

GENERAL ATOMICS'
SITE DECOMMISSIONING PLAN

SEPTEMBER 1996

(Revised December 1996)
(Revised April 1997)

APRIL 1997 CHANGES TO
GENERAL ATOMICS' SITE DECOMMISSIONING PLAN

1. Added Buildings 1, 7, 13, 14, 15, 19, and 29-1 to Table S-1 as non-impacted areas; all buildings are office buildings with no history of use involving radioactive materials, no reasonable potential for contamination and are physically isolated from areas where radioactive materials were used.
2. Regulatory jurisdiction indicated for Building 25 in Table S-1.
3. Building 2 -- typographical error corrected - 36 labs changed to 33 labs in Table S-1 (only 33 labs in Building 2 remain to be released to unrestricted use).
4. Added the following new paragraphs (in italics) to section 6.1.3 (page 6-2):

GA will prepare individual detailed survey plans for each facility or group of laboratories and will advise NRC of the schedule and the availability of these survey plans for their review upon request.
5. Corrected Natural Uranium concentration limit on Table 6-2 (changed from 35 pCi/g to 10 pCi/g). Added Depleted Uranium concentration limit to Table 6-2 of 35 pCi/g.
6. Section 6 has minor revisions except for Section 6.1.4 "Classification of Areas by Contamination Potential" which was revised significantly in accordance with the subdivision of categories from 3 categories; (1) scoping or confirmatory survey, (2) unaffected area survey and (3) affected area survey) to 4 categories as follows:
 - (1) Non-impacted Areas
 - (2) Scoping or Confirmatory Survey
 - (3) Unaffected Areas
 - (4) Affected Areas - Further subdivided into:
 - Non-suspect Affected Areas
 - Suspect Affected Areas
Added information for each category including survey units and specific number of measurements to be conducted for each unit.
7. Section 4.6 Schedule -- changed from 5-10 years to "approximately 5 years".
8. Table of Contents changed (Chapter 6 revised).

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RCRA Facility Standards Overview Training—This class covers the requirements established under 40 CFR 264.16 for personnel who may handle hazardous wastes within the Facility. The class covers the Federal Standards and discusses compliance requirements for generators of hazardous and mixed wastes. An annual update is provided.

4.4.5 Other Training

Waste Acceptance Criteria—Training is provided to the requirements established for the disposal site(s). An annual training update is provided.

GA Emergency Response Training—GA has an “Emergency Plan” (a.k.a. Radiological Contingency Plan), as required by the NRC and the State of California. All facilities in which licensed material is stored or used have specific implementing procedures for this plan. Training on the Radiological Contingency Plan is provided annually to Emergency Response and Recovery Directors (specific to each facility) and their alternates. Emergency Response Team members also receive training specific to their facility’s potential hazards/emergencies.

4.5 Procedures

All decommissioning work will be performed in accordance with written, approved procedures and/or plans.

Revisions to Decommissioning Project procedures are reviewed, approved, and processed in the same manner as the initial document. Field changes to existing approved procedures are made in accordance with current procedure control requirements.

HP procedures are developed by Project and GA HP personnel and approved by GA HP and Licensing, Safety, and Nuclear Compliance (LS&NC) management. Quality Assurance procedures are developed by Project and GA Quality Assurance personnel and approved by GA Quality Assurance management.

4.6 Schedule

GA anticipates decommissioning, or the transfer of jurisdiction to the State of California, of all facilities described in Table S-1 to take approximately 5 years.

4.7 Methods Used For Protection of Occupational and Public Health and Safety

4.7.1 ALARA Program

SUMMARY

A summary of the GA sites to be decommissioned is provided in Table S-1, which provides a short description of each facility, the type of activity conducted, the radioactive material used, the status and current activity, the current regulatory jurisdiction (NRC and/or State of CA), whether jurisdiction could be transferred to State only, whether ground contamination is suspected, the anticipated D&D effort and approach to be used, and the final survey anticipated to be required.

Additional information on each facility/site listed in Table S-1 is provided in Chapter 3. Detailed information on each approach anticipated for the facilities/sites in Table S-1 is provided in Chapter 5. Detailed information on the Final Survey anticipated to be required is provided in Chapter 6.

The information provided in this General Decommissioning Plan meets the requirements of 10CFR70.38.

TABLE S-1: General Atomics' Facilities and Sites to Be Decommissioned (Status as of April 15, 1997)

Building No.	Name/ Description	Type of Activity	Radioactive Material Used	Status and Current Activity	Regulatory Jurisdiction	Ground (soil) Contamination	Anticipated	
							D&D Effort and Approach ⁽⁴⁾	Final Survey Required
Buildings 1, 7, 13, 14, 15, 19, 29, 29-2 and surrounding land areas	Office Buildings, Parking Lots and Recreational Areas	None. Never used for work involving radioactive materials or radiation machines	None	Office Use, Parking and Recreation	NRC and State	No	Non-impacted Areas No D&D needed	None Required (Areas that have no reasonable potential for residual contamination do not need any level of survey coverage)
Land Surrounding Bldgs. 37-42 to North, West and South	Raw land on hillside upgradient of Bldgs. 37-42 (Between fence and property line)	None. Never used for work involving radioactive materials or radiation machines	None	Steep hillside Area not utilized or occupied	NRC and State	No	Non-impacted Areas No D&D needed	None Required (Areas that have no reasonable potential for residual contamination do not need any level of survey coverage)
Sorrento Electronics	Leased facility in MIA Mesa	Manufacture of radiation monitoring instrumentation	Byproduct	In operation	State	No	No D&D of facility is expected Removal of Sources needed Approach A	Unaffected Area Survey assuming no contamination is found.
Room 049 of Building 9	(a.k.a "E" or experimental Building)	TRIGA Fuel Fabrication prior to 1976	SNM	No Rad Usage/Telecon Equipment Storage Only All of Bldg 9 released except room 049	NRC	None expected	Moderate D&D Approach B	Affected Area Survey

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Building No.	Name/ Description	Type of Activity	Radioactive Material Used	Status and Current Activity	Regulatory Jurisdiction	Ground (soil) Contamination	Anticipated	
							D&D Effort and Approach ⁽⁴⁾	Final Survey Required
10	HP Lab (1/97) Previously Cal Lab	Calibration of radiation detection equipment and HP laboratory	Byproduct, sealed sources	In use. Health Physics Laboratory (as of ~12/96)	State	No	No D&D of facility expected. Remove sources and equipment including hood and ducts Approach B	Affected Area Survey
21	TRIGA Reactor Facility	Non-power Reactors; R&D	All	Mark I reactor license active Mark F reactor disabled/POLA	NRC and State	To be Determined	Major D&D Approach C and Soil Cleanup	Affected Area Survey Soil Criteria
22	TRIGA Fuel Fabrication Facility	TRIGA Fuel Manufacturing	Predominantly SNM Some Depleted uranium	Operations ceased. All equipment removed, ready for D&D	NRC	Yes	Major D&D Approach C and Soil Cleanup	Affected Area Survey Soil Criteria
23	Hot Cell	R&D and PIE	All	Currently in D&D. Expected to be completed by 1999.	State & NRC	Yes	In accordance with NRC and State of CA approved D&D Plan (Refs. NRC SNM-696 license amendment #35 dated 5/1/96 and State of CA Radioactive Material License 0145-80 amendment # 123 dated 7/5/96)	

TABLE S-1: General Atomics' Facilities and Sites to Be Decommissioned (Status as of April 15, 1997)

Building No.	Name/ Description	Type of Activity	Radioactive Material Used	Status and Current Activity	Regulatory Jurisdiction	Ground (soil) Contamination	Anticipated	
							D&D Effort and Approach ⁽⁴⁾	Final Survey Required
25	Liquid Waste Treatment Facility	Treat liquid LLW for Discharge to sewer	All	In Use.	State & NRC / To be transferred to State only	Yes	Moderate D&D expected and possible Soil Remediation Approach C	Affected Area Survey and Soil Criteria
41	Nuclear Waste Processing Facility (NWPF)	Nuclear Waste (LLW) Processing	All	In Use. Baling, compacting, solidification, & drying repackaging	State & NRC / To be transferred to State only	Yes	Major D&D expected and Soil Remediation Approach C	Affected Area Survey and Soil Criteria
27	EA (Experimental Area)	Radiochemistry and Chemistry Labs	All	Inactive Shut-down 9/96	State & NRC / To be transferred to State only	Possibly	Moderate D&D expected and possible Soil Remediation Approach B	Affected Area Survey (possibly Soil Criteria)
27-1	EA-1 Bunker Facility	R&D associated with radiochemistry	All	Inactive Equipment Removed. Ready for D&D.	State & NRC / To be transferred to State only	Possibly	Moderate D&D expected and possible Soil Remediation Approach C	Affected Area Survey (possibly Soil Criteria)
Room 118 of Building 30	Linac Facility	Irradiated Fuel Storage in Casks	All	In Use. Storage Only.	NRC / State, after the removal of fuel (SNM)	No	No D&D of facility anticipated Confirmatory Survey Needed Approach A	Unaffected Area Survey if no contamination is found.

TABLE S-1: General Atomics' Facilities and Sites to Be Decommissioned (Status as of April 15, 1997)

Building No.	Name/Description	Type of Activity	Radioactive Material Used	Status and Current Activity	Regulatory Jurisdiction	Ground (soil) Contamination	Anticipated	
							D&D Effort and Approach ⁽⁴⁾	Final Survey Required
Bldg. 30 (except room 118)	Linac Building	Activation Products	Activation Products	Not In Use. Operations ceased.	State	No	Confirmatory Survey Required Approach A	Affected Area Survey
Room 103 of Bldg. 31	Nuclear material Accountability (NMA)	Radioactive Material Storage	All	In use. Storage, sampling, and combining.	State and NRC State, after removal of SNM	No	Minor D&D, if needed Approach B	Affected Area Survey
33	ICF Fusion	Radiation Machines and sealed tritium source	tritium	In Use.	State	No	Remove sources. No D&D of facilities expected. Approach A	Unaffected Area Survey
33-1	Former HP Lab	Samples containing small quantities of radioactive material	All	Inactive	State (SNM in lab under State license)	No	No D&D of facility was needed (survey performed after move of HP Lab; no contamination detected). Approach A	Unaffected Area Survey if no contamination is found.
34	DIII-D	Fusion Research	Short-lived Activation Products and Tritium	In use.	State	No	No D&D of facility expected. Remove sources and activated equipment. Approach A	Unaffected Area Survey Affected Area Survey in DIII-D pit

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							D&D Effort and Approach ⁽⁴⁾	Final Survey Required
35	Test Tower	Testing and maintenance of contaminated helium circulators	Mixed fission and activation products	Operations ceased.	State	No	Scoping Survey needed. No contamination expected. Approach A	Unaffected Area Survey if no contamination is found.
37 (1) (Formerly the South end of Building 37)	SVA-South	Temporary storage of packaged LLW from 37 North D&D Sealed sources for calibration of TRIGA monitoring/control equipment	All	No rad material usage. Only non-rad activities in building.	State & NRC / To be transferred to State only	No	Scoping survey needed. Approach A	Unaffected Area Survey if no contamination is found.
39	SVB/Pilot Plant	Pilot Plant - Fuel Development R&D	SNM Depleted U Thorium	Operations ceased. Equipment Removal and Characterization in progress.	State and NRC	Yes	Major D&D Approach C (possibly Soil Remediation)	Affected Area Survey and Soil Criteria
42	Calibration Facility; previously Radiography Bldg.	Previously the Industrial Radiography bldg; now calibration facility.	Cs-137 Sealed Source, cal standards	In operation. Calibration of Instruments	State	No	Remove all sources Approach A	Affected Area Survey

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Building No.	Name/Description	Type of Activity	Radioactive Material Used	Status and Current Activity	Regulatory Jurisdiction	Ground (soil) Contamination	Anticipated	
							D&D Effort and Approach ⁽⁴⁾	Final Survey Required
2 ⁽²⁾	Science Laboratory Building (a.k.a. "L" or Laboratories Bldg.)	R&D, Testing, Experimental	Variable	Inactive except for HP lab which is being moved to Bldg. 10. 102 labs have been released. 33 labs to be released. ⁽²⁾	State and/or NRC/ Lab Specific/ To be transferred to State only	None expected	Lab Specific	Lab Specific
Bldg 2 Service Core	Service Core and Drain lines	Services provided to labs plus drain lines from some of the labs.	All	Inactive All known radioactively contaminated ducts in the core were removed in 1994. All other accessible ducts were surveyed and no contamination found or removed as radioactive waste.	State and/or NRC / To be transferred to State only	To date, 2 drain lines and one area of concrete known to be contaminated. No other known contamination.	To be Determined	Affected Area Survey for Selected Areas Rest of core Unaffected Area
Building 2 lab 307 Underground Storage Tank	Temporary storage of radioactively contaminated liquids; primarily Cs-137, Co-60 Sr-90		Tank removed and soil remediated in 1984.		State and NRC	Soil was remediated in 1984.	D&D effort including soil remediation completed 11/94. See Report to NRC dated 11/30/94 (letter 696-6083). Area not decontaminated to Option I Release Criteria	

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Building No.	Name/Description	Type of Activity	Radioactive Material Used	Status and Current Activity	Regulatory Jurisdiction	Ground (soil) Contamination	Anticipated	
							D&D Effort and Approach ⁽⁴⁾	Final Survey Required
Under-ground Storage Tanks ⁽³⁾	Bldg 9 Tank Bldg 31 Tank Bldg 21 Tank Bldg 2 Lab 540 Tank	Temporary storage of radioactively contaminated liquids.	Various	Tanks Removed in 1984 ⁽³⁾	State and NRC	No	GA report dated 2/11/85 shows soil concentrations below the Option I release criteria. Soil Samples Obtained by the NRC during removal of the tanks. Formal Release Not Yet Obtained.	

(1) The north end of Building 37 (HTGR Fuel Fab Facility) was released in 1995 and the north end of the building dismantled (no longer exists).

(2) **Building 2 Summary:** Total of 142 labs; of these 33 labs *Have Not Yet Been* Released to Unrestricted Use and 109 labs have been released to unrestricted use in Groups 1 through 8C (Groups 8B and 8C release anticipated in 1996 and included in total number of labs released).

Labs not yet released are as follows:

Laboratory B Section: Labs 202, 204, 206, 208/210, 216, 218, 238/240 and 242 (10 labs)

Laboratory C Section: Labs 325 (mezzanine released), 401, 403, 405, 407, 409/411 and mezzanine, 413 and mezzanine, 415 and mezzanine, 441, 443/445 and mezzanine (12 labs)

Laboratory A Section: Labs 511, 513, 517, 605, 607, 615, 617, 619/ 621 and mezzanine, 623 and 645 (11 labs).

(3) The underground storage tanks were removed in 1984. A report dated 2/11/85 provides the results of soil samples collected in each area where tanks were removed. Official release to unrestricted use from the NRC and the State of CA has not been obtained (as of 9/25/96).

(4) **Summary of Approaches:**

Approach A: Removal of radioactive material sources Only. No contamination expected or likely. Confirmatory or Scoping Survey needed. If no contamination is found, no further action is needed.

Approach B: Minor facility cleanup required including scabbling a small area of concrete.

Approach C: Major cleanup required including aggressive D&D of large areas. Facility contamination is widespread.

6. PLANNED FINAL RADIATION SURVEY

The purpose of a Final Radiation Survey is to demonstrate that the radiological condition of the Site and Facility are at or below established release criteria in anticipation of State and NRC approval of license amendments removing a facility as a location to handle licensed materials and remove restrictions from use of a facility or property and permit its unrestricted use.

The Planned Final Radiation Survey discussed in this chapter deals with release of the facility and any facility yard areas to unrestricted use following removal of extraneous equipment and removal of identified contamination through the most cost-effective means necessary. Specific release criteria for surface contamination, soil and other bulk materials are included in this chapter. The anticipated final survey needed for each facility was provided in the summary Table S-1. During actual decommissioning the classification may change based on characterization survey results. GA has developed the Final Survey Plan using the guidance presented in the NUREG/CR-5849.¹

6.1 Release Criteria for Items, equipment and Facility

This section provides the specific criteria for release of items, materials and equipment and the facility. These criteria are shown in Table 6-1. The beta/gamma emitter release criteria shown in Table 6-1 can be applied for Sr-90 if it is in mixed fission products that has not been technologically enhanced above what would be expected to be present due to fission yields and radioactive decay.

6.1.1 Release of Items and Equipment

All materials leaving a facility Restricted Area will be surveyed to ensure that licensed materials are not inadvertently released from the Facility. Applicable decommissioning project and GA HP procedures will be adhered to in performing these evaluations. These evaluations will include the following types of evaluations.

Materials and Equipment—Direct frisk (β - γ and α) with portable detectors and/or indirect survey for smearable activity will be conducted as needed using appropriate instrumentation typical of those provided in Table 4-1. Materials and equipment will be released in accordance with GA and Project HP procedures in accordance with criteria specified in GA's NRC (SNM-696) and State of California (0145-80) licenses. Those criteria are summarized in Table 6-1.

Items painted with other than original manufacturer's paint will be reviewed on a case-by-case basis. Normally, the item will be assumed to be contaminated unless process knowledge demonstrates that the paint was applied to a clean, non-radioactive surface prior to use in the Restricted Area or an acceptable survey (i.e., paint sampling and analysis and/or fixed readings before and after paint was removed) demonstrates that levels are below the release criteria.

If the potential exists for contamination on inaccessible surfaces, the equipment will be assumed to be internally contaminated unless (1) the equipment is dismantled allowing access

¹ NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, Draft for Comment, June 1992.

for surveys, (2) appropriate tool or pipe monitors with acceptable detection capabilities are utilized that would provide sufficient confidence that no licensed materials were present, or (3) it may readily be concluded that surveys from accessible areas are representative of the inaccessible surfaces (i.e., surveying the internal surface from both ends of a straight pipe from a non-radioactive process system with cotton swabs could be representative of the inaccessible areas).

6.1.2 Release of a Facility

The acceptable surface contamination levels (above background levels) for facilities are provided in Table 6-1. Appropriate background levels for each type of surface will be established.

GA may apply the soil release criteria for asphalt, concrete, or other similar construction media that have been reduced to rubble.

6.1.3 Description of Final Radiation Survey Plan

Once all identified affected areas are evaluated and cleaned up as necessary, a final radiation survey must be performed to demonstrate compliance with the release criteria.

Each handling area (or group of handling locations) will have a formal survey plan developed prior to initiating final release survey. The survey plan will describe the survey design in detail. A well-documented survey plan will be the basis for meeting these objectives and will be prepared prior to performing the final survey. The plan will vary for each facility and will be based upon the physical characteristics of the facility, site, or laboratory being surveyed. These characteristics include the number and size of buildings, type of building construction, building or lab condition, total area, and structures (including overhead structures) in each room. Features such as ceiling height, ducts, piping, lights, drain lines and walls surfaces will be considered in determining the number and type of sampling required to demonstrate compliance with the release criteria.

The plan will include, (1) a list of the types, numbers, and locations of measurements and samples to be obtained; (2) information on the equipment and techniques to be used for measuring, sampling, and analyzing data; and (3) the methods to be used to interpret and evaluate the survey data.

An example of a survey plan completed for the General Atomics Group 8B labs is provided at the end of this chapter and is representative of what is prepared for release of laboratories.

GA will prepare individual detailed survey plans for each facility or group of laboratories and will advise NRC of the schedule and the availability of these survey plans for their review upon request.

Table 6-1: ACCEPTABLE SURFACE CONTAMINATION LEVELS ¹

Nuclides ^a	Average ^{b,c,f} (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 α
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

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, and 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.

¹ 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.

6.1.4 Classification of Areas by Contamination Potential

The survey will be designed so that areas with higher potential for contamination receive a higher degree of survey effort, the process will be both effective and efficient. Four (4) classifications of the types of surveys anticipated for each facility have been identified and provided for each facility in Table S-1.

These are (1) "non-impacted areas", (2) "scoping or confirmatory survey", (3) "unaffected area survey", and (4) "affected area survey" which is subdivided into "non-suspect affected area survey" and "suspect affected area survey". These classifications are defined as follows:

6.1.4.1 Non-impacted Area

Areas that have no reasonable potential for residual contamination do not need any level of survey coverage and have been designated as non-impacted areas in Table S-1. These areas have no radiological impact from site operations, have never been used for work involving radioactive materials and are isolated from areas where any activities involving radioactive materials were conducted. Background reference areas are typically selected from non-impacted areas.

6.1.4.2 Scoping or Confirmatory Survey

The scoping or confirmatory classification is intended for locations where there is no present use of radioactive material or known contamination (see Table S-1 for facilities/sites where a scoping or confirmatory survey is needed). The type of survey needed will vary with each facility and must be done on a case-by-case basis.

6.1.4.3 Unaffected Area Survey

Definition- All areas not classified as "affected" (including "non-suspect affected" and "suspect affected") are considered "unaffected." These areas are not expected to contain residual radioactivity based upon a knowledge of site history and survey information. Table S-1 shows the facilities/sites anticipated to be classified as unaffected areas. An area's classification may require changing based on accumulated survey data.

Gridding - Unaffected areas do not require gridding for the purposes of establishing measurement or sampling locations; however, grids systems may be used in order to facilitate referencing of survey locations in those areas to a common site reference system.

Scanning - Unaffected area surveys will include a scan of approximately 10% of the accessible surface area comprising floors and walls below 2 meters.

Measurements - A measurement is either (1) a "fixed" measurement representing total activity or (2) a wipe representing removable activity. The number of measurements will be based in part on the size of the area being surveyed. The minimum number of measurements per survey unit will be:

Survey units $\leq 1500 \text{ m}^2$	A minimum of 30 measurement locations
Survey units $\geq 1500 \text{ m}^2$	A minimum of 1 measurement for each 50 m^2

Identification of activity levels in excess of 75% of the guideline, as determined by measurements, will require investigation for possible reclassification of the area to the "affected" (non-suspect affected or suspect affected) category.

Exposure Rate Measurements - Exposure rate measurements will be performed at approximately evenly-spaced intervals throughout the lab or facility. The number of measurements will be determined by the size and history of the area. At a minimum, an exposure rate measurement will be performed every 10 m^2 floor area.

Outside Surveys for Unaffected Areas (Concrete or Asphalt Surfaces) - Outside surveys for unaffected concrete or asphalt surfaces will be uniformly scanned for radiations from the radionuclides of interest. Spacing intervals between scanning paths will be such that a minimum of approximately 10% of the surface is scanned. Exposure rates are not to exceed 10 micro-R/hr above background at 1 m above the surface (concrete or asphalt surfaces). For open areas, exposure rates (measured at 1 m above the surface) can be averaged over 100 m^2 grid areas. The maximum exposure rates over any discrete area may not exceed two times the limit above background.

6.1.4.4 Affected Area Survey

An affected area is any area which has the potential for radioactive contamination based on plant operating history, known radioactive contamination or previous radiological surveys. Affected areas are further subdivided into *non-suspect affected* and *suspect affected* areas.

Non-Suspect Affected Area Survey

Definition - This designation is assigned to ceiling and wall surfaces above 2 meters within an affected survey unit where it was not expected that the average removable or total surface activity would exceed 75% of the guideline values. This designation may also be assigned to other surfaces (such as the outer walls of buildings, external piping of a building, and roofs) unless the surface meets the criteria for a suspect affected survey unit. This classification *may also be assigned* to areas where licensed materials were used in the past but contamination is not likely due to the types of activities and preliminary surveys performed in the area. For example, a laboratory in Building 2 which has not been used for work involving radioactive materials in over 10 years and where surveys indicate the lab is not contaminated.

Gridding - Non-suspect affected areas do not require gridding for the purposes of establishing measurement or sampling locations; however, grids systems may be used in order to facilitate referencing of survey locations in those areas to a common site reference system.

Scanning - Non-suspect affected area surveys will include a scan of approximately 10% of the accessible surface area comprising floors and walls below 2 meters. Scanning above 2 meters (upper walls and ceilings) is not necessary because direct and removable measurements will be performed as described below.

Measurements - A measurement is either (1) a "fixed" measurement representing total activity or (2) a wipe representing removable activity. The number of measurement locations will be based in part on the size of the area being surveyed. The minimum number of measurements per survey unit will be:

For survey units $\leq 600 \text{ m}^2$ A minimum of 30 measurement locations

For survey units $> 600 \text{ m}^2$ A minimum of 1 measurement location for each 20 m^2

Identification of activity levels in excess of 75% of the guideline, as determined by measurements, will require investigation for possible reclassification of the area to the "suspect affected" category.

Exposure Rate Measurements - Exposure rate measurements will be performed at approximately evenly-spaced intervals through the lab or facility; the number of measurements will be determined by the size and history of the area. At a minimum, an exposure rate measurement will be performed approximately every 10 m^2 floor area.

Outside Surveys for Non-Suspect Affected Areas (Concrete or Asphalt Surfaces) - Outside surveys for non-suspect affected concrete or asphalt surfaces will be uniformly scanned for radiations from the radionuclides of interest. Spacing intervals between scanning paths will be such that a minimum of approximately 10% of the surface is scanned. Exposure rates are not to exceed 10 micro-R/hr above background at 1 m above the surface (concrete or asphalt surfaces). For open areas, exposure rates (measured at 1 m above the surface) can be averaged over 100 m^2 grid areas. The maximum exposure rates over any discrete area may not exceed two times the limit above background.

Suspect Affected Area Survey

Definition - This designation is assigned to the floors and wall surfaces below two meters if they are known or suspected to be contaminated. It is also assigned to other surfaces known or suspected to be contaminated. This would normally include areas where radioactive materials in a form which could become airborne was used, where liquid radioactive materials were handled, and where records indicate spills and other unusual occurrences that could have resulted in spread of contamination. This could also include areas immediately surrounding, or adjacent to, these areas because of the potential for inadvertent spread of contamination.

Gridding - A grid consists of a system of intersecting lines, referenced to a fixed site location or bench mark. Grids are established at the site to (1) facilitate systematic selection of measuring/sampling locations, (2) provide a mechanism for referencing a measurement/sample back to a specific location so that the same survey point can be relocated, and (3) provide a convenient means for determining average activity levels. Gridding is required in suspect affected areas unless it is not feasible. For example, interior structural surfaces, system piping, portions of interior walls, where interferences exist and are not expected to be removed and for small areas, i.e., a 3m by 5m lab (unless decontamination was necessary to meet the guideline values).

For surveys of structures the basic grid system for affected areas is a 1m by 1m grid. For surveys of outside areas, the basic grid system is 10m by 10m or 5m by 5m. Gridding inside structures may be

limited to the floor and lower (up to 2 m height) walls. Survey locations are referenced to the grid system; surveys of ungridded surfaces are referenced to the floor or to prominent building/area features or landmarks. The grids described above are intended primarily for reference purposes, and although grid intersections are the locations where measurements or samples are normally collected, they do not necessarily dictate the spacing of survey measurements or sampling.

Scanning- Scans of approximately 100% of the accessible suspect affected area (normally the floor and 2 m up the wall) will be performed for all radiations which may be emitted from the radionuclides of interest. Locations of areas of elevated activity will be identified and direct measurements will be taken at these locations. Residual activity above the release criteria will be remediated until the release criteria is satisfied.

For upper walls and ceilings that are classified as suspect affected areas, a reasonable effort will be made to survey at least 25% of the suspected contaminated surfaces. Additional survey coverage is needed if levels detected are $\geq 75\%$ of the limits is detected on any of the surfaces. Survey coverage may also be modified based on an assessment of the situation. For example, if contamination has been detected only on I-beams or other flat horizontal surfaces and generally not on vertical surfaces, then a reasonable effort to survey approximately 100% of the flat horizontal surfaces will be made and an attempt to survey at least 10% of vertical surfaces will be made.

Measurements - A measurement is either (1) a "fixed" measurement representing total activity or (2) a wipe representing removable activity. The number of measurement locations will be based in part on the size of the area being surveyed. The minimum number of measurements per survey unit will be:

For survey units $\leq 20 \text{ m}^2$ A minimum of 30 measurement locations

For survey units $\geq 20 \text{ m}^2$ A minimum of 1 measurement location for each 20 m^2

In addition, in suspect affected areas, the survey plan must incorporate additional sampling points specific to each area and developed on a case-by-case basis. This will include consideration for survey of overhead structures (including lights, I-beams, piping, ducts, vents, and other structures), survey of drains, etc.

Exposure Rate Measurements - If gamma emitting radionuclides are among the potential contaminants, exposure rate measurements will be taken approximately every 4 m^2 of accessible floor area. If potential contaminants did not include gamma emitters, exposure rate measurements will be performed at a minimum spacing of 1 measurement per 10 m^2 .

Outside Surveys for Affected Areas (Concrete or Asphalt Surfaces)

Exposure rates are not to exceed 10 micro-R/hr above background at 1 m above the surface (concrete or asphalt surfaces). For open land areas, exposure rates (measured at 1 m above the surface) can be averaged over 10m by 10m grids. The maximum exposure rates over any discrete area may not exceed two times the limit above background. It is GA's intent to remediate all areas where micro-R readings exceed $10 \mu\text{R/hr}$ at 1 m above the surface. However, in the event that reasonable efforts have been made and measurements continue to remain elevated, GA may apply the averaging criteria described above to determine compliance.

6.2 Soil Sampling Plan

The objective of soil sampling is to demonstrate compliance with approved soil release criteria. This plan was developed using the guidance in NUREG/5849.²

6.2.1. Release Criteria

Soil Concentration Limits

Table 6-2 shows release criteria based upon the most limiting pathway for a variety of radionuclides that may be encountered on the GA site (or those that conceivably could be encountered). Decommissioning projects at GA over the past 12 years have shown that the predominant contaminants on the GA site are Cs-137, Co-60, enriched uranium and thorium. The soil concentrations are acceptable values above normal background levels.

If additional nuclides are encountered during the remediation or Final Release Survey activities, their respective release criteria would be determined in the same manner as the values provided above.

If more than one radionuclide exists, the sum of the fractions must be less than one in order for the soil to meet the release criteria. The sum will be calculated as follows:

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

C_i = The average soil concentration of radionuclide i .

L_i = The maximum soil limit for i (pCi/g).

Exposure Rate Limits

Exposure rates are not to exceed 10 microR/hr above background at 1 m above the surface.

For open land areas, exposure rates (measured at 1 m above the surface) can be averaged over 100 m² grid areas. The maximum exposure rates over any discrete area may not exceed two times the limit *above background*.

6.2.2 Soil Background Concentrations

² Manual for Conducting Radiological Surveys in Support of License Termination (Draft for Comment), NUREG/CR-5849, ORAU-92/C57, Oak Ridge Associated Universities, June 1992.

Typical soil concentrations are provided in the table below which represent the average results of seventeen (17) surface soil samples and ten (10) concrete samples collected in undisturbed areas from the region surrounding the GA site.

Media Type	Cs-137 (pCi/g)	U-238 (pCi/g)	U-235 (pCi/g)	Th-232 (pCi/g)
Soil	0.21 ± 0.20	1.26 ± 0.78	0.08 ± 0.04	1.72 ± 0.92
Concrete	0.04 ± 0.02	4.27 ± 0.63	0.12 ± 0.03	3.62 ± 0.24

6.2.3 Unaffected Areas - Open Land Surveys

Unaffected open land area will be uniformly scanned for radiations from the radionuclides of interest. Spacing intervals between scanning paths will be such that a minimum of 10% of the surface is scanned.

Identification of hot-spots or individual locations with activity levels in excess of 75% of the guideline value requires reclassification of the area as "affected".

6.2.4 Affected Areas - Open Land Surveys

Grounds and open land areas classified as affected areas are gridded at 10 meter intervals.

As with structure surfaces, GA will perform approximately 100% coverage of affected open land areas (soil). Scanning will be performed to identify locations of elevated activity levels. Areas of suspected elevated activity, identified in this manner, are evaluated by sampling and analyses to determine their activity level and extent of contamination, and results are compared with criteria, cleanup is performed, as required, and scanning repeated. After scanning has indicated the guidelines and conditions have been satisfied, systematic soil sampling of each affected area grid block is performed at locations equal distant between the center and each of the four grid block corners or on a 5 meter triangular grid system recommended by EPA procedure (EPA 1989) for a 95% assurance that elevated areas in excess of 10 m² surface area are identified.

If scanning is not capable of detecting surface areas with activity levels \leq 75% of the guideline values for the radionuclides of interest, the 5 meter triangular grid system will be used.

Exposure rates are measured at 1 m above the surface on the grid pattern.

Underneath a concrete slab

In cases where contamination is suspected underneath a concrete slab, biased samples will be collected from underneath the concrete slab (under cracks and/or drains where the soil appears affected; i.e., discolored, odiferous or otherwise abnormal or suspected of contamination).

Scanning (along the surface of the soil) will be performed to identify locations of elevated

activity levels. Areas of suspected activity, identified by scanning or visual inspection, will be evaluated to determine their activity levels and the extent of contamination. Cleanup will be performed, as required, and the scanning repeated until remediation is accomplished as demonstrated by additional soil sampling, analysis and comparisons with the guidelines.

After scanning and remediation of known contaminated areas, systematic soil sampling will be performed on a triangular grid with a sampling interval of 5 m on a side. Additional remediation will be conducted if release criteria are not met. If elevated area (areas above release criteria) are identified during the final survey, they will be evaluated for acceptability using NUREG/CR-5849 averaging methods, regardless of whether or not remediation will be conducted.

Underneath drain lines

If underground drain lines are removed and sampling is needed (i.e., in trenches created during removal of potentially contaminated drain lines), biased samples will be collected as follows:

- 1) Soil samples will be collected from underneath and around any drain lines which appear broken, corroded or otherwise deteriorated.
- 2) Soil samples will be collected whenever exposure rates are elevated (measured using microR meters and/or NaI (TI) detectors/ratemeters).
- 3) Soil samples will be collected if the soil appears affected, i.e., discolored, odiferous or otherwise abnormal.

In addition, systematic samples will be collected approximately every 5 m (about every 15 feet) from underneath the drain lines.

Subsurface Samples

Remediation of soil will continue to a depth required to reduce the concentrations to levels below the release criteria. A final sample(s) after remediation will demonstrate that residual activity is below the release criteria.

Subsurface samples underneath the concrete slab may be collected to a depth of three (3) feet. Subsurface samples will be collected in biased locations and will include: 1) each location (larger than 5 m²) where soil contamination above the guidelines was discovered and remediated and 2) any location where exposure rate measurements were elevated (greater than two times the external radiation exposure limit, above background). These measurements will be made using a microR meter or NaI (TI) detector/ratemeter.

Subsurface samples may also be collected underneath drain lines as necessary to assure that subsurface contamination above the release criteria does not exist. Normally, subsurface sampling in affected areas where drain lines were removed will be conducted every 20 feet to a depth of 2 feet. Additional sampling at further depths and/or at other locations will be conducted, if contamination above the release criteria is present or suspected.

Subsurface samples may also be collected in other suspect locations, if warranted by exposure rate measurements or remediation efforts.

Outside Areas of Buildings

Scanning (along the surface of the soil) will be performed in all exposed soil locations to identify locations of elevated activity levels. Spacing intervals between scanning paths should be such that approximately 100% of the surface is scanned.

Table 6-2—Soil and Concrete/Asphalt Rubble Release Criteria¹

Isotope	Release Criteria Based upon External Exposure Limitations (pCi/g)	Release Criteria Based upon Internal Exposure Limitations (pCi/g)
⁶⁰ Co	8 ²	
¹³⁴ Cs	10	
¹³⁷ Cs	15 ²	
¹⁵² Eu	11	
¹⁵⁴ Eu	10	
¹⁵⁵ Eu	635	
⁹⁴ Nb	7.5	
¹²⁵ Sb	37	
⁹⁰ Sr		1800 ²
²³⁸ Pu		26 ⁴
²³⁹ Pu		27 ⁴
²⁴⁰ Pu		27 ⁴
²⁴¹ Pu		4326 ⁴
²⁴² Pu		28 ⁴
²⁴⁴ Pu		28 ⁴
²⁴¹ Am		25 ⁴
Natural Uranium		10 ³
Depleted Uranium		35 ³
Enriched Uranium		30 ³
(²³⁴ U & ²³⁵ U) ⁵		
Thorium (²³² Th & ²²⁸ Th)		10 ³

¹ The release criteria shown in this table without annotation by footnotes 2, 3, or 4 were calculated by the licensee using RESRAD version 5.18 adhering to the same assumptions that were provided in the correspondence listed in note 2, below. This corresponds to conservative calculation of the homogenous concentration of an isotope in the soil that by itself would give approximately 10 μ R/hr external exposure rate above background for the maximum year of exposure. It is the licensee's intent to apply criteria from this table to concrete, asphalt, or similar construction media materials that have been ground to a coarse rubble. These criteria were approved by the NRC for the Hot Cell Decommissioning project by letter dated May 1, 1996, Robert C. Pierson to K. E. Asmussen.

² These release criteria are based upon past precedent through NRC and State of California approved release limits for the GA site. See Correspondence K. E. Asmussen to W. T. Crow, dated October 1, 1985, correspondence identification 696-8023, Subject: "Docket 70-734: Plan for Obtaining Release of Certain Areas to Unrestricted Use."

³ These release criteria are based upon past precedent established by NRC through NRC Policy Issue SECY-81-576, dated October 5, 1981, Subject: "Disposal or on-site storage of residual thorium or uranium (either as natural ores or without daughters present) from past operations."

⁴ Numbers were established using the most limiting of lung dose (20 mrem/yr) or bone dose (60 mrem/yr) using Dose Conversion Factors from NUREG/CR-0150, Volume 2, with an alpha quality factor of 20, where applicable, lung mass of 580 grams, and AMAD of 1.0.

⁵ For enriched uranium, GA shall determine the U-234:U-235 ratio by uranium isotopic analysis and then use gamma spectroscopy results of U-235 to demonstrate compliance with the release criteria for enriched uranium.

6.2.5 Sample Collection

A 15 cm "surface" soil sample will be collected with a sample size of approximately 1 kilogram. The sampling locations will be identified on drawings. The samples will be properly logged, labeled, packaged and tracked. All debris (grass, rocks, sticks, and foreign objects) will be removed from the sample. Samples will be dried and counted by gamma spectroscopy. Results will be reported in pCi/g for each radionuclide.

Shallow sampling may be conducted using manual equipment (post-hole diggers, small-diameter split barrel or Shelby tube samplers, and portable hand-operated or motorized augers). For depths below several meters, heavier equipment, such as a drill rig with an auger and/or a core sampler will be required.

6.2.6 Direct Radiation Measurements

To determine compliance with the external radiation limit of 10 microR/hr at 1 m above the surface, exposure rate measurements will be taken at 1 meter at all systematic soil sampling locations (after soil remediation has been completed). The results will be compared with the release criteria shown in Table 1 (and discussed above).

A calibrated microR meter will be used to determine exposure rate measurements in microR/hr.

It is GA's intent to remediate areas containing elevated activity levels in the soil. However, in the event that reasonable efforts have been made and soil concentrations continue to remain elevated, GA may establish the guideline that areas of residual activity exceeding the guideline value, known as "elevated" areas, are acceptable, provided they do not exceed the guideline value by greater than a factor of $(100/A)^{1/4}$, where A is the area of residual activity in m^2 , and provided the activity level at any location does not exceed three times the guideline values. In addition, radionuclide concentrations will be averaged to demonstrate the average is at or below guideline values, established as acceptable to NRC. Averaging will be based on a 100 m^2 (10 m x 10 m) grid.

6.3 *Methods to be Employed for Reviewing, Analyzing, and Auditing Data*

6.3.1 Laboratory/Radiological Measurements Quality Assurance

During decommissioning survey activities, many direct and indirect measurements and sample media samples will be collected, measured, and analyzed for radiological contaminants. The results of these surveys will be utilized to evaluate the suitability of the material or item for release to unrestricted use, or whether decontamination of structures, components, and the surrounding site have achieved the desired result. Sample collection, analysis, and the associated documentation will adhere to written procedures and meet the guidance of the NRC. Outside (i.e., non-GA) laboratories selected to analyze facility decommissioning samples will be approved by the GA Quality Assurance organization and listed on the Non Safety-Related QA Suppliers List or other similar document maintained by the GA Quality Assurance Department.

Quality control records for laboratory counting systems will include the results of measurements of radioactive check sources, calibration sources, backgrounds, and blanks. Records relating to overall laboratory performance will include the results of the analysis of quality control samples such as analytical blanks, replicates, and other quality control analyses.

6.3.2 Supervisory and Management Review of Results

Radiological surveys are conducted by HP Technician staff members who are trained and qualified in accordance with General Atomics' SNM and State of California Byproduct Material License. In addition, radiological surveys and sample results are reviewed by the HP Management or designated Health Physics Technician (other than the individual that performed the survey).

6.4 Final Survey Report

All survey results will be documented and provided to the Nuclear Regulatory Commission and the State of California in a final report. Note: For areas where remediation was conducted, the report will include the results of surveys conducted prior to the area being remediated as well as the final survey results.

Example Survey Plan (from Group 8B Labs Final Report)

Type of Survey	506 144 ft ²	506A 132 ft ²	508 144 ft ²	508A 121 ft ²	515 288 ft ²	519/521 576 ft ²	523 168 ft ²	530/532 576 ft ²	635 312 ft ²	637/639 648 ft ²	635/637/639 Mezzanine 663 ft ²
History of Use	X-ray diffraction and electron microscopy of samples containing U-235, U-238, thorium and/or depleted uranium. Last used 12/95				No history of radioactive material use.	Two gamma calibration sources used to calibrate gamma robot Used for rad work until 1986.	No history of radioactive material use.	Ion accelerator used. Last used in 1986.	Ar-41 gas. Sealed Pu-238 sources. U-235, U-238 and/or thorium in the form of metal, fuel particles and/or fuel compacts. Used for rad work until 1982.		
Floor 100% α scan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Floor 100% β scan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Lower Walls (bottom 2m) 100% β scan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Upper Walls -10% β scan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Fixed Measurements (See list)	32 (2 min)				15 (2 min)	27 (5 min)	10 (2 min)	28 (5 min)	12 (5 min)	27 (5 min)	28 (5 min)
# of Paint Samples	4 #1-4	None (original or no paint)	4 (#9-12)	4 (#5-8)	4 (#13-16)	None (original or no paint)	4 #17-20	4 #21-24	2 #25-26	None (original or no paint)	None (original or no paint)
# of Smears (See List)	72				26	56	36	60	28	60	64



Type of Survey	506 144 ft ²	506A 132 ft ²	508 144 ft ²	508A 121 ft ²	515 288 ft ²	519/521 576 ft ²	523 168 ft ²	530/532 576 ft ²	635 312 ft ²	637/639 648 ft ²	635/637/639 Mezzanine 663 ft ²
History of Use	X-ray diffraction and electron microscopy of samples containing U-235, U-238, thorium and/or depleted uranium. Last used 12/95				No history of radioactive material use.	Two gamma calibration sources used to calibrate gamma robot. Used for rad work until 1986.	No history of radioactive material use.	Ion accelerator used. Last used in 1986.	Ar-41 gas. Sealed Pu-238 sources. U-235, U-238 and/or thorium in the form of metal, fuel particles and/or fuel compacts. Used for rad work until 1982.		
# of MicroR Readings	4	4	4	4	8	16	6	16	8	16	16 & Scan entire surface
Floor Drains?	Above ground floor drain	None	None	None	None	None	None	None	None	None	None
Floor Surface	Concrete Surface				~ ½ concrete ~ ½ linoleum	Concrete	Linoleum	Linoleum	Concrete	Concrete	Wood
Total # of Measurements (Fixed Measurements & Smears)	104				41	83	46	88	40	87	92

Example Survey Plan (Detailed Locations of Fixed Measurements and Smears)		
Laboratory	Fixed Measurements	Smears
Labs 506, 506A, 508 and 508A	<u>Fixed Measurements (32)</u>	<u>Smears (72)</u>
	12 Floors - 3 in each room	20 Floors - 5 in each room
	16 Walls - 1 on each wall (4) of each room (4)	16 Walls - 1 on each wall (4) of each room (4)
	1 Inside Square Duct in Lab 506A	10 Blinds in 508
	1 Inside Round Duct in Lab 508	8 Light fixtures (2/room)
	1 Inside Square Duct in Lab 508	4 Ducts in 506A
	1 On top of drain in 506 (drain is above ground)	2 Ducts in 508
Lab 515	<u>Fixed Measurements (15)</u>	<u>Smears (26)</u>
	5 Floor	10 Floor
	4 Walls (1 on each wall)	8 Walls (2 on each wall)
	4 Lights (2/light)	4 Lights (2 on each light)
	2 I-Beam	2 I-Beam
		1 On Vent
		1 Top of the closed duct
Labs 519/521	<u>Fixed Measurements (27)</u>	<u>Smears (56)</u>
	10 Floor	20 Floor
	8 Walls (2/wall)	16 Walls (4 per wall)
	3 Each opening of the duct	6 Duct (one in each of 3 openings and 3 on top of the duct)
	4 Lights (one on each)	8 Lights (2 per light)
	1 box (on wall)	3 Wall exhaust ducts (square duct, round duct and exhaust vent out)
	1 Round exhaust duct in wall)	3 I-beam

Example Survey Plan (Detailed Locations of Fixed Measurements and Smears)		
Laboratory	Fixed Measurements	Smears
Lab 523	<u>Fixed Measurements (10)</u> 4 Floors 4 Walls (one per wall) 2 Lights (one per light)	<u>Smears (36)</u> 12 Floors 4 Walls (one per wall) 4 Lights (one per light) 8 I-beams 8 Window ledge
Labs 530/532	<u>Fixed Measurements (28)</u> 16 Floors 4 Walls 2 I beams 2 Inside ducts 4 Lights (1 each light)	<u>Smears (60)</u> 20 Floors 16 Walls 4 I-beams 8 Light Fixtures 10 "Hood Umbrella" 2 Roof Drain (drain goes through the lab only - no entrance or exit to lab)
Lab 635	<u>Fixed Measurements (12)</u> 5 Floor 4 Walls 1 Inside the large duct 1 Square duct 1 Inside the open vertical duct	<u>Smears (28)</u> 10 Floor 8 Walls (2 per wall) 6 Ducts (2 inside each duct) 4 Ducts (top of ducts)
Labs 637/639	<u>Fixed Measurements (27)</u> 16 Floor 8 Walls (2 per wall; 1 on unpainted area, 1 on painted area - no paint samples are needed) 1 Top of the electrical panel 2 Ducts	<u>Smears (60)</u> 20 Floor 16 Walls (4 per wall) 10 Stairway 2 Handrail 12 Inside of ducts

Example Survey Plan (Detailed Locations of Fixed Measurements and Smears)		
Laboratory	Fixed Measurements	Smears
635/637/639 Mezzanine	<u>Fixed Measurements (28)</u>	<u>Smears (64)</u>
	20 Floor	20 Floor
	4 Walls (2 per wall)	4 Walls (2 per wall) Note: one wall is windows and the other wall is part of lower labs.
	1 Duct	4 Railing
	2 I-beams	16 Blinds (4 on each of the 3 large blinds; 2 on each of the 2 small blinds)
	1 Lights	8 I-beams
		4 Lights
		4 Inside ducts
		4 Top of ducts