

OFFICIAL RECORD COPY MATERIALS LICENSE

Amendment No. 29

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

Licensee		In accordance with the letter dated September 10, 1996	
1.	U.S. Department of the Interior Geological Survey National Center	3. License Number	45-15923-01
2.	12201 Sunrise Valley Drive Reston, Virginia 22092	is amended in its entirety to read as follows:	
		4. Expiration Date	November 30, 2000
		5. Docket or Reference No.	030-10034
6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License	
A. Carbon 14	A. Any	A. 15 millicuries (555 MBq) total	
B. Nickel 63	B. Foil and/or plated sources contained in compatible detector cells registered pursuant to 10 CFR 32.210 or an equivalent Agreement State regulation	B. Not to exceed 15 millicuries (555 MBq) per sealed or plated source	
C. Any byproduct material produced from irradiation of geologic samples(rocks...)	C. Neutron activated geologic samples	C. 530 millicuries (19.65 GBq) total	
D. Neptunium 237	D. Any	D. 10 microcuries (370 kBq) total	
E. Americium 241	E. Any	E. 0.96 millicurie (35.5 MBq) total	

200118

9. Authorized Use:
- A. For use in laboratory tracer studies and molecular biology procedures.
 - B. For use in gas chromatographs for sample analysis.
 - C. For use in laboratory research studies of neutron activated geologic samples.
 - D. and E. For storage incident to disposal.

**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number 45-15923-01

Docket or Reference Number 080-10034

Amendment No. 29

CONDITIONS

10. Licensed material may be used at:
 - A. Geological Survey Physics Building, Lot "O" off South Lakes Drive, and the National Center, 12201 Sunrise Valley Drive, Reston Virginia.
 - B. U.S. Geological Survey, Stephenson Center, Suite 129, 729 Gracern Road, Columbia, South Carolina.
11. The Radiation Safety Officer (RSO) for this license is Charles W. Naeser, Ph.D.
12. Authorized users:
 - A. Charles W. Naeser For materials listed in Subitems 6.C and for 6.A through E incident to radiation safety duties.
 - B. Nancy D. Naeser For materials listed in Subitem 6.B. and C.
 - C. Jeffrey N. Grossman For materials listed in Subitems 6.C.
 - D. Michael J. Kunk For materials listed in Subitem 6.C.
 - E. Curtis A. Palmer For materials listed in Subitems 6.B. and C.
 - F. Elizabeth J. Jones For materials listed in Subitems 6.A. and B.
 - G. John F. Sutter For materials listed in Subitem 6.C.
 - H. James E. Landmeyer For materials listed in Subitems 6.B.
 - I. Francis H. Chapelle For materials listed in Subitems 6.A. and B.
 - J. Paul M. Bradley For materials listed in Subitem 6.B.
13.
 - A.(1) The sealed source(s) specified in Item 7, shall be tested for leakage and/or contamination at intervals not to exceed 6 months. Any sealed source received from another person which is not accompanied by a certificate indicating that a test was performed within 6 months before the transfer shall not be put into use until tested.
 - (2) Notwithstanding the periodic leak test required by this condition, any licensed sealed source is exempt from such leak tests when the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.
 - B. Any source in storage and not being used need not be tested. When the source is removed from storage for use or transfer to another person, it shall be tested before use or transfer.
 - C. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the source shall be removed from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. A report shall be filed within 5 days of the date the leak test result is known with the U. S. Nuclear Regulatory Commission, Region II, Division of Nuclear Materials Safety, Nuclear Materials Licensing/Inspection Branch, 101 Marietta Street, Suite 2900, Atlanta, Georgia 30323. The report shall specify the source involved, the test results, and corrective action taken. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. Records may be disposed of following Commission inspection.
 - D. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically licensed by the Commission or an Agreement State to perform such services.

**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number 45-15923-01

Docket or Reference Number 45-10034

Amendment No. 29

CONDITIONS

14. Sealed sources containing licensed material shall not be opened by the licensee.
15. Detector cells containing licensed material shall not be opened or the sources removed from the detector cell by the licensee.
16. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under this license.
17. Licensed material shall not be used in or on human beings or in products distributed to the public.
18. The licensee shall maintain records of information important to safe and effective decommissioning at the U.S. Department of the Interior, Geological Survey, 990 National Center, Reston, Virginia, pursuant to the provisions of 10 CFR 30.35(g) until this license is terminated by the Commission.
19. In addition to the possession limits in item 8, the licensee shall further restrict the possession of licensed material as follows:
 - A. For unsealed sources to quantities less than 10^5 times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d) and
 - B. For sealed sources, to quantities less than 10^{10} times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d).
20. The licensee may transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
21. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.
 - A. Application dated:
 - (1) June 26, 1990
 - (2) November 28, 1995 [Renewal application which down sizes operations]

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number 45-15923-01

Docket or Reference Number 050-10034

Amendment No. 29

CONDITIONS

21.(cont)

- B. Letters dated:
- (1) October 4, 1990
 - (2) July 1, 1994
 - (3) January 30, 1995
 - (4) March 1, 1996
 - (5) June 14, 1996
 - (6) September 10, 1996
 - (7) September 18, 1996
 - (8) January 21, 1997

[Change user names, add authorized user, delete departed users, change rooms]
[Add authorized users]
[NRC letter extends expiration date per 10 CFR 30.36]
[New location of lab]
[Delete radioisotopes no longer possessed/delete users/increase C-14 possession limit to 15 millicuries/change Radiation Safety Officer]
[Provides licensee's basis for release to non-radiological use of rooms 3D231 and 3D239 of the John Wesley Powell Building]
[Additional information in support of amendment application]

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

EARL G. WRIGHT

DATE JAN 21 1997

BY

Earl G. Wright

Region II, Division of Nuclear Materials Safety
101 Marietta Street, N.W., Suite 2900
Atlanta, GA 30323-0199

N:\MLICENSE\45-15923.A29

JF 1/24/97

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

: (FOR LFMS USE)
: INFORMATION FROM LTS
: -----
:
: Program Code: 03620
: Status Code: 0
: Fee Category: EX 3M
: Exp. Date: 20001130
: Fee Comments: _____
: Decom Fin Assur Req'd: Y
: ::::::::::::::::::::::::::::::

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

Applicant/Licensee: INTERIOR, DEPARTMENT OF THE
Received Date: 960920
Docket No: 3010034
Control No.: 257207
License No.: 45-15923-01
Action Type: Amendment

2. FEE ATTACHED

Amount: _____
Check No.: _____

3. COMMENTS

Signed _____
Date _____

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /__/))

1. Fee Category and Amount: _____

2. Correct Fee Paid. Application may be processed for:

Amendment _____
Renewal _____
License _____

3. OTHER _____

Signed _____
Date _____



United States Department of the Interior

GEOLOGICAL SURVEY
Reston, VA 22092



September 10, 1996

*Received
Hard copy 9/23/96
YW*

United States Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W., Suite 2900
Atlanta, GA 30323-0199

Attn: Earl G. Wright
Senior License Reviewer
Division of Nuclear Materials Safety

License No. 45-15923-01
Expiration Date: November 30, 2000
Mail Control No.: 256959

Dear Mr. Wright:

This letter requests an amendment to License No. 45-15923-01. The requested amendment addresses several items in your July 29, 1996 letter in addition other changes are necessary to reflect the changes in program and personnel.

Dr. Charles Naeser has completed the 24 hours of classroom training provided by Mr. Michael Terpilak. Attached is a copy of Mr. Terpilak's letter, regarding Dr. Naeser's training. Dr. Naeser has also received "on-the-job training" from Mr. Gregory Wandless, the current RSO. This training began on or about June 1, 1996, and will continue until this ammendment request is granted. This training has encompassed a wide variety of day-to-day operated tasks. It is Mr. Wandless' impression that Dr. Naeser is now fully qualified to perform the duties of RSO. As such the USGS wishes to request that Dr. Charles Naeser be listed as RSO for this license (45-15923-01) and for SMB-237, and SNM-1330.

In recent years the USGS has been reducing the scope of the license activities that are performed at the Reston location. We, therefore, wish to make the following changes to the sources section of the license:

- 6A. Hydrogen 3 - remove - see attached disposal manifest shipping date 11-20-91
- 6B. Carbon 14 - increase to 15 millicuries (555 MBq)
- 6C. Phosphorus 32 - remove - no record for receipt of, none on recent inventory
- 6D. Phosphorus 33 - remove - no record for receipt of, none on recent inventory
- 6E. Sulfur 35 - remove - no record for receipt of, none on recent inventory
- 6F. Chlorine 36 remove - no record for receipt of, none on recent inventory
- 6G. Cobalt 60 - remove - records indicate that two 7.2 uCi sealed sources were transferred to the Denver Federal Center, January 1990. These were the only Cobalt 60 sealed sources held on the license.
- 6H. Cobalt 60 - remove - see attached memo to Todd Eastman of ATG regarding amending the inventory of waste pickup.

*control #
257207*

- 6I. Nickel 63 - no change, will provide NRC with information regarding status of GC sealed sources on or before October 31, as per your request in Item 2 B. of letter dated July 29, 1996.
- 6J. Nickel 63 - no change, as above.
- 6L. Iron 55 - remove - see attached disposal manifest shipping date 8-30-96
- 6M. Strontium 89 - remove - see attached disposal manifest shipping date 8-30-96
- 6N. Strontium 90 - remove - see attached disposal manifest shipping date 8-30-96
- 6O. Tin 113 - remove - see attached disposal manifest shipping date 8-30-96
- 6P. Antimony 125 - remove - no record for receipt of, none on recent inventory
- 6Q. Barium 133 - remove - see attached disposal manifest shipping date 8-30-96
- 6R. Cesium 137 - remove - no sealed sources on record
- 6S. Cesium 137 - remove - see attached disposal manifest shipping date 8-30-96
- 6T. Promethium 147 - remove - see attached disposal manifest shipping date 8-30-96
- 6U. Protactinium 231 - remove - see attached disposal manifest shipping date 8-30-96
- 6V. Neptunium 237 - no change - in storage until disposal permitted
- 6W. Americium 241 - increase to 1.1 mCi. During the shutdown of the INAA project and transfer of licensed material to the "Hot Rock" shed for storage in early 1996, a vial containing 1 mCi of ²⁴¹Am was discovered. This source and the sealed sources (Item 6X.) will be placed in storage until such time as disposal is permitted.
- 6X. Americium 241 - no change - in storage until disposal permitted.
- 6Y. Any byproduct material - no change.
- 6Z. Technetium 99 - remove - no record for receipt of, none on recent inventory

The following people should be removed as authorized users:

- 12A. Allan Tanner - retired
- 12D. Philip A. Baedeker - retired
- 12H. Derek R. Lovely - no longer at USGS
- 12I. John W. Morgan - retired
- 12L. Micheal J. Pickering - no longer at USGS
- 12M. John F. Sutter - no longer using license materials
- 12O. Joan Woodward - retired

These changes will ensure that the license held by the USGS will better reflect the activities involving licensed material. We would greatly appreciate this amendment be expedited. Should you have any question you contact Mr. Gregory Wandless at (703)648-6189 or Dr. Charles Naeser at (703) 648-6964.

Sincerely,

A handwritten signature in dark ink, appearing to read "Gregory A Wandless". The signature is written in a cursive, somewhat stylized font.

Gregory Wandless
Radiation Safety Officer

cc: Jim Devine, MS 106
Curt Larsen, MS 953
Gary Kramer, MS 246
Wayne Martin, MS 954
Michael Terpilak
RSO file

GENERATOR NAME

Reston, VA

CONTINU

(20) ITEM NO	(21) RADIO- NUCLIDE EACH CONTAINER	(22) PERCENT OF ACTIVITY OF mCi OF EACH NUCLIDE	(23) ACTIVITY EACH CONTAINER (mCi)	(24) PHYSICAL FORM	(25) CHEMICAL FORM AND NAME & % OF CHELATING AGENT	(26) WASTE DESCRIPTION	(27) WASTE FORM CLASS
6-1	Au195	0.01	14.7165	Solid	Chlorides	Lab trash (paper, plastic, metal, glass, soil, rocks, cardboard, rubber) and powders-ores-minerals	A
	Ba133	1.275			oxides		
	Bi207	0.02					
	Bi210	0.155					
	Cd109	0.01					
	Co57	0.005					
	Cs137	0.00021					
	Eu152	0.003					
	Fe55	0.026					
	Gd153	3.8E-8					
	Ge68	0.01					
	Na22	0.1					
	Pa234	0.007					
	Pb210	2E-6					
	Pm147	1.55					
	Pb210	5E-6					
	Sn113	1E-8					
	Tl204	0.01					
	U(Nat)	0.0353				powder, reagents & ores	
	U(dep)	3E-9				rock samples in vials	
	Sc49	4.0					
	Fe59	3.0					
	Cs137	0.5				dry standards in vials	C
	Sr90	3.0				(centered in plastic jar in middle of drum - soil used for shielding only)	C
	Sr89	1.0					B
						inside of drum is contaminated from decay daughters	
1			14.7165			PAGE TOTALS	

ON SHEET

PAGE 2 OF 3

SITE CLEARANCE NUMBER
SCN 180-96

[illegible]

DOT Shipping Papers
Per DOT E-11575
CUSTOMER COPY

9702200235-1

Shipping date 8-30-96



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

JAN 27 1997

INFORMATION FOR NRC MATERIAL LICENSEES

Please find enclosed:

- ☒ Your NRC material license
- ☐ Amendment to your NRC material license
- ☐ Amendment renewing your NRC material license
- ☐ Amendment terminating your NRC material license
- ☐ Notice for Radiographer Quality Assurance Approval Program

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify this office (ATTN: Ms. Diane Heim at (404) 331-4673) so that we can provide appropriate corrections and answers.

Please be advised that your license expires at the end of the day in the month and year stated in the license. Unless your license has been terminated, you must conduct your program involving byproduct materials in accordance with the conditions of your NRC license, representations made in your license application, and NRC regulations. In particular, note that you must:

1. Operate in accordance with NRC regulations 10 CFR 19, "Notice, Instructions and Reports to Workers; Inspections," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.
2. Not possess and use materials authorized in Items 6, 7, and 8, on the license until:
 - a. you have constructed the facilities and obtained the equipment described in the license application and supporting documentation; and
 - b. you have notified the U. S. Nuclear Regulatory Commission, Region II, ATTN: Materials Licensing\Inspection Branch, in writing, that activities authorized by the license will be initiated.
 - c. you have submitted and certified implementation of a Quality Management Program (10 CFR 35.32) for radiotherapy, or for administering > 30 uCi of I-125 or I-131.
3. Notify NRC, in writing, within 30 days:
 - a. when an authorized user, Radiation Safety Officer, or Teletherapy Physicist permanently discontinues performance of duties under the license or has a name change; or
 - b. when the licensee's mailing address changes (no fee is required if the location of byproduct material remains the same).
4. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license:
 - a. when you decide to terminate all activities involving materials authorized under the license; or
 - b. if you decide not to complete the facility, acquire equipment, or possess and use authorized material.

5. Request and obtain a license amendment before you:
 - a. receive or use byproduct material for a clinical procedure permitted under Part 35 but not permitted by your license issued pursuant to this part.
 - b. permit anyone, not authorized under 10 CFR 35, Subpart J, to work as an authorized user under a license for medical use of byproduct material.
 - c. permit anyone, not authorized under 10 CFR 35, Subpart J, to work as a Radiation Safety Officer, Teletherapy Physicist, or Nuclear Pharmacist, under a license for medical use of byproduct material.
 - d. order byproduct material in excess of the amount, or a different radionuclide or form, other than authorized on the license;
 - e. add or change the areas of use or address (or addresses) of use identified in the license application or on the license; or
 - f. change ownership of your organization.
6. Submit a complete renewal application with proper fee or termination request at least 30 days before the expiration date of your license. You will receive a reminder notice approximately 90 days before the expiration date. Possession of byproduct material after your license expires is a violation of NRC regulations. Transfer of licensed materials must be consistent with 10 CFR 30.41, 40.51 or 70.42, as applicable. A license will not normally be renewed, except on a case-by-case basis, in instances where licensed material has never been possessed or used.

In addition, please note that NRC Form 313 requires the applicant, by his/her signature, to verify that the applicant understands that all statements contained in the application are true and correct to the best of the applicant's knowledge. The signatory for the application should be the licensee or certifying official rather than a consultant.

You will be periodically inspected by NRC. Failure to conduct your program in accordance with NRC regulations, license conditions, and representations made in your license application and supplemental correspondence with NRC will result in enforcement action against you. This could include issuance of a Notice of Violation, or imposition of a Civil Penalty, or an order suspending, modifying or revoking your license as specified in the "General Statement of Policy and Procedures for NRC Enforcement Actions," NUREG-1600, (7/95). Since serious consequences to employees and the public can result from failure to comply with NRC requirements, prompt and vigorous enforcement action will be taken against those who do not achieve the necessary attention to detail and standard of compliance expected of licensees.

Thank you for your cooperation.

Enclosures:

1. NRC License
2. Category Marked Below for:
 - ☐ New licenses: NUREG-1600 (7/95); 19; 20; 30; 40 or 70, as appropriate; 71; 170; NRC Form 3; Agreement State list; and NRC Form 313.
 - ☐ New radiography licenses: Parts 34; 150.
 - ☐ New medical and teletherapy licenses: Part 35.
 - ☐ Amendments and renewals: NRC Form 313.

g:\drss\nmis\ltr.cov

FAX

Date 01/22/97 2:14 PM

Number of pages including cover sheet 3

TO: Mr. Earl G. Wright
NRC Region II
Suite 2900
101 Marietta St.
Atlanta, GA 30323

Phone (404) 331-5617

Fax Phone (404) 331-7437

FROM: Gregory Wandless
U.S. Geological Survey
12201 Sunrise Valley
Drive
Mail Stop 954
Reston, VA 20092

Phone (703) 648-6189

Fax Phone (703) 648-6383

CC:

REMARKS: ☐ Urgent ☒ For your review ☐ Reply ASAP ☐ Please Comment

Earl,

Attached is a FAX of our response to your request for further information regarding License No. 45-15923-01 to enable you to continue the process. The original copy will arrive via postal mail shortly.

If you have any questions please call me.

Cheers,

Greg



United States Department of the Interior

GEOLOGICAL SURVEY
Reston, VA 22092



Memorandum

Date: January 21, 1997
To: Earl G. Wright, NRC
From: Gregory Wandless, Radiation Safety Officer *GW*
Subject: January 8, 1997 FAX

This is in response to our phone conversation of January 7, 1997 and your FAX requesting further information regarding my letter of September 10, 1996 requesting changes to License No. 45-15923-01.

Item 1.

Since I anticipate no use of materials covered under this license, upon naming of Dr. Naeser as Radiation Safety Officer I should be removed as an authorized user.

Item 2.

Concerning whether Dr. Landa should remain as an authorized user of Technetium 99. Since the 5 uCi source he has in his possession is an exempt quantity as was purchased as such and since he does not use any other licensed material he may be removed from the license as an authorized user.

Item 3.

The places currently listed on the license should remain. Until the pending license application for the South Carolina facility is approved they will continue to operate under this license.

Item 4.

Zinc 65 should not appear on this license.

Item 5.

(a) The ^{241}Am source is contained in a small, heavy wall, glass vial with a screw top cap. It is in liquid form, probably a chloride salt, with a volume of approximately 10 ml. The bottle cap has been taped to prevent it from opening, the entire bottle has been wrapped in several layers of Kimwipes and placed in a 500-ml Nalgene poly bottle with a screw top. The poly bottle has been labeled and the top sealed with security tape. This should prevent any accidental release of the material.

(b) No significant detectable removable contamination was found based on wipes of the bottle's outer surface. The radiation levels are 20 mR/hr on contact and 0.5 mR/hr at 1 foot.

(c) The manufacture's label is still intact and clearly indicates that the isotope was purchased from ICN Chemicals and the vial contains 1mCi of ^{241}Am . Since this isotope was most likely purchased in the late 1960's or early 1970's no other information is available.

(d) Since the original amount of ^{241}Am was 1 mCi and some 20 to 30 years has past since its labeling of 1 mCi, sufficient decay has occurred to place the amount of ^{241}Am below the 1 mCi limit for the requirement of a decommissioning funding plan. I believe this confirms the conversation you had with Mr. Terpilak on 1-18-97 and with me today.

(e) Reviewing the ^{241}Am sources in possession I believe that what I had originally thought were "custom sealed sources" are not. These sources were used by the Radiochemistry project to perform energy calibrations of gamma-ray detectors. They were prepared by placing a small drop of the ^{241}Am solution into a small poly-vial and allowing it to dry. The vial was then heat sealed and placed into a 2/5-dram vial and then into 2-dram vial for use. Five such sources were prepared and each contains approximately 10 uCi of ^{241}Am . We therefore, have no sources that would be classified as "custom sealed sources".

I believe this provides you with the necessary information to complete the requested amendment to License No. 45-15923-01. However, should further clarification be needed please feel free to contact me.

cc: Jim Devine, MS 106
Charles Naeser, MS 926A
Curt Larsen, MS 953
Wayne Martin, MS 953

January 8, 1997



TELEFAX

**Region II
Materials Licensing
Suite 2900
101 Marietta St.
Atlanta, GA 30323**

FROM: EARL G. WRIGHT, NML
Voice: (404) 331-5617
Fax: (404) 331-7437, or 5559

*efw 07
1/8/97*

TO: Dr. Greg Wandless, RSO
USGS
Reston, VA

*Licensee responded
by FAX dated 1/22/97*

Fax: (703-648-6383)

(2 pages + cover)

This confirms our telephone call of 1/7/97 about your letter of September 10, 1996 requesting changes to License No. 45-15923-01. As discussed, please provide the following:

1. Clarification of whether you are to remain on the license as authorized user once we name Dr. Naeser as Radiation Safety Officer.

Ans NO

control # 257207

2. Please clarify the names of authorized users and authorized uses which should appear in Condition 12 of your amended license.

Remove Dr Landa

3. Clarify the places of use that should be specified in Condition 10 of your amended license.

*Retain SC location until
other lic issued. Being processed
by Wade Loo.*

4. Clarify whether zinc 65 should appear in Item 6 of your license.

NO

5. *OK* Your letter of September 10, 1996 makes reference to "a vial containing 1 millicurie of americium 241 discovered in early 1996" which you now have in storage awaiting disposal. Please provide the following clarifying information about this material.

- (a) A description of the physical and chemical form and the method of safely containing the material (for example, liquid contained in a screw top glass vial...) Also, please specify specific procedures for preventing or reducing the impact of any spill or loss of containment of the material.
- (b) Specify the results of smear and instrument surveys of the vial to determine if removable contamination is present and the external radiation levels at a specified distance from the vial surface (i.e. 1 inch).
- (c) Describe your basis for concluding that the vial contains 1 millicurie of americium 241.
- (d) If your current possession limit of americium 241 is greater than 1 millicurie as indicated, you will need to submit a decommissioning funding plan as specified in 10 CFR 30.35(a) and (e). Procedures for submitting this plan are contained in RG 3.66 which will be sent to you by postal mail.
- (e) Also, please clarify the number of custom sealed source of americium 241 you currently possess and provide details about how the sources were fabricated (i.e. materials of

*5 sources do not meet
def. of ss.*

- (e) Also, please clarify the number of custom sealed source of americium 241 you currently possess and provide details about how the sources were fabricated (i.e. materials of construction, method of sealing the containment/activity per source and results of current leak tests).

If you have questions about this FAX, please call me.

Total initial activity of Am-241 in liquid form
initial 1 mci procured about 1/70
Thus the source has a decay period of about
27 years.

$$T_{1/2} \text{ Am } 241 = 458 \text{ y}$$

$$A = A_0 e^{-0.693 t / T_{1/2}}$$

$$A = (1 \text{ mci}) e^{-0.693 \left(\frac{27}{458} \right)}$$

$$= (1 \text{ mci}) e^{-0.693 (0.059)}$$

$$= (1 \text{ mci}) e^{-0.041}$$

$$= (1 \text{ mci}) (0.9578291)$$

$$= (1 \text{ mci}) (0.96)$$

$$= 0.96 \text{ mci}$$

Thus the licensee
possesses $\leq 1 \text{ mci}$

1/7/97

TELEPHONE OR VERBAL CONVERSATION RECORD

TIME

☐ INCOMING CALL☐ OUTGOING CALL☐ VISIT

PERSON CALLING

EARL KRIGHT

OFFICE/ADDRESS

OFFICE/ADDRESS

RSO

PHONE NUMBER

EXTEN

PHONE NUMBER

EXTEN

703-648-6189

CONVERSATION

SUBJECT

Lic # 45-15923-01

SUMMARY

Call to clarify.

1. Once answer is handed RSO is wandless to be removed from license? NO. To remain as authorized user.
- * 2. confirm that the current set of users (cond 12) is accurate [Dr Wandless will check + let me know]
- * 3. what authorized places of use are to remain in cond 10. (note: Physics building?)
4. Recalculate FAM requirements [For 1.1 MCA Am 241 in unscaled form will need DFP]
- * 5. Zinc 65 ?? [will check + let me know]
- * 6. Leak Tests/surveys of Am 241
what is form of Am 241 / type of vial
removable contamination? Am 241 cellom made
Sources ?? [How did Dr wandless ascertain the
activity level of the Am-241 liquid?]
Am 241 is a liquid in screw cap
glass vial. Now stored in "Rock Shed"
for disposal only.

Check Items

[Y] [N]	Decommissio
[Y] [N]	Facility Reqn
[Y] [N]	Qual. Mgmt.
[Y] [N]	Contingency
[Y] [N]	Decay-In-Stor
[Y] [N]	SRP/RG
[Y] [N]	
[Y] [N]	

REFERRED TO: C. Hasey 1/7/97

☐ ADVISE ME OF
ACTION TAKEN

ACTION REQUESTED

provided copies of corresp.
check plans to do follow up
insp. about the Am-241

INITIALS

DATE

ACTION TAKEN

* promised to ck on these items
+ call me back.

INITIALS

DATE

ETA 1/7/97



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

21

Department of the Interior
ATTN: Gregory A. Wandless
Radiation Safety Officer
12201 Sunrise Valley Drive
Reston, Virginia 22092

Mail Control No. 257207
Docket No. 030-10034
License No. 45-15923-01

SUBJECT: ACKNOWLEDGEMENT OF REQUEST FOR A LICENSING ACTION

(Your: ☒ Letter ☐ Application ☒ Dated ☐ Received **September 10, 1996**)

Dear Sir or Madam:

1. In response to your request, we have performed an administrative review of your application for a:
☐ new ☒ amendment ☐ renewal ☐ termination licensing action.

It should be noted that a technical review may identify additional omissions in the submitted information, technical issues that require additional information, or policy/technical issues that require coordination with headquarters or other NRC regional offices.

2. It appears that your request is ☐ incomplete ☒ complete and: ☐ routine (see 3-5 below);
☐ non-routine, and if necessary, can be completed within 30 - 45 days, following fee approval and response to any telephone or telefax deficiency requests from our license reviewer.
3. New and amendment actions are normally processed in 20 - 30 days, unless we find major deficiencies, or policy issues requiring central program office assistance.
4. Renewal actions are normally processed in 60 - 90 days, however under timely filing (before expiration) you may continue to operate under your existing license.
5. Termination actions are normally processed in 20 - 30 days, unless confirmatory surveys following decontamination are involved.
6. A copy of your correspondence has been forwarded to our Licensing Fee and Debt Collection Branch (301/415-6067) for approval of the fee category and amount.
7. If you have a compelling safety or business-related reason for requesting expedited review, please contact me or our Licensing Assistant, Diane Heim, at 404/331-4673 [voice/ans] or 404/331-7437 [fax] or Internet: ddh@nrc.gov. We will try to complete your request, as stated in 2. above.
8. Please call or write with any questions. I can be reached directly at 404/331-5617 [voice/ans] or via Internet: egw@nrc.gov.

Sincerely,

Earl G. Wright

Earl G. Wright, Senior License Reviewer
Materials Licensing/Inspection Branch



United States Department of the Interior

GEOLOGICAL SURVEY
Reston, VA 22092



September 18, 1996

United States Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W., Suite 2900
Atlanta, GA 30323-0199

ATTN: Jay L. Henson
Materials License Reviewer
Division of Nuclear Material Safety

License No. 45-15923-01
Expiration Date: November 30, 2000

Dear Mr. Henson:

Attached please find two copies of Mr. Michael Terpilak's, CHP, final survey report of Rooms 3D231 and 3D239 of the John Wesley Powell Building of the U.S. Geological Survey, in Reston, VA, prepared at our request for the purpose of determining if those rooms may be released for unrestricted use. Based upon Mr. Terpilak's findings we believe those rooms meet the guideline for release for unrestricted access and request that those rooms be released for unrestricted access. The release of these rooms does not terminate licensed activities in the John Wesley Powell Building of the U.S. Geological Survey.

This report does not address the release of rooms in the Solid State Physics Building. Management deemed the release of the 3D rooms to be of greater importance than the Physics Building areas, at this time. The collection of the remaining information you requested (Ref No. 256959) regarding the Solid State Physics Building is expected to take place in early October 1996. Upon its completion we will send you that information.

As I have related to Mr. Wright, the USGS has been mandated by Congress to house members of the abolished National Biological Service and the Bureau of Mines. In order to accommodate the personnel from those agencies GSA is performing extensive renovation of exiting lab space for conversion to office space. It would be greatly appreciated if the review of this report could be expedited in any way so that those renovations may begin. Should have any questions please call me at (703) 648-6189 or Dr. Charles Naeser at (703) 648-6964.

Sincerely,

Gregory Wandless

Gregory Wandless
Radiation Safety Officer

cc: Curt Larsen, MS 954
Gary Kramer, MS 246
Wayne Martin, MS 954
RSO files

257203

RAY-SAFE ASSOCIATES

Consultants in Radiation Protection Training and Management Programs

November 22, 1996

United States Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W., Suite 2900
Atlanta, Georgia 30323-0199

Attn: Jay L. Henson	Mail Control No. 257206
License Reviewer	Docket No. 030-10034
Materials Licensing/Inspection Branch 2	License No. 45-15923-01

Dear Mr. Henson:

This correspondence is a follow-up to our telephone conversation on November 8, 1996 and your letter dated October 21, 1996 (Enclosure A). As per our discussion, the additional information you requested concerning the Radiological Safety Assessment dated September 16, 1996 is submitted. The information requested is as follows:

- **Identification of the specific radionuclides that were used by the Licensee in Rooms 3D231 and 3D239.**
- **The inclusion of the levels of fixed contamination on surfaces surveyed in these laboratories and the results expressed in dpm/100 cm².**
- **The comparison of the instrument and swipe surveys conducted in these laboratories with the specific radionuclides used in these laboratories, and an assessment to compare the survey results to the USNRC guidance document, entitled "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," April, 1993.**

Enclosed is a Supplement to the initial report with the necessary information as requested (Enclosure B).

Since time is of the essence, I am submitting this information on behalf of the Licensee who has retained me as their Technical Health Physics Consultant.

Thank you in advance for your utmost attention and cooperation in this matter.

Sincerely,

Michael S. Terpilak

Michael S. Terpilak
Certified Health Physicist

ENCLOSURE A

UNITED STATES NUCLEAR REGULATORY COMMISSION
CORRESPONDENCE

ACKNOWLEDGMENT OF REQUEST
FOR A
LICENSING ACTION

OCTOBER 21, 1996



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

OCT 21 1996

Department of the Interior
ATTN: Gregory A. Wandless
Radiation Safety Officer
12201 Sunrise Valley Drive
Reston, Virginia 22092

Mail Control No. 257206
Docket No. 030-10034
License No. 45-15923-01

SUBJECT: ACKNOWLEDGEMENT OF REQUEST FOR A LICENSING ACTION
(Your: ☒ Letter ☐ Application ☒ Dated ☐ Received September 18, 1996)

Dear Sir or Madam:

1. In response to your request, we have performed an administrative review of your application for a:
☐ new ☒ amendment ☐ renewal ☐ termination licensing action.

It should be noted that a technical review may identify additional omissions in the submitted information, technical issues that require additional information, or policy/technical issues that require coordination with headquarters or other NRC regional offices.

2. It appears that your request is ☒ incomplete ☐ complete and: ☐ routine (see 3-5 below);
☒ non-routine, and if necessary, can be completed within 20 - 30 days, following fee approval and response to any telephone or telefax deficiency requests from our license reviewer.

3. New and amendment actions are normally processed in 20 - 30 days, unless we find major deficiencies, or policy issues requiring central program office assistance.

4. Renewal actions are normally processed in 60 - 90 days, however under timely filing (before expiration) you may continue to operate under your existing license.

5. Termination actions are normally processed in 20 - 30 days, unless confirmatory surveys following decontamination are involved.

6. A copy of your correspondence has been forwarded to our Licensing Fee and Debt Collection Branch (301/415-6067) for approval of the fee category and amount.

7. If you have a compelling safety or business-related reason for requesting expedited review, please contact me or our Licensing Assistant, Diane Heim, at 404/331-4673 [voice/ans] or 404/331-7437 [fax] or Internet: ddh@nrc.gov. We will try to complete your request, as stated in 2. above.

8. Please call or write with any questions. I can be reached directly at 404/331-0344 [voice/ans] or via Internet: jlh@nrc.gov.

Sincerely,

Jay L. Henson
Jay L. Henson, License Reviewer
Materials Licensing/Inspection Branch 2

ENCLOSURE B

SUPPLEMENT

TO

RADIOLOGICAL SAFETY ASSESSMENT

FOR

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

RESTON, VIRGINIA 22092

TASK ORDER NO. D3A96IN31179-06A

NOVEMBER 15, 1996

PREPARED BY:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

U.S. PUBLIC HEALTH SERVICE

DIVISION OF FEDERAL OCCUPATIONAL HEALTH

WASHINGTON, D.C. FIELD OFFICE

PREPARED FOR:

U.S. DEPARTMENT OF INTERIOR

U.S. GEOLOGICAL SURVEY

SUPPLEMENT TO
RADIOLOGICAL SAFETY ASSESSMENT
UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

NOVEMBER 15, 1996

DISCLAIMER

Reports and other publications issued by the Environmental Health Service (EHS) Program of the Division of Federal Occupational Health (DFOH) are prepared under procedures established by DFOH, which are designed to assure the technical competency of the persons or organizations under contract to the DFOH. In addition, reports and other publications are reviewed internally by one or more DFOH technical staff, and all comments are addressed to the satisfaction of the issuing office, prior to dissemination.

Mention of company name or products does not constitute endorsement by DFOH.

TABLE OF CONTENTS

Section

I.	Introduction	1
II.	Radionuclide Usage in Laboratories 3D231 and 3D239	1
III.	Radiation Surveys	4
IV.	Analysis and Comparison of Radiation Survey Results to U.S. Nuclear Regulatory Commission (NRC) Guidelines	5
V.	Results and Conclusions	5

I. INTRODUCTION

The John Wesley Powell Building on the United States Geological Survey (USGS) National Center Campus located in Reston, Virginia is a multistory administrative and laboratory complex which houses approximately a few thousand employees. The complex consists of about 75% administrative offices and about 25% laboratory space. The two laboratories surveyed will be released for unrestricted use and will be converted into office space (Figure 1).

II. RADIONUCLIDE USAGE IN LABORATORIES 3D231 AND 3D239

The only radionuclides used in this laboratory space were as follows:

- Scandium - 46
- Iron - 59
- Cobalt - 60

Attached for your information is Table 1.0 that identifies the specific characteristics of these radionuclides (Attachment A).

Radiation History Room 3D231 John Wesley Powell Building, USGS, Reston, VA

This laboratory was approved to use radioactive material for the first time on February 15, 1995. Prior to that time the laboratory was used for routine chemical analysis. Radioactive material processed in its laboratory consisted of mineral and glass material irradiated at the USGS TRIGA Reactor Facility in Denver, Colorado. The mineral grains 0.01g per sample were embedded in epoxy or Teflon and covered with mica detectors during irradiation. All irradiated material was in the solid state, no radioactive liquids or gases were involved. The functions of this laboratory were moved to 3C232 in May of 1996. Levels of activity were <3 mr/hr when irradiations were received from reactor. In addition, the physical half-lives of the irradiated material was primarily in days with eventual decay of the samples in a short period of time.

Based on the above use of this laboratory it was designed as an unaffected area as defined in NUREG/R-5849 and as such section 4.2.3 Selecting Measurement Sampling Locations for Structure Surveys states that scans of unaffected areas should cover a minimum of 10% of the floor and lower wall surface area.

Radiation History Room 3D239, John Wesley Powell Building, USGS, Reston, VA

The John Wesley Powell building was completed in 1972. Room 3D239 was occupied on or about that date by the Radiochemistry Project of the Branch of Analytical Labs. This room was used solely for the purpose of performing chemical separation of neutron activated

FIGURE 1

JOHN WESLEY POWELL BUILDING *

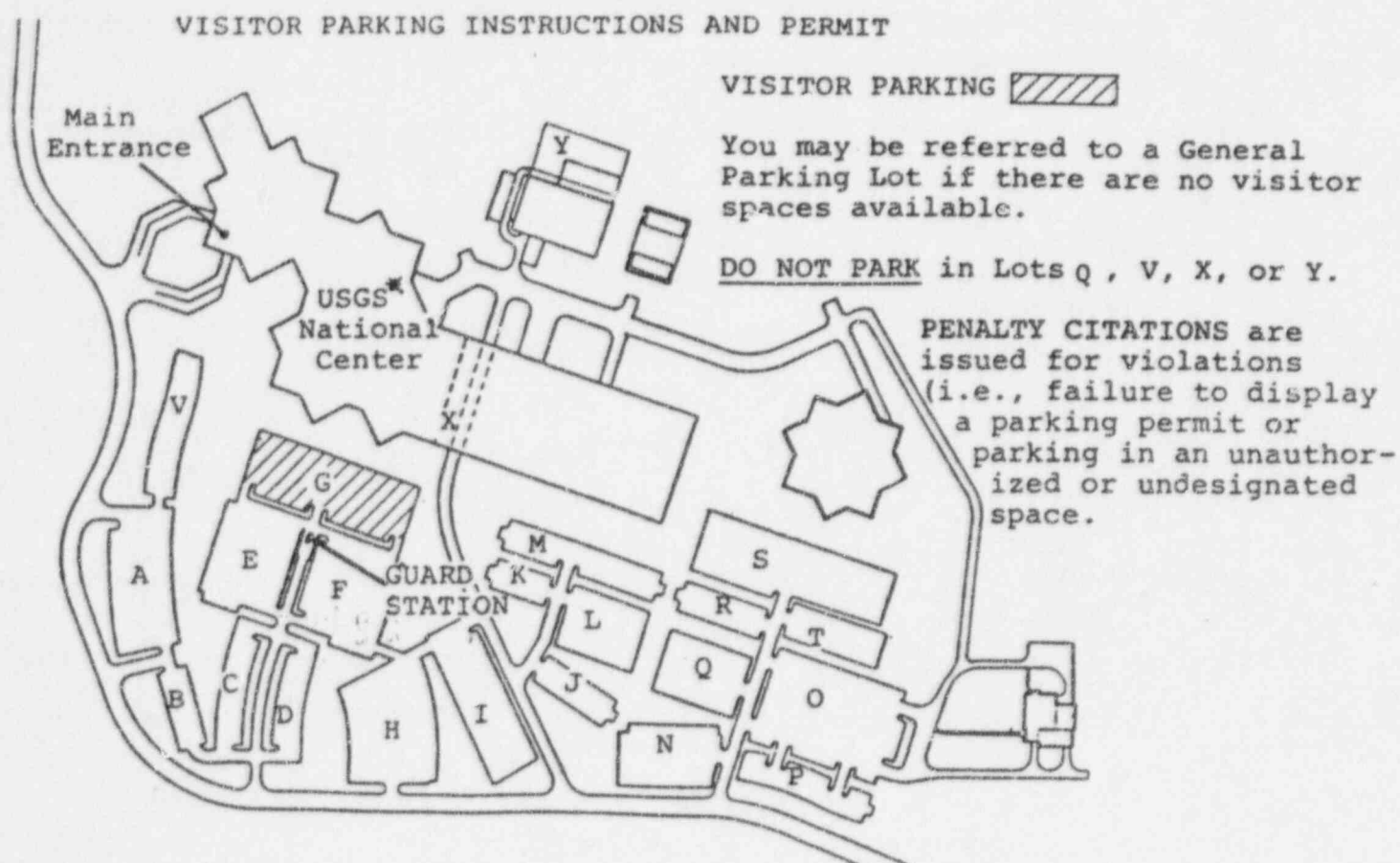


TABLE 1.0

CHARACTERISTICS OF RADIONUCLIDES
USED IN LABORATORIES 3D231 AND 3D239

Radionuclide	Radiation	Energy	Half-Life
• Scandium-46	Beta	0.357 MeV (Max.)	84 days
	Gamma	1.120 MeV (100%) 0.889 MeV (100%) Ti - x-ray	
• Iron-59	Beta		45 days
	B-1	130.8 keV Max. (1.27%) 35.8 keV Avg.	
	B-2	273.4 keV Max. 80.8 keV Avg. (45.6%)	
	B-3	465.8 keV Max. 149.3 keV Avg. (52.8%)	
	B-4	1.565 MeV Max. 635.8 keV Avg. (0.18%)	
	Gamma		
	γ -1	190 keV (3%)	
	γ -2	1.10 MeV (56%)	
	γ -3	1.29 MeV (44%)	
	γ -4	143 keV (1%)	
• Cobalt-60	Beta		5.27 years
	Beta	318.0 keV Max. (99%) 95.80 keV Aug. (99%)	
	Gamma	1.173 MeV (100%) 1.332 MeV (100%)	

In addition, all irradiated samples were in a solid state, no radioactive liquids or gases were involved, and all irradiated samples were sealed, no unsealed radioactive material or sources were used in these laboratories. The estimated activity of the radioactive materials never exceeded microcurie quantities.

geological samples. This work was performed until approximately 1985 when the Radiochemistry Project was moved to the Solid State Physics Building. This room was no longer used by the radiochemistry project for performing radiochemical experiments. Activated samples were processed chemically, using various acid digestion techniques, ion-exchange chromatography and precipitation. Active liquids were present during these periods of laboratory use.

Radioactive material processed in this laboratory consisted of minerals indicated at the USGS Triga Reactor Facility in Denver, Colorado. Since 1985 until the present, the laboratory only utilized sealed sources in Argon-Argon analysis and samples were never unsealed. Repeated instrument and swipe surveys over the last 20 years indicated no spills and no record of contamination.

Based on the above use of this laboratory it was designated as an affected area as defined in NUREG/CR-5849 and as such section 4.23 Selecting Measurement Sampling Locations for Structure Surveys states that scans of unaffected areas should cover a minimum of 100% of the floor and lower wall surface area. Since there was no reason to suspect residual activity exceeding 25% of the guideline value on these surfaces, a minimum of 30 measurement locations each, on vertical and horizontal surfaces where radioactive materials would likely accumulate (air exhaust vents and horizontal surfaces where dust would settle) was selected. To assure a reasonable coverage of these surfaces, an average of at least 1 measurement location per 20m² of surface area was selected.

III. RADIATION SURVEYS

The radiation surveys conducted by portable radiation detection instruments in each of the laboratories 3D231 and 3D239 did not indicate any fixed contamination on all the surfaces surveyed. A total of 115 and 156 surfaces, areas and locations were surveyed in laboratories 3D231 and 3D239 respectively and all instrument surveys indicated no radiation levels above natural background, therefore an indication of no fixed contamination was identified.

As a result of these instrument surveys since there was no fixed contamination identified, there was no need to express results in fixed contamination in dpm/100 cm². The specific radionuclides in question have energies similar to the calibration energies of the radiation instruments used for the surveys. In addition, the scanning and survey technique was demonstrated to have a detection sensitivity for the radionuclide or radiations of interest at $\leq 25\%$ of the guideline level.

In addition, all swipe surveys in these laboratories were determined to be Minimum Detectable Activity (MDA), i.e., zero Disintegrations per Minute (DPM) which indicates that there was no removable and/or loose surface contamination identified.

IV. ANALYSIS AND COMPARISON OF RADIATION SURVEY RECRUITS TO U.S. NUCLEAR REGULATORY COMMISSION (NRC) GUIDELINES

The USNRC guidance document entitled "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," April 1993 states that depending on the specific radionuclides identified acceptable surface contamination levels shall be followed.

Therefore, based on three radionuclides identified in these two laboratories the category Beta-Gamma emitters was selected as the criteria for analysis and comparison with the radiation survey results (instrument and swipes).

The Beta-Gamma emitter nuclide category for acceptable surface contamination levels are as follows:

- Average - 5,000 dpm Bγ/100 cm²
- Maximum - 15,000 dpm Bγ/100 cm²
- Removable - 1,000 dpm Bγ/100 cm²

In addition, 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.

Swipe surveys at each laboratory indicted that samples were nondetectable, i.e., Minimum Detectable Activity (MDA), the results were significantly below the average, maximum and removable acceptable surface contamination levels.

Subsequently the radiation instrument surveys of each laboratory indicated levels in the range of 0.020 mR/hr and 15-20 μR/hr which indicate natural background radiation and were significantly below the average and maximum radiation levels associated with surface contamination resulting from then beta-gamma emitters.

V. RESULTS AND CONCLUSION

Based on the results of the radiological safety assessment, i.e., radiation instrument and swipe survey and comparison with the USNRC guidelines, Laboratory Rooms 3D231 and 3D239 can be released for unrestricted use.

FINAL REPORT
RADIOLOGICAL SAFETY ASSESSMENT
FOR
UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092
TASK ORDER NO. D3A96IN31179-06A

SEPTEMBER 16, 1996

PREPARED BY:

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH AND HUMAN SERVICES
FEDERAL OCCUPATIONAL HEALTH
WASHINGTON, D.C. FIELD OFFICE

PREPARED FOR:
U.S. DEPARTMENT
U.S. GEO

FINAL REPORT
RADIOLOGICAL SAFETY ASSESSMENT
FOR
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U.S. GEOLOGICAL SURVEY

DISCLAIMER

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TABLE OF CONTENTS

SECTION	PAGE
I. EXECUTIVE SUMMARY AND ACTION ITEMS	1
II. INTRODUCTION	1
III. BACKGROUND	2
IV. EVALUATION METHODS	4
V. BRIEF SUMMARY OF STANDARDS/CRITERIA	8
VI. RESULTS AND CONCLUSIONS	8
VII. REFERENCES	9
VIII. APPENDICES	
• APPENDIX A - UNITED STATES GEOLOGICAL SURVEY RADIOACTIVE MATERIALS LICENSE, JULY 29, 1996	
• APPENDIX B - UNITED STATES NUCLEAR REGULATORY COMMISSION NUREG/CR-5489, MANUAL FOR CONDUCTING RADIOLOGICAL SURVEYS IN SUPPORT OF LICENSE TERMINATION, JUNE, 1992	
• APPENDIX C - RADIOLOGICAL ASSESSMENT RADIATION DETECTION INSTRUMENT SURVEY	
• APPENDIX D - PORTABLE RADIATION SURVEY INSTRUMENTS UTILIZED IN SCANNING SURVEY	
• APPENDIX E - RADIATION ASSESSMENT SWIPE SAMPLE ANALYSIS	
• APPENDIX F - GUIDELINES FOR DECONTAMINATION OF • FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIAL	
• APPENDIX G - CALIBRATION CERTIFICATES FOR RADIATION SURVEY INSTRUMENTS UTILIZED IN SCANNING SURVEY	

I. EXECUTIVE SUMMARY AND ACTION ITEMS

A radiological safety assessment of the United States Department of Interior, U.S. Geological Survey (USGS) John Wesley Building was conducted on August 15 and 16, 1996 by Michael S. Terpilak, Certified Health Physicist.

The radiological safety assessment included a radiation survey utilizing portable radiation detection survey instruments. In addition, a total 271 swipe samples were conducted at two laboratories located in the John Wesley Building on the campus of the USGS National Center located at Reston, Virginia.

The findings and results of all samples (instrument and swipe surveys) indicated that the 2 laboratories were free of fixed and removable contamination and qualify for release for UNRESTRICTED USE in accordance with the current U.S. Nuclear Regulatory Commission (NRC) guidelines, April 1993.

II. INTRODUCTION

This radiological assessment was requested by May Beth Givan, Contract Officers Technical Representation (COTR), Public Health Service, Division of Federal Occupational Health (PHS/FDOH), Washington Field Office. This radiological assessment was also conducted at the request of Mr. Gary Kramer, Bureau Safety Manager of the USGS National Center. The date of request was August 16, 1996 and the Task Order number is USGS - D3A96IN31179-06A. The Radiological Safety Assessment was performed by Michael S. Terpilak, Certified Health Physicist, on August 15 and 16, 1996.

The objective of this report is to present the findings and results of the radiation survey and to indicate whether the laboratories surveyed qualify for release for UNRESTRICTED USE in accordance with current U.S. NRC guidelines April, 1993 and NUREG/CR-5839, "Manual for Conducting Radiological Surveys in Support of License Termination," June 1992.

III. BACKGROUND

The U.S. Department of the Interior, U.S. Geological Survey (USGS) currently holds an NRC License (License Number - 45-15923-01 as amended through amendment 28) to operate the following facilities: (Appendix A)

- U.S. Geological Survey National Center
12201 Sunrise Valley Drive
Physics Building Laboratories
Reston, Virginia 22092
- U.S. Geological Survey
Stephenson Center
Suite 129
729 Gracern Road
Columbia, South Carolina 29210

The current license expired on November 30, 1995. In accordance with 10 CFR 30.37, to ensure that the operating license did not expire, the USGS submitted the renewal application on November 27, 1995 and renewed July 29, 1996 with an expiration date of November 30, 2000.

The Nuclear Regulatory Commission (NRC) has established Technical and Financial Regulations for decommissioning Licensed Nuclear Facilities (53 CFR 24018, June 27, 1988). The regulations address decommissioning planning, needs, timing, funding methods, and environmental review requirements for Public and Private Facilities having licenses under 10 CFR parts 30, 40, 50, 70 and 72. The intent of the regulations is to ensure that the decommissioning of all Licensed facilities will be accomplished in a safe and timely manner and that licensees will provide adequate funds to cover all costs associated with decommissioning. The rule defines "Decommissioning" as the following: To safely remove nuclear facilities from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license.

As noted in Part 30.35.f.4, government licensees may elect to submit a statement of intent containing an amount based on the possession limit of the license and indicating that funds will be obtained when decommissioning actually occurs. Part 30.35.c.2 states that if the licensee chooses to submit a certificate of financial assurance (statement of intent) at this time, a decommissioning funding plan and cost estimate shall be included in the licensee's next application for license renewal.

The regulations specify that a facility licensee either must set aside money for decommissioning activities or must provide a guarantee through a third party that funds will be

available. The funds set aside or guaranteed are determined by a decommissioning funding plan (DFP) which the licensee provides.

Specific requirements are stated in 10 CFR 30.35, "Financial Assurance and Recordkeeping for Decommissioning." 10 CFR 30.35.f.4 state that in the case of Federal, State, or local government of licensees, a statement of intent containing a cost estimate--or a value fixed by the regulation and determined by the type of facility--is acceptable. **The regulations do not explicitly address the need for a DFP for all Federal, State, or Local government licensees. However, other NRC documents indicate the need for a DFP before the issuance of a new license or the renewal of an existing license.**

Specific details of what the NRC considers an acceptable DFP are documented in NUREG-1336, "Interim Guidance on the Standard Format and Content of Financial Mechanisms Required for Decommissioning Under 10 CFR Parts 30, 40, and 70," and subsequent Regulatory Guide (Reg Guide) 3.66 published in June 1990. Also, NUREG-1337, "Interim Guidance on the Standard Review Plan for the Review of Financial Assurance Mechanisms for Decommissioning Under 10 CFR Parts 30, 40, and 70," serves as an outline and checklist for NRC staff reviewers. Reg Guide 3.65, "Standard Format and Content of Decommissioning Plan for Licensees under 10 CFR Parts 30, 40, and 70," outlines the overall decommissioning plan requirements showing the relationship of the DFP to the decommissioning process.

In addition, the following radiological surveys were conducted by the contractor for the Licensee prior to the release of Laboratories 3D231 and 3D239 for unrestricted use.

- Establishing Background Levels
- Scanning Survey Using Portable Radiation Instruments
- Removable Surface Contamination Measurements
- Laboratory Analysis and Measurement of Smear (Filter Paper) Samples

In accordance with section 4.2.2 Establishing Reference Grid Systems, since unaffected areas do not require gridding for the purpose of establishing measurement or sampling locations, the specific laboratory survey locations (instrument and smear) were marked, identified by white adhesive tabs and the laboratories were locked and secured to deny and prohibit areas pending the NRC review of this Radiological Safety Assessment report.

IV. EVALUATION METHODS

The radiological assessment was conducted by Michael S. Terpilak, Certified Health Physicist, in a manner similar to typical radiation surveys of licensees by the Nuclear Regulatory Commission (NRC).

These surveys were accomplished and performed in accordance with and as specified in the Nuclear Regulatory Commission (NRC), NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," Draft Report for Comment, June, 1992 as described and specified in section 4.2 and in addition to 10 CFRs Part 30 (Appendix B).

ESTABLISHING BACKGROUND LEVELS

Background was determined by conducting survey measurements and/or sampling at locations on the site, which are unaffected by-site operations, i.e., preferable locations for interior background determinations all within on-site buildings of similar constructions, or even John Wesley Powell Building location that has had no previous history of licensed operations, i.e., use of radioactive materials. Surveys conducted with portable radiation instruments as well as smear surveys were duplicated in laboratories and/or office space similar in dimensions and construction as the laboratories that are presently using licensed materials (i.e., laboratories using radioactive materials). Background surveys radiation instrument surveys were in the range of 0.020 mR/hr and 15-20 μ R/hr and random smear samples were nondetectable, i.e., Minimum Detectable Activity (MDA).

Based on previous historical records, interviews with personnel, present licence inventory and possession license limits and conditions as well as current and present documented monthly Laboratory Contamination Surveys it was determined in accordance with Section 4.2 Designing the Survey, NUREG/CR-5849 that the two laboratories to be surveyed 3D231 was classified as an unaffected area and 3D239 was classified as an affected area, i.e., these laboratories are not expected to contain residual radioactivity, based on a knowledge of site history and previous survey information.

Since it can be readily shown from previous records, inventories, possession limits and many surveys that alpha radioactive material has never been used at this facility, it is recommended that only Beta-Gamma (β - γ) assessment be performed at this time.

SCANNING SURVEYS USING PORTABLE RADIATION INSTRUMENTS

These measurements typically consist of surface scanning (moving the detector at a consistent speed and distance near the surface) and measuring levels of direct radiation (surface activity and exposure rate) at representative points.

Before conducting any fixed measurements, surfaces are scanned to identify the presence of elevated direct radiation which might indicate residual gross activity or hot-spots. Scans are conducted for all radiations potentially present, based on the operational history. The scanning detector is kept as close as possible to the surface and moved cross the surface at a slow speed. Nominally, the distance between the detector and the surface is maintained at less than two centimeters. For particulate radiations (beta) which may have very limited ranges, the scan speed should not exceed 1 detector width per second; this speed should be reduced to as low as 1/3 detector width per second for those situations when relatively low count rates may be indicative of residual activity exceeding guideline values. For gamma radiation the scanning speed may be greater; the probe is typically moved in a serpentine pattern while advancing at a speed of about 0.5 m per second.

For optimum detection sensitivity, changes in the instrument response are monitored via the audible output (use of headphones is recommended), rather than by observing fluctuations in the analog meter reading. This use of an audible signal negates concern for the time constant related to the meter response. Locations of direct radiation, discernable above the ambient level (typically 2 to 3 times the ambient count rate), are marked on facility maps and identified for further measurements and/or sampling.

A complete radiological assessment included a radiation survey utilizing a Radiological Instrumentation as identified and specified in section 5 Radiological Instrumentation of NUREG/CR5489 (Appendix C).

- Beta-Gamma (β - γ) Field Survey Instrumentation

The following instruments were utilized in the survey.

- Ludlum Model #2 survey meter serial #88228 with a pancake type halogen quenched Geiger-Muller (G-M) Probe Model #44-9 Serial #010560 with a 1.7 ± 0.3 mg/cm² mica end window and active area of 15 cm².
- Ludlum Model #3 survey meter serial #22331 with an end window halogen quenched Geiger-Muller (G-M) Probe Model #44-7 Serial #PRO5338 with a 1.7 ± 0.3 mg/cm² mica end window and active area of 6 cm².
- Gamma Field Survey Instrumentation

The following instrument was utilized in the survey.

- Victoreen Model 450P Pressurized Ion Chamber Survey Meter with a high sensitivity Micro-R measurements of exposures and exposure rates. Serial #1618.

The appropriate calibration certificates for the above instruments are enclosed (Appendix G).

The Beta-Gamma (β - γ) field survey instrumentation, i.e., the surface scanning (moving the detectors at a consistent speed and distance near the surface of each area approximately 1 cm) was conducted at 115 surface locations in Laboratory 3D231 and 156 locations in Laboratory 3DL39 and reported in mR/hr (Appendix C).

The gamma (γ) field survey instruments were conducted at approximately 1 meter from the 115 surface locations in Laboratory 3D231 and 156 locations in Laboratory 3D239 and reported in μ R/hr at 1 meter (Appendix C). The radiological surveys were conducted consistent and in compliance with 10 CFR 30 and NUREG/CR 5849. In addition a total of 271 wipe samples were conducted in the two laboratories, 115 wipes in Laboratory 3D231 and 156 wipes in Laboratory 3D239 located in the John Wesley Powell Building, Main Campus, Reston, Virginia. **Laboratory 3D231 was classified as an UNAFFECTED AREAS, i.e., these areas were not expected to contain residual radioactivity, based on a knowledge of site history and previous survey information.**

Radiation History Room 3D231 John Wesley Powell Building, USGS, Reston, VA

This laboratory was approved to use radioactive material for the first time on February 15, 1995. Prior to that time the laboratory was used for routine chemical analysis. Radioactive material processed in its laboratory consisted of mineral and glass material irradiated at the USGS TRIGA Reactor Facility in Denver, Colorado. The mineral grains 0.01g per sample were embedded in epoxy or Teflon and covered with mica detectors during irradiation. All irradiated material was in the solid state, no radioactive liquids or gases were involved. The functions of this laboratory were moved to 3C232 in May of 1996. Levels of activity were <3 mR/hr when irradiations were received from reactor. In addition, the physical half-lives of the irradiated material was primarily in minutes and/or days with eventual decay of the samples in a short period of time.

Based on the above use of this laboratory it was designated as an **unaffected area** as defined in NUREG/R-5849 and as such section 4.2.3 Selecting Measurement Sampling Locations for Structure Surveys states **that scans of unaffected areas should cover a minimum of 10% of the floor and lower wall surface area.**

Radiation History Room 3D239, John Wesley Powell Building, USGS, Reston, VA.

The John Wesley Powell building was completed in 1972. Room 3D239 was occupied on or about that date by the Radiochemistry Project of the Branch of Analytical Labs. This room was used solely for the purpose of performing chemical separation of neutron activated geological samples. This work was performed until approximately 1985 when the Radiochemistry Project was moved to the Solid State Physics Building. This room was no

longer used by the radiochemistry project for performing radiochemical separations. Activated samples were processed chemically, using various acid digestion techniques, ion-exchange chromatography and precipitation. Active liquids were present during these periods of laboratory use.

Radioactive material processed in this laboratory consisted of minerals indicated at the USGS Triga Reactor Facility in Denver, Colorado. **Since 1985 until the present, the laboratory only utilized sealed sources in Argon-Argon analysis and samples were never unsealed. Repeated instrument and swipe surveys over the last 20 years indicated no spills and no record of contamination.**

Based on the above use of this laboratory it was designated as an affected area as defined in NUREG/CR-5849 and as such section 4.23 Selecting Measurement Sampling Locations for Structure Surveys states that scans of unaffected areas should cover a minimum of 100% of the floor and lower wall surface area. Since there was no reason to suspect residual activity exceeding 25% of the guideline value on these surfaces, a minimum of 30 measurement locations each, on vertical and horizontal surfaces where radioactive materials would likely accumulate (air exhaust rents and horizontal surfaces where dust would settle was selected). To assure a reasonable coverage of these surfaces, an average of at least 1 measurement location per 20m² of surface area was selected.

REMOVABLE SURFACE CONTAMINATION MEASUREMENTS

A total of 115 wipe areas and 115 Beta-Gamma and 115 Gamma instrument measurements were conducted in laboratory 3d231, which is approximately 24' x 24' or 576 square feet or 54 square meters, which is a great deal more than recommended (Appendix E).

A total of 156 wipe areas and 156 Beta-Gamma and 156 Gamma instrument measurements were conducted in laboratory 3d239 which is approximately 28' x 25' or 700 square feet or 65 square meters, which is a great deal more than recommended (Appendix E).

Swipe samples were conducted over a surface area of 100 cm² within a 1 m² area of each laboratory.

The 271 wipe samples were analyzed for the following:

- Gross BETA - Gas Flow Proportional Counter
- GAMMA Spectroscopy - Sodium Iodide (NAI) Detector

LABORATORY ANALYSIS AND MEASUREMENT OF SMEAR (FILTER PAPER) SAMPLES

If any samples were identified with radioactive contamination, then these samples were analyzed for specific radioactivity (i.e., isotopic analysis). The results of the swipe sample analysis are enclosed (Appendix E).

V. BRIEF SUMMARY OF STANDARDS/CRITERIA

The U.S. Nuclear Regulatory Commission (NRC), Division of Fuel Cycle, Medical, Academic and Commercial Use Safety, Washington, D.C., has published a technical document entitled "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," dated April 1993. The document delineates specific instructions concerning instrument and swipe surveys and Table 1, specifically states "Acceptable Surface Contamination Levels" that shall be used for decontamination of facilities and equipment prior to release for unrestricted use (Appendix F).

VI. RESULTS AND CONCLUSIONS

Based on the results of the radiological safety assessment, i.e., the radiation instrument and swipe survey, the following laboratories located in the John Wesley Powell Building United States Geological Survey (USGS) National Center can be released for unrestricted use:

- Laboratory Room 3D231
- Laboratory Room 3D239

VII. REFERENCES

Title 10 Code of Federal Regulations, Part 20, Standards for Protection Against Radiation, January 1993. Federal Register Vol. 56, No. 98, Tuesday, May 2, 1991, pp. 23360-23474 (Includes revisions to Parts 2, 19, 20, 30, 31, 32, 34, 35, 39, 40, 50, 61, and 70).

Title 10 Code of Federal Regulations, Part 30, Rules of General Applicability to Domestic Licensing of Byproduct Material, January 1, 1993.

Title 10 Code of Federal Regulations, Part 33, Specific Domestic Licenses of Broad Scope for Byproduct Materials January 1, 1993.

Title 10 Code of Federal Regulations, Part 71, Packaging and Transportation of Radioactive Materials, January 1993.

Title 49 Code of Federal Regulation, Parts 100 to 177, Transportation, October 1, 1992.

Regulatory Guide 3.66, Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning under 10 CFR Parts 30, 40, 70, and 72, June 1990.

Regulatory Guide 7.10, Establishing Quality Assurance Programs for Packaging Used in the Transport of Radioactive Material, Rev. 1, June 1986.

Regulatory Guide 8.7, Instructions for Recording and Reporting Occupational Radiation Exposure Data, Rev. 1, June 1992.

Regulatory Guide 8.9, Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program, Rev. 1, July 1993.

Regulatory Guide, 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposure as Low as Reasonably Achievable, Rev. 1, May 1977.

Regulatory Guide 8.18, Information Relevant to Ensuring that Occupational Radiation Exposures at Medical Institutions Will Be As Low As Reasonably Achievable, Rev. 1, October 1982.

Regulatory Guide 8.23, Radiation Safety Surveys at Medical Institutions, Rev. 1, January 1981.

Regulatory Guide 8.25, Air Sampling in the Workplace, 1992.

Regulatory Guide 8.33, Quality Management Program, October 1991.

Regulatory Guide 8.34, Monitoring Criteria and Methods to Calculate Occupational Radiation Doses, July 1992.

Regulatory Guide 8.36, Radiation Dose to the Embryo/Fetus, July 1992.

Regulatory Guide 8.37, ALARA Levels for Effluents from Materials Facilities, July 1993.

APPENDIX A

UNITED STATES GEOLOGICAL SURVEY

RADIOACTIVE MATERIALS LICENSE

NUMBER--45-15923-01

JULY 29, 1996



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

July 29, 1996

United States Department of Interior
U.S. Geological Survey (USGS)
ATTN: Mr. Gregory Alan Wandless,
Radiation Safety Officer (RSO)
12201 Sunrise Valley Drive
Reston, VA 22092

SUBJECT: TRANSMITTAL AND EXPLANATION OF A MATERIALS LICENSE AMENDMENT
(REFERENCE: 257104; DOCKET NO. 030-10034)

Dear Mr. Wandless:

Enclosed is Amendment No. 28 to License No. 45-15923-01 issued in response to your letter dated June 14, 1996. This amendment authorizes the relocation of research activities conducted by Drs. Charles and Nancy Naeser to Room 3C232 of the J. W. Powell Building.

However, prior to decommissioning their former laboratory in Room 3D231, please provide the additional information specified in Mr. Jay Henson's letter of July 9, 1996 (copy enclosed). Please do not release Room 3D231 for non-radiological use until you have received written NRC authorization.

Also, I have reviewed your letter dated May 29, 1996 concerning the down-sizing of your program for use of licensed material. Outlined below are my comments.

1. Information referenced in Items 2, 3, and 4 of your letter has been reviewed by Mr. Jay Henson. His comments are contained in his letter to you dated July 9, 1996 (copy enclosed).
2. Concerning the other items in your letter:
 - A. Item 1: Be sure that the documentation you provide to me for licensed material transferred includes the isotope, activity and the Item number on your NRC license that authorizes the isotope (for example, 6.A. Hydrogen 3, 6.B. Cobalt 60, ...).
 - B. Item 5 and 6: Specify the anticipated date the information will be provided to the NRC.
 - C. Item 7: Upon satisfactory completion of Dr. Naeser's training program for RSO, provide me with a letter attesting to his competency to independently perform the RSO duties.

Even though the USGS program is being down-sized, I am not sure that 24 hours of on-the-job training in radiation safety, as you proposed, would be adequate for naming Dr. Naeser as sole Radiation Safety Officer (RSO).

Accordingly, I have revised Condition No. 11 of License No. 45-15923-01 to continue to name Gregory Wandless as RSO and to identify Dr. Charles Naeser as "RSO in training".

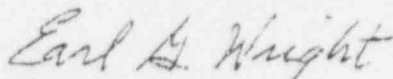
When Dr. Naeser satisfactorily completes the 24-hour classroom training given by Mr. Michael Terpilak and at least three months (no specified clock hours) of on-the-job training in radiation safety under the supervision of Mr. Gregory Wandless, please provide me with a letter specifying inclusive dates of training and attesting to Dr. Naeser's competency to independently perform the RSO duties. This letter should be signed by the persons giving the training.

D. Item 8: No further information is required.

Please provide two copies of your response and refer to Mail Control No. 256959.

Thank you for your cooperation in this matter. If you have questions about this letter or your license, please call me at 404/331-5617 (FAX: 404/331-7437).

Sincerely,



Earl G. Wright
Senior License Reviewer
Division of Nuclear Materials Safety

Enclosure:

1. Letter dated July 9, 1996

CC:

Mr. Gordon Eaton, Director USGS
Mr. Michael Terpilak, Consultant to USGS
bcc: Mr. Jay Henson MLIB 2, DNMS, RII

MATERIALS LICENSE

Amendment No. 28

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

Licensee		In accordance with the letter dated June 14, 1996	
1. U.S. Department of the Interior Geological Survey National Center		3. License Number	45-15923-01
2. M.S. 927 12201 Sunrise Valley Drive Reston, Virginia 22092		is amended in its entirety to read as follows:	
		4. Expiration Date	November 30, 2000 (extended)
		5. Docket or Reference No.	030-10034
6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License	
A. Hydrogen 3	A. Any	A. 2 millicuries (74 MBq) total	
B. Carbon 14	B. Any	B. 8 millicuries (296 MBq) total	
C. Phosphorus 32	C. Any	C. 2 millicuries (74 MBq) total	
D. Phosphorus 33	D. Any	D. 2 millicuries (74 MBq) total	
E. Sulphur 35	E. Any	E. 4 millicuries (148 MBq) total	
F. Chlorine 36	F. Liquid	F. 50 microcuries (1.85 MBq)	
G. Cobalt 60	G. Sealed sources	G. 3 sources, not to exceed 16 microcuries (582 kBq) total	
H. Cobalt 60	H. Any	H. 500 microcuries (18.5 MBq) total	
I. Nickel 63	I. Foils in Shimadzu Model EDC-M2 detector cells	I. Not to exceed 15 millicuries (555 MBq) per foil	
J. Nickel 63	J. Sealed or plated sources	J. Not to exceed 15 millicuries (555 MBq) per sealed or plated source	
K. Iron 55	K. Any	K. 10 millicuries (370 MBq)	
L. Zinc 65	L. Any	L. 200 microcuries (7.4 MBq)	
M. Strontium 89	M. Any	M. 10 microcuries (370 kBq)	
N. Strontium 90	N. Any	N. 10 microcuries (370 kBq)	
O. Tin 113	O. Any	O. 10 microcuries (370 kBq)	

License Number

45-15923-01

Docket or Reference Number

030-10034

MATERIALS LICENSE
SUPPLEMENTARY SHEET

Amendment No. 28

Continued -

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
P. Antimony 125	P. Any	P. 100 microcuries (3.7 MBq)
Q. Barium 133	Q. Any	Q. 500 microcuries (18.5 MBq) total
R. Cesium 137	R. Sealed sources	R. 3 sources, not to exceed 20 microcuries (740 kBq) total
S. Cesium 137	S. Any	S. 10 millicuries (370 MBq)
T. Promethium 147	T. Sealed sources	T. 2 millicuries (74 MBq)
U. Protactinium 231	U. Any	U. 10 microcuries (370 kBq) total
V. Neptunium 237	V. Any	V. 10 microcuries (370 kBq) total
W. Americium 241	W. Any	W. 500 microcuries (18.5 MBq) total
X. Americium 241	X. Sealed sources (custom made)	X. 20 sources, not to exceed 40 millicuries (1.48 GBq) total
Y. Any byproduct material	Y. Activated samples	Y. 530 millicuries (19.65 GBq) total
Z. Technetium 99	Z. Liquid	Z. 1 millicurie (37 MBq)

9. Authorized Use:

A. through E.

For use in laboratory tracer studies and molecular biology procedures

F. For use in molecular biology procedures

G. For use in the testing, evaluation, and calibration of detectors

H. For use in laboratory tracer studies

I. For use in Shimadzu Mini-2E gas chromatographs for sample analysis

J. For use in gas chromatographs for sample analysis

K. through Q.

For use in laboratory tracer studies

R. For use in testing, evaluation, and calibration of detectors

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number 45-15923-01

Docket or Reference Number 020-10034

Amendment No. 28

9. Authorized Use (Continued)

S. through W.

For use in laboratory tracer studies

X. For use in X-ray fluorescence studies

Y. For possession incident to neutron activations and radioactive dating studies

Z. For use in laboratory studies

CONDITIONS

10. Licensed material may be used at:

A. Geological Survey Physics Building, Lot "O" off South Lakes Drive, and the National Center (John Wesley Powell Federal Building), 12201 Sunrise Valley Drive, Reston Virginia.

B. Room 519, U.S. Geological Survey, Stephenson Center, Suite 129, 729 Gracern Road, Columbia, South Carolina.

11. The Radiation Safety Officer (RSO) for this license is Gregory A. Wandless. The Radiation Safety Officer in-training is Charles W. Naeser, Ph.D.

12. Authorized users:

A. Allan B. Tanner For materials listed in Subitems 6.A. through Z.

B. Eurybiades Busenburg For material listed in Subitem 6.I.

C. Nancy D. Naeser For materials listed in Subitem 6.Y.

D. Philip A. Baedecker For materials listed in Subitems 6.F, H, L through O, S, U through W and Y.

E. Jeffrey N. Grossman For materials listed in Subitems 6.F, H, L through O, S, U through W, and Y.

F. Michael J. Kunk For materials listed in Subitem 6.Y.

G. Edward R. Landa For material listed in Subitem Z.

H. Derek R. Lovely For materials listed in Subitems 6.A through C, D, J and Z.

I. John W. Morgan For materials listed in Subitems 6.F, H, J through O, S, U through W, and Y.

J. Curtis A. Palmer For materials listed in Subitems 6.F, H, J through O, S, U through W, and Y.

K. Elizabeth J. Jones For materials listed in Subitems 6.A through C, E and J.

L. Michael J. Pickering For materials listed in Subitems 6.G, R, and Y.

License Number 45-15923-01

Docket or Reference Number 10034

MATERIALS LICENSE
SUPPLEMENTARY SHEET

Amendment No. 28

CONDITIONS

Continued-

12. Authorized Users: (Continued)

M.	John F. Sutter	For materials listed in Subitem 6.Y.
N.	Gregory A. Wandless	For materials listed in Subitems 6.F, H, L through Q, S, V through Y.
O.	Joan Woodward	For materials listed in Subitems 6.A through E, and J.
P.	Francis H. Chapelle	For materials listed in Subitems 6.B, C and J.
Q.	Paul M. Bradley	For materials listed in Subitems 6.C, D and J.
R.	James E. Landmeyer	For materials listed in Subitems 6.C, D and J.
S.	Debra J. Lonergan	For materials listed in Subitems 6.C, D and F.
T.	Peggy K. Widman	For materials listed in Subitems 6.A through E, and J.
U.	Charles W. Naeser	For materials listed in Subitems 6.Y.

13. A.(1) The sealed source(s) specified in Item 7, shall be tested for leakage and/or contamination at intervals not to exceed 6 months. Any sealed source received from another person which is not accompanied by a certificate indicating that a test was performed within 6 months before the transfer shall not be put into use until tested.
- (2) Notwithstanding the periodic leak test required by this condition, any licensed sealed source is exempt from such leak tests when the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.
- B. Any source in storage and not being used need not be tested. When the source is removed from storage for use or transfer to another person, it shall be tested before use or transfer.
- C. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the source shall be removed from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. A report shall be filed within 5 days of the date the leak test result is known with the U. S. Nuclear Regulatory Commission, Region II, Division of Nuclear Materials Safety, Nuclear Materials Licensing/Inspection Branch, 101 Marietta Street, Suite 2900, Atlanta, Georgia 30323. The report shall specify the source involved, the test results, and corrective action taken. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. Records may be disposed of following Commission inspection.
- D. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically licensed by the Commission or an Agreement State to perform such services.
14. Sealed sources containing licensed material shall not be opened by the licensee.

FROM

NRC FORM 374A
(7-94)

U.S. NUCLEAR REGULATORY COMMISSION

PAGE 5 OF 6 PAGES

License Number 45-15923-01

Docket or Reference Number 10034

Amendment No. 28

MATERIALS LICENSE
SUPPLEMENTARY SHEET

CONDITIONS

Continued-

15. Detector cells containing licensed material shall not be opened or the sources removed from the detector cell by the licensee.
16. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under this license.
17. Licensed material shall not be used in or on human beings or in products distributed to the public.
18. The licensee shall maintain records of information important to safe and effective decommissioning at the U.S. Department of the Interior, Geological Survey, National Center, 12201 Sunrise Valley Drive, Reston, Virginia, pursuant to the provisions of 10 CFR 30.35(g) until this license is terminated by the Commission.
19. In addition to the possession limits in item 8, the licensee shall further restrict the possession of licensed material as follows:
 - A. For unsealed sources to quantities less than 10^5 times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d) and
 - B. For sealed sources, to quantities less than 10^{10} times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d).
20. The licensee may transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number 45-15923-01

Docket or Reference Number ~~45-15923-01~~ 10034

Amendment No. 28

CONDITIONS

Continued-

21. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Application dated June 26, 1990

- B. Letters dated:
- (1) October 4, 1990
 - (2) August 29, 1991
 - (3) December 10, 1991
 - (4) January 14, 1993
 - (5) January 14, 1993
 - (6) November 23, 1993
 - (7) July 1, 1994
 - (8) August 22, 1994
 - (9) January 30, 1995
 - (10) February 22, 1995
 - (11) March 1, 1996
 - (12) June 14, 1996

[Add Columbia SC and authorized users there]
 [Add P-32, Ms. Lonergan as user, reinstate Cl-36 use]
 [Add P-33 w/Ms. Lonergan as user, deletes Yuri Gorby and Steven Mee as authorized users]
 [Change user names, add authorized user, delete departed users, change rooms]
 [Change Radiation Safety Officer]
 [Add authorized users]
 [Increase C-14 limit to 8 mCi]
 [NRC letter extends expiration date per 10 CFR 30.36]
 [New laboratory location, Room 3C232 of J. W. Powell Building]

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

EARL G. WRIGHT

DATE

JUL 29 1996

BY

Earl G. Wright

Region II, Division of Nuclear Materials Safety
 101 Marietta Street, N.W., Suite 2900
 Atlanta, GA 30323-0199

N:\MLICENSE\45-15923-A28

APPENDIX B

UNITED STATES

NUCLEAR REGULATORY COMMISSION

NUREG/CR - 5489

MANUAL FOR CONDUCTING

RADIOLOGICAL SURVEYS IN SUPPORT OF

LICENSE TERMINATION

JUNE, 1992

NUREG/CR-5849
ORAU-92/C57

Manual for Conducting Radiological Surveys in Support of License Termination

Draft Report for Comment

Prepared by
J. D. Berger

Oak Ridge Associated Universities

Prepared for
U.S. Nuclear Regulatory Commission

Reprinted February 1993

Manual for Conducting Radiological Surveys in Support of License Termination

Draft Report for Comment

Manuscript Completed: May 1992
Date Published: June 1992

Prepared by
J. D. Berger

Environmental Survey and Site Assessment Program
Energy/Environmental Systems Division
Oak Ridge Associated Universities
Oak Ridge, TN 37831-0117

Prepared for
Division of Regulatory Applications
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555
NRC FIN L1569

4.0 Planning and Designing the Final Status Survey

The purpose of the final status survey is to demonstrate that the release criteria established by the NRC have been met. Demonstrating that this has been achieved requires collection of data for determining surface activity levels, direct exposure rates, and radionuclide concentrations in soil. In addition, supplemental information, such as radionuclide concentrations in ground water and total site inventory of radioactive material, may be required by the NRC. The data should be accurate and reliable and should be adequate to satisfy other conditions and considerations which the NRC may impose. A well-documented, statistically based survey plan will be the basis for meeting these objectives.

The survey plan should describe the survey design in detail. The plan should include:

- A list of the types, numbers, and locations of measurements and samples to be obtained;
- Information on the equipment and techniques to be used for measuring, sampling, and analyzing data;
- The methods to be used to interpret and evaluate the survey data; and,
- Quality control procedures for ensuring the validity of the data.

This section discusses considerations for developing such a plan, including quality control procedures, and site information required to plan and design the survey. This section also describes how to select measurement/sampling locations and to determine the sampling frequency that will be required to assure the statistical significance of the data. A general flow chart for a radiological survey supporting license termination is provided in Figure 4-6; detailed flow charts for various activities related to the survey process are provided in Section 6.0. Appendix B provides a sample survey plan for a hypothetical reference fuel fabrication facility.

4.1 General Considerations for Survey Planning

4.1.1 Quality Assurance

Because the purpose of the final status survey is to demonstrate that a facility meets the established release criteria, the survey should be performed in a manner that assures the results are accurate and that uncertainties have been adequately considered. An effective QA program will define the data quality objectives of the survey and thereby determine, to a significant extent, the survey design. This program will operate in all stages of the survey through final validation of the data and the interpretation of the results.

The consensus nuclear industry standard for quality assurance is ANSI/ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities (ANSI 1989). The NRC has also issued guidance for an acceptable QA program in Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Program — Effluent Streams and the Environment (NRC 1979). A quality assurance program, consistent with the information contained in these documents, should be developed.

Surveys should be performed by trained individuals who are following standard, written procedures, and are using properly calibrated instruments which are sensitive to the suspected contaminant. The custody of samples should be tracked from collection to analysis. Data should be recorded in an orderly and verifiable way and reviewed for accuracy and consistency. Every step of the decommissioning process, from training personnel to calculating and interpreting the data, should be documented in a way that lends itself to audit. These requirements are achieved through a formal program of quality assurance. Failure to follow such requirements may limit the usefulness of portions of the survey data.

QA Plans

The decommissioning plan should include a written QA plan that describes the organizational structure under which the decommissioning efforts — and particularly the final status survey — will be conducted. Functional and administrative responsibilities and interfaces of key individuals should be clearly delineated. Education, experience, and any other requirements for each key position should be specified. The size and complexity of the organizational structure will be determined by the magnitude of the decommissioning action.

QA Coordination

One individual should be designated as the QA officer or QA coordinator. This individual should not be involved in survey activities that generate data and should report directly to the project manager. The QA officer/coordinator should be responsible for ensuring that all QA objectives of the survey are met, should review selected field and analytical data to ensure adherence to procedures, and should approve the quality of data before it is used to test hypotheses regarding attainment of cleanup standards. Specifically, this individual:

- Serves as the focal point for survey QA activities and ensures that they are conducted in accordance with established policies and procedures
- Oversees survey activities by conducting internal audits and/or surveillance.

Documentation Requirements

All aspects of the survey should be documented in detail. For certain field or laboratory activities, consensus or industry-wide procedures, such as those developed by the Environmental Protection Agency (EPA), American Society of Testing and Materials (ASTM), DOE's Environmental Measurements Laboratory (EML), or other such organizations may be either adopted in whole or adapted to meet the requirements of the specific decommissioning action. These procedures become part of the administrative record of the survey. The procedures should be approved by the individual responsible for the decommissioning project and the effective date of the procedure should be indicated. Changes or exceptions to established procedures are likely to be required; and these also should be properly documented, signed, and dated.

Training/Certification of Survey Staff

All personnel conducting the surveys should receive training to qualify in the procedures being performed. The extent of training and qualifications should be commensurate with the education, experience, and proficiency of the individual and the scope, complexity, and nature of the activity. Training should be designed to achieve initial proficiency and to maintain that proficiency at least over the course of the decommissioning process. Records of training, including testing to demonstrate qualification, should be maintained.

Equipment Maintenance and Calibration

Measuring equipment should be maintained, calibrated, and tested to assure the validity of the survey data. Further, the procedures, responsibilities, and schedules for calibrating and testing equipment should be documented.

Proper maintenance of equipment varies, but maintenance information and use limitations should be provided in the vendor documentation. All measurement

and analytical equipment should be tested and calibrated before initial use and should be recalibrated if maintenance or modifications could invalidate earlier calibrations. Field and laboratory equipment should be calibrated based on standards traceable to the National Institute of Standards and Technology (NIST). In those cases where NIST-traceable standards are not available, standards of an industry-recognized organization (for example, the New Brunswick Laboratory for various uranium standards) may be used. Minimum frequencies for calibrating equipment should be established and documented.

Measuring equipment should be tested at least once each day the equipment is used. Test results should be recorded in tabular or graphic form and compared to predetermined, acceptable performance ranges. Equipment that does not conform to the performance criteria should be immediately removed from service until the deficiencies can be resolved.

Data Management

A consistent method of data generation, handling, computations, evaluation, and reporting should be developed and documented as part of the survey plan. In general, information and data should be recorded in bound logs or on standardized field and laboratory record forms. Analytical data should not be obliterated by erasing or the use of whiteout. Incorrect entries should be corrected by striking a single line across the entry and entering new data. The correction or change should be initialed and dated by the person making the entry.

A system of data review and validation is important to ensure consistency, thoroughness, and acceptability. This begins with regular (daily or weekly) reviews of calculations based on field data; and reviews of final reports by survey and laboratory supervisors, QA officials, and project managers. All reviews should be signed and dated. Any questionable or invalid data should be identified in project records and in the survey report. Active records should remain under direct control of a designated individual during report preparation; inactive records should be protected from loss or destruction by storage in access-controlled areas or files and in facilities with fire protection. It is also recommended that copies (microfilm, computer disc, photostats, etc.) of critical data be produced and stored at a separate location.

Sample Chain-of-Custody

One of the most important aspects of sample management is to ensure that the integrity of the sample is maintained; that is, that there is an accurate record of sample collection, transport, analysis, and disposal. This ensures that samples are neither lost nor tampered with and that the sample analyzed in the laboratory is actually and verifiably the sample taken from a specific location in the field.

Sample custody should be assigned to one individual at a time. This will prevent confusion of responsibility. Custody is maintained when (1) the sample is under direct surveillance by the assigned individual, (2) the sample is maintained in a tamper-free container, or (3) the sample is within a controlled-access facility.

A chain-of-custody record (a standard form) should be initiated by the individual collecting or overseeing the collection of samples. A copy of this form should accompany the samples throughout transportation and analyses; and any break in custody or evidence of tampering should be documented.

Audits

Periodic audits should be performed to verify that survey activities comply with established procedures and other aspects of the QA plan and to evaluate the overall effectiveness of the QA program. The audits should be conducted in accordance with written guidelines or checklists, and should be performed by individuals not actively participating in the activities being audited. Audit results are reported to responsible management in writing, and actions to resolve identified deficiencies should be tracked and appropriately documented.

4.1.2 Health and Safety

Consistent with the approach for any operation, decommissioning activities should be planned and monitored to assure the health and safety of the worker and other personnel, both on- and off-site, are adequately protected.

Contamination control and radiation control support surveys are conducted for protection of personnel performing decontamination activities. These surveys are operational in nature, as opposed to determining the radiological status of a facility, and are typically conducted as part of a licensee's ongoing radiation protection program. However, at the stage of determining the final status of the site, residual radioactivity is expected to be below the guideline values for unrestricted release; therefore, the final status survey should not require radiation protection controls.

The primary health and safety concerns during a final survey are the common potential industrial hazards typically found at a construction site. These include exposed electrical circuitry, excavations, enclosed work spaces, sharp objects or

surfaces, falling objects, tripping hazards, and working at heights. The survey plan should incorporate requirements and procedures for eliminating, avoiding, or minimizing these potential safety hazards.

4.1.3 Physical Characteristics of Site

The physical characteristics of the site will have a significant impact on the complexity, schedule, and cost of a survey. These characteristics include the number and size of buildings, type of building construction, building condition, total area of grounds, topography, and ground cover.

Building Interiors

Building design and condition will have a marked influence on the survey efforts. The time required to conduct a survey of building interior surface is essentially directly proportional to the total surface area. For this reason the degree of survey coverage is decreased as the potential for residual activity decreases.

Building construction features such as ceiling height and incorporation of ducts, piping, and certain other services into the construction will determine the ease of accessibility of various surfaces. Scaffolding, cranes, manlifts, or ladders may be necessary to reach some surfaces. Accessing some locations may actually require dismantling portions of the building. If the building is constructed of porous materials, such as wood or concrete, and the surface was not sealed, contamination may have found its way into the walls, floors, and other surfaces. It may be necessary to obtain cores for laboratory analysis. Another common difficulty is the presence of contamination beneath tile or other floor coverings. This occurs because the covering placed over contaminated surfaces or the joints in tile were not sealed to prevent penetration. It has been the practice in some facilities to "fix" contamination (particularly alpha emitters) by painting over the surface of the contaminated area. All this should be addressed in surveys.

The condition of surfaces after decontamination may affect the survey process. Removing contamination that has penetrated a surface usually involves removing the surface as well. As a result, the floors and walls of decontaminated facilities are frequently badly scarred or broken up and are often very uneven. Such surfaces are more difficult to survey, because it is not possible to maintain a fixed distance between the detector and the surface and pitted or porous surfaces may significantly attenuate radiations — particularly alpha and low-energy beta particles. Use of monitoring equipment on wheels is precluded by rough surfaces, and such surfaces also pose an increased risk of damage to fragile detector probe faces.

The presence of furnishings and equipment will restrict access to building surfaces and add additional items which the survey should address. Equipment that was used directly for processes or activities involving radioactive materials will likely have been removed; however, in cases where such equipment remains, relatively

inaccessible surfaces may require evaluation. It may also become necessary to remove or relocate certain furnishings such as lab benches and hoods, to obtain access to potentially contaminated floors and walls.

Piping, drains, sewers, sumps, tanks and other components of liquid handling systems present special difficulties because of the inaccessibility of interior surfaces. Process information, operating history, and preliminary monitoring at available access points will assist in evaluating the extent of sampling and measurements that will be required. Evaluation of inaccessible surfaces is addressed in Sections 6.4.3 - 6.4.5

Expansion joints, stress cracks, and penetrations into floors and walls for piping, conduit, anchor bolts, etc. are potential sites for accumulation of contamination and pathways for migration into subfloor soil and hollow wall spaces. Wall/floor interfaces are also likely locations for residual contamination. Coring, drilling, or other such methods may be necessary to gain access for survey.

Building Exteriors

Exterior building surfaces will typically have a low potential for residual contamination; however, there are several locations which should be surveyed. If there were roof exhausts or the facility is in proximity to the air effluent discharge points, the possibility of roof contamination should be considered. Because roofs are periodically resurfaced, contaminants may have been trapped in roofing material, and samples of this material may have to be obtained. Wall penetrations for process equipment, piping, and exhaust ventilation are potential locations for exterior contamination. Roof drainage points such as driplines along overhangs, downspouts, and gutters are also important survey locations. Window ledges and outside exits (doors, doorways, landings, stairways, etc.) from former contamination control areas are also building exterior surfaces which should be addressed.

Grounds

Depending upon site processes and operating history, the radiological survey may include varying portions of the land areas. At a minimum, those areas immediately adjacent to facilities where radioactive materials were handled should be surveyed. Other potentially contaminated open land or paved areas to be considered include equipment, product, waste, and raw material storage areas; liquid waste collection lagoons; areas downwind (based on predominant wind directions on an average annual basis, if possible) of stack release points; surface drainage pathways; and roadways that may have been used for transport of radioactive or contaminated materials.

Buried piping and underground tanks, spills, and septic leach fields which may have received contaminated liquids are locations of possible contamination that

will require sampling of subsurface soil. Information regarding soil type (e.g. clay, sand, etc.) may provide insight into the retention or migration characteristics of specific radionuclides. The need for special sampling by coring or split-spoon equipment, usually by a commercial firm, should be anticipated.

Disposition of on-site, low-level waste burials, authorized under AEC/NRC regulations, will require a decision by the NRC following review of the licensee's decommissioning plan. If radioactive waste has been removed, surveys of excavations will be necessary before backfilling. If such material is to be left in place, the NRC may request subsurface sampling around the burial site perimeter to assess the potential for future migration.

If ground cover should be removed or if there are other obstacles that limit access by either survey personnel or by any needed special equipment (electromagnetic scanners and subsurface sampling rigs) the time and expense of making land areas accessible should be considered. In addition, precautionary procedures should be developed to prevent spreading surface contamination during ground cover removal and/or the use of heavy equipment.

4.2 Designing the Survey

4.2.1 Classification of Areas by Contamination Potential

All areas of the site will not have the same potential for residual contamination and therefore do not require the same level of survey coverage to achieve an acceptable level of confidence that the site satisfies the established release criteria. By designing the survey such that areas with higher potential for contamination receive a higher degree of survey effort, the process will be both effective and efficient.

Two classifications of areas are used in this Manual; these are termed **affected** and **unaffected** areas. These classifications are defined as follows:

- **affected areas:** Areas that have potential radioactive contamination (based on plant operating history) or known radioactive contamination (based on past or preliminary radiological surveillance). This would normally include areas where radioactive materials were used and stored, where records indicate spills or other unusual occurrences that could have resulted in spread of contamination, and where radioactive materials were buried. Areas immediately surrounding or adjacent to locations where radioactive materials were used or stored, spilled, or buried are included in this classification because of the potential for inadvertent spread of contamination.
- **unaffected areas:** All areas not classified as affected. These areas are not expected to contain residual radioactivity, based on a knowledge of site history and previous survey information.

Segregation of the site into these two classifications should be justified by the licensee in the decommissioning plan (in those cases where a decommissioning plan is required to be submitted) and in the final survey report. It should be emphasized that review and concurrence by the NRC of the classification of areas is to the advantage of the licensee at the early stages of planning the final survey. It should also be recognized that as the final survey progresses, an area's classification may require changing, based on accumulated survey data.

4.2.2 Establishing Reference Grid Systems

Grid systems are established at the site to:

- Facilitate systematic selection of measuring/sampling locations,
- Provide a mechanism for referencing a measurement/sample back to a specific location so that the same survey point can be relocated, and
- Provide a convenient means for determining average activity levels.

A grid consists of a system of intersecting lines, referenced to a fixed site location or bench mark. Typically, the grid lines are arranged in a perpendicular pattern, dividing the survey location into squares or blocks of equal area; however, other types of patterns (triangular, rectangular, hexagonal) have been used for survey reference purposes.

Grid patterns on horizontal surfaces are usually identified numerically on one axis and alphabetically on the other axis or in distances in different compass directions from the grid origin. Examples of building interior and land area grids are shown in Figures 4-1 and 4-2, respectively. Grids on vertical surfaces include a third designator, indicating position relative to floor or ground level. Figure 4-1 provides examples of designating grid locations in three dimensions.

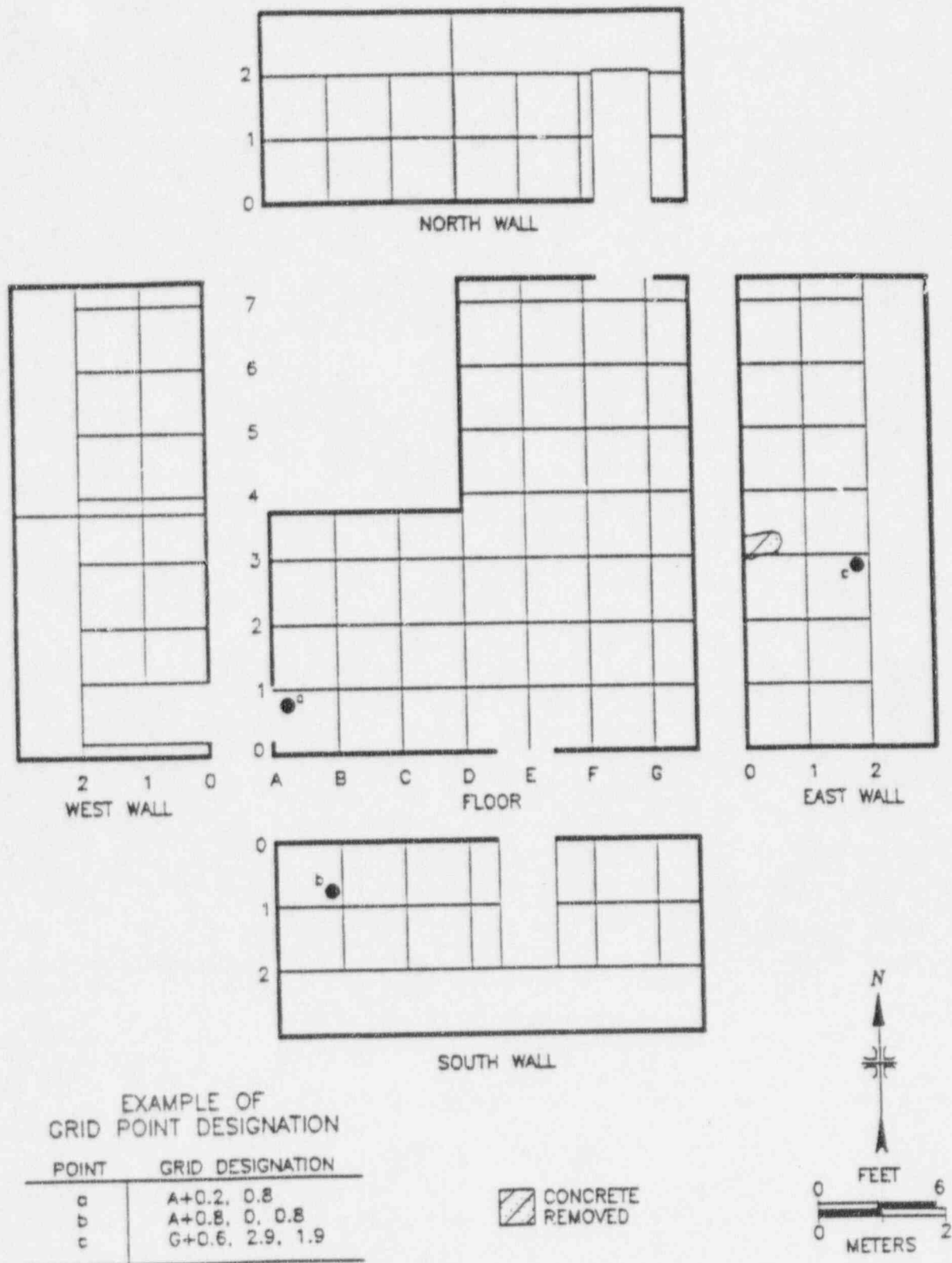
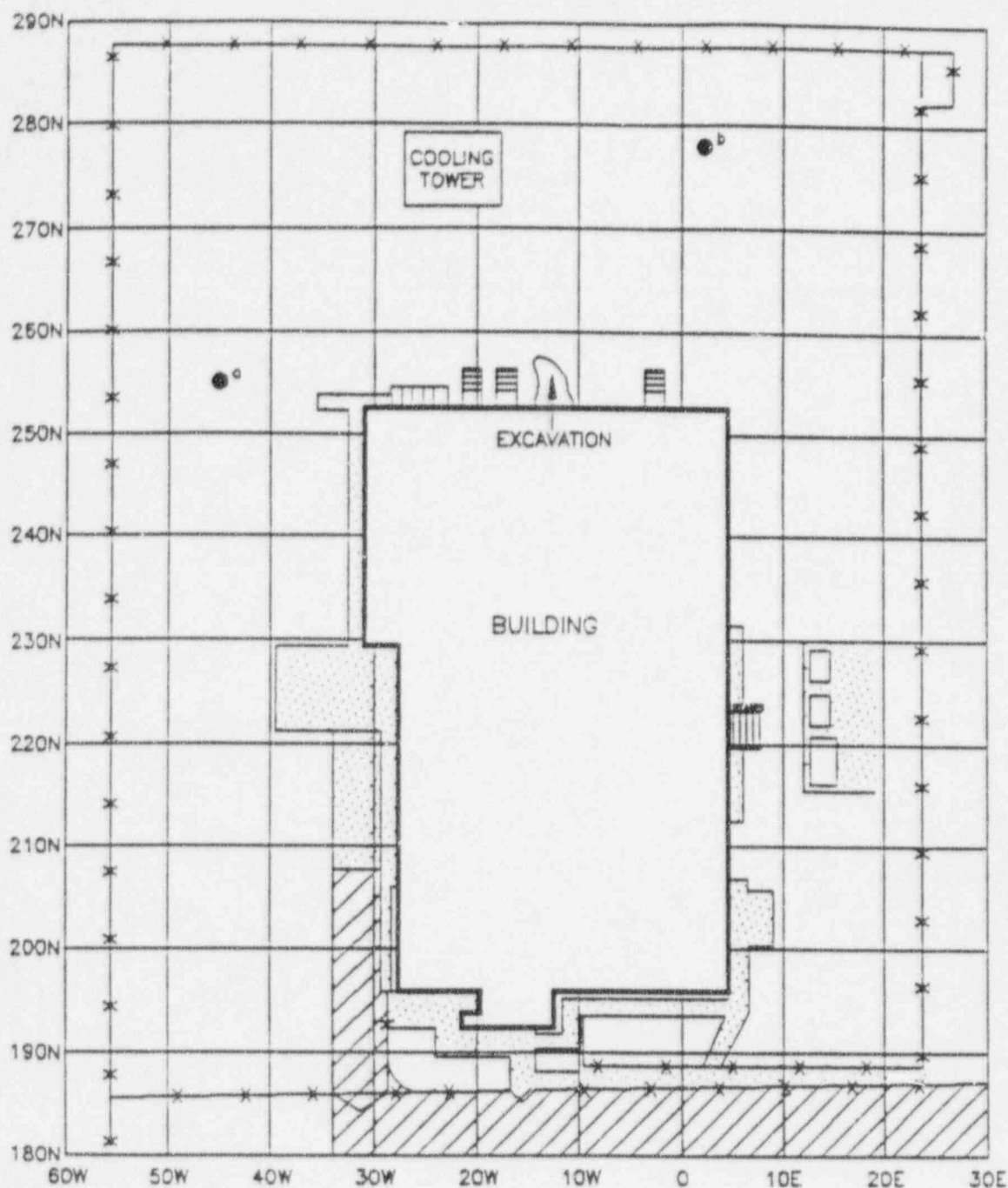


FIGURE 4-1: Example of a Grid System Used for Building Interior Survey



EXAMPLE OF GRID POINT DESIGNATION

POINT	GRID DESIGNATION
a	255N, 45W
b	278N, 2E

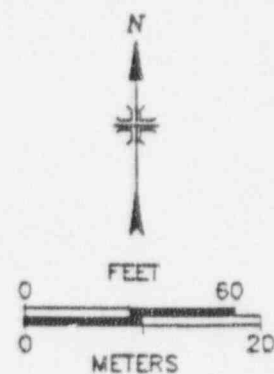
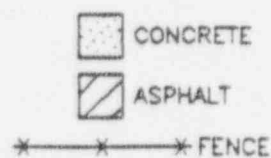


FIGURE 4-2: Example of Grid System for Survey of Site Grounds

For surveys of structures the basic grid system for affected areas is 1 m. Gridding may be limited to the floor and lower (up to 2 m height) walls, unless there is also a potential for upper wall and ceiling area contamination. Survey locations are referenced to the grid system; surveys of ungridded surfaces are referenced to the floor grid (if one exists) or to prominent building features.

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

Unaffected areas do not require gridding for the purposes of establishing measurement or sampling locations; however, grids systems of larger spacing, e.g. 5 to 10 m for large structural surfaces and 20 to 50 m for land areas, may be helpful to the licensee by facilitating the referencing of survey locations in those areas to a common site reference system.

The grids described above are intended primarily for reference purposes and do not necessarily dictate the spacing of survey measurements or sampling. Closer spaced survey locations may be required to demonstrate that average and *elevated area* guideline values are met to the required level of confidence. Larger spacing may be acceptable, based on the capabilities of survey techniques. Considerations for determining measurement/sampling spacing are provided in Sections 4.2.3 and 8.5.

To facilitate survey design and assure that the number of survey data points from an area is sufficient to enable statistical evaluation, the area may be divided into survey "units" which have common history or other characteristics or are naturally distinguishable from other portions of the site. Such **survey units** may combine contiguous rooms or land areas having the same potential contamination classification. The size of a survey unit should be chosen to assure that the total number of data points and/or the spacing (frequency) of measurement/sampling satisfy the requirements of Section 4.2.3. The maximum survey unit size for building surface areas classified as affected, limited to 100 m². A survey unit cannot include both affected and unaffected areas.

4.2.3 Selecting Measurement/Sampling Locations

It is not possible to perform measurements or conduct sampling at the theoretically infinite number of locations on a site. Instead, a survey should have as its objective the collection of quality radiological data from sufficient representative site locations, such that a statistically sound conclusion regarding the radiological status of the entire site can be developed. Meeting this objective requires a statistically based plan for selecting measurement and sampling locations.

Experience has indicated that residual contamination on a former radioactive material site is typically concentrated in a relatively small portion of the site. The pattern is asymmetrical, with much of the activity often located in small isolated hot-spots. If the licensee's cleanup efforts have been effective, however, essentially all locations will have residual activity below the guideline levels, and many areas will contain levels in the range of natural background and/or below the measurement sensitivities of the survey and analytical procedures. After cleanup, the pattern of residual activity will therefore likely approximate a normal distribution; the approach to survey design described below assumes such a distribution. If, based on site operating history or the results of preliminary surveys, there is reason to believe there may be unusual localized contamination patterns, the licensee should supplement the survey with samples from randomly selected points in the area of suspect localized contamination.

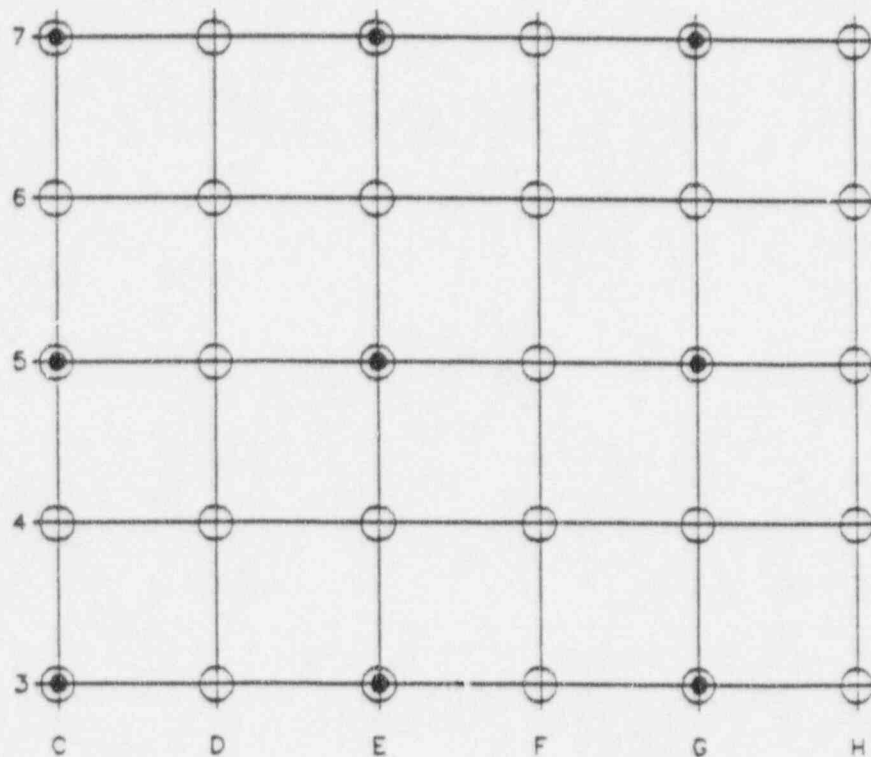
Structure Surveys

Affected Areas

At a minimum, the floors and lower walls of affected areas should receive 100% coverage during the final status survey. The coverage provided for upper walls and ceilings will be dependent upon the contamination potential for these surfaces. The survey measurements for surface activity will consist of a combination of surface scans, direct measurements, and measurements of removable activity. Procedures for performing these measurements are described in Section 6.4

Scans of 100% of affected area floor and lower wall surfaces are performed for all radiations which may be emitted from the radionuclides of interest. Locations of areas of elevated activity are identified and direct measurements are performed to define their extent and activity levels. Residual activity which exceeds 3 times the guideline value results in external radiation in excess of 2 times the guideline value above background at 1 m from the surface, or results in an average activity above the guideline value in any contiguous 1 m² area (refer to Section 8.5.2 for averaging procedures) should be remediated until these conditions are satisfied.

Once all identified elevated areas are evaluated and cleaned up as necessary, systematic measurements of surface activity are performed. If the scanning technique has been demonstrated to have a detection sensitivity for the radionuclide or radiations of interest at $\leq 25\%$ of the guideline level, systematic measurements are performed at a spacing of 2 m or less to provide at least 30 data point locations. A recommended approach is to obtain data from grid line intersections (see Figure 4-3) or grid block centers. If the detection sensitivity of the scanning technique is not $\leq 25\%$ of the guideline value, systematic measurements are performed at 1 m intervals.



- MEASUREMENT LOCATIONS IF SCANNING TECHNIQUE IS CAPABLE TO DETECTING $\leq 25\%$ OF GUIDELINE LEVEL
- MEASUREMENT LOCATIONS IF SCANNING TECHNIQUE IS NOT CAPABLE TO DETECTING $\leq 25\%$ OF GUIDELINE LEVEL



FIGURE 4-3: Standard Measurement/Sampling Pattern
For Systematic Grid Survey of Structure Surfaces

The number of data points required to demonstrate that the confidence level of the survey satisfies the 95% objective for a survey unit, is a function of the average and variance of the data. Following the procedures in Sections 8.5 and 8.6, the need for any additional measurements is determined; if additional measurements are required, they should be obtained at approximately evenly-spaced intervals throughout the survey unit.

Upper walls, ceilings, and other overhead surfaces which are suspected of having residual activity at greater than 25% of the guideline value, based on operating history and previous surveys, are surveyed in the same manner as floors and lower walls. If there is no reason to suspect residual activity exceeding 25% of the guideline value on these surfaces, a minimum of 30 measurement locations each, on vertical and horizontal surfaces where radioactive material would likely accumulate, (air exhaust vents and horizontal surfaces where dust would settle) is selected. To assure a reasonable coverage of these surfaces, an average of at least 1 measurement location per 20 m² of surface area should be selected. At each location a scan of the immediate area is performed to identify the presence of any elevated activity levels, followed by the measurement. If scans or measurements indicate residual activity exceeding 25% of the guideline, the area is considered potentially contaminated and the surface exhibiting such levels should be surveyed in the same manner as floors and lower walls of affected areas.

If gamma emitting radionuclides are among the potential contaminants, exposure rate measurements at 1 m from floor and lower wall surfaces are performed at a frequency of 1 systematic measurement per every 4 m². If potential contaminants did not include gamma emitters, exposure rate measurements should be performed at a minimum spacing of 1 measurement per 10 m².

Unaffected Areas

Scans of unaffected surfaces should cover a minimum of 10% of the floor and lower wall surface area. At least 30 randomly selected measurement locations or an average measurement of 1 per 50 m² of building surface area, whichever is greater, for total and removable activity, should be performed for each survey unit. These locations should include all building surfaces. Identification of activity levels in excess of 25% of the guideline, either by scans or measurements, will require reclassification of the area to the "affected" category. Testing of the data relative to the confidence level objective is performed in the same manner as for affected areas and any additional measurement locations required should be selected randomly. Exposure rate measurements at 1 m from the floor are performed at each location of surface activity measurement.

Open Land Surveys

Affected Areas

As with structure surfaces, 100% coverage of affected open land areas (paved surfaces and soil) is necessary. Scanning is 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 area extent, and results are compared with criteria (see Sections 2.2 and 8.5); 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 equidistant between the center and each of the four grid block corners (see Figure 4-4). If scanning is not capable of detecting surface areas with activity levels $\leq 75\%$ of the guideline values for the radionuclides of interest, additional sampling will be required to provide an acceptable level of confidence that locations of elevated activity have been identified. An EPA procedure (EPA 1989) recommends a triangular grid with a sampling interval of 5 m on a side (enclosed area of approximately 10.8 m^2) for a 95% assurance that elevated areas in excess of 10 m^2 surface area are identified. By beginning with the standard systematic pattern and including additional sampling points, located along the 10 m grid lines, at block corners and centers, and midway between grid block corners (Figure 4-5), a triangular sampling pattern with spacing of 5 m or less (enclosed area of approximately 6.3 m^2) is obtained.

Paved surfaces are surveyed in the same manner as described above for structure surfaces.

For both soil sampling and paved surface measurements, a minimum of 30 data locations should be used. Data for each of these surface types are tested relative to the guideline value and the confidence level objective, and additional systematic sampling/measurement locations that may be required are obtained at approximately uniformly spaced intervals throughout the survey unit.

Exposure rates are measured at 1 m above the surface on the pattern shown in Figure 4-4.

Unaffected Areas

Unaffected open land area should be uniformly scanned for radiations from the radionuclides of interest. Spacing intervals between scanning paths should be such that a minimum of 10% of the surface is scanned. Soil sampling is performed at a minimum of 30 randomly selected locations. Surface activity measurements on paved areas are also performed at 30 randomly selected locations. Identification of hot-spots or individual locations with activity levels

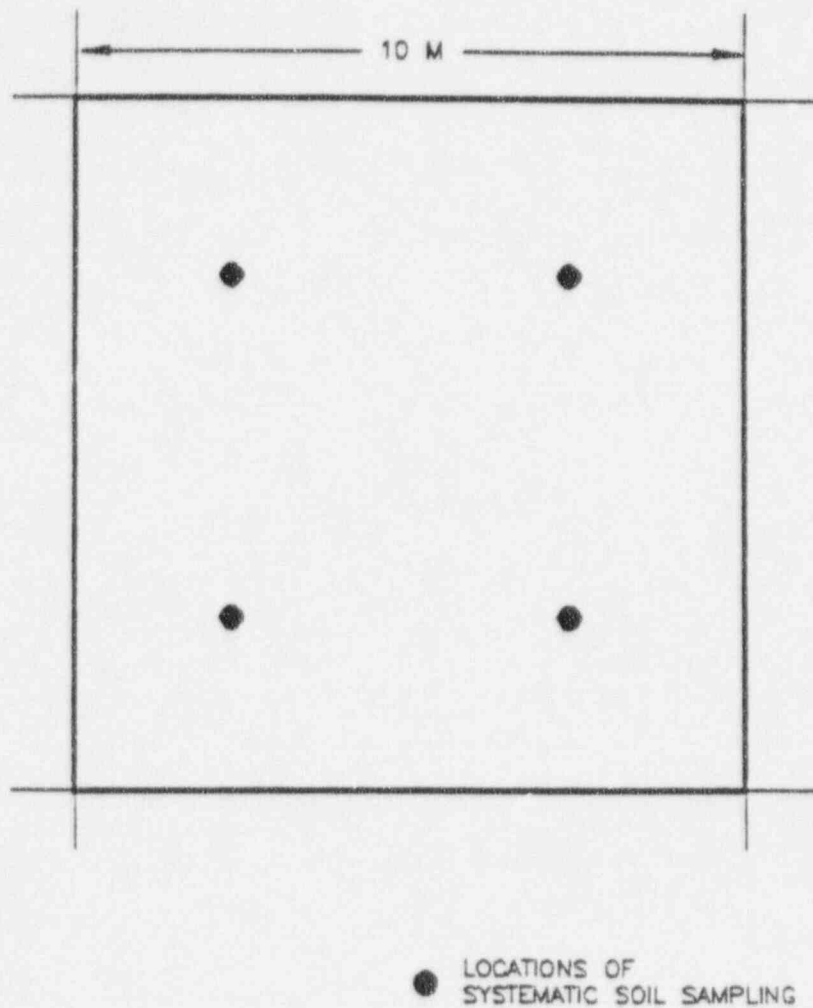
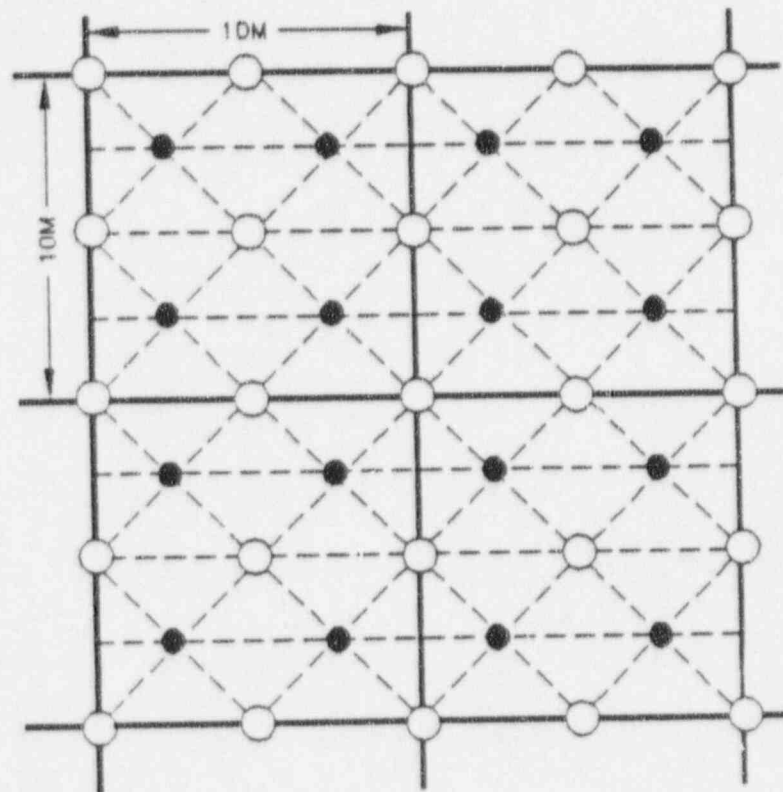


FIGURE 4-4: Standard Sampling Pattern for Systematic Grid Survey of Soil



- SYSTEMATIC SAMPLING LOCATIONS
- ADDITIONAL SAMPLING LOCATIONS TO PROVIDE CLOSE-SPACED TRIANGULAR GRID PATTERNS

FIGURE 4-5: Sampling Pattern to Identify Soil Areas of Elevated Activity

in excess of 75% of the guideline value requires reclassification of the area as "affected".

Testing of results, relative to guidelines and confidence level objectives is performed according to Section 8.6 and any additional samples/measurements required are obtained at randomly selected locations in the survey unit.

Other Measurement/Sampling Locations

In addition to the building and land surface areas described above, there are numerous other locations where measurements and/or sampling should be performed. Examples include items of equipment and furnishings, building fixtures, drains, ducts, and piping. Many of these items or locations have both internal and external surfaces, requiring evaluation.

Each such location classified as affected should be scanned and individual measurements and/or samples obtained at representative points. Unaffected locations can, as with the building and land surfaces in such areas, be surveyed at lower frequencies, consistent with the contamination potential, the capability of scanning techniques to identify activity levels at or above guidelines, and findings as the survey progresses. Surveys of these types of locations are discussed in more detail in Section 6.0.

4.2.4 Subsurface Sampling

At the stage where the final status survey is being conducted, contaminated subsurface soil should already have been identified, characterized, and remediated, if necessary. Subsurface activity data may be required for determination of residual site inventory. In addition, if there is potential for residual activity below the surface layer, the survey plan should include subsurface sampling. The number and locations of samples should follow the same pattern as described above in section 4.2.3 sampling depth of surface soil. As an initial evaluation, samples may be collected at 1 m intervals, starting at the surface and continuing to at least 1 m below the suspected or potential region of activity. 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. Use of electromagnetic sensing techniques, such as ground penetrating radar and magnetometry will assist in locating potential sampling areas and also should be a safety consideration if buried utilities or containers of potentially hazardous material (radiological or chemical) may be present. Use of a subsurface sampling technique which results in a borehole or soil face, accessible with a gamma sensitive detector, also enables scanning of the exposed soil surface to identify the presence and distribution of subsurface activity.

If a potential exists for activity to enter subsurface water, samples of water should be collected (if available) from the same locations as the subsurface soil samples. Knowledge of expected constituents is necessary when collecting subsurface water to determine whether special precautions for sample handling and collection are required to ensure representative samples. Expertise of hydrology specialists and those knowledgeable in subsurface water sampling technique should be sought, when such conditions are anticipated.

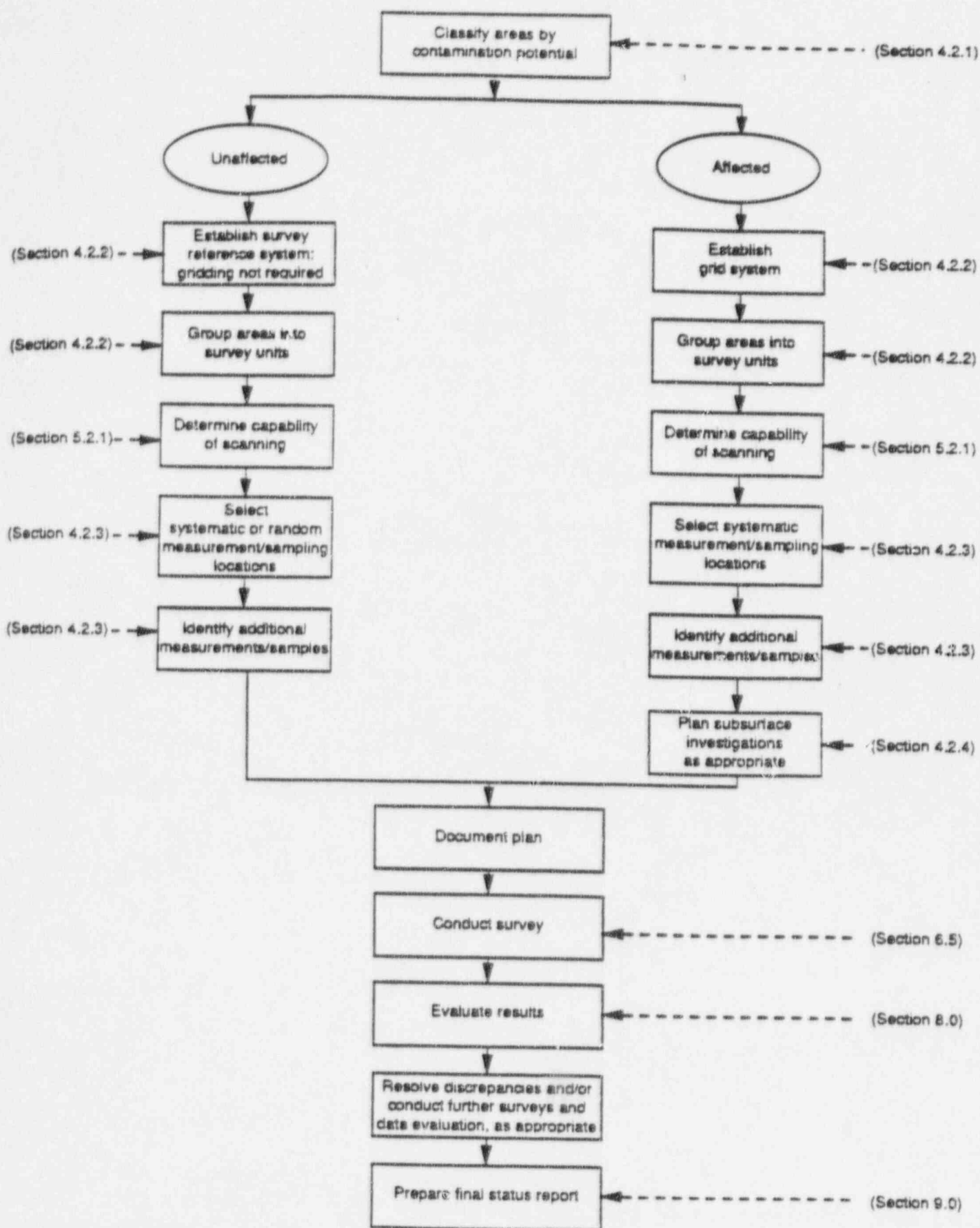


FIGURE 4.6: Flow Diagram for Planning Final Status Surveys

APPENDIX C

RADIOLOGICAL ASSESSMENT

RADIATION DETECTION

INSTRUMENT SURVEY

The following instrument surveys were taken in these designated laboratories located in

John Wesley Powell Building:

- Laboratory 3D231
- Laboratory 3D239

LABORATORY 3D231*
JOHN WESLEY BUILDING
NATIONAL CENTER
RESTON VIRGINIA

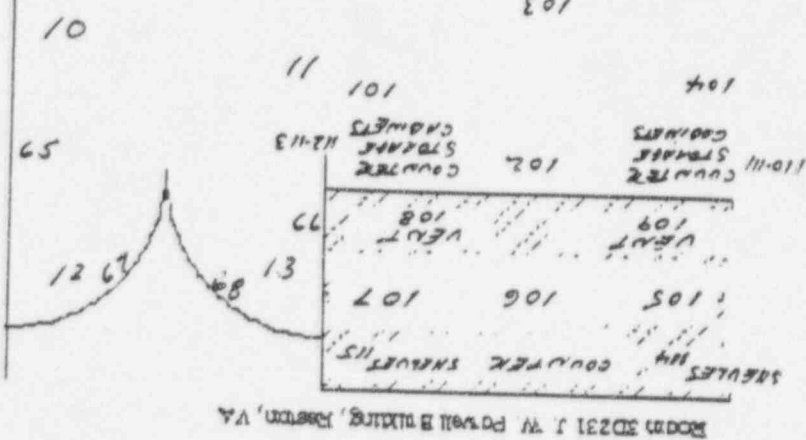
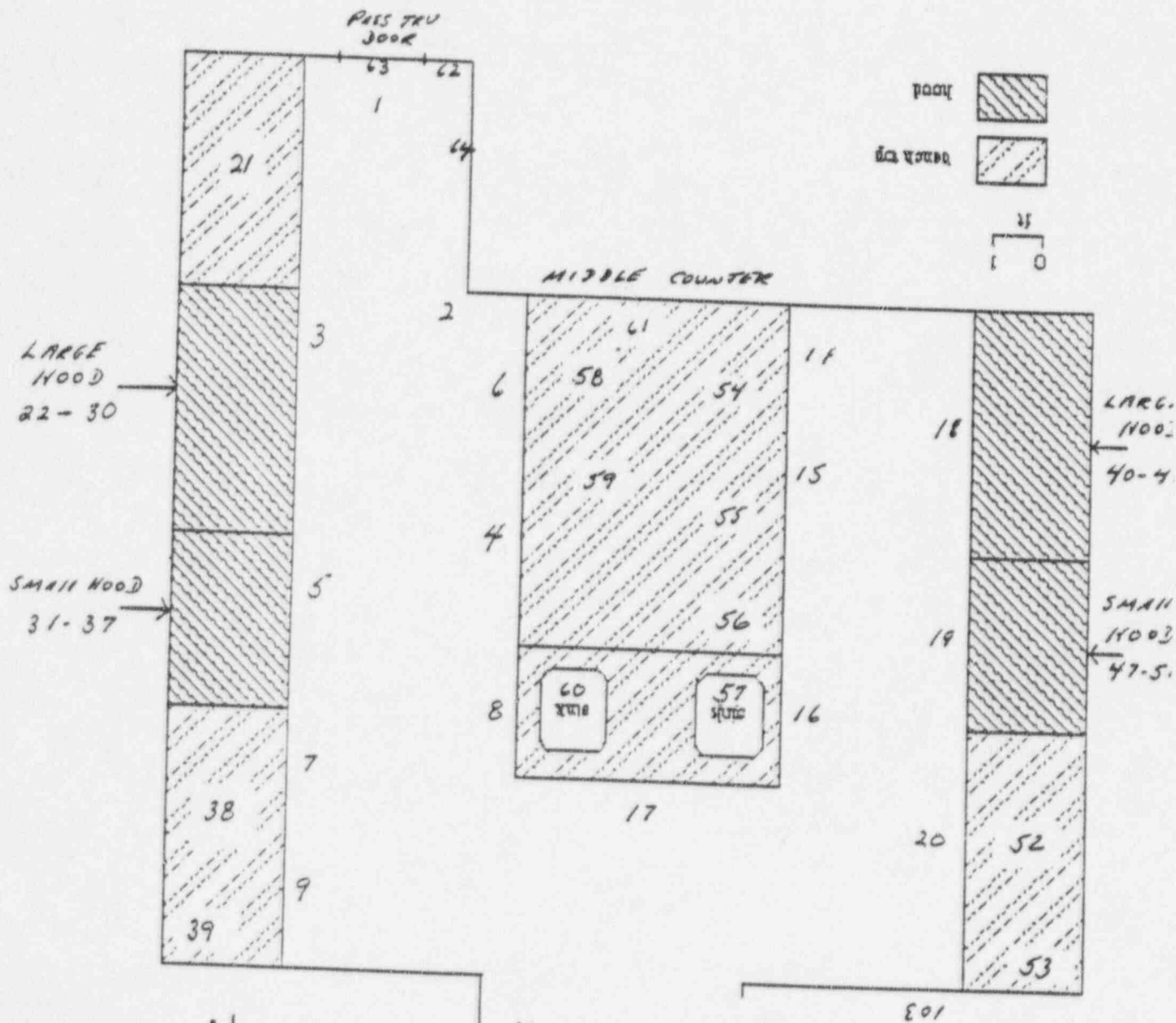
Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
1	west side of lab	floor	below door	0.020	15.0
2	west side of lab	floor	adjacent to counter	0.020	15.0
3	west side of lab	floor	adjacent to large hood	0.020	15.0
4	west side of lab	floor	adjacent to small hood	0.020	15.0
5	west side of lab	floor	adjacent to counter	0.020	15.0
6	west side of lab	floor	adjacent to middle counter	0.020	15.0
7	west side of lab	floor	adjacent to counter	0.020	15.0
8	west side of lab	floor	adjacent to sink	0.020	15.0
9	west side of lab	floor	adjacent to counter	0.020	15.0
10	west side of lab	floor	adjacent to wall	0.020	15.0
11	east side of lab	floor	entrance to small room	0.020	15.0
12	west side of lab	floor	entrance to lab	0.020	15.0
13	east side of lab	floor	entrance to lab	0.020	15.0
14	middle counter	floor	adjacent to counter	0.020	15.0
15	middle counter	floor	adjacent to counter	0.020	15.0
16	middle counter	floor	adjacent to sink	0.020	15.0
17	middle counter	floor	front of sinks	0.020	15.0
18	middle counter	floor	adjacent to large hood	0.020	15.0
19	middle counter	floor	adjacent to small hood	0.020	15.0
20	middle counter	floor	adjacent to counter	0.020	15.0
21	west side of lab	counter	middle	0.020	15.0
22	west side of lab	large hood	middle (bottom)	0.020	15.0
23	west side of lab	large hood	right side	0.020	15.0
24	west side of lab	large hood	left side	0.020	15.0
25	west side of lab	large hood	back portion	0.020	15.0
26	west side of lab	large hood	front glass	0.020	15.0
27	west side of lab	large hood	front grill	0.020	15.0
28	west side of lab	large hood	trap (inside hood)	0.020	15.0

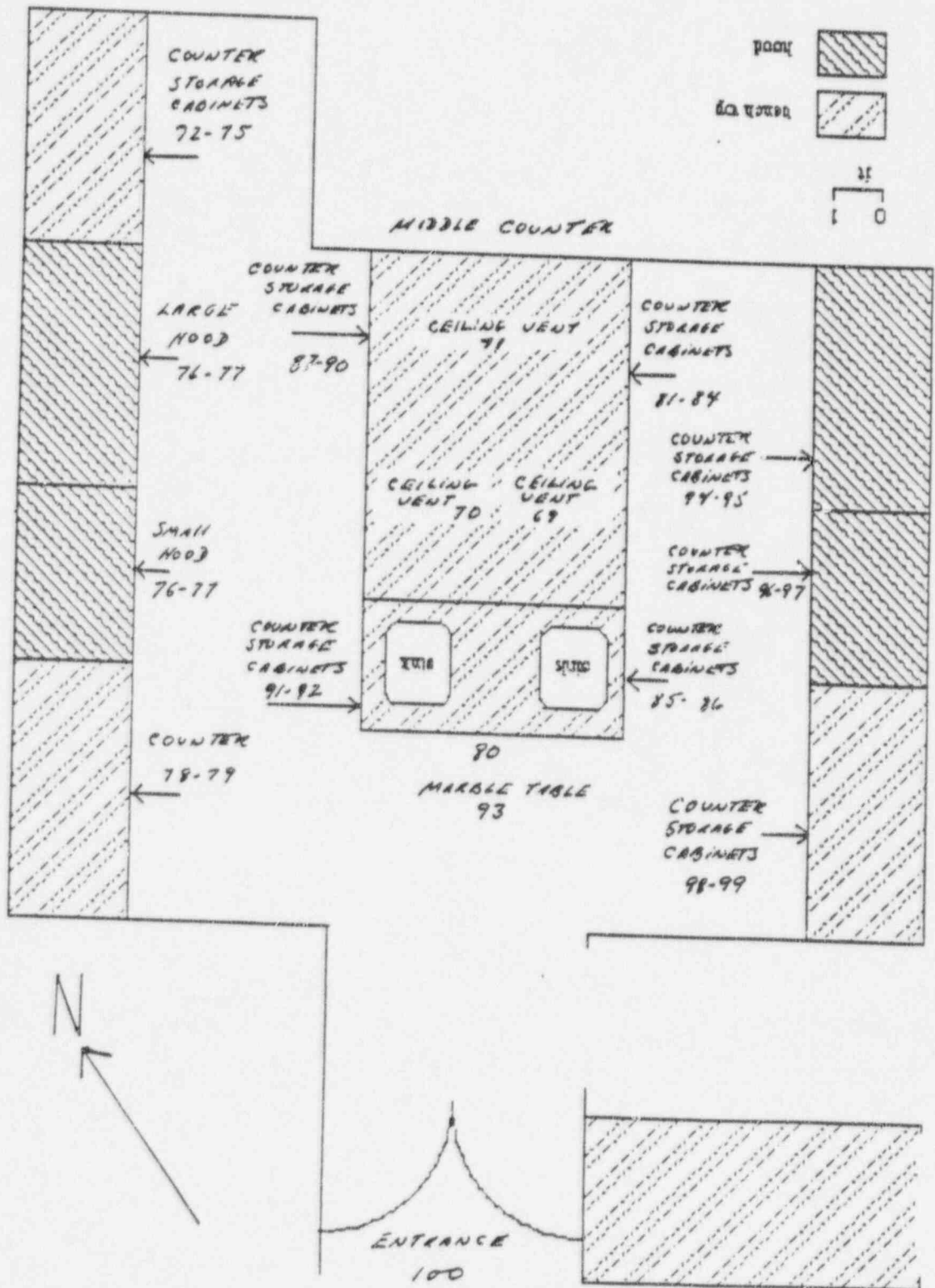
Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
29	west side of lab	large hood	trap (counter)	0.020	15.0
30	west side of lab	large hood	sill front of hood	0.020	15.0
31	west side of lab	small hood	middle (bottom)	0.020	15.0
32	west side of lab	small hood	right side	0.020	15.0
33	west side of lab	small hood	left side	0.020	15.0
34	west side of lab	small hood	back portion	0.020	15.0
35	west side of lab	small hood	front glass	0.020	15.0
36	west side of lab	small hood	front grill	0.020	15.0
37	west side of lab	small hood	sill front of hood	0.020	15.0
38	west side of lab	counter	middle	0.020	15.0
39	west side of lab	counter	inside trap	0.020	15.0
40	west side of lab	large hood	middle-bottom	0.020	15.0
41	east side of lab	large hood	right side	0.020	15.0
42	east side of lab	large hood	left side	0.020	15.0
43	east side of lab	large hood	back portion	0.020	15.0
44	east side of lab	large hood	front glass	0.020	15.0
45	east side of lab	large hood	front grill	0.020	15.0
46	east side of lab	large hood	sill front of hood	0.020	15.0
47	east side of lab	small hood	middle (bottom)	0.020	15.0
48	east side of lab	small hood	right side	0.020	15.0
49	east side of lab	small hood	left side	0.020	15.0
50	east side of lab	small hood	back side	0.020	15.0
51	east side of lab	small hood	sill front of hood	0.020	15.0
52	east side of lab	counter	middle	0.020	15.0
53	east side of lab	counter	inside trap	0.020	15.0
54	middle counter	counter	middle	0.020	15.0
55	middle counter	counter	middle	0.020	15.0
56	middle counter	counter	near sink	0.020	15.0

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
57	middle counter	sink	inside and drain	0.020	15.0
58	middle counter	counter	middle	0.020	15.0
59	middle counter	counter	middle	0.020	15.0
60	middle counter	sink	inside and drain	0.020	15.0
61	middle counter	counter	inside trap	0.020	15.0
62	west side of lab	wall	3 feet up wall	0.020	15.0
63	west side of lab	pass through door	3 feet up wall	0.020	15.0
64	west side of lab	wall	2 feet up wall	0.020	15.0
65	west side of lab	wall near door entrance	3 feet up wall	0.020	15.0
66	east side of lab	wall near door entrance	3 feet up wall	0.020	15.0
67	west side of lab	door inside	2 feet up wall	0.020	15.0
68	east side of lab	door inside	2 feet up wall	0.020	15.0
69	east side of lab	ceiling vents	front - eastside	0.020	15.0
70	west side of lab	ceiling vents	front - westside	0.020	15.0
71	rear side of lab	ceiling vents	rear of lab	0.020	15.0
72	west side of lab	counter storage	inside drawers	0.020	15.0
73	west side of lab	counter storage	outside drawers	0.020	15.0
74	west side of lab	counter storage	inside drawers	0.020	15.0
75	west side of lab	counter storage	outside drawers	0.020	15.0
76	west side of lab	large & small hood storage	inside storage area	0.020	15.0
77	west side of lab	large & small hood storage	outside storage area	0.020	15.0
78	west side of lab	counter storage	inside drawers	0.020	15.0
79	west side of lab	counter storage	outside drawers	0.020	15.0
80	middle counter	middle counter storage	outside	0.020	15.0
81	middle counter	middle counter	inside drawers	0.020	15.0
82	middle counter	counter east side	outside drawers	0.020	15.0
83	middle counter	counter east side	inside drawers	0.020	15.0
84	middle counter	counter east side	outside drawers	0.020	15.0

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
85	middle counter	middle counter storage sink	inside drawers	0.020	15.0
86	middle counter	middle counter	outside drawers	0.020	15.0
87	middle counter	middle counter storage	inside drawers	0.020	15.0
88	middle counter	middle counter west side	outside drawers	0.020	15.0
89	middle counter	middle counter west side	inside drawers	0.020	15.0
90	middle counter	middle counter west side	outside drawers	0.020	15.0
91	middle counter	middle counter west side	inside drawers	0.020	15.0
92	middle counter	middle counter west side	outside drawers	0.020	15.0
93	middle counter	marble table	middle drawers	0.020	15.0
94	east side of lab	counter storage	inside drawers	0.020	15.0
95	east side of lab	counter storage	outsider drawers	0.020	15.0
96	east side of lab	counter storage	insider drawers	0.020	15.0
97	east side of lab	counter storage	outsider drawers	0.020	15.0
98	east side of lab	counter storage	insider drawers	0.020	15.0
99	east side of lab	counter storage	outsider drawers	0.020	15.0
100	east side of lab	entrance to lab	front of doors	0.020	15.0
101	east side of lab	small room storage	floor, entrance	0.020	15.0
102	east side of lab	small room storage	floor, front of cabinets	0.020	15.0
103	east side of lab	small room storage	floor, front of wall	0.020	15.0
104	east side of lab	small room storage	floor, rear wall	0.020	15.0
105	east side of lab	small room storage	counter top middle	0.020	15.0
106	east side of lab	small room storage	counter top middle	0.020	15.0
107	east side of lab	small room storage	counter top middle	0.020	15.0
108	east side of lab	small room storage	vent front of room	0.020	15.0
109	east side of lab	small room storage	vent rear of room	0.020	15.0
110	east side of lab	small room storage	storage cabinets (inside)	0.020	15.0
111	east side of lab	small room storage	storage cabinets (outside)	0.020	15.0
112	east side of lab	small room storage	storage cabinets (inside)	0.020	15.0
113	east side of lab	small room storage	storage cabinets (outside)	0.020	15.0
114	east side of lab	small room storage	storage shelves, back	0.020	15.0
115	east side of lab	small room storage	storage shelves, front	0.020	15.0

* In accordance with section 4.2.2 Establishing Reference Grid Systems, since unaffected areas do not require gridding for the purpose of establishing measurement or sampling locations, the specific laboratory survey locations (instrument and smear) were marked, identified by white adhesive tabs and the laboratories were locked and secured to deny and prohibit areas pending the NRC review of this Radiological Safety Assessment report.





ROOM 30231 J. W. FOWELL BUILDING, FORT MONROE, VA

LABORATORY 3D239
JOHN WESLEY BUILDING
NATIONAL CENTER
RESTON VIRGINIA

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
1	west side of lab	floor	below door	0.020	15.0
2	west side of lab	floor	adjacent to counter/hood	0.020	15.0
3	west side of lab	floor	adjacent to hood	0.020	15.0
4	west side of lab	floor	between 2 hoods	0.020	15.0
5	west side of lab	floor	adjacent to hood	0.020	15.0
6	west side of lab	floor	adjacent to middle counter	0.020	15.0
7	west side of lab	floor	adjacent to middle counter		
8	west side of lab	floor	corner of middle counter	0.020	15.0
9	west side of lab	floor	entrance to small room	0.020	15.0
10	west side of lab	floor	entrance to small room	0.020	15.0
11	west side of lab	floor	middle of floor	0.020	15.0
12	east side of lab	floor	adjacent to middle counter	0.020	15.0
13	east side of lab	floor	adjacent to counter and hood	0.020	15.0
14	east side of lab	floor	adjacent to middle counter	0.020	15.0
15	east side of lab	floor	adjacent to middle counter	0.020	15.0
16	east side of lab	floor	middle of floor	0.020	15.0
17	east side of lab	floor	corner of middle counter	0.020	15.0
18	east side of lab	floor	adjacent to middle counter	0.020	15.0
19	east side of lab	floor	adjacent to hood	0.020	15.0
20	east side of lab	floor	adjacent to hood	0.020	15.0
21	west side of lab	room	middle of marble table	0.020	15.0
22	west side of lab	room	middle of floor	0.020	15.0
23	west side of lab	room	middle of wood table	0.020	15.0
24	west side of lab	room	desk, middle	0.020	15.0
25	west side of lab	room	wall, 3 feet up	0.020	15.0
26	east side of lab	room	middle of floor	0.020	15.0
27	east side of lab	room	middle of floor	0.020	15.0
28	east side of lab	room	middle of floor	0.020	15.0

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
29	east side of lab	room	wall, 3 feet up	0.020	15.0
30	east side of lab	room	wall, 3 feet up	0.020	15.0
31	east side of lab	counter	middle	0.020	15.0
32	east side of lab	counter	middle	0.020	15.0
33	east side of lab	counter	middle	0.020	15.0
34	east side of lab	counter	inside trap	0.020	15.0
35	east side of lab	canopy hood	inside	0.020	15.0
36	east side of lab	canopy hood	outside	0.020	15.0
37	east side of lab	shelving	inside	0.020	15.0
38	east side of lab	shelving	outside	0.020	15.0
39	east side of lab	shelving	inside	0.020	15.0
40	east side of lab	shelving	outside	0.020	15.0
41	east side of lab	vent	front of room	0.020	15.0
42	east side of lab	vent	rear of room	0.020	15.0
43	east side of lab	storage areas	inside	0.020	15.0
44	east side of lab	storage areas	outside	0.020	15.0
45	east side of lab	storage areas	inside	0.020	15.0
46	east side of lab	storage areas	outside	0.020	15.0
47	west side of lab	wall	rear, 3 feet up	0.020	15.0
48	east side of lab	wall	rear, 3 feet up	0.020	15.0
49	east side of lab	wall	front, 3 feet up	0.020	15.0
50	east side of lab	wall	front, 3 feet up	0.020	15.0
51	west side of lab	counter	middle	0.020	15.0
52	west side of lab	counter	middle	0.020	15.0
53	west side of lab	counter	inside trap	0.020	15.0
54	west side of lab	equipment	on counter	0.020	15.0
55	west side of lab	counter storage area	inside	0.020	15.0
56	west side of lab	counter storage area	outside	0.020	15.0

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
57	west side of lab	counter storage area	inside	0.020	15.0
58	west side of lab	counter storage area	outside	0.020	15.0
59	west side of lab	counter storage area	inside	0.020	15.0
60	west side of lab	counter storage area	outside	0.020	15.0
61	west side of lab	counter, hood	middle, bottom	0.020	15.0
62	west side of lab	counter, hood	right side		
63	west side of lab	counter, hood	left side	0.020	15.0
64	west side of lab	counter, hood	back portion		
65	west side of lab	counter, hood	front glass	0.020	15.0
66	west side of lab	counter, hood	front grill	0.020	15.0
67	west side of lab	counter, hood	sill front of hood	0.020	15.0
68	west side of lab	counter, hood	middle, bottom	0.020	15.0
69	west side of lab	counter, hood	right side	0.020	15.0
70	west side of lab	counter, hood	left side	0.020	15.0
71	west side of lab	counter, hood	back portion	0.020	15.0
72	west side of lab	counter, hood	front glass	0.020	15.0
73	west side of lab	counter, hood	front grill	0.020	15.0
74	west side of lab	counter, hood	sill front of hood	0.020	15.0
75	west side of lab	counter, hood	inside trap	0.020	15.0
76	west side of lab	counter, hood	inside trap	0.020	15.0

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
77	west side of lab	storage areas (hood)	inside	0.020	1a5.0
78	west side of lab	storage areas (hood)	outside	0.020	15.0
79	west side of lab	storage areas (hood)	inside	0.020	15.0
80	west side of lab	storage areas (hood)	outside	0.020	15.0
81	west side of lab	storage areas (hood)	inside	0.020	15.0
82	west side of lab	storage areas (hood)	outside	0.020	15.0
83	west side of lab	storage areas (hood)	inside	0.020	15.0
84	west side of lab	storage areas (hood)	outside	0.020	15.0
85	east side of lab	counter	middle	0.020	15.0
86	east side of lab	counter	middle	0.020	15.0
87	east side of lab	counter	middle	0.020	15.0
88	east side of lab	counter	equipment	0.020	15.0
89	east side of lab	storage areas (counter)	inside	0.020	15.0
90	east side of lab	storage areas (counter)	outside	0.020	15.0
91	east side of lab	storage areas (counter)	inside	0.020	15.0
92	east side of lab	storage areas (counter)	outside	0.020	15.0
93	east side of lab	storage areas (counter)	inside	0.020	15.0
94	east side of lab	storage areas (counter)	outside	0.020	15.0
95	east side of lab	hood	middle, bottom	0.020	15.0
96	east side of lab	hood	right side	0.020	15.0
97	east side of lab	hood	left side	0.020	15.0
98	east side of lab	hood	back portion	0.020	15.0
99	east side of lab	hood	front glass	0.020	15.0

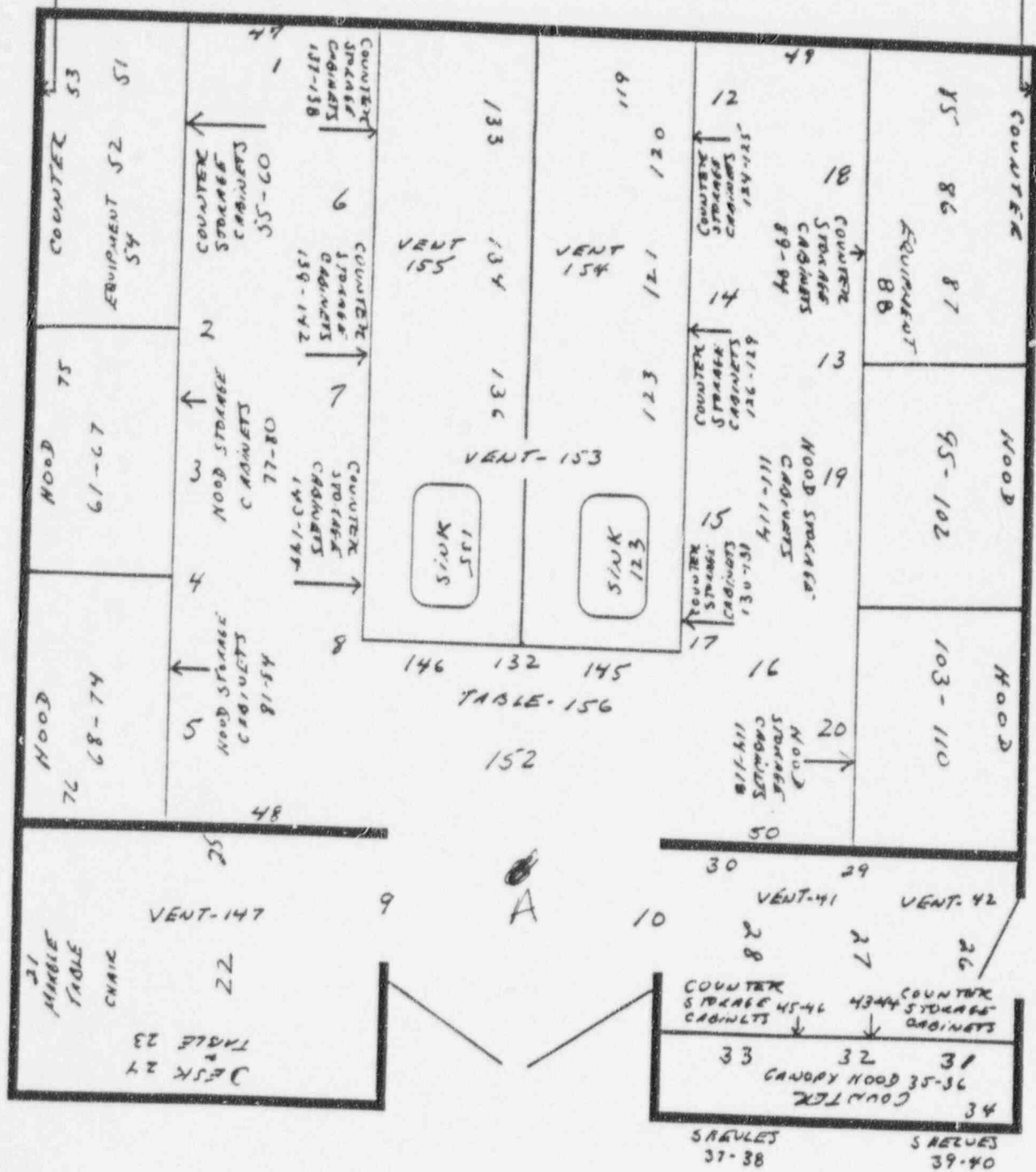
Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
100	east side of lab	hood	front grill	0.020	1a5.0
101	east side of lab	hood	sill. front of hood		
102	east side of lab	hood	trap - inside	0.020	15.0
103	east side of lab	hood	middle bottom	0.020	15.0
104	east side of lab	hood	right side		
105	east side of lab	hood	left side	0.020	15.0
106	east side of lab	hood	back portion		
107	east side of lab	hood	front glass	0.020	15.0
108	east side of lab	hood	front grill		
109	east side of lab	hood	sill. front of hood	0.020	15.0
110	east side of lab	hood	trap - inside		
111	east side of lab	storage areas. hood	inside drawers	0.020	15.0
112	east side of lab	storage areas. hood	outside drawers	0.020	15.0
113	east side of lab	storage areas. hood	insider drawers	0.020	15.0
114	east side of lab	storage areas. hood	outside drawers	0.020	15.0
115	east side of lab	storage areas. hood	inside drawers	0.020	15.0
116	east side of lab	storage areas. hood	outside drawers	0.020	15.0
117	east side of lab	storage areas. hood	inside drawers	0.020	15.0
118	east side of lab	storage areas. hood	outside drawers	0.020	15.0
119	east side of lab	middle counter	inside trap	0.020	15.0
120	east side of lab	middle counter. hood	middle		15.0
121	east side of lab	middle counter. hood	middle	0.020	15.0
122	east side of lab	middle counter. hood	middle	0.020	15.0

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
123	east side of lab	middle counter sink	inside drains and sink	0.020	15.0
124	east side of lab	middle counter storage	inside drawers	0.020	15.0
125	east side of lab	middle counter storage	outside drawers	0.020	15.0
126	east side of lab	middle counter storage	inside drawers	0.020	15.0
127	east side of lab	middle counter storage	outside drawers	0.020	15.0
128	east side of lab	middle counter storage	inside drawers	0.020	15.0
129	east side of lab	middle counter storage	outside drawers	0.020	15.0
130	east side of lab	middle counter storage	inside drawers	0.020	15.0
131	east side of lab	middle counter storage	outside drawers	0.020	15.0
132	east side of lab	middle counter	front. 3 feet up	0.020	15.0
133	west side of lab	counter	middle	0.020	15.0
134	west side of lab	counter	middle	0.020	15.0
135	west side of lab	counter	middle	0.020	15.0
136	west side of lab	sink	inside sink and drains	0.020	15.0
137	west side of lab	counter storage area	inside drawers	0.020	15.0
138	west side of lab	counter storage area	outside drawers	0.020	15.0
139	west side of lab	counter storage area	inside drawers	0.020	15.0
140	west side of lab	counter storage area	outside drawers	0.020	15.0
141	west side of lab	counter storage area	inside drawers	0.020	15.0
142	west side of lab	counter storage area	outside drawers	0.020	15.0
143	west side of lab	counter storage area	inside drawers	0.020	15.0

Swipe	Area		Location	Radiation Reading mR/hr at 1 cm	Radiation Reading μ R/hr at 1 meter
144	west side of lab	counter storage area	outside drawers	0.020	15.0
145	east side of lab	counter storage area	front	0.020	15.0
146	west side of lab	counter storage area	front	0.020	15.0
147	west side of lab	vent (inside)	room, inside	0.020	15.0
148	west side of lab	shelves	inside		
149	west side of lab	shelves	outside	0.020	15.0
150	east side of lab	shelves	inside	0.020	15.0
151	east side of lab	shelves	outside	0.020	15.0
152	middle of lab	front of sink	floor	0.020	15.0
153	middle of lab	middle counter	front vent	0.020	15.0
154	east side of lab	lab	vent	0.020	15.0
155	west side of lab	lab	vent	0.020	15.0
156	middle of lab entrance	table	front of middle counter	0.020	15.0

SHelves
150-151

SHelves
148-149



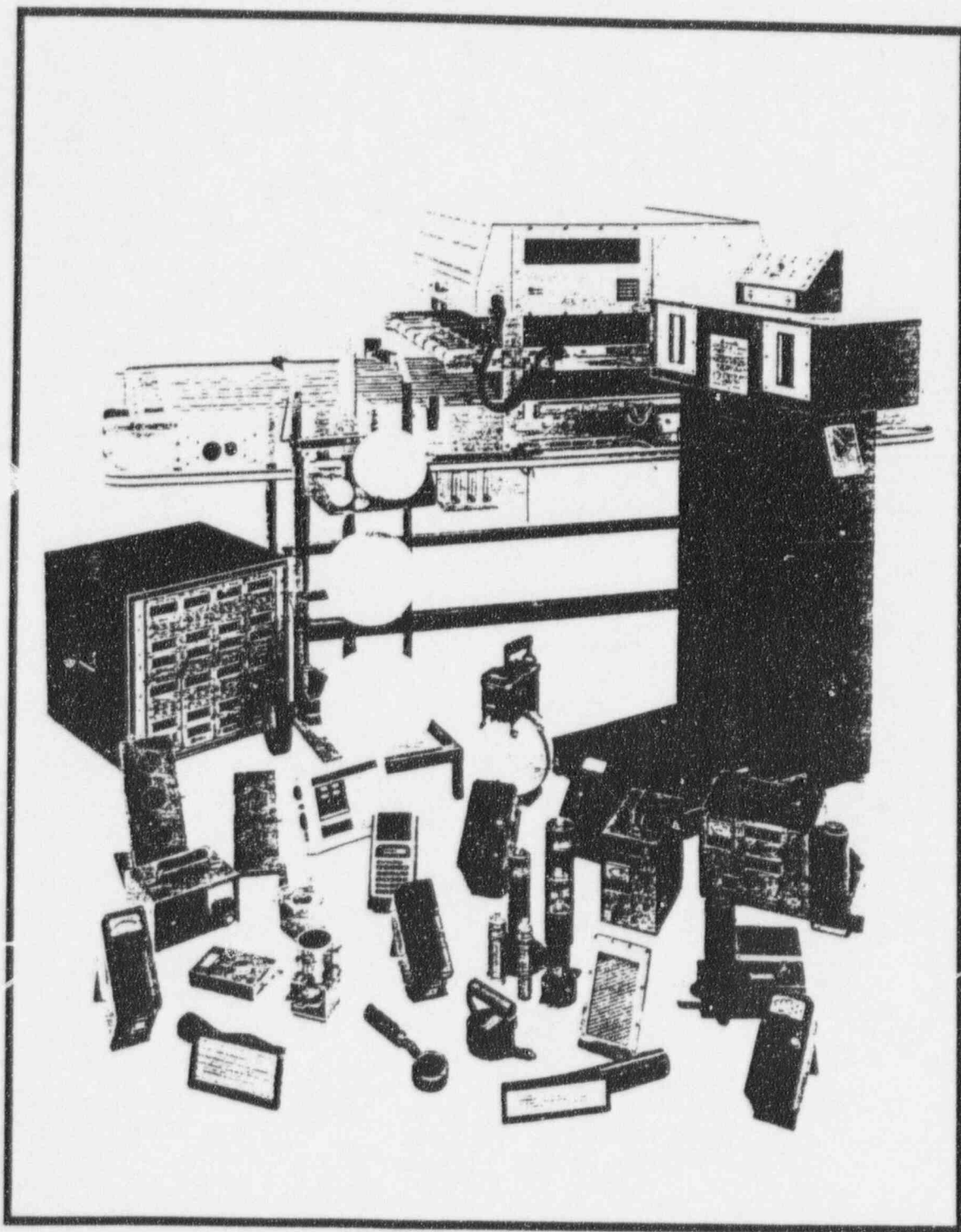
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APPENDIX D

PORTABLE RADIATION SURVEY

INSTRUMENTS UTILIZED IN

SCANNING SURVEY



LUDLUM MEASUREMENTS, INC.

P.O. Box 810 • 501 Oak • Sweetwater, Texas 79556

915-235-5494 • Fax 915-235-4672 • 800-622-0828(USA)

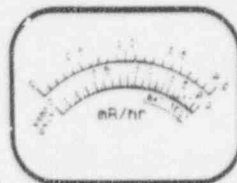
GENERAL PURPOSE PORTABLE SURVEY METERS

METER DIALS

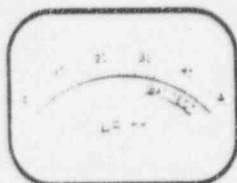
202-2 for Models 2,3
with any detector
0 - 5k cpm



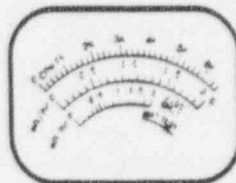
202-627 for Models 3, 14C
with 44-9
0 - 2 mR/hr



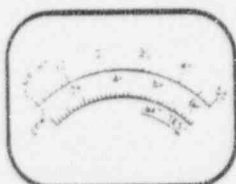
202-666 for Model 3
with 44-2
0 - 50 μ R/hr



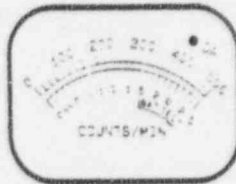
202-608 for Models 3, 14C
with 44-9
Dual Scale
0 - 2 mR/hr
0 - 6.6k cpm



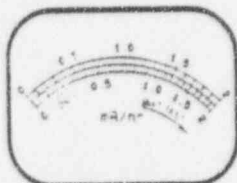
202-654 for Model 3
with 44-2
Dual Scale
0 - 50 μ R/hr
0 - 6.4k cpm



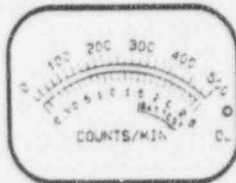
202-558 for Models 4
with any detector
0 - 500 cpm
0 - 2.5 kV
OR (overrange)



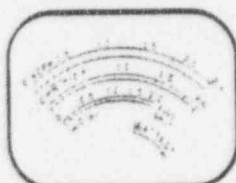
202-084 for Models 3, 14C
with 44-6, 44-38
0 - 2 mR/hr



202-643 for Model 16
with any detector
0 - 500 cpm
0 - 2.5 kV
OL (overload)



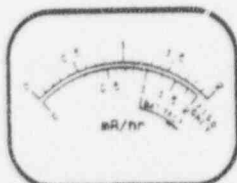
202-241 for Models 3, 14C
with 44-6, 44-38
Dual Scale
0 - 2 mR/hr
0 - 2.4k cpm



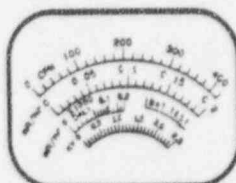
202-356 for Models 12, 18
with any detector
0 - 500 cpm
0 - 2.5 kV



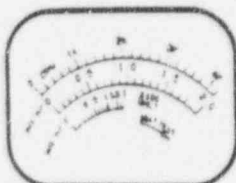
202-085 for Models 3, 14C
with 44-7
0 - 2 mR/hr



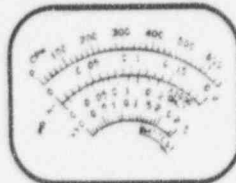
202-365 for Models 12, 18
with 44-7
Dual Scale
0 - 0.2 mR/hr
0 - 420 cpm
0 - 2.5 kV



202-330 for Models 3, 14C
with 44-7
Dual Scale
0 - 2 mR/hr
0 - 4.2k cpm



202-618 for Models 12, 18
with 44-9
Dual Scale
0 - 0.2 mR/hr
0 - 660 cpm
0 - 2.5 kV



ABOVE METER DIALS ARE MOST COMMON OTHERS ARE AVAILABLE ON REQUEST

1

GENERAL PURPOSE PORTABLE SURVEY METERS

COMMON SPECIFICATIONS

CONNECTOR: Series "C" (*others available*)

AUDIO: Built in unimorph speaker with ON/OFF switch (*greater than 60 dB at 2 feet*)

LINEARITY: Reading within $\pm 10\%$ of true value with detector connected

CALIBRATION CONTROLS: Accessible from front of instrument (*protective cover provided*)

RESPONSE: Toggle switch for FAST (4 seconds) or SLOW (22 seconds)
from 10% to 90% of final reading

RESET: Pushbutton to zero meter

POWER: 2 each "D" cell batteries

(*housed in sealed compartment that is externally accessible*)

BATTERY LIFE: Typically 600 hours with alkaline batteries

(*battery condition can be checked on meter*)

BATTERY DEPENDANCE: Less than 3% change in readings to battery endpoint.

METER: 2.5" (6.4cm) arc, 1 mA analog type

CONSTRUCTION: Cast and drawn aluminum with beige polyurethane enamel paint

TEMPERATURE RANGE: 5°F (-15°C) to 122°F (50°C)

May be certified for operation from -40°F (-40°C) to 150°F (65°C)

SIZE: 6.5" (16.5cm) H X 3.5" (8.9cm) W X 8.5" (21.6cm) L including handle

WEIGHT: 3.5 lbs (1.6kg) including batteries

MODEL 3 Survey Meter

COMPATIBLE DETECTORS: G-M, scintillation

METER DIAL: 0 - 2 mR/hr, or 0 - 5k cpm, BAT TEST
(*others available*)

MULTIPLIERS: X0.1, X1, X10, X100

HIGH VOLTAGE: Adjustable from 200 - 1500 volts

THRESHOLD: 30 mV \pm 10 mV

NOTE: The 3 range version of the Model 3 is the Model 2 Survey Meter

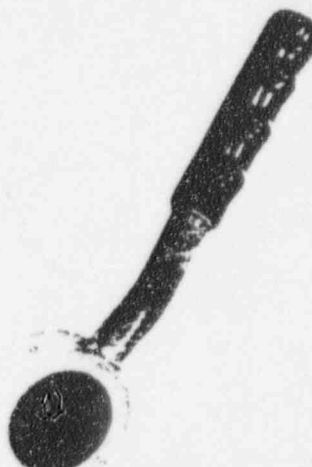
4 Range General Purpose Survey Meter
(typical range 0 - 200 mR/hr or 0 - 500,000 cpm)



ALPHA BETA-GAMMA G-M DETECTORS



MODEL 44-7
End Window G-M Detector



MODEL 44-9
Pancake G-M Detector

MODEL 44-7

INDICATED USE: Alpha, beta-gamma survey, and sample counting

DETECTOR: End window halogen quenched G-M

WINDOW: $1.7 \pm 0.3 \text{ mg cm}^{-2}$ mica

WINDOW AREA:

Active - 6 cm^2

Open - 5 cm^2

EFFICIENCY(2pi geometry): 5%- ^{137}Cs , 20%- ^{90}Sr , 15%- ^{239}Pu

SENSITIVITY: Typically 2100 cpm/mR/hr (^{137}Cs gamma)

ENERGY RESPONSE: Energy dependant

DEAD TIME: Typically 160 μs

COMPATIBLE INSTRUMENTS: General purpose survey meters, ratemeters, and scalars

OPERATING VOLTAGE: 900 volts

CONNECTOR: Series "C" (others available)

CONSTRUCTION: Anodized Aluminum housing with stainless steel protective screen (79% open)

TEMPERATURE RANGE: 5°F (-15°C) to 122°F (50°C)

May be certified to operate from -40°F (-40°C) to 50°F (65°C)

SIZE: 1.8" (4.6cm) diameter X 5.8" (14.7cm) L

WEIGHT: 1 lb (0.5kg)

MODEL 44-9

INDICATED USE: Alpha, beta-gamma survey, frisking

DETECTOR: Pancake type halogen quenched G-M

WINDOW: $1.7 \pm 0.3 \text{ mg cm}^{-2}$ mica

WINDOW AREA:

Active - 15 cm^2

Open - 12 cm^2

EFFICIENCY(2pi geometry): Typically 10%- ^{137}Cs , 45%- ^{90}Sr , 38%- ^{239}Pu , 65%- ^{32}P , 30%- ^{239}Pu

SENSITIVITY: Typically 3300 cpm/mR/hr (^{137}Cs gamma)

ENERGY RESPONSE: Energy dependant

DEAD TIME: Typically 80 μs

COMPATIBLE INSTRUMENTS: General purpose survey meters, ratemeters, and scalars

OPERATING VOLTAGE: 900 volts

CONNECTOR: Series "C" (others available)

CONSTRUCTION: Aluminum body with beige polyurethane enamel paint, and stainless steel protective screen (79% open)

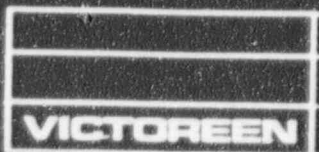
TEMPERATURE RANGE: 5°F (-15°C) to 122°F (50°C)

May be certified to operate from -40°F (-40°C) to 150°F (65°C)

SIZE: 1.8" (4.6cm) H X 2.7" (6.9cm) W X 10.7" (27.2cm) L

WEIGHT: 1 lb (0.5kg)

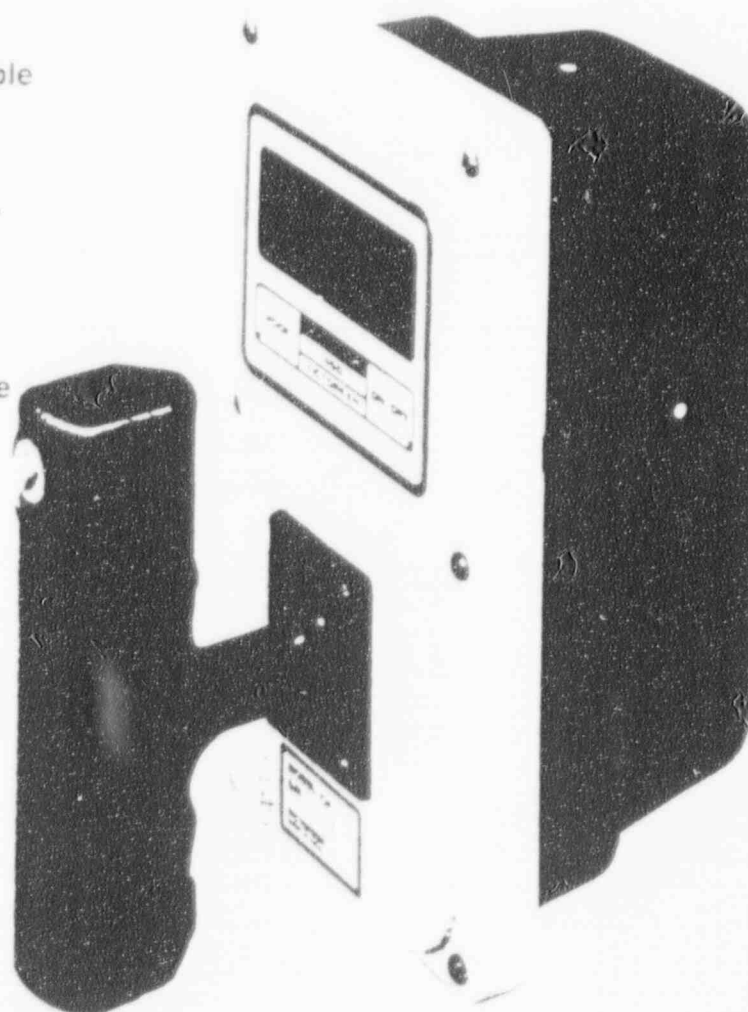
NOTE: Handle is available in different lengths



VICTOREEN, INC.
(216) 248-9300
FAX (216) 248-9301

Pressurized Ion Chamber Survey Meter Model 450P

- Extremely Fast Response to measure radiation from leakage, scatter, beams, and pin holes.
- High Sensitivity Micro-R measurements of exposures and exposure rates.
- Display Flash Alarm Feature programmable on any range.
- Unique Method of Communication for calibration and use as a remote detector.
- Serves Wide Range of Applications for NDT, x-ray, accelerator, environmental and others.
- Illuminated Analog/Digital Display can be used in the dark.
- Available with a Dose Equivalent Energy Response and SI units.*



The Model 450P is a light-weight portable survey meter consisting of a pressurized ionization chamber, microprocessor-based with a combined analog/digital liquid crystal display. The 450P has the extremely fast response required to measure ionizing radiation from leakage, scatter, beams and pinholes. The 450P has an illuminated analog/digital LCD display. The instrument utilizes an infrared communicator for calibration and allows the instrument to be used as a remote detector. The Model 450P has a programmable "flash

alarm" which causes the display to pulsate at a rate of once per second when the measured dose rate exceeds a preset limit (set via a terminal). The ionization chamber is filled to a pressure of 6 atmospheres to enhance sensitivity and energy independence.

The 450P measures exposure, exposure rate, and can be used to "freeze" the maximum exposure rate encountered. The user can configure either integrate or freeze mode. Model 450P-DE-SI.

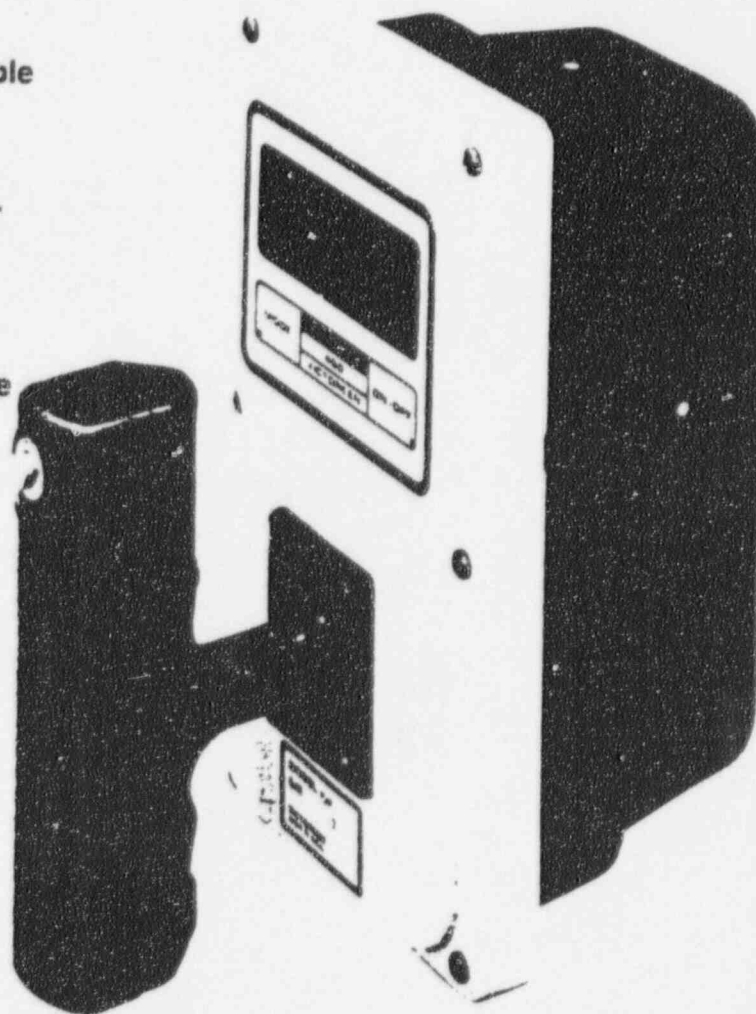
(continued on reverse side)



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- **Extremely Fast Response** to measure radiation from leakage, scatter, beams, and pin holes.
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The Model 450P is a light-weight portable survey meter consisting of a pressurized ionization chamber, microprocessor-based with a combined analog/digital liquid crystal display. The 450P has the extremely fast response required to measure ionizing radiation from leakage, scatter, beams and pinholes. The 450P has an illuminated analog/digital LCD display. The instrument utilizes an infrared communicator for calibration and allows the instrument to be used as a remote detector. The Model 450P has a programmable "flash

alarm" which causes the display to pulsate at a rate of once per second when the measured dose rate exceeds a preset limit (set via a terminal). The ionization chamber is filled to a pressure of 6 atmospheres to enhance sensitivity and energy independence.

The 450P measures exposure, exposure rate, and can be used to "freeze" the maximum exposure rate encountered. The user can configure either integrate or freeze mode.

*Model 450P-DE-SI.

(continued on reverse side)

Detector: 300 cc volume air ionization chamber pressurized to 6 atmospheres.

Controls: Two push button switches are provided on the front surface of the instrument: "ON/OFF" and "MODE".

Automatic Features:
Auto-ranging and auto-zeroing.

Response Time: Analog response time from 10% to 90% of reading for a full scale step increase is dependent on operating range.

Response time for a step increase in radiation exposure rate from background:

Step increase, background to:	Time to reach 90% of final value (seconds)
400 μ R/h	4.8
4 mR/h	3.3
10 mR/h	4.3
40 mR/h	4.5
100 mR/h	2.7
1 R/h	2.0
4 R/h	2.7

The following table shows time measured from 10% to 90% of final value for a step increase or decrease in exposure rate such that a range change does not occur. These values are the response times for the various ranges.

Range	10%-90% Response (sec.)
0-500 μ R/h (5 μ Sv/h)	5
0-5 mR/h (50 μ Sv/h)	2
0-50 mR/h (500 μ Sv/h)	1.8
0-500 mR/h (5 mSv/h)	1.8
0-5 R/h (50 mSv/h)	1.8

Options: Model 450-1A Communicator: Consists of RS-232 serial port with 1200 baud operation.

The Model 450-1A Communicator, connected to the survey meter and a dumb terminal or a computer with a terminal program, provides the following functions:

Read stored calibration coefficients and other data from the internal EEPROM device; Recall current factors and data; Modify current calibration coefficients; Enter test mode; Change function: FREEZE or Integrate, or Read internal integrate value when in FREEZE; Change units: Conventional or SI; Baud rate: 1200; Exit and store current calibration coefficients, display units, and user notes; Quit, and do not modify any calibration coefficients, or user notes.

Display: A liquid crystal Analog/Digital display is provided

Analog display:

100 element bar graph 2.5 inches (6.4cm) long. Bar graph is divided into 5 major segments, each labeled with the appropriate value for the range of the instrument.

Digital display:

2 1/2 digit display is followed by a significant zero digit depending on the operating range of the instrument. The units of measurement are indicated on the display at all times. Digits are 1/4 inch (6.4mm) high. "Low Battery" and "Freeze" messages, indicating the operating condition of the instrument, are also provided on the display.

Batteries: Two 9 volt transistor batteries

Battery Life: 200 hours continuously on new batteries. To continue integration, batteries may be changed one at a time permitting the instrument to remain operational.

Warm-Up Time: Less than two minutes for initial operation when the instrument is in equilibrium with ambient temperature.

Environmental Effects

Temp. range: -20°C to +50°C.

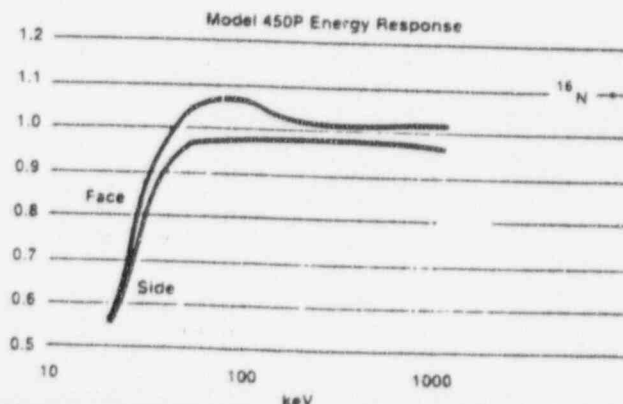
Humidity range: 0 to 100%. Instrument is designed to be moisture-proof.

Geotropism: negligible

Dimensions: 4 inches (10cm) wide, 8 inches (20cm) long, 6 inches (15cm) high.

Weight: 2 lb. 6 oz. (1.07 kg)

Energy Response: ¹⁶Nitrogen gamma rays are 110% to 120% of indicated readings as determined at the University of Lowell.



Model 450P Pressurized Ion Chamber Survey Meter

VICTOREEN



- Extremely fast response to measure radiation from leakage, scatter beams, and pinholes
- High sensitivity micro-R measurements of exposures and exposure rates
- Display flash alarm, programmable on any range
- Unique method of communication for calibration and use as a remote detector
- Serves wide range of applications for NDT, X-ray, accelerator, environmental and others
- Illuminated display can be used in the dark
- Available with a dose equivalent energy response and SI units *

Introduction:

The Model 450P is an innovative radiation survey instrument. It is based on the proven characteristics of the ion chamber radiation detector married to the latest CMOS microprocessor technology and liquid crystal displays.

The only controls present on the basic instrument are an ON/OFF button and a MODE button. No other controls are necessary because the instrument is both auto-ranging and auto-zeroing.

The display is unique, offering both a 100 element analog bargraph that is fully labelled with scale digits and a 2 1/2 digit digital display that also provides the proper units of measurement. The bar graph is provided with a faster time constant than the digital display making the instrument ideal for surveys.

* Model 450P-DE-SI

The top surface of the instrument has an overlay which covers both of the display switches, completely sealing this surface. The instrument is fully gasketed to make it moisture proof. The gasket also serves to shock-mount the printed circuit boards, liquid crystal display, and ion chamber assembly. The instrument will remain operational after a drop from a height of 3 ft. onto a concrete floor.

The variables FREEZE, INTEGRATE: R or Sv are factory set when the Model 450P is purchased without a communicator. The customer can choose settings.

The FREEZE button is a special feature that permits the instrument to remember and indicate the highest dose rate from the time the instrument is placed in the freeze mode. This feature permits placing an instrument in a potentially high radiation area and determining the maximum value the instrument sees.

The Integrate Mode operates continuously 30 seconds after the instrument has been turned on. Integration is performed even if the instrument is displaying in mR/h or R/h.

The Model 450P has a programmable "flash" alarm which causes the display to pulsate at a rate of once per second when the measured dose rate exceeds a preset limit (set via a terminal). The ionization chamber is filled to a pressure of 6 atmospheres to enhance sensitivity and energy independence.

Calibration is accomplished by an infra-red two-way communication, Model 450-1A. The communicator uses a RS-232 port. The two-way communicator can be used to interrogate the instrument for calibration information, perform a calibration of the instrument, change between the integrate display mode or the FREEZE display mode, or change units (English-SI).

The IR Communicator also allows the use of the Model 450P as a remote detector.

To guard against battery-related instrument failure, a "Low Battery" condition is indicated continuously on the face of the display when a battery change is required.

Specifications

Radiation Detected:

Beta above 1 MeV, gamma and X-rays above 25 keV.

Operating Ranges:

0-500 μ R/h or 0-5 μ Sv/h
0-5 mR/h or 0-50 μ Sv/h
0-50 mR/h or 0-500 μ Sv/h
0-500 mR/h or 0-5 mSv/h
0-5 R/h or 0-50 mSv/h

Accuracy:

Within 10% of reading between 10% and 100% of full scale indication on any range, exclusive of energy response. Calibration source is ^{137}Cs .

SPECIFICATIONS:

Radiation Types Detected: Beta above 1 MeV, gamma and X-rays above 25 keV.

Operating Ranges:

0-500 μ R/h or 0-5 μ Sv/h
0-5 mR/h or 0-50 μ Sv/h
0-50 mR/h or 0-500 μ Sv/h
0-500 mR/h or 0-5 mSv/h
0-5 R/h or 0-50 mSv/h

Accuracy: Within 10% of reading between 10% and 100% of full scale, indication on any range, exclusive of energy response. Calibration source is ^{137}Cs .

Detector: 300 cc volume air ionization chamber pressurized to 6 atmospheres.

Warm-Up Time: Less than 2 minutes for initial operation when the instrument is in equilibrium with ambient temperature.

Energy Response: See curve. ^{16}N data taken at the University of Lowell.

Angular Response: At ^{137}Cs and 38 keV - within 10% through 180° .

Response Time: Analog response time from 10% to 90% of reading for a full scale step increase is dependent on operating range.

Response time for a step increase in radiation exposure rate from background:

Step increase, background to:	Time to reach 90% of final value (seconds)
400 μ R/h	4.8
4 mR/h	3.3
10 mR/h	4.3
40 mR/h	4.5
100 mR/h	1.8
400 mR/h	2.7
1 R/h	2.0
4 R/h	2.7

The following table shows time measured from 10% to 90% of final value for a step increase or decrease in exposure rate such that a range change does not occur. These values are the response times for the various ranges.

Range	10%-90% Response (sec.)
0-500 μ R/h (5 μ Sv/h)	5
0-5 mR/h (50 μ Sv/h)	2
0-50 mR/h (500 μ Sv/h)	1.8
0-500 mR/h (5 mSv/h)	1.8
0-5 R/h (50 mSv/h)	1.8

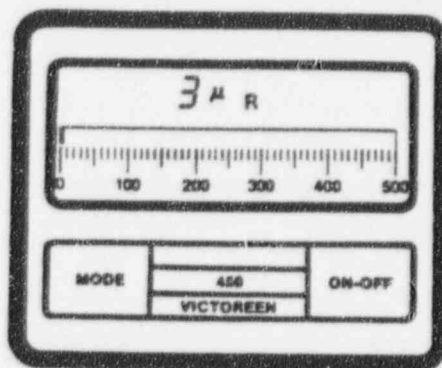
Dimensions: 4" (10 cm) wide x 8" (20 cm) long x 6" (15 cm) high

Weight: 1 lbx. 14 oz. (0.85 kg)

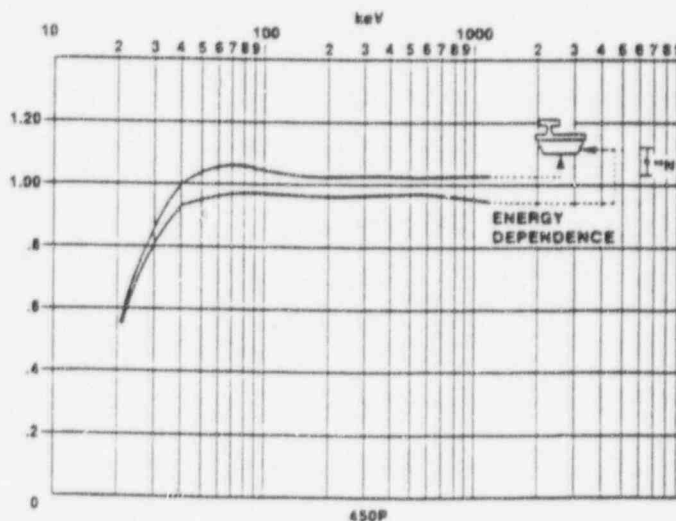
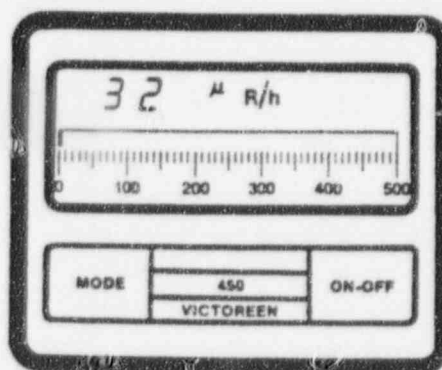
Option: Model 450-1A Communicator: Consists of RS232 serial port 1200 baud operation. The Model 450-1A Communicator, connected to the survey meter and a dumb terminal or computer with terminal emulation program, provides the following functions:

- Read stored calibration coefficients and other data from the internal EEPROM device;
- Recall current factors and data;
- Modify current calibration coefficients;
- Enter test mode;
- Change function: FREEZE, Integrate, or Read internal integrate value when in FREEZE;
- Change units: Conventional or SI;
- Baud rate: 1200;
- Exit and store current calibration coefficients, display units, and user notes;
- Quit, and do not modify any calibration coefficients, or user notes.

Integrated Exposure: <0.1 second to hours exposure time.



Exposure Rate: <5 second response 0-500 μ R/h, upper ranges even faster.



APPENDIX E
RADIOLOGICAL ASSESSMENT
SWIPE SAMPLE ANALYSIS

The following instrument surveys were taken in these designated laboratories located in John Wesley Powell Building:

- Laboratory 3D231
- Laboratory 3D239

REPORT OF SAMPLE ANALYSIS

Rev 1.0

For: Ray Safe Associates
Job: Wipe Samples(H.P. Survey)
Sample Type:Gross Gamma

Date: August 21, 1996
By: 8/16/96

Sample Date: July 28, 1995

Equipment Description:

Counter	Detector
Packard Prias 1	Nal

Counting Parameters:

Gross Gamma

Input Background Data:

Background Cts	Ct Time (m)	Background CPM	% Error
456.00	5.00	91.20	9.18%

Input Efficiency Data:

Isotope	Gross Counts	Time (m)	DPM	Efficiency (4 Pi)	% Error
I-129	18482	1	31080	59.17%	10.00%

MDA Calculation:

MDA (CPM)	MDA (DPM)	MDA (uCi)
20.50	35	1.56E-05

Sample Data: Note: A zero reading for DPM or uCi values indicates only that the sample activity was less than the MDA.

Sequence Number	Sample ID	Gross Counts	Ct Time (m)	DPM	uCi	% Error at 95% C.L.
1	Lab 3D231 1-5	443	5	0	0.00E+00	0
2	6-10	443	5	0	0.00E+00	0
3	11-12	450	5	0	0.00E+00	0
4	13-17	475	5	0	0.00E+00	0
5	18-23	461	5	0	0.00E+00	0
6	24-30	448	5	0	0.00E+00	0
7	31-36	466	5	0	0.00E+00	0
8	37-41	442	5	0	0.00E+00	0
9	42-44	462	5	0	0.00E+00	0
10	45-49	457	5	0	0.00E+00	0
11	50-54	442	5	0	0.00E+00	0
12	55-61	446	5	0	0.00E+00	0
13	62-66	458	5	0	0.00E+00	0
14	67-69	432	5	0	0.00E+00	0
15	70-74	457	5	0	0.00E+00	0
16	75-79	474	5	0	0.00E+00	0
17	80-84	454	5	0	0.00E+00	0
18	85-89	457	5	0	0.00E+00	0
19	90-92	451	5	0	0.00E+00	0
20	93-97	442	5	0	0.00E+00	0
21	98-101	450	5	0	0.00E+00	0
22	102-107	442	5	0	0.00E+00	0
23	108-112	463	5	0	0.00E+00	0
24	113-115	453	5	0	0.00E+00	0

LS Counter Data Reduction Program - ESI (LS 1701)

Report Date: 8/21/96
Sample Date: 8/16/96

Instrument Data:	Beckman LS-1701
Window:	Wide Window (User No. 1)

Background Data:	Bkg	Count Time	% Error
	CPM	(min)	(95% C.L.)
	23	1	40.87%

MDA Data:	MDA (CPM): 25	MDA (DPM): 42
-----------	---------------	---------------

Sample Data: Note: A zero reading for DPM values indicates only that the sample activity was less than the MDA.

Seq No	Sample ID	Count Time (min)	SCR	CPM	Efficiency	CF	DPM	Error (95% C.L.)
1	Ray Sate Assoc. Lab 3D321	1	0.194	36	58.703%	1.00	0	0.00%
2	2	1	0.200	30	58.260%	1.00	0	0.00%
3	3	1	0.207	29	57.743%	1.00	0	0.00%
4	4	1	0.087	23	66.605%	1.00	0	0.00%
5	5	1	0.182	33	59.589%	1.00	0	0.00%
6	6	1	0.105	38	65.276%	1.00	0	0.00%
7	7	1	0.304	23	50.580%	1.00	0	0.00%
8	8	1	0.136	22	62.986%	1.00	0	0.00%
9	9	1	0.138	29	62.839%	1.00	0	0.00%
10	10	1	0.167	30	60.697%	1.00	0	0.00%
11	11	1	0.226	31	56.340%	1.00	0	0.00%
12	12	1	0.292	24	51.466%	1.00	0	0.00%
13	13	1	0.200	25	58.260%	1.00	0	0.00%
14	14	1	0.143	28	62.469%	1.00	0	0.00%
15	15	1	0.194	31	58.703%	1.00	0	0.00%
16	16	1	0.241	29	55.232%	1.00	0	0.00%
17	17	1	0.174	23	60.180%	1.00	0	0.00%
18	18	1	0.214	28	57.226%	1.00	0	0.00%
19	19	1	0.103	29	65.423%	1.00	0	0.00%
20	20	1	0.200	25	58.260%	1.00	0	0.00%
21	21	1	0.114	35	64.611%	1.00	0	0.00%
22	22	1	0.100	30	65.645%	1.00	0	0.00%
23	23	1	0.050	20	69.338%	1.00	0	0.00%
24	24	1	0.043	23	69.854%	1.00	0	0.00%
25	25	1	0.172	29	60.328%	1.00	0	0.00%
26	26	1	0.107	28	65.128%	1.00	0	0.00%
27	27	1	0.100	20	65.645%	1.00	0	0.00%
28	28	1	0.192	26	58.851%	1.00	0	0.00%
29	29	1	0.261	23	53.755%	1.00	0	0.00%
30	30	1	0.143	35	62.469%	1.00	0	0.00%
31	31	1	0.167	30	60.697%	1.00	0	0.00%
32	32	1	0.172	29	60.328%	1.00	0	0.00%
33	33	1	0.130	23	63.430%	1.00	0	0.00%
34	34	1	0.037	27	70.298%	1.00	0	0.00%
35	35	1	0.069	29	67.934%	1.00	0	0.00%
36	36	1	0.108	37	65.054%	1.00	0	0.00%
37	37	1	0.219	32	56.857%	1.00	0	0.00%
38	38	1	0.083	36	66.900%	1.00	0	0.00%
39	39	1	0.120	25	64.168%	1.00	0	0.00%
40	40	1	0.182	22	59.589%	1.00	0	0.00%
41	41	1	0.045	22	69.707%	1.00	0	0.00%
42	42	1	0.250	40	54.567%	1.00	0	0.00%
43	43	1	0.375	32	45.336%	1.00	0	0.00%
44	44	1	0.194	36	58.703%	1.00	0	0.00%
45	45	1	0.125	32	63.799%	1.00	0	0.00%
46	46	1	0.222	27	56.635%	1.00	0	0.00%
47	47	1	0.143	42	62.469%	1.00	0	0.00%
48	48	1	0.097	31	65.867%	1.00	0	0.00%
49	49	1	0.172	29	60.328%	1.00	0	0.00%
50	50	1	0.185	27	59.368%	1.00	0	0.00%

LS Counter Data Reduction Program - ESI (LS 1701)

Report Date: 8/21/96

Sample Date: 8/16/96

Instrument Data:

Beckman LS-1701

Window: Wide Window (User No. 1)

Background Data:

Rkg	Count Time	% Error
CPM	(min)	(95% C.L.)
23	1	40.87%

MDA Data:

MDA (CPM): 25 MDA (DPM): 42

Sample Data: Note: A zero reading for DPM values indicates only that the sample activity was less than the MDA.

Seq No.	Sample ID	Count Time (min)	SCR	CPM	Efficiency	CF	DPM	Error (95% C.L.)
1	Ray Safe Assoc. Lab 3D321	1	0.160	25	61.214%	1.00	0	0.00%
2	52	1	0.200	30	58.260%	1.00	0	0.00%
3	53	1	0.038	26	70.224%	1.00	0	0.00%
4	54	1	0.269	26	53.164%	1.00	0	0.00%
5	55	1	0.156	32	61.509%	1.00	0	0.00%
6	56	1	0.167	30	60.697%	1.00	0	0.00%
7	57	1	0.182	33	59.589%	1.00	0	0.00%
8	58	1	0.211	38	57.448%	1.00	0	0.00%
9	59	1	0.174	23	60.180%	1.00	0	0.00%
10	60	1	0.091	33	66.310%	1.00	0	0.00%
11	61	1	0.107	28	65.128%	1.00	0	0.00%
12	62	1	0.222	36	56.635%	1.00	0	0.00%
13	63	1	0.292	24	51.466%	1.00	0	0.00%
14	64	1	0.200	35	58.260%	1.00	0	0.00%
15	65	1	0.143	28	62.469%	1.00	0	0.00%
16	66	1	0.174	23	60.180%	1.00	0	0.00%
17	67	1	0.194	36	58.703%	1.00	0	0.00%
18	68	1	0.087	23	66.605%	1.00	0	0.00%
19	69	1	0.143	35	62.469%	1.00	0	0.00%
20	70	1	0.122	41	64.020%	1.00	0	0.00%
21	71	1	0.200	30	58.260%	1.00	0	0.00%
22	72	1	0.375	24	45.336%	1.00	0	0.00%
23	73	1	0.161	31	61.140%	1.00	0	0.00%
24	74	1	0.172	29	60.328%	1.00	0	0.00%
25	75	1	0.222	36	56.635%	1.00	0	0.00%
26	76	1	0.050	20	69.338%	1.00	0	0.00%
27	77	1	0.139	36	62.765%	1.00	0	0.00%
28	78	1	0.028	36	70.962%	1.00	0	0.00%
29	79	1	0.088	34	66.531%	1.00	0	0.00%
30	80	1	0.182	33	59.589%	1.00	0	0.00%
31	81	1	0.179	28	59.811%	1.00	0	0.00%
32	82	1	0.176	34	60.032%	1.00	0	0.00%
33	83	1	0.061	33	68.525%	1.00	0	0.00%
34	84	1	0.135	37	63.060%	1.00	0	0.00%
35	85	1	0.171	35	60.402%	1.00	0	0.00%
36	86	1	0.094	32	66.088%	1.00	0	0.00%
37	87	1	0.111	27	64.833%	1.00	0	0.00%
38	88	1	0.265	34	53.460%	1.00	0	0.00%
39	89	1	0.217	23	57.005%	1.00	0	0.00%
40	90	1	0.107	28	65.128%	1.00	0	0.00%
41	91	1	0.107	28	65.128%	1.00	0	0.00%
42	92	1	0.139	36	62.765%	1.00	0	0.00%
43	93	1	0.080	25	67.122%	1.00	0	0.00%
44	94	1	0.176	34	60.032%	1.00	0	0.00%
45	95	1	0.172	29	60.328%	1.00	0	0.00%
46	96	1	0.194	36	58.703%	1.00	0	0.00%
47	97	1	0.219	32	56.857%	1.00	0	0.00%
48	98	1	0.097	31	65.867%	1.00	0	0.00%
49	99	1	0.200	30	58.260%	1.00	0	0.00%
50	100	1	0.219	32	56.857%	1.00	0	0.00%

LS Counter Data Reduction Program - ESI (LS 1701)

Report Date: 8/21/96
Sample Date: 8/16/96

Instrument Data:	Beckman LS-1701
Window:	Wide Window (User No. 1)

Background Data:	Bkg	Count Time	% Error
	CPM	(min)	(95% C.L.)
	23	1	40.87%

MDA Data:	MDA (CPM): 25	MDA (DPM): 41
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Sample Data: Note: A zero reading for DPM values indicates only that the sample activity was less than the MDA.

Seq No	Sample ID	Count Time (min)	SCR	CPM	Efficiency	CF	DPM	Error (95% C.L.)
1	Ray Safe Assoc. Lab 3D321	1	0.175	40	60.106%	1.00	0	0.00%
2	102	1	0.103	29	65.423%	1.00	0	0.00%
3	103	1	0.114	35	64.611%	1.00	0	0.00%
4	104	1	0.128	39	63.577%	1.00	0	0.00%
5	105	1	0.200	25	58.260%	1.00	0	0.00%
6	106	1	0.065	31	68.230%	1.00	0	0.00%
7	107	1	0.212	33	57.374%	1.00	0	0.00%
8	108	1	0.107	28	65.128%	1.00	0	0.00%
9	109	1	0.233	30	55.823%	1.00	0	0.00%
10	110	1	0.118	34	64.316%	1.00	0	0.00%
11	111	1	0.125	40	63.799%	1.00	0	0.00%
12	112	1	0.194	36	58.703%	1.00	0	0.00%
13	113	1	0.050	20	69.338%	1.00	0	0.00%
14	114	1	0.094	32	66.088%	1.00	0	0.00%
15	115	1	0.346	26	47.478%	1.00	0	0.00%

REPORT OF SAMPLE ANALYSIS

Rev 1.0

For: Ray Safe Associates
 Job: Wipe Samples (H.P. Survey)
 Sample Type: Gross Gamma

Date: August 21, 1996
 By: ELW

Sample Date: August 16, 1996

Equipment Description:

Counter	Detector
Packard Prins 1	NaI

Counting Parameters:

Gross Gamma

Input Background Data:

Background Cts	Ct Time (m)	Background CPM	% Error
456.00	5.00	91.20	9.18%

Input Efficiency Data:

Isotope	Gross Counts	Time (m)	DPM	Efficiency (4 Pi)	% Error
I-129	18482	1	31080	59.17%	10.00%

MDA Calculation:

MDA (CPM)	MDA (DPM)	MDA (uCi)
20.50	35	1.56E-05

Sample Data: Note: A zero reading for DPM or uCi values indicates only that the sample activity was less than the MDA.

Sequence Number	Sample ID	Gross Counts	Ct Time (m)	DPM	uCi	% Error at 95% C.L.
1	Lab3D239 1-6	467	5	0	0.00E+00	0
2	7-13	457	5	0	0.00E+00	0
3	14-20	446	5	0	0.00E+00	0
4	21-25	440	5	0	0.00E+00	0
5	26-30	443	5	0	0.00E+00	0
6	31-35	467	5	0	0.00E+00	0
7	36-39	454	5	0	0.00E+00	0
8	40-44	460	5	0	0.00E+00	0
9	45-49	459	5	0	0.00E+00	0
10	50-53	458	5	0	0.00E+00	0
11	54-58	458	5	0	0.00E+00	0
12	59-61	450	5	0	0.00E+00	0
13	62-68	466	5	0	0.00E+00	0
14	69-71	451	5	0	0.00E+00	0
15	72-76	464	5	0	0.00E+00	0
16	77-79	475	5	0	0.00E+00	0
17	80-84	445	5	0	0.00E+00	0
18	85-89	455	5	0	0.00E+00	0
19	90-93	437	5	0	0.00E+00	0
20	94-98	460	5	0	0.00E+00	0
21	99-100	463	5	0	0.00E+00	0
22	101-105	447	5	0	0.00E+00	0
23	106-111	448	5	0	0.00E+00	0
24	112-116	463	5	0	0.00E+00	0
25	117-121	438	5	0	0.00E+00	0

REPORT OF SAMPLE ANALYSIS

Rev 1.0

For: Ray Safe Associates
 Job: Wipe Samples(H.P. Survey)
 Sample Type: Gross Gamma

Date: August 21, 1996
 By: ELW

Sample Date: August 16, 1996

Equipment Description:

Counter	Detector
Packard Prias 1	NaI

Counting Parameters:

Gross Gamma

Input Background Data:

Background Cts	Ct Time (m)	Background CPM	% Error
456.00	5.00	91.20	9.18%

Input Efficiency Data:

Isotope	Gross Counts	Time (m)	DPM	Efficiency (4 Pi)	% Error
I-129	18482	1	31080	59.17%	10.00%

MDA Calculation:

MDA (CPM)	MDA (DPM)	MDA (uCi)
20.50	35	1.56E-05

Sample Data: Note: A zero reading for DPM or uCi values indicates only that the sample activity was less than the MDA.

Sequence Number	Sample ID	Gross Counts	Ct Time (m)	DPM	uCi	% Error at 95% C.L.
1	Lab 3D239 122-127	461	5	0	0.00E+00	0
2	128-132	461	5	0	0.00E+00	0
3	133-136	461	5	0	0.00E+00	0
4	137-141	452	5	0	0.00E+00	0
5	142-146	459	5	0	0.00E+00	0
6	147-151	443	5	0	0.00E+00	0
7	152-156	440	5	0	0.00E+00	0

LS Counter Data Reduction Program - ESI (LS 1701)

Report Date: 8/21/96
Sample Date: 8/16/96

Instrument Data:	Beckman LS-1701
Window:	Wide Window (User No. 1)

Background Data:	Bkg CPM	Count Time (min)	% Error (95% C.L.)
	23	1	40.87%

MDA Data:	MDA (CPM): 25	MDA (DPM): 41
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Sample Data: Note: A zero reading for DPM values indicates only that the sample activity was less than the MDA.

Seq No.	Sample ID	Count Time (min)	SCR	CPM	Efficiency	CF	DPM	Error (95% C.L.)
1	Ray Safe Assoc. Lab3D239	1	0.067	30	68.082%	1.00	0	0.00%
2	2	1	0.172	29	60.328%	1.00	0	0.00%
3	3	1	0.095	21	66.014%	1.00	0	0.00%
4	4	1	0.111	36	64.833%	1.00	0	0.00%
5	5	1	0.240	25	55.306%	1.00	0	0.00%
6	6	1	0.143	35	62.469%	1.00	0	0.00%
7	7	1	0.185	27	59.368%	1.00	0	0.00%
8	8	1	0.083	24	66.900%	1.00	0	0.00%
9	9	1	0.256	43	54.124%	1.00	0	0.00%
10	10	1	0.200	35	58.260%	1.00	0	0.00%
11	11	1	0.250	24	54.567%	1.00	0	0.00%
12	12	1	0.217	23	57.005%	1.00	0	0.00%
13	13	1	0.233	43	55.823%	1.00	0	0.00%
14	14	1	0.138	29	62.839%	1.00	0	0.00%
15	15	1	0.172	29	60.328%	1.00	0	0.00%
16	16	1	0.179	28	59.811%	1.00	0	0.00%
17	17	1	0.125	24	63.799%	1.00	0	0.00%
18	18	1	0.143	28	62.469%	1.00	0	0.00%
19	19	1	0.148	27	62.100%	1.00	0	0.00%
20	20	1	0.206	34	57.817%	1.00	0	0.00%
21	21	1	0.308	26	50.284%	1.00	0	0.00%
22	22	1	0.154	39	61.657%	1.00	0	0.00%
23	23	1	0.292	24	51.466%	1.00	0	0.00%
24	24	1	0.194	31	58.703%	1.00	0	0.00%
25	25	1	0.138	29	62.839%	1.00	0	0.00%
26	26	1	0.138	29	62.839%	1.00	0	0.00%
27	27	1	0.129	31	63.503%	1.00	0	0.00%
28	28	1	0.167	24	60.697%	1.00	0	0.00%
29	29	1	0.200	25	58.260%	1.00	0	0.00%
30	30	1	0.148	27	62.100%	1.00	0	0.00%
31	31	1	0.143	28	62.469%	1.00	0	0.00%
32	32	1	0.324	37	49.103%	1.00	0	0.00%
33	33	1	0.273	22	52.869%	1.00	0	0.00%
34	34	1	0.097	31	65.867%	1.00	0	0.00%
35	35	1	0.125	32	63.799%	1.00	0	0.00%
36	36	1	0.162	37	61.066%	1.00	0	0.00%
37	37	1	0.207	29	57.743%	1.00	0	0.00%
38	38	1	0.167	30	60.697%	1.00	0	0.00%
39	39	1	0.175	40	60.106%	1.00	0	0.00%
40	40	1	0.290	31	51.614%	1.00	0	0.00%
41	41	1	0.042	24	69.928%	1.00	0	0.00%
42	42	1	0.160	25	61.214%	1.00	0	0.00%
43	43	1	0.125	32	63.799%	1.00	0	0.00%
44	44	1	0.161	31	61.140%	1.00	0	0.00%
45	45	1	0.111	36	64.833%	1.00	0	0.00%
46	46	1	0.188	32	59.146%	1.00	0	0.00%
47	47	1	0.143	35	62.469%	1.00	0	0.00%
48	48	1	0.148	27	62.100%	1.00	0	0.00%
49	49	1	0.161	31	61.140%	1.00	0	0.00%
50	50	1	0.258	31	53.977%	1.00	0	0.00%

LS Counter Data Reduction Program - ESI (LS 1701)

Report Date: 8/21/96
Sample Date: 8/16/96

Instrument Data:	Beckman LS-1701
Window:	Wide Window (User No. 1)

Background Data:	Bkg	Count Time	% Error
	CPM	(min)	(95% C.L.)
	23	1	40.87%

MDA Data:	MDA (CPM): 25	MDA (DPM): 42
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Sample Data: Note: A zero reading for DPM values indicates only that the sample activity was less than the MDA.

Seq No.	Sample ID	Count Time (min)	SCR	CPM	Efficiency	CF	DPM	Error (95% C.L.)
1	51	1	0.107	28	65.128%	1.00	0	0.00%
2	52	1	0.156	32	61.509%	1.00	0	0.00%
3	53	1	0.231	26	55.971%	1.00	0	0.00%
4	54	1	0.235	34	55.675%	1.00	0	0.00%
5	55	1	0.167	30	60.697%	1.00	0	0.00%
6	56	1	0.182	22	59.589%	1.00	0	0.00%
7	57	1	0.240	25	55.306%	1.00	0	0.00%
8	58	1	0.171	35	60.402%	1.00	0	0.00%
9	59	1	0.088	34	66.531%	1.00	0	0.00%
10	60	1	0.152	23	61.805%	1.00	0	0.00%
11	61	1	0.097	31	65.867%	1.00	0	0.00%
12	62	1	0.083	24	66.900%	1.00	0	0.00%
13	63	1	0.065	31	68.230%	1.00	0	0.00%
14	64	1	0.176	34	60.032%	1.00	0	0.00%
15	65	1	0.154	39	61.657%	1.00	0	0.00%
16	66	1	0.162	37	61.066%	1.00	0	0.00%
17	67	1	0.138	19	62.839%	1.00	0	0.00%
18	68	1	0.136	22	62.986%	1.00	0	0.00%
19	69	1	0.172	29	60.328%	1.00	0	0.00%
20	70	1	0.250	24	54.567%	1.00	0	0.00%
21	71	1	0.178	24	59.885%	1.00	0	0.00%
22	72	1	0.121	33	64.094%	1.00	0	0.00%
23	73	1	0.115	26	64.537%	1.00	0	0.00%
24	74	1	0.147	34	62.174%	1.00	0	0.00%
25	75	1	0.152	33	61.805%	1.00	0	0.00%
26	76	1	0.114	35	64.611%	1.00	0	0.00%
27	77	1	0.167	36	60.697%	1.00	0	0.00%
28	78	1	0.161	31	61.140%	1.00	0	0.00%
29	79	1	0.200	30	58.260%	1.00	0	0.00%
30	80	1	0.139	36	62.765%	1.00	0	0.00%
31	81	1	0.321	28	49.324%	1.00	0	0.00%
32	82	1	0.250	44	54.567%	1.00	0	0.00%
33	83	1	0.136	22	62.986%	1.00	0	0.00%
34	84	1	0.154	26	61.657%	1.00	0	0.00%
35	85	1	0.088	34	66.531%	1.00	0	0.00%
36	86	1	0.167	30	60.697%	1.00	0	0.00%
37	87	1	0.176	34	60.032%	1.00	0	0.00%
38	88	1	0.219	32	56.857%	1.00	0	0.00%
39	89	1	0.171	35	60.402%	1.00	0	0.00%
40	90	1	0.091	22	66.310%	1.00	0	0.00%
41	91	1	0.097	31	65.867%	1.00	0	0.00%
42	92	1	0.157	31	61.436%	1.00	0	0.00%
43	93	1	0.074	24	67.565%	1.00	0	0.00%
44	94	1	0.281	27	52.278%	1.00	0	0.00%
45	95	1	0.176	32	60.032%	1.00	0	0.00%
46	96	1	0.296	34	51.170%	1.00	0	0.00%
47	97	1	0.333	27	48.438%	1.00	0	0.00%
48	98	1	0.143	30	62.469%	1.00	0	0.00%
49	99	1	0.139	28	62.765%	1.00	0	0.00%
50	100	1	0.161	36	61.140%	1.00	0	0.00%

LS Counter Data Reduction Program - ESI (LS 1701)

Report Date: 8/21/96

Sample Date: 8/16/96

Instrument Data: Beckman LS-1701

Window: Wide Window (User No. 1)

Background Data:

Bkg CPM	Count Time (min)	% Error (95% C.L.)
23	1	40.87%

MDA Data:

MDA (CPM): 25

MDA (DPM): 42

Sample Data: Note: A zero reading for DPM values indicates only that the sample activity was less than the MDA.

Seq No.	Sample ID	Count Time (min)	SCR	CPM	Efficiency	CF	DPM	Error (95% C.L.)
1	Ray Safe Assoc. 101	1	0.161	31	61.140%	1.00	0	0.00%
2	102	1	0.158	19	61.362%	1.00	0	0.00%
3	103	1	0.321	28	49.324%	1.00	0	0.00%
4	104	1	0.136	22	62.986%	1.00	0	0.00%
5	105	1	0.188	32	59.146%	1.00	0	0.00%
6	106	1	0.222	27	56.635%	1.00	0	0.00%
7	107	1	0.129	31	63.503%	1.00	0	0.00%
8	108	1	0.038	26	70.224%	1.00	0	0.00%
9	109	1	0.132	38	63.282%	1.00	0	0.00%
10	110	1	0.138	29	62.839%	1.00	0	0.00%
11	111	1	0.120	25	64.168%	1.00	0	0.00%
12	112	1	0.115	26	64.537%	1.00	0	0.00%
13	113	1	0.108	37	65.054%	1.00	0	0.00%
14	114	1	0.132	38	63.282%	1.00	0	0.00%
15	115	1	0.115	26	64.537%	1.00	0	0.00%
16	116	1	0.121	33	64.094%	1.00	0	0.00%
17	117	1	0.121	33	64.094%	1.00	0	0.00%
18	118	1	0.100	30	65.645%	1.00	0	0.00%
19	119	1	0.160	25	61.214%	1.00	0	0.00%
20	120	1	0.178	45	59.885%	1.00	0	0.00%
21	121	1	0.100	30	65.645%	1.00	0	0.00%
22	122	1	0.136	22	62.986%	1.00	0	0.00%
23	123	1	0.357	28	46.666%	1.00	0	0.00%
24	124	1	0.152	33	61.805%	1.00	0	0.00%
25	125	1	0.219	32	56.857%	1.00	0	0.00%
26	126	1	0.080	25	67.122%	1.00	0	0.00%
27	127	1	0.161	31	61.140%	1.00	0	0.00%
28	128	1	0.103	29	65.423%	1.00	0	0.00%
29	129	1	0.192	26	58.851%	1.00	0	0.00%
30	130	1	0.091	22	66.310%	1.00	0	0.00%
31	131	1	0.074	27	67.563%	1.00	0	0.00%
32	132	1	0.098	20	65.793%	1.00	0	0.00%
33	133	1	0.194	31	58.703%	1.00	0	0.00%
34	134	1	0.138	29	62.839%	1.00	0	0.00%
35	135	1	0.120	25	64.168%	1.00	0	0.00%
36	136	1	0.147	34	62.174%	1.00	0	0.00%
37	137	1	0.133	30	63.208%	1.00	0	0.00%
38	138	1	0.143	28	62.469%	1.00	0	0.00%
39	139	1	0.273	22	52.869%	1.00	0	0.00%
40	140	1	0.200	30	58.260%	1.00	0	0.00%
41	141	1	0.067	30	68.082%	1.00	0	0.00%
42	142	1	0.167	36	60.697%	1.00	0	0.00%
43	143	1	0.125	32	63.799%	1.00	0	0.00%
44	144	1	0.125	32	63.799%	1.00	0	0.00%
45	145	1	0.190	21	58.999%	1.00	0	0.00%
46	146	1	0.139	36	62.765%	1.00	0	0.00%
47	147	1	0.190	21	58.999%	1.00	0	0.00%
48	148	1	0.083	36	66.900%	1.00	0	0.00%
49	149	1	0.111	27	64.833%	1.00	0	0.00%
50	150	1	0.194	36	58.71%	1.00	0	0.00%

LS Counter Data Reduction Program - ESI (LS 1701)

Report Date: 8/21/96
Sample Date: 8/16/96

Instrument Data: Beckman LS-1701

Window: Wide Window (User No. 1)

Background Data:	Bkg CPM	Count Time (min)	% Error (95% C.L.)
	23	1	40.87%

MDA Data:

MDA (CPM):	25	MDA (DPM):	37
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Sample Data: Note: A zero reading for DPM values indicates only that the sample activity was less than the MDA.

Seq No	Sample ID	Count		SCR	CPM	Efficiency	CF	DPM	Error (95% C.L.)
		Time (min)							
1	Ray Safe Assoc. 151	1		0.042	24	69.928%	1.00	0	0.00%
2	152	1		0.111	27	64.833%	1.00	0	0.00%
3	153	1		0.033	30	70.593%	1.00	0	0.00%
4	154	1		0.097	31	65.867%	1.00	0	0.00%
5	155	1		0.094	32	66.088%	1.00	0	0.00%
6	156	1		0.027	37	71.036%	1.00	0	0.00%

APPENDIX F

GUIDELINES FOR DECONTAMINATION OF

FACILITIES AND EQUIPMENT

PRIOR TO RELEASE FOR UNRESTRICTED USE

OR TERMINATION OF LICENSES FOR BYPRODUCT,

SOURCE, OR SPECIAL NUCLEAR MATERIAL

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT
PRIOR TO RELEASE FOR UNRESTRICTED USE
OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE,
OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Division of Fuel Cycle, Medical, Academic,
and Commercial Use Safety
Washington, DC 20555

April 1993

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.
2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.
3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.
4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:
 - a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent and degree of residual surface contamination.
 - b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The reports should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:
- a. Identify the premises.
 - b. Show that reasonable effort has been made to eliminate residual contamination.
 - c. Describe the scope of the survey and general procedures followed.
 - d. State the findings of the survey in units specified in the instructions.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1
ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES ^a	AVERAGE ^{b,c,f}	MAXIMUM ^{b,d,f}	REMOVABLE ^{b,e,f}
U-nat, U-235, U-238, and associated decay products	5,000 dpm α /100 cm ²	15,000 dpm α /100 cm ²	1,000 dpm α /100 cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm ²	3,000 dpm/100 cm ²	200 dpm/100 cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm $\beta\gamma$ /100 cm ²	15,000 dpm $\beta\gamma$ /100 cm ²	1,000 dpm $\beta\gamma$ /100 cm ²

- ^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, the 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.

APPENDIX G
CALIBRATION CERTIFICATES
FOR
RADIATION SURVEY INSTRUMENTS
UTILIZED IN
SCANNING SURVEY

Certificate of Calibration

Calibrated on: 08.12.96

Calibration Due: 02.12.97

Job # 60589

Issued To:

Ray-Safe Associates
1916 Grayslake Drive
Silver Spring, Maryland 20906

Mike Terpilak
(301)598-5633

Instrument Identification:

Instrument: Ludlum Model 2 SN: 22331
Detectors:
1. Ludlum Model 44-7 SN: PR05338

Calibration Data:

mR/hr

Equipment: J.L. Shepherd Model 28-5A
(SN 10245, 137Cs, 51 mRHM)

Scale/Range	Actual	As Found	Indicated	Correction
X 0.1	0.100	0.100	0.100	1.00
	0.400	0.400	0.400	1.00
X 1	1.00	1.00	1.00	1.00
	4.00	3.80	3.80	1.05
X 10	10.0	7.5	10.0	1.00
	40.0	31.0	40.0	1.00

Precalibration Checks:

Battery Reading: Bat. Test
Detector Shield: Open
Condition Received: Good
Contamination Levels: ☒ < 100 DPM
☐ > 100 DPM
Input Sensitivity: 31.2 mV
High Voltage: 880 V
Audio Response: Sat
Meter deflection/response: Sat
Zero adj.: Zeroed
Reset Sw: Sat
Other:

Environmental Conditions:

Temperature (C): 22.03
Pressure (mmHg): 754.6
Relative Humidity (%): 58.64

Detector Response:

Detector Orientation: Perpendicular
Nuclide: N/A
Nuclide S/N: N/A
Efficiency: N/A
Uncertainty: N/A
Correction Factors:
a) Temp/Pressure: 1.000
b) Branching Ratio: 1.000
c) Geometry: 1.000
d) Total: 1.000

Check Source:

Nuclide: Unknown
Scale/Range: X 1
Indication: 0.9 mR/hr

Serviced By: 

Reviewed By: 

ESI
QC
1

Comments:



HPSI Corp and Affiliated Companies

1350 Piccard Dr, Suite 121, Rockville, MD 20850

(301) 670-1818

(800) 969-HPSI

CALIBRATION CERTIFICATE

Facility

Al. L. Department of the Interior

Date

4.5.96

Due

4.97

Survey Meter:

Manufacturer: Lucille

Model:

3

Serial #:

88228

Probe:

Manufacturer: Lucille

Model:

44-9

Serial #:

010560

Calibrated



Cs-137



Electronic

Meter zeroed



Operators check



Battery check



Internal Adjustment



Scale	Calculated Exposure Rate	Meter Reading	Correction Factor (C.F.)
<u>x100</u>	<u>100</u> <u>20</u>	<u>100</u> <u>20</u>	<u>1.0</u>
<u>x10</u>	<u>10</u> <u>2</u>	<u>10</u> <u>2</u>	<u>1.0</u>
<u>x1</u>	<u>1.0</u> <u>.2</u>	<u>1.0</u> <u>.2</u>	<u>1.0</u>
<u>x.1</u>	<u>.10</u> <u>.02</u>	<u>.10</u> <u>.02</u>	<u>1.0</u>

Efficiencies:

Isotope

-

% Efficiency

-

Isotope

% Efficiency

Isotope

% Efficiency

Detector center axis



parallel



perpendicular



to radiation field. Beta shield:



Open



Close

Instrument check source: Scale:

Reading

HV applied to detector:

This instrument has been calibrated using procedures recommended by the U.S.N.R.C. and was functioning correctly at the time of calibration with the following exceptions:

None

Calibrated By:

Scott Benjamin

(Md License No. 31-035-01)

Victoreen, Inc.

OREEN

Survey Meter Calibration Report / Certificate of Calibration

Customer RESPONS RENTALS

Est. PO #

Victoreen # REP #36626

Model 450

Serial # 1618

CALIBRATION NOTES

Radiation levels are based on standards whose calibrations are traceable to the N.I.S.T.

The suggested re-calibration date is only a suggestion. The actual frequency of re-calibration may vary depending on Federal, state or local requirements.

During calibration the survey meter was positioned with the detector perpendicular to the beam axis.

The source used for calibration was Cs-137.

All readings were corrected for Air Density. To determine the Air Density Correction Factor use the formula:

$$((273.2 + T) / 295.2) \times (760 / P)$$

Where T = temperature in degrees Celsius
and P = barometric pressure in mm/Hg.

All readings below 10 mR/h were corrected for Background Radiation.

The formula for % Error is:

$$((\text{Reading} - \text{Rate}) / \text{Rate}) \times 100$$

IMPORTANT

Any correction to the instrument readings (e.g. Air Density or Energy Dependence) are up to the user to apply. Care must be used in applying those factors.

The test response date is on page two (2) of this report.

Victoreen, Inc.



Model 430 Serial #1618

CALIBRATION DATA

RATE

	Range (mR/h)	Rate (mR/h)	Reading (mR/h)	% Error	Comments
Background	0 - 5	N/A	0.021	N/A	
	0 - 5	3.67	3.71	1.09	Cal Point
	0 - 5	11.7	11.7	1.74	
	0 - 50	41.0	41.3	0.73	Cal Point
	0 - 50	11.7	12.2	4.27	
	0 - 500	436.7	430	-1.53	Cal Point
	0 - 500	146.7	156	4.91	
	(R/h)	(R/h)	(R/h)		
	0 - 5	3.26	3.20	-1.84	Cal Point
	0 - 50	40.68	40.3	-0.93	Cal Point

INTEGRATE

Range (mR)	Exposure (mR)	Reading (mR)	
0 - 50	14.6 mR	14.6	0.00 Cal Point

Calibrated by Rodger Fay 10-Sep-95

Operational checkout by Jan Kim 28-Aug-95

Suggested rental rate 1.00/day

Traceable to the N.I.S.T.
Test No DG9852/95
Dated Jan. 25, 1995
PTW Chamber Model N10331
Serial No. 174

Temperature 22.7 °C

Humidity 52 %

6000 Cochran Road
Cleveland, Ohio 44130-0001
216 248-9200
216 248-9201
216 248-9202

U.S. Geological Survey
12201 Sunrise Valley Drive
Reston, VA 20192

F A X C O V E R S H E E T

DATE: September 18, 1996 TIME: 14:06
TO: Mr. Earl Wright PHONE:
NRC, Region II FAX: (404) 331-7437
FROM: Gregory Wandless PHONE: (703) 648-6189
USGS FAX: (703) 648-6383
RE: Amendment request
CC:

Number of pages including cover sheet: 6

Message

Mr. Wright,

This is the ammendment request that we have been working with on. IT should contain the information that you need.

Greg Wandless, RSO

Michael S. Terpilak
Certified Health Physicist
1916 Grayslake Drive
Silver Spring, MD 20906
Phone # (301) 598-5633
Fax # (301) 871-6741

September 16, 1996

United States Department of Interior
U.S. Geological Survey (USGS)
Attn: Mr. Gregory Alan Wandless
Radiation Safety Officer (RSO)
Mail Stop 954
12201 Sunrise Valley Drive
Reston, VA 22092

Dear Mr. Wandless:

Enclosed for your information is the agenda and outline of the individualized training provided for Dr. Charles Naeser which consisted of a total of 24 hours as specified by the United States Nuclear Regulatory Commission (NRC) to qualify as the Radiation Safety Officer (RSO) for the United States Geological Survey (USGS) Materials License 45-15923-01 (Enclosure A).

Should there be any questions concerning this matter, please feel free to contact me at (301) 598-5633.

Thank you for your utmost cooperation and attention in this matter.

Sincerely,

Michael S. Terpilak

Michael S. Terpilak
Certified Health Physicist

July 24, 1996	Course Instructor Michael S. Terpilak Certified Health Physicist
TIME	SUBJECT
9:00 a.m. - 12:00 noon	U.S. Geological Survey (USGS) Radiation Safety Manual (Sections 9-17)
12:00 noon - 1:00 p.m.	Lunch
	U.S. Geological Survey (USGS) Radiation Safety Manual (Sections 9-17) References and Appendices A, B, and C
1:00 p.m. - 2:00 p.m.	Sections 9-17, References and Appendices (Enclosure A)

July 31, 1996	Course Instructor Michael S. Terpilak Certified Health Physicist
TIME	SUBJECT
9:00 a.m. - 12:00 noon	U.S.G.S. Report entitled Radiation Safety Assessment Task Order D3A6IN31179-01 February 16, 1996 This report dealt with the radiation survey conducted in the Physics Building.
12:00 noon - 1:00 p.m.	Lunch
1:00 p.m. - 2:00 p.m.	U.S.G.S. Report entitled Physical Inventory of Hot Storage Shed Task Order D3A6IN31179-02 March 25, 1996 This report dealt with the Physical Inventory of all Radioactive Materials on the U.S.G.S. Materials License.

RADIATION SAFETY TRAINING

July 10, 1996	Course Instructor Michael S. Terpilak Certified Health Physicist
TIME	SUBJECT
9:00 a.m. - 9:15 a.m.	Overview of Training Program
9:15 a.m. - 10:15 a.m.	U.S.G.S. Current U.S. NRC Materials License
10:15 a.m. - 12:00 noon	U.S. NRC Title 10 CFR 19 - Notices, Instructions and Reports to Workers; Inspection and Investigations and 10 CFR 20 Standards for Protection Against Radiation
12:00 noon - 1:00 p.m.	Lunch
1:00 p.m. - 2:00 p.m.	U.S. NRC Title 10 CFR 19 - Notices, Instructions and Reports to Workers; Inspection and Investigations and 10 CFR 20 Standards for Protection Against Radiation

July 17, 1996	Course Instructor Michael S. Terpilak Certified Health Physicist
TIME	SUBJECT
9:00 a.m. - 12:00 noon	U.S. Geological Survey (USGS) Radiation Safety Manual (Sections 1-7)
12:00 noon - 1:00 p.m.	Lunch
1:00 p.m. - 2:00 p.m.	U.S. Geological Survey (USGS) Radiation Safety Manual (Section 8) Sections 1-8 (Enclosure A)

August 14, 1996	Course Instructor Michael S. Terpilak Certified Health Physicist
TIME	SUBJECT
9:00 a.m. - 12:00 noon	The following regulatory guides were discussed and how these documents relate to the implementation of the revised 10 CFR 20.
1. Regulatory Guide 8.7, Revision 1, "Instructions for Recording and Reporting Occupational Exposure Data."	
2. Regulatory Guide 8.9, Revision 1, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program"	
3. Regulatory Guide 8.25, Revision 1, "Air Sampling in the Workplaces"	
4. Regulatory Guide 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses"	
5. Regulatory Guide 8.35, "Planned Special Exposures:"	
6. Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus"	
7. Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities"	
8. Regulatory Guide 10.8, Revision 2, Appendix X, "Guidance on Complying with New Part 20 Requirements"	
1:00 p.m. - 2:00 p.m.	Review of all materials covered in the last 5 sessions.
Total Training	24 Hours

Enclosure A

**UNITED STATES GEOLOGICAL SURVEY
NATIONAL CENTER**

IN

RESTON, VIRGINIA

RADIATION SAFETY MANUAL

Prepared by

Michael S. Terpilak

Certified Health Physicist

U.S. Department of Health and Human Services

Division of Federal Occupational Health

Region III

September, 1995

FOREWORD

This Radiation Safety Manual establishes policies and practices for the Radiation Safety Program at the United States Geological Survey (USGS) which has been issued 3 licenses by the U.S. Nuclear Regulatory Commission (NRC), and are subject to the provisions of this Manual.

The affected Centers operate at the following federal facilities:

12201 Sunrise Valley Drive
Reston, Virginia 22092

Stephenson Center
729 Gracern Road
Columbia, SC 29210

1711 Illinois Street
Golden, Colorado 80401

Federal Center
Denver, Colorado 80225

A key element and fundamental principle underlying this Manual is the commitment to maintaining radiation exposures *as low as reasonably achievable (ALARA)*. Fundamental radiation protection philosophy can be summarized by the following: *No occupational exposure of workers or exposure to the public should occur without the expectation of an overall benefit from the activity causing the exposure.*

USGS is firmly committed to having a Radiation Safety Program of the highest quality. USGS's commitment applies to all activities that manage radiation and radioactive materials and that may potentially result in radiation exposure to USGS workers, clients, and neighbors; members of the general public; and the environment. Personal radiation exposure shall be maintained ALARA. Radiation exposure of the work force, clients and other visitors, and the public shall be controlled to ensure that any radiation exposure is well below regulatory limits, and no radiation exposure occurs without commensurate benefit.

Each person who uses, handles and transports radioactive material is expected to demonstrate an informed, disciplined, and cautious attitude toward radiation and radioactivity. Excellent performance is evident when radiation exposures are maintained well below regulatory limits, contamination is minimal, radioactivity is well controlled, and radioactive spills or uncontrolled releases are prevented. Continuing improvement is expected and essential to excellence in radiation safety. Excellence is achieved and maintained by management commitment and worker involvement in the Radiation Protection Program.

CONTENTS

	Page
FOREWORD	iii
TABLES AND FIGURES	x
ACRONYMS AND ABBREVIATIONS	xi
 1. INTRODUCTION AND OVERVIEW	 1-1
2. RADIATION PROTECTION ORGANIZATION AND ADMINISTRATION	2-1
2.1 RADIATION SAFETY COMMITTEE	2-1
2.2 RADIATION SAFETY OFFICER	2-3
2.3 PRINCIPAL INVESTIGATOR	2-4
2.4 INDIVIDUAL USER	2-5
 3. STOP WORK AUTHORITY	 3-1
4. TRAINING AND QUALIFICATION OF PERSONNEL	4-1
4.1 OVERVIEW	4-1
4.2 PRINCIPAL INVESTIGATORS	4-2
4.3 INDIVIDUAL USERS	4-2
4.4 RADIATION SAFETY OFFICER	4-2
4.5 HEALTH PHYSICIST	4-3
4.6 HEALTH PHYSICS TECHNICIANS	4-3
 5. RADIATION EXPOSURE CONTROL	 5-1
5.1 OVERVIEW	5-1
5.1.1 Regulatory Exposure Limits	5-2
5.1.2 Dose Limits	5-2
5.2 EXPOSURE OF THE UNBORN	5-4
5.2.1 Dose to the Embryo/Fetus	5-5
5.3 EXTERNAL EXPOSURE MONITORING	5-6
5.4 INTERNAL EXPOSURE LIMITS	5-7
5.5 INTERNAL EXPOSURE MONITORING	5-8
5.5.1 Intake Projections	5-9
5.5.2 Bioassay Program	5-12
5.5.3 Interpretation of Bioassay Results	5-13
5.6 DOSE ASSESSMENT	5-14

	Page
6. ALARA PROGRAM	6-1
6.1 OVERVIEW	6-1
6.2 RADIATION SAFETY COMMITTEE	6-2
6.3 GOOD OPERATING PRACTICES	6-3
7. CONTAMINATION CONTROL	7-1
7.1 OVERVIEW	7-1
7.2 CONTAMINATION CONTROL CRITERIA	7-1
7.3 CONTAMINATION MONITORING	7-2
7.4 DECONTAMINATION OF PERSONNEL	7-3
7.5 DECONTAMINATION OF EQUIPMENT	7-4
7.6 CONTROL OF WORK IN CONTAMINATION ZONES	7-4
8. INSTRUMENTATION AND SURVEILLANCE	8-1
8.1 OVERVIEW	8-1
8.2 INSTRUMENTATION AND CALIBRATION	8-1
8.3 DETECTION LIMIT	8-1
8.4 CHECKS OF INSTRUMENT RESPONSE	8-5
8.5 DOSE RATE INSTRUMENTS	8-6
8.6 LABORATORY SURVEILLANCE	8-6
8.7 OTHER AREAS	8-8
9. RADIOLOGICAL AREAS AND POSTING	9-1
10. CONTROL OF RADIOLOGICAL WORK	10-1
10.1 OVERVIEW	10-1
10.2 APPLICATION FOR APPROVAL OF A NEW PROTOCOL	10-1
10.3 RADIATION SAFETY COMMITTEE REVIEW	10-2
10.4 GENERAL RADIOLOGICAL REQUIREMENTS	10-2
10.5 RADIOACTIVE MATERIALS USER TRAINING	10-3
11. RECEIPT, HANDLING, AND IDENTIFICATION OF RADIOACTIVE MATERIALS	11-1
11.1 OVERVIEW	11-1
11.2 ORDERING, RECEIPT, AND SURPLUS OF EQUIPMENT CONTAINING RADIOACTIVE SEALED SOURCES	11-1
11.3 RADIOACTIVE SEALED SOURCES	11-1
11.4 PROCEDURES FOR RECEIVING AND OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS	11-3
11.5 HANDLING PROCEDURES	11-5
11.6 IDENTIFICATION OF RADIOACTIVE MATERIALS	11-6

12. PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS	12-1
12.1 OVERVIEW	12-1
12.2 LIMITED QUANTITY SHIPMENTS	12-2
12.3 SHIPMENTS AMONG USGS FACILITIES	12-3
12.4 LOW-SPECIFIC ACTIVITY SHIPMENTS	12-3
12.5 LARGER QUANTITY SHIPMENTS	12-4
13. CONTROL OF RADIOACTIVE WASTE	13-1
13.1 OVERVIEW	13-1
13.2 WASTE MINIMIZATION	13-1
13.3 "SPECIFIC" WASTES	13-2
13.4 DECAY-IN-STORAGE	13-3
13.5 GENERAL REQUIREMENTS FOR WASTE COLLECTION AND STORAGE	13-5
13.6 WASTE CLASSIFICATION	13-5
13.7 WASTE FORM	13-9
13.8 LABELING RADIOACTIVE WASTES	13-11
13.9 TRAINING	13-11
13.10 MIXED WASTES	13-11
14. RADIATION PROTECTION RECORDS	14-1
14.1 OVERVIEW	14-1
14.2 OCCUPATIONAL RADIATION DOSE RECORDS	14-2
14.3 DETERMINING TOTAL EFFECTIVE DOSE EQUIVALENT	14-2
14.4 DETERMINING THE TOTAL ORGAN DOSE EQUIVALENT	14-3
14.5 DETERMINING OTHER DOSE EQUIVALENTS	14-3
14.6 RECORDING DOSE EQUIVALENTS	14-3
14.7 FORM OF RECORDS	14-3
15. DOCUMENTATION	15-1
16. EMERGENCY RESPONSE AND NOTIFICATION	16-1
16.1 OVERVIEW	16-1
16.2 MINOR SPILLS	16-2
16.3 NOTIFICATION REQUIREMENTS	16-2
16.3.1 NRC Reporting Requirements	16-2
16.3.2 EPA Reportable Quantities	16-5

Page

17. QUALITY ASSURANCE IN RADIOLOGICAL PROTECTION	17-1
17.1 MANAGEMENT RESPONSIBILITY	17-2
17.1.1 Quality Policy	17-2
17.1.2 Organization	17-3
17.1.3 Management Review	17-4
17.2 RADIATION SAFETY PROGRAM	17-4
17.3 CONTRACT REVIEW	17-5
17.4 PROCESS CONTROL	17-5
17.4.1 Radiological Process Planning	17-5
17.4.2 Radiological Process Design Review Input, Output, Verification, and Changes	17-6
17.5 DOCUMENT CONTROL	17-7
17.5.1 Document Approval and Issue	17-7
17.5.2 Document Changes/Modifications	17-7
17.6 PURCHASING	17-8
17.6.1 Assessment of Subcontractors	17-8
17.6.2 Purchasing Data	17-8
17.6.3 Verification of Purchased Radiological Controls Service	17-9
17.7 PURCHASER-SUPPLIED RADIOLOGICAL CONTROLS PRODUCT	17-9
17.8 IDENTIFICATION AND TRACEABILITY	17-9
17.9 PROCESS CONTROL	17-10
17.9.1 General	17-10
17.9.2 Special Radiological Processes	17-10
17.10 INSPECTION AND TESTING	17-11
17.10.1 Receiving Inspection and Testing	17-11
17.10.2 In-process Inspection and Testing	17-11
17.10.3 Final Inspection and Testing	17-11
17.10.4 Inspection and Test Records	17-12
17.11 INSPECTION, MEASURING, AND TEST EQUIPMENT	17-12
17.12 INSPECTION AND TEST STATUS	17-13
17.13 CONTROL OF NONCONFORMING RADIOLOGICAL CONTROLS PRODUCT	17-14
17.14 CORRECTIVE ACTION	17-15
17.15 HANDLING, STORAGE, PACKAGING, AND DELIVERY	17-15
17.15.1 Handling and Storage	17-15
17.15.2 Packaging and Delivery	17-16
17.16 RADIATION SAFETY RECORDS	17-16
17.17 INTERNAL QUALITY AUDITS	17-16

	Page
17.18 TRAINING	17-17
17.19 SERVICING	17-17
17.20 STATISTICAL TECHNIQUES	17-17
REFERENCES	R-1
APPENDIX A. TERMS AND DEFINITIONS	A-1
APPENDIX B. ANNUAL LIMITS ON INTAKE AND DERIVED AIR CONCENTRATIONS OF RADIONUCLIDES FOR OCCUPATIONAL EXPOSURE, EFFLUENT CONCENTRATIONS, AND CONCENTRATIONS FOR RELEASE TO SEWERAGE	B-1
APPENDIX C. QUANTITIES OF LICENSED MATERIAL REQUIRING LABELING (FROM 10 CFR 20.1001—.2401)	C-1



United States Department of the Interior

GEOLOGICAL SURVEY
Reston, VA 22092



Memorandum

Date: September 12, 1996
To: Todd Eastman, ATG
From: Gregory Wandless, Radiation Protection Officer *GW*
Subject: Amendment to Rad Waste Pickup

In reviewing the manifest of the August 30, 1996 pickup at the USGS National Center, 3mCi of ⁶⁰Co were inadvertently left off the final inventory. It was in the form of dried chloride salt in polyethylene bottle. Please make any necessary changes to rectify the omission. Contact me should any further action is needed on my part.

DEFENSE CONSOLIDATION FACILITY

Shipment Control No. LSA 5-924-713ORIGINATING COMMAND U.S. Geological Survey
Reston, Virginia

CONTINUATION SHEET

PAGE 4 OF 5

(1) ITEM NO.	(2) RADIONUCLIDE EACH CONTAINER	(3) ACTIVITY EACH RADIONUCLIDE (MC)	(4) PHYSICAL FORM	(5) CHEMICAL FORM AND NAME & % OF CHELATING AGENT	(6) WASTE DESCRIPTION	(7) WASTE CLASS (A, B, C)	(8) SPECIAL NUCLEAR MATERIAL (Grams)	(9) SOURCE MATERIAL (Pounds)	(10) CONTAINER WEIGHT (Pounds)	(11) CONTAINER VOLUME (Cu. Ft.)	(12) CONTAINER TYPE	CONTAINER RADIATION LEVELS		CONTAMINATION CONTAINMENT SURFACE (DPM/100 cm ²)			(14) LABEL MARKINGS USED
												Cont. Int. Surface DPM/100 cm ²	(13) Meter mR/hr	Alpha	Beta	Gamma	
U-116	Co 60	3E-10	Solid	(oxides)	Lab Trash (plastic, paper, metal, rubber, Rock) - Compactible DPM	A	N/P	N/P	76	7.5	Strong-tight	0.17	0.1	4220	4220		Radioactive-LSA
	Se 46	3E-9															Radioactive-
	Eu 154	6E-10															Radioactive-
U-111	Co 60	3E-10				A	N/P	N/P	76	7.5		0.3	0.2				Radioactive-LSA
	Se 46	3E-9															Radioactive-
	Eu 154	6E-10															Radioactive-
U-113	Co 60	3E-10							73	7.5		0.2	0.13				Radioactive-LSA
	Se 46	3E-9															Radioactive-
	Eu 154	6E-10															Radioactive-
U-114	Co 60	3E-10							99	7.5		0.2	0.14				Radioactive-LSA
	Se 46	3E-9															Radioactive-
	Eu 154	6E-10															Radioactive-
U-115	U-238	0.2			Rock, Rock Fragment, metal part (stainless steel) contaminated with tritium - Not Compactible	A			390	7.5		1.5	0.5				Radioactive-LSA
	Th-232	0.2															Radioactive-
	H3	10															Radioactive-
U-116	Co 60	3E-10			Lab trash (plastic, paper, metal, rubber, Rock) - Compactible DPM				92	7.5		0.2	0.1				Radioactive-LSA
	Se 46	3E-9															Radioactive-
	Eu 154	6E-10															Radioactive-
U-117	Co 60	3E-10							99	7.5		0.18	0.1				Radioactive-LSA
	Se 46	3E-9															Radioactive-
	Eu 154	6E-10															Radioactive-
10.444			Page Totals				N/P	N/P	927	52.5			N/A				Radioactive-

ORIGINAL - DCF; GREEN - CARRIER; GOLDENROD - U.S. MAIL

Shipping Ltr 11/20/91