiable entities.

Documentation

Surveys were taken in accordance with an approved survey plan by qualified Health Physics Technicians having a minimum of three years health physics experience. Soil samples and wipes (100 cm²) were counted in GA's Health Physics Laboratory which maintains an effective QA program.

Every survey taken was documented on a daily basis to a worksheet/drawing showing the approximate locations surveyed/sampled. The figures provided in this report include the measurement locations (and, in some cases, the results of these measurements (including units), the technician's name, date(s) of the surveys, instrument(s) used (including the model and serial number of both the ratemeter and detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

Comparisons with Site Decommissioning Plan

Comparisons of the site Decommissioning Plan requirements with the Final Surveys performed in relation to the percentage of surface area scanned, number of fixed and removable measurements performed, exposure rate measurements (μ R/hr) and soil samples taken are provided as follows:

Comparisons of Site Decommissioning Plan (Site D-Plan) Requirements with the Final Surveys Performed in the Building 2 Group 13 Labs							
Suspect Affected Area	Scanning α, β on concrete	# of Measurements (fixed & wipes)	# of Exposure Rate Measurements (μR/hr) @ 1m above the surface	Soil Samples			
Site D-Plan	100% coverage floor and lower walls	30 minimum 1 per 4m ² or 1 every ~2m	1 per $4m^2$ or 1 every $\sim 2m$ or 1 every $\sim 3m^1$	Suspect affected areas. One every 5m			
Final Surveys Performed in Group 13 Labs	100% α on floor 100% β on floor 100% β on lower walls (<2m)	~ 200 total ~1 every 2m	1 every ~2m	3 per trench, 1 every 5m			

¹ If no gamma emitters are present.

RESULTS OF THE FINAL SURVEY

Final Survey Scans

For the final survey in Suspect Affected Areas, 100% of the floor was scanned with floor monitors for alpha and beta radiations. 100% of the lower walls (< 2m) were scanned for beta radiation. In areas where the floor monitors indicated elevated readings, the area was scanned with 100 cm² beta detectors or hand held GM detectors and/or a hand held 50 cm² alpha detectors. The results of the scans are provided in Table 5 and the locations are shown in the respective figures as noted on Table 5.

For the final survey in Unaffected Areas, 100% of the floor was scanned with floor monitors for beta radiation and 10% of the floor was scanned for alpha radiation. In addition, 100% of the lower walls (<2m) were scanned for beta radiation. In areas where the floor monitors indicated elevated readings, the area was scanned with 100 cm² beta detectors or hand held GM detectors and/or a hand held 50 cm² alpha detectors. The results of the scans are provided in Table 5 and the locations are shown in the respective figures as noted on Table 5.

Fixed Measurements

Fixed measurements were performed for beta radiation using a gas-flow proportional counter having a 100 cm^2 detector. The counting time for the beta fixed measurements was one (1) minute. Alpha fixed measurements were obtained using the 50 cm² alpha detector. The counting time for each alpha fixed measurements was ~30 seconds.

For all fixed measurements, an appropriate background was determined for each type of surface and subtracted from the survey readings. The readings were converted to dpm/100 cm² using the efficiency of the detector and the detector size. GA's intent was to demonstrate (with fixed measurements) that levels were below the release criteria for the isotopes identified in each lab.

The results of the fixed measurements in the Group 13 laboratories are summarized in Table 5 and the locations are shown in the respective figures as noted on Table 5. A total of 200 fixed measurements were taken, at ~ 1 every 2m. The results show that all radiation levels were well below the release criteria. The maximum activity detected after decontamination was 1766 dpm/100 cm² in lab 619/621 (the contaminant was identified as Cs-137, and the release criteria is 5000 dpm/100 cm²), all other measurements were less than the MDA for the material surveyed.

Removable Contamination Surveys

Removable contamination measurements (smears) were performed on all surfaces including the floors, walls, ducts, lights and support beams. Smear surveys consisted of using a Whatman Filter Paper (4.7 cm diameter) and wiping an area of ~100 cm². The smears were counted in GA's Health Physics Laboratory using a Canberra 2404 low level alpha/beta gas flow proportional counter.

A total of 209 smears were taken. The results of all removable contamination surveys are provided

in Table 5 and the approximate locations where the smears were taken are shown in the respective figures as noted on Table 5. Removable contamination levels were all below the release criteria. Alpha results were all <10 dpm/100 cm² and beta results were all ≤ 20 dpm/100 cm².

Paint samples were obtained from each of the walls in each room. Fixed beta measurements were taken at the sample locations before and after the sample were removed. The fixed beta measurements on the walls were all <MDA. All 37 paint samples were counted in the HP Lab for alpha and beta radiation, only three of the paint samples measured 275, 126, and 136 dpm/100 cm² beta from labs 218, 411, and 413 respectively. These elevated readings are below the release criteria for the isotopes identified; however, it was decided to obtain additional fixed beta measurements and paint samples during the Internal Confirmatory Survey. Those samples and measurements were all at or near background levels. See Appendix B for the results of those surveys.

Exposure Rate Measurements

Direct radiation exposure rate measurements using a microR meter were taken 1m from the surface in every room ~2m apart. A total of 135 measurements were taken. The radiation levels ranged from 8 to 17 μ R/hr, which are at or near normal background radiation levels.

Soil Sample Results

Soil sample results were collected from each lab where the concrete floor was removed during decontamination efforts or to gain access to the drain lines. All of the soil samples were processed and analyzed by gamma spectroscopy; the results were below the criteria for release to unconditional use. See Table 7 for the results.

INTERNAL CONFIRMATORY SURVEY

After completing its' final surveys, GA conducted an internal confirmatory survey of the "Group 13" labs. During the Internal Confirmatory Survey, elevated radiation measurements were detected on four (4) areas on the floor in Lab 415. These areas were decontaminated and subsequent surveys showed levels at or near background levels. In Labs 218, 411, and 413 additional paint samples and surveys were taken from the area where elevated paint sample results had been obtained during the Final Survey.

The results of subsequent surveys showed radiation levels at or near background levels. See Appendix B for detailed results.

CONCLUSION

The results of the final and confirmatory surveys provided in this report, demonstrate that the labs, designated as "Group 13", meet the NRC- and State- approved guidelines for release to unrestricted use.

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TABLES

Table 1: USNRC'S ACCEPTABLE SURFACE CONTAMINATION LEVELS 1						
Nuclides	Average ^{bal} (dpm/100cm ²)	Maximum ^{b,d,f} (dpm/100cm ²⁾	Removable ^{b,e,f} (dpm/100cm ²⁾			
U-nat, ²³⁵ U, ²³⁸ U, & associated decay products	5,000 α	15,000 α	1,000 œ			
Transuranics, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ L	100	300	20			
Th-nat. 232 Th. 90 Sr. 223 Ra. 224 Ra. 232 U. 126 I. 133 I. 131 I	1,000	3,000	200			
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and other noted above.	5,000	15,000	1,000			

a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors

associated with the instrumentation.

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

d The maximum contamination level applies to an area of not more than 100 cm².

e The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.

f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mRad/hr at 1 cm and 1.0 mRad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material, USNRC, July 1982, incorporated into GA's SNM 696 license.

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Building 2 Group 13

Table 2: STATE OF CA ACCEPTABLE SURFACE CONTAMINATION LEVELS 1						
Nüclides	Average ^{b.f} (dpm/100cm ²)	Maximum ^{bd.f} (dpm/100cm ²⁾	Removable ^{b.e.f} (dpm/100cm ²⁾			
U-nat, ²³⁵ U, ²³⁸ U, & associated decay products	5,000	15,000	1,000			
Transuranics, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I	100	300	20			
Th-nat, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³³ I, ¹³¹ I	1,000	3,000	200			
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and other noted above	5,000	15,000	1,000			
	11.4.4	:	with antablished for			

a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors associated with the instrumentation.

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

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

e The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.

- f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mRad/hr at 1 cm and 1.0 mRad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.
- Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material, also known as "Decon-1" incorporated into GA's State of CA Radioactive Materials License.

TABLE 3: LIST OF INSTRUMENTS						
Instrument	Detector	Range (cpm)	Calibration Due Date	Efficiency	Background	Description
Ludlum Model 2221 S/N 97287	Ludlum Model 43-37 gas proportional (434 cm ²) Alpha detector S/N 148926	Four Linear Ranges 0-500,000 & one Log 50-500,000	9-13-00 5-10-00	21.25% 21.36%	Varies according to surface being scanned See Table 4	Active Probe Area = 434 cm^2 . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 2221 S/N 86302	Ludlum Model 43-37 gas proportional (434 cm ²) Beta detector S/N 086215	Four Linear Ranges 0-500,000 & one Log 50-500,000	10-23-00 7-17-00	21.96% 21.92%	Varies according to surface being scanned See Table 4	Active Probe Area = 434 cm^2 . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 2221 S/N 84459	Ludlum Model 43-37 gas proportional (434 cm ²) Beta detector S/N 086213	Four Linear Ranges 0-500,000 & one Log 50-500,000	10-30-00 9-12-00 9-31-00	21.45% 21.42% 21.42%	Varies according to surface being scanned See Table 4	Active Probe Area = 434 cm^2 . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 2221 S/N 154202	Ludlum Model 43-37 gas proportional (434 cm ²) Beta detector S/N 149071	Four Linear Ranges 0-500,000 & one Log 50-500,000	10-17-00	22.79	Varies according to surface being scanned See Table 4	Active Probe Area = 434 cm^2 . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 2221 S/N 84734	Ludlum Model 43-37 gas proportional (434 cm ²) Beta detector S/N 147965	Four Linear Ranges 0-500,000 & one Log 50-500,000	01-25-01	22.33	Varies according to surface being scanned See Table 4	Active Probe Area = 434 cm^2 . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.

rable 3: list of instruments						
Instrument	Detector	Range (cpm)	Calibration Due Date	Efficiency	Background	Description
Ludlum Model 2221 S/N 148436	Ludlum Model 43-68 100 cm ² proportional Beta detector S/N 120477	Four Linear Ranges 0-500,000 & one Log 50-500,000	12-7-00 7-10-00	27.40% 26.27%	Varies according to surface being scanned See Table 4	100 cm ² gas flow proportional counter.
Ludlum Model 19 Micro-R Meter S/N 123930	RCA 6199 coupled to a Nal (Tl) Scintillator	Five Ranges 0-5 mR/hr	4-11-00	N/A	10-18 µR/hr	1 inch x 1 inch NaI (TI) scintillator is mounted internally. Used for initial survey on ground floor and for measuring external dose rates on the surface and at one meter.
Ludlum Model 19 Micro-R Meter S/N 144068	RCA 6199 coupled to a NaI (Tl) Scintillator	Five Ranges 0-5 mR/hr	7-3-00	N/A	10-18 µR/hr	1 inch x 1 inch NaI (Tl) scintillator is mounted internally. Used for initial survey on ground floor and for measuring external dose rates on the surface and at one meter.
Ludlum Model 12 S/N 73924	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag) S/n 120477	Four Ranges 0 - 500,000	12-07-00	26.27%	0 - 20	Active Probe Area = 50 cm ²
Ludlum Model 12 S/N 91103	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag) S/N 92192	Four Ranges 0 - 500,000	10-12-00	21.58%	0 - 20	Active Probe Area = 50 cm ²
Ludlum Model 3 S/N 15055	Ludlum Model 44-9 15 cm ² Beta/Gamma S/N 076109	Four Ranges 0-100,000	11-22-00 5-29-00	24.23% 24.23%	60-80 (metal)	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm ² .
Ludlum Model 3 S/N 143349	Ludlum Model 44-9 15 cm ² Beta/Gamma S/N 145967	Four Ranges 0-100,000	11-23-00	20.26%	80-120	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm ² .
Ludlum Model 3 S/N 131601	Ludium Model 44-62 0.5" x 0.5" NaI(Tl) S/N 158626	Four Ranges 0-2,500 µR/hr	7-13-00	N/A	7 - 9 µR/hr (encased steel pipe)	An external 0.5 inch x 0.5 inch NaI (Tl) scintillator probe attached to a Ludlum 3 rate meter. Used for the surveying of pipes, ie. drain lines.

TABLE 3: LI	ST OF INSTRUME	INTS				
Instrument	Detector	Range (cpm)	Calibration Due Date	Efficiency	Background	Description
Canberra Low Level α/β Counter Model 2404	Gas Flow Proportional Detector	N/A	As needed	~26-30%	Varies	Canberra Model 2404 Low Level α/β gas proportional counting system used to count wipes for removable contamination. Results are usually reported as dpm/100 cm ² .
Canberra Gamma Spectroscopy System	High Purity Germanium Detector	N/A	As needed	Varies with Sample	Varies with Sample	Gamma Spectroscopy MCA system using a high purity Germanium detector.

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	Table 4: Background Measurements	
Ludlum Model 2221 R 100	ate Mater S/N 148436 with Model 43-68 cm ² Beta Detector (Efficiency = 25.04%	i Probe S/N 120477)
Background Material	Average of 10 Measurements 1 minute each (cpm ± 2 ^o)	MDA (dpm/100 cm ²)
Concrete	554 ± 56	443
Cement Block	437 ± 36	399
Drywall	273 ± 40	318
	Efficiency = 27.06%	
Metal Grating	406 ± 56	357
	Efficiency = 26.27%	
Stucco/Plaster	304 ± 36	319
Ludiun Model 2221 1 Alpha Floor Monitor Bac	Rate Meter S/N 97287 with Model 43-37 kground Scan Results: 434 cm ² Detector	Probe S/N 148926 (Efficiency = 21.36%)
Background Surface Material	Alpha Scan Rai	nge (cpm)
Concrete	0-20	
Metal	0-20	
Cement Block	0-20	
Ludlum Model 2221 Beta Floor Monitor Bacl	Rate Meter S/N 86302 with Model 43-37 ground Scan Results: 434 cm ² detector	Probe S/N 086215 (Effifiency = 22.84%)
Background Surface Material	Beta/Gamma Scan	Range (cpm)
Cement Block	1253 -15	38
Metal	853 - 11	85
Wood	915 - 12	44
Drywall	693 - 95	51
Plaster	838 - 11	93
	Efficiency = 21.85 %	
Concrete	1478 - 17	65
	Efficiency = 21.92 %	
Glass	856 - 10	09

Table: 4-E	Background Measurements
Ludium Model 2221 Rate Met Beta Floor Monitor Background	er S/N 84459 with Model 43-37 Probe S/N 086213 Scan Results: 434 cm² detector (Effifiency =21.14%)
Background Surface Material	Beat/Gamma Scan Range (cpm)
Concrete	1858 - 2036
Cement Block	1174 - 1409
Metal	816 - 1047
Drywall	770 - 937
	Efficiency = 21.27%
Wood	1061-1262
	Efficiency = 21.42%
Stucco/Plaster	1083 - 1250
Ludium Model 2221 Rate Met Beta Floor Monitor Background Background Surface Material	er S/N 154202 with Model 43-37 Probe S/N 149017 <u>Scan Results: 434 cm² detector (Efficiency = 22.84 %)</u> Beta/Gamma Scan Range (cpm)
Cement Block	1567-1719
Concrete	1600-1995
	Efficiency = 22.79%
Wood	945-1086
Glass	806-952
Metal	697-806
Stucco/Plaster	1136-1303
Ludlum Model 2221 Rate Ma Beta Floor Monitor Background	iter S/N 84734 with Model 43-37 Probe S/N 149701 Sean Results: 434 cm ² detector (Efficiency = 22.00%)
Background Surface Material	Beta/Gamma Scan Range (cpm)
Concrete	1881-2079

Table 5:	Table 5: Results of Final Surveys in Building 2 Group 13 Labs													
Figure	Location	# of Fixed β Measurements	Maximum β Result	Scan Results 434cm² β	Scan Results	#of	Maximun (dpm/10	Maximum Results # o (dpm/100 cm ²) Expo		Exposure Rate Range				
#		(100 cm ² detector)	(dpm/100cm*)	(cpm range)	434cm a (cpm range)	Smears	C.	β	Measurement S	(µюл)				
Suspect Affected Areas														
3, 4, 5	Lab 218 Floor	9	<mda 443 (concrete)</mda 	1500-1900 (concrete)	4-24	8	<10	14	12	15-17				
3, 4	Lab 218 Walls	7	<mda 399 (cement block) 318 (drywall) 319 (plaster)</mda 	800-1200 (drywall) 1100-1400 (plaster) 1400-1800 (cement block)		8	<10	<10	-					
6	Lab 218 Overhead Fixtures			60-80 cpm (w/ 15 cm ² probe)		19	<10	17						
7, 8, 9	Lab 411 Floor	8	<mda 443 (concrete)</mda 	1300-1600 (concrete)	0-20	8	<10	<10	16	12-14				
7, 8	Lab 411Walls	8	< MDA 399 (cement block) 318 (drywall) 319 (plaster)	1000-1400 (cement block) 800-1000 (drywall) 900-1200 (plaster)		8	<10	<10	_	_				
10	Lab 411 Overhead Fixtures			30-60 cpm (w/ 15 cm ² probe)		10	<10	<10						
11	Lab 411 Drain Line Trench								3	14-15				
12, 13, 14	Lab 413 Floor	9	<mda 443 (concrete)</mda 	1400-2000 (concrete)	0-80	8	<10	<10	11	13-15				

Table 5:	Table 5: Results of Final Surveys in Building 2 Group 13 Labs													
Figure	Location	# of Fixed β Measurements	Fixed β urements Maximum β Result 434cm ² β Results $\beta = 10^{-2}$		Maximum Results # of (dpm/100 cm ²)			# of Exposure	Exposure Rate Range					
#		detector)	(opm/luucm ⁻)	(cpm range)	434cm ⁻ α (cpm range)	Smears	α	β	Kate Measurement s	(µrom)				
12, 13	Lab 413 Walls	8	< MDA 399 (cement block) 318 (drywall) 319 (plaster)	800-1500		8	<10	<10		-				
15	Lab 413 Overhead Fixtures			40-80 (w/ 15 cm ² probe)		10	<10	10						
16	Lab 413 Drain Line Trench								3	13-14				
17, 18, 19	Lab 415 Floor	8	< MDA 443 (concrete)	1300-2100 (concrete)	0-20	8	<10	<10	11	13-16				
17, 18	Lab 415 Walls	9	449	800-1100 (drywall) 900-1100 (plaster) 1100-1900 * (cement block)	0-80	8	<10	<10	-	-				
20	Lab 415 Overhead Fixtures			30 - 80 (w/ 15 cm ² probe)		10	<10	14						
21	Lab 413 Drain Line Trench								3	14-15				
* Two small ar fixed beta read	eas on the east wall, one ~ ings taken in these areas ha	300 cm ² and one <100 ave a maximum result) cm ² , are above the aler of 449 dpm/100 cm ² .	t level of 1700 cpm for ceme	nt block (for thi	s instrument).	The rest of th	e wall is 110	0-1600 cpm. Two	additional				
22, 23, 24	Lab 619/621 Floor	16	1766 (Cs-137)	1600-2600*	0-70	10	<10	17	25	13-16				
22, 23	Lab 619/621 Walls	4	<mda 399 (cement block) 319 (plaster)</mda 	810-1700		10	<10	<10						

Table 5: Results of Final Surveys in Building 2 Group 13 Labs												
Figure	Location	# of Fixed β Measurements	Maximum β Result	Scan Results 434cm ² β	Scan Results	# of	Maximun (dpm/10	1 Results 0 cm²)	# of Exposure	Exposure Rate Range		
#		(100 cm ² detector)	(dpm/100cm ²)	(cpm range)	434cm ⁴ α (cpm range)	Smears	α	β	Measurement S			
25	Lab 619/621 Overhead Fixtures			60-80 (w/ 15 cm ² probe)		10	<10	<10				
	Lab 619/621 Drain Line in Wall			60-80 (w/ 15 cm ² probe)		1	<10	<10		10-12		
* Six areas of contamination	* Six areas of the floor have elevated Beta scans. One minute fixed Beta measurements in these areas showed a maximum result of 1766 dpm/100 cm ² , well below the average limit for Cs-137 contamination of 5000 dpm/100 cm ² .											
				Unaffected Areas					T			
27, 28, 29,	Labs 409-415 Mezzanine Floors	5	285	600-1000	0-20	11	<10	10	34	8-12		
27, 28	Labs 409-415 Mezzanine Walls	17	< MDA 399 (cement block) 318 (drywall) 319 (plaster)	600-1600		12	<10	<10				
30	Labs 409-415 Mezzanine Overhead Fixtures			60-80cpm (w/ 15 cm ² probe)		13	<10	<10				
27, 29	Labs 409-415 Mezzanine Stairs			900-1400	60-70				4	10-11		
31, 32, 33	Lab 619/621 Mezzanine Floor	16	<mda 443 (concrete)</mda 	836-1130	0-22	8	<10	<10	13	10-12		
31, 32	Lab 619/621 Mezzanine Walls	4	<mda 399 (cement block) 318 (drywall) 319 (plaster)</mda 	830-1440		8	<10	<10	_	_		

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Table 5:	Fable 5: Results of Final Surveys in Building 2 Group 13 Labs													
Figure	Location	# of Fixed β Measurements	Maximum β Result	Scan Results 434cm ² β	Scan Results	# of	Maximum Results (dpm/100 cm ²)		# of Exposure	Exposure Rate Range				
# .		(100 cm ² detector)	(dpm/100cm ²)	(cpm range)	434cm [*] α (cpm range)	Smears	α	β	Measurement S	(brow)				
34	Lab 619/621 Mezzanine Overhead Fixtures			60-80 (w/ 15 cm ² probe)		10	<10	<10						
35	Lab 619/621 and Mezzanine Vents			280-420 (w/ 100 cm ² probe)		6	<10	<10						

TABLE 6: BUILDING 2 GROUP 13 - PAINT SAMPLE RESULTS											
			Fixed Beta M	leasurements	HP Lab Counting Room Results						
Figure Location	Location	# of Fixed β Measurements	Maximun (dpm/1	n þ Result 00 cm²)	# of	Maximum Results (clpm/100 cm ²)					
			Before removal	After removal	Samples	α	β				
5	Lab 218 Walls	8	<mda< td=""><td><mda< td=""><td>4</td><td><10</td><td>275</td></mda<></td></mda<>	<mda< td=""><td>4</td><td><10</td><td>275</td></mda<>	4	<10	275				
9	Lab 411 Walls	8	< MDA	< MDA	4	42	126				
14	Lab 413 Walls	8	< MDA	< MDA	4	13	136				
19	Lab 415 Walls	8	< MDA	< MDA	4	<10	22				
29	Labs 409-415 Mezzanine Walls	28	< MDA	< MDA	14	10	38				
24	Lab 619/621 Walls	8	<mda< td=""><td><mda< td=""><td>4</td><td>3</td><td>42</td></mda<></td></mda<>	<mda< td=""><td>4</td><td>3</td><td>42</td></mda<>	4	3	42				
33	Lab 619/621 Mezzanine Walls	6	<mda< td=""><td><mda< td=""><td>3</td><td><10</td><td>49</td></mda<></td></mda<>	<mda< td=""><td>3</td><td><10</td><td>49</td></mda<>	3	<10	49				
ME	A's: cement block 399 dpm	/100 cm ² ; drywall 318 dpr	m/100 cm ² ; plaster 3	19 dpm/100 cm ²							

Building 2 Group 13

TABLE 7: GAMMA SPECTROSCOPY RESULTS OF SOIL SAMPLES FROM LABS 411, 413, 415, and 619													
Radionuclide Co	Radionuclide Concentration (pCi/gm) - Results ± 20 - Background not Subtracted - 30 minute counts												
Sample ID	Figure No.	¹³⁷ Cs 662 kev peak	⁶⁰ Co Ave.of 1173/1332 peaks	²²⁸ Th Ave. of 238/583 kev peaks	²²⁸ Ra (²³² Th) Ave. 338/911 keV peaks	Total Thorium ²²⁸ Th+ ²³² Th	²³⁸ U 92.77 keV peak	²³⁵ U 186(144) keV peak	Sum of Fractions*	Evaluation and Comments			
B2 Lab 411 S1	11	ND	ND	0.65 ± 0.09	1.17 ± 0.39	1.81	1.04 ± 0.50	0.10 ± 0.06	0.32	Below Release Criteria			
B2 Lab 411 S2	11	0.11 ± 0.05	ND	0.69 ± 0.08	1.03 ± 0.25	1.72	1.46 ± 0.53	0.11 ± 0.05	0.33	Below Release Criteria			
B2 Lab 411 S3	11	ND	ND	0.59 ± 0.12	1.07 ± 0.38	1.65	1.32 ± 0.73	0.13 ± 0.07	0.34	Below Release Criteria			
B2 Lab 413 S1	16	ND	ND	0.59 ± 0.26	1.28 ± 0.36	1.87	1.04 ± 0.67	0.13 ± 0.08	0.35	Below Release Criteria			
B2 Lab 413 S2	16	ND	ND	0.63 ± 0.09	1.10 ± 0.24	1.72	2.13 ± 0.63	0.16 ± 0.06	0.40	Below Release Criteria			
B2 Lab 413 S3	16	ND	ND	0.60 ± 0.10	1.10 ± 0.35	1.70	1.33 ± 0.61	0.26 ± 0.08	0.47	Below Release Criteria			
B2 Lab 415 S1	21	ND	ND	0.60 ± 0.10	1.63 ± 0.35	2.23	1.20 ± 0.66	0.07 ± 0.07	0.33	Below Release Criteria			
B2 Lab 415 S2	21	ND	ND	0.70 ± 0.09	0.62 ± 0.13	1.32	1.93 ± 0.61	0.16 ± 0.07	0.36	Below Release Criteria			
B2 Lab 415	21	ND	ND	0.66 ± 0.10	1.41 ± 0.39	2.08	1.06 ± 0.64	0.14 ± 0.08	0.38	Below Release Criteria			
Lab 619 #1	26	ND	ND	1.44 ± 0.08	1.79 ± 0.29	2.93	2.37 ± 0.54	0.19 ± 0.05	0.56	Below Release Criteria			
Lab 619 #2	26	ND	ND	0.97 ± 0.08	1.54 ± 0.25	2.50	2.56 ± 0.50	0.16 ±0.05	0.50	Below Release Criteria			

* Without background subtraction

Building 2 Group 13

TABLE 8: Background Soil (Surface) Samples Samples Collected 06/05/00 & 06/06/00 By Ed Rudgers Samples Counted for this report 7/20/00 - 7/24/00												
Radionuclide Concentration = pCi/g 30 Minute Count Time												
Sample ID	¹³⁷ Cs 662 keV	⁶⁰ Co Ave. of 1173/ 1332 keV	²²⁸ Th Ave. of 238/583 keV	²²⁸ Ra (²³² Th) Ave. of 338/911 keV	Total Thorium ²²⁸ Th + ²³² Th keV	²³⁸ U 92.77 keV	²³⁵ U 186(144) keV					
X 1	ND	ND	0.48 ± 0.09	0.89 ± 0.27	1.37	1.89 ± 0.57	0.13 ± 0.06					
X2	ND	ND	0.67 ± 0.12	1.50 ± 0.40	2.17	1.07 ± 0.58	0.13 ± 0.08					
X3	0.06 ± 0.04	ND	1.01 ± 0.10	1.51 ± 0.29	2.52	1.86 ± 0.29	0.23 ± 0.09					
X4	ND	ND	1.19 ± 0.23	3.04 ± 0.84	4.24	2.48 ± 1.48	0.28 ± 0.17					
X5	ND	ND	1.40 ± 0.19	2.43 ± 0.68	3.83	4.49 ± 1.64	0.32 ± 016					
X6	ND	ND	0.66 ± 0.10	1.00 ± 0.30	1.66	1.91 ± 0.65	0.14 ± 0.08					
X7	0.13 ± 0.07	ND	1.19 ± 0.14	2.27 ± 0.56	3.46	3.38 ± 1.08	0.18 ± 0.10					
X8	ND	ND	0.98 ± 0.12	1.48 ± 0.35	2.46	2.34 ± 0.95	0.14 ± 0.09					
X9	0.09 ± 0.08	ND	0.65 ± 0. 11	1.09 ± 0.43	1.74	1.16 ± 0.68	0.10 ± 0.08					
X10	ND	ND	0.87 ± 0.12	1.36 ± 0.39	2.22	1.97 ± 0.66	0.16 ± 0.08					
AVE.	0.09 ± 0.06	ND	0.91 ± 0.13	1.66 ± 0.45	2.57	2.26 ± 0.83	0.18 ± 0.10					

ND = Not Detected.

Sample Locations

- X1 Sorrento Valley Road near sample location ST65 on the hillside ~1 mile from Building 37.
- X2 Sorrento Valley Road near Carmel Mountain Road junction on steep cliff.
- X3 Sorrento Valley Road in Los Penasquitos Preserve ~2 miles from Building 37.
- X4 Sorrento Valley Court at end of the road in the field.
- X5 Roselle Street, East of sample location ST64 from the hillside $\sim \frac{1}{2}$ mile from Building 37.
- X6 Roselle Street, East of sample location ST64 from the hillside ~1 ½ mile from Building 37.
- X7 Lusk Boulevard, from the hillside $\sim 1 \frac{1}{2}$ miles from Building 37.
- X8 Vista Sorrento Parkway, from the hillside $\sim \frac{1}{2}$ mile from Building 37.
- X9 Callahan Road, from the hillside $\sim \frac{1}{2}$ mile from Building 37.
- X10 Eastgate Mall road, from field ~3 miles from Building 37.

FIGURES

Figure 1: Main Site and Sorrento Valley Site



Figure 2: Building 2 Laboratory







Figure 3 : Lab 218- Alpha Scans of Floor and Beta Scans of Floor and Walls

Surveys Conducted By: M. Dupray & R. Stowell Date: 03/09-10/00

Notes:

- 1. Survey results are provided in Table 5. Results are in cpm.
- 2. ~100% of the Floor was scanned for Alpha.
- 3. ~100% of the Floor and Walls (below 2m) and 10% of walls (above 2m) were scanned for Beta.



Figure 4: Lab 218 - Locations and Results of Fixed Beta Measurements and Locations of Removable Contamination Wipes

Surveys Conducted By: M Dupray & R. Stowell Date: 03/09-10/00

Notes:

- 1. Survey results are provided in Table 5.
- 2. The values are dpm/100 cm² and indicate the approximate locations of the measurements taken.
- 3. One minute fixed Beta readings were taken.
- 4. The Numbers circled are the approximate locations of wipes taken.


Figure 5: Lab 218 - Exposure Rate Measurements and Paint Sample Locations

Notes:

Survey Conducted By: M. Dupray & R Stowell Date: 03/10/00 & 03/13/00

- 1. Survey results are provided in Table 5.
- 2. The values are μ R/hr and indicate the approximate locations of the Exposure Rate Measurements taken ~1m above floor surface.
- 3. The diamonds indicate the approximate paint sample locations. $\sqrt{1}$
- One minute fixed Beta measurements (dpm/100 cm²) taken at each paint sample location are before paint removal. after paint removal



- 1. Survey results are provided in Table 5.
- 2. Scan results shown in cross hatched areas. Results are in cpm.
- 3. Numbers circled are the approximate locations of wipes taken.
- 4. Upper wall (>2m) not to scale.



Figure 7: Lab 411- Alpha Scans of Floor and Beta Scans of Floor and Walls

- 1. Survey results are provided in Table 5. Results are in cpm.
- 2. ~100% of the Floor was scanned for Alpha.
- 3. ~100% of the Floor and Walls (below 2m) and 10% of walls (above 2m) were scanned for Beta.



Figure 8: Lab 411 - Locations and Results of Fixed Beta Measurements and Locations of Removable Contamination Wipes

- 1. Survey results are provided in Table 5.
- 2. The values are dpm/100 cm² and indicate the approximate locations of the measurements taken.
- 3. One minute fixed Beta readings were taken.
- 4. The Numbers circled are the approximate locations of wipes taken.



Figure 9: Lab 411 - Exposure Rate Measurements and Paint Sample Locations

10100.

- 1. Survey results are provided in Table 5.
- 2. The values are μ R/hr and indicate the approximate locations of the Exposure Rate Measurements taken ~1m above floor surface.
- 3. The diamonds indicate the approximate paint sample locations. $\langle 1 \rangle$
- One minute fixed Beta measurements (dpm/100 cm²) taken at each paint sample location are before paint removal .
 after paint removal





- 1. Survey results are provided in Table 5.
- 2. Scan results shown in cross hatched areas. Results are in cpm.
- 3. Numbers circled are the approximate locations of wipes taken.



Figure 11: Lab 411- Soil Samples

- 1. Sample results are provided in Table 6.
- 2. Drain line removed and soil samples collected.
- 3. Values are μ R/hr, $\underline{xx} = \underline{@1m}$. xx contact



Figure 12: Lab 413- Alpha Scans of Floor and Beta Scans of Floor and Walls



INSTRU	JMENT
MODEL	Ludium 2221 a
SN	97287
PROBE	148926
PROBE MODEL	43-37
CAL DUE	09/13/00
EFF	21.25%
BKGD(concrete)	0-20 cpm

INSTRU	JMENT
MODEL	Ludium 2221 B
SN	84459
PROBE	086213
PROBE MODEL	43-37
CAL DUE	09-12-00
EFF	21.42%
BKGD (metat)	816-1047 cpm
BKGD (drywall)	770-937 cpm
BKGD plaster)	1083-1250cpm
BKGD (cmt blk)	1174-1409 cpm
BKGD (concrete)	1858-2036 cpm

Surveys Conducted By: R. Stowell Dates: 03/21-28/00 & 07/10/00

- 1. Survey results are provided in Table 5. Results are in cpm.
- 2. ~100% of the Floor was scanned for Alpha.
- 3. ~100% of the Floor and Walls (below 2m) and 10% of walls (above 2m) were scanned for Beta.



N W S

INSTR	UMENT	
MODEL	Ludium 2221 B	
SN	148436	
PROBE	120477	
PROBE MODEL	43-68	
GAL DUE	07/10/00	
EFF	26.27%	
BKGD (concrete)	554 cpm	
BKGD (drywall)	273 cpm	
BKGD (cmt blk)	437 cpm	
BKGD (plaster)	304 cpm	

Survey Conducted By: R. Stowell Date: 03/22/00 & 07/07/00

Notes:

- 1. Survey results are provided in Table 5.
- 2. The values are dpm/100 cm² and indicate the approximate locations of the measurements taken.
- 3. One minute fixed Beta readings were taken.
- 4. The Numbers circled are the approximate locations of wipes taken.

Figure 13: Lab 413 - Locations and Results of Fixed Beta Measurements and Locations of Removable Contamination Wipes





INSTRU	MENT
MODEL	Ludium 19 y
SN	123930
PROBE	NA
PROBE MODEL	NA
CAL DUE	04/11/00
EFF	NA
BKGD	10-18 µR/hr

INSTR	UMENT
MODEL	Ludium 2221 ß
SN	148436
PAOBE	120477
PROBE MODEL	43-68
CAL DUE	07/10/00
EFF	26.27
BKGD(cmt blk)	437 cpm
BKGO (plaster)	304 cpm
BKGD (drywall)	273 cpm

Surveys Conducted By: R.Stowell Date: 03/23/00

Notes:

- 1. Survey results are provided in Table 5.
- 2. The values are μ R/hr and indicate the approximate locations of the Exposure Rate Measurements taken ~1m above floor surface.
- 3. The diamonds indicate the approximate paint sample locations. $\langle 1 \rangle$
- One minute fixed Beta measurements (dpm/100 cm²) taken at each paint sample location are before paint removal .
 after paint removal

Figure 14: Lab 413 - Exposure Rate Measurements and Paint Sample Locations



Figure 15: Lab 413- Overhead Fixtures

- 1. Survey results are provided in Table 5.
- 2. Scan results shown in cross hatched areas. Results are in cpm.
- 3. Numbers circled are the approximate locations of wipes taken.



Figure 16: Lab 413- Soil Samples

:sətoN

- 1. Sample results are provided in Table 6.
- 2. Drain line removed and soil samples collected.
- 3. Values are µR/hr, <u>xx</u> = @ 1m. . xx contact

Figure 17: Lab 415- Alpha Scans of Floor and East Wall and Beta Scans of Floor and Walls



- Survey results are provided in Table 5. Results are in cpm.
- ~100% of the Floor and ~ $6m^2$ of the East Wall was scanned for Alpha. e,
- ~100% of the Floor and Walls (below 2m) and 10% of walls (above 2m) were scanned for Beta. ŝ



Figure 18: Lab 415 - Locations and Results of Fixed Beta Measurements and Locations of Removable Contamination Wipes

- 1. Survey results are provided in Table 5.
- 2. The values are dpm/100 cm² and indicate the approximate locations of the measurements taken.
- 3. One minute fixed Beta readings were taken.
- 4. The Numbers circled are the approximate locations of wipes taken.



Figure 19: Lab 415 - Exposure Rate Measurements and Paint Sample Locations



INSTR	UMENT
MODEL	Ludium 19 y
SN	123930
PROBE	NA
PROBE MODEL	NA
CAL DUE	04/11/00
EFF	NA
BKGD	10-18 uB/hr

MODEL	Ludium 2221 β
SN	148436
PROBE	120477
PROBE MODEL	43-68
CAL DUE	07/10/00
EFF	26.27
BKGD (cmt blk)	437 cpm
BKGD (plaster)	304 cpm
BKGD (drywall)	273 cpm

Surveys Conducted By: R.Stowell Date: 03/24-29/00

- 1. Survey results are provided in Table 5.
- 2. The values are μ R/hr and indicate the approximate locations of the Exposure Rate Measurements taken ~1m above floor surface.
- 3. The diamonds indicate the approximate paint sample locations. $\langle 1 \rangle$
- 4. One minute fixed Beta measurements (dpm/100 cm²)taken at each paint sample location are <u>before paint removal</u>. after paint removal



Ludium 3 B/y SN 15055 PROBE 076109 PROBE MODEL CAL DUE 44-9 05/29/00 EFF 24.23% BKGD (metal) 60-80 cpm

MODEL

INSTRUMENT

Survey Conducted By : R.Stowell Date: 03/28/00

- 1. Survey results are provided in Table 5.
- 2. Scan results shown in cross hatched areas. Results are in cpm.
- 3. Numbers circled are the approximate locations of wipes taken.











INSTRI	JMENT
MODEL	Ludium 19 y
SN	123930
PROBE	NA
PROBE MODEL	NA
CAL DUE	07/13/00
EFF	NA
BKGD	10-18 μ R/hr

Survey Conducted By: R. Stowell Date: 06/21/00

- 1. Sample results are provided in Table 6.
- 2. Drain line removed and soil samples collected.
- 3. Values are μ R/hr, $\underline{xx} = \underline{@1m}$. xx contact



Figure 22: Labs 619/621- Alpha Scans of Floor and Beta Scans of Floor and Walls

2. ~100% of the Floor was scanned for Alpha.

Notes:

1.

3. ~100% of the Floor and Walls (below 2m) and 10% of walls (above 2m) were scanned for Beta.

4. Values in shaded (elevated) areas on the Floor are maximum Beta results.



Measurements and Locations of Removable Contamination Wipes Figure 23: Labs 619/621- Locations and Results of Fixed Beta

Notes:

1. Survey results are provided in Table 5.

2. The values are dpm/100 cm² and indicate the approximate locations of the measurements taken.

3. One minute fixed Beta readings were taken. Values in shaded areas on the Floor are maximum Beta result for that area.

4. The Numbers circled are the approximate locations of wipes taken.



2. The values are µR/hr and indicate the approximate locations of the Exposure Rate taken ~1m above floor surface.

3. The diamonds indicate the approximate paint sample locations. $\langle 1 \rangle$

4. One minute fixed Beta measurements (dpm/100 cm²) taken at each paint sample location are <u>before paint removal</u> . after paint removal

Figure 24: Labs 619/621 - Exposure Rate Measurements and Paint Sample Locations





<u>səlon</u>:

Survey results are provided in Table 5.

2. ~25% of cross hatched area scanned. Results are in cpm.

3. Numbers circled are the approximate locations of wipes taken.



Figure 26: Labs 619/621- Soil Samples

- 1. Soil sample results are provided in Table 6.
- 2. Shaded circles are approximate soil sample locations.
- 3. $\frac{XX}{XX} = \frac{contact}{@ 1m}$ exposure rate measurements at sample location.



2.

3.

Surveys Conducted By: R. Stowell & M Dupray Dates: 03/17-31/00

838-1193 cpm

BKGD (plaster)

Figure 27: Lab 409-415 Mezzanine T Alpha Scans of Floor and



- The values are dpm/100 cm² and indicate the approximate locations of the measurements taken. 2.
- 3. One minute fixed Beta readings were taken.
- 4. The Numbers circled are the approximate locations of wipes taken.

Surveys Conducted By: M Dupray Date: 03/30-31/00



after

4. One minute fixed Beta measurements taken at each sample location are before dpm/100 cm².

Surveys Conducted By: M. Dupray & R. Stowell Date: 03/30-31/00

Figure 30: Lab 409-415 Mezzanine Overhead Fixtures



mqo 08-0a	BKGD (metal)
54.23%	EEE
02/59/00	CVF DAE
6-11	PROBE MODEL
60192	PROBE
12022	NS
λ/g ε wnibul	MODEC
SIN	BMUATENI

Survey Conducted By: M. Dupray Date: 03/31/00

<u>:sətoN</u>

- Survey results are provided in Table 5.
- 2. Scan results shown in cross hatched areas. Results are in cpm.
- Numbers circled are the approximate locations of wipes taken.



Figure 31: Labs 619/621 Mezzanine - Alpha Floor Scans and Beta Floor and Wall Scans

2. ~100% of the floor was scanned for Alpha.

3. ~100% of the floor and walls (below 2m) and 10% of the walls (above 2m) were scanned for Beta.



Beta Measurements and Locations of Removable Contamination Wipes Figure 32: Labs 619/621 Mezzanine - Locations and Results of Fixed

The values are dpm/100 cm² and indicate the approximate locations of the measurements taken.

3. One minute fixed Beta readings were taken.

The Numbers circled are the approximate locations of wipes taken. 4.



 One minute fixed Beta measurements in (dpm/100 cm²) taken at each paint sample location are before paint removal.
after paint removal

Figure 33: Labs 619/621 Mezzanine - Exposure Rate Measurements and Paint Sample Locations



- 1. Survey results are provided in Table 5.
- 2. Scan results shown in cross hatched areas. Results are in cpm.
- 3. Numbers circled are the approximate locations of wipes taken.



3. The Numbers circled are the wipes. We denotes vent.

4. Wipes and Beta measurements were taken inside the vents.

APPENDIX A

GENERAL ATOMICS' SURVEY PLAN

FOR THE "GROUP 13" LABS OF BUILDING 2

Note:

The Survey Plan provided in this Appendix was originally written to cover Labs 218, 401, 403, 405, 407, 411, 413, 415, 619/621 and the associated mezzanines above Labs 409, 411/413 and 619/621.

It was later decided to separate these labs into 2 Groups, "Group 12" which consists of Labs 401, 403, 405 and 407 and "Group 13" which consists of Labs 218, 411, 415, and 619/621. Lab 415 was originally classified as an "unaffected area" but was reclassified as an "affected area" after contamination was found; "affected area" surveys were performed in this lab as well as the other "Group 13" labs (except the mezzanines).

	ERAL ATOMICS		
INTERNA	AL CORRESPONDENCE,		
From:	Laura Gonzales	In Reply Refer To:	LQG:2000:19
To:	Distribution	Date:	March 8, 2000

Subject: Issuance of the Final Survey Plan for the "Group 12" Laboratories in Building 2

Attached is a copy of the Final Survey Plan for the "Group 12" Laboratories in Building 2. Please review the plan carefully. If you have *any* questions about implementing the plan, please talk to Paul Maschka or me. The "Group 12" labs is the most important project onsite other than the Hot Cell.

The responsibilities for performing these surveys are assigned as follows:

- 1. **Dick Stowell** -- Responsible for coordinating all surveys to be performed.
- 2. **Dick Stowell** -- Responsible for collecting each survey performed at the end of each work day from each technician assigned to the project.
- 3. Joe Sullivan -- Responsible for auditing the data the next morning to ensure that the following information has been documented. In cases where the information was not recorded properly, he will be responsible for getting the information recorded in a timely manner (within ~1-2 days from the day the survey was performed).

Every survey conducted must be documented on a daily basis on a drawing showing the approximate locations surveyed . Include the results (including units), the technician"s name and signature, date, instrument(s) used (including model and serial number of both the rate meter and the detector), calibration due date, % efficiency, background readings, (if applicable), and any other applicable information.

- 4. **Dick Stowell** -- Responsible for providing a detailed weekly report to Laura Gonzales and Paul Maschka. The report is due by Monday at noon every week. Please include what surveys have were completed the past week, the % completion for each survey and what is still needed.
- 5. **Barbara Hunter** -- Responsible for preparing the tables for the final report by summarizing the data from the surveys performed.
- 6. **Stephen Finchum** -- Responsible for doing the drawings needed for the surveyors and the drawing for the final report.

- 7. **Dick Stowell** Responsible for auditing the data collected to ensure that the Survey Plan is being properly implemented.
- 8. Paul Maschka Responsible for writing the Final Report.

Distribution: K. Asmussen

A. Lewis

HP Surveyors:

- P. Maschka
- B. LaBonte
- R. Dalry (w/o attachment)
- R. Noren (w/o attachment)

B. Hunter J. SullivanR. Stowell C. StanleyM. Dupray

FINAL SURVEY PLAN FOR "GROUP 12" LABS IN BUILDING 2

Prepared by:

Laura Q. Gonzales

aura Q Honzales)

Date: March 8, 2000

Background

The Building 2 labs consist of a total of 142 laboratories. Of these, 132 labs have been released to unrestricted use in Groups 1-11. The Group 12 labs consist of Labs 218, 401, 403, 405, 407, 411, 413, 415, the mezzanine above labs 409, 411/413, and 415, and labs 619/621 and the mezzanine above labs 619/621. This Final Survey Plan covers the survey to be conducted in each of these laboratories.

Survey Objectives and Responsibility

The purpose of performing a final survey is to demonstrate that the radiological conditions in each laboratory satisfy the NRC and State of CA guidelines for release to unrestricted use. The objectives include (1) to show that the average surface contamination levels for each survey unit are within the authorized value, (2) to show that the maximum residual activity ("hot spot" area) do not exceed three times the average value in an area up to 100 cm^2 and (3) that a reasonable effort has been made to clean removable contamination and fixed contamination and (4) that the exposure rates in occupiable locations are less than 10μ R/hr above background measured at 1 meter above the surface. Samples will be counted in GA's Health Physics laboratory. Surveys will be taken only by qualified Health Physics Technicians having a minimum of 3 years Health Physics Technician experience following approved Health Physics procedures and this Plan. The survey and final report documenting the survey will be performed by GA's Health Physics group.

History of Use with Radioactive Materials

GA's Work Authorization logs were researched in order to review the previous activities conducted in each lab and to identify the radionuclides of concern. Three of the six labs (labs 216, 325 and 615) had no history of use involving radioactive materials. The following is a brief summary of the activities involving radioactive materials performed in each lab and the classification of each lab based on its history.

LABS	GROUP 12 SUMMARY
218	No history of use of radioactive materials.
401, 403 and 405	Projects Performed: Radiochemistry Laboratories from 1974 through 1989. Uranium, thorium, and depleted uranium were authorized to be used in these labs. Chemical and Spectro-Graphic analysis was performed on various types of nuclear fuels.
	The labs were also used in the to manufacture thermionics fuel for the DOE in the 1980's. The fuel used ~20% enriched uranium.

LABS	GROUP 12 SUMMARY
407	Projects Performed: Fuel samples containing uranium and thorium were used as well as fission and activation products. Dissolution and radiochemistry performed on samples. Performed chemical and instrument analysis. From 1974 through 1982, Uranium, thorium, natural and depleted uranium as well as mixed fission and mixed activation were authorized to be used in these labs primarily for Chemical and Spectro- Graphic analysis was performed on various types of nuclear fuels. The lab was also used in the to manufacture thermionics fuel for the DOE in the 1980's. The fuel used ~20% enriched uranium.
409	Projects Performed: Radiochemistry lab beginning in 1971. Small quantities of Sr-89 were handled in this lab. Src2 in graphite. Measured the degree of in reactor oxidation using the vacuum fusion apparatus. In 1974, an X-ray florescent X-ray unit within an enclosed system. From 1974 through 1982, Uranium, thorium, natural and depleted uranium as well as mixed fission and mixed activation were authorized to be used in these labs primarily for Chemical and Spectro-Graphic analysis was performed on various types of nuclear fuels. The lab was also used in the to manufacture thermionics fuel for the DOE in the 1980's. The fuel used ~20% enriched uranium.
411 and 413	Projects Performed: From 1974 through 1982, Uranium, thorium, natural and depleted uranium as well as mixed fission and mixed activation were authorized to be used in these labs for Chemical and Spectro-Graphic analysis was performed on various types of nuclear fuels. The lab were also used in the to manufacture thermionics fuel for the DOE in the 1980's. The fuel used ~20% enriched uranium. Reported a spill (date unknown) of Cs-134 (Half life: 2.0648 Y) and Sr-89 (Half life: 50.53 D) carelessly spilled. Precautions should be taken (survey wise) of other probability of Isotopic spills.
415 and 415 Mezzanine	No history use of radioactive materials.
619/621 and Mezzanine	No history use of radioactive materials.

Survey Plan for Tile and Linoleum on floors of the Group 12 Labs

A survey plan for the tile and linoleum cover over the concrete floors of the Group 12 labs was prepared and implemented. Radioactive contamination was found in five (5) of the labs; these labs are 218, 401, 407, 413, 415 and 619/621. The following action has been taken:

- 1. The floor tile in lab 218 was removed and will be disposed of as radioactive waste.
- 2. The radioactively contaminated portions of tile and/or linoleum from the other labs has been removed and will be disposed of as radioactive waste. The rest of the tile will be disposed of appropriately.
- 3. Samples of the tile were collected in each of the 5 contaminated labs in order to try and
determine the radioactive contaminant(s) present in each lab for gamma spec analysis. In labs 407, 413 and 619/621, the contaminant was found to be Cs-137. In labs 218 and 415, the contaminant could not be identified. Both of these labs had no history of use involving radioactive material by GA. Lab 218 was recently used by a tenant who did use radioactive mals; GA believes the contaminant is C-14 (a low energy pure beta emitter). In lab 415, only a small area of the tile was found to have elevated beta/gamma levels but the levels were so low that even the gamma spec results did not identify the contamination. The survey did not identify the show any alpha contamination; therefore, the beta/gamma limits will be applied to this lab also.

Classification

Because of the history of use and the results of the tile/linoleum surveys, the following labs are classified as "Suspect Affected Areas": Labs 218, 401, 403, 405, 407, 411, 413 and 619/621 for purposes of this Final Survey, i.e., all 10 labs except lab 415.

The following areas are classified as "Unaffected Areas": Lab 415 and the *mezzanine above labs* 409, 411/413, and 415, and the *mezzanine* above labs 619/621

<u>Release Limits</u>

The primary contaminants of concern for these labs are Cs-137 (beta/gamma emitter). The limit for C-14 is at least as high as the Cs-137 limit. Uranium also has the same limits as follows:

<u>Uranium</u>

5000 dpm $\alpha/100$ cm², averaged over a 1 m² area 15,000 dpm $\alpha/100$ cm², maximum in a 100 cm² area if the average over 1 m² is met. 1000 dpm $\alpha/100$ cm², removable activity

Beta/Gamma Emitters

5000 dpm /100cm², averaged over a 1 m² area 15,000 dpm/100cm², maximum in a 100 cm² area if the average over 1 m² is met. 1000 dpm /100cm², removable activity

Alert Levels

Notify Health Physics management if any of the following alert levels are exceeded.

Smears

If any smear is >75% of the release level (750 dpm/100cm²), increase the number of smears to define the area of contamination and mark the area.

Alpha Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate if decontamination is required.

> 100 cpm alpha using the large area (434 cm²) probe
> 60 cpm using a hand-held alpha probe (50 cm²) - (~ 1500 dpm/100cm²)

Beta Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate if decontamination is required.

 $> \sim 300$ cpm beta above background using the large area (434 cm²) probe

 $> \sim 200$ cpm <u>above background</u> using the 100 cm² probe

>~100 cpm above background using a portable GM detector.

Documentation

Every survey conducted must be documented on a daily basis on a drawing showing the approximate locations surveyed. Include the results (including units), the technician's name and signature, date, instrument(s) used (including model and serial number of both the rate meter and the detector), calibration due date, % efficiency, background readings, (if applicable), and any other applicable information.

-

Radiological Final Surveys for the "Group 12" labs in Building 2

Turne of	218 ~300 ft²	401 ~250 ft²	403 ~408 ft²	405 ~336 ft²	407 ~312 ft ²	411 ~456 ft²	413 ~336 ft²	415 ~336 ft²	Mezzanine above 409, 411/413, 415 ~882 ft ²	619/621 ~672 ft²	Mezzanine above 619/621 ~464 ft ²
Survey	Suspect Affected Area	Suspect Affected Area	Suspect Affected Area	Suspect Affected Area	Suspect Affected Area	Suspect Affected Area	Suspect Affected Area	Unaffected Area	Unaffected Area	Suspect Affected Area	Unaffected Area
Gridding	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Floor α scan	10%	100%	100%	100%	100%	100%	100%	10%	10%	100%	10%
Floor β scan	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Walls Bottom 2m β scan	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Walls above 2m β scan	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
No. of Fixed Measurements	16 1 min. β	16 1 min. β	16 1 min. β	16 1 min. β	22 1 min. β	20 1 min. β	16 1 min. β				
No. Of Paint Samples	l per wall	l per wall	1 per wall	l per wall	l per wall	l per wall	1 per wall	l per wall	1 per wall	1 per wall	1 per wall
			Ta	ake a 1 minut	e fixed Beta	measuremer	nt before and	& after paint r	emoval.		
No. Smears	16 8 - floor 8 - walls	16 8 - floor 8 - walls	16 8- floor 8 - walls	16 8- floor 8- walls	16 8- floor 8- walls	16 8- floor 8- walls	16 8- floor 8- walls	16 8- floor 8- walls	22 11-floor 11-wall	20 10-floor 10-wall	16 8- floor 8- walls
No. Of MicroR Readings	Every 2 m	Every 2 m	Every 2 m	Every 2 m	Every 2 m	Every 2 m	Every 2 m				
Overhead Fixtures Smears & Scans of flat surfaces	10 smears & scan 25% of fixtures	10 smears & scan 25% of fixtures	10 smears & scan 25% of fixtures	10 smears & scan 25% of fixtures	10 smears & scan 50 % of fixtures	10 smears & scan 25% of fixtures	10 smears & scan 50% of fixtures	10 smears & scan 25% of fixtures	10 smears & scan 25% of fixtures	10 smears & scan 25% of fixtures	10 smears & scan 50% of fixtures
Floor Drains	Take	direct read	ings (alpha d	and beta) and	d smears on a	each floor di	rain found.	In addition, coll	lect sludge samp	ole when app	licable

APPENDIX B

GENERAL ATOMICS' INTERNAL CONFIRMATORY SURVEY FOR THE "GROUP 13" LABS OF BUILDING 2

Appendix B: GA Internal Confirmatory Survey of the Group 13 Laboratories

Confirmatory Survey Plan

Objective

The objective of this survey is to provide additional assurance that the Final Survey conducted in the "Group 13" labs of Building 2 was effective in demonstrating that the radiological conditions meet the criteria for unrestricted use. The "Group 13" labs consist of labs 218, 411, 413, 415, the mezzanines above labs 409, 411/413, 415, and labs 619/621 and the mezzanines above labs 619/621.

Responsibility

Joe Sullivan and William Schuck will perform the survey.

Beta Scans

- 1. Scan \sim 50% of all floors using a 434 cm² beta gas flow proportional counter.
- 2. Spot check the wall along the floor and in and around areas that were decontaminated.
- 3. Check all areas that measure above alert levels with a GM detector.

Alpha Scans

- 1. Scan ~ 25% of all floors using a 434 cm² alpha gas flow proportional counter.
- 2. Check all areas that measure above alert levels with a hand-held alpha counter.

Direct Measurements

Use the 100 cm^2 beta counter and a hand-held alpha counter (50 cm²), take 4 measurements with each instrument on the floor in each lab. Beta readings must all be 2 minute readings and alpha readings 1 minute.

Removable Contamination Smears

Collect 6 smears in each lab in random locations on the floors and walls.

Exposure Rate Measurements using the microR meter Scan $\sim 25\%$ of the floor surface (~ 6 " above the floor) in each lab. Take 2 measurements in each lab at 1m above the surface.

<u>Alert Levels</u>	
434 cm ² beta detector	>300 cpm above background
434 cm ² alpha detector	>100 cpm above background
100 cm ² beta detector	>200 cpm above background
50 cm ² alpha detector	> 60 cpm above background
15 cm ² GM detector	>100 cpm above background
MicroR meter	> 25 μ R/hr on the surface and 20 μ R/hr at 1m from the surface.

Special Surveys

Lab 218 (No floor drain)

Scan 100% of all decontaminated areas and about 1 m around each contaminated area.

<u>Lab 411</u>

Collect a soil sample from the middle of the room (beginning of the excavated area).

Lab 413 (Cs-137 contamination)

Collect a soil sample from the middle of the room (beginning of the excavated area).

<u>Lab 415</u>

- (1) Conduct 100% alpha scan on all of the lower walls (< 2 m). [Note: Alpha contamination was detected on the east wall; this wall was decontaminated].
- (2) Conduct a 10% alpha scan on the upper walls (> 2m).
- (3) Collect a sample on the wall where the highest reading was located and have it gamma scanned to determine contaminant(s).
- (4) Conduct a surface microR survey of the drain line (scan both the sides and the bottom of the trenches).
- (5) Collect 1 soil sample at the middle of the room (beginning of the excavation in each room). Gamma spec the soil sample.

Lab 619/621

- (1) Use a geiger counter and scan 100% of each grids E5 and E6.
- (2) Collect a soil sample in excavated area (~grid E6).

Documentation

Every survey conducted must be documented *on a daily basis* on a drawing showing the approximate locations surveyed. Include the results (including units), the technician's signature, date, instrument(s) used (including model and serial number of both the ratemeter and the detector), calibration due date, % efficiency, background readings (if applicable) and any other applicable information.

Confirmatory Survey Results

<u>Summary</u>

During GA's Internal Confirmatory Survey, elevated radiation measurements were detected on four (4) areas of the floor in Lab 415. These areas were decontaminated and subsequent surveys showed radiation levels at or near background levels. There were no other elevated areas found in any of the other "Group 13" labs.

In Labs 218, 411, and 413 additional paint samples and surveys were taken from the area where elevated (but below the release criteria) paint sample results had been obtained during the Final Survey. The results of these samples and fixed measurements taken before and after removal of the paint showed levels well below the release criteria.

All other results taken during the confirmatory survey were well below the appropriate release criteria including paint samples, exposure rate measurements and soil sample results. <u>Note:</u> Confirmatory surveys were not performed in the mezzanines of these labs since these mezzanines were unaffected and no contamination was detected during the final survey.

Instruments Used

Each figure provides information on the instruments used during the radiological survey documented on that figure. The figures typically include: (1) the instrument, the model and serial numbers, (2) the detector type (if applicable), size and serial number, (3) calibration due dates and efficiencies and (4) typical background count rates. All instruments used were calibrated semiannually and after repair except for exposure rate meters which were calibrated quarterly.

<u>Scanning</u> - The results of the alpha and beta scans are provided in Table 1B and in Figure CS-1 (for Lab 218), Figure CS-5 (for Lab 411), Figure CS-9 (for Lab 413), Figures CS-13 and CS-14 (for Lab 415), and Figure CS-17 (for Lab 619/621).

The scans showed elevated levels in Lab 415 (Figure CS-13) which was verified with fixed measurements which indicated radiation levels above the release criteria in locations 1, 2, 3 and 4 as shown in Figure CS-13. Additional remediation was performed. Subsequent alpha and beta scans showed levels at or near background levels (Figure CS-14).

Radiation levels in all the other "Group 13" labs were at or near background levels.

<u>Fixed Measurements</u>- As mentioned above, 4 small areas with remaining activity in Lab 415 were found during the internal confirmatory survey. Measurements indicated beta levels as high as ~11,235 dpm/100 cm² (3000 cpm on the 100 cm² detector with ~26.3% efficiency) beta in location 1 as shown in Figure CS-13 and ~1554 dpm/100 cm² (200 cpm on the 50 cm² detector with ~21.58% efficiency) alpha in location 4 as shown in Figure CS-13.

The 4 areas were remediated; levels decreased to $< 768 \text{ dpm}/100 \text{ cm}^2$ alpha and $< 433 \text{ dpm}/100 \text{ cm}^2$ beta after decontamination.

Alpha and beta fixed measurements in all laboratories (a total of 48 measurements) were below release criteria. The highest measurement was $< 768 \text{ dpm}/100 \text{ cm}^2$ alpha and $< 433 \text{ dpm}/100 \text{ cm}^2$ beta.

<u>Removable Contamination Levels</u> - A total of 30 smears (100 cm²) were collected and counted for gross alpha/gross beta radioactivity using a low-level alpha/beta counting system. All results were < 10 dpm/100 cm² alpha and \leq 11 dpm/100 cm² beta (See Table 1B).

<u>Exposure Rate Measurements</u> - Exposure rate measurements were taken at 1 m from the surface in each lab. Readings ranged from 13-16 μ R/hr (see Table 1B); well below the release criteria. In addition, exposure rate measurements were taken in exposed soil areas on the surface and at 1 m from the surface. These results are provided in Table 3B and in the respective figures for each lab. All results are well below the release criteria.

Paint Sample Results and Fixed Measurements Before and After Paint Removal

Table 2B provides the results of paint samples collected from the walls of Labs 218, 411 and 413. The paint samples were counted using a low-level alpha beta counting system. All alpha results were < 10 dpm/100 cm². The maximum gross beta activity found was 24 dpm/100 cm² from a sample collected in Lab 218.

Fixed measurements were taken before and after the paint was removed. The levels before removal of the paint sample were well below the release criteria. There was no increase in radiation level after paint removal. All of the results were well below the release criteria.

Soil Sample Results

A soil sample was collected in the excavated area of each laboratory. The samples were processed and counted by gamma spectroscopy. The results are provided in Table 2B. All the results showed radionuclide concentrations at or near natural background levels.

Exposure rate measurements on the surface of the soil and at 1 m from the soil surface were also obtained. These measurements were at normal background levels.

Conclusion

The confirmatory survey indicated four (4) small areas in Lab 415 where elevated readings remained. GA decontaminated each of these 4 small areas and subsequent surveys showed radiation levels below the release criteria

The results of the final and confirmatory surveys provided in this report, demonstrate that the labs, designated as "Group 13", meet the NRC- and State- approved guidelines for release to unrestricted use.

Table 1B:	Results of Confi	rmatory Su	rveys in Building	g 2 Grou	p 13 Laborate	ories				
Firmer		α Scan Results	β Scan Results		Fixed Measure	ments	R Coi	emovable ntaminati	Exposure Rate Measurements	
# and	Location and Surface	434 cm ² (range in	434 cm ² (range in cpm)	Total	Alpha	Beta	Total #	Alpha	Beta	(µR/hr) @ 1m from
Lab		cpm)		#	maxi (dpm/10	mum 0 cm²)	#	Maxin dpm/10	num 0 cm ²	surface
CS-1, CS-2, CS-3 and	concrete floor	0 – 20	1800-2000		MDA (768)	MDA (443)	6	~10	11	14-16
Lab 218	concrete block wall	0 – 20	1200-1400	8			0	<10	11	
CS-4 Lab 218	Paint Samples, Scans and Fixed Measurements (before and after paint removal)	$0 \\ (50 \text{ cm}^2 \\ \alpha)$	60-120 (15 cm² β)	4		< 318 < 318	2 Paint Samples	<10	24	
CS-5, CS-6, CS-7 Lab 411	concrete floor	0-20	1400-1800	8	MDA(768)	MDA (443)	6	<10	11	13-14
CS-8 Lab 411	Paint Sample Location, Scans & Fixed Measurements (before and after paint removal)	$\begin{matrix} 0\\ (50 \text{ cm}^2 \alpha) \end{matrix}$	40-80 (15 cm ² β)	4		< 318 < 318	2 Paint Samples	<10	<10	

Table 1B	Table 1B: Results of Confirmatory Surveys in Building 2 Group 13 Laboratories														
Einung		a Scan Results	β Scan Results		Fixed Measure	ments	R Co	.emovabl ntaminati	e on	Exposure Rate Measurements					
# and	Location and Surface	434 cm ² (range in	434 cm ² (range in cpm)	Total	Alpha	Beta	Total	Alpha	Beta	(μR/hr) @ 1m from					
Lab		cpm)		#	maxi (dpm/10	mum 10 cm²)	Ŧ	Maxir dpm/10	Maximum sur pm/100 cm ²						
CS-9, CS-10, CS-11	Concrete Floor	0-20	1400-1800	8	MDA (768)	MDA (443)	6	<10	<10	13-14					
Lab 413	<u> </u>	′	ļ'	 '			 '	 	↓ ′						
CS-12 Lab 413	Paint Sample Location, Scans & Fixed Measurements (before and after paint removal)	0 (50 cm ² α)	40-80 (15 cm ² β)	2 Paint Samples		MDA (318) MDA (318)	2 paint samples	<10	<10						
CS-13, CS-14, CS-15 &	Concrete Floor	0-20			~1554 Before Remediation	~11,235 Before Remediation									
Lab 415	Walls	0-20	1500-1800	8	MDA (768) After Remediation	MDA (443) After Remediation	6	<10	<10	15-16					
CS-17, CS-18 & CS-19 Lab	Concrete Floor	0-20	1800-2200	8	MDA (768)	MDA (443)	6	<10	<10	16					
619/621			<u> </u> '				<u> </u>	<u> </u>							

	ТАВ	LE 2B: GAMM/	A SPECTROSCO	PY RESULTS O	F SOIL SAMPL	ES FROM THI	BUILDING 2 "	GROUP 13" LA	BS
Radionuclic	le Concentration	(pCi/gm) - Result	s ± 20 - Backgrour	nd not Subtracted	- 30 minute counts	i			
Sample ID	Sample Location	¹³⁷ Cs 662 Kev peak	⁶⁰ Co Ave.of 1173/1332 Kev peaks	²²⁸ Th Ave, of 238/583 kev peaks	²⁷⁸ Ra (²³² Th) Ave. 338/911 keV peaks	Total Thorium ²²⁸ Th+ ²³² Th	²³⁸ U 92.77 keV peak	²³⁵ U 186(144) keV peak	Evaluation and Comments
B2 411-1	Soil from lab 411	ND	ND	0.62 ± 0.09	1.15 ± 0.29	1.77	1.45 ± 0.56	0.13 ±0.06	Below Release Criteria
B2 413	Soil from lab 413	ND	ND	0.70 ± 0.09	1.17 ± 0.32	1.87	1.03 ± 0.60	0.13 ± 0.07	Below Release Criteria
B2 415	Soil from lab 415	ND	ND	0.92 ± 0.10	1.55 ± 0.44	2.47	1.34 ± 0.61	0.31 ± 0.28	Below Release Criteria
B2 619	Soil from lab 619	ND	ND	1.27 ± 0.11	1.73 ± 0.46	3.0	1.69 ± 0.63	0.18 ± 0.07	Below Release Criteria

Table 3B: Exposure Rate Measurements on Exposed Soil from the Building 2 "Group 13" Labs											
Location	On Soil Surface (μ R/hr)	At 1 m from the Surface (μ R/hr)									
B2 Lab 411	18	14									
B2 Lab 413	16	14									
B2 Lab 415	19	16									
B2 Lab 619	20	16									

•



	1	2	3	4	5	6	7	8		N
A										S S
В										
С			<768			<768				Denotes Alpha Reading
D				<443		<443				dpm/100cm²
E								, , , , ,		Denotes Beta Reading dpm/100cm²
F					<768)				
G										
Н		• • •		<768		<443				
				443						
J							_			
K		*****								*****
	*	**	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$				****	mete	er	
Locatio	n:Group 1	13 Lab 41	1 Direct /	Alpha and B	leta 1 M	linute Meas	surement	ts		
	Instrumer	ntation(s)		M-12		2221				
	Serial N	Number		91103)	148436	·			
	Calibrat	ion Due		10/12/0	0 1:	2/07/00				
	Effici	iency		21.58		26.27				
 	Broba	lumbar		0-20		554				
 	Probe			09219	2 1	204/7				
Comme	ents:Beta	MDA= 44		<u>50cm²</u>)0cm² Alph	a MDA	=768 dpm/	100cm²	1		I
				n_{A}	<u> </u>					
Signature:	rill	Ì	2/8	ft. Jul	Ľ		Schu	ck/Sullivan	I	Date:07/25/00
Review	ed By:							<u> </u>		Date:

Figure CS-2: Lab 218 Location and results of Fixed Alpha and Beta Measurements

Fig	gure (CS-3:	Lab an	218 E Id Sme	xposi ear Lo	ure Ra ocatio	ate n	e mea	asure	men	t	
	1	2	3	4	5	6		7	8	* * * * * * * * * *		
A										5	N	THE
В					2				4			5
С		****		20		22					16	1m Reading in µR/hr
D				18	16			****			(1)	Smear Location
Е		*****			***	18					\bigcirc	
F		3		17	5 5 6 7 7 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8			***			18	6" Reading in µR/hr
G					 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	19						
Н		****		14 18								
l				1	18			5				
J						6						
К												
									meter			
ocation	n:Group 1	3 Lab 218	3 Smear	and Dose	Rate Sur	vey						
	nstrumer	ntation(s)		M-19								
	Serial N	lumber		123930)							
	Calibrati	ion Due		10/1//0 n/a	0							
	Backo	round		15-18 μ	R					.		
<u> . </u>	Probe N	lumber		n/a								
	Probe	Size		1x1 Na	1	····						
Comme	nts:										·	
Signatur Reviewe	re: Wre(ed By:	Sor	- Al	t Sull				Sul	llivan/Sch	uck Dal Dal	e:07/25/00)

	Figu	re CS-4	4: L	.ab (218	Pajı	nt Sa	ımpl	le an	d	Wall	Su	rvey	÷	
	1	2		3	4		5	***	6		7		8	9 9 9 9 9 9	N
A				60-	→ <3 <3 20cpm β	18/ 318 γ						*****		W	S
В					pm-α >> <31 <3'	8/ 18									
С											********			<318/ <318	1 minut scaler readin dpm/100c
D	******					************									
E						*****									
F					 		******								
G															
Н				*****			*****						*****		

J								***							
K				*******						***** *	· · · · · · ·				-
Locati	tion:Group 13	1 3 Lab 218 Pa	int sa	amples						<u>1</u>	<u></u>	<u></u>		<u> </u>	-
	Instrument	tation(s)		M-	3	M	-12	2	221						
	Serial N	umber		143	349	73	924	14	8436						
	Calibratio	on Due		11/2	3/00	01/	17/01	12	/07/00	_					
	Efficie	ency		20.	26	2	1.58	43	10.27 Teonebik	+	·				
	Backgr	ound		1450	267	0-2	294	27	3drywall 00477	+					
	Probe	Size		150	m²	50)cm ²	1()0cm ²	+					
Comm	nents: 2 Pair	nt samples ta	aken.	2" abo	ove and	l below	previou	is sam	ple. Are	a 1'	around	previ	ous sample	e	
scanne	ed for α , β , γ	. All readin	ngs ec	qual to	or less	than t	ackgrou	ind. A		e Sc	aler read	ing v	vith 100cm	2	
probe	was taken b	eiore and af	ter pa	unt sar	iipie wa	as coll	ecied, 22	221 MI	JA=318	u dru					
Signa	ture: <i>Will</i>	Sor								So	chuck I	Date:	08/12/00		
Revie	wed By:										1	Date:	:		



Figure CS-5: Lab 411 Alpha and Beta Scans of Floor









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Figure CS-17: Lab 619-621 Alpha and Beta Scans of Floor



