DEPARTMENT OF HEALTH & HUMAN SERVICES

National Institutes of Health
National Institute on Drug Abuse
Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

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J-6

January 22, 2009

Administrator
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415
ATTN: Mr. Dennis Lawyer
NNMS Branch II
Division of Nuclear Materials Safety

03031714

License #19-09760-02

Dear Mr. Lawyer:

This is a request for the termination of our license of broad-scope in accordance with 10 CFR 30.36 as we are terminating or transferring licensed activities, and NRC Form 314 is supplied as an attachment. The following provides specific information associated with this request.

All use of radioactive material work ceased as of May 1, 2008.

Buildings C, 5500 Nathan Shock Drive, and Building G, 5510 Nathan Shock Drive, located within the Johns Hopkins Bayview Research Campus, Baltimore, MD, were leased by NIDA IRP, and those leases are being terminated. Historical site reviews for both facilities was performed and are supplied.

NIAD IRP laboratories in the TRIAD Building, 333 Cassell Drive, located within the Johns Hopkins Bayview Research Campus, Baltimore, MD, have been transferred to the National Institutes of Health's License of Broad Scope, No. 19-00296-10.

All radioactive waste was removal by a contracted licensed waste broker for transfer to authorized radioactive waste contractors for eventual disposition. The contractor was Ecology Services Management Consultants, LLC, 10220 Old Columbia Road, Columbia, MD 21046, License No. MD-27-061-01, Phone 410-381-2600.

143233

NMSS/RGN1 MATERIALS-002

All locations where all radioactive material was used or stored in Building C and Building G were surveyed, in accordance with MARSSIM procedures. These reports are supplied as attachments.

Item B in our license, 555 MBq (15 mCi) ^{137}Cs sealed source, has been transferred to an Agreement-State licensee. A copy of the sealed source certificate and their state license indicating their approval to receive the transferred source is supplied as an attachment.

Sealed sources that remained under licensee control following cessation of licensed activities were returned to manufacturers when practical. All transferred sources were leak tested and found to be free from contamination prior to shipping. Copies of leak test certification and acknowledgement of returned sources are supplied as attachments

Inventory of previous waste shipments and sanitary sewage disposals are supplied as attachments.

If you have any questions, please contact me at 301-594-4018 or by e-mail at jjacobus@mail.nih.gov.

Sincerely,

JJacobus

John Jacobus, MS
Certified Health Physicist
Radiation Safety Officer
National Institute of Drug Addiction, Intramural Research Program

Enclosures:
Certification of Disposition of Materials, NRC Form 314 of 1/22/2009
Radiological Historical Site Review for the C Building, Johns Hopkins Bayview Campus
Final Status Survey Report for the C Building, Johns Hopkins Bayview Campus
Radiological Historical Site Review for the G Building, Johns Hopkins Bayview Campus
Final Status Survey Report for the G Building, Johns Hopkins Bayview Campus
Copy of receipt, Sealed Source Leak Test Certification for transferred ^{137}Cs Source Calibrator, and recipient's State of Tennessee license
Copy of receipt and Sealed Source Leak Test Certificates for eight sealed sources returned to Siemens Medical Solutions, Knoxville, TN
Copy of receipt and Sealed Source Leak Test Certificates for one sealed source returned to Sanders Medical Products, Inc, Knoxville, TN
Inventory of Waste Shipments – 1990 to 2008
Inventory Sanitary Sewage Disposal – 1990 to 2008

NRC FORM 314 (4-2008) 10 CFR 30.36(j)(1); 40.42(j)(1); 70.38(j)(1); and 72.54(k)(5)(1)(1)

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF DISPOSITION OF MATERIALS

APPROVED BY OMB: NO. 3150-0028 EXPIRES: 08/31 2010

Estimated burden per response to comply with this mandatory collection request: 30 minutes. This submittal is used by NRC as part of the basis for its determination that the facility is released for unrestricted use. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0028), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE NAME AND ADDRESS
U.S. Department of Health and Human Services
National Institute on Drug Abuse, NIH
5500 Nathan Shock Drive
Baltimore, MD 21224

LICENSE NUMBER: 19-09760-02

DOCKET NUMBER: 03031714

LICENSE EXPIRATION DATE: October 31, 2010

A. LICENSE STATUS *(Check the appropriate box)*

☐ This license has expired. ☑ This license has not yet expired; please terminate it.

B. DISPOSAL OF RADIOACTIVE MATERIAL

(Check the appropriate boxes and complete as necessary. If additional space is needed, provide attachments)

The licensee, or any individual executing this certificate on behalf of the licensee, certifies that:

☐ 1. No radioactive materials have ever been procured or possessed by the licensee under this license.

☑ 2. All activities authorized by this license have ceased, and all radioactive materials procured and/or possessed by the licensee under this license number cited above have been disposed of in the following manner.

☑ a. Transfer of radioactive materials to the licensee listed below: *(1) Item 6.B. in our license transferred to University of Tennessee, Memphis, TN, State of Tennessee License No. R-79019-J09, on May 9, 2008. Contact Bryan Lemieux, Phone (901) 448-6114; (2) one sealed source retuned to Sanders Medical; (3) eight sealed sources returned to Siemens Medical*

☑ b. Disposal of radioactive materials:

☑ 1. Directly by the licensee: *Disposal soluble waste released into the sanitary sewerage in accordance with 10 CFR 20.2003*

☐ 2. By licensed disposal site:

☑ 3. By waste contractor:
Ecology Services Management Consultants, LLC, 10220 Old Columbia Road, Columbia, MD 21046
License No. MD-27-061-01, Phone 410-381-2600

☑ c. All radioactive materials have been removed such that any remaining residual radioactivity is within the limits of 10 CFR Part 20, Subpart E, and is ALARA.

C. SURVEYS PERFORMED AND REPORTED

☑ 1. A radiation survey was conducted by the licensee. The survey confirms:

☑ a. the absence of licensed radioactive materials

☑ b. that any remaining residual radioactivity is within the limits of 10 CFR 20, Subpart E, and is ALARA.

☑ 2. A copy of the radiation survey results:

☑ a. is attached; or ☐ b. is not attached (Provide explanation); or ☐ c. was forwarded to NRC on: _____ Date

☐ 3. A radiation survey is not required as only sealed sources were ever possessed under this license, and

☐ a. The results of the latest leak test are attached; and/or ☐ b. No leaking sources have ever been identified.

The person to be contacted regarding the information provided on this form:

NAME	TITLE	TELEPHONE *(Include Area Code)*	E-MAIL ADDRESS
John Jacobus, CHP	Radiation Safety Officer	301-594-4018	jjacobus@mail.nih.gov

Mail all future correspondence regarding this license to:
Division of Radiation Safety, National Institutes of Health, 21 Wilson Dr., Bethesda, MD 20892-6780

C. CERTIFYING OFFICIAL

I CERTIFY UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT

PRINTED NAME AND TITLE	SIGNATURE	DATE
John Jacobus, Radiation Safety Officer, NIDA IRP	JJacobus	**01/22/2009**

WARNING: FALSE STATEMENTS IN THIS CERTIFICATE MAY BE SUBJECT TO CIVIL AND/OR CRIMINAL PENALTIES. NRC REGULATIONS REQUIRE THAT SUBMISSIONS TO THE NRC BE COMPLETE AND ACCURATE IN ALL MATERIAL RESPECT. 18 U.S.C. SECTION 1001 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

143233

Radiological Historical Site Assessment
For The
C Building
Johns Hopkins Bayview Campus
5500 Nathan Shock Drive
Baltimore, MD 21224

Prepared for:

Aria Environmental, Inc.
PO Box 286
Woodbine, MD 21797

Prepared by:

Chesapeake Nuclear Services
788 Sonne Drive
Annapolis, MD 21401

February 2008

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Appendix A- HSA Personnel Interview Form

Appendix B- USGS Quadrangle and Floor Diagrams

Appendix C- Copies of Closeout Surveys or Related Surveys

1.0 Glossary of Terms, Acronyms and Abbreviations

ADAMHA	Alcohol, Drug Abuse and Mental Health Administration
ARC	Addiction Research Center
BSC	Biological Safety Cabinet
cm^2	square centimeter
curie	A unit of radioactivity; $3.7x10^{10}$ disintegrations per second
DCGL	Derived Concentration Guideline Level
DIS	Decay in storage
dpm	disintegrations per minute
DP	Decommissioning Plan
DQO	data quality objective
EPA	Environmental Protection Agency
FSS	final status survey
ft^2	square feet
GC	Gas Chromatograph
GM	Geiger Mueller (type of radiation detector)
HSA	historical site assessment
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDE	Maryland Department of the Environment
NARM	Natural or Accelerator Produced Radioactive Materials
NIDA	National Institute on Drug Abuse
NaI	Sodium Iodide (a scintillation type of radiation detector)
NIH	National Institutes of Health
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NUREG	regulation document prepared by NRC staff
PET	positron emission tomography
PDR	Public Document Room
RFP	Request for Proposal
RSO	Radiation Safety Officer
$T_{1/2}$	The physical half-life of a radioactive substance

2.0 Executive Summary

This Historical Site Assessment (HSA) of Johns Hopkins Bayview Research Campus, Building C was performed in accordance with the requirements of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, EPA 402-R-97-016 and Consolidated Guidance, NUREG-1757. An HSA usually provides input to the design of Final Status Surveys (FSS), which in turn determine if the storage and use areas are suitable for unrestricted release as specified by the Nuclear Regulatory Commission (NRC). A separate historical assessment of industrial and chemical hazards is to be conducted by Aria Environmental, Inc., while this HSA relates only to radiological hazards.

Radiological operations in Building C are currently authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) which expires on October 31, 2010. The current license authorizes (1) the use of material in animal studies listed in 10 CFR 33.100 Schedule A (Type B Broad License) with quantities of certain material limited by its License Condition 12, (2) a 15 millicurie sealed cesium-137 source manufactured by 3M model number 4F6S for use in instrument calibrations and checks, and (3) 100 millicuries of I-125 as radioactive waste. The facility is also exempted by Maryland Department of the Environment (MDE) from Maryland licensure requirements regarding the receipt, possession, and use of certain accelerator produced radionuclides (NARM). The Maryland exemption for NARM in biomedical research projects is for brain imaging of human research subjects and research animals. All NRC licensed radioactive material is planned to be totally removed from Building C in early 2008.

MDE had also issued specific individual licenses for radioactive material use which were terminated in 1990, when the NRC license became effective. MDE performed a closeout survey in that year for areas where radionuclides were previously used in the building and it serves as a benchmark of no contamination for the beginning of activities under the NRC license.

Since 1990, forty-three rooms were identified as impacted, where licensed materials were either used or stored, and require a close-out survey for building surface contamination. Most laboratories and use areas were associated with the radionuclides: H-3, C-14, I-125, P-32, P-33, and S-35. Only two laboratories were identified with use of Cl-36. As radioactive material was removed from laboratories and as described in the application for the license, NIDA performed closeout surveys. Following the closeout surveys, these laboratories were considered as unrestricted for purposes of radiation control. Short-lived radionuclides such as those permitted under the MDE exemption would no longer be a contamination issue. Several research areas have already closed and only ten rooms are currently posted for use or storage of radioactive materials.

To meet NRC requirements for the removal of Building C as an authorized use location and acceptable for unrestricted use, all licensed material must be removed, areas decontaminated as necessary, and close out surveys performed; any missing or incomplete surveys should be redone. The records of all close out surveys must be presented to the NRC. Most of the existing closeout records do not include the administrative details requested by the NRC, *i.e.* make and model of survey meter. Copies of closeout surveys in existence are included in Appendix C. Any missing records or records with incomplete data should be reviewed and the surveys redone or explanatory notes added as necessary; particularly, if long-lived material is involved.

During future closeout surveys, attention should be given to (1) the traps in the radioactive waste disposal sinks in Room 119 and (2) the radioactive air discharge vents and filter locations on the roof. The rooms where radioactive materials are stored in freezers (i.e., fourth floor mechanical room, freezer rooms) should also be characterized for contamination. In addition to these rooms, some radioactive waste was stored in a cargo storage container outside the facility near Room 121 and it should also be surveyed.

Non-impacted areas include areas in which radioactive materials were not used for laboratory work, storage, or animal boarding. Corridors adjacent to posted areas were periodically monitored for contamination with negative results. The adjacent spaces should be surveyed as part of the closeout work.

A Decommissioning Plan (DP) is not required to be submitted to the NRC as worker cleanup activities and procedures to date are consistent with those approved for routine operations and no dose analysis is required.

3.0 Purpose of the Historical Site Assessment

As a result of the decision to cease operations in Building C, NIDA-NIH has directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC. Use of radioactive materials was authorized by NRC License 19-09760-02, Docket Number 030-31714.

The purpose of this Historical Site Assessment (HSA) is to collect existing information concerning the site and its surroundings regarding the use of NRC licensed radioactive materials. The data collected may be used to differentiate areas that need further action from those that pose little or no threat to human health and the environment.

4.0 Property Description

The facility is part of the Johns Hopkins Bayview Medical Center which is one of five member institutions in the Johns Hopkins Health System. Building C is owned by FSK Land Corporation and C is leased to and operated by NIDA-NIH. The building consists of a four-story, 110,000 sq. ft. medical research facility. Appendix B contains a diagram of each floor of the facility; it houses the following departments:

- Administrative
  - Office, Office Support
  - Ancillary Support
- BSL2 Laboratory
  - Laboratory
  - Laboratory Support
  - Specialty Lab
- Vivarium
  - Vivarium Behavior Lab
  - Vivarium Support
  - Vivarium Procedural Room
  - Vivarium Housing
- Clinical
  - Clinical Testing Lab
  - Clinical Support and Patient Rooms

4.1 Owner and Operator's Address

The owner of the facility is FSK Land Corporation (a Hopkins Entity) 1101 East 33rd Street, Suite E100, Baltimore, MD 21218-3637. The contact is Mr. Nick Farrell, Senior Director, Facilities, Design & Construction, and may be reached by telephone at (443) 997-3735 or by e-mail at nfarrell@jhu.edu.

The operator of the facility is the U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), NIH, 5500 Nathan Shock Drive, Baltimore, MD 21224. Mr. John P. Jacobus is the current RSO and may be reached by telephone at (301) 594-4018 or by e-mail at jjacobus@mail.nih.gov.

4.2 Facility Location

The facility is located in Johns Hopkins Bayview Research Campus, Building C, 5500 Nathan Shock Drive, Baltimore, MD 21224 which is in the east suburbs of Baltimore City, MD, an independent city surrounded but not included by Baltimore County, MD.

4.3 Topography

Figure 1 illustrates the facility location and its relationship to the surrounding community.

A USGS 7.5 minute quadrangle is provided in Appendix B.

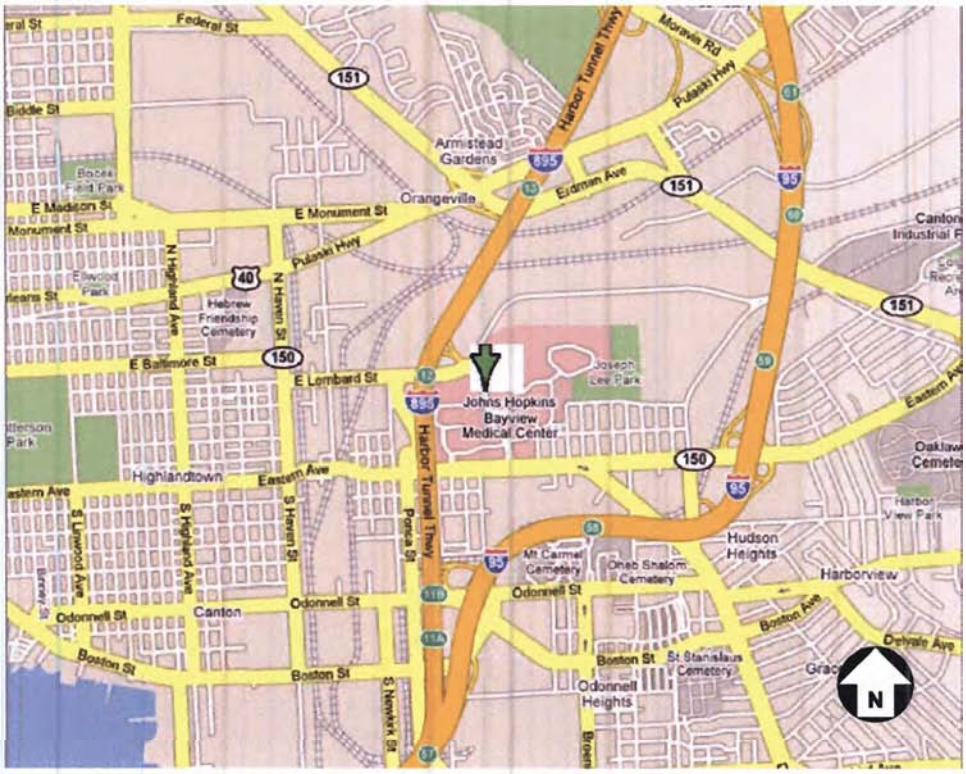


Figure 1. Local Map for Facility (Courtesy of Google Map Services)

5.0 Historical Site Assessment Methodology

5.1 Approach and Rationale

Information was gathered to provide an initial classification of site areas as impacted or non-impacted.

Impacted areas have a potential for radioactive contamination (based on historical data) or contain known radioactive contamination (based on past or preliminary radiological surveillance). This includes areas where (1) radioactive materials were used and stored; (2) records indicate spills, discharges, or other unusual occurrences that could result in the spread of contamination; and (3) radioactive materials were buried or disposed. Areas immediately surrounding or adjacent to these locations are included in this classification because of the potential for inadvertent spread of contamination.

Non-impacted areas were identified through knowledge of site history or previous survey information are those areas where there is no reasonable possibility for residual radioactive contamination.

5.2 Boundaries of Site

Except for the waste storage container located outside of Room 121, the boundaries of the site are considered to be the facility structure. There are no underground storage tanks outside the facility structure and all land areas outside the facility are considered non-impacted. No environmental studies using radioactive material were authorized by the NRC license.

5.3 Documents Reviewed

The Request for Proposal (RFP) for this work contained two documents which were key to this evaluation:

- The "BRC Equipment Inventory List" (Attachment 3 of the RFP) provides information that was used for initial screening of areas where radioactive materials may exist or were used.
- The "Checklist for Hazardous Substances that may be Encountered in Decommissioning Biomedical Facilities" (Attachment 4 of the RFP), provides a general identification of the likely sources, type of equipment, and pathways that were considered.

Records at the NRC Public Document Room (PDR) provided minimal additional information as most records had been withdrawn from public view as sensitive to national security from terrorists. Only twelve documents were available for review at the PDR mostly regarding licensing amendments and inspections; these documents were also available at Building C.

Records maintained by the radiation safety staff at Building C were reviewed. The following comments are provided on those records related to area classification as impacted or non-impacted.

<u>NRC Correspondence Notebook</u>:

- Jan. 21, 2002 letter to NRC regarding Notice of Violation (NOV) for (a) disposal of waste > 120 day $T_{1/2}$ of 0.05 microcuries of H-3 between 1/1/99 to 7/1/00 and (b) not performing corridor survey between 10/17/00 and 12/6/01 (no spills were noted during this period) and (c) posted areas not consistently performing and maintaining records between 1/1/01 and 12/6/01,(inspection conducted 12/5-6101).
- CY2000 Annual Management Review: Most discussion related to PET facility. No NRC inspections.

- Oct. 6, 2000 letter to NRC's Duncan White: Gas Chromatograph (GC) detectors and exit signs will be tracked by Safety Office.
- June 26, 2000 Application for renewal of License. Provided a description of use of materials.
- Jan.15, 1997, letter to NRC regarding NOV: (a) calibration of survey meters in a timely manner (b) Providing training to individuals opening packages. The NRC inspection was conducted on 12/2-3/96.
- CY 1996 Management Review. No comments regarding spills were noted.
- Oct. 15, 1991 letter to NRC regarding NOV for Addiction Research Center (ARC): (a) Labs were not under constant surveillance and control (unlocked), (b-1) calibration of survey meters was not performed in a timely manner, (b-2) Records of daily surveys and inventory were not maintained correctly in some cases, and (c) No posting of NRC Form 3. The NRC inspection was conducted on 7/16-17/96.

Incoming Radioactive Isotopes Notebook: This log had entries indicating material received at the site from 5/29/90 to 12/5/06. After that date material receipt logging was maintained by computer records. H-3, C-14, P-32, Cl-36, S-35, and I-125 appeared with entries in the microcurie to millicurie range. Ge-68 as a generator for Ga-68 was also noted in the log.

Corridor Surveys Notebook: Contained records of quarterly surveys of various corridor floors from 3/20/02 to 9/28/06 for contamination by beta and gamma emitting radionuclides. All final results were <220 dpm/100 cm^2 as any identified contamination was removed by standard janitorial techniques.

Incident Folder: One case identified as 60 mCi of H-3 incinerated at a different facility on 12/26/2003; NRC was notified. This case did not indicate contamination at Building C.

Meter Calibrations Notebook: Contained miscellaneous records of meter calibrations from 2/00. Types and models of survey meters used at the facility included: Ludlum model 3 or model 177and 44-9 pancake probe, 2401-EC2 GM; Ludum 12-4 and 42-21; Biodex model 2 (portable GM); Johnson 65B-105; Johnson GP200 GM; RSO model RSP-1 pancake GM; APC model 069-761 GM; Bicron microRem; and Victoreen model 425-110 NaI detector. The calibrations were either performed in-house, or by Ludlum Instruments, Inc., RSO, Inc., or Ecology Services, Inc.

Licenses:
- Amendment 01 to 19-09760-02 signed 12/31/92 and expired 12/31/95; for animal studies.
- Amendment 04 to 19-09760-02 signed 03/20/06 and expires 10/31/10; for animal studies.
- MDE letter regarding exempted NARM dated September 30, 2005.

A review was also conducted at MDE, 1800 Washington Boulevard, Baltimore, MD of records for three MDE licenses issued for work at the facility: MD-07-008-30, MD-07-008-42, and MD-07-008-48. A close out survey was conducted at the facility September 12, 1990 and all of these licenses were terminated by MDE on October 24, 1990. Correspondence from MDE dated December 11, 1990, states, "Results of this survey indicate that these areas meet the Department's requirements for future use under Radioactive Material License NRC-09760-02." Radionuclides, quantity, and use parallel the NRC issued license and there were no indications of facility contamination.

5.4 Property Inspections

Property inspections were conducted by Mr. Claude Wiblin, CHP, and Mr. Steve Giebel on November 7, 9, 13, 15, and 21, 2007. The inspections consisted of a review of the use of radioactive material as authorized by the NRC license and the MDE exemption. Material use and quantities appeared to be in conformance with those documents. The areas posted were as described during personnel interviews.

- No exit signs containing radium or tritium were observed; none were identified by the radiation safety staff.
- Approximately 50-60 smoke detectors containing radioactive Am-241 were stored by the radiation safety staff for ultimate disposal as radioactive waste.

Animal areas could not be inspected due to the requirement to have current physical exams, inoculation history and a recent TB test with negative results. Limited access to these areas did not detract from the property inspection as facility staff described the ongoing operations and use; most operations could be observed through door windows, etc.

5.5 Personal Interviews

Sixteen (16) individuals were interviewed in person or by telephone as indicated below. Telephone and e-mail addresses are given as available. The interviews followed the questions identified in the Historical Site Interview Form in Appendix A. To assure as much recall as possible, all were provided a copy of the form prior to the interview.

- Radiation and Safety Staff
  (1) John Shaver, former RSO before Mr. Doob, 410-292-5725
  (2) Pete Doob, former RSO, (301-436-2178) peter.doob@fda.hhs.gov
  (2) Larry Koenig, former technician, (301-594-2408) lkoenig@mail.nih.gov
  (3) Mike Duclos, record review, (410-550-1847) MDUCLOS@intra.nida.nih.gov
  (4) Karen Baxley, NIDA Safety Officer, (410.550.1675) baxleyka@od.nih.gov
  (5) John P. Jacobus, current RSO, (301-594-4018) jjacobus@mail.nih.gov
- Current NIDA Supervisory Users
  (6) Bruce Hope, (410-550-1422), bhope@intra.nida.nih.gov
  (7) Alane Kimes, (410-550-1440 x314) akimes@intra.nida.nih.gov
  (8) Mike McCoy, (410-550-1532 x383) mmccoy@intra.nida.nih.gov
  (9) Theresa Kopajtic (410-550-1553) tkopajti@intra.nida.nih.gov
- NIDA Supervisory Users who are in TRIAD Building on the Bayview Campus and were at one time in Building C:
  (10) Chris Dersch, (410-550-1789) cdersch@intra.nida.nih.gov
  (11) John Partilla, (410-550-1782) jpartilla@intra.nida.nih.gov
  (12) Donna Walther, (410-550-2843x148) dwalther@irp.nida.nih.gov
  (13) Teruo Hayashi, (410-550-6568 x118) thayashi@intra.nida.nih.gov
  (14) Marisela Morales, (410-550-6870 x18) mmorales@irp.nida.nih.gov
- NIDA Supervisory Users who are inactive, but had authorization in Building C:
  (15) Dave Darwin, (410-550-1689) ddarwin@intra.nida.nih.gov
  (16) Christina Backman, (410-550-3079) cbackman@intra.nida.nih.gov

The supervisory users (McCoy, Kopajtic, Kimes, Walther, Dersch, and Partilla) were all at NIDA when the license was first issued in 1990. Mr. John Shaver was the RSO at that time.

6.0 History and Current Usage

Building C is part of the Johns Hopkins Bayview Medical Center, formerly known as Francis Scott Key Medical Center and Baltimore City Hospital, in east Baltimore, MD. The cornerstone for Building C reads 1950; and from 1950 to 1965, it was the Baltimore City Tuberculosis Sanitarium. From 1965 to 1984 the building was vacant. In 1984, Baltimore City transferred ownership of the hospital to the Johns Hopkins Hospital and the Johns Hopkins University; and in that year, the Alcohol, Drug Abuse and Mental Health Administration (ADAMHA) moved the National Institute on Drug Abuse (NIDA) into the building.

6.1 History

NIDA activities include those associated with basic research laboratories, behavioral laboratories, administrative operations, clinical laboratories, the Addiction Research Center, and the Archway Clinic, which is a treatment center for substance abuse.

Operations conducted in the building include wet laboratory work with viruses, human samples and biological material. One third of the work in the building is with animals. Current animal subjects include: mice, rats, non-human primates, and turtles. Historically, doves, frogs, rabbits, guinea pigs and hamsters were also studied. Chemicals that NIDA laboratories worked with include controlled substances, metabolites of these substances, neurotoxins, cellular meta-modifier, and tetrodotox. An organic synthesis laboratory where heavy metals were used had moved out of the building. Most laboratories used formalin, alcohol, isoflurane, cleaners and disinfectants, and mercury thermometers. Photo processing was performed in the building. Silver collection units were installed approximately 15 years ago. Fume hoods and Biological Safety Cabinets (BSCs) are present in the building. Historic use of reactive chemicals including small quantities of azides in aqueous solution and perchloric acid for protein extraction and analysis existed. Laboratory 359 was noted as a potential location for this work. All BSC hoods including the pharmacy cabinet will be decontaminated and moved. A separate historical assessment of industrial and chemical hazards is to be conducted by Aria Environmental, Inc., while this HSA relates only to radiological hazards.

Prior to the license issued by the NRC, the Addiction Research Center operated under three specific licenses issued by the State of Maryland: MD-07-008-30, -42, and -48. Mr. John Shaver was the initial RSO and followed by Mr. Peter Doob. Following a closeout survey conducted by MDE on September 12, 1990, these licenses were terminated on October 24, 1990.

The Maryland Department of Environment (MDE) authorized the use of accelerator produced radionuclides for brain imaging of primates and humans and certain sealed sources required for calibration of instruments. The sealed sources exempted by MDE consisted of two sources containing Cobalt-57, 5 millicuries each, and sources containing Gallium-68 with a total possession limit of 40 millicuries.

Since1990, use of radioactive materials has been authorized by NRC License 19-09760-02, Docket Number 030-31714. The earliest log date indicates radioactive material use beginning May 1990. Peter Doob was the RSO until he retired in 2006 and was replaced by the current RSO, John Jacobus. The license authorizes (1) the use of material in animal studies listed in 10 CFR 33.100 Schedule A (Type B Broad License) with quantities of certain material limited by License Condition 12; (2) a 15 millicurie sealed Cs-137 source manufactured by 3M, model number 4F6S for use in instrument calibrations and checks; and (3) 100 millicuries of I-125 as radioactive waste. The following provides a topical review of key radiation safety practices which were implemented at the facility to limit radioactive contamination of the facility and the environment.

- Procurement. All requests for procurement of byproduct material for use in NIDA laboratories were first approved by the RSO or his designee. Radioactive material was received, logged, inspected and stored at a chemical receiving room by radiation safety staff under the direction of the NIDA-RSO.
- Routine Laboratory Surveys. A contamination survey of each restricted area was performed twice per year.
- Daily Survey. During days of use, contamination surveys were performed on work surfaces, floors, and equipment in the vicinity of the radioactive material work. Daily surveys were not always documented. Historic and current practice indicates that contamination was removed when found and that areas and equipment be cleaned to < 220 dpm/100 cm^2.
- Receiving Area, Corridor, and Radioactive Waste Room Surveys. Contamination surveys were performed in the receiving area on a weekly basis, and four times per year in corridors adjacent to restricted areas.
- Calibration of Survey Meters. Currently, calibration of survey meters is out-sourced to licensed calibration facilities; however, in the past NIDA had performed calibrations with NRC approved procedures at the site.
- Radioactive Liquid Waste. Laboratories were forbidden to dispose of radioactive liquid materials into sinks. The radiation safety office uses two sinks (common drain) in Room 119 for disposal of radioactive material. Fifteen 5-gallon carboy containers were scheduled to be released to the sanitary sewer during the week ending Nov. 16, 2007. A 5-gallon carboy container of 6.03 mCi of H-3 was held in inventory.
- Radioactive Waste. Any waste containing radioactive material (liquids, solids, trash, animal carcasses and excreta, used scintillation counting liquids, etc.) were collected and prepared for disposal by the radiation safety staff at least twice weekly. Various segregation requirements regarding type (bio-hazard, sharps, etc.) were in place including separation into short-lived (half-life of less than 65 days) or long-lived. Short-lived material was held for ten half-lives, surveyed, and discarded as ordinary trash. Long-lived material was stored until it was sent to an authorized disposal site. Licensed material was also disposed of per 10 CFR § 20.2005, Disposal of specific wastes, small concentrations as if it were not radioactive:
    - (1) 0.05 microcurie (1.85 kBq), or less, of H-3 or C-14 per gram of medium used for liquid scintillation counting; and
    - (2) 0.05 microcurie (1.85 kBq), or less, of H-3 or C-14 per gram of animal tissue, averaged over the weight of the entire animal.

  No on-site burial of radioactive material was reported or suspected.

  Prior to 1990, there was an incinerator for non-radiological waste in the back of the building; it was removed in two parts, the stack and base. No incinerator was used on site for licensed material.

- Leak Testing of Sealed Sources. As required depending upon quantity and type, sealed sources were leak tested at intervals of six months or at longer intervals if permitted by a certificate of registration. No test was reported as detecting 0.005 microcurie or more.
- Closeout surveys. The NIDA-RSO arranged for a survey of areas posted before removing restrictions. In 1990, a comprehensive contamination survey was performed by MDE of all Building C areas; that survey established the base line for no contribution from earlier licenses and operations.

6.2 Current Usage

As indicated above, the license authorizes (1) the use of material in animal studies listed in 10 CFR 33.100 Schedule A (Type B Broad License) with quantities of certain material limited by License Condition 12, (2) a 15 millicurie sealed Cs-137 source, 3M model number 4F6S for use in instrument calibrations and checks, and (3) 100 millicuries of I-125 as radioactive waste.

During the HSA, the laboratory inventory of radioactive material was described as shown in the following table:

Table 1. Laboratory Inventory (mCi)

Room	H-3	C-14	S-35	I-125
105, 111	26.3		0.149	0.00016
308		0.002		
377, 383	4.8			
209A, 311	7.128	0.0036		0.2889
Totals	38.2	0.0056	0.149	0.289

Sealed sources were controlled by the radiation safety staff and maintained in a locked safe in Room 119. There were a total of thirteen sealed sources in inventory with the largest one containing 10.7 mCi of Cs-137. There was also a smaller Cs-137 sealed source containing 0.15 mCi, three Co-57 sealed sources ranging from 0.00013 to 0.38 mCi, and eight Ge-68 sealed sources with activities ranging from 0.023 to 0.7 mCi. The smoke detectors containing Am-241 are also stored in this room.

The radioactive waste inventory included material for decay-in-storage (DIS) or subsequent transfer to an authorized burial site. Radioactive waste was stored by the radiation safety staff in Rooms 119, 135, a cargo box container (~ 7' wide by 10' high by 20' long) outside the building near Room 121, a freezer for animal carcasses in Room 112A, and a freezer located on the fourth floor on the north wing. An inventory of 6.03 mCi of H-3 in a 5-gallon carboy container was held for later disposal into the sanitary sewer system. The following tables indicate the radionuclide and activity in storage.

Table 2. Decay-In-Storage Waste Inventory (mCi)

Type	P-32	P-33	S-35	I-125
Miscellaneous	7.21	9.05	25.88	36.77

Table 3. Waste Stored for Burial (mCi)

Type	H-3	C-14	P-33	S-35	I-125
Dry waste or animal carcasses	18.32	0.15		0.01	0.06
Liquid scintillation fluid	0.27	0.1	0.001	0.14	

6.3 Adjacent Land Usage

Once an industrial town with an economic base in manufacturing, Baltimore's economy has become primarily service sector-oriented. The largest employer is now The Johns Hopkins University and The Johns Hopkins Hospital.

Building C is part of a 130-acre campus owned by FSK Land Corporation and is part of the Johns Hopkins Bayview Medical Center. Founded in 1773, as the Baltimore City Hospital, the Johns Hopkins Bayview Medical Center is one of five member institutions in the Johns Hopkins Health System.

7.0 Findings

MDE exempted radionuclides C-11, O-15, F-18, and I-123 that were used at the facility, are short-lived and no longer pose a residual contamination issue. These radionuclides and their approximate half-lives are shown in the following table.

Table 4. Short-lived Accelerator Radionuclides

Radionuclide	~Half-life
C-11	21 min
F-18	2 h
O-15	2 min
I-123	13 h

7.1 Potential Contaminants

Records indicate that the potential contaminants of unsealed radionuclides are as indicated in the table below. Radionuclides with a half-live of less than 120 days, which can be disposed of by decay-in-storage, are also listed as these were in storage or use during the property inspection.

Table 5. Potential Contaminants of Concern

Radionuclide	Half-life	~Decay Mode Energy (MeV)*
H-3	12.28 y	Beta 0.006
C-14	5730 y	Beta 0.050
P-32	14.3 d	Beta 0.070
P-33	25.4 d	Beta 0.077
S-35	87.4 d	Beta 0.049
Cl-36	3.01E5 y	Beta 0.251
I-125	60.1 d	various electrons <0.04 MeV
		various gammas <0.04 MeV

* Average energy used for beta particles

As long as sealed sources remain on the site there is a potential for leakage. Until the sealed sources are leak tested and transferred, Cs-137, Co-57, and Ge-68 and its decay product Ga-68 are potential contaminates. The smoke detectors containing Am-241 are controlled by the radiation safety staff and these should not pose a risk unless the sources are removed or damaged.

7.2 Potential Contaminated Areas

7.2.1 Impacted Areas—known and potential

The following forty-three rooms were identified in which radioactive material was used or stored through the years: 105, 111, 112, 112A, 119, 135, 209A, 217A, 301, 304, 305, 306, 307, 308, 309, 310, 311, 312, 324, 328, 330, 331, 332, 337, 339, 340, 347, 348, 349, 357, 359, 361, 363, 368, 372, 377, 383, 384, 385, 386, 387, 409, and 420.

- Room modifications on the 3rd floor indicate that Room 306 is now part of Room 305, Room 328 is now part of Room 329, and Room 357 is now part of Room 358.
- Room 383 was renovated to be an office but it was reported that the room was stripped of all potentially contaminated material including the floor tile during renovation.

Only ten rooms are currently posted as radioactive material areas: 105, 111, 112, 119, 135, 209A, 308, 311, 324, and 384. Of these, radioactive material is no longer used in Room 384.

- There are three freezers for animal carcasses with radioactive material in Rooms 112A and 119 and in the north wing of the 4th floor in the mechanical space.
- Two sinks which were used for disposal of radioactive material to the sanitary sewer system are located in Room 119.

The locations of these rooms are highlighted in yellow in Appendix B. A closeout survey for each area, if available, is provided in Appendix C. Copies of several surveys are also included even though they are not marked as closeout surveys because they provide historical information.

Table 6. Impacted Rooms, Status or Close Date, and Associated Radionuclides

Room	Description	Status/ Close Date	Radionuclides*						
			H-3	C-14	S-35	P-32	P-33	Cl-36	I-125
105	Wet Lab	Posted**	X		X	X	X		X
111	Wet Lab	Posted	X		X	X	X		X
112	Beh. Testing	Posted	X						X
119	Rad. Waste	Posted	X		X	X	X		X
135	Chem. Stock	Posted	X		X	X	X		X
209A	Beh. Testing	Posted	X		X	X	X		X
217A	Beh. Testing	7/11/2003							X
301	Office	9/13/2001	X	X	X	X			X
304	Office	9/13/2002	X	X	X	X			X
305	Wet Lab	9/11/2002	X	X	X	X			X
306	Wet Lab	9/11/2002	X	X	X	X			X
307	AV Lab	10/16/2002	X	X	X	X			
308	Wet Lab	Posted	X	X	X	X			
309	Wet Lab	10/8/2002	X	X	X	X			X
310	Tissue Culture	Not in file						X	
311	Wet Lab	Posted	X	X	X	X		X	X
312	Wet Lab	11/17/2000			X	X			
324	Equip. Room	Posted	X		X	X	X		X

Table 6. Impacted Rooms, Status or Close Date, and Associated Radionuclides (Continued)

Room	Description	Status/ Close Date	Radionuclides*						
			H-3	C-14	S-35	P-32	P-33	Cl-36	I-125
328	Wet Lab	11/25/2002	X	X	X	X			X
330	Beh. Testing	3/13/2003	X	X	X	X			X
331	Beh. Testing	3/13/2003	X			X	X		X
332	Animal Hous.	3/11/003	X			X	X		X
337	Wet Lab	Not in file	X						
339	Beh. Testing	Not in file	X		X	X			X
340	Beh. Testing	Not in file	X	X	X				
347	Wet Lab	9/13/2002	X	X	X	X			X
348	Wet Lab	9/13/2002	X	X	X	X			X
349	Wet Lab	9/11/2002	X	X	X	X			X
357	Wet Lab	9/9/2002	X	X		X			
359	Cold Chem.	10/24/2000	X						X
361	Cold Chem.	2/13/1996	X						
	Cold Room	2/13/1996	X						
363	Cold Chem.	2/13/1996	X		X	X			X
368	Wet Lab	Not in file	X						X
372	Office	Not in file	X	X					
377	Wet Lab	7/11/00 & 9/07	X	X	X	X	X		X
383	Office	Not in file	X	X					
384	Equip. Room	Posted	X	X	X	X	X		X
385	Research	2/13/1996	X						
386	Research	2/13/1996	X		X	X			
387	Equip. Room	9/4/1997	X	X					X
409	Glass Wash.	8/24/2004	X	X	X	X	X		X
420	Iodination Lab	9/14/2004							X
420 Hood	Iodination Lab	9/10/2004							X

* X indicates use. ** Posted as Radioactive Materials areas

7.2.2 Non-Impacted Areas

Non-impacted areas would include any areas which did not require use of radioactive materials in laboratory work, storage, or animal boarding; this is the larger portion of the facility. Most radioactive material use and storage areas have received closeout surveys which indicate that they are no longer impacted.

NUREG-1556, Vol. 11, indicates that when equipment or facilities are to be released for unrestricted use, surface contamination surveys should be conducted for both removable and fixed contamination before the facilities or equipment are released from restricted to unrestricted use. For the potential contaminates of concern listed in Table 5, NUREG-1556 provides the maximum acceptable residual levels for radionuclides used in Building C as indicated in the Table 7 below.

Table 7. Acceptable Surface Contamination Levels

Radio-nuclide	Average[1] (dpm/100 cm^2)	Maximum[2] (dpm/100 cm^2)	Removable[3] (dpm/100 cm^2)
I-125	100	300	20
Other beta-gamma emitters	5,000	15,000	1,000

[1] 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.

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

[3] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency.

Closeout survey records indicate that wipes were analyzed to a minimum detection level of 220 dpm/100 cm^2 for all beta-gamma emitters including I-125. With the short half-life of I-125 of 60.1 days, any residual activity would decay to less than 20 dpm/100 cm^2 within 208 days.

7.3 Potential Contaminated Media

Except for interim storage of waste in a cargo container, radioactive material was confined to the building interiors. As such, the type of operations limited the likelihood for release of radioactivity into the following environmental media: surface soil, subsurface soil, sediment, surface water, ground water, air, and other buildings. Records indicated that annual assessments were being conducted regarding potential air releases and no adjacent buildings should be impacted. The building is on a public sewer system and releases were reported to be within NRC limits. Based on these facts, no suspected contamination of other media was noted.

7.4 Related Environmental Concerns

Based upon an evaluation of the potential contaminated media above, no related environmental concerns were identified in this HSA.

8.0 Conclusions

Per NUREG-1757, Vol. 1, Rev.2, of the seven Decommissioning Groups, this facility should be classified as Group 2. Facilities in this Group are expected to have some residual radiological contamination present in building surfaces. Licensees in Group 2 typically possess historical records of material receipt, use, and disposal, such that quantifying past radiological material possession and use may be developed with a high degree of confidence. Furthermore, these licensees have radiological survey records that characterize the residual radiological contamination levels present within the facilities and at their sites. That is, they are able to demonstrate residual radiological contamination levels without more sophisticated survey procedures (greater than those used for operational surveys) or dose modeling. These licensees do not need to use site-specific parameters or establish site-specific DCGLs in order to demonstrate acceptability for release of their sites.

For Group 2 facilities, a DP is not required, but licensees must demonstrate that the site meet NRC screening criteria. A DP is not required because worker cleanup activities and procedures are consistent with those approved for routine operations, and no dose analysis is required. An assumption is made that the screening criteria is met when levels are below those in Table 7.

MDE issued specific individual licenses for radioactive material use which were terminated in 1990, when the NRC license became effective. MDE performed a closeout survey in that year for areas used which provides a benchmark of no contamination for the beginning of activities under the NRC license.

Since 1990, forty-three rooms were identified as impacted, where licensed materials were either used or stored, and require a close-out survey for building surface contamination. Most laboratories and use areas were associated with the radionuclides: H-3, C-14, I-125, P-32, P33, and S-35. Only two laboratories were identified with Cl-36. As radioactive material was removed from laboratories and as described in the application for the license, NIDA performed closeout surveys. Following the closeout surveys, these laboratories were considered as unrestricted for purposes of radiation control. Short-lived radionuclides such as those permitted under the MDE exemption would no longer be a contamination issue.

During closeout surveys, attention should be given to (1) the traps in the radioactive waste disposal sinks in Room 119 and (2) the radioactive air discharge vents and filter locations on the roof. The rooms where radioactive materials are stored in freezers (i.e., fourth floor mechanical room, freezer rooms) should also be characterized for contamination. In addition to these rooms, some radioactive waste was stored in a cargo storage container outside the facility near Room 121 that should also be surveyed.

To meet NRC requirements for the removal of Building C as an authorized use location and acceptable for unrestricted use, all licensed material must be removed; areas decontaminated as necessary; a close out survey must be performed; and any missing or incomplete surveys should be redone. The records of all close out survey must be presented to the NRC. Copies of available close out surveys are presented in Appendix C. Each survey should include the information listed below if that is not possible then a statement addressing missing data (such as make and model number of instruments) should be provided.

- A diagram of the area surveyed
- A list of items and equipment surveyed
- Specific locations on the survey diagram where wipe test was taken
- Ambient radiation levels with appropriate units
- Contamination levels with appropriate units
- Make and model number of instruments used
- Background levels
- Name of the person making the evaluation and recording the results and date.

Any missing records or records with incomplete data should be reviewed and the surveys redone as necessary; particularly, if long-lived material is involved.

Non-impacted areas would include areas in which radioactive materials were not used for laboratory work, storage, or animal boarding. Corridors adjacent to posted areas were periodically monitored for contamination with negative results but should still be reviewed during closeout work.

9.0 References

9.1 *Guidance for the Data Quality Objective Process*, U.S. EPA, 2000.

9.2 *A Non-Parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys,* NUREG-1505, U.S. NRC, 1999.

9.3 *Multi-Agency Radiation Survey and Site Investigation Manual*, EPA/402/R-97-016, Revision 1. NUREG-1575, U.S. NRC, August, 2000.

9.4 *Consolidated NMSS Decommissioning Guidance,* NUREG-1757 Volumes 1 and 2, U.S. NRC, 2003.

9.5 *Residual Radioactive Contamination From Decommissioning*, NUREG/CR-5512, October, 1992.

9.6 "Standards for Protection Against Radiation," Title 10 Code of Federal Regulations, Part 20 (10 CFR 20), U.S. NRC, as amended.

9.7 *Decommissioning Health Physics*, EW Abelquist, IOP Publishing Ltd, 2001.

9.8 *The Health Physics and Radiological Handbook*, Revised Edition, Scinta, Inc. Silver Spring, MD 20902, 1992.

9.9 NRC Materials License 19-09760-02, U.S. NRC, March 20, 2006.

9.10 *Program-Specific Guidance About Licenses of Broad Scope - Final Report*, NUREG-1556, Vol. 11, U.S. NRC, April 1999

APPENDIX A

HSA Personnel Interview Form

HISTORICAL SITE ASSESSMENT
NIH BUILDING C DECOMMISSIONING
PERSONNEL INTERVIEW FORM

Date: _____/ ____ /_____

Name: _____

Phone Number: ( ) -

e-mail address: _____

Title:

Time Period: _____ to _____

How many researchers did you supervise? _____
(please provide names, phone number and e-mail if available)

Names	Phone Number	e-mail

Work/Storage conducted in rooms: _____

Radionuclides & Maximum Quantity In Inventory At Any Time (please list all):

Radionuclide	Quantity	Radionuclide	Quantity	Radionuclide	Quantity
H-3					
C-14					
I-129					
P-33					

Any sealed sources? ____ Yes ____No
Any leak test results >0.005 uCi? ____ Yes ____No
If yes, please describe:

How was radioactive material received (central location, straight to lab, etc)?

Air Effluents (please indicate the use or presence of the following)

Fume and Biologic Hoods	____ Yes	____No
Exhaust Ductwork	____ Yes	____No
Exhaust filters	____ Yes	____No
Reactive chemicals (perchloric acid, picrates and azides)	____ Yes	____No
Detector cells?	____ Yes	____No
Were titanium tritide foil or scandium tritide foils vented to outside?	____ Yes	____No

Was radioactive material used in animal research? ____ Yes ____No

Where were animals kept during studies?

_____

Were there particular storage areas of material (safes, lockers, etc.)? ____ Yes ____No

_____

Waste Disposal

Radiological waste sink in use? ____ Yes ____No
Was an incinerator ever used? ____ Yes ____No
Where did laboratory waste go; interim storage? ____ Yes ____No

< 120 day half-life material was disposed by _____

> 120 day half-life material (H-3, C-14, etc.) by _____

How were animals disposed? _____

_____

Where there ever spills (small to large)? ____ Yes ____No
Description if yes--

Where are records of surveys kept? _____
Did your lab receive any lab violations (green sheets) ? ____ Yes ____No
What for if yes:

Any radioactive material currently in storage? ____ Yes ____No
If yes, where and what kind?

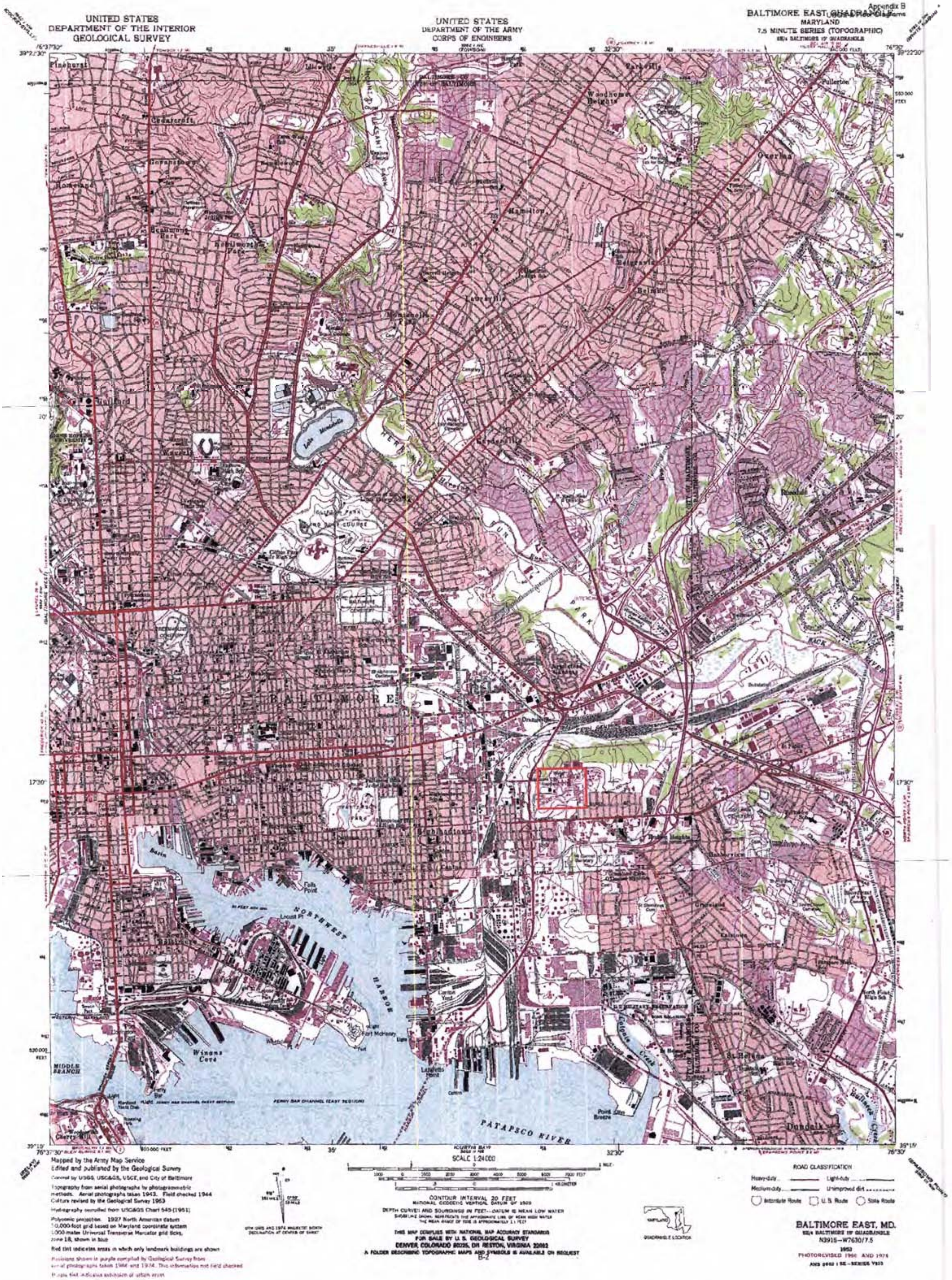
Were any contaminated animals or radioactive material buried onsite?____ Yes ____No
If yes, where and when?

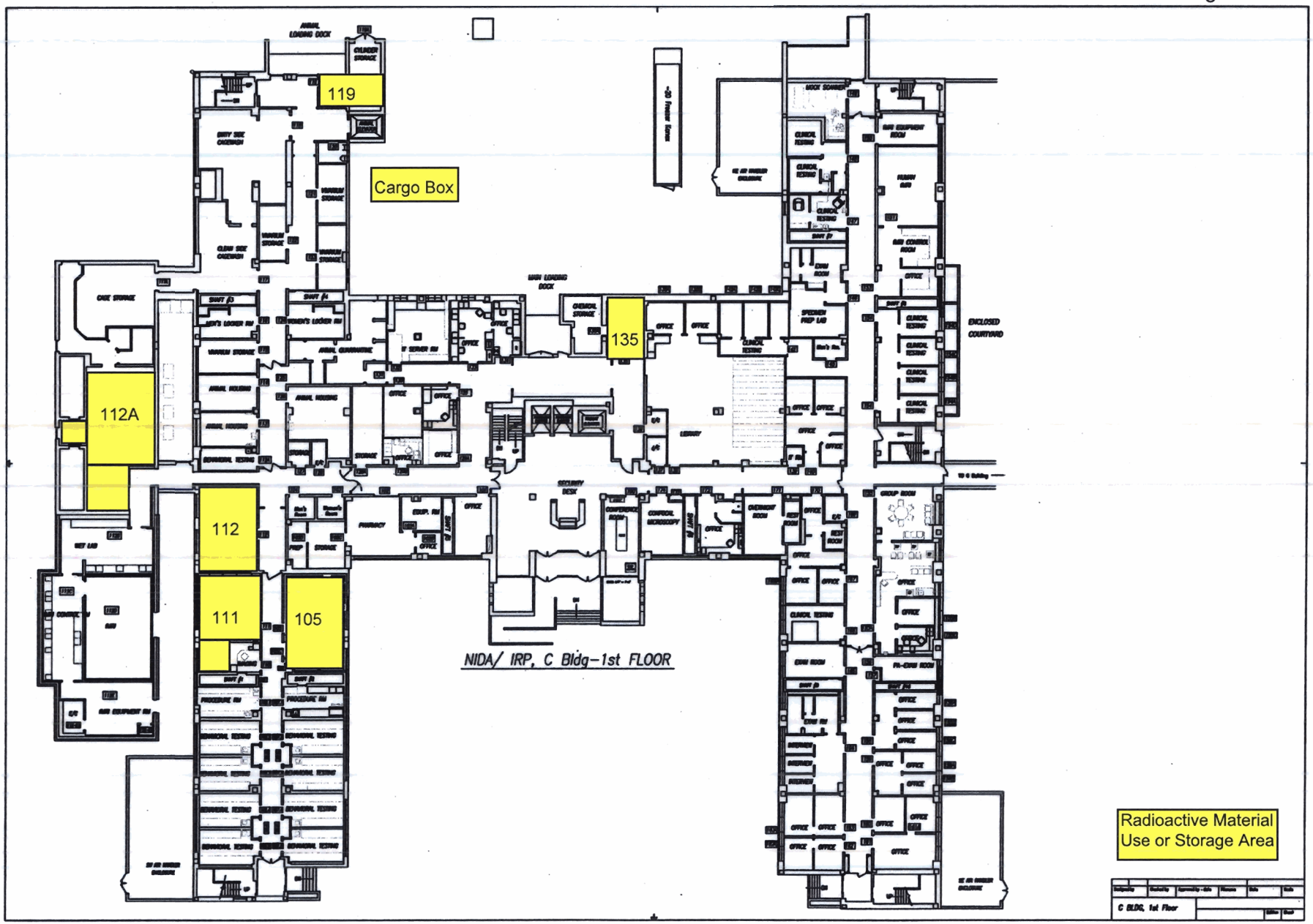
Do you recall any modifications/renovations of the labs where radioactive material was once used? ____ Yes ____No
Have any lab floors where R.M. was used been carpeted? ____ Yes ____No

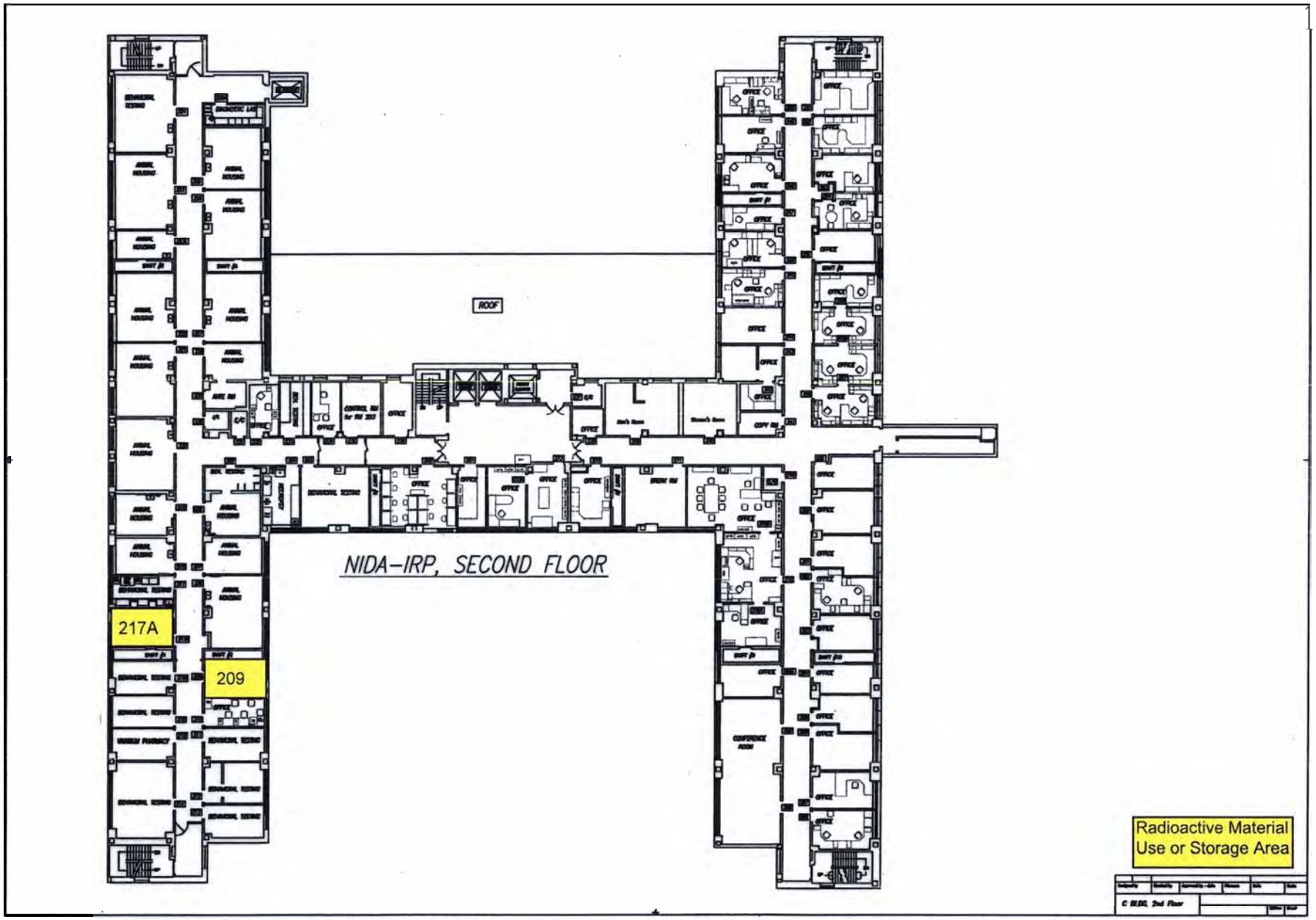
Please provide any comments which may aid in determining whether or not these areas were impacted. What is your expectation of any residual contamination (regardless of how small) and the best place to look for it?

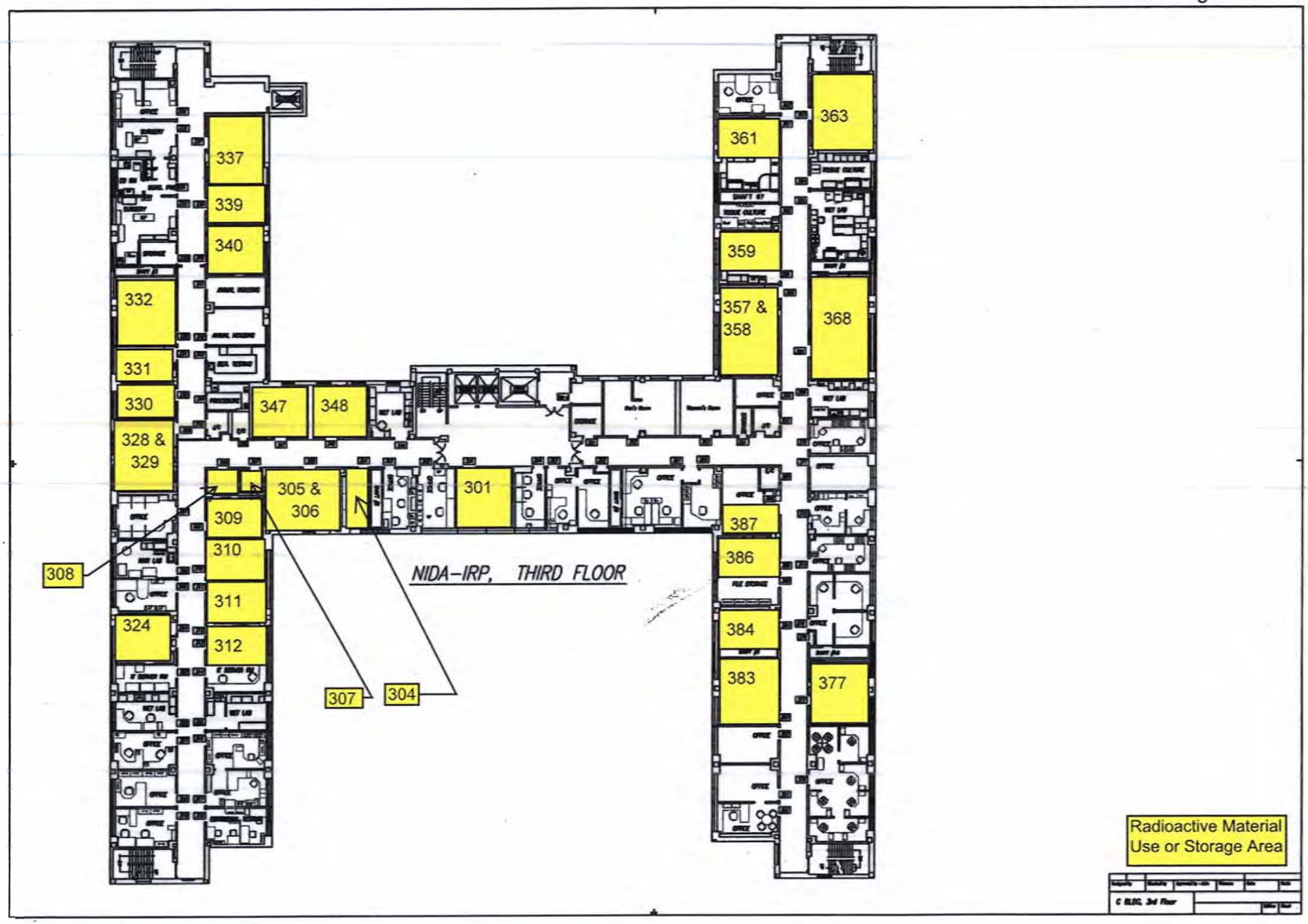
APPENDIX B

USGS Quadrangle and Floor Diagrams


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
BALTIMORE EAST QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
76°37'30"
39°22'30"
76°30'
32'30"
35'
20'
17'30"
39°15'
BALTIMORE
PATAPSCO RIVER
NORTHWEST HARBOR
Winans Cove
MIDDLE BRANCH
Fort McHenry
Lake Montebello
Dundalk
Mapped by the Army Map Service
Edited and published by the Geological Survey
Control by USGS, USC&GS, USCE, and City of Baltimore
Topography from aerial photographs by photogrammetric methods. Aerial photographs taken 1943. Field checked 1944
Culture revised by the Geological Survey 1963
Hydrography compiled from USC&GS Chart 545 (1951)
Polyconic projection. 1927 North American datum
10,000-foot grid based on Maryland coordinate system
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue
Red tint indicates areas in which only landmark buildings are shown
SCALE 1:24000
CONTOUR INTERVAL 20 FEET
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
QUADRANGLE LOCATION
ROAD CLASSIFICATION
Heavy-duty
Light-duty
Medium-duty
Unimproved dirt
Interstate Route
U. S. Route
State Route
BALTIMORE EAST, MD.
N3915—W7630/7.5
PHOTOREVISED 1966 AND 1974


119
Cargo Box
135
112A
112
111
105
NIDA/ IRP, C Bldg-1st FLOOR
Radioactive Material
Use or Storage Area


ROOF
NIDA-IRP, SECOND FLOOR
217A
209
Radioactive Material
Use or Storage Area


337
339
340
332
331
330
328 &
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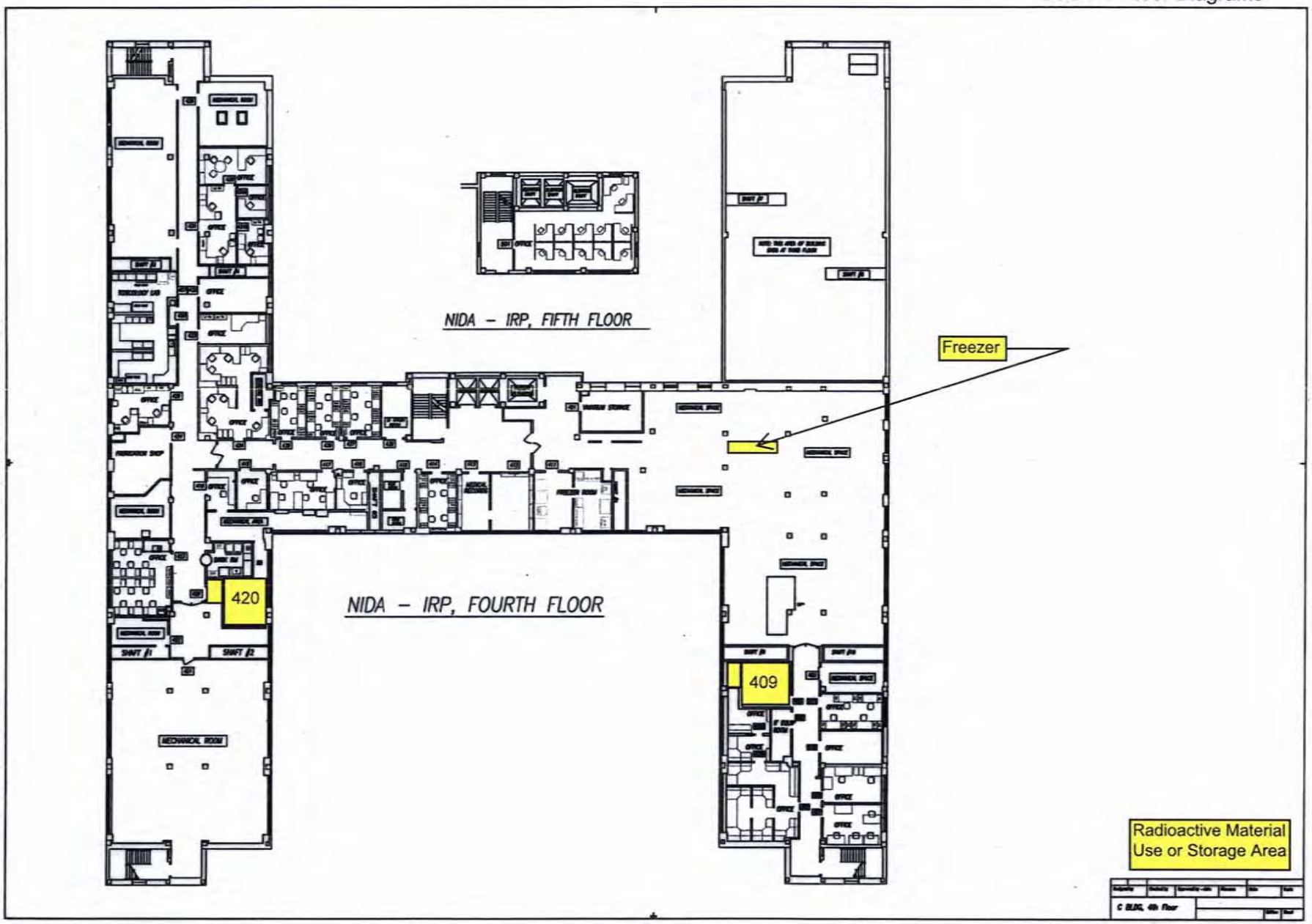
347
348
305 &
306
301
309
310
311
312
324
308
307
304
NIDA-IRP, THIRD FLOOR
361
363
359
357 &
358
368
387
386
384
383
377
Radioactive Material
Use or Storage Area


NIDA – IRP, FIFTH FLOOR
NIDA – IRP, FOURTH FLOOR
Freezer
420
409
Radioactive Material
Use or Storage Area

smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

- **Room 330:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 14 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 331:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 12 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 332:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 337:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 10 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 339:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 340:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 10 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

- **Room 309:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 310:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analyticals result for H-3, C-14 or P-32 was 15 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 311:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 312:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 6 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 324:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 14 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 328/329:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of

presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

- **Hallway 2-1:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 301:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 304:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 6 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 305/306:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analysis result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 307:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 308:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of

- **Room 135:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 11 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Cargo Container:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analyticalresult for H-3, C-14 or P-32 was 4 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 1-1:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analysis result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 1-2:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 6 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 1-3:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 209A:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 217A:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are

6.4 Review of Individual Survey Units

Each individual survey unit meets the release criteria. The following paragraphs present a summary of the direct, scan and smear measurement results for each survey unit. Often the results are zero or less than zero which is normal for measurements at or near background levels. All results with relevant standard deviations, uncertainty, efficiencies, areas, number of samples per area, and actual locations are presented in Appendices A-C; vendor laboratory results are presented in Appendix D.

- **Room 105:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 111:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 112:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 112A:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 119:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 35 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

Table 12. Comparison of Duplicate Sample Measurements

Room	Survey Unit N	1st Result (dpm/100cm^2)	StdDev 1st Result (dpm/100cm^2)	2nd Result (dpm/100cm^2)	Resolution	Actual Ratio	Required Ratio
105	1	1060	245	1650	4	0.6	0.5-2.0
111	12	2320	281	2600	8	0.9	0.6-1.66
112	13	2400	286	1620	8	1.5	0.6-1.66
112A	5	1460	255	1840	6	0.8	0.5-2.0
Hall 1-1	10	430	224	1560	2	0.3	None
209A	8	-100	204	870	<0	-0.1	None
217A	8	1020	245	540	4	1.9	0.5-2.0
Hall 2-1	8	1250	250	1750	5	0.7	0.5-2.0
301	11	-330	342	-1000	-1	0.3	None
304	8	-100	204	170	<0	-0.6	None
305/306	14	840	235	1080	4	0.8	0.5-2.0
307	8	1140	245	1570	5	0.7	0.5-2.0
308	8	1000	240	1320	4	0.8	0.5-2.0
310	7	480	122	590	4	0.8	0.5-2.0
311	4	860	235	1210	4	0.7	0.5-2.0
312	1	-130	347	-370	<0	0.4	None
324	10	1670	265	1380	6	1.2	0.5-2.0
328/329	4	190	214	380	1	0.5	None
330	8	410	219	840	2	0.5	None
331	8	830	235	1140	4	0.7	0.5-2.0
332	9	1630	265	810	6	2.0	0.5-2.0
337	8	320	219	240	1	1.3	None
339	8	400	219	190	2	2.1	None
340	8	540	224	760	2	0.7	None
347	8	570	230	920	2	0.6	None
348	8	90	255	-180	0	-0.5	None
349	8	30	209	240	0	0.1	None
357/358	8	430	224	670	2	0.6	None
361	8	780	235	900	3	0.9	None
363	4	830	235	760	4	1.1	0.5-2.0
368	10	160	214	190	1	0.8	None
372	15	-110	347	-1030	<0	0.1	None
383	3	-60	347	-480	<0	0.1	None
384	8	-450	240	-390	-2	1.2	None
385	8	-240	413	270	-1	-0.9	None
386	8	170	214	440	1	0.4	None
387	6	160	352	-710	0	-0.2	None

Table 11. Criteria for Accepting the Measurement*

Resolution	Ratio
<4	
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

A beta static measurement was selected for quality control comparison from individual survey units. The results are summarized in the tables below. Drawings and locations are provided in Appendix A. Required ratios were not given by the NRC for resolutions <4 which includes negative values, very low values, and most below the MDC; these are deemed acceptable as both the first and second results are low; twenty-two of the duplicate measurements fell into this category. Fifteen comparisons had rounded resolutions of 4 or more and the actual ratios were within the range of the required ratios. Table 12 provides the values used in the comparison.

Table 10. Summary of Static, Scans and Gross Smear Measurements (Continued)

Room/ Hallway	N Statics	Statics (dpm/100cm^2)		Scans (dpm/100cm^2)	N Smears	Gross Smears (dpm/100cm^2)	
		Average	Maximum	Maximum		Average	Maximum
386	15	395	890	1120	17	22	150
387	15	40	970	549	15	22	110
Hall 3-1	15	1295	1970	2466	15	17	100
Hall 3-2	15	1237	1810	1723	15	7	100
Hall 3-3	15	931	1780	1814	15	5	140
Hall 3-4	15	1152	1780	2094	15	45	110
Hall 3-5	15	1227	1790	2488	15	-11	90
409	15	1207	1920	1676	18	8	90
420 A	15	201	750	1232	15	39	100
Hall 4-1	15	139	520	853	15	22	100
Hall 4-2	15	123	540	630	15	10	150
Hall 4-3	15	-61	360	923	15	12	80

* For Room 301, the selected counter background material was originally Formica; however, the measured values appeared low and a more conservative background material of linoleum was selected. Even with the change, the result average was negative, perhaps due to a preservative coating on the table. When residual levels are close to background, it is not uncommon to encounter negative values for the average static measurements as was the case here for seven survey units. Positive results are expected also to background variability and may be skewed even more to the positive as conservative surface efficiencies were applied.

6.3 Results of Miscellaneous Duplicate Measurements

The survey technicians were afforded the opportunity to perform judgmental measurements in areas of highest potential contamination (e.g., corners, seams between concrete pours, or base of support poles) based on professional judgment. This provides a qualitative level of confidence that no areas of elevated activity were missed by the random measurements and that there were no errors in area classification. Additionally, the technicians selected 37 unique locations for duplicate measurements.

Guidance found in NRC Inspection Procedure 84750 was used to determine if data quality was met per set of duplicate measurements. Review and follow-up actions was per that document. Professional judgment was used for sample results that were negative or less than the MDC. The following NRC guidance is presented:

- Divide the first result for each sample by its associated uncertainty to obtain the resolution. (Note: For purposes of this plan, the uncertainty is defined as the relative standard deviation, one sigma, of the lab results as calculated from counting statistics.)
- Divide each first result by the corresponding second result to obtain the ratio (First result/second result).
- The measurements are in agreement if the value of the ratio falls within the limits shown in the following table for the corresponding resolution.

Table 10. Summary of Static, Scans and Gross Smear Measurements

Room/ Hallway	N Statics	Statics (dpm/100cm^2)		Scans (dpm/100cm^2)	N Smears	Gross Smears (dpm/100cm^2)	
		Average	Maximum	Maximum		Average	Maximum
105	15	2015	2830	4481	19	-8	90
111	15	2187	3030	3474	20	20	100
112	15	2079	3030	4462	20	14	100
112A	15	1909	2370	3715	18	54	290
119	15	1111	1970	3211	15	41	170
135	15	1415	2400	4544	15	29	100
Cargo	15	517	920	-665	15	36	110
Hall 1-1	15	989	1890	2610	15	41	100
Hall 1-2	15	779	1700	-627	15	31	160
Hall 1-3	15	667	1410	848	15	34	150
209A	15	761	1600	6710	17	32	90
217A	15	552	1300	7064	17	32	90
Hall 2-1	15	1244	2160	1374	15	22	110
301	15	-278*	170	529	16	13	90
304	15	68	490	2302	16	-9	140
305/306	15	353	1020	1575	17	17	100
307	15	1221	1570	3433	16	-6	90
308	15	1158	1440	4301	15	17	70
309	15	568	1100	1138	17	37	100
310	15	483	750	2225	18	49	120
311	15	1379	1760	2186	19	-2	90
312	15	-135	440	860	15	19	100
324	15	1214	2140	613	15	22	130
328/329	15	540	1080	897	19	12	130
330	15	650	1300	1272	17	18	170
331	15	995	1330	1414	17	14	70
332	15	995	1630	2015	18	-3	80
337	15	213	570	1777	19	18	160
339	15	254	560	1737	17	27	120
340	15	461	830	1535	17	7	70
347	15	447	810	1272	17	29	170
348	15	-147	200	1676	17	-27	70
349	15	195	570	555	17	-2	130
357/358	15	581	860	2363	17	43	100
359	15	842	1790	1818	15	25	150
361	15	709	1320	2244	22	28	160
363	15	909	1400	1923	19	29	70
368	15	435	790	1287	20	-6	90
372	15	-698	110	1696	15	27	130
377	15	419	1290	2262	15	57	160
383	15	-341	50	787	15	24	120
384	15	-353	10	232	16	7	90

6.1 Background Material Results

Table 9 summarizes the results of the measurements for the reference materials with the three types of instruments used. The survey code is presented as a guide to the data sheets found in Appendix A.

Table 9. Summary of Reference Material Measurements

Reference Material	Survey Code	Ludlum 43-68		Ludlum 43-37		Ludlum 43-37-1	
		Background (cpm)	StdDev (cpm)	Background (cpm)	StdDev (cpm)	Background (cpm)	StdDev (cpm)
Concrete Painted	CP	246	13	873	22	876	42
Black Lab Top	BL	229	13	737	33	not used	not used
White Lab Top	WL	226	13	not used	not used	939	43
Unpainted Concrete	CU	349	26	1087	38	1469	49
Linoleum Tile	TL	255	12	819	27	957	27
Sheet Linoleum	SL	275	16	884	25	1043	36
Formica Tables	FT	303	22	not used	not used	1219	35
Carpet	CF	342	16	880	33	1295	34
Metal	SS	296	24	785	33	not used	not used
Jig Blank	JB	373	24	945	38	1211	49

6.2 Survey Unit Results for Required Measurements

The following table summarizes the results of the static, scan, and smear measurements for the survey units; respectively. Details of measurement results including standard deviations and uncertainty for each individual location are provided in Appendices A-C. Drawings showing measurement locations are provided in Appendix A.

For static calculations, the background material in the particular room which produced more conservative results was selected and applied to every measurement in the room; i.e., the background of 226 for "White Lab Tops" would be selected over that for "Concrete Painted" of 246. For scan calculations, backgrounds were particular to the material being scanned.

RSO, Inc., reported that there were 5 additional smear samples included with the Chain of Custody dated June 28, 2008. None of the results from these smears were considered remarkable and it is assumed they stuck to the smear actually being used. These results are presented in Appendix D but were not included in data analysis as FSS data.

6.0 DATA INTERPRETATION

During the FSS, data was documented so that aspects of the FSS can be referenced in the future if desired. The survey documentation is of sufficient detail to allow for the recreation of the survey procedure, location, instrumentation used, and results.

Fixed measurements, scanning measurements, and removable contamination were documented in detail. Instrument measurements and analytical results include the following data:

- Daily background measurements
- Location of the measurement or sample
- Date and time of the measurement or sample
- Gross or net instrument readings. Net instrument readings will often be negative since samples without any added radioactivity will often be below the background count. These numbers were recorded since they may be necessary for statistical evaluation of the data.
- Measured concentrations in dpm/100 cm^2 for surface contamination
- Name of surveyor, sampler, or analyst
- Instrument specifications and calibration date
- Minimum detectable concentrations or activity
- Name of person reviewing results
- Other relevant information

Per NUREG-1757, Vol.2, the survey results (presented in Appendix A) for each survey unit include the following:

- the number of samples taken for the survey unit;
- a description of the survey unit, including (a) a drawing of the survey unit showing the random locations for Class 3 survey units, and (b) discussion of unique material features and remedial actions;
- the measured sample concentrations, in units that are comparable to the DCGLs;
- the statistical evaluation of the measured concentrations.

The locations of static and smear measurements and scanning sections are illustrated in Appendix A. Statistical data in the appendices are shown by rounding and minor errors in calculations may propagate.

5.7.6 Determination of Survey Point Locations

Before the surveys were conducted within a survey unit, a fixed reproducible starting point was selected, such as the southwestern corner of the survey unit at ground level. The survey unit points were provided with the FSS drawings. Equipment such as tape and laser measurers were used in the measurement of the survey units for the FSS. SAE units (feet and inches) of measure were used..

Reference material measurements were taken and recorded in a similar fashion to measurements taken in the survey units. The gross activity measurements (uncorrected for background) in the reference area(s) were compared to the gross activity measurements in the survey units to determine if the null hypothesis (the survey unit is contaminated) is accepted or rejected. All reference material and Class 3 survey points were randomly selected.

The (0, 0) point was generally taken as the left corner of the survey unit or survey area as the area is entered. Survey unit diagrams are provided in Appendix A. Class 3 survey unit maps were deemed to be of sufficient clarity that coordinates were not shown.

5.7.7 Surface Activity Measurements

Each survey unit and the reference area were initially designed to have a minimum of 15 randomly located survey points. All survey units received a 100% beta scan on work surfaces, floors, fume hoods, and sinks. A smear was performed at each survey point and on selected drains, sinks, or HVAC vents.

Direct Measurements

Direct measurements of surface activity were performed at selected locations using the Ludlum 43-68 instrumentation listed in Table 5. Measurements were conducted by integrating counts over a 1 minute period.

Removable Contamination Measurements

A standardized method for smear testing of a relatively uniform area was used to aid in comparing contamination at different times and places. A smear taken from an area of about 100 cm^2 is deemed acceptable to indicate levels of removable contamination.

5.7.5 Determining the Number of Survey Points

The following technique is used to determine the number of samples required. Section 5.5.2.2 of MARSSIM describes the process for determining the number of survey measurements necessary to ensure a data set sufficient for statistical analysis. For building and structure surfaces, the Wilcoxon Rank-Sum (WRS) test may be used. The method for determining the combined number of data points (N) for the survey unit and reference area is based on the expected contaminant variability and the predetermined acceptable Type I and Type II error rates. The project data quality objectives (DQO) established the Type I and Type II error rates (α and β respectively) at 0.05.

The "relative shift" (Δ/σ) is the ratio involving the concentration to be measured (Δ) relative to the expected variability in that concentration sigma (σ), and can be thought of as an expression of the resolution of the measurements. The sigma (σ) is selected from the larger of that found in the survey unit or the reference area. The shift (Δ) is the width of the statistical gray region or difference in the release criterion and the Lower Bound of the Gray Region (LBGR). The gray region is the area where the impact of making an incorrect error decision (Type I or Type II error) is small. The LBGR is the concentration at which the type II error rate is set. It is advantageous to set the LBGR at or above the expected median contaminant concentration in the survey unit. Preliminary data indicated that residual levels up to 2000 dpm/100cm^2 or about 40% of the DCGL was expected and was set as the LBGR. The LBGR also represents average concentrations that one expects to find after remediation is complete; by definition, the LBGR is something less than the DCGL. Preliminary data also indicated that the worst case for sigma (σ) as ~ 700 dpm/100cm^2 which was about 14% of the DCGL. All of this is summarized in the following formulas:

$$\frac{\Delta}{\sigma} = \frac{DCGL - LBGR}{\sigma}$$

$$\frac{\Delta}{\sigma} = \frac{5000 - 2000}{700}$$

$$\frac{\Delta}{\sigma} \approx 4.3$$

To determine the number of data points needed in each survey unit and reference area, MARSSIM Table 5.3 is used. The low level of contaminant averages and associated sigmas drove the relative shift to levels (4.3 and higher) which are not particularly useful for an FSS design. MARSSIM recommends that if the relative shift is greater than 3 to adjust the LBGR until the relative shift is between the values of 1 and 3. This adjustment would be required for all survey units. At a derived relative shift of 3 and with the DQOs for α and β at 0.05, the required number of data points needed in each survey unit and reference area is 10. By selecting 15 as the target number of sample locations in each survey unit, the probability of not obtaining sufficient data obviously diminishes. Each structure survey unit and the reference materials are expected to have a minimum of 15 survey points; in fact, each reference material received 20 measurements. However, from the HSA, preliminary data was available to estimate the relative shift which was confirmed during the FSS.

- Class 3 areas are impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the DCGL.

- Non-impacted areas: For this facility, the HSA concludes that potentially impacted areas do not include any other floors or areas as radioactive material was used exclusively in the basement.

5.7.2 Selection of Area Size and DCGLs for Survey Units

Suggested survey unit sizes from MARSSIM are given in the following table. These areas are suggested in MARSSIM because they give a reasonable sampling density and they are consistent with most commonly used dose modeling codes. However, the size and shape of a particular survey unit may be adjusted to conform to the existing features of the particular site area.

Table 8. Suggested Area Limits for Survey Units

Class	Structures - floor area
1	Up to 100 m^2
2	100 to 1000 m^2
3	no limit

For this survey, each individual laboratory and the considered hallways were treated as individual survey units.

5.7.3 Surface Scans

All work areas and floors in each survey unit received a 100% beta-gamma scan; this exceeds the MARSSIM requirement and precludes errors of professional judgment regarding the scanning of suspect areas as all are scanned. As directed by MARSSIM, each survey unit received a surface scan using appropriate survey instruments. Scan speed (observation time) was pre-determined per survey unit depending upon the DCGL and area size; minimum scanning time goals were set. For beta contamination detectors, scanning at much less than one detector width per second was required to ensure that the scan MDC met the project DQOs.

5.7.4 Background Materials

The background or reference materials were chosen due to their similarity in construction materials, construction date, and absence of any history of storing or handling radioactive materials.

For comparability of results, survey measurements were collected from the reference material areas using similar instruments and survey techniques employed in the survey unit areas. Each background reference material was surveyed using 20 random static measurements.

The standard deviation of the instrument total efficiency was about 0.013 cpm/dpm.

4) The total uncertainty in the measurement activity related to the efficiencies and the net count rate is determined using MARSSIM's equation for error propagation for division:

$$\sigma_u = \frac{C_{net}}{\varepsilon_{total}} * \sqrt{\left(\frac{\sigma_{eff}}{\varepsilon_{total}}\right)^2 + \left(\frac{\sigma_r}{C_{net}}\right)^2}$$

$$\sigma_u = \frac{60-55.6}{(0.25*0.552)} * \sqrt{\left(\frac{0.013}{0.138}\right)^2 + \left(\frac{9}{60-55.6}\right)^2} \text{ dpm}$$

$$\sigma_u = 65 \text{ dpm}$$

5) The activity will then be 32 dpm/100 cm^2 and the total uncertainty for this one sigma formula will be about 65 dpm/100 cm^2. (Note that the count time is considered to have trivial variance and is assumed to be a constant.)

Referring to MARSSIM Table 6.9, a k value of +/-1.96 represents a confidence interval equal to 95% about the mean of a normal distribution. Therefore, the 95% confidence interval would be 1.96 x 65 dpm/100 cm^2 = 130 dpm/100 cm^2. The final result is 32 +/- 130 dpm/100 cm^2. These values are presented for each measurement in the results with any adjustment required for the physical size of the probe.

Similar equations and techniques were used for static and scanning measurements.

5.7 Survey Plan

5.7.1 Area Classification

For the indicated impacted areas at the facility, the HSA suggests that classification of impacted areas be into one class, based on MARSSIM definitions for Class 1, 2, and 3 given below. The Acceptable License Termination Surface Screening Values listed in Table 4 above were used in this determination and all impacted areas were deemed to be Class 3. Although minor spills are common in laboratory research, the HSA did not identify large quantities that would require more than ordinary cleanup practices.

- Class 1 areas are impacted areas that, prior to remediation, had concentrations of residual radioactivity above the DCGL.

- Class 2 areas have or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the DCGL.

1) The total number of disintegrations is:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

$$\frac{dpm}{100cm^2} = \frac{60cpm - 55.6cpm}{(0.25epm/dpm)(0.552cpm/epm)\left(\frac{100cm^2}{100cm^2}\right)}$$

$$\frac{dpm}{100cm^2} = 32$$

2) The equation used for calculating the standard deviation of a count rate over a time t with consideration given to background is found as MARSSIM formula (6-15) modified here considering that the background sigma was determined for a sequence of background counts:

$$s_r = \sqrt{\frac{R_c}{t_c} + \sigma_B^2}$$

$$s_r = \sqrt{\frac{60cpm}{1\min} + (5.1cpm)^2}$$

$$s_r = 9cpm$$

3) The uncertainty for the instrument efficiency was estimated at one standard deviation for the set of 20 measurements of the check source and corresponding 20 measurements of the instrument background using the following approach.

$$\varepsilon_{total} = \frac{AverageCountRate - AverageBackgroundRate}{4\pi EmissionRate}$$

The equation used for calculating the standard deviation of a net count rate over a time t with consideration given to background is found as MARSSIM formula (6-15):

$$s_r = \sqrt{\frac{R_c}{t_s} + \frac{R_B}{t_B}}$$

Where:

R_c = Sample count rate (cpm)

R_B = Background count rate (cpm)

For this work, t_B is the total number of one minute counts used to determine the background count rate is 20. This value is used for reference area counts for static/scan measurements and a laboratory blank is used for smears.

The MARSSIM equation for error propagation for division or multiplication is used to calculate total uncertainty:

$$\sigma_u = u * \sqrt{\left(\frac{\sigma_x}{x}\right)^2 + \left(\frac{\sigma_y}{y}\right)^2}$$

where u = x / y or x * y

The following example of a typical determination of the measurement result for a smear (see results for sample 11, Room B201) and its related uncertainty at the 95% confidence level is provided. The following is given:

C_s = 60 cpm

R_B = 55.6 cpm

t_S = 1 min

t_B = 20 min

ε_i = 0.552 epm/dpm

ε_s = 0.25 cpm/epm

a = 100 cm^2

Background and sample count times used to analyze a smear on the Ludlum 2929 are typically twenty minutes and one minute, respectively. When the background count time and the sample count time are different, the following MDC formula, taken from NUREG-1507, Equation 3-11, as modified for here, applies:

$$MDC = \frac{3 + 3.29\sqrt{R_B t_S\left(1 + \frac{t_S}{t_B}\right)}}{(\varepsilon_s)(\varepsilon_i)(t_S)\left(\frac{a}{100cm^2}\right)}$$

where:

a = area of surface smear in cm^2, nominally 100 cm^2

5.6 Reporting Activity and Confidence Intervals

The term "measurement uncertainty" is used interchangeably with the term standard deviation. The uncertainty is qualified as numerically identical to the standard deviation associated with a normally distributed range of values. When reporting a confidence interval for a value, the range of values that represent a pre-determined level of confidence (*i. e.*, 95%) is made. To make this calculation, the final standard deviation, or total uncertainty σ_U as shown in MARSSIM Equation 6-16, is multiplied by a constant factor k representing the area under a normal curve as a function of the standard deviation. The values of k selected for this report is 1.96 representing a 95% confidence level.

The basic formula for calculating the dpm per 100 cm^2 is repeated here as follows:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_B}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

Note that the numerator has an uncertainty associated with the count rates and the denominator has two efficiency terms and each of them has an uncertainty also. The standard deviation of the count rate is determined by MARSSIM equation 6-15; the uncertainty of the source efficiency is stated in Table 5.5 of NUREG-1507 as +/- 0.054 at the 95% CL; and the uncertainty of the calibration sources are presented above. The percentage uncertainty related to the instrument efficiency is assumed to be equal to the uncertainty percentage values reported for the calibration sources. The total efficiency uncertainty was determined through propagation of the uncertainties related to ε_s and ε_i. The uncertainty of the measurement was then determined through propagation of the uncertainties related to ε_{total} and the uncertainty of the count rate. Handling only two at a time of the various uncertainties permitted the use of the uncertainty propagation techniques described in paragraph 6.8.3 of MARSSIM.

where:

1.38 = a desired performance proportions level of 0.95 for true positive results and a level 0.6 false positives;
R_B = Background rate in cpm; and
$\sqrt{0.5}$ = MARSSIM determined level of performance for the surveyor.

Table 7. Nominal Beta MDCs and MDCRs

Model	Serial	Area (cm^2)	Background (cpm)	ScanMDC ($dpm/100cm^2$)	ScanMDCR (cpm)	Static MDC ($dpm/100cm^2$)	Static MDCR (cpm)
43-68	PR148454	126	373	1158	292	107	27
43-37	PR128625	582	945	399	465	Not used	
43-37-1	PR145081	771	1211	341	526	Not used	

5.4 Beta Surface Activity Measurements

A beta measurement for surface activity is performed over an area, represented by the physical surface area of the detector. To convert instrument counts to conventional surface activity units, the following equation is used:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

C_s = Integrated counts recorded by the instrument
C_b = Background counts recorded by the instrument
t_S = Sample counting time
t_B = Background counting time

5.5 Smear Analysis

All smears were analyzed with the Ludlum 2929 or Ludlum 3030 for a gross determination of contamination levels as dpm/100 cm^2. Except for H-3, the efficiencies are acceptable, e.g., C-14 as 8%. Smears were then analyzed for H-3 and I-125 by Radiation Services Organization, Inc, (RSO), Laurel, MD. The liquid scintillation counting technique used for H-3 permits concurrent analysis for C-14 and P-32. I-125 analysis was performed with gamma spectroscopy with a reported MDA of 20 dpm per a batch of 10 wipes.

5.2.2 Description of Instrument Calibration and Use of Check Sources

Calibration of the NaI probe was performed in a Cs-137 gamma field as 1) response is energy dependent and 2) the manufacturer provides multipliers to the response to Cs-137 gamma energy for responses to other energies.

For beta measurements, calibration to C-14 was performed. C-14 decays by beta emission with a maximum energy of 0.156 MeV and an average energy of 0.05 MeV. Use of C-14 is considered conservative as the C-14 average energy is considerably less than the beta energy for Co-60, about the same as the electron from Ag/109m, and at least a magnitude less than the average positron energy from Ga-68. Instrument efficiency in the field will be better than that reported and results will be reported higher than actual.

The daily check sources used were traceable to the National Institute of Standards and Technology (NIST). Calibration sheets and instrument use logs are filed in ChesNuc's Field Notes.

5.3 Efficiency Determinations and Minimum Detectable Concentrations

5.3.1 Beta Static and Scan Minimum Detectable Concentrations (MDC)

NUREG-1507 (Reference 8.6) provides a rigorous derivation of the calculational expression for instrument sensitivity, typically stated as the minimum detectable concentration (MDC). The MDC equations and example values for both static measurements and swipe analysis are presented in this section.

For static measurements, background and indicator measurements are both typically one minute in duration. The following equation for the MDC from NUREG-1507, Equation 3-10, as modified, applies:

$$StaticMDC = \frac{3 + 4.65\sqrt{C_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

C_b = Background count in one minute
ε_i = Intrinsic instrument efficiency
ε_s = Surface efficiency
a = probe area in cm^2

For scanning, the time interval over an area is typically one second. The following equation is developed from reference NUREG-1507.

$$ScanMDC = \frac{1.38 * 60\sqrt{\frac{R_B}{60}}}{\sqrt{0.5}(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

Table 6. Instruments

Application	Instrument	Probe Physical Area
Fixed-point measurements	Ludlum 2350-1 data logger with Ludlum 43-68 Gas Flow Proportional	126 cm^2
Beta scans	Ludlum 2350-1 data logger with either detector (1) Ludlum 43-37, (2) Ludlum 43-37-1, *or* (2) Ludlum 43-68 Gas Flow Proportional	582 cm^2 771 cm^2 126 cm^2
Smears	Ludlum Model 2929 sample counter; Detector Model 43-10-1 Alpha beta sample counter, scintillator is ZnS(Ag)	2 inch diameter

5.2.1 Description of Probes

Beta-gamma (gas flow) probes 43-68, 43-37 and 43-37-11 gamma probes were used in this survey. A photo of the 43-68 is shown in Figure 3; the 43-37 and 43-37-1 are similar in construction to the 43-68.

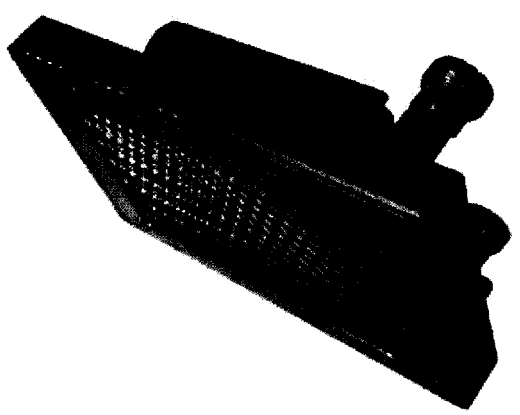


Figure 7. Ludlum Model 43-68

Manufacturer data for the physical probe area of the Ludlum 43-68 probe indicates dimensions of 3.9"(10cm)H X 4.6"(11.7cm)W X 7.8"(19.8cm)L; the area used for measurements is the screened area of 126 cm^2. Manufacturer data for the physical probe area of the Ludlum 43-37 probe is quoted as 582 cm^2 and for the 43-37-1 probe as 771 cm^2.

5.2 Instrumentation

ChesNuc performed the specified radiation scan and measurements using its proprietary Mapping and Radiation Survey System (*MARSS-Surveyor*). *MARSS - Surveyor* is an integrated radiation survey system. It was specifically designed to plan, perform, and coordinate radiological surveys coupled with management, evaluation, and reporting of radiation measurement data. Its survey planning and data collection capability support MARSSIM site characterization and final status surveys. Scan measurements are continually recorded on a hand-held personal data assistant (PDA) on a user-defined frequency, typically set at about once every second. Static measurements are collected and recorded directly into the system data management system, linking the location, survey unit, and instrument data for automated data evaluation and reporting. This approach provides automated survey records, and does not have to rely on the user alone for identifying elevated measurements.

The Base Unit is designed to manage the overall radiological survey project data. At the initiation of a project, survey requirements are established in the Base Unit for use in guiding the overall survey performance and evaluation. The Surveyor field units provide the scan and static measurement devices, collecting the prescribed radiation measurements coupled with other key information, such as survey unit, designated locations, date and time, user selected background, and key instrument information. MARSS-Surveyor has built-in data summary and reporting functions that support timely preparation of the required FSS reports.

The instruments selected for use during the FSS and their applications, which are integral to the MARSS-Surveyor system, are provided in Table 5.

Table 6 lists the characteristics and application of the instruments; these instruments or equivalent will be used. All instruments were calibrated using NIST-traceable standards. Instruments will be response checked daily to ensure they are operating properly. In keeping with ANSI guidance, an acceptable ± 20% response range is determined *a priori*.

Instrument records, including dates of use, efficiencies, probe areas, calibration due dates, and source traceability are maintained. These records are integral to the application of *MARSS-Surveyor* to this project.

For field applications, it is important that the values of the MDC, Investigation Level, and acceptable release criteria are well documented and understood in the field. From a project planning standpoint, these values/criteria are typically expressed in dpm/100cm^2. The *MARSS-Surveyor* system provides the mechanism for integrating these values/criteria directly to the field surveys. MDCs are verified; Investigation Level alarms are established for the field instruments; and data for documenting compliance with the release criteria are automatically stored and evaluated.

5.0 SURVEY PLAN AND PROCEDURES

5.1 FSS Data Quality Objectives

Data Quality Objectives (DQOs) are fundamental components for planning. These will be considered during the scoping surveys, become formal elements of the FSSP, and integrated/implemented during the FSS performance. The objective of the FSS is to prove that the residual radioactivity levels in the survey units within the facility are at or below the release criteria. The following DQOs are quantitative and qualitative statements derived from the output of the DQO process.

- The number of survey measurements and locations per survey unit will be determined by MARSSIM techniques. Not less than 10 measurement locations will be used for each radioactive use laboratory, storage area or for each segment of hallway contiguous to radioactive material use and storage areas
- The background reference area or materials will be located in the facility from an area that has similar construction materials to those being surveyed and located.
- For beta fixed-point and scanning measurements, excluding H-3, instrument MDCs will be less than 2500 dpm/100 cm^2 which is 50% of the total surface activity release criteria for averages.
- For I-125 smear measurements, the instrument MDC must be less than the release criteria (20 dpm/100 cm^2); I-125 analysis need not be performed for areas with known decay of >20 half-lives since last use. For all other smear measurements, instrument MDCs will be less than 50% of the removable activity release criteria (<500 dpm/100cm^2) for the category of "all other radionuclides". For gross smear measurements, instrument MDCs will be less than 500 dpm/100 cm^2 which is 50% of the removable activity release criteria; excluding H-3 and I-125.
- Smear measurements for H-3 will serve as a surrogate for total surface activity and smear measurement results will be considered as 10% of the total activity. The smear investigation level (IL) will be measurements >500 dpm/100 cm^2.
- Quality control (QC) measurements will be made to evaluate instrument and operator precision; at least 35 of fixed point measurements will be re-performed by the radiological engineer. Acceptability of measurements will be determined using guidance found in NRC Inspection Procedure 84750.
- A beta-gamma scan will be performed over 100% of work areas and floors within the laboratory and storage areas. Contiguous hallways will also receive a 100% scan (beginning and end determined by professional judgment). The scanning investigation level (IL) will be measurements > 50% DCGL; excluding H-3 and I-125.
- A response check form or instrument control log will be used to keep track of background counts and response checks on a daily basis during work activities.

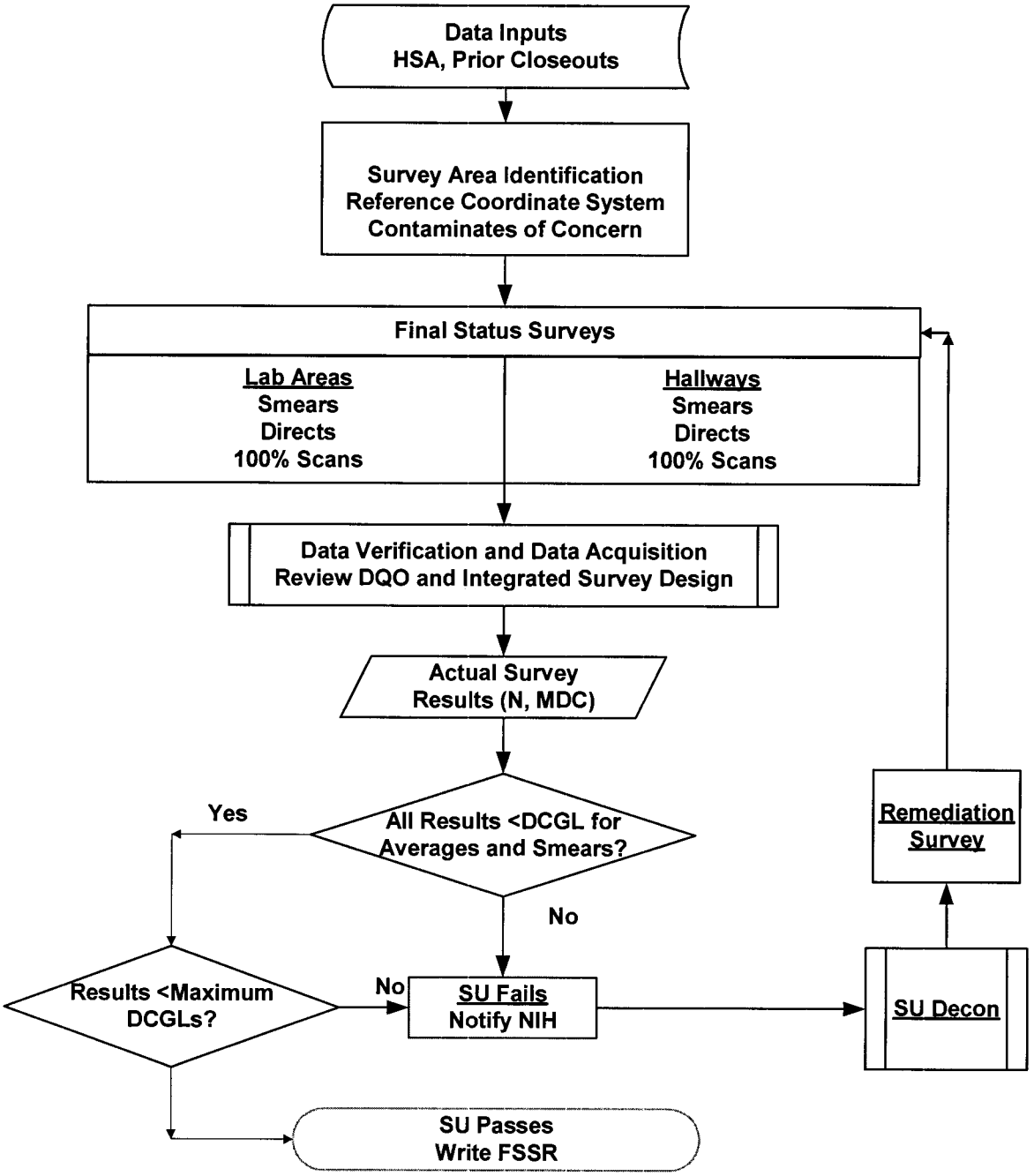


Figure 6. Work Process Flow Chart

4.5 General Survey Plan

The survey plan consisted of systematic processes and procedures that have been deemed acceptable by industry practices and the NRC. MARSSIM methodology and its graded approach were afforded particular attention. Activities (organized units of work needed to complete a function) were defined and tasks (specific work assignments within a specific activity) were delegated to the appropriate team members. Table 5 provides a breakdown of activities and tasks of the FSSP.

Table 5. Overview of Major Activities and Tasks

Activities	Tasks
Evaluate contamination potential	1. Review radiological data from scoping and characterization surveys.
	2. Identify radionuclides of concern and determine DCGLs.
	3. Identify boundaries of survey units and classes.
Establish reference system	1. Determine frequency and locations of measurements to meet criteria.
	2. Prepare facility survey maps and work packages.
Determine background levels	1. Review HSA.
	2. Measure indoor beta levels on various materials.
Perform Measurements	1. Perform surface scans.
	2. Perform fixed point measurements.
	3. Collect smears.
Analyze samples	1. Count smears
Interpret data	1. Convert data to standard units.
	2. Calculate average levels.
	3. Compare data with criteria.
Prepare report	1. Construct data tables.
	2. Develop graphics.
	3. Prepare text.
	4. Submit report.

An example work process flow chart is shown in Figure 6.

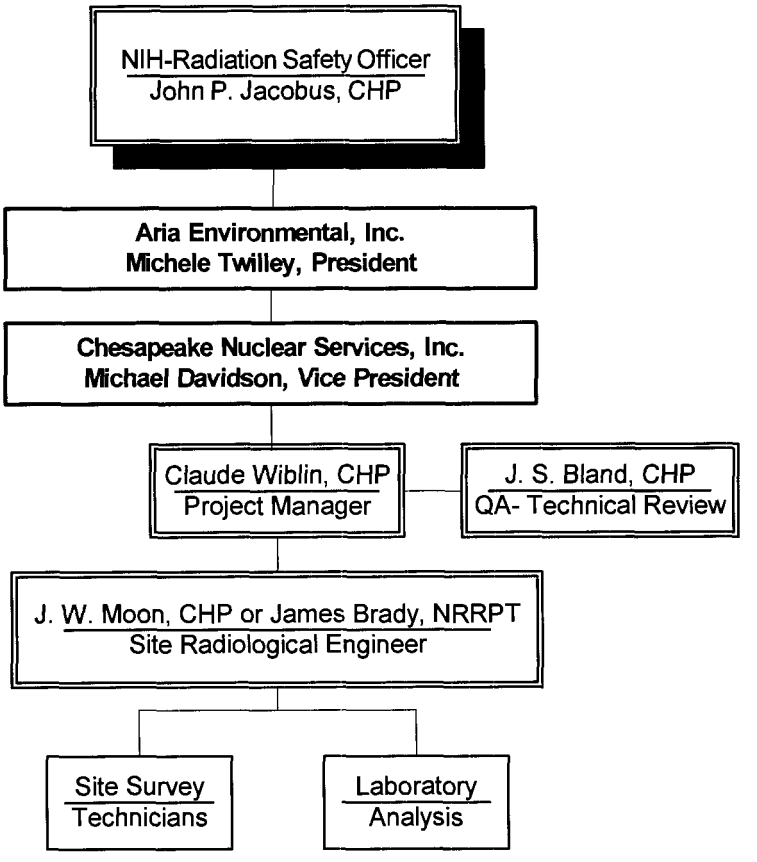


Figure 5. FSS Organizational Chart

4.2 Organization and Responsibilities

The survey was performed by Chesapeake Nuclear Services using a qualified team composed of technical experts and radiation safety technicians. This is the same organizational structure which conducted the characterization survey activities. Figure 5 shows the organizational chart for the survey activities.

The ChesNuc team operated under the supervision of Claude Wiblin, CHP. Mr. Wiblin had the authority to make appropriate changes to the survey plan (subject to the established QA/QC program) as deemed necessary as the survey progressed. Mr. Wiblin also directed laboratory services for in-house analyses.

Field measurements of radiological parameters and sample collection were under the direction of Mr. J.W. Moon, CHP or Mr. James Brady, NRRPT.

QA/QC responsibilities were handled by a QA officer whose work responsibilities were otherwise separate from those on the survey team. Mr. J. Stewart Bland, CHP, served as the QA officer and coordinated all interface requirements during the survey process. Applicable ChesNuc QA procedures are developed from guidelines presented in ANSI/ASTM NQA-1, Quality Assurance Program Requirements for Nuclear Facilities (1989).

Mr. John P. Jacobus is the NIDA Radiation Safety Officer and observed portions of the survey.

4.3 Training

ChesNuc provides continuing training for its survey personnel and other workers who may be exposed to radioactive materials. Training varies according to potential exposure and the nature of the employee's job duties, which is consistent with 10 CFR Part 19.12, "Instruction to Workers" (Reference 8.12). In addition to the regular training, special training was provided on equipment, special techniques, and practices relative to the survey activities for those employees who were involved in taking radiological measurements and samples. All members of the final status survey team attended an in-house training session regarding radiation protection, survey procedures, and quality assurance activities. Documentation of training participation was retained in the ChesNuc training files.

4.4 Laboratory Services

All smears were analyzed by ChesNuc personnel offsite due to the amount of natural radon interference at the facility. Smears were analyzed for H-3 and I-125 by Radiation Services Organization, Inc, (RSO), Laurel, MD. The liquid scintillation counting technique used for H-3 permits concurrent analysis for C-14 and P-32. I-125 analysis was performed with gamma spectroscopy.

4.0 FINAL STATUS SURVEY OVERVIEW

4.1 Survey Objectives

The purpose of the final status survey was to demonstrate that the radiological conditions at the facility satisfy the NRC release criteria and therefore, the site can be released for future use without radiological controls. The primary objectives of the final status survey were to:

- select/verify survey unit classification;
- demonstrate that the potential dose or risk from residual contamination is below the release criterion for each survey unit ; and
- demonstrate that the potential dose or risk from small areas of elevated activity, if any, is below the release criterion for each survey unit.

The final status survey provides data to demonstrate that all radiological parameters satisfy the established guideline values and conditions. Professional judgment and biased sampling are important for locating contamination and characterizing the extent of contamination at a site. However, the MARSSIM focus is on planning the final status survey, which utilizes a more systematic approach to sampling. Systematic sampling is based on rules that endeavor to achieve the representativeness in sampling consistent with the application of statistical tests.

The Final Status Survey for release of areas was conducted in accordance with guidance given in MARSSIM. MARSSIM provides guidance on classifying areas and survey requirements based on potential level of residual radioactive material contamination relative to the established release criteria. MARSSIM also provides the following guidance as an aid in conducting surveys, and these are incorporated into this survey.

- Determine background activity for building surfaces. Only interior building surfaces are a concern per the HSA; exterior building parts and outdoor areas are considered non-impacted.

- Perform systematic and judgmental surface scan measurements.

- If elevated levels of contamination are identified (>50% of DCGLs), perform selective direct measurements and sampling of areas of elevated activity of residual radioactivity to provide data on upper ranges of residual contamination levels. Note that locations of high scan values should be used.

- Document survey and sampling locations. Establish the reference coordinate system as the left corner as entering the room. Prepare drawings as appropriate.

Table 4. Acceptable License Termination Screening Values of Common Radionuclides for Building Surface Contamination

Radionuclide	Acceptable Screening Levels
H-3	1.2×10^8 dpm/100cm^2
C-14	3.7×10^6 dpm/100cm^2
S-35	1.3×10^7 dpm/100cm^2
Cl-36	5.0×10^5 dpm/100cm^2

Table 2 values are the more conservative and will be used as DCGLs. If I-125 is identified in a mixture, the "sum of fractions" rule will be applied; see 10 CFR Part 20, Appendix B, Note 4. Mixtures not containing I-125 will be summed and compared to Table 2 above, as will other beta-gamma emitters.

3.0 DERIVED CONCENTRATION GUIDELINE LEVELS (DCGLs)

NUREG-1556, Vol. 11, indicates that when equipment or facilities are to be released for unrestricted use, surface contamination surveys should be conducted for both removable and fixed contamination before the facilities or equipment are released from restricted to unrestricted use. For the potential contaminants of concern listed in Table S5, NUREG-1556 provides the maximum acceptable residual levels for radionuclides used in Building C as indicated in the Table 3 below.

A standardized method for smear testing of a relatively uniform area was used to aid in comparing contamination at different times and places. A smear taken from an area of about 100 cm^2 is acceptable to indicate levels of removable contamination.

Table 3. Acceptable Surface Contamination Levels

Radionuclide	Average[1] (dpm/100 cm^2)	Maximum[2] (dpm/100 cm^2)	Removable[3] (dpm/100 cm^2)
I-125	100	300	20
Other beta-gamma emitters	5,000	15,000	1,000

[1] 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.

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

[3] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency.

Additionally, NUREG -1556, Vol. 11, Table 11.1, provides screening level DCGLs based on the assumption that the fraction of removable surface contamination is equal to 0.1. The screening values represent surface concentrations of individual radionuclides that would be deemed in compliance with the 25 mrem/yr unrestricted release dose limit in 10 CFR 20.1402. For radionuclides in a mixture, the "sum of fractions" rule applies; see 10 CFR Part 20, Appendix B, Note 4. The table is reproduced here for the radionuclides used or stored at the facility. Note that the table does not include radionuclides with half-lives less than 120 days.

Table 2. Impacted Rooms, Status or Close Date, and Associated Radionuclides (Continued)

Room	Description	HSA Status/ Close Date	Radionuclides With Known Half-Lives Since Use						
			Cl-36	C-14	H-3	S-35	I-125	P-33	P-32
377	Wet Lab	9/1/2007		X	X	X	X	11	X
383	Office	Not in file		X	X				
384	Equip. Room	Posted		X	X	X	X	X	X
385	Research	2/13/1996			X				
386	Research	2/13/1996			X	X			310
387	Equip. Room	9/4/1997		X	X		64		
409	Glass Wash.	8/24/2004		X	X	X	23	53	95
420A	Iodination Lab	9/14/2004					22		

* X indicates use in that laboratory. Posted: Means in use during HSA.
Blank indicates no use of particular radionuclide. An inserted number indicates that radionuclide has decayed through the multiple of half-lives shown since laboratory closure.

2.4.3 Non-Impacted Areas

For this survey, non-impacted areas are those not specifically listed above as impacted.

2.4.4 Potentially Contaminated Media

A review of potential migration routes within impacted areas was conducted. Migration routes include inside structures such as floor drains, trenches, or sumps; exhaust/ventilation (e.g., hoods); and sinks (e.g., hand-washing or industrial sinks) that may allow or increase the migration of radionuclides beyond the area where the storage or handling of radioactive materials originally occurred. The survey team was instructed to survey floor drains, sinks, hoods, and air ventilation discharge vents.

The contiguous and near contiguous areas used for storage or use of licensed radioactive material are considered as impacted. The boundaries for these areas were selected based on professional judgment, either in terms of contiguous area, natural boundaries (walls), or historical information, such as prior use (i.e., potentially affected or unaffected areas).

Table 2. Impacted Rooms, Status or Close Date, and Associated Radionuclides

Room	Description	HSA Status/ Close Date	Radionuclides With Known Half-Lives Since Use						
			Cl-36	C-14	H-3	S-35	I-125	P-33	P-32
105	Wet Lab	Posted			X	X	X	X	X
111	Wet Lab	Posted			X	X	X	X	X
112	Beh. Testing	Posted			X		X		
119	Rad. Waste	Posted			X	X	X	X	X
135	Chem. Stock	Posted			X	X	X	X	X
209A	Beh. Testing	Posted			X	X	X	X	X
217A	Beh. Testing	7/11/2003					29		
301	Office	9/13/2001		X	X	28	40		169
304	Office	9/13/2002		X	X	24	34		144
305	Wet Lab	9/11/2002		X	X	24	34		144
306	Wet Lab	9/11/2002		X	X	24	34		144
307	AV Lab	10/16/2002		X	X	23			142
308	Wet Lab	Posted		X	X	X			X
309	Wet Lab	10/8/2002		X	X	23	34		142
310	Tissue Culture	Not in file	X						
311	Wet Lab	Posted	X	X	X	X	X		X
312	Wet Lab	11/17/2000				31			190
324	Equip. Room	Posted			X	X	X	X	X
328/329	Wet Lab	11/25/2002		X	X	23	33		139
330	Beh. Testing	3/13/2003		X	X	21	31		131
331	Beh. Testing	3/13/2003			X		31	74	131
332	Animal Housing.	3/11/2003			X		31	74	131
337	Wet Lab	Not in file			X				
339	Beh. Testing	Not in file			X	X	X		X
340	Beh. Testing	Not in file		X	X	X			
347	Wet Lab	9/13/2002		X	X	24	34		144
348	Wet Lab	9/13/2002		X	X	24	34		144
349	Wet Lab	9/11/2002		X	X	24	34		144
357/358	Wet Lab	9/9/2002		X	X				144
359	Cold Chem.	10/24/2000			X		46		
361	Cold Chem.	2/13/1996			X				
363	Cold Chem.	2/13/1996			X	51	74		310
368	Wet Lab	Not in file			X		X		
372	Office	Not in file		X	X				

2.4.1 Radionuclides of Concern

The HSA indicates that the potential radiological contaminants of unsealed radionuclides are as indicated in the table below. Radionuclides with a half-life of less than 120 days, which can be disposed of by decay-in-storage, are also listed as these were in storage or use during the HSA property inspection.

Table 1. Potential Radiological Contaminants

Radionuclide	Half-life	~Average Decay Mode Energy (MeV)	Maximum Decay Energy (MeV)
H-3	12.28 y	Beta 0.006	0.019
C-14	5730 y	Beta 0.049	0.156
P-32	14.3 d	Beta 0.695	1.710
P-33	25.4 d	Beta 0.077	0.249
S-35	87.4 d	Beta 0.049	0.167
Cl-36	3.01E5 y	Beta 0.251	0.710
I-125	60.1 d	various electrons <0.04 MeV	0.031
		various gammas <0.04 MeV	

2.4.2 Impacted Areas

The following forty-three rooms were identified in the HSA in which radioactive material was used or stored through the years: 105, 111, 112, 112A, 119, 135, 209A, 217A, 301, 304, 305/306, 307, 308, 309, 310, 311, 312, 324, 328/329, 330, 331, 332, 337, 339, 340, 347, 348, 349, 357/358, 359, 361, 363, 368, 372, 377, 383, 384, 385, 386, 387, 409, and 420A.

- Room modifications on the 3rd floor indicate that Room 306 is now part of Room 305, Room 328 is now part of Room 329, and Room 357 is now part of Room 358.

- Room 383 was renovated to be an office but it was reported that the room was stripped of all potentially contaminated material including the floor tile during renovation.

- Three freezers for animal carcasses with radioactive material were identified in Rooms 112A and 119 and in the north wing of the 4th floor in the mechanical space.

- Two sinks which were used for disposal of radioactive material to the sanitary sewer system are located in Room 119.

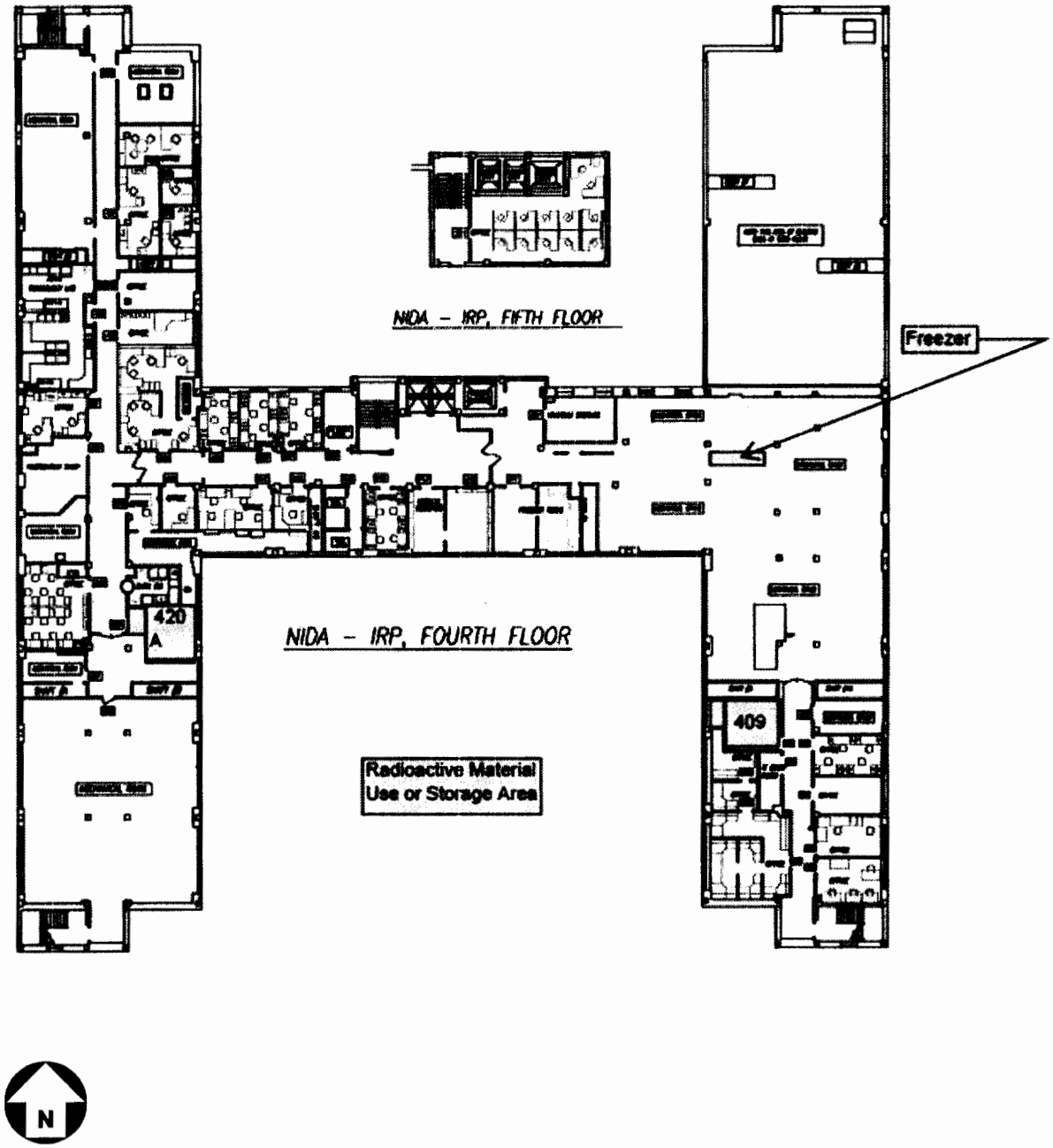


Figure 4. Building C – 4th Floor Locations of Radioactive Material Use or Storage

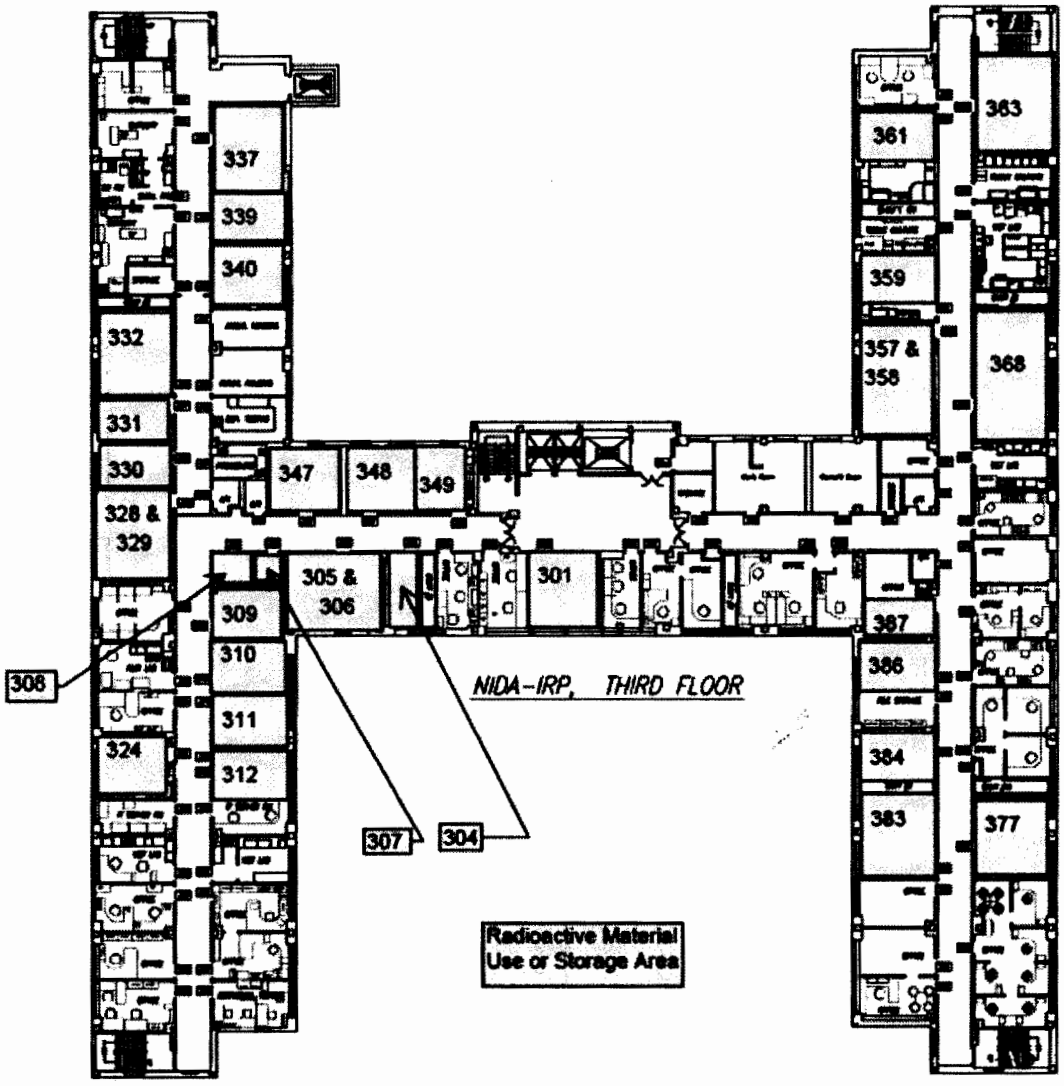


Figure 3. Building C – 3rd Floor Locations of Radioactive Material Use or Storage

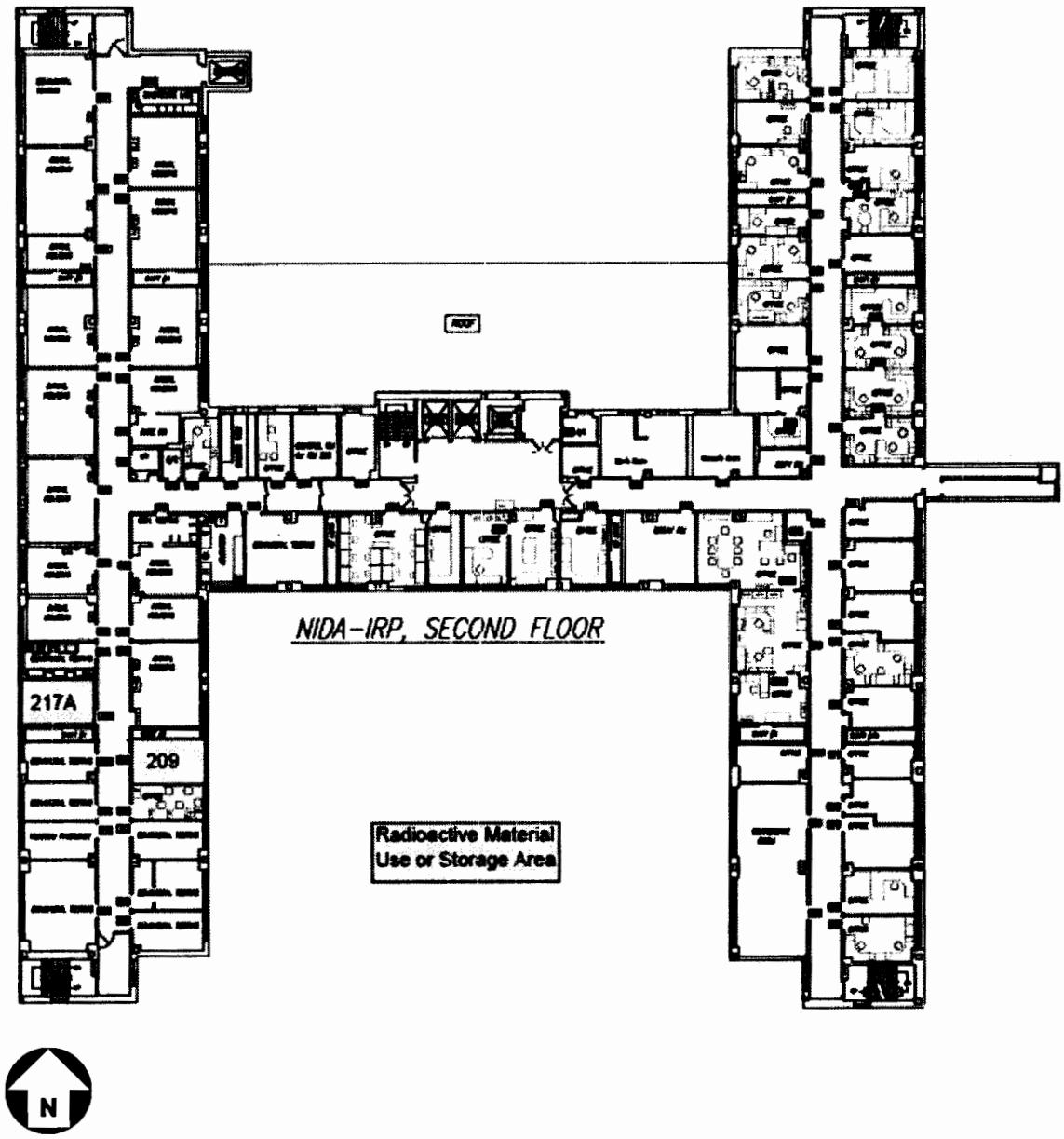


Figure 2. Building C – 2nd Floor Locations of Radioactive Material Use or Storage

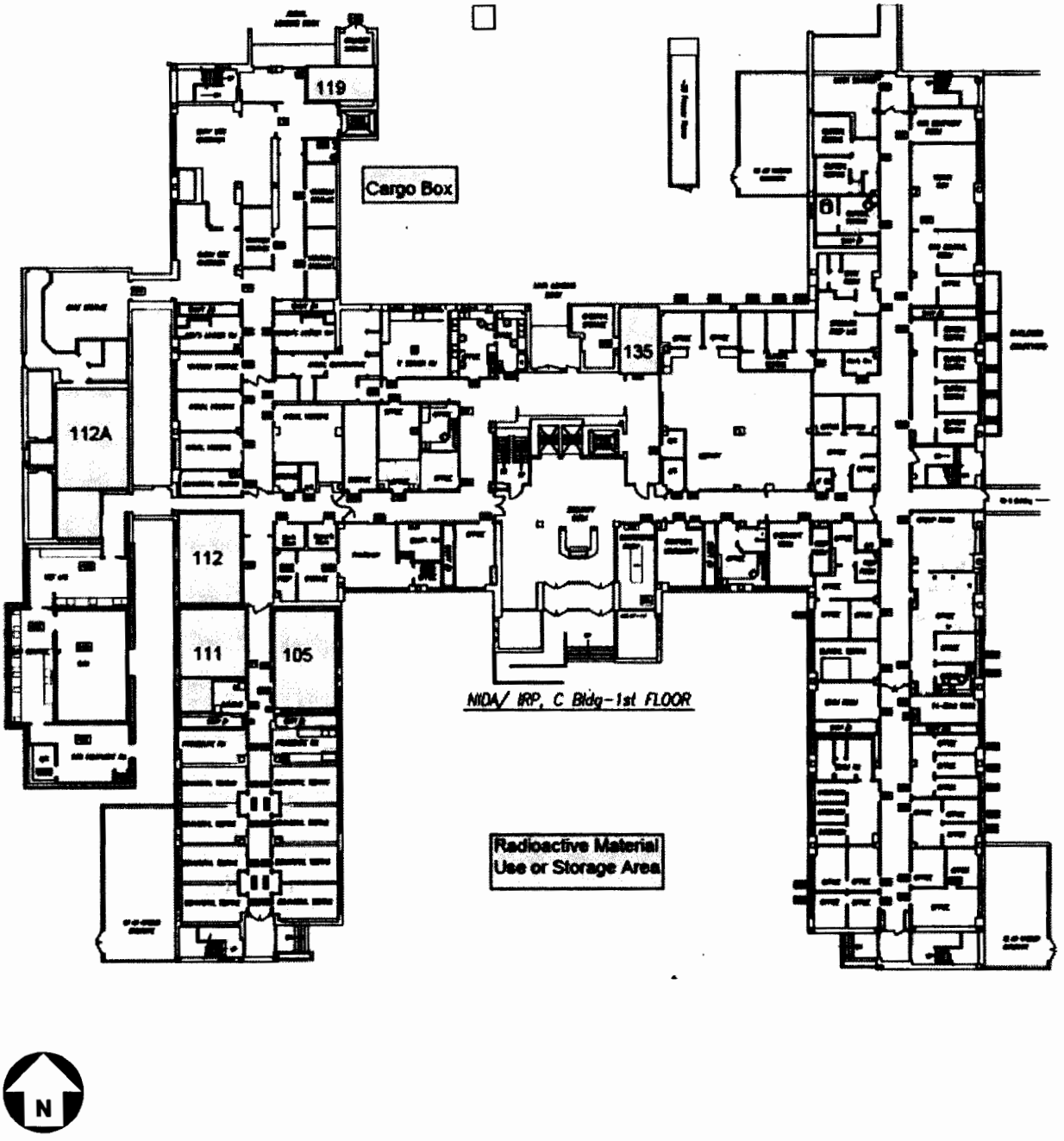


Figure 1. Building C – 1st Floor Locations of Radioactive Material Use or Storage

2.4 Historical Site Assessment (HSA)

An HSA was conducted by ChesNuc during November - December 2007 and the results are identified in Reference 7-1. The HSA report was completed in February 2008, and provides the basis for area classifications used in this FSS.

Since 1990, forty-three rooms were identified as impacted, where licensed materials were either used or stored, and currently require a close-out survey for building surface contamination. Most laboratories and use areas were associated with the radionuclides H-3, C-14, I-125, P-32, P-33, and S-35. Only two laboratories were identified with use of Cl-36.

The HSA provided the following comments regarding operations:

- As radioactive material was removed from laboratories and as described in the application for the license, NIDA performed closeout surveys. Following the closeout surveys, these laboratories were considered as unrestricted for purposes of radiation control. Short-lived radionuclides such as those permitted under the MDE exemption would no longer be a contamination issue.
- During closeout surveys, attention should be given to (1) the traps in the radioactive waste disposal sinks in Room 119 and (2) the radioactive air discharge vents and filter locations on the roof. [Note the filters were removed and the hood area was surveyed; additionally, there was a close out survey with negative findings.] The rooms where radioactive materials are stored in freezers (i.e., fourth floor mechanical room, freezer rooms) should also be surveyed for contamination. In addition to these rooms, some radioactive waste was stored in a cargo storage container outside the facility near Room 121 that should also be surveyed.

To meet NRC requirements for the removal of Building C as an authorized use location and acceptable for unrestricted use, all licensed material must be removed; areas decontaminated as necessary; and a close out survey performed. At the time of the HSA, there were ten laboratories and storage with use or storage of radioactive materials. Records of closeout surveys had been filed for 26 laboratories indicating decontamination to less than 220 dpm/100 cm^2. Records of closeout surveys could not be found for seven other laboratories. It was noted that several closeout records were incomplete and that surveys for these and those for laboratories with missing records should be re-performed.

The following figures provide an illustration of the location of these laboratories and storage areas are by floor plan.

2.0 BACKGROUND INFORMATION

The facility is part of the Johns Hopkins Bayview Medical Center which is one of five member institutions in the Johns Hopkins Health System. Building C is owned by FSK Land Corporation and is leased to and operated by NIDA-NIH.

2.1 Owner and Operator's Address

The owner of the facility is FSK Land Corporation (a Hopkins Entity) 1101 East 33rd Street, Suite E100, Baltimore, MD 21218-3637. The contact is Mr. Nick Farrell, Senior Director, Facilities, Design & Construction, and may be reached by telephone at (443) 997-3735 or by e-mail at nfarrell@jhu.edu.

The operator of the facility is the U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), NIH, 5500 Nathan Shock Drive, Baltimore, MD 21224. Mr. John P. Jacobus is the current RSO and may be reached by telephone at (301) 594-4018 or by e-mail at jjacobus@mail.nih.gov.

2.2 Facility Location

The facility is located on Johns Hopkins Bayview Research Campus, Building C, 5500 Nathan Shock Drive, Baltimore, MD 21224 which is in the east suburbs of Baltimore City, MD, an independent city surrounded but not included by Baltimore County, MD. A USGS Quadrangle map of the was provided in the HSA.

2.3 Site Information

2.3.1 Site Description

The facility is part of the Johns Hopkins Bayview Medical Center which is one of five member institutions in the Johns Hopkins Health System. Building C is owned by FSK Land Corporation and C is leased to and operated by NIDA-NIH. The building consists of a four-story, 110,000 sq. ft. medical research facility.

2.3.2 Site Conditions at Time of Final Survey

At the start of the FSS and except for the waste storage area and the cargo container, all NRC-licensed materials had been removed from the facility. FSS for the waste storage area and the cargo container was postponed until the licensed material had been removed.

Routine adherence to procedures and good housekeeping were the ALARA practices employed to achieve final activity levels.

No changes were made in the FSS from what was proposed in the FSS Plan. Minor adjustments were made in map illustrations for "as found" survey areas. No changes were required in the initial survey unit assumptions relative to the extent of residual radioactivity (e.g., material not accounted for during site characterization).

Final Status Survey Report
Building C, Johns Hopkins Bayview Campus,
5500 Nathan Shock Drive, Baltimore, MD 21224

1.0 OVERVIEW

As a result of the decision to cease operations in Building C, the National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC in 10 CFR Part 20. Chesapeake Nuclear Services, Inc. (ChesNuc) performed the final status surveys (FSS) for Building C during May-December 2008 in compliance with federal regulations. The purpose of the Final Status Survey Report (FSSR) is to demonstrate that radiological conditions at the facility satisfy release criteria and that the site can be released for unrestricted use.

Radiological operations in Building C are authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) which expires on October 31, 2010. The current license authorizes (1) the use of material in animal studies listed in 10 CFR 33.100 Schedule A (Type B Broad License) with quantities of certain material limited by its License Condition 12, (2) a 15 millicurie sealed cesium-137 source manufactured by 3M model number 4F6S for use in instrument calibrations and checks, and (3) 100 millicuries of I-125 as radioactive waste. The facility is also exempted by Maryland Department of the Environment (MDE) from Maryland licensure requirements regarding the receipt, possession, and use of certain accelerator produced radionuclides (NARM). The Maryland exemption for NARM in biomedical research projects is for brain imaging of human research subjects and research animals. Prior to this closeout survey, as NRC licensed radioactive material was removed from an individual laboratory, each laboratory was surveyed and decontaminated to acceptable residual levels.

MDE had also issued specific individual licenses for radioactive material use which were terminated in 1990, when the NRC license became effective. MDE performed a closeout survey in that year for areas where radionuclides were previously used in the building and it serves as a benchmark of no contamination for the beginning of activities under the NRC license.

The following is provided as a guide to correlate the information presented herein with that specified in NUREG-1757, Vol. 2 for information to be submitted in an FSS:

- Results of the Historical Site Assessment (HSA) are provided in Section 2.
- A summary of the DCGLs developed for this facility is provided in Section 3.
- An overview of the work performed is provided in Section 4.
- A description of the survey plan is provided in Section 5. The technique used to determine the number of samples required is provided in paragraph 5.7.5. The justification for the values used to determine the number of samples is also provided in paragraph 5.7.5.
- An overview of the results of the FSS is provided in Section 6.

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Executive Summary

As a result of the decision to cease operations in Building C, NIH-NIDA directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC in 10 CFR Part 20. Chesapeake Nuclear Services, Inc. (ChesNuc) performed the final status surveys (FSS) for Building G during August 2008 in compliance with federal regulations. The purpose of the Final Status Survey Report (FSSR) is to demonstrate that radiological conditions at the facility satisfy release criteria and that the site can be released for unrestricted use.

Radiological operations in Building C are currently authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institutes of Health (NIH) National Institute on Drug Abuse, (NIDA), with an expiration date of October 31, 2010.

An Historical Site Assessment (HSA) of C Building, Johns Hopkins Bayview Campus, 5500 Nathan Shock Drive, Baltimore, MD 21224 was conducted by Chesapeake Nuclear Services, Inc. (ChesNuc) during November and December 2007. Forty-three rooms were identified in which radioactive material was used or stored through the years. Most laboratories and use areas were associated with the radionuclides H-3, C-14, I-125, P-32, P-33, and S-35. Only two laboratories were identified with use of Cl-36.

ChesNuc performed a Final Status Survey for Building C during the May-December 2008 time period. All Data Quality Objectives (DQOs) of the survey were met; data and statistical analyses for individual measurements and individual survey unit summaries are provided.

Results for direct and scan measurements may be skewed positive due to the requirement to use conservative efficiency factors in calculations and also from other events such as the varying activity of natural radon gas on different days. However, no levels of radiation and radioactive material were detected during fixed measurements and scanning that exceeded the investigation level; and therefore, no discussion regarding this type of anomalous data is provided in the individual survey unit summaries.

In summary, residual contamination levels for each survey unit are a small fraction of the acceptable residual levels for radionuclides listed in Table S-5, NUREG-1556 and even a smaller fraction of the NRC Acceptable License Termination Screening Values. This report and the HSA should be submitted to the NRC in the NIH-NIDA request to remove the authorized address from the NRC license.

Glossary of Terms, Acronyms and Abbreviations

Bq	Becquerel; 1 Bq = 1 disintegration per second
C-14	Carbon-14
ChesNuc	Chesapeake Nuclear Services, Inc.
CHP	Certified by American Board of Health Physics
Cl-36	Chlorine-36
cm^2	square centimeter
cpm	counts per minute
DCGL	Derived Concentration Guideline Level
dpm	disintegrations per minute
DQO	data quality objective
EPA	Environmental Protection Agency
FSS	Final status survey
FSSP	Final status survey plan
FSSR	Final status survey report
H-3	Tritium
h	hour
HSA	Historical Site Assessment
I-125	Iodine-125
LBGR	Lower Bound of the Gray Region
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
MARSS	Mapping and Radiation Survey System
MDC	minimum detectable count
MDCR	minimum detectable count rate
MDE	Maryland Department of the Environment
MeV	mega electron volt; equal to 1.602 × 10-13 joules
mrem/yr	millirem per year
NARM	Natural and Accelerator Produced Radioactive Material
NIDA	National Institute on Drug Abuse
NIH	National Institutes of Health
NRC	Nuclear Regulatory Commission
NUREG	NRC nuclear regulation document
NRRPT	National Registry of Radiation Protection Technologists
P-32,33	Phosporus-32, -33
QA/QC	Quality Assurance/Quality Control
S-35	Sulphur-35
s	second
StdDev	Standard Deviation
SU	survey unit
WRS	Wilcoxon Rank Sum
y	year

Final Status Survey Report
C Building
Johns Hopkins Bayview Campus
5500 Nathan Shock Drive
Baltimore, MD 21224

Prepared for:

Aria Environmental, Inc.
PO Box 286
Woodbine, MD 21797

December 2008

Chesapeake Nuclear Services

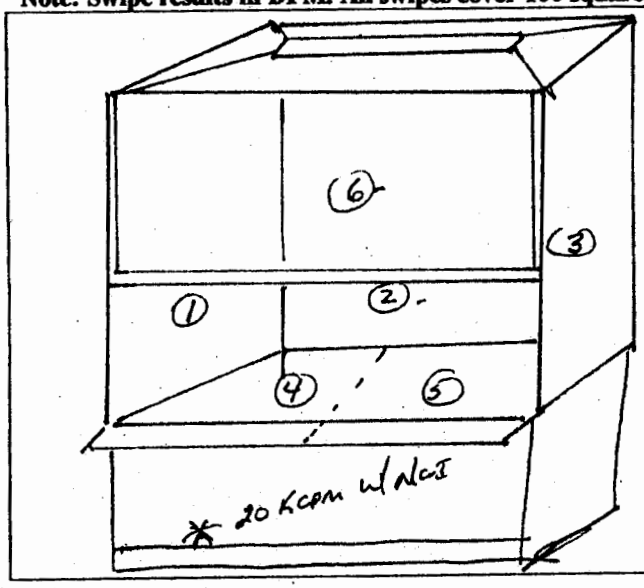
788 Sonne Drive • Annapolis, MD 21401 • 410-266-9174

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Dorb, P. Koenig, L	Phone:	Room: 420 hood
		Date: 9-10-04

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	I-125			
1	<220			
2				
3				
4				
5				
6				
7	X	X	X	X
8	X	X	X	X
9	X	X	X	X
10	X	X	X	X

**********CLOSE OUT SURVEY**********

#1 - left side inside hood
#2 - Back Panel
#3 - Right side - inside hood
#4 - bottom left
#5 - bottom right
#6 behind back panel

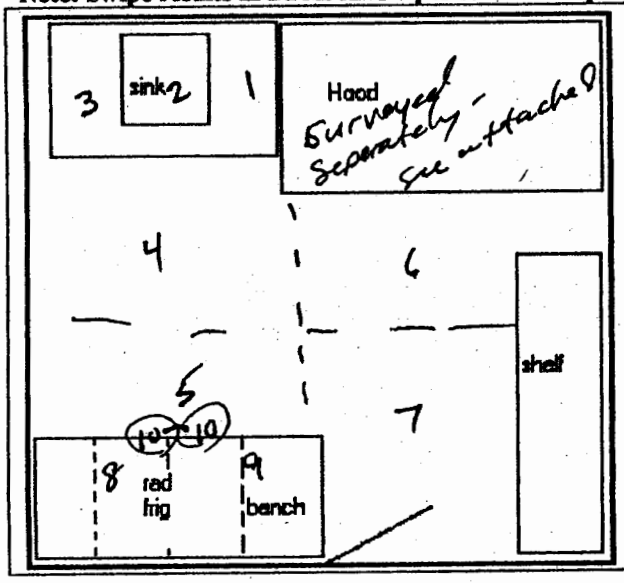
Removed back panel of hood and decontaminated. Now < 220 dpm/100cm²
All swipes < 220 dpm/100cm².
Decontaminated all surfaces of hood. No contamination detected with portable GM with NaI detector.
* Removed the floor that was contaminated with 20 KCPM NaI and disposed of rad waste in decay-18-33 storage.

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Doob, P.	Phone:	Room: 420
Koenig, L.		Date: 9-14-04

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	I-125			
1	<220			
2				
3				
4				
5				
6				
7				
8				
9				
10				

**********CLOSE OUT SURVEY**********

All radioactive materials removed from lab and disposed of as rad-waste. All radioactive waste removed from lab.

All contaminated equipment was bagged, boxed, and placed in rad storage for use in new iodination facility.

The iodination box was bagged and placed in rad storage.

The fume hood was decontaminated until ~~no detectable ra~~ radiation levels were < 220 dpm/100cm². (see attachment)

The rad. Refrigerators were swiped and are < 220 dpm/100 cm².

~~Room is now~~ Removed all "C.R.A.M." labels. Room is now unrestricted.

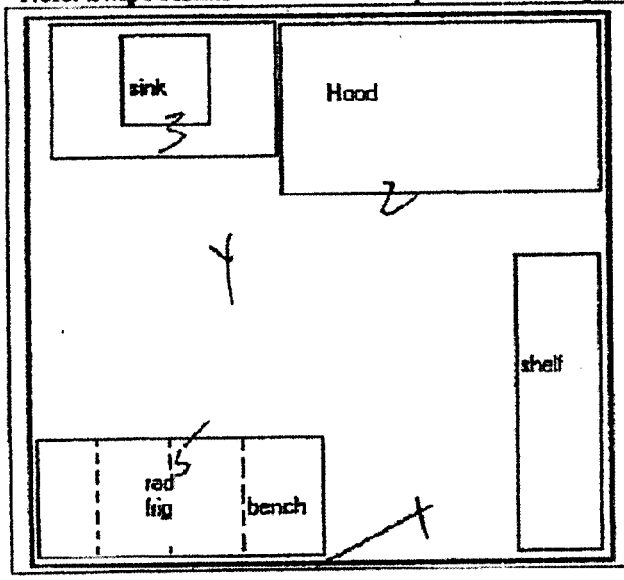
9/14/04

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Doob, P. Koenig, L	Phone:	Room: 409
		Date: 7.20-04

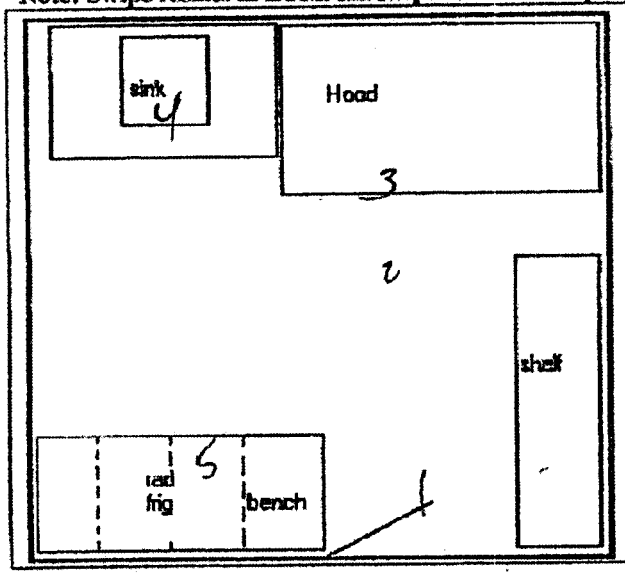
Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	I-125			
1	<220			
2				
3				
4				
5				
6	X	X	X	X
7	X	X	X	X
8	X	X	X	X
9	X	X	X	X
10	X	X	X	X

Supervisory User: Doob, P. Koenig, L.	Phone:	Room: 409
		Date: 8.24.04

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	I-125			
1	<220			
2				
3				
4				
5				
6	X	X	X	X
7	X	X	X	X
8	X	X	X	X
9	X	X	X	X
10	X	X	X	X

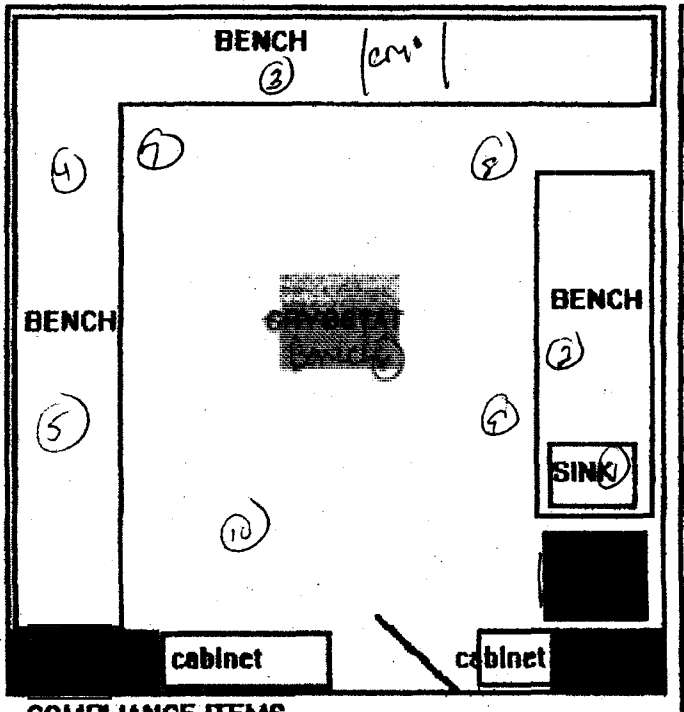
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Kimes, A. Phone:_____Room: 387

Surveyor: Koenig, L Date: 9/4/97



Smear results in DPM, all smears cover 100 cm sq.

location	nuc 1	nuc 2	nuc 3
	3H	14C	125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[*]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[*]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[*]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[*]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[*]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[*]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

CLOSEOUT SURVEY

*1) Sign removed from door.

*2, *12) All source containers removed from lab.

*5) All waste and waste containers removed from lab.

*6) Labeled equipment <220 dpm/100cm². "C.R.A.N." markings removed.

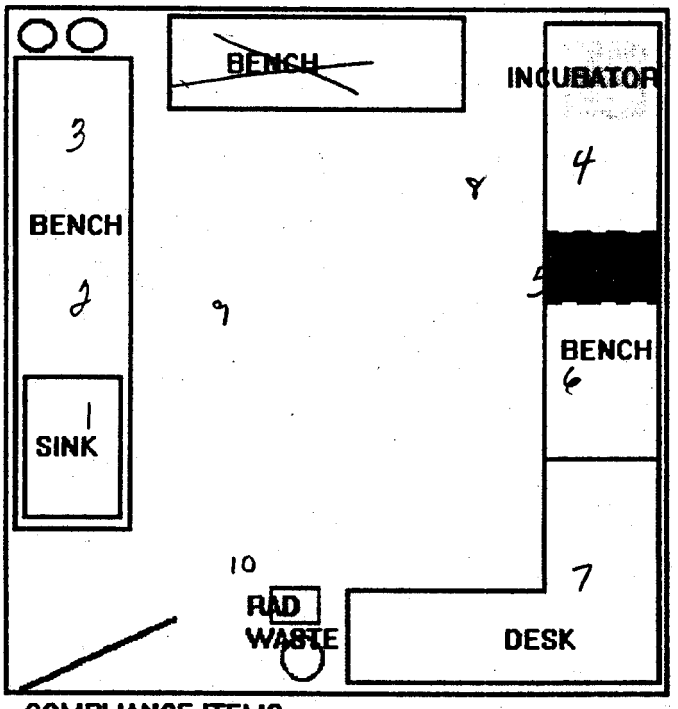
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: McCoy, M. Phone:_____Room: 386

Surveyor: Koenig, L Date: 2/13/96



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
	3H	35S	32P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[x]	[ ]	1.Signs and labels:room	[x]	[ ]	14.Proper use of shielding
[x]	[ ]	2.source containers	[x]	[ ]	15.Prohibition of eating,drinking,smoking
[x]	[ ]	3.refrigerator / freezer	[x]	[ ]	16.Survey records current
[x]	[ ]	4.liquid scintillation vials	[x]	[ ]	17.Inventory/Disposal records current
[x]	[ ]	5.waste containers	[x]	[ ]	18.Personnel trained
[x]	[ ]	6.other equipment	[x]	[ ]	19.Prohibition on mouth pipetting
[x]	[ ]	7.Proper use of absorbent paper	[x]	[ ]	20.Proper corridor storage
[N]	[A]	8.Adequate hood flow @100 LFPM	[x]	[ ]	21.Exposure level < 2.0 mR/h
[N]	[A]	9.Hood air flow in calibration	[x]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[x]	[ ]	10.Proper use of external monitoring	[x]	[ ]	23.Survey meters available
[x]	[ ]	11.Proper radioactive waste management	[x]	[ ]	24.Survey meters operational
[x]	[ ]	12.Proper radionuclide storage	[x]	[ ]	25.Calibration current
[x]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

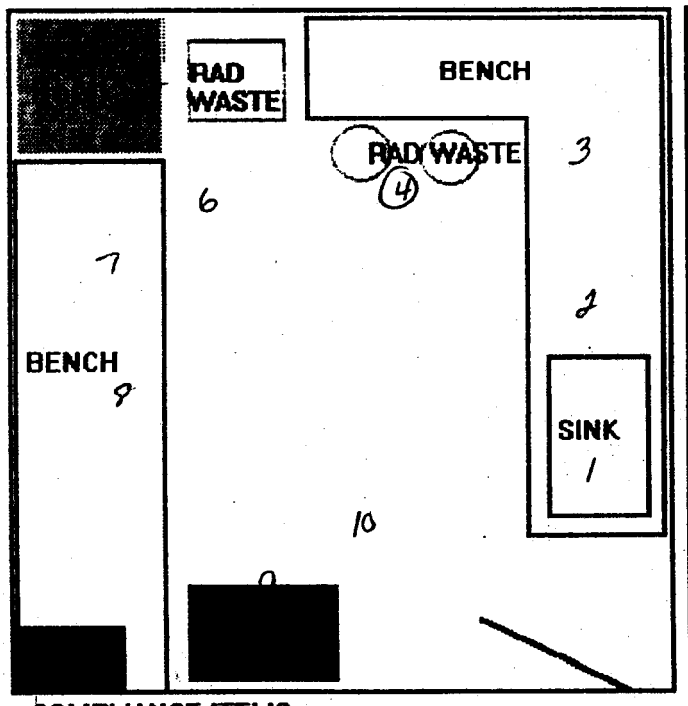
Remarks (Refer to violation by number)

Supervisory User Authorization transferred to Sonia Ordonez
Memo Dated 1/31/96.

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: McCoy, M. Phone:_____Room: 385

Surveyor: Koenig, L Date: 2/13/96



Smear results in DPM, all smears cover 100 cm sq. location	nuc 1	nuc 2	nuc 3
	3H		
1	<220		
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[x]	[ ]	1.Signs and labels:room	[x]	[ ]	14.Proper use of shielding
[x]	[ ]	2.source containers	[x]	[ ]	15.Prohibition of eating,drinking,smoking
[x]	[ ]	3.refrigerator / freezer	[x]	[ ]	16.Survey records current
[x]	[ ]	4.liquid scintillation vials	[x]	[ ]	17.Inventory/Disposal records current
[x]	[ ]	5.waste containers	[x]	[ ]	18.Personnel trained
[x]	[ ]	6.other equipment	[x]	[ ]	19.Prohibition on mouth pipetting
[x]	[ ]	7.Proper use of absorbent paper	[x]	[ ]	20.Proper corridor storage
[x]	[ ]	8.Adequate hood flow @100 LFPM	[x]	[ ]	21.Exposure level < 2.0 mR/h
[x]	[ ]	9.Hood air flow in calibration	[x]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[x]	[ ]	10.Proper use of external monitoring	[x]	[ ]	23.Survey meters available
[x]	[ ]	11.Proper radioactive waste management	[x]	[ ]	24.Survey meters operational
[x]	[ ]	12.Proper radionuclide storage	[x]	[ ]	25.Calibration current
[x]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

Supervisory User Authorization transferred to Alane Kirner
Memo Dated 1/31/96.

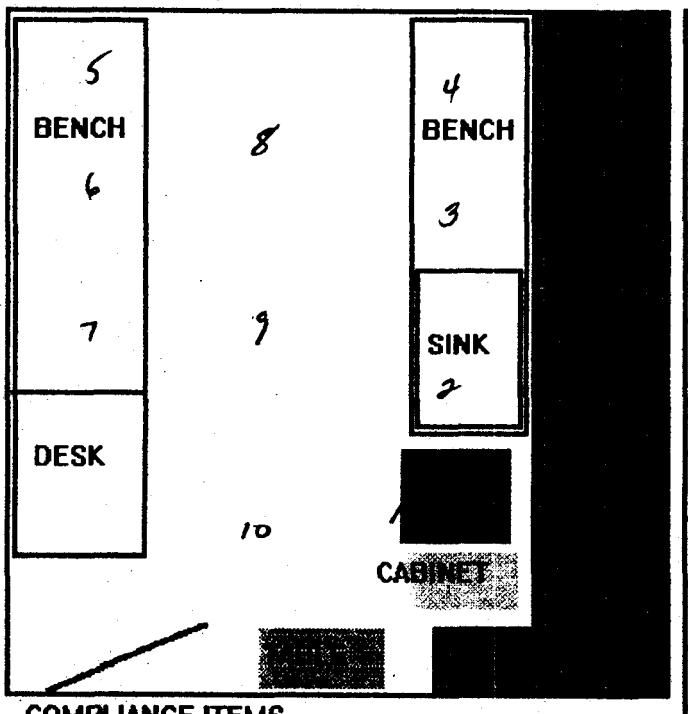
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: McCoy, M. Phone:_____Room: 384

Surveyor: Koenig, L Date: 2 / 13 / 96



Smear results in DPM, all smears cover 100 cm sq.

location	nuc 1	nuc 2	nuc 3
	3H	125I	
1	<220	<220	
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[X]	[ ]	1.Signs and labels:room	[X]	[ ]	14.Proper use of shielding
[X]	[ ]	2.source containers	[X]	[ ]	15.Prohibition of eating,drinking,smoking
[X]	[ ]	3.refrigerator / freezer	[X]	[ ]	16.Survey records current
[X]	[ ]	4.liquid scintillation vials	[X]	[ ]	17.Inventory/Disposal records current
[X]	[ ]	5.waste containers	[X]	[ ]	18.Personnel trained
[X]	[ ]	6.other equipment	[X]	[ ]	19.Prohibition on mouth pipetting
[X]	[ ]	7.Proper use of absorbent paper	[X]	[ ]	20.Proper corridor storage
[X]	[ ]	8.Adequate hood flow @100 LFPM	[X]	[ ]	21.Exposure level < 2.0 mR/h
[X]	[ ]	9.Hood air flow in calibration	[X]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[X]	[ ]	10.Proper use of external monitoring	[X]	[ ]	23.Survey meters available
[X]	[ ]	11.Proper radioactive waste management	[X]	[ ]	24.Survey meters operational
[X]	[ ]	12.Proper radionuclide storage	[X]	[ ]	25.Calibration current
[X]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

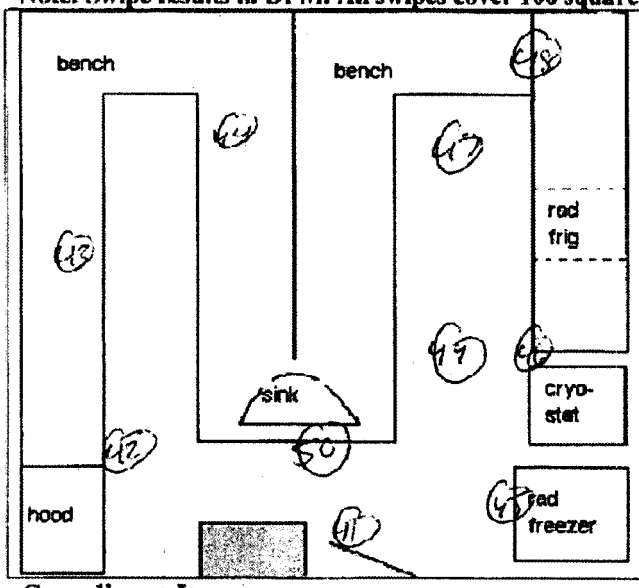
Supervisory User Authorization transferred to Alane Kines.
Memo Dated 1/31/96

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Kimes, A.	Phone:	Room: 377
Dulos, Mike 10/07		Date: 9/07

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	H3 <270	S35 <220	P32/P33 <220	I-125 <220
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Compliance Items

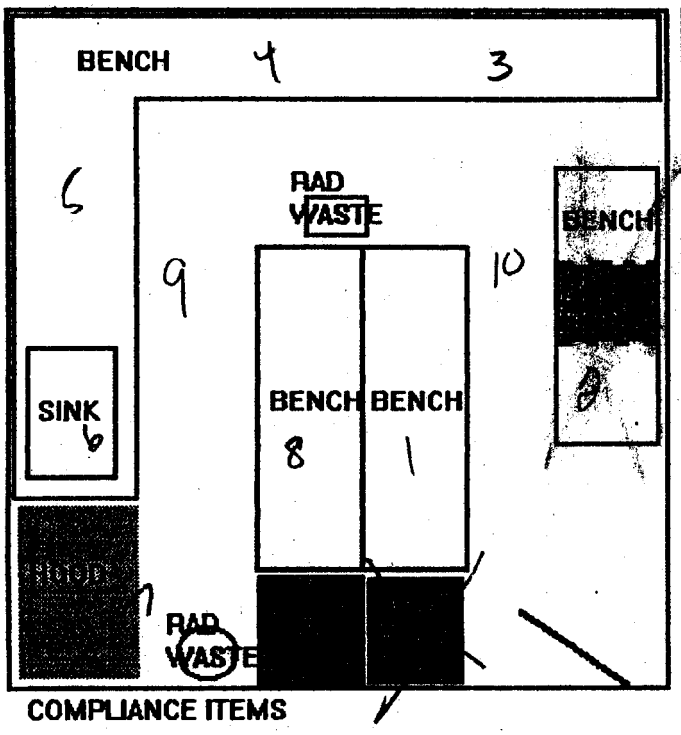
Yes	No	Item		Yes	No	Item	
✓		1	Signs and labels: room	✓		14	Proper use of shielding
✓		2	Source containers	✓		15	No eating, drinking, and smoking
✓		3	Refrigerator/freezer	✓		16	Survey record current
✓		4	Liquid scintillation vials	✓		17	Inventory & disposal records current
✓		5	Waste containers	✓		18	Personnel trained
✓		6	Other equipment	✓		19	Prohibition on mouth pipetting
✓		7	Proper use of absorbent paper	✓		20	Proper corridor storage
✓		8	Adequate hood flow @ 100 LFPM	✓		21	Exposure level < 2.0 mR/hr
✓		9	Hood air flow in calibration	✓		22	Smears < 220 DPM/100 cm sq.
✓		10	Proper use of external monitoring	✓		23	Survey meters available
✓		11	Proper radioactive waste management	✓		24	Survey meters operational
✓		12	Proper radionuclide storage	✓		25	Calibration current
✓		13	Routine use of lab coat and gloves			26	Other (specify in remarks)

Remarks (refer to violation by item number)
Fume Hood Due - Last Cal 3/06

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: KIMES, A. Phone:_____Room: 377

Surveyor: Koenig, L Date: 7 / 11 / 2000



COMPLIANCE ITEMS

Smear results in DPM, all smears cover 100 cm sq. location	nuc 1	nuc 2	nuc 3
	^{3}H	^{125}I	^{14}C
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Closed Out

Remarks (Refer to violation by number)

CLOSE OUT SURVEY

Note: Each smear covered an area of ~ 1000 cm^2.

* All radioactive materials was removed from lab.
* All contaminated equipment was either decontaminated and removed from lab, or moved to another posted lab.
* All radioactive waste containers were removed from lab.
* lab personnel monitored for contamination and decontaminated areas > 220 dpm/100 cm^2 [illegible]

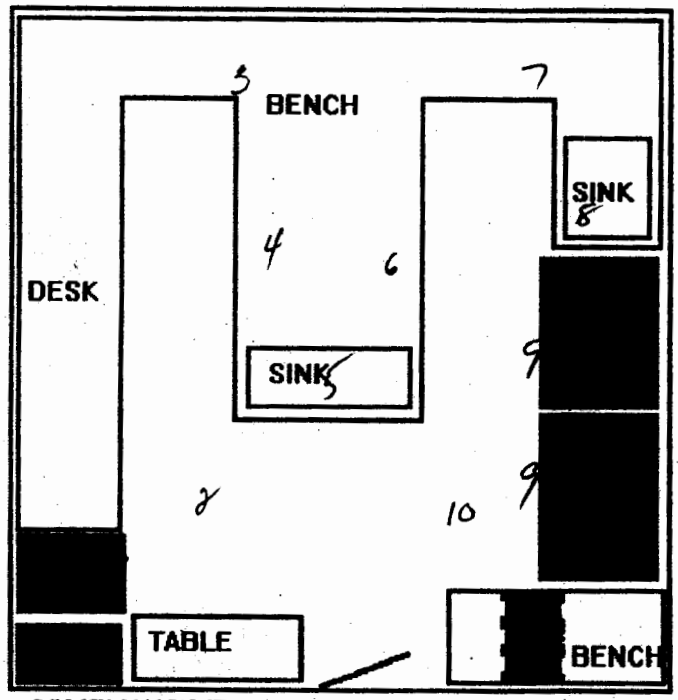
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: McCoy, M. Phone:_____Room: 363

Surveyor: Koenig, L Date: 2/13/96



Smear results in DPM, all smears cover 100 cm sq.

location	nuc 1 3H	nuc 2 33P/32P	nuc 3 125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[X]	[ ]	1.Signs and labels:room	[X]	[ ]	14.Proper use of shielding
[X]	[ ]	2.source containers	[X]	[ ]	15.Prohibition of eating,drinking,smoking
[X]	[ ]	3.refrigerator / freezer	[X]	[ ]	16.Survey records current
[X]	[ ]	4.liquid scintillation vials	[X]	[ ]	17.Inventory/Disposal records current
[X]	[ ]	5.waste containers	[X]	[ ]	18.Personnel trained
[X]	[ ]	6.other equipment	[X]	[ ]	19.Prohibition on mouth pipetting
[X]	[ ]	7.Proper use of absorbent paper	[X]	[ ]	20.Proper corridor storage
[X]	[ ]	8.Adequate hood flow @100 LFPM	[X]	[ ]	21.Exposure level < 2.0 mR/h
[X]	[ ]	9.Hood air flow in calibration	[X]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[X]	[ ]	10.Proper use of external monitoring	[X]	[ ]	23.Survey meters available
[X]	[ ]	11.Proper radioactive waste management	[X]	[ ]	24.Survey meters operational
[X]	[ ]	12.Proper radionuclide storage	[X]	[ ]	25.Calibration current
[X]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

Supervisory User Authorization transferred to Donna Walther
Memo Dated 1/31/96.

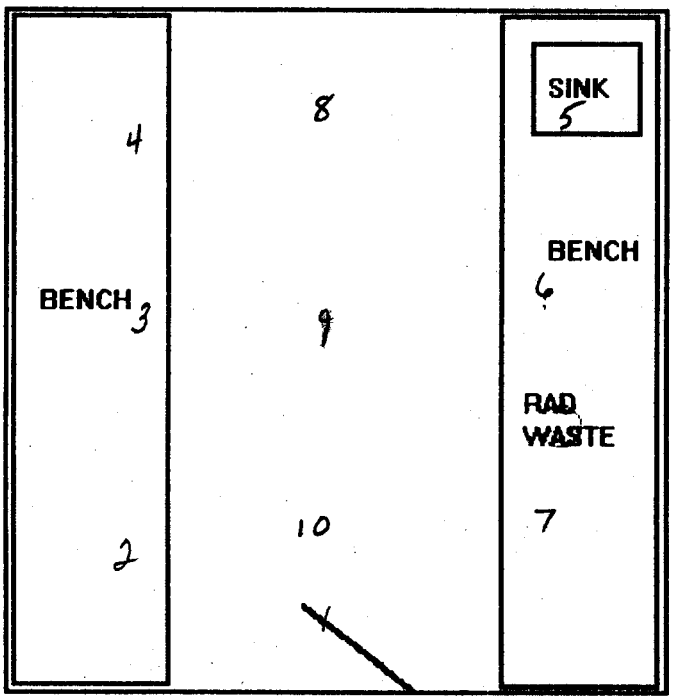
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: McCoy, M. Phone:_____Room:COLD ROOM

Surveyor: Koenig, L Date: 2/13/96



Smear results in DPM, all smears cover 100 cm sq. location	nuc 1 β	nuc 2 γ	nuc 3
1	<220	<220	
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[X]	[ ]	1.Signs and labels:room	[X]	[ ]	14.Proper use of shielding
[X]	[ ]	2.source containers	[X]	[ ]	15.Prohibition of eating,drinking,smoking
[X]	[ ]	3.refrigerator / freezer	[X]	[ ]	16.Survey records current
[X]	[ ]	4.liquid scintillation vials	[X]	[ ]	17.Inventory/Disposal records current
[X]	[ ]	5.waste containers	[X]	[ ]	18.Personnel trained
[X]	[ ]	6.other equipment	[X]	[ ]	19.Prohibition on mouth pipetting
[X]	[ ]	7.Proper use of absorbent paper	[X]	[ ]	20.Proper corridor storage
[N]	[A]	8.Adequate hood flow @100 LFPM	[X]	[ ]	21.Exposure level < 2.0 mR/h
[N]	[A]	9.Hood air flow in calibration	[X]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[X]	[ ]	10.Proper use of external monitoring	[X]	[ ]	23.Survey meters available
[X]	[ ]	11.Proper radioactive waste management	[X]	[ ]	24.Survey meters operational
[X]	[ ]	12.Proper radionuclide storage	[X]	[ ]	25.Calibration current
[X]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

Supervisory User Authorization transferred to Sonia Ordonez.
Memo Dated 1/31/96.

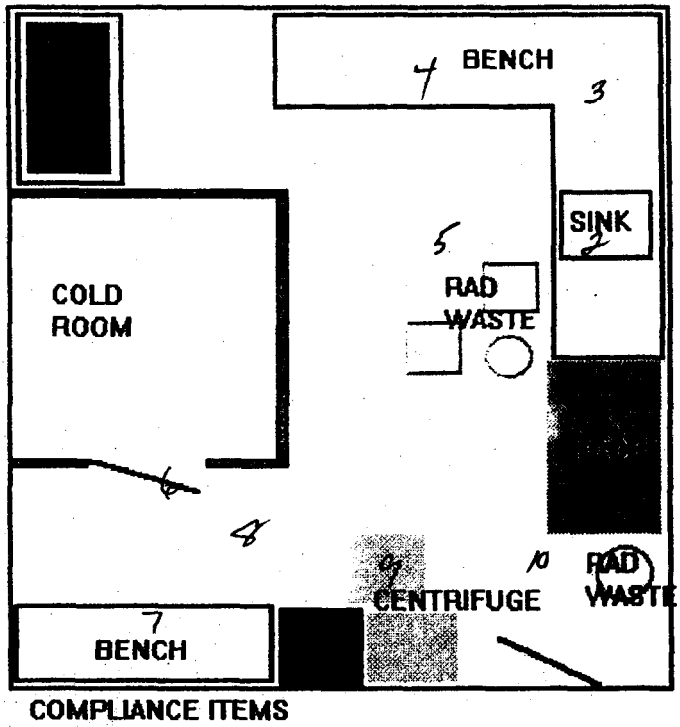
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: McCoy, M. Phone:_____Room: 361

Surveyor: Koenig, L Date: 2/13/96



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
	3H		
1	<220		
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[X]	[ ]	1.Signs and labels:room	[X]	[ ]	14.Proper use of shielding
[X]	[ ]	2.source containers	[X]	[ ]	15.Prohibition of eating,drinking,smoking
[X]	[ ]	3.refrigerator / freezer	[X]	[ ]	16.Survey records current
[X]	[ ]	4.liquid scintillation vials	[X]	[ ]	17.Inventory/Disposal records current
[X]	[ ]	5.waste containers	[X]	[ ]	18.Personnel trained
[X]	[ ]	6.other equipment	[X]	[ ]	19.Prohibition on mouth pipetting
[X]	[ ]	7.Proper use of absorbent paper	[X]	[ ]	20.Proper corridor storage
[X]	[ ]	8.Adequate hood flow @100 LFPM	[X]	[ ]	21.Exposure level < 2.0 mR/h
[X]	[ ]	9.Hood air flow in calibration	[X]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[X]	[ ]	10.Proper use of external monitoring	[X]	[ ]	23.Survey meters available
[X]	[ ]	11.Proper radioactive waste management	[X]	[ ]	24.Survey meters operational
[X]	[ ]	12.Proper radionuclide storage	[X]	[ ]	25.Calibration current
[X]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

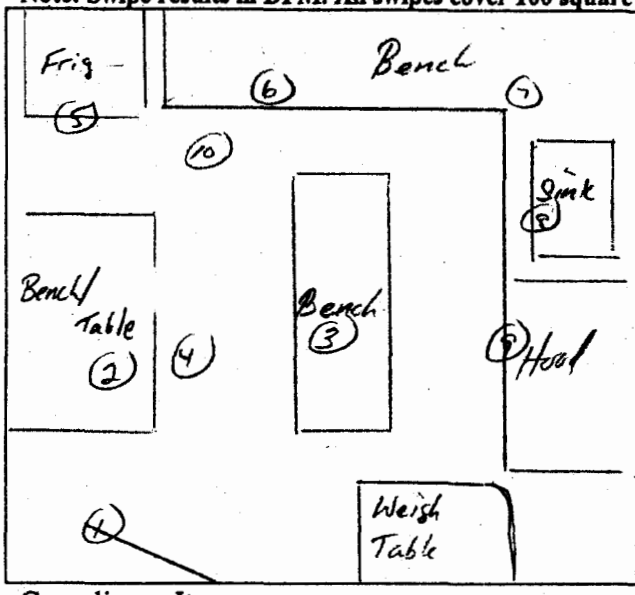
Supervisory User Authorization transferred to Sonia Ordonez.
Memo Dated 1/31/96

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Kimes, A.	Phone:	Room: 359
Koenig, L		Date: 10-24-00

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	^{3}H	^{125}I		
1	<220	<220		
2				
3				
4				
5				
6				
7				
8				
9				
10				

Compliance Items

Yes	No	Item		Yes	No	Item	
		1	Signs and labels: room			14	Proper use of shielding
		2	Source containers			15	No eating, drinking, and smoking
		3	Refrigerator/freezer			16	Survey record current
		4	Liquid scintillation vials			17	Inventory & disposal records current
		5	Waste containers			18	Personnel trained
		6	Other equipment			19	Prohibition on mouth pipetting
		7	Proper use of absorbent paper			20	Proper corridor storage
		8	Adequate hood flow @ 100 LFPM			21	Exposure level < 2.0 mR/hr
		9	Hood air flow in calibration			22	Smears < 220 DPM/100 cm sq.
		10	Proper use of external monitoring			23	Survey meters available
		11	Proper radioactive waste management			24	Survey meters operational
		12	Proper radionuclide storage			25	Calibration current
		13	Routine use of lab coat and gloves			26	Other (specify in remarks)

Remarks (refer to violation by item number)

CLOSE OUT SURVEY

Note: Lab was posted for approximately 3 weeks while renovations were being completed on their primary radiation lab.

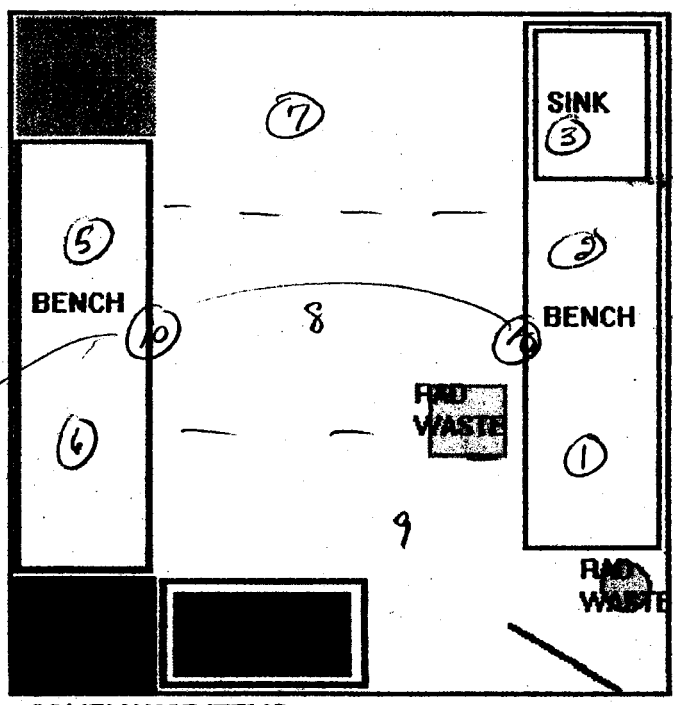
All radioactive waste containers have been removed.

No "caution radioactive materials" stickers are visible in the lab.

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: HAYASHI, T. Phone:_____ Room: 357

Surveyor: Koenig, L Date: 9/9/02



Drawers, and Fig

Smear results in DPM, all smears cover 100 cm sq.

location	nuc 1	nuc 2	nuc 3
	3H	14C	32P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[X]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

Note: CLOSE OUT SURVEY

All radioactive Materials have been removed. All labeled equipment has been removed. All radioactive waste and waste containers have been removed. CRAM sign removed. All swipes < 220 dpm/100cm² No other contamination detected.

CPS

Laboratory Radiological Survey

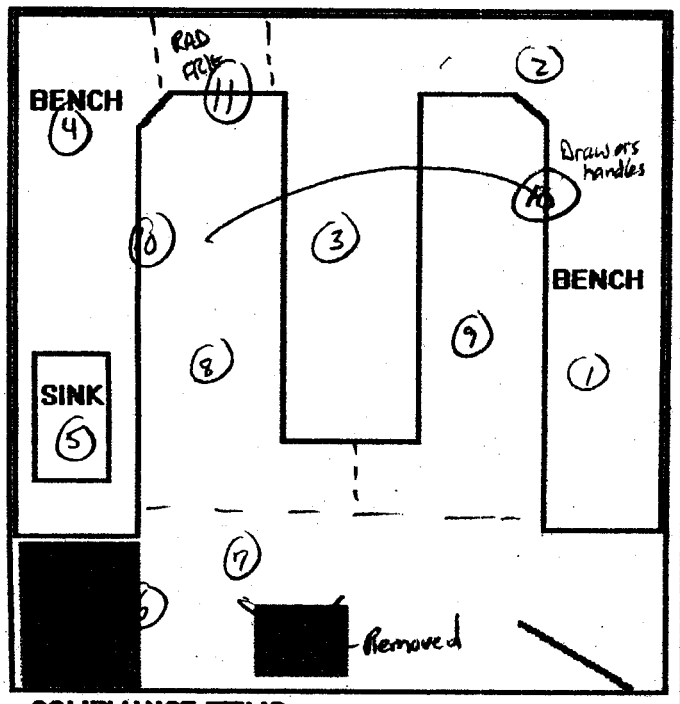
NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther, D. Phone:_____Room: 349

Surveyor: Koenig, L Date: 9 / 11 / 02

21-30



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
	3H	14C/35S	32P/125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

CLOSEOUT SURVEY

All radioactive materials have been removed. All labeled equipment has been removed. All radioactive waste and waste containers have been removed. C.R.A.M Sign removed. All smears <220 dpm/100cm² CRAM label removed from Rad. Free. No other contamination detected.

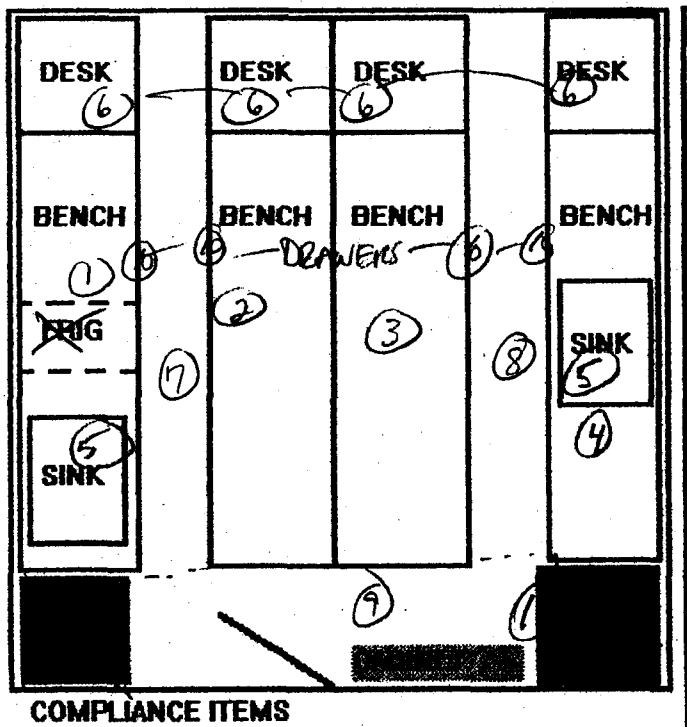
R/X

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther,D, Phone:_____Room: 348

#2

Surveyor: Koenig, L Date: 9/13/02



Smear results in DPM, all smears cover 100 cm sq. location	nuc 1 3H	nuc 2 14C/35S	nuc 3 32P/125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

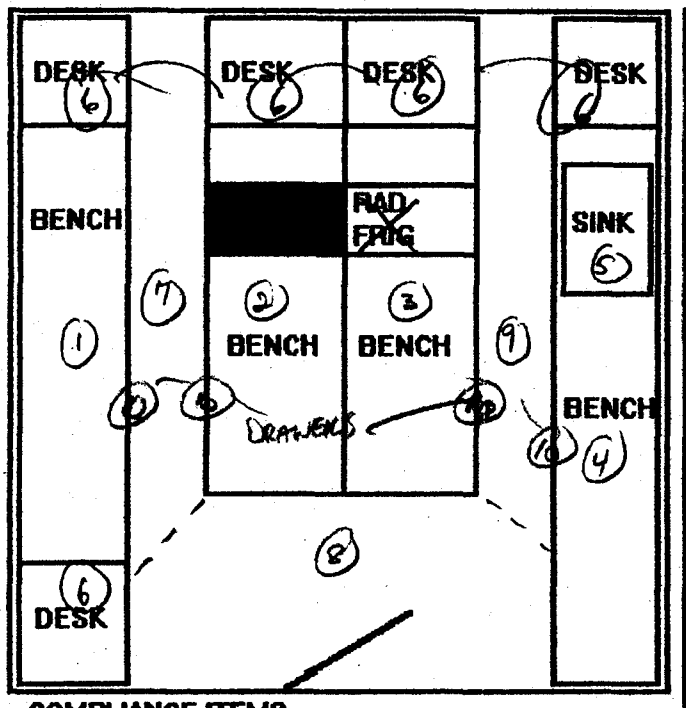
* CLOSEOUT SURVEY *

All radioactive materials have been removed. All labeled equipment has been removed or checked for contamination. All radioactive waste and waste containers have been removed. CRAM sign removed. All swipes < 220 dpm/100cm².
No other B. Y contamination detected.

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther,D, Phone:_____Room: 347

#4 Surveyor: Koenig, L Date: 9/13/02



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc. 2	nuc 3
	3H	14/55	32P/125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

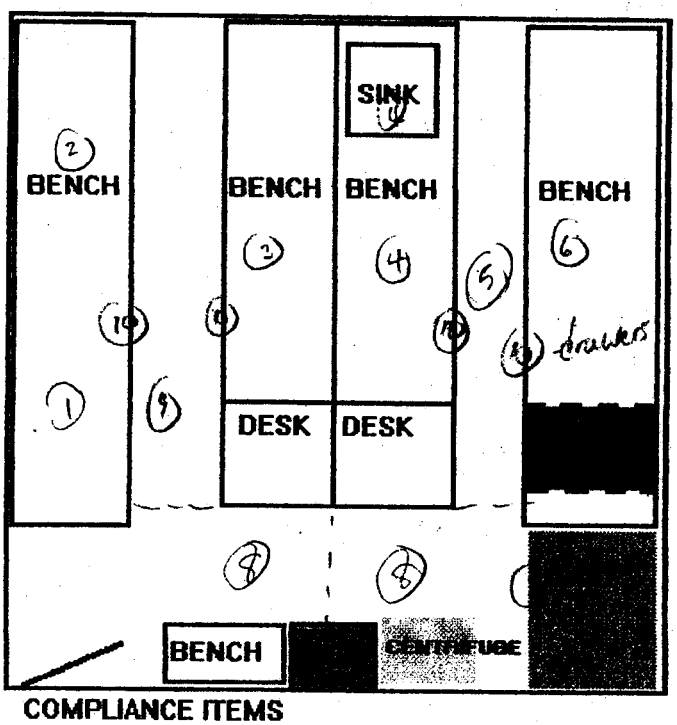
* CLOSEOUT SURVEY *
All radioactive materials have been removed. All labeled equipment has been removed. All radioactive waste and waste containers have been removed.
CRAM sign removed. All swipes < 220 dpm/100cm².
No other B/R contamination detected.

Laboratory Radiological Survey

NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Phone:_____ Room: 332

Surveyor: Koenig, L Date: 3/11/03



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc. 2	nuc 3
	3H	35S/36Cl	32P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

* CLOSE OUT SURVEY *

Note: All radioactive materials have been removed from lab. All radioactive equipment has been removed from lab. All radioactive waste, and waste containers have been removed from lab. No contamination detected with GM, and NaI detectors. All swipe samples < 2200dpm/100cm
"RAM" sign removed from door. Room is now unrestricted.

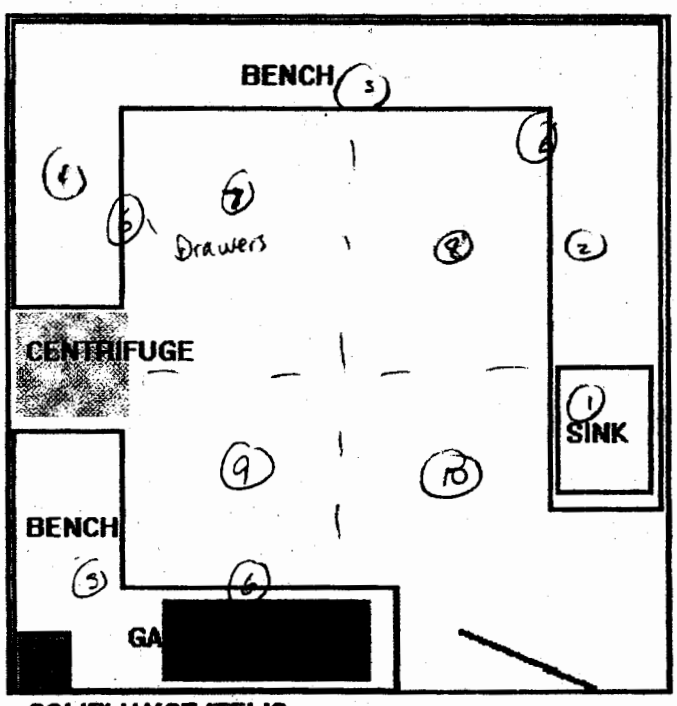
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Phone:_____Room: 331

Surveyor: Koenig, L Date: 3/13/03



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
	3H	33P/32P	32P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

* CLOSEOUT SURVEY *

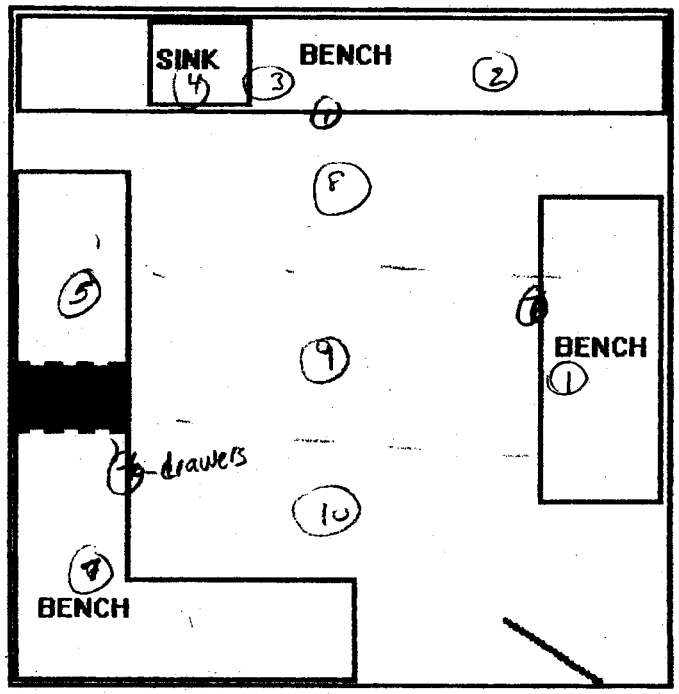
ALL Radioactive materials were removed from lab. All radioactive waste, and waste containers removed from lab. All equipment labeled "CRAM" removed from lab. No radioactive contamination detected with pan. GM, and NaI detectors. All swipes < 220 dpm/100cm². "CRAM" sign removed from lab. Lab is now unrestricted.

3/13/03

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Phone:_____Room: 330

Surveyor: Koenig, L Date: 3/13/03



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
	3H	33P/35S	32P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

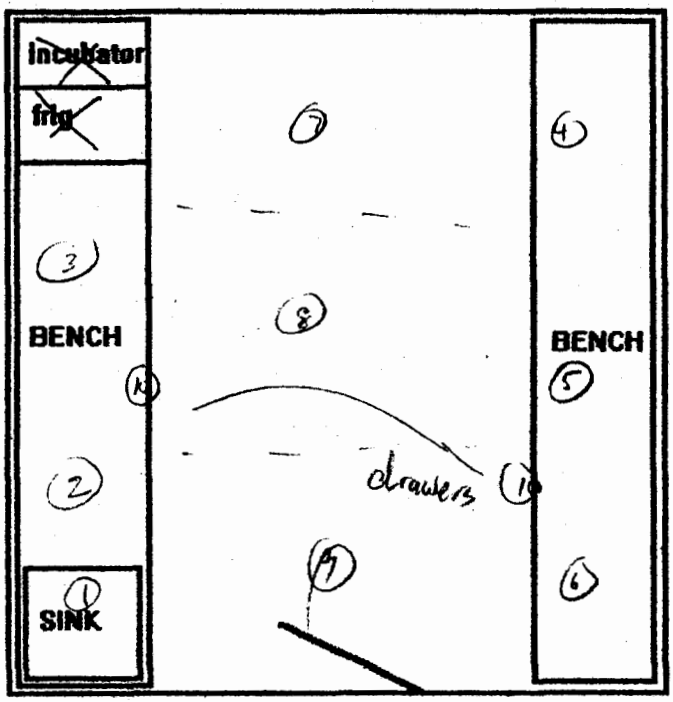
Remarks (Refer to violation by number)

* CLOSE OUT SURVEY *
All radioactive materials were removed from lab. All radioactive waste, and waste Containers removed from lab. All equipment labeled "CRAM" removed from lab. No radioactive contamination detected with GM, and NaI detectors. All swipes < 220 dpm/100 cm².
"CRAM" Sign removed from lab. Lab is now unrestricted. 3/13/03

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther,D, Phone:_____Room: 328

Surveyor: Koenig, L Date: 11/25/02



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
	3H	35S	32P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

** CLOSEOUT SURVEY **

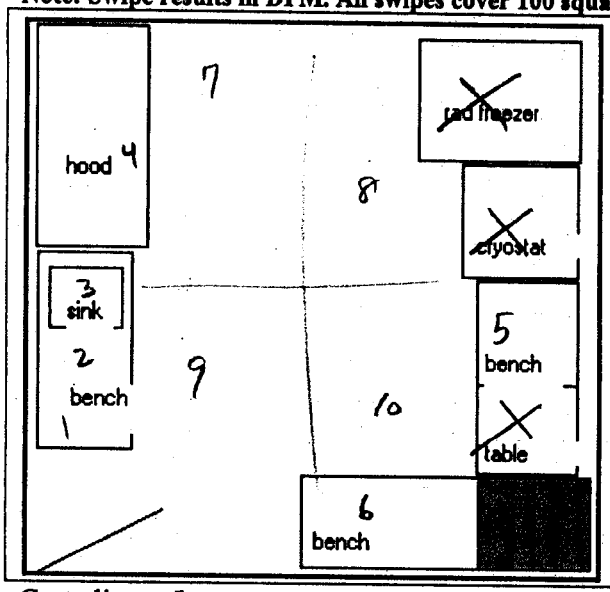
All radioactive materials have been removed from lab. All labeled equipment has been removed from lab. No β, or γ contamination detected. All smears are < 220 dpm/100cm². All radioactive waste and waste containers have been removed from lab. C.RAM SOF13 removed. Lab is now considered an unrestricted area.

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Morales	Phone:	Room: 324
Koenigk.		Date: 4-26-02

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	3H	35S	33P	125I
1	<220	<220	<220	<220
2				
3				
4				
5				
6				
7				
8				
9				
10				

Compliance Items

Yes	No	Item		Yes	No	Item	
		1	Signs and labels: room			14	Proper use of shielding
		2	Source containers			15	No eating, drinking, and smoking
		3	Refrigerator/freezer			16	Survey record current
		4	Liquid scintillation vials			17	Inventory & disposal records current
		5	Waste containers			18	Personnel trained
		6	Other equipment			19	Prohibition on mouth pipetting
		7	Proper use of absorbent paper			20	Proper corridor storage
		8	Adequate hood flow @ 100 LFPM	X		21	Exposure level < 2.0 mR/hr
		9	Hood air flow in calibration	X		22	Smears < 220 DPM/100 cm sq.
		10	Proper use of external monitoring			23	Survey meters available
		11	Proper radioactive waste management			24	Survey meters operational
		12	Proper radionuclide storage			25	Calibration current
		13	Routine use of lab coat and gloves			26	Other (specify in remarks)

Remarks (refer to violation by item number)

* Closeout Survey

All radioactive materials were removed from lab. All radioactive equipment removed from lab.

C.R.A.M. Sign removed from door. No contamination found.

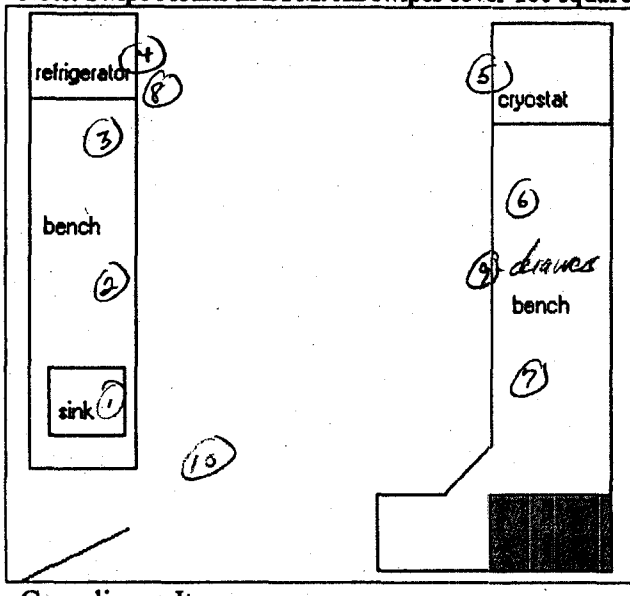
Room is now unrestricted. ~~N~~

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Morales	Phone:	Room: 312
Koenig, L.		Date: 11-17-2000

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	35S	33P		
1	< 220	< 220		
2				
3				
4				
5				
6				
7				
8				
9				
10				

Compliance Items

Yes	No	Item		Yes	No	Item	
		1	Signs and labels: room			14	Proper use of shielding
		2	Source containers			15	No eating, drinking, and smoking
		3	Refrigerator/freezer			16	Survey record current
		4	Liquid scintillation vials			17	Inventory & disposal records current
		5	Waste containers			18	Personnel trained
		6	Other equipment			19	Prohibition on mouth pipetting
		7	Proper use of absorbent paper			20	Proper corridor storage
		8	Adequate hood flow @ 100 LFPM			21	Exposure level < 2.0 mR/hr
		9	Hood air flow in calibration			22	Smears < 220 DPM/100 cm sq.
		10	Proper use of external monitoring			23	Survey meters available
		11	Proper radioactive waste management			24	Survey meters operational
		12	Proper radionuclide storage			25	Calibration current
		13	Routine use of lab coat and gloves			26	Other (specify in remarks)

Remarks (refer to violation by item number)

CLOSE-OUT SURVEY

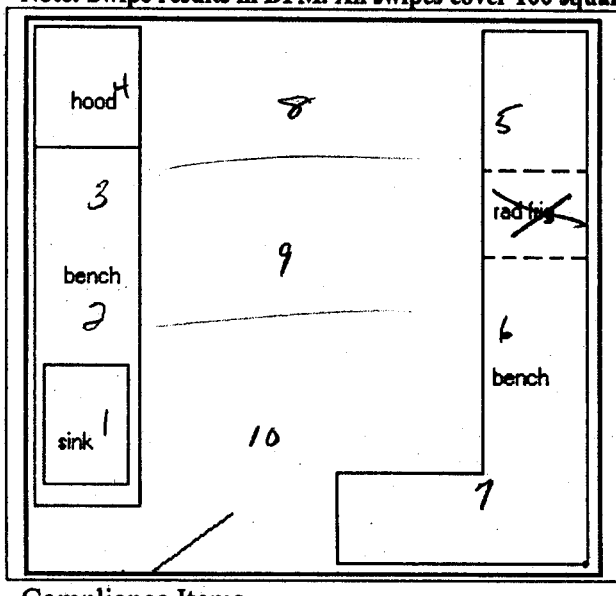
Note: All "Caution Radioactive Materials" marking were removed by laboratory staff.
No radioactive materials was left in lab.
No residual radioactivity was detected with Geiger-Mueller Pancake detector and all smears are < 220 dpm/100 cm².
"CAUTION RADIOACTIVE MATERIALS" door sign was removed. 11-17-2000

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Morales, M.	Phone:	Room: 311
Koenig, L.		Date: 4-26-02

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	3H	35S	33P	125I
1	<220	<220	<220	<220
2				
3				
4				
5				
6				
7				
8				
9				
10				

Compliance Items

Yes	No	Item		Yes	No	Item	
		1	Signs and labels: room			14	Proper use of shielding
		2	Source containers			15	No eating, drinking, and smoking
		3	Refrigerator/freezer			16	Survey record current
		4	Liquid scintillation vials			17	Inventory & disposal records current
		5	Waste containers			18	Personnel trained
		6	Other equipment			19	Prohibition on mouth pipetting
		7	Proper use of absorbent paper			20	Proper corridor storage
		8	Adequate hood flow @ 100 LFPM			21	Exposure level < 2.0 mR/hr
		9	Hood air flow in calibration	X		22	Smears < 220 DPM/100 cm sq.
		10	Proper use of external monitoring			23	Survey meters available
		11	Proper radioactive waste management			24	Survey meters operational
		12	Proper radionuclide storage			25	Calibration current
		13	Routine use of lab coat and gloves			26	Other (specify in remarks)

Remarks (refer to violation by item number)

* CLOSE-OUT SURVEY

All radioactive materials were removed from lab. All radioactive equipment removed from lab

C.R.A.M. sign removed from door. No contamination detected.

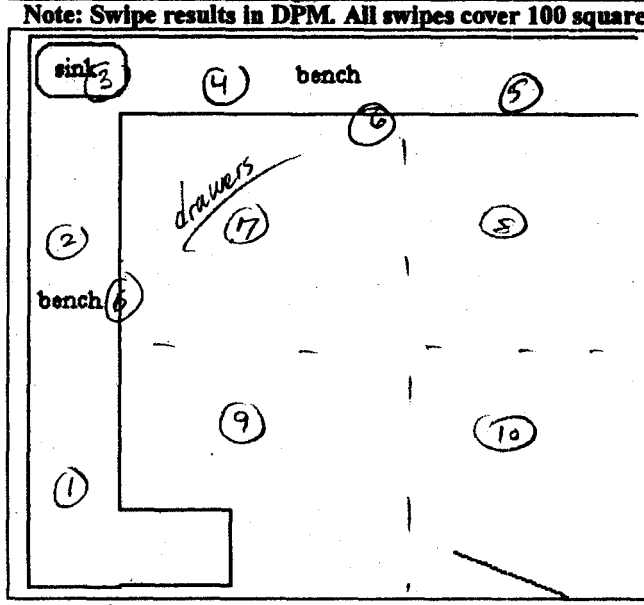
Room is now unrestricted.

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Walther, D.	Phone:	Room: 309
Koenig, L.		Date: 10-8-02

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	3H	14C/35S	32P	
1	<220	<220	<220	
2				
3				
4				
5				
6				
7				
8				
9				
10				

Compliance Items

Yes	No	Item		Yes	No	Item	
		1	Signs and labels: room			14	Proper use of shielding
		2	Source containers			15	No eating, drinking, and smoking
		3	Refrigerator/freezer			16	Survey record current
		4	Liquid scintillation vials			17	Inventory & disposal records current
		5	Waste containers			18	Personnel trained
		6	Other equipment			19	Prohibition on mouth pipetting
		7	Proper use of absorbent paper			20	Proper corridor storage
		8	Adequate hood flow @ 100 LFPM			21	Exposure level < 2.0 mR/hr
		9	Hood air flow in calibration			22	Smears < 220 DPM/100 cm sq.
		10	Proper use of external monitoring			23	Survey meters available
		11	Proper radioactive waste management			24	Survey meters operational
		12	Proper radionuclide storage			25	Calibration current
		13	Routine use of lab coat and gloves			26	Other (specify in remarks)

Remarks (refer to violation by item number)

CLOSEOUT SURVEY
All radioactive materials have been removed from lab. All rad. waste and waste containers have been removed. All labeled equipment has been removed from lab. No B or γ contamination detected. All smears <220 dpm/100 cm²
C.R.A.M. sign removed from door.

10/8/02

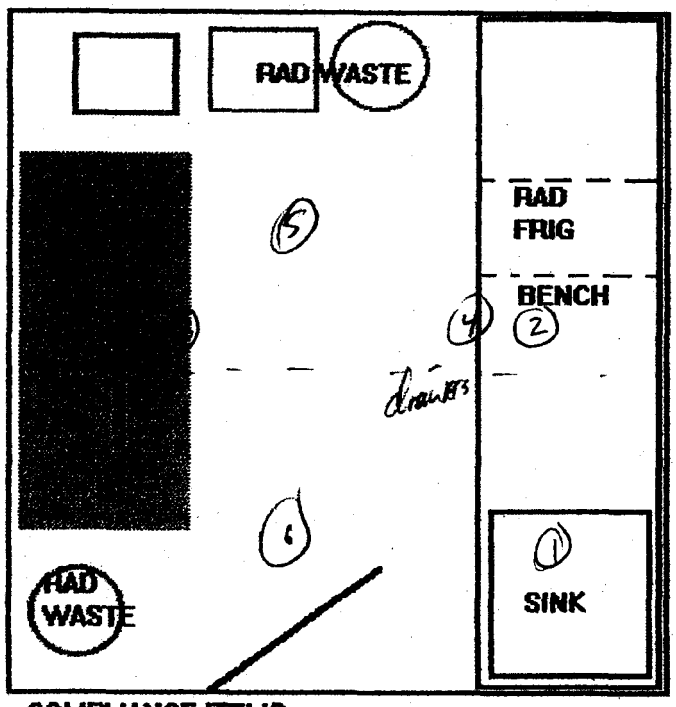
Laboratory Radiological Survey

NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther,D, Phone:_____Room: 308

Surveyor: Koenig, L Date: 10/16/02



Smear results in DPM, all smears cover 100 cm sq.

location	nuc 1 ^{3}H	nuc 2 $^{14}C/^{35}S$	nuc 3 ^{32}P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

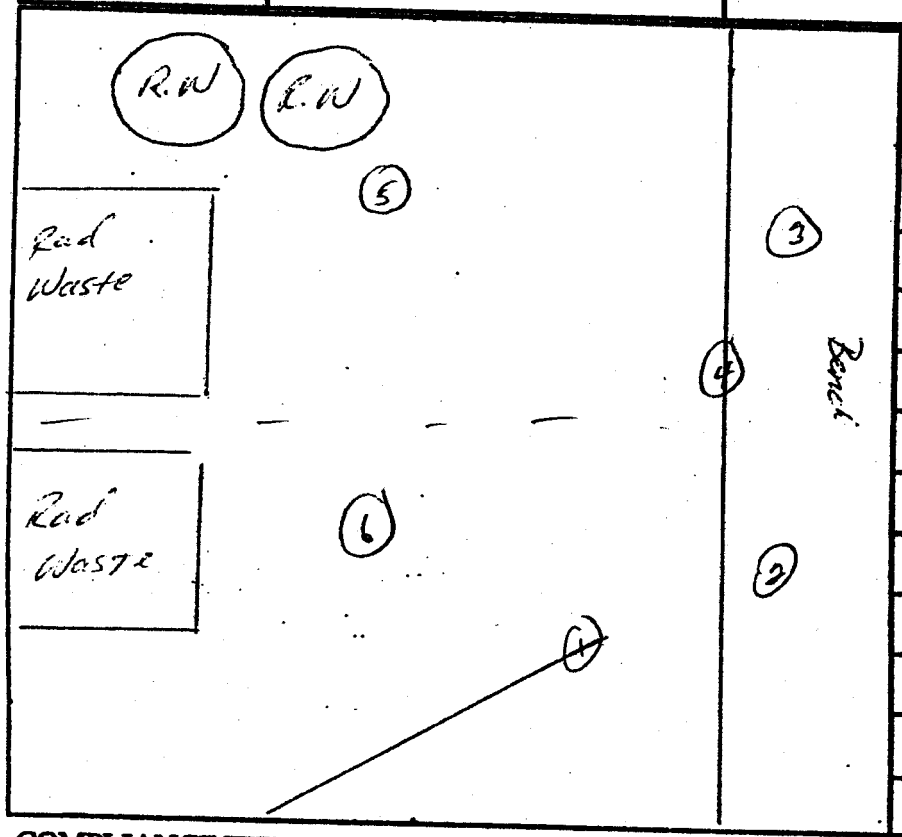
Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[X]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

* CLOSEOUT SURVEY *
All Radioactive materials have been removed from lab. All radioactive waste, and waste containers have been removed from lab. All labeled equipment has been removed from lab. No β^- or γ contamination detected with portable survey equipment. All swipes < 220 dpm/100cm². C.R.M.M. door sign removed.

LABORATORY CONTAMINATION SURVEY	NIDA Addiction Research Center, 4940 Eastern Avenue, Baltimore, MD 21224	COMPANY NAME: NIDA	
		BUILDING: C	ROOM NUMBER: 307

AUTHORIZED INVESTIGATOR	last name, first initial: Walther, D.	PHONE NO.	DATE (month, day, year): 10-16-02
SURVEYOR	last name, first initial	PHONE NO.	



SMEAR RESULTS (in DPM)

(fill in nuclide(s) across the top of the table. All smears 100 cm 2)

LOCATION	Nuclide 1 3H	Nuclide 2 14C/35S	Nuclide 3 32P
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

YES	NO		YES	NO		YES	NO	
		(1) Signs & labels: room			(10) Adequate personnel external monitoring			(19) Personnel trained
		(2) source containers			(11) Radioactive waste management			(20) Prohibition on mouth pipetting
		(3) refrigerator/freezer			(12) Adequate radionuclide storage			(21) Corridor storage meets requirements
		(4) LSC vials			(13) Routine use of: gloves			(22) Radiation levels <2.5 mR/h
		(5) waste containers			(14) lab coats			(23) Contamination (smears) <100 DPM
		(6) other equipment			(15) shielding, if required			(24) Survey meters available
		(7) Absorbent paper (on radionuclide use area)			(16) Prohibition on eating, drinking, smoking			(25) Survey meters operational
		(8) Adequate hood flow			(17) Inventory/disposal records current			(26) Calibration current
		(9) Hood air flow in calibration			(18) Survey records current			(27) Other (Specify in Remarks)

REMARKS *(Refer to item No. Include violations corrected by surveyor.)*

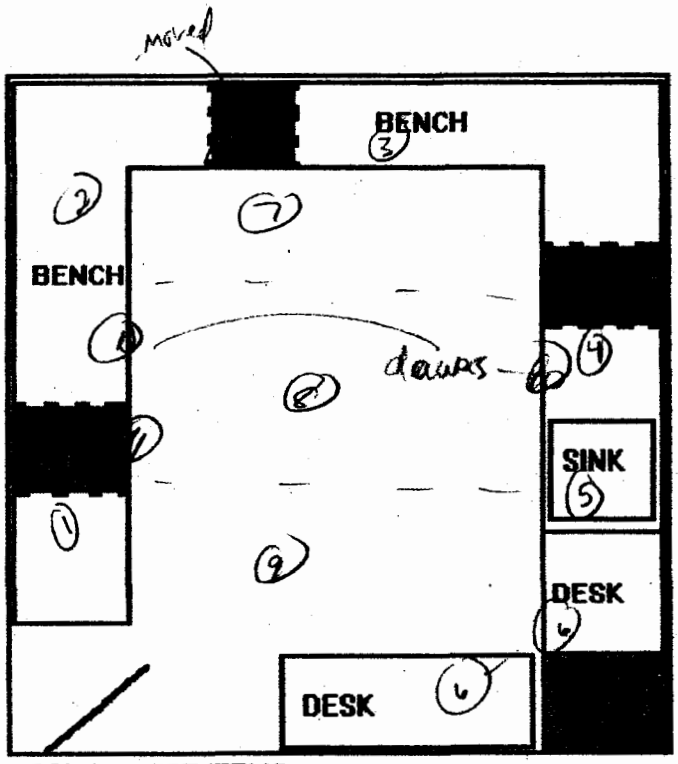
* CLOSEOUT SURVEY *

All radioactive materials have been removed from lab. All radioactive waste, and waste containers have been removed from lab. All labeled equipment has been removed from lab. No B spot contamination detected with portable survey equipment. All swipes <220 dpm/100cm2. C.R.A.M. sign removed.

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther, D. Phone:_____Room: 306

Surveyor: Koenig, L Date: 9/11/02



Smear results in DPM, all smears cover 100 cm sq. location	nuc 1	nuc 2	nuc 3
	3H	35/14C	22Na / 125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[X]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

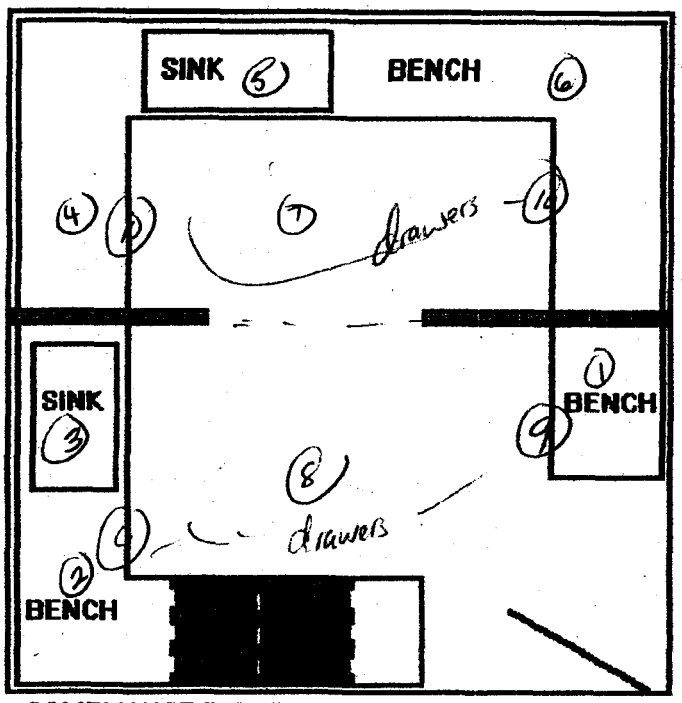
Remarks (Refer to violation by number)

CLOSEOUT SURVEY
All radioactive Materials have been removed. All labeled equipment has been removed. All radioactive waste and waste containers have been removed. All swipes < 200dpm/100cm². No other β/γ contamination detected. CRAM sign Removed

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther, D. Phone:_____Room: 305

Surveyor: Koenig, L Date: 9 / 11 / 02



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
	3H	14C/35S	32P/125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

CLOSEOUT SURVEY

All radioactive materials have been removed. All labeled equipment has been removed. All radioactive waste and waste containers have been removed. CRAM sign removed. All smears <220 dpm/100cm2 No other contamination detected.

Laboratory Radiological Survey

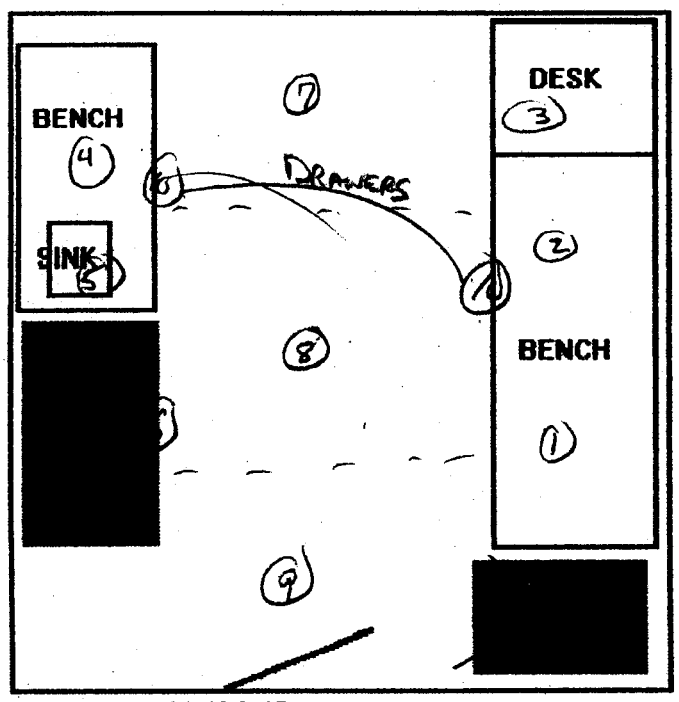
NIDA-Division of Intramural Research

4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther, D. Phone:_____Room: 304

#3

Surveyor: Koenig, L Date: 9/13/08



Smear results in DPM, all smears cover 100 cm sq. location	nuc 1	nuc 2	nuc 3
	3H	14C/35S	32P/125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

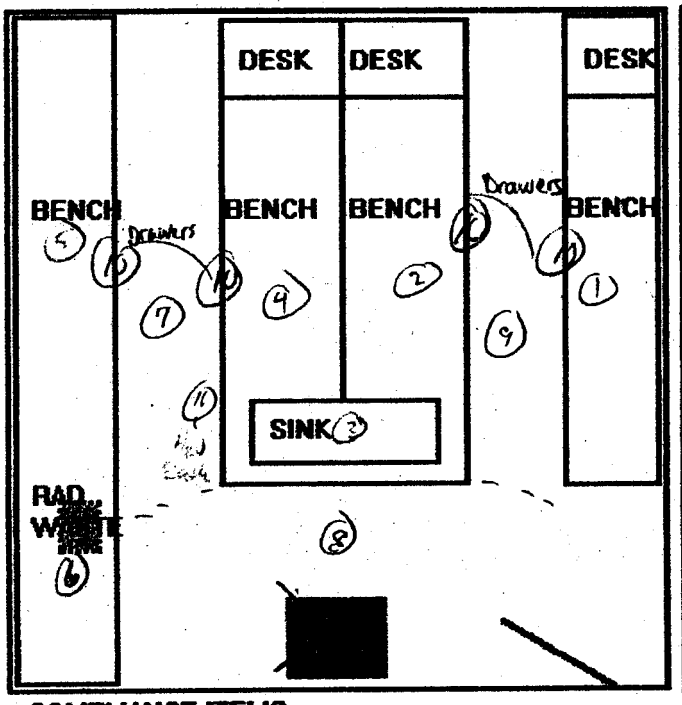
* CLOSEOUT SURVEY *
All radioactive materials have been removed. All labeled equipment has been removed. All radioactive waste and waste containers have been removed. CRAM sign removed. All smears < 220 dpm /100cm². No other B/G contamination detected.

Laboratory Radiological Survey
NIDA-Division of Intramural Research
4940 Eastern Ave. Bld.C
Baltimore, MD 21224

Supervisory User: Walther, D. Phone:_____Room: 301

Surveyor: Koenig, L Date: 9/13/01

#1 1-11



Smear results in DPM, all smears cover 100 cm sq.			
location	nuc 1	nuc 2	nuc 3
[redacted]	3H	14C/35S	32P/125I
1	<220	<220	<220
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

COMPLIANCE ITEMS

Yes	No		Yes	No	
[ ]	[ ]	1.Signs and labels:room	[ ]	[ ]	14.Proper use of shielding
[ ]	[ ]	2.source containers	[ ]	[ ]	15.Prohibition of eating,drinking,smoking
[ ]	[ ]	3.refrigerator / freezer	[ ]	[ ]	16.Survey records current
[ ]	[ ]	4.liquid scintillation vials	[ ]	[ ]	17.Inventory/Disposal records current
[ ]	[ ]	5.waste containers	[ ]	[ ]	18.Personnel trained
[ ]	[ ]	6.other equipment	[ ]	[ ]	19.Prohibition on mouth pipetting
[ ]	[ ]	7.Proper use of absorbent paper	[ ]	[ ]	20.Proper corridor storage
[ ]	[ ]	8.Adequate hood flow @100 LFPM	[ ]	[ ]	21.Exposure level < 2.0 mR/h
[ ]	[ ]	9.Hood air flow in calibration	[ ]	[ ]	22.Contamination(smears)<220dpm/100cm sq.
[ ]	[ ]	10.Proper use of external monitoring	[ ]	[ ]	23.Survey meters available
[ ]	[ ]	11.Proper radioactive waste management	[ ]	[ ]	24.Survey meters operational
[ ]	[ ]	12.Proper radionuclide storage	[ ]	[ ]	25.Calibration current
[ ]	[ ]	13.Routine use of lab coats and gloves	[ ]	[ ]	26.other(specify in remarks)

Remarks (Refer to violation by number)

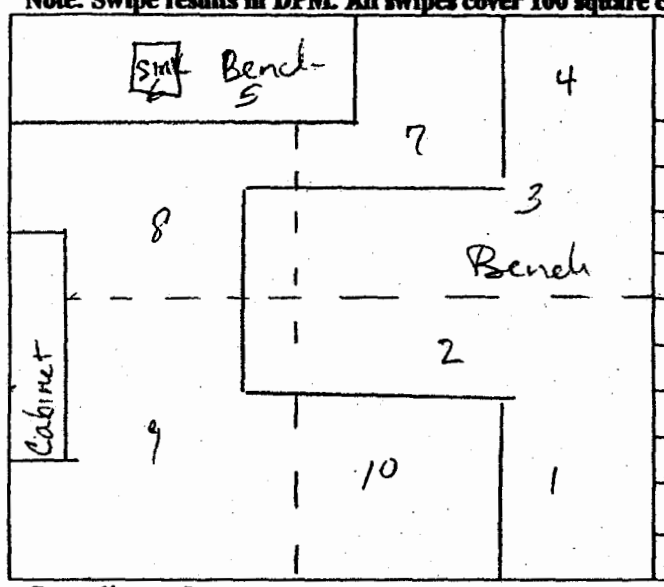
* CLOSEOUT SURVEY *
All radioactive material have removed. All labeled equipment has been removed.
All radioactive waste and waste containers have been removed. CRAM signs
removed. All swipes < 220 dpm /100cm². No other β or γ contamination detected.

Laboratory Radiological Survey

NIDA-Intramural Research Program
5500 Nathan Shock Drive
Baltimore, MD 21224

Supervisory User: Backman, C. Kuenig, L.	Phone:	Room: 217A
		Date: 7-11-03

Note: Swipe results in DPM. All swipes cover 100 square centimeters.



Isotope	^{125}I			
1	<220			
2				
3				
4				
5				
6				
7				
8				
9				
10				

CLOSE OUT SURVEY

This lab is not routinely used for radioactive materials. Dr. Backman requested to use this room for an overnight study (Protocol # 03-001) As per sec. 9 of the NIDA-IRP Radiation Safety Manual, the room was not posted "C.R.A.M.", but the cages were. Exposure rates at the surface of the cage was 0.4 mRem/hr. A closeout survey was performed upon completion of the study. All radioactive waste was removed from lab. The cages were checked for contamination. The cage bottoms, and tops were disposed of as radioactive waste. No contamination was detected using a NaI detector. All swipe samples < 220 dpm/100 cm². Room is acceptable for general use.

APPENDIX C

Copies of Closeout Surveys or Related Surveys

- **Room 347:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 348:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analysis result for H-3, C-14 or P-32 was 15 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 349:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 11 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 357/358:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 359:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 361:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 363:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are

presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

- **Room 368:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 372:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 5 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 377:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 6 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 383:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 4 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 384:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 385:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 6 dpm/100cm^2; the averages were lower. The highest result for a batch of

10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

- **Room 386:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 14 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 387:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 6 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 3-1:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 13 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 3-2:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 10 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 3-3:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 3-4:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 7 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of

smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

- **Hallway 3-5:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 10 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 409:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 11 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Room 420A:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 59 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 4-1:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 9 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 4-2:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 8 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.
- **Hallway 4-3:** Results for the beta static average, maximum and the maximum scan, and the average and maximum removable contamination levels are presented in Table 10 above. The highest analytical result for H-3, C-14 or P-32 was 6 dpm/100cm^2; the averages were lower. The highest result for a batch of 10 smears analyzed together for I-125 was 4 dpm; this is below the minimum detectable activity of ~20 dpm/100cm^2 for an individual smear. The number of smears equaled or exceeded the number of static measurements (15). These values are below the acceptable surface contamination limits.

7.0 SUMMARY OF RESULTS

Statistical analyses of the FSS data was performed at the survey unit level for evaluating compliance with the approved release criteria. Including hallways, there were 55 survey units and 15 static random measurements were made in each, smears were collected at each static location plus suspicious areas such as exhaust vents and drains. All floors and work areas (bench tops, sinks, and fume hoods) received a 100% beta-gamma scan.

- All DQOs were met.
- All 37 duplicate measurement results were acceptable.
- Of all survey units, the highest average and maximum beta static measurements were 2187 and 3030 dpm/100cm^2 which are 44% and 20% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.
- Of all survey units, the highest maximum beta scan measurement was 7064 dpm/100cm^2 which is 47% of the respective DCGL of 15000 dpm/100cm^2.
- Of all survey units, the highest average and maximum gross beta smear measurements were 57 and 290 dpm/100cm^2 which are 6% and 29% of the DCGL of 1000 dpm/100cm^2.
    - The highest H-3 smear result was 11 dpm/100cm^2 which is about 1% of the acceptable surface contamination levels.
    - Attributing all radioactivity to a single smear of a 10 pack used in the gamma analysis for I-125, the maximum smear result was 4 dpm/100cm^2. This value is less than the 20 dpm/100cm^2 DCGL for removable I-125 contamination. With a half-life of ~60 days, residual I-125 is rapidly decaying.

Results for direct and scan measurements may be skewed positive due to the requirement to use conservative efficiency factors in calculations and also from other events such as the varying activity of natural radon gas on different days. As all measured data are below the DCGL, no further analysis such as the Wilcoxon Rank Sum is required. In summary, residual contamination levels for each survey unit are a small fraction of the acceptable residual levels for radionuclides listed in Table S-5, NUREG-1556 and even a smaller fraction of the NRC Acceptable License Termination Screening Values. This report and the HSA should be submitted to the NRC in the NIH-NIDA request to remove the authorized address from the NRC license.

8.0 REFERENCES

8.1 *Radiological Historical Site Assessment For the C Building Johns Hopkins Bayview Campus, 5500 Nathan Shock Drive, Baltimore, MD 21224*, Chesapeake Nuclear Services, Inc., February 2008.

8.2 Materials License 19-09760-02, U.S. NRC, March 20, 2006.

8.3 *Evaluation of Surface Contamination-part1, Beta Emitters and Alpha Emitters* (ISO 7503-1), International Organization for Standardization, 1988.

8.4 *Guidance for the Data Quality Objective Process*, U.S. EPA, 2000.

8.5 *Guideline For Decontamination Of Facilities And Equipment Prior To The Release For Unrestricted Use Or Termination Of Licenses For Byproduct, Source Or Special Nuclear Material,* U.S. NRC, 1982.

8.6 *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*, NUREG 1507, U.S. NRC, June, 1998.

8.7 *A Non-Parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys,* NUREG-1505, U.S. NRC, 1999.

8.8 *Multi-Agency Radiation Survey and Site Investigation Manual*, EPA/402/R-97-016, Revision 1. NUREG-1575, U.S. NRC, August, 2000.

8.9 *Consolidated NMSS Decommissioning Guidance,* NUREG-1757 Volumes 1 and 2, U.S. NRC, 2003.

8.10 *Residual Radioactive Contamination From Decommissioning*, NUREG/CR-5512, October, 1992.

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8.13 *Decommissioning Health Physics*, EW Abelquist, IOP Publishing Ltd, 2001.

8.14 *Systematic Radiological Assessment of Exemptions for Source and Byproduct Materials*, NUREG-1717, U.S, NRC, 2001.

8.15 *The Health Physics and Radiological Handbook,* Revised Edition, Scinta, Inc., Silver Spring, MD 20902, 1992.

8.16 *Ludlum User Manual – Ludlum Model 43-68, Model 43-68/1, and Model 43-68/2 December 2000,* Ludlum Measurements, Inc., Sweetwater, Texas, 79556.

8.17 *Ludlum User Manual – Ludlum Model 239-1F Floor Monitor, January 1999,* Ludlum Measurements, Inc., Sweetwater, Texas, 79556.

8.18 *Ludlum User Manual – Ludlum Model 2929 Dual-Channel Scaler, January 2008,* Ludlum Measurements, Inc., Sweetwater, Texas, 79556.

8.19 *Ludlum User Manual – Ludlum Model 3030& 3030E Alpha-Beta Sample Counters, September 2004,* Ludlum Measurements, Inc., Sweetwater, Texas, 79556.

8.20 *Residual Radioactive Contamination From Decommissioning: Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent,* NUREG/CR-5512 V1, October 1992.

8.21 *Radioactive Waste Treatment, And Effluent and Environmental Monitoring*, NRC INSPECTION MANUAL- INSPECTION PROCEDURE 84750, U.S. NRC, March 15, 1994.

8.22 *Program-Specific Guidance About Licenses of Broad Scope*, NUREG-1556, Vol 11, U.S. NRC, April 1999.

8.23 *Radiological Final Status Survey Plan For the G Building Johns Hopkins Bayview Campus, 5510 Nathan Shock Drive, Baltimore, MD 21224*, Chesapeake Nuclear Services, Inc., September 2008.

APPENDIX A

Diagrams of Survey Units

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 611912008

Room 105

STATIC & SMEAR LOCATIONS

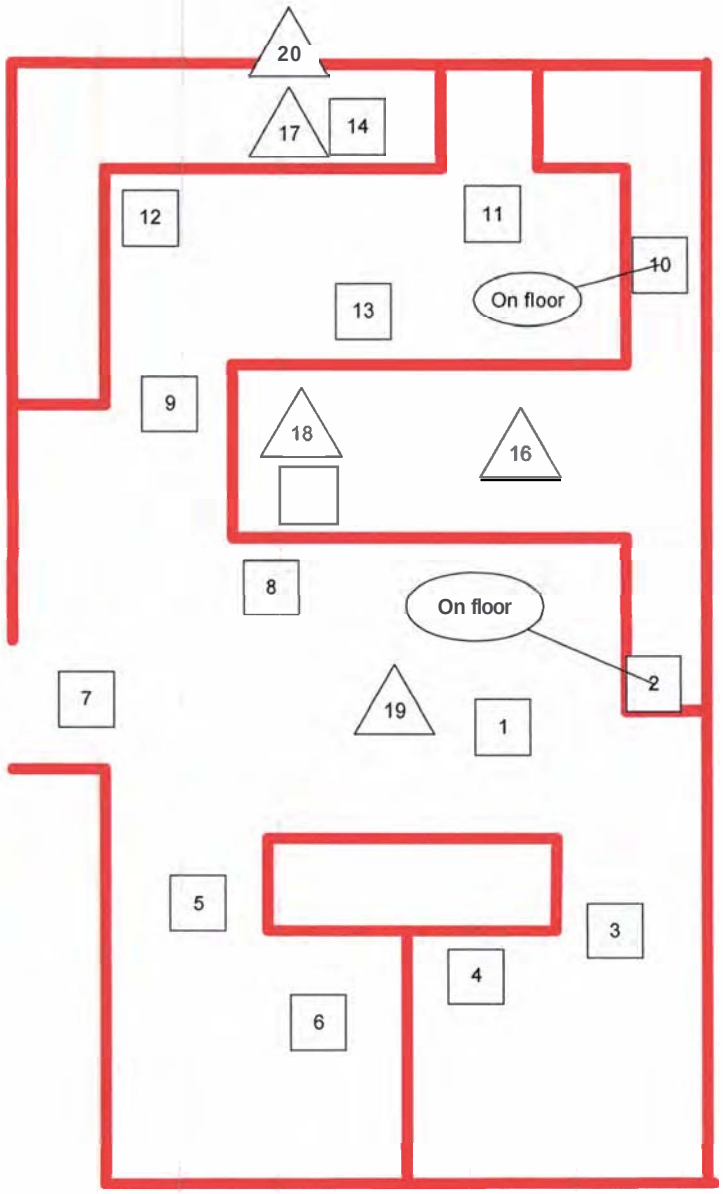
16-18 Sink Bowls
19- Floor Drain
20- Shelf Rack

DQO Locations

SURVEY INSTRUMENTS

2350-1 #80496
43-68 PR148454 Statics/Scans
43-37-1 PR145081 Floor Scan

No Scale



Surveyor: Byron Hand, Sr HPT
Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: *611 912008*

Room 111

STATIC & SMEAR LOCATIONS

16- Wall
17, 19, 21 Sink Bowls
18- Floor Drain
20- Floor Drain

DQO Locations

SURVEY INSTRUMENTS

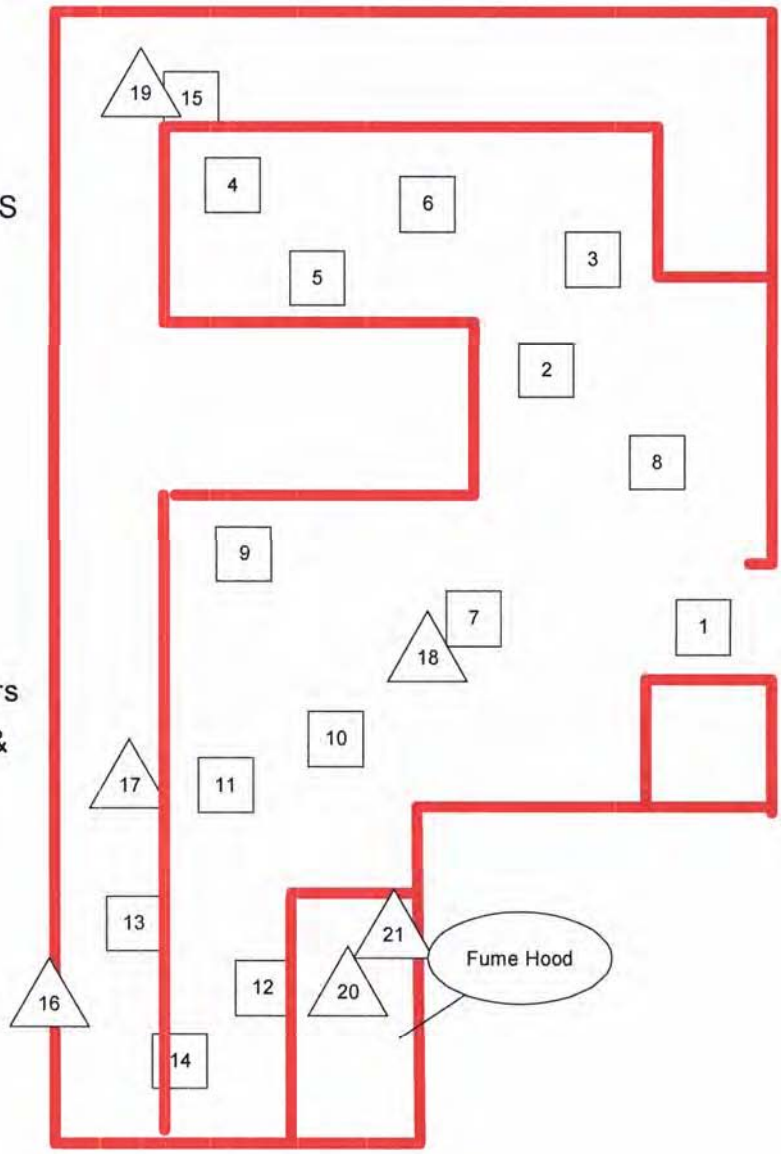
2350-1 #80496

43-68 PR148454 Statics/Drawers

43-37-1 PR145081 Floor Scan & Benchtop

43-37 PR128635 Floor Scan

No Scale



Surveyor: Byron Bland, Sr HPT
Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/1912008

Room 112

X indicates use in lab.

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

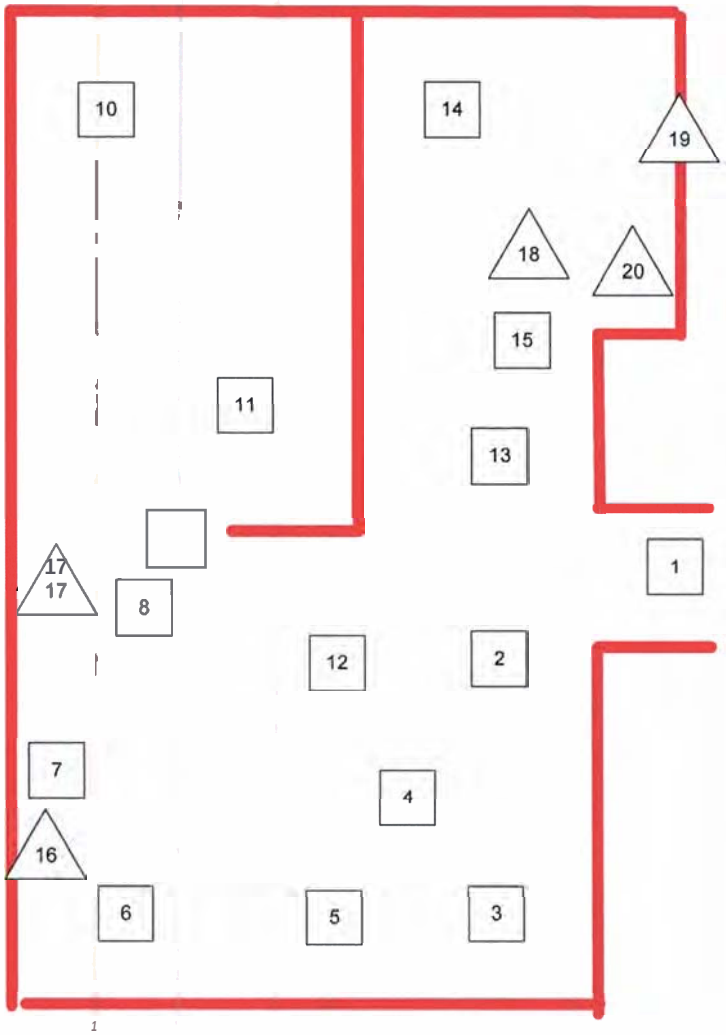
43-37-1 PR145081 Floor Scan,

STATIC & SMEAR LOCATIONS

16- Bias
17- Sink Bowl
18- Floor Drain
19- Drying Rack
20- Bias

DQO Locations

No Scale



Surveyor: Byron Band. Sr HPT
Reviewer: J. W. Moon, CHP

Final Status Closeout Survey for C Building
Johns Hopkins **Bayview** Campus

Date: 611912008

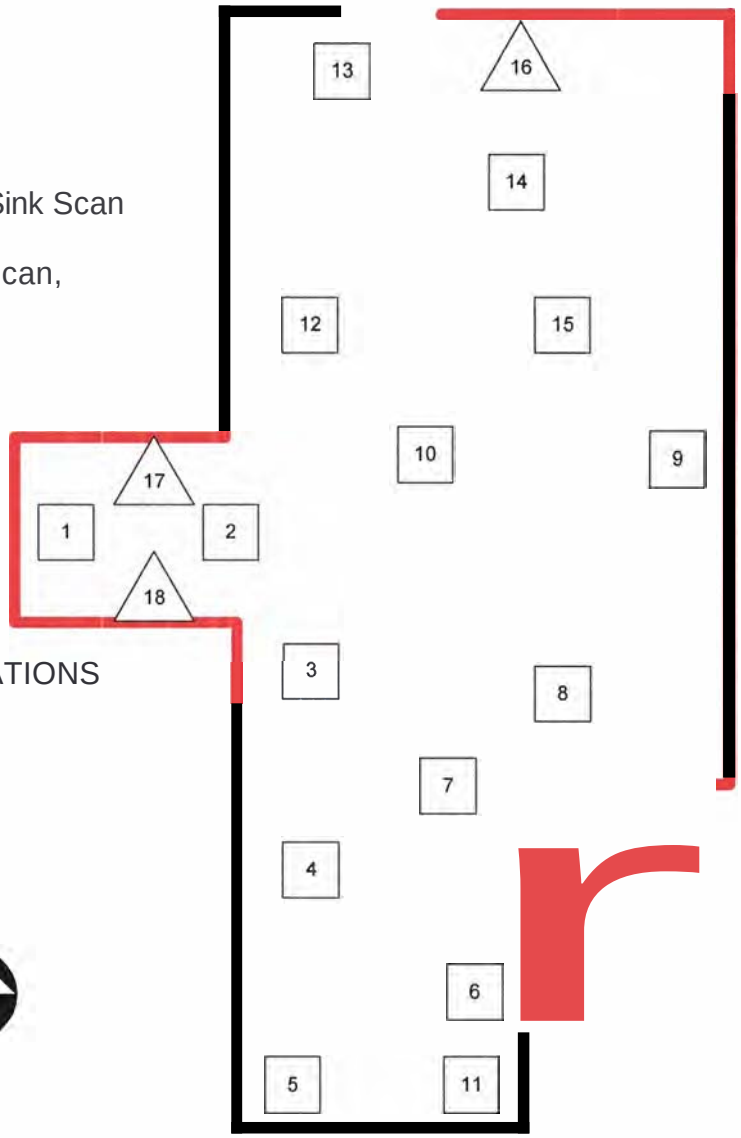
Room 112A

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Sink Scan

43-37-1 PR145081 Floor Scan,



STATIC & SMEAR LOCATIONS

16- Sink Bowl

17, 18- Bias

DQO Locations

No Scale

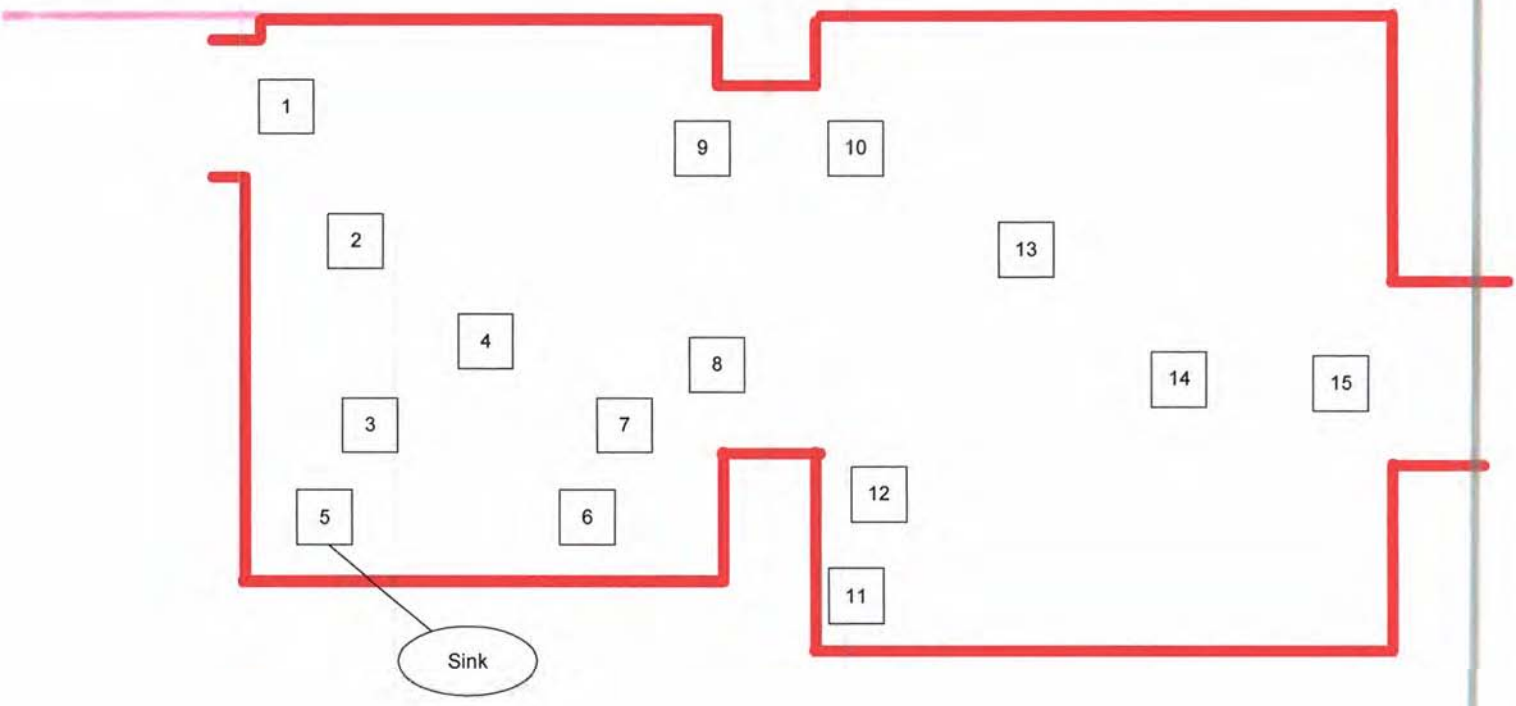
N

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 11/19/2008

Room 10519



SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Sink Scan

43-37-1 PR145081 Floor Scan,

STATIC & SMEAR LOCATIONS

DQO Locations

No **Scale**

N

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 1111912008

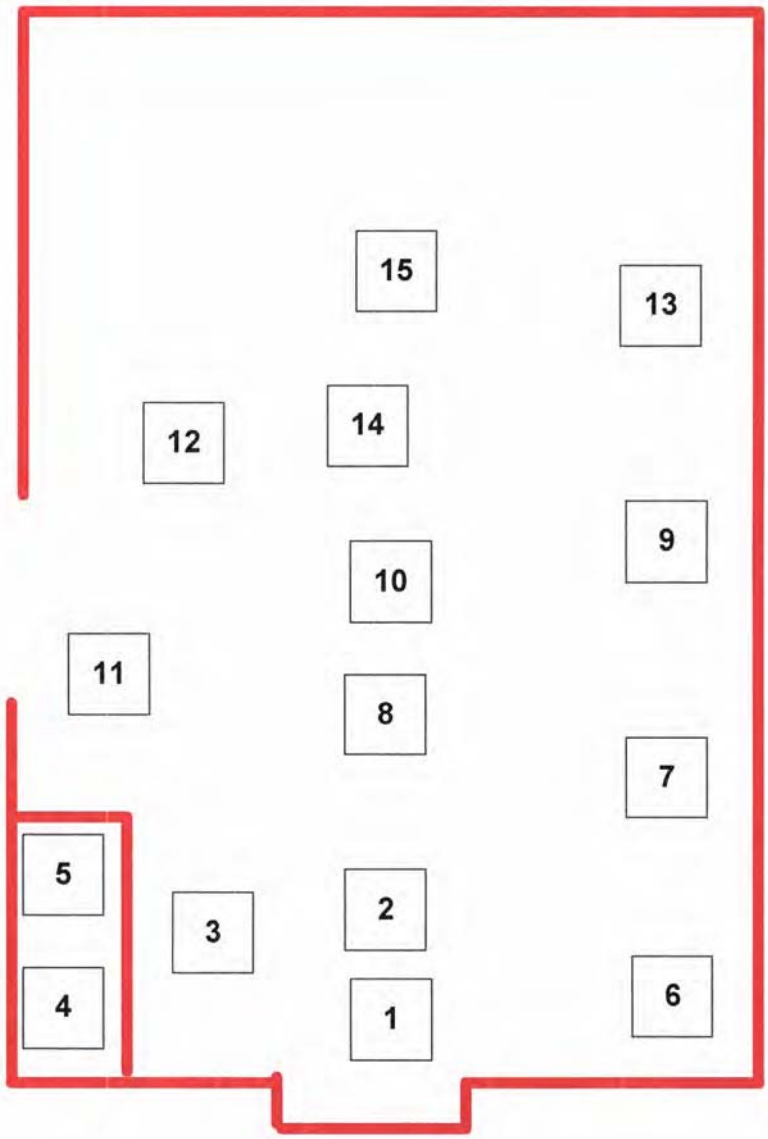
Room 135

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Sink Scan

43-37-1 PR145081 Floor Scan,



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

N

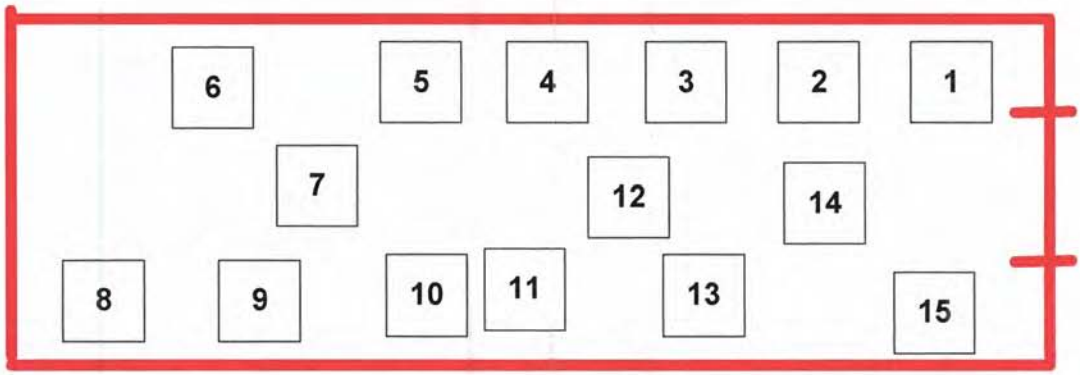
Surveyor: Byron Bland, Sr HPT

Reviewer: J. W. Moon, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 11/24/2008

Room: Cargo Container



SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Sink Scan

43-37-1 PR145081 Floor Scan,

STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

N

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/1912008

Hall 1-1

STATIC & SMEAR LOCATIONS

DQO Locations

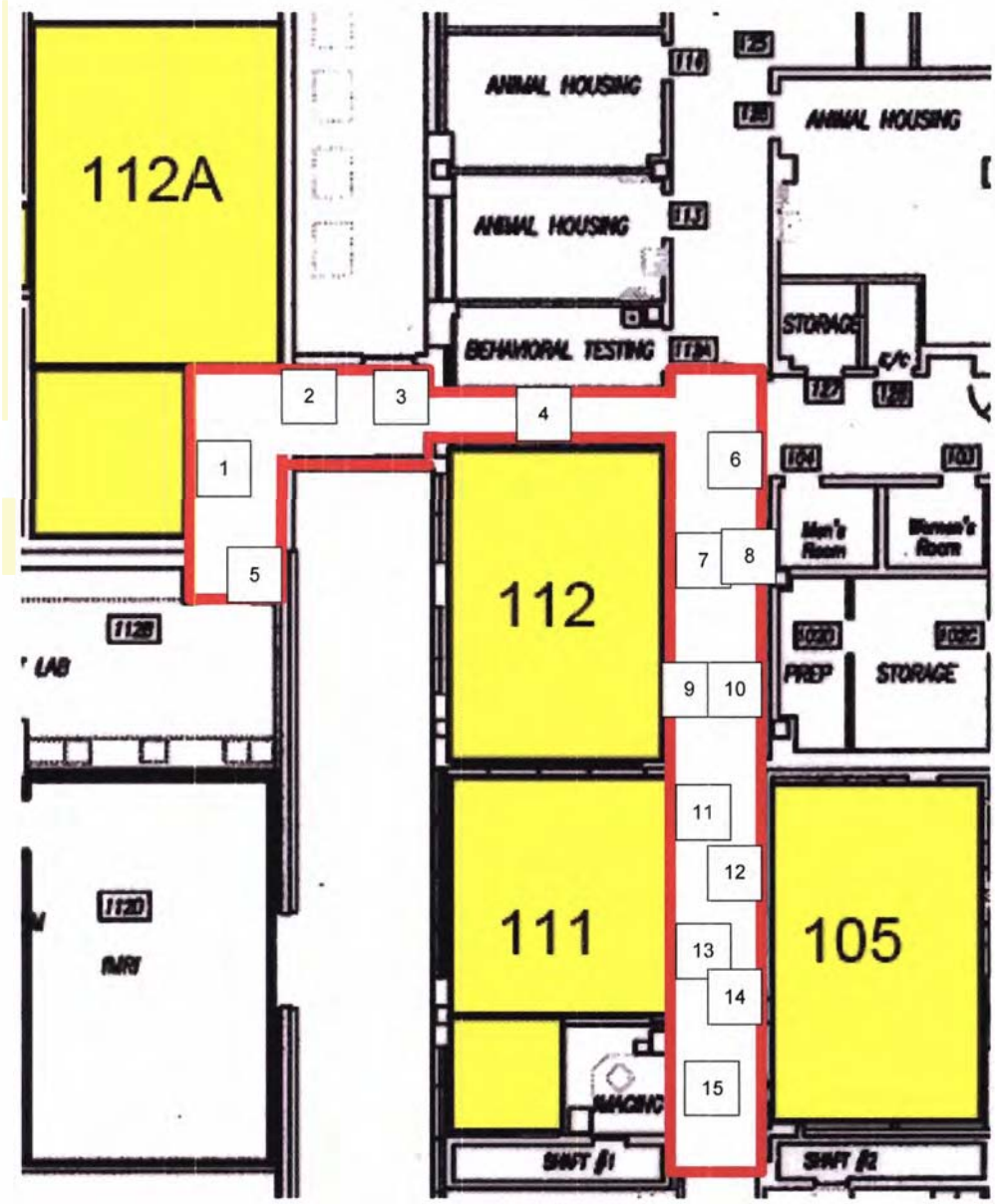
SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor Scan

No Scale



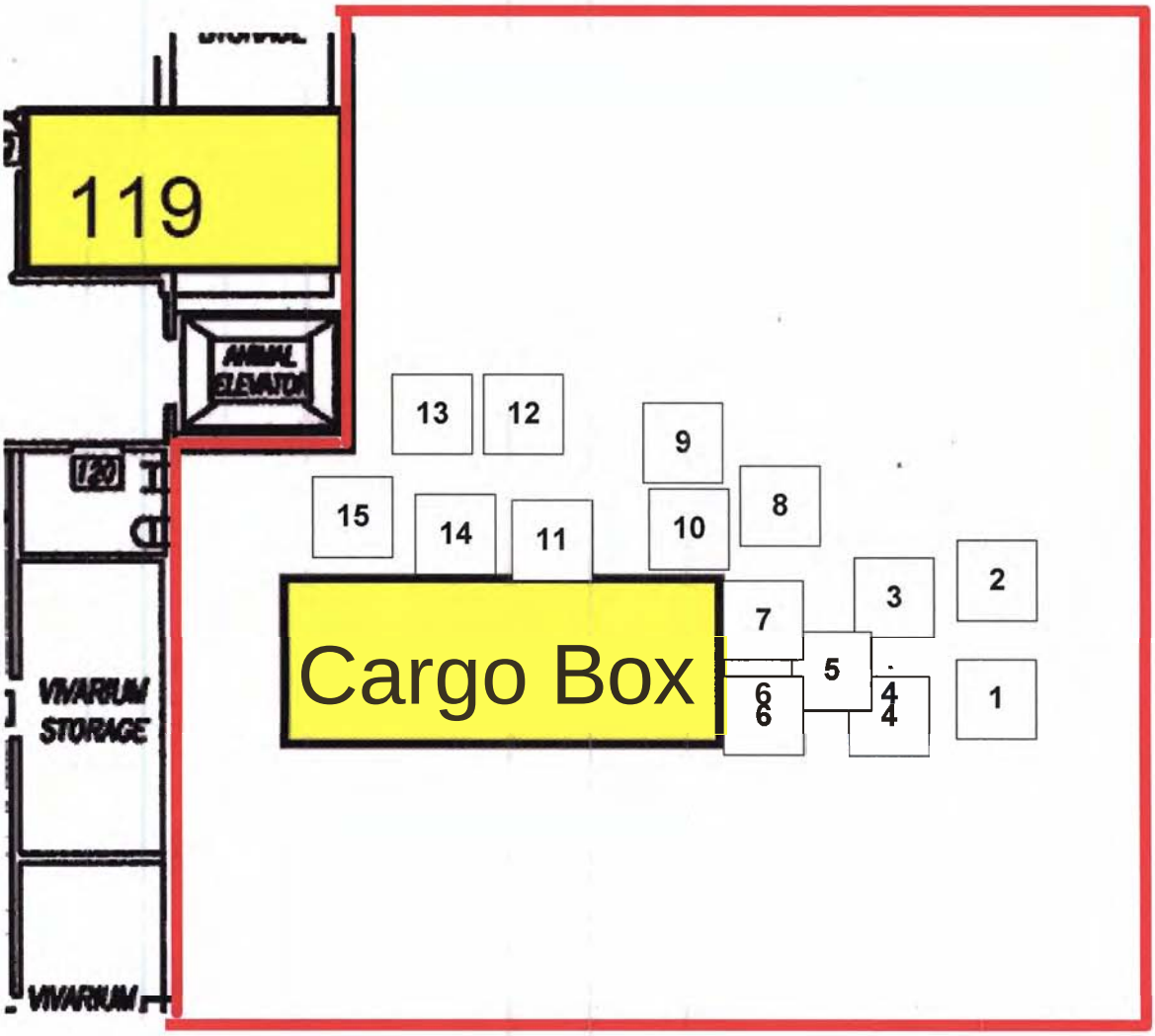
Surveyor: Byron Bland, Sr HPT

Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 11/1912008

Hall 1-2



STATIC & SMEAR LOCATIONS

DQO Locations

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor Scan

No Scale

N

Surveyor: Byron Band, Sr HPT

Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 11/1912008

Hall 1-3

STATIC & SMEAR LOCATIONS

DQO Locations

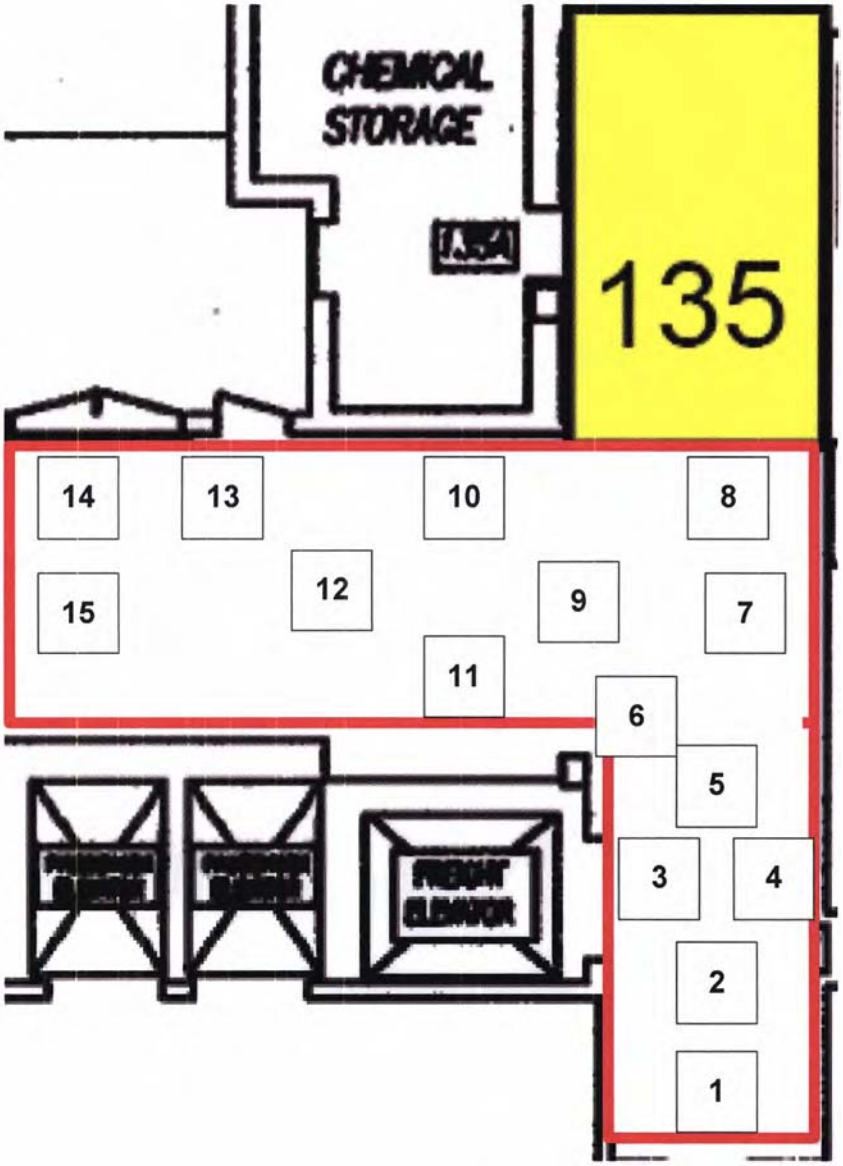
SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor Scan

No Scale



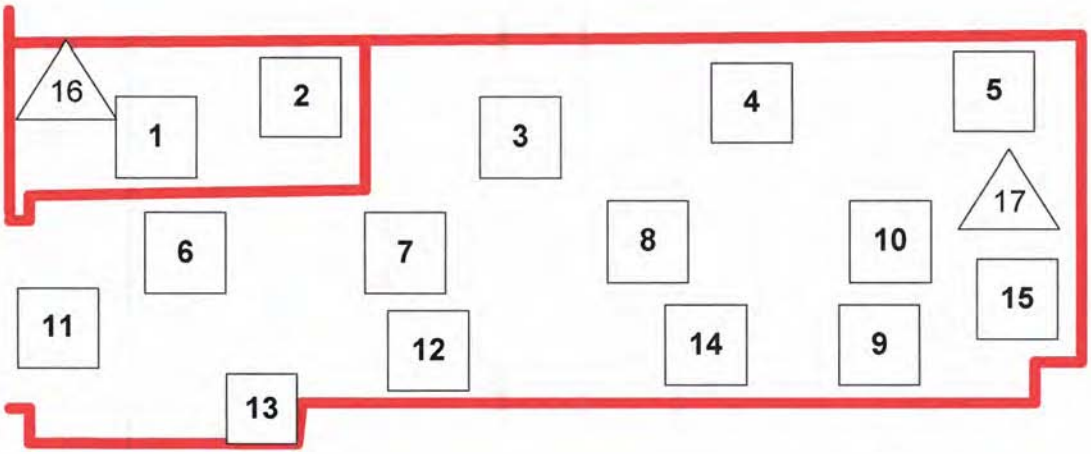
Surveyor: Byron Bland, Sr HPT

Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 / 30 12008

Room 209



STATIC & SMEAR LOCATIONS

DQO

Bias Smear 16 was taken insde sink, 17 was taken inuctside room exhaust duct

No Scale

N

Survey Instruments
2350-1 # 80496
43-68 PR148454 Statics /Scans
43-37 PR128625 Scans
43-37-1 PR128625 Scans

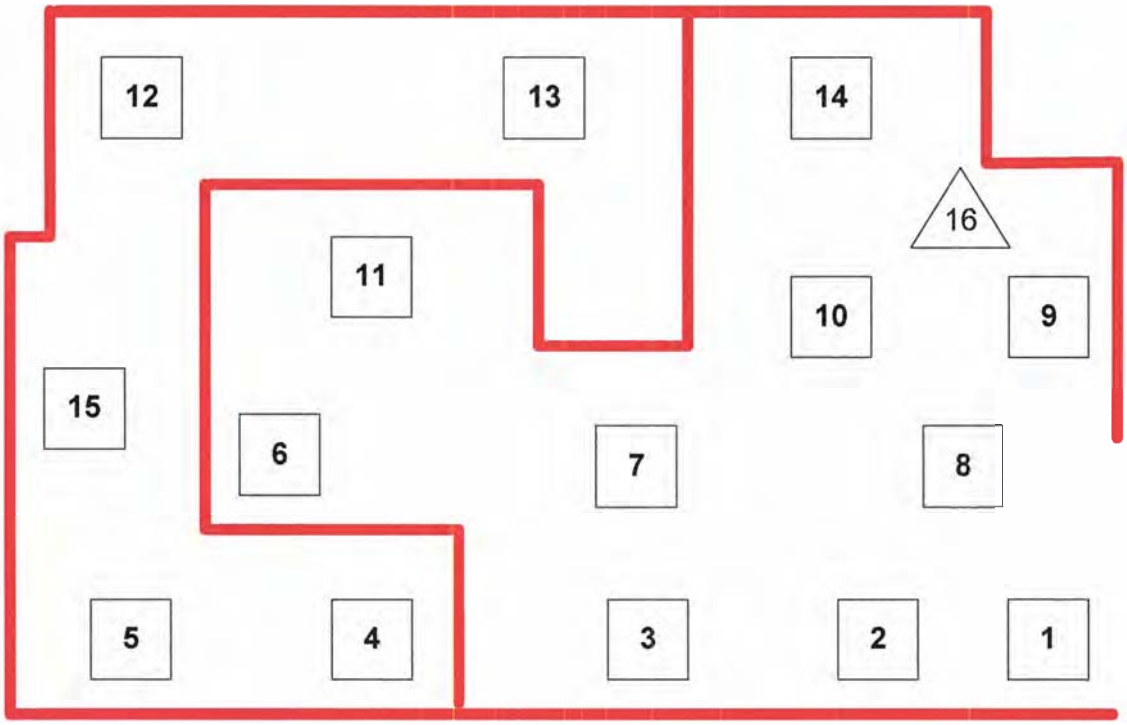
Surveyor
James Brady Sr RPT

Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 / 30 / 2008

Room 217A



STATIC & SMEAR LOCATIONS

DQO

Bias Smear
16 Inside Room Exhaust Duct

Note : Static and Smear 15 Taken Inside Sink

No Scale

N

Survey Instruments
2350-1 # 80496
43-68 PR148454 Statics /Scans
43-37 PR128625 Scans
43-37-1 PR128625 Scans

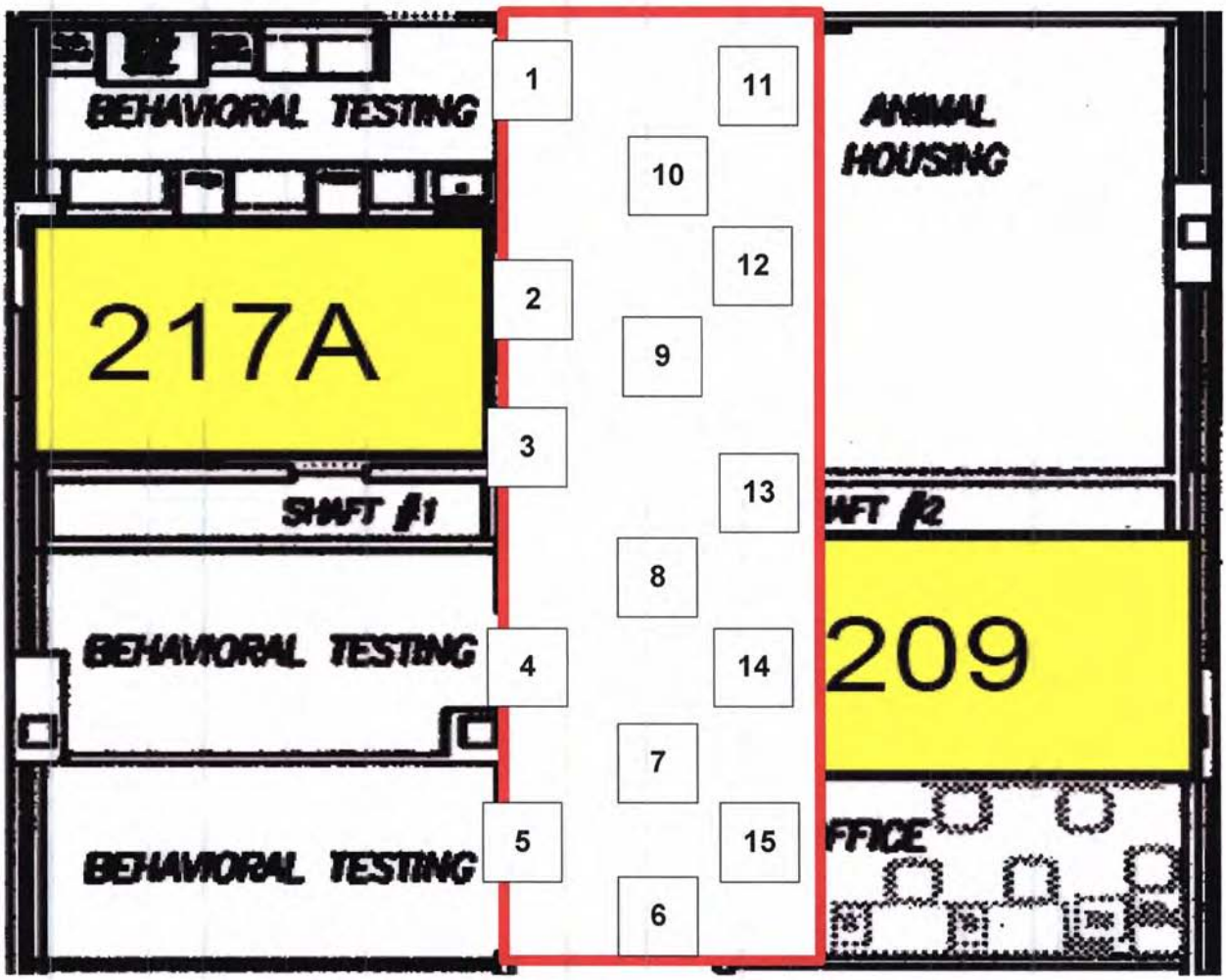
Surveyor
James Brady Sr RPT

Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 1 30 12008

Hall 2-1



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

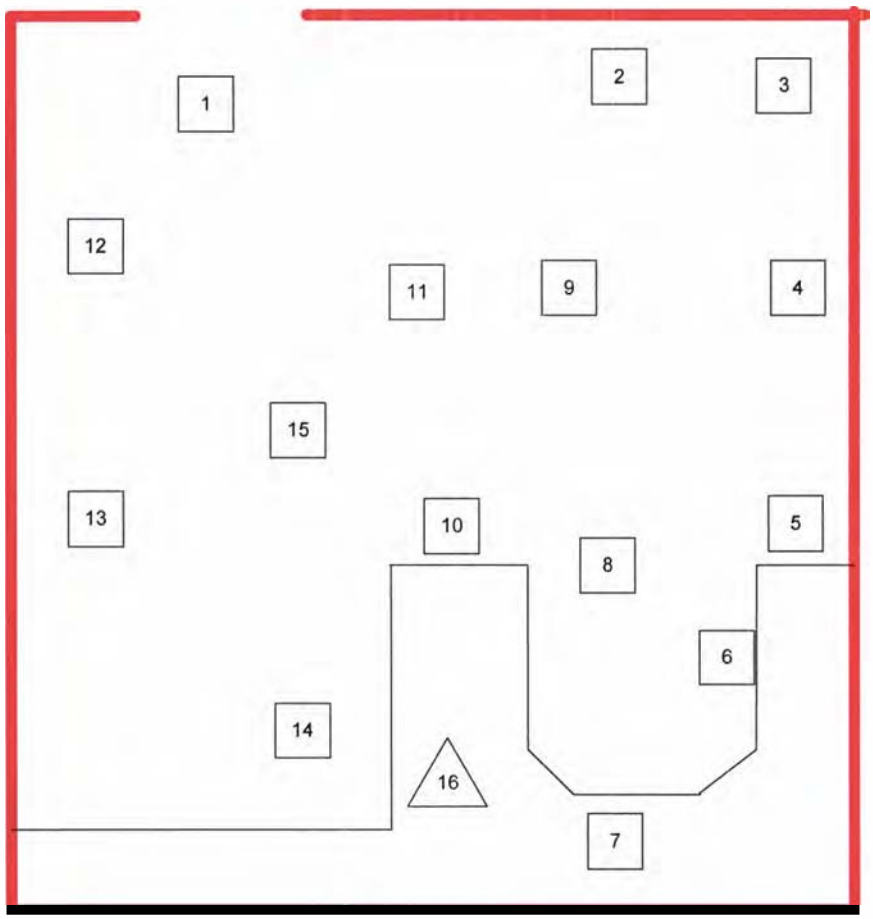
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
43-37 PR 128625 Scans

Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/23/2008

Room 301



STATIC & SMEAR LOCATIONS

DQO Locations

16 Bias Smear

No Scale

N

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor Scan

43-37 PR128625

Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 / 31 12008

Room 304

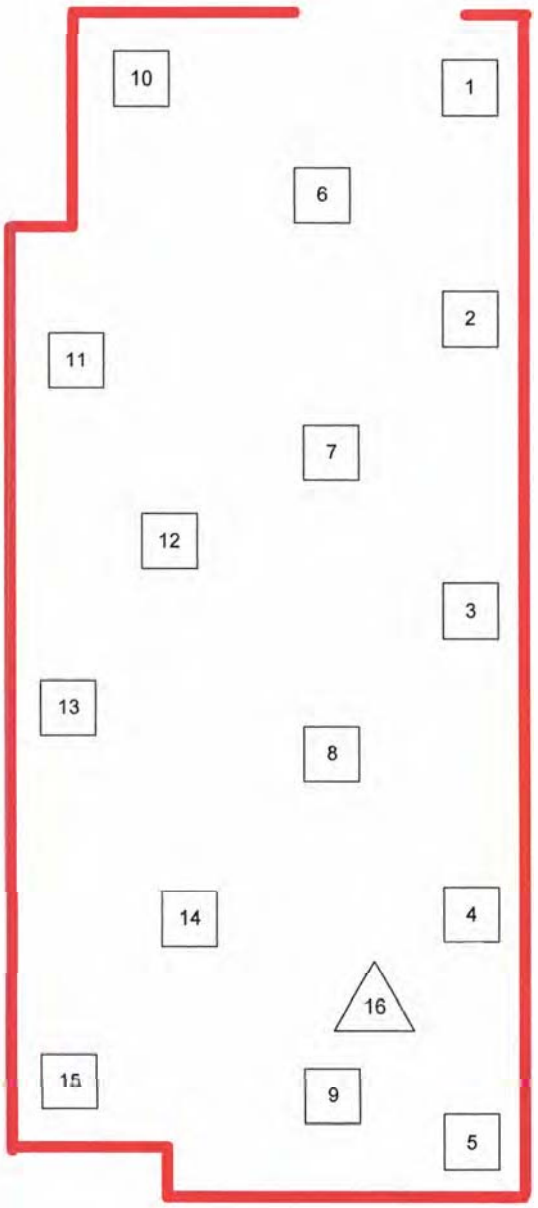
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
4337 PR 128625 Statics /Scans

STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16
Taken Inside
Exhaust Duct

No Scale



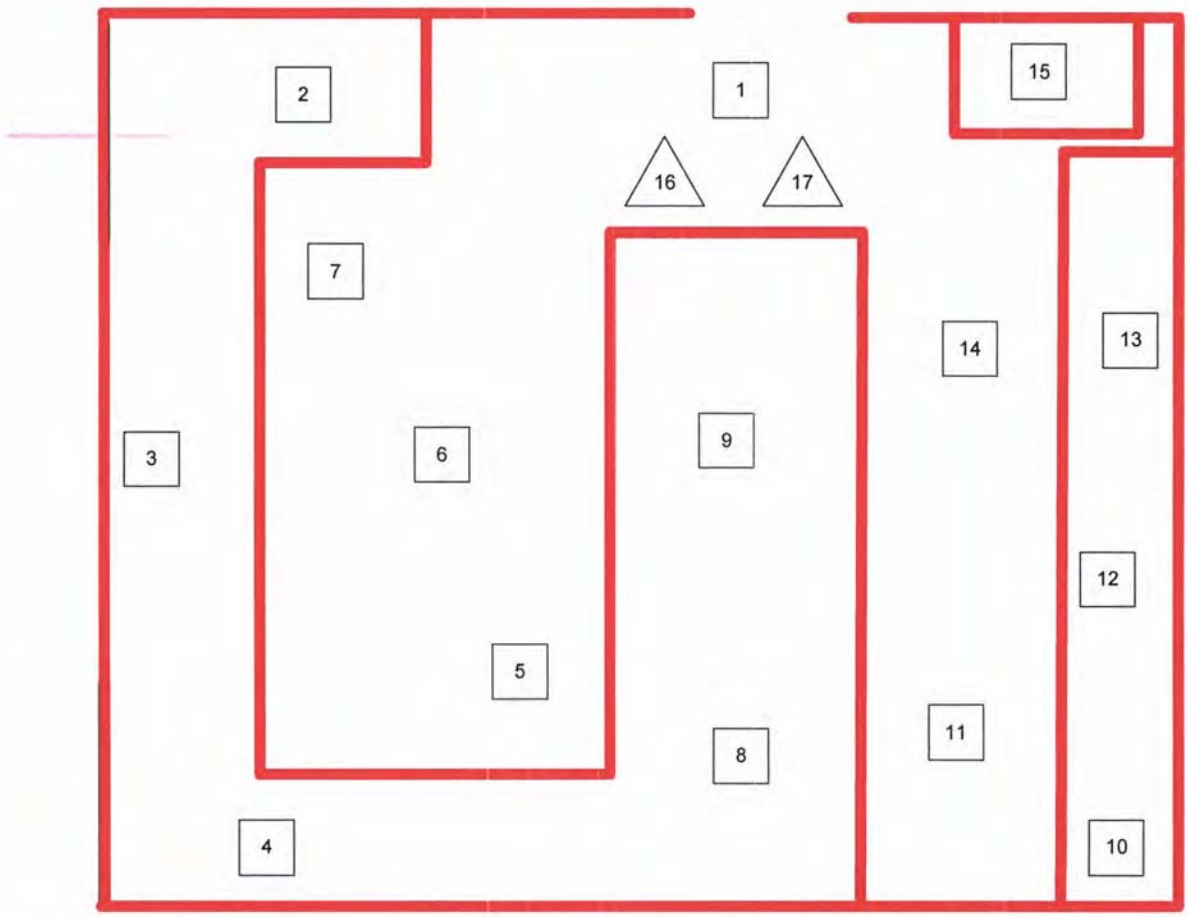
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 / 31 *12008*

Rooms 304 & 306



STATIC & SMEAR LOCATIONS

DQO Locations

Smear 16 and 17 Taken Inside Sinks

Note: Static Reading and Smear 10 Taken Inside Fume Hood

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
4337 PR 128625 Scans
43-37-1 PR145081 Floor Scan

No Scale

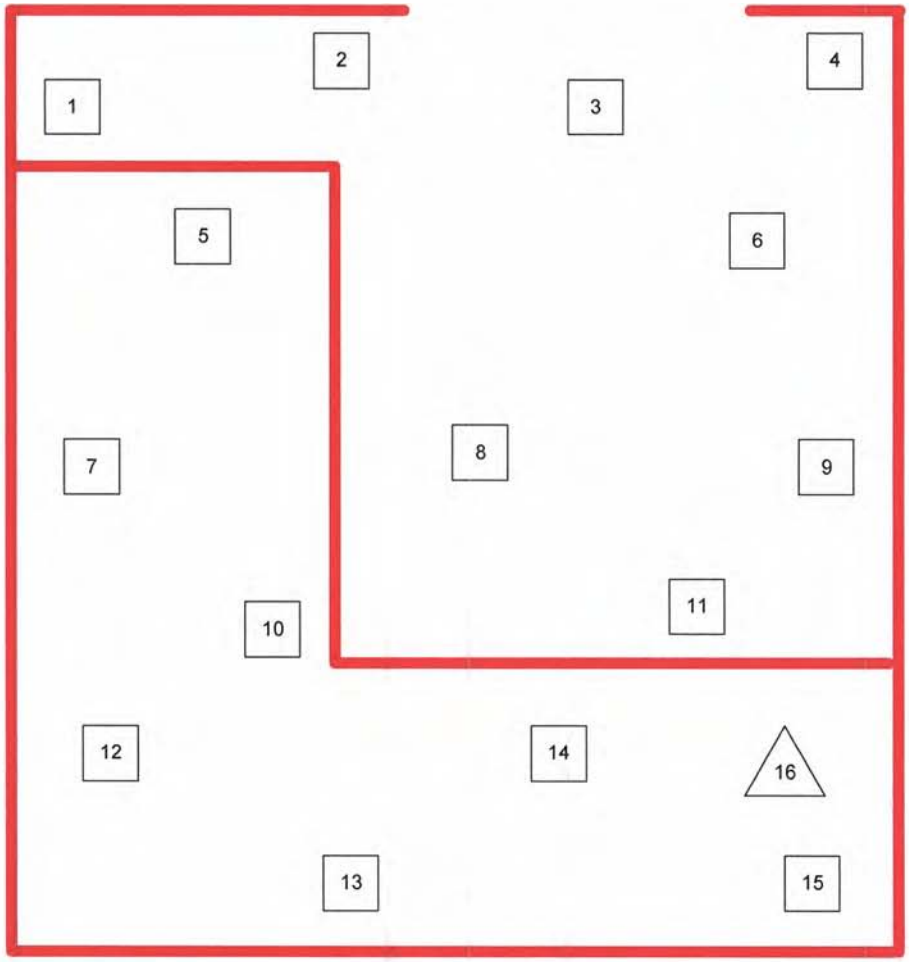
N

Surveyor
James Brady Sr RPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 1 / 2008

Room 307



SURVEY INSTRUMENTS

2350-1 #80496
43-68 PR148454 Statics
43-37-1 PR145081 Scans

STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken Inside Room Exhaust Duct

No Scale

N

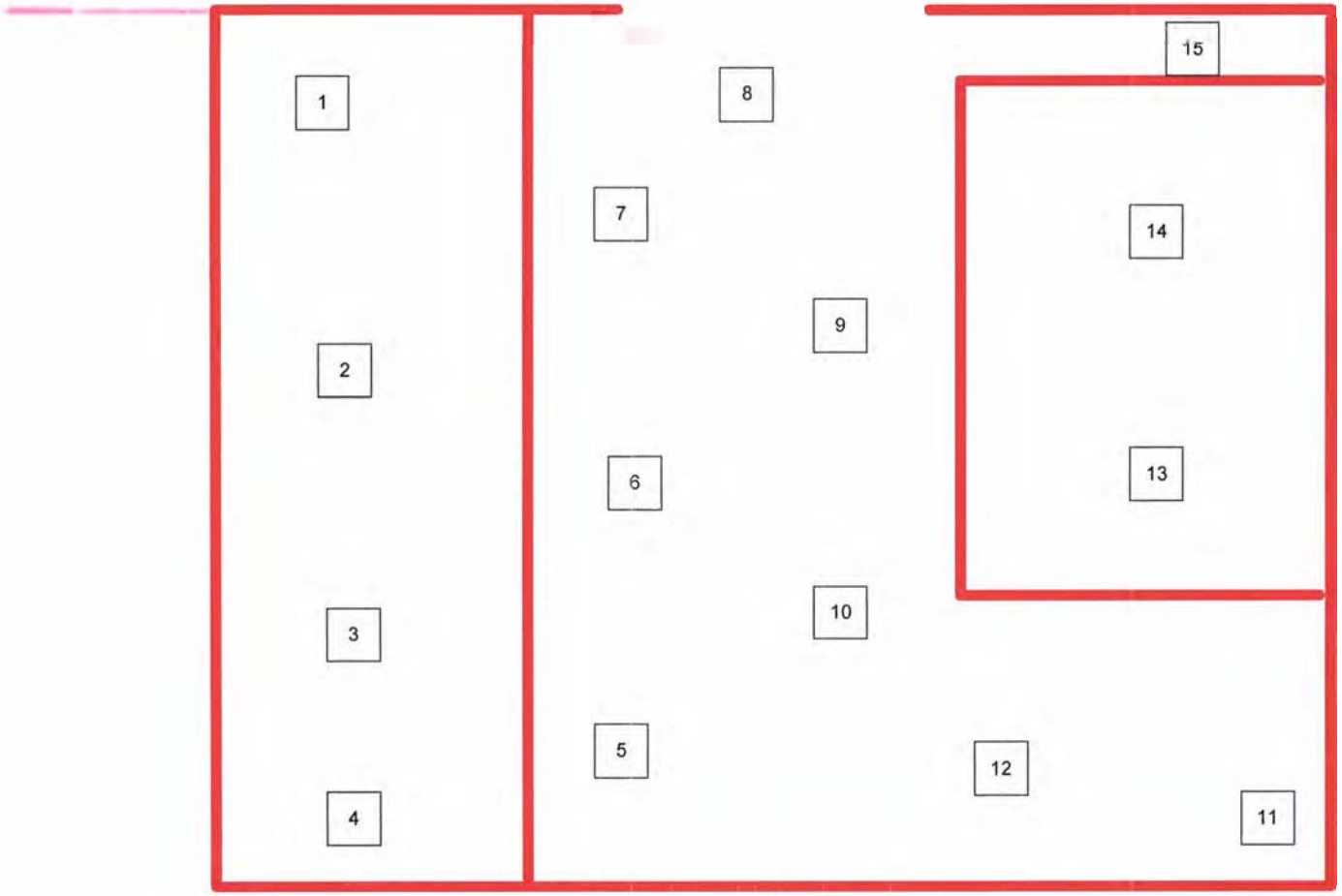
Surveyor
James Brady Sr RPT
Byron Bland Sr RPT

Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: *8 11 12008*

Room 308



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37-1 PR 145081 Scans

Note; Static and Smear 1 Taken Inside Sink, 13 and 14 Taken Inside Fume Hood

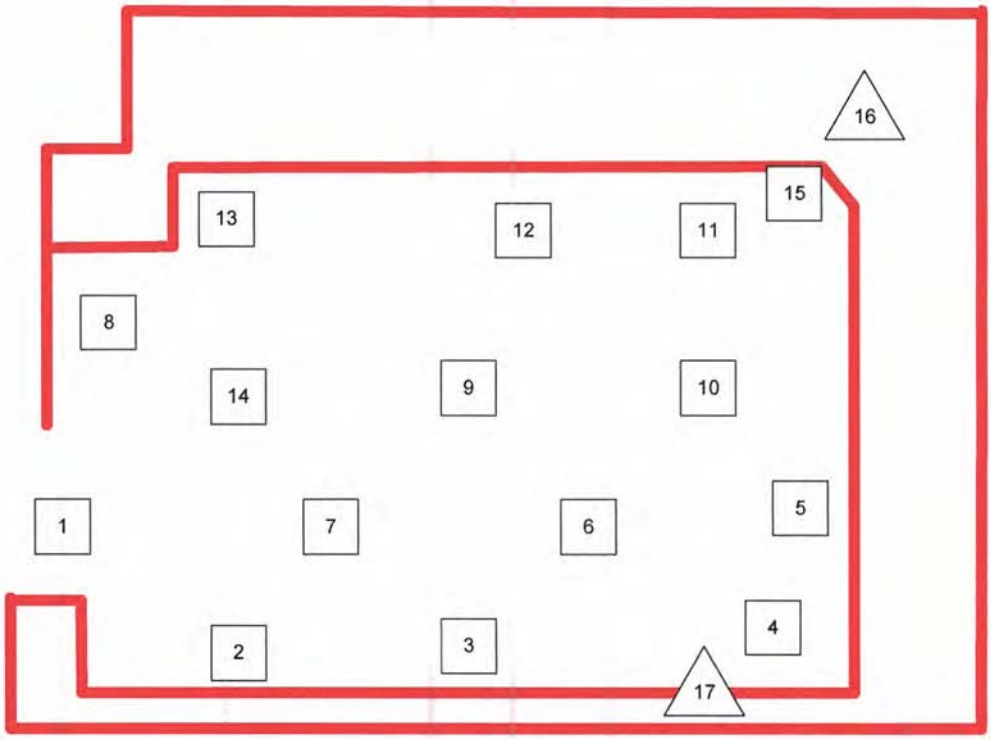
No Scale N

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 612012008

Room 309



SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Scans

43-37-1 PR145081 Floor Scan

STATIC & SMEAR LOCATIONS

DQO Locations

16- Bias Sink Smear

17- Bias Ceiling Vent Smear

No Scale

N

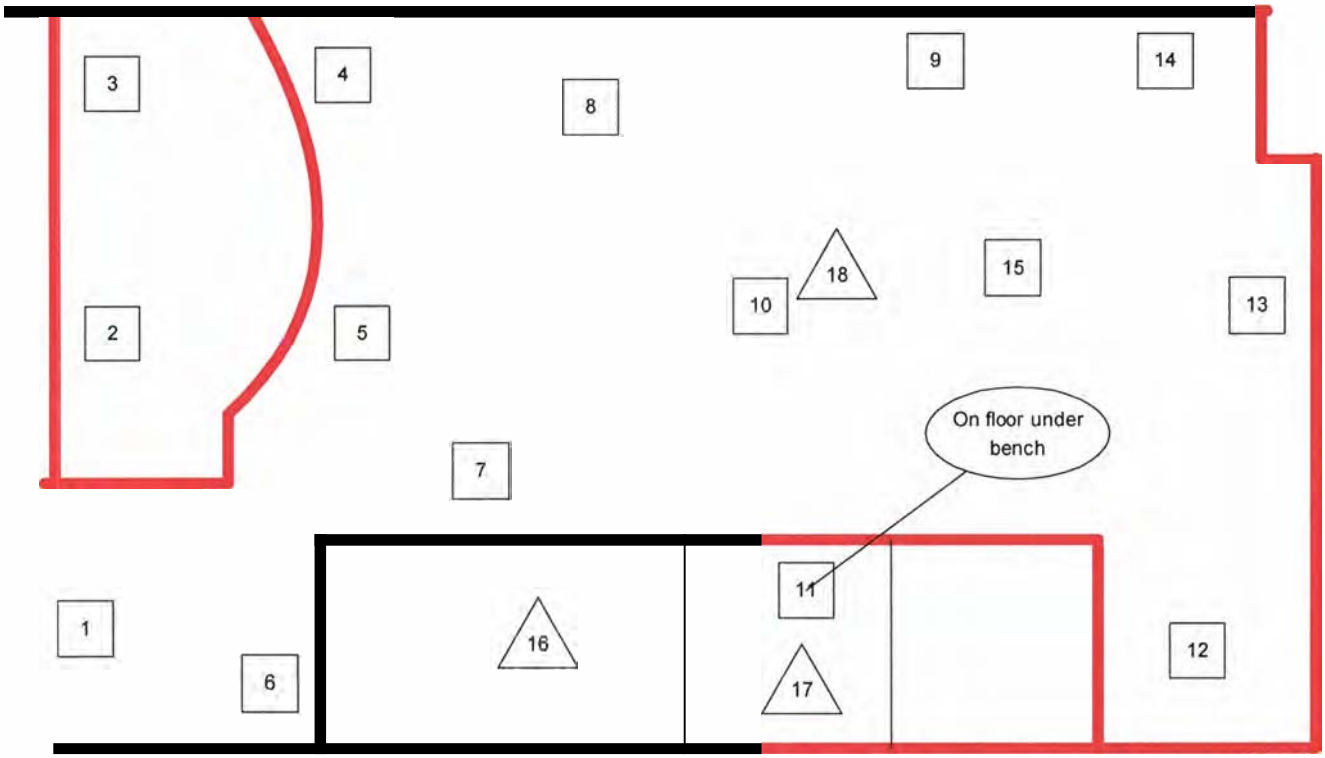
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/23/2008

Room 310



STATIC & SMEAR LOCATIONS

DQO Locations

16- Bias Sink Smear
17- Bias Smear
18- Bias Floor Drain

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Scans

43-37-1 PR145081 Floor & Benchtops Scan

No Scale

N

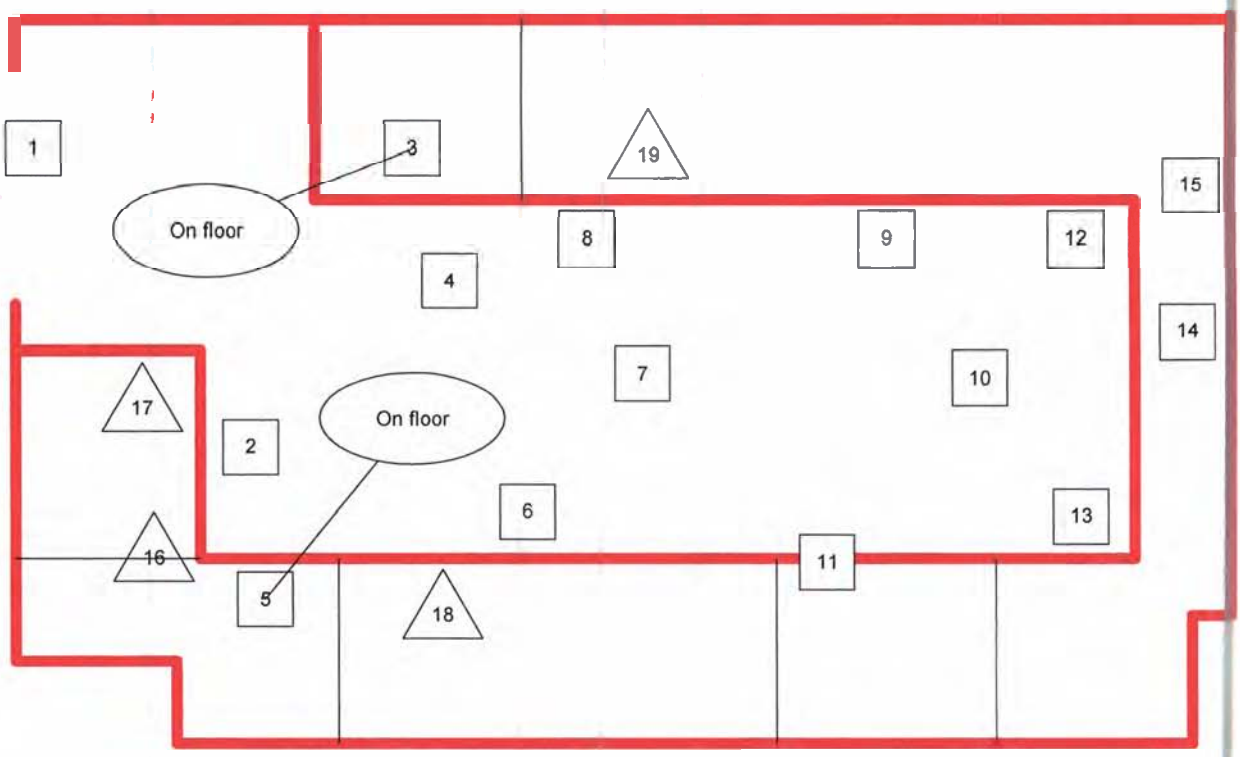
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/23/2008,

Room 311



STATIC & SMEAR LOCATIONS

DQO Locations

16,18, 19 - Bias

17- Bias Sink

SURVEY INSTRUMENTS

2350-1 **#80496**

43-68 **PR148454** Statics, Drawers, & Sink Scans

43-37-1 **PR145081** Floor, Benchtops, & Shelves Scan

43-37 **PR128625** Floor Scan

No Scale

N

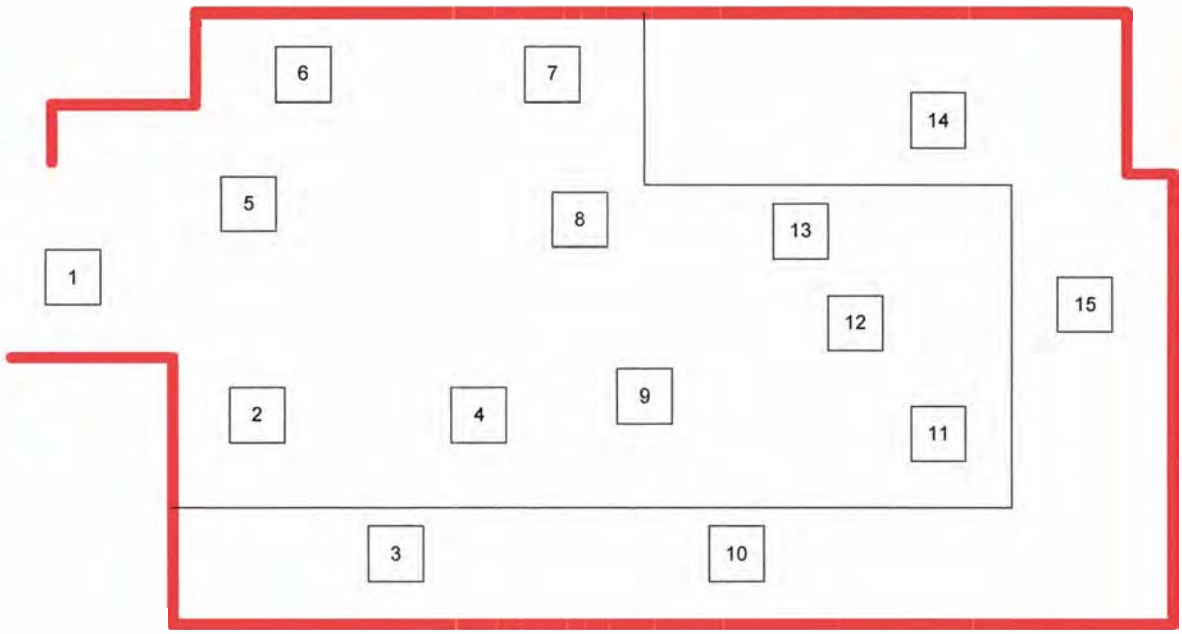
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/23/2008

Room 312



STATIC & SMEAR LOCATIONS

DQO Locations

16- Bias Sink Smear
17- Bias Smear
18- Bias Floor Drain

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor

43-37 PR128625 Floor Recesses Scan

No Scale

N

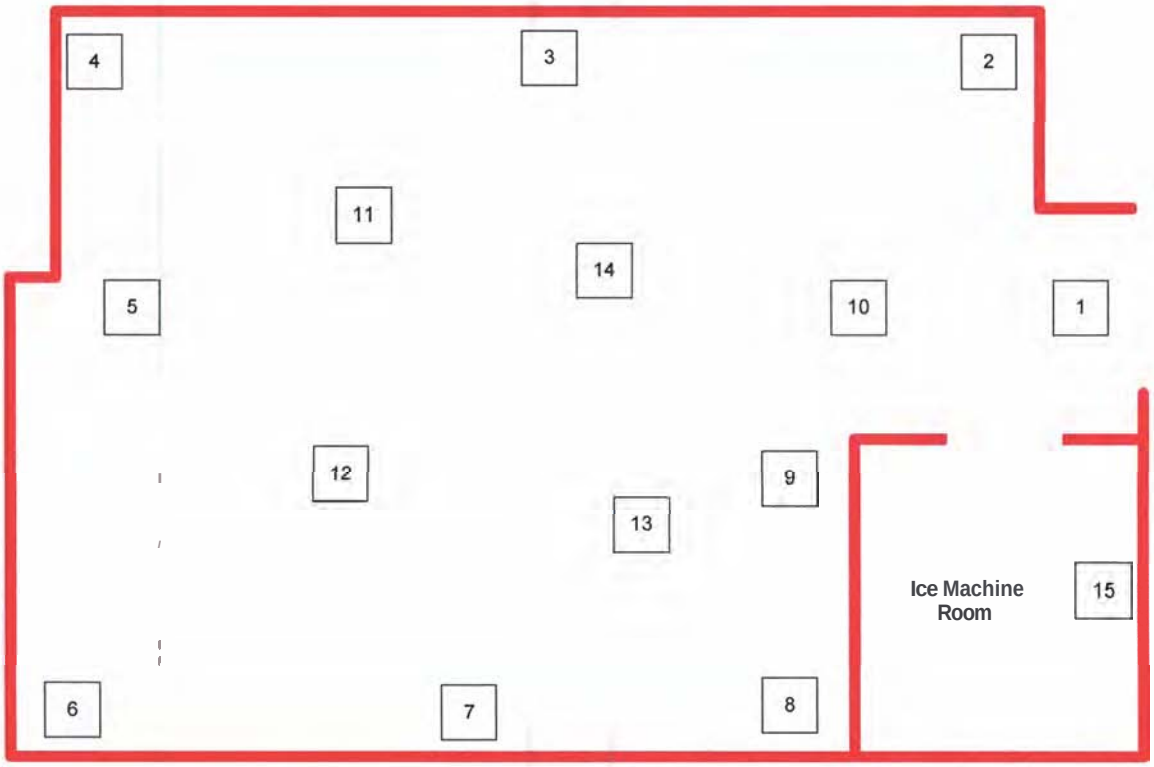
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/23/2008

Room 324



STATIC & SMEAR LOCATIONS

DQO Locations

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor, Shelving

No Scale

N

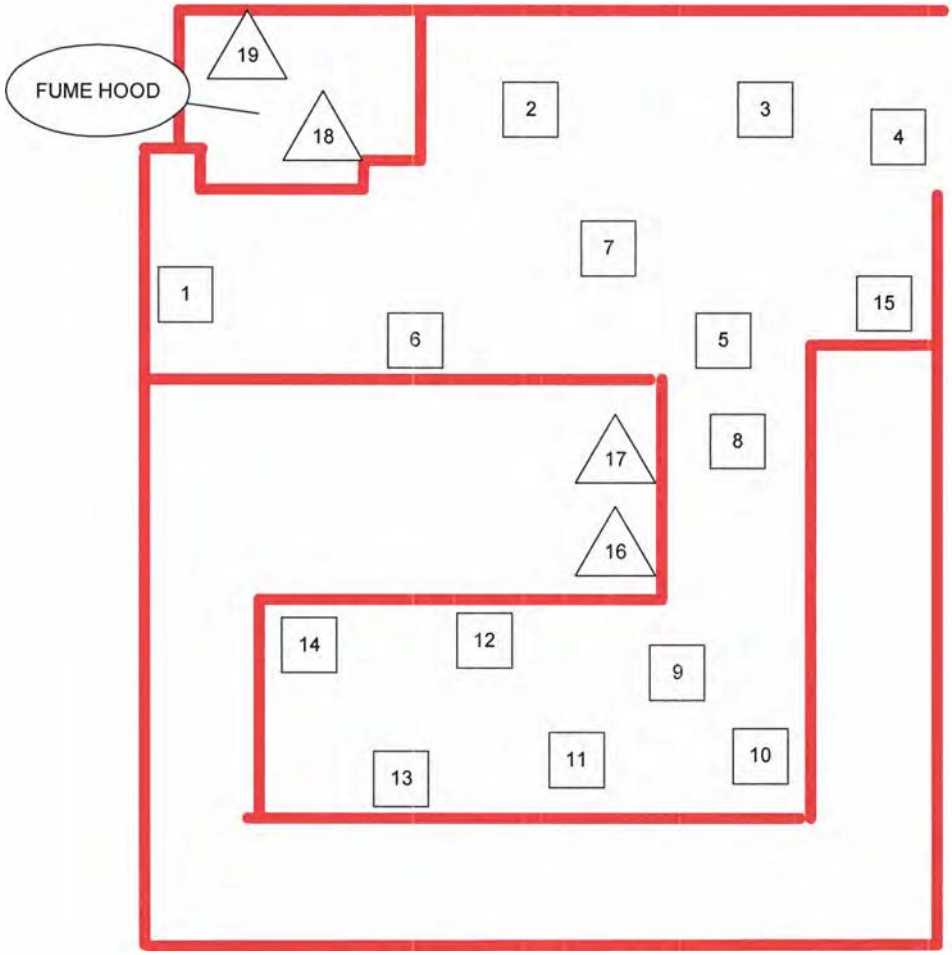
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/20& 2512008

Room 3281329



STATIC & SMEAR LOCATIONS

DQO Locations

16, 17.19- Bias Sink Smear
18- Bias Fume Hood Smear

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Static, Scan

43-37-1 PR145081 Floor Scan

No Scale

N

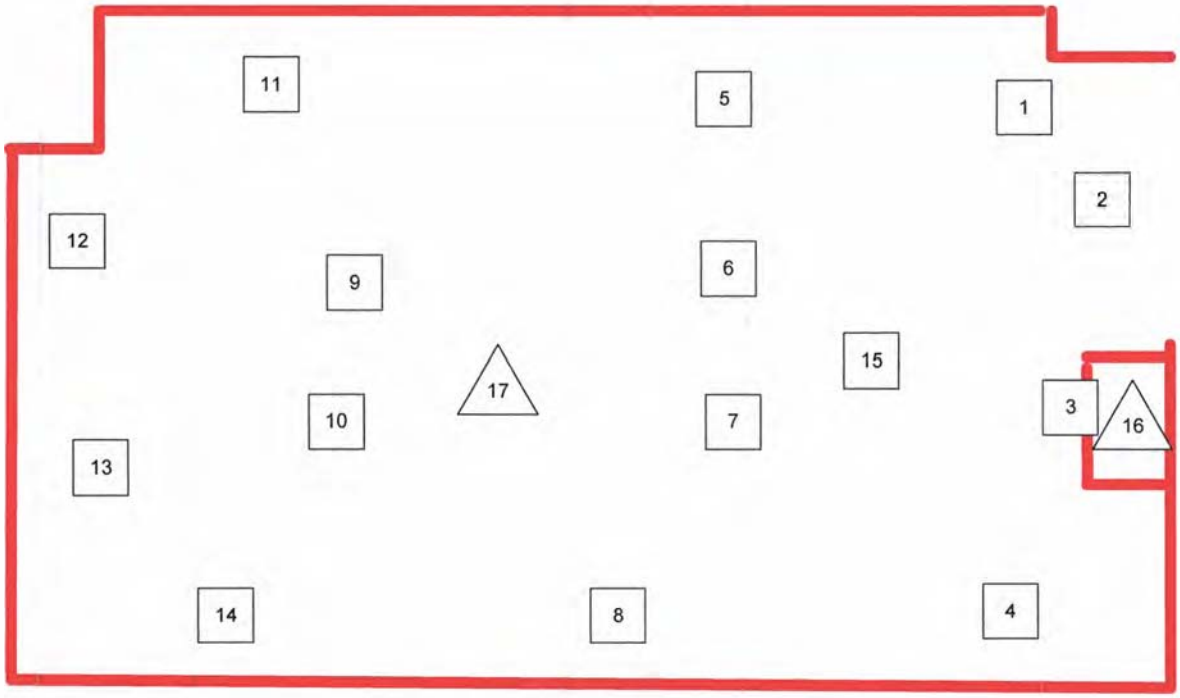
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Room 330



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken Inside Sink, 17 Taken Inside Room Exhaust Duct

Survey Instruments
2350-1 # 80496
43-68 PR148454 Statics /Scans
43-37 PR128625 Scans
43-37-1 PR145081 Scans

No Scale

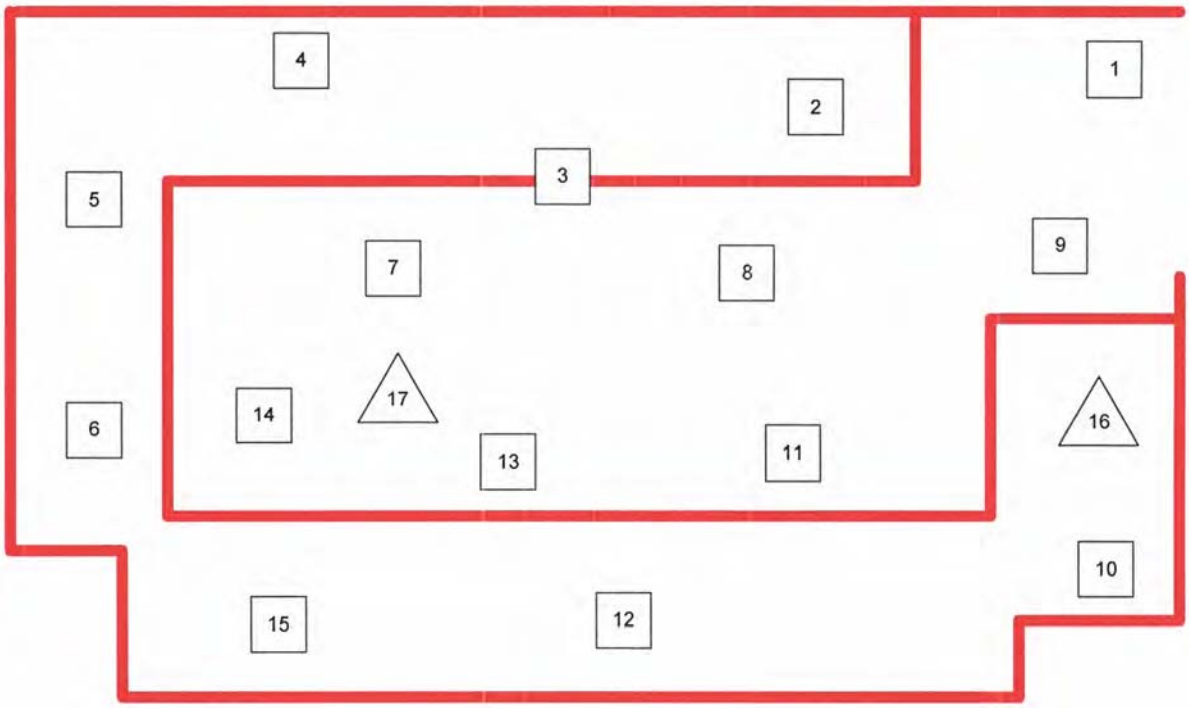
N

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: *8 / 3 12008*

Room 331



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken **Inside Sink**, 17 Taken Inside Room Exhaust Duct

Survey Instruments
2350-1 # 80496
43-68 **PR148454** Statics /**Scans**
4337 **PR128625** Scans
43-37-1 PR145081 Scans

No Scale

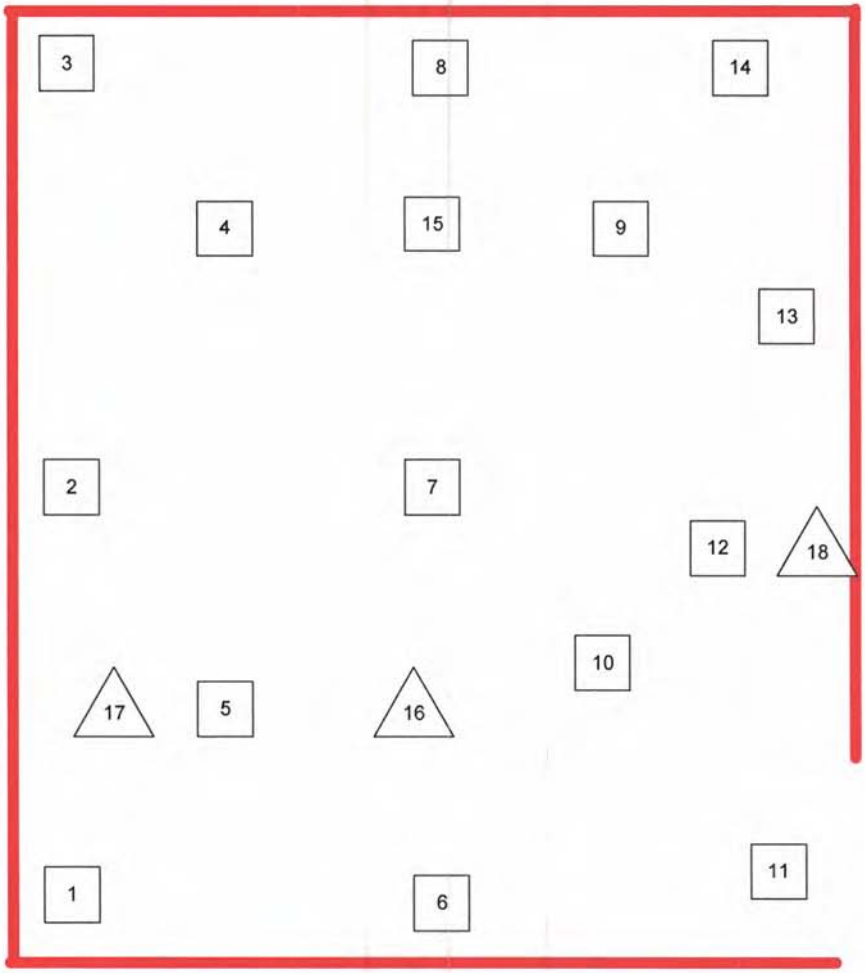
N

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 612012008

Room 332



STATIC & SMEAR LOCATIONS

DQO Locations

16, 17- Ceiling VentSmears

18- Bias Sink Smear

No Scale

N

SURVEY INSTRUMENTS

2350-1 **#80496**

43-68 **PR**148454 Statics

43-37-1 **PR145081** Floor Scan

43-37 **PR128625** Sink Scans

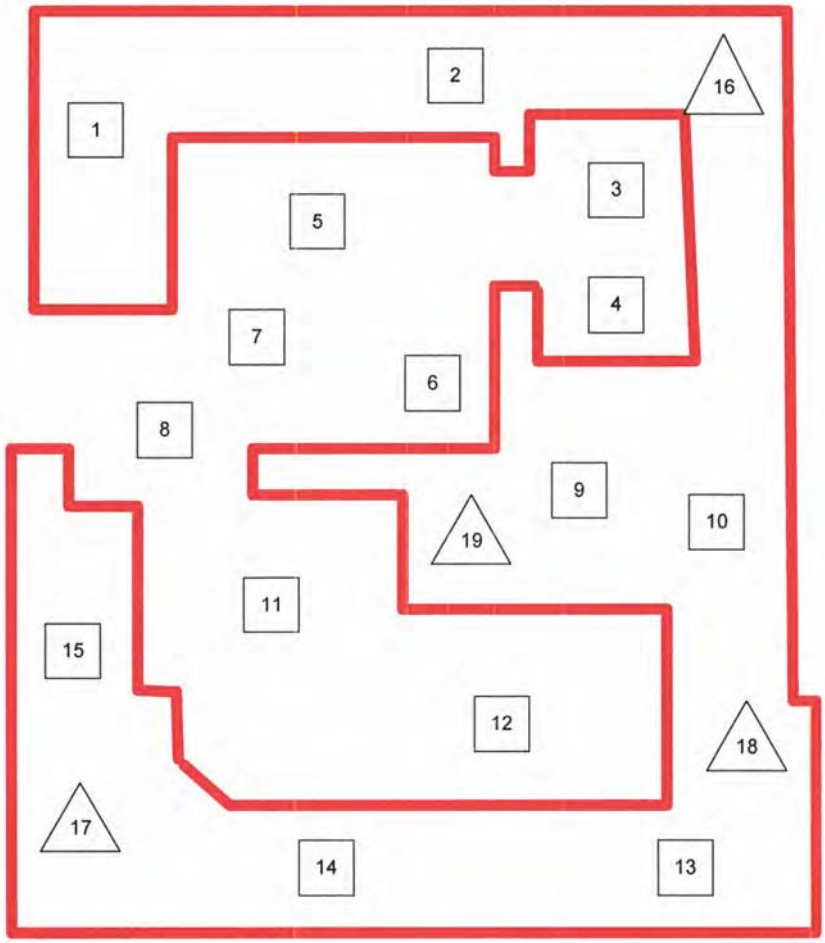
Surveyor: Byron Bland, Sr RPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Room 337



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16, 17, 18 Taken inside Sink,
19 Taken Inside Fume Hood

No Scale

N

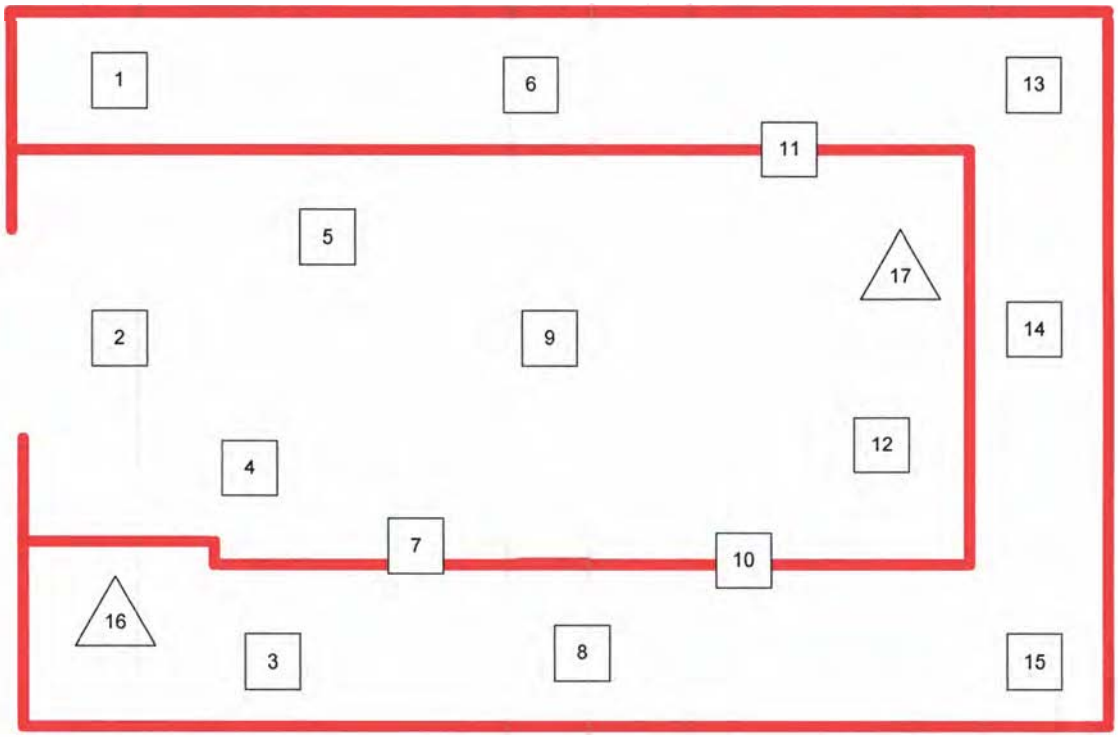
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Scans

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 /2008

Room 339



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16
Taken Inside
Sink, 17
Taken Inside
Room
Exhaust Duct

Survey Instruments
2350-1 # 80496
43-68 PR148454 Statics /Scans
43-37 PR128625 Scans
43-37-1 PR145081 Scans

No Scale

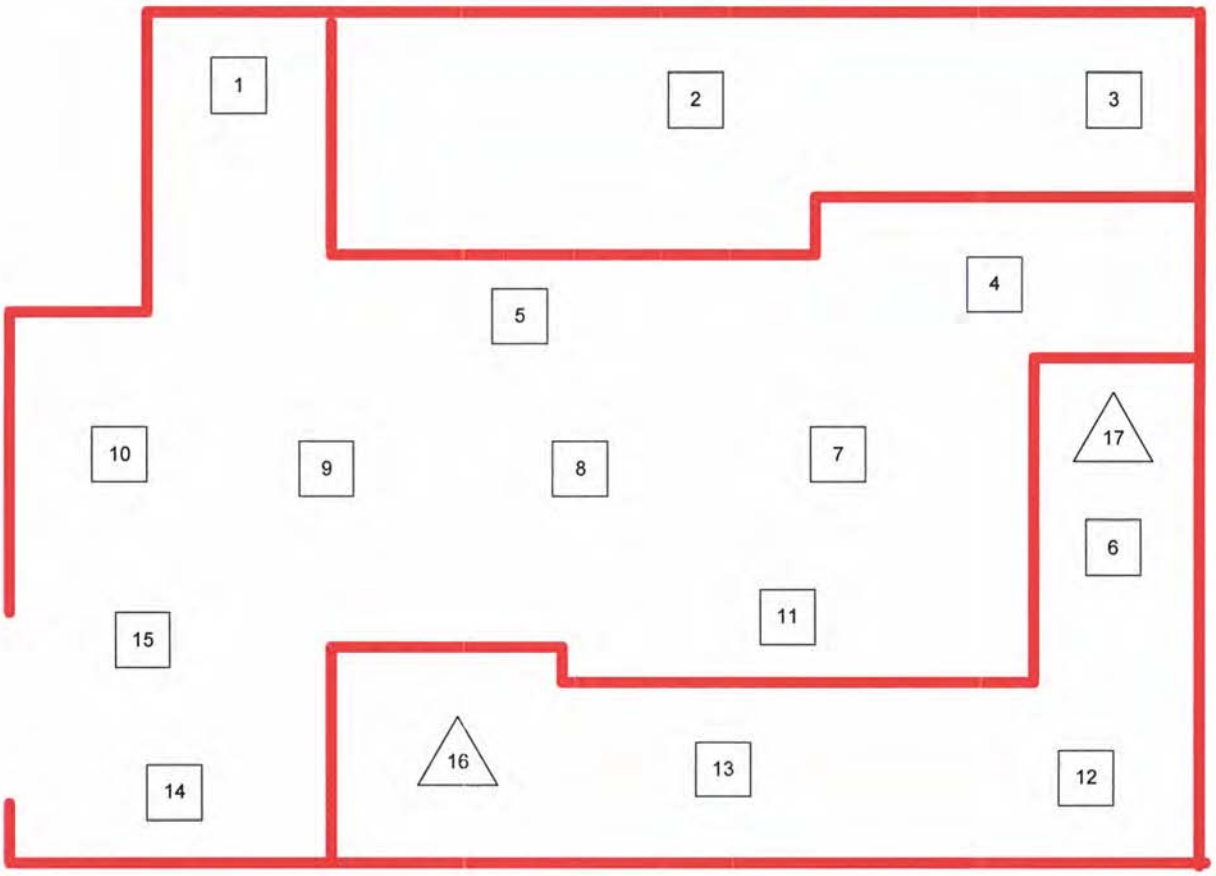
N

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: *8 / 3 12008*

Room 340



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken Inside Sink, 17 Taken Inside Room Exhaust Duct

No Scale

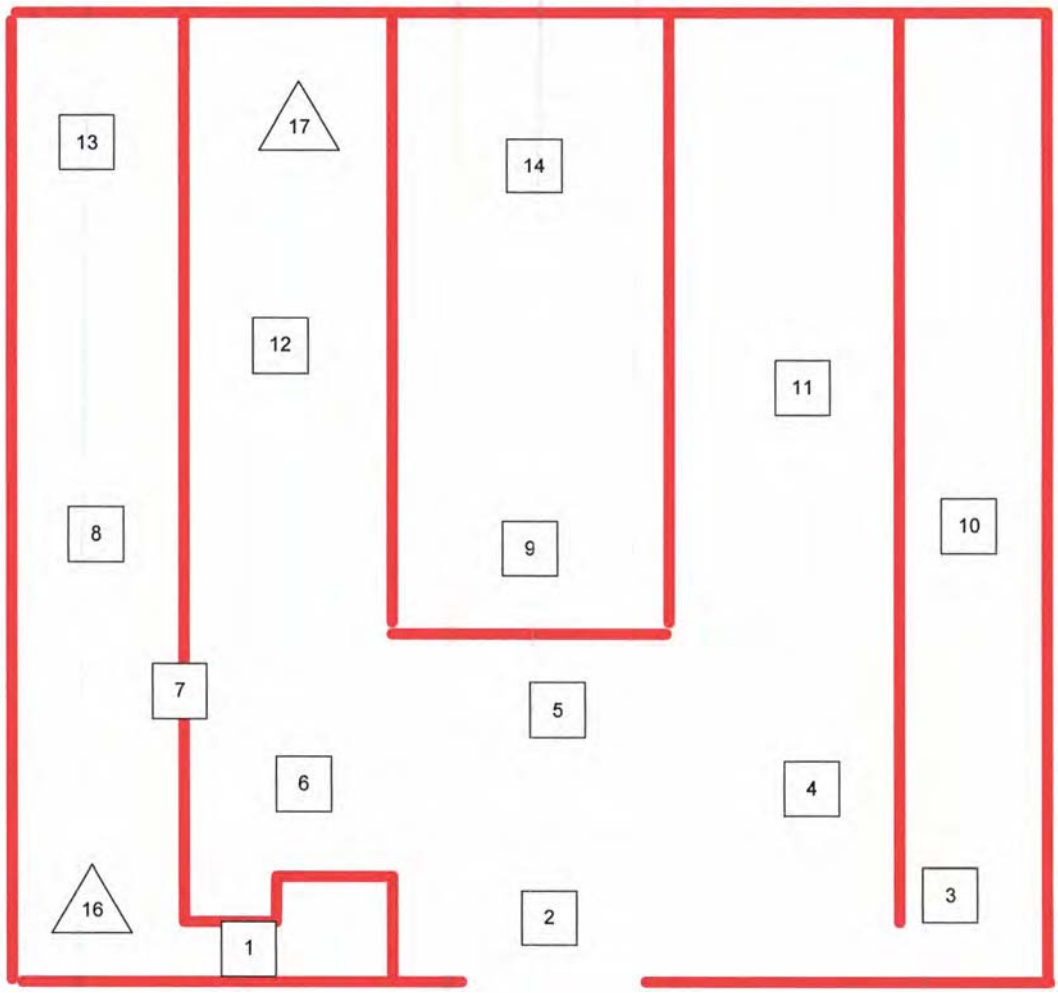
Survey Instruments
2350-1 # 80496
43-68 **PR148454** Statics/**Scans**
43-37 PR128625 Scans
43-37-1 **PR145081** Scans

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Room 347



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken inside Sink, 17 Taken inside Room Exhaust Duct

No Scale

N

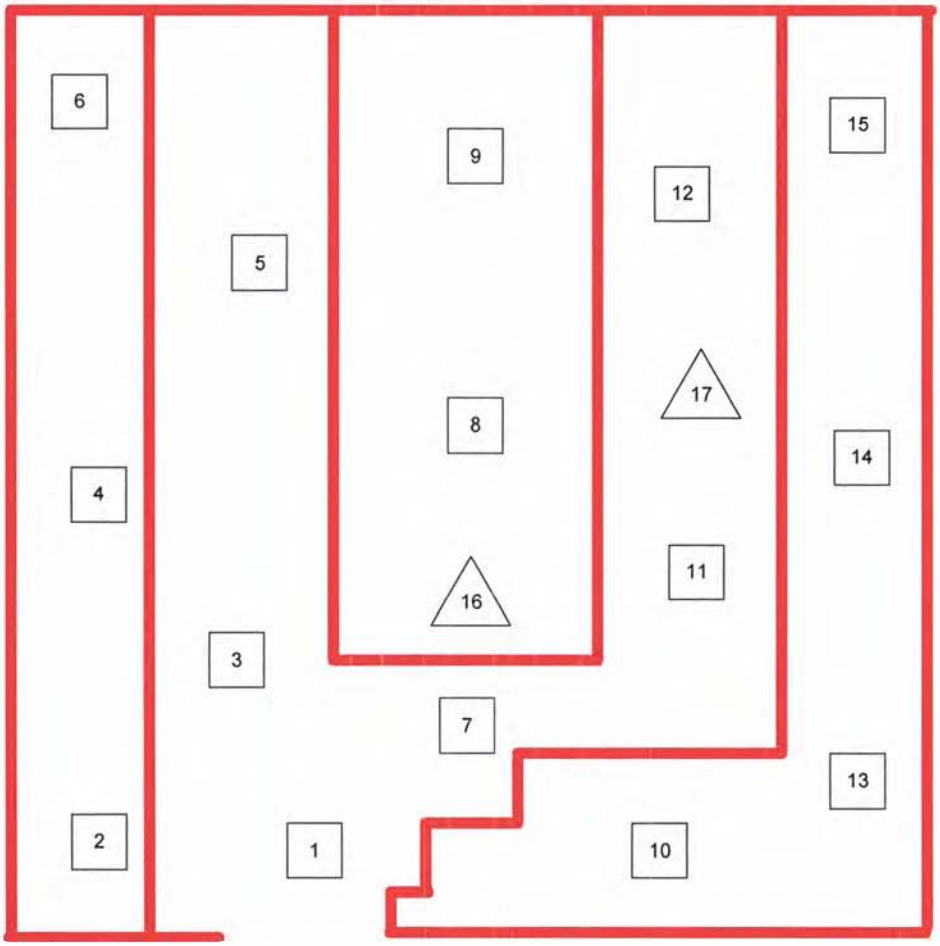
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Scans

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Room 348



STATIC & SMEAR LOCATIONS

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37-1 PR145081 Scans

DQO
Locations

Bias Smear 16 Taken
Inside Sink, 17 Taken
inside Room Exhaust Duct

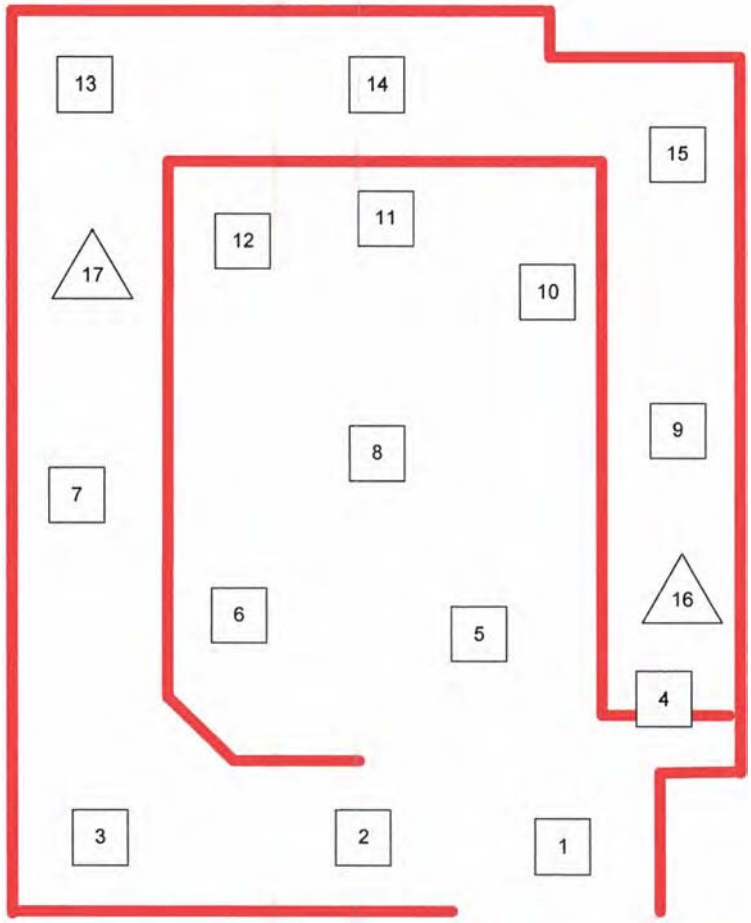
No Scale

Surveyor
James Brady Sr HPT
Byron Bland Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Room 349



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken inside Sink, 17 Taken Inside Room Exhaust Duct

No Scale

N

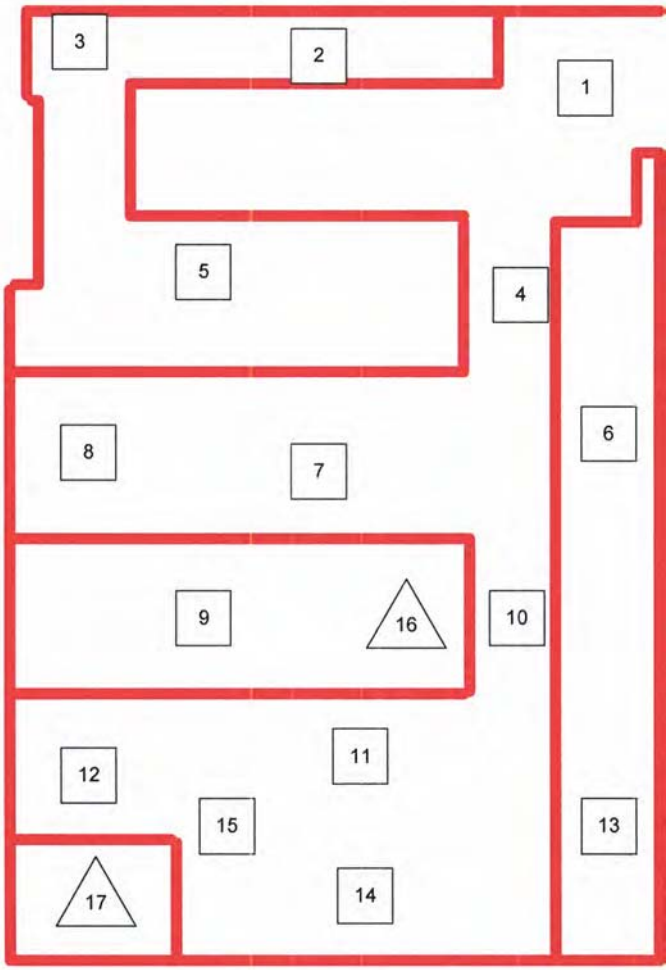
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
43-37-1 PR 145081 Scans

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Rooms 357 & 358



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken Inside Sink, 17 Taken inside Room Exhaust Duct

No Scale

N

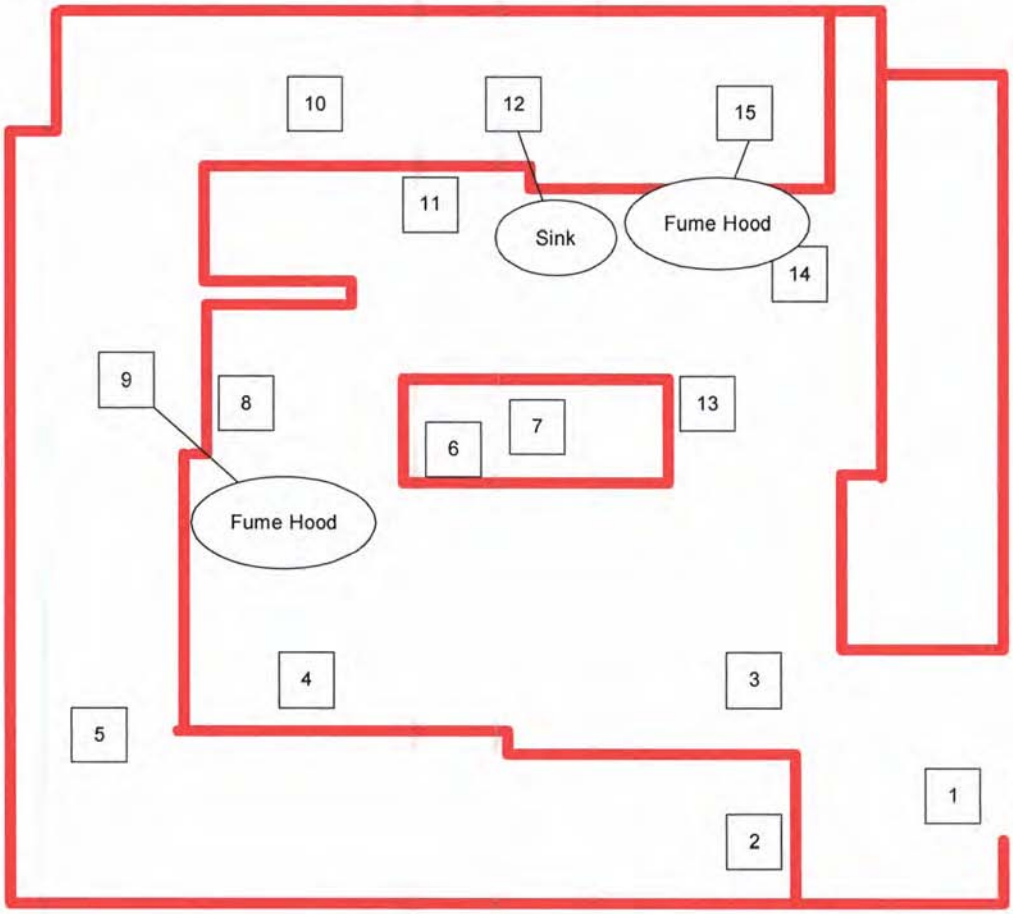
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
4337 PR 128625 Scans

Surveyor
James Brady Sr HPT
Byron Bland Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 1111912008

Room 359



STATIC & SMEAR LOCATIONS

DQO Locations

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics/Scans
43-37-1 PR 145081 Scans

No Scale

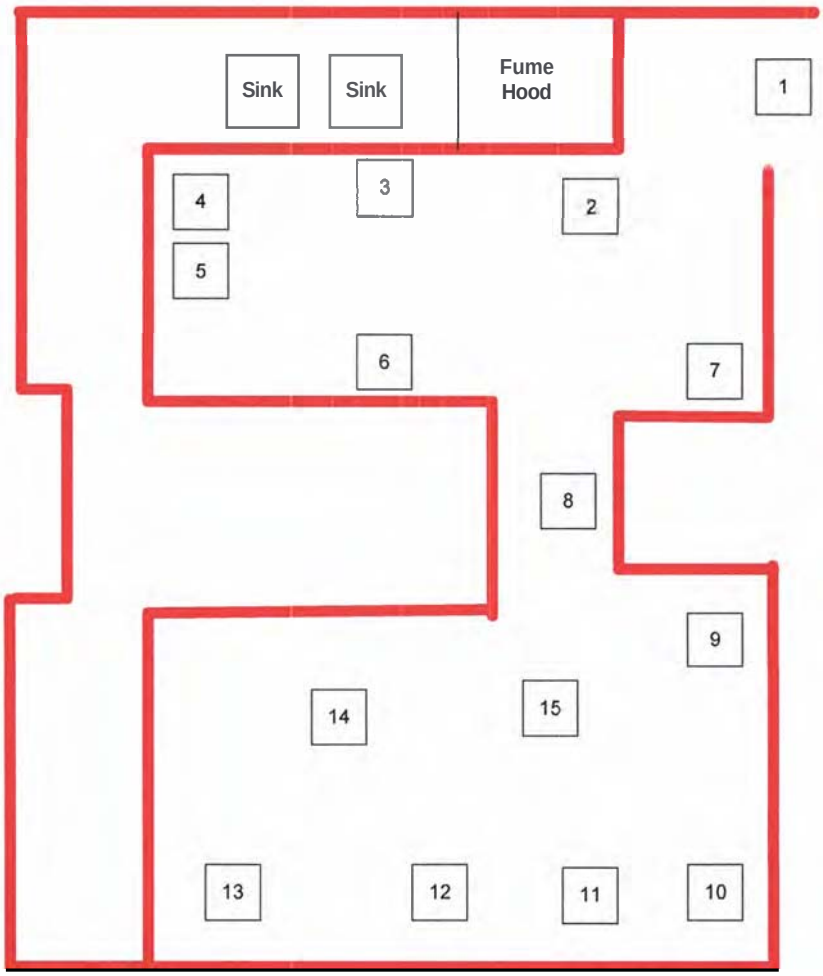
N

Surveyor: Byron Bland, Sr HPT
Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/25/2008

Room 361



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Sinks & Fume Hood Scans

43-37-1 PR145081 Floor and Benchtop Scan

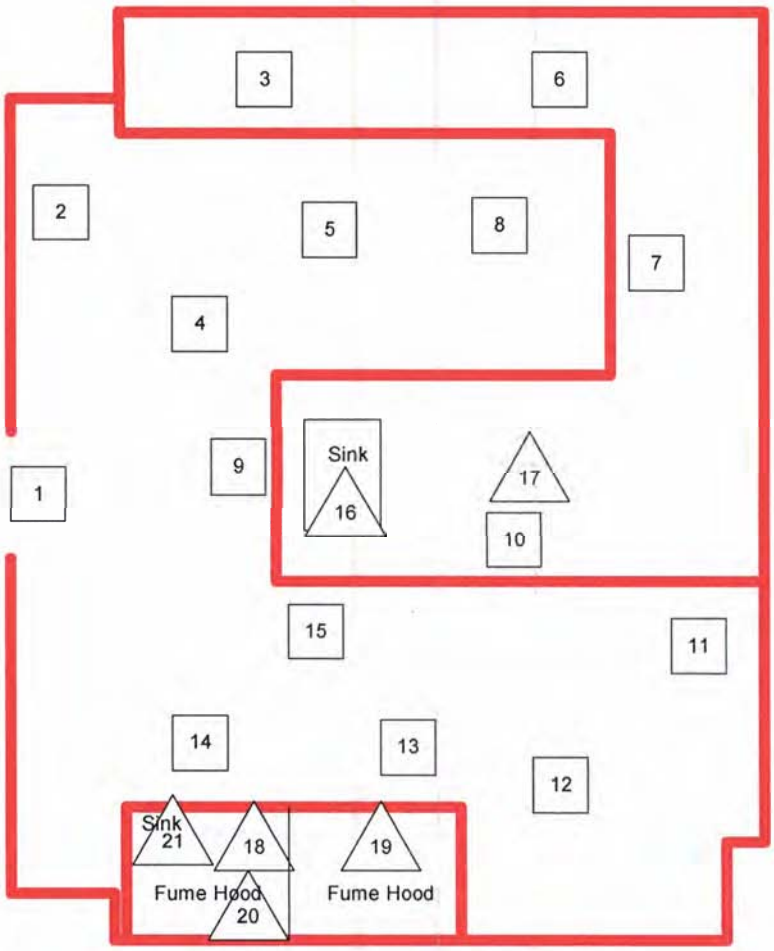
Surveyor: Byron Bland. Sr HPT

Reviewer: Claude Wblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/25/2008

Room 363



STATIC & SMEAR LOCATIONS

16-18 Sink Bowls
19- Floor Drain
20- Shelf Rack

DQO Locations

No Scale

N

SURVEY INSTRUMENTS

43-68 PR148454 **Statics, Sinks & Fume Hood Scans**

43-37-1 PR145081 **Floor and Benchtop Scan**

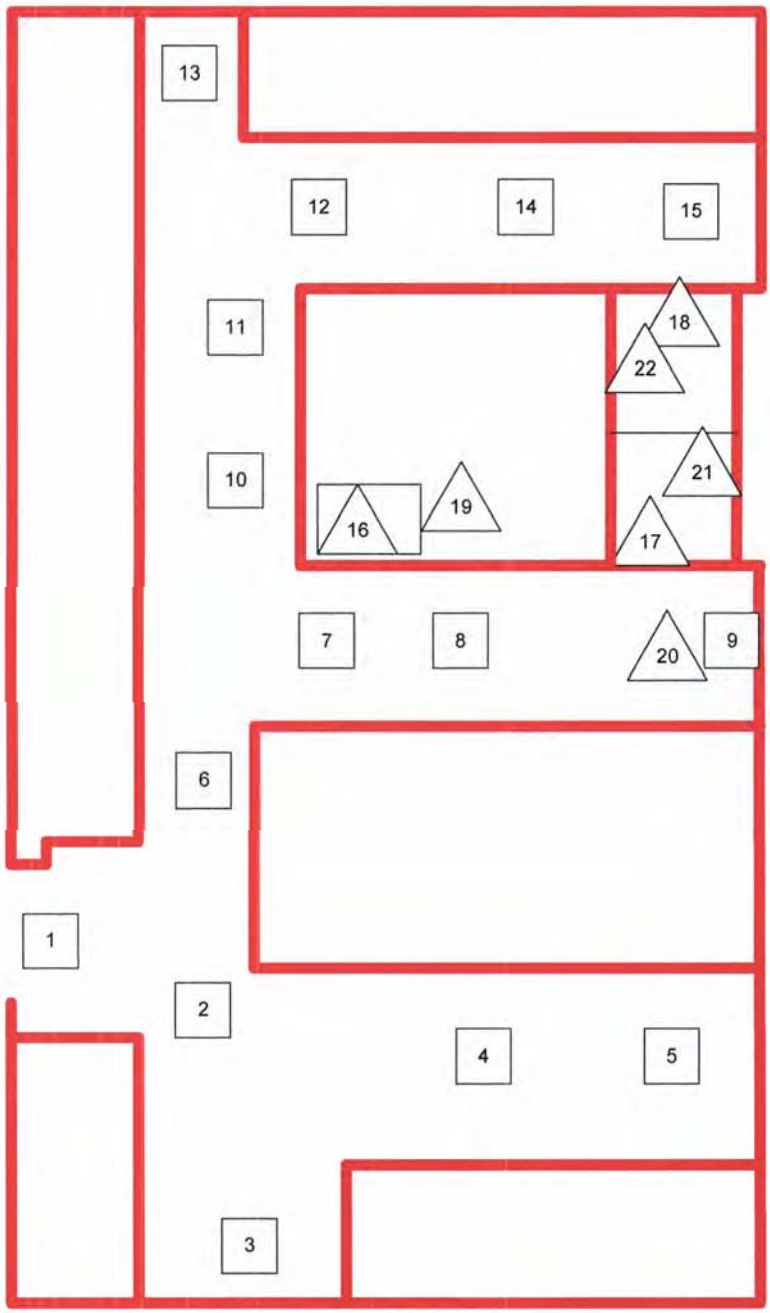
43-37 PR128625 **Floor Scans**

Surveyor: Byron Bland, Sr HPT
Reviewer: Claude Wblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/25/2008

Room 368



STATIC & SMEAR LOCATIONS

DQO Locations

16- Bias Sink
17, 18, 21, 22- Bias Fume Hood
20- Bias Floor Drain

No Scale

N

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics, Sinks & Fume Hood Scans

43-37-1 PR145081 Floor and Benchtops Scan

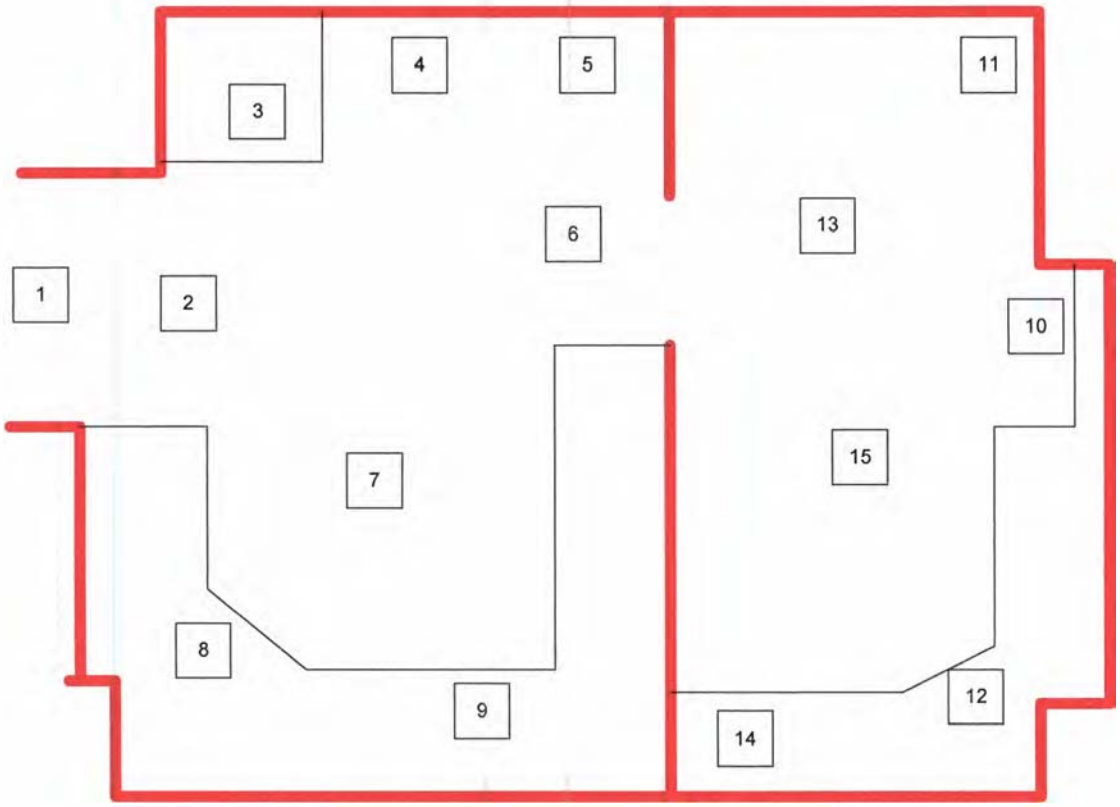
Surveyor: Byron Band, Sr HPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/24/2008

Room 372



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

N

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor, Desk tops Scan

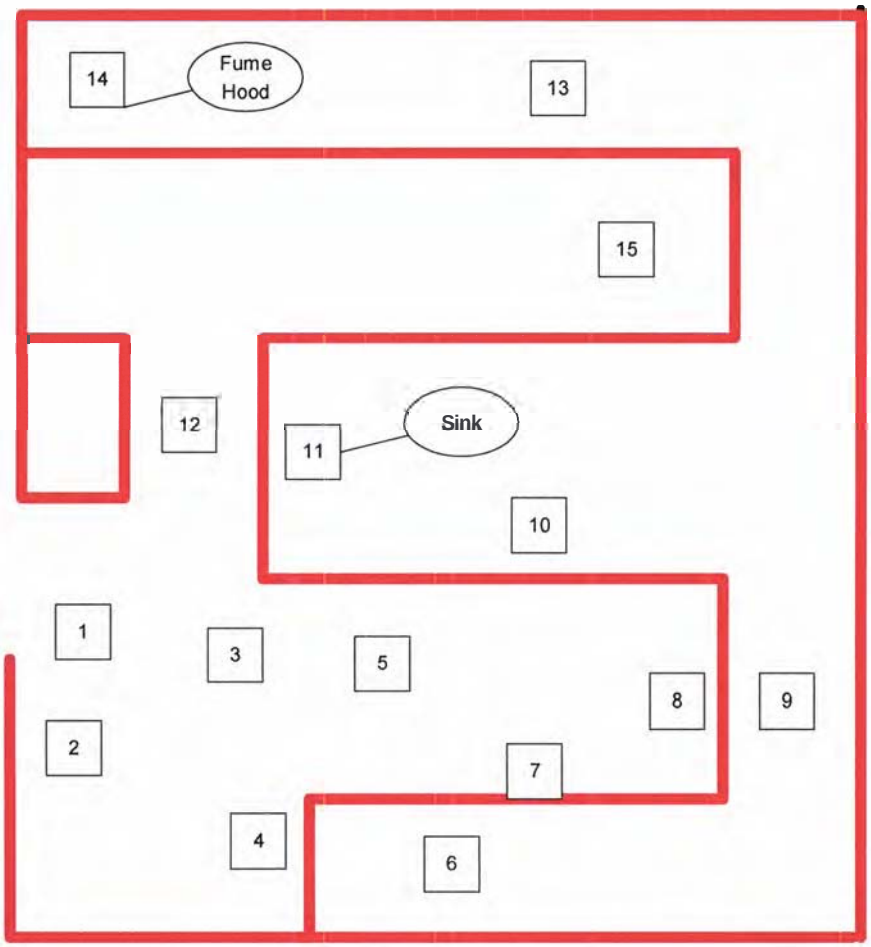
43-37 PR128625 Floor Scan

Surveyor: Byron Hand, Sr HPT
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 11/1912008

Room 377



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 **Statics and scans**

43-37-1 PR145081 **Floor scan**

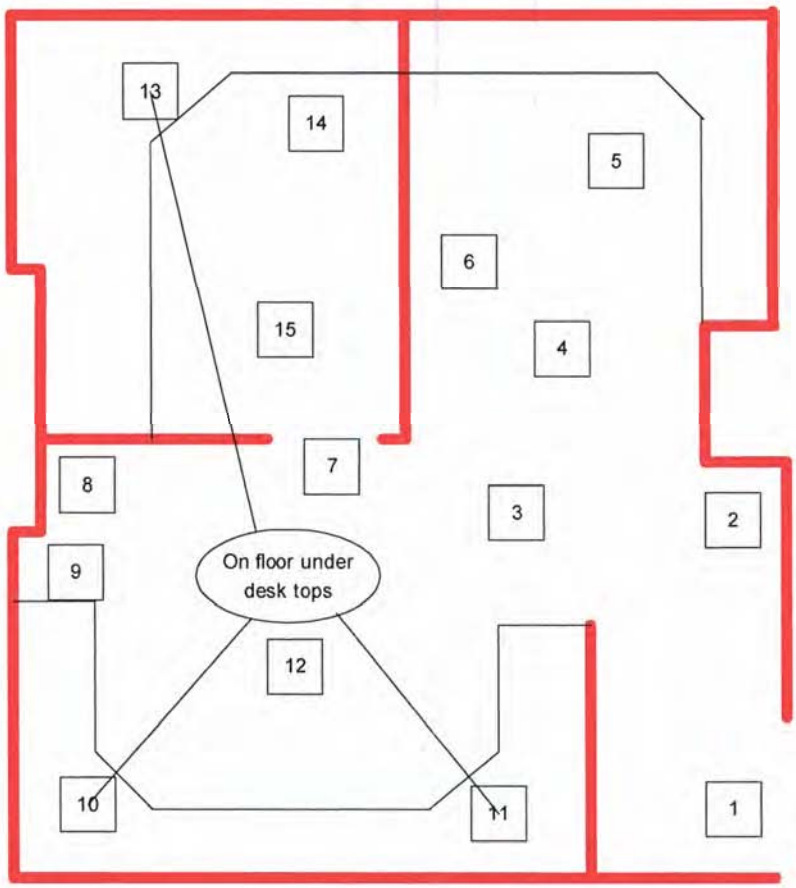
Surveyor: Byron Hand, Sr HPT

Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/24/2008

Room 383



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

N

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics& scan

43-37-1 PR145081 Floor Scan

43-37 PR128625 Recesses Scan

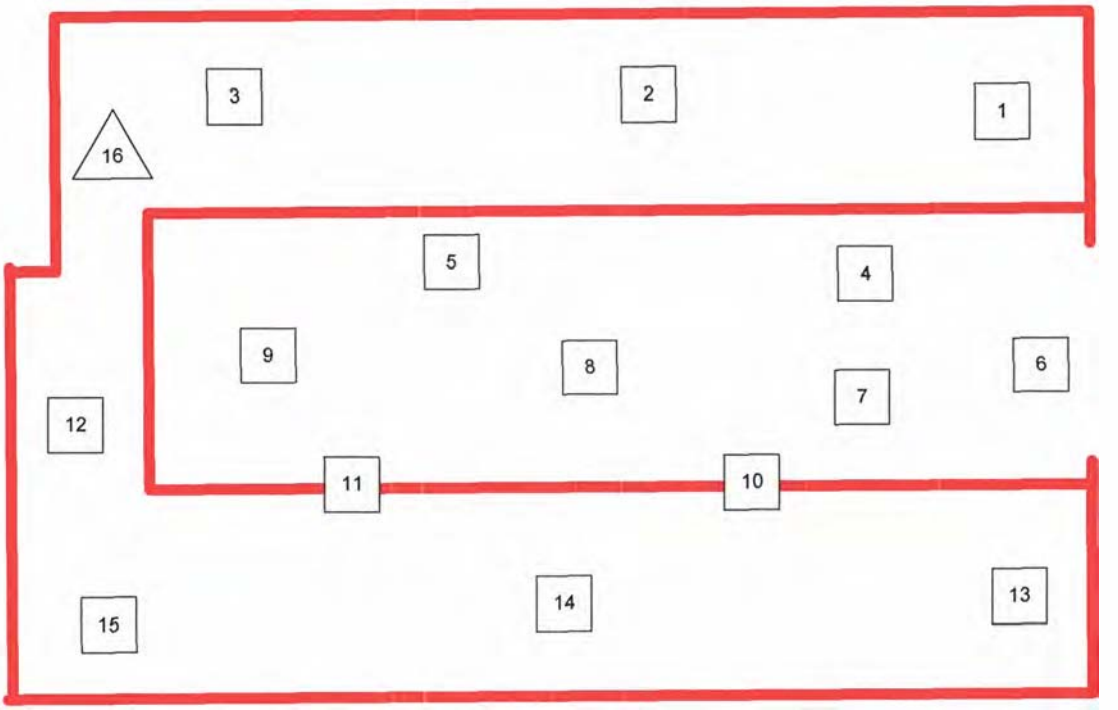
Surveyor: Byron Bland. Sr HPT

Reviewer: C. Wiblin. CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 12008

Room 384



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken inside Room Exhaust Duct

No Scale

N

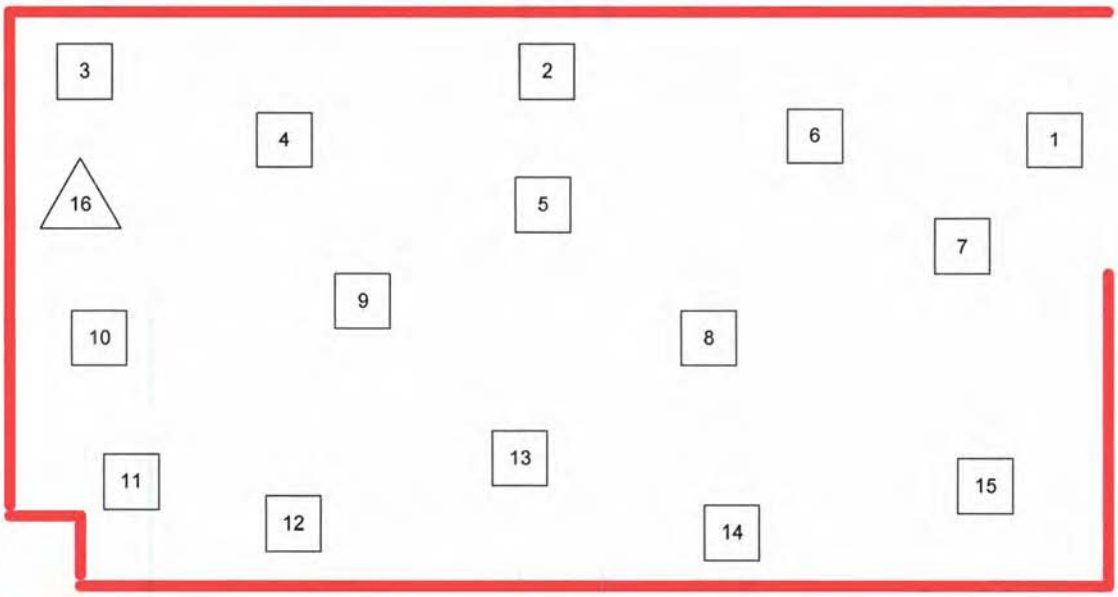
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Scans

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Room 385



STATIC & SMEAR LOCATIONS

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Scans

DQO
Locations

Bias Smear 16
Taken Inside
Room
Exhaust Duct

No Scale

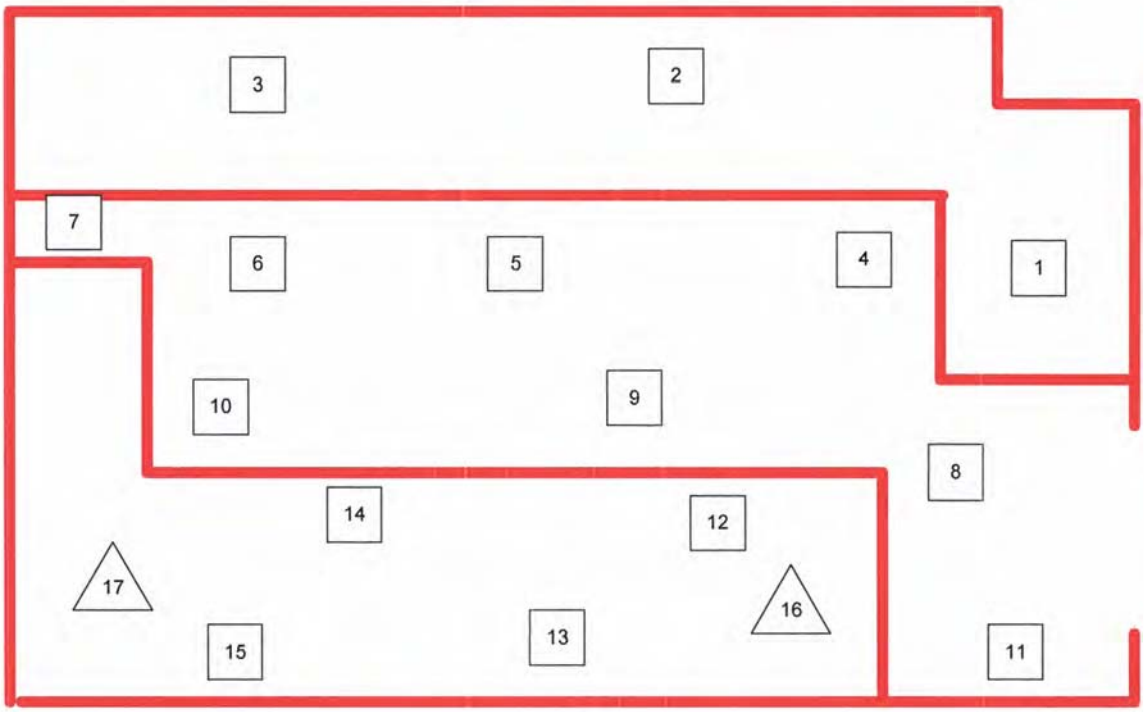
N

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 12008

Room 386



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken inside Sink, 17 Taken Inside Room Exhaust Duct

No Scale

N

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

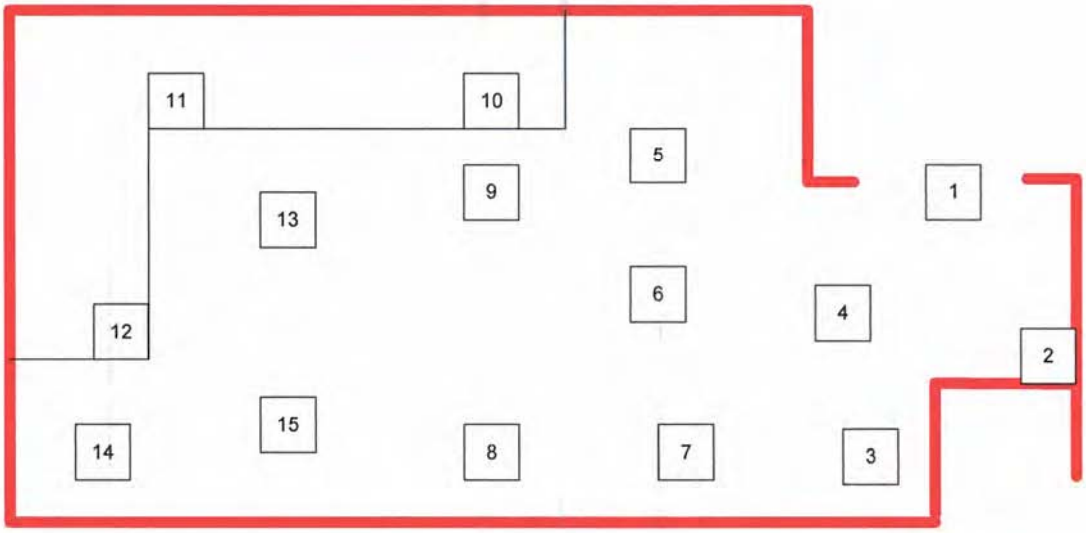
43-37-1 PR145081 Floor Scan

Surveyor
James Brady Sr HPT
Byron Bland Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 6/23/2008

Room 387



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

SURVEY INSTRUMENTS

2350-1 #80496

43-68 PR148454 Statics

43-37-1 PR145081 Floor, Shelving

43-37 PR128625 Floor Recesses Scan

Surveyor: Byron Eland, Sr HPT
Reviewer: C. Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 / 31 / 2008

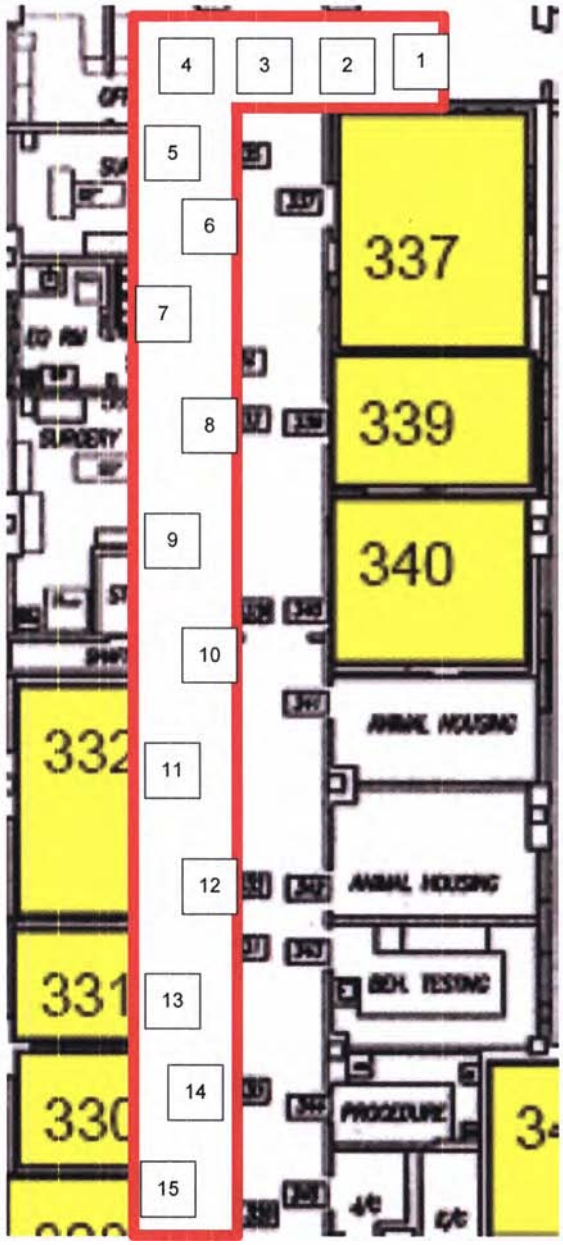
Hall 3-1

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
4337 PR 128625 Scans

STATIC & SMEAR LOCATIONS

DQO Locations

No Scale



Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 *131 12008*

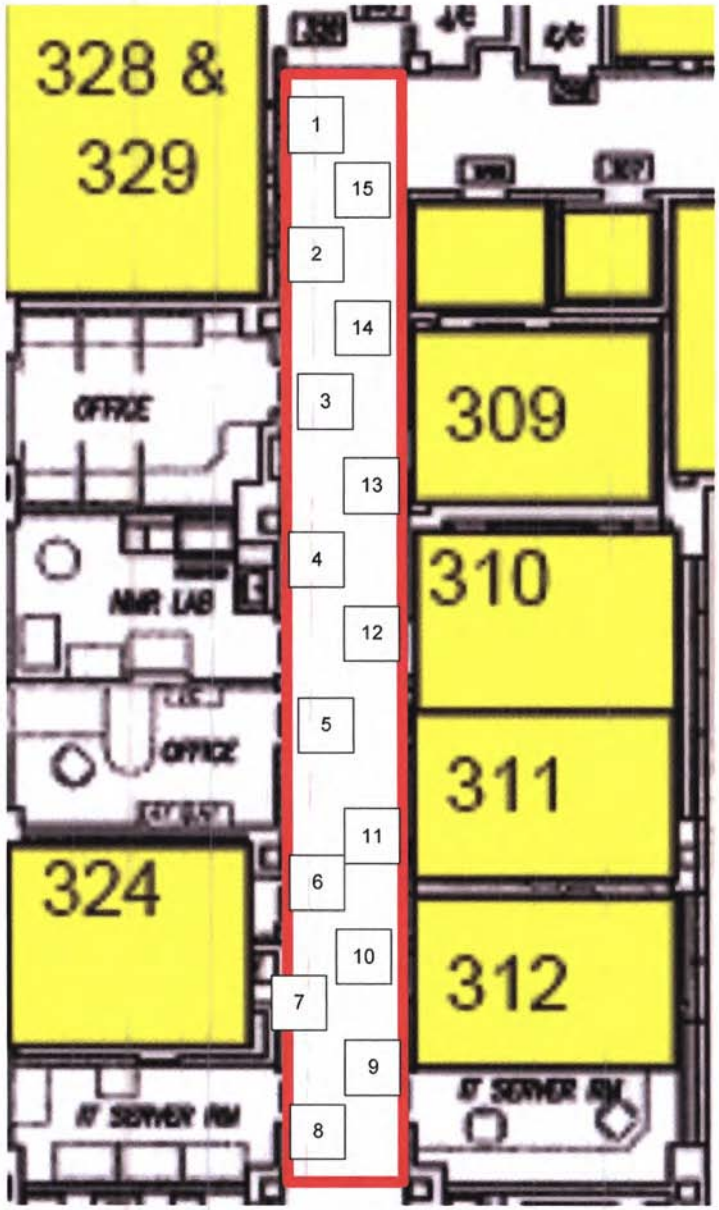
Hall 3-2

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
4337 PR 128625 Scans

STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

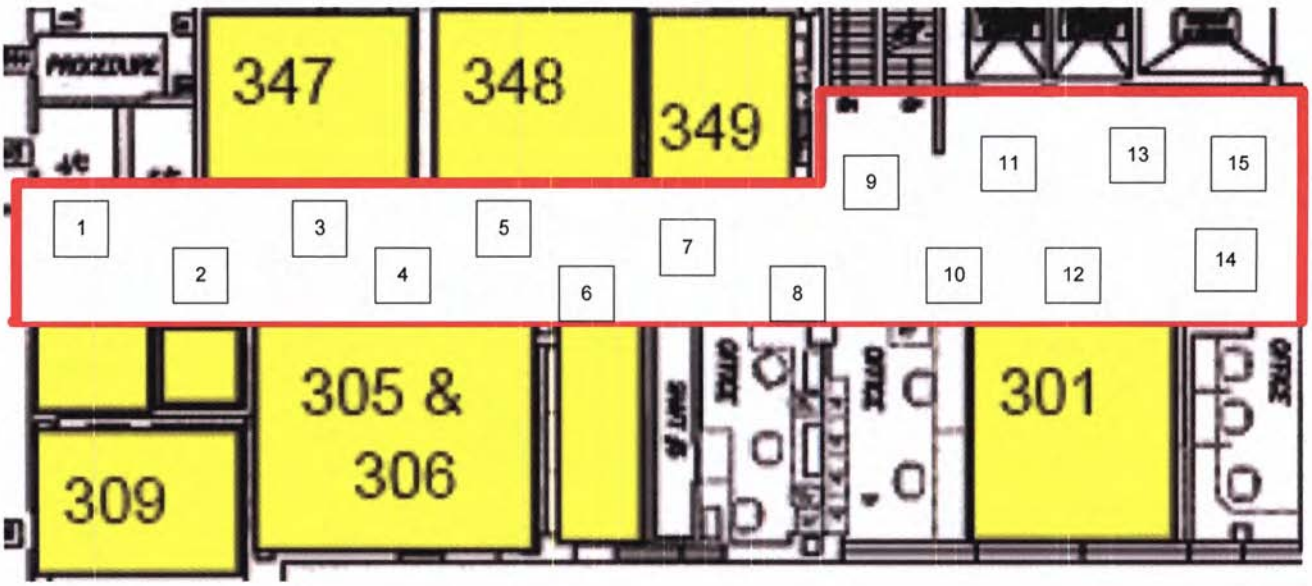


Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 / 31 *12008*

Hall 3-3



STATIC & SMEAR LOCATIONS

DQO Locations

No **Scale**

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
4337 PR 128625 Scans

Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

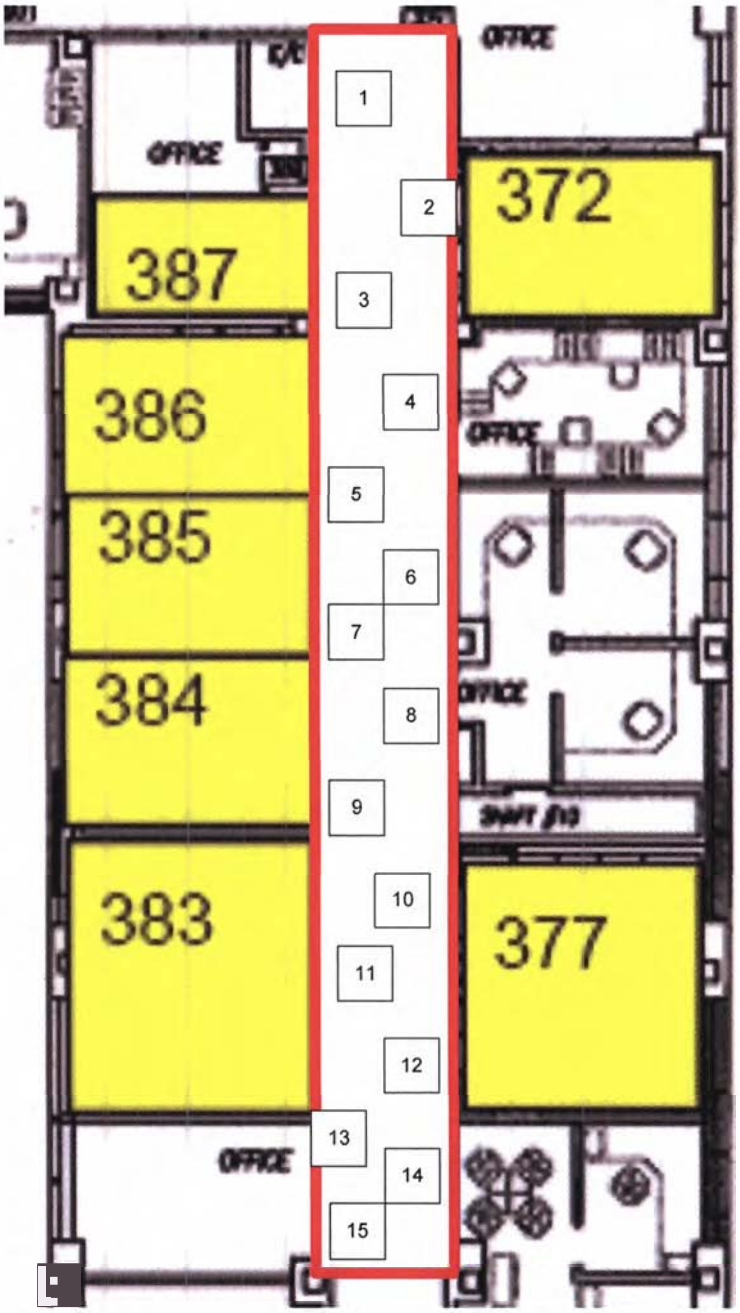
Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus
Date: **8 / 3 / 2008**
Hall 3-4

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
43-37 PR 128625 Scans

STATIC & SMEAR LOCATIONS

DQO Locations

No Scale



Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 7 / 31 / 2008

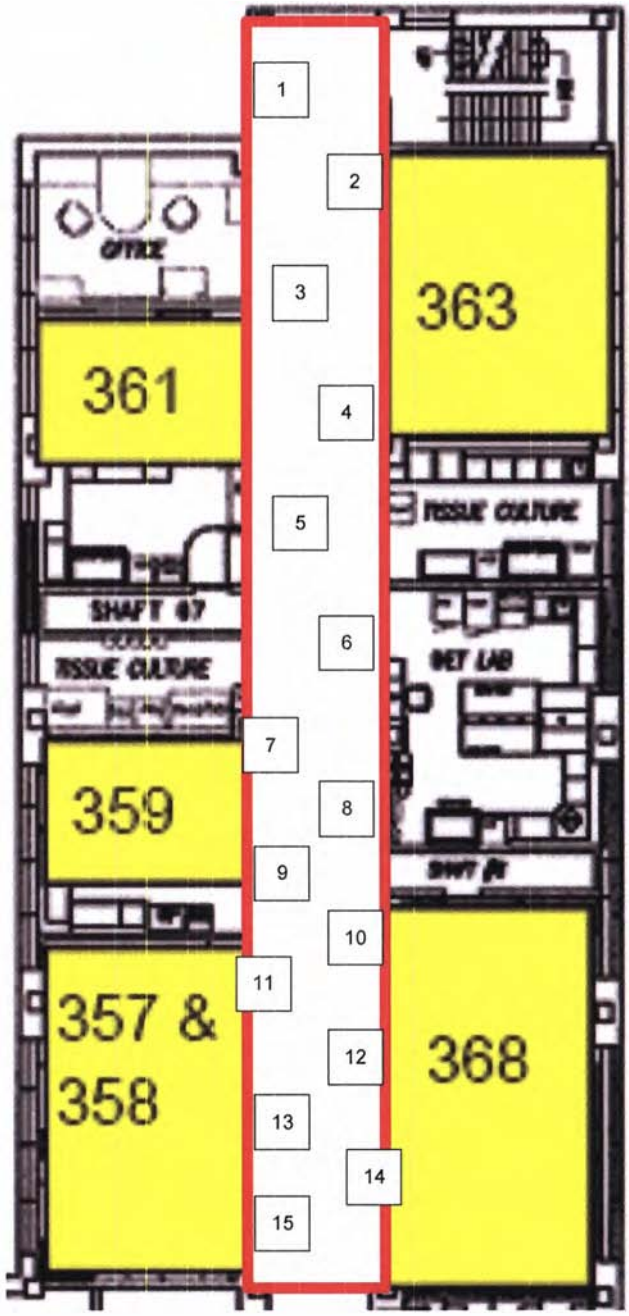
Hall 3-5

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
4337 PR 128625 Scans

STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

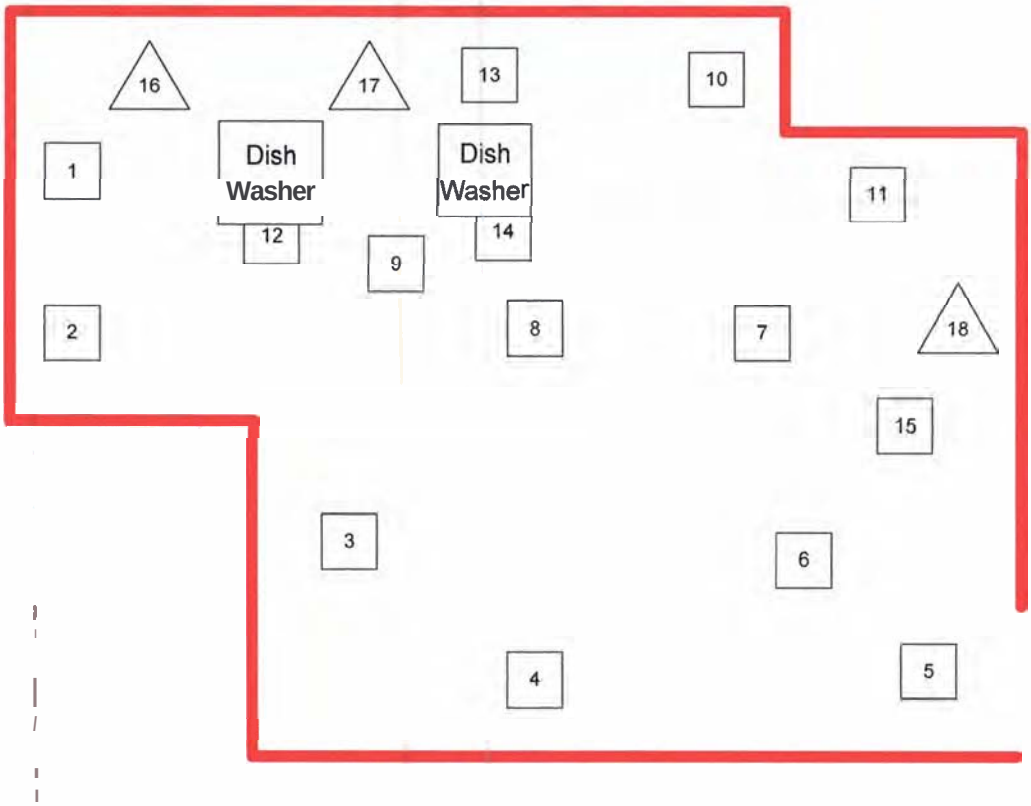


Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 1 *12008*

Room 409



STATIC & SMEAR LOCATIONS

DQO Locations

Bias Smear 16 Taken Inside Roan Exhaust Duct, 17 and 18 Taken Inside Sinks

Static and Smear 12 & 14 Taken Inside Dish Washers, 13 Taken Inside The Floor Drain Sump

No Scale

N

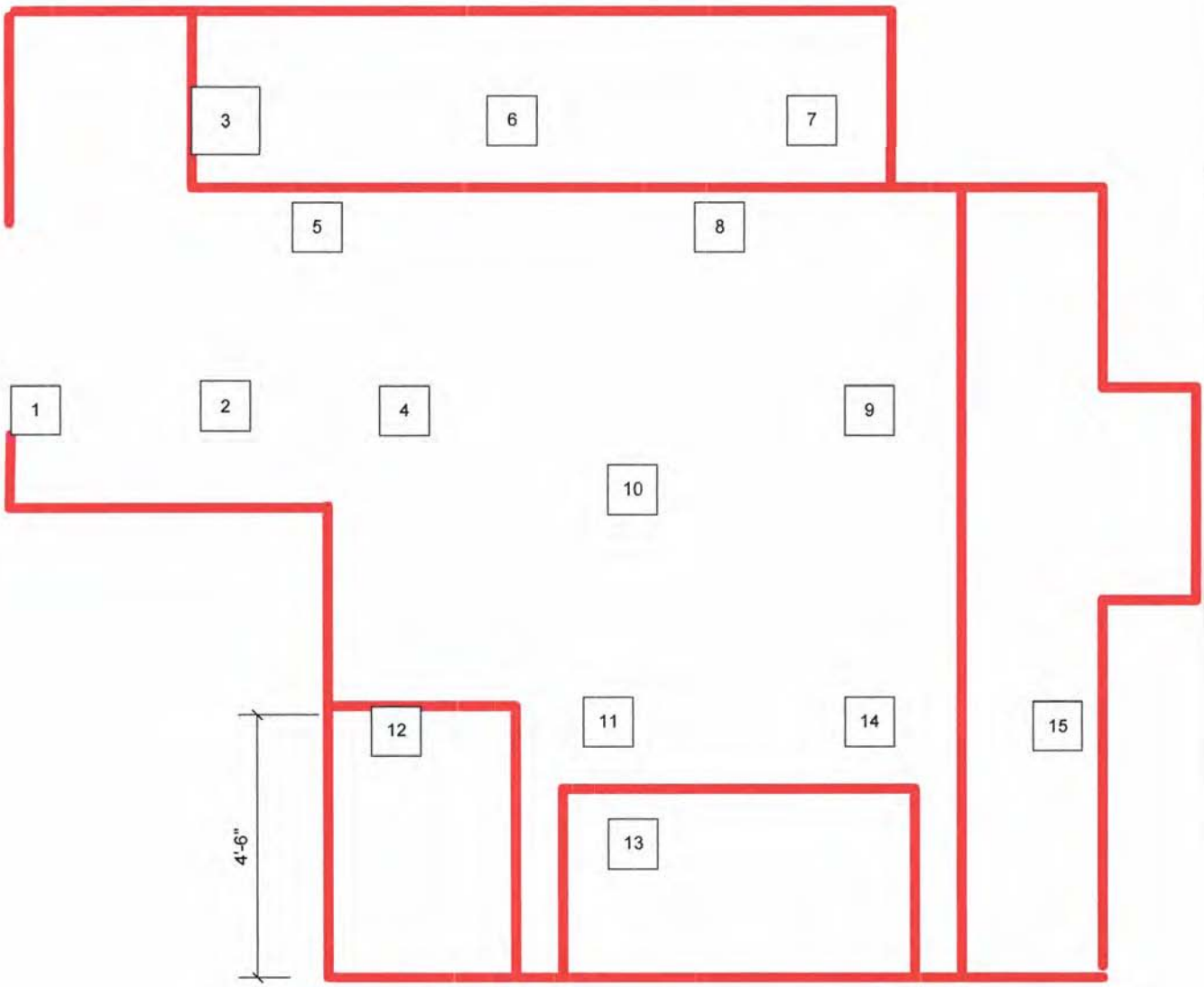
Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Scans

Surveyor
James Brady Sr HPT
Byron Bland SR HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 1111912008

Room 420A



STATIC & SMEAR LOCATIONS

DQO Locations

No Scale

N

Survey Instruments
2350-1 # 80496
43-68 PR148454 Statics /Scans
43-37-1 PR145081 Scans

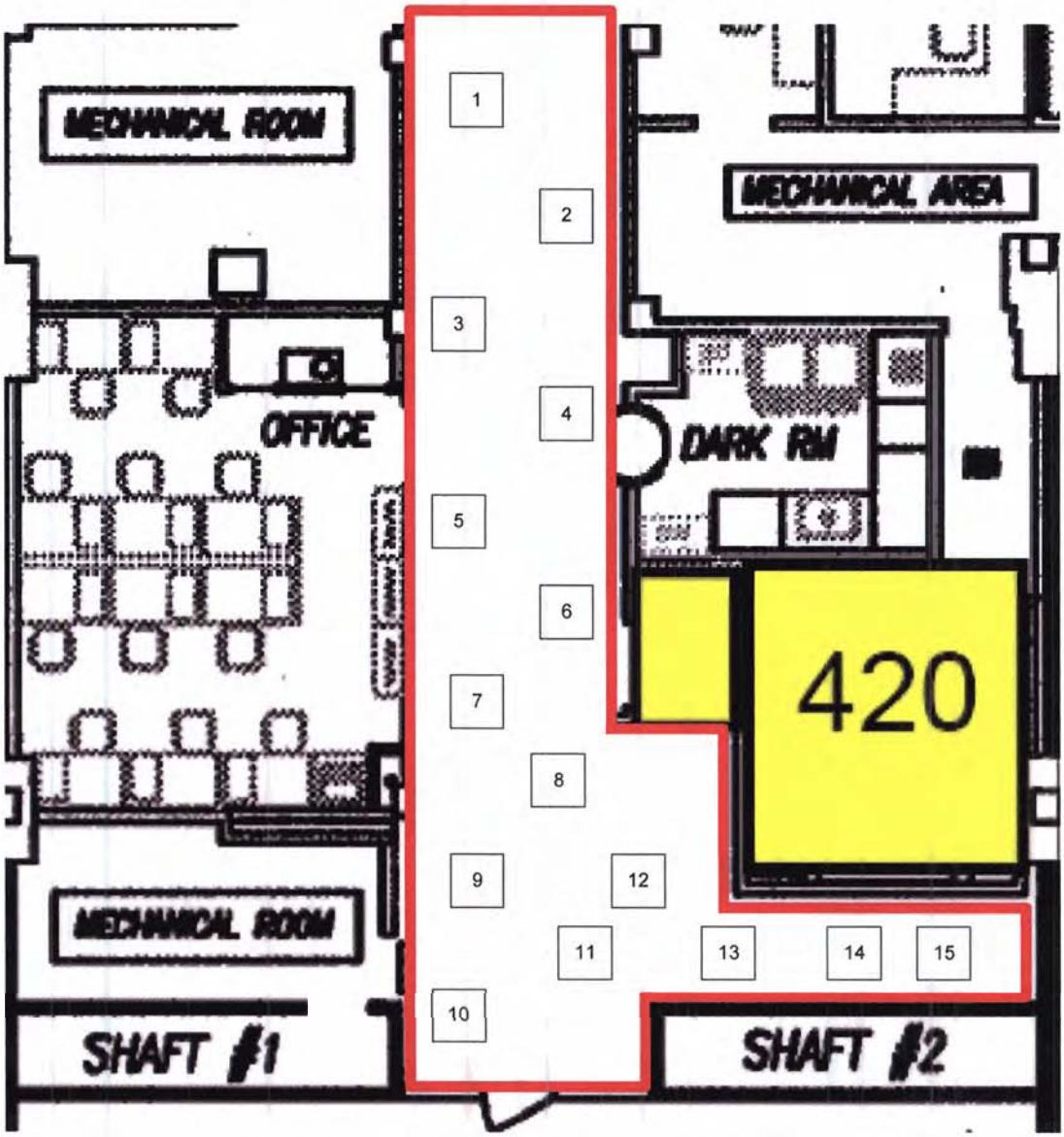
Surveyor: Byron Hand, Sr HPT

Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Hall 4-1



STATIC & SMEAR LOCATIONS

DQO Locations

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Scans

No Scale

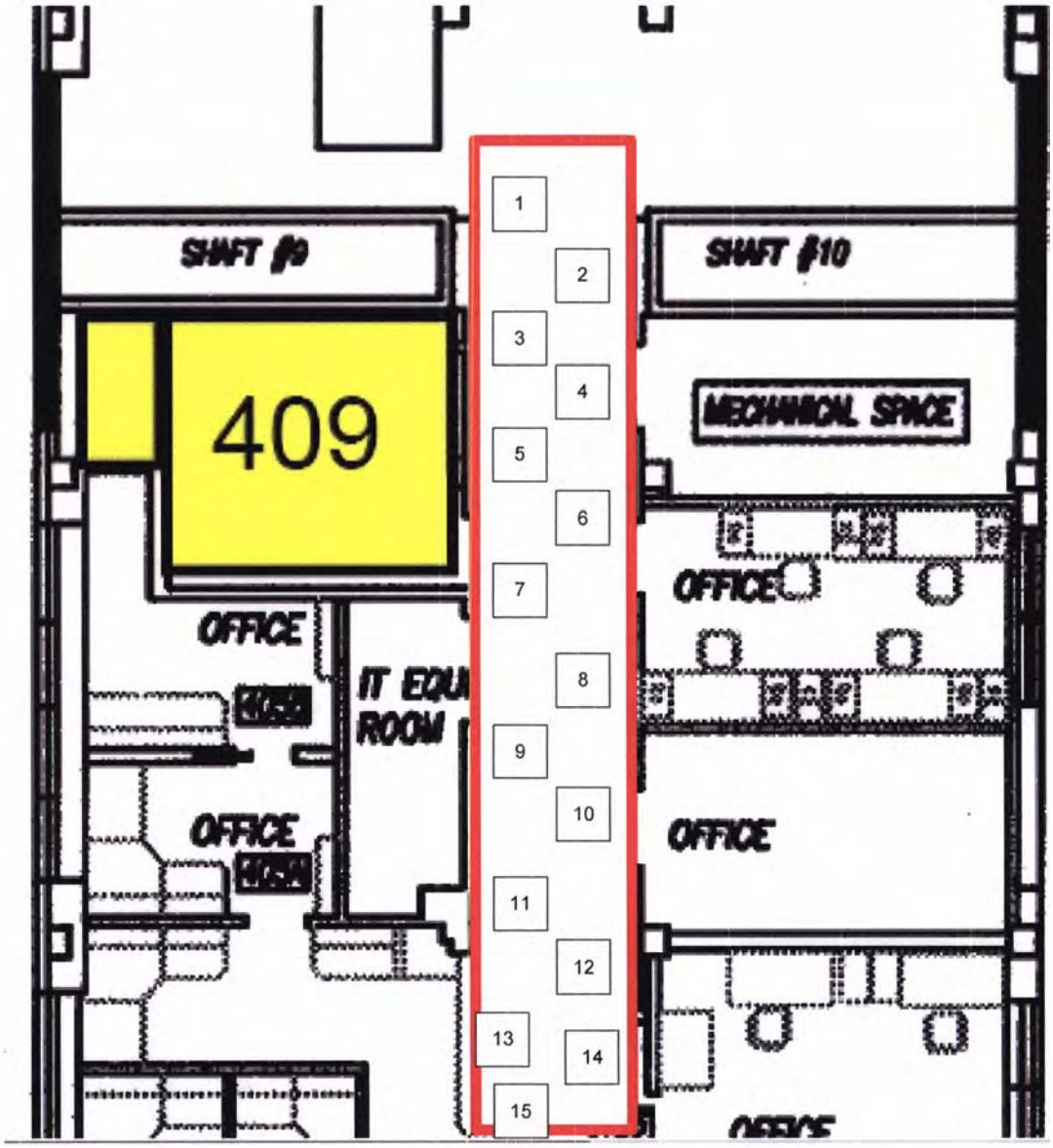
N

Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: 8 / 3 / 2008

Hall 4-2



Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
4337 PR 128625 Scans

STATIC & SMEAR LOCATIONS

DOO Locations

No Scale

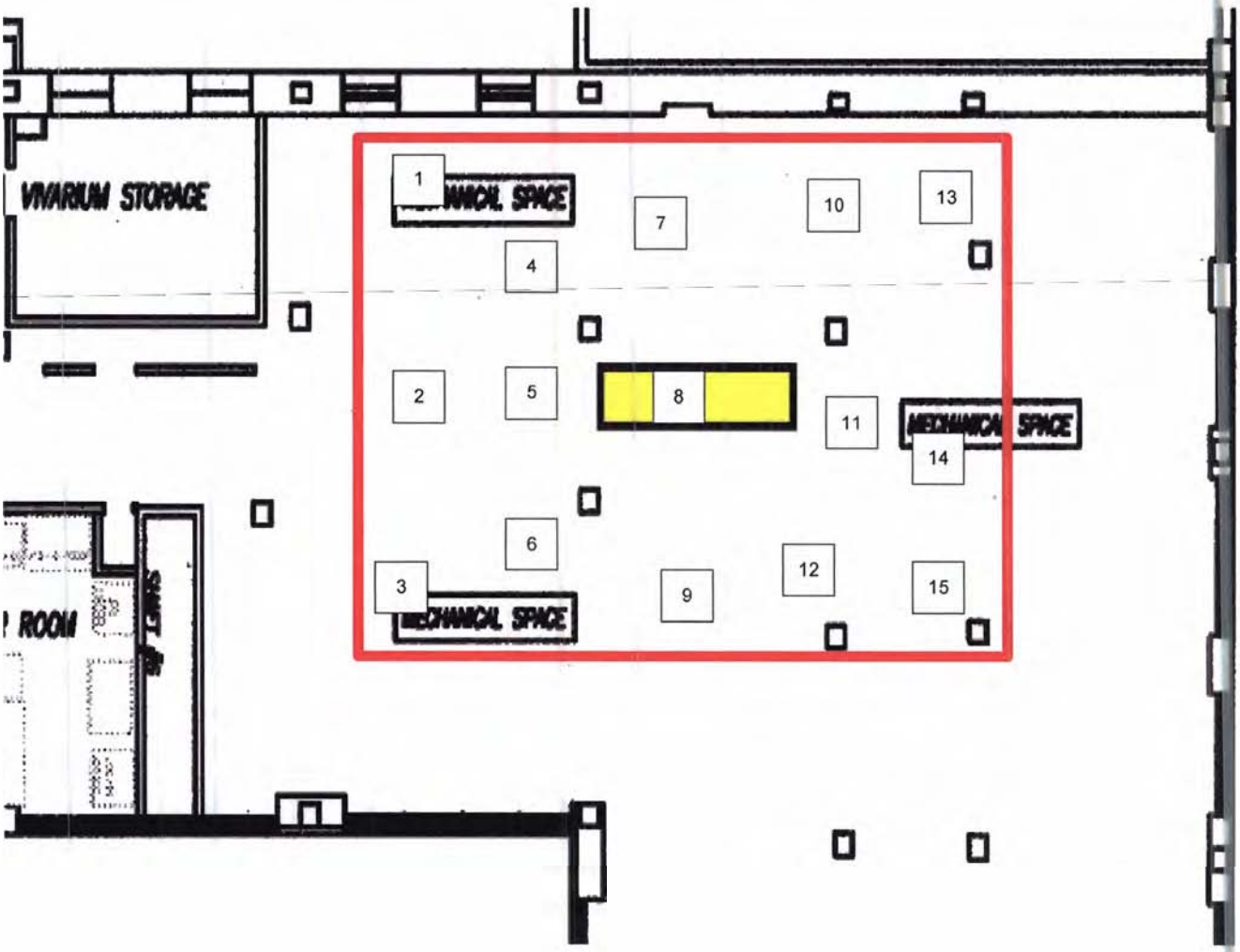
N

Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

Final Status Closeout Survey for C Building
Johns Hopkins Bayview Campus

Date: *8* / *3* / 2008

Hall 4-3



STATIC & SMEAR LOCATIONS

DQO Locations

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics
4337 PR 128625 Scans

No Scale

Surveyor
James Brady Sr HPT
Reviewer
Claude Wiblin CHP

APPENDIX B

Results of Static and Scan Measurements

Summary of Static Measurements

Survey Unit: 105
Survey Date: 6/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	293	67	15	1060	480
2	357	131	17	2080	540
3	351	125	17	1980	530
4	321	95	16	1510	510
5	279	53	15	840	460
6	326	100	16	1590	510
7	328	102	16	1620	510
8	355	129	17	2050	540
9	404	178	19	2830	580
10	383	157	18	2490	560
11	379	153	18	2430	560
12	370	144	18	2290	550
13	390	164	18	2600	570
14	399	173	18	2750	580
15	359	133	17	2110	540
			Minimum:	840	
			Maximum:	2830	
			Average:	2015	
			Std Dev:	593	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 111
Survey Date: 6/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	366	137	17	2170	550
2	420	191	19	3030	590
3	365	136	17	2160	540
4	367	138	18	2190	550
5	384	155	18	2460	560
6	346	117	17	1860	530
7	368	139	18	2210	550
8	354	125	17	1980	530
9	418	189	19	3000	590
10	345	116	17	1840	530
11	384	155	18	2460	560
12	375	146	18	2320	550
13	276	47	15	750	460
14	393	164	18	2600	570
15	341	112	17	1780	520
			Minimum:	750	
			Maximum:	3030	
			Average:	2187	
			Std Dev:	548	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 112
Survey Date: 6/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	376	150	18	2380	560
2	335	109	17	1730	520
3	338	112	17	1780	520
4	343	117	17	1860	530
5	341	115	17	1830	530
6	366	140	18	2220	550
7	417	191	19	3030	590
8	346	120	17	1900	530
9	352	126	17	2000	540
10	356	130	17	2060	540
11	385	159	18	2520	560
12	373	147	18	2330	550
13	377	151	18	2400	560
14	322	96	16	1520	510
15	329	103	16	1630	510
			Minimum:	1520	
			Maximum:	3030	
			Average:	2079	
			Std Dev:	401	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 112A
Survey Date: 6/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	372	126	17	2000	540
2	327	81	16	1290	490
3	395	149	18	2370	560
4	350	104	17	1650	510
5	338	92	16	1460	500
6	345	99	16	1570	510
7	351	105	17	1670	520
8	382	136	17	2160	540
9	395	149	18	2370	560
10	358	112	17	1780	520
11	385	139	18	2210	550
12	371	125	17	1980	530
13	354	108	17	1710	520
14	375	129	17	2050	540
15	395	149	18	2370	560
			Minimum:	1290	
			Maximum:	2370	
			Average:	1909	
			Std Dev:	349	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CP
Material Background:	246 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1205 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 119
Survey Date: 11/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	304	75	27	1190	850
2	322	93	28	1480	860
3	238	9	26	140	810
4	344	115	28	1830	880
5	296	67	27	1060	850
6	304	75	27	1190	850
7	285	56	27	890	840
8	269	40	27	630	830
9	256	27	27	430	820
10	321	92	28	1460	860
11	268	39	27	620	830
12	333	104	28	1650	870
13	353	124	28	1970	880
14	313	84	28	1330	860
15	279	50	27	790	840
			Minimum:	140	
			Maximum:	1970	
			Average:	1111	
			Std Dev:	528	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	26 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 135
Survey Date: 11/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	323	94	16	1490	510
2	319	90	16	1430	500
3	282	53	15	840	460
4	379	150	18	2380	560
5	361	132	17	2100	540
6	380	151	18	2400	560
7	274	45	15	710	460
8	303	74	16	1170	490
9	277	48	15	760	460
10	291	62	15	980	470
11	287	58	15	920	470
12	265	36	14	570	450
13	371	142	18	2250	550
14	311	82	16	1300	490
15	350	121	17	1920	530
			Minimum:	570	
			Maximum:	2400	
			Average:	1415	
			Std Dev:	644	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Cargo
Survey Date: 11/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	266	40	14	630	450
2	230	4	13	60	410
3	279	53	15	840	460
4	284	58	15	920	470
5	274	48	15	760	460
6	234	8	13	130	410
7	251	25	14	400	430
8	267	41	14	650	450
9	261	35	14	560	440
10	281	55	15	870	470
11	234	8	13	130	410
12	269	43	15	680	450
13	244	18	14	290	430
14	243	17	14	270	420
15	262	36	14	570	450
			Minimum:	60	
			Maximum:	920	
			Average:	517	
			Std Dev:	286	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 1-1
Survey Date: 6/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	340	94	16	1490	510
2	321	75	16	1190	490
3	291	45	15	710	460
4	283	37	14	590	450
5	288	42	15	670	450
6	365	119	17	1890	530
7	336	90	16	1430	500
8	347	101	16	1600	510
9	302	56	15	890	470
10	273	27	14	430	440
11	293	47	15	750	460
12	263	17	14	270	420
13	279	33	14	520	440
14	282	36	14	570	450
15	362	116	17	1840	530
			Minimum:	270	
			Maximum:	1890	
			Average:	989	
			Std Dev:	536	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CP
Material Background:	246 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1205 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 1-2
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	403	54	27	850	840
2	420	71	27	1120	850
3	417	68	27	1080	850
4	420	71	27	1120	850
5	431	82	28	1300	860
6	456	107	28	1700	870
7	424	75	27	1190	850
8	428	79	27	1250	850
9	406	57	27	900	840
10	352	3	26	40	810
11	369	20	26	310	820
12	383	34	27	540	830
13	401	52	27	820	840
14	387	38	27	600	830
15	278	-71	25	-1130	770
			Minimum:	-1130	
			Maximum:	1700	
			Average:	779	
			Std Dev:	674	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CU
Material Background:	349 cpm
Background Sigma:	26 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1427 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 1-3
Survey Date:

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	297	42	14	670	420
2	330	75	15	1190	460
3	206	-49	10	-780	300
4	299	44	14	700	430
5	339	84	15	1330	470
6	337	82	15	1300	470
7	341	86	15	1370	470
8	255	0	12	0	370
9	282	27	13	430	410
10	321	66	14	1050	450
11	310	55	14	870	440
12	344	89	15	1410	480
13	259	4	12	60	380
14	287	32	13	510	410
15	249	-6	12	-100	370
			Minimum:	-780	
			Maximum:	1410	
			Average:	667	
			Std Dev:	651	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 209A
Survey Date: 7/30/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	246	20	14	320	430
2	270	44	15	700	450
3	302	76	16	1210	490
4	240	14	14	220	420
5	287	61	15	970	470
6	277	51	15	810	460
7	248	22	14	350	430
8	220	-6	13	-100	400
9	281	55	15	870	470
10	254	28	14	440	440
11	292	66	15	1050	480
12	268	42	15	670	450
13	300	74	16	1170	490
14	298	72	16	1140	480
15	327	101	16	1600	510
			Minimum:	-100	
			Maximum:	1600	
			Average:	761	
			Std Dev:	453	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 217A
Survey Date: 7/30/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	222	-4	13	-60	400
2	241	15	14	240	420
3	218	-8	13	-130	390
4	252	26	14	410	430
5	268	42	15	670	450
6	245	19	14	300	430
7	262	36	14	570	450
8	290	64	15	1020	480
9	272	46	15	730	460
10	285	59	15	940	470
11	251	25	14	400	430
12	308	82	16	1300	490
13	298	72	16	1140	480
14	241	15	14	240	420
15	258	32	14	510	440
			Minimum:	-130	
			Maximum:	1300	
			Average:	552	
			Std Dev:	419	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 2-1
Survey Date: 7/30/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	306	60	15	950	470
2	327	81	16	1290	490
3	356	110	17	1750	520
4	311	65	15	1030	480
5	289	43	15	680	450
6	342	96	16	1520	510
7	312	66	15	1050	480
8	325	79	16	1250	490
9	360	114	17	1810	520
10	320	74	16	1170	490
11	331	85	16	1350	500
12	382	136	17	2160	540
13	301	55	15	870	470
14	312	66	15	1050	480
15	292	46	15	730	460
			Minimum:	680	
			Maximum:	2160	
			Average:	1244	
			Std Dev:	417	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CP
Material Background:	246 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1205 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 301
Survey Date: 6/23/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	235	-40	15	-630	460
2	243	-32	15	-510	470
3	286	11	16	170	510
4	238	-37	15	-590	460
5	254	-21	15	-330	480
6	266	-9	16	-140	490
7	270	-5	16	-80	490
8	282	7	16	110	500
9	231	-44	15	-700	450
10	244	-31	15	-490	470
11	282	7	16	110	500
12	281	6	16	100	500
13	236	-39	15	-620	460
14	279	4	16	60	500
15	235	-40	15	-630	460
			Minimum:	-700	
			Maximum:	170	
			Average:	-278	
			Std Dev:	334	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1272 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Static Measurements

Survey Unit: 304
Survey Date: 7/31/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	260	31	14	490	440
2	221	-8	13	-130	390
3	260	31	14	490	440
4	178	-51	11	-810	340
5	260	31	14	490	440
6	210	-19	12	-300	380
7	232	3	13	50	410
8	223	-6	13	-100	400
9	245	16	14	250	420
10	223	-6	13	-100	400
11	260	31	14	490	440
12	237	8	13	130	410
13	243	14	14	220	420
14	228	-1	13	-20	400
15	221	-8	13	-130	390
			Minimum:	-810	
			Maximum:	490	
			Average:	68	
			Std Dev:	361	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 305/306
Survey Date: 7/31/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	251	22	14	350	430
2	232	3	13	50	410
3	209	-20	12	-320	380
4	241	12	13	190	420
5	224	-5	13	-80	400
6	251	22	14	350	430
7	263	34	14	540	440
8	277	48	15	760	460
9	218	-11	13	-170	390
10	265	36	14	570	450
11	292	63	15	1000	470
12	293	64	15	1020	480
13	232	3	13	50	410
14	282	53	15	840	460
15	238	9	13	140	420
			Minimum:	-320	
			Maximum:	1020	
			Average:	353	
			Std Dev:	424	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 307
Survey Date: 8/1/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	308	79	16	1250	490
2	297	68	15	1080	480
3	302	73	16	1160	480
4	312	83	16	1320	490
5	314	85	16	1350	500
6	295	66	15	1050	480
7	278	49	15	780	460
8	301	72	16	1140	480
9	312	83	16	1320	490
10	328	99	16	1570	510
11	314	85	16	1350	500
12	327	98	16	1560	510
13	294	65	15	1030	480
14	308	79	16	1250	490
15	299	70	15	1110	480
			Minimum:	780	
			Maximum:	1570	
			Average:	1221	
			Std Dev:	206	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 308
Survey Date: 8/1/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	301	72	16	1140	480
2	298	69	15	1100	480
3	320	91	16	1440	500
4	307	78	16	1240	490
5	317	88	16	1400	500
6	298	69	15	1100	480
7	318	89	16	1410	500
8	292	63	15	1000	470
9	278	49	15	780	460
10	314	85	16	1350	500
11	300	71	15	1130	480
12	312	83	16	1320	490
13	282	53	15	840	460
14	308	79	16	1250	490
15	284	55	15	870	470
			Minimum:	780	
			Maximum:	1440	
			Average:	1158	
			Std Dev:	214	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 309
Survey Date: 6/20/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	285	59	15	940	470
2	254	28	14	440	440
3	256	30	14	480	440
4	251	25	14	400	430
5	272	46	15	730	460
6	295	69	15	1100	480
7	274	48	15	760	460
8	252	26	14	410	430
9	238	12	13	190	420
10	281	55	15	870	470
11	241	15	14	240	420
12	238	12	13	190	420
13	255	29	14	460	440
14	266	40	14	630	450
15	269	43	15	680	450
			Minimum:	190	
			Maximum:	1100	
			Average:	568	
			Std Dev:	277	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 310
Survey Date: 6/23/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	279	50	15	400	230
2	273	44	15	350	230
3	286	57	15	450	230
4	272	43	15	340	230
5	286	57	15	450	230
6	273	44	15	350	230
7	289	60	15	480	240
8	295	66	15	520	240
9	323	94	16	750	250
10	283	54	15	430	230
11	236	7	13	60	210
12	323	94	16	750	250
13	306	77	16	610	240
14	320	91	16	720	250
15	302	73	16	580	240
			Minimum:	60	
			Maximum:	750	
			Average:	483	
			Std Dev:	184	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.5 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.10 epm/dpm
Total Efficiency Uncertainty:	0.0008 epm/dpm
MDC:	582 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 311
Survey Date: 6/23/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	305	79	16	1250	490
2	293	67	15	1060	480
3	312	86	16	1370	500
4	280	54	15	860	460
5	308	82	16	1300	490
6	288	62	15	980	470
7	303	77	16	1220	490
8	311	85	16	1350	500
9	335	109	17	1730	520
10	337	111	17	1760	520
11	324	98	16	1560	510
12	314	88	16	1400	500
13	320	94	16	1490	510
14	334	108	17	1710	520
15	330	104	17	1650	510
			Minimum:	860	
			Maximum:	1760	
			Average:	1379	
			Std Dev:	277	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 312
Survey Date: 6/23/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	295	-8	22	-130	680
2	293	-10	22	-160	680
3	309	6	22	100	690
4	331	28	23	440	700
5	276	-27	21	-430	670
6	299	-4	22	-60	680
7	275	-28	21	-440	660
8	305	2	22	30	690
9	297	-6	22	-100	680
10	282	-21	22	-330	670
11	312	9	22	140	690
12	256	-47	21	-750	650
13	278	-25	21	-400	670
14	299	-4	22	-60	680
15	311	8	22	130	690
			Minimum:	-750	
			Maximum:	440	
			Average:	-135	
			Std Dev:	297	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	FT
Material Background:	303 cpm
Background Sigma:	22 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1332 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 324
Survey Date: 6/23/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	266	37	14	590	450
2	260	31	14	490	440
3	270	41	14	650	450
4	272	43	15	680	450
5	324	95	16	1510	510
6	313	84	16	1330	500
7	331	102	16	1620	510
8	320	91	16	1440	500
9	299	70	15	1110	480
10	334	105	17	1670	520
11	306	77	16	1220	490
12	319	90	16	1430	500
13	302	73	16	1160	480
14	364	135	17	2140	540
15	303	74	16	1170	490
			Minimum:	490	
			Maximum:	2140	
			Average:	1214	
			Std Dev:	460	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 328/329
Survey Date: 6/23/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	255	29	14	460	440
2	227	1	13	20	410
3	226	0	13	0	400
4	238	12	13	190	420
5	269	43	15	680	450
6	273	47	15	750	460
7	254	28	14	440	440
8	255	29	14	460	440
9	269	43	15	680	450
10	247	21	14	330	430
11	294	68	15	1080	480
12	285	59	15	940	470
13	267	41	14	650	450
14	290	64	15	1020	480
15	251	25	14	400	430
			Minimum:	0	
			Maximum:	1080	
			Average:	540	
			Std Dev:	333	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 330
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	257	31	14	490	440
2	268	42	15	670	450
3	249	23	14	370	430
4	265	39	14	620	450
5	281	55	15	870	470
6	308	82	16	1300	490
7	283	57	15	900	470
8	252	26	14	410	430
9	286	60	15	950	470
10	265	39	14	620	450
11	248	22	14	350	430
12	271	45	15	710	460
13	267	41	14	650	450
14	254	28	14	440	440
15	251	25	14	400	430
			Minimum:	350	
			Maximum:	1300	
			Average:	650	
			Std Dev:	266	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 331
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	292	66	15	1050	480
2	281	55	15	870	470
3	296	70	15	1110	480
4	273	47	15	750	460
5	310	84	16	1330	500
6	304	78	16	1240	490
7	298	72	16	1140	480
8	278	52	15	830	460
9	273	47	15	750	460
10	268	42	15	670	450
11	297	71	15	1130	480
12	307	81	16	1290	490
13	269	43	15	680	450
14	301	75	16	1190	490
15	294	68	15	1080	480
			Minimum:	670	
			Maximum:	1330	
			Average:	1007	
			Std Dev:	228	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 332
Survey Date: 6/20/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	285	59	15	940	480
2	283	57	15	900	480
3	285	59	15	940	480
4	293	67	16	1060	490
5	276	50	15	790	470
6	291	65	16	1030	480
7	276	50	15	790	470
8	290	64	16	1020	480
9	329	103	17	1630	520
10	285	59	15	940	480
11	284	58	15	920	480
12	290	64	16	1020	480
13	306	80	16	1270	500
14	290	64	16	1020	480
15	267	41	15	650	460
			Minimum:	650	
			Maximum:	1630	
			Average:	995	
			Std Dev:	226	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13.3 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 337
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	258	32	14	510	440
2	230	4	13	60	410
3	243	17	14	270	420
4	228	2	13	30	410
5	262	36	14	570	450
6	225	-1	13	-20	400
7	231	5	13	80	410
8	246	20	14	320	430
9	229	3	13	50	410
10	253	27	14	430	440
11	237	11	13	170	420
12	229	3	13	50	410
13	209	-17	12	-270	380
14	249	23	14	370	430
15	262	36	14	570	450
			Minimum:	-270	
			Maximum:	570	
			Average:	213	
			Std Dev:	246	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 339
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	252	26	14	410	430
2	258	32	14	510	440
3	238	12	13	190	420
4	247	21	14	330	430
5	235	9	13	140	420
6	241	15	14	240	420
7	230	4	13	60	410
8	251	25	14	400	430
9	240	14	14	220	420
10	228	2	13	30	410
11	233	7	13	110	410
12	247	21	14	330	430
13	228	2	13	30	410
14	261	35	14	560	440
15	242	16	14	250	420
			Minimum:	30	
			Maximum:	560	
			Average:	254	
			Std Dev:	168	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 340
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	278	52	15	830	460
2	250	24	14	380	430
3	244	18	14	290	430
4	268	42	15	670	450
5	228	2	13	30	410
6	265	39	14	620	450
7	248	22	14	350	430
8	260	34	14	540	440
9	247	21	14	330	430
10	256	30	14	480	440
11	245	19	14	300	430
12	271	45	15	710	460
13	248	22	14	350	430
14	247	21	14	330	430
15	271	45	15	710	460
			Minimum:	30	
			Maximum:	830	
			Average:	461	
			Std Dev:	214	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 347
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	240	14	14	220	420
2	261	35	14	560	440
3	243	17	14	270	420
4	262	36	14	570	450
5	243	17	14	270	420
6	238	12	13	190	420
7	241	15	14	240	420
8	262	36	14	570	450
9	265	39	14	620	450
10	248	22	14	350	430
11	262	36	14	570	450
12	259	33	14	520	440
13	263	37	14	590	450
14	248	22	14	350	430
15	277	51	15	810	460
			Minimum:	190	
			Maximum:	810	
			Average:	447	
			Std Dev:	187	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 348
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	262	-13	16	-210	480
2	243	-32	15	-510	470
3	273	-2	16	-40	500
4	256	-19	15	-310	480
5	281	6	16	90	500
6	267	-8	16	-130	490
7	249	-26	15	-420	470
8	281	6	16	90	500
9	261	-14	16	-230	480
10	258	-17	15	-280	480
11	256	-19	15	-310	480
12	260	-15	16	-240	480
13	288	13	16	200	510
14	275	0	16	-10	500
15	282	7	16	100	500
			Minimum:	-510	
			Maximum:	200	
			Average:	-147	
			Std Dev:	211	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 349
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	225	-1	13	-20	400
2	248	22	14	350	430
3	262	36	14	570	450
4	257	31	14	490	440
5	246	20	14	320	430
6	228	2	13	30	410
7	231	5	13	80	410
8	228	2	13	30	410
9	237	11	13	170	420
10	229	3	13	50	410
11	216	-10	13	-160	390
12	221	-5	13	-80	400
13	251	25	14	400	430
14	261	35	14	560	440
15	234	8	13	130	410
			Minimum:	-160	
			Maximum:	570	
			Average:	195	
			Std Dev:	237	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 357-358
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	274	48	15	760	460
2	268	42	15	670	450
3	280	54	15	860	460
4	271	45	15	710	460
5	255	29	14	460	440
6	262	36	14	570	450
7	266	40	14	630	450
8	253	27	14	430	440
9	263	37	14	590	450
10	275	49	15	780	460
11	269	43	15	680	450
12	258	32	14	510	440
13	245	19	14	300	430
14	247	21	14	330	430
15	253	27	14	430	440
			Minimum:	300	
			Maximum:	860	
			Average:	581	
			Std Dev:	168	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 359
Survey Date: 11/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	282	56	15	890	470
2	242	16	14	250	420
3	312	86	16	1370	500
4	309	83	16	1320	490
5	273	47	15	750	460
6	289	63	15	1000	470
7	235	9	13	140	420
8	291	65	15	1030	480
9	247	21	14	330	430
10	339	113	17	1790	520
11	258	32	14	510	440
12	259	33	14	520	440
13	314	88	16	1400	500
14	286	60	15	950	470
15	250	24	14	380	430
			Minimum:	140	
			Maximum:	1790	
			Average:	842	
			Std Dev:	488	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 361
Survey Date: 6/25/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	272	46	15	730	460
2	253	27	14	430	440
3	240	14	14	220	420
4	254	28	14	440	440
5	273	47	15	750	460
6	255	29	14	460	440
7	272	46	15	730	460
8	275	49	15	780	460
9	276	50	15	790	460
10	269	43	15	680	450
11	274	48	15	760	460
12	291	65	15	1030	480
13	276	50	15	790	460
14	309	83	16	1320	490
15	272	46	15	730	460
			Minimum:	220	
			Maximum:	1320	
			Average:	709	
			Std Dev:	261	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 363
Survey Date: 6/25/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	294	65	15	1030	480
2	317	88	16	1400	500
3	278	49	15	780	460
4	281	52	15	830	460
5	300	71	15	1130	480
6	262	33	14	520	440
7	317	88	16	1400	500
8	285	56	15	890	470
9	279	50	15	790	460
10	296	67	15	1060	480
11	273	44	15	700	450
12	265	36	14	570	450
13	258	29	14	460	440
14	284	55	15	870	470
15	305	76	16	1210	490
			Minimum:	460	
			Maximum:	1400	
			Average:	909	
			Std Dev:	294	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 368
Survey Date: 6/25/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	251	22	14	350	430
2	248	19	14	300	430
3	222	-7	13	-110	400
4	248	19	14	300	430
5	278	49	15	780	460
6	251	22	14	350	430
7	272	43	15	680	450
8	275	46	15	730	460
9	249	20	14	320	430
10	239	10	13	160	420
11	274	45	15	710	460
12	256	27	14	430	440
13	235	6	13	100	410
14	269	40	14	630	450
15	279	50	15	790	460
			Minimum:	-110	
			Maximum:	790	
			Average:	435	
			Std Dev:	274	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 372
Survey Date: 6/24/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	244	-59	21	-940	640
2	243	-60	21	-950	640
3	255	-48	21	-760	650
4	253	-50	21	-790	650
5	268	-35	21	-560	660
6	267	-36	21	-570	660
7	252	-51	21	-810	650
8	223	-80	20	-1270	630
9	241	-62	21	-980	640
10	294	-9	22	-140	680
11	310	7	22	110	690
12	239	-64	20	-1020	640
13	238	-65	20	-1030	640
14	262	-41	21	-650	650
15	296	-7	22	-110	680
			Minimum:	-1270	
			Maximum:	110	
			Average:	-698	
			Std Dev:	389	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	FT
Material Background:	303 cpm
Background Sigma:	22 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1332 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 377
Survey Date: 11/19/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	273	47	15	750	460
2	261	35	14	560	440
3	252	26	14	410	430
4	258	32	14	510	440
5	284	58	15	920	470
6	215	-11	13	-170	390
7	215	-11	13	-170	390
8	240	14	14	220	420
9	307	81	16	1290	490
10	160	-66	10	-1050	320
11	274	48	15	760	460
12	257	31	14	490	440
13	259	33	14	520	440
14	236	10	13	160	420
15	294	68	15	1080	480
			Minimum:	-1050	
			Maximum:	1290	
			Average:	419	
			Std Dev:	578	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	WL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 383
Survey Date: 6/24/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	305	2	22	30	690
2	263	-40	21	-630	660
3	299	-4	22	-60	680
4	269	-34	21	-540	660
5	256	-47	21	-750	650
6	290	-13	22	-210	680
7	284	-19	22	-300	670
8	295	-8	22	-130	680
9	252	-51	21	-810	650
10	283	-20	22	-320	670
11	285	-18	22	-290	670
12	262	-41	21	-650	650
13	293	-10	22	-160	680
14	306	3	22	50	690
15	281	-22	21	-350	670
			Minimum:	-810	
			Maximum:	50	
			Average:	-341	
			Std Dev:	277	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	FT
Material Background:	303 cpm
Background Sigma:	22 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1332 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: 384
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	262	-13	16	-210	480
2	241	-34	15	-550	460
3	262	-13	16	-210	480
4	247	-28	15	-450	470
5	254	-21	15	-340	480
6	270	-5	16	-90	490
7	246	-29	15	-470	470
8	247	-28	15	-450	470
9	249	-26	15	-420	470
10	238	-37	15	-590	460
11	247	-28	15	-450	470
12	258	-17	15	-280	480
13	276	1	16	10	500
14	243	-32	15	-510	470
15	258	-17	15	-280	480
			Minimum:	-590	
			Maximum:	10	
			Average:	-353	
			Std Dev:	173	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 385
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	393	44	27	700	840
2	332	-17	26	-270	810
3	362	13	27	200	830
4	352	3	26	40	820
5	338	-11	26	-180	810
6	368	19	27	300	830
7	361	12	27	190	830
8	334	-15	26	-240	810
9	364	15	27	230	830
10	361	12	27	190	830
11	322	-27	26	-430	800
12	368	19	27	300	830
13	337	-12	26	-190	810
14	337	-12	26	-190	810
15	350	1	26	10	820
			Minimum:	-430	
			Maximum:	700	
			Average:	44	
			Std Dev:	296	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CU
Material Background:	349 cpm
Background Sigma:	26.3 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1427 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 386
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	265	39	14	620	450
2	252	26	14	410	430
3	245	19	14	300	430
4	239	13	13	210	420
5	240	14	14	220	420
6	248	22	14	350	430
7	255	29	14	460	440
8	237	11	13	170	420
9	255	29	14	460	440
10	263	37	14	590	450
11	282	56	15	890	470
12	246	20	14	320	430
13	231	5	13	80	410
14	260	34	14	540	440
15	245	19	14	300	430
			Minimum:	80	
			Maximum:	890	
			Average:	395	
			Std Dev:	208	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	226 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1157 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 387
Survey Date: 6/23/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	266	-37	21	-590	660
2	260	-43	21	-680	650
3	270	-33	21	-520	660
4	272	-31	21	-490	660
5	324	21	22	330	700
6	313	10	22	160	690
7	331	28	23	440	700
8	320	17	22	270	700
9	299	-4	22	-60	680
10	334	31	23	490	710
11	306	3	22	50	690
12	319	16	22	250	700
13	302	-1	22	-20	680
14	364	61	23	970	730
15	303	0	22	0	680
			Minimum:	-680	
			Maximum:	970	
			Average:	40	
			Std Dev:	459	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CF
Material Background:	303 cpm
Background Sigma:	22 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1332 dpm/100 cm^2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: J. W. Moon, CHP

Summary of Static Measurements

Survey Unit: Hall 3-1
Survey Date: 7/31/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	344	98	16	1560	510
2	318	72	16	1140	480
3	350	104	17	1650	510
4	370	124	17	1970	530
5	260	14	14	220	420
6	288	42	15	670	450
7	312	66	15	1050	480
8	310	64	15	1020	480
9	342	96	16	1520	510
10	350	104	17	1650	510
11	328	82	16	1300	490
12	321	75	16	1190	490
13	352	106	17	1680	520
14	328	82	16	1300	490
15	341	95	16	1510	510
			Minimum:	220	
			Maximum:	1970	
			Average:	1295	
			Std Dev:	442	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CP
Material Background:	246 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1205 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 3-2
Survey Date: 7/31/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	357	111	17	1760	520
2	360	114	17	1810	520
3	326	80	16	1270	490
4	350	104	17	1650	510
5	314	68	15	1080	480
6	326	80	16	1270	490
7	305	59	15	940	470
8	320	74	16	1170	490
9	306	60	15	950	470
10	323	77	16	1220	490
11	317	71	15	1130	480
12	340	94	16	1490	510
13	314	68	15	1080	480
14	303	57	15	900	470
15	298	52	15	830	460
			Minimum:	830	
			Maximum:	1810	
			Average:	1237	
			Std Dev:	311	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CP
Material Background:	246 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1205 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 3-3
Survey Date: 7/31/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	362	107	16	1700	490
2	318	63	14	1000	450
3	351	96	15	1520	480
4	280	25	13	400	400
5	367	112	16	1780	500
6	348	93	15	1480	480
7	321	66	14	1050	450
8	318	63	14	1000	450
9	316	61	14	970	450
10	298	43	14	680	430
11	266	11	12	170	390
12	279	24	13	380	400
13	303	48	14	760	430
14	268	13	13	210	390
15	309	54	14	860	440
			Minimum:	170	
			Maximum:	1780	
			Average:	931	
			Std Dev:	519	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 3-4
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	337	82	15	1300	470
2	302	47	14	750	430
3	367	112	16	1780	500
4	331	76	15	1210	460
5	319	64	14	1020	450
6	355	100	16	1590	490
7	342	87	15	1380	470
8	327	72	15	1140	460
9	298	43	14	680	430
10	342	87	15	1380	470
11	317	62	14	980	450
12	303	48	14	760	430
13	324	69	15	1100	450
14	338	83	15	1320	470
15	311	56	14	890	440
			Minimum:	680	
			Maximum:	1780	
			Average:	1152	
			Std Dev:	316	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 3-5
Survey Date: 7/31/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	335	80	15	1270	470
2	350	95	15	1510	480
3	319	64	14	1020	450
4	303	48	14	760	430
5	322	67	15	1060	450
6	368	113	16	1790	500
7	327	72	15	1140	460
8	303	48	14	760	430
9	315	60	14	950	440
10	359	104	16	1650	490
11	366	111	16	1760	500
12	338	83	15	1320	470
13	307	52	14	830	440
14	321	66	14	1050	450
15	352	97	16	1540	480
			Minimum:	760	
			Maximum:	1790	
			Average:	1227	
			Std Dev:	353	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 409
Survey Date: 8/1/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	303	74	16	1170	490
2	290	61	15	970	470
3	350	121	17	1920	530
4	275	46	15	730	460
5	284	55	15	870	470
6	311	82	16	1300	490
7	304	75	16	1190	490
8	308	79	16	1250	490
9	297	68	15	1080	480
10	308	79	16	1250	490
11	294	65	15	1030	480
12	328	99	16	1570	510
13	317	88	16	1400	500
14	302	73	16	1160	480
15	306	77	16	1220	490
			Minimum:	730	
			Maximum:	1920	
			Average:	1207	
			Std Dev:	285	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: 420A
Survey Date: 11/25/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	252	23	14	370	430
2	237	8	13	130	410
3	214	-15	12	-240	390
4	220	-9	13	-140	390
5*	352	3	13	50	410
6	249	20	14	320	430
7	276	47	15	750	460
8	251	22	14	350	430
9	265	36	14	570	450
10	261	32	14	510	440
11	234	5	13	80	410
12	255	26	14	410	430
13	210	-19	12	-300	380
14	208	-21	12	-330	380
15	259	30	14	480	440
			Minimum:	-330	
			Maximum:	750	
			Average:	201	
			Std Dev:	339	

* Background for unpainted concrete applied.

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	BL
Material Background:	229 cpm
Background Sigma:	13 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1165 dpm/100 cm^2

Surveyor: Byron Bland, Sr. HP
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 4-1
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	282	27	13	430	410
2	265	10	12	160	390
3	240	-15	11	-240	350
4	262	7	12	110	380
5	251	-4	12	-60	370
6	254	-1	12	-20	370
7	288	33	13	520	410
8	253	-2	12	-30	370
9	264	9	12	140	380
10	249	-6	12	-100	370
11	257	2	12	30	380
12	278	23	13	370	400
13	260	5	12	80	380
14	273	18	13	290	400
15	280	25	13	400	400
			Minimum:	-240	
			Maximum:	520	
			Average:	139	
			Std Dev:	221	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 4-2
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	250	-5	12	-80	370
2	247	-8	12	-130	360
3	273	18	13	290	400
4	248	-7	12	-110	360
5	252	-3	12	-50	370
6	268	13	13	210	390
7	248	-7	12	-110	360
8	261	6	12	100	380
9	257	2	12	30	380
10	260	5	12	80	380
11	275	20	13	320	400
12	289	34	13	540	420
13	260	5	12	80	380
14	272	17	13	270	390
15	280	25	13	400	400
			Minimum:	-130	
			Maximum:	540	
			Average:	123	
			Std Dev:	208	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Static Measurements

Survey Unit: Hall 4-3
Survey Date: 8/3/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	323	-26	26	-420	800
2	361	12	27	190	830
3	340	-9	26	-150	810
4	328	-21	26	-340	810
5	339	-10	26	-160	810
6	348	-1	26	-20	820
7	372	23	27	360	830
8	361	12	27	190	830
9	368	19	27	300	830
10	340	-9	26	-150	810
11	360	11	27	170	820
12	326	-23	26	-370	800
13	340	-9	26	-150	810
14	328	-21	26	-340	810
15	347	-2	26	-30	820
			Minimum:	-420	
			Maximum:	360	
			Average:	-61	
			Std Dev:	254	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CU
Material Background:	349 cpm
Background Sigma:	26.3 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1427 dpm/100 cm^2

Surveyor: James Brady, RRPT
Radiological Engineer: C. Wiblin, CHP

Summary of Scan Measurements

Room/Area	Date	Item	Material	Probe Serial	Probe Model	Average (gcpm)	Maximum (gcpm)	Average (dpm/100cm^2)	Maximum (dpm/100cm^2)
105	6/17/08	Recesses	CP	145081	43-37-1	780	923	-318	190
	6/6/08	Floor	CP	145081	43-37-1	1026	1206	496	1320
	6/2/08	Counter	WL	145081	43-37-1	890	1070	-160	432
	6/3/08	Counter	WL	148454	43-68	329	448	2076	4481
	6/3/08	Sink	WL	148454	43-68	311	380	1720	3113
	6/3/08	Counter	WL	148454	43-68	279	351	1077	2531
111	6/4/08	Hood	BL	148454	43-68	325	401	1935	3474
	6/3/08	Counter	BL	145081	43-37-1	932	1264	-11	651
	6/6/08	Floor	CP	145081	43-37-1	1006	1190	430	1256
	6/6/08	Recesses	CP	128625	43-37	811	1396	-270	2286
	6/3/08	Sink	BL	148454	43-68	312	379	1670	3024
112	6/3/08	Floor	CP	145081	43-37-1	1130	1373	838	1989
	6/3/08	Sink	WL	148454	43-68	355	447	2607	4462
	6/3/08	Counter	WL	145081	43-37-1	902	1156	-122	716
112A	6/6/08	Floor	CP	145081	43-37-1	1452	1804	1902	3715
119	11/19/08	Counter	BL	145081	43-37-1	957	1164	30	450
	11/18/08	Floor	CU	145081	43-37-1	873	981	-1967	-1611
	11/19/08	Sink	WL	148454	43-68	273	385	949	3211
135	11/14/08	Floor	CP	145081	43-37-1	1112	1203	779	1309
	11/19/08	Counter	BL	148454	43-68	342	454	2282	4544
Cargo	11/18/08	Floor	CP	145081	43-37-1	638	710	-785	-665
Hall 1-1	6/17/08	Floor	CP	145081	43-37-1	1166	1528	957	2610
Hall 1-2	11/18/08	Floor	CU	145081	43-37-1	1118	1279	-1158	-627
Hall1-3	11/18/08	Floor	TL	145081	43-37-1	1053	1214	317	848
209A	6/3/08	Counter	WL	145081	43-37-1	1025	3502	283	6710
	7/23/08	Floor	CP	128625	43-37	862	1070	-48	861
	6/3/08	Sink	WL	148454	43-68	252	289	518	1277
	11/18/08	Floor	CP	145081	43-37-1	867	1042	-30	665
217A	6/3/08	Counter	WL	145081	43-37-1	933	1141	-18	666
	6/3/08	Sink	WL	148454	43-68	310	375	1700	3000
	6/3/08	Counter	WL	145081	43-37-1	930	3609	-30	7064
	7/23/08	Counter	BL	128625	43-37	872	1016	-35	595
	7/22/08	Floor	CP	128625	43-37	842	1029	-136	682
	6/3/08	Sink	WL	148454	43-68	276	355	1011	2602
Hall 2-1	6/6/08	Floor	SL	145081	43-37-1	1222	1459	592	1374
301	6/4/08	Table	FT	145081	43-37-1	1164	1379	-180	529
	6/17/08	Floor	CF	145081	43-37-1	1084	1259	-696	-119
	6/17/08	Recesses	CF	128625	43-37	872	996	-36	508
304	7/24/08	Floor	CF	128625	43-37	790	888	-393	35
	7/31/08	Counter	BL	148454	43-68	268	343	788	2302
305	6/25/08	Recesses	SL	145081	43-37-1	914	1022	-425	-70
	7/24/08	Floor	TL	128625	43-37	799	953	-87	586
	7/31/08	Counter	BL	148454	43-68	227	307	-40	1575

Summary of Scan Measurements

Room/Area	Date	Item	Material	Probe Serial	Probe Model	Average (gcpm)	Maximum (gcpm)	Average (dpm/100cm^2)	Maximum (dpm/100cm^2)
307	6/18/08	Floor	TL	145081	43-37-1	1566	1773	2011	2693
	8/1/08	Counter	BL	148454	43-68	333	399	2100	3433
308	6/18/08	Floor	TL	145081	43-37-1	1404	1541	1476	1927
	8/1/08	Counter	BL	148454	43-68	331	442	2060	4301
	8/1/08	Hood	BL	148454	43-68	275	305	929	1535
	8/1/08	Sink	BL	148454	43-68	319	390	1818	3251
309	6/18/08	Floor	TL	145081	43-37-1	1103	1276	483	1054
	6/25/08	Floor	TL	145081	43-37-1	885	946	-239	-36
	6/4/08	Counter	WL	145081	43-37-1	1060	1284	401	1138
310	6/4/08	Counter	BL	145081	43-37-1	994	1116	91	355
	6/4/08	Table	FT	145081	43-37-1	1003	1224	-357	8
	6/18/08	Floor	CP	145081	43-37-1	1288	1432	1361	2225
	6/23/08	Counter	BL	148454	43-68	221	289	-169	1207
311	6/18/08	Floor	CP	145081	43-37-1	1257	1422	1259	2186
	6/4/08	Counter	WL	145081	43-37-1	1045	1299	349	1187
	6/20/08	Floor	CP	128625	43-37	906	1010	144	599
	6/23/08	Sink	BL	148454	43-68	237	284	171	1103
312	6/4/08	Table	FT	145081	43-37-1	1208	1480	-37	860
	6/18/08	Floor	CF	145081	43-37-1	1118	1241	-584	-180
	6/20/08	Floor	CF	128625	43-37	882	994	11	499
324	6/4/08	Counter	BL	145081	43-37-1	1043	1135	171	392
	6/18/08	Floor	CF	145081	43-37-1	1269	1481	-86	613
329	6/18/08	Floor	SL	145081	43-37-1	1095	1315	173	897
	6/25/08	Recesses	SL	145081	43-37-1	1037	1263	-21	727
	6/25/08	Counter	WL	145081	43-37-1	945	1199	20	857
	6/20/08	Sink	BL	148454	43-68	215	267	-283	771
330	6/4/08	Counter	WL	145081	43-37-1	974	1156	117	718
	8/3/08	Floor	CP	128625	43-37	839	1011	-149	603
	8/3/08	Sink	BL	148454	43-68	249	292	404	1272
331	6/4/08	Counter	WL	145081	43-37-1	988	1173	161	772
	8/3/08	Floor	CP	128625	43-37	901	1043	122	743
	8/3/08	Sink	BL	148454	43-68	254	299	505	1414
332	6/18/08	Floor	CP	145081	43-37-1	1191	1379	1038	2015
	6/20/08	Sink	SS	128625	43-37	775	926	-16	233
337	8/3/08	Floor	SL	128625	43-37	794	918	-393	149
	8/3/08	Hood	BL	148454	43-68	235	292	121	1272
	8/3/08	Sink	BL	148454	43-68	224	263	-101	687
	8/3/08	Counter	WL	148454	43-68	241	314	303	1777

Summary of Scan Measurements

Room/Area	Date	Item	Material	Probe Serial	Probe Model	Average (gcpm)	Maximum (gcpm)	Average (dpm/100cm^2)	Maximum (dpm/100cm^2)
339	6/4/08	Counter	WL	145081	43-37-1	1020	1178	268	787
	8/3/08	Floor	SL	128625	43-37	807	917	-337	144
	8/3/08	Sink	BL	148454	43-68	257	315	565	1737
340	6/4/08	Counter	WL	145081	43-37-1	1124	1313	612	1233
	8/3/08	Floor	SL	128625	43-37	818	933	-289	214
	8/3/08	Sink	BL	148454	43-68	251	305	444	1535
347	6/18/08	Floor	SL	145081	43-37-1	1171	1299	423	844
	6/4/08	Counter	WL	145081	43-37-1	1103	1317	542	1247
	8/3/08	Sink	WL	148454	43-68	251	289	505	1272
	8/3/08	Counter	WL	148454	43-68	261	277	707	1030
348	6/18/08	Floor	SL	145081	43-37-1	1185	1365	469	1064
	8/3/08	Sink	BL	148454	43-68	262	312	666	1676
349	6/25/08	Floor	SL	145081	43-37-1	1056	1211	43	555
	6/25/08	Floor	SL	145081	43-37-1	863	986	-593	-188
	6/18/08	Counter	WL	145081	43-37-1	1041	1264	336	1073
358	8/3/08	Floor	SL	128625	43-37	820	972	-280	385
	8/3/08	Hood	BL	148454	43-68	243	279	283	1010
	8/3/08	Sink	BL	148454	43-68	235	298	121	1393
	8/3/08	Counter	WL	148454	43-68	257	343	626	2363
359	11/18/08	Hood	BL	148454	43-68	248	319	384	1818
	11/14/08	Floor	TL	145081	43-37-1	944	1090	-43	439
	11/18/08	Table	FT	148454	43-68	269	364	-687	1232
361	6/18/08	Floor	TL	145081	43-37-1	1233	1448	910	1621
	6/25/08	Floor	TL	128625	43-37	891	994	315	766
	6/25/08	Counter	BL	148454	43-68	227	260	-46	634
	6/25/08	Counter	WL	148454	43-68	208	248	-2413	-2279
	6/4/08	Counter	WL	145081	43-37-1	1195	1619	845	2244
363	6/4/08	Counter	BL	145081	43-37-1	1178	1542	394	1208
	6/16/08	Floor	TL	145081	43-37-1	1296	1540	1120	1923
	6/17/08	Floor	TL	128625	43-37	958	1079	606	1138
368	6/18/08	Floor	SL	145081	43-37-1	1176	1363	440	1056
	6/25/08	Recesses	SL	145081	43-37-1	947	1034	-315	-31
	6/25/08	Hood	BL	148454	43-68	219	293	-201	1287
	6/4/08	Counter	WL	145081	43-37-1	1093	1241	507	997
372	6/6/08	Table	FT	145081	43-37-1	1014	1204	-678	-50
	6/17/08	Floor	CF	128625	43-37	1139	1268	1132	1696
	6/17/08	Recesses	CF	128625	43-37	850	998	-131	514

Summary of Scan Measurements

Room/Area	Date	Item	Material	Probe Serial	Probe Model	Average (gcpm)	Maximum (gcpm)	Average (dpm/100cm^2)	Maximum (dpm/100cm^2)
377	11/14/08	Floor	TL	145081	43-37-1	923	1024	-112	221
	11/18/08	Hood	BL	148454	43-68	263	297	687	1373
	11/18/08	Counter	WL	148454	43-68	245	338	384	2262
383	6/17/08	Floor	CF	145081	43-37-1	1210	1355	-280	197
	6/6/08	Table	FT	145081	43-37-1	1004	1193	-708	-86
	6/17/08	Recesses	CF	128625	43-37	938	1060	253	787
384	8/3/08	Floor	SL	128625	43-37	864	937	-87	232
	8/3/08	Table	FT	148454	43-68	236	271	-1353	-646
385	8/3/08	Floor	CU	128625	43-37	1132	1255	197	735
386	6/6/08	Counter	BL	145081	43-37-1	906	1080	-54	283
	6/6/08	Table	FT	145081	43-37-1	988	1230	-762	36
	6/25/08	Recesses	TL	145081	43-37-1	976	1082	63	411
	6/18/08	Floor	TL	145081	43-37-1	788	1296	-556	1120
387	6/6/08	Table	FT	145081	43-37-1	915	1080	-1004	-460
	6/17/08	Floor	CF	145081	43-37-1	1160	1405	-446	364
	6/17/08	Floor	CF	128625	43-37	864	1005	-71	549
Hall 3-1	7/23/08	Floor	CP	128625	43-37	1160	1437	1255	2466
Hall 3-2	7/23/08	Floor	CP	128625	43-37	1089	1267	944	1723
Hall 3-3	7/23/08	Floor	TL	128625	43-37	1043	1234	979	1814
Hall 3-4	7/23/08	Floor	TL	128625	43-37	1108	1298	1264	2094
Hall3-5	7/23/08	Floor	TL	128625	43-37	1218	1388	1744	2488
409	8/3/08	Floor	CP	128625	43-37	937	1053	280	787
	7/24/08	Floor	CP	128625	43-37	909	1047	157	761
	8/10/08	Counter	BL	148454	43-68	272	312	868	1676
	8/1/08	Floor	PC	148454	43-68	274	310	565	1292
	8/3/08	Dishwashe	SS	148454	43-68	236	294	-1212	-40
	8/1/08	Sink	BL	148454	43-68	227	257	-40	565
	8/3/08	Sump	SS	148454	43-68	239	254	-1151	-848
420A	11/18/08	Hood	BL	148454	43-68	250	290	424	1232
	11/14/08	Floor	SL	145081	43-37-1	888	1042	-512	-3
	11/18/08	Table	FT	148454	43-68	244	326	-1191	464
Hall 4-1	7/24/08	Floor	TL	128625	43-37	855	1014	157	853
Hall 4-2	7/24/08	Floor	TL	128625	43-37	803	963	-70	630
Hall 4-3	7/24/08	Floor	CU	128625	43-37	1150	1298	275	923

APPENDIX C

Results of Gross Smear Measurements

Summary of Smear Measurements

Survey Unit: 105 **Survey Date:** 6/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	67	9	6	70	90
2	59	1	6	10	80
3	45	-13	4	-90	60
4	56	-2	6	-10	80
5	61	3	6	20	90
6	46	-12	5	-90	70
7	70	12	7	90	100
8	60	2	6	10	80
9	55	-3	5	-20	80
10	60	2	6	10	80
11	61	3	6	20	90
12	46	-12	5	-90	70
13	64	6	6	40	90
14	58	0	6	0	80
15	62	4	6	30	90
16	67	9	6	70	90
17	61	3	6	20	90
18	51	-7	5	-50	70
19	40	-18	4	-130	50
20	50	-8	5	-60	70

Maximum:	90
Average:	-8
Std Dev:	60

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/7/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 111 **Survey Date:** 6/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	74	18	7	100	70
2	62	6	6	40	60
3	69	13	6	70	70
4	46	-10	4	-50	50
5	51	-5	5	-30	50
6	55	-1	5	0	60
7	64	8	6	50	70
8	63	7	6	40	60
9	50	-6	5	-30	50
10	52	-4	5	-20	50
11	61	5	6	30	60
12	53	-3	5	-10	50
13	70	14	6	80	70
14	62	6	6	40	60
15	58	2	5	10	60
16	43	-13	4	-70	40
17	48	-8	4	-40	50
18	65	9	6	50	70
19	70	14	6	80	70
20	63	7	6	40	60
21	63	7	6	40	60
			Maximum:	100	
			Average:	20	
			Std Dev:	47	

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/10/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 112 **Survey Date:** 6/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	55	-1	5	0	60
2	56	0	5	0	60
3	58	2	5	10	60
4	66	10	6	60	70
5	74	18	7	100	70
6	50	-6	5	-30	50
7	51	-5	5	-30	50
8	47	-9	4	-50	50
9	57	1	5	10	60
10	71	15	6	90	70
11	56	0	5	0	60
12	53	-3	5	-10	50
13	65	9	6	50	70
14	49	-7	4	-40	50
15	60	4	6	20	60
16	52	-4	5	-20	50
17	60	4	6	20	60
18	59	3	5	20	60
19	74	18	7	100	70
20	51	-5	5	-30	50

Maximum:	100
Average:	14
Std Dev:	45

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/7/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 112A **Survey Date:** 6/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	61	3	6	20	90
2	57	-1	6	-10	80
3	72	14	7	100	100
4	53	-5	5	-40	80
5	68	10	7	70	90
6	72	14	7	100	100
7	55	-3	5	-20	80
8	67	9	6	70	90
9	67	9	6	70	90
10	49	-9	5	-60	70
11	65	7	6	50	90
12	73	15	7	110	100
13	98	40	9	290	120
14	98	40	9	290	120
15	56	-2	6	-10	80
16	61	3	6	20	90
17	56	-2	6	-10	80
18	48	-10	5	-70	70

Maximum:	290
Average:	54
Std Dev:	102

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/7/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 119 **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	61	3	6	20	90
2	66	8	6	60	90
3	74	16	7	120	100
4	61	3	6	20	90
5	65	7	6	50	90
6	63	5	6	40	90
7	52	-6	5	-40	70
8	60	2	6	10	80
9	66	8	6	60	90
10	67	9	6	70	90
11	61	3	6	20	90
12	57	-1	6	-10	80
13	59	1	6	10	80
14	59	1	6	10	80
15	81	23	7	170	110

Maximum:	170
Average:	41
Std Dev:	52

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 11/25/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 135 **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	61	5	6	30	60
2	57	1	5	10	60
3	55	-1	5	0	60
4	51	-5	5	-30	50
5	59	3	5	20	60
6	58	2	5	10	60
7	70	14	6	80	70
8	56	0	5	0	60
9	55	-1	5	0	60
10	74	18	7	100	70
11	68	12	6	70	70
12	63	7	6	40	60
13	65	9	6	50	70
14	59	3	5	20	60
15	63	7	6	40	60

Maximum:	100
Average:	29
Std Dev:	35

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 11/25/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Cargo **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	58	2	5	10	60
2	73	17	7	100	70
3	64	8	6	50	70
4	57	1	5	10	60
5	50	-6	5	-30	50
6	76	20	7	110	80
7	56	0	5	0	60
8	50	-6	5	-30	50
9	59	3	5	20	60
10	54	-2	5	-10	60
11	69	13	6	70	70
12	71	15	6	90	70
13	72	16	7	90	70
14	65	9	6	50	70
15	57	1	5	10	60

Maximum:	110
Average:	36
Std Dev:	47

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 11/25/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 1-2 **Survey Date:** 6/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	59	3	5	20	60
2	55	-1	5	0	60
3	63	7	6	40	60
4	61	5	6	30	60
5	56	0	5	0	60
6	73	17	7	100	70
7	55	-1	5	0	60
8	56	0	5	0	60
9	72	16	7	90	70
10	60	4	6	20	60
11	71	15	6	90	70
12	66	10	6	60	70
13	64	8	6	50	70
14	64	8	6	50	70
15	66	10	6	60	70

Maximum:	100
Average:	41
Std Dev:	35

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/7/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 1-2 **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	62	4	6	30	90
2	67	9	6	70	90
3	60	2	6	10	80
4	62	4	6	30	90
5	52	-6	5	-40	70
6	80	22	7	160	110
7	57	-1	6	-10	80
8	64	6	6	40	90
9	60	2	6	10	80
10	59	1	6	10	80
11	62	4	6	30	90
12	68	10	7	70	90
13	59	1	6	10	80
14	63	5	6	40	90
15	58	0	6	0	80

Maximum:	160
Average:	31
Std Dev:	46

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 11/25/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 1-3 **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	57	-1	6	-10	80
2	54	-4	5	-30	80
3	66	8	6	60	90
4	68	10	7	70	90
5	60	2	6	10	80
6	58	0	6	0	80
7	59	1	6	10	80
8	67	9	6	70	90
9	73	15	7	110	100
10	62	4	6	30	90
11	78	20	7	150	100
12	61	3	6	20	90
13	65	7	6	50	90
14	59	1	6	10	80
15	53	-5	5	-40	80

Maximum:	150
Average:	34
Std Dev:	52

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 11/25/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 209A **Survey Date:** 7/28/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	72	16	7	90	70
2	69	13	6	70	70
3	64	8	6	50	70
4	66	10	6	60	70
5	67	11	6	60	70
6	58	2	5	10	60
7	57	1	5	10	60
8	61	5	6	30	60
9	63	7	6	40	60
10	47	-9	4	-50	50
11	50	-6	5	-30	50
12	52	-4	5	-20	50
13	69	13	6	70	70
14	69	13	6	70	70
15	55	-1	5	0	60
16	69	13	6	70	70
17	60	4	6	20	60

Maximum:	90
Average:	32
Std Dev:	41

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/7/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 217A **Survey Date:** 7/30/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (dpm/100 cm²) Activity	Uncertainty @ 95% CL
1	72	16	7	90	70
2	69	13	6	70	70
3	64	8	6	50	70
4	66	10	6	60	70
5	67	11	6	60	70
6	58	2	5	10	60
7	57	1	5	10	60
8	61	5	6	30	60
9	63	7	6	40	60
10	47	-9	4	-50	50
11	50	-6	5	-30	50
12	52	-4	5	-20	50
13	69	13	6	70	70
14	69	13	6	70	70
15	55	-1	5	0	60
16	69	13	6	70	70
17	60	4	6	20	60

Maximum:	90
Average:	32
Std Dev:	41

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/6/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 2-1 **Survey Date:** 7/30/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	61	5	6	30	60
2	56	0	5	0	60
3	70	14	6	80	70
4	57	1	5	10	60
5	53	-3	5	-10	50
6	60	4	6	20	60
7	57	1	5	10	60
8	54	-2	5	-10	60
9	46	-10	4	-50	50
10	60	4	6	20	60
11	50	-6	5	-30	50
12	64	8	6	50	70
13	57	1	5	10	60
14	71	15	6	90	70
15	75	19	7	110	80

Maximum:	110
Average:	22
Std Dev:	44

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607	Analysis Date:	8/6/2008
Detector	43-10-1	PR229364		

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 301 **Survey Date:** 6/23/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	56	0	5	0	60
2	51	-5	5	-30	50
3	71	15	6	90	70
4	49	-7	4	-40	50
5	54	-2	5	-10	60
6	69	13	6	70	70
7	52	-4	5	-20	50
8	52	-4	5	-20	50
9	57	1	5	10	60
10	51	-5	5	-30	50
11	63	7	6	40	60
12	67	11	6	60	70
13	55	-1	5	0	60
14	64	8	6	50	70
15	55	-1	5	0	60
16	61	5	6	30	60

Maximum:	90
Average:	13
Std Dev:	40

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/10/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 304 **Survey Date:** 7/31/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	52	-6	5	-40	70
2	64	6	6	40	90
3	47	-11	5	-80	70
4	51	-7	5	-50	70
5	61	3	6	20	90
6	51	-7	5	-50	70
7	77	19	7	140	100
8	67	9	6	70	90
9	57	-1	6	-10	80
10	46	-12	5	-90	70
11	51	-7	5	-50	70
12	56	-2	6	-10	80
13	60	2	6	10	80
14	53	-5	5	-40	80
15	61	3	6	20	90
16	54	-4	5	-30	80

Maximum:	140
Average:	-9
Std Dev:	59

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/6/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 305/306 **Survey Date:** 7/31/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	64	6	6	40	90
2	70	12	7	90	100
3	42	-16	4	-120	60
4	59	1	6	10	80
5	62	4	6	30	90
6	64	6	6	40	90
7	64	6	6	40	90
8	55	-3	5	-20	80
9	56	-2	6	-10	80
10	58	0	6	0	80
11	64	6	6	40	90
12	63	5	6	40	90
13	49	-9	5	-60	70
14	72	14	7	100	100
15	55	-3	5	-20	80
16	65	7	6	50	90
17	64	6	6	40	90

Maximum:	100
Average:	17
Std Dev:	53

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/6/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 307 **Survey Date:** 8/1/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	65	7	6	50	90
2	60	2	6	10	80
3	70	12	7	90	100
4	55	-3	5	-20	80
5	59	1	6	10	80
6	53	-5	5	-40	80
7	61	3	6	20	90
8	57	-1	6	-10	80
9	55	-3	5	-20	80
10	50	-8	5	-60	70
11	47	-11	5	-80	70
12	45	-13	4	-90	60
13	64	6	6	40	90
14	60	2	6	10	80
15	63	5	6	40	90
16	52	-6	5	-40	70

Maximum:	90
Average:	-6
Std Dev:	49

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/7/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 308 **Survey Date:** 8/1/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	68	10	7	70	90
2	58	0	6	0	80
3	68	10	7	70	90
4	57	-1	6	-10	80
5	62	4	6	30	90
6	57	-1	6	-10	80
7	53	-5	5	-40	80
8	61	3	6	20	90
9	56	-2	6	-10	80
10	66	8	6	60	90
11	65	7	6	50	90
12	63	5	6	40	90
13	55	-3	5	-20	80
14	60	2	6	10	80
15	56	-2	6	-10	80

Maximum:	70
Average:	17
Std Dev:	35

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/7/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 309 **Survey Date:** 6/20/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	73	17	7	100	70
2	59	3	5	20	60
3	63	7	6	40	60
4	57	1	5	10	60
5	74	18	7	100	70
6	63	7	6	40	60
7	60	4	6	20	60
8	59	3	5	20	60
9	57	1	5	10	60
10	68	12	6	70	70
11	60	4	6	20	60
12	59	3	5	20	60
13	61	5	6	30	60
14	56	0	5	0	60
15	60	4	6	20	60
16	69	13	6	70	70
17	62	6	6	40	60

Maximum:	100
Average:	37
Std Dev:	30

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/10/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 310 **Survey Date:** 6/23/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	69	11	7	80	100
2	74	16	7	120	100
3	67	9	6	70	90
4	56	-2	6	-10	80
5	70	12	7	90	100
6	67	9	6	70	90
7	61	3	6	20	90
8	57	-1	6	-10	80
9	60	2	6	10	80
10	53	-5	5	-40	80
11	63	5	6	40	90
12	66	8	6	60	90
13	62	4	6	30	90
14	67	9	6	70	90
15	66	8	6	60	90
16	70	12	7	90	100
17	67	9	6	70	90
18	66	8	6	60	90

Maximum:	120
Average:	49
Std Dev:	41

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/10/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 311 **Survey Date:** 6/23/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	54	-4	5	-30	80
2	66	8	6	60	90
3	71	13	7	90	100
4	53	-5	5	-40	80
5	52	-6	5	-40	70
6	64	6	6	40	90
7	60	2	6	10	80
8	47	-11	5	-80	70
9	67	9	6	70	90
10	58	0	6	0	80
11	64	6	6	40	90
12	62	4	6	30	90
13	58	0	6	0	80
14	55	-3	5	-20	80
15	53	-5	5	-40	80
16	54	-4	5	-30	80
17	53	-5	5	-40	80
18	51	-7	5	-50	70
19	58	0	6	0	80

Maximum:	90
Average:	-2
Std Dev:	46

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/10/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 312 **Survey Date:** 6/23/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	64	8	6	50	70
2	51	-5	5	-30	50
3	59	3	5	20	60
4	61	5	6	30	60
5	54	-2	5	-10	60
6	63	7	6	40	60
7	63	7	6	40	60
8	65	9	6	50	70
9	56	0	5	0	60
10	60	4	6	20	60
11	59	3	5	20	60
12	54	-2	5	-10	60
13	47	-9	4	-50	50
14	59	3	5	20	60
15	74	18	7	100	70

Maximum:	100
Average:	19
Std Dev:	37

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/10/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 324 **Survey Date:** 6/23/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	59	1	6	10	80
2	61	3	6	20	90
3	71	13	7	90	100
4	54	-4	5	-30	80
5	63	5	6	40	90
6	72	14	7	100	100
7	53	-5	5	-40	80
8	59	1	6	10	80
9	58	0	6	0	80
10	68	10	7	70	90
11	62	4	6	30	90
12	58	0	6	0	80
13	49	-9	5	-60	70
14	76	18	7	130	100
15	53	-5	5	-40	80

Maximum:	130
Average:	22
Std Dev:	56

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/10/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 328/329 **Survey Date:** 6/25/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	63	5	6	40	90
2	70	12	7	90	100
3	45	-13	4	-90	60
4	58	0	6	0	80
5	44	-14	4	-100	60
6	55	-3	5	-20	80
7	56	-2	6	-10	80
8	58	0	6	0	80
9	58	0	6	0	80
10	67	9	6	70	90
11	47	-11	5	-80	70
12	70	12	7	90	100
13	76	18	7	130	100
14	53	-5	5	-40	80
15	64	6	6	40	90
16	71	13	7	90	100
17	63	5	6	40	90
18	60	2	6	10	80
19	52	-6	5	-40	70

Maximum:	130
Average:	12
Std Dev:	65

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/10/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 330 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	50	-8	5	-60	70
2	47	-11	5	-80	70
3	66	8	6	60	90
4	64	6	6	40	90
5	59	1	6	10	80
6	70	12	7	90	100
7	61	3	6	20	90
8	71	13	7	90	100
9	66	8	6	60	90
10	57	-1	6	-10	80
11	50	-8	5	-60	70
12	52	-6	5	-40	70
13	63	5	6	40	90
14	81	23	7	170	110
15	59	1	6	10	80
16	53	-5	5	-40	80
17	60	2	6	10	80

Maximum:	170
Average:	18
Std Dev:	65

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/8/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 331 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	58	2	5	10	60
2	51	-5	5	-30	50
3	67	11	6	60	70
4	53	-3	5	-10	50
5	49	-7	4	-40	50
6	64	8	6	50	70
7	57	1	5	10	60
8	63	7	6	40	60
9	55	-1	5	0	60
10	55	-1	5	0	60
11	42	-14	4	-80	40
12	67	11	6	60	70
13	63	7	6	40	60
14	68	12	6	70	70
15	50	-6	5	-30	50
16	68	12	6	70	70
17	58	2	5	10	60

Maximum:	70
Average:	14
Std Dev:	43

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/8/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 332 **Survey Date:** 6/20/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	69	11	7	80	100
2	48	-10	5	-70	70
3	56	-2	6	-10	80
4	56	-2	6	-10	80
5	56	-2	6	-10	80
6	44	-14	4	-100	60
7	47	-11	5	-80	70
8	58	0	6	0	80
9	69	11	7	80	100
10	69	11	7	80	100
11	61	3	6	20	90
12	56	-2	6	-10	80
13	64	6	6	40	90
14	63	5	6	40	90
15	64	6	6	40	90
16	46	-12	5	-90	70
17	59	1	6	10	80
18	49	-9	5	-60	70

Maximum: 80
Average: -3
Std Dev: 58

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/8/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 337 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	55	-3	5	-20	80
2	68	10	7	70	90
3	68	10	7	70	90
4	56	-2	6	-10	80
5	43	-15	4	-110	60
6	58	0	6	0	80
7	64	6	6	40	90
8	69	11	7	80	100
9	66	8	6	60	90
10	80	22	7	160	110
11	64	6	6	40	90
12	62	4	6	30	90
13	51	-7	5	-50	70
14	65	7	6	50	90
15	59	1	6	10	80
16	61	3	6	20	90
17	48	-10	5	-70	70
18	55	-3	5	-20	80
19	57	-1	6	-10	80

Maximum:	160
Average:	18
Std Dev:	61

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/8/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 339 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	67	11	6	60	70
2	53	-3	5	-10	50
3	57	1	5	10	60
4	63	7	6	40	60
5	77	21	7	120	80
6	57	1	5	10	60
7	60	4	6	20	60
8	48	-8	4	-40	50
9	65	9	6	50	70
10	51	-5	5	-30	50
11	58	2	5	10	60
12	71	15	6	90	70
13	53	-3	5	-10	50
14	58	2	5	10	60
15	70	14	6	80	70
16	67	11	6	60	70
17	53	-3	5	-10	50

Maximum:	120
Average:	27
Std Dev:	44

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/8/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 340 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	56	-2	6	-10	80
2	55	-3	5	-20	80
3	54	-4	5	-30	80
4	66	8	6	60	90
5	49	-9	5	-60	70
6	65	7	6	50	90
7	57	-1	6	-10	80
8	56	-2	6	-10	80
9	63	5	6	40	90
10	52	-6	5	-40	70
11	53	-5	5	-40	80
12	63	5	6	40	90
13	67	9	6	70	90
14	58	0	6	0	80
15	66	8	6	60	90
16	62	4	6	30	90
17	57	-1	6	-10	80

Maximum:	70
Average:	7
Std Dev:	41

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/7/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 347 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	71	13	7	90	100
2	69	11	7	80	100
3	56	-2	6	-10	80
4	51	-7	5	-50	70
5	61	3	6	20	90
6	50	-8	5	-60	70
7	53	-5	5	-40	80
8	81	23	7	170	110
9	55	-3	5	-20	80
10	53	-5	5	-40	80
11	48	-10	5	-70	70
12	66	8	6	60	90
13	75	17	7	120	100
14	67	9	6	70	90
15	68	10	7	70	90
16	63	5	6	40	90
17	66	8	6	60	90

Maximum:	170
Average:	29
Std Dev:	70

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/7/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 347 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	47	-11	5	-80	70
2	57	-1	6	-10	80
3	67	9	6	70	90
4	62	4	6	30	90
5	53	-5	5	-40	80
6	54	-4	5	-30	80
7	67	9	6	70	90
8	60	2	6	10	80
9	40	-18	4	-130	50
10	49	-9	5	-60	70
11	47	-11	5	-80	70
12	58	0	6	0	80
13	50	-8	5	-60	70
14	47	-11	5	-80	70
15	52	-6	5	-40	70
16	54	-4	5	-30	80
17	58	0	6	0	80

Maximum:	70
Average:	-27
Std Dev:	54

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/8/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 349 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	49	-9	5	-60	70
2	71	13	7	90	100
3	64	6	6	40	90
4	43	-15	4	-110	60
5	46	-12	5	-90	70
6	48	-10	5	-70	70
7	54	-4	5	-30	80
8	52	-6	5	-40	70
9	65	7	6	50	90
10	76	18	7	130	100
11	60	2	6	10	80
12	64	6	6	40	90
13	56	-2	6	-10	80
14	52	-6	5	-40	70
15	69	11	7	80	100
16	58	0	6	0	80
17	55	-3	5	-20	80

Maximum:	130
Average:	-2
Std Dev:	66

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/8/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 357-358 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	46	-10	4	-50	50
2	74	18	7	100	70
3	67	11	6	60	70
4	67	11	6	60	70
5	55	-1	5	0	60
6	56	0	5	0	60
7	70	14	6	80	70
8	72	16	7	90	70
9	74	18	7	100	70
10	71	15	6	90	70
11	63	7	6	40	60
12	71	15	6	90	70
13	58	2	5	10	60
14	64	8	6	50	70
15	60	4	6	20	60
16	56	0	5	0	60
17	53	-3	5	-10	50

Maximum:	100
Average:	43
Std Dev:	46

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/7/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 359 **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	73	15	7	110	100
2	66	8	6	60	90
3	63	5	6	40	90
4	50	-8	5	-60	70
5	70	12	7	90	100
6	78	20	7	150	100
7	53	-5	5	-40	80
8	51	-7	5	-50	70
9	57	-1	6	-10	80
10	56	-2	6	-10	80
11	64	6	6	40	90
12	65	7	6	50	90
13	57	-1	6	-10	80
14	58	0	6	0	80
15	60	2	6	10	80

Maximum:	150
Average:	25
Std Dev:	60

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 11/25/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 361 **Survey Date:** 6/25/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	64	8	6	50	70
2	63	7	6	40	60
3	65	9	6	50	70
4	55	-1	5	0	60
5	70	14	6	80	70
6	69	13	6	70	70
7	56	0	5	0	60
8	85	29	7	160	80
9	67	11	6	60	70
10	54	-2	5	-10	60
11	58	2	5	10	60
12	58	2	5	10	60
13	57	1	5	10	60
14	70	14	6	80	70
15	48	-8	4	-40	50
16	48	-8	4	-40	50
17	66	10	6	60	70
18	56	0	5	0	60
19	64	8	6	50	70
20	58	2	5	10	60
21	56	0	5	0	60
22	50	-6	5	-30	50
			Maximum:	160	
			Average:	28	
			Std Dev:	47	

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/8/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 363 **Survey Date:** 6/30/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	60	4	6	20	60
2	63	7	6	40	60
3	62	6	6	40	60
4	59	3	5	20	60
5	54	-2	5	-10	60
6	66	10	6	60	70
7	65	9	6	50	70
8	68	12	6	70	70
9	68	12	6	70	70
10	55	-1	5	0	60
11	62	6	6	40	60
12	62	6	6	40	60
13	57	1	5	10	60
14	52	-4	5	-20	50
15	51	-5	5	-30	50
16	61	5	6	30	60
17	66	10	6	60	70
18	52	-4	5	-20	50
19	68	12	6	70	70
20	57	1	5	10	60
21	64	8	6	50	70
			Maximum:	70	
			Average:	29	
			Std Dev:	32	

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/8/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 368 **Survey Date:** 6/25/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	54	-4	5	-30	80
2	52	-6	5	-40	70
3	58	0	6	0	80
4	62	4	6	30	90
5	51	-7	5	-50	70
6	59	1	6	10	80
7	55	-3	5	-20	80
8	54	-4	5	-30	80
9	59	1	6	10	80
10	63	5	6	40	90
11	57	-1	6	-10	80
12	54	-4	5	-30	80
13	65	7	6	50	90
14	51	-7	5	-50	70
15	56	-2	6	-10	80
16	71	13	7	90	100
17	49	-9	5	-60	70
18	55	-3	5	-20	80
19	53	-5	5	-40	80
20	68	10	7	70	90
21	57	-1	6	-10	80
22	54	-4	5	-30	80
			Maximum:	90	
			Average:	-6	
			Std Dev:	40	

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/8/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 372 **Survey Date:** 6/24/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	61	5	6	30	60
2	50	-6	5	-30	50
3	51	-5	5	-30	50
4	61	5	6	30	60
5	57	1	5	10	60
6	78	22	7	130	80
7	56	0	5	0	60
8	68	12	6	70	70
9	69	13	6	70	70
10	58	2	5	10	60
11	69	13	6	70	70
12	51	-5	5	-30	50
13	65	9	6	50	70
14	49	-7	4	-40	50
15	66	10	6	60	70

Maximum:	130
Average:	27
Std Dev:	49

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/10/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 377 **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	67	11	6	60	70
2	51	-5	5	-30	50
3	62	6	6	40	60
4	67	11	6	60	70
5	56	0	5	0	60
6	63	7	6	40	60
7	56	0	5	0	60
8	71	15	6	90	70
9	69	13	6	70	70
10	53	-3	5	-10	50
11	62	6	6	40	60
12	76	20	7	110	80
13	79	23	7	130	80
14	72	16	7	90	70
15	85	29	7	160	80

Maximum:	160
Average:	57
Std Dev:	54

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 11/25/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 383 **Survey Date:** 6/24/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	45	-11	4	-60	40
2	52	-4	5	-20	50
3	64	8	6	50	70
4	54	-2	5	-10	60
5	61	5	6	30	60
6	68	12	6	70	70
7	59	3	5	20	60
8	57	1	5	10	60
9	77	21	7	120	80
10	61	5	6	30	60
11	62	6	6	40	60
12	59	3	5	20	60
13	55	-1	5	0	60
14	67	11	6	60	70
15	56	0	5	0	60

Maximum:	120
Average:	24
Std Dev:	42

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 7/10/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 384 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	64	8	6	50	70
2	59	3	5	20	60
3	60	4	6	20	60
4	45	-11	4	-60	40
5	58	2	5	10	60
6	50	-6	5	-30	50
7	71	15	6	90	70
8	59	3	5	20	60
9	47	-9	4	-50	50
10	57	1	5	10	60
11	63	7	6	40	60
12	56	0	5	0	60
13	53	-3	5	-10	50
14	52	-4	5	-20	50
15	59	3	5	20	60
16	56	0	5	0	60

Maximum:	90
Average:	7
Std Dev:	37

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/7/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 385 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	50	-6	5	-30	50
2	57	1	5	10	60
3	86	30	8	170	80
4	58	2	5	10	60
5	61	5	6	30	60
6	64	8	6	50	70
7	46	-10	4	-50	50
8	49	-7	4	-40	50
9	54	-2	5	-10	60
10	58	2	5	10	60
11	56	0	5	0	60
12	53	-3	5	-10	50
13	59	3	5	20	60
14	58	2	5	10	60
15	60	4	6	20	60
16	63	7	6	40	60

Maximum:	170
Average:	14
Std Dev:	50

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/8/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 386 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	54	-4	5	-30	80
2	62	4	6	30	90
3	54	-4	5	-30	80
4	48	-10	5	-70	70
5	55	-3	5	-20	80
6	55	-3	5	-20	80
7	62	4	6	30	90
8	69	11	7	80	100
9	54	-4	5	-30	80
10	73	15	7	110	100
11	51	-7	5	-50	70
12	60	2	6	10	80
13	62	4	6	30	90
14	64	6	6	40	90
15	78	20	7	150	100
16	69	11	7	80	100
17	66	8	6	60	90

Maximum:	150
Average:	22
Std Dev:	60

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/8/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 387 **Survey Date:** 6/23/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	55	-3	5	-20	80
2	70	12	7	90	100
3	54	-4	5	-30	80
4	61	3	6	20	90
5	69	11	7	80	100
6	59	1	6	10	80
7	46	-12	5	-90	70
8	60	2	6	10	80
9	62	4	6	30	90
10	49	-9	5	-60	70
11	69	11	7	80	100
12	73	15	7	110	100
13	69	11	7	80	100
14	51	-7	5	-50	70
15	68	10	7	70	90

Maximum:	110
Average:	22
Std Dev:	62

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 7/10/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 3-1 **Survey Date:** 7/31/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	55	-1	5	0	60
2	52	-4	5	-20	50
3	53	-3	5	-10	50
4	56	0	5	0	60
5	61	5	6	30	60
6	52	-4	5	-20	50
7	67	11	6	60	70
8	74	18	7	100	70
9	55	-1	5	0	60
10	51	-5	5	-30	50
11	70	14	6	80	70
12	58	2	5	10	60
13	49	-7	4	-40	50
14	63	7	6	40	60
15	66	10	6	60	70

Maximum:	100
Average:	17
Std Dev:	42

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: *8/6/2008*
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 3-2 **Survey Date:** 7/31/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	55	-1	5	0	60
2	53	-3	5	-10	50
3	44	-12	4	-60	40
4	53	-3	5	-10	50
5	51	-5	5	-30	50
6	58	2	5	10	60
7	65	9	6	50	70
8	59	3	5	20	60
9	51	-5	5	-30	50
10	55	-1	5	0	60
11	59	3	5	20	60
12	62	6	6	40	60
13	74	18	7	100	70
14	61	5	6	30	60
15	50	-6	5	-30	50

Maximum:	100
Average:	7
Std Dev:	39

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/6/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 3-3 **Survey Date:** 7/31/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	46	-12	5	-90	70
2	54	-4	5	-30	80
3	63	5	6	40	90
4	69	11	7	80	100
5	57	-1	6	-10	80
6	61	3	6	20	90
7	63	5	6	40	90
8	56	-2	6	-10	80
9	59	1	6	10	80
10	61	3	6	20	90
11	57	-1	6	-10	80
12	77	19	7	140	100
13	49	-9	5	-60	70
14	51	-7	5	-50	70
15	55	-3	5	-20	80

Maximum:	140
Average:	5
Std Dev:	57

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/6/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 3-4 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	76	20	7	110	80
2	63	7	6	40	60
3	72	16	7	90	70
4	66	10	6	60	70
5	55	-1	5	0	60
6	60	4	6	20	60
7	69	13	6	70	70
8	60	4	6	20	60
9	60	4	6	20	60
10	68	12	6	70	70
11	70	14	6	80	70
12	58	2	5	10	60
13	59	3	5	20	60
14	65	9	6	50	70
15	57	1	5	10	60

Maximum:	110
Average:	45
Std Dev:	34

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/6/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 3-5 **Survey Date:** 7/31/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	60	2	6	10	80
2	59	1	6	10	80
3	52	-6	5	-40	70
4	62	4	6	30	90
5	55	-3	5	-20	80
6	43	-15	4	-110	60
7	71	13	7	90	100
8	66	8	6	60	90
9	56	-2	6	-10	80
10	59	1	6	10	80
11	57	-1	6	-10	80
12	53	-5	5	-40	80
13	52	-6	5	-40	70
14	49	-9	5	-60	70
15	51	-7	5	-50	70

Maximum:	90
Average:	-11
Std Dev:	50

Instrument Data and Analysis Parameters

Analysis Unit 2929 SN176108 Analysis Date: 8/6/2008
Detector 44-10-1 PR181905

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 409 **Survey Date:** 8/1/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	57	1	5	10	60
2	59	3	5	20	60
3	56	0	5	0	60
4	48	-8	4	-40	50
5	62	6	6	40	60
6	54	-2	5	-10	60
7	50	-6	5	-30	50
8	61	5	6	30	60
9	48	-8	4	-40	50
10	49	-7	4	-40	50
11	71	15	6	90	70
12	56	0	5	0	60
13	53	-3	5	-10	50
14	57	1	5	10	60
15	59	3	5	20	60
16	56	0	5	0	60
17	72	16	7	90	70
18	57	1	5	10	60

Maximum:	90
Average:	8
Std Dev:	38

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/6/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: 420A **Survey Date:** 11/19/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	64	8	6	50	70
2	70	14	6	80	70
3	56	0	5	0	60
4	51	-5	5	-30	50
5	73	17	7	100	70
6	51	-5	5	-30	50
7	66	10	6	60	70
8	71	15	6	90	70
9	54	-2	5	-10	60
10	63	7	6	40	60
11	71	15	6	90	70
12	51	-5	5	-30	50
13	61	5	6	30	60
14	64	8	6	50	70
15	73	17	7	100	70

Maximum:	100
Average:	39
Std Dev:	49

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 11/25/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 4-1 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	73	17	7	100	70
2	70	14	6	80	70
3	63	7	6	40	60
4	55	-1	5	0	60
5	67	11	6	60	70
6	69	13	6	70	70
7	54	-2	5	-10	60
8	61	5	6	30	60
9	50	-6	5	-30	50
10	56	0	5	0	60
11	54	-2	5	-10	60
12	56	0	5	0	60
13	54	-2	5	-10	60
14	66	10	6	60	70
15	47	-9	4	-50	50

Maximum:	100
Average:	22
Std Dev:	44

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/7/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 4-2 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	64	6	6	40	90
2	78	20	7	150	100
3	65	7	6	50	90
4	43	-15	4	-110	60
5	69	11	7	80	100
6	67	9	6	70	90
7	50	-8	5	-60	70
8	66	8	6	60	90
9	60	2	6	10	80
10	61	3	6	20	90
11	53	-5	5	-40	80
12	57	-1	6	-10	80
13	42	-16	4	-120	60
14	55	-3	5	-20	80
15	62	4	6	30	90

Maximum:	150
Average:	10
Std Dev:	73

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108	Analysis Date:	8/7/2008
Detector	44-10-1	PR181905		

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: Hall 4-3 **Survey Date:** 8/3/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	60	4	6	20	60
2	46	-10	4	-50	50
3	48	-8	4	-40	50
4	70	14	6	80	70
5	54	-2	5	-10	60
6	56	0	5	0	60
7	61	5	6	30	60
8	55	-1	5	0	60
9	63	7	6	40	60
10	59	3	5	20	60
11	66	10	6	60	70
12	48	-8	4	-40	50
13	69	13	6	70	70
14	57	1	5	10	60
15	54	-2	5	-10	60

Maximum:	80
Average:	12
Std Dev:	40

Instrument Data and Analysis Parameters

Analysis Unit 3030 SN217607 Analysis Date: 8/7/2008
Detector 43-10-1 PR229364

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

APPENDIX D

Results of Vendor LSC and Gamma Measurements

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 105**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	8	-2	-1
2	1	2	-2
3	1	2	-3
4	8	1	3
5	1	-2	3
6	-2	-4	2
7	6	5	-3
8	1	-1	-3
9	2	-3	0
10	3	-5	0
11	1	-3	2
12	1	-1	-4
13	4	-3	-1
14	-5	1	0
15	2	0	-3
16	-1	0	0
17	-5	5	-4
18	-3	2	-1
19	1	0	3
Minimum:	-5	-5	-4
Maximum:	8	5	3
Average:	1	0	-1
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 111**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	3	0	0
2	0	-1	-4
3	5	-1	2
4	2	3	2
5	7	1	0
6	5	0	-1
7	-4	4	-2
8	1	3	0
9	3	2	-1
10	-1	-1	-4
11	-2	1	1
12	-3	-5	3
13	3	5	-1
14	-5	0	-1
15	4	-1	-3
16	-5	-3	0
17	1	-4	-1
18	7	-2	6
19	-1	3	-4
20	-6	0	0
Minimum:	-5	-5	-4
Maximum:	7	5	6
Average:	1	0	0
Std Dev:	4	3	3

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 112**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	9	-1	-3
2	0	4	-3
3	-3	-1	-3
4	-1	0	-1
5	9	1	2
6	5	-4	1
7	4	-4	1
8	-1	2	-1
9	-6	1	2
10	1	0	2
11	5	0	0
12	1	-1	0
13	0	-1	-3
14	0	3	1
15	-1	-2	3
16	3	1	3
17	-4	3	-3
18	7	-1	1
19	1	-2	-1
20	6	-1	-2
Minimum:	-6	-4	-3
Maximum:	9	4	3
Average:	2	0	0
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 112A**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-6	3	0
2	-3	-4	-1
3	-2	-2	-2
4	-2	-4	3
5	-1	-2	-1
6	-5	4	-1
7	-5	0	-4
8	-8	4	3
9	0	-2	-1
10	-2	-1	-1
11	3	0	-1
12	3	-1	0
13	-5	0	-3
14	4	7	0
15	7	-1	-3
16	1	0	2
17	-5	0	-2
18	0	1	0
Minimum:	-8	-4	-4
Maximum:	7	7	3
Average:	-1	0	-1
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 119**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-3	-2	0
2	8	-3	1
3	4	-3	-1
4	3	-2	3
5	15	0	0
6	35	2	3
7	-2	-2	0
8	1	-1	1
9	5	-2	-1
10	0	2	3
11	-1	0	3
12	-5	6	1
13	-4	0	0
14	1	-1	1
15	1	7	-2
Minimum:	-5	-3	-2
Maximum:	35	7	3
Average:	4	0	1
Std Dev:	10	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 135**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	0	0
2	2	-2	-2
3	1	-3	0
4	-4	-1	-1
5	3	-1	-3
6	3	0	1
7	-1	-2	0
8	3	2	1
9	-7	-1	0
10	-2	2	1
11	2	-1	1
12	2	4	-1
13	11	-3	3
14	5	1	2
15	0	-1	-1
Minimum:	-7	-3	-3
Maximum:	11	4	3
Average:	1	0	0
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Cargo**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	0	-2
2	4	3	2
3	-10	0	1
4	-2	1	-2
5	0	-3	-2
6	0	-1	1
7	-1	1	1
8	3	-1	0
9	3	-2	0
10	3	0	1
11	-1	0	-2
12	4	-2	-2
13	4	-2	0
14	1	1	-4
15	4	-1	1
Minimum:	-10	-3	-4
Maximum:	4	3	2
Average:	1	0	0
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 1-1**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-5	0	-2
2	1	-2	1
3	7	6	-4
4	-4	-2	3
5	7	1	-1
6	-5	-3	-1
7	1	2	-3
8	1	-3	-2
9	1	2	-1
10	7	1	-4
11	-6	0	-1
12	6	-3	2
13	-2	1	2
14	0	0	-1
15	1	-4	-1
Minimum:	-6	-4	-4
Maximum:	7	6	3
Average:	1	0	-1
Std Dev:	5	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 1-2**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	5	-2	1
2	5	-1	2
3	-4	2	4
4	2	-4	0
5	-1	3	-1
6	-3	3	2
7	-5	0	1
8	6	0	0
9	0	-1	-1
10	-3	1	4
11	2	-1	2
12	3	0	0
13	-1	3	-1
14	2	0	0
15	2	0	0
Minimum:	-5	-4	-1
Maximum:	6	3	4
Average:	1	0	1
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 1-3**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	-2	1
2	-1	1	1
3	-5	-3	0
4	1	0	0
5	0	-4	3
6	4	-2	2
7	2	-1	2
8	7	-3	1
9	0	-1	-2
10	-2	-1	2
11	-3	1	1
12	0	-3	1
13	4	-5	3
14	-1	1	-2
15	-2	3	0
Minimum:	-5	-5	-2
Maximum:	7	3	3
Average:	0	-1	1
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 209A**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	1	4	3
2	5	3	0
3	6	-1	2
4	2	3	-1
5	0	3	3
6	-6	5	0
7	1	1	2
8	3	0	0
9	-3	4	-1
10	4	2	-3
11	0	3	0
12	3	4	2
13	6	6	-1
14	3	-2	2
15	1	-2	1
16	1	0	4
17	7	3	-1
Minimum:	-6	-2	-3
Maximum:	7	6	4
Average:	2	2	1
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 217A**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	9	-3	-1
2	3	-1	3
3	5	-2	2
4	-5	3	4
5	5	2	2
6	-1	3	0
7	3	3	0
8	3	-1	0
9	-1	3	-1
10	3	2	3
11	7	1	1
12	3	1	-3
13	5	-1	2
14	7	-2	2
15	7	0	-2
16	6	-1	-2
Minimum:	-5	-3	-3
Maximum:	9	3	4
Average:	4	0	1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 2-1**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	1	4	0
2	-3	3	4
3	0	-2	0
4	5	3	1
5	9	-2	2
6	8	1	-3
7	6	1	1
8	3	1	1
9	6	1	2
10	1	1	-2
11	-1	1	-2
12	-4	0	3
13	5	1	2
14	2	2	2
15	3	3	2
Minimum:	-4	-2	-3
Maximum:	9	4	4
Average:	3	1	1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 301**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-7	-1	3
2	1	5	-1
3	0	-1	-1
4	-1	-3	2
5	4	-4	2
6	1	4	-1
7	-1	2	0
8	6	0	-1
9	-3	1	-4
10	0	-2	3
11	-4	-2	0
12	9	1	-2
13	-2	2	1
14	-3	4	2
15	3	1	-3
16	0	0	2
Minimum:	-7	-4	-4
Maximum:	9	5	3
Average:	0	0	0
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 304**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	2	-1
2	1	1	-3
3	1	1	2
4	2	-2	0
5	6	1	0
6	1	3	-1
7	-2	1	1
8	-2	2	-1
9	3	-2	0
10	1	0	-2
11	6	1	0
12	3	1	-1
13	-3	3	4
14	3	-2	1
15	-3	0	2
16	6	3	-3
Minimum:	-3	-2	-3
Maximum:	6	3	4
Average:	1	1	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 305**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	1	1	-1
2	2	3	4
3	-1	5	-2
4	1	1	2
5	3	-3	1
6	-2	1	2
7	4	0	3
8	7	1	-1
9	-1	1	2
10	0	3	1
11	4	1	3
12	-3	4	1
13	4	-1	-1
14	5	-1	-1
15	2	1	-3
16	3	1	0
17	3	-1	0
Minimum:	-3	-3	-3
Maximum:	7	5	4
Average:	2	1	1
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 307**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	6	-3	-1
2	3	1	6
3	3	-5	0
4	0	6	-1
5	-2	-4	2
6	1	4	3
7	6	-6	3
8	7	2	3
9	6	0	-1
10	4	1	0
11	5	0	0
12	4	3	-3
13	3	-2	0
14	3	1	-1
15	1	6	0
16	-1	0	1
Minimum:	-2	-6	-3
Maximum:	7	6	6
Average:	3	0	1
Std Dev:	3	4	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 308**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	4	-1	2
2	3	0	-1
3	1	-3	2
4	1	2	0
5	6	-4	-1
6	1	2	0
7	4	0	2
8	6	-1	-3
9	4	1	3
10	7	0	-4
11	-2	3	-2
12	4	-2	-2
13	6	2	3
14	2	1	0
15	5	1	3
Minimum:	-2	-4	-4
Maximum:	7	3	3
Average:	3	0	0
Std Dev:	2	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 309**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-6	8	0
2	-2	-2	-1
3	5	-1	0
4	-1	-3	6
5	6	-4	0
6	-2	-4	-2
7	-2	-2	3
8	0	4	0
9	3	1	-1
10	-6	2	0
11	3	-2	2
12	-2	1	-1
13	-3	-1	-1
14	1	2	-3
15	-4	2	0
16	0	-2	-1
17	2	1	-4
Minimum:	-6	-4	-4
Maximum:	6	8	6
Average:	0	0	0
Std Dev:	3	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 310**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	15	-2	2
2	4	3	0
3	-3	-5	-2
4	8	2	-1
5	0	5	-1
6	-1	-1	-1
7	0	2	-4
8	0	6	0
9	2	-2	2
10	2	5	0
11	-7	3	-3
12	0	0	3
13	0	4	0
14	3	-4	0
15	1	2	-2
16	0	-2	2
17	2	1	-2
18	2	1	1
Minimum:	-7	-5	-4
Maximum:	15	5	3
Average:	2	1	0
Std Dev:	5	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 311**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	4	1	-1
2	-4	-1	0
3	-3	1	-2
4	-6	4	-3
5	3	0	4
6	0	3	-1
7	8	-2	-1
8	2	4	2
9	4	-2	-2
10	-2	0	-4
11	-1	2	-1
12	-4	4	-2
13	2	0	-4
14	2	1	0
15	0	-3	2
16	-5	3	0
17	6	-1	0
18	2	-1	-1
19	-7	2	-1
Minimum:	-7	-3	-4
Maximum:	8	4	4
Average:	0	1	-1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 312**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	6	-2	0
2	1	-1	-3
3	4	-1	-1
4	-2	-1	0
5	2	0	0
6	-3	3	0
7	1	-4	1
8	4	-2	-4
9	3	-1	-1
10	-1	-6	5
11	2	-2	-2
12	1	-3	-4
13	3	-1	0
14	-4	-5	1
15	5	0	2
Minimum:	-4	-6	-4
Maximum:	6	3	5
Average:	1	-2	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 324**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	6	-4	-1
2	-1	-3	2
3	8	-3	1
4	-3	7	0
5	0	0	-3
6	3	-1	-1
7	-1	2	-2
8	2	1	-3
9	5	-5	-2
10	3	-4	0
11	5	-5	0
12	-1	1	-3
13	-3	0	2
14	3	-5	-1
15	14	3	0
Minimum:	-3	-5	-3
Maximum:	14	7	2
Average:	3	-1	-1
Std Dev:	5	4	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 329**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	0	0
2	2	-3	-1
3	1	-1	1
4	3	-2	0
5	1	2	2
6	-4	-1	2
7	-1	3	-2
8	4	-2	0
9	-5	5	1
10	1	3	-3
11	-6	0	-3
12	-5	2	-3
13	-5	3	1
14	3	1	-3
15	7	0	0
16	4	-5	-1
17	-2	-3	-1
18	-7	0	-1
19	3	-1	-1
Minimum:	-7	-5	-3
Maximum:	7	5	2
Average:	0	0	-1
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 330**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	10	2	-1
2	6	1	2
3	4	-3	6
4	9	-4	-2
5	4	0	3
6	14	3	3
7	9	-1	-3
8	1	-3	2
9	7	2	2
10	1	0	0
11	5	1	1
12	-1	5	3
13	5	-3	-3
14	6	1	0
15	1	2	-1
16	1	1	0
17	6	3	0
Minimum:	-1	-4	-3
Maximum:	14	5	6
Average:	5	0	1
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 331**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	-1	2
2	4	1	-1
3	6	3	1
4	1	-1	1
5	4	1	2
6	3	-4	-1
7	4	2	-1
8	10	1	6
9	0	-1	1
10	3	0	3
11	3	4	-1
12	12	1	2
13	1	1	-2
14	0	-2	3
15	6	-1	4
16	-1	0	-1
17	0	5	2
Minimum:	-1	-4	-2
Maximum:	12	5	6
Average:	3	1	1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 332**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	4	-2	-1
2	3	-2	-1
3	0	0	-4
4	7	-5	-2
5	0	1	-1
6	1	2	-3
7	3	1	0
8	1	0	-1
9	-1	0	-1
10	2	2	1
11	8	-2	0
12	6	-5	3
13	-3	0	-1
14	3	1	-2
15	-8	1	0
16	2	2	0
17	-4	0	-2
18	1	1	-3
Minimum:	-8	-5	-4
Maximum:	8	2	3
Average:	1	0	-1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 337**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	3	2	0
2	1	3	-1
3	3	-2	1
4	-2	0	1
5	1	3	-2
6	1	-1	-1
7	8	-3	-3
8	4	0	2
9	9	-1	0
10	-1	4	1
11	1	-1	2
12	0	2	-3
13	5	-2	-1
14	6	-2	3
15	4	-5	0
16	10	1	-2
17	4	-5	3
18	3	1	1
19	5	-1	3
Minimum:	-2	-5	-3
Maximum:	10	4	3
Average:	3	0	0
Std Dev:	3	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 339**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	2	-1
2	6	-1	-1
3	3	0	5
4	4	-3	-1
5	7	-2	-1
6	2	-2	-1
7	-4	0	4
8	-1	-2	2
9	3	-4	-1
10	7	2	1
11	3	3	-1
12	7	1	2
13	2	2	4
14	1	3	1
15	5	0	2
16	6	4	-1
17	1	0	-1
Minimum:	-4	-4	-1
Maximum:	7	4	5
Average:	3	0	1
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 340**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	7	0	0
2	10	-1	2
3	2	-1	-3
4	1	1	2
5	6	-1	-2
6	2	1	3
7	4	2	-1
8	0	-2	4
9	5	-2	2
10	4	1	0
11	10	1	-1
12	4	0	-3
13	6	1	-1
14	5	-1	2
15	3	-3	-1
16	10	-2	0
17	8	0	3
Minimum:	0	-3	-3
Maximum:	10	2	4
Average:	5	0	0
Std Dev:	3	1	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 347**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	3	-1
2	0	5	-1
3	5	3	1
4	-1	3	1
5	2	-1	2
6	3	1	-1
7	0	-3	-4
8	7	-1	3
9	8	1	0
10	1	-1	-1
11	-2	-1	-1
12	4	1	-1
13	0	-2	3
14	1	-1	6
15	1	2	0
16	1	2	-2
17	1	1	0
Minimum:	-2	-3	-4
Maximum:	8	5	6
Average:	2	1	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 348**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-5	6	1
2	3	1	1
3	0	3	-1
4	15	1	2
5	3	2	0
6	8	-2	0
7	2	1	-1
8	7	4	-1
9	-1	0	-3
10	10	-2	3
11	0	3	-1
12	0	3	1
13	8	-4	2
14	2	3	4
15	3	-2	-3
16	6	0	0
17	12	0	0
Minimum:	-5	-4	-3
Maximum:	15	6	4
Average:	4	1	0
Std Dev:	5	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 349**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	6	-1	1
2	2	1	3
3	6	1	-1
4	7	1	-1
5	0	3	-1
6	4	1	-1
7	-2	0	0
8	0	2	2
9	0	-1	0
10	11	-5	3
11	5	-1	-4
12	2	4	1
13	5	-4	3
14	5	0	1
15	-2	0	3
16	4	0	3
17	-1	-2	-1
Minimum:	-2	-5	-4
Maximum:	11	4	3
Average:	3	0	1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 357/358**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	0	3
2	1	2	2
3	7	4	-3
4	4	0	4
5	-3	3	1
6	2	1	3
7	6	0	2
8	3	0	2
9	8	-1	3
10	7	-3	4
11	3	4	-1
12	0	-1	2
13	1	-2	3
14	1	-5	0
15	-1	1	-1
16	4	3	3
17	4	0	-2
Minimum:	-3	-5	-3
Maximum:	8	4	4
Average:	3	0	1
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 359**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-2	3	-2
2	-5	1	0
3	1	-3	2
4	1	0	0
5	1	-1	-1
6	1	2	-2
7	2	-3	1
8	2	0	0
9	-3	3	1
10	-3	2	1
11	0	1	0
12	3	-3	0
13	7	-3	0
14	-5	0	-1
15	1	2	3
Minimum:	-5	-3	-2
Maximum:	7	3	3
Average:	0	0	0
Std Dev:	3	2	1

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 361**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-5	3	1
2	8	2	1
3	-7	1	-1
4	-3	3	-3
5	3	-5	-1
6	-2	3	1
7	9	-3	-1
8	2	0	-3
9	0	-2	-1
10	-6	3	1
11	-3	1	-2
12	-5	3	0
13	1	0	-2
14	0	1	-1
15	-2	1	1
16	1	-3	-5
17	-6	-1	-1
18	1	-3	4
19	-4	3	1
20	2	-2	0
21	-7	0	-2
22	5	0	0
Minimum:	-7	-5	-5
Maximum:	9	3	4
Average:	-1	0	-1
Std Dev:	5	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 363**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	-2	2
2	0	0	-3
3	1	6	-2
4	-5	2	-1
5	6	-4	-1
6	-2	3	-3
7	0	3	2
8	1	2	-3
9	4	1	0
10	-2	1	-3
11	8	0	2
12	-6	3	0
13	7	0	-3
14	-5	1	1
15	0	1	-3
16	2	-6	-2
17	-3	2	-1
18	-4	2	1
19	-5	0	-3
Minimum:	-6	-6	-3
Maximum:	8	6	2
Average:	0	1	-1
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 368**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	8	-2	0
2	-1	0	-1
3	-3	-3	-1
4	1	3	-4
5	-2	-1	1
6	-2	1	0
7	-5	-1	0
8	2	3	1
9	7	-1	-2
10	7	5	0
11	-2	-2	2
12	9	3	-3
13	0	-2	2
14	-1	-2	0
15	-1	1	0
16	0	0	1
17	-5	-1	0
18	3	0	-4
19	7	1	-4
20	-1	-2	-1
Minimum:	-5	-3	-4
Maximum:	9	5	2
Average:	1	0	-1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 372**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	1	-1	-5
2	5	-4	3
3	0	5	2
4	3	-3	-2
5	-1	1	-3
6	4	4	-3
7	4	1	-5
8	5	2	-1
9	-4	1	-3
10	1	4	0
11	1	3	-3
12	-3	2	-5
13	2	-1	-1
14	-2	-2	2
15	3	4	0
Minimum:	-4	-4	-5
Maximum:	5	5	3
Average:	1	1	-2
Std Dev:	3	3	3

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 377**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	1	1
2	-2	1	0
3	6	-3	2
4	-1	1	0
5	2	-2	0
6	4	0	0
7	2	0	2
8	-3	-4	-1
9	1	1	2
10	1	-1	1
11	0	1	-2
12	4	1	2
13	0	-1	0
14	5	-6	4
15	-4	3	0
Minimum:	-4	-6	-2
Maximum:	6	3	4
Average:	1	-1	1
Std Dev:	3	2	1

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 383**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-4	2	-1
2	-3	2	2
3	-5	0	-1
4	1	0	-1
5	-1	0	-3
6	-4	-2	0
7	4	-4	1
8	-5	1	-3
9	0	-2	0
10	-5	4	1
11	2	0	0
12	-3	1	0
13	1	-3	-1
14	0	2	-1
15	1	-4	1
Minimum:	-5	-4	-3
Maximum:	4	4	2
Average:	-2	0	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 384**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	1	-1	3
2	3	0	1
3	-4	4	-1
4	4	3	2
5	-2	3	-4
6	4	1	3
7	2	-3	-3
8	1	1	-2
9	1	2	3
10	9	-1	-1
11	1	-3	2
12	1	-1	-1
13	4	3	-2
14	3	-3	-1
15	2	0	1
16	8	-2	3
Minimum:	-4	-3	-4
Maximum:	9	4	3
Average:	2	0	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 385**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-1	4	1
2	-5	3	1
3	2	2	-4
4	-4	1	0
5	-1	3	2
6	0	-1	2
7	-2	2	3
8	2	-2	0
9	5	-2	2
10	-6	1	0
11	2	-2	1
12	1	6	1
13	4	2	-3
14	5	3	-1
15	-2	1	-1
16	-6	3	-2
Minimum:	-6	-2	-4
Maximum:	5	6	3
Average:	0	2	0
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 386**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	-2	5
2	8	-1	2
3	8	-2	2
4	1	-2	3
5	14	-6	2
6	-5	0	0
7	4	0	0
8	4	2	-1
9	4	-5	0
10	7	0	3
11	8	0	-4
12	3	2	-2
13	1	-1	2
14	1	-2	1
15	5	0	1
16	7	0	1
17	8	0	-1
Minimum:	-5	-6	-4
Maximum:	14	2	5
Average:	5	-1	1
Std Dev:	4	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 387**
RSO Report Date: 8/5/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	1	2
2	5	6	-3
3	2	-3	0
4	-4	0	-4
5	1	0	-2
6	1	1	-3
7	-4	4	-1
8	-1	1	-1
9	2	-1	-2
10	-4	0	-3
11	4	0	3
12	-5	1	0
13	4	-1	-1
14	-1	1	1
15	-3	0	0
Minimum:	-5	-3	-4
Maximum:	5	6	3
Average:	0	1	-1
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 3-1**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	5	0	0
2	5	-4	4
3	4	-3	1
4	3	2	2
5	13	-3	-2
6	6	0	-1
7	5	1	0
8	6	-5	-1
9	2	1	-4
10	11	1	2
11	8	-2	-1
12	3	1	1
13	1	-2	3
14	1	0	-1
15	3	-1	-1
Minimum:	1	-5	-4
Maximum:	13	2	4
Average:	5	-1	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 3-2**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	5	1	-3
2	8	-1	-1
3	7	0	1
4	4	1	0
5	8	-3	8
6	0	-3	1
7	-1	2	0
8	2	-2	1
9	2	1	2
10	10	-2	-1
11	5	-3	2
12	7	4	-3
13	2	8	1
14	-1	0	3
15	3	3	2
Minimum:	-1	-3	-3
Maximum:	10	8	8
Average:	4	0	1
Std Dev:	3	3	3

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 3-3**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	7	2	1
2	3	3	-1
3	6	0	-2
4	3	-1	4
5	-1	1	0
6	2	-2	0
7	5	-1	0
8	2	-2	3
9	1	1	1
10	6	-1	0
11	3	-1	1
12	6	-4	1
13	1	1	2
14	7	0	-1
15	2	2	1
Minimum:	-1	-4	-2
Maximum:	7	3	4
Average:	4	0	1
Std Dev:	2	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 3-4**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	1	0
2	3	5	3
3	6	2	2
4	2	0	-1
5	3	-2	3
6	4	-3	0
7	-3	5	1
8	1	5	-1
9	6	-1	0
10	5	-1	0
11	5	-2	-1
12	7	0	0
13	4	1	3
14	-4	2	4
15	-3	-2	3
Minimum:	-4	-3	-1
Maximum:	7	5	4
Average:	2	1	1
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 3-5**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	5	0	0
2	2	2	3
3	4	1	-1
4	1	-1	-2
5	3	-2	3
6	1	2	1
7	5	-5	3
8	8	1	1
9	-2	1	-1
10	1	5	-2
11	-2	1	0
12	10	1	0
13	-1	7	-3
14	2	1	-3
15	-2	-1	0
Minimum:	-2	-5	-3
Maximum:	10	7	3
Average:	2	1	0
Std Dev:	4	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 409**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	2	1	3
2	0	1	-3
3	5	2	-3
4	2	2	0
5	1	1	0
6	5	3	0
7	6	1	3
8	0	3	1
9	3	0	1
10	11	3	2
11	4	-1	0
12	6	-1	-3
13	2	-2	-1
14	1	0	-1
15	1	0	2
16	3	-3	1
17	9	0	3
18	3	-1	3
Minimum:	0	-3	-3
Maximum:	11	3	3
Average:	4	1	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Room 420A**
RSO Report Date: 11/27/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	11	59	3
2	-4	1	-2
3	2	0	3
4	-1	-1	-2
5	-3	0	0
6	1	3	1
7	-1	3	0
8	-3	-2	1
9	1	-2	-2
10	-6	1	1
11	7	1	3
12	0	-2	2
13	-2	4	-3
14	1	3	-1
15	2	1	1
Minimum:	-6	-2	-3
Maximum:	11	59	3
Average:	0	5	0
Std Dev:	4	15	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 4-1**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	4	-3	0
2	0	2	1
3	-1	1	-3
4	0	4	-3
5	3	-1	3
6	3	3	0
7	1	3	0
8	1	3	1
9	9	1	0
10	5	-5	2
11	1	2	-3
12	3	2	-1
13	1	0	-3
14	5	-2	2
15	5	-2	1
Minimum:	-1	-5	-3
Maximum:	9	4	3
Average:	3	1	0
Std Dev:	3	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 4-2**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	-1	6	-3
2	4	4	0
3	4	-3	4
4	3	-1	-1
5	3	-2	2
6	2	0	-1
7	4	-1	4
8	0	2	3
9	5	-3	-3
10	8	-2	-1
11	1	-3	0
12	6	-1	-1
13	1	-1	2
14	2	6	0
15	5	-2	-2
Minimum:	-1	-3	-3
Maximum:	8	6	4
Average:	3	0	0
Std Dev:	2	3	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of LSC Smear Measurements

Analysis performed by: RSO, Inc.

Survey Unit: **Hall 4-3**
RSO Report Date: 8/14/2008

	Activity (dpm/100cm^2)		
Location	H-3	C-14	P-32
1	0	2	-3
2	2	-1	-3
3	2	1	3
4	0	-1	-3
5	0	0	3
6	-3	-1	0
7	2	1	0
8	6	-3	0
9	4	-3	4
10	0	0	0
11	-2	1	0
12	-2	3	-1
13	3	2	0
14	3	2	3
15	5	2	2
Minimum:	-3	-3	-3
Maximum:	6	3	4
Average:	1	0	0
Std Dev:	3	2	2

Surveyor: Byron Bland, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 322 • 410-792-7444 • FAX 301-498-3017

NAME: Chesapeake Nuclear Svcs.	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: 788 Sonne Drive	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-521 ~~34~~
Annapolis, MD 21401	PROJECT NAME/#: Bayview	REVIEWED BY:
CONTACT: Claude Wiblin	COMMENTS:	SAMPLER:
PHONE: 410-353-6450 FAX: 410-266-5811		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
310				18	6/08		γ - I-125
372				15			LSC - H-3, C-14, P-32
383				15			
309				17			
301				16			
363			21	19			Actual 21 wipes GDS
332				18			
311				19			
112				20			
111			21	20			Actual 21 wipes GDS
324				15			
329				19			

TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	REMARKS:
C Wiblin	[signature]	7/29		C. Smith indicated 10 smears at a time for γ and then LSC.
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

Total 340 wipe test samples GDS

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME: Chesapeake Nuclear Svcs.	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: 788 Sonne Drive	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-521
Annapolis, MD 21401	PROJECT NAME/#: Bayview	REVIEWED BY:
CONTACT: Claude Wiblin	COMMENTS:	SAMPLER:
PHONE: 410-353-6450 FAX: 410-266-5811		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
387			16	15	6/08		γ: I-125 Actual 16 wipe ODS
Hall 1-2				15			LSC: H-3, C-14, P-32
312				15			
105			20	~~19~~			20 Actual 20 wipe ON
368				20			
361				22			
112A				18			

TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	REMARKS:
C. Wiblin	G. Smith	7/29/08		G. Smith indicated 10 s means at a time for γ and then LSC.
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

Assay Definition-

Assay Description:
CHESAPEAKE NUCLEAR

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\20080804_1025.results
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Sets:
Low Energy: 3H-Tol-3-10-08
Mid Energy: 14C-TOL-07-17-06
High Energy: 32P-UG-02-28-05
Count Time (min): 2.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: On
Colored Samples: On Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	SIS	tSIE	LUM
1	10.00	4	9	6	0	0	0	52.09	417.07	2
2	2.00	4	-1	1	15	-2	2	0.00	369.58	0
3	2.00	2	3	0	4	3	0	47.92	381.12	0
4	2.00	-2	-4	-2	-3	-5	-2	0.00	424.34	0
5	2.00	3	2	-1	8	2	-1	91.84	396.41	0
6	2.00	0	4	-1	-0	5	-1	50.95	392.66	0
7	2.00	-1	-1	-1	-1	-1	-1	0.00	388.37	0
8	2.00	-0	1	-4	-0	2	-4	0.00	418.90	0

9	2.00	1	5	-0	0	6	-0	48.04	379.71	0
10	2.00	0	-1	1	2	-2	2	0.00	402.24	0
11	2.00	1	4	-0	2	5	-0	68.10	430.36	0
12	2.00	-2	1	-3	-7	3	-3	0.00	411.71	0
13	2.00	0	0	2	0	-0	3	57.30	364.56	0
14	2.00	0	3	0	0	4	0	84.30	383.42	0
15	2.00	0	-3	0	3	-4	0	0.00	363.62	0
16	2.00	0	2	-2	1	2	-2	34.59	405.23	0
17	2.00	-0	-1	2	0	-2	2	0.00	393.65	4
18	2.00	1	0	-2	2	1	-2	124.55	389.79	0
19	2.00	1	1	1	2	1	1	100.70	449.38	3
20	2.00	0	-2	-4	1	-1	-5	0.00	415.45	0
21	2.00	2	-3	3	5	-4	3	0.00	404.26	0
22	2.00	0	5	2	-0	5	2	40.64	446.37	0
23	2.00	1	-2	-2	3	-3	-2	0.00	462.03	0
24	2.00	-0	-0	-3	-1	1	-3	0.00	456.15	0
25	2.00	2	3	-2	4	4	-3	89.29	417.23	0
26	2.00	2	0	-4	4	1	-5	225.18	406.77	0
27	2.00	2	2	-1	5	2	-1	59.43	426.42	0
28	2.00	-2	0	-2	-4	1	-3	0.00	422.80	0
29	2.00	1	4	0	1	4	0	47.03	462.61	0
30	2.00	1	2	-2	1	3	-3	57.36	435.38	0
31	2.00	-1	1	-4	-3	2	-5	0.00	430.65	0
32	2.00	0	-1	-1	2	-1	-1	0.00	449.38	0
33	2.00	-1	-1	1	-2	-2	2	0.00	459.74	0
34	2.00	1	3	0	3	4	0	77.34	419.26	0
35	2.00	-1	2	-1	-4	2	-1	99.03	405.27	0
36	2.00	-1	2	2	-3	2	2	325.17	438.62	0
37	2.00	-2	-1	-1	-5	-0	-1	0.00	417.21	0
38	2.00	0	-0	-1	1	-0	-1	0.00	435.05	0
39	2.00	-0	-1	-3	-1	-0	-3	0.00	427.58	0
40	2.00	-2	-2	0	-4	-2	0	0.00	398.44	0
41	2.00	1	-3	1	4	-4	1	0.00	446.93	0
42	2.00	-2	1	-2	-5	1	-3	0.00	428.14	0
43	2.00	-0	-2	-0	-0	-2	-0	0.00	421.06	0
44	2.00	-1	3	1	-5	4	1	207.13	419.33	0
45	2.00	1	-0	-0	2	-0	-0	153.60	470.14	0
46	2.00	-1	1	-0	-3	1	-0	0.00	436.21	0
47	2.00	-0	-2	-1	1	-3	-1	0.00	415.70	0
48	2.00	0	1	-1	-0	2	-1	195.65	418.24	0
49	2.00	-0	-3	1	1	-4	1	0.00	441.48	0
50	2.00	-1	7	-0	-6	8	-0	105.74	392.95	0
51	2.00	-1	-2	-1	-2	-2	-1	0.00	413.49	5
52	2.00	2	-1	-0	5	-1	-0	224.06	514.11	4
53	2.00	-0	-2	5	-1	-3	6	0.00	406.16	5
54	2.00	2	-3	0	6	-4	0	0.00	490.95	4
55	2.00	-1	-4	-2	-2	-4	-2	0.00	445.99	0
56	2.00	-1	-1	3	-2	-2	3	0.00	508.58	0
57	2.00	0	3	0	-0	4	0	120.08	486.07	3
58	2.00	1	1	-1	3	1	-1	119.32	427.43	3
59	2.00	-2	1	0	-6	2	0	0.00	464.80	4
60	2.00	1	-1	1	3	-2	2	0.00	434.90	4
61	2.00	-1	0	-1	-2	1	-1	0.00	430.68	4
62	2.00	-1	-1	-1	-3	-1	-1	0.00	461.58	5
63	2.00	1	1	-2	1	2	-3	120.46	419.22	0
64	2.00	-1	2	0	-4	2	0	331.75	370.95	4
65	2.00	-0	-2	-1	0	-2	-1	0.00	492.14	0
66	2.00	1	0	-4	2	1	-4	242.52	472.63	0
67	2.00	-3	-0	3	-7	-1	3	0.00	427.65	5
68	2.00	1	4	-1	1	5	-1	106.95	443.82	0
69	2.00	-0	-1	-1	0	-1	-1	0.00	396.74	0
70	2.00	-1	-2	1	-1	-3	2	0.00	435.03	0

71	2.00	1	-3	1	4	-4	2	0.00	408.20	0
72	2.00	1	3	-1	1	4	-1	103.80	408.66	0
73	2.00	-0	1	0	-1	2	0	225.66	425.89	4
74	2.00	2	1	-1	6	0	-1	44.19	440.38	3
75	2.00	-1	-0	-4	-3	1	-4	0.00	401.25	5
76	2.00	-0	-1	2	0	-2	3	0.00	401.12	0
77	2.00	-2	-2	0	-4	-2	0	0.00	436.37	0
78	2.00	3	1	-2	9	1	-2	95.18	429.00	0
79	2.00	-1	2	1	-2	2	1	338.01	407.75	4
80	2.00	-1	4	2	-3	4	2	176.34	428.11	0
81	2.00	1	-1	-3	3	-1	-3	0.00	404.19	4
82	2.00	-0	0	2	-0	-0	2	0.00	401.45	4
83	2.00	1	-2	2	2	-2	2	0.00	452.40	4
84	2.00	-0	-0	-3	-0	0	-3	0.00	420.85	0
85	2.00	1	5	-2	1	6	-2	64.90	407.12	0
86	2.00	-2	2	-1	-5	2	-1	0.00	425.36	0
87	2.00	2	-3	-1	6	-4	-1	0.00	427.01	0
88	2.00	-1	2	-3	-2	3	-3	235.24	447.68	4
89	2.00	0	3	1	0	3	2	0.00	431.74	3
90	2.00	-0	1	-2	-1	2	-3	233.69	397.21	4
91	2.00	1	-1	0	4	-1	0	375.09	445.74	0
92	2.00	-1	1	-3	-2	1	-3	0.00	424.52	0
93	2.00	3	1	1	8	-0	2	0.62	437.07	3
94	2.00	-2	2	0	-6	3	0	0.00	451.24	4
95	2.00	2	0	-3	7	0	-3	0.00	458.00	0
96	2.00	-2	1	1	-5	1	1	0.00	392.77	0
97	2.00	-0	-1	-2	0	-1	-3	0.00	405.63	5
98	2.00	0	-5	-2	2	-6	-2	0.00	427.84	7
99	2.00	-1	1	-1	-3	2	-1	609.42	407.44	4
100	2.00	-1	1	1	-4	2	1	0.00	427.10	0
101	2.00	-2	-1	-3	-5	-0	-3	0.00	413.42	0
102	2.00	-0	2	1	-1	2	2	112.43	397.53	3
103	2.00	-1	2	-1	-3	3	-1	285.53	425.65	4
104	2.00	1	-1	-1	4	-2	-1	0.00	436.05	4
105	2.00	1	-1	-1	3	-2	-1	0.00	425.44	8
106	2.00	-0	-0	-3	-0	0	-4	0.00	482.99	4
107	2.00	2	-4	-2	7	-5	-2	0.00	453.61	5
108	2.00	0	0	-1	0	1	-1	9.15	460.43	4
109	2.00	0	2	-2	1	2	-3	51.04	474.60	3
110	2.00	1	1	0	3	1	0	27.83	459.37	3
111	2.00	0	0	-1	1	0	-1	599.79	448.29	4
112	2.00	-1	-0	-1	-1	-0	-1	0.00	447.02	9
113	2.00	1	2	1	2	2	1	130.87	458.57	3
114	2.00	2	-1	0	8	-2	0	24.45	400.70	4
115	2.00	2	-3	3	6	-5	3	0.00	472.14	4
116	2.00	-1	0	-1	-3	0	-1	0.00	449.26	9
117	2.00	1	-1	-2	3	-1	-2	0.00	450.26	8
118	2.00	-3	0	-0	-8	1	-0	0.00	430.83	5
119	2.00	1	2	0	2	2	0	15.84	407.67	3
120	2.00	-2	-0	-2	-4	0	-2	0.00	424.51	5
121	2.00	0	1	-3	1	1	-3	93.25	463.78	0
122	2.00	2	-1	-1	4	-1	-1	0.00	454.22	4
123	2.00	-2	-1	0	-4	-1	0	0.00	469.86	0
124	2.00	-1	0	-2	-3	1	-2	0.00	401.97	0
125	2.00	-2	3	-2	-6	4	-3	0.00	429.07	4
126	2.00	1	1	3	3	-0	4	222.40	425.06	4
127	2.00	0	3	-1	0	3	-1	165.37	398.75	0
128	2.00	3	-1	-1	8	-2	-1	0.00	448.99	4
129	2.00	1	3	1	2	4	2	113.01	434.50	3
130	2.00	1	-2	-2	4	-2	-2	0.00	400.96	0
131	2.00	-1	-0	-3	-2	0	-4	0.00	408.37	4
132	2.00	-0	1	-1	-1	2	-1	61.95	436.91	0

133	2.00	-1	3	-2	-4	4	-2	109.62	424.76	0
134	2.00	1	-1	-4	2	0	-4	0.00	382.14	0
135	2.00	1	1	0	2	1	0	87.54	460.38	0
136	2.00	-0	-2	1	0	-3	2	0.00	412.69	5
137	2.00	-2	2	-0	-5	3	-0	0.00	394.95	0
138	2.00	2	-0	-0	6	-1	-0	60.83	397.26	4
139	2.00	1	-1	-1	2	-1	-1	0.00	431.58	4
140	2.00	-2	1	-1	-7	2	-1	0.00	392.74	4
141	2.00	3	-1	-2	9	-1	-3	36.19	387.57	0
142	2.00	0	3	-3	0	4	-3	192.30	429.45	3
143	2.00	-1	-1	-2	-3	-1	-3	0.00	403.21	5
144	2.00	-1	-0	-1	-1	-0	-1	0.00	446.85	4
145	2.00	4	1	1	9	1	2	42.08	450.48	3
146	2.00	1	-3	1	5	-4	1	0.00	430.94	0
147	2.00	1	-3	1	4	-4	1	0.00	458.74	0
148	2.00	-0	1	-1	-1	2	-1	197.58	398.29	0
149	2.00	-2	1	2	-6	1	2	0.00	443.77	4
150	2.00	0	0	1	1	-0	2	0.00	446.80	4
151	2.00	2	1	0	5	0	0	114.82	462.39	0
152	2.00	0	-0	0	1	-1	0	428.05	420.90	0
153	2.00	-0	-1	-3	0	-1	-3	0.00	470.20	5
154	2.00	0	3	1	-0	3	1	40.45	414.40	3
155	2.00	-0	-1	3	-1	-2	3	0.00	428.30	5
156	2.00	1	2	2	3	1	3	145.32	370.91	3
157	2.00	-1	2	-3	-4	3	-3	175.91	423.79	4
158	2.00	3	-0	1	7	-1	1	89.14	471.28	0
159	2.00	-0	-2	-1	1	-2	-1	0.00	440.17	5
160	2.00	2	-0	-2	6	-1	-2	86.51	411.19	0
161	2.00	1	0	-0	3	0	-0	53.13	395.22	4
162	2.00	-0	-1	-3	0	-1	-4	0.00	394.20	5
163	2.00	1	-0	1	5	-1	2	0.00	408.17	4
164	2.00	1	3	1	2	3	2	77.88	428.56	3
165	2.00	3	1	0	7	1	0	83.90	437.11	3
166	2.00	2	-0	-1	5	-0	-1	0.00	428.21	4
167	2.00	-1	2	-2	-4	4	-2	0.00	361.39	0
168	2.00	1	3	-0	1	3	-0	92.10	440.86	3
169	2.00	1	1	-1	3	2	-1	0.00	424.66	3
170	2.00	-1	-1	-4	-1	-1	-4	0.00	407.54	0
171	2.00	-1	1	1	-2	1	1	781.15	425.71	0
172	2.00	-2	-3	2	-3	-5	3	0.00	447.47	7
173	2.00	2	4	-1	3	5	-1	36.54	412.25	0
174	2.00	-2	-0	-1	-5	-0	-1	0.00	437.11	0
175	2.00	1	-1	-3	4	-1	-3	0.00	428.20	4
176	2.00	-2	-3	-0	-5	-3	-0	0.00	386.89	0
177	2.00	-0	-3	-1	1	-4	-1	0.00	438.43	5
178	2.00	2	-0	5	7	-2	6	20.95	495.59	3
179	2.00	-0	2	-3	-1	3	-4	224.00	487.19	0
180	2.00	-2	-0	-0	-6	0	-0	0.00	408.72	5
181	2.00	2	-1	-2	5	-1	-2	0.00	432.67	0
182	2.00	2	-3	-1	6	-4	-1	0.00	491.79	4
183	2.00	-1	-2	1	-1	-3	2	0.00	493.78	0
184	2.00	3	-2	1	8	-3	1	59.55	491.69	0
185	2.00	-0	6	0	-3	7	-0	167.02	468.76	3
186	2.00	0	-0	-2	0	0	-3	0.00	436.13	0
187	2.00	1	-1	-1	3	-1	-1	0.00	448.68	4
188	2.00	-0	2	-2	-1	2	-2	130.38	435.72	4
189	2.00	1	0	-2	2	1	-3	0.00	438.60	0
190	2.00	1	-4	-2	5	-5	-2	0.00	452.95	5
191	2.00	1	-3	-0	3	-4	-0	0.00	468.36	5
192	2.00	1	-4	-0	5	-5	-0	0.00	459.51	5
193	2.00	-0	1	-2	-1	1	-3	52.48	439.11	4
194	2.00	-1	0	1	-3	-0	2	0.00	447.12	4

195	2.00	0	-4	-1	3	-5	-1	0.00	441.85	6
196	2.00	6	3	0	14	3	0	60.21	469.96	0
197	2.00	1	1	0	2	0	0	252.89	512.17	4
198	2.00	0	-2	-1	2	-3	-1	0.00	434.97	5
199	2.00	-1	-1	1	-1	-1	1	0.00	490.01	0
200	2.00	1	-1	-0	3	-2	-0	0.00	479.12	0
201	2.00	0	2	2	1	2	2	56.40	482.08	3
202	2.00	-1	-1	2	-4	-1	2	0.00	459.05	0
203	2.00	-0	2	-2	-1	3	-2	146.14	480.31	0
204	2.00	1	-1	-0	4	-2	-0	0.00	480.50	0
205	2.00	-1	4	1	-5	5	1	122.57	468.46	0
206	2.00	0	2	-3	1	3	-3	68.92	404.85	0
207	2.00	-2	-1	-3	-6	-0	-3	0.00	390.83	5
208	2.00	-2	1	-2	-5	2	-3	0.00	470.68	0
209	2.00	-2	2	1	-5	3	1	601.39	478.07	0
210	2.00	1	0	-3	3	1	-3	45.31	412.65	0
211	2.00	2	1	-0	7	0	-0	0.00	417.97	0
212	2.00	1	-4	-1	4	-5	-1	0.00	469.28	5
213	2.00	-1	-2	-1	-2	-3	-1	0.00	510.53	0
214	2.00	-3	-1	-1	-7	-0	-1	0.00	444.90	0
215	2.00	1	-1	-1	3	-1	-1	0.00	519.90	4
216	2.00	-0	1	1	-0	1	2	92.45	460.96	0
217	2.00	3	5	-3	5	6	-3	61.06	497.49	3
218	2.00	0	-2	-0	2	-3	-0	0.00	442.34	5
219	2.00	-2	-1	-3	-4	-0	-4	0.00	486.12	0
220	2.00	0	-0	-2	1	-0	-2	0.00	441.77	4
221	2.00	0	0	-2	1	1	-3	76.56	462.10	4
222	2.00	-1	3	-1	-4	4	-1	268.52	445.42	0
223	2.00	-0	0	-1	-1	1	-1	0.00	458.18	4
224	2.00	1	-1	-2	2	-1	-2	0.00	461.51	4
225	2.00	-2	-0	-3	-4	0	-3	0.00	460.25	0
226	2.00	1	1	3	4	-0	3	225.58	486.73	3
227	2.00	-2	1	0	-5	1	0	0.00	433.25	0
228	2.00	2	-1	-1	4	-1	-1	90.04	460.76	0
229	2.00	-0	1	1	-1	1	1	306.72	457.60	0
230	2.00	-1	0	0	-3	0	0	0.00	456.59	0
231	2.00	1	-1	-3	2	-1	-4	0.00	476.93	0
232	2.00	-2	-0	-1	-5	0	-2	0.00	386.14	0
233	2.00	0	-2	1	1	-2	1	0.00	455.34	0
234	2.00	3	5	-4	7	6	-4	93.91	482.91	0
235	2.00	-2	-1	2	-4	-2	3	0.00	446.78	0
236	2.00	3	1	-1	7	1	-1	9.87	433.15	0
237	2.00	-2	-2	-1	-5	-3	-1	0.00	390.73	0
238	2.00	0	2	-2	1	2	-3	3.69	377.04	0
239	2.00	-0	-2	-2	1	-3	-2	0.00	398.55	0
240	2.00	1	2	-1	1	2	-1	151.74	425.11	0
241	2.00	2	1	-3	7	1	-4	0.00	396.37	0
242	2.00	-2	-0	-1	-6	0	-1	0.00	430.13	0
243	2.00	2	-2	2	6	-3	2	0.00	430.26	0
244	2.00	-1	1	1	-2	1	2	636.70	434.66	0
245	2.00	-0	-0	-1	0	-0	-1	0.00	465.75	0
246	2.00	-1	-3	-1	-1	-4	-1	0.00	469.38	6
247	2.00	2	-1	0	6	-2	0	0.00	441.66	0
248	2.00	0	-1	-3	1	-1	-3	0.00	434.80	0
249	2.00	1	-1	-1	4	-1	-1	112.51	486.81	0
250	2.00	-1	-1	-0	-2	-1	-0	0.00	471.20	5
251	2.00	1	0	0	2	0	0	68.37	470.53	4
252	2.00	-1	3	-0	-3	3	-0	106.30	480.92	4
253	2.00	-0	-3	1	1	-4	1	0.00	471.07	0
254	2.00	1	-2	-4	4	-2	-4	0.00	483.57	4
255	2.00	1	-1	-1	3	-1	-1	0.00	511.62	4
256	2.00	-1	-4	4	-1	-6	5	0.00	459.40	7

257	2.00	0	-2	-2	2	-2	-2	0.00	477.98	0
258	2.00	-0	-3	-3	1	-3	-4	0.00	469.19	0
259	2.00	1	-0	0	3	-1	0	241.87	436.57	4
260	2.00	-2	-4	1	-4	-5	1	0.00	414.04	0
261	2.00	2	1	2	5	-0	2	100.70	452.13	0
262	2.00	3	-1	-1	8	-2	-1	0.00	407.83	0
263	2.00	-0	2	-2	-1	2	-2	224.00	433.83	0
264	2.00	-0	1	-3	-1	2	-3	446.35	412.86	0
265	2.00	3	0	2	8	-1	3	29.48	457.24	0
266	2.00	0	-1	2	1	-2	3	0.00	434.97	4
267	2.00	-1	-3	1	-2	-4	2	0.00	435.29	6
268	2.00	2	4	-3	6	5	-3	46.57	395.51	0
269	2.00	0	-1	-3	1	-1	-3	0.00	390.04	0
270	2.00	0	-2	-0	2	-3	-0	0.00	368.05	0
271	2.00	0	-3	0	3	-5	0	0.00	367.44	0
272	2.00	-1	-2	1	-1	-3	2	0.00	378.63	5
273	2.00	0	-1	-3	1	-1	-4	0.00	382.80	4
274	2.00	1	-2	-1	4	-3	-1	0.00	420.16	5
275	2.00	-2	0	0	-5	1	0	0.00	429.02	0
276	2.00	1	-0	-3	2	0	-3	81.37	435.47	0
277	2.00	-0	-0	-0	-1	-0	-0	0.00	464.52	4
278	2.00	-2	3	-3	-5	5	-4	247.01	449.09	0
279	2.00	-1	1	-1	-3	2	-1	245.08	403.81	0
280	2.00	0	0	2	1	-0	3	431.26	427.92	4
281	2.00	2	1	-2	4	1	-2	83.78	465.37	0
282	2.00	3	-1	-0	8	-2	-0	62.43	498.72	4
283	2.00	-0	-0	-1	-1	-0	-1	0.00	468.98	4
284	2.00	-2	-3	-1	-3	-3	-1	0.00	446.96	0
285	2.00	0	2	-3	1	3	-4	100.70	450.60	0
286	2.00	-1	-1	1	-2	-1	1	0.00	431.03	0
287	2.00	-1	1	0	-2	1	0	0.00	441.41	0
288	2.00	-2	-1	-0	-5	-1	-0	0.00	458.53	5
289	2.00	1	3	1	2	3	1	65.51	472.08	6
290	2.00	2	-0	-2	7	-1	-2	34.99	448.99	3
291	2.00	3	5	0	7	5	0	46.67	469.57	0
292	2.00	-1	-1	1	-2	-2	2	0.00	515.68	5
293	2.00	4	3	-2	9	3	-3	64.41	478.38	3
294	2.00	-0	-1	1	0	-2	2	0.00	474.71	5
295	2.00	-0	-2	-0	-1	-2	-0	0.00	413.02	5
296	2.00	-0	1	0	-1	1	0	572.50	458.69	0
297	2.00	-0	0	1	-0	-0	1	0.00	436.11	0
298	2.00	-2	-1	0	-5	-1	0	0.00	322.30	0
299	2.00	1	-0	-3	3	0	-4	0.00	337.00	0
300	2.00	3	0	-4	7	1	-4	99.56	472.27	3
301	2.00	-1	-2	-1	-1	-2	-1	0.00	434.71	0
302	2.00	-2	2	1	-5	3	1	493.70	471.52	4
303	2.00	3	2	1	8	2	1	115.66	468.79	0
304	2.00	-3	0	-1	-7	1	-1	0.00	448.00	0
305	2.00	-1	2	-2	-3	3	-3	919.18	455.77	0
306	2.00	1	-4	-1	3	-5	-1	0.00	484.04	0
307	2.00	-1	3	1	-2	3	1	221.57	441.73	0
308	2.00	3	-2	-1	9	-3	-1	214.43	484.40	0
309	2.00	1	0	-2	2	0	-3	224.06	446.80	0
310	2.00	-0	-1	-1	0	-2	-1	0.00	448.26	0
311	2.00	-2	3	1	-6	3	1	370.27	447.01	4
312	2.00	-1	1	-2	-3	1	-2	0.00	448.65	0
313	2.00	-1	2	0	-5	3	0	496.11	460.35	4
314	2.00	-1	-0	-2	-1	-0	-2	0.00	526.24	0
315	2.00	0	0	-1	0	1	-1	192.12	459.98	0
316	2.00	-1	1	1	-2	1	1	543.61	464.13	0
317	2.00	-0	-3	-5	1	-3	-5	0.00	447.14	0
318	2.00	-2	-1	-1	-6	-1	-1	0.00	391.31	0

319	2.00	-0	-2	3	1	-3	4	0.00	447.37	0
320	2.00	-1	3	1	-4	3	1	160.87	454.96	0
321	2.00	0	-2	-0	2	-2	-0	0.00	408.91	0
322	2.00	-3	-0	-2	-7	0	-2	0.00	444.55	0
323	2.00	2	1	-0	5	0	-0	40.67	439.46	0
324	2.00	-2	3	-0	-6	3	-0	179.92	372.54	0
325	2.00	-2	-3	-1	-3	-4	-1	0.00	463.25	0
326	2.00	-1	-2	-2	-2	-2	-2	0.00	450.56	0
327	2.00	-1	-3	3	-2	-4	3	0.00	383.65	0
328	2.00	-1	-2	-1	-1	-2	-1	0.00	415.74	0
329	2.00	-1	3	-1	-5	4	-1	199.10	429.20	0
330	2.00	-2	-1	-4	-5	0	-4	0.00	427.76	0
331	2.00	-2	4	3	-8	4	3	112.19	380.94	0
332	2.00	-0	-2	-1	0	-2	-1	0.00	442.18	0
333	2.00	-1	-1	-1	-2	-1	-1	0.00	464.81	0
334	2.00	1	-0	-1	3	-0	-1	97.42	447.23	4
335	2.00	1	-1	0	3	-1	0	0.00	441.82	4
336	2.00	-2	-0	-2	-5	0	-3	0.00	435.91	0
337	2.00	2	6	-0	4	7	-0	104.85	408.28	2
338	2.00	2	-1	-3	7	-1	-3	0.00	442.03	0
339	2.00	0	1	1	1	0	2	58.74	453.58	0
340	2.00	-2	-1	-2	-5	-0	-2	0.00	495.97	0
341	2.00	-0	1	-0	-0	1	-0	0.00	450.61	0

CHESAPEAKE NUCLEAR
Count Time(minutes): 15.00
Assay Type: CPM
Background Subtract : Manual
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	MAN	75 - 400 keV	MAN	15 - 2000 keV
Bkg:	0.00		0.00		0.00	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	104240	1.39	120.0	40.8	104380	1.38
14 MISSING TUBE(S)						
16	44800.0	2.11	81380.0	1.57	245520	0.90
14 MISSING TUBE(S)						
31	23.6	6.17	86.9	3.21	224.3	2.00
14 MISSING TUBE(S)						
46	27.9	5.71	80.1	3.37	227.1	2.00
47	22.3	6.17	74.3	3.38	212.3	2.00
48	26.3	5.92	81.1	3.37	230.6	2.00
49	24.0	6.02	80.5	3.28	217.0	2.00
50	24.1	6.06	79.5	3.34	221.5	2.00
51	23.3	6.09	75.9	3.37	215.3	2.00

02 Aug 2008 17:02 POWER FAILURE

CN 10 pack

S #1 - ^{129}I STD

#16 - ^{137}Cs STD

#31 - BKG

#46 thru 83 " 10-PACK"

ε for ^{129}I in Window A $\simeq$ 61 %

Assume ^{109}Cd ε = 61%

$\therefore$ MDA $\simeq$ 10 dpm/wipe

Restart after
Power Failure

Protocol #:14 3-Window Counts User : Lab Technici

CHESAPEAKE NUCLEAR
Count Time(minutes): 15.00
Assay Type: CPM
Background Subtract : Manual
Outlier: 5.0 FLAG
Dilution Operator :
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

CN 10 pack

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	MAN	75 - 400 keV	MAN	15 - 2000 keV
Bkg:	0.00		0.00		0.00	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
52	26.7	5.89	81.6	3.37	230.4	2.01
53	26.0	5.86	79.6	3.35	221.2	2.01
54	26.7	5.84	78.2	3.41	226.1	2.01
55	25.9	5.83	82.3	3.27	217.8	2.01
56	28.3	5.57	77.3	3.37	217.8	2.01
57	27.0	5.81	79.9	3.38	226.3	2.01

58	24.1	6.09	79.5	3.35	220.5	2.01
59	25.4	5.86	76.2	3.39	216.0	2.01
60	26.1	5.88	79.6	3.36	223.3	2.01
61	27.7	5.61	78.1	3.34	216.3	2.01
62	22.7	6.15	75.2	3.38	212.4	2.01
63	26.7	5.69	78.3	3.32	213.5	2.01
64	27.2	5.71	72.8	3.49	219.3	2.01
65	24.0	6.05	77.4	3.37	217.9	2.01
66	26.7	5.86	79.9	3.39	227.9	2.01
67	29.2	5.48	76.4	3.38	216.7	2.01
68	24.9	5.91	77.5	3.35	214.9	2.01
69	25.9	5.81	74.1	3.44	216.6	2.01
70	26.4	5.74	77.7	3.35	216.3	2.01
71	22.7	6.17	75.8	3.38	213.9	2.01
72	26.7	5.67	70.5	3.49	212.4	2.01
73	23.6	6.07	78.6	3.33	215.4	2.01
74	29.1	5.44	75.3	3.38	213.3	2.01
75	27.4	5.77	78.3	3.41	225.2	2.01
76	27.0	5.59	73.8	3.38	208.6	2.01
77	28.1	5.57	76.7	3.37	215.3	2.01
78	29.1	5.45	75.2	3.39	214.1	2.01
79	27.8	5.64	74.9	3.43	218.2	2.01
80	28.7	5.49	73.8	3.42	213.5	2.01
81	25.8	5.72	78.4	3.28	210.3	2.01
82	26.5	5.69	76.9	3.34	212.4	2.01
83	28.8	5.47	73.4	3.42	213.2	2.01

***** ARCHIVE ERROR: _archive.x14 parameter file not found

02 Aug 2008 23:51 RSO, Inc. Page #1

Protocol #:14 3-Window Counts User : Lab Technici

CHESAPEAKE NUCLEAR

S#1 - S#10

BKG Replicate

N=10

Count Time(minutes):	15.00
Assay Type:	CPM
Background Subtract :	Manual
Outlier:	5.0 FLAG
%Spillup:	0.00
%Spilldown:	0.00
Screening:	OFF

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	MAN	75 - 400 keV	MAN	15 - 2000 keV
Bkg:	0.00		0.00		0.00	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	24.0	6.00	76.4	3.36	215.9	2.00
2	28.9	5.46	70.9	3.49	215.6	2.00
3	22.7	6.23	80.2	3.31	220.3	2.00
4	23.7	6.11	82.5	3.27	221.0	2.00
5	24.4	5.98	79.0	3.32	218.4	2.00
6	24.1	5.99	78.7	3.31	215.5	2.00
7	25.8	5.77	72.1	3.45	215.2	2.00

8	25.1	5.98	78.8	3.37	224.4	2.00
9	22.9	6.07	74.9	3.36	211.6	2.00
10	24.9	5.99	77.8	3.39	223.0	2.00

***** ARCHIVE ERROR: _archive.x14 parameter file not found

BK6 A 1

Job: Chesapeake Nuclear
Sample Date: See COC
Sample Matrix: Wipe
Sample Analysis: Gamma Screen
Analysis Date(s): 3-Aug-08

Job No.: 2008-521
Report Date: 21-Jul-08

Equipment: TRI-CARB 3100TR sn 424558
Analyst: RE

Sample Count Time (min)	Background Count Time (min)	Background Count Rate 15-75 keV (cpm)	Background Count Rate 15-2000 keV (cpm)
15	15	29	218

Minimum Detectable Concentration

MDC = (2.71 + 4.66 * SQRT(σ_{BKG}) / (Efficiency x Volume x 2.22E6 dpm/uCi)

Sample ID	Sample Date	"Target" Radionuclide	Gross	Countrate Background (cpm)	Net	Counting Efficiency	Activity (dpm)	+/- 2 std dev	Sample Size (mL)	Activity Concentration (uCi/mL)	+/- 2 std dev	Estimated MDC (uCi/mL)
	See COC	I-125	265	29	236	61%	386	+/- 4	1.0	1.7E-04	+/- 1%	8.9E-06
		Gross Gamma	476	218	258	50%	516	+/- 6	1.0	2.3E-04	+/- 1%	1.1E-05
	See COC	I-125	710	29	681	61%	1116	+/- 6	1.0	5.0E-04	+/- 1%	8.9E-06
		Gross Gamma	926	218	708	50%	1416	+/- 7	1.0	6.4E-04	+/- 0%	1.1E-05

Prepared by:

Signature Gregory D. Smith, CHP

Reviewed by:

Signature Richard Emmons, Laboratory Analyst

Lab Control #: 2008-547

Reviewed By: _____

RSO, Inc. JOB WORKSHEET

RSO Contact: GDS

Project #: _____

Date: 8/7/2008

Customer Information:
Name: Chesapeake Nuclear Services
Address: _____
Contact: Claude Wiblin
Phone: 410-353-6450
Contract/PO#: _____

Billing Address:
Name: _____
Address: _____
Contact: _____
Phone: _____

Job Description: _____ Job Date: _____

Mobilization:

Description	Qty	X	Unit Cost	

Service/Labor:

Description	Qty	X	Unit Cost	

Material/Expenses/Transportation:

RSO Stock	Item Description	Qty	X	Unit Cost	
☐					
☐					
☐					
				Sub Total:	

Lab Analysis Request

☐ Alpha ☒ Beta ☒ Gamma

ID Method On Container ☐

# of Samples 472 # 1 - 472

Required _____

Disposition:
Return ☐
Hold ☐
Discard ☒

Sample Description (Matrix)
☐ Air ☒ Wipe
☐ Water ☐ Leak Test
☐ Soil/Ash ☐ Waste
☐ Bioassay ☐ Other

Chain of Custody (If Required):

Delivered By: _____ Time: _____ Date: _____

Received By: _____ Time: _____ Date: _____

Report Type Required:

LSC Print Out: ☐ On a 3.5" Disk ☐

Analysis 3 Chan.DPM ☐ Single Label ☐ Other:

Report Units:
☐ dpm ☐ pCi/ml
☐ pCi/g ☐ uCi/ml
☐ pCi/l ☐ Other

Laboratory Services:

Sub Total (from above): _____

Sample Description	Qty	X	Cost	

Job Complete: ☐ Yes ☐ No

Invoice #: _____

Invoice Data: _____

Total Amount _____

Invoice Amount _____

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME: Chesapeake Nuclear Services	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: 788 Sonne Drive	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-547
Annapolis, MD 21032	PROJECT NAME/#: Bayview - C	REVIEWED BY:
CONTACT: Claude Wiblin	COMMENTS: Page 1 of 3	SAMPLER:
PHONE: 410-353-6450 / FAX: 410-266-5811		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
209A				17	8/8		γ scan
305				17			LSC: H-3, C-14, P-32
304				16			
Hall 2-1				15			
217A				16			
409				18			
307				16			
Hall 4-2				15			
386				17			
384				16			
Hall 4-1				15			
385				16			

TRANSFERRED BY: Byron Bland	RECEIVED BY: Rich Emmons	DATE	TIME	REMARKS: G. Smith indicated 10 spears at a time for γ scan and then LSC.
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME:	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS:	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-547
	PROJECT NAME/#:	REVIEWED BY:
CONTACT:	COMMENTS:	SAMPLER:
PHONE: FAX:	Page 2 of 3	

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
347				17			
337				19			
Hall 3-2				15			
Hall 3-3				15			
Hall 3-4				15			
Hall 3-5				15			
339				17			
331				17			
348				17			
330				17			
Hall 3-1				15			
340				17			

TRANSFERRED BY:	RECEIVED BY: R Cannon	DATE	TIME	REMARKS:
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME:	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS:	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-547
	PROJECT NAME/#:	REVIEWED BY:
CONTACT:	COMMENTS: Page 3 of 3	SAMPLER:
PHONE: / FAX:		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
357/358					17		
Hall4-3					15		
308					15		
420					18		
349					17		

TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	REMARKS:
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

NIH

Assay Definition-

Assay Description:
CHESAPEAKE NUCLEAR

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\NIH\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\NIH\Triple Lable DPM\20080812_2208.results
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Sets:
Low Energy: 3H-Tol-3-10-08
Mid Energy: 14C-TOL-07-17-06
High Energy: 32P-UG-02-28-05
Count Time (min): 2.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

REVIEWED
GD Smith, CHP
RSO, Inc.
8/14/08
Date

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: On
Colored Samples: On Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	SIS	tSIE	LUM
1	10.00	4	7	6	0	0	0	98.77	836.28	1
2	2.00	1	4	2	1	4	3	95.67	833.49	0
3	2.00	3	2	0	5	3	0	82.23	842.32	0
4	2.00	3	-0	2	6	-1	2	46.16	861.22	0
5	2.00	2	2	-1	2	3	-1	127.81	863.72	0
6	2.00	0	3	2	-0	3	3	40.51	730.21	0
7	2.00	-2	4	0	-6	5	0	3.45	832.31	0
8	2.00	1	1	1	1	1	2	0.00	761.26	0
9	2.00	2	0	-0	3	-0	-0	0.00	830.26	0

NIH

10	2.00	-1	3	-1	-3	4	-1	3.57	720.38	0
11	2.00	3	1	-3	4	2	-3	58.19	830.48	0
12	2.00	0	3	0	-0	3	0	48.83	783.17	0
13	2.00	2	4	1	3	4	2	82.12	803.76	0
14	2.00	4	5	-1	6	6	-1	34.00	888.13	0
15	2.00	2	-1	1	3	-2	2	0.00	866.37	0
16	2.00	0	-2	1	1	-2	1	0.00	836.46	0
17	2.00	1	1	3	1	0	4	193.14	839.13	4
18	2.00	4	3	-1	7	3	-1	55.50	678.69	0
19	2.00	1	1	-1	1	1	-1	0.00	782.31	0
20	2.00	1	3	3	2	3	4	99.25	878.56	0
21	2.00	0	4	-2	-1	5	-2	185.94	842.56	0
22	2.00	1	-1	2	1	-1	2	0.00	870.20	0
23	2.00	2	-2	1	3	-3	1	0.00	813.66	0
24	2.00	-1	1	2	-2	1	2	709.41	768.59	0
25	2.00	2	1	2	4	0	3	66.16	894.42	0
26	2.00	4	1	-1	7	1	-1	37.10	849.41	0
27	2.00	-1	1	1	-1	1	2	126.45	850.49	0
28	2.00	0	3	1	0	3	1	82.71	717.69	0
29	2.00	2	1	3	4	1	3	87.47	799.50	0
30	2.00	-1	4	1	-3	4	1	119.87	727.16	0
31	2.00	2	-1	-1	4	-1	-1	0.00	785.04	0
32	2.00	3	-1	-1	5	-1	-1	0.00	733.56	0
33	2.00	1	1	-2	2	1	-3	0.00	758.37	0
34	2.00	2	-1	0	3	-1	0	0.00	753.77	0
35	2.00	1	-1	-0	3	-1	-0	0.00	814.63	0
36	2.00	0	2	-1	-0	2	-1	106.83	817.04	0
37	2.00	1	0	-3	1	1	-3	64.54	860.37	0
38	2.00	1	-1	1	1	-1	2	0.00	843.53	0
39	2.00	1	-1	0	2	-2	0	0.00	864.56	0
40	2.00	3	1	0	6	1	0	100.96	800.82	0
41	2.00	1	2	-1	1	3	-1	98.01	757.62	0
42	2.00	-1	1	1	-2	1	1	0.00	846.03	0
43	2.00	-1	1	-1	-2	2	-1	0.00	769.63	0
44	2.00	2	-1	-0	3	-2	-0	0.00	799.52	0
45	2.00	0	-1	-2	1	-0	-2	0.00	892.16	0
46	2.00	3	2	0	6	1	0	13.37	872.25	0
47	2.00	1	1	-1	3	1	-1	0.00	812.28	0
48	2.00	-1	3	4	-3	3	4	498.09	837.56	0
49	2.00	1	-1	1	3	-2	1	0.00	833.94	0
50	2.00	-1	-0	1	-3	-0	2	0.00	837.71	0
51	2.00	4	2	-3	6	3	-3	86.77	779.25	0
52	2.00	1	3	-0	1	4	-0	96.45	721.80	0
53	2.00	-1	3	3	-3	3	4	275.35	834.46	0
54	2.00	0	-2	0	0	-2	0	0.00	741.51	0
55	2.00	3	3	1	5	3	1	54.08	808.90	0
56	2.00	5	-1	1	9	-2	2	0.00	786.70	0
57	2.00	4	-0	-2	8	-1	-3	0.00	881.89	0
58	2.00	3	1	1	6	1	1	37.79	782.83	0
59	2.00	2	1	1	3	1	1	0.00	722.96	0
60	2.00	3	-1	2	6	-1	2	0.00	712.67	4
61	2.00	1	1	-2	1	1	-2	0.00	764.92	0
62	2.00	-1	-2	-2	-1	-1	-2	0.00	797.68	0
63	2.00	-2	0	3	-4	-0	3	0.00	836.48	0
64	2.00	3	1	1	5	1	2	59.06	806.79	0
65	2.00	1	2	1	2	2	2	0.00	763.89	0
66	2.00	2	3	2	3	3	2	125.38	701.48	0
67	2.00	5	-2	-1	9	-3	-1	0.00	874.93	0
68	2.00	2	0	3	3	-1	3	54.90	876.81	0
69	2.00	3	-1	2	5	-2	2	0.00	819.74	0
70	2.00	-2	3	4	-5	3	4	0.00	837.49	0
71	2.00	3	2	1	5	2	2	20.96	865.50	0

NIH

72	2.00	0	3	0	-1	3	0	218.25	836.58	0
73	2.00	2	3	0	3	3	0	56.57	843.82	0
74	2.00	2	-0	0	3	-1	0	0.53	876.14	0
75	2.00	-0	2	-1	-1	3	-1	0.00	768.83	0
76	2.00	2	2	3	3	2	3	67.79	801.02	0
77	2.00	4	2	1	7	1	1	19.19	879.63	0
78	2.00	2	1	-2	3	1	-3	0.00	857.53	0
79	2.00	3	-0	1	5	-1	2	0.00	757.25	0
80	2.00	4	-1	1	7	-2	2	0.00	789.39	0
81	2.00	4	0	-2	7	0	-2	27.61	864.00	0
82	2.00	3	-1	-2	6	-1	-2	0.00	861.52	0
83	2.00	1	1	3	2	1	3	46.62	717.29	0
84	2.00	0	0	-3	-0	1	-3	63.40	810.46	0
85	2.00	3	1	-2	5	2	-3	0.00	795.89	0
86	2.00	1	2	-0	2	2	-0	0.00	774.54	0
87	2.00	1	1	0	1	1	0	64.81	708.50	0
88	2.00	3	3	-0	5	3	-0	0.00	668.86	0
89	2.00	3	2	3	6	1	3	157.07	890.18	0
90	2.00	1	3	1	0	3	1	133.62	776.66	0
91	2.00	2	0	1	3	-0	1	80.86	759.83	0
92	2.00	6	4	2	11	3	2	102.20	882.02	0
93	2.00	2	-1	0	4	-1	0	13.24	866.87	0
94	2.00	3	-1	-2	6	-1	-3	0.00	777.25	0
95	2.00	1	-1	-1	2	-2	-1	0.00	864.21	0
96	2.00	1	0	-1	1	0	-1	0.00	811.22	0
97	2.00	-0	0	1	-1	0	2	0.00	757.58	0
98	2.00	1	-2	1	3	-3	1	0.00	657.25	0
99	2.00	5	1	2	9	-0	3	19.41	818.83	0
100	2.00	2	-0	2	3	-1	3	0.00	817.21	0
101	2.00	3	-2	-1	6	-3	-1	0.00	851.44	0
102	2.00	2	2	5	3	1	6	27.28	800.40	0
103	2.00	1	-4	0	3	-5	0	0.00	792.50	0
104	2.00	1	5	-1	-0	6	-1	120.96	848.94	0
105	2.00	-1	-3	2	-2	-4	2	0.00	818.19	0
106	2.00	1	4	2	1	4	3	195.55	887.84	0
107	2.00	3	-4	3	6	-6	3	0.00	816.00	0
108	2.00	4	2	2	7	2	3	109.99	882.55	0
109	2.00	3	0	-1	6	-0	-1	95.25	820.84	0
110	2.00	2	1	0	4	1	0	69.67	794.10	0
111	2.00	3	0	-0	5	-0	-0	96.98	841.29	0
112	2.00	3	2	-2	4	3	-3	36.08	815.78	0
113	2.00	2	-1	-0	3	-2	-0	0.00	840.79	0
114	2.00	2	1	-1	3	1	-1	213.20	853.81	0
115	2.00	1	5	-0	1	6	-0	89.02	839.17	0
116	2.00	-1	0	1	-1	0	1	0.00	721.43	0
117	2.00	0	4	-3	-1	6	-3	81.55	784.00	0
118	2.00	3	3	-0	4	4	-0	45.52	812.33	0
119	2.00	2	-1	4	4	-3	4	0.00	792.34	0
120	2.00	1	-0	-1	3	-1	-1	78.30	789.03	0
121	2.00	2	-1	2	3	-2	2	0.00	816.76	0
122	2.00	1	-0	-1	2	-0	-1	14.10	832.57	0
123	2.00	2	-0	3	4	-1	4	0.00	870.51	0
124	2.00	0	2	2	-0	2	3	170.28	872.01	0
125	2.00	2	-3	-3	5	-3	-3	0.00	792.75	0
126	2.00	4	-2	-1	8	-2	-1	0.00	853.78	0
127	2.00	0	-3	0	1	-3	0	0.00	851.05	0
128	2.00	3	-1	-1	6	-1	-1	0.00	831.89	0
129	2.00	1	-0	1	1	-1	2	0.00	752.96	0
130	2.00	2	5	-0	2	6	-0	57.49	872.79	0
131	2.00	3	-2	-2	5	-2	-2	0.00	814.80	0
132	2.00	0	-1	4	0	-2	5	0.00	918.40	0
133	2.00	4	0	2	8	-1	2	0.00	808.47	0

134	2.00	4	-1	2	8	-2	2	0.00	865.62	0
135	2.00	1	-1	3	1	-2	3	0.00	853.40	0
136	2.00	7	-4	1	14	-6	2	0.00	819.30	0
137	2.00	-2	-0	0	-5	-0	0	0.00	752.29	0
138	2.00	2	0	-0	4	-0	-0	0.00	776.31	0
139	2.00	2	2	-1	4	2	-1	72.57	829.83	0
140	2.00	2	-4	-0	4	-5	-0	0.00	786.32	0
141	2.00	4	1	2	7	-0	3	0.00	879.51	3
142	2.00	4	0	-4	8	0	-4	0.00	830.57	3
143	2.00	2	1	-2	3	2	-2	0.00	832.33	0
144	2.00	1	-0	1	1	-1	2	865.90	800.40	0
145	2.00	1	-1	1	1	-2	1	0.00	728.56	0
146	2.00	3	1	1	5	0	1	0.00	831.02	0
147	2.00	3	0	1	7	-0	1	20.89	814.34	0
148	2.00	4	0	-1	8	-0	-1	7.60	732.34	0
149	2.00	-0	-0	3	-1	-1	3	0.00	768.79	0
150	2.00	1	-0	1	3	-0	1	0.00	794.28	0
151	2.00	-1	3	-1	-4	4	-1	143.65	800.95	4
152	2.00	3	3	1	4	3	2	0.00	770.68	3
153	2.00	-1	2	-3	-2	3	-4	38.65	804.50	0
154	2.00	2	1	2	4	1	3	56.88	842.88	0
155	2.00	0	-3	-2	2	-3	-3	0.00	808.83	0
156	2.00	1	0	-2	1	1	-2	0.00	785.89	0
157	2.00	1	2	2	1	2	3	0.00	806.84	4
158	2.00	5	-1	-1	9	-1	-1	0.00	783.52	0
159	2.00	0	-2	2	1	-3	2	0.00	690.51	0
160	2.00	-0	-1	-1	-1	-1	-1	0.00	703.74	0
161	2.00	2	3	-2	4	3	-2	159.54	761.60	0
162	2.00	1	-2	-1	3	-3	-1	0.00	785.13	0
163	2.00	1	1	1	2	0	1	0.00	826.70	0
164	2.00	4	-0	3	8	-2	3	0.00	739.28	0
165	2.00	2	-2	-0	4	-3	-0	0.00	798.54	0
166	2.00	0	2	1	-0	2	1	0.00	764.48	0
167	2.00	-0	0	-3	-1	1	-3	0.00	788.79	0
168	2.00	1	3	-3	0	4	-3	166.72	785.53	0
169	2.00	2	0	3	3	-1	3	0.00	784.52	0
170	2.00	2	3	0	3	3	0	7.22	772.77	0
171	2.00	0	2	-0	-1	3	-0	119.21	766.04	0
172	2.00	1	3	1	1	3	1	36.07	809.11	0
173	2.00	5	1	-0	9	1	-0	45.15	861.68	0
174	2.00	2	-4	1	5	-5	2	0.00	805.05	0
175	2.00	1	1	-2	1	2	-3	0.00	795.28	0
176	2.00	2	2	-1	3	2	-1	78.70	772.38	0
177	2.00	-0	-1	-2	-1	-0	-3	0.00	793.11	0
178	2.00	2	-1	1	5	-2	2	0.00	752.47	0
179	2.00	3	-1	1	5	-2	1	0.00	746.80	0
180	2.00	0	4	1	-1	4	1	0.00	388.41	3
181	2.00	-1	2	1	-5	3	1	0.00	417.53	0
182	2.00	1	1	-4	2	2	-4	0.00	464.66	0
183	2.00	-1	1	-0	-4	1	-0	0.00	555.11	0
184	2.00	-0	3	1	-1	3	2	0.00	624.40	0
185	2.00	0	-0	2	0	-1	2	0.00	598.41	0
186	2.00	-0	2	2	-2	2	3	0.00	513.61	0
187	2.00	1	-1	-0	2	-2	-0	0.00	543.20	0
188	2.00	3	-1	2	5	-2	2	0.00	691.66	0
189	2.00	-2	1	-0	-6	1	-0	0.00	563.98	0
190	2.00	1	-1	1	2	-2	1	0.00	557.39	0
191	2.00	1	6	1	1	6	1	46.15	641.23	0
192	2.00	2	1	-3	4	2	-3	0.00	685.04	0
193	2.00	3	2	-1	5	3	-1	0.00	632.75	0
194	2.00	-1	1	-1	-2	1	-1	0.00	461.06	0
195	2.00	-2	2	-2	-6	3	-2	0.00	670.92	0

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196	2.00	2	2	-1	2	3	-1	134.75	857.79	0
197	2.00	1	4	-1	0	5	-1	66.65	839.17	0
198	2.00	3	3	1	5	3	1	79.19	820.58	0
199	2.00	-0	2	1	-1	3	1	230.03	819.57	0
200	2.00	1	-1	2	2	-1	2	0.00	829.73	0
201	2.00	2	1	-1	3	1	-1	0.00	866.12	0
202	2.00	-0	-3	-4	-0	-3	-4	0.00	889.98	0
203	2.00	4	-0	2	7	-1	3	0.00	896.05	0
204	2.00	5	1	-0	8	1	-0	0.00	793.53	0
205	2.00	0	-1	-1	1	-1	-1	0.00	829.20	0
206	2.00	-1	-1	-1	-2	-1	-1	0.00	837.15	0
207	2.00	2	1	-1	4	1	-1	146.03	827.06	0
208	2.00	0	-1	3	0	-2	3	0.00	894.93	0
209	2.00	1	-0	5	1	-1	6	400.45	809.68	0
210	2.00	1	2	0	1	2	0	0.00	740.24	0
211	2.00	1	1	-2	1	2	-2	0.00	806.64	0
212	2.00	1	1	-0	1	1	-0	0.00	661.71	0
213	2.00	2	2	-0	3	2	-0	69.51	847.82	0
214	2.00	1	3	-1	1	3	-1	71.42	793.34	0
215	2.00	2	-1	1	3	-2	1	0.00	824.56	0
216	2.00	-1	-0	1	-2	-0	1	0.00	789.86	0
217	2.00	1	2	-2	1	3	-2	0.00	844.25	0
218	2.00	1	-1	-1	1	-1	-1	0.00	834.07	0
219	2.00	4	-3	-3	8	-3	-3	0.00	786.18	0
220	2.00	2	1	1	4	0	2	0.00	786.74	0
221	2.00	4	-1	-0	9	-1	-0	0.00	852.81	0
222	2.00	0	4	1	-1	4	1	71.86	778.90	0
223	2.00	1	-1	1	1	-1	2	0.00	818.73	0
224	2.00	0	1	-2	-0	2	-3	151.67	862.09	0
225	2.00	3	-1	-1	5	-2	-1	0.00	819.25	0
226	2.00	3	-1	3	6	-2	3	0.00	818.80	0
227	2.00	2	-4	-0	4	-5	-0	0.00	858.60	0
228	2.00	5	1	-2	10	1	-2	43.99	799.42	0
229	2.00	2	-3	3	4	-5	3	0.00	901.63	0
230	2.00	2	1	1	3	1	1	0.00	866.12	0
231	2.00	3	0	3	5	-1	3	51.21	885.19	0
232	2.00	3	1	-2	5	1	-3	0.00	830.10	0
233	2.00	4	-0	-1	8	-1	-1	0.00	879.55	0
234	2.00	4	1	1	7	0	1	120.60	806.39	0
235	2.00	3	1	-0	4	1	-0	53.64	857.71	0
236	2.00	4	-1	7	8	-3	8	0.00	815.27	0
237	2.00	-0	-2	1	-0	-3	1	0.00	751.79	0
238	2.00	-0	2	-0	-1	2	-0	0.00	774.24	0
239	2.00	1	-2	1	2	-2	1	0.00	812.95	0
240	2.00	1	1	1	2	1	2	26.92	780.75	0
241	2.00	5	-2	-1	10	-2	-1	0.00	850.91	0
242	2.00	3	-2	2	5	-3	2	0.00	789.71	0
243	2.00	4	3	-2	7	4	-3	86.47	825.40	0
244	2.00	2	7	1	2	8	1	136.82	876.47	0
245	2.00	-0	1	2	-1	0	3	0.00	839.52	0
246	2.00	2	3	2	3	3	2	61.10	798.13	0
247	2.00	4	3	1	7	2	1	23.75	832.10	0
248	2.00	2	3	-1	3	3	-1	45.13	814.05	0
249	2.00	3	-0	-2	6	-0	-2	0.00	799.57	0
250	2.00	2	0	3	3	-1	4	11.00	769.41	0
251	2.00	-0	1	0	-1	1	0	0.00	814.48	0
252	2.00	1	-2	-0	2	-2	-0	0.00	767.05	0
253	2.00	2	-1	-0	5	-1	-0	0.00	850.57	0
254	2.00	1	-1	2	2	-2	3	0.00	812.34	5
255	2.00	1	1	1	1	1	1	170.08	842.71	0
256	2.00	3	-1	0	6	-1	0	0.00	794.63	0
257	2.00	2	-0	1	3	-1	1	0.00	819.66	0

258	2.00	3	-3	1	6	-4	1	0.00	829.04	0
259	2.00	1	1	1	1	1	2	0.00	797.31	0
260	2.00	4	0	-1	7	-0	-1	0.00	847.21	0
261	2.00	1	2	1	2	2	1	41.40	793.62	4
262	2.00	0	1	0	-0	1	0	0.00	740.97	0
263	2.00	2	5	3	3	5	3	17.81	791.66	0
264	2.00	3	2	1	6	2	2	93.95	804.02	0
265	2.00	1	-0	-1	2	-0	-1	42.76	772.73	4
266	2.00	2	-1	3	3	-2	3	0.00	809.12	4
267	2.00	2	-2	0	4	-3	0	0.00	824.19	0
268	2.00	-1	5	1	-3	5	1	110.03	823.43	0
269	2.00	1	4	-1	1	5	-1	161.09	849.61	0
270	2.00	3	-0	0	6	-1	0	0.00	863.70	4
271	2.00	3	-1	0	5	-1	0	55.37	858.72	0
272	2.00	3	-2	-1	5	-2	-1	0.00	844.79	0
273	2.00	4	0	0	7	-0	0	0.00	771.08	0
274	2.00	2	1	2	4	1	3	30.04	780.20	0
275	2.00	-2	2	4	-4	2	4	380.39	768.96	5
276	2.00	-2	-1	3	-3	-2	3	0.00	837.76	7
277	2.00	3	0	0	5	-0	0	46.16	769.83	0
278	2.00	1	2	2	2	2	3	53.87	841.88	4
279	2.00	3	1	-1	4	1	-1	88.56	846.65	0
280	2.00	-0	-1	-2	-1	-1	-2	0.00	896.58	0
281	2.00	2	-1	2	3	-2	3	0.00	830.86	0
282	2.00	1	2	1	1	2	1	39.32	861.63	0
283	2.00	2	-3	3	5	-5	3	0.00	749.12	5
284	2.00	4	1	1	8	1	1	0.00	766.68	3
285	2.00	-1	1	-1	-2	1	-1	0.00	752.91	0
286	2.00	1	4	-2	1	5	-2	100.44	755.86	0
287	2.00	-1	1	-0	-2	1	-0	0.00	791.52	0
288	2.00	6	1	-0	10	1	-0	22.31	862.01	0
289	2.00	0	5	-2	-1	7	-3	167.72	829.47	3
290	2.00	1	0	-3	2	1	-3	74.25	845.55	4
291	2.00	-1	-1	0	-2	-1	0	0.00	832.06	0
292	2.00	1	1	-1	2	2	-1	105.60	842.96	0
293	2.00	3	-1	-1	6	-1	-1	0.00	896.96	0
294	2.00	2	1	4	3	0	5	94.90	914.31	4
295	2.00	2	-2	-1	4	-3	-1	0.00	863.89	0
296	2.00	3	-1	-1	7	-2	-1	0.00	804.41	4
297	2.00	1	-2	-1	2	-2	-1	0.00	848.74	0
298	2.00	-2	0	4	-4	-0	4	0.00	850.35	6
299	2.00	-1	-2	2	-1	-2	2	0.00	850.20	0
300	2.00	1	-3	-1	3	-4	-1	0.00	845.94	0
301	2.00	4	2	1	7	2	1	103.91	909.75	0
302	2.00	2	3	-1	3	3	-1	67.03	828.53	3
303	2.00	4	1	1	7	1	2	49.35	862.61	0
304	2.00	1	2	3	2	2	4	18.76	879.24	0
305	2.00	1	3	1	1	3	1	31.08	825.90	3
306	2.00	3	0	2	5	-0	2	76.77	883.28	0
307	2.00	4	3	-1	6	4	-1	85.92	902.61	0
308	2.00	1	-0	-1	1	-0	-1	340.26	759.81	5
309	2.00	0	-0	1	0	-1	2	0.00	848.59	0
310	2.00	2	1	-1	4	1	-1	0.00	842.17	0
311	2.00	4	3	1	6	3	1	7.34	815.31	0
312	2.00	0	-0	1	1	-1	1	681.32	861.23	5
313	2.00	3	2	1	4	1	2	58.62	868.84	3
314	2.00	1	-3	-1	3	-4	-1	0.00	801.72	6
315	2.00	2	1	-1	4	2	-1	0.00	836.72	3
316	2.00	5	2	5	10	1	6	22.33	854.42	3
317	2.00	0	-0	1	0	-1	1	0.00	818.42	0
318	2.00	2	1	2	3	0	3	0.00	800.16	4
319	2.00	2	3	-1	3	4	-1	110.47	901.75	3

320	2.00	7	2	2	12	1	2	73.09	905.15	0
321	2.00	1	0	-2	1	1	-2	0.00	818.65	4
322	2.00	0	-1	3	0	-2	3	0.00	845.69	5
323	2.00	3	-0	3	6	-1	4	3.95	878.78	4
324	2.00	-0	-0	-1	-1	-0	-1	0.00	780.40	0
325	2.00	1	5	2	-0	5	2	163.71	766.43	0
326	2.00	-2	5	1	-5	6	1	170.69	777.42	4
327	2.00	2	1	1	3	1	1	64.29	879.77	4
328	2.00	0	2	-1	-0	3	-1	64.86	838.11	0
329	2.00	8	2	2	15	1	2	12.10	854.95	2
330	2.00	2	2	-0	3	2	-0	189.12	826.15	3
331	2.00	4	-1	-0	8	-2	-0	0.00	810.48	4
332	2.00	1	1	-1	2	1	-1	0.00	746.35	0
333	2.00	4	3	-1	7	4	-1	65.18	863.66	0
334	2.00	-0	-0	-2	-1	0	-3	0.00	796.88	0
335	2.00	5	-0	3	10	-2	3	0.00	774.32	3
336	2.00	1	2	-1	0	3	-1	71.42	868.37	4
337	2.00	1	3	1	0	3	1	0.00	807.96	4
338	2.00	4	-2	1	8	-4	2	0.00	876.81	0
339	2.00	1	3	4	2	3	4	171.74	800.54	3
340	2.00	2	-2	-2	3	-2	-3	0.00	804.96	0
341	2.00	3	0	0	6	-0	0	0.00	783.07	0
342	2.00	6	1	0	12	0	0	21.24	685.64	0
343	2.00	5	2	-1	10	2	-1	64.96	858.44	3
344	2.00	3	1	1	6	1	2	0.00	803.07	0
345	2.00	2	-2	5	4	-3	6	0.00	797.34	5
346	2.00	5	-3	-2	9	-4	-2	0.00	843.76	4
347	2.00	2	0	2	4	-0	3	150.94	845.74	0
348	2.00	8	4	3	14	3	3	53.29	873.69	0
349	2.00	5	-1	-2	9	-1	-3	38.67	866.24	0
350	2.00	0	-2	2	1	-3	2	0.00	842.27	6
351	2.00	4	3	1	7	2	2	24.35	782.49	0
352	2.00	1	-0	-0	1	-0	-0	0.00	792.30	5
353	2.00	3	2	1	5	1	1	0.00	871.01	3
354	2.00	0	4	2	-1	5	3	1.87	813.71	3
355	2.00	2	-3	-2	5	-3	-3	0.00	833.89	5
356	2.00	3	1	0	6	1	0	115.30	806.19	0
357	2.00	1	1	-1	1	2	-1	0.00	870.25	4
358	2.00	1	1	-0	1	1	-0	0.00	861.43	4
359	2.00	4	3	0	6	3	0	39.56	837.35	3
360	2.00	3	1	0	5	0	0	41.08	692.96	4
361	2.00	2	-2	3	5	-4	4	0.00	803.88	5
362	2.00	2	-2	1	4	-3	1	0.00	815.10	5
363	2.00	2	2	1	3	2	2	68.56	751.48	0
364	2.00	7	-2	-2	13	-3	-2	0.00	743.86	0
365	2.00	3	1	-1	6	0	-1	0.00	782.95	3
366	2.00	3	1	-0	5	1	-0	0.28	751.70	0
367	2.00	2	-4	-1	6	-5	-1	0.00	722.90	5
368	2.00	1	1	-3	2	1	-4	154.03	765.83	4
369	2.00	6	2	1	11	1	2	28.62	755.91	0
370	2.00	4	-2	-1	8	-2	-1	0.00	735.04	0
371	2.00	1	1	1	3	1	1	0.00	792.26	0
372	2.00	1	-1	2	1	-2	3	0.00	773.25	0
373	2.00	1	0	-1	1	0	-1	0.00	819.50	0
374	2.00	1	-1	-1	3	-1	-1	2.64	760.85	0
375	2.00	4	1	-0	7	0	-0	0.00	814.03	0
376	2.00	5	0	2	10	-1	2	59.85	804.63	0
377	2.00	1	-1	-3	2	-1	-3	0.00	854.68	0
378	2.00	1	1	1	1	1	2	6.75	791.09	0
379	2.00	3	-1	-2	6	-1	-2	0.00	801.44	4
380	2.00	1	1	2	2	1	3	153.50	807.62	0
381	2.00	2	1	-0	4	2	-1	30.65	800.00	3

382	2.00	0	-1	4	0	-2	4	0.00	773.11	0
383	2.00	3	-1	2	5	-2	2	167.72	805.19	0
384	2.00	2	1	-0	4	1	-0	33.55	853.77	0
385	2.00	5	1	-1	10	1	-1	0.00	825.48	3
386	2.00	2	-0	-2	4	0	-3	0.00	800.07	4
387	2.00	3	1	-1	6	1	-1	119.14	844.04	0
388	2.00	3	-0	1	5	-1	2	0.00	791.76	0
389	2.00	1	-3	-1	3	-3	-1	0.00	803.25	5
390	2.00	5	-1	-0	10	-2	-0	0.00	876.38	0
391	2.00	5	1	3	8	0	3	43.55	890.20	0
392	2.00	1	0	2	2	-0	3	135.62	884.35	0
393	2.00	-0	2	2	-1	2	2	58.20	840.87	0
394	2.00	4	3	-2	7	4	-3	37.87	805.95	0
395	2.00	2	1	3	4	-0	4	29.81	752.93	0
396	2.00	-1	2	1	-3	3	1	362.62	797.60	0
397	2.00	1	1	2	2	1	3	0.00	735.72	0
398	2.00	3	0	1	6	-0	2	0.00	749.64	0
399	2.00	2	1	2	3	0	2	0.00	883.31	0
400	2.00	4	-0	2	8	-1	3	0.00	793.80	0
401	2.00	4	-1	4	7	-3	4	0.00	761.11	0
402	2.00	2	3	-1	3	4	-1	22.50	760.14	0
403	2.00	0	-0	2	0	-1	2	0.00	740.83	0
404	2.00	1	-1	3	1	-2	3	0.00	820.37	0
405	2.00	0	-4	-0	1	-5	-0	0.00	772.32	0
406	2.00	-0	1	-1	-1	1	-1	0.00	800.70	0
407	2.00	3	3	3	4	3	3	72.83	778.68	0
408	2.00	2	0	-2	4	0	-2	0.00	679.85	0
409	2.00	0	1	-3	-0	2	-3	0.00	591.07	4
410	2.00	1	-1	-2	2	-1	-3	0.00	756.83	0
411	2.00	1	1	2	2	1	3	0.00	772.73	0
412	2.00	0	-1	-2	0	-1	-3	0.00	838.77	0
413	2.00	0	1	2	0	0	3	0.00	796.64	0
414	2.00	-1	-1	0	-3	-1	0	0.00	798.62	0
415	2.00	1	1	-0	2	1	-0	0.00	759.99	0
416	2.00	3	-2	0	6	-3	0	0.00	795.21	4
417	2.00	2	-2	3	4	-3	4	0.00	830.01	0
418	2.00	0	0	-0	0	0	-0	0.00	827.05	0
419	2.00	-1	1	-0	-2	1	-0	0.00	751.24	5
420	2.00	-1	2	-1	-2	3	-1	0.00	810.79	0
421	2.00	2	2	-0	3	2	-0	0.00	737.87	0
422	2.00	2	3	3	3	2	3	48.03	828.59	0
423	2.00	3	2	1	5	2	2	78.52	812.63	0
424	2.00	2	-0	1	4	-1	2	0.00	878.03	0
425	2.00	2	-0	-1	3	-0	-1	0.00	890.03	0
426	2.00	0	-2	1	1	-3	2	0.00	895.70	6
427	2.00	1	2	0	1	2	0	166.26	827.99	0
428	2.00	3	-3	-1	6	-4	-1	0.00	762.41	0
429	2.00	1	2	0	1	2	0	88.73	720.08	0
430	2.00	2	0	2	4	-0	2	2.48	853.73	0
431	2.00	3	-1	-2	6	-1	-3	0.00	833.58	0
432	2.00	2	2	2	4	1	3	0.00	793.47	0
433	2.00	4	-0	-4	7	-0	-4	0.00	839.10	0
434	2.00	-1	2	-2	-2	3	-2	0.00	803.02	0
435	2.00	2	-2	-2	4	-2	-2	0.00	780.60	0
436	2.00	4	2	2	6	2	3	0.00	820.13	0
437	2.00	1	1	-0	2	1	-0	0.00	794.42	0
438	2.00	3	2	3	5	1	3	0.00	872.79	3
439	2.00	1	-1	0	1	-1	0	0.00	834.66	0
440	2.00	-0	2	0	-1	3	0	245.14	896.79	0
441	2.00	-0	0	-0	-1	0	-0	0.00	865.14	0
442	2.00	1	-2	2	2	-3	3	0.00	783.50	0
443	2.00	3	1	4	5	-0	5	108.79	804.39	0

444	2.00	2	-1	-2	3	-1	-2	0.00	801.22	0
445	2.00	3	8	2	5	9	2	87.97	809.55	0
446	2.00	1	-1	1	1	-2	1	0.00	852.41	0
447	2.00	3	-1	-1	6	-1	-1	0.00	876.67	4
448	2.00	0	4	3	-1	4	3	196.79	817.63	0
449	2.00	1	-1	2	1	-2	3	0.00	866.95	0
450	2.00	0	3	3	-1	3	3	60.13	859.39	0
451	2.00	3	-2	3	6	-3	3	0.00	801.33	0
452	2.00	2	-0	2	3	-1	2	0.00	768.84	0
453	2.00	2	-0	-3	4	-0	-3	0.00	661.84	0
454	2.00	1	0	-0	1	0	-0	0.00	784.50	4
455	2.00	-1	-4	-1	-1	-4	-1	0.00	837.73	0
456	2.00	0	0	-1	0	0	-1	119.57	868.13	0
457	2.00	3	-1	1	6	-1	1	0.00	844.89	0
458	2.00	1	1	2	2	1	3	249.07	864.44	4
459	2.00	3	1	-1	6	1	-1	0.00	796.21	0
460	2.00	4	1	-1	7	1	-1	0.00	816.12	0
461	2.00	1	2	-1	0	3	-1	58.64	852.84	0
462	2.00	2	1	-1	4	1	-1	29.04	832.97	0
463	2.00	-1	-0	0	-2	-0	0	0.00	773.03	0
464	2.00	0	2	1	-0	2	2	59.15	803.57	4
465	2.00	0	-1	0	0	-1	0	0.00	863.46	0
466	2.00	5	-3	2	11	-5	3	0.00	799.73	0
467	2.00	3	-1	-3	5	-1	-4	0.00	910.12	0
468	2.00	2	4	1	2	4	1	59.08	820.88	0
469	2.00	3	-2	2	5	-4	3	0.00	822.56	5
470	2.00	3	0	1	5	-0	1	0.00	819.44	0
471	2.00	-1	1	3	-2	0	3	0.00	785.48	5
472	2.00	2	1	2	4	0	3	47.05	764.35	0
473	2.00	-1	-2	-1	-1	-2	-1	0.00	662.09	0

REVIEWED
QD Smith, CHP
RSO, Inc.
8/16/08
Date
1-9

Protocol #: 7 SWIPES User : Lab Technician

CHESAPEAKE NUCLEAR
Count Time(minutes): 10.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

REVIEWED
GD Smith, CHP
RSO, Inc.
8/14/08
Date

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	25.9		27.4		222	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	1.0	31.9	1.8	23.7	6.2	12.7
2	0.0		3.8	16.3	5.9	13.0
3	0.0		0.9	33.7	1.1	29.6
4	0.0		0.5	45.6	0.0	
5	0.0		1.0	31.9	0.0	
6	0.0		2.8	19.0	0.0	
7	0.0		0.0		0.0	
8	0.2	74.5	3.4	17.2	3.2	17.6
9	0.0		1.1	30.4	0.0	
10	0.0		0.8	35.8	0.0	
11	0.0		2.7	19.3	0.0	
12	0.0		0.0		4.3	15.2
13	0.3	59.8	0.0		7.2	11.8
14	0.0		1.5	26.0	3.6	16.6
15	2.9	18.6	0.0		2.7	19.1
16	0.0		0.7	38.3	5.4	13.6
17	0.0		2.8	19.0	3.1	17.8
18	0.0		0.0		0.0	
19	0.0		0.0		0.4	47.7
20	0.0		0.0		5.1	13.9
21	0.0		0.0		5.6	13.3
22	0.0		0.0		6.3	12.6
23	0.0		0.0		0.0	
24	0.0		0.5	45.6	2.6	19.5
25	0.0		0.0		0.0	
26	1.3	28.0	0.0		0.0	
27	0.0		0.0		0.0	
28	0.1	112	0.0		0.0	
29	0.0		0.0		0.0	
30	0.0		0.0		0.0	
31	0.0		0.0		0.0	
32	0.0		0.0		0.0	
33	0.0		0.9	33.7	0.0	

Protocol #: 7 SWIPES User : Lab Technicia

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
34	0.0		0.0		0.0	
35	0.0		3.2	17.7	0.0	
36	0.0		0.0		0.0	
37	0.0		0.0		6.8	12.1
38	0.0		0.8	35.8	1.3	27.3
39	0.0		0.0		4.3	15.2
40	0.0		2.4	20.5	3.2	17.6
41	0.0		1.2	29.1	0.0	
42	0.0		2.1	21.9	12.0	9.11
43	0.0		0.0		0.0	
44	0.0		0.0		0.0	

EDITDATA.D07 Archived to C:\ARCH\ARCH07D.239
C:\DATA\P7DATA Copied to C:\DATA\ARCH07A.239

11 Aug 08 12:42:48 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 7
SWIPES
CHESAPEAKE NUCLEAR
COUNT TIME 10.00 Minutes

Window A		Window B		Window C	
LLD:	15 keV	LLD:	75 keV	LLD:	15 keV
ULD:	75 keV	ULD:	165 keV	ULD:	2000 keV
EFF:	79 %	EFF:	85 %	EFF:	70 %

Sample #	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	1	1	2	2	6	9
2	0	0	4	4	6	8
3	0	0	1	1	1	2
4	0	0	1	1	0	0
5	0	0	1	1	0	0
6	0	0	3	3	0	0
7	0	0	0	0	0	0
8	0	0	3	4	3	5
9	0	0	1	1	0	0
10	0	0	1	1	0	0
11	0	0	3	3	0	0
12	0	0	0	0	4	6
13	0	0	0	0	7	10
14	0	0	2	2	4	5
15	3	4	0	0	3	4
16	0	0	1	1	5	8
17	0	0	3	3	3	4
18	0	0	0	0	0	0
19	0	0	0	0	0	1
20	0	0	0	0	5	7

23	0	0	0	0	0	0
24	0	0	1	1	3	4
25	0	0	0	0	0	0
26	1	2	0	0	0	0
27	0	0	0	0	0	0
28	0	0	0	0	0	0
29	0	0	0	0	0	0
30	0	0	0	0	0	0
31	0	0	0	0	0	0
32	0	0	0	0	0	0
33	0	0	1	1	0	0
34	0	0	0	0	0	0
35	0	0	3	4	0	0
36	0	0	0	0	0	0
37	0	0	0	0	7	10
38	0	0	1	1	1	2
39	0	0	0	0	4	6
40	0	0	2	3	3	5
41	0	0	1	1	0	0
42	0	0	2	2	12	17
43	0	0	0	0	0	0
44	0	0	0	0	0	0

Protocol #: 7 SWIPES User : Lab Technician

CHESAPEAKE NUCLEAR

Count Time(minutes):	10.00
Assay Type:	CPM
Background Subtract :	IPA Bkg
Outlier:	5.0 FLAG
%Spillup:	0.00
%Spilldown:	0.00
Screening:	OFF

REVIEWED
GD Smith, CHP
RSO, Inc.
8/14/08
Date

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	25.9		27.4		222	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
45	0.0		0.0		4.4	15.0
46	0.0		0.0		0.0	
47	0.0		0.0		0.0	
48	0.0		0.0		0.0	
49	0.0		0.0		0.0	
50	0.5	45.6	0.0		0.0	
51	0.0		0.0		0.0	
52	0.0		0.0		0.8	34.5
53	0.0		0.0		0.0	
54	0.0		0.2	74.5	0.0	
55	0.0		2.7	19.3	2.2	21.1
56	2.4	20.5	0.0		1.0	31.0
57	0.0		0.5	45.6	3.5	16.8
58	0.1	112	0.0		0.0	

EDITDATA.D07 Archived to C:\ARCH\ARCH07D.240
C:\DATA\P7DATA Copied to C:\DATA\ARCH07A.240

12 Aug 08 07:16:40 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 7
SWIPES
CHESAPEAKE NUCLEAR
COUNT TIME 10.00 Minutes

Window A		Window B		Window C	
LLD:	15 keV	LLD:	75 keV	LLD:	15 keV
ULD:	75 keV	ULD:	165 keV	ULD:	2000 keV
EFF:	79 %	EFF:	85 %	EFF:	70 %

Sample

45	0	0	0	0	0	0
46	0	0	0	0	0	0
47	0	0	0	0	0	0
48	0	0	0	0	0	0
49	0	0	0	0	0	0
50	1	1	0	0	0	0
51	0	0	0	0	0	0
52	0	0	0	0	1	1
53	0	0	0	0	0	0
54	0	0	0	0	0	0
55	0	0	3	3	2	3
56	2	3	0	0	1	1
57	0	0	1	1	4	5
58	0	0	0	0	0	0

REVIEWED
GD Smith, CHP
RSO, Inc.
8/11/08
Date

10 pair

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME: Claude Wiblin	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: Chesapeake Nuclear	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-802
	PROJECT NAME/#: NIH Bldg-C	REVIEWED BY:
CONTACT:	COMMENTS:	SAMPLER:
PHONE: 410-353-6450 FAX:		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
119		Smears		15	11/20/08		10 pack for γ I-125
135				15			LSC for H-3, C-14 & P-32
Cargo				15			
H 1-2				15			
H 1-3				15			
359				15			
377				15			
420A				15			

TRANSFERRED BY: Claude Wiblin	RECEIVED BY: Steve Niland	DATE 11/24/08	TIME	REMARKS:
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

CHESAPEAKE NUCLEAR
Count Time(minutes): 10.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	24.9		26.9		227	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	0.2	64.5	1.1	29.6	0.0	
2	0.0		0.8	34.5	0.0	
3	0.0		0.1	84.5	0.0	
4	0.0		1.5	25.5	0.0	
5	1.5	25.5	1.7	24.0	0.0	
6	1.3	27.3	0.0		0.0	
7	0.0		1.6	24.7	0.4	47.7
8	0.0		0.0		0.0	
9	0.0		0.0		0.0	
10	1.1	29.6	0.5	43.0	0.0	
11	2.7	19.1	0.0		0.0	
12	0.3	54.2	1.9	22.7	3.6	16.6
13	0.0		1.2	28.4	0.0	
14	1.3	27.3	0.8	34.5	0.0	
15	0.1	84.5	0.0		0.0	
16	0.2	64.5	2.0	22.1	2.6	19.5

EDITDATA.D07 Archived to C:\ARCH\ARCH07D.241
C:\DATA\P7DATA Copied to C:\DATA\ARCH07A.241

26 Nov 08 10:15:18 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 7
SWIPES
CHESAPEAKE NUCLEAR
COUNT TIME 10.00 Minutes

Window A		Window B		Window C	
LLD:	15 keV	LLD:	75 keV	LLD:	15 keV
ULD:	75 keV	ULD:	165 keV	ULD:	2000 keV
EFF:	79 %	EFF:	85 %	EFF:	70 %

Sample #	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	0	0	1	1	0	0

2	0	0	1	1	0	0
3	0	0	0	0	0	0
4	0	0	2	2	0	0
5	2	2	2	2	0	0
6	1	2	0	0	0	0
7	0	0	2	2	0	1
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	1	1	1	1	0	0
11	3	3	0	0	0	0
12	0	0	2	2	4	5
13	0	0	1	1	0	0
14	1	2	1	1	0	0
15	0	0	0	0	0	0
16	0	0	2	2	3	4

Protocol# 1 - Triple Lable DPM.lsa User: NIH

NIH

Assay Definition-

Assay Description:
CHESAPEAKE NUCLEAR

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\NIH\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\NIH\Triple Lable DPM\20081126_1736.results
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Sets:
Low Energy: 3H-Tol-3-10-08
Mid Energy: 14C-TOL-07-17-06
High Energy: 32P-UG-02-28-05
Count Time (min): 3.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: On
Colored Samples: On Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	SIS	tSIE	LUM
1	10.00	4	9	5	0	0	0	70.28	531.84	2
2	3.00	-1	-2	-0	-3	-2	-0	0.00	507.37	0
3	3.00	3	-2	1	8	-3	1	0.00	531.67	0
4	3.00	1	-2	-1	4	-3	-1	0.00	512.93	3
5	3.00	1	-1	2	3	-2	3	48.71	495.04	3
6	3.00	6	0	-0	15	-0	-0	0.00	538.01	2
7	3.00	14	4	2	35	2	3	12.50	496.88	0
8	3.00	-1	-1	0	-2	-2	0	0.00	498.81	0
9	3.00	0	-0	1	1	-1	1	0.00	491.61	0

10	3.00	2	-2	-1	5	-2	-1	0.00	559.08	3
11	3.00	0	2	2	0	2	3	0.00	521.80	0
12	3.00	-0	1	2	-1	0	3	179.57	545.64	0
13	3.00	-2	5	1	-5	6	1	52.54	525.09	2
14	3.00	-2	-0	0	-4	-0	0	0.00	510.04	3
15	3.00	0	-1	1	1	-1	1	0.00	513.31	0
16	3.00	1	5	-2	1	7	-2	74.28	508.72	2
17	3.00	1	0	0	2	-0	0	0.00	512.02	2
18	3.00	1	-1	-1	2	-2	-2	0.00	506.84	3
19	3.00	0	-2	0	1	-3	0	0.00	488.56	0
20	3.00	-2	-1	-1	-4	-1	-1	0.00	530.43	3
21	3.00	1	-1	-3	3	-1	-3	0.00	493.84	3
22	3.00	2	1	1	3	0	1	73.10	554.44	0
23	3.00	-0	-2	0	-1	-2	0	0.00	518.83	3
24	3.00	2	2	1	3	2	1	11.21	546.92	2
25	3.00	-3	-1	0	-7	-1	0	0.00	505.92	4
26	3.00	-1	2	1	-2	2	1	66.36	503.71	2
27	3.00	1	-0	1	2	-1	1	0.00	541.92	3
28	3.00	1	3	-1	2	4	-1	23.83	492.21	2
29	3.00	5	-2	2	11	-3	3	0.00	555.83	12
30	3.00	2	1	2	5	1	2	0.00	503.90	0
31	3.00	-0	-1	-1	-0	-1	-1	0.00	521.18	3
32	3.00	1	0	-1	2	0	-2	0.00	533.54	2
33	3.00	2	3	1	4	3	2	35.24	515.70	0
34	3.00	-4	-0	1	-10	-0	1	0.00	479.34	4
35	3.00	-1	0	-1	-2	1	-2	0.00	483.75	3
36	3.00	-0	-3	-1	0	-3	-2	0.00	560.47	3
37	3.00	0	-1	1	0	-1	1	0.00	502.14	3
38	3.00	-0	1	1	-1	1	1	148.60	496.03	2
39	3.00	1	-0	0	3	-1	0	0.00	593.12	0
40	3.00	1	-1	-0	3	-2	-0	0.00	499.69	3
41	3.00	1	0	1	3	-0	1	15.66	503.66	2
42	3.00	-0	0	-1	-1	0	-2	0.00	486.70	3
43	3.00	1	-2	-2	4	-2	-2	0.00	506.81	3
44	3.00	1	-2	0	4	-2	0	0.00	508.86	3
45	3.00	1	0	-3	1	1	-4	73.17	533.55	2
46	3.00	2	-0	1	4	-1	1	55.55	510.31	2
47	3.00	2	-1	1	5	-2	1	0.00	537.86	3
48	3.00	2	-1	1	5	-1	2	0.00	544.25	0
49	3.00	-2	2	3	-4	2	4	0.00	526.98	2
50	3.00	0	-3	0	2	-4	0	0.00	549.83	0
51	3.00	-0	2	-1	-1	3	-1	0.00	533.72	0
52	3.00	-1	2	2	-3	3	2	117.56	544.04	0
53	3.00	-2	0	1	-5	0	1	0.00	535.40	0
54	3.00	3	0	0	6	-0	0	0.00	555.22	2
55	3.00	-0	-1	-1	-0	-1	-1	0.00	527.89	0
56	3.00	-1	1	3	-3	1	4	0.00	516.23	0
57	3.00	1	-0	2	2	-1	2	0.00	522.25	3
58	3.00	1	0	0	3	-0	0	77.62	543.92	0
59	3.00	-0	2	-1	-1	3	-1	18.08	523.24	2
60	3.00	1	-0	0	2	-0	0	0.00	507.62	3
61	3.00	1	0	0	2	0	0	0.00	536.10	2
62	3.00	-0	-1	1	-0	-2	1	0.00	552.64	3
63	3.00	-0	1	1	-1	1	1	0.00	519.31	3
64	3.00	-2	-3	-0	-5	-3	-0	0.00	494.38	8
65	3.00	0	0	0	1	-0	0	63.52	540.06	3
66	3.00	-0	-2	3	-0	-4	3	0.00	503.34	7
67	3.00	1	-1	1	4	-2	2	0.00	572.02	3
68	3.00	1	-0	2	2	-1	2	0.00	538.71	3
69	3.00	3	-2	1	7	-3	1	0.00	507.03	5
70	3.00	0	-1	-1	0	-1	-2	0.00	503.48	3
71	3.00	-1	-1	2	-2	-1	2	0.00	597.82	3

NIH

72	3.00	-1	1	1	-3	1	1	0.00	509.74	3
73	3.00	-0	-3	1	-0	-3	1	0.00	523.20	3
74	3.00	1	-4	2	4	-5	3	0.00	484.16	3
75	3.00	-0	1	-2	-1	1	-2	0.00	520.50	3
76	3.00	-1	3	0	-2	3	0	78.45	493.59	2
77	3.00	-1	2	-2	-2	3	-2	85.84	526.47	0
78	3.00	-2	1	0	-5	1	0	0.00	568.42	3
79	3.00	0	-2	2	1	-3	2	0.00	524.92	3
80	3.00	-0	-0	0	-1	-0	0	0.00	515.95	3
81	3.00	0	-1	-1	1	-1	-1	0.00	510.23	3
82	3.00	1	1	-1	1	2	-2	0.00	523.89	2
83	3.00	1	-2	1	2	-3	1	0.00	536.54	3
84	3.00	1	0	0	2	-0	0	111.62	515.01	2
85	3.00	-1	3	1	-3	3	1	104.31	518.37	2
86	3.00	-1	2	1	-3	2	1	0.00	504.89	2
87	3.00	0	1	0	0	1	0	58.58	500.57	2
88	3.00	1	-2	0	3	-3	0	0.00	581.29	6
89	3.00	3	-2	0	7	-3	0	0.00	504.96	3
90	3.00	-2	-0	-1	-5	0	-1	0.00	499.01	6
91	3.00	1	2	2	1	2	3	0.00	522.24	4
92	3.00	0	1	1	-0	1	1	12.86	545.12	2
93	3.00	-1	1	0	-2	1	0	2353.73	518.31	3
94	3.00	2	-2	2	6	-3	2	0.00	528.91	5
95	3.00	-0	0	-0	-1	1	-0	818.28	512.54	3
96	3.00	1	-1	0	2	-2	0	0.00	499.89	3
97	3.00	2	0	0	4	-0	0	0.00	557.77	2
98	3.00	1	1	1	2	0	2	0.00	500.15	2
99	3.00	-2	-3	-1	-3	-4	-1	0.00	508.17	4
100	3.00	1	1	1	1	1	2	0.00	507.69	2
101	3.00	0	-1	1	1	-1	1	0.00	550.93	5
102	3.00	-0	-1	-2	-0	-1	-2	0.00	551.47	3
103	3.00	2	1	2	4	1	2	38.33	506.62	2
104	3.00	-0	-1	0	-0	-1	0	0.00	511.41	3
105	3.00	2	-4	3	5	-6	4	0.00	519.01	3
106	3.00	-2	2	0	-4	3	0	443.78	526.48	3
107	3.00	2	49	2	-11	59	3	72.97	500.57	1
108	3.00	-2	-0	-2	-4	1	-2	0.00	510.55	3
109	3.00	1	0	2	2	-0	3	0.00	564.93	5
110	3.00	-1	-1	-1	-1	-1	-2	0.00	533.80	3
111	3.00	-1	0	-0	-3	0	-0	0.00	513.31	3
112	3.00	-0	2	1	-1	3	1	16.80	500.71	2
113	3.00	-0	2	0	-1	3	0	146.76	558.76	6
114	3.00	-2	-2	1	-3	-2	1	0.00	532.06	4
115	3.00	0	-2	-2	1	-2	-2	0.00	497.50	3
116	3.00	-2	1	1	-6	1	1	0.00	487.87	3
117	3.00	3	1	2	7	1	3	40.12	549.54	2
118	3.00	-0	-1	1	0	-2	2	0.00	566.90	3
119	3.00	-1	3	-3	-2	4	-3	13.29	514.01	2
120	3.00	1	2	-1	1	3	-1	53.94	522.59	2
121	3.00	1	1	1	2	1	1	0.00	520.66	2

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME: Chesapeake Nuclear Svcs.	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: 788 Sonne Drive	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-521
Annapolis, MD 21401	PROJECT NAME/#: Bayview	REVIEWED BY:
CONTACT: Claude Wiblin	COMMENTS:	SAMPLER:
PHONE: 410-353-6450 FAX: 410-266-5811		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
310				18	6/08		γ - I-125
372				15			LSC - H-3, C-14, P-32
383				15			
309				17			
301				16			
363			21	19			Actual 21 wipes GDS
332				18			
311				19			
112				20			
111			21	20			Actual 21 wipes GDS
324				15			
329				19			

TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	REMARKS:
C Wiblin	[signature]	7/29		G. Smith indicated 10 smears at a time for γ and then LSC.
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

Total 340 wipe test samples GDS

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME: Chesapeake Nuclear Svcs.	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: 788 Sonne Drive	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-521
Annapolis, MD 21401	PROJECT NAME/#: Bayview	REVIEWED BY:
CONTACT: Claude Wiblin	COMMENTS:	SAMPLER:
PHONE: 410-353-6450 FAX: 410-266-5811		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
387			16	15	6/08		γ: I-125 Actual 16 wipe OKS
Hall 1-2				15			LSC: H-3, C-14, P-32
312				15			
105			20	~~19~~			20 Actual 20 wipe OKS
368				20			
361				22			
112A				18			

TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	REMARKS:
C. Wiblin	G. Smith	7/29/08		G. Smith indicated 10 samples at a time for γ and then LSC.
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

Assay Definition-

Assay Description:
CHESAPEAKE NUCLEAR

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\20080804_1025.results
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Sets:
Low Energy: 3H-Tol-3-10-08
Mid Energy: 14C-TOL-07-17-06
High Energy: 32P-UG-02-28-05
Count Time (min): 2.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: On
Colored Samples: On Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	SIS	tSIE	LUM
1	10.00	4	9	6	0	0	0	52.09	417.07	2
2	2.00	4	-1	1	15	-2	2	0.00	369.58	0
3	2.00	2	3	0	4	3	0	47.92	381.12	0
4	2.00	-2	-4	-2	-3	-5	-2	0.00	424.34	0
5	2.00	3	2	-1	8	2	-1	91.84	396.41	0
6	2.00	0	4	-1	-0	5	-1	50.95	392.66	0
7	2.00	-1	-1	-1	-1	-1	-1	0.00	388.37	0
8	2.00	-0	1	-4	-0	2	-4	0.00	418.90	0

9	2.00	1	5	-0	0	6	-0	48.04	379.71	0
10	2.00	0	-1	1	2	-2	2	0.00	402.24	0
11	2.00	1	4	-0	2	5	-0	68.10	430.36	0
12	2.00	-2	1	-3	-7	3	-3	0.00	411.71	0
13	2.00	0	0	2	0	-0	3	57.30	364.56	0
14	2.00	0	3	0	0	4	0	84.30	383.42	0
15	2.00	0	-3	0	3	-4	0	0.00	363.62	0
16	2.00	0	2	-2	1	2	-2	34.59	405.23	0
17	2.00	-0	-1	2	0	-2	2	0.00	393.65	4
18	2.00	1	0	-2	2	1	-2	124.55	389.79	0
19	2.00	1	1	1	2	1	1	100.70	449.38	3
20	2.00	0	-2	-4	1	-1	-5	0.00	415.45	0
21	2.00	2	-3	3	5	-4	3	0.00	404.26	0
22	2.00	0	5	2	-0	5	2	40.64	446.37	0
23	2.00	1	-2	-2	3	-3	-2	0.00	462.03	0
24	2.00	-0	-0	-3	-1	1	-3	0.00	456.15	0
25	2.00	2	3	-2	4	4	-3	89.29	417.23	0
26	2.00	2	0	-4	4	1	-5	225.18	406.77	0
27	2.00	2	2	-1	5	2	-1	59.43	426.42	0
28	2.00	-2	0	-2	-4	1	-3	0.00	422.80	0
29	2.00	1	4	0	1	4	0	47.03	462.61	0
30	2.00	1	2	-2	1	3	-3	57.36	435.38	0
31	2.00	-1	1	-4	-3	2	-5	0.00	430.65	0
32	2.00	0	-1	-1	2	-1	-1	0.00	449.38	0
33	2.00	-1	-1	1	-2	-2	2	0.00	459.74	0
34	2.00	1	3	0	3	4	0	77.34	419.26	0
35	2.00	-1	2	-1	-4	2	-1	99.03	405.27	0
36	2.00	-1	2	2	-3	2	2	325.17	438.62	0
37	2.00	-2	-1	-1	-5	-0	-1	0.00	417.21	0
38	2.00	0	-0	-1	1	-0	-1	0.00	435.05	0
39	2.00	-0	-1	-3	-1	-0	-3	0.00	427.58	0
40	2.00	-2	-2	0	-4	-2	0	0.00	398.44	0
41	2.00	1	-3	1	4	-4	1	0.00	446.93	0
42	2.00	-2	1	-2	-5	1	-3	0.00	428.14	0
43	2.00	-0	-2	-0	-0	-2	-0	0.00	421.06	0
44	2.00	-1	3	1	-5	4	1	207.13	419.33	0
45	2.00	1	-0	-0	2	-0	-0	153.60	470.14	0
46	2.00	-1	1	-0	-3	1	-0	0.00	436.21	0
47	2.00	-0	-2	-1	1	-3	-1	0.00	415.70	0
48	2.00	0	1	-1	-0	2	-1	195.65	418.24	0
49	2.00	-0	-3	1	1	-4	1	0.00	441.48	0
50	2.00	-1	7	-0	-6	8	-0	105.74	392.95	0
51	2.00	-1	-2	-1	-2	-2	-1	0.00	413.49	5
52	2.00	2	-1	-0	5	-1	-0	224.06	514.11	4
53	2.00	-0	-2	5	-1	-3	6	0.00	406.16	5
54	2.00	2	-3	0	6	-4	0	0.00	490.95	4
55	2.00	-1	-4	-2	-2	-4	-2	0.00	445.99	0
56	2.00	-1	-1	3	-2	-2	3	0.00	508.58	0
57	2.00	0	3	0	-0	4	0	120.08	486.07	3
58	2.00	1	1	-1	3	1	-1	119.32	427.43	3
59	2.00	-2	1	0	-6	2	0	0.00	464.80	4
60	2.00	1	-1	1	3	-2	2	0.00	434.90	4
61	2.00	-1	0	-1	-2	1	-1	0.00	430.68	4
62	2.00	-1	-1	-1	-3	-1	-1	0.00	461.58	5
63	2.00	1	1	-2	1	2	-3	120.46	419.22	0
64	2.00	-1	2	0	-4	2	0	331.75	370.95	4
65	2.00	-0	-2	-1	0	-2	-1	0.00	492.14	0
66	2.00	1	0	-4	2	1	-4	242.52	472.63	0
67	2.00	-3	-0	3	-7	-1	3	0.00	427.65	5
68	2.00	1	4	-1	1	5	-1	106.95	443.82	0
69	2.00	-0	-1	-1	0	-1	-1	0.00	396.74	0
70	2.00	-1	-2	1	-1	-3	2	0.00	435.03	0

71	2.00	1	-3	1	4	-4	2	0.00	408.20	0
72	2.00	1	3	-1	1	4	-1	103.80	408.66	0
73	2.00	-0	1	0	-1	2	0	225.66	425.89	4
74	2.00	2	1	-1	6	0	-1	44.19	440.38	3
75	2.00	-1	-0	-4	-3	1	-4	0.00	401.25	5
76	2.00	-0	-1	2	0	-2	3	0.00	401.12	0
77	2.00	-2	-2	0	-4	-2	0	0.00	436.37	0
78	2.00	3	1	-2	9	1	-2	95.18	429.00	0
79	2.00	-1	2	1	-2	2	1	338.01	407.75	4
80	2.00	-1	4	2	-3	4	2	176.34	428.11	0
81	2.00	1	-1	-3	3	-1	-3	0.00	404.19	4
82	2.00	-0	0	2	-0	-0	2	0.00	401.45	4
83	2.00	1	-2	2	2	-2	2	0.00	452.40	4
84	2.00	-0	-0	-3	-0	0	-3	0.00	420.85	0
85	2.00	1	5	-2	1	6	-2	64.90	407.12	0
86	2.00	-2	2	-1	-5	2	-1	0.00	425.36	0
87	2.00	2	-3	-1	6	-4	-1	0.00	427.01	0
88	2.00	-1	2	-3	-2	3	-3	235.24	447.68	4
89	2.00	0	3	1	0	3	2	0.00	431.74	3
90	2.00	-0	1	-2	-1	2	-3	233.69	397.21	4
91	2.00	1	-1	0	4	-1	0	375.09	445.74	0
92	2.00	-1	1	-3	-2	1	-3	0.00	424.52	0
93	2.00	3	1	1	8	-0	2	0.62	437.07	3
94	2.00	-2	2	0	-6	3	0	0.00	451.24	4
95	2.00	2	0	-3	7	0	-3	0.00	458.00	0
96	2.00	-2	1	1	-5	1	1	0.00	392.77	0
97	2.00	-0	-1	-2	0	-1	-3	0.00	405.63	5
98	2.00	0	-5	-2	2	-6	-2	0.00	427.84	7
99	2.00	-1	1	-1	-3	2	-1	609.42	407.44	4
100	2.00	-1	1	1	-4	2	1	0.00	427.10	0
101	2.00	-2	-1	-3	-5	-0	-3	0.00	413.42	0
102	2.00	-0	2	1	-1	2	2	112.43	397.53	3
103	2.00	-1	2	-1	-3	3	-1	285.53	425.65	4
104	2.00	1	-1	-1	4	-2	-1	0.00	436.05	4
105	2.00	1	-1	-1	3	-2	-1	0.00	425.44	8
106	2.00	-0	-0	-3	-0	0	-4	0.00	482.99	4
107	2.00	2	-4	-2	7	-5	-2	0.00	453.61	5
108	2.00	0	0	-1	0	1	-1	9.15	460.43	4
109	2.00	0	2	-2	1	2	-3	51.04	474.60	3
110	2.00	1	1	0	3	1	0	27.83	459.37	3
111	2.00	0	0	-1	1	0	-1	599.79	448.29	4
112	2.00	-1	-0	-1	-1	-0	-1	0.00	447.02	9
113	2.00	1	2	1	2	2	1	130.87	458.57	3
114	2.00	2	-1	0	8	-2	0	24.45	400.70	4
115	2.00	2	-3	3	6	-5	3	0.00	472.14	4
116	2.00	-1	0	-1	-3	0	-1	0.00	449.26	9
117	2.00	1	-1	-2	3	-1	-2	0.00	450.26	8
118	2.00	-3	0	-0	-8	1	-0	0.00	430.83	5
119	2.00	1	2	0	2	2	0	15.84	407.67	3
120	2.00	-2	-0	-2	-4	0	-2	0.00	424.51	5
121	2.00	0	1	-3	1	1	-3	93.25	463.78	0
122	2.00	2	-1	-1	4	-1	-1	0.00	454.22	4
123	2.00	-2	-1	0	-4	-1	0	0.00	469.86	0
124	2.00	-1	0	-2	-3	1	-2	0.00	401.97	0
125	2.00	-2	3	-2	-6	4	-3	0.00	429.07	4
126	2.00	1	1	3	3	-0	4	222.40	425.06	4
127	2.00	0	3	-1	0	3	-1	165.37	398.75	0
128	2.00	3	-1	-1	8	-2	-1	0.00	448.99	4
129	2.00	1	3	1	2	4	2	113.01	434.50	3
130	2.00	1	-2	-2	4	-2	-2	0.00	400.96	0
131	2.00	-1	-0	-3	-2	0	-4	0.00	408.37	4
132	2.00	-0	1	-1	-1	2	-1	61.95	436.91	0

133	2.00	-1	3	-2	-4	4	-2	109.62	424.76	0
134	2.00	1	-1	-4	2	0	-4	0.00	382.14	0
135	2.00	1	1	0	2	1	0	87.54	460.38	0
136	2.00	-0	-2	1	0	-3	2	0.00	412.69	5
137	2.00	-2	2	-0	-5	3	-0	0.00	394.95	0
138	2.00	2	-0	-0	6	-1	-0	60.83	397.26	4
139	2.00	1	-1	-1	2	-1	-1	0.00	431.58	4
140	2.00	-2	1	-1	-7	2	-1	0.00	392.74	4
141	2.00	3	-1	-2	9	-1	-3	36.19	387.57	0
142	2.00	0	3	-3	0	4	-3	192.30	429.45	3
143	2.00	-1	-1	-2	-3	-1	-3	0.00	403.21	5
144	2.00	-1	-0	-1	-1	-0	-1	0.00	446.85	4
145	2.00	4	1	1	9	1	2	42.08	450.48	3
146	2.00	1	-3	1	5	-4	1	0.00	430.94	0
147	2.00	1	-3	1	4	-4	1	0.00	458.74	0
148	2.00	-0	1	-1	-1	2	-1	197.58	398.29	0
149	2.00	-2	1	2	-6	1	2	0.00	443.77	4
150	2.00	0	0	1	1	-0	2	0.00	446.80	4
151	2.00	2	1	0	5	0	0	114.82	462.39	0
152	2.00	0	-0	0	1	-1	0	428.05	420.90	0
153	2.00	-0	-1	-3	0	-1	-3	0.00	470.20	5
154	2.00	0	3	1	-0	3	1	40.45	414.40	3
155	2.00	-0	-1	3	-1	-2	3	0.00	428.30	5
156	2.00	1	2	2	3	1	3	145.32	370.91	3
157	2.00	-1	2	-3	-4	3	-3	175.91	423.79	4
158	2.00	3	-0	1	7	-1	1	89.14	471.28	0
159	2.00	-0	-2	-1	1	-2	-1	0.00	440.17	5
160	2.00	2	-0	-2	6	-1	-2	86.51	411.19	0
161	2.00	1	0	-0	3	0	-0	53.13	395.22	4
162	2.00	-0	-1	-3	0	-1	-4	0.00	394.20	5
163	2.00	1	-0	1	5	-1	2	0.00	408.17	4
164	2.00	1	3	1	2	3	2	77.88	428.56	3
165	2.00	3	1	0	7	1	0	83.90	437.11	3
166	2.00	2	-0	-1	5	-0	-1	0.00	428.21	4
167	2.00	-1	2	-2	-4	4	-2	0.00	361.39	0
168	2.00	1	3	-0	1	3	-0	92.10	440.86	3
169	2.00	1	1	-1	3	2	-1	0.00	424.66	3
170	2.00	-1	-1	-4	-1	-1	-4	0.00	407.54	0
171	2.00	-1	1	1	-2	1	1	781.15	425.71	0
172	2.00	-2	-3	2	-3	-5	3	0.00	447.47	7
173	2.00	2	4	-1	3	5	-1	36.54	412.25	0
174	2.00	-2	-0	-1	-5	-0	-1	0.00	437.11	0
175	2.00	1	-1	-3	4	-1	-3	0.00	428.20	4
176	2.00	-2	-3	-0	-5	-3	-0	0.00	386.89	0
177	2.00	-0	-3	-1	1	-4	-1	0.00	438.43	5
178	2.00	2	-0	5	7	-2	6	20.95	495.59	3
179	2.00	-0	2	-3	-1	3	-4	224.00	487.19	0
180	2.00	-2	-0	-0	-6	0	-0	0.00	408.72	5
181	2.00	2	-1	-2	5	-1	-2	0.00	432.67	0
182	2.00	2	-3	-1	6	-4	-1	0.00	491.79	4
183	2.00	-1	-2	1	-1	-3	2	0.00	493.78	0
184	2.00	3	-2	1	8	-3	1	59.55	491.69	0
185	2.00	-0	6	0	-3	7	-0	167.02	468.76	3
186	2.00	0	-0	-2	0	0	-3	0.00	436.13	0
187	2.00	1	-1	-1	3	-1	-1	0.00	448.68	4
188	2.00	-0	2	-2	-1	2	-2	130.38	435.72	4
189	2.00	1	0	-2	2	1	-3	0.00	438.60	0
190	2.00	1	-4	-2	5	-5	-2	0.00	452.95	5
191	2.00	1	-3	-0	3	-4	-0	0.00	468.36	5
192	2.00	1	-4	-0	5	-5	-0	0.00	459.51	5
193	2.00	-0	1	-2	-1	1	-3	52.48	439.11	4
194	2.00	-1	0	1	-3	-0	2	0.00	447.12	4

195	2.00	0	-4	-1	3	-5	-1	0.00	441.85	6
196	2.00	6	3	0	14	3	0	60.21	469.96	0
197	2.00	1	1	0	2	0	0	252.89	512.17	4
198	2.00	0	-2	-1	2	-3	-1	0.00	434.97	5
199	2.00	-1	-1	1	-1	-1	1	0.00	490.01	0
200	2.00	1	-1	-0	3	-2	-0	0.00	479.12	0
201	2.00	0	2	2	1	2	2	56.40	482.08	3
202	2.00	-1	-1	2	-4	-1	2	0.00	459.05	0
203	2.00	-0	2	-2	-1	3	-2	146.14	480.31	0
204	2.00	1	-1	-0	4	-2	-0	0.00	480.50	0
205	2.00	-1	4	1	-5	5	1	122.57	468.46	0
206	2.00	0	2	-3	1	3	-3	68.92	404.85	0
207	2.00	-2	-1	-3	-6	-0	-3	0.00	390.83	5
208	2.00	-2	1	-2	-5	2	-3	0.00	470.68	0
209	2.00	-2	2	1	-5	3	1	601.39	478.07	0
210	2.00	1	0	-3	3	1	-3	45.31	412.65	0
211	2.00	2	1	-0	7	0	-0	0.00	417.97	0
212	2.00	1	-4	-1	4	-5	-1	0.00	469.28	5
213	2.00	-1	-2	-1	-2	-3	-1	0.00	510.53	0
214	2.00	-3	-1	-1	-7	-0	-1	0.00	444.90	0
215	2.00	1	-1	-1	3	-1	-1	0.00	519.90	4
216	2.00	-0	1	1	-0	1	2	92.45	460.96	0
217	2.00	3	5	-3	5	6	-3	61.06	497.49	3
218	2.00	0	-2	-0	2	-3	-0	0.00	442.34	5
219	2.00	-2	-1	-3	-4	-0	-4	0.00	486.12	0
220	2.00	0	-0	-2	1	-0	-2	0.00	441.77	4
221	2.00	0	0	-2	1	1	-3	76.56	462.10	4
222	2.00	-1	3	-1	-4	4	-1	268.52	445.42	0
223	2.00	-0	0	-1	-1	1	-1	0.00	458.18	4
224	2.00	1	-1	-2	2	-1	-2	0.00	461.51	4
225	2.00	-2	-0	-3	-4	0	-3	0.00	460.25	0
226	2.00	1	1	3	4	-0	3	225.58	486.73	3
227	2.00	-2	1	0	-5	1	0	0.00	433.25	0
228	2.00	2	-1	-1	4	-1	-1	90.04	460.76	0
229	2.00	-0	1	1	-1	1	1	306.72	457.60	0
230	2.00	-1	0	0	-3	0	0	0.00	456.59	0
231	2.00	1	-1	-3	2	-1	-4	0.00	476.93	0
232	2.00	-2	-0	-1	-5	0	-2	0.00	386.14	0
233	2.00	0	-2	1	1	-2	1	0.00	455.34	0
234	2.00	3	5	-4	7	6	-4	93.91	482.91	0
235	2.00	-2	-1	2	-4	-2	3	0.00	446.78	0
236	2.00	3	1	-1	7	1	-1	9.87	433.15	0
237	2.00	-2	-2	-1	-5	-3	-1	0.00	390.73	0
238	2.00	0	2	-2	1	2	-3	3.69	377.04	0
239	2.00	-0	-2	-2	1	-3	-2	0.00	398.55	0
240	2.00	1	2	-1	1	2	-1	151.74	425.11	0
241	2.00	2	1	-3	7	1	-4	0.00	396.37	0
242	2.00	-2	-0	-1	-6	0	-1	0.00	430.13	0
243	2.00	2	-2	2	6	-3	2	0.00	430.26	0
244	2.00	-1	1	1	-2	1	2	636.70	434.66	0
245	2.00	-0	-0	-1	0	-0	-1	0.00	465.75	0
246	2.00	-1	-3	-1	-1	-4	-1	0.00	469.38	6
247	2.00	2	-1	0	6	-2	0	0.00	441.66	0
248	2.00	0	-1	-3	1	-1	-3	0.00	434.80	0
249	2.00	1	-1	-1	4	-1	-1	112.51	486.81	0
250	2.00	-1	-1	-0	-2	-1	-0	0.00	471.20	5
251	2.00	1	0	0	2	0	0	68.37	470.53	4
252	2.00	-1	3	-0	-3	3	-0	106.30	480.92	4
253	2.00	-0	-3	1	1	-4	1	0.00	471.07	0
254	2.00	1	-2	-4	4	-2	-4	0.00	483.57	4
255	2.00	1	-1	-1	3	-1	-1	0.00	511.62	4
256	2.00	-1	-4	4	-1	-6	5	0.00	459.40	7

257	2.00	0	-2	-2	2	-2	-2	0.00	477.98	0
258	2.00	-0	-3	-3	1	-3	-4	0.00	469.19	0
259	2.00	1	-0	0	3	-1	0	241.87	436.57	4
260	2.00	-2	-4	1	-4	-5	1	0.00	414.04	0
261	2.00	2	1	2	5	-0	2	100.70	452.13	0
262	2.00	3	-1	-1	8	-2	-1	0.00	407.83	0
263	2.00	-0	2	-2	-1	2	-2	224.00	433.83	0
264	2.00	-0	1	-3	-1	2	-3	446.35	412.86	0
265	2.00	3	0	2	8	-1	3	29.48	457.24	0
266	2.00	0	-1	2	1	-2	3	0.00	434.97	4
267	2.00	-1	-3	1	-2	-4	2	0.00	435.29	6
268	2.00	2	4	-3	6	5	-3	46.57	395.51	0
269	2.00	0	-1	-3	1	-1	-3	0.00	390.04	0
270	2.00	0	-2	-0	2	-3	-0	0.00	368.05	0
271	2.00	0	-3	0	3	-5	0	0.00	367.44	0
272	2.00	-1	-2	1	-1	-3	2	0.00	378.63	5
273	2.00	0	-1	-3	1	-1	-4	0.00	382.80	4
274	2.00	1	-2	-1	4	-3	-1	0.00	420.16	5
275	2.00	-2	0	0	-5	1	0	0.00	429.02	0
276	2.00	1	-0	-3	2	0	-3	81.37	435.47	0
277	2.00	-0	-0	-0	-1	-0	-0	0.00	464.52	4
278	2.00	-2	3	-3	-5	5	-4	247.01	449.09	0
279	2.00	-1	1	-1	-3	2	-1	245.08	403.81	0
280	2.00	0	0	2	1	-0	3	431.26	427.92	4
281	2.00	2	1	-2	4	1	-2	83.78	465.37	0
282	2.00	3	-1	-0	8	-2	-0	62.43	498.72	4
283	2.00	-0	-0	-1	-1	-0	-1	0.00	468.98	4
284	2.00	-2	-3	-1	-3	-3	-1	0.00	446.96	0
285	2.00	0	2	-3	1	3	-4	100.70	450.60	0
286	2.00	-1	-1	1	-2	-1	1	0.00	431.03	0
287	2.00	-1	1	0	-2	1	0	0.00	441.41	0
288	2.00	-2	-1	-0	-5	-1	-0	0.00	458.53	5
289	2.00	1	3	1	2	3	1	65.51	472.08	6
290	2.00	2	-0	-2	7	-1	-2	34.99	448.99	3
291	2.00	3	5	0	7	5	0	46.67	469.57	0
292	2.00	-1	-1	1	-2	-2	2	0.00	515.68	5
293	2.00	4	3	-2	9	3	-3	64.41	478.38	3
294	2.00	-0	-1	1	0	-2	2	0.00	474.71	5
295	2.00	-0	-2	-0	-1	-2	-0	0.00	413.02	5
296	2.00	-0	1	0	-1	1	0	572.50	458.69	0
297	2.00	-0	0	1	-0	-0	1	0.00	436.11	0
298	2.00	-2	-1	0	-5	-1	0	0.00	322.30	0
299	2.00	1	-0	-3	3	0	-4	0.00	337.00	0
300	2.00	3	0	-4	7	1	-4	99.56	472.27	3
301	2.00	-1	-2	-1	-1	-2	-1	0.00	434.71	0
302	2.00	-2	2	1	-5	3	1	493.70	471.52	4
303	2.00	3	2	1	8	2	1	115.66	468.79	0
304	2.00	-3	0	-1	-7	1	-1	0.00	448.00	0
305	2.00	-1	2	-2	-3	3	-3	919.18	455.77	0
306	2.00	1	-4	-1	3	-5	-1	0.00	484.04	0
307	2.00	-1	3	1	-2	3	1	221.57	441.73	0
308	2.00	3	-2	-1	9	-3	-1	214.43	484.40	0
309	2.00	1	0	-2	2	0	-3	224.06	446.80	0
310	2.00	-0	-1	-1	0	-2	-1	0.00	448.26	0
311	2.00	-2	3	1	-6	3	1	370.27	447.01	4
312	2.00	-1	1	-2	-3	1	-2	0.00	448.65	0
313	2.00	-1	2	0	-5	3	0	496.11	460.35	4
314	2.00	-1	-0	-2	-1	-0	-2	0.00	526.24	0
315	2.00	0	0	-1	0	1	-1	192.12	459.98	0
316	2.00	-1	1	1	-2	1	1	543.61	464.13	0
317	2.00	-0	-3	-5	1	-3	-5	0.00	447.14	0
318	2.00	-2	-1	-1	-6	-1	-1	0.00	391.31	0

319	2.00	-0	-2	3	1	-3	4	0.00	447.37	0
320	2.00	-1	3	1	-4	3	1	160.87	454.96	0
321	2.00	0	-2	-0	2	-2	-0	0.00	408.91	0
322	2.00	-3	-0	-2	-7	0	-2	0.00	444.55	0
323	2.00	2	1	-0	5	0	-0	40.67	439.46	0
324	2.00	-2	3	-0	-6	3	-0	179.92	372.54	0
325	2.00	-2	-3	-1	-3	-4	-1	0.00	463.25	0
326	2.00	-1	-2	-2	-2	-2	-2	0.00	450.56	0
327	2.00	-1	-3	3	-2	-4	3	0.00	383.65	0
328	2.00	-1	-2	-1	-1	-2	-1	0.00	415.74	0
329	2.00	-1	3	-1	-5	4	-1	199.10	429.20	0
330	2.00	-2	-1	-4	-5	0	-4	0.00	427.76	0
331	2.00	-2	4	3	-8	4	3	112.19	380.94	0
332	2.00	-0	-2	-1	0	-2	-1	0.00	442.18	0
333	2.00	-1	-1	-1	-2	-1	-1	0.00	464.81	0
334	2.00	1	-0	-1	3	-0	-1	97.42	447.23	4
335	2.00	1	-1	0	3	-1	0	0.00	441.82	4
336	2.00	-2	-0	-2	-5	0	-3	0.00	435.91	0
337	2.00	2	6	-0	4	7	-0	104.85	408.28	2
338	2.00	2	-1	-3	7	-1	-3	0.00	442.03	0
339	2.00	0	1	1	1	0	2	58.74	453.58	0
340	2.00	-2	-1	-2	-5	-0	-2	0.00	495.97	0
341	2.00	-0	1	-0	-0	1	-0	0.00	450.61	0

Radiological Historical Site Assessment
For The
G Building
Johns Hopkins Bayview Campus
5510 Nathan Shock Drive
Baltimore, MD 21224

Prepared for:

Aria Environmental, Inc.
PO Box 286
Woodbine, MD 21797

Prepared by:

Chesapeake Nuclear Services
788 Sonne Drive
Annapolis, MD 21401

August 2008

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Appendix A- Cyclotron Close Out Survey

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1.0 Glossary of Terms, Acronyms and Abbreviations

ARC	Addiction Research Center
cm^2	square centimeter
curie	A unit of radioactivity; $3.7x10^{10}$ disintegrations per second
DCGL	Derived Concentration Guideline Level
DIS	Decay in storage
dpm	disintegrations per minute
DP	Decommissioning Plan
DQO	data quality objective
EPA	Environmental Protection Agency
FSS	final status survey
ft^2	square feet
GC	Gas Chromatograph
GM	Geiger Mueller (type of radiation detector)
HSA	historical site assessment
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDE	Maryland Department of the Environment
NARM	Natural or Accelerator Produced Radioactive Materials
NIDA	National Institute on Drug Abuse
NaI	Sodium Iodide (a scintillation type of radiation detector)
NIH	National Institutes of Health
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NUREG	regulation document prepared by NRC staff
PET	positron emission tomography
PDR	Public Document Room
RFP	Request for Proposal
RSO	Radiation Safety Officer
$T_{1/2}$	The physical half-life of a radioactive substance

2.0 Executive Summary

This Historical Site Assessment (HSA) of Johns Hopkins Bayview Research Campus, Building G was performed in accordance with the requirements of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, EPA 402-R-97-016 and Consolidated Guidance, NUREG-1757. An HSA usually provides input to the design of Final Status Surveys (FSS), which in turn determine if the storage and use areas are suitable for unrestricted release as specified by the Nuclear Regulatory Commission (NRC). A separate historical assessment of industrial and chemical hazards is to be conducted by Aria Environmental, Inc., while this HSA relates only to radiological hazards.

Radiological operations in Building G are currently authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) with an expiration date of October 31, 2010. Maryland Department of the Environment (MDE) exempted the facility from Maryland licensure requirements regarding the receipt, possession, and use of certain accelerator (cyclotron) produced radionuclides (NARM) until the NRC provided regulation. The cyclotron was removed from the facility, the area surveyed in June 2007, and then released for public use at the direction of the NID-NIDA Radiation Safety Officer (RSO). The cyclotron had been removed and considered acceptable for release prior to the effective date of NRC regulations (November 30, 2007) addressing NARM radioactivity pertinent to the cyclotron. However, per 10 CFR Part 20, §20.1001, the NRC controls dose from radioactive materials when in combination with licensed materials. As detectable concentrations of Co-60 were identified prior to the release of the area, the concentrations would remain detectable today. Any remaining contamination would be automatically authorized by the broad-scope license issued to NIDA.

Only certain rooms in the basement of Building G were identified as impacted, where licensed materials were either used or stored, and require a close-out survey for building surface contamination. Contamination involving Cd-109 was noted during this HSA and was removed.

Considering that the cyclotron was never licensed by the NRC and the area had been released for public use, a Decommissioning Plan (DP) is not required to be submitted to the NRC. For other licensed material this area is considered as a Group 2 Decommissioning Group per NUREG-1757.

To meet NRC requirements for the removal of Building G as an authorized use location and acceptable for unrestricted use, all licensed material must be removed; areas decontaminated as necessary and a close out survey must be performed. The records of all close out survey must be presented to the NRC. A copy of the close out survey for the cyclotron room is presented in Appendix A. Each survey should include the information listed below:

- A diagram of the area surveyed
- A list of items and equipment surveyed
- Specific locations on the survey diagram where wipe test was taken
- Ambient radiation levels with appropriate units
- Contamination levels with appropriate units
- Make and model number of instruments used
- Background levels
- Name of the person making the evaluation and recording the results and date.

Non-impacted areas would include areas in which radioactive materials were not used for laboratory work, storage, or animal boarding. Corridors adjacent to posted areas were periodically monitored for contamination with negative results but should still be reviewed during closeout work.

3.0 Purpose of the Historical Site Assessment

As a result of the decision to cease operations in Building G, NIH-NIDA has directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC in 10 CFR Part 20. Use of radioactive materials was authorized by NRC License 19-09760-02, Docket Number 030-31714.

The purpose of this Historical Site Assessment (HSA) is to collect existing information concerning the site and its surroundings regarding the use of NRC licensed radioactive materials. The data collected may be used to differentiate areas that need further action from those that pose little or no threat to human health and the environment.

4.0 Property Description

The facility is part of the Johns Hopkins Bayview Medical Center which is one of five member institutions in the Johns Hopkins Health System. Building G is owned by FSK Land Corporation and C is partially leased to and operated by NIH-NIDA. NIH-NIDA leases a total of 11,520 sq. ft. of the larger medical research two-story building. Leased space is on the 1st floor and basement only. Appendix B contains a diagram of the facility basement where the work with radioactive materials took place.

4.1 Owner and Operator's Address

The owner of the facility is FSK Land Corporation (a Hopkins Entity) 1101 East 33rd Street, Suite E100, Baltimore, MD 21218-3637. The contact is Mr. Nick Farrell, Senior Director, Facilities, Design & Construction, and may be reached by telephone at (443) 997-3735 or by e-mail at nfarrell@jhu.edu.

The operator of the facility is the U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), NIH, 5510 Nathan Shock Drive, Baltimore, MD 21224. Mr. John P. Jacobus is the current RSO and may be reached by telephone at (301) 594-4018 or by e-mail at jjacobus@mail.nih.gov.

4.2 Facility Location

The facility is located in Johns Hopkins Bayview Research Campus, Building G, 5510 Nathan Shock Drive, Baltimore, MD 21224 which is in the east suburbs of Baltimore City, MD, an independent city surrounded but not included by Baltimore County, MD.

4.3 Topography

Figure 1 illustrates the facility location and its relationship to the surrounding community.

A USGS 7.5 minute quadrangle is provided in Appendix B.

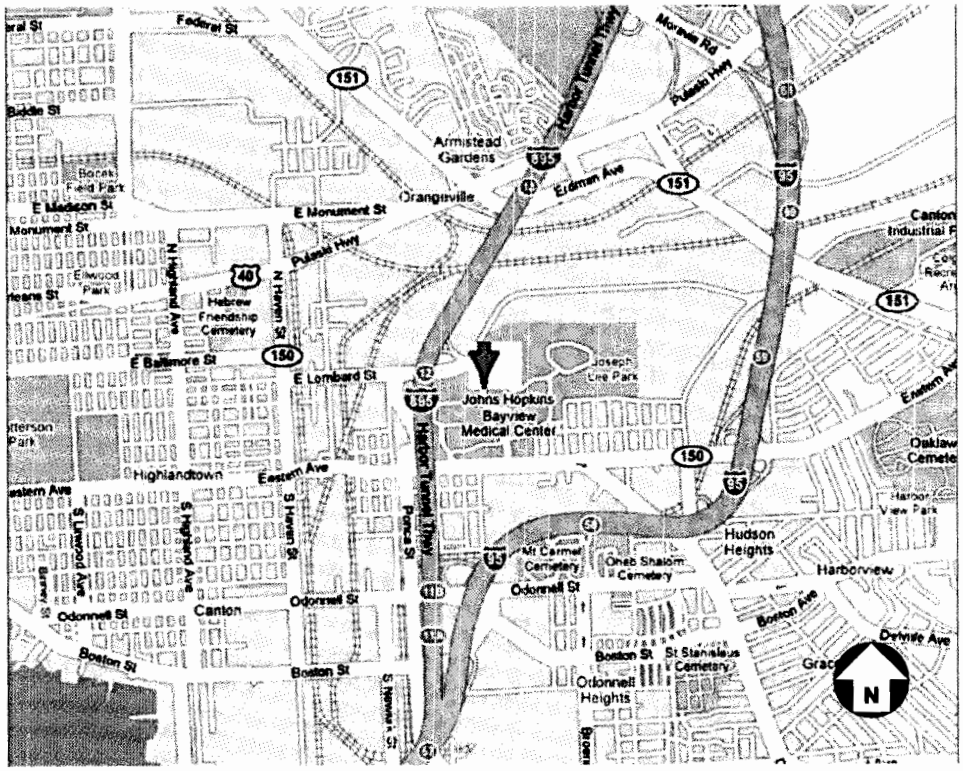


Figure 1. Local Map for Facility (Courtesy of Google Map Services)

5.0 Historical Site Assessment Methodology

5.1 Approach and Rationale

Information was gathered to provide an initial classification of site areas as impacted or non-impacted by radioactive material.

Impacted areas have a potential for radioactive contamination (based on historical data) or contain known radioactive contamination (based on past or preliminary radiological surveillance). This includes areas where (1) radioactive materials were used and stored; (2) records indicate spills, discharges, or other unusual occurrences that could result in the spread of contamination; and (3) radioactive materials were buried or disposed. Areas immediately surrounding or adjacent to these locations are included in this classification because of the potential for inadvertent spread of contamination.

Non-impacted areas were identified through knowledge of site history or previous survey information are those areas where there is no reasonable possibility for residual radioactive contamination.

5.2 Boundaries of Site

The boundaries of the site are considered to be the facility structure. There are no underground storage tanks outside the facility structure and all land areas outside the facility are considered non-impacted. No environmental studies using radioactive material were authorized by the NRC license.

5.3 Documents Reviewed

Records at the NRC Public Document Room (PDR) provided minimal additional information as most records had been withdrawn from public view as sensitive to national security from terrorists. Only twelve documents were available for review at the PDR mostly regarding licensing amendments and inspections; these documents were also available at the Radiation Safety Office in Building C.

Records maintained by the radiation safety staff were reviewed. The following comments are provided on those records related to area classification as impacted or non-impacted. Please note that these comments are applicable to the multiple locations authorized on the license including Building G.

<u>NRC Correspondence Notebook</u>:

- Jan. 21, 2002 letter to NRC regarding Notice of Violation (NOV) for (a) disposal of waste > 120 day $T_{1/2}$ of 0.05 microcuries of H-3 between 1/1/99 to 7/1/00 and (b) not performing corridor survey between 10/17/00 and 12/6/01 (no spills were noted during this period) and (c) posted areas not consistently performing and maintaining records between 1/1/01 and 12/6/01,(inspection conducted 12/5-6/01).
- CY2000 Annual Management Review: Most discussion related to PET facility. No NRC inspections.
- Oct. 6, 2000 letter to NRC's Duncan White: Gas Chromatograph (GC) detectors and exit signs will be tracked by Safety Office.
- June 26, 2000 Application for renewal of License. Provided a description of use of materials.
- Jan.15, 1997, letter to NRC regarding NOV: (a) calibration of survey meters in a timely manner and (b) providing training to individuals opening packages. The NRC inspection was conducted on 12/2-3/96.
- CY 1996 Management Review. No comments regarding spills were noted.

- Oct. 15, 1991 letter to NRC regarding NOV for Addiction Research Center (ARC): (a) Labs were not under constant surveillance and control (unlocked), (b-1) calibration of survey meters was not performed in a timely manner, (b-2) Records of daily surveys and inventory were not maintained correctly in some cases, and (c) No posting of NRC Form 3. The NRC inspection was conducted on 7/16-17/96.

Incoming Radioactive Isotopes Notebook: This log had entries indicating material received at the site from 5/29/90 to 12/5/06. After that date material receipt logging was maintained by computer records.

Incident Folder: One case identified as 60 mCi of H-3 incinerated at a different facility on 12/26/2003; NRC was notified. This case did not indicate contamination at Building G.

Meter Calibrations Notebook: Contained miscellaneous records of meter calibrations from February 2000 through June 2007. Types and models of survey meters used at the facility included: Ludlum model 3 or model 177and 44-9 pancake probe, 2401-EC2 GM; Ludum 12-4 and 42-21; Biodex model 2 (portable GM); Johnson 65B-105; Johnson GP200 GM; RSO model RSP-1 pancake GM; APC model 069-761 GM; Bicron microRem; and Victoreen model 425-110 NaI detector. The calibrations were either performed in-house, or by Ludlum Instruments, Inc., RSO, Inc., or Ecology Services, Inc.

Licenses:

- Amendment 01 to 19-09760-02 signed 12/31/92 and expired 12/31/95; for animal studies.
- Amendment 04 to 19-09760-02 signed 03/20/06 and expires 10/31/10; for animal studies.
- MDE letter regarding exempted NARM dated September 30, 2005.

5.4 Property Inspections

Property inspections were conducted by Mr. Claude Wiblin, CHP, and Mr. Stewart Bland, CHP, in the company of the NIH-NIDA RSO on July 22, 2008. The inspections consisted of a review of the use of radioactive material as authorized by the NRC license and the MDE exemption. The described material use and quantities appeared to be in conformance with those documents.

- No exit signs containing radium or tritium were observed; none were identified by the radiation safety staff. No smoke detectors containing Am-241 were observed.

- The following rooms were identified as those involved in the production or use of licensed material:

  Cyclotron room -- B214A
  Hot chemistry -- B214
  Prep lab 1 -- B210
  Prep lab 2 -- B206
  Wet lab -- B202
  Gantry -- B205
  Micro PET -- B201

5.5 Personal Interviews

Six individuals were interviewed in person or by telephone as indicated below. The interviews were directed toward an understanding of the total license as material was used at several authorized addresses including Building G and the adjacent Building C. The radiation safety

program was applicable to Buildings C and G which are physically connected. The telephone and e-mail addresses are given as available.

(1) John Shaver, former RSO before Mr. Doob, 410-292-5725
(2) Pete Doob, former RSO, (301-436-2178) peter.doob@fda.hhs.gov
(2) Larry Koenig, former technician, (301-594-2408) lkoenig@mail.nih.gov
(3) Mike Duclos, record review, (410-550-1847) MDUCLOS@intra.nida.nih.gov
(4) Karen Baxley, NIDA Safety Officer, (410.550.1675) baxleyka@od.nih.gov
(5) John P. Jacobus, current RSO, (301-594-4018) jjacobus@mail.nih.gov
(6) Alane Kimes, NIDA Supervisory Users (410-550-1440 x314) akimes@intra.nida.nih.gov

6.0 History and Current Usage

Building G is part of the Johns Hopkins Bayview Medical Center, formerly known as Francis Scott Key Medical Center and Baltimore City Hospital, in East Baltimore, MD.

Peter Doob was the RSO until he retired in 2006 and was replaced by the current RSO, John Jacobus.

6.1 History

NIDA activities include those associated with basic research laboratories, behavioral laboratories, administrative operations, clinical laboratories, the Addiction Research Center, and the Archway Clinic, which is a treatment center for substance abuse. NIDA research studies how certain drugs affect the body and brain. The Archway Clinic at NIDA provides treatment for drug users who are participating in treatment-related research studies there. Ecstasy, cocaine, marijuana, and heroin are drugs included in the research studies and treatment programs.

Operations conducted in the building include wet laboratory work with viruses, human samples and biological material. Chemicals that NIDA laboratories worked with include controlled substances, metabolites of these substances, neurotoxins, cellular meta-modifier, and tetrodotox. A separate historical assessment of industrial and chemical hazards is to be conducted by Aria Environmental, Inc., while this HSA relates only to radiological hazards.

The exemption letter from Maryland Department of Environment (MDE) authorized the use of accelerator produced radionuclides for brain imaging of primates and humans and certain sealed sources required for calibration of instruments. The sealed sources exempted by MDE consisted of two sources containing Cobalt-57, 5 millicuries each, and sources containing Gallium-68 with a total possession limit of 40 millicuries. This exemption was to be effective until the NRC took national control of the accelerator and cyclotron programs; however, this cyclotron was removed before the effective date of NRC regulations regarding such programs.

Since 1990, use of radioactive materials has been authorized by NRC License 19-09760-02, Docket Number 030-31714. Note that use of radioactive material did not occur until late 1999 and the cyclotron began operation in 2000. The license authorizes (1) the use of material in animal studies listed in 10 CFR 33.100 Schedule A (Type B Broad License) with quantities of certain material limited by License Condition 12; (2) a 15 millicurie sealed Cs-137 source manufactured by 3M, model number 4F6S for use in instrument calibrations and checks; and (3) 100 millicuries of I-125 as radioactive waste.

The following provides a topical review of key radiation safety practices which were implemented at the facility to limit radioactive contamination of the facility and the environment.

- Procurement. All requests for procurement of byproduct material for use in NIDA

laboratories were first approved by the RSO or his designee. Radioactive material was received, logged, inspected and stored at a chemical receiving room in Building C by radiation safety staff under the direction of the NIDA-RSO.

- Routine Laboratory Surveys. A contamination survey of each area with radioactive material was performed twice per year.
- Daily Survey. During days of use, contamination surveys were performed on work surfaces, floors, and equipment in the vicinity of the radioactive material work. Daily surveys were not always documented. Historic practice indicates that contamination was removed when found and that areas and equipment were cleaned to < 220 dpm/100 cm^2 as removable contamination.
- Receiving Area and Radioactive Waste Room Surveys. These services were provided in Building C by the radiation safety staff.
- Calibration of Survey Meters. Calibration of survey meters had been out-sourced to licensed calibration facilities; however, in the past NIDA had performed calibrations at the site.
- Radioactive Liquid Waste. Laboratories in Building G were forbidden to dispose of radioactive liquid materials into sinks.
- Radioactive Waste. Any waste containing radioactive material (liquids, solids, trash, animal carcasses and excreta, used scintillation counting liquids, etc.) were collected and prepared for disposal by the radiation safety staff at least twice weekly and stored in Building C. No on-site burial of radioactive material was reported or suspected.
- Leak Testing of Sealed Sources. As required depending upon quantity and type, sealed sources were leak tested at intervals of six months or at longer intervals if permitted by a certificate of registration. No test was reported as detecting 0.005 microcurie or more.
- Closeout surveys. Except for Room 214A, the Cyclotron Room, no records of closeout surveys were available.

6.2 Current Usage

No radioactive material use was noted during the property inspection conducted on July 22, 2008. The NIDA CTI Eclipse Cyclotron has not operated since October 2006 and was removed from the facility. To remove the cyclotron, the northern wall of the cyclotron room was demolished and replaced with new wall-blocks.

6.3 Adjacent Land Usage

Once an industrial town with an economic base in manufacturing, Baltimore's economy has become primarily service sector-oriented. The largest employer is now The Johns Hopkins University and The Johns Hopkins Hospital.

Building G is part of a 130-acre campus owned by FSK Land Corporation and is part of the Johns Hopkins Bayview Medical Center. Founded in 1773, as the Baltimore City Hospital, the Johns Hopkins Bayview Medical Center is one of five member institutions in the Johns Hopkins Health System.

7.0 Findings

All use and storage of radioactive material was confined to the Basement area. The use of a cyclotron to produce positron-emitting radionuclides, beginning in 2000, lead to the production of radioactive material in the shielding used in the vault or room housing the cyclotron. The creation of radioactive material is principally due to neutron activation of trace elements found in the shielding material. A review of the literature has shown that a number of radionuclides can be found in concrete. The NIDA CTI Eclipse Cyclotron was removed and had not operated since October 2006. A survey of the cyclotron and immediate area was conducted by the NIH-NIDA RSO June 23, 2007 with negative results for gamma emitters except for Co-60; see report shown in Appendix A. A brochure describing the cyclotron is also included in Appendix A.

Activation products and activated components associated with cyclotron production were confined to the cyclotron room (B214A) and Hot Chem lab (B214). During characterization work for this HSA, Cd-109 was identified in the small hot cells in B214. There is a Ag-109(p,n)Cd-109 production mechanism and the NIDA cyclotron did use a silver target. The abundance of Ag-109 in natural silver is 48.7%. The half life of Cd-109 is 470 days, and decays to Ag-109m. The half-life of Ag-109m is 39 seconds, and one of the emissions is an 88 keV x-ray that appears in 5% of the decays. Cd-109 was identified as a waste contaminate in a number of filters used in the production of F-18; these filters were moved prior to this HSA to the radioactive waste storage area in Building C. Contaminated items identified in this HSA were bagged and removed by the RSO; the Hot Cells were wiped down with a cleaning solution.

F-18 was used in all posted labs: Cyclotron room - B214A, Hot chemistry - B214, Prep Lab 1 - B210, Prep lab 2 - B206, Wet lab - B202, Gantry - B205, and the Micro PET - B201. C-11 was used in the B214 and B214A. O-15 was used in the B205, B214, and B214A.

Ge/Ga-68 in liquid form was used in B210 and B205.

Ge/Ga-68, Co-57, and Cs-137 sealed sources were used in B201, B205 and B210. There were no accounts of leaking sources.

MDE exempted radionuclides C-11, O-15, and F-18 that were used at the facility, are short-lived and no longer pose a residual contamination issue. These radionuclides and their approximate half-lives are shown in the following table.

Table 1. Short-lived Accelerator Radionuclides

Radionuclide	~Half-life
C-11	21 min
F-18	2 h
O-15	2 min

All sealed sources had been transferred to another authorized use location, Building C at 5500 Nathan Shock Drive. The radioactive material in the transferred sealed sources included Cs-137, Co-57, and Ge-68 and its decay product Ga-68.

Tritium was reported as potentially used at the facility in Room B202; this could not be confirmed in site records.

7.1 Potential Contaminants

Records indicate that the potential contaminants of unsealed radionuclides are as indicated in the table below. Please note that a radionuclide may be restricted to a specific room as indicated above.

Table 2. Potential Contaminants of Concern

Radionuclide	~Half-life*	Principal Decay Mode Energy (MeV)
H-3	12.3y	Beta 0.019
Ge/Ga-68	288d/68m	Electron 0.008/ Positron 1.89 max Gamma 0.511
Cd-109/Ag109m	464d/40s	Electron 0.018 / Electron~0.084 Gamma 0.088
Co-60	5.27y	Beta 0.317 Gamma 1.17 and 1.33

* Rounded values from MicroShield® User's Manual.

7.2 Potential Contaminated Areas

7.2.1 Impacted Areas—known and potential

The following rooms were identified as those involved in the production or use of licensed material:

Cyclotron room -- B214A
Hot chemistry -- B214
Prep lab 1 -- B210
Prep lab 2 -- B206
Wet lab -- B202
Gantry -- B205
Micro PET -- B201

7.2.2 Non-Impacted Areas

Non-impacted areas include any areas which did not require use of radioactive materials; this is the larger portion of the facility.

7.3 Potential Contaminated Media

Radioactive material was confined to the building interiors. As such, the type of operations limited the likelihood for release of radioactivity into the following environmental media: surface soil, subsurface soil, sediment, surface water, ground water, air, and other buildings. Records indicated that annual assessments were being conducted regarding potential air releases and no adjacent buildings were impacted. The building is on a public sewer system and releases were reported to be within NRC limits. Based on these facts, no suspected contamination of other media was noted.

7.4 Related Environmental Concerns

Based upon an evaluation of the potential contaminated media above, no related environmental concerns were identified in this HSA.

8.0 Conclusions

Considering that the cyclotron was never licensed by the NRC and the area has already been released for public use, a Decommissioning Plan (DP) is not required to be submitted to the NRC. For other licensed material this area is considered as a Group 2 Decommissioning Group per NUREG-1757.

Facilities in Group 2 are expected to have some residual radiological contamination present in building surfaces. Licensees in Group 2 typically possess historical records of material receipt, use, and disposal, such that quantifying past radiological material possession and use may be developed with a high degree of confidence. Furthermore, these licensees have radiological survey records that characterize the residual radiological contamination levels present within the facilities and at their sites. That is, they are able to demonstrate residual radiological contamination levels without more sophisticated survey procedures (greater than those used for operational surveys) or dose modeling. These licensees do not need to use site-specific parameters or establish site-specific DCGLs in order to demonstrate acceptability for release of their sites.

For Group 2 facilities, a DP is not required, but licensees must demonstrate that the site meets NRC screening criteria. A DP is not required because worker cleanup activities and procedures are consistent with those approved for routine operations, and no dose analysis is required.

As radioactive material was removed from laboratories and as described in the application for the license, NIDA performed closeout surveys. Following the closeout surveys, these laboratories were considered as unrestricted for purposes of radiation control. Short-lived radionuclides such as those permitted under the MDE exemption would no longer be a contamination issue.

To meet NRC requirements for the removal of Building G as an authorized use location and acceptable for unrestricted use, all licensed material must be removed; areas decontaminated as necessary and a close out survey must be performed. The records of all close out survey must be presented to the NRC. A copy of the close out survey for the cyclotron room is presented in Appendix A. Each survey should include the information listed below:

- A diagram of the area surveyed
- A list of items and equipment surveyed
- Specific locations on the survey diagram where wipe test was taken
- Ambient radiation levels with appropriate units
- Contamination levels with appropriate units
- Make and model number of instruments used
- Background levels
- Name of the person making the evaluation and recording the results and date.

Non-impacted areas would include areas in which radioactive materials were not used for laboratory work, storage, or animal boarding. Corridors adjacent to posted areas were periodically monitored for contamination with negative results but should still be reviewed during closeout work.

9.0 References

9.1 *Guidance for the Data Quality Objective Process*, U.S. EPA, 2000.

9.2 *A Non-Parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys,* NUREG-1505, U.S. NRC, 1999.

9.3 *Multi-Agency Radiation Survey and Site Investigation Manual*, EPA/402/R-97-016, Revision 1. NUREG-1575, U.S. NRC, August, 2000.

9.4 *Consolidated NMSS Decommissioning Guidance,* NUREG-1757 Volumes 1 and 2, U.S. NRC, 2003.

9.5 *Residual Radioactive Contamination From Decommissioning*, NUREG/CR-5512, October, 1992.

9.6 "Standards for Protection Against Radiation," Title 10 Code of Federal Regulations, Part 20 (10 CFR 20), U.S. NRC, as amended.

9.7 *Decommissioning Health Physics*, EW Abelquist, IOP Publishing Ltd, 2001.

9.8 *The Health Physics and Radiological Handbook*, Revised Edition, Scinta, Inc. Silver Spring, MD 20902, 1992.

9.9 NRC Materials License 19-09760-02, U.S. NRC, March 20, 2006.

9.10 *Program-Specific Guidance About Licenses of Broad Scope - Final Report*, NUREG-1556, Vol. 11, U.S. NRC, April 1999

9.11 *Program-Specific Guidance About Possession Licenses for Production of Radioactive Material Using an Accelerator*, NUREG-1556, Vol. 21, U.S. NRC, October 2007.

9.12 *MicroShield® User's Manual Version 7*, Revision 2, Grove Software, Inc. Lynchburg, VA 24502, October 2006.

Appendix A

Cyclotron Closeout Survey and Related Material

August 31, 2007

Stan Wadsworth
Radiation Safety Officer
Radiation Safety Office
Mudd Hall
3400 Charles Street
Baltimore, MD 21218

Re: Ionizing Radiation Survey and Activation Analysis of Cyclotron Vault, Building G, JHMI Bayview Campus

SUMMARY: Prior to the release of the Cyclotron Vault located in Building G basement on the Johns Hopkins Medical Institute (JHMI) Bayview campus, meter surveys of the room were made to determine the existing radiation exposure levels. Exposure values in the vault were at background levels and within the acceptable exposure levels for members of the public. In addition, sampling of the walls and floor of this room were conducted to determine residual activity resulting from the use of the National Institutes of Drug Addiction (NIDA) CTI Eclipse Cyclotron. Samples of concrete and cinder blocks used in shielding were taken at the most likely location of activation and contamination, and the results indicate only extremely low levels of fixed contamination remain. As JHMI expects to install another cyclotron in this room, release to the facility is considered appropriate.

BACKGROUND: The use of cyclotrons to produce positron-emitting radionuclides lead to the production of radioactive material in the shielding used in the vault or room housing the cyclotrons[1]. The creation of radioactive material is principally due to neutron activation of trace elements found in the shielding material. A review of the literature has shown that a number of radionuclide can be found in concrete.[1,2,3,4] The quantities of these activation products will depend on type of particle used for bombardment, the current (μA) through which the particles are accelerated, and for how many hours the cyclotron has operating.

With regard to the Cyclotron Vault located in Building G, several factors entered in to the sampling and analysis procedures to measure activation of shielding in the Cyclotron Vault.

- The NIDA CTI Eclipse Cyclotron generally has not operated on a frequent basis or for extended periods of time. Thus, estimation of quantities of activation products based on published data would be speculative.

- The NIDA CTI Eclipse Cyclotron has not operated since October 2006, so that any short-lived radionuclides of less than 30 days would have decayed by the time of sampling.

- There were no original samples of un-irradiated concrete or cinder blocks used in the vault.

- Only gamma counting of the samples needed to be performed as all activation products would be fixed into the shielding material. Risks from beta radiation would not be of a concern.

- From references on cyclotrons accelerating protons to energies similar to the NIDA CTI Eclipse Cyclotron,[1,2] it was determined that most likely radionuclides to be exist in concrete due to activation were ^{40}K, ^{59}Fe, ^{152}Eu, ^{154}Eu, ^{60}Co, and ^{134}Cs. No information was available on the composition of the cinder blocks, but any fixed contamination would be identified during sample analysis.

Prior to meter surveys and sample collection, the two cyclotron target assemblies were removed from the cyclotron and taken from the vault. Results of the meter surveys are listed at the end of this report.

SAMPLE COLLECTION: On June 23, 2007, samples of the concrete floors and walls of the cyclotron vault, and the cinder blocks shielding the gas recovery system were collected by drilling shallow holes in the material Collection locations are noted on the sketch that follows.

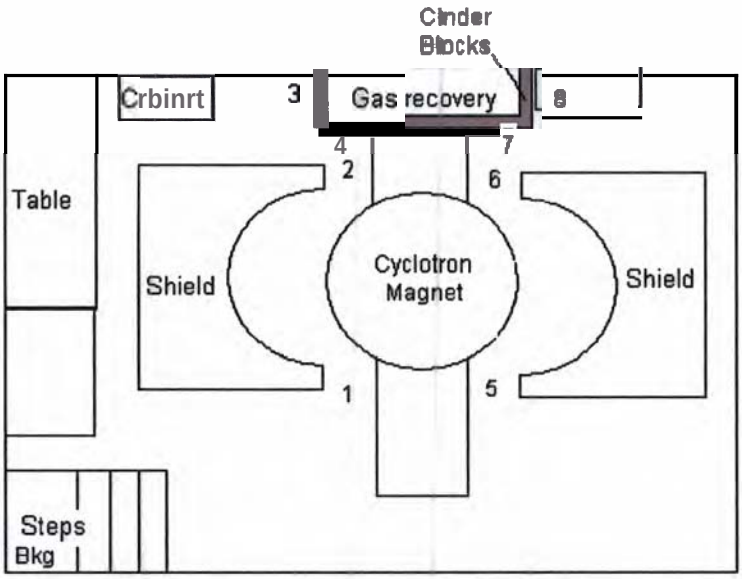
- Locations 1, 2, 5, and 6 were on the floor where previous neutron radiation meter measurements made during cyclotron operations last year indicated the highest neutron readings.

- Locations 3 and 8 are on the concrete walls about 120 cm above the floor that corresponded to the height of the cyclotron magnet exit ports.

- Locations 4 and 7 are on the cinder blocks closest to the location where the movable shields meet the cyclotron housing, and at a height of about 120 cm.

- As a sample of un-irradiated concrete was not available, a background, listed as Bkg in the sketch, sample of concrete was taken at the farthest location from the cyclotron near the ceiling at the top of the steps leading to the rest of the basement floor of Building C.

At each location, three shallow holes approximately 1 cm deep were drilled. All of the dust was collected, and the average weight of the samples was 8.9 g.



SAMPLE ANALYSIS RESULTS: Concrete and cinder block samples were analyzed at National Institutes of Health, Davison of Radiation Safety Analytical Laboratory in Bethesda. Each sample was analyzed separately using a High Purity-Germanium detector coupled to an Ortec Digital Multi-Channel Analyzer, DSpec Jr, and evaluated using Ortec's Gamma Vision v3.2 gamma spec software. Due to the low activity of the samples, a peaked background correction was made based on the 1 hour count of the concrete background sample. The results are given on the last page of this report with the radionuclides of interest, ^{40}K, ^{59}Fe, ^{152}Eu, ^{154}Eu, ^{60}Co, and ^{134}Cs, indicated.

A review of the identified radionuclides and concentrations indicate that all samples are at or below the background sample with the exception of ^{60}Co. No quantity of ^{60}Co appears in the background sample. More importantly, the large uncertainty percentage values for the listed radionuclide concentrations in μCi/gm add credence that only small quantities of activation products are present in the samples taken. It should also be noted that the concentration values of the activation products examined easily fall below the naturally occurring radionuclides of ^{210}Pb, ^{212}Bi, and ^{212}Pb in the background sample.

EXPOSURE METERING SURVEY: A meter survey of the cyclotron vault was conducted to identify any radiation sources in the cyclotron vault and to evaluate the exposure levels that individuals would be exposed to during the removal of the cyclotron. Activity surveys were conducted using a Ludlum survey meter with a GM-pancake probe. Exposure rate measurements were made with a Bicron RSO-5 ion chamber meter.

No significant activity or exposure values above background were identified in the Cyclotron Vault with the exception of the exit ports of the cyclotron magnet. On contact, ion chamber meter exposure rate measurements were 0.4 mR/hr. As approximately 30 cm from the exit ports, the exposure rate measurements were less than 0.1 mR/hr. These exposure values are below the regulatory exposure values for members of the public of 20 μSv/hr (2 mrem/hr).

Upon removal of the NIDA CTI Eclipse Cyclotron, exposure levels in the Cyclotron Vault are expected to be such that the annual limit of I mSv to a member of the public would not be exceeded.

Sincerely,

John P. Jacobus, MS
Certified Health Physicist
Senior Health Physicist, Division of Radiation Safety, National Institutes of Health
Radiation Safety Officer, National Institute of Drug Addiction, Intramural Research Programs

REFERENCES:

[1]CALANDRINO, R; DEL VECCHIO, A; SAVI, A; TODDE, S; GRIFFONI, V; BRAMBILLA, S; PARISI, R; SIMONE, G; FAZIO, F, "DECOMMISSIONING PROCEDURES FOR AN 11 MEV SELF-SHIELDED MEDICAL CYCLOTRON AFTER 16 YEARS OF WORKING TIME," HEALTH PHYSICS 90(6):588-596, JUNE 2006.

[2]CARROLL L. R.: "PREDICTING LONG-LIVED, NEUTRON-INDUCED ACTIVATION OF CONCRETE IN A CYCLOTRON VAULT", POSTER PRESENTATION AT CAARI 2000 -- CONFERENCE ON APPLICATIONS OF ACCELERATORS IN RESEARCH AND INDUSTRY, DENTON TX, NOV 1-4, 2000. AMERICAN INSTITUTE OF PHYSICS CONFERENCE PROCEEDINGS, MAY, 2001.

[3]KIMURA, KEN-ICHI; ISHIKAWA, TOSHIO; KINNO, MASAHARU; YAMADERA, AKIRA; NAKAMURA, TAKASHI, "RESIDUAL LONG-LIVED RADIOACTIVITY DISTRIBUTION IN THE INNER CONCRETE WALL OF A CYCLOTRON VAULT," HEALTH PHYSICS 67(6):621-631, DECEMBER 1994.

[4]PHILLIPS, A. B.; PRULL, D. E.; RISTINEN, R. A.; KRAUSHAAR, J. J., "RESIDUAL RADIOACTIVITY IN A CYCLOTRON AND ITS SURROUNDINGS," HEALTH PHYSICS 51(3):337-342, SEPTEMBER 1986.

NIDA CYCLOTRON FACILITY
CORE SAMPLE RESULTS
COUNT TIME: 60 MINUTES W/ PEAKED BACKGROUND CORRECTION

	SAMPLE #								
NUCLIDE	BKG	1	2	3	4	5	6	7	8
NA-22 ACTIVITY UNCERTAINTY									X 6.37E-07 62.01
K-40 ACTIVITY UNCERTAINTY	XX 4.46E-05 26.02								
SC-46 ACTIVITY UNCERTAINTY	X 5.23E-07 72.16								
MN-54 ACTIVITY UNCERTAINTY					X 4.20E-07 67.82				

FE-59 ACTIVITY UNCERTAINTY									
CO-60 ACTIVITY UNCERTAINTY	-	-	XX 5.19E-07 85.70	XX 1.24E-06 65.26	-	-	XX 1.34E-06 74.98		
ZN-65 ACTIVITY UNCERTAINTY									
CS-134 ACTIVITY UNCERTAINTY	XX 1.14E-06 49.62								
CS-137 ACTIVITY UNCERTAINTY									
EU-152 ACTIVITY UNCERTAINTY	XX 9.66E-08 95.79								
EU-154 ACTIVITY UNCERTAINTY									
PB-210 ACTIVITY UNCERTAINTY	X 2.18E-05 56.35		X 1.44E-05 50.98						
BI-211 ACTIVITY UNCERTAINTY	X 5.64E-06 64.29				X 5.40E-06 51.51		X 1.40E-05 67.69		X 4.87E-06 84.56
PB-211 ACTIVITY UNCERTAINTY	X 4.02E-05 48.45								
BI-212 ACTIVITY UNCERTAINTY						X 1.63E-05 57.44	X 1.38E-05 60.11		
PB-212 ACTIVITY UNCERTAINTY	X 2.57E-06 43.90		X 1.11E-06 73.94						

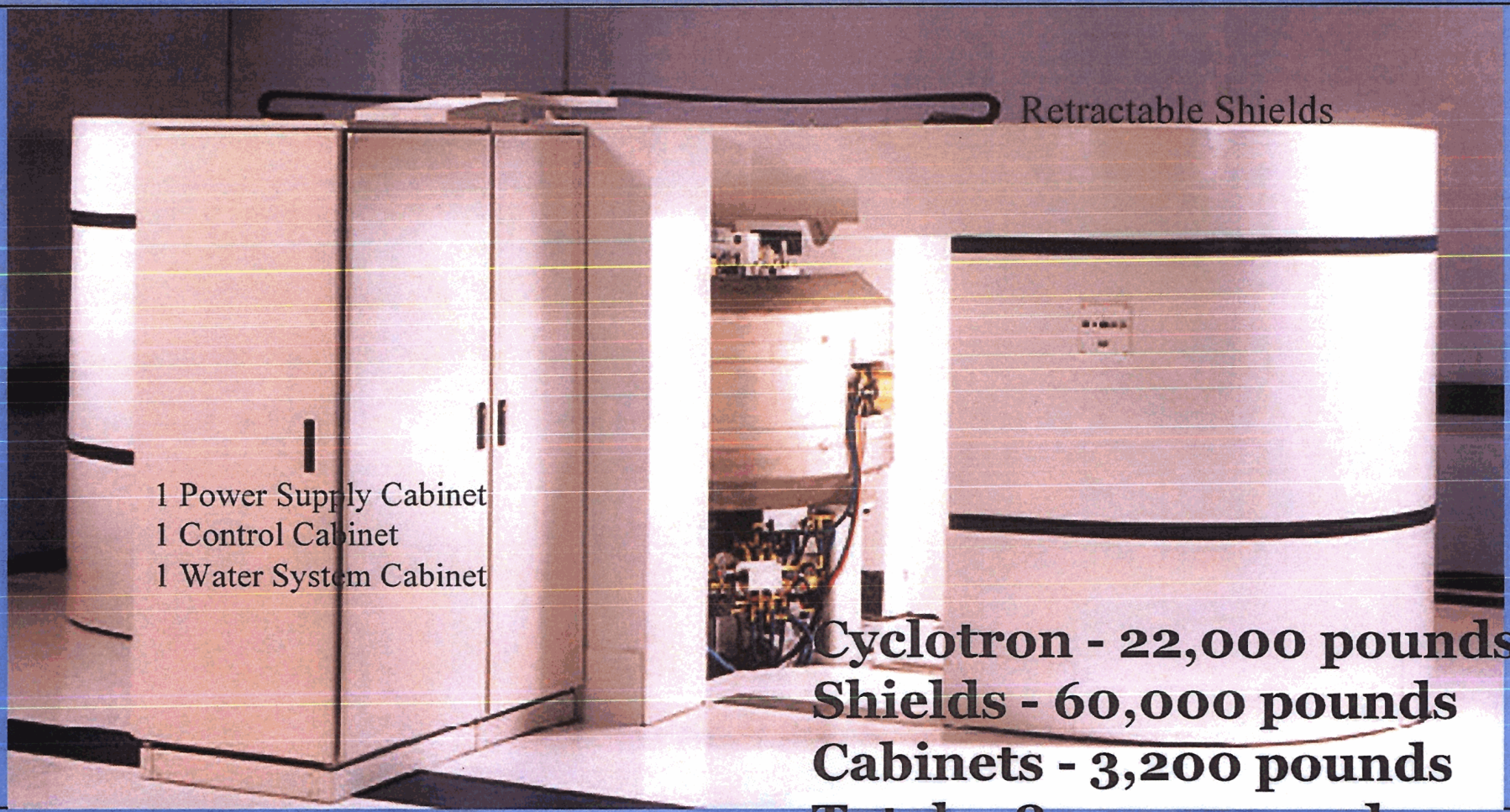
Activity read in µCi/g

Uncertainty read In %

real life answers

cti

PET Cyclotrons – Technical Considerations
CTI RDS-111 PET Cyclotron (newer)



Cyclotron - 22,000 pounds
Shields - 60,000 pounds
Cabinets - 3,200 pounds
Total = 85,200 pounds

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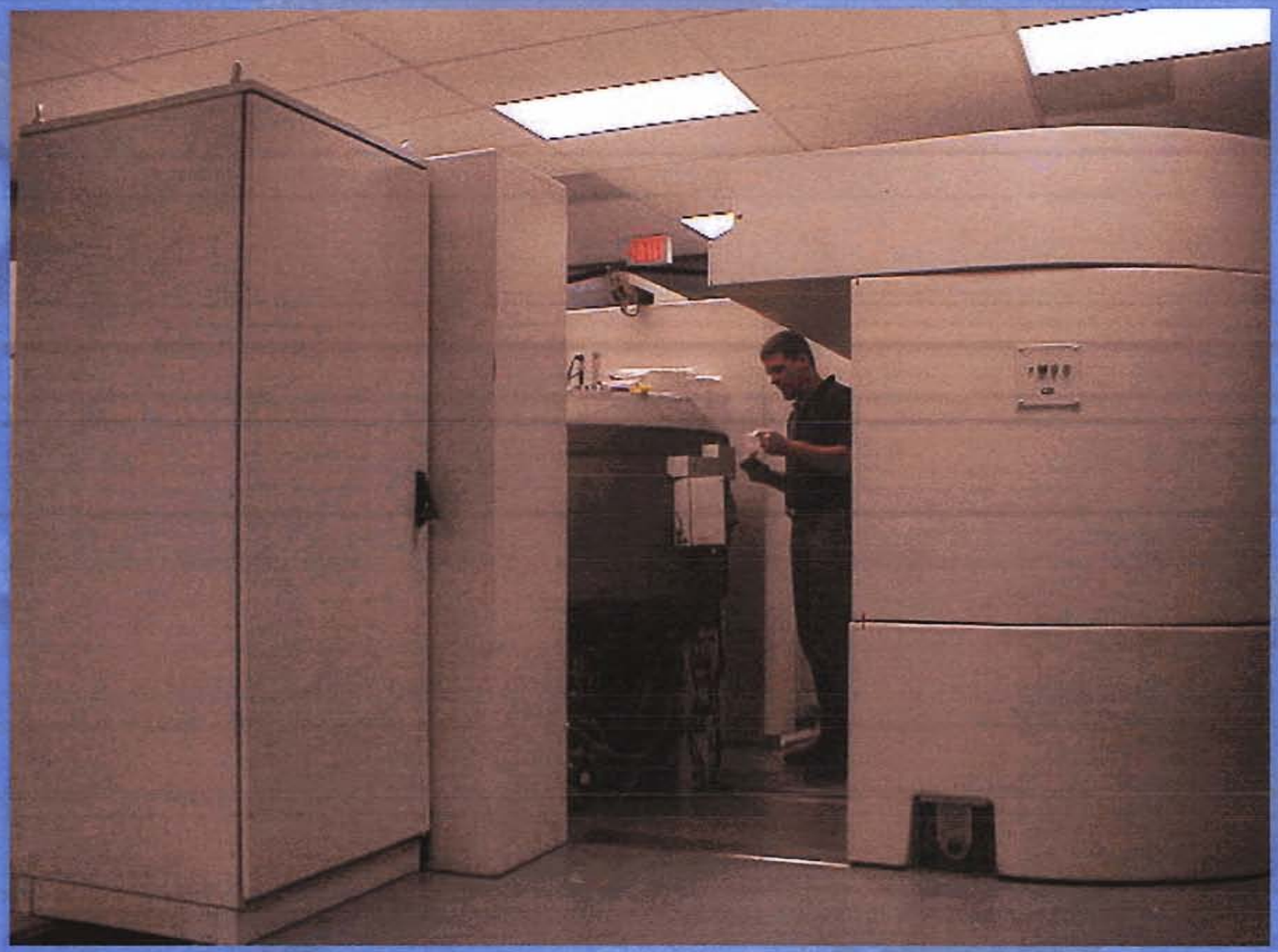
real life answers

cti

PET Cyclotrons – Technical Considerations
CTI RDS-111 PET Cyclotron



real life answers

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RDS Cyclotron Shields

RDS 111

Inner shield is approximately 30 cm thick high-density core cast out of a mixture of lead, epoxy, and boron carbide.

Outer shield is approximately 70 cm thick made of polyethylene and boron carbide loaded concrete.

RDS Eclipse

Inner shield is approximately 25 cm thick high-density core cast out of a mixture of lead, epoxy, and boron carbide.

Outer shield is approximately 76 cm thick made of polyethylene and boron carbide loaded concrete.

©

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Cyclotron: Activation Issues

- Materials selection- minimization of activation products

- Neutron activation

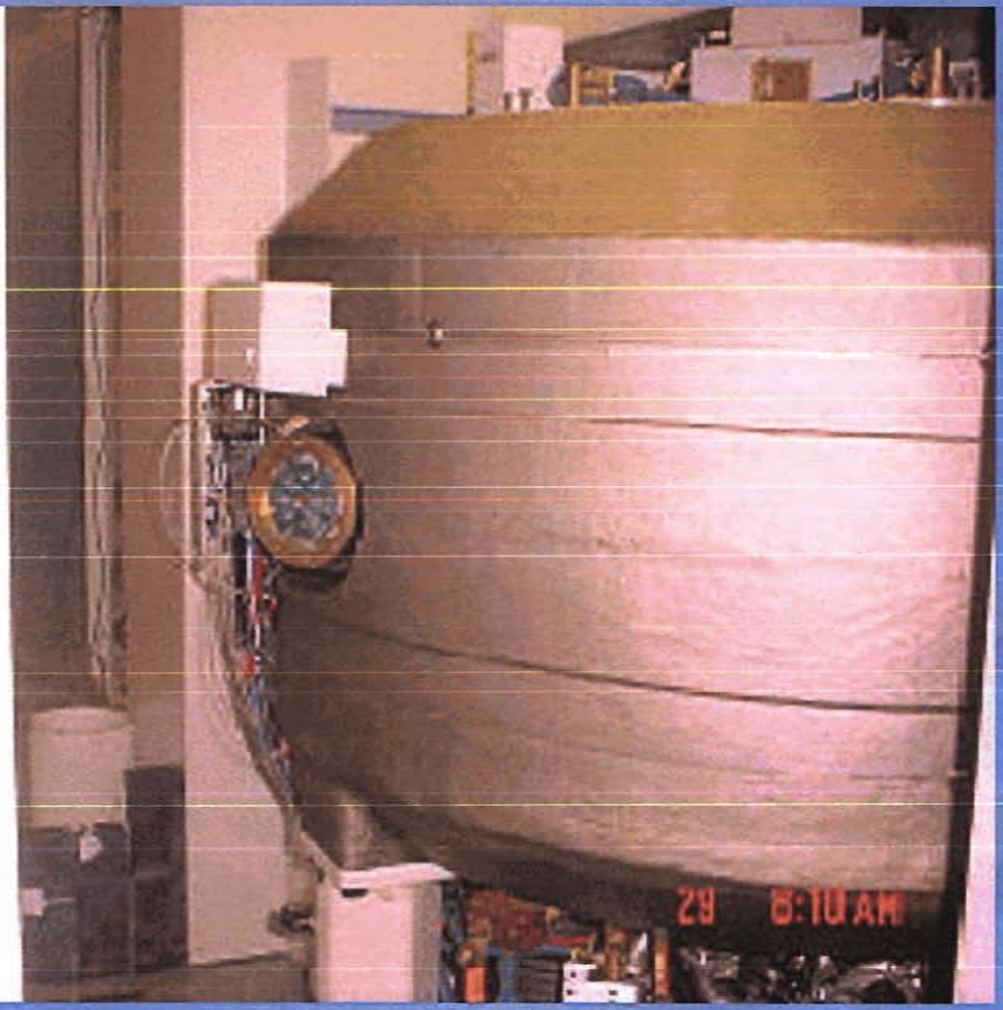
Magnet Yoke	Fe-54 (n,p) Mn-54	312d	835keV
	Fe-56 (n,α) Mn-56	2.58hr	847keV
Magnet Coils	Cu-63 (n,r) Cu-64	12.8hr	511keV
Vacuum Tank	Al-27 (n,α) Na-24	15hr	2750keV
Concrete	Si-28 (n,p) Al-28	2.25m	1780keV

- Proton activation

Target Window	Mn-52m	21m	2456keV
	Mn-52	5.7d	4134keV
	Co-56	78d	2302keV
	Co-57	272d	122keV

real life answers

PET Cyclotrons – Technical Considerations
RDS-111 Cyclotron: Target Area



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PET Cyclotrons
Regulatory Considerations

- Positive Experiences: 26 licenses/registrations in last 3 years
- Regulatory/Licensing inconsistencies
  - CRCPD states that the mission is to promote consistency in addressing and resolving radiation protection issues...
- Licensing Guides
  - New states: Meeting/Guidance – Surrounding States/Subjective
  - Most states: No guidance
  - Several states: Research accelerator or LINAC guidance borrowed but not kept up

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Regulatory Considerations (cont.)

- Licensing Review
  - Review questions: Number and Contents
  - Approval time
  - Self-Shields vs. Vault Questions
- Registration Forms: Accelerator vs. X-Ray (independent HP review)
- Cyclotron Engineers: Qualifications discrepancies and training requirements
- Licensing review turns into research projects
- Start-up Surveys: Licensee vs. Independent HP

real life answers

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PET Cyclotrons Regulatory Considerations

CTI's/PETNET's Proposed Solutions

- CRCPD/Stakeholders Partnership
  - CRCPD - A partnership dedicated to radiation protection
- CTI/PETNET is willing to:
  - Provide and participate in training programs for PET Nuclear Pharmacy Programs
  - Participate in working groups to come up with consistent rules and regulations in licensing guides
  - Participate and share experiences at CRCPD annual conferences and special meetings

©

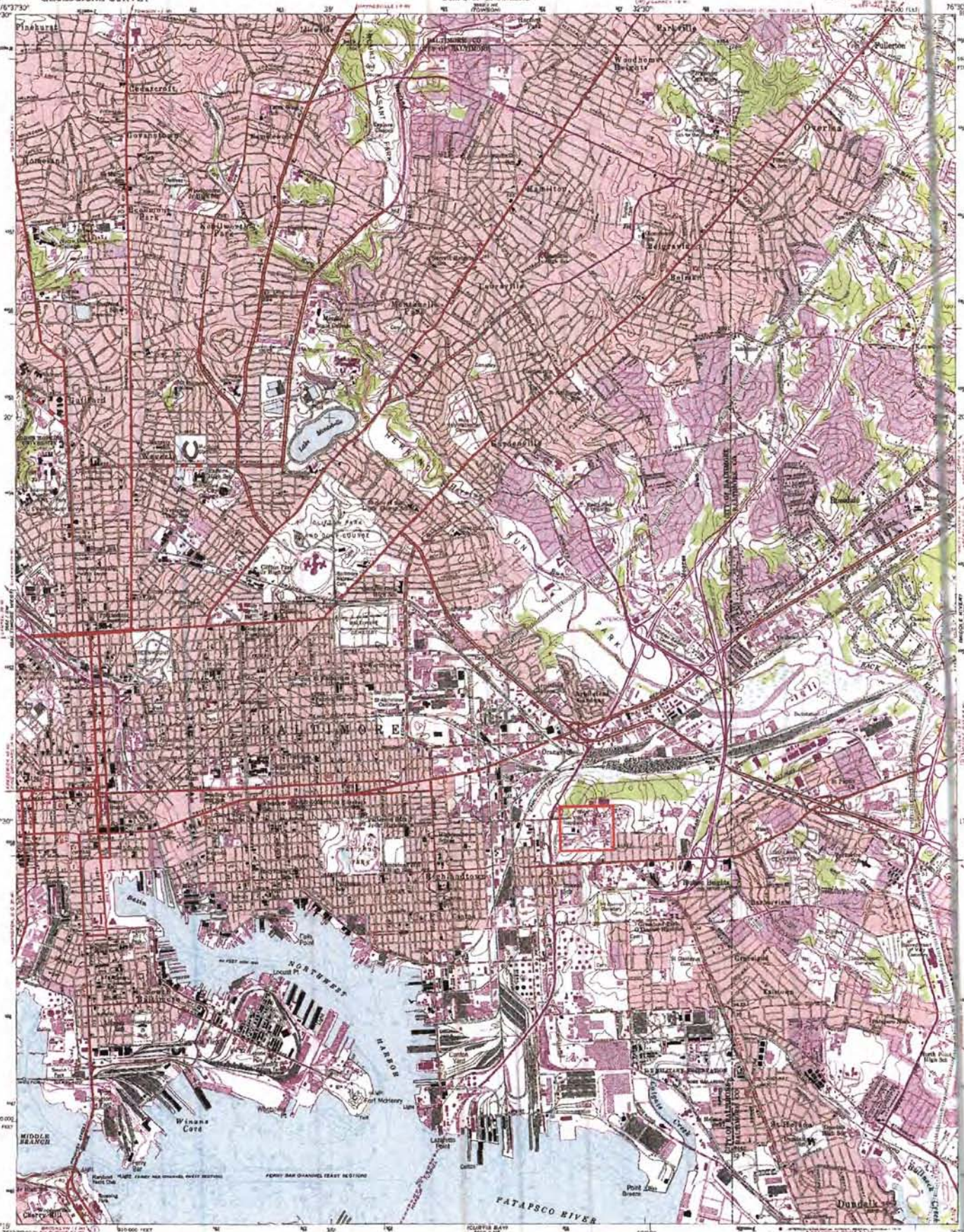
Appendix B

USGS Quadrangle and Basement Floor Diagram

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

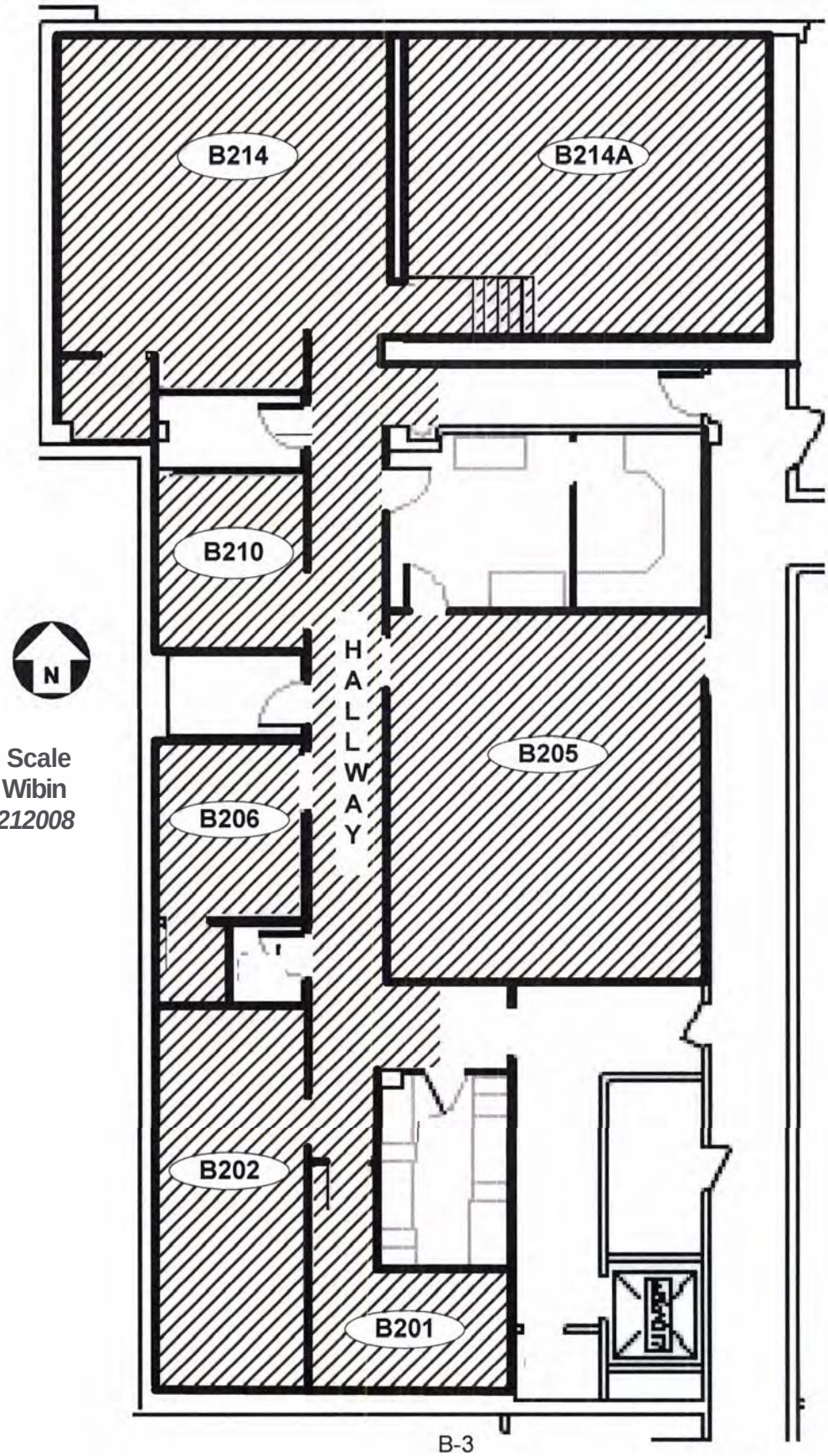
BALTIMORE EAST QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 BALTIMORE 15' QUADRANGLE



Mapped by the Army Map Service
Edited and published by the Geological Survey
Control by USGS, USC&GS, USCE, and City of Baltimore
Topography from aerial photographs by photogrammetric methods. Aerial photographs taken 1943. Field checked 1944
Culture revised by the Geological Survey 1953
Hydrography compiled from USC&GS Chart 545 (1951)
Polyconic projection. 1927 North American Datum
10,000 foot grid based on Maryland coordinate system
1000 meter Universal Transverse Mercator grid ticks, zone 18, shown in blue
Red tint indicates areas in which only landmark buildings are shown
Purple tint indicates extension of urban areas
Revisions shown in purple compiled by Geological Survey from aerial photographs taken 1966 and 1974. This information not field checked
Roads and railroads substantially as shown 1966

UTM GRID AND DATA MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Impacted Area - Building G Basement
Johns Hopkins Bayview Campus



No Scale
C. Wibin
811212008

Final Status Survey Report
G Building
Johns Hopkins Bayview Campus
5510 Nathan Shock Drive
Baltimore, MD 21224

Prepared for:

Aria Environmental, Inc.
PO Box 286
Woodbine, MD 21797

September 2008

Chesapeake Nuclear Services

788 Sonne Drive • Annapolis, MD 21401 • 410-266-9174

Glossary of Terms, Acronyms and Abbreviations

Bq	Becquerel; 1 Bq = 1 disintegration per second
ChesNuc	Chesapeake Nuclear Services, Inc.
cm^2	square centimeter
cm^3	cubic centimeter
CHP	Certified by American Board of Health Physics
cpm	counts per minute
DCGL	Derived Concentration Guideline Level
NIDA	National Institute on Drug Abuse
d	day
dpm	disintegrations per minute
DQO	data quality objective
EPA	Environmental Protection Agency
FSS	Final status survey
FSSP	Final status survey plan
FSSR	Final status survey report
g	gram
h	hour
HSA	Historical Site Assessment
LBGR	Lower Bound of the Gray Region
m	meter or month
m^2	square meter
m^3	cubic meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
MARSS	Mapping and Radiation Survey System
MDC	minimum detectable count
MDCR	minimum detectable count rate
MDE	Maryland Department of the Environment
MeV	mega electron volt; equal to 1.602 × 10-13 joules
mrem/yr	millirem per year
NARM	Natural and Accelerator Produced Radioactive Material
NIDA	National Institute on Drug Abuse
NIH	National Institutes of Health
NRC	Nuclear Regulatory Commission
NUREG	NRC nuclear regulation document
NRRPT	National Registry of Radiation Protection Technologists
pCi	picocurie
QA/QC	Quality Assurance/Quality Control
s	second
StdDev	Standard Deviation
SU	survey unit
Sv	Sievert; 1 Sv=100 rems
sq. ft.	square feet
WRS	Wilcoxon Rank Sum
y	year
µrem	microrem

Final Status Survey Report
Building G, Johns Hopkins Bayview Campus, 5510 Nathan Shock Drive, Baltimore, MD 21224

EXECUTIVE SUMMARY

As a result of the decision to cease operations in Building G, NIH-NIDA directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC in 10 CFR Part 20. Chesapeake Nuclear Services, Inc. (ChesNuc) performed the final status surveys (FSS) for Building G during August 2008 in compliance with federal regulations. The purpose of the Final Status Survey Report (FSSR) is to demonstrate that radiological conditions at the facility satisfy release criteria and that the site can be released for unrestricted use.

Radiological operations in Building G are currently authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) with an expiration date of October 31, 2010. Maryland Department of the Environment (MDE) exempted the facility from Maryland licensure requirements regarding the receipt, possession, and use of certain accelerator (cyclotron) produced radionuclides (NARM) until the NRC provided regulation. The cyclotron was removed from the facility, the area surveyed in June 2007, and then released for public use at the direction of the NIH-NIDA Radiation Safety Officer (RSO). The cyclotron had been removed and considered acceptable for release prior to the effective date of NRC regulations (November 30, 2007) addressing NARM radioactivity pertinent to the cyclotron. However, per 10 CFR Part 20, §20.1001, the NRC controls dose from radioactive materials when in combination with licensed materials. As detectable concentrations of Co-60 were identified prior to the release of the area, the concentrations would remain detectable today. Thus, the requirement exists to perform a final status close out survey for areas associated with cyclotron produced material. Any remaining contamination would be automatically authorized by the broad-scope license issued to NIDA.

The cyclotron was used to produce short-lived radionuclides for studies and research, including C-11, O-15, and F-18, which, by nature of radioactive half-life, no longer pose a residual contamination issue. However, the process was also created Cd-109, which was identified as a contaminant in Room B214 during the HSA. The materials contaminated with Cd-109 were removed during the conduct of the HSA; surface areas were decontaminated by the radiation safety staff.

The Historical Site Assessment (HSA) conducted by ChesNuc during July 2008 also indicated:

- A survey conducted by the Radiation Safety Officer reported detectable levels of Co-60 on the floor of the cyclotron Room B214A. The activity was reported as below regulatory dose concerns and the area had been released prior to the HSA.
- Ge/Ga-68 in liquid form was used in B210 and B205.
- H-3 was reported to have been used in some of the laboratories; in particular, Room B202.

All Data Quality Objectives (DQOs) of the survey were met; data and statistical analyses for individual measurements and individual survey unit summaries are provided.

No levels of radiation and radioactive material were detected during fixed measurements and scanning that exceeded the investigation level; and therefore, no discussion regarding this type of anomalous data is provided in the individual survey unit summaries.

In summary, residual contamination levels for each survey unit were a small fraction of the DCGL and the site is recommended for unrestricted release. This report and the HSA should be submitted to the NRC in the NIH-NIDA request to remove the authorized address from the NRC license.

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Final Status Survey Report
Building G, Johns Hopkins Bayview Campus, 5510 Nathan Shock Drive, Baltimore, MD 21224

1.0 OVERVIEW

As a result of the decision to cease operations in Building G, the National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC in 10 CFR Part 20. Chesapeake Nuclear Services, Inc. (ChesNuc) performed the final status surveys (FSS) for Building G during August 2008 in compliance with federal regulations. The purpose of the Final Status Survey Report (FSSR) is to demonstrate that radiological conditions at the facility satisfy release criteria and that the site can be released for unrestricted use.

Radiological operations in Building G are currently authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) with an expiration date of October 31, 2010. Maryland Department of the Environment (MDE) exempted the facility from Maryland licensure requirements regarding the receipt, possession, and use of certain accelerator (cyclotron) produced radionuclides (NARM) until the NRC provided regulation. The cyclotron was removed from the facility, the area surveyed in June 2007, and then released for public use at the direction of the NID-NIDA Radiation Safety Officer (RSO). The cyclotron had been removed and considered acceptable for release prior to the effective date of NRC regulations (November 30, 2007) addressing NARM radioactivity pertinent to the cyclotron. However, per 10 CFR Part 20, §20.1001, the NRC controls dose from radioactive materials when in combination with licensed materials. As detectable concentrations of Co-60 were identified prior to the release of the area, the concentrations would remain detectable today. Thus, the requirement exists to perform a final status close out survey for areas associated with cyclotron produced material. Any remaining contamination would be automatically authorized by the broad-scope license issued to NIDA.

The following is provided as a guide to correlate the information presented herein with that specified in NUREG-1757, Vol. 2 for information to be submitted in an FSS:

- Results of the Historical Site Assessment (HSA) are provided in Section 2.
- A summary of the DCGLs developed for this facility is provided in Section 3.
- An overview of the work performed is provided in Section 4.
- A description of the survey plan is provided in Section 5. The technique used to determine the number of samples required is provided in paragraph 5.7.5. The justification for the values used to determine the number of samples is also provided in paragraph 5.7.5.
- An overview of the results of the FSS is provided in Section 6.

No changes were made in the FSS from what was proposed in the FSS Plan. Minor adjustments were made in area requirements for "as found" survey areas. No changes were required in the initial survey unit assumptions relative to the extent of residual radioactivity (e.g., material not accounted for during site characterization).

2.0 BACKGROUND INFORMATION

The facility is part of the Johns Hopkins Bayview Medical Center which is one of five member institutions in the Johns Hopkins Health System. Building G is owned by FSK Land Corporation and is leased to and operated by NIDA-NIH.

2.1 Owner and Operator's Address

The owner of the facility is FSK Land Corporation (a Hopkins Entity) 1101 East 33rd Street, Suite E100, Baltimore, MD 21218-3637. The contact is Mr. Nick Farrell, Senior Director, Facilities, Design & Construction, and may be reached by telephone at (443) 997-3735 or by e-mail at nfarrell@jhu.edu.

The operator of the facility is the U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), NIH, 5500 Nathan Shock Drive, Baltimore, MD 21224. Mr. John P. Jacobus is the current RSO and may be reached by telephone at (301) 594-4018 or by e-mail at jjacobus@mail.nih.gov.

2.2 Facility Location

The facility is located on Johns Hopkins Bayview Research Campus, Building G, 5510 Nathan Shock Drive, Baltimore, MD 21224 which is in the east suburbs of Baltimore City, MD, an independent city surrounded but not included by Baltimore County, MD.

2.3 Site Information

2.3.1 Site Description

NIDA-NIH leases a total of 11,520 sq. ft. of the larger medical research two-story building. Leased space is on the 1st floor and basement only. Figure 1 presents a diagram of the facility basement where the work with radioactive materials took place. The rooms and the hallway impacted by radioactive materials are shown with a cross hatch line and their room number.

2.3.2 Site Conditions at Time of Final Survey

All bulk radioactive materials including waste had been removed. No radioactive work was ongoing at the time of the FSS. Only minor contamination levels (below release criteria) on working surfaces and low levels of activated Co-60 in the cyclotron room were expected to be identified during the FSS. The northern wall of the cyclotron room had been replaced with new wall-blocks following removal of the cyclotron.

Routine adherence to procedures and good housekeeping were the ALARA practices employed to achieve final activity levels.

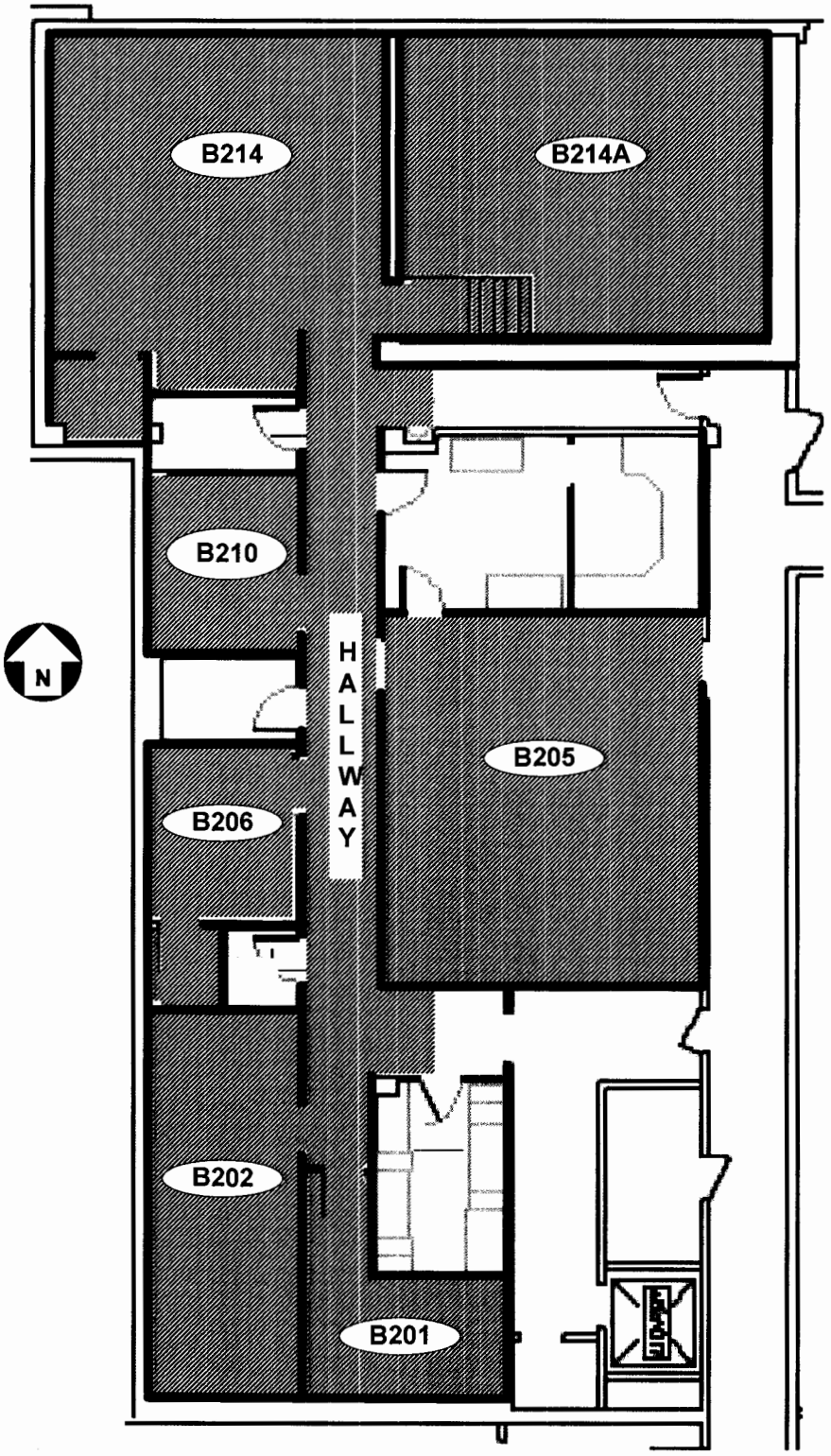

Figure 1. Building G, Basement Impacted Areas

2.4 Historical Site Assessment (HSA)

The HSA of the Building G activities was performed in accordance with the requirements of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG 1575, EPA 402-R-97-016. The HSA provided input to the design of Final Status Surveys, which in turn determine if the storage and use areas are suitable for unrestricted release as specified by the Nuclear Regulatory Commission (NRC).

The cyclotron was used to produce short-lived radionuclides for studies and research, including C-11, O-15, and F-18, which, by nature of radioactive half-life, no longer pose a residual contamination issue. However, the process was also used to create Cd-109, which was identified as a contaminant in Room B214 during the HSA. The materials contaminated with Cd-109 were removed during the conduct of the HSA; surface areas were decontaminated by the radiation safety staff.

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- A survey conducted by the Radiation Safety Officer reported detectable levels of Co-60 on the floor of the cyclotron Room B214A. The activity was reported as below regulatory dose concerns and the area had been released prior to the HSA.
- Ge/Ga-68 in liquid form was used in B210 and B205.
- H-3 was reported to have been used in some of the laboratories; in particular, Room B202.

Summaries from the HSA of the information and data collected are provided below:

2.4.1 Potential Contaminants

The HSA indicates that the potential radiological contaminants of unsealed radionuclides are as indicated in Table 1. Radionuclides with a half-life of less than 120 days, which can be disposed of by decay-in-storage, are also listed as these were in storage or use during the HSA property inspection.

Table 1. Potential Radionuclide Contaminants of Concern

Radionuclide	~Half-life*	Principal Decay Mode Energy (MeV)
H-3	12.3y	Beta 0.019
Ge/Ga-68	288d/68m	Electron 0.008/ Positron 1.89 max Gamma 0.511
Cd-109/Ag109m	464d/40s	Electron 0.018 / Electron~0.084 Gamma 0.088
Co-60	5.27y	Beta 0.317 Gamma 1.17 and 1.33

* Rounded values from MicroShield® User's Manual.

2.4.2 Impacted Areas

The following rooms and areas were identified as those involved in the production or use of radioactive material:

Cyclotron room -- B214A
Hot chemistry -- B214
Prep lab 1 -- B210
Prep lab 2 -- B206
Wet lab -- B202
Gantry -- B205
Micro PET -- B201
Adjacent Corridor

2.4.3 Non-Impacted Areas

For this survey, non-impacted areas are those not specifically listed above as impacted.

2.4.4 Potentially Contaminated Media

A review of potential migration routes within impacted areas was conducted. Migration routes include inside structures such as floor drains, trenches, or sumps; exhaust/ventilation (e.g., hoods); and sinks (e.g., hand-washing or industrial sinks) that may allow or increase the migration of radionuclides beyond the area where the storage or handling of radioactive materials originally occurred. The survey team was instructed to survey floor drains, sinks, hoods, and air ventilation discharge vents.

3.0 DERIVED CONCENTRATION GUIDELINE LEVELS (DCGLs)

The NRC has provided lookup DCGL tables when the surface contamination is not more than 10 mm thick. DCGLs must be developed per site when contamination is greater than 10 mm in thickness. As the cyclotron created volumetric sources greater than 10 mm in thickness, a volumetric DCGL was developed. NRC lookup tables are applicable to the rest of the impacted areas and are also discussed below.

3.1 Development of Volumetric DCGL

Operation of the cyclotron led to the production of radioactive material by activation in the shielding materials in the room housing the cyclotrons. The creation of radioactive material is principally due to activation of trace elements found in the shielding material. As the cyclotron (and associated shielding) has been removed, only activation of the concrete floor is considered per the results of the survey conducted by the NIDA-NIH RSO. As indicated in the HSA, Co-60 is the only radionuclide in the activated materials of potential concern in the cyclotron area.

Both the building renovation and occupancy scenarios described in NUREG/CR-5512, Vol. 1, were selected for review. During renovation the surface and volume sources will be disturbed, creating loose contamination. The exposure pathways for building renovation are primarily

- External exposure to penetrating radiation from volume sources (predominantly the concrete floor),
- Inhalation from airborne radioactive dust, and
- Inadvertent ingestion of loose surface contamination.

The external dose was determined with MicroShield® modeling considering the floor area (~400 ft^2) of the cyclotron room. The contamination thickness was approximated as 12 cm which is suggested by the depth distribution curve Kimura, reference 8.21. At a one meter distance above the center of the circular disk used for modeling, the exposure rate was 1.63 μR/hour per 1 pCi/g of Co-60. This exposure rate is a conservative value as the entire floor of the cyclotron room was not exposed to a uniform field of neutron radiation. For the model renovation time period of 500 hours, the dose was estimated to be ~ 0.8 mrem/year per pCi/g. .

Per NUREG/CR-5512, the concepts and factors involved in calculation of the committed effective dose equivalent (CEDE) for inhalation for the building renovation scenario are described in the following word equation:

[CEDE for inhalation] = [Exposure duration for renovation; 500 hours]
x [Volumetric breathing rate; 1.2 m^3/h]
x [Airborne dust-loading factor; 10^{-4} g/m^3]
x [Inhalation dose factor; 5.91E-8 Sv/Bq)]
x [Average concentration of radionuclide in concrete; 8.88E-2 Bq/cc]
/ [density of material; 2.4 g/cc]

For an average concentration in the concrete of 1 pCi/g or 8.88E-2 Bq/cc and applying the conversion factor of 1 Sv = 10^5 mrem, the CEDE is about 1.31 E-5 mrem per year.

Per NUREG/CR-5512, the concepts and factors involved in calculation of the committed effective dose equivalent (CEDE) for the inadvertent ingestion of loose surface contamination

after transfer to hands, foods, or other items entering the mouth is described in the following word equation:

[CEDE for ingestion] = [Exposure duration for renovation; 500 hours]
x [Effective transfer rate for ingestion; 10mg/h]
x [Ingestion dose factor; 7.28E-9 Sv/Bq)]
x [mean volume activity; 8.88E-2 Bq/cc]
/ [density of material; 2.4 g/cc]

For an average concentration in the concrete of 1 pCi/g or 8.88E-2 Bq/cc and applying the conversion factor of 1 Sv = 10^5 mrem, the CEDE is about 1.35 E-4 mrem per year.

A sum of doses from all pathways indicates that external exposure is the dominant one and that the inhalation and ingestion pathways are insignificant. A volumetric DCGL for Co-60 for the renovation scenario equivalent to 25 mrem is 31 pCi/g.

For the building occupancy scenario, the same modeling as described above for renovation is used but with a 2000 hours per year exposure time rather than the 500 hours assumed for renovation. As illustrated above, external exposure is the dominant pathway; and the inhalation and ingestion pathways are insignificant. A corresponding occupancy volumetric DCGL for Co-60 for 25 mrem/y is 7.7 pCi/g. As this is the smaller DCGL of the two scenarios, it was selected for this facility. Area factors, which increase DCGL values for small contaminated areas, were not determined for this evaluation as all concentrations were expected to be lower than the DCGL.

3.2 Development of Surface DCGLs

NUREG-1556, Vol. 11, indicates that surface contamination surveys should be conducted for both removable and fixed contamination before the facilities or equipment are released from restricted to unrestricted use. For the potential contaminants of concern listed above, Table S5 of NUREG-1556 provides the maximum acceptable residual levels for radionuclides used in Building G as indicated in Table 2.

Table 2. Acceptable Surface Contamination Levels

Radionuclide	Average[1] (dpm/100 cm^2)	Maximum[2] (dpm/100 cm^2)	Removable[3] (dpm/100 cm^2)
General beta-gamma emitters	5,000	15,000	1,000
[1] 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.			
[2] The maximum contamination level applies to an area of not more than 100 cm^2.			
[3] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency.			

Additionally, NUREG -1556, Vol. 11, Table 11.1, provides screening level DCGLs for H-3 and Co-60 based on the assumption that the fraction of removable surface contamination is equal to 0.1. The screening values represent surface concentrations of individual radionuclides that would be deemed in compliance with the 25 mrem/yr unrestricted release dose limit in 10 CFR 20.1402. For radionuclides in a mixture, the "sum of fractions" rule applies; see 10 CFR Part 20, Appendix B, Note 4. The screening level used for Cd-109 is found in Table 5.19 of NUREG/CR-5512, Vol. 3. It should be noted that this NUREG also contains screening values used in NUREG-1556. Neither NUREG had a screening level for the Ge/Ga-68.

Table 3. Acceptable License Termination Surface Screening Values

Radionuclide	Acceptable Screening Levels
H-3	1.2×10^8 dpm/100cm^2
Cd-109/Ag109m	1.1×10^5 dpm/100cm^2
Co-60	7.1×10^3 dpm/100cm^2

Table 2 values are the more conservative and were selected as DCGLs. If H-3, Cd-109, or Co-60 were identified in a mixture, the "sum of fractions" rule would be applied; see 10 CFR Part 20, Appendix B, Note 4. Mixtures may be summed and compared to Table 2 above.

4.0 FINAL STATUS SURVEY OVERVIEW

4.1 Survey Objectives

The purpose of the final status survey was to demonstrate that the radiological conditions at the facility satisfy the NRC release criteria and therefore, the site can be released from licensing restrictions for future use without radiological controls. The primary objectives of the final status survey are to:

- select/verify survey unit classification;
- demonstrate that the potential dose or risk from residual contamination is below the release criterion for each survey unit ; and
- demonstrate that the potential dose or risk from small areas of elevated activity, if any, is below the release criterion for each survey unit.

The final status survey provides data to demonstrate that all radiological parameters satisfy the established guideline values and conditions.

Professional judgment and biased sampling are important for locating contamination and characterizing the extent of contamination at a site. However, the MARSSIM focus is on planning the final status survey, which utilizes a more systematic approach to sampling. Systematic sampling is based on rules that endeavor to achieve the representativeness in sampling consistent with the application of statistical tests.

The Final Status Survey for release of areas was conducted in accordance with guidance given in MARSSIM. MARSSIM provides guidance on classifying areas and survey requirements based on potential level of residual radioactive material contamination relative to the established release criteria. MARSSIM also provides the following guidance as an aid in conducting surveys, and these are incorporated into this survey.

- Determine background activity for building surfaces. Only interior building surfaces are a concern per the HSA; exterior building parts and outdoor areas are considered non-impacted.

- Perform systematic and judgmental surface scan measurements.

- If elevated levels of contamination are identified (>50% of DCGLs), perform selective direct measurements and sampling of areas of elevated activity of residual radioactivity to provide data on upper ranges of residual contamination levels. Note that locations of high scan values should be used.

- Document survey and sampling locations. Establish a reference coordinate system. Prepare scale drawings as appropriate.

4.2 Organization and Responsibilities

The survey was performed by Chesapeake Nuclear Services using a qualified team composed of technical experts and radiation safety technicians. This is the same organizational structure which conducted the characterization survey activities. Figure 2 shows the organizational chart for the survey activities.

The ChesNuc team operated under the supervision of Claude Wiblin, CHP. Mr. Wiblin had the authority to make appropriate changes to the survey plan (subject to the established QA/QC program) as deemed necessary as the survey progressed. Mr. Wiblin also directed laboratory services for in-house analyses.

Field measurements of radiological parameters and sample collection were under the direction of Mr. James Brady, NRRPT.

QA/QC responsibilities were handled by a QA officer whose work responsibilities were otherwise separate from those on the survey team. Mr. J. Stewart Bland, CHP, served as the QA officer and coordinated all interface requirements during the survey process. Applicable ChesNuc QA procedures are developed from guidelines presented in ANSI/ASTM NQA-1, Quality Assurance Program Requirements for Nuclear Facilities (1989).

Mr. John P. Jacobus is the NIDA Radiation Safety Officer and observed portions of the survey.

4.3 Training

ChesNuc provides continuing training for its survey personnel and other workers who may be exposed to radioactive materials. Training varies according to potential exposure and the nature of the employee's job duties, which is consistent with 10 CFR Part 19.12, "Instruction to Workers" (Reference 8.12). In addition to the regular training, special training was provided on equipment, special techniques, and practices relative to the survey activities for those employees who were involved in taking radiological measurements and samples. All members of the final status survey team attended an in-house training session regarding radiation protection, survey procedures, and quality assurance activities. Documentation of training participation was retained in the ChesNuc training files.

4.4 Laboratory Services

All smears were analyzed by ChesNuc personnel offsite due to the amount of natural radon interference at the facility. Liquid scintillation counting for H-3 was performed by RSO, Inc., of Laurel, MD.

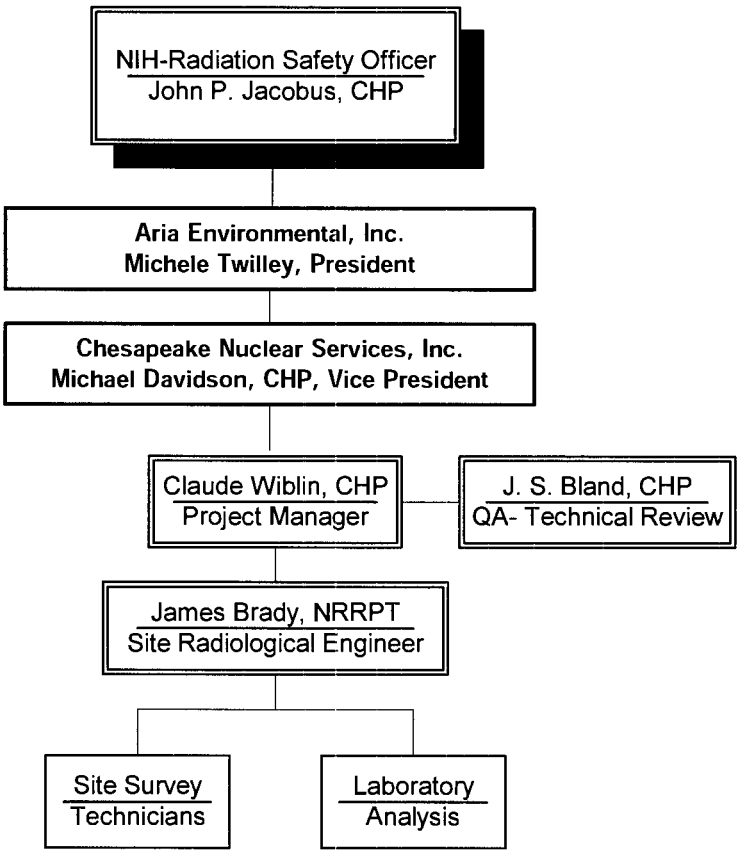

Figure 2. FSS Organization Chart

4.5 General Survey Plan

The survey plan consisted of systematic processes and procedures that have been deemed acceptable by industry practices and the NRC. MARSSIM methodology and its graded approach were afforded particular attention. Activities (organized units of work needed to complete a function) were defined and tasks (specific work assignments within a specific activity) were delegated to the appropriate team members. Table 4 provides a breakdown of activities and tasks of the FSSP.

Table 4. Overview of Major Activities and Tasks

Activities	Tasks
Evaluate contamination potential	1. Review radiological data from scoping and characterization surveys.
	2. Identify radionuclides of concern and determine DCGLs.
	3. Identify boundaries of survey units and classes.
Establish reference system	1. Determine frequency and locations of measurements to meet criteria.
	2. Prepare facility survey maps and work packages.
Determine background levels	1. Review HSA.
	2. Measure indoor beta levels on various materials.
Perform Measurements	1. Perform surface scans.
	2. Perform fixed point measurements.
	3. Collect smears.
Analyze samples	1. Count smears
Interpret data	1. Convert data to standard units.
	2. Calculate average levels.
	3. Compare data with criteria.
Prepare report	1. Construct data tables.
	2. Develop graphics.
	3. Prepare text.
	4. Submit report.

An example work process flow chart is shown in Figure 3.

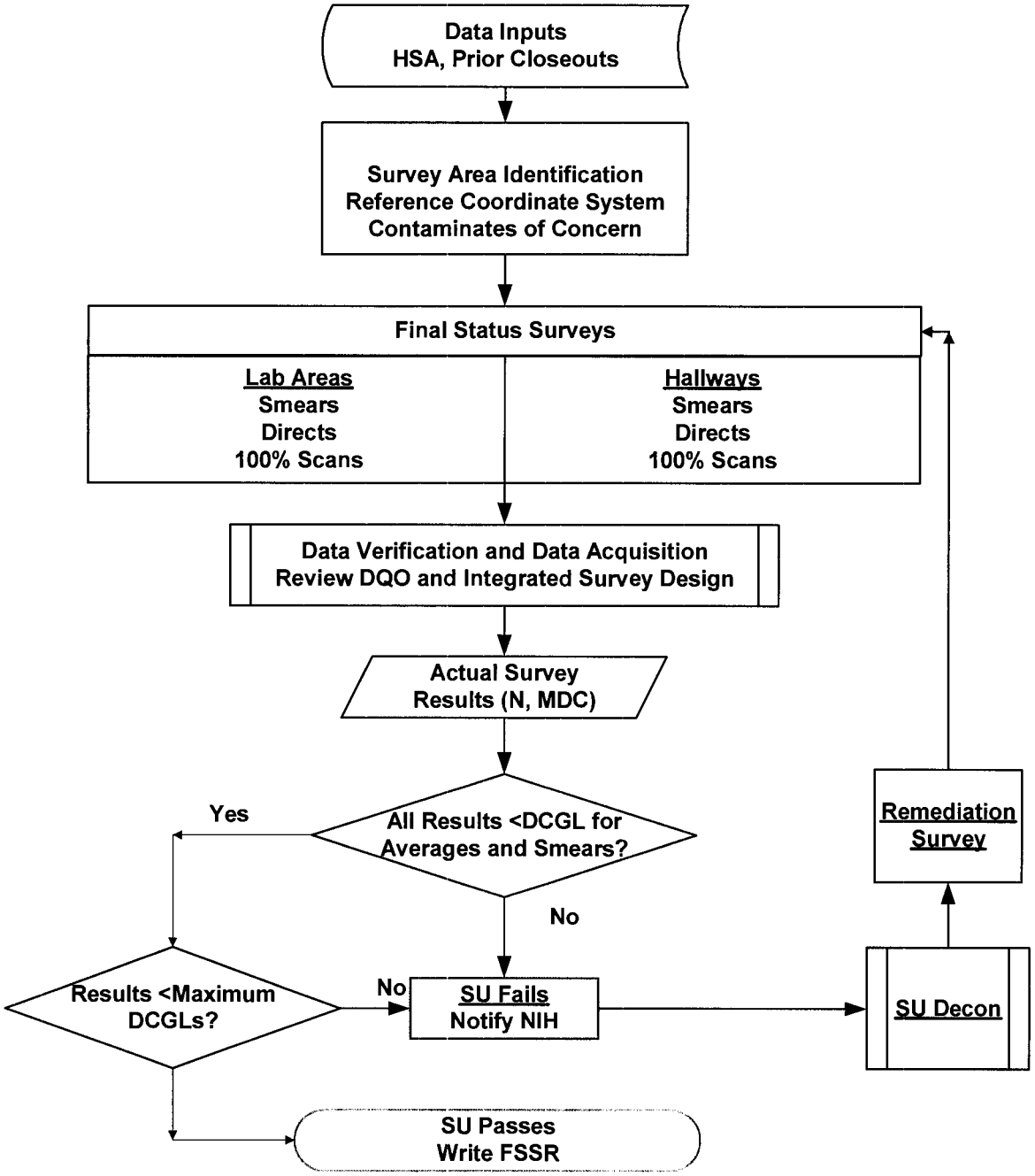

Figure 3. Work Process Flow Chart

5.0 SURVEY PLAN AND PROCEDURES

5.1 FSS Data Quality Objectives

Data Quality Objectives (DQOs) are fundamental components for planning. These were considered during the scoping surveys, became formal elements of the FSSP, and integrated/implemented during the FSS performance. The following DQOs are quantitative and qualitative statements derived from the output of the DQO process.

- The objective of the FSS is to prove that the residual radioactivity levels in the survey units within the facility are at or below the release criteria.
- The background reference materials will be located in the facility in an area that has similar construction materials to those being surveyed.
- The number of survey measurements and locations per survey unit will be determined by MARSSIM techniques.
- A response check form or instrument control log will be used to keep track of background counts and response checks on a daily basis during work activities.
- For beta fixed-point and scanning measurements, excluding H-3, instrument MDCs will be less than 2500 dpm/100 cm^2 which is 50% of the total surface activity release criteria for averages.
- For gamma static fixed-point and scanning measurements, excluding H-3, instrument MDCs will be less than 2500 dpm/100 cm^2 which is 50% of the total surface activity release criteria for averages.
- For gamma volumetric fixed-point and scanning measurements for Co-60, instrument MDCs will be less than 3.9 pCi/g which is 50% of the total surface activity release criteria for averages.
- For smear measurements, instrument MDCs will be less than 500 dpm/100 cm^2 which is 50% of the removable activity release criteria.
- Smear measurements for H-3 will serve as a surrogate for total surface activity and smear measurement results will be considered as 10% of the total activity. The smear investigation level (IL) will be measurements >500 dpm/100 cm^2.
- A beta scan will be performed over 100% of work areas and floors within the laboratory, storage areas, and contiguous hallway. A gamma scan will be performed over 100% of work areas and floors of laboratory and storage areas with known gamma emitters. The scanning investigation level (IL) will be measurements > 50% DCGLs; excluding H-3.
- Quality control (QC) measurements will be made to evaluate instrument and operator precision; about 5% of fixed point measurements will be re-performed by the radiological engineer. Acceptability of measurements will be determined using guidance found in NRC Inspection Procedure 84750.

5.2 Instrumentation

5.2.1 Description of Probes

Both beta-gamma (gas flow) probes 43-68 and 43-37 and gamma probe 44-10 were used in this survey. Photos of the 43-68 and 44-10 are shown in Figure 4; the 43-37 is similar in construction to the 43-68.

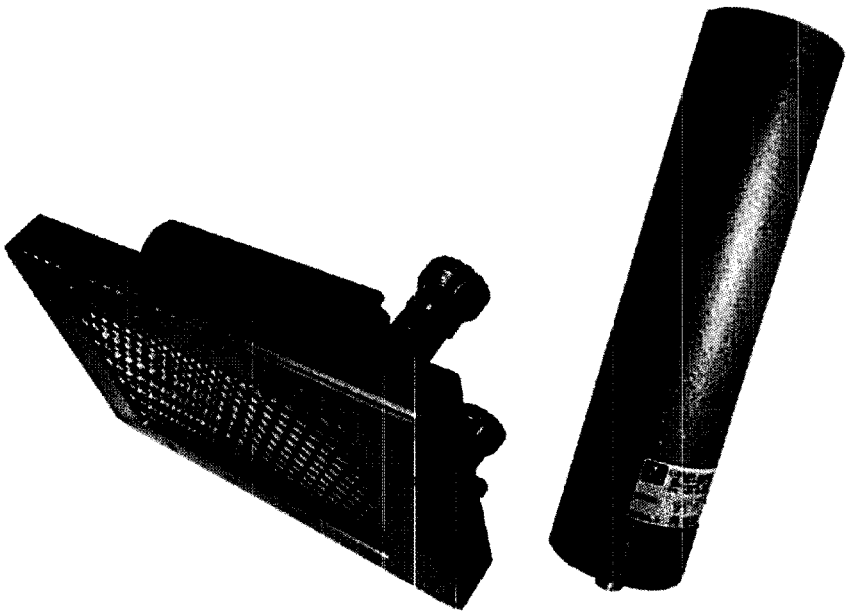

Figure 4. Ludlum Model 43-68 and 44-10 Probes

Manufacturer data for the physical probe area of the Ludlum 43-68 probe indicates dimensions of 3.9"(10cm)H X 4.6"(11.7cm)W X 7.8"(19.8cm)L; the area used for measurements is the screened area of 126 cm^2. Manufacturer data for the physical probe area of the Ludlum 43-37 probe is similarly quoted as 0.8"(2cm)H X 6.3"(16cm)W X 18.3"(46.5cm)L; the area used for measurements is 582 cm^2.

5.2.2 Description of Instrument Calibration and Use of Check Sources

Calibration of the NaI probe was performed in a Cs-137 gamma field as 1) response is energy dependent and 2) the manufacturer provides multipliers to the response to Cs-137 gamma energy for responses to other energies.

For beta measurements, calibration to C-14 was performed. C-14 decays by beta emission with a maximum energy of 0.156 MeV and an average energy of 0.05 MeV. Use of C-14 is considered conservative as the C-14 average energy is considerably less than the beta energy for Co-60, about the same as the electron from Ag/109m, and at least a magnitude less than the average positron energy from Ga-68. Instrument efficiency in the field will be better than that reported and results will be reported higher than actual.

The daily check sources used were traceable to the National Institute of Standards and Technology (NIST). Calibration sheets and instrument use logs are filed in ChesNuc's Field Notes.

5.3 Efficiency Determinations and Minimum Detectable Concentrations

5.3.1 Beta Static and Scan Minimum Detectable Concentrations (MDC)

NUREG-1507 (Reference 8.6) provides a rigorous derivation of the calculational expression for instrument sensitivity, typically stated as the minimum detectable concentration (MDC). The MDC equations and example values for both static measurements and swipe analysis are presented in this section.

For static measurements, background and indicator measurements are both typically one minute in duration. The following equation for the MDC from NUREG-1507, Equation 3-10, as modified, applies:

$$StaticMDC = \frac{3 + 4.65\sqrt{C_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

C_b = Background count in one minute
ε_i = Intrinsic instrument efficiency
ε_s = Surface efficiency
a = probe area in cm^2

For scanning, the time interval over an area is typically one second. The following equation is developed from reference NUREG-1507.

$$ScanMDC = \frac{1.38 * 60\sqrt{\frac{R_B}{60}}}{\sqrt{0.5}(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

1.38 = a desired performance proportions level of 0.95 for true positive results and a level 0.6 false positives;
R_B = Background rate in cpm; and
$\sqrt{0.5}$ = MARSSIM determined level of performance for the surveyor.

Table 5. Nominal Beta MDCs and MDCRs

Model	Serial	Area (cm^2)	Background (cpm)	ScanMDC ($dpm/100cm^2$)	ScanMDCR (cpm)	Static MDC ($dpm/100cm^2$)	Static MDCR (cpm)
43-68	Pr148454	126	373	1158	292	107	27
43-37	Pr128625	582	945	399	465	Not used	

5.3.2 Gamma Static and Scan Minimum Detectable Concentrations (MDC)

Modeling of the small area of elevated activity (using MicroShield® software) determines the net exposure rate produced by a radionuclide concentration at distances of 2.5 cm and 6 cm above the source. These positions are selected because it relates to the height of the center of the detector during fixed measurements and the average height of the NaI(Tl) scintillation detector above the surface during scanning. Note that the scanning distance for this indoor scanning is smaller than the example provided by MARSSIM for soil scanning; this is possible as there are no obstructions or protrusions from the floor versus the ever present grass and sticks in soil monitoring.

The factors considered in the modeling include:

_ radionuclide of interest
_ expected concentration of the radionuclide of interest
_ areal dimensions of the area of elevated activity
_ depth of the area of elevated activity
_ location of dose point NaI(Tl) scintillation detector height above the surface density of material being surveyed

Modeling analyses were conducted with MicroShield® software for the different areas and radionuclides of interest which were identified in the HSA and which have a gamma component: Co-60, Cd-109/Ag-109m, and Ge-68/Ga-68. The objective was to determine the radionuclide concentration that is correlated to the minimum detectable net exposure rate for each of the radionuclides of interest. Results of all MicroShield® computer analyses printouts are found in Appendix B.

5.3.2.1 Considerations for Co-60

Co-60 was identified during the closeout survey conducted by the RSO. Modeling analyses were conducted considering a cylindrical area dimension of elevated activity of 0.25 m^2 (radius of 28 cm), the depth of the area of elevated activity is 12 cm, the dose point is 6 cm above the surface, and the density of concrete is 2.4 g/cm^3. A depth of 12 cm for activated concrete is considered to be appropriate for this model as this is the depth indicated by Kimura (Reference 8.21).

The scan MDC for Co-60 for a 2 in. by 2 in. NaI(Tl) scintillation detector is considered in detail. Assume that the background level is 7,100 cpm and that the desired level of performance (95% correct detections and 60% false positive rate) results in a *d'* of 1.38. The scan rate of 0.25m/s

provides an observation interval of 2 seconds (based on a diameter of about 56 cm for the area of elevated activity). The $MDCR_{surveyor}$ may be calculated assuming a surveyor efficiency (p) of 0.5 as follows:

1) b_i = (7,100 cpm) (2 sec) (1 min/60 sec)=237 counts

2) MDCR = (1.38) ($\sqrt{237}$) (60 /2)= 637 cpm

3) $MDCR_{surveyor} = 637/\sqrt{0.5} = 900$ cpm

The corresponding minimum detectable activity concentration is determined for this detector and radionuclide. Interpolation of the manufacturer's data for gamma energy versus cpm per µR/h of this particular 2 in. by 2 in. NaI(Tl) scintillation detector yields a count-to-exposure rate ratio for Co-60 of 474 cpm per µR/h for the 1.173 MeV gamma and 414 cpm per µR/h for the 1.332 MeV gamma A MicroShield® computer run was performed to determine the exposure rates for a unity (1pCi/g) concentration of Co-60 in concrete. The results are shown in Table 6.

Table 6. NaI Scan Efficiency for Co-60

Energy (MeV)	Exposure Rate (µR/hr) With Buildup	cpm per µR/h	cpm per pCi/g
1.1732	0.73	474	345
1.3325	0.81	414	336
Totals	**1.54**		**681**

The scan MDC is calculated by dividing the $MDCR_{surveyor}$ (900 cpm) by the total cpm per pCi/g shown in the table above. The minimum scan detectable concentration for this example is 1.3 pCi/g.

For static measurements the MDC was estimated with the following formula:

$$MDC = \frac{3 + 4.65\sqrt{C_B}}{KT}$$

Where C_B is the background count in time, T, and K is the instrument efficiency. For a background of 7,100 cpm for the concrete immediately under the cyclotron and a closer distance of 2.5 cm, a MicroShield® computer run was performed to determine the exposure rates for a unity (1pCi/g) concentration of Co-60 in concrete. The results are shown in Table 7.

Table 7. NaI Static Efficiency for Co-60

Energy (MeV)	Exposure Rate (μR/hr) With Buildup	cpm per μR/h	cpm per pCi/g
1.1732	0.92	474	436
1.3325	1.03	414	425
Totals	**1.95**		**861**

The static MDC is then calculated by applying the total cpm per pCi/g shown in the table above. The minimum static detectable concentration for this example is ~0.5 pCi/g.

5.3.2.2 Considerations for Cd-109/Ag-109m

Similarly for Cd-109/Ag-109m, a MicroShield® computer run was performed to determine the exposure rates from a surface with a contamination level of 5,000 dpm/100 cm^2. Interpolation of manufacturer data of the NaI detector was made for the results shown in the Table 8

Table 8. NaI Efficiency for Cd-109/Ag-109m

Energy (MeV)	Exposure Rate (mR/hr) With Buildup		cpm per μR/h	cpm per 5000 dpm/100cm^2	
	2.5 cm	6 cm		2.5 cm	6 cm
0.022	5.57E-05	3.62E-05	2792	156	101
0.022	1.05E-04	6.82E-05	2792	293	190
0.0222	1.04E-04	6.74E-05	2792	290	188
0.0222	1.96E-04	1.27E-04	2792	546	355
0.0249	2.62E-05	1.70E-05	3680	96	63
0.0249	4.94E-05	3.21E-05	3680	182	118
0.088	5.06E-06	3.29E-06	11136	56	37
Totals	**5.41E-04**	**3.51E-04**		1619	1052

A general background for most of the laboratory areas was determined to be 5,454 cpm. Using the formulas given above to determine the surveyor's MDCR:

1) $b_{i=}$ (5454 cpm) (2 sec) (1 min/60 sec)=182 counts

2) MDCR =(1.38) ($\sqrt{182}$) (60 /2)= 558 cpm

3) $MDCR_{surveyor}$ = 637/$\sqrt{0.5}$ = 789 cpm

The scan MDC is calculated by dividing the $MDCR_{surveyor}$ (789 cpm) by 0.21 cpm per dpm/100cm^2 for a 6 cm height as determined from the above table. The minimum scan detectable concentration for Cd-109/Ag-109m is about 3,760 dpm/100cm^2.

The static MDC is determined using an efficiency of 0.32 cpm per dpm/100cm^2 at a 2.5 cm height as determined from the above table. The minimum static detectable concentration for Cd-109/Ag-109m is about 1,070 dpm/100cm^2.

5.3.2.3 Considerations for Ge/Ga-68

Similarly for Ge/Ga-68, a MicroShield® computer run was performed to determine the exposure rates from a surface with a contamination level of 5,000 dpm/100 cm^2. Interpolation of manufacturer data of the NaI detector was made for the results shown in Table 9.

Table 9. NaI Efficiency for Ge-68/Ga-68

Energy (MeV)	Exposure Rate (mR/hr) With Buildup		cpm per µR/h	cpm per 5000 dpm/100cm^2	
	2.5 cm	6 cm		2.5 cm	6 cm
0.511	1.79E-03	1.16E-03	1244	2221	1443
1.0145	4.49E-06	2.92E-06	534	2	2
1.0774	6.45E-05	4.19E-05	511	33	21
1.8831	4.23E-06	2.75E-06	281	1	1
Totals	**3.35E-03**	**2.17E-03**		2257	1467

As before, a general background for most of the laboratory areas was determined to be 5,454 cpm. Using the formulas given above to determine the surveyor's MDCR:

1) $b_{i=}$ (5454 cpm) (2 sec) (1 min/60 sec)=182 counts

2) MDCR =(1.38) ($\sqrt{182}$) (60 /2)= 558 cpm

3) $MDCR_{surveyor}$ = 637/$\sqrt{0.5}$ = 789 cpm

The scan MDC is calculated by dividing the $MDCR_{surveyor}$ (789 cpm) by 0.29 cpm per dpm/100cm^2 for a 6 cm height as determined from the above table. The minimum scan detectable concentration for Ge-68/Ga-68 is about 2,720 dpm/100cm^2.

The static MDC is determined using an efficiency of 0.45 cpm per dpm/100cm^2 at a 2.5 cm height as determined from the above table. The minimum static detectable concentration for Ge-68/Ga-68 is about 770 dpm/100cm^2.

5.4 Activity Measurements

5.4.1 Beta Surface Activity

A beta measurement for surface activity is performed over an area, represented by the physical surface area of the detector. To convert instrument counts to conventional surface activity units, the following equation is used:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

C_s = Integrated counts recorded by the instrument

C_b = Background counts recorded by the instrument

t_S = Sample counting time

t_B = Background counting time

5.4.2 Gamma Surface Activity

A gamma measurement for surface gamma activity is performed over an area, represented by the model area of the NaI detector. To convert instrument counts to conventional surface activity units, the following equation is used:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{\varepsilon_{Total}}$$

where:

ε_{Total} = instrument total efficiency (cpm per dpm/100cm^2)

5.4.3 Gamma Volume Activity

A gamma measurement for volume gamma activity is performed over a concrete area, represented by the model area of the NaI detector. To convert instrument counts to conventional surface activity units, the following equation is used:

$$\frac{pCi}{g} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{\varepsilon_{Total}}$$

where:

ε_{Total} = instrument total efficiency (cpm per pCi/g)

5.5 Smear Analysis

All smears were analyzed with the Ludlum 2929 for a gross determination of contamination levels as dpm/100 cm^2. Except for H-3, the efficiencies are acceptable, e.g., C-14 as 8%. Smears were then analyzed for H-3 by Radiation Services Organization, Inc, (RSO), Laurel, MD. RSO uses liquid scintillation counting for H-3 which permits concurrent analysis for C-14 and P-32.

Background and sample count times used to analyze a smear on the Ludlum 2929 are typically twenty minutes and one minute, respectively. When the background count time and the sample count time are different, the following MDC formula, taken from NUREG-1507, Equation 3-11, as modified for here, applies:

$$MDC = \frac{3 + 3.29\sqrt{R_B t_S\left(1 + \frac{t_S}{t_B}\right)}}{(\varepsilon_s)(\varepsilon_i)(t_S)\left(\frac{a}{100cm^2}\right)}$$

where:

a = area of surface smear in cm^2, nominally 100 cm^2

5.6 Reporting Activity and Confidence Intervals

The term "measurement uncertainty" is used interchangeably with the term standard deviation. The uncertainty is qualified as numerically identical to the standard deviation associated with a normally distributed range of values. When reporting a confidence interval for a value, the range of values that represent a pre-determined level of confidence (*i. e.*, 95%) is made. To make this calculation, the final standard deviation, or total uncertainty σ_U as shown in MARSSIM Equation 6-16, is multiplied by a constant factor k representing the area under a normal curve as a function of the standard deviation. The values of k selected for this report is 1.96 representing a 95% confidence level.

The basic formula for calculating the dpm per 100 cm^2 is repeated here as follows:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_B}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

Note that the numerator has an uncertainty associated with the count rates and the denominator has two efficiency terms and each of them has an uncertainty also. The standard deviation of the count rate is determined by MARSSIM equation 6-15; the uncertainty of the source efficiency is stated in Table 5.5 of NUREG-1507 as +/- 0.054 at the 95% CL; and the uncertainty of the calibration sources are presented above. The percentage uncertainty related to the instrument efficiency is assumed to be equal to the uncertainty percentage values reported for

the calibration sources. The total efficiency uncertainty was determined through propagation of the uncertainties related to ε_s and ε_i. The uncertainty of the measurement was then determined through propagation of the uncertainties related to ε_{total} and the uncertainty of the count rate. Handling only two at a time of the various uncertainties permitted the use of the uncertainty propagation techniques described in paragraph 6.8.3 of MARSSIM.

The equation used for calculating the standard deviation of a net count rate over a time t with consideration given to background is found as MARSSIM formula (6-15):

$$s_r = \sqrt{\frac{R_c}{t_s} + \frac{R_B}{t_B}}$$

Where:

R_c = Sample count rate (cpm)

R_B = Background count rate (cpm)

For this work, t_B is the total number of one minute counts used to determine the background count rate is 20. This value is used for reference area counts for static/scan measurements and a laboratory blank is used for smears.

The MARSSIM equation for error propagation for division or multiplication is used to calculate total uncertainty:

$$\sigma_u = u * \sqrt{\left(\frac{\sigma_x}{x}\right)^2 + \left(\frac{\sigma_y}{y}\right)^2}$$

where u = x / y or x * y

The following <u>example</u> of a typical determination of the measurement result for a smear (see results for sample 11, Room B201) and its related uncertainty at the 95% confidence level is provided. The following is given:

C_s = 60 cpm

R_B = 55.6 cpm

t_S = 1 min

t_B = 20 min

ε_i = 0.552 epm/dpm

ε_s = 0.25 cpm/epm

a = 100 cm^2

1) The total number of disintegrations is:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

$$\frac{dpm}{100cm^2} = \frac{60cpm - 55.6cpm}{(0.25epm/dpm)(0.552cpm/epm)\left(\frac{100cm^2}{100cm^2}\right)}$$

$$\frac{dpm}{100cm^2} = 32$$

2) The equation used for calculating the standard deviation of a count rate over a time t with consideration given to background is found as MARSSIM formula (6-15) modified here considering that the background sigma was determined for a sequence of background counts:

$$s_r = \sqrt{\frac{R_c}{t_c} + \sigma_B^2}$$

$$s_r = \sqrt{\frac{60cpm}{1\min} + (5.1cpm)^2}$$

$$s_r = 9cpm$$

3) The uncertainty for the instrument efficiency was estimated at one standard deviation for the set of 20 measurements of the check source and corresponding 20 measurements of the instrument background using the following approach.

$$\varepsilon_{total} = \frac{AverageCountRate - AverageBackgroundRate}{4\pi EmissionRate}$$

The standard deviation of the instrument total efficiency was about 0.013 cpm/dpm.

4) The total uncertainty in the measurement activity related to the efficiencies and the net count rate is determined using MARSSIM's equation for error propagation for division:

$$\sigma_u = \frac{C_{net}}{\varepsilon_{total}} * \sqrt{\left(\frac{\sigma_{eff}}{\varepsilon_{total}}\right)^2 + \left(\frac{\sigma_r}{C_{net}}\right)^2}$$

$$\sigma_u = \frac{60-55.6}{(0.25*0.552)} * \sqrt{\left(\frac{0.013}{0.138}\right)^2 + \left(\frac{9}{60-55.6}\right)^2} \text{ dpm}$$

$$\sigma_u = 65 \text{ dpm}$$

5) The activity will then be 32 dpm/100 cm^2 and the total uncertainty for this one sigma formula will be about 65 dpm/100 cm^2. (Note that the count time is considered to have trivial variance and is assumed to be a constant.)

Referring to MARSSIM Table 6.9, a k value of +/-1.96 represents a confidence interval equal to 95% about the mean of a normal distribution. Therefore, the 95% confidence interval would be 1.96 x 65 dpm/100 cm^2 = 130 dpm/100 cm^2. The final result is 32 +/- 130 αpm/100 cm^2. These values are presented for each measurement in the results with any adjustment required for the physical size of the probe.

Similar equations and techniques were used for static and scanning measurements.

5.7 Survey Plan

5.7.1 Area Classification

For the indicated impacted areas at the facility, the HSA suggests that classification of impacted areas be into two classes, based on MARSSIM definitions for Class 1 and 3.

- Class 1 areas are impacted areas that, prior to remediation, had concentrations of residual radioactivity above the DCGL. Remediated areas were Class 1 and Rooms 214 and 214A were identified as such.

- Class 2 areas have or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the DCGL. No areas were identified in this category. No Class 2 areas were identified at this facility.

- Class 3 areas are impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the DCGL. The hallway and rooms of use other than B214 and B214A were considered in this category.

- Non-impacted areas: For this facility, the HSA concludes that potentially impacted areas do not include any other floors or areas as radioactive material was used exclusively in the basement.

5.7.2 Selection of Area Size and DCGLs for Survey Units

Suggested survey unit sizes from MARSSIM are given in the following table. These areas are suggested in MARSSIM because they give a reasonable sampling density and they are consistent with most commonly used dose modeling codes. However, the size and shape of a particular survey unit may be adjusted to conform to the existing features of the particular site area.

Table 10. Suggested Area Limits for Survey Units

Class	Structures - floor area
1	Up to 100 m^2
2	100 to 1000 m^2
3	no limit

For this survey, each individual laboratory and the hallway were treated as individual survey units. Both Class 1 areas were under 100 m^2 in floor area and the remainder of the survey units were less than 1000 m^2 each.

5.7.3 Surface Scans

As Cd-109/Ag-109m contamination was discovered during the HSA in Room B214, it was prudent to perform a 100% beta-gamma scan on all work counters, floors, inside fume hoods, and sink areas. Additionally, 100% gamma scans were performed on all work counters, floors, inside fume hoods, and sink areas in rooms B205, B210, B214, and B214A as material identified with these rooms have a gamma decay component.

As directed by MARSSIM, each survey unit received a surface scan using appropriate survey instruments. Scan speed (observation time) was pre-determined per survey unit depending upon the DCGL and area size; minimum scanning time goals were set. For beta contamination detectors, scanning at much less than one detector width per second was required to ensure that the scan MDC met the project DQOs. For the NaI scan surveys, the speed was set for a 2 second observation interval. Both speeds ensure a sufficiently low MDC as discussed earlier to meet DQOs.

5.7.4 Background Materials

The background or reference materials were chosen due to their similarity in construction materials, construction date, and absence of any history of storing or handling radioactive materials.

For comparability of results, survey measurements were collected from the reference material areas using similar instruments and survey techniques employed in the survey unit areas. Each background reference material was surveyed using 20 random static/scan measurements.

5.7.5 Determining the Number of Survey Points

The following technique is used to determine the number of samples required. The number of survey points as estimated may be increased, but MARSSIM suggests the value should be conservative until all actual values are known. A review was made post-survey to determine if more samples were required but conservatism is also built into the design to preclude this from happening.

Section 5.5.2.2 of MARSSIM describes the process for determining the number of survey measurements necessary to ensure a data set sufficient for statistical analysis. For building and structure surfaces, the Wilcoxon Rank-Sum (WRS) test may be used. The method for determining the combined number of data points (N) for the survey unit and reference area is based on the expected contaminant variability and the predetermined acceptable Type I and Type II error rates. The project data quality objectives (DQO) established the Type I and Type II error rates (α and β respectively) at 0.05.

The "relative shift" (Δ/σ) is the ratio involving the concentration to be measured (Δ) relative to the expected variability in that concentration sigma (σ), and can be thought of as an expression of the resolution of the measurements. The sigma (σ) is selected from the larger of that found in the survey unit or the reference area. The shift (Δ) is the width of the statistical gray region or difference in the release criterion and the lower bound of the gray region (LBGR). The gray region is the area where the impact of making an incorrect error decision (Type I or Type II error) is small. The LBGR is the concentration at which the type II error rate is set. It is advantageous to set the LBGR at or above the expected median contaminate concentration in the survey unit; characterization data from the HSA indicated that 50% of the DCGL was well above the expected concentration levels. The Lower Bound of the Gray Region (LBGR) represents average concentrations that one expects to find after remediation is complete; by definition, the LBGR is something less than the DCGLw.

As decontamination efforts were on-going during the HSA with FSS activities to follow immediately, a conservative approach to the required number of samples was used. MARSSIM recommends assuming a coefficient of variation of 30% for sigma when preliminary data are not available, an assumption of 0.3 times a DCGL. Routinely the LBGR is set at one-half of the DCGL or the mean of any scoping/characterization surveys. All of this is summarized in the following formulas:

$$\frac{\Delta}{\sigma} = \frac{DCGL - 0.5 * DCGL}{\sigma}$$

$$\frac{\Delta}{\sigma} = \frac{0.5}{0.3}$$

$$\frac{\Delta}{\sigma} \approx 1.7$$

To determine the number of data points needed in each survey unit and reference area, MARSSIM Table 5.3 is used. For this example, each structure survey unit and the reference area are expected to have a minimum of 15 survey points. However, from the HSA, preliminary data was available to estimate the relative shift which was confirmed during the FSS. The low level of contaminant averages and associated sigmas drove the relative shift to levels (4.5 and higher) which are not particularly useful for an FSS design. MARSSIM recommends that if the relative shift is greater than 3 to adjust the LBGR until the relative shift is between the values of 1 and 3. This adjustment was required in all survey units. At a derived relative shift of 3 and with the DQOs for α and β at 0.05, the required number of data points needed in each survey unit and reference area, MARSSIM Table 5.3 is used, is 10. Similarly at a relative shift of 1.7, the number of data points in each survey unit is 15. By selecting 15 as the target number of sample locations in each survey unit, the probability of not obtaining sufficient data obviously diminishes. However, the shape of the cyclotron unit required 16 data points to complete the grid pattern.

5.7.6 Determination of Survey Point Locations

Before the surveys are conducted within a survey unit, a fixed reproducible starting point is selected, such as the southwestern corner of the survey unit at ground level. The survey unit points are based on an X-Y reference-coordinate system that was provided with the FSS maps. Equipment such as tape and laser measurers were used in the measurement of the survey units for the FSS. SAE units (feet and inches) were used for measuring the survey units. Visual aids such as chalk or removable tape were used to mark survey point locations within the survey unit.

Reference material measurements were taken and recorded in a similar fashion to measurements taken in the survey units. The gross activity measurements (uncorrected for background) in the reference area(s) were compared to the gross activity measurements in the

survey units to determine if the null hypothesis (the survey unit is contaminated) is accepted or rejected. All reference material and Class 3 survey points were randomly selected.

Once the number of data points required for each survey unit is determined, the location of the first survey point in each survey unit is determined using a random number generator to generate an X and Y coordinate in meters from a reference point (0, 0).

The (0, 0) point was generally taken as the southwestern corner of the survey unit or survey area at ground level. The referenced points are clearly identified on each survey unit map. For an X or Y coordinate to be valid, it must fall on the survey map within the survey unit.

The survey points for the Class 1 Survey Units had a randomly selected starting point. Once the initial randomly selected survey point was determined, the remaining points were mapped on the survey map using a systematic triangular grid pattern.

Survey unit maps are provided in Appendix A. These show the survey points with their (X, Y) coordinates for the Class 1 survey units. Class 3 survey unit maps were deemed to be of sufficient clarity that coordinates were not shown.

5.7.7 Surface Activity Measurements

Each survey unit and the reference area were initially designed to have a minimum of 15 randomly located survey points. All survey units received a 100% beta scan on work surfaces, floors, fume hoods, and sinks. A smear was performed at each survey point and on selected drains, sinks, or HVAC vents.

Direct Measurements

Direct measurements of surface activity were performed at selected locations using instrumentation listed in Table 5. Measurements were conducted by integrating counts over a 1 minute period.

Removable Contamination Measurements

A standardized method for smear testing of a relatively uniform area was used to aid in comparing contamination at different times and places. A smear taken from an area of about 100 cm^2 is deemed acceptable to indicate levels of removable contamination.

6.0 DATA INTERPRETATION

During the FSS, data was properly documented so that aspects of the FSS can be referenced in the future if desired. The survey documentation is of sufficient detail to allow for the recreation of the survey procedure, location, instrumentation used, and results.

All of the data taken including fixed measurements, scanning measurements, and removable contamination were documented in detail. Instrument measurements and analytical results include the following data:

- Daily background measurements
- Location of the measurement or sample
- Date and time of the measurement or sample
- Gross or net instrument readings. Net instrument readings will often be negative since samples without any added radioactivity will often be below the background count. These numbers were recorded since they may be necessary for statistical evaluation of the data.
- Measured concentrations in dpm/100 cm^2 for surface contamination
- Name of surveyor, sampler, or analyst
- Instrument specifications and calibration date
- Minimum detectable concentrations or activity
- Name of person reviewing results
- Other relevant information

Per NUREG-1757, Vol.2, the survey results in Appendix A for each survey unit include the following:

- the number of samples taken for the survey unit;
- a description of the survey unit, including (a) a drawing of the survey unit showing the reference system and random start systematic sample locations for the Class 1 survey units, and random locations for Class 3 survey units, and (b) discussion of unique material features and remedial actions;
- the measured sample concentrations, in units that are comparable to the DCGLs;
- the statistical evaluation of the measured concentrations.

The locations of static and smear measurements and scanning sections are illustrated in Appendix A. Statistical data in the appendices are shown by rounding and minor errors in calculations may propagate.

6.1 Background Material Results

Table 11 summarizes the results of the measurements for the reference materials with the three types of instruments used. The survey code is presented as a guide to the data sheets found in Appendix A.

Table 11. Summary of Reference Material Static Measurements

Material	Survey Code	Ludlum 43-37		Ludlum 43-68		Ludlum NaI 2x2	
		Background (cpm)	StdDev (cpm)	Background (cpm)	StdDev (cpm)	Background (cpm)	StdDev (cpm)
Concrete Painted	CP	873	22	246	13	6730	671
Sheet Linoleum	SL	884	25	275	16	Not used	Not used
Counter Top	CT	Not used	Not used	229	13	Not used	Not used
Linoleum Tile	TL	819	27	255	12	5454	180
Unpainted Concrete	CU	1087	38	349	26	Not used	Not used

6.2 Survey Unit Results for Required Measurements

The following tables summarize the results of the static, scan, and smear measurements for the survey units; respectively. Details of measurement results for each individual location are provided in Appendix A. Drawings and coordinates are provided in Appendix A.

- The highest average and maximum beta static measurements were 1119 and 2000 dpm/100cm^2 which are 22% and 13% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The highest average and maximum beta scan measurements were 1164 and 2270 dpm/100cm^2 which are 23% and 15% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The highest average and maximum beta smear measurements were 30 and 221 dpm/100cm^2 which are 3% and 22% of the DCGL of 1000 dpm/100cm^2. The highest H-3 result was 11 dpm/100cm^2 which is about 1% of the acceptable surface contamination levels.

- The highest average and maximum gamma static surface measurements were 0 and 800 dpm/100cm^2 which are 0% and 5% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The highest average and maximum gamma scan surface measurements were 0 and 2216 dpm/100cm^2 which are 0% and 14% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The average and maximum gamma static volumetric measurements were 0.0 and 2.7 pCi/g which are 0% and 35% of the DCGL of 7.8 pCi/g; respectively.

- The average and maximum gamma scan volumetric measurements were 0.4 and 3.5 pCi/g which are 5% and 45% of the DCGL of 7.8 pCi/g; respectively.

Table 12. Summary of Beta Static Measurements*

Room	N	Activity (dpm/100cm^2)		
		Maximum	Average	Standard Deviation
B201	15	1630	704	622
B202	15	980	335	624
B205	15	1760	907	489
B206	15	1500	547	655
B210	15	740	224	531
B214	15	410	-351	680
B214A	15	1210	559	285
Hall	15	2000	1219	351

* Reference material background averages have been subtracted.

Table 13. Summary of Beta Scan Measurements*

Room Survey	Item	Material	Probe Serial	Probe Model	Average (cpm)	Maximum (cpm)	Average dpm/100cm^2	Maximum dpm/100cm^2
B201	Floor	SL	128625	43-37	1002	1175	515	1271
B201	Counter	CT	148454	43-68	226	340	-7	1803
B202	Floor	SL	128625	43-37	948	1079	278	852
B202	Hood	CT	148454	43-68	177	215	-788	-188
B202	Sink	CT	148454	43-68	181	232	-720	92
B202	Counter	CT	148454	43-68	204	274	-355	761
B205	Floor	SL	128625	43-37	996	1174	488	1268
B205	Sink	CT	148454	43-68	208	237	-296	173
B205	Counter	CT	148454	43-68	201	263	-399	586
B206	Floor	SL	128625	43-37	970	1101	375	948
B206	Counter	CT	148454	43-68	192	231	-547	77
B206	Counter	CT	148454	43-68	193	282	-530	876
B210	Floor	SL	128625	43-37	973	1129	388	1071
B210	Sink	CT	148454	43-68	177	224	-784	-39
B210	Counter	CT	148454	43-68	207	271	-309	709
B214	Floor	SL	128625	43-37	712	853	-751	-137
B214	Floor	SL	128625	43-37	829	967	-240	363
B214	Hood	CT	148454	43-68	190	237	-580	166
B214	Counter	CT	148454	43-68	206	276	-323	783
B214A	Floor	CP	128625	43-37	1140	1393	1164	2270
B214	Sink	CT	148454	43-68	205	254	-343	434
HALL	Floor	TL	128625	43-37	1065	1222	1076	1764

* Reference material background averages have been subtracted.

Table 14. Summary of Gross Beta Smear Measurements*

Room	N	Activity (dpm/100cm^2)		
		Maximum	Average	Standard Deviation
B201	17	97	0	37
B202	17	78	17	39
B205	16	89	1	45
B206	16	97	10	59
B210	17	221	30	63
B214	17	84	26	34
B214A	19	72	13	39
Hall	15	126	21	67

*Only instrument background has been subtracted.

Table 15. Summary of H-3 Smear Results

	Hall	B201	B202	B205	B206	B210	B214	B214A
Report Lines	2-16	17-33	34-50	51-66	67-82	83-99	100-116	117-135
N	Activity (dpm/100cm^2)							
1	2	-3	1	-3	-4	3	-6	-1
2	-1	3	6	2	2	-1	7	-1
3	-2	1	0	11	1	-2	-4	1
4	3	-5	-1	-2	0	3	-1	-5
5	-3	-4	7	3	-2	1	-1	0
6	0	5	2	6	4	5	-1	-3
7	-4	2	1	3	-3	-1	-3	-7
8	-3	-2	-3	-2	1	0	-2	2
9	1	-1	1	-4	-1	0	0	-6
10	-1	-1	6	-2	-1	1	-4	5
11	-3	8	3	1	-3	2	6	6
12	-5	3	4	0	2	2	1	-5
13	4	5	1	-1	1	2	0	-4
14	4	2	-2	-1	-2	4	2	4
15	-1	-7	0	-2	6	-1	-2	1
16		-1	-2	0	0	3	3	-1
17		-2	1			0	-4	-5
18								-1
19								-2
Average	-1	0	1	1	0	1	-1	-1
Maximum	4	8	7	11	6	5	7	6

The laboratory report is found at the end of Appendix A. The report lines listed in the table correspond to that report; values are found in the "DPM1" column.

Table 16. Summary of Gamma Static Measurements* •

Room	N	Activity (dpm/100cm2)		
		Maximum	Average	Standard Deviation
B205	15	800	<0	1134
B210	15	720	<0	1088
B214	15	<0	<0	1372
		Activity (pCi/g)		
B214A	16	2.7	0.0	1.0

* Reference material background averages have been subtracted.

Table 17. Summary of Gamma Scan Measurements*

Room	Radio-nuclide	Activity (dpm/100cm^2)	
		Average	Maximum
B205	Ge-68	<0	2126
B210	Ge-68	<0	<0
B214	Cd-109	<0	827
		Activity (pCi/g)	
B214A	Co-60	0.4	3.5

* Reference material background averages have been subtracted.

6.3 Results of Miscellaneous Duplicate Measurements

The FSSP required that survey technicians be afforded the opportunity to perform judgmental measurements in areas of highest potential (e.g., corners, seams between concrete pours, or base of support poles) based on professional judgment. This provides a qualitative level of confidence that no areas of elevated activity were missed by the random measurements and that there were no errors in area classification.

Guidance found in NRC Inspection Procedure 84750 was used to determine data quality and if ratios could not be determined, review and follow-up actions was per that document. Professional judgment was used for sample results that are negative or less than MDC. The following NRC guidance is presented:

- Divide the first result for each sample by its associated uncertainty to obtain the resolution. (Note: For purposes of this plan, the uncertainty is defined as the relative standard deviation, one sigma, of the lab results as calculated from counting statistics.)
- Divide each first result by the corresponding second result to obtain the ratio (First result/second result).
- The measurements are in agreement if the value of the ratio falls within the limits shown in the following table for the corresponding resolution.

Table 18. Criteria for Accepting the Measurement*

Resolution	Ratio
<4	
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

A beta static measurement was selected for quality control comparison from each survey unit. The results are summarized in the tables below. Drawings and locations are provided in Appendix A. Required ratios were not given by the NRC for resolutions <4 which includes negative values, very low values, and most below the MDC; these are deemed acceptable as both the first and second results are low. Three comparisons had resolution >4 and the actual ratios were within the range of the required ratios. All duplicate measurement results were acceptable.

Table 19. Comparison of Duplicate Sample Measurements

Survey Unit Area/Room	Survey Unit N	1st Result	StdDev 1st Result	2nd Result	Resolution	Actual Ratio	Required Ratio
B201	10	280	255	490	1	0.57	None
B202	8	-100	245	600	0	-0.17	None
B205	8	1530	290	1610	5	0.95	0.5-2.0
B206	9	900	275	1280	3	0.70	None
B210	10	420	260	520	2	0.81	None
B214	10	-130	245	360	-1	-0.36	None
B214A	12	790	130	630	6	1.25	0.5-2.0
Hall	8	980	225	1320	4	0.74	0.5-2.0

6.4 Review of Individual Survey Units

Each individual survey unit meets the release criteria. The following paragraphs present a summary of the fixed, scans and smears for each survey unit. Often the results are zero or less than zero which is normal for measurements at or near background levels.

6.4.1 Room B201, the Micro PET

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 704, 1630, and 80 dpm/100 cm^2, respectively. The average and highest beta scan results were 231 and 1757 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were 0 and 8 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.2 Room B202, the Wet Lab

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 335, 980, and 90 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 852 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were 1 and 7 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.3 Room B205, the Gantry

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 907, 1760, and 100 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 1268 dpm/100 cm^2, respectively. Results for the gamma static average and maximum surface contamination levels were <0 and 740 dpm/100 cm^2, respectively. The highest gamma scan result was 2126 dpm/100 cm^2. The average and maximum H-3 smear results were 1 and 11 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.4 Room B206, Prep Lab 2

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 547, 1500, and 80 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 948 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were 0 and 6 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.5 Room B210, Prep Lab 1

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 224, 740, and 200 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 1071 dpm/100 cm^2, respectively. Results for the gamma static average and maximum surface contamination levels were <0 and 650 dpm/100 cm^2, respectively. The highest gamma scan result was <0 dpm/100 cm^2. The average and maximum H-3 smear results were 1 and 5 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.6 Room B214, Hot Chemistry

Results for the beta static average, maximum and the maximum removable surface contamination levels were <0, 410, and 100 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 737 dpm/100 cm^2, respectively. Results for the gamma static average and maximum surface contamination levels were both <0 dpm/100 cm^2, respectively. The highest gamma scan result was 827 dpm/100 cm^2. The average and maximum H-3 smear results were <0 and 7 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.7 Room B214A, the Cyclotron Room

Results for the static average, maximum and the maximum removable surface contamination levels were 559, 1210, and 90 dpm/100 cm^2, respectively. The average and highest beta scan

results were 1076 and 1764 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were <0 and 6 dpm/100 cm^2, respectively. Results for the gamma static average and maximum volumetric contamination levels were 0.3 and 2.4 pCi/g, respectively. The highest gamma scan result was 3.2 pCi/g. These values are below the acceptable surface and volumetric contamination DCGLs.

6.4.8 The Hallway

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 1219, 2000, and 110 dpm/100 cm^2, respectively. The highest beta scan result was 948 dpm/100 cm^2. The average and maximum H-3 smear results were <0 and 4 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

7.0 CONCLUSIONS

The survey conducted by the NIH-NIDA RSO reported detectable levels of Co-60 in the floor of the cyclotron Room B214A. As the activity was reported as below regulatory dose concerns, the area had been released prior to the HSA. FSS results for residual contamination levels confirm that only a small fraction of the DCGL remains.

The cyclotron was used to produce short-lived radionuclides for studies and research, including C-11, O-15, and F-18, which, by nature of radioactive half-life, no longer pose a residual contamination issue. However, the process also created Cd-109, which was identified as a contaminant in Room B214 during the HSA. The materials contaminated with Cd-109 were removed during the conduct of the HSA; surface areas were decontaminated by the radiation safety staff. FSS results of Room B214 indicate that decontamination efforts were successful.

Tritium (H-3) was the only radionuclide of concern which required a special analysis by liquid scintillation counting of smears. For the entire survey, the highest H-3 contamination level identified was 11 dpm/100cm2. H-3 is known to be readily removable and levels identified here are extremely small compared to today's acceptable license termination surface screening values of 1.2×10^8 dpm/100cm^2

All DQOs for the survey were met and results of the duplicate measurement program were acceptable. The residual contamination levels for each survey unit were a small fraction of the DCGL and the site is recommended for unrestricted release.

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Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

DRAWINGS AND SURVEY RESULTS

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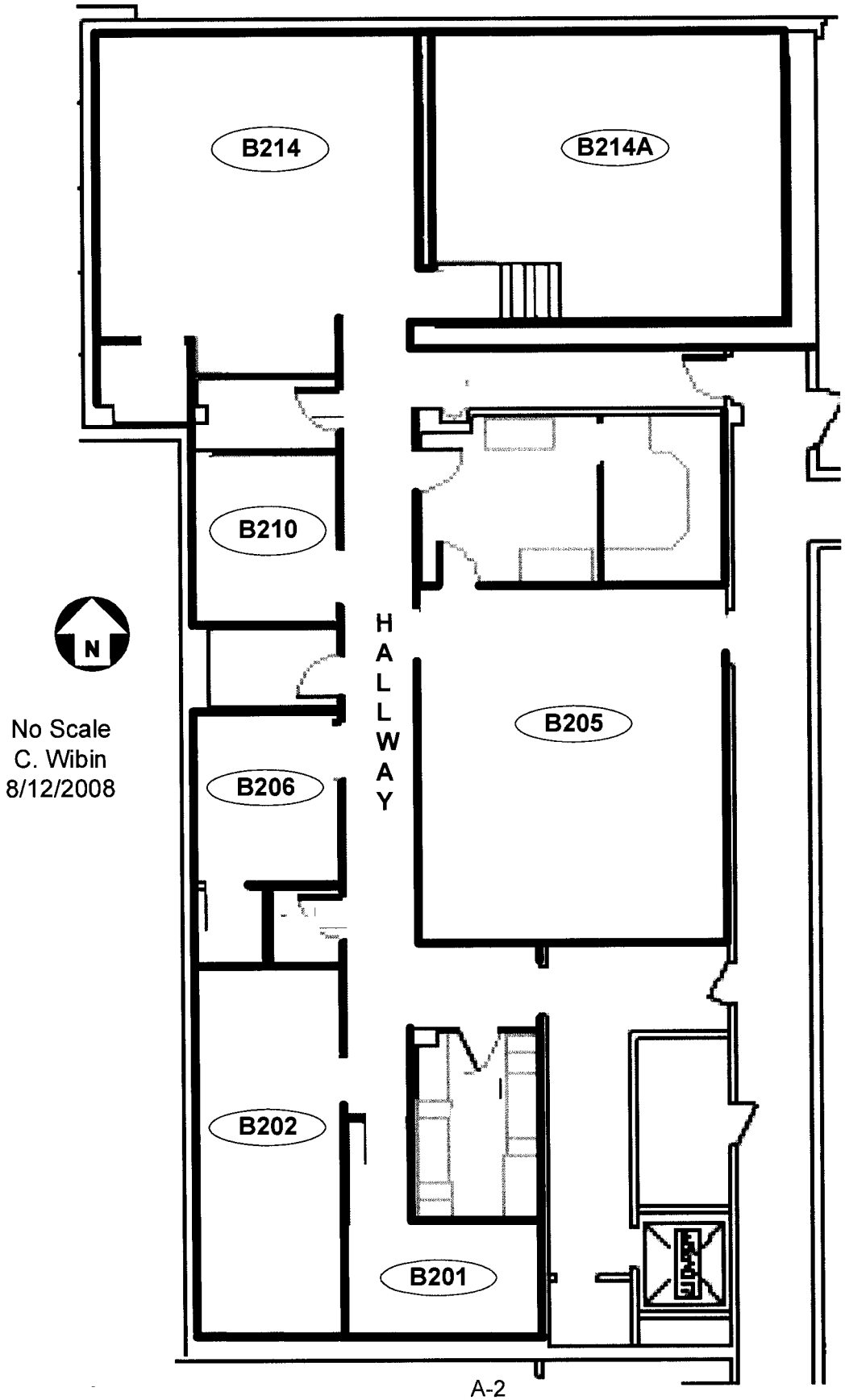
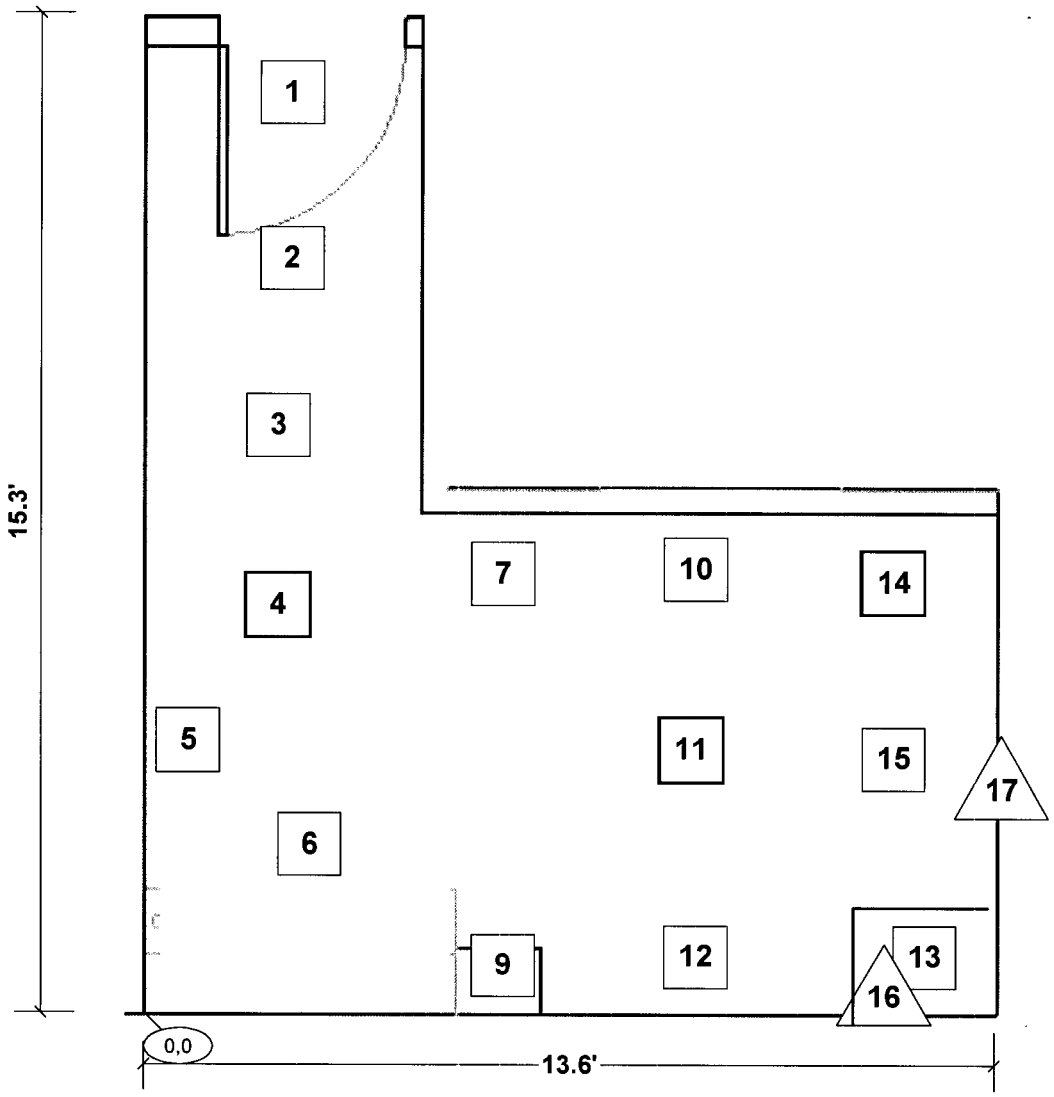
Impacted Area - Building G Basement
Johns Hopkins Bayview Campus

Appendix A



Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Room: B201 Micro Pet **Date: 7 / 26 / 2008**



STATIC & SMEAR LOCATIONS

DQO Location

16 Bias Sink Smear
17 Room Exhaust Duct

No Scale

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B201
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	322	47	17	740	540
2	360	85	18	1340	570
3	338	63	18	990	560
4	310	35	17	550	530
5	360	85	18	1340	570
6	362	87	19	1370	580
7	291	16	16	250	510
8	306	31	17	490	530
9	303	28	17	440	520
10	293	18	17	280	510
11	309	34	17	530	530
12	221	-54	14	-860	440
13	342	67	18	1060	560
14	378	103	19	1630	590
15	301	26	17	410	520
			Maximum:	1630	
			Average:	704	
			Std Dev:	622	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B201 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	55	-1	9	-4	130
2	56	0	9	3	130
3	56	0	9	3	130
4	54	-2	9	-11	130
5	55	-1	9	-4	130
6	49	-7	9	-47	130
7	55	-1	9	-4	130
8	61	5	9	39	140
9	61	5	9	39	140
10	69	13	10	97	140
11	60	4	9	32	130
12	50	-6	9	-40	130
13	57	1	9	11	130
14	55	-1	9	-4	130
15	52	-4	9	-26	130
16	49	-7	9	-47	130
17	51	-5	9	-33	130

Maximum:	97
Average:	0
Std Dev:	37

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

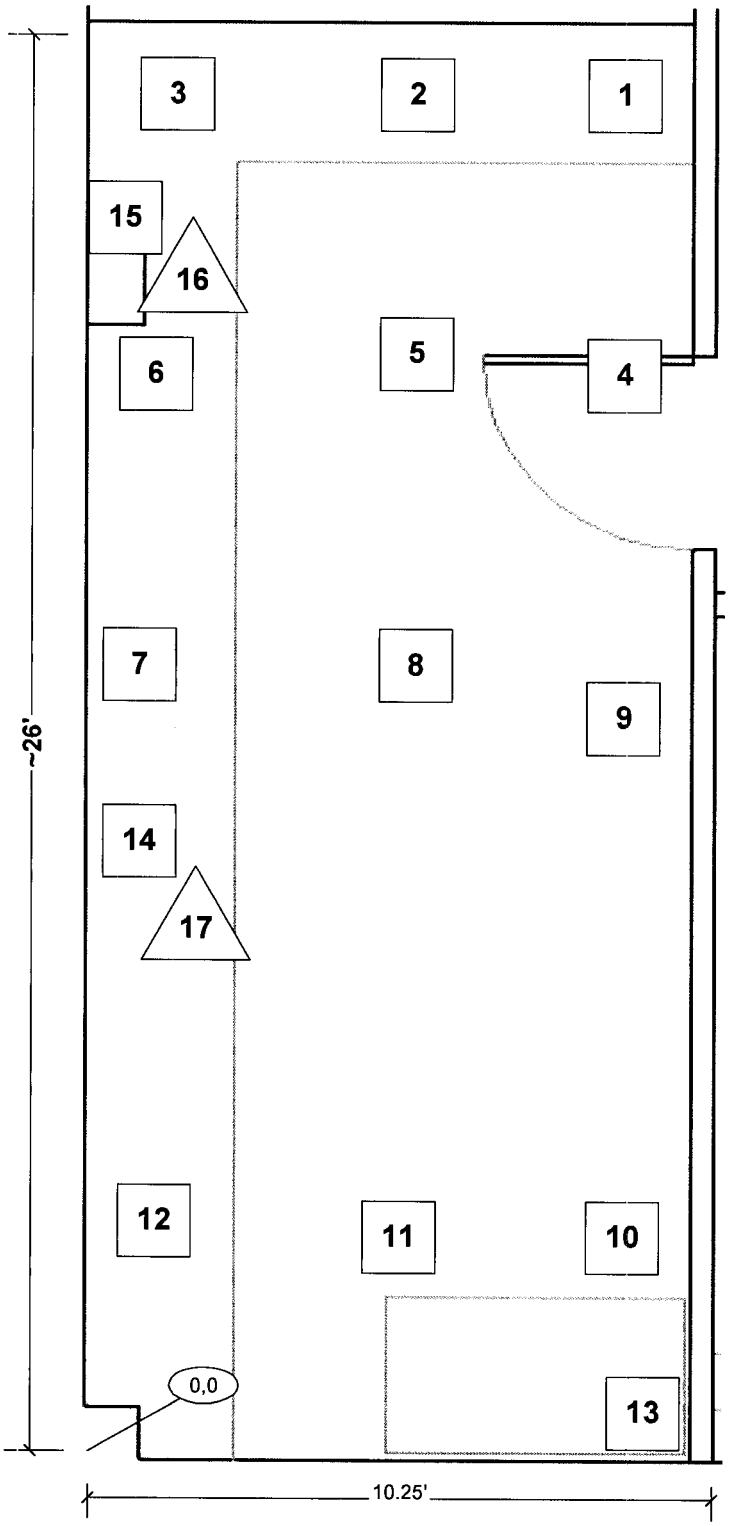
R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B202 Wet Lab **Date: 7 / 26 /2008**



STATIC & SMEAR LOCATIONS

DQO Locations

Biased Smear Location:
16 - Inside Sink
17- Inside Sink

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

No Scale

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B202
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	301	26	17	410	520
2	332	57	18	900	550
3	325	50	17	790	540
4	331	56	18	880	550
5	315	40	17	630	530
6	294	19	17	300	520
7	311	36	17	570	530
8	269	-6	16	-100	490
9	289	14	16	220	510
10	316	41	17	640	540
11	337	62	18	980	550
12	306	31	17	490	530
13	298	23	17	360	520
14	202	-73	14	-1170	420
15	220	-55	14	-880	440
			Maximum:	980	
			Average:	335	
			Std Dev:	624	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B202 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	57	-1	9	-6	110
2	64	6	10	33	110
3	60	2	10	11	110
4	69	11	10	61	110
5	68	10	10	56	110
6	49	-9	9	-50	100
7	66	8	10	45	110
8	57	-1	9	-6	110
9	60	2	10	11	110
10	70	12	10	67	110
11	59	1	10	6	110
12	56	-2	9	-11	100
13	54	-4	9	-22	100
14	64	6	10	33	110
15	49	-9	9	-50	100
16	72	14	10	78	110
17	65	7	10	39	110

Maximum:	78
Average:	17
Std Dev:	39

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

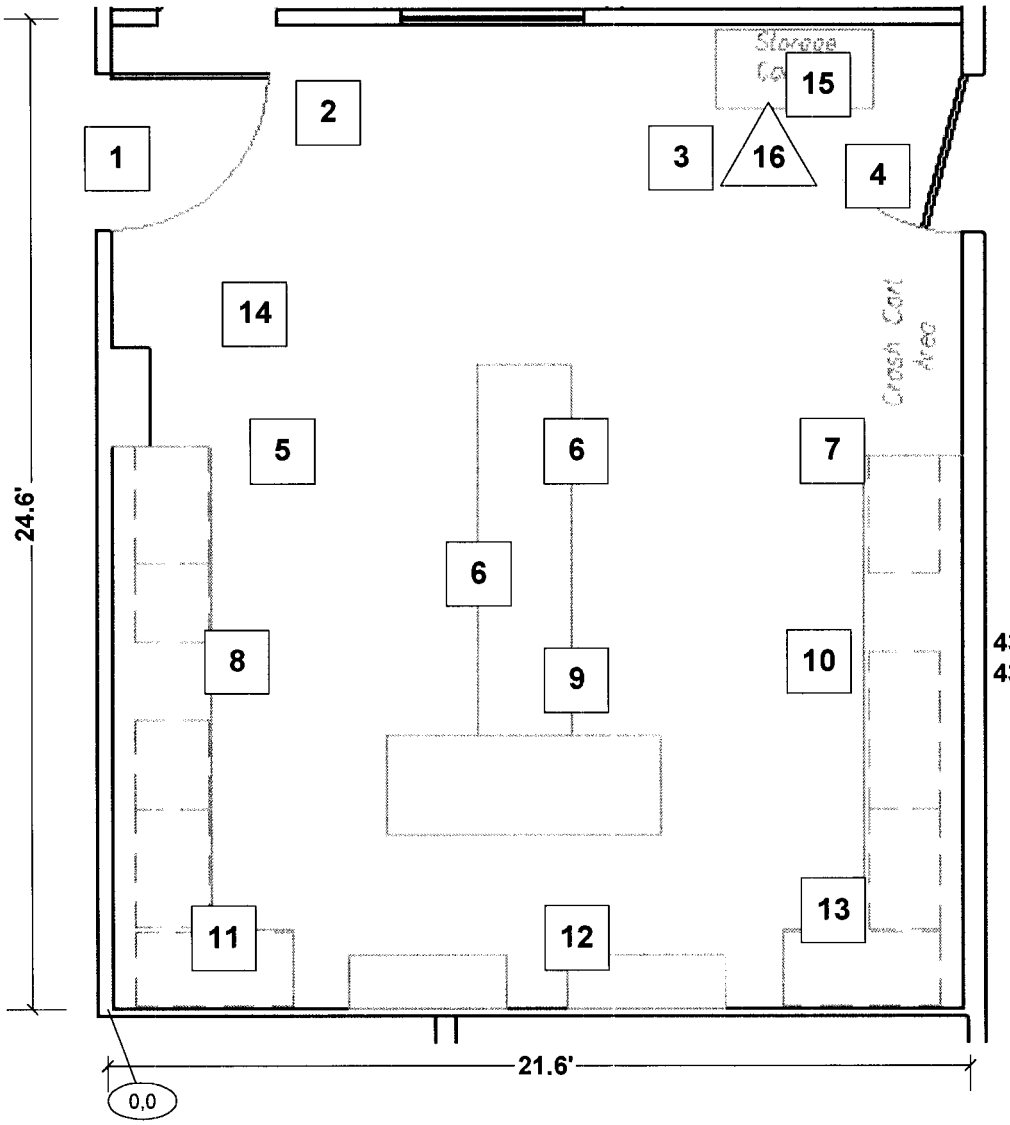
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B205 Gantry
(Scanning Room)

Date: 7 / 26 / 2008



STATIC & SMEAR LOCATIONS

DQO

Bias Smear
16 Inside Sink

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

No Scale

Note: Smear And Static Reading 14 were taken inside the room exhaust duct

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B205
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	338	63	18	990	560
2	301	26	17	410	520
3	331	56	18	880	550
4	386	111	19	1760	600
5	334	59	18	930	550
6	321	46	17	720	540
7	361	86	18	1360	580
8	372	97	19	1530	580
9	330	55	18	870	550
10	364	89	19	1410	580
11	316	41	17	640	540
12	334	59	18	930	550
13	269	-6	16	-100	490
14	338	63	18	990	560
15	293	18	17	280	510
			Maximum:	1760	
			Average:	907	
			Std Dev:	489	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B205 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	55	-3	9	-17	100
2	56	-2	9	-11	100
3	58	0	10	0	110
4	66	8	10	45	110
5	74	16	10	89	120
6	50	-8	9	-45	100
7	51	-7	9	-39	100
8	47	-11	9	-61	100
9	57	-1	9	-6	110
10	71	13	10	72	110
11	56	-2	9	-11	100
12	53	-5	9	-28	100
13	65	7	10	39	110
14	49	-9	9	-50	100
15	60	2	10	11	110
16	52	-6	9	-33	100
17	60	2	10	11	110
18	59	1	10	6	110
19	74	16	10	89	120
20	51	-7	9	-39	100

Maximum:	89
Average:	1
Std Dev:	45

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B205 **Survey Date:** 8/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (dpm/100 cm²) Activity	Net (dpm/100 cm²) Uncertainty @ 95% CL
1	5114	-340	194	-750	860
2	4990	-464	193	-1030	860
3	5468	14	195	30	860
4	5104	-350	194	-770	860
5	4542	-912	192	-2020	850
6	3892	-1562	191	-3460	840
7	5817	363	195	800	870
8	5201	-253	194	-560	860
9	4450	-1004	192	-2230	850
10	5557	103	195	230	860
11	4686	-768	193	-1700	850
12	4282	-1172	192	-2600	850
13	5224	-230	194	-510	860
14	5123	-331	194	-730	860
15	4882	-572	193	-1270	860

Maximum:	800
Average:	-1105
Std Dev:	1134

Instrument Data and Analysis Parameters

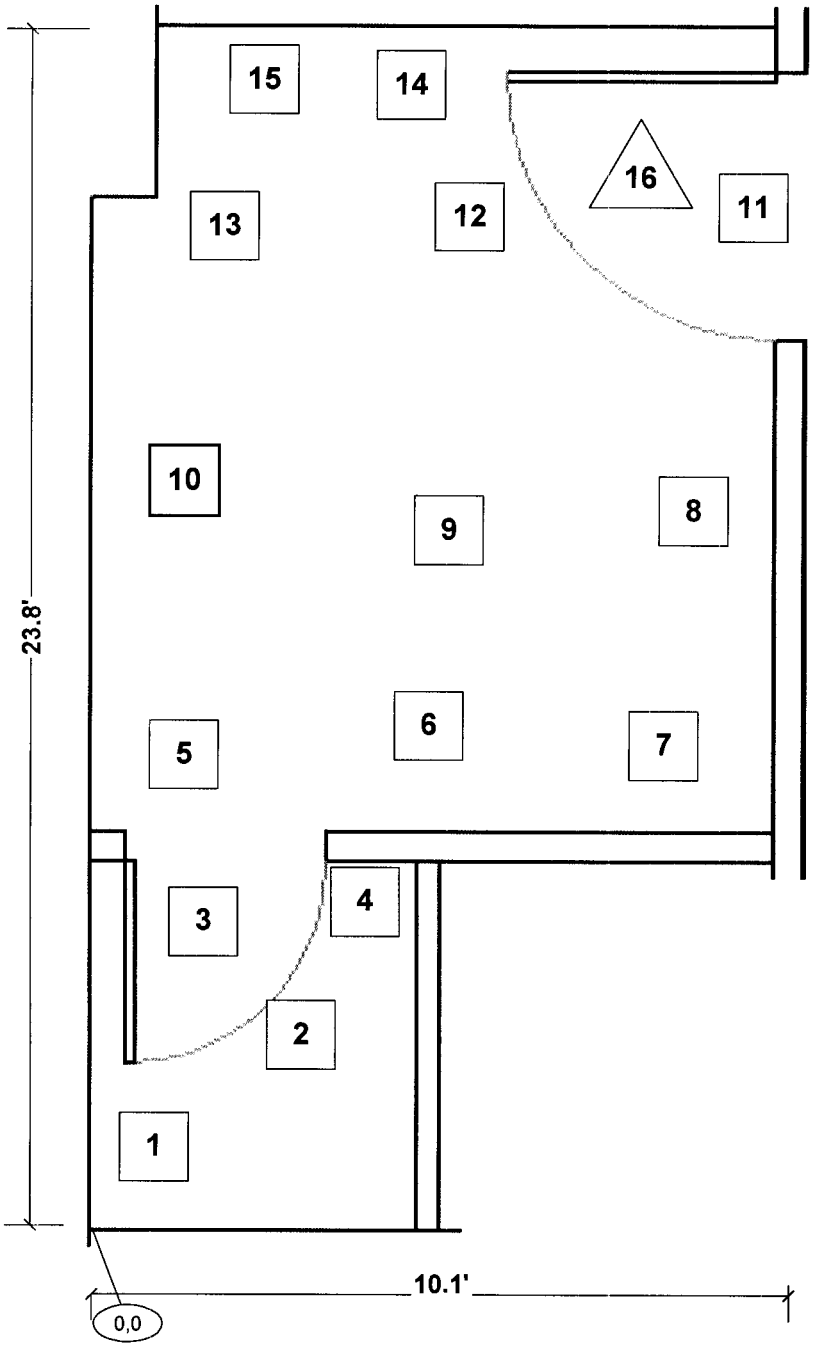
Analysis Unit	2929	SN176108			
Detector	44-10	PR186963			
R_B	5454	cpm	Radionuclide	Ge-68	
σ_B	180	cpm	ε_{total}	0.45	cpm/dpm/100cm²
T_S	1	m			
T_B	20	m	MDC	767	dpm/100cm²

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B206 Prep Lab 2 **Date: 7 / 26 /2008**



Static and Smear Locations:

DQO

Biased Smear Location 16 Was Taken Inside Room Exhaust Duct

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

No Scale

Note: Smear and Static Reading 15 were taken inside room sink

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B206
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	321	46	17	720	540
2	301	26	17	410	520
3	334	59	18	930	550
4	328	53	18	830	550
5	294	19	17	300	520
6	300	25	17	390	520
7	370	95	19	1500	580
8	290	15	16	230	510
9	332	57	18	900	550
10	333	58	18	910	550
11	324	49	17	770	540
12	345	70	18	1100	560
13	327	52	18	820	550
14	250	-25	15	-400	470
15	200	-75	13	-1200	420
			Maximum:	1500	
			Average:	547	
			Std Dev:	655	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B206 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	68	12	10	90	140
2	43	-13	8	-91	120
3	62	6	9	47	140
4	57	1	9	11	130
5	48	-8	9	-55	120
6	65	9	10	68	140
7	56	0	9	3	130
8	52	-4	9	-26	130
9	61	5	9	39	140
10	59	3	9	25	130
11	57	1	9	11	130
12	44	-12	8	-84	120
13	52	-4	9	-26	130
14	51	-5	9	-33	130
15	67	11	10	83	140
16	69	13	10	97	140

Maximum:	97
Average:	10
Std Dev:	59

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

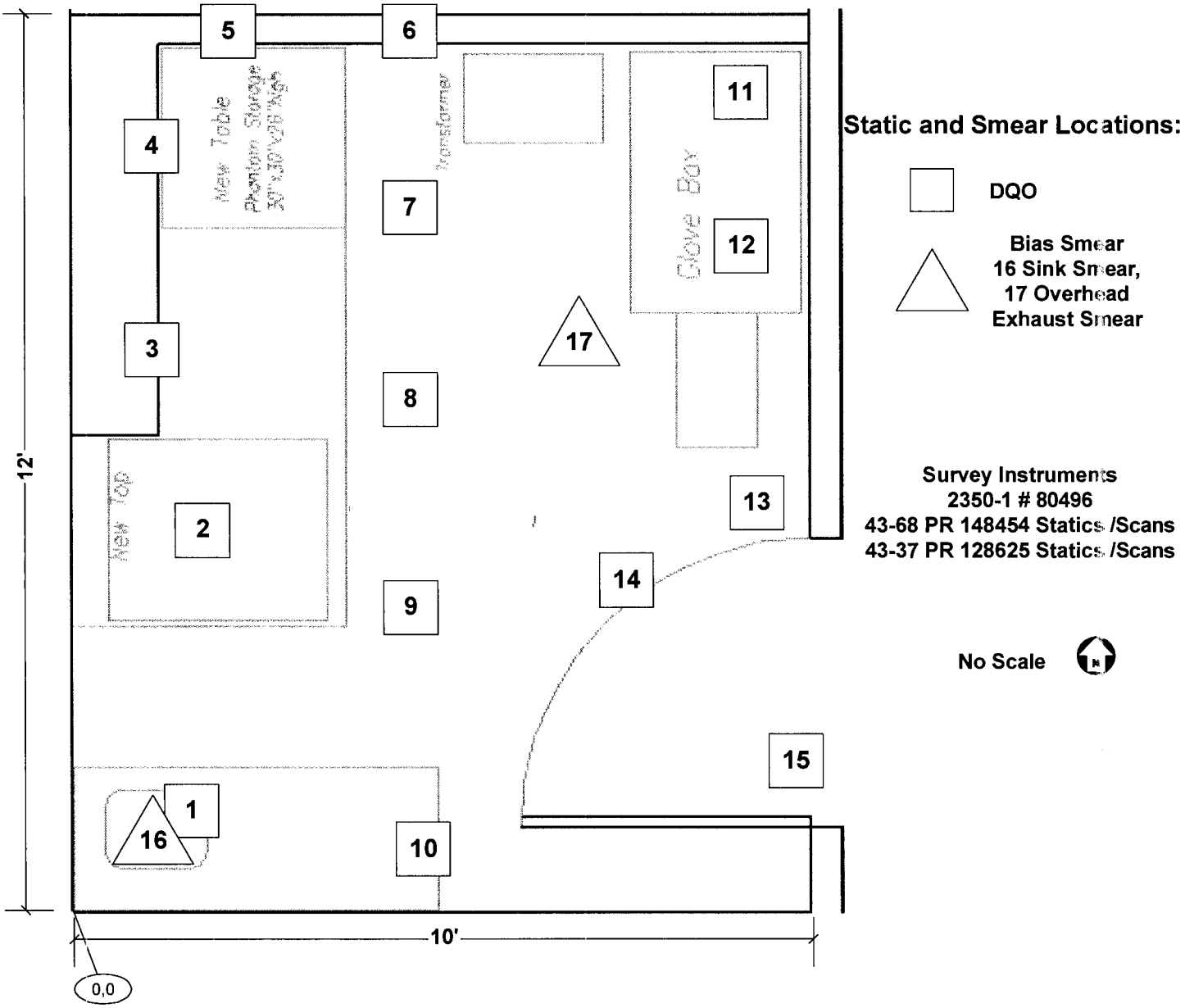
R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B210 Prep Lab 1 **Date: 7 / 29 / 2008**



Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B210
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	212	-63	14	-1010	430
2	322	47	17	740	540
3	241	-34	15	-550	460
4	250	-25	15	-400	470
5	312	37	17	580	530
6	259	-16	15	-260	480
7	281	6	16	90	500
8	306	31	17	490	530
9	310	35	17	550	530
10	302	27	17	420	520
11	298	23	17	360	520
12	322	47	17	740	540
13	307	32	17	500	530
14	312	37	17	580	530
15	308	33	17	520	530
			Maximum:	740	
			Average:	223	
			Std Dev:	531	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B210 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	63	7	9	54	140
2	51	-5	9	-33	130
3	52	-4	9	-26	130
4	60	4	9	32	130
5	58	2	9	18	130
6	55	-1	9	-4	130
7	86	30	11	221	150
8	49	-7	9	-47	130
9	56	0	9	3	130
10	57	1	9	11	130
11	69	13	10	97	140
12	59	3	9	25	130
13	63	7	9	54	140
14	62	6	9	47	140
15	50	-6	9	-40	130
16	64	8	9	61	140
17	61	5	9	39	140

Maximum:	221
Average:	30
Std Dev:	63

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B210 **Survey Date:** 8/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (dpm/100 cm²) Activity	Net (dpm/100 cm²) Uncertainty @ 95% CL
1	5320	-134	194	-300	860
2	4811	-643	193	-1420	850
3	4438	-1016	192	-2250	850
4	4096	-1358	191	-3010	850
5	4287	-1167	192	-2590	850
6	3881	-1573	190	-3480	840
7	4638	-816	192	-1810	850
8	4924	-530	193	-1170	860
9	5020	-434	193	-960	860
10	5777	323	195	720	870
11	4690	-764	193	-1690	850
12	4374	-1080	192	-2390	850
13	5178	-276	194	-610	860
14	4740	-714	193	-1580	850
15	4981	-473	193	-1050	860

Maximum:	720
Average:	-1573
Std Dev:	1088

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108			
Detector	44-10	PR186963			
R_B	5454	cpm	Radionuclide		Ge-68
σ_B	180	cpm	ε_{total}	0.45	cpm/dpm/100cm²
T_S	1	m			
T_B	20	m	MDC	767	dpm/100cm²

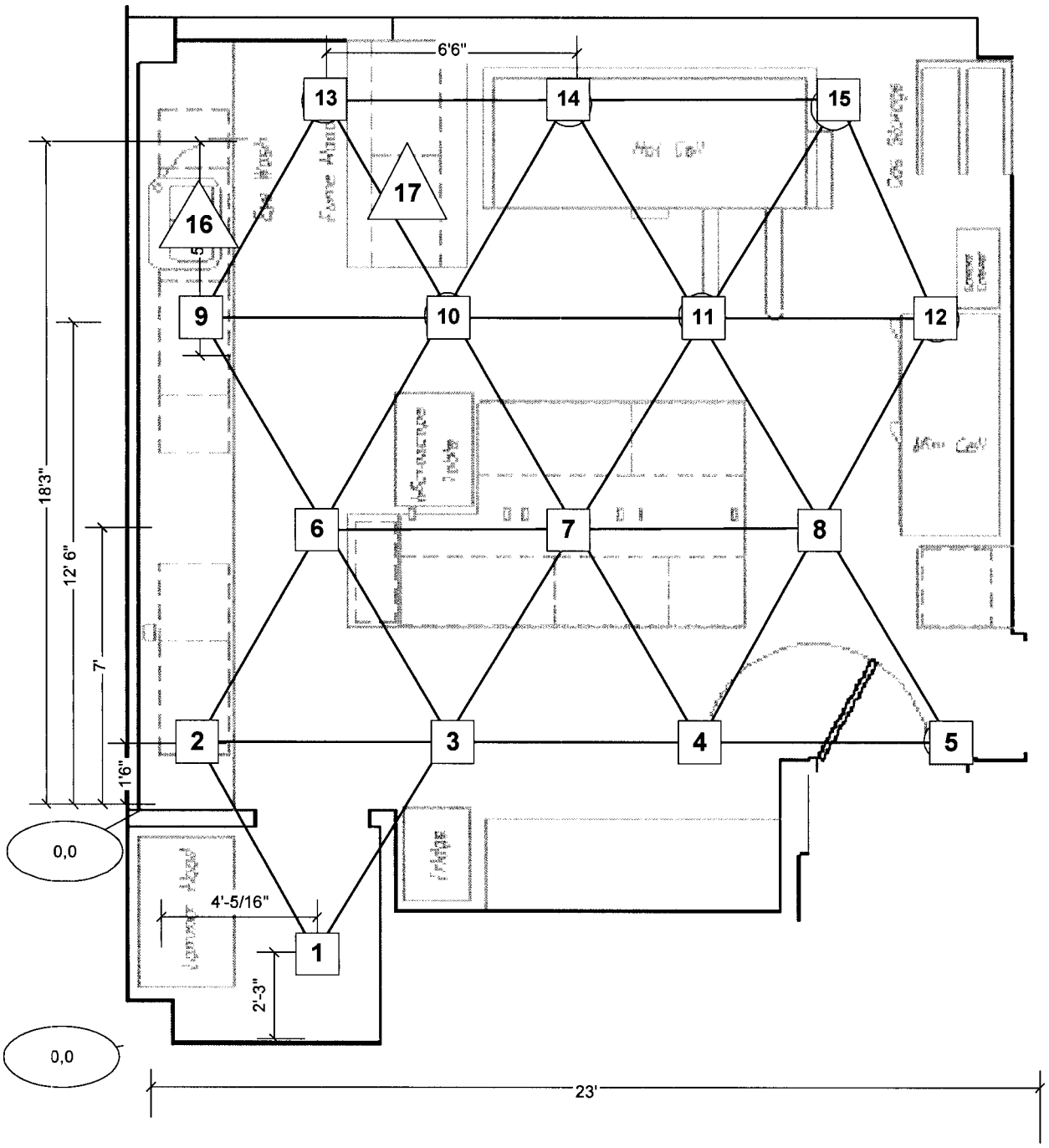
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B214 Hot Chemistry

Date: 7 / 26 /2008



Static and Smear Locations:

☐ **DQO**

△ **Bias Smear 16 Inside Sink, 17 Inside Fume Hood**

N

Note: See next page for grid coordinates and instrument data

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Room: B214 Hot Chemistry Date: 7 / 26 /2008

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Grid Coordinates (feet)

N	X	Y	N	X	Y
1	4	2	9	0.75	12.7
2	0.75	1.5	10	7.25	12.7
3	7.25	1.5	11	13.75	12.7
4	13.75	1.5	12	20.25	12.7
5	20.25	1.5	13	4	18.25
6	4	7	14	10.5	18.25
7	10.5	7	15	17	18.25
8	17	7			

Point one is on individual grid.
Points 2-15 are on different grid.
Point 3 was random start.

Summary of Beta Static Measurements

Survey Unit: B214
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	255	-20	15	-320	480
2	301	26	17	410	520
3	248	-27	15	-430	470
4	256	-19	15	-310	480
5	289	14	16	220	510
6	228	-47	14	-750	450
7	248	-27	15	-430	470
8	251	-24	15	-390	470
9	300	25	17	390	520
10	267	-8	16	-130	490
11	276	1	16	10	500
12	258	-17	15	-280	480
13	293	18	17	280	510
14	187	-88	13	-1400	400
15	141	-134	11	-2130	340
			Maximum:	410	
			Average:	-351	
			Std Dev:	680	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B214 **Survey Date:** 7/28/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	59	1	10	6	110
2	55	-3	9	-17	100
3	63	5	10	28	110
4	61	3	10	17	110
5	56	-2	9	-11	100
6	73	15	10	84	110
7	55	-3	9	-17	100
8	56	-2	9	-11	100
9	72	14	10	78	110
10	60	2	10	11	110
11	71	13	10	72	110
12	66	8	10	45	110
13	64	6	10	33	110
14	64	6	10	33	110
15	66	8	10	45	110

Maximum:	84
Average:	26
Std Dev:	34

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B214 **Survey Date:** 7/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (dpm/100 cm²) Activity	Net (dpm/100 cm²) Uncertainty @ 95% CL
1	4822	-632	193	-1950	1190
2	4956	-498	193	-1540	1190
3	4984	-470	193	-1450	1190
4	5446	-8	195	-20	1200
5	5019	-435	193	-1340	1190
6	4755	-699	193	-2160	1190
7	4811	-643	193	-1990	1190
8	4845	-609	193	-1880	1190
9	4857	-597	193	-1840	1190
10	4969	-485	193	-1500	1190
11	4867	-587	193	-1810	1190
12	4296	-1158	192	-3580	1180
13	4458	-996	192	-3080	1190
14	3932	-1522	191	-4700	1180
15	3716	-1738	190	-5370	1170

Maximum:	-20
Average:	-2281
Std Dev:	1372

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108			
Detector	44-10	PR186963			
R_B	5454	cpm	Radionuclide		Cd-109
σ_B	180	cpm	ε_{total}	0.32	cpm/dpm/100cm²
T_S	1	m			
T_B	20	m	MDC	1070	dpm/100cm²

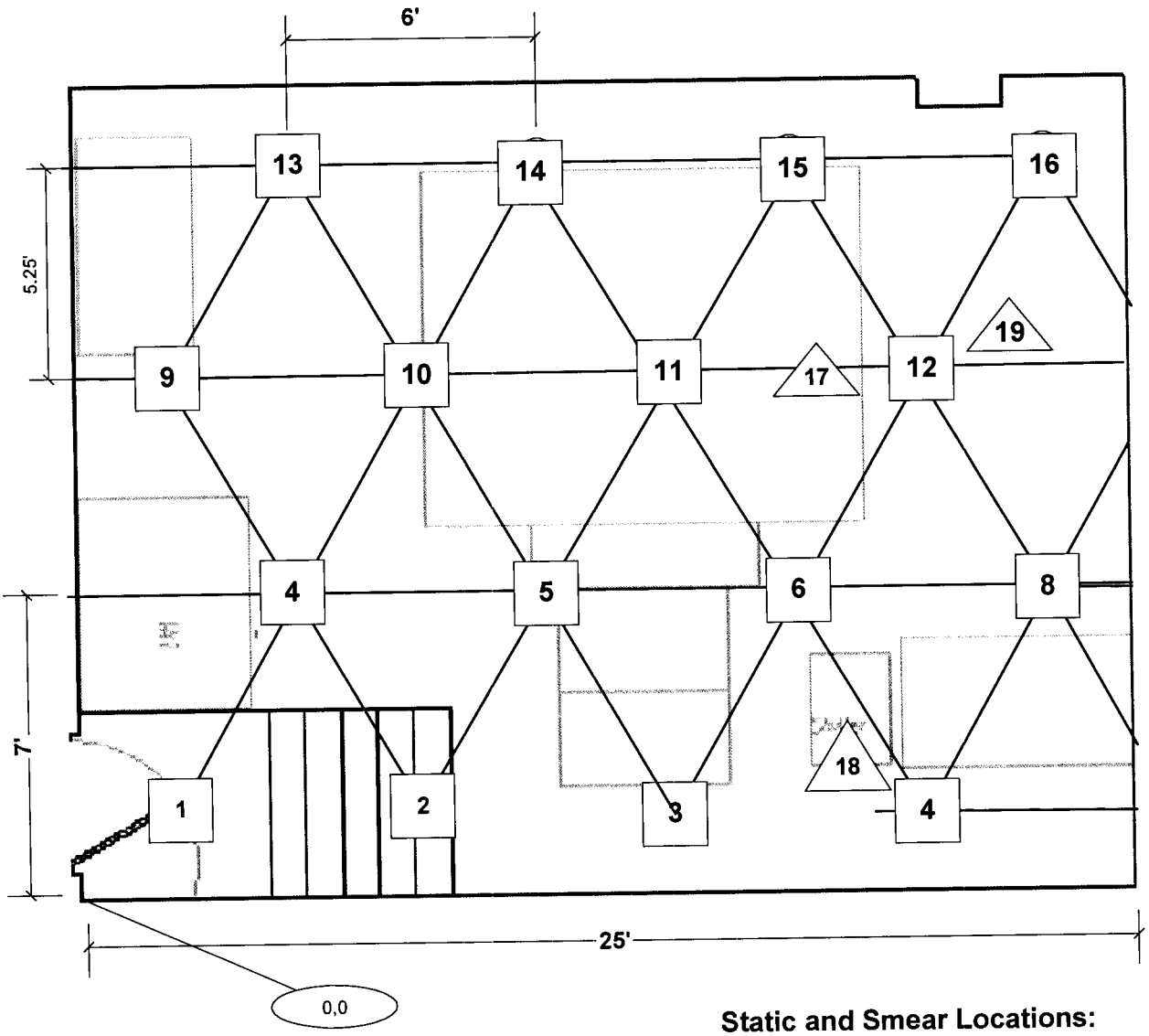
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B214A Cyclotron Room

Date: 7 / 29 /2008



Static and Smear Locations:

DQO

Bias Smear 17 & 18 taken inside floor drain, 19 taken inside room exhaust duct

Note: See next page for grid coordinates and instrument data

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Room: B214A Cyclotron Room

Date: 7 / 29 /2008

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Grid Coordinates (feet)

N	X	Y	N	X	Y
1	2	1.75	9	2	12.25
2	8	1.75	10	8	12.25
3	14	1.75	11	14	12.25
4	20	1.75	12	20	12.25
5	5	7	13	5	17.5
6	11	7	14	11	17.5
7	17	7	15	17	17.5
8	23	7	16	23	17.5

Point 5 was the random start.

Summary of Beta Static Measurements

Survey Unit: B214A
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	320	74	16	590	250
2	302	56	15	440	240
3	290	44	15	350	230
4	286	40	15	320	230
5	308	62	15	490	240
6	362	116	17	920	270
7	301	55	15	440	240
8	321	75	16	600	250
9	263	17	14	130	220
10	315	69	16	550	240
11	398	152	18	1210	280
12	345	99	17	790	260
13	311	65	16	520	240
14	298	52	15	410	240
15	325	79	16	630	250
16	250	4	13	30	210
			Maximum:	1210	
			Average:	559	
			Std Dev:	285	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CP
Material Background:	246 cpm
Background Sigma:	13.3 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.5 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.10 epm/dpm
Total Efficiency Uncertainty:	0.0008 epm/dpm
MDC:	603 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B214A **Survey Date:** 7/28/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	56	-2	9	-11	100
2	51	-7	9	-39	100
3	71	13	10	72	110
4	49	-9	9	-50	100
5	54	-4	9	-22	100
6	69	11	10	61	110
7	52	-6	9	-33	100
8	52	-6	9	-33	100
9	57	-1	9	-6	110
10	51	-7	9	-39	100
11	63	5	10	28	110
12	67	9	10	50	110
13	55	-3	9	-17	100
14	64	6	10	33	110
15	55	-3	9	-17	100
16	61	3	10	17	110

Maximum:	72
Average:	0
Std Dev:	39

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B214A **Survey Date:** 7/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (pCi/g) Activity	Net (pCi/g) Uncertainty @ 95% CL
1	4930	-1800	728	-2.1	1.7
2	6543	-187	729	-0.2	1.7
3	7143	413	730	0.5	1.7
4	7224	494	730	0.6	1.7
5	6610	-120	730	-0.1	1.7
6	6958	228	730	0.3	1.7
7	6817	87	730	0.1	1.7
8	7112	382	730	0.4	1.7
9	6305	-425	729	-0.5	1.7
10	6966	236	730	0.3	1.7
11	9062	2332	731	2.7	1.7
12	7146	416	730	0.5	1.7
13	6312	-418	729	-0.5	1.7
14	6695	-35	730	0.0	1.7
15	6828	98	730	0.1	1.7
16	5715	-1015	729	-1.2	1.7
			Maximum:	2.7	
			Average:	0.0	
			Std Dev:	1.0	

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108		
Detector	44-10	PR186963		
R_B	6730 cpm		Radionuclide	Co-60
σ_B	725 cpm		ε_{total}	861 cpm/pCi/g
T_S	1 m			
T_B	20 m		MDC	0.4 pCi/g

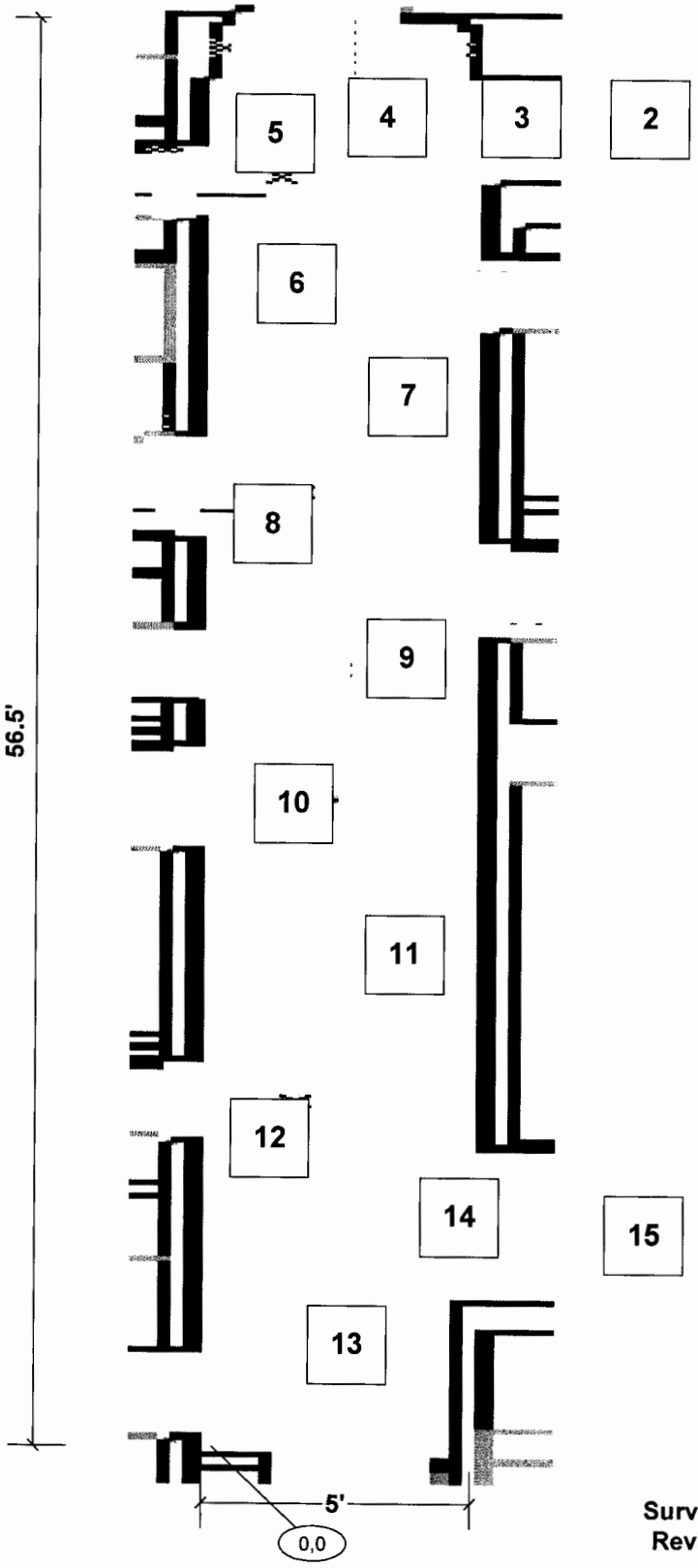
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: Basement Hall Way

Date: 7 / 29 /2008



Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Static and Smear Locations:

DQO

N

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: Hall
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	347	92	15	1460	480
2	332	77	15	1220	460
3	381	126	16	2000	510
4	368	113	16	1790	500
5	347	92	15	1460	480
6	322	67	15	1060	450
7	303	48	14	760	430
8	317	62	14	980	450
9	328	73	15	1160	460
10	318	63	14	1000	450
11	334	79	15	1250	470
12	317	62	14	980	450
13	342	87	15	1380	470
14	318	63	14	1000	450
15	304	49	14	780	430
			Maximum:	2000	
			Average:	1219	
			Std Dev:	351	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B-Hallway

Survey Date: 7/28/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	48	-8	9	-55	120
2	64	8	9	61	140
3	68	12	10	90	140
4	58	2	9	18	130
5	67	11	10	83	140
6	73	17	10	126	140
7	60	4	9	32	130
8	61	5	9	39	140
9	67	11	10	83	140
10	52	-4	9	-26	130
11	50	-6	9	-40	130
12	61	5	9	39	140
13	45	-11	8	-76	120
14	61	5	9	39	140
15	41	-15	8	-105	120

Maximum:	126
Average:	21
Std Dev:	67

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Lab Control #: 2008-542

Appendix A

Reviewed By: _____

RSO, Inc. JOB WORKSHEET

RSO Contact: _____ Project #: _____ Date: 8/7/2008

Customer Information:

Name: Chesapeake Nuclear Services, Inc.

Address: 788 Sonne Dr.
Annapolis, MD 21401

Contact: Claude Wiblin

Phone: 410-353-6450

Contract/PO#:

Billing Address:

Name:

Address:

Contact:

Phone:

Job Description: **Bayview Swipe Survey** Job Date: _____

Mobilization:

Description	Qty	X	Unit Cost	

Service/Labor:

Description	Qty	X	Unit Cost	

Material/Expenses/Transportation:

RSO Stock	Item Description	Qty	X	Unit Cost	
☐					
☐					
☐					
				Sub Total:	

Lab Analysis Request

Comment: **Bayview Swipe Survey**

☐ Alpha ☒ Beta ☒ Gamma

ID Method On Container ☐

# of Samples 134 # 1 - 134

Required MDA: _____

Disposition:
- Return ☐
- Hold ☐
- Discard ☒

Sample Description (Matrix)
- ☐ Air
- ☐ Water
- ☐ Soil/Ash
- ☐ Bioassay
- ☒ Wipe
- ☐ Leak Test
- ☐ Waste
- ☐ Other

Chain of Custody (If Required):

Delivered By: _____ Time: _____ Date: _____

Received By: _____ Time: _____ Date: _____

Report Type Required:

LSC Print Out: ☐ On a 3.5" Disk ☐

Report Units:
- ☐ dpm
- ☐ pCi/g
- ☐ pCi/l
- ☐ pCi/ml
- ☐ uCi/ml
- ☐ Other

Analysis: 3 Chan.DPM ☐ Single Label ☐ Other:

Laboratory Services:

Sub Total (from above): _____

Sample Description	Qty	X	Cost	

Job Complete: ☐ Yes ☐ No

Invoice #: A-33

Invoice Date: _____

Total Amount _____

Invoice Amount _____

PRIORITY

Appendix A

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME: Chesapeake Nuclear Services	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: 788 Sonne Drive	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-542
Annapolis, MD 21032	PROJECT NAME/#: Bayview-G	REVIEWED BY:
CONTACT: Claude Wiblin	COMMENTS: LSC only	SAMPLER:
PHONE: 410-353-6450 FAX: 410-266-5811		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
Hall				15	8/8		LSC: H-3, C-14 + P-32
B201				17			
B 202				17			
B 205				16			
B 206				16			
B 210				17			
B 214				17			
B214A				19			

TRANSFERRED BY: Byron Bland	RECEIVED BY: Rich Emmons	DATE	TIME	REMARKS:
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

Assay Definition-

Assay Description:
CHESAPEAKE NUCLEAR

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\20080812_1356.results
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Sets:
Low Energy: 3H-Tol-3-10-08
Mid Energy: 14C-TOL-07-17-06
High Energy: 32P-UG-02-28-05
Count Time (min): 2.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: On
Colored Samples: On Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	SIS	tSIE	LUM
1	10.00	5	8	5	0	0	0	75.60	838.79	0
2	2.00	1	2	5	2	1	6	153.55	751.42	0
3	2.00	-0	-0	-1	-1	0	-2	0.00	770.88	0
4	2.00	-1	-1	2	-2	-2	2	0.00	800.24	0
5	2.00	2	2	2	3	2	2	201.02	803.00	0
6	2.00	-2	-2	2	-3	-3	2	0.00	846.39	0
7	2.00	-0	-1	1	-0	-2	1	0.00	751.63	0
8	2.00	-2	3	-1	-4	4	-1	572.36	767.90	0

9	2.00	-1	2	2	-3	2	2	49.84	752.76	0
10	2.00	1	-0	1	1	-1	1	0.00	759.66	0
11	2.00	-1	-2	3	-1	-3	4	0.00	896.55	5
12	2.00	-1	-0	1	-3	-0	1	0.00	777.32	0
13	2.00	-2	-1	-0	-5	-0	-0	0.00	724.65	0
14	2.00	2	-2	2	4	-3	2	305.75	859.55	0
15	2.00	2	-0	5	4	-2	6	192.98	792.03	0
16	2.00	-0	1	-0	-1	1	-0	213.47	803.95	0
17	2.00	-2	-1	1	-3	-1	1	0.00	847.58	0
18	2.00	2	-1	-0	3	-1	-0	354.79	774.67	0
19	2.00	1	-0	-2	1	0	-2	0.00	859.52	0
20	2.00	-2	2	-0	-5	3	-0	0.00	828.79	0
21	2.00	-2	1	1	-4	1	1	0.00	815.71	0
22	2.00	3	0	1	5	-0	1	2.19	860.12	3
23	2.00	1	-0	2	2	-1	2	15.96	836.76	0
24	2.00	-1	-1	-1	-2	-0	-2	0.00	807.04	0
25	2.00	-0	-1	-0	-1	-1	-0	0.00	826.87	0
26	2.00	-0	0	1	-1	0	1	0.00	776.50	0
27	2.00	5	2	3	8	1	4	59.86	841.00	0
28	2.00	2	2	1	3	2	1	90.02	869.85	0
29	2.00	2	-3	1	5	-4	1	0.00	820.43	0
30	2.00	1	1	-0	2	1	-0	140.61	875.09	0
31	2.00	-4	-1	1	-7	-1	1	0.00	867.01	0
32	2.00	-1	-2	4	-1	-3	4	0.00	787.03	0
33	2.00	-1	-2	3	-2	-3	4	0.00	844.69	0
34	2.00	0	-4	-1	1	-5	-2	0.00	785.11	0
35	2.00	3	-3	3	6	-4	4	0.00	798.19	0
36	2.00	0	2	2	-0	2	2	0.00	761.16	0
37	2.00	-1	0	0	-1	1	0	0.00	755.60	0
38	2.00	3	-2	5	7	-4	5	91.75	880.42	0
39	2.00	1	-1	2	2	-1	2	0.00	772.04	0
40	2.00	0	-0	4	1	-1	5	0.00	921.02	0
41	2.00	-2	-1	3	-3	-2	3	0.00	838.65	0
42	2.00	0	-2	4	1	-3	4	0.00	744.56	0
43	2.00	3	-2	-1	6	-2	-1	112.26	845.18	0
44	2.00	1	-2	-2	3	-2	-2	0.00	811.85	0
45	2.00	3	2	-1	4	3	-1	142.14	861.83	0
46	2.00	0	-1	2	1	-2	3	0.00	777.91	0
47	2.00	-0	4	0	-2	5	0	56.51	764.10	0
48	2.00	0	-1	1	0	-1	1	0.00	850.68	0
49	2.00	-1	-1	-1	-2	-1	-1	0.00	750.03	0
50	2.00	1	-1	-0	1	-1	-0	0.00	757.53	0
51	2.00	-1	1	-0	-3	1	-0	0.00	816.66	4
52	2.00	1	-1	-2	2	-1	-3	0.00	852.55	0
53	2.00	6	-1	0	11	-2	0	57.34	879.30	3
54	2.00	-1	-1	0	-2	-1	0	0.00	856.90	0
55	2.00	1	-1	-1	3	-1	-1	107.80	852.10	0
56	2.00	4	2	3	6	2	3	35.62	766.01	0
57	2.00	1	-3	0	3	-3	0	0.00	818.28	0
58	2.00	-1	-2	-1	-2	-2	-1	0.00	840.58	0
59	2.00	-2	-0	-2	-4	1	-3	0.00	764.20	5
60	2.00	-1	-3	1	-2	-4	1	0.00	724.39	0
61	2.00	1	-0	3	1	-1	4	827.38	771.39	0
62	2.00	-0	-1	1	-0	-2	1	0.00	834.27	0
63	2.00	-1	-1	1	-1	-1	1	0.00	848.53	0
64	2.00	-0	-1	1	-1	-1	1	0.00	762.36	0
65	2.00	-1	-0	2	-2	-0	2	0.00	804.85	0
66	2.00	0	0	-2	0	1	-2	0.00	785.02	0
67	2.00	-2	0	2	-4	0	2	0.00	808.75	0
68	2.00	1	0	0	2	0	0	128.06	771.23	0
69	2.00	1	-1	1	1	-2	1	0.00	861.95	4
70	2.00	1	3	2	0	3	2	89.31	811.24	0

71	2.00	-1	-1	-2	-2	-0	-3	0.00	827.28	0
72	2.00	2	-4	1	4	-5	1	0.00	759.34	0
73	2.00	-1	-0	2	-3	-0	2	0.00	681.35	0
74	2.00	0	-1	-0	1	-1	-0	0.00	768.56	0
75	2.00	-1	-3	-0	-1	-4	-0	0.00	732.54	0
76	2.00	-1	-3	3	-1	-4	4	0.00	760.25	0
77	2.00	-1	3	2	-3	3	2	101.69	792.82	0
78	2.00	1	-2	5	2	-3	5	0.00	804.96	0
79	2.00	1	5	1	1	6	1	116.04	697.91	0
80	2.00	-1	2	5	-2	2	6	256.34	851.19	0
81	2.00	3	-3	1	6	-4	1	0.00	852.66	0
82	2.00	-0	-2	-1	0	-2	-2	0.00	791.03	0
83	2.00	1	-4	0	3	-5	0	0.00	746.54	0
84	2.00	-1	-0	3	-1	-1	4	0.00	802.34	0
85	2.00	-1	0	-0	-2	1	-0	0.00	783.96	0
86	2.00	1	-2	-0	3	-2	-0	0.00	790.83	0
87	2.00	1	1	-0	1	1	-0	183.66	817.80	0
88	2.00	2	-2	0	5	-2	0	0.00	743.98	0
89	2.00	-1	-2	-1	-1	-2	-1	0.00	777.12	0
90	2.00	-1	-4	-0	-0	-5	-0	0.00	889.64	0
91	2.00	0	-0	3	0	-1	4	0.00	783.23	0
92	2.00	0	-2	0	1	-3	0	0.00	819.72	0
93	2.00	1	-1	-2	2	-1	-2	779.23	763.85	0
94	2.00	1	-1	1	2	-2	1	0.00	770.29	0
95	2.00	1	-1	-3	2	-0	-3	105.13	866.82	0
96	2.00	2	3	-2	4	4	-2	40.11	832.66	0
97	2.00	-0	-0	1	-1	-0	1	0.00	840.64	0
98	2.00	1	-3	0	3	-3	0	0.00	766.94	0
99	2.00	-0	-3	0	-0	-4	0	0.00	768.04	0
100	2.00	-1	4	1	-6	5	1	0.00	404.89	0
101	2.00	3	-4	0	7	-5	0	0.00	769.53	0
102	2.00	-2	-2	0	-4	-2	0	0.00	755.27	0
103	2.00	-1	-1	-1	-1	-1	-1	0.00	732.05	0
104	2.00	-1	-2	-2	-1	-1	-3	0.00	679.49	0
105	2.00	-0	1	2	-1	1	2	279.67	844.89	0
106	2.00	-1	-0	2	-3	-1	3	0.00	636.07	0
107	2.00	-1	1	3	-2	1	4	0.00	790.74	0
108	2.00	0	1	-0	0	1	-0	0.00	780.41	0
109	2.00	-1	2	2	-4	3	2	49.84	562.71	0
110	2.00	3	-1	1	6	-2	1	0.00	669.49	0
111	2.00	0	-1	1	1	-2	1	0.00	794.10	0
112	2.00	-0	-3	2	-0	-4	2	0.00	755.95	0
113	2.00	1	-2	3	2	-3	3	0.00	730.02	4
114	2.00	-1	-1	2	-2	-1	2	0.00	802.86	0
115	2.00	1	-2	2	3	-3	2	0.00	764.99	0
116	2.00	-2	-1	3	-4	-2	4	0.00	735.78	5
117	2.00	-1	-2	1	-1	-2	1	0.00	607.95	0
118	2.00	-0	1	4	-1	0	4	1122.30	702.43	0
119	2.00	0	-1	0	1	-2	0	0.00	747.47	0
120	2.00	-2	0	-0	-5	1	-0	0.00	722.33	0
121	2.00	-0	-3	2	-0	-4	2	0.00	538.23	0
122	2.00	-1	3	2	-3	4	2	327.82	808.14	0
123	2.00	-4	-3	1	-7	-3	1	0.00	682.40	0
124	2.00	1	0	1	2	-0	1	0.00	714.23	0
125	2.00	-2	1	2	-6	1	2	0.00	589.74	0
126	2.00	2	-1	0	5	-2	0	0.00	712.46	0
127	2.00	3	-2	-0	6	-2	-0	0.00	767.33	0
128	2.00	-2	0	3	-5	0	3	0.00	698.18	0
129	2.00	-2	0	1	-4	0	1	0.00	760.65	0
130	2.00	2	0	-0	4	-0	-0	0.00	823.14	3
131	2.00	1	4	1	1	5	1	45.83	745.69	0
132	2.00	-1	-2	0	-1	-3	0	0.00	646.13	0

133	2.00	-2	3	1	-5	4	1	183.66	715.34	0
134	2.00	-1	0	-1	-1	1	-1	0.00	798.42	0
135	2.00	-0	3	7	-2	3	8	0.00	516.42	0

11 Aug 2008 06:58 RSO, Inc. Page #1
Protocol #: 7 SWIPES User : Lab Technician

CHESAPEAKE NUCLEAR
Count Time(minutes): 10.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	25.9		27.4		222	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	0.0		0.0		1.9	22.7
2	0.0		0.0		0.0	
3	0.0		3.5	17.0	6.4	12.5
4	0.0		0.0		0.0	
5	0.0		0.0		0.0	
6	0.0		0.0		0.0	
7	0.0		0.5	45.6	11.0	9.52
8	0.0		0.0		0.0	
9	0.0		0.0		0.0	
10	0.0		1.2	29.1	2.9	18.4
11	0.7	38.3	0.0		0.4	47.7
12	0.4	51.3	1.9	23.1	6.2	12.7
13	0.0		0.0		0.6	39.5
14	0.5	45.6	0.0		0.0	
15	0.0		2.2	21.4	5.3	13.7
16	0.0		0.0		2.3	20.7

EDITDATA.D07 Archived to C:\ARCH\ARCH07D.238
C:\DATA\P7DATA Copied to C:\DATA\ARCH07A.238

11 Aug 08 06:48:23 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 7
SWIPES
CHESAPEAKE NUCLEAR
COUNT TIME 10.00 Minutes

Window A	Window B	Window C
LLD: 15 keV	LLD: 75 keV	LLD: 15 keV

#	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	0	0	0	0	2	3
2	0	0	0	0	0	0
3	0	0	4	4	6	9
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	1	1	11	16
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	1	1	3	4
11	1	1	0	0	0	1
12	0	1	2	2	6	9
13	0	0	0	0	1	1
14	1	1	0	0	0	0
15	0	0	2	3	5	8
16	0	0	0	0	2	3

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix B

MISCELLANEOUS SUPPORTING DOCUMENTS

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Final Status Survey Report
G Building
Johns Hopkins Bayview Campus
5510 Nathan Shock Drive
Baltimore, MD 21224

Prepared for:

Aria Environmental, Inc.
PO Box 286
Woodbine, MD 21797

September 2008

Chesapeake Nuclear Services

788 Sonne Drive • Annapolis, MD 21401 • 410-266-9174

Glossary of Terms, Acronyms and Abbreviations

Bq	Becquerel; 1 Bq = 1 disintegration per second
ChesNuc	Chesapeake Nuclear Services, Inc.
cm^2	square centimeter
cm^3	cubic centimeter
CHP	Certified by American Board of Health Physics
cpm	counts per minute
DCGL	Derived Concentration Guideline Level
NIDA	National Institute on Drug Abuse
d	day
dpm	disintegrations per minute
DQO	data quality objective
EPA	Environmental Protection Agency
FSS	Final status survey
FSSP	Final status survey plan
FSSR	Final status survey report
g	gram
h	hour
HSA	Historical Site Assessment
LBGR	Lower Bound of the Gray Region
m	meter or month
m^2	square meter
m^3	cubic meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
MARSS	Mapping and Radiation Survey System
MDC	minimum detectable count
MDCR	minimum detectable count rate
MDE	Maryland Department of the Environment
MeV	mega electron volt; equal to 1.602 × 10-13 joules
mrem/yr	millirem per year
NARM	Natural and Accelerator Produced Radioactive Material
NIDA	National Institute on Drug Abuse
NIH	National Institutes of Health
NRC	Nuclear Regulatory Commission
NUREG	NRC nuclear regulation document
NRRPT	National Registry of Radiation Protection Technologists
pCi	picocurie
QA/QC	Quality Assurance/Quality Control
s	second
StdDev	Standard Deviation
SU	survey unit
Sv	Sievert; 1 Sv=100 rems
sq. ft.	square feet
WRS	Wilcoxon Rank Sum
y	year
µrem	microrem

Final Status Survey Report
Building G, Johns Hopkins Bayview Campus, 5510 Nathan Shock Drive, Baltimore, MD 21224

EXECUTIVE SUMMARY

As a result of the decision to cease operations in Building G, NIH-NIDA directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC in 10 CFR Part 20. Chesapeake Nuclear Services, Inc. (ChesNuc) performed the final status surveys (FSS) for Building G during August 2008 in compliance with federal regulations. The purpose of the Final Status Survey Report (FSSR) is to demonstrate that radiological conditions at the facility satisfy release criteria and that the site can be released for unrestricted use.

Radiological operations in Building G are currently authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) with an expiration date of October 31, 2010. Maryland Department of the Environment (MDE) exempted the facility from Maryland licensure requirements regarding the receipt, possession, and use of certain accelerator (cyclotron) produced radionuclides (NARM) until the NRC provided regulation. The cyclotron was removed from the facility, the area surveyed in June 2007, and then released for public use at the direction of the NIH-NIDA Radiation Safety Officer (RSO). The cyclotron had been removed and considered acceptable for release prior to the effective date of NRC regulations (November 30, 2007) addressing NARM radioactivity pertinent to the cyclotron. However, per 10 CFR Part 20, §20.1001, the NRC controls dose from radioactive materials when in combination with licensed materials. As detectable concentrations of Co-60 were identified prior to the release of the area, the concentrations would remain detectable today. Thus, the requirement exists to perform a final status close out survey for areas associated with cyclotron produced material. Any remaining contamination would be automatically authorized by the broad-scope license issued to NIDA.

The cyclotron was used to produce short-lived radionuclides for studies and research, including C-11, O-15, and F-18, which, by nature of radioactive half-life, no longer pose a residual contamination issue. However, the process was also created Cd-109, which was identified as a contaminant in Room B214 during the HSA. The materials contaminated with Cd-109 were removed during the conduct of the HSA; surface areas were decontaminated by the radiation safety staff.

The Historical Site Assessment (HSA) conducted by ChesNuc during July 2008 also indicated:

- A survey conducted by the Radiation Safety Officer reported detectable levels of Co-60 on the floor of the cyclotron Room B214A. The activity was reported as below regulatory dose concerns and the area had been released prior to the HSA.
- Ge/Ga-68 in liquid form was used in B210 and B205.
- H-3 was reported to have been used in some of the laboratories; in particular, Room B202.

All Data Quality Objectives (DQOs) of the survey were met; data and statistical analyses for individual measurements and individual survey unit summaries are provided.

No levels of radiation and radioactive material were detected during fixed measurements and scanning that exceeded the investigation level; and therefore, no discussion regarding this type of anomalous data is provided in the individual survey unit summaries.

In summary, residual contamination levels for each survey unit were a small fraction of the DCGL and the site is recommended for unrestricted release. This report and the HSA should be submitted to the NRC in the NIH-NIDA request to remove the authorized address from the NRC license.

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Final Status Survey Report
Building G, Johns Hopkins Bayview Campus, 5510 Nathan Shock Drive, Baltimore, MD 21224

1.0 OVERVIEW

As a result of the decision to cease operations in Building G, the National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) directed that an investigation be performed at the facility to ensure that former use and storage locations are suitable for unrestricted release as specified by the NRC in 10 CFR Part 20. Chesapeake Nuclear Services, Inc. (ChesNuc) performed the final status surveys (FSS) for Building G during August 2008 in compliance with federal regulations. The purpose of the Final Status Survey Report (FSSR) is to demonstrate that radiological conditions at the facility satisfy release criteria and that the site can be released for unrestricted use.

Radiological operations in Building G are currently authorized under NRC Materials License 19-09760-02 issued to U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), National Institutes of Health (NIH) with an expiration date of October 31, 2010. Maryland Department of the Environment (MDE) exempted the facility from Maryland licensure requirements regarding the receipt, possession, and use of certain accelerator (cyclotron) produced radionuclides (NARM) until the NRC provided regulation. The cyclotron was removed from the facility, the area surveyed in June 2007, and then released for public use at the direction of the NID-NIDA Radiation Safety Officer (RSO). The cyclotron had been removed and considered acceptable for release prior to the effective date of NRC regulations (November 30, 2007) addressing NARM radioactivity pertinent to the cyclotron. However, per 10 CFR Part 20, §20.1001, the NRC controls dose from radioactive materials when in combination with licensed materials. As detectable concentrations of Co-60 were identified prior to the release of the area, the concentrations would remain detectable today. Thus, the requirement exists to perform a final status close out survey for areas associated with cyclotron produced material. Any remaining contamination would be automatically authorized by the broad-scope license issued to NIDA.

The following is provided as a guide to correlate the information presented herein with that specified in NUREG-1757, Vol. 2 for information to be submitted in an FSS:

- Results of the Historical Site Assessment (HSA) are provided in Section 2.
- A summary of the DCGLs developed for this facility is provided in Section 3.
- An overview of the work performed is provided in Section 4.
- A description of the survey plan is provided in Section 5. The technique used to determine the number of samples required is provided in paragraph 5.7.5. The justification for the values used to determine the number of samples is also provided in paragraph 5.7.5.
- An overview of the results of the FSS is provided in Section 6.

No changes were made in the FSS from what was proposed in the FSS Plan. Minor adjustments were made in area requirements for "as found" survey areas. No changes were required in the initial survey unit assumptions relative to the extent of residual radioactivity (e.g., material not accounted for during site characterization).

2.0 BACKGROUND INFORMATION

The facility is part of the Johns Hopkins Bayview Medical Center which is one of five member institutions in the Johns Hopkins Health System. Building G is owned by FSK Land Corporation and is leased to and operated by NIDA-NIH.

2.1 Owner and Operator's Address

The owner of the facility is FSK Land Corporation (a Hopkins Entity) 1101 East 33rd Street, Suite E100, Baltimore, MD 21218-3637. The contact is Mr. Nick Farrell, Senior Director, Facilities, Design & Construction, and may be reached by telephone at (443) 997-3735 or by e-mail at nfarrell@jhu.edu.

The operator of the facility is the U. S. Department of Health and Human Services, National Institute on Drug Abuse, (NIDA), NIH, 5500 Nathan Shock Drive, Baltimore, MD 21224. Mr. John P. Jacobus is the current RSO and may be reached by telephone at (301) 594-4018 or by e-mail at jjacobus@mail.nih.gov.

2.2 Facility Location

The facility is located on Johns Hopkins Bayview Research Campus, Building G, 5510 Nathan Shock Drive, Baltimore, MD 21224 which is in the east suburbs of Baltimore City, MD, an independent city surrounded but not included by Baltimore County, MD.

2.3 Site Information

2.3.1 Site Description

NIDA-NIH leases a total of 11,520 sq. ft. of the larger medical research two-story building. Leased space is on the 1st floor and basement only. Figure 1 presents a diagram of the facility basement where the work with radioactive materials took place. The rooms and the hallway impacted by radioactive materials are shown with a cross hatch line and their room number.

2.3.2 Site Conditions at Time of Final Survey

All bulk radioactive materials including waste had been removed. No radioactive work was ongoing at the time of the FSS. Only minor contamination levels (below release criteria) on working surfaces and low levels of activated Co-60 in the cyclotron room were expected to be identified during the FSS. The northern wall of the cyclotron room had been replaced with new wall-blocks following removal of the cyclotron.

Routine adherence to procedures and good housekeeping were the ALARA practices employed to achieve final activity levels.

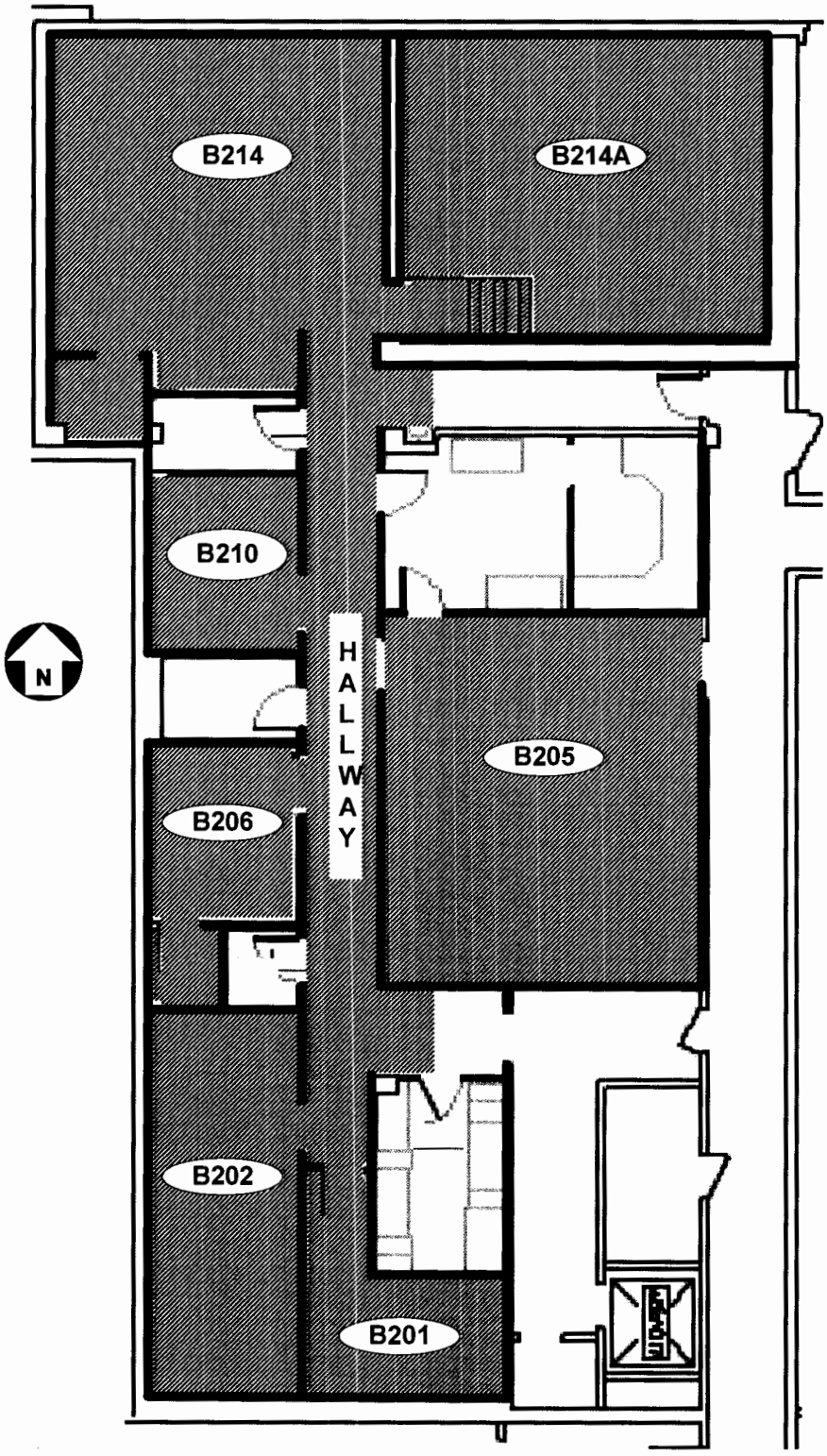

Figure 1. Building G, Basement Impacted Areas

2.4 Historical Site Assessment (HSA)

The HSA of the Building G activities was performed in accordance with the requirements of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG 1575, EPA 402-R-97-016. The HSA provided input to the design of Final Status Surveys, which in turn determine if the storage and use areas are suitable for unrestricted release as specified by the Nuclear Regulatory Commission (NRC).

The cyclotron was used to produce short-lived radionuclides for studies and research, including C-11, O-15, and F-18, which, by nature of radioactive half-life, no longer pose a residual contamination issue. However, the process was also used to create Cd-109, which was identified as a contaminant in Room B214 during the HSA. The materials contaminated with Cd-109 were removed during the conduct of the HSA; surface areas were decontaminated by the radiation safety staff.

The Historical Site Assessment (HSA) conducted by ChesNuc during July 2008 also indicated:

- A survey conducted by the Radiation Safety Officer reported detectable levels of Co-60 on the floor of the cyclotron Room B214A. The activity was reported as below regulatory dose concerns and the area had been released prior to the HSA.
- Ge/Ga-68 in liquid form was used in B210 and B205.
- H-3 was reported to have been used in some of the laboratories; in particular, Room B202.

Summaries from the HSA of the information and data collected are provided below:

2.4.1 Potential Contaminants

The HSA indicates that the potential radiological contaminants of unsealed radionuclides are as indicated in Table 1. Radionuclides with a half-life of less than 120 days, which can be disposed of by decay-in-storage, are also listed as these were in storage or use during the HSA property inspection.

Table 1. Potential Radionuclide Contaminants of Concern

Radionuclide	~Half-life*	Principal Decay Mode Energy (MeV)
H-3	12.3y	Beta 0.019
Ge/Ga-68	288d/68m	Electron 0.008/ Positron 1.89 max Gamma 0.511
Cd-109/Ag109m	464d/40s	Electron 0.018 / Electron~0.084 Gamma 0.088
Co-60	5.27y	Beta 0.317 Gamma 1.17 and 1.33

* Rounded values from MicroShield® User's Manual.

2.4.2 Impacted Areas

The following rooms and areas were identified as those involved in the production or use of radioactive material:

Cyclotron room -- B214A
Hot chemistry -- B214
Prep lab 1 -- B210
Prep lab 2 -- B206
Wet lab -- B202
Gantry -- B205
Micro PET -- B201
Adjacent Corridor

2.4.3 Non-Impacted Areas

For this survey, non-impacted areas are those not specifically listed above as impacted.

2.4.4 Potentially Contaminated Media

A review of potential migration routes within impacted areas was conducted. Migration routes include inside structures such as floor drains, trenches, or sumps; exhaust/ventilation (e.g., hoods); and sinks (e.g., hand-washing or industrial sinks) that may allow or increase the migration of radionuclides beyond the area where the storage or handling of radioactive materials originally occurred. The survey team was instructed to survey floor drains, sinks, hoods, and air ventilation discharge vents.

3.0 DERIVED CONCENTRATION GUIDELINE LEVELS (DCGLs)

The NRC has provided lookup DCGL tables when the surface contamination is not more than 10 mm thick. DCGLs must be developed per site when contamination is greater than 10 mm in thickness. As the cyclotron created volumetric sources greater than 10 mm in thickness, a volumetric DCGL was developed. NRC lookup tables are applicable to the rest of the impacted areas and are also discussed below.

3.1 Development of Volumetric DCGL

Operation of the cyclotron led to the production of radioactive material by activation in the shielding materials in the room housing the cyclotrons. The creation of radioactive material is principally due to activation of trace elements found in the shielding material. As the cyclotron (and associated shielding) has been removed, only activation of the concrete floor is considered per the results of the survey conducted by the NIDA-NIH RSO. As indicated in the HSA, Co-60 is the only radionuclide in the activated materials of potential concern in the cyclotron area.

Both the building renovation and occupancy scenarios described in NUREG/CR-5512, Vol. 1, were selected for review. During renovation the surface and volume sources will be disturbed, creating loose contamination. The exposure pathways for building renovation are primarily

- External exposure to penetrating radiation from volume sources (predominantly the concrete floor),
- Inhalation from airborne radioactive dust, and
- Inadvertent ingestion of loose surface contamination.

The external dose was determined with MicroShield® modeling considering the floor area (~400 ft^2) of the cyclotron room. The contamination thickness was approximated as 12 cm which is suggested by the depth distribution curve Kimura, reference 8.21. At a one meter distance above the center of the circular disk used for modeling, the exposure rate was 1.63 μR/hour per 1 pCi/g of Co-60. This exposure rate is a conservative value as the entire floor of the cyclotron room was not exposed to a uniform field of neutron radiation. For the model renovation time period of 500 hours, the dose was estimated to be ~ 0.8 mrem/year per pCi/g. .

Per NUREG/CR-5512, the concepts and factors involved in calculation of the committed effective dose equivalent (CEDE) for inhalation for the building renovation scenario are described in the following word equation:

[CEDE for inhalation] = [Exposure duration for renovation; 500 hours]
x [Volumetric breathing rate; 1.2 m^3/h]
x [Airborne dust-loading factor; 10^{-4} g/m^3]
x [Inhalation dose factor; 5.91E-8 Sv/Bq)]
x [Average concentration of radionuclide in concrete; 8.88E-2 Bq/cc]
/ [density of material; 2.4 g/cc]

For an average concentration in the concrete of 1 pCi/g or 8.88E-2 Bq/cc and applying the conversion factor of 1 Sv = 10^5 mrem, the CEDE is about 1.31 E-5 mrem per year.

Per NUREG/CR-5512, the concepts and factors involved in calculation of the committed effective dose equivalent (CEDE) for the inadvertent ingestion of loose surface contamination

after transfer to hands, foods, or other items entering the mouth is described in the following word equation:

[CEDE for ingestion] = [Exposure duration for renovation; 500 hours]
x [Effective transfer rate for ingestion; 10mg/h]
x [Ingestion dose factor; 7.28E-9 Sv/Bq)]
x [mean volume activity; 8.88E-2 Bq/cc]
/ [density of material; 2.4 g/cc]

For an average concentration in the concrete of 1 pCi/g or 8.88E-2 Bq/cc and applying the conversion factor of 1 Sv = 10^5 mrem, the CEDE is about 1.35 E-4 mrem per year.

A sum of doses from all pathways indicates that external exposure is the dominant one and that the inhalation and ingestion pathways are insignificant. A volumetric DCGL for Co-60 for the renovation scenario equivalent to 25 mrem is 31 pCi/g.

For the building occupancy scenario, the same modeling as described above for renovation is used but with a 2000 hours per year exposure time rather than the 500 hours assumed for renovation. As illustrated above, external exposure is the dominant pathway; and the inhalation and ingestion pathways are insignificant. A corresponding occupancy volumetric DCGL for Co-60 for 25 mrem/y is 7.7 pCi/g. As this is the smaller DCGL of the two scenarios, it was selected for this facility. Area factors, which increase DCGL values for small contaminated areas, were not determined for this evaluation as all concentrations were expected to be lower than the DCGL.

3.2 Development of Surface DCGLs

NUREG-1556, Vol. 11, indicates that surface contamination surveys should be conducted for both removable and fixed contamination before the facilities or equipment are released from restricted to unrestricted use. For the potential contaminants of concern listed above, Table S5 of NUREG-1556 provides the maximum acceptable residual levels for radionuclides used in Building G as indicated in Table 2.

Table 2. Acceptable Surface Contamination Levels

Radionuclide	Average[1] (dpm/100 cm^2)	Maximum[2] (dpm/100 cm^2)	Removable[3] (dpm/100 cm^2)
General beta-gamma emitters	5,000	15,000	1,000
[1] 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.			
[2] The maximum contamination level applies to an area of not more than 100 cm^2.			
[3] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency.			

Additionally, NUREG -1556, Vol. 11, Table 11.1, provides screening level DCGLs for H-3 and Co-60 based on the assumption that the fraction of removable surface contamination is equal to 0.1. The screening values represent surface concentrations of individual radionuclides that would be deemed in compliance with the 25 mrem/yr unrestricted release dose limit in 10 CFR 20.1402. For radionuclides in a mixture, the "sum of fractions" rule applies; see 10 CFR Part 20, Appendix B, Note 4. The screening level used for Cd-109 is found in Table 5.19 of NUREG/CR-5512, Vol. 3. It should be noted that this NUREG also contains screening values used in NUREG-1556. Neither NUREG had a screening level for the Ge/Ga-68.

Table 3. Acceptable License Termination Surface Screening Values

Radionuclide	Acceptable Screening Levels
H-3	1.2×10^8 dpm/100cm^2
Cd-109/Ag109m	1.1×10^5 dpm/100cm^2
Co-60	7.1×10^3 dpm/100cm^2

Table 2 values are the more conservative and were selected as DCGLs. If H-3, Cd-109, or Co-60 were identified in a mixture, the "sum of fractions" rule would be applied; see 10 CFR Part 20, Appendix B, Note 4. Mixtures may be summed and compared to Table 2 above.

4.0 FINAL STATUS SURVEY OVERVIEW

4.1 Survey Objectives

The purpose of the final status survey was to demonstrate that the radiological conditions at the facility satisfy the NRC release criteria and therefore, the site can be released from licensing restrictions for future use without radiological controls. The primary objectives of the final status survey are to:

- select/verify survey unit classification;
- demonstrate that the potential dose or risk from residual contamination is below the release criterion for each survey unit ; and
- demonstrate that the potential dose or risk from small areas of elevated activity, if any, is below the release criterion for each survey unit.

The final status survey provides data to demonstrate that all radiological parameters satisfy the established guideline values and conditions.

Professional judgment and biased sampling are important for locating contamination and characterizing the extent of contamination at a site. However, the MARSSIM focus is on planning the final status survey, which utilizes a more systematic approach to sampling. Systematic sampling is based on rules that endeavor to achieve the representativeness in sampling consistent with the application of statistical tests.

The Final Status Survey for release of areas was conducted in accordance with guidance given in MARSSIM. MARSSIM provides guidance on classifying areas and survey requirements based on potential level of residual radioactive material contamination relative to the established release criteria. MARSSIM also provides the following guidance as an aid in conducting surveys, and these are incorporated into this survey.

- Determine background activity for building surfaces. Only interior building surfaces are a concern per the HSA; exterior building parts and outdoor areas are considered non-impacted.

- Perform systematic and judgmental surface scan measurements.

- If elevated levels of contamination are identified (>50% of DCGLs), perform selective direct measurements and sampling of areas of elevated activity of residual radioactivity to provide data on upper ranges of residual contamination levels. Note that locations of high scan values should be used.

- Document survey and sampling locations. Establish a reference coordinate system. Prepare scale drawings as appropriate.

4.2 Organization and Responsibilities

The survey was performed by Chesapeake Nuclear Services using a qualified team composed of technical experts and radiation safety technicians. This is the same organizational structure which conducted the characterization survey activities. Figure 2 shows the organizational chart for the survey activities.

The ChesNuc team operated under the supervision of Claude Wiblin, CHP. Mr. Wiblin had the authority to make appropriate changes to the survey plan (subject to the established QA/QC program) as deemed necessary as the survey progressed. Mr. Wiblin also directed laboratory services for in-house analyses.

Field measurements of radiological parameters and sample collection were under the direction of Mr. James Brady, NRRPT.

QA/QC responsibilities were handled by a QA officer whose work responsibilities were otherwise separate from those on the survey team. Mr. J. Stewart Bland, CHP, served as the QA officer and coordinated all interface requirements during the survey process. Applicable ChesNuc QA procedures are developed from guidelines presented in ANSI/ASTM NQA-1, Quality Assurance Program Requirements for Nuclear Facilities (1989).

Mr. John P. Jacobus is the NIDA Radiation Safety Officer and observed portions of the survey.

4.3 Training

ChesNuc provides continuing training for its survey personnel and other workers who may be exposed to radioactive materials. Training varies according to potential exposure and the nature of the employee's job duties, which is consistent with 10 CFR Part 19.12, "Instruction to Workers" (Reference 8.12). In addition to the regular training, special training was provided on equipment, special techniques, and practices relative to the survey activities for those employees who were involved in taking radiological measurements and samples. All members of the final status survey team attended an in-house training session regarding radiation protection, survey procedures, and quality assurance activities. Documentation of training participation was retained in the ChesNuc training files.

4.4 Laboratory Services

All smears were analyzed by ChesNuc personnel offsite due to the amount of natural radon interference at the facility. Liquid scintillation counting for H-3 was performed by RSO, Inc., of Laurel, MD.

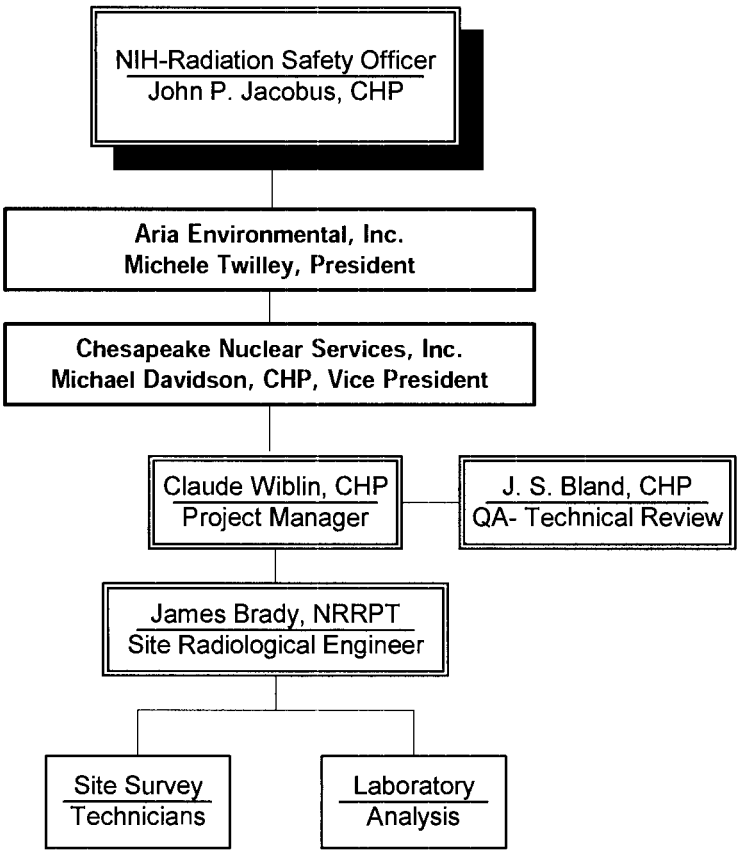

Figure 2. FSS Organization Chart

4.5 General Survey Plan

The survey plan consisted of systematic processes and procedures that have been deemed acceptable by industry practices and the NRC. MARSSIM methodology and its graded approach were afforded particular attention. Activities (organized units of work needed to complete a function) were defined and tasks (specific work assignments within a specific activity) were delegated to the appropriate team members. Table 4 provides a breakdown of activities and tasks of the FSSP.

Table 4. Overview of Major Activities and Tasks

Activities	Tasks
Evaluate contamination potential	1. Review radiological data from scoping and characterization surveys.
	2. Identify radionuclides of concern and determine DCGLs.
	3. Identify boundaries of survey units and classes.
Establish reference system	1. Determine frequency and locations of measurements to meet criteria.
	2. Prepare facility survey maps and work packages.
Determine background levels	1. Review HSA.
	2. Measure indoor beta levels on various materials.
Perform Measurements	1. Perform surface scans.
	2. Perform fixed point measurements.
	3. Collect smears.
Analyze samples	1. Count smears
Interpret data	1. Convert data to standard units.
	2. Calculate average levels.
	3. Compare data with criteria.
Prepare report	1. Construct data tables.
	2. Develop graphics.
	3. Prepare text.
	4. Submit report.

An example work process flow chart is shown in Figure 3.

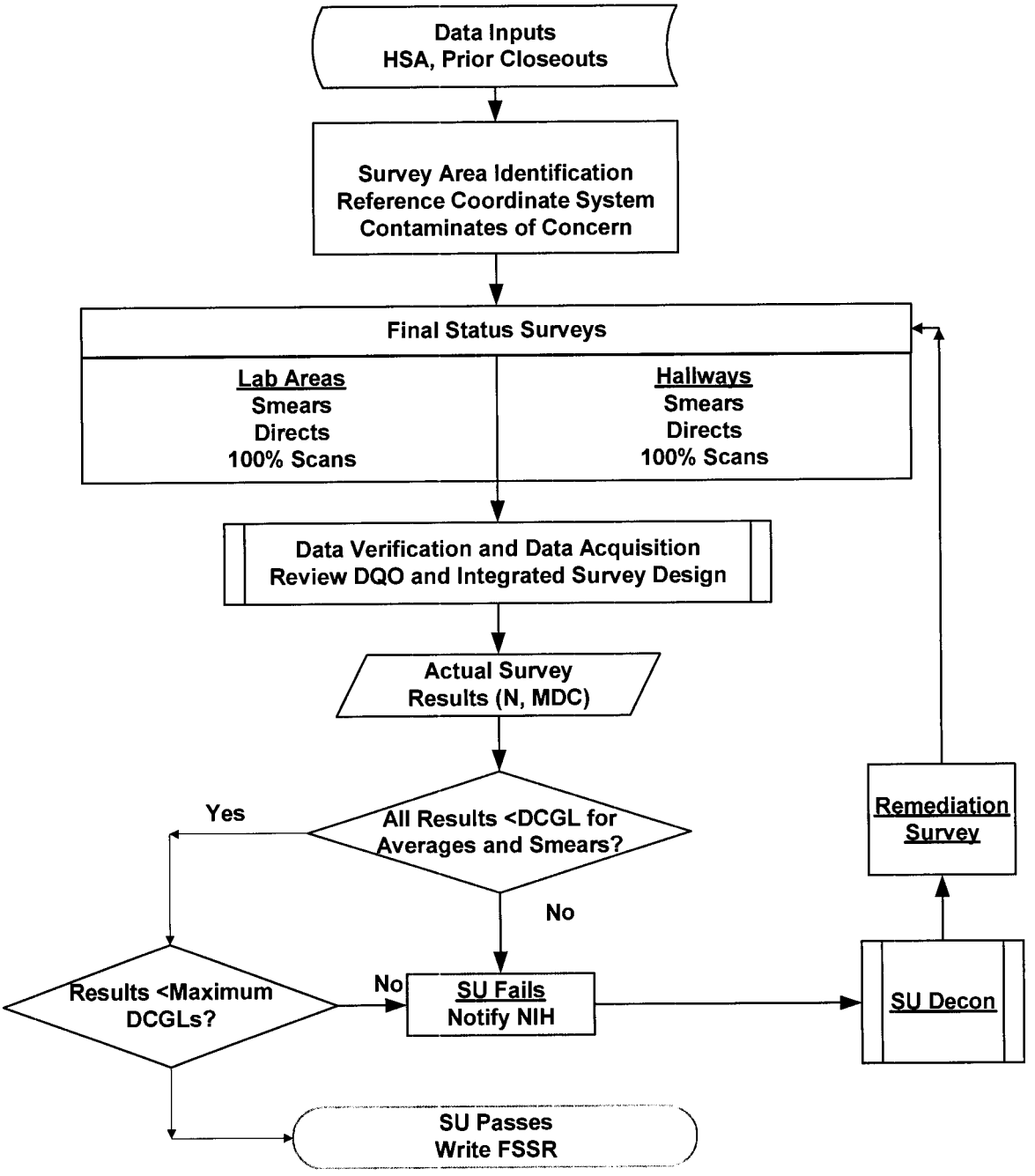

Figure 3. Work Process Flow Chart

5.0 SURVEY PLAN AND PROCEDURES

5.1 FSS Data Quality Objectives

Data Quality Objectives (DQOs) are fundamental components for planning. These were considered during the scoping surveys, became formal elements of the FSSP, and integrated/implemented during the FSS performance. The following DQOs are quantitative and qualitative statements derived from the output of the DQO process.

- The objective of the FSS is to prove that the residual radioactivity levels in the survey units within the facility are at or below the release criteria.
- The background reference materials will be located in the facility in an area that has similar construction materials to those being surveyed.
- The number of survey measurements and locations per survey unit will be determined by MARSSIM techniques.
- A response check form or instrument control log will be used to keep track of background counts and response checks on a daily basis during work activities.
- For beta fixed-point and scanning measurements, excluding H-3, instrument MDCs will be less than 2500 dpm/100 cm^2 which is 50% of the total surface activity release criteria for averages.
- For gamma static fixed-point and scanning measurements, excluding H-3, instrument MDCs will be less than 2500 dpm/100 cm^2 which is 50% of the total surface activity release criteria for averages.
- For gamma volumetric fixed-point and scanning measurements for Co-60, instrument MDCs will be less than 3.9 pCi/g which is 50% of the total surface activity release criteria for averages.
- For smear measurements, instrument MDCs will be less than 500 dpm/100 cm^2 which is 50% of the removable activity release criteria.
- Smear measurements for H-3 will serve as a surrogate for total surface activity and smear measurement results will be considered as 10% of the total activity. The smear investigation level (IL) will be measurements >500 dpm/100 cm^2.
- A beta scan will be performed over 100% of work areas and floors within the laboratory, storage areas, and contiguous hallway. A gamma scan will be performed over 100% of work areas and floors of laboratory and storage areas with known gamma emitters. The scanning investigation level (IL) will be measurements > 50% DCGLs; excluding H-3.
- Quality control (QC) measurements will be made to evaluate instrument and operator precision; about 5% of fixed point measurements will be re-performed by the radiological engineer. Acceptability of measurements will be determined using guidance found in NRC Inspection Procedure 84750.

5.2 Instrumentation

5.2.1 Description of Probes

Both beta-gamma (gas flow) probes 43-68 and 43-37 and gamma probe 44-10 were used in this survey. Photos of the 43-68 and 44-10 are shown in Figure 4; the 43-37 is similar in construction to the 43-68.

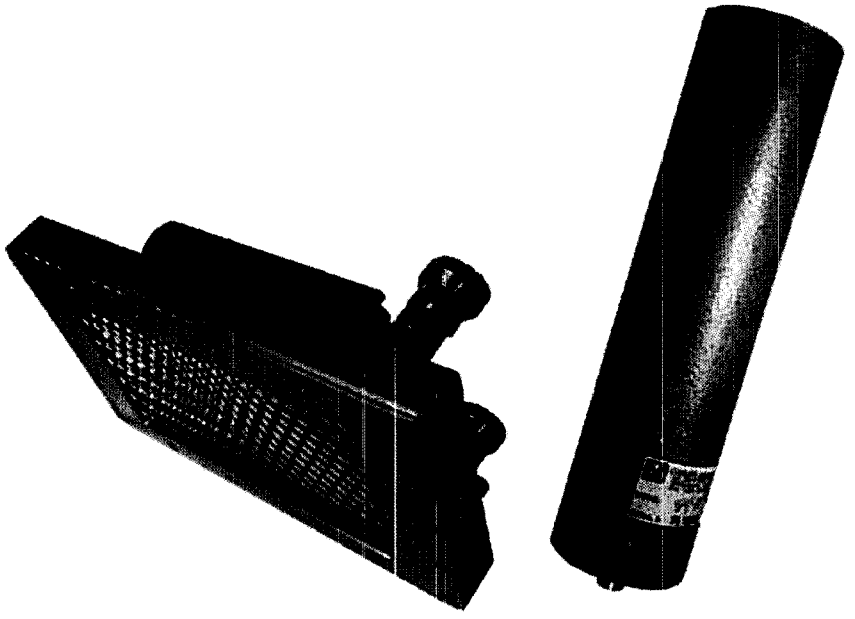

Figure 4. Ludlum Model 43-68 and 44-10 Probes

Manufacturer data for the physical probe area of the Ludlum 43-68 probe indicates dimensions of 3.9"(10cm)H X 4.6"(11.7cm)W X 7.8"(19.8cm)L; the area used for measurements is the screened area of 126 cm^2. Manufacturer data for the physical probe area of the Ludlum 43-37 probe is similarly quoted as 0.8"(2cm)H X 6.3"(16cm)W X 18.3"(46.5cm)L; the area used for measurements is 582 cm^2.

5.2.2 Description of Instrument Calibration and Use of Check Sources

Calibration of the NaI probe was performed in a Cs-137 gamma field as 1) response is energy dependent and 2) the manufacturer provides multipliers to the response to Cs-137 gamma energy for responses to other energies.

For beta measurements, calibration to C-14 was performed. C-14 decays by beta emission with a maximum energy of 0.156 MeV and an average energy of 0.05 MeV. Use of C-14 is considered conservative as the C-14 average energy is considerably less than the beta energy for Co-60, about the same as the electron from Ag/109m, and at least a magnitude less than the average positron energy from Ga-68. Instrument efficiency in the field will be better than that reported and results will be reported higher than actual.

The daily check sources used were traceable to the National Institute of Standards and Technology (NIST). Calibration sheets and instrument use logs are filed in ChesNuc's Field Notes.

5.3 Efficiency Determinations and Minimum Detectable Concentrations

5.3.1 Beta Static and Scan Minimum Detectable Concentrations (MDC)

NUREG-1507 (Reference 8.6) provides a rigorous derivation of the calculational expression for instrument sensitivity, typically stated as the minimum detectable concentration (MDC). The MDC equations and example values for both static measurements and swipe analysis are presented in this section.

For static measurements, background and indicator measurements are both typically one minute in duration. The following equation for the MDC from NUREG-1507, Equation 3-10, as modified, applies:

$$StaticMDC = \frac{3 + 4.65\sqrt{C_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

C_b = Background count in one minute
ε_i = Intrinsic instrument efficiency
ε_s = Surface efficiency
a = probe area in cm^2

For scanning, the time interval over an area is typically one second. The following equation is developed from reference NUREG-1507.

$$ScanMDC = \frac{1.38 * 60\sqrt{\frac{R_B}{60}}}{\sqrt{0.5}(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

1.38 = a desired performance proportions level of 0.95 for true positive results and a level 0.6 false positives;
R_B = Background rate in cpm; and
$\sqrt{0.5}$ = MARSSIM determined level of performance for the surveyor.

Table 5. Nominal Beta MDCs and MDCRs

Model	Serial	Area (cm^2)	Background (cpm)	ScanMDC ($dpm/100cm^2$)	ScanMDCR (cpm)	Static MDC ($dpm/100cm^2$)	Static MDCR (cpm)
43-68	Pr148454	126	373	1158	292	107	27
43-37	Pr128625	582	945	399	465	Not used	

5.3.2 Gamma Static and Scan Minimum Detectable Concentrations (MDC)

Modeling of the small area of elevated activity (using MicroShield® software) determines the net exposure rate produced by a radionuclide concentration at distances of 2.5 cm and 6 cm above the source. These positions are selected because it relates to the height of the center of the detector during fixed measurements and the average height of the NaI(Tl) scintillation detector above the surface during scanning. Note that the scanning distance for this indoor scanning is smaller than the example provided by MARSSIM for soil scanning; this is possible as there are no obstructions or protrusions from the floor versus the ever present grass and sticks in soil monitoring.

The factors considered in the modeling include:

_ radionuclide of interest
_ expected concentration of the radionuclide of interest
_ areal dimensions of the area of elevated activity
_ depth of the area of elevated activity
_ location of dose point NaI(Tl) scintillation detector height above the surface density of material being surveyed

Modeling analyses were conducted with MicroShield® software for the different areas and radionuclides of interest which were identified in the HSA and which have a gamma component: Co-60, Cd-109/Ag-109m, and Ge-68/Ga-68. The objective was to determine the radionuclide concentration that is correlated to the minimum detectable net exposure rate for each of the radionuclides of interest. Results of all MicroShield® computer analyses printouts are found in Appendix B.

5.3.2.1 Considerations for Co-60

Co-60 was identified during the closeout survey conducted by the RSO. Modeling analyses were conducted considering a cylindrical area dimension of elevated activity of 0.25 m^2 (radius of 28 cm), the depth of the area of elevated activity is 12 cm, the dose point is 6 cm above the surface, and the density of concrete is 2.4 g/cm^3. A depth of 12 cm for activated concrete is considered to be appropriate for this model as this is the depth indicated by Kimura (Reference 8.21).

The scan MDC for Co-60 for a 2 in. by 2 in. NaI(Tl) scintillation detector is considered in detail. Assume that the background level is 7,100 cpm and that the desired level of performance (95% correct detections and 60% false positive rate) results in a *d'* of 1.38. The scan rate of 0.25m/s

provides an observation interval of 2 seconds (based on a diameter of about 56 cm for the area of elevated activity). The $MDCR_{surveyor}$ may be calculated assuming a surveyor efficiency (p) of 0.5 as follows:

1) b_i = (7,100 cpm) (2 sec) (1 min/60 sec)=237 counts

2) MDCR = (1.38) ($\sqrt{237}$) (60 /2)= 637 cpm

3) $MDCR_{surveyor} = 637/\sqrt{0.5}$ = 900 cpm

The corresponding minimum detectable activity concentration is determined for this detector and radionuclide. Interpolation of the manufacturer's data for gamma energy versus cpm per µR/h of this particular 2 in. by 2 in. NaI(Tl) scintillation detector yields a count-to-exposure rate ratio for Co-60 of 474 cpm per µR/h for the 1.173 MeV gamma and 414 cpm per µR/h for the 1.332 MeV gamma A MicroShield® computer run was performed to determine the exposure rates for a unity (1pCi/g) concentration of Co-60 in concrete. The results are shown in Table 6.

Table 6. NaI Scan Efficiency for Co-60

Energy (MeV)	Exposure Rate (µR/hr) With Buildup	cpm per µR/h	cpm per pCi/g
1.1732	0.73	474	345
1.3325	0.81	414	336
Totals	**1.54**		**681**

The scan MDC is calculated by dividing the $MDCR_{surveyor}$ (900 cpm) by the total cpm per pCi/g shown in the table above. The minimum scan detectable concentration for this example is 1.3 pCi/g.

For static measurements the MDC was estimated with the following formula:

$$MDC = \frac{3 + 4.65\sqrt{C_B}}{KT}$$

Where C_B is the background count in time, T, and K is the instrument efficiency. For a background of 7,100 cpm for the concrete immediately under the cyclotron and a closer distance of 2.5 cm, a MicroShield® computer run was performed to determine the exposure rates for a unity (1pCi/g) concentration of Co-60 in concrete. The results are shown in Table 7.

Table 7. NaI Static Efficiency for Co-60

Energy (MeV)	Exposure Rate (µR/hr) With Buildup	cpm per µR/h	cpm per pCi/g
1.1732	0.92	474	436
1.3325	1.03	414	425
Totals	**1.95**		**861**

The static MDC is then calculated by applying the total cpm per pCi/g shown in the table above. The minimum static detectable concentration for this example is ~0.5 pCi/g.

5.3.2.2 Considerations for Cd-109/Ag-109m

Similarly for Cd-109/Ag-109m, a MicroShield® computer run was performed to determine the exposure rates from a surface with a contamination level of 5,000 dpm/100 cm^2. Interpolation of manufacturer data of the NaI detector was made for the results shown in the Table 8

Table 8. NaI Efficiency for Cd-109/Ag-109m

Energy (MeV)	Exposure Rate (mR/hr) With Buildup		cpm per µR/h	cpm per 5000 dpm/100cm^2	
	2.5 cm	6 cm		2.5 cm	6 cm
0.022	5.57E-05	3.62E-05	2792	156	101
0.022	1.05E-04	6.82E-05	2792	293	190
0.0222	1.04E-04	6.74E-05	2792	290	188
0.0222	1.96E-04	1.27E-04	2792	546	355
0.0249	2.62E-05	1.70E-05	3680	96	63
0.0249	4.94E-05	3.21E-05	3680	182	118
0.088	5.06E-06	3.29E-06	11136	56	37
Totals	**5.41E-04**	**3.51E-04**		1619	1052

A general background for most of the laboratory areas was determined to be 5,454 cpm. Using the formulas given above to determine the surveyor's MDCR:

1) $b_{i=}$ (5454 cpm) (2 sec) (1 min/60 sec)=182 counts

2) MDCR =(1.38) ($\sqrt{182}$) (60 /2)= 558 cpm

3) $MDCR_{surveyor}$ = 637/ $\sqrt{0.5}$ = 789 cpm

The scan MDC is calculated by dividing the $MDCR_{surveyor}$ (789 cpm) by 0.21 cpm per dpm/100cm^2 for a 6 cm height as determined from the above table. The minimum scan detectable concentration for Cd-109/Ag-109m is about 3,760 dpm/100cm^2.

The static MDC is determined using an efficiency of 0.32 cpm per dpm/100cm^2 at a 2.5 cm height as determined from the above table. The minimum static detectable concentration for Cd-109/Ag-109m is about 1,070 dpm/100cm^2.

5.3.2.3 Considerations for Ge/Ga-68

Similarly for Ge/Ga-68, a MicroShield® computer run was performed to determine the exposure rates from a surface with a contamination level of 5,000 dpm/100 cm^2. Interpolation of manufacturer data of the NaI detector was made for the results shown in Table 9.

Table 9. NaI Efficiency for Ge-68/Ga-68

Energy (MeV)	Exposure Rate (mR/hr) With Buildup		cpm per µR/h	cpm per 5000 dpm/100cm^2	
	2.5 cm	6 cm		2.5 cm	6 cm
0.511	1.79E-03	1.16E-03	1244	2221	1443
1.0145	4.49E-06	2.92E-06	534	2	2
1.0774	6.45E-05	4.19E-05	511	33	21
1.8831	4.23E-06	2.75E-06	281	1	1
Totals	**3.35E-03**	**2.17E-03**		2257	1467

As before, a general background for most of the laboratory areas was determined to be 5,454 cpm. Using the formulas given above to determine the surveyor's MDCR:

1) $b_{i=}$ (5454 cpm) (2 sec) (1 min/60 sec)=182 counts

2) MDCR =(1.38) ($\sqrt{182}$) (60 /2)= 558 cpm

3) $MDCR_{surveyor} = 637/\sqrt{0.5} = 789$ cpm

The scan MDC is calculated by dividing the $MDCR_{surveyor}$ (789 cpm) by 0.29 cpm per dpm/100cm^2 for a 6 cm height as determined from the above table. The minimum scan detectable concentration for Ge-68/Ga-68 is about 2,720 dpm/100cm^2.

The static MDC is determined using an efficiency of 0.45 cpm per dpm/100cm^2 at a 2.5 cm height as determined from the above table. The minimum static detectable concentration for Ge-68/Ga-68 is about 770 dpm/100cm^2.

5.4 Activity Measurements

5.4.1 Beta Surface Activity

A beta measurement for surface activity is performed over an area, represented by the physical surface area of the detector. To convert instrument counts to conventional surface activity units, the following equation is used:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

where:

C_s = Integrated counts recorded by the instrument

C_b = Background counts recorded by the instrument

t_S = Sample counting time

t_B = Background counting time

5.4.2 Gamma Surface Activity

A gamma measurement for surface gamma activity is performed over an area, represented by the model area of the NaI detector. To convert instrument counts to conventional surface activity units, the following equation is used:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{\varepsilon_{Total}}$$

where:

ε_{Total} = instrument total efficiency (cpm per dpm/100cm^2)

5.4.3 Gamma Volume Activity

A gamma measurement for volume gamma activity is performed over a concrete area, represented by the model area of the NaI detector. To convert instrument counts to conventional surface activity units, the following equation is used:

$$\frac{pCi}{g} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{\varepsilon_{Total}}$$

where:

ε_{Total} = instrument total efficiency (cpm per pCi/g)

5.5 Smear Analysis

All smears were analyzed with the Ludlum 2929 for a gross determination of contamination levels as dpm/100 cm^2. Except for H-3, the efficiencies are acceptable, e.g., C-14 as 8%. Smears were then analyzed for H-3 by Radiation Services Organization, Inc, (RSO), Laurel, MD. RSO uses liquid scintillation counting for H-3 which permits concurrent analysis for C-14 and P-32.

Background and sample count times used to analyze a smear on the Ludlum 2929 are typically twenty minutes and one minute, respectively. When the background count time and the sample count time are different, the following MDC formula, taken from NUREG-1507, Equation 3-11, as modified for here, applies:

$$MDC = \frac{3 + 3.29\sqrt{R_B t_S\left(1 + \frac{t_S}{t_B}\right)}}{(\varepsilon_s)(\varepsilon_i)(t_S)\left(\frac{a}{100cm^2}\right)}$$

where:

a = area of surface smear in cm^2, nominally 100 cm^2

5.6 Reporting Activity and Confidence Intervals

The term "measurement uncertainty" is used interchangeably with the term standard deviation. The uncertainty is qualified as numerically identical to the standard deviation associated with a normally distributed range of values. When reporting a confidence interval for a value, the range of values that represent a pre-determined level of confidence (*i. e.*, 95%) is made. To make this calculation, the final standard deviation, or total uncertainty σ_U as shown in MARSSIM Equation 6-16, is multiplied by a constant factor k representing the area under a normal curve as a function of the standard deviation. The values of k selected for this report is 1.96 representing a 95% confidence level.

The basic formula for calculating the dpm per 100 cm^2 is repeated here as follows:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_B}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

Note that the numerator has an uncertainty associated with the count rates and the denominator has two efficiency terms and each of them has an uncertainty also. The standard deviation of the count rate is determined by MARSSIM equation 6-15; the uncertainty of the source efficiency is stated in Table 5.5 of NUREG-1507 as +/- 0.054 at the 95% CL; and the uncertainty of the calibration sources are presented above. The percentage uncertainty related to the instrument efficiency is assumed to be equal to the uncertainty percentage values reported for

the calibration sources. The total efficiency uncertainty was determined through propagation of the uncertainties related to ε_s and ε_i. The uncertainty of the measurement was then determined through propagation of the uncertainties related to ε_{total} and the uncertainty of the count rate. Handling only two at a time of the various uncertainties permitted the use of the uncertainty propagation techniques described in paragraph 6.8.3 of MARSSIM.

The equation used for calculating the standard deviation of a net count rate over a time t with consideration given to background is found as MARSSIM formula (6-15):

$$s_r = \sqrt{\frac{R_c}{t_s} + \frac{R_B}{t_B}}$$

Where:

R_c = Sample count rate (cpm)

R_B = Background count rate (cpm)

For this work, t_B is the total number of one minute counts used to determine the background count rate is 20. This value is used for reference area counts for static/scan measurements and a laboratory blank is used for smears.

The MARSSIM equation for error propagation for division or multiplication is used to calculate total uncertainty:

$$\sigma_u = u * \sqrt{\left(\frac{\sigma_x}{x}\right)^2 + \left(\frac{\sigma_y}{y}\right)^2}$$

where u = x / y or x * y

The following <u>example</u> of a typical determination of the measurement result for a smear (see results for sample 11, Room B201) and its related uncertainty at the 95% confidence level is provided. The following is given:

C_s = 60 cpm

R_B = 55.6 cpm

t_S = 1 min

t_B = 20 min

ε_i = 0.552 epm/dpm

ε_s = 0.25 cpm/epm

a = 100 cm^2

1) The total number of disintegrations is:

$$\frac{dpm}{100cm^2} = \frac{\frac{C_s}{t_s} - \frac{C_b}{t_b}}{(\varepsilon_s)(\varepsilon_i)\left(\frac{a}{100cm^2}\right)}$$

$$\frac{dpm}{100cm^2} = \frac{60cpm - 55.6cpm}{(0.25epm/dpm)(0.552cpm/epm)\left(\frac{100cm^2}{100cm^2}\right)}$$

$$\frac{dpm}{100cm^2} = 32$$

2) The equation used for calculating the standard deviation of a count rate over a time t with consideration given to background is found as MARSSIM formula (6-15) modified here considering that the background sigma was determined for a sequence of background counts:

$$s_r = \sqrt{\frac{R_c}{t_c} + \sigma_B^2}$$

$$s_r = \sqrt{\frac{60cpm}{1\min} + (5.1cpm)^2}$$

$$s_r = 9cpm$$

3) The uncertainty for the instrument efficiency was estimated at one standard deviation for the set of 20 measurements of the check source and corresponding 20 measurements of the instrument background using the following approach.

$$\varepsilon_{total} = \frac{AverageCountRate - AverageBackgroundRate}{4\pi EmissionRate}$$

The standard deviation of the instrument total efficiency was about 0.013 cpm/dpm.

4) The total uncertainty in the measurement activity related to the efficiencies and the net count rate is determined using MARSSIM's equation for error propagation for division:

$$\sigma_u = \frac{C_{net}}{\varepsilon_{total}} * \sqrt{\left(\frac{\sigma_{eff}}{\varepsilon_{total}}\right)^2 + \left(\frac{\sigma_r}{C_{net}}\right)^2}$$

$$\sigma_u = \frac{60-55.6}{(0.25*0.552)} * \sqrt{\left(\frac{0.013}{0.138}\right)^2 + \left(\frac{9}{60-55.6}\right)^2} \text{ dpm}$$

$$\sigma_u = 65 \text{ dpm}$$

5) The activity will then be 32 dpm/100 cm^2 and the total uncertainty for this one sigma formula will be about 65 dpm/100 cm^2. (Note that the count time is considered to have trivial variance and is assumed to be a constant.)

Referring to MARSSIM Table 6.9, a k value of +/-1.96 represents a confidence interval equal to 95% about the mean of a normal distribution. Therefore, the 95% confidence interval would be 1.96 x 65 dpm/100 cm^2 = 130 dpm/100 cm^2. The final result is 32 +/- 130 αpm/100 cm^2. These values are presented for each measurement in the results with any adjustment required for the physical size of the probe.

Similar equations and techniques were used for static and scanning measurements.

5.7 Survey Plan

5.7.1 Area Classification

For the indicated impacted areas at the facility, the HSA suggests that classification of impacted areas be into two classes, based on MARSSIM definitions for Class 1 and 3.

- Class 1 areas are impacted areas that, prior to remediation, had concentrations of residual radioactivity above the DCGL. Remediated areas were Class 1 and Rooms 214 and 214A were identified as such.

- Class 2 areas have or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the DCGL. No areas were identified in this category. No Class 2 areas were identified at this facility.

- Class 3 areas are impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the DCGL. The hallway and rooms of use other than B214 and B214A were considered in this category.

- Non-impacted areas: For this facility, the HSA concludes that potentially impacted areas do not include any other floors or areas as radioactive material was used exclusively in the basement.

5.7.2 Selection of Area Size and DCGLs for Survey Units

Suggested survey unit sizes from MARSSIM are given in the following table. These areas are suggested in MARSSIM because they give a reasonable sampling density and they are consistent with most commonly used dose modeling codes. However, the size and shape of a particular survey unit may be adjusted to conform to the existing features of the particular site area.

Table 10. Suggested Area Limits for Survey Units

Class	Structures - floor area
1	Up to 100 m^2
2	100 to 1000 m^2
3	no limit

For this survey, each individual laboratory and the hallway were treated as individual survey units. Both Class 1 areas were under 100 m^2 in floor area and the remainder of the survey units were less than 1000 m^2 each.

5.7.3 Surface Scans

As Cd-109/Ag-109m contamination was discovered during the HSA in Room B214, it was prudent to perform a 100% beta-gamma scan on all work counters, floors, inside fume hoods, and sink areas. Additionally, 100% gamma scans were performed on all work counters, floors, inside fume hoods, and sink areas in rooms B205, B210, B214, and B214A as material identified with these rooms have a gamma decay component.

As directed by MARSSIM, each survey unit received a surface scan using appropriate survey instruments. Scan speed (observation time) was pre-determined per survey unit depending upon the DCGL and area size; minimum scanning time goals were set. For beta contamination detectors, scanning at much less than one detector width per second was required to ensure that the scan MDC met the project DQOs. For the NaI scan surveys, the speed was set for a 2 second observation interval. Both speeds ensure a sufficiently low MDC as discussed earlier to meet DQOs.

5.7.4 Background Materials

The background or reference materials were chosen due to their similarity in construction materials, construction date, and absence of any history of storing or handling radioactive materials.

For comparability of results, survey measurements were collected from the reference material areas using similar instruments and survey techniques employed in the survey unit areas. Each background reference material was surveyed using 20 random static/scan measurements.

5.7.5 Determining the Number of Survey Points

The following technique is used to determine the number of samples required. The number of survey points as estimated may be increased, but MARSSIM suggests the value should be conservative until all actual values are known. A review was made post-survey to determine if more samples were required but conservatism is also built into the design to preclude this from happening.

Section 5.5.2.2 of MARSSIM describes the process for determining the number of survey measurements necessary to ensure a data set sufficient for statistical analysis. For building and structure surfaces, the Wilcoxon Rank-Sum (WRS) test may be used. The method for determining the combined number of data points (N) for the survey unit and reference area is based on the expected contaminant variability and the predetermined acceptable Type I and Type II error rates. The project data quality objectives (DQO) established the Type I and Type II error rates (α and β respectively) at 0.05.

The "relative shift" (Δ/σ) is the ratio involving the concentration to be measured (Δ) relative to the expected variability in that concentration sigma (σ), and can be thought of as an expression of the resolution of the measurements. The sigma (σ) is selected from the larger of that found in the survey unit or the reference area. The shift (Δ) is the width of the statistical gray region or difference in the release criterion and the lower bound of the gray region (LBGR). The gray region is the area where the impact of making an incorrect error decision (Type I or Type II error) is small. The LBGR is the concentration at which the type II error rate is set. It is advantageous to set the LBGR at or above the expected median contaminate concentration in the survey unit; characterization data from the HSA indicated that 50% of the DCGL was well above the expected concentration levels. The Lower Bound of the Gray Region (LBGR) represents average concentrations that one expects to find after remediation is complete; by definition, the LBGR is something less than the DCGLw.

As decontamination efforts were on-going during the HSA with FSS activities to follow immediately, a conservative approach to the required number of samples was used. MARSSIM recommends assuming a coefficient of variation of 30% for sigma when preliminary data are not available, an assumption of 0.3 times a DCGL. Routinely the LBGR is set at one-half of the DCGL or the mean of any scoping/characterization surveys. All of this is summarized in the following formulas:

$$\frac{\Delta}{\sigma} = \frac{DCGL - 0.5 * DCGL}{\sigma}$$

$$\frac{\Delta}{\sigma} = \frac{0.5}{0.3}$$

$$\frac{\Delta}{\sigma} \approx 1.7$$

To determine the number of data points needed in each survey unit and reference area, MARSSIM Table 5.3 is used. For this example, each structure survey unit and the reference area are expected to have a minimum of 15 survey points. However, from the HSA, preliminary data was available to estimate the relative shift which was confirmed during the FSS. The low level of contaminant averages and associated sigmas drove the relative shift to levels (4.5 and higher) which are not particularly useful for an FSS design. MARSSIM recommends that if the relative shift is greater than 3 to adjust the LBGR until the relative shift is between the values of 1 and 3. This adjustment was required in all survey units. At a derived relative shift of 3 and with the DQOs for α and β at 0.05, the required number of data points needed in each survey unit and reference area, MARSSIM Table 5.3 is used, is 10. Similarly at a relative shift of 1.7, the number of data points in each survey unit is 15. By selecting 15 as the target number of sample locations in each survey unit, the probability of not obtaining sufficient data obviously diminishes. However, the shape of the cyclotron unit required 16 data points to complete the grid pattern.

5.7.6 Determination of Survey Point Locations

Before the surveys are conducted within a survey unit, a fixed reproducible starting point is selected, such as the southwestern corner of the survey unit at ground level. The survey unit points are based on an X-Y reference-coordinate system that was provided with the FSS maps. Equipment such as tape and laser measurers were used in the measurement of the survey units for the FSS. SAE units (feet and inches) were used for measuring the survey units. Visual aids such as chalk or removable tape were used to mark survey point locations within the survey unit.

Reference material measurements were taken and recorded in a similar fashion to measurements taken in the survey units. The gross activity measurements (uncorrected for background) in the reference area(s) were compared to the gross activity measurements in the

survey units to determine if the null hypothesis (the survey unit is contaminated) is accepted or rejected. All reference material and Class 3 survey points were randomly selected.

Once the number of data points required for each survey unit is determined, the location of the first survey point in each survey unit is determined using a random number generator to generate an X and Y coordinate in meters from a reference point (0, 0).

The (0, 0) point was generally taken as the southwestern corner of the survey unit or survey area at ground level. The referenced points are clearly identified on each survey unit map. For an X or Y coordinate to be valid, it must fall on the survey map within the survey unit.

The survey points for the Class 1 Survey Units had a randomly selected starting point. Once the initial randomly selected survey point was determined, the remaining points were mapped on the survey map using a systematic triangular grid pattern.

Survey unit maps are provided in Appendix A. These show the survey points with their (X, Y) coordinates for the Class 1 survey units. Class 3 survey unit maps were deemed to be of sufficient clarity that coordinates were not shown.

5.7.7 Surface Activity Measurements

Each survey unit and the reference area were initially designed to have a minimum of 15 randomly located survey points. All survey units received a 100% beta scan on work surfaces, floors, fume hoods, and sinks. A smear was performed at each survey point and on selected drains, sinks, or HVAC vents.

Direct Measurements

Direct measurements of surface activity were performed at selected locations using instrumentation listed in Table 5. Measurements were conducted by integrating counts over a 1 minute period.

Removable Contamination Measurements

A standardized method for smear testing of a relatively uniform area was used to aid in comparing contamination at different times and places. A smear taken from an area of about 100 cm^2 is deemed acceptable to indicate levels of removable contamination.

6.0 DATA INTERPRETATION

During the FSS, data was properly documented so that aspects of the FSS can be referenced in the future if desired. The survey documentation is of sufficient detail to allow for the recreation of the survey procedure, location, instrumentation used, and results.

All of the data taken including fixed measurements, scanning measurements, and removable contamination were documented in detail. Instrument measurements and analytical results include the following data:

- Daily background measurements
- Location of the measurement or sample
- Date and time of the measurement or sample
- Gross or net instrument readings. Net instrument readings will often be negative since samples without any added radioactivity will often be below the background count. These numbers were recorded since they may be necessary for statistical evaluation of the data.
- Measured concentrations in dpm/100 cm^2 for surface contamination
- Name of surveyor, sampler, or analyst
- Instrument specifications and calibration date
- Minimum detectable concentrations or activity
- Name of person reviewing results
- Other relevant information

Per NUREG-1757, Vol.2, the survey results in Appendix A for each survey unit include the following:

- the number of samples taken for the survey unit;
- a description of the survey unit, including (a) a drawing of the survey unit showing the reference system and random start systematic sample locations for the Class 1 survey units, and random locations for Class 3 survey units, and (b) discussion of unique material features and remedial actions;
- the measured sample concentrations, in units that are comparable to the DCGLs;
- the statistical evaluation of the measured concentrations.

The locations of static and smear measurements and scanning sections are illustrated in Appendix A. Statistical data in the appendices are shown by rounding and minor errors in calculations may propagate.

6.1 Background Material Results

Table 11 summarizes the results of the measurements for the reference materials with the three types of instruments used. The survey code is presented as a guide to the data sheets found in Appendix A.

Table 11. Summary of Reference Material Static Measurements

Material	Survey Code	Ludlum 43-37		Ludlum 43-68		Ludlum NaI 2x2	
		Background (cpm)	StdDev (cpm)	Background (cpm)	StdDev (cpm)	Background (cpm)	StdDev (cpm)
Concrete Painted	CP	873	22	246	13	6730	671
Sheet Linoleum	SL	884	25	275	16	Not used	Not used
Counter Top	CT	Not used	Not used	229	13	Not used	Not used
Linoleum Tile	TL	819	27	255	12	5454	180
Unpainted Concrete	CU	1087	38	349	26	Not used	Not used

6.2 Survey Unit Results for Required Measurements

The following tables summarize the results of the static, scan, and smear measurements for the survey units; respectively. Details of measurement results for each individual location are provided in Appendix A. Drawings and coordinates are provided in Appendix A.

- The highest average and maximum beta static measurements were 1119 and 2000 dpm/100cm^2 which are 22% and 13% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The highest average and maximum beta scan measurements were 1164 and 2270 dpm/100cm^2 which are 23% and 15% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The highest average and maximum beta smear measurements were 30 and 221 dpm/100cm^2 which are 3% and 22% of the DCGL of 1000 dpm/100cm^2. The highest H-3 result was 11 dpm/100cm^2 which is about 1% of the acceptable surface contamination levels.

- The highest average and maximum gamma static <u>surface</u> measurements were 0 and 800 dpm/100cm^2 which are 0% and 5% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The highest average and maximum gamma scan <u>surface</u> measurements were 0 and 2216 dpm/100cm^2 which are 0% and 14% of the respective DCGLs of 5000 dpm/100cm^2 and 15000 dpm/100cm^2; respectively.

- The average and maximum gamma static volumetric measurements were 0.0 and 2.7 pCi/g which are 0% and 35% of the DCGL of 7.8 pCi/g; respectively.

- The average and maximum gamma scan volumetric measurements were 0.4 and 3.5 pCi/g which are 5% and 45% of the DCGL of 7.8 pCi/g; respectively.

Table 12. Summary of Beta Static Measurements*

Room	N	Activity (dpm/100cm^2)		
		Maximum	Average	Standard Deviation
B201	15	1630	704	622
B202	15	980	335	624
B205	15	1760	907	489
B206	15	1500	547	655
B210	15	740	224	531
B214	15	410	-351	680
B214A	15	1210	559	285
Hall	15	2000	1219	351

* Reference material background averages have been subtracted.

Table 13. Summary of Beta Scan Measurements*

Room Survey	Item	Material	Probe Serial	Probe Model	Average (cpm)	Maximum (cpm)	Average dpm/100cm^2	Maximum dpm/100cm^2
B201	Floor	SL	128625	43-37	1002	1175	515	1271
B201	Counter	CT	148454	43-68	226	340	-7	1803
B202	Floor	SL	128625	43-37	948	1079	278	852
B202	Hood	CT	148454	43-68	177	215	-788	-188
B202	Sink	CT	148454	43-68	181	232	-720	92
B202	Counter	CT	148454	43-68	204	274	-355	761
B205	Floor	SL	128625	43-37	996	1174	488	1268
B205	Sink	CT	148454	43-68	208	237	-296	173
B205	Counter	CT	148454	43-68	201	263	-399	586
B206	Floor	SL	128625	43-37	970	1101	375	948
B206	Counter	CT	148454	43-68	192	231	-547	77
B206	Counter	CT	148454	43-68	193	282	-530	876
B210	Floor	SL	128625	43-37	973	1129	388	1071
B210	Sink	CT	148454	43-68	177	224	-784	-39
B210	Counter	CT	148454	43-68	207	271	-309	709
B214	Floor	SL	128625	43-37	712	853	-751	-137
B214	Floor	SL	128625	43-37	829	967	-240	363
B214	Hood	CT	148454	43-68	190	237	-580	166
B214	Counter	CT	148454	43-68	206	276	-323	783
B214A	Floor	CP	128625	43-37	1140	1393	1164	2270
B214	Sink	CT	148454	43-68	205	254	-343	434
HALL	Floor	TL	128625	43-37	1065	1222	1076	1764

* Reference material background averages have been subtracted.

Table 14. Summary of Gross Beta Smear Measurements*

Room	N	Activity (dpm/100cm^2)		
		Maximum	Average	Standard Deviation
B201	17	97	0	37
B202	17	78	17	39
B205	16	89	1	45
B206	16	97	10	59
B210	17	221	30	63
B214	17	84	26	34
B214A	19	72	13	39
Hall	15	126	21	67

*Only instrument background has been subtracted.

Table 15. Summary of H-3 Smear Results

	Hall	B201	B202	B205	B206	B210	B214	B214A
Report Lines	2-16	17-33	34-50	51-66	67-82	83-99	100-116	117-135
N	Activity (dpm/100cm^2)							
1	2	-3	1	-3	-4	3	-6	-1
2	-1	3	6	2	2	-1	7	-1
3	-2	1	0	11	1	-2	-4	1
4	3	-5	-1	-2	0	3	-1	-5
5	-3	-4	7	3	-2	1	-1	0
6	0	5	2	6	4	5	-1	-3
7	-4	2	1	3	-3	-1	-3	-7
8	-3	-2	-3	-2	1	0	-2	2
9	1	-1	1	-4	-1	0	0	-6
10	-1	-1	6	-2	-1	1	-4	5
11	-3	8	3	1	-3	2	6	6
12	-5	3	4	0	2	2	1	-5
13	4	5	1	-1	1	2	0	-4
14	4	2	-2	-1	-2	4	2	4
15	-1	-7	0	-2	6	-1	-2	1
16		-1	-2	0	0	3	3	-1
17		-2	1			0	-4	-5
18								-1
19								-2
Average	-1	0	1	1	0	1	-1	-1
Maximum	4	8	7	11	6	5	7	6

The laboratory report is found at the end of Appendix A. The report lines listed in the table correspond to that report; values are found in the "DPM1" column.

Table 16. Summary of Gamma Static Measurements*

Room	N	Activity (dpm/100cm2)		
		Maximum	Average	Standard Deviation
B205	15	800	<0	1134
B210	15	720	<0	1088
B214	15	<0	<0	1372
		Activity (pCi/g)		
B214A	16	2.7	0.0	1.0

* Reference material background averages have been subtracted.

Table 17. Summary of Gamma Scan Measurements*

Room	Radio-nuclide	Activity (dpm/100cm^2)	
		Average	Maximum
B205	Ge-68	<0	2126
B210	Ge-68	<0	<0
B214	Cd-109	<0	827
		Activity (pCi/g)	
B214A	Co-60	0.4	3.5

* Reference material background averages have been subtracted.

6.3 Results of Miscellaneous Duplicate Measurements

The FSSP required that survey technicians be afforded the opportunity to perform judgmental measurements in areas of highest potential (e.g., corners, seams between concrete pours, or base of support poles) based on professional judgment. This provides a qualitative level of confidence that no areas of elevated activity were missed by the random measurements and that there were no errors in area classification.

Guidance found in NRC Inspection Procedure 84750 was used to determine data quality and if ratios could not be determined, review and follow-up actions was per that document. Professional judgment was used for sample results that are negative or less than MDC. The following NRC guidance is presented:

- Divide the first result for each sample by its associated uncertainty to obtain the resolution. (Note: For purposes of this plan, the uncertainty is defined as the relative standard deviation, one sigma, of the lab results as calculated from counting statistics.)
- Divide each first result by the corresponding second result to obtain the ratio (First result/second result).
- The measurements are in agreement if the value of the ratio falls within the limits shown in the following table for the corresponding resolution.

Table 18. Criteria for Accepting the Measurement*

Resolution	Ratio
<4	
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

A beta static measurement was selected for quality control comparison from each survey unit. The results are summarized in the tables below. Drawings and locations are provided in Appendix A. Required ratios were not given by the NRC for resolutions <4 which includes negative values, very low values, and most below the MDC; these are deemed acceptable as both the first and second results are low. Three comparisons had resolution >4 and the actual ratios were within the range of the required ratios. All duplicate measurement results were acceptable.

Table 19. Comparison of Duplicate Sample Measurements

Survey Unit Area/Room	Survey Unit N	1st Result	StdDev 1st Result	2nd Result	Resolution	Actual Ratio	Required Ratio
B201	10	280	255	490	1	0.57	None
B202	8	-100	245	600	0	-0.17	None
B205	8	1530	290	1610	5	0.95	0.5-2.0
B206	9	900	275	1280	3	0.70	None
B210	10	420	260	520	2	0.81	None
B214	10	-130	245	360	-1	-0.36	None
B214A	12	790	130	630	6	1.25	0.5-2.0
Hall	8	980	225	1320	4	0.74	0.5-2.0

6.4 Review of Individual Survey Units

Each individual survey unit meets the release criteria. The following paragraphs present a summary of the fixed, scans and smears for each survey unit. Often the results are zero or less than zero which is normal for measurements at or near background levels.

6.4.1 Room B201, the Micro PET

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 704, 1630, and 80 dpm/100 cm^2, respectively. The average and highest beta scan results were 231 and 1757 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were 0 and 8 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.2 Room B202, the Wet Lab

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 335, 980, and 90 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 852 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were 1 and 7 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.3 Room B205, the Gantry

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 907, 1760, and 100 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 1268 dpm/100 cm^2, respectively. Results for the gamma static average and maximum surface contamination levels were <0 and 740 dpm/100 cm^2, respectively. The highest gamma scan result was 2126 dpm/100 cm^2. The average and maximum H-3 smear results were 1 and 11 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.4 Room B206, Prep Lab 2

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 547, 1500, and 80 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 948 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were 0 and 6 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.5 Room B210, Prep Lab 1

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 224, 740, and 200 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 1071 dpm/100 cm^2, respectively. Results for the gamma static average and maximum surface contamination levels were <0 and 650 dpm/100 cm^2, respectively. The highest gamma scan result was <0 dpm/100 cm^2. The average and maximum H-3 smear results were 1 and 5 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.6 Room B214, Hot Chemistry

Results for the beta static average, maximum and the maximum removable surface contamination levels were <0, 410, and 100 dpm/100 cm^2, respectively. The average and highest beta scan results were <0 and 737 dpm/100 cm^2, respectively. Results for the gamma static average and maximum surface contamination levels were both <0 dpm/100 cm^2, respectively. The highest gamma scan result was 827 dpm/100 cm^2. The average and maximum H-3 smear results were <0 and 7 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

6.4.7 Room B214A, the Cyclotron Room

Results for the static average, maximum and the maximum removable surface contamination levels were 559, 1210, and 90 dpm/100 cm^2, respectively. The average and highest beta scan

results were 1076 and 1764 dpm/100 cm^2, respectively. The average and maximum H-3 smear results were <0 and 6 dpm/100 cm^2, respectively. Results for the gamma static average and maximum volumetric contamination levels were 0.3 and 2.4 pCi/g, respectively. The highest gamma scan result was 3.2 pCi/g. These values are below the acceptable surface and volumetric contamination DCGLs.

6.4.8 The Hallway

Results for the beta static average, maximum, and the maximum removable surface contamination levels were 1219, 2000, and 110 dpm/100 cm^2, respectively. The highest beta scan result was 948 dpm/100 cm^2. The average and maximum H-3 smear results were <0 and 4 dpm/100 cm^2, respectively. These values are below the acceptable surface contamination DCGLs.

7.0 CONCLUSIONS

The survey conducted by the NIH-NIDA RSO reported detectable levels of Co-60 in the floor of the cyclotron Room B214A. As the activity was reported as below regulatory dose concerns, the area had been released prior to the HSA. FSS results for residual contamination levels confirm that only a small fraction of the DCGL remains.

The cyclotron was used to produce short-lived radionuclides for studies and research, including C-11, O-15, and F-18, which, by nature of radioactive half-life, no longer pose a residual contamination issue. However, the process also created Cd-109, which was identified as a contaminant in Room B214 during the HSA. The materials contaminated with Cd-109 were removed during the conduct of the HSA; surface areas were decontaminated by the radiation safety staff. FSS results of Room B214 indicate that decontamination efforts were successful.

Tritium (H-3) was the only radionuclide of concern which required a special analysis by liquid scintillation counting of smears. For the entire survey, the highest H-3 contamination level identified was 11 dpm/100cm2. H-3 is known to be readily removable and levels identified here are extremely small compared to today's acceptable license termination surface screening values of 1.2×10^8 dpm/100cm^2

All DQOs for the survey were met and results of the duplicate measurement program were acceptable. The residual contamination levels for each survey unit were a small fraction of the DCGL and the site is recommended for unrestricted release.

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Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

DRAWINGS AND SURVEY RESULTS

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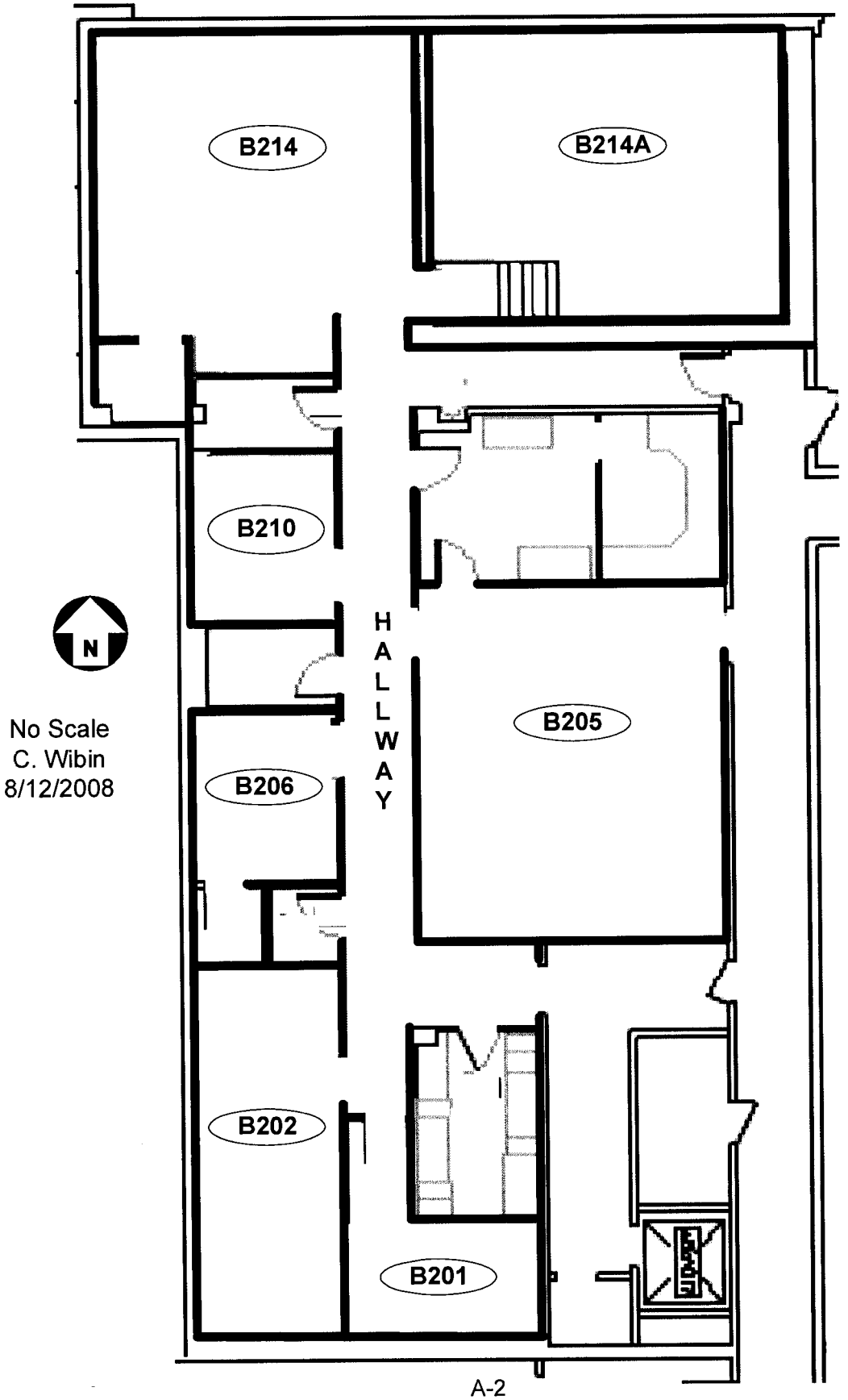
Impacted Area - Building G Basement
Johns Hopkins Bayview Campus

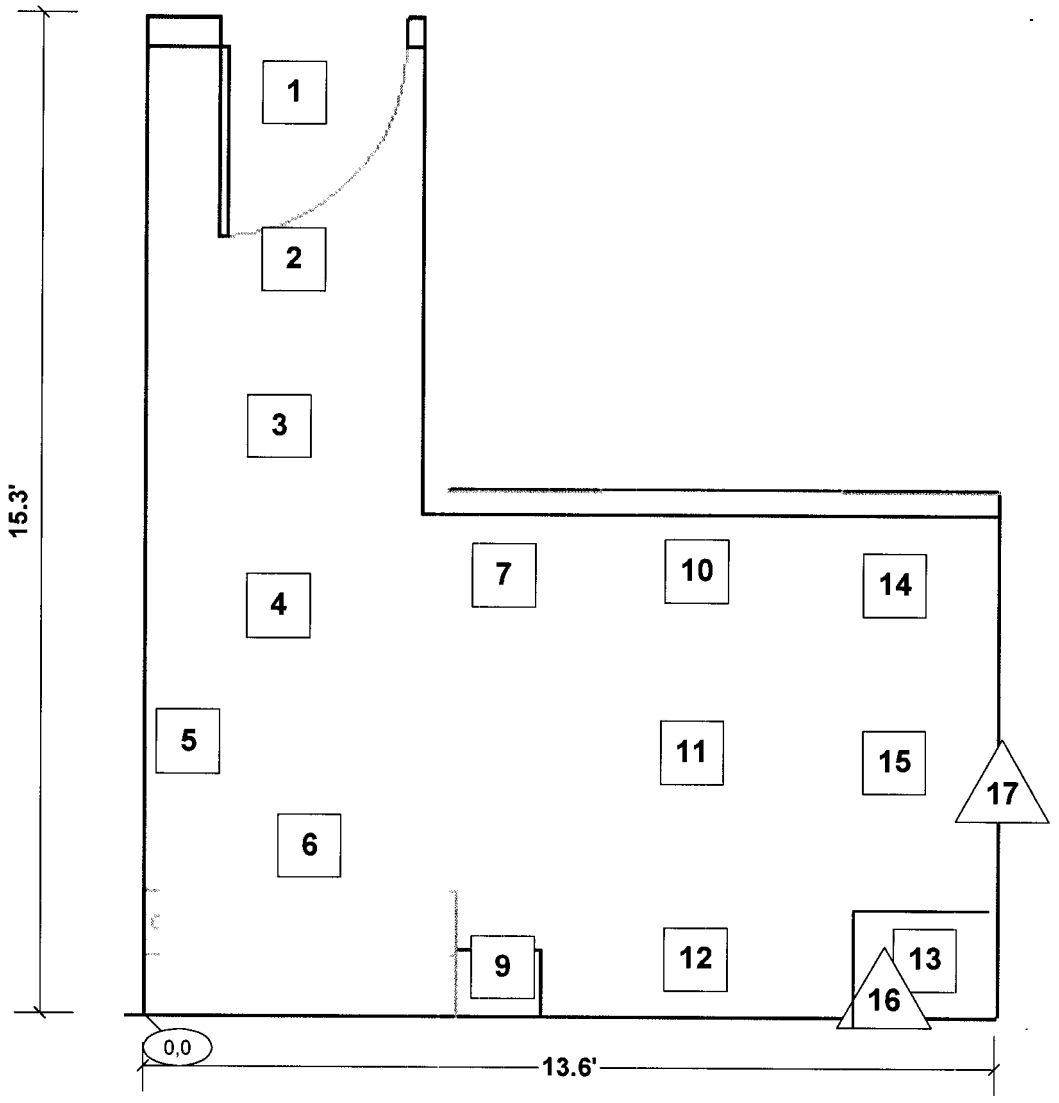
Appendix A



No Scale
C. Wibin
8/12/2008

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Room: B201 Micro Pet **Date: 7 / 26 / 2008**



STATIC & SMEAR LOCATIONS

DQO Location

16 Bias Sink Smear
17 Room Exhaust Duct

No Scale

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B201
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	322	47	17	740	540
2	360	85	18	1340	570
3	338	63	18	990	560
4	310	35	17	550	530
5	360	85	18	1340	570
6	362	87	19	1370	580
7	291	16	16	250	510
8	306	31	17	490	530
9	303	28	17	440	520
10	293	18	17	280	510
11	309	34	17	530	530
12	221	-54	14	-860	440
13	342	67	18	1060	560
14	378	103	19	1630	590
15	301	26	17	410	520
			Maximum:	1630	
			Average:	704	
			Std Dev:	622	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B201 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	55	-1	9	-4	130
2	56	0	9	3	130
3	56	0	9	3	130
4	54	-2	9	-11	130
5	55	-1	9	-4	130
6	49	-7	9	-47	130
7	55	-1	9	-4	130
8	61	5	9	39	140
9	61	5	9	39	140
10	69	13	10	97	140
11	60	4	9	32	130
12	50	-6	9	-40	130
13	57	1	9	11	130
14	55	-1	9	-4	130
15	52	-4	9	-26	130
16	49	-7	9	-47	130
17	51	-5	9	-33	130

Maximum:	97
Average:	0
Std Dev:	37

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

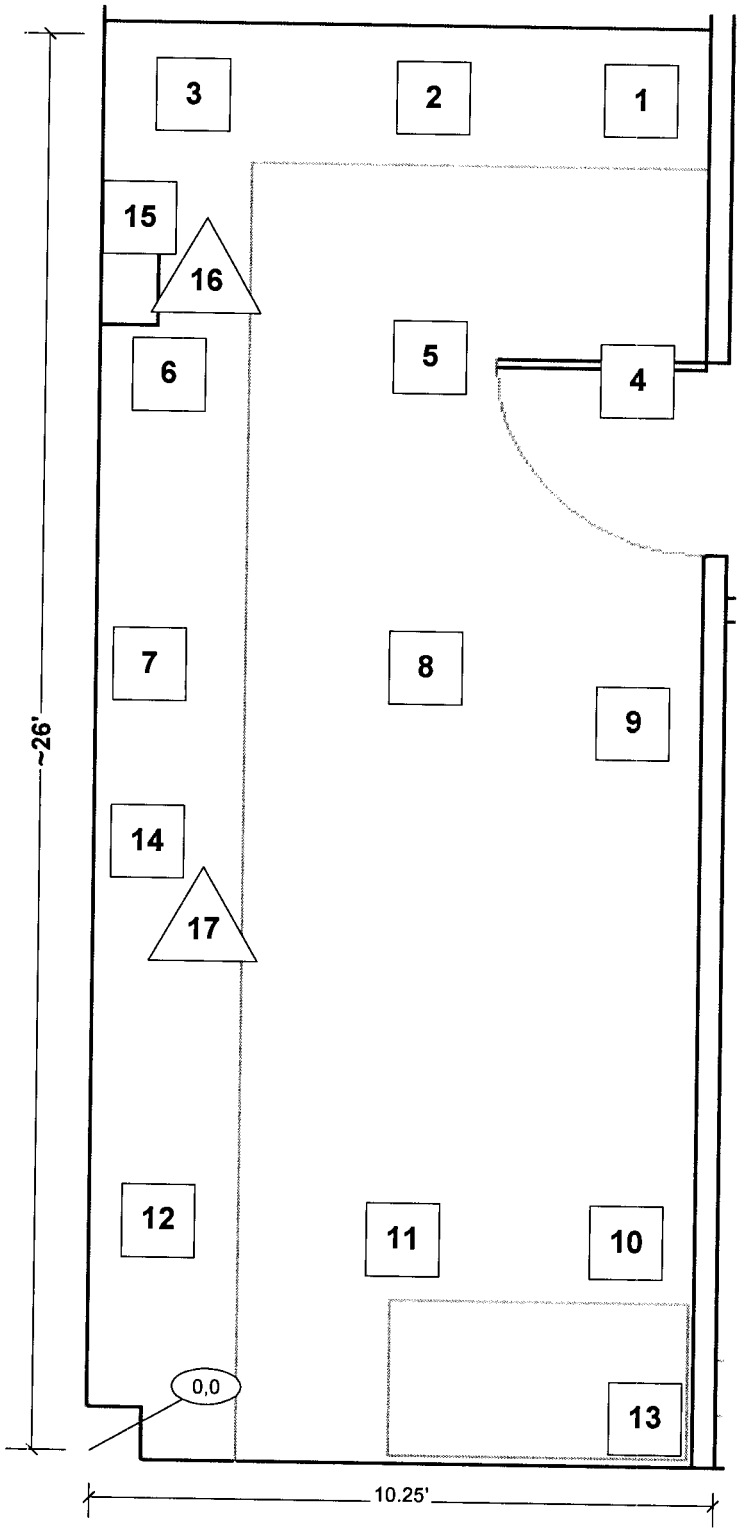
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B202 Wet Lab

Date: 7 / 26 /2008



STATIC & SMEAR LOCATIONS

DQO Locations

Biased Smear Location:
16 - Inside Sink
17- Inside Sink

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

No Scale

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B202
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	301	26	17	410	520
2	332	57	18	900	550
3	325	50	17	790	540
4	331	56	18	880	550
5	315	40	17	630	530
6	294	19	17	300	520
7	311	36	17	570	530
8	269	-6	16	-100	490
9	289	14	16	220	510
10	316	41	17	640	540
11	337	62	18	980	550
12	306	31	17	490	530
13	298	23	17	360	520
14	202	-73	14	-1170	420
15	220	-55	14	-880	440
			Maximum:	980	
			Average:	335	
			Std Dev:	624	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B202 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	57	-1	9	-6	110
2	64	6	10	33	110
3	60	2	10	11	110
4	69	11	10	61	110
5	68	10	10	56	110
6	49	-9	9	-50	100
7	66	8	10	45	110
8	57	-1	9	-6	110
9	60	2	10	11	110
10	70	12	10	67	110
11	59	1	10	6	110
12	56	-2	9	-11	100
13	54	-4	9	-22	100
14	64	6	10	33	110
15	49	-9	9	-50	100
16	72	14	10	78	110
17	65	7	10	39	110

Maximum:	78
Average:	17
Std Dev:	39

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

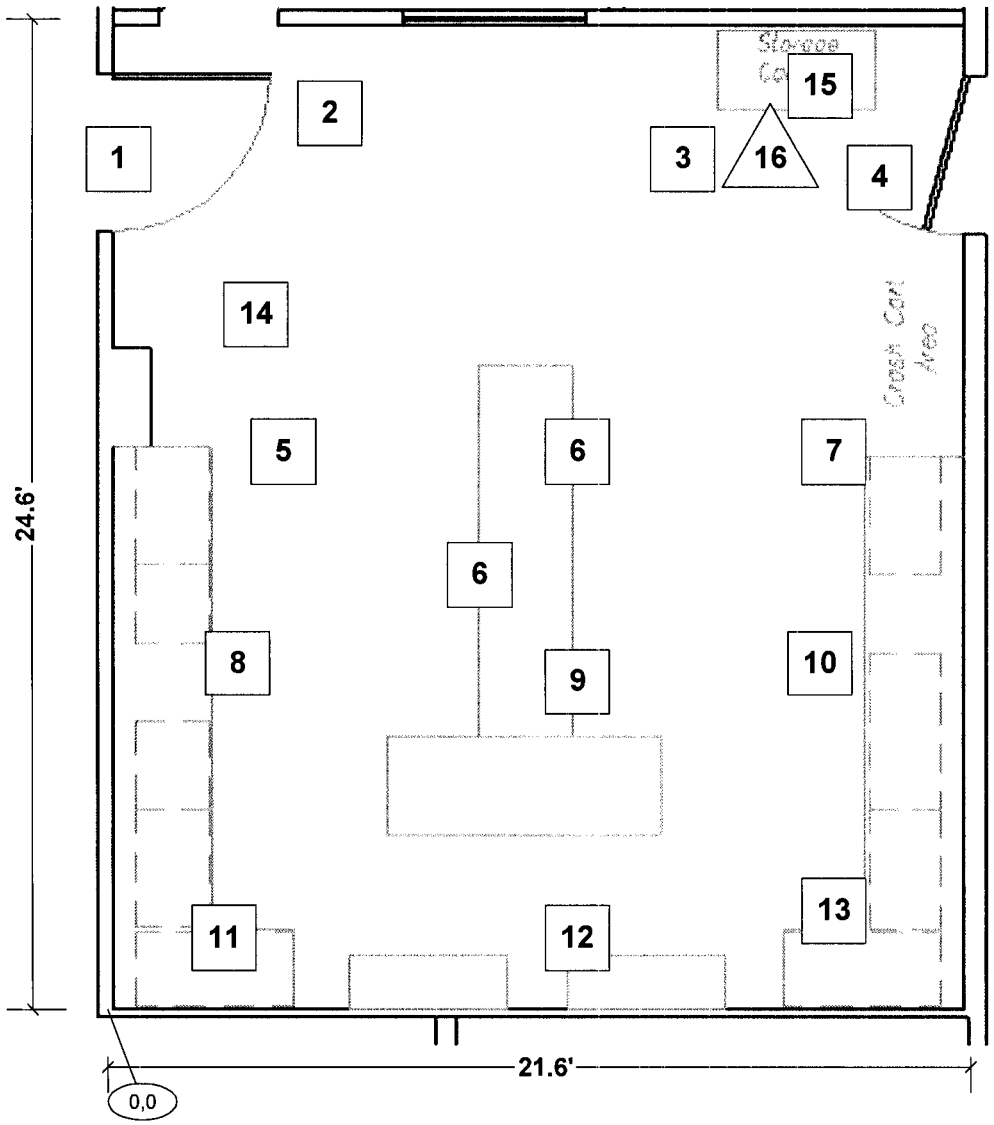
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B205 Gantry (Scanning Room)

Date: 7 / 26 / 2008



STATIC & SMEAR LOCATIONS

DQO

Bias Smear 16 Inside Sink

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

No Scale

Note: Smear And Static Reading 14 were taken inside the room exhaust duct

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B205
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	338	63	18	990	560
2	301	26	17	410	520
3	331	56	18	880	550
4	386	111	19	1760	600
5	334	59	18	930	550
6	321	46	17	720	540
7	361	86	18	1360	580
8	372	97	19	1530	580
9	330	55	18	870	550
10	364	89	19	1410	580
11	316	41	17	640	540
12	334	59	18	930	550
13	269	-6	16	-100	490
14	338	63	18	990	560
15	293	18	17	280	510
			Maximum:	1760	
			Average:	907	
			Std Dev:	489	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B205 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	55	-3	9	-17	100
2	56	-2	9	-11	100
3	58	0	10	0	110
4	66	8	10	45	110
5	74	16	10	89	120
6	50	-8	9	-45	100
7	51	-7	9	-39	100
8	47	-11	9	-61	100
9	57	-1	9	-6	110
10	71	13	10	72	110
11	56	-2	9	-11	100
12	53	-5	9	-28	100
13	65	7	10	39	110
14	49	-9	9	-50	100
15	60	2	10	11	110
16	52	-6	9	-33	100
17	60	2	10	11	110
18	59	1	10	6	110
19	74	16	10	89	120
20	51	-7	9	-39	100

Maximum:	89
Average:	1
Std Dev:	45

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B205 **Survey Date:** 8/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (dpm/100 cm²) Activity	Net (dpm/100 cm²) Uncertainty @ 95% CL
1	5114	-340	194	-750	860
2	4990	-464	193	-1030	860
3	5468	14	195	30	860
4	5104	-350	194	-770	860
5	4542	-912	192	-2020	850
6	3892	-1562	191	-3460	840
7	5817	363	195	800	870
8	5201	-253	194	-560	860
9	4450	-1004	192	-2230	850
10	5557	103	195	230	860
11	4686	-768	193	-1700	850
12	4282	-1172	192	-2600	850
13	5224	-230	194	-510	860
14	5123	-331	194	-730	860
15	4882	-572	193	-1270	860

Maximum:	800
Average:	-1105
Std Dev:	1134

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10	PR186963

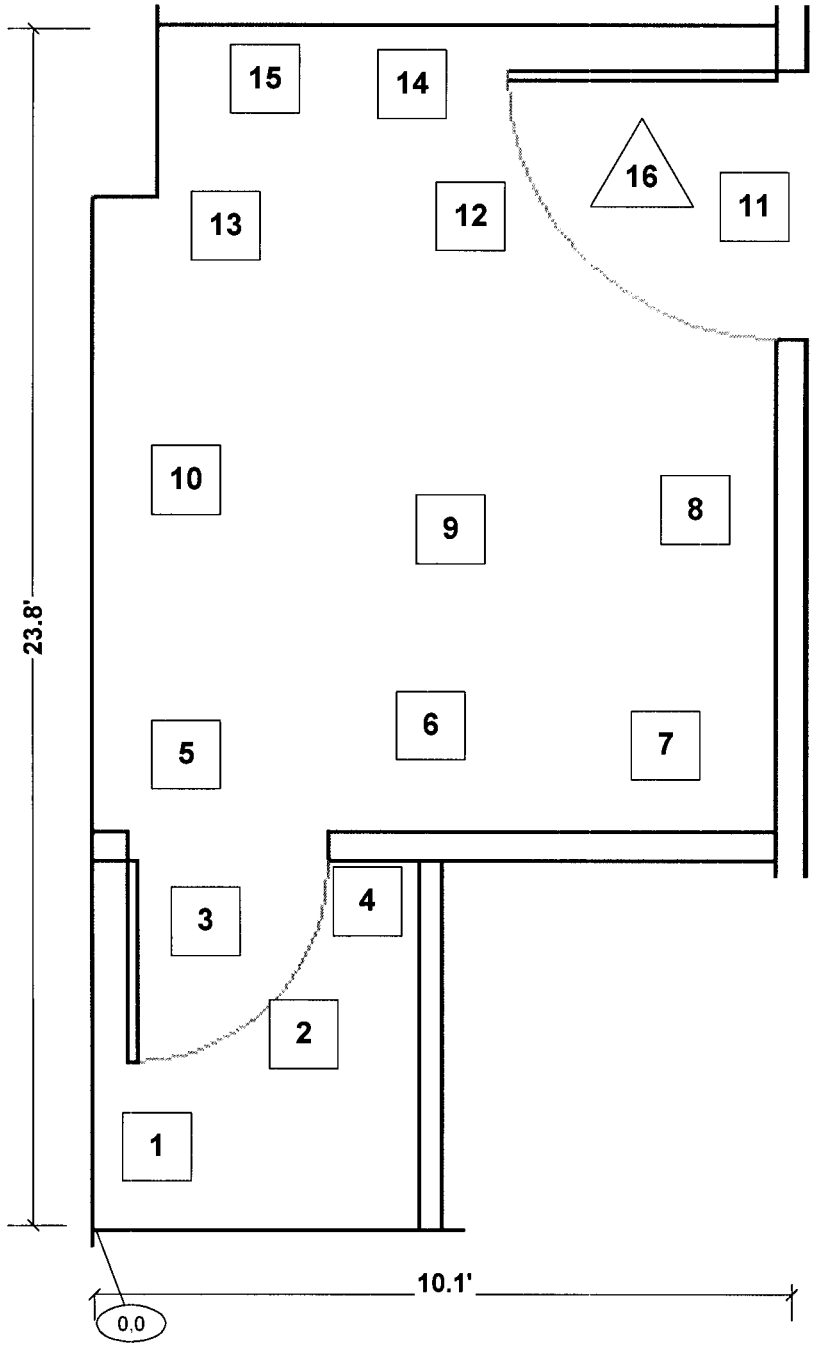
R_B	5454	cpm	Radionuclide		Ge-68
σ_B	180	cpm	ε_{total}	0.45	cpm/dpm/100cm²
T_S	1	m			
T_B	20	m	MDC	767	dpm/100cm²

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B206 Prep Lab 2 **Date: 7 / 26 /2008**



Static and Smear Locations:

DQO

Biased Smear Location 16 Was Taken Inside Room Exhaust Duct

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

No Scale

Note: Smear and Static Reading 15 were taken inside room sink

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B206
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	321	46	17	720	540
2	301	26	17	410	520
3	334	59	18	930	550
4	328	53	18	830	550
5	294	19	17	300	520
6	300	25	17	390	520
7	370	95	19	1500	580
8	290	15	16	230	510
9	332	57	18	900	550
10	333	58	18	910	550
11	324	49	17	770	540
12	345	70	18	1100	560
13	327	52	18	820	550
14	250	-25	15	-400	470
15	200	-75	13	-1200	420
			Maximum:	1500	
			Average:	547	
			Std Dev:	655	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B206 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Uncertainty @ 95% CL
1	68	12	10	90	140
2	43	-13	8	-91	120
3	62	6	9	47	140
4	57	1	9	11	130
5	48	-8	9	-55	120
6	65	9	10	68	140
7	56	0	9	3	130
8	52	-4	9	-26	130
9	61	5	9	39	140
10	59	3	9	25	130
11	57	1	9	11	130
12	44	-12	8	-84	120
13	52	-4	9	-26	130
14	51	-5	9	-33	130
15	67	11	10	83	140
16	69	13	10	97	140

Maximum:	97
Average:	10
Std Dev:	59

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

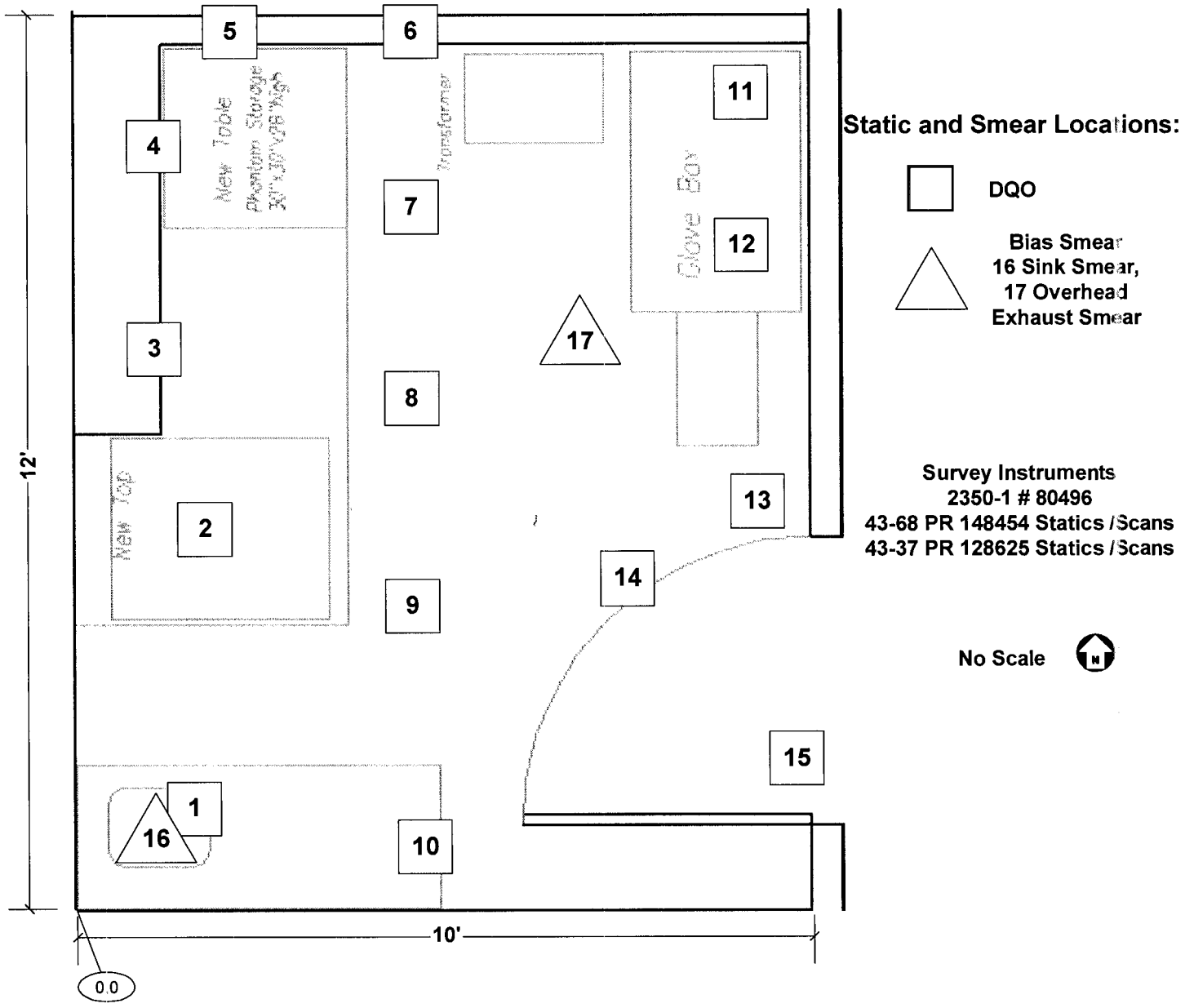
R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B210 Prep Lab 1 **Date: 7 / 29 / 2008**



Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: B210
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	212	-63	14	-1010	430
2	322	47	17	740	540
3	241	-34	15	-550	460
4	250	-25	15	-400	470
5	312	37	17	580	530
6	259	-16	15	-260	480
7	281	6	16	90	500
8	306	31	17	490	530
9	310	35	17	550	530
10	302	27	17	420	520
11	298	23	17	360	520
12	322	47	17	740	540
13	307	32	17	500	530
14	312	37	17	580	530
15	308	33	17	520	530
			Maximum:	740	
			Average:	223	
			Std Dev:	531	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B210 **Survey Date:** 7/26/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	63	7	9	54	140
2	51	-5	9	-33	130
3	52	-4	9	-26	130
4	60	4	9	32	130
5	58	2	9	18	130
6	55	-1	9	-4	130
7	86	30	11	221	150
8	49	-7	9	-47	130
9	56	0	9	3	130
10	57	1	9	11	130
11	69	13	10	97	140
12	59	3	9	25	130
13	63	7	9	54	140
14	62	6	9	47	140
15	50	-6	9	-40	130
16	64	8	9	61	140
17	61	5	9	39	140

Maximum:	221
Average:	30
Std Dev:	63

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B210 **Survey Date:** 8/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (dpm/100 cm²) Activity	Net (dpm/100 cm²) Uncertainty @ 95% CL
1	5320	-134	194	-300	860
2	4811	-643	193	-1420	850
3	4438	-1016	192	-2250	850
4	4096	-1358	191	-3010	850
5	4287	-1167	192	-2590	850
6	3881	-1573	190	-3480	840
7	4638	-816	192	-1810	850
8	4924	-530	193	-1170	860
9	5020	-434	193	-960	860
10	5777	323	195	720	870
11	4690	-764	193	-1690	850
12	4374	-1080	192	-2390	850
13	5178	-276	194	-610	860
14	4740	-714	193	-1580	850
15	4981	-473	193	-1050	860

Maximum:	720
Average:	-1573
Std Dev:	1088

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108			
Detector	44-10	PR186963			
R_B	5454	cpm	Radionuclide		Ge-68
σ_B	180	cpm	ε_{total}	0.45	cpm/dpm/100cm²
T_S	1	m			
T_B	20	m	MDC	767	dpm/100cm²

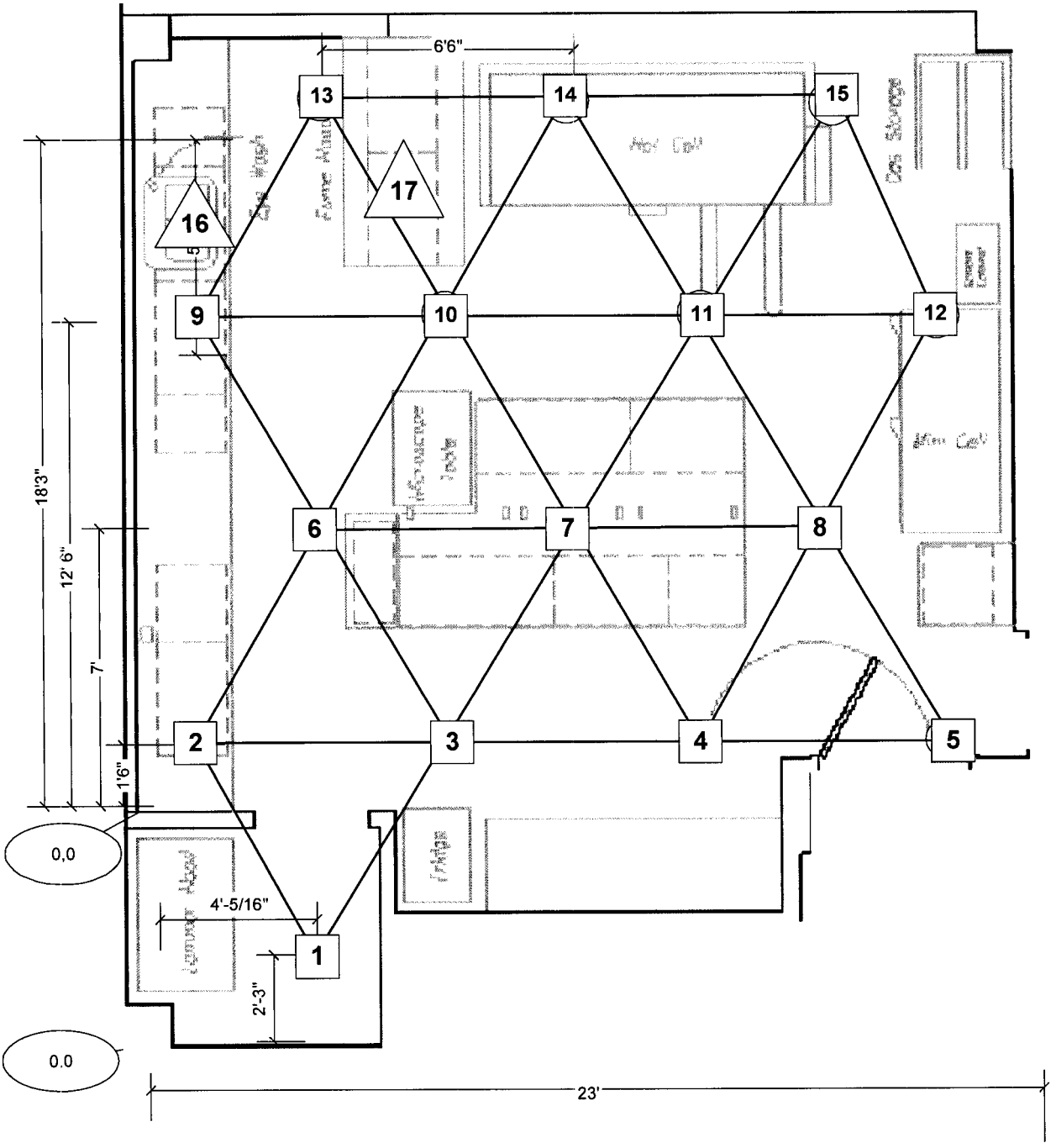
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B214 Hot Chemistry

Date: 7 / 26 /2008



Static and Smear Locations:

☐ **DQO**

△ **Bias Smear 16 Inside Sink, 17 Inside Fume Hood**

N

Note: See next page for grid coordinates and instrument data

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Room: B214 Hot Chemistry Date: 7 / 26 /2008

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Grid Coordinates (feet)

N	X	Y	N	X	Y
1	4	2	9	0.75	12.7
2	0.75	1.5	10	7.25	12.7
3	7.25	1.5	11	13.75	12.7
4	13.75	1.5	12	20.25	12.7
5	20.25	1.5	13	4	18.25
6	4	7	14	10.5	18.25
7	10.5	7	15	17	18.25
8	17	7			

Point one is on individual grid.
Points 2-15 are on different grid.
Point 3 was random start.

Summary of Beta Static Measurements

Survey Unit: B214
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	255	-20	15	-320	480
2	301	26	17	410	520
3	248	-27	15	-430	470
4	256	-19	15	-310	480
5	289	14	16	220	510
6	228	-47	14	-750	450
7	248	-27	15	-430	470
8	251	-24	15	-390	470
9	300	25	17	390	520
10	267	-8	16	-130	490
11	276	1	16	10	500
12	258	-17	15	-280	480
13	293	18	17	280	510
14	187	-88	13	-1400	400
15	141	-134	11	-2130	340
			Maximum:	410	
			Average:	-351	
			Std Dev:	680	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	SL
Material Background:	275 cpm
Background Sigma:	16 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1273 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B214 **Survey Date:** 7/28/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	59	1	10	6	110
2	55	-3	9	-17	100
3	63	5	10	28	110
4	61	3	10	17	110
5	56	-2	9	-11	100
6	73	15	10	84	110
7	55	-3	9	-17	100
8	56	-2	9	-11	100
9	72	14	10	78	110
10	60	2	10	11	110
11	71	13	10	72	110
12	66	8	10	45	110
13	64	6	10	33	110
14	64	6	10	33	110
15	66	8	10	45	110

Maximum:	84
Average:	26
Std Dev:	34

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B214 **Survey Date:** 7/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (dpm/100 cm²) Activity	Net (dpm/100 cm²) Uncertainty @ 95% CL
1	4822	-632	193	-1950	1190
2	4956	-498	193	-1540	1190
3	4984	-470	193	-1450	1190
4	5446	-8	195	-20	1200
5	5019	-435	193	-1340	1190
6	4755	-699	193	-2160	1190
7	4811	-643	193	-1990	1190
8	4845	-609	193	-1880	1190
9	4857	-597	193	-1840	1190
10	4969	-485	193	-1500	1190
11	4867	-587	193	-1810	1190
12	4296	-1158	192	-3580	1180
13	4458	-996	192	-3080	1190
14	3932	-1522	191	-4700	1180
15	3716	-1738	190	-5370	1170

Maximum:	-20
Average:	-2281
Std Dev:	1372

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108			
Detector	44-10	PR186963			
R_B	5454	cpm	Radionuclide		Cd-109
σ_B	180	cpm	ε_{total}	0.32	cpm/dpm/100cm²
T_S	1	m			
T_B	20	m	MDC	1070	dpm/100cm²

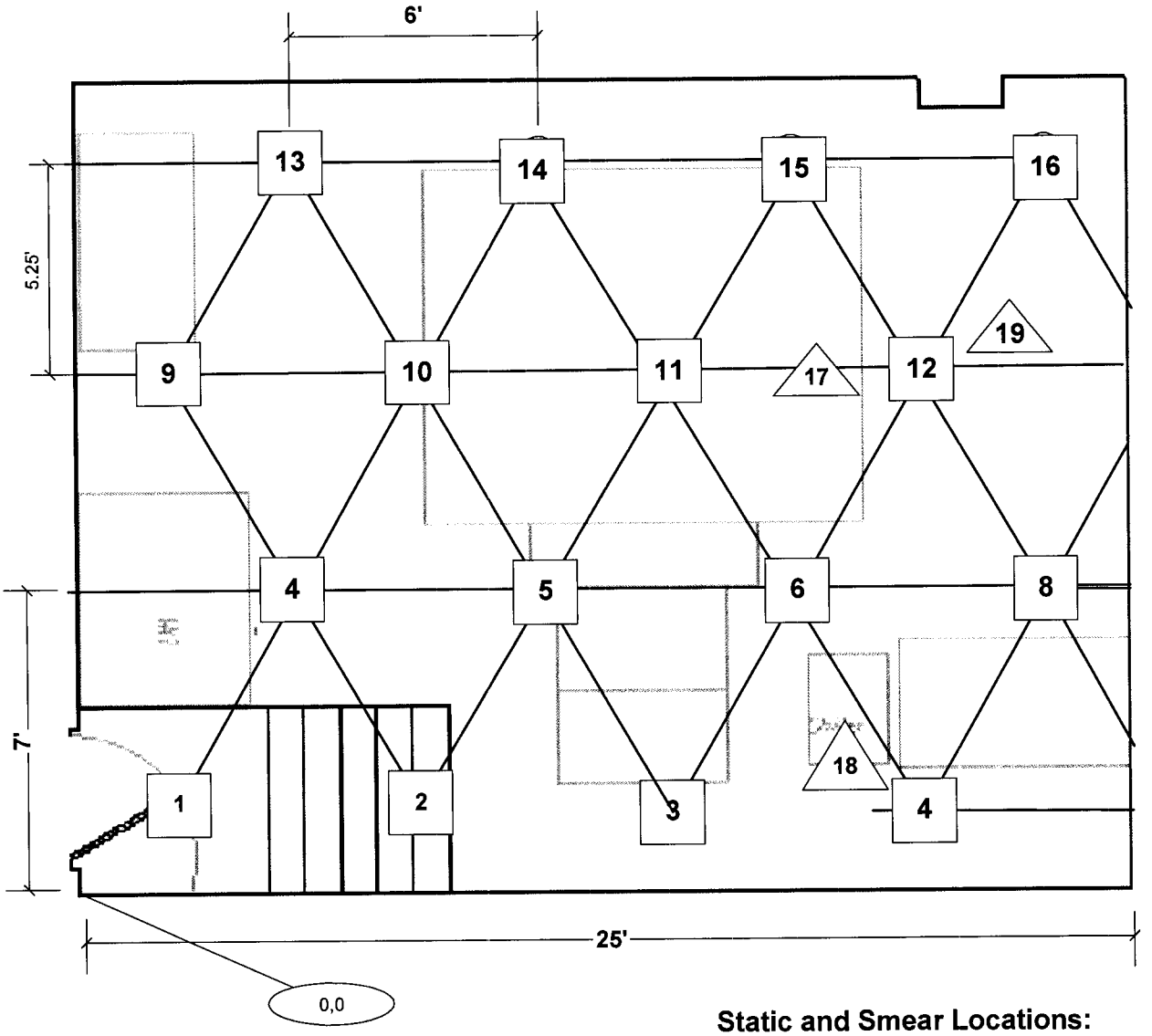
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: B214A Cyclotron Room

Date: 7 / 29 /2008



Static and Smear Locations:

DQO

Bias Smear 17 & 18 taken inside floor drain, 19 taken inside room exhaust duct

Note: See next page for grid coordinates and instrument data

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Room: B214A Cyclotron Room

Date: 7 / 29 /2008

Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Grid Coordinates (feet)

N	X	Y	N	X	Y
1	2	1.75	9	2	12.25
2	8	1.75	10	8	12.25
3	14	1.75	11	14	12.25
4	20	1.75	12	20	12.25
5	5	7	13	5	17.5
6	11	7	14	11	17.5
7	17	7	15	17	17.5
8	23	7	16	23	17.5

Point 5 was the random start.

Summary of Beta Static Measurements

Survey Unit: B214A
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	320	74	16	590	250
2	302	56	15	440	240
3	290	44	15	350	230
4	286	40	15	320	230
5	308	62	15	490	240
6	362	116	17	920	270
7	301	55	15	440	240
8	321	75	16	600	250
9	263	17	14	130	220
10	315	69	16	550	240
11	398	152	18	1210	280
12	345	99	17	790	260
13	311	65	16	520	240
14	298	52	15	410	240
15	325	79	16	630	250
16	250	4	13	30	210
			Maximum:	1210	
			Average:	559	
			Std Dev:	285	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	CP
Material Background:	246 cpm
Background Sigma:	13.3 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.5 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.10 epm/dpm
Total Efficiency Uncertainty:	0.0008 epm/dpm
MDC:	603 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B214A **Survey Date:** 7/28/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	56	-2	9	-11	100
2	51	-7	9	-39	100
3	71	13	10	72	110
4	49	-9	9	-50	100
5	54	-4	9	-22	100
6	69	11	10	61	110
7	52	-6	9	-33	100
8	52	-6	9	-33	100
9	57	-1	9	-6	110
10	51	-7	9	-39	100
11	63	5	10	28	110
12	67	9	10	50	110
13	55	-3	9	-17	100
14	64	6	10	33	110
15	55	-3	9	-17	100
16	61	3	10	17	110

Maximum:	72
Average:	0
Std Dev:	39

Instrument Data and Analysis Parameters

Analysis Unit	3030	SN217607
Detector	43-10-1	PR229364

R_B	58.0 cpm	ε_S	0.25 epm/dpm
σ_B	5.7 cpm	ε_i	0.718 cpm/epm
T_S	1 m	σ_ε	0.0016 cpm/dpm
T_B	20 m	MDC	160 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Summary of Direct Gamma

Survey Unit: B214A **Survey Date:** 7/26/2008

Location	Gross (counts)	NCPM	±1 σ NCPM	Net (pCi/g) Activity	Net (pCi/g) Uncertainty @ 95% CL
1	4930	-1800	728	-2.1	1.7
2	6543	-187	729	-0.2	1.7
3	7143	413	730	0.5	1.7
4	7224	494	730	0.6	1.7
5	6610	-120	730	-0.1	1.7
6	6958	228	730	0.3	1.7
7	6817	87	730	0.1	1.7
8	7112	382	730	0.4	1.7
9	6305	-425	729	-0.5	1.7
10	6966	236	730	0.3	1.7
11	9062	2332	731	2.7	1.7
12	7146	416	730	0.5	1.7
13	6312	-418	729	-0.5	1.7
14	6695	-35	730	0.0	1.7
15	6828	98	730	0.1	1.7
16	5715	-1015	729	-1.2	1.7
			Maximum:	2.7	
			Average:	0.0	
			Std Dev:	1.0	

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108		
Detector	44-10	PR186963		
R_B	6730	cpm	Radionuclide	Co-60
σ_B	725	cpm	ε_{total}	861 cpm/pCi/g
T_S	1	m		
T_B	20	m	MDC	0.4 pCi/g

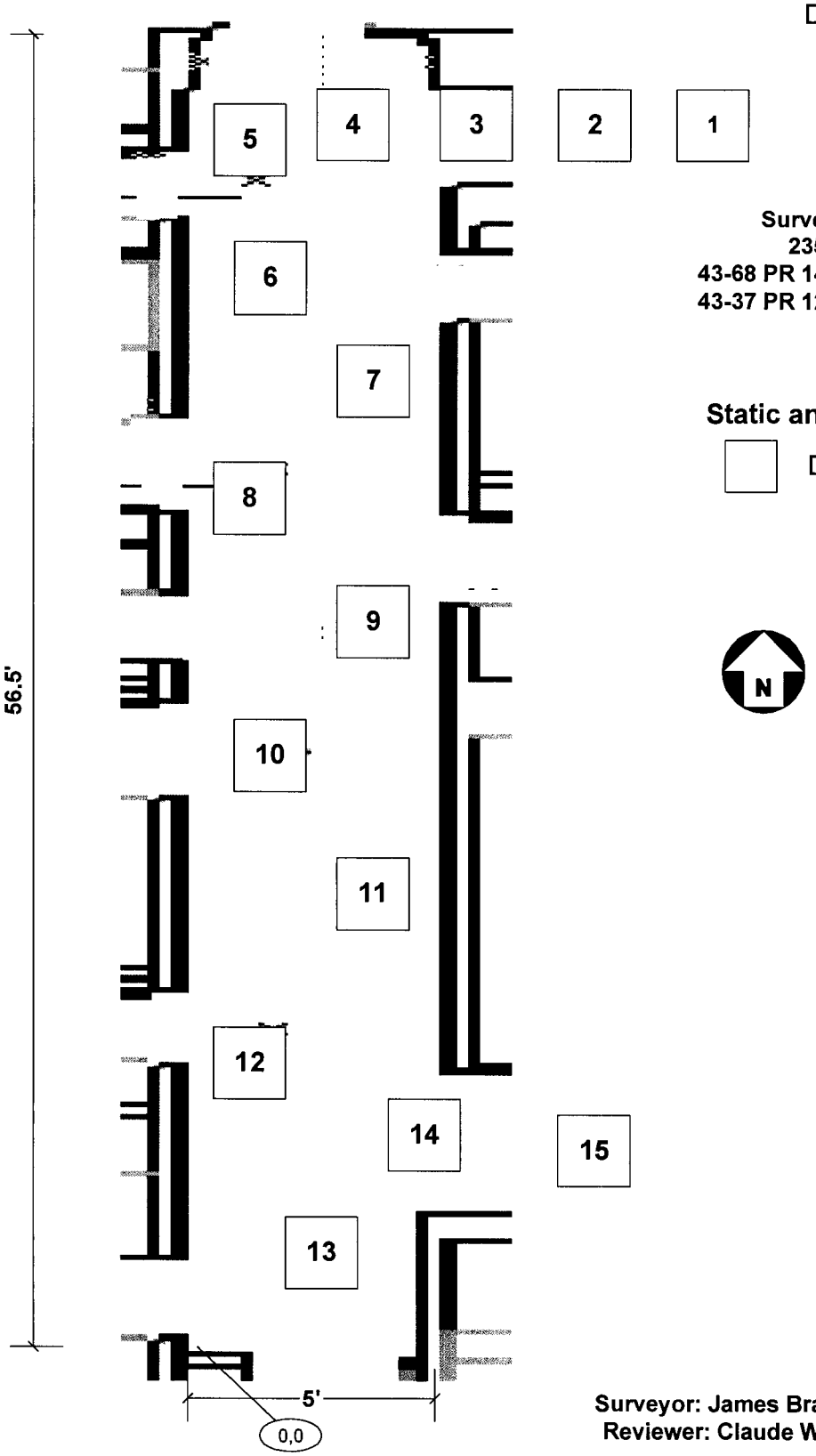
Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix A

Room: Basement Hall Way

Date: 7 / 29 /2008



Survey Instruments
2350-1 # 80496
43-68 PR 148454 Statics /Scans
43-37 PR 128625 Statics /Scans

Static and Smear Locations:

DQO

Surveyor: James Brady / Sr HPT
Reviewer: Claude Wiblin / CHP

Summary of Beta Static Measurements

Survey Unit: Hall
Survey Date: 7/26/2008

Location	Gross (counts)	NCPM	NCPM Uncertainty	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	347	92	15	1460	480
2	332	77	15	1220	460
3	381	126	16	2000	510
4	368	113	16	1790	500
5	347	92	15	1460	480
6	322	67	15	1060	450
7	303	48	14	760	430
8	317	62	14	980	450
9	328	73	15	1160	460
10	318	63	14	1000	450
11	334	79	15	1250	470
12	317	62	14	980	450
13	342	87	15	1380	470
14	318	63	14	1000	450
15	304	49	14	780	430
			Maximum:	2000	
			Average:	1219	
			Std Dev:	351	

Instrument Data and Analysis Parameters

	Model	Serial No
Instrument:	L2350-1	80496
Detector:	43-68	148454
Probe Area:	126 cm2	

Reference Material:	TL
Material Background:	255 cpm
Background Sigma:	12 cpm
Sample Analysis Time:	1 min
Surface Efficiency:	0.25 epm/dpm
Instrument Efficiency:	0.20 cpm/epm
Total Efficiency:	0.05 epm/dpm
Total Efficiency Uncertainty:	0.0004 epm/dpm
MDC:	1226 dpm/100 cm^2

Surveyor: James Brady, Senior Health Physics Technician
Radiological Engineer: Claude Wiblin, CHP

Summary of Smear Measurements

Survey Unit: B-Hallway

Survey Date: 7/28/2008
Analysis Date: 8/7/2008

Location	Gross (counts)	NCPM	$\pm 1\ \sigma_{NCPM}$	Net (dpm/100 cm^2) Activity	Net (dpm/100 cm^2) Uncertainty @ 95% CL
1	48	-8	9	-55	120
2	64	8	9	61	140
3	68	12	10	90	140
4	58	2	9	18	130
5	67	11	10	83	140
6	73	17	10	126	140
7	60	4	9	32	130
8	61	5	9	39	140
9	67	11	10	83	140
10	52	-4	9	-26	130
11	50	-6	9	-40	130
12	61	5	9	39	140
13	45	-11	8	-76	120
14	61	5	9	39	140
15	41	-15	8	-105	120

Maximum:	126
Average:	21
Std Dev:	67

Instrument Data and Analysis Parameters

Analysis Unit	2929	SN176108
Detector	44-10-1	PR181905

R_B	55.6 cpm	ε_S	0.25 epm/dpm
σ_B	5.1 cpm	ε_i	0.55 cpm/epm
T_S	1 m	σ_ε	0.0012 cpm/dpm
T_B	20 m	MDC	204 dpm

Surveyor: Byron Bland, Senior Health Physics Technician
Reviewer: Claude Wiblin, CHP

Lab Control #: 2008-542

Appendix A

Reviewed By: _____

RSO, Inc. JOB WORKSHEET

RSO Contact: _____ Project #: _____ Date: 8/7/2008

Customer Information:	**Billing Address:**
Name: Chesapeake Nuclear Services, Inc.	Name:
Address: 788 Sonne Dr. Annapolis, MD 21401	Address:
Contact: Claude Wiblin	Contact:
Phone: 410-353-6450	Phone:
Contract/PO#:	

Job Description: **Bayview Swipe Survey** Job Date: _____

Mobilization:	Description	Qty	X	Unit Cost	

Service/Labor:	Description	Qty	X	Unit Cost	

Material/Expenses/Transportation:

RSO Stock	Item Description	Qty	X	Unit Cost	
☐					
☐					
☐					
				Sub Total:	

Lab Analysis Request
Comment: **Bayview Swipe Survey**

☐ Alpha ☒ Beta ☒ Gamma

ID Method On Container ☐

# of Samples 134 # 1 - 134

Required MDA: _____

Disposition:
- Return ☐
- Hold ☐
- Discard ☒

Sample Description (Matrix)
- ☐ Air
- ☐ Water
- ☐ Soil/Ash
- ☐ Bioassay
- ☒ Wipe
- ☐ Leak Test
- ☐ Waste
- ☐ Other

Chain of Custody (If Required):

Delivered By: _____ Time: _____ Date: _____

Received By: _____ Time: _____ Date: _____

Report Type Required:

LSC Print Out: ☐ On a 3.5" Disk ☐

Report Units:
- ☐ dpm
- ☐ pCi/g
- ☐ pCi/l
- ☐ pCi/ml
- ☐ uCi/ml
- ☐ Other

Analysis: 3 Chan.DPM ☐ Single Label ☐ Other:

Laboratory Services: Sub Total (from above): _____

Sample Description	Qty	X	Cost	

Job Complete: ☐ Yes ☐ No

Invoice #: A-33

Invoice Date: _____

Total Amount _____

Invoice Amount _____

PRIORITY

Appendix A

RSO, Inc.

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

5204 Minnick Road • Laurel, Maryland 20707 • 301-953-2482 • 410-792-7444 • FAX 301-498-3017

NAME: Chesapeake Nuclear Services	CONTRACT/P.O. NUMBER:	(LAB USE ONLY)
ADDRESS: 788 Somme Drive	SAMPLE TURNAROUND TIME:	LAB CONTROL #: 2008-542
Annapolis, MD 21032	PROJECT NAME/#: Bayview-G	REVIEWED BY:
CONTACT: Claude Wiblin	COMMENTS: LSC only	SAMPLER:
PHONE: 410-353-6450 / FAX: 410-266-5811		

SAMPLE ID	SAMPLE LOCATION	MATRIX	CONTAINER DESCRIPTION	# of CONTAINERS	DATE	TIME	ANALYSIS REQUIRED/COMMENTS
Hall				15	8/8		LSC: H-3, C-14 + P-32
B201				17			
B202				17			
B205				16			
B206				16			
B210				17			
B214				17			
B214A				19			

TRANSFERRED BY: Byron Bland	RECEIVED BY: Rich Emmons	DATE	TIME	REMARKS:
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	
TRANSFERRED BY:	RECEIVED BY:	DATE	TIME	

Assay Definition-

Assay Description:
CHESAPEAKE NUCLEAR

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\20080812_1356.results
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Sets:
Low Energy: 3H-Tol-3-10-08
Mid Energy: 14C-TOL-07-17-06
High Energy: 32P-UG-02-28-05
Count Time (min): 2.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: On
Colored Samples: On Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	SIS	tSIE	LUM
1	10.00	5	8	5	0	0	0	75.60	838.79	0
2	2.00	1	2	5	2	1	6	153.55	751.42	0
3	2.00	-0	-0	-1	-1	0	-2	0.00	770.88	0
4	2.00	-1	-1	2	-2	-2	2	0.00	800.24	0
5	2.00	2	2	2	3	2	2	201.02	803.00	0
6	2.00	-2	-2	2	-3	-3	2	0.00	846.39	0
7	2.00	-0	-1	1	-0	-2	1	0.00	751.63	0
8	2.00	-2	3	-1	-4	4	-1	572.36	767.90	0

9	2.00	-1	2	2	-3	2	2	49.84	752.76	0
10	2.00	1	-0	1	1	-1	1	0.00	759.66	0
11	2.00	-1	-2	3	-1	-3	4	0.00	896.55	5
12	2.00	-1	-0	1	-3	-0	1	0.00	777.32	0
13	2.00	-2	-1	-0	-5	-0	-0	0.00	724.65	0
14	2.00	2	-2	2	4	-3	2	305.75	859.55	0
15	2.00	2	-0	5	4	-2	6	192.98	792.03	0
16	2.00	-0	1	-0	-1	1	-0	213.47	803.95	0
17	2.00	-2	-1	1	-3	-1	1	0.00	847.58	0
18	2.00	2	-1	-0	3	-1	-0	354.79	774.67	0
19	2.00	1	-0	-2	1	0	-2	0.00	859.52	0
20	2.00	-2	2	-0	-5	3	-0	0.00	828.79	0
21	2.00	-2	1	1	-4	1	1	0.00	815.71	0
22	2.00	3	0	1	5	-0	1	2.19	860.12	3
23	2.00	1	-0	2	2	-1	2	15.96	836.76	0
24	2.00	-1	-1	-1	-2	-0	-2	0.00	807.04	0
25	2.00	-0	-1	-0	-1	-1	-0	0.00	826.87	0
26	2.00	-0	0	1	-1	0	1	0.00	776.50	0
27	2.00	5	2	3	8	1	4	59.86	841.00	0
28	2.00	2	2	1	3	2	1	90.02	869.85	0
29	2.00	2	-3	1	5	-4	1	0.00	820.43	0
30	2.00	1	1	-0	2	1	-0	140.61	875.09	0
31	2.00	-4	-1	1	-7	-1	1	0.00	867.01	0
32	2.00	-1	-2	4	-1	-3	4	0.00	787.03	0
33	2.00	-1	-2	3	-2	-3	4	0.00	844.69	0
34	2.00	0	-4	-1	1	-5	-2	0.00	785.11	0
35	2.00	3	-3	3	6	-4	4	0.00	798.19	0
36	2.00	0	2	2	-0	2	2	0.00	761.16	0
37	2.00	-1	0	0	-1	1	0	0.00	755.60	0
38	2.00	3	-2	5	7	-4	5	91.75	880.42	0
39	2.00	1	-1	2	2	-1	2	0.00	772.04	0
40	2.00	0	-0	4	1	-1	5	0.00	921.02	0
41	2.00	-2	-1	3	-3	-2	3	0.00	838.65	0
42	2.00	0	-2	4	1	-3	4	0.00	744.56	0
43	2.00	3	-2	-1	6	-2	-1	112.26	845.18	0
44	2.00	1	-2	-2	3	-2	-2	0.00	811.85	0
45	2.00	3	2	-1	4	3	-1	142.14	861.83	0
46	2.00	0	-1	2	1	-2	3	0.00	777.91	0
47	2.00	-0	4	0	-2	5	0	56.51	764.10	0
48	2.00	0	-1	1	0	-1	1	0.00	850.68	0
49	2.00	-1	-1	-1	-2	-1	-1	0.00	750.03	0
50	2.00	1	-1	-0	1	-1	-0	0.00	757.53	0
51	2.00	-1	1	-0	-3	1	-0	0.00	816.66	4
52	2.00	1	-1	-2	2	-1	-3	0.00	852.55	0
53	2.00	6	-1	0	11	-2	0	57.34	879.30	3
54	2.00	-1	-1	0	-2	-1	0	0.00	856.90	0
55	2.00	1	-1	-1	3	-1	-1	107.80	852.10	0
56	2.00	4	2	3	6	2	3	35.62	766.01	0
57	2.00	1	-3	0	3	-3	0	0.00	818.28	0
58	2.00	-1	-2	-1	-2	-2	-1	0.00	840.58	0
59	2.00	-2	-0	-2	-4	1	-3	0.00	764.20	5
60	2.00	-1	-3	1	-2	-4	1	0.00	724.39	0
61	2.00	1	-0	3	1	-1	4	827.38	771.39	0
62	2.00	-0	-1	1	-0	-2	1	0.00	834.27	0
63	2.00	-1	-1	1	-1	-1	1	0.00	848.53	0
64	2.00	-0	-1	1	-1	-1	1	0.00	762.36	0
65	2.00	-1	-0	2	-2	-0	2	0.00	804.85	0
66	2.00	0	0	-2	0	1	-2	0.00	785.02	0
67	2.00	-2	0	2	-4	0	2	0.00	808.75	0
68	2.00	1	0	0	2	0	0	128.06	771.23	0
69	2.00	1	-1	1	1	-2	1	0.00	861.95	4
70	2.00	1	3	2	0	3	2	89.31	811.24	0

71	2.00	-1	-1	-2	-2	-0	-3	0.00	827.28	0
72	2.00	2	-4	1	4	-5	1	0.00	759.34	0
73	2.00	-1	-0	2	-3	-0	2	0.00	681.35	0
74	2.00	0	-1	-0	1	-1	-0	0.00	768.56	0
75	2.00	-1	-3	-0	-1	-4	-0	0.00	732.54	0
76	2.00	-1	-3	3	-1	-4	4	0.00	760.25	0
77	2.00	-1	3	2	-3	3	2	101.69	792.82	0
78	2.00	1	-2	5	2	-3	5	0.00	804.96	0
79	2.00	1	5	1	1	6	1	116.04	697.91	0
80	2.00	-1	2	5	-2	2	6	256.34	851.19	0
81	2.00	3	-3	1	6	-4	1	0.00	852.66	0
82	2.00	-0	-2	-1	0	-2	-2	0.00	791.03	0
83	2.00	1	-4	0	3	-5	0	0.00	746.54	0
84	2.00	-1	-0	3	-1	-1	4	0.00	802.34	0
85	2.00	-1	0	-0	-2	1	-0	0.00	783.96	0
86	2.00	1	-2	-0	3	-2	-0	0.00	790.83	0
87	2.00	1	1	-0	1	1	-0	183.66	817.80	0
88	2.00	2	-2	0	5	-2	0	0.00	743.98	0
89	2.00	-1	-2	-1	-1	-2	-1	0.00	777.12	0
90	2.00	-1	-4	-0	-0	-5	-0	0.00	889.64	0
91	2.00	0	-0	3	0	-1	4	0.00	783.23	0
92	2.00	0	-2	0	1	-3	0	0.00	819.72	0
93	2.00	1	-1	-2	2	-1	-2	779.23	763.85	0
94	2.00	1	-1	1	2	-2	1	0.00	770.29	0
95	2.00	1	-1	-3	2	-0	-3	105.13	866.82	0
96	2.00	2	3	-2	4	4	-2	40.11	832.66	0
97	2.00	-0	-0	1	-1	-0	1	0.00	840.64	0
98	2.00	1	-3	0	3	-3	0	0.00	766.94	0
99	2.00	-0	-3	0	-0	-4	0	0.00	768.04	0
100	2.00	-1	4	1	-6	5	1	0.00	404.89	0
101	2.00	3	-4	0	7	-5	0	0.00	769.53	0
102	2.00	-2	-2	0	-4	-2	0	0.00	755.27	0
103	2.00	-1	-1	-1	-1	-1	-1	0.00	732.05	0
104	2.00	-1	-2	-2	-1	-1	-3	0.00	679.49	0
105	2.00	-0	1	2	-1	1	2	279.67	844.89	0
106	2.00	-1	-0	2	-3	-1	3	0.00	636.07	0
107	2.00	-1	1	3	-2	1	4	0.00	790.74	0
108	2.00	0	1	-0	0	1	-0	0.00	780.41	0
109	2.00	-1	2	2	-4	3	2	49.84	562.71	0
110	2.00	3	-1	1	6	-2	1	0.00	669.49	0
111	2.00	0	-1	1	1	-2	1	0.00	794.10	0
112	2.00	-0	-3	2	-0	-4	2	0.00	755.95	0
113	2.00	1	-2	3	2	-3	3	0.00	730.02	4
114	2.00	-1	-1	2	-2	-1	2	0.00	802.86	0
115	2.00	1	-2	2	3	-3	2	0.00	764.99	0
116	2.00	-2	-1	3	-4	-2	4	0.00	735.78	5
117	2.00	-1	-2	1	-1	-2	1	0.00	607.95	0
118	2.00	-0	1	4	-1	0	4	1122.30	702.43	0
119	2.00	0	-1	0	1	-2	0	0.00	747.47	0
120	2.00	-2	0	-0	-5	1	-0	0.00	722.33	0
121	2.00	-0	-3	2	-0	-4	2	0.00	538.23	0
122	2.00	-1	3	2	-3	4	2	327.82	808.14	0
123	2.00	-4	-3	1	-7	-3	1	0.00	682.40	0
124	2.00	1	0	1	2	-0	1	0.00	714.23	0
125	2.00	-2	1	2	-6	1	2	0.00	589.74	0
126	2.00	2	-1	0	5	-2	0	0.00	712.46	0
127	2.00	3	-2	-0	6	-2	-0	0.00	767.33	0
128	2.00	-2	0	3	-5	0	3	0.00	698.18	0
129	2.00	-2	0	1	-4	0	1	0.00	760.65	0
130	2.00	2	0	-0	4	-0	-0	0.00	823.14	3
131	2.00	1	4	1	1	5	1	45.83	745.69	0
132	2.00	-1	-2	0	-1	-3	0	0.00	646.13	0

133	2.00	-2	3	1	-5	4	1	183.66	715.34	0
134	2.00	-1	0	-1	-1	1	-1	0.00	798.42	0
135	2.00	-0	3	7	-2	3	8	0.00	516.42	0

11 Aug 2008 06:58 RSO, Inc. Page #1
Protocol #: 7 SWIPES User : Lab Technician

CHESAPEAKE NUCLEAR
Count Time(minutes): 10.00
Assay Type: CPM
Background Subtract : IPA Bkg
Outlier: 5.0 FLAG
%Spillup: 0.00
%Spilldown: 0.00
Screening: OFF

	Window A		Window B		Window C	
Nuclide:	I-125	15 - 75 keV	Co-57	75 - 165 keV	MAN	15 - 2000 keV
Bkg:	25.9		27.4		222	
Sigma:	0.00		0.00		2.00	
LCR:	0		0		0	
Half Life(hours):	0.00		0.00			
Multiplier:	1.0000					
%CV Flag Limit:	0.00		0.00			

S#	A:CPM	A:%SIG	B:CPM	B:%SIG	C:CPM	C:%SIG
1	0.0		0.0		1.9	22.7
2	0.0		0.0		0.0	
3	0.0		3.5	17.0	6.4	12.5
4	0.0		0.0		0.0	
5	0.0		0.0		0.0	
6	0.0		0.0		0.0	
7	0.0		0.5	45.6	11.0	9.52
8	0.0		0.0		0.0	
9	0.0		0.0		0.0	
10	0.0		1.2	29.1	2.9	18.4
11	0.7	38.3	0.0		0.4	47.7
12	0.4	51.3	1.9	23.1	6.2	12.7
13	0.0		0.0		0.6	39.5
14	0.5	45.6	0.0		0.0	
15	0.0		2.2	21.4	5.3	13.7
16	0.0		0.0		2.3	20.7

EDITDATA.D07 Archived to C:\ARCH\ARCH07D.238
C:\DATA\P7DATA Copied to C:\DATA\ARCH07A.238

11 Aug 08 06:48:23 Packard Model 5003 COBRA SN: 424559

PROTOCOL # 7
SWIPES
CHESAPEAKE NUCLEAR
COUNT TIME 10.00 Minutes

Window A	Window B	Window C
LLD: 15 keV	LLD: 75 keV	LLD: 15 keV

#	A:CPM	A:DPM	B:CPM	B:DPM	C:CPM	C:DPM
1	0	0	0	0	2	3
2	0	0	0	0	0	0
3	0	0	4	4	6	9
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	1	1	11	16
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	1	1	3	4
11	1	1	0	0	0	1
12	0	1	2	2	6	9
13	0	0	0	0	1	1
14	1	1	0	0	0	0
15	0	0	2	3	5	8
16	0	0	0	0	2	3

Final Status Closeout Survey for G Building
Johns Hopkins Bayview Campus

Appendix B

MISCELLANEOUS SUPPORTING DOCUMENTS

Co-60 in Large Concrete Area.....B-2
Co-60 in Large Concrete Area.....B-4
Cd-109/Ag-109m Floor Area.....B-6
Ge-68/Ga-68 Floor Area..... B-8
NUREG-1507 Count Rate Versus Exposure Rate..... B10

MicroShield 7.02

Date	By	Checked	

Filename	Run Date	Run Time	Duration
Co-60 in Large Area Concrete.ms7	4-Sep-08	10:10:19 AM	0:00:00

Project Info

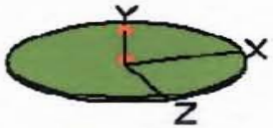
Case Title	Co-60 in Concrete
Description	Unity 1 pCi/g for Large Area Evaluation
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions

Height	12.0 cm (4.7 in)
Radius	344.0 cm (11 ft 3.4 in)

Dose Points

A	X	Y	Z
#1	0.0 cm (0.0 in)	14.54 cm (5.7 in)	0.0 cm (0.0 in)
#2	0.0 cm (0.0 in)	18.0 cm (7.1 in)	0.0 cm (0.0 in)
#3	0.0 cm (0.0 in)	112.0 cm (3 ft 8.1 in)	0.0 cm (0.0 in)



Shields

Shield N	Dimension	Material	Density
Source	4.46e+06 cm³	Concrete	2.4
Air Gap		Air	0.00122

Source Input: Grouping Method - Actual Photon Energies

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³	pCi/g
Co-60	1.07E-05	3.96E+05	2.40E-06	8.88E-02	1.00E+00

Buildup: The material reference is Source

Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results - Dose Point # 1 - (0,14.54,0) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.6938	6.46E+01	2.66E-05	5.70E-05	5.14E-08	1.10E-07
1.1732	3.96E+05	3.45E-01	6.39E-01	6.17E-04	1.14E-03
1.3325	3.96E+05	4.15E-01	7.42E-01	7.19E-04	1.29E-03
Totals	7.92E+05	7.60E-01	1.38E+00	1.34E-03	2.43E-03
Results - Dose Point # 2 - (0,18,0) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.6938	6.46E+01	2.63E-05	5.63E-05	5.08E-08	1.09E-07
1.1732	3.96E+05	3.41E-01	6.31E-01	6.10E-04	1.13E-03
1.3325	3.96E+05	4.10E-01	7.33E-01	7.11E-04	1.27E-03
Totals	7.92E+05	7.51E-01	1.36E+00	1.32E-03	2.40E-03
Results - Dose Point # 3 - (0,112,0) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.6938	6.46E+01	1.88E-05	3.92E-05	3.63E-08	7.58E-08
1.1732	3.96E+05	2.42E-01	4.30E-01	4.32E-04	7.69E-04
1.3325	3.96E+05	2.89E-01	4.96E-01	5.01E-04	8.61E-04
Totals	7.92E+05	5.30E-01	9.27E-01	9.33E-04	1.63E-03

MicroShield 7.02			
Date	By	Checked	
Filename	Run Date	Run Time	Duration
Co-60 in Small Area Concrete.ms7	17-Sep-08	11:20:19 AM	0:00:00

Project Info	
Case Title	NIDA Cyclotron
Description	1 pCi/g Co-60 in 12 cm Concrete: Area is 2500 sq cm
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	12.0 cm (4.7 in)
Width	50.0 cm (1 ft 7.7 in)
Height	50.0 cm (1 ft 7.7 in)

Dose Points			
A	X	Y	Z
#1	14.54 cm (5.7 in)	25.0 cm (9.8 in)	25.0 cm (9.8 in)
#2	18.0 cm (7.1 in)	25.0 cm (9.8 in)	25.0 cm (9.8 in)

Shields			
Shield N	Dimension	Material	Density
Source	3.00e+04 cm³	Concrete	2.4
Air Gap		Air	0.00122

Source Input: Grouping Method - Actual Photon Energies					
Nuclide	Ci	Bq	µCi/cm³	Bq/cm³	pCi/g
Co-60	7.20E-08	2.66E+03	2.40E-06	8.88E-02	1
Buildup: The material reference is Source					
Integration Parameters					
X Direction	10				
Y Direction	20				
Z Direction	20				
Results - Dose Point # 1 - (14.54,25,25) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.6938	4.35E-01	2.34E-05	4.74E-05	4.53E-08	9.15E-08
1.1732	2.66E+03	2.98E-01	5.15E-01	5.32E-04	9.20E-04
1.3325	2.66E+03	3.55E-01	5.92E-01	6.16E-04	1.03E-03
Totals	5.33E+03	6.53E-01	1.11E+00	1.15E-03	1.95E-03
Results - Dose Point # 2 - (18,25,25) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.6938	4.35E-01	1.95E-05	3.79E-05	3.76E-08	7.32E-08
1.1732	2.66E+03	2.44E-01	4.08E-01	4.37E-04	7.28E-04
1.3325	2.66E+03	2.90E-01	4.67E-01	5.04E-04	8.11E-04
Totals	5.33E+03	5.35E-01	8.75E-01	9.40E-04	1.54E-03

MicroShield 7.02

Date	By	Checked	

Filename	Run Date	Run Time	Duration
Cd-109 Floor Area.ms7	25-Aug-08	11:35:17 AM	0:00:00

Project Info

Case Title	Cd-109/Ag109m
Description	Floor contamination 5000dpm/100cm2
Geometry	3 - Disk

Source Dimensions

Radius	28.0 cm (11.0 in)

Dose Points

A	X	Y	Z
#1	2.54 cm (1.0 in)	0.0 cm (0.0 in)	0.0 cm (0.0 in)
#2	6.0 cm (2.4 in)	0.0 cm (0.0 in)	0.0 cm (0.0 in)

Shields

Shield N	Dimension	Material	Density
Air Gap		Air	0.00122

Source Input: Grouping Method - Actual Photon Energies

Nuclide	Ci	Bq	µCi/cm²	Bq/cm²
Ag-109m	5.54E-08	2.05E+03	2.25E-05	8.33E-01
Cd-109	5.54E-08	2.05E+03	2.25E-05	8.33E-01

Buildup: The material reference is Air Gap

Integration Parameters

Radial	20
Circumferential	20

Results - Dose Point # 1 - (2.54,0,0) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.022	2.03E+02	2.16E-03	2.17E-03	5.55E-05	5.57E-05
0.022	3.82E+02	4.07E-03	4.08E-03	1.05E-04	1.05E-04
0.0222	3.84E+02	4.12E-03	4.14E-03	1.03E-04	1.04E-04
0.0222	7.23E+02	7.76E-03	7.80E-03	1.95E-04	1.96E-04
0.0249	1.24E+02	1.49E-03	1.50E-03	2.61E-05	2.62E-05
0.0249	2.33E+02	2.82E-03	2.83E-03	4.92E-05	4.94E-05
0.088	7.63E+01	3.27E-03	3.28E-03	5.05E-06	5.06E-06
Totals	**2.12E+03**	**2.57E-02**	**2.58E-02**	**5.38E-04**	**5.41E-04**
Results - Dose Point # 2 - (6,0,0) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.022	2.03E+02	1.40E-03	1.41E-03	3.60E-05	3.62E-05
0.022	3.82E+02	2.64E-03	2.65E-03	6.78E-05	6.82E-05
0.0222	3.84E+02	2.67E-03	2.69E-03	6.70E-05	6.74E-05
0.0222	7.23E+02	5.03E-03	5.06E-03	1.26E-04	1.27E-04
0.0249	1.24E+02	9.69E-04	9.75E-04	1.69E-05	1.70E-05
0.0249	2.33E+02	1.83E-03	1.84E-03	3.19E-05	3.21E-05
0.088	7.63E+01	2.13E-03	2.14E-03	3.28E-06	3.29E-06
Totals	**2.12E+03**	**1.67E-02**	**1.68E-02**	**3.49E-04**	**3.51E-04**

MicroShield 7.02			
Date	By	Checked	
Filename	Run Date	Run Time	Duration
Ge-68 Floor Area.ms7	25-Aug-08	11:44:13 AM	0:00:00

Project Info	
Case Title	Ge-68/Ga-68
Description	Floor contamination 5000dpm/100cm2
Geometry	3 - Disk

Source Dimensions	
Radius	28.0 cm (11.0 in)

Dose Points			
A	X	Y	Z
#1	2.54 cm (1.0 in)	0.0 cm (0.0 in)	0.0 cm (0.0 in)
#2	6.0 cm (2.4 in)	0.0 cm (0.0 in)	0.0 cm (0.0 in)

Shields			
Shield N	Dimension	Material	Density
Air Gap		Air	0.00122

Source Input: Grouping Method - Actual Photon Energies				
Nuclide	Ci	Bq	µCi/cm²	Bq/cm²
Ga-68	5.54E-08	2.05E+03	2.25E-05	8.33E-01
Ge-68	5.54E-08	2.05E+03	2.25E-05	8.33E-01

Buildup: The material reference is Air Gap Integration Parameters	
Radial	20
Circumferential	20

Results - Dose Point # 1 - (2.54,0,0) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.001	1.45E+00	6.98E-07	7.01E-07	2.12E-06	2.13E-06
0.0011	1.38E+01	7.25E-06	7.28E-06	2.02E-05	2.03E-05
0.0086	2.88E+01	1.19E-04	1.19E-04	4.22E-05	4.24E-05
0.0086	5.65E+01	2.33E-04	2.34E-04	8.28E-05	8.31E-05
0.0092	2.68E+02	1.19E-03	1.19E-03	3.94E-04	3.95E-04
0.0093	5.25E+02	2.33E-03	2.34E-03	7.70E-04	7.74E-04
0.0096	1.15E+01	5.27E-05	5.29E-05	1.69E-05	1.70E-05
0.0103	1.12E+02	5.52E-04	5.54E-04	1.54E-04	1.55E-04
0.511	3.65E+03	9.08E-01	9.09E-01	1.78E-03	1.79E-03
1.0145	4.94E+00	2.44E-03	2.44E-03	4.49E-06	4.49E-06
1.0774	6.75E+01	3.54E-02	3.55E-02	6.45E-05	6.45E-05
1.8831	2.92E+00	2.68E-03	2.68E-03	4.23E-06	4.23E-06
Totals	**4.74E+03**	**9.53E-01**	**9.54E-01**	**3.34E-03**	**3.35E-03**

Results - Dose Point # 2 - (6,0,0) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.001	1.45E+00	4.51E-07	4.53E-07	1.37E-06	1.38E-06
0.0011	1.38E+01	4.68E-06	4.71E-06	1.30E-05	1.31E-05
0.0086	2.88E+01	7.66E-05	7.71E-05	2.73E-05	2.74E-05
0.0086	5.65E+01	1.51E-04	1.52E-04	5.34E-05	5.38E-05
0.0092	2.68E+02	7.65E-04	7.70E-04	2.54E-04	2.56E-04
0.0093	5.25E+02	1.50E-03	1.51E-03	4.97E-04	5.00E-04
0.0096	1.15E+01	3.40E-05	3.42E-05	1.09E-05	1.10E-05
0.0103	1.12E+02	3.56E-04	3.58E-04	9.94E-05	1.00E-04
0.511	3.65E+03	5.90E-01	5.91E-01	1.16E-03	1.16E-03
1.0145	4.94E+00	1.59E-03	1.59E-03	2.92E-06	2.92E-06
1.0774	6.75E+01	2.30E-02	2.31E-02	4.19E-05	4.19E-05
1.8831	2.92E+00	1.74E-03	1.75E-03	2.75E-06	2.75E-06
Totals	**4.74E+03**	**6.20E-01**	**6.20E-01**	**2.16E-03**	**2.17E-03**

NUREG-1507
Table 6.3 NaI Scintillation Detector Count Rate Versus Exposure Rate (cpm per μR/h)

Highlighted rows are interpolated from actual NUREG-1507 data.

	Gamma Energy (keV)	cpm per μR/h
	20	2200
Cd-109	22	2792
Cd-109	25	3680
	30	5160
	40	8880
	50	11800
	60	13000
	80	12000
Cd-109	88	11136
	100	9840
	150	6040
	200	4230
	300	2520
	400	1700
	500	1270
Ge-68	511	1244
	600	1010
	662	900
Co-60	694	856
	800	710
	1000	540
Ge-68	1015	534
Ge-68	1077	511
Co-60	1173	474
Co-60	1332	414
	1500	350
Ge-68	1883	281
	2000	260
	3000	180

Jacobus, John (NIH/OD/ORS) [E]

From: Lemieux, Bryan P [blemieux@utmem.edu]
Sent: Thursday, May 08, 2008 10:52 AM
To: Jacobus, John (NIH/OD/ORS) [E]
Subject: Mission Accomplished - Almost

Hello Jon,

We have received the source. Please send the keys, most recent leak test documentation, and any additional paperwork as soon as possible.

Thanks!

Bryan Lemieux, M.S., CHP
Radiation Safety Officer
University of Tennessee Health Science Center
3 N Dunlap St. S110 Van Vleet Bldg
Memphis, TN 38163
Phone: 901-448-6114
Fax: 901-448-7774

Sealed Source Leak Test Certification

SOURCE DESCRIPTION: Single Source Calibrator, JL Shepard Series 10A

Serial Number: 11051

Nuclide: Cs-137

Sealed Source: 3M Capsule Type 4F6S, S.N. MB 2993

Original Activity: 47.4 MBq (12.8 mCi) on 7/27/99

Current activity: 38.7 MBq (10.5 mCi)

Test Date: 4/28/2008

Results: Less than 185 Bq (0.005 microcuries)

Note: Source removed from storage and prepared for shipment to
University of Tennessee, Memphis
License No. R-79019-J97

4/28/08

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Form RHS 8-7A
(9-92)

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

RADIOACTIVE MATERIAL LICENSE

Amendment 72

 License Number R-79019-J09

University of Tennessee, Memphis
Radiation Safety Office
800 Madison Avenue
Memphis, Tennessee 38163

Attention: Bryan Lemieux, MS, CHP, Radiation Safety Officer

As requested by Bryan Lemieux and in accordance with his letter dated February 12, 2008, Tennessee Radioactive Material License number R-79019-J09 is amended as follows:

To add:

6. Radioactive Material (Element and Mass Number)	8. Chemical and/or Physical Form	9. Maximum Radioactivity and/or Quantity of Material Which Licensee May Possess at Any One Time
X. Cesium 137	X. Sealed source (3M Model 4F6S)	X. One (1) source not to exceed 12.8 millicuries.

---

10. Authorized use

X. To be used in a J. L. Shepherd & Associates Model 10A Calibrator for instrument calibration.

To change Condition 28. This condition will now read as follows:

28. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 8, and 9 of this license in accordance with statements, representations, and procedures contained in the following:

- Application dated September 25, 1992, with attachments
- Letters dated February 4, 1993, August 31, 1993, with attachment, December 4, 2002, March 10, 2004, July 9, 2004, February 11, 2005, February 18, 2005, February 28, 2007, with attachment, and February 12, 2008

14 08 09:38a RADIATION SAFETY OFFICE 9014487774 p.1
Fax:615-532-7938 Feb 14 2008 9:02 p.02

Form RES 8-7A
(9-92)

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

RADIOACTIVE MATERIAL LICENSE

Amendment 72

 License Number R-79019-J09

- Telephone conversation on October 7, 1992, with David Edwards

---

All other parts of this license remain unchanged.
Date: February 14, 2008

For the Commissioner
Tennessee Department of
Environment and Conservation

By Charles Arnott

Charles Arnott
Health Physicist
Division of Radiological Health

RETURN SOURCE PACKING LIST

FROM:
Company Name National Institute on Drug Addiction (NIDA)
Address 251 Bayview Blvd, BRC Suite 200 (NIDA)
City Baltimore State MD
Zip 21224
Contact Name John Jacobus
Phone Number 301-594-4018

SHIP TO:
SIEMENS

Siemens Medical Solutions
810 Innovation Drive
Knoxville, TN 37932
ATTN: Source Department

SOURCE INFORMATION

5/1

Isotope	Activity	Reference Date	Serial Number	Model/Description
68Ge	4.31 mCi	25-Jun 04	4065	Line Source/LS-HR+
68Ge	4.31 mCi	25-Jun 04	4066	Line Source/LS-HR+
68Ge	4.31 mCi	25-Jun 04	4067	Line Source/LS-HR+
68Ge	4.69 mCi	7/8/2005	4753	Line Source/LS-HR+
68Ge	4.69 mCi	7/8/2005	4752	Line Source/LS-HR+
68Ge	4.69 mCi	7/8/2005	4754	Line Source/LS-HR+
68Ge	3.3 mCi	28 June 04	1817	Uniform Phantom/CS-20-3
68Ge	3.49 mCi	7/8/2005	2219	Uniform Phantom/CS-20-3

If you would like a receipt acknowledgement for these sources please provide a valid FAX number below.

FAX NUMBER: 301-496-3544

Received at Siemens Medical Solutions by:
Name: [illegible]
Date: 5-15-08
Comments:

D0001555 Rev B

Sealed Source Certification

Source Description: Line Source

Model Type: LS – HR+

Serial Number: 4753

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid ceramic matrix of ^{68}Ge distributed in polyethylene tube encased in a stainless steel rod.

Original Activity: 174 MBq (4.69 mCi) On 7/8/05

Current Activity: 12.5 MBq (0.339 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/08

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Sealed Source Certification

Source Description: Line Source

Model Type: LS – HR+

Serial Number: 4752

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid ceramic matrix of ^{68}Ge distributed in polyethylene tube encased in a stainless steel rod.

Original Activity: 174 MBq (4.69 mCi) On 7/8/05

Current Activity: 12.5 MBq (0.339 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/08

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Sealed Source Certification

Source Description: Line Source

Model Type: LS – HR+

Serial Number: 4754

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid ceramic matrix of ^{68}Ge distributed in polyethylene tube encased in a stainless steel rod.

Original Activity: 174 MBq (4.69 mCi) On 7/8/05

Current Activity: 12.5 MBq (0.339 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/08

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Sealed Source Certification

Source Description: Cylindrical Source

Model Type: CS-20-3

Serial Number: 2219

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid matrix of ^{68}Ge encased in high density polyethylene tube sealed in a leak proof mechanical assembly.

Original Activity: 129 MBq (3.49 mCi) On 7/8/05

Current Activity: 9.29 MBq (0.251 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/08

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Sealed Source Certification

Source Description: Cylindrical Source

Model Type: CS-20-3

Serial Number: 1817

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid matrix of ^{68}Ge encased in high density polyethylene tube sealed in a leak proof mechanical assembly.

Original Activity: 122 MBq (3.30 mCi) On 6/28/04

Current Activity: 3.36 MBq (0.091 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/08

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Sealed Source Certification

Source Description: Line Source

Model Type: LS - HR+

Serial Number: 4066

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid ceramic matrix of ^{68}Ge distributed in polyethylene tube encased in a stainless steel rod

Original Activity: 166 MBq (4.49 mCi) On 6/28/04

Current Activity: 4.35 MBq (0.124 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/2008

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Sealed Source Certification

Source Description: Line Source

Model Type: LS - HR+

Serial Number: 4065

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid ceramic matrix of ^{68}Ge distributed in polyethylene tube encased in a stainless steel rod

Original Activity: 166 MBq (4.49 mCi) On 6/28/04

Current Activity: 4.35 MBq (0.124 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/2008

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Sealed Source Certification

Source Description: Line Source

Model Type: LS - HR+

Serial Number: 4067

Nuclide: $^{68}Ge/^{68}Ga$

Description: Solid ceramic matrix of ^{68}Ge distributed in polyethylene tube encased in a stainless steel rod

Original Activity: 166 MBq (4.49 mCi) On 6/28/04

Current Activity: 4.35 MBq (0.124 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Siemens Medical Solutions, 810 Innovative Drive, Knoxville, TN 37932

5/1/2008

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Jacobus, John (NIH/OD/ORS) [E]

From: Ming@sandersmedical.com
Sent: Wednesday, October 22, 2008 11:35 AM
To: Jacobus, John (NIH/OD/ORS) [E]
Subject: Re: Return of sealed source

Hi, John,

Just want to confirm that we received the returns from you on June 18, 2008.

Let me know if you have any questions.

Best regards,

Ming
Sanders Medical Products, Inc.
Phone: 865-588-8998
Fax: 865-588-8191
www.sandersmedical.com

On Oct 20, 2008, at 5:05 PM, Jacobus, John (NIH/OD/ORS) [E] wrote:

> Ms Ming,
> As noted below, I shipped the identified Ge-68 microPET source to you on June 13, 2008, and FedEx says it was delivered on June 18, 2008. In order to close out my records, can I have a written acknowledgement to the sources deliver. You can reply to this message.
>
> Thanks.
>
> -- John
> John P. Jacobus, MS, CHP
> Radiation Safety Officer, NIDA IRP
> and
> Senior Health Physicist
> NIH, Division of Radiation Safety
> Building 21, Room 238
> Bethesda, MD 20892-6780
> Phone and voicemail -- 301-594-4018
> FAX -- 301-496-3544
>
> ---
>
> **From:** Jacobus, John (NIH/OD/ORS) [E]
> **Sent:** Friday, June 13, 2008 12:57 PM
> **To:** 'ming@sandersmedical.com'
> **Subject:** Return of sealed source
>
> Hi,
> I was told to send you an e-mail regarding the return of a Ge-68 microPET source that we had supplied to us in November 2002. During a recent inventor, we are found this item and are returning via FedEx, Tracking No. 8639-1220-3295.
>
> Source description is as follows
> Model No. PET-0.1/0.5
> Serial No. 3277
> Radionuclide Germanium-68
> Activity: 0.6 mCi (22 MBq)
> Reference Date: 25 Nov 2002

Sealed Source Certification

Source Description: MicroPET Marker Source

Model Type: PET-0.10.5

Serial Number: 3277

Nuclide: $^{68}Ge/^{68}Ga$

Description: Polymer of ceramic volume with ^{68}Ge added encased in stainless steel cover.

Original Activity: 22 MBq (0.6 mCi) On 22 Nov 2002

Current Activity: 0.75MBq (0.004 mCi)

Results: Less than 185 Bq (0.005 µCi) With Dry Smear

Note: Source removed from storage to be returned to supplier, Sanders Medical Product, Inc., 520 Bearden Park Circle, Knoxville, TN 37919

5/1/08

John P. Jacobus, Radiation Safety Officer, NIDA IRP, Baltimore, MD

Waste Shipments								
		Activity (NP -- Not Processed)						
Date Shipped	Type	Units	All	Tritium	C-14	Tc-99	I-129	Special Nuclear Matieral
8/30/1990	Liquid Scintillation	mCi	2.134	2.122	0.010	NP	NP	NP
9/18/1990	L	mCi	0.892	0.872	NP	NP	NP	NP
9/27/1990	L	mCi	0.191	0.181	0.005	NP	NP	NP
11/27/1990	L	mCi	1.221	1.216	NP	NP	NP	NP
7/12/1990	Solid	mCi	1.877	0.200	NP	NP	NP	NP
7/17/1990	S	mCi	1.854	0.155	0.030	NP	NP	NP
7/31/1990	S	mCi	60.408	0.351	0.002	NP	NP	NP
8/14/1990	S	mCi	21.834	13.047	0.042	NP	NP	NP
8/21/1990	S	mCi	11.260	6.334	0.020	NP	NP	NP
8/28/1990	S	mCi	5.235	1.050	NP	NP	NP	NP
9/11/1990	S	mCi	5.692	1.261	NP	NP	NP	NP
9/18/1990	S	mCi	13.187	0.730	NP	NP	NP	NP
10/2/1990	S	mCi	2.475	0.120	NP	NP	NP	NP
10/10/1990	S	mCi	11.313	0.078	NP	NP	NP	NP
10/16/1990	S	mCi	17.280	1.140	NP	NP	NP	NP
10/22/1990	S	mCi	457.000	0.310	0.005	NP	NP	NP
11/6/1990	S	mCi	0.240	NP	NP	NP	NP	NP
11/13/1990	S	mCi	10.273	0.132	NP	NP	NP	NP
11/20/1990	S	mCi	1.010	0.120	NP	NP	NP	NP
12/4/1990	S	mCi	9.343	0.943	1.259	NP	NP	NP
12/11/1990	S	mCi	0.642	0.155	NP	NP	NP	NP
1/9/1991	Liquid Scintillation	mCi	1.595	0.825	NP	NP	NP	NP
2/7/1991	L	mCi	0.120	0.051	NP	NP	NP	NP
2/26/1991	L	mCi	0.453	0.451	NP	NP	NP	NP
3/11/1991	L	mCi	0.472	0.466	NP	NP	NP	NP
3/25/1991	L	mCi	0.048	0.026	NP	NP	NP	NP
5/15/1991	L	mCi	0.650	0.650	NP	NP	NP	NP
6/6/1991	L	mCi	1.227	0.622	NP	NP	NP	NP
6/18/1991	L	mCi	0.342	0.342	NP	NP	NP	NP
7/16/1991	L	mCi	0.842	0.839	NP	NP	NP	NP
8/20/1991	L	mCi	1.726	1.721	NP	NP	NP	NP
9/17/1991	L	mCi	0.675	0.550	NP	NP	NP	NP
10/22/1991	L	mCi	0.860	0.856	NP	NP	NP	NP
11/13/1991	L	mCi	0.589	0.540	NP	NP	NP	NP
12/4/1991	L	mCi	0.387	0.379	NP	NP	NP	NP

Waste Shipments								
		Activity (NP -- Not Processed)						
Date Shipped	Type	Units	All	Tritium	C-14	Tc-99	I-129	Special Nuclear Matieral
1/2/1991	Solid	mCi	17.524	0.247	0.010	NP	NP	NP
1/8/1991	S	mCi	55.505	0.500	50.000	NP	NP	NP
1/15/1991	S	mCi	0.132	0.011	NP	NP	NP	NP
1/23/1991	S	mCi	0.405	0.035	NP	NP	NP	NP
1/29/1991	S	mCi	13.260	1.000	NP	NP	NP	NP
2/5/1991	S	mCi	1.162	0.001	NP	NP	NP	NP
2/12/1991	S	mCi	2.185	0.565	0.250	NP	NP	NP
2/19/1991	S	mCi	3.533	0.193	0.050	NP	NP	NP
2/26/1991	S	mCi	0.386	0.122	NP	NP	NP	NP
3/8/1991	S	mCi	0.311	0.020	NP	NP	NP	NP
3/21/1991	S	mCi	7.199	1.678	NP	NP	NP	NP
3/28/1991	S	mCi	0.240	0.070	NP	NP	NP	NP
4/10/1991	S	mCi	4.495	0.021	0.100	NP	NP	NP
4/23/1991	S	mCi	17.203	0.897	0.020	NP	NP	NP
4/30/1991	S	mCi	0.181	0.061	0.050	NP	NP	NP
5/7/1991	S	mCi	2.378	0.013	NP	NP	NP	NP
5/15/1991	S	mCi	3.503	0.300	NP	NP	NP	NP
5/22/1991	S	mCi	2.126	0.336	NP	NP	NP	NP
5/29/1991	S	mCi	4.602	1.257	NP	NP	NP	NP
6/11/1991	S	mCi	0.619	0.119	NP	NP	NP	NP
6/18/1991	S	mCi	4.962	0.302	NP	NP	NP	NP
7/9/1991	S	mCi	7.914	0.303	NP	NP	NP	NP
7/16/1991	S	mCi	7.564	0.262	NP	NP	NP	NP
8/6/1991	S	mCi	0.957	0.337	NP	NP	NP	NP
8/13/1991	S	mCi	4.321	0.261	NP	NP	NP	NP
8/20/1991	S	mCi	2.363	0.223	0.050	NP	NP	NP
9/3/1991	S	mCi	1.810	0.200	NP	NP	NP	NP
9/4/1991	S	mCi	7.275	1.161	0.010	NP	NP	NP
9/10/1991	S	mCi	4.153	0.093	NP	NP	NP	NP
9/24/1991	S	mCi	0.323	0.176	NP	NP	NP	NP
10/1/1991	S	mCi	1.000	0.335	NP	NP	NP	NP
10/8/1991	S	mCi	0.096	0.016	NP	NP	NP	NP
10/15/1991	S	mCi	4.723	0.383	NP	NP	NP	NP
10/22/1991	S	mCi	0.216	0.036	NP	NP	NP	NP
10/29/1991	S	mCi	0.098	0.015	NP	NP	NP	NP
11/13/1991	S	mCi	2.398	0.118	NP	NP	NP	NP
11/19/1991	S	mCi	0.121	0.061	NP	NP	NP	NP
11/26/1991	S	mCi	3.060	0.010	NP	NP	NP	NP
12/10/1991	S	mCi	2.576	0.651	NP	NP	NP	NP
12/17/1991	S	mCi	0.059	0.059	NP	NP	NP	NP
12/24/1991	S	mCi	6.320	0.270	NP	NP	NP	NP

Waste Shipments								
		Activity (NP -- Not Processed)						
Date Shipped	Type	Units	All	Tritium	C-14	Tc-99	I-129	Special Nuclear Matieral
1/8/1992	Solid	mCi	2.251	0.426	1.500	NP	NP	NP
1/21/1992	S	mCi	4.169	0.099	NP	NP	NP	NP
1/28/1992	S	mCi	1.014	0.014	NP	NP	NP	NP
2/4/1992	S	mCi	1.036	0.025	NP	NP	NP	NP
2/11/1992	S	mCi	3.229	0.088	NP	NP	NP	NP
2/18/1992	S	mCi	3.367	0.044	NP	NP	NP	NP
2/25/1992	S	mCi	4.512	0.306	NP	NP	NP	NP
3/3/1992	S	mCi	2.200	0.150	NP	NP	NP	NP
3/10/1992	S	mCi	3.209	1.784	NP	NP	NP	NP
3/24/1992	S	mCi	6.087	4.409	NP	NP	NP	NP
3/31/1992	S	mCi	17.110	0.035	NP	NP	NP	NP
4/8/1992	S	mCi	1.064	0.049	0.005	NP	NP	NP
4/14/1992	S	mCi	2.435	0.320	NP	NP	NP	NP
4/21/1992	S	mCi	0.024	0.024	NP	NP	NP	NP
4/28/1992	S	mCi	1.031	0.026	NP	NP	NP	NP
5/5/1992	S	mCi	1.151	0.288	NP	NP	NP	NP
5/12/1992	S	mCi	1.801	0.261	NP	NP	NP	NP
5/19/1992	S	mCi	0.037	0.017	NP	NP	NP	NP
6/2/1992	S	mCi	3.203	1.113	NP	NP	NP	NP
6/9/1992	S	mCi	0.093	0.041	NP	NP	NP	NP
6/17/1992	S	mCi	5.217	1.255	NP	NP	NP	NP
6/30/1992	S	mCi	1.642	1.085	NP	NP	NP	NP
7/14/1992	S	mCi	1.470	0.135	0.050	NP	NP	NP
7/21/1992	S	mCi	2.336	1.900	0.179	NP	NP	NP
7/28/1992	S	mCi	1.203	0.085	0.003	NP	NP	NP
8/4/1992	S	mCi	3.053	0.032	1.001	NP	NP	NP
8/11/1992	S	mCi	2.190	0.179	0.006	NP	NP	NP
8/18/1992	S	mCi	7.206	6.101	NP	NP	NP	NP
9/1/1992	S	mCi	2.533	0.403	NP	NP	NP	NP
9/14/1992	S	mCi	6.265	1.165	NP	NP	NP	NP
10/5/1992	S	mCi	12.709	3.281	NP	NP	NP	NP
10/29/1992	S	mCi	6.724	0.481	NP	NP	NP	NP
11/18/1992	S	mCi	4.233	1.175	NP	NP	NP	NP
11/23/1992	S	mCi	0.304	0.044	NP	NP	NP	NP
1/8/1992	Liquid Scintillation	mCi	1.068	1.068	NP	NP	NP	NP
2/4/1992	L	mCi	0.647	0.646	NP	NP	NP	NP
2/25/1992	L	mCi	1.446	1.438	NP	NP	NP	NP
4/8/1992	L	mCi	2.576	2.553	NP	NP	NP	NP
4/28/1992	L	mCi	0.394	0.394	NP	NP	NP	NP
6/17/1992	L	mCi	1.351	1.299	NP	NP	NP	NP
7/28/1992	L	mCi	0.561	0.531	NP	NP	NP	NP
9/14/1992	L	mCi	2.006	1.433	0.500	NP	NP	NP
10/5/1992	L	mCi	0.453	0.445	NP	NP	NP	NP
12/1/1992	L	mCi	1.844	1.816	NP	NP	NP	NP

Waste Shipments								
		Activity (NP -- Not Processed)						
Date Shipped	Type	Units	All	Tritium	C-14	Tc-99	I-129	Special Nuclear Matieral
1/5/1993	Solid	mCi	5.581	1.228	NP	NP	NP	NP
1/28/1993	S	mCi	2.407	0.177	NP	NP	NP	NP
2/16/1993	S	mCi	1.443	0.192	NP	NP	NP	NP
3/17/1993	S	mCi	3.753	0.727	NP	NP	NP	NP
4/14/1993	S	mCi	9.077	4.689	NP	NP	NP	NP
5/12/1993	S	mCi	17.021	11.392	NP	NP	NP	NP
6/23/1993	S	mCi	5.280	2.060	NP	NP	NP	NP
7/14/1993	S	mCi	10.270	3.620	NP	NP	NP	NP
8/4/1993	S	mCi	9.996	2.868	NP	NP	NP	NP
9/8/1993	S	mCi	7.989	4.244	0.001	NP	NP	NP
10/12/1993	S	mCi	2.555	0.505	NP	NP	NP	NP
11/15/1993	S	mCi	14.356	6.235	5.000	NP	NP	NP
1/5/1993	Liquid Scintillation	mCi	0.610	0.610	NP	NP	NP	NP
1/28/1993	LS	mCi	0.518	0.518	NP	NP	NP	NP
2/16/1993	LS	mCi	0.391	0.391	NP	NP	NP	NP
3/17/1993	LS	mCi	0.956	0.956	NP	NP	NP	NP
4/14/1993	LS	mCi	0.496	0.496	NP	NP	NP	NP
5/13/1993	LS	mCi	1.205	1.196	NP	NP	NP	NP
6/23/1993	LS	mCi	1.228	1.211	0.012	NP	NP	NP
7/14/1993	LS	mCi	0.416	0.416	NP	NP	NP	NP
8/4/1993	LS	mCi	0.540	0.530	0.010	NP	NP	NP
9/8/1993	LS	mCi	0.563	0.562	0.001	NP	NP	NP
10/12/1993	LS	mCi	0.790	0.790	NP	NP	NP	NP
11/15/1993	LS	mCi	0.691	0.691	NP	NP	NP	NP
1/10/1994	Solid	mCi	7.871	1.312	NP	NP	NP	NP
2/9/1994	S	mCi	17.810	8.310	NP	NP	NP	NP
3/16/1994	S	mCi	29.289	8.689	NP	NP	NP	NP
4/15/1994	S	mCi	15.899	4.417	3.953	NP	NP	NP
4/25/1994	S	mCi	1.049	0.049	NP	NP	NP	NP
5/10/1994	S	mCi	3.133	0.378	NP	NP	NP	NP
1/10/1994	Liquid Scintillation	mCi	0.887	0.887	NP	NP	NP	NP
2/9/1994	LS	mCi	1.402	1.402	NP	NP	NP	NP
3/16/1994	LS	mCi	1.000	1.000	NP	NP	NP	NP
4/15/1994	LS	mCi	0.685	0.685	NP	NP	NP	NP
5/18/1994	LS	mCi	0.461	0.461	NP	NP	NP	NP
7/13/1994	LS	mCi	0.805	0.805	NP	NP	NP	NP
8/17/1994	LS	mCi	0.547	0.547	NP	NP	NP	NP
10/5/1994	LS	mCi	0.764	0.764	NP	NP	NP	NP
12/13/1994	LS	mCi	0.913	0.913	NP	NP	NP	NP
3/15/1995	Liquid Scintillation	mCi	0.818	0.818	NP	NP	NP	NP
4/26/1995	LS	mCi	0.909	0.909	NP	NP	NP	NP
6/14/1995	LS	mCi	0.894	0.714	NP	NP	NP	NP
10/25/1995	LS	mCi	0.702	0.644	NP	NP	NP	NP
2/7/1995	Liquid Scintillation	mCi	0.857	0.857	NP	NP	NP	NP
9/6/1995	LS	mCi	1.927	1.876	NP	NP	NP	NP
1/24/1996	Liquid Scintillation	mCi	0.565	0.463	NP	NP	NP	NP
3/13/1996	LS	mCi	1.853	0.658	NP	NP	NP	NP
4/24/1996	LS	mCi	0.608	0.607	NP	NP	NP	NP
6/3/1996	LS	mCi	0.592	0.592	NP	NP	NP	NP
7/31/1996	LS	mCi	2.100	1.620	NP	NP	NP	NP
9/26/1996	LS	mCi	1.021	0.789	NP	NP	NP	NP
12/4/1996	LS	mCi	1.496	1.203	0.050	NP	NP	NP

Waste Shipments								
		Activity (NP -- Not Processed)						
Date Shipped	Type	Units	All	Tritium	C-14	Tc-99	I-129	Special Nuclear Matieral
11/19/1996	Solid	mCi	101.843	8.931	0.542	NP	NP	NP
10/8/1997	Liquid Scintillation	MBq	200.577	173.678	NP	NP	NP	NP
3/13/1998	Liquid Scintillation	MBq	63.696	44.104	0.220			
8/5/1998	LS	MBq	37.925	35.261	NP	NP	NP	NP
10/22/1998	Solid	MBq	4383.817	3028.912	122.988	NP	NP	NP
2/24/1999	Liquid Scintillation	MBq	58.275	47.915	2.590	NP	NP	NP
6/5/1999	LS	MBq	55.870	38.110	NP	NP	NP	NP
10/22/1999	Solid	MBq	3870.126	3040.956	340.696	NP	NP	NP
3/1/2000	Liquid Scintillation	MBq	66.970	66.970	NP	NP	NP	NP
5/17/2000	LS	MBq	40.145	22.755	0.740	NP	NP	NP
9/28/2000	LS	MBq	61.420	4181.000	NP	NP	NP	NP
10/25/2000	Solid	MBq	819.320	120.990	0.370	NP	NP	NP
5/4/2001	Liquid Scintillation	MBq	131.054	96.977	NP	NP	NP	NP
9/12/2001	Liquid Scintillation	MBq	825.174	525.067	NP	NP	NP	NP
11/29/2001	LS	MBq	55.685	38.665	NP	NP	NP	NP
9/18/2002	Solid	MBq	843.341	540.607	1.184	NP	NP	NP
11/4/2003	Liquid Scintillation	MBq	181.041	126.540	1.110	NP	NP	NP
12/4/2003	Solid	MBq	370.296	226.773	2.220	NP	NP	NP
10/14/2004	Liquid Scintillation	MBq	27.380	26.640	NP	NP	NP	NP
10/14/2004	Solid	MBq	1903.300	1812.500	2.405	NP	NP	NP
4/6/2006	Liquid Scintillation	MBq	41.255	41.255	NP	NP	NP	NP
11/9/2006	Solid	MBq	1857.000	1843.300	13.024	NP	NP	NP
9/24/2008	Biological	MBq	0.421	0.052	0.033	NP	NP	NP
9/24/2008	Liquid Scintillation	MBq	75.000	27.860	7.437	NP	NP	NP
9/24/2008	Solid	MBq	43.523	31.768	0.413	NP	0.37	NP

Sewage Disposal

Sample Concentration (microcurie/ml)							Monthly Activity (millicurie) Concentration (microcurie/ml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	I-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	I-125	Cl-36	Ge-68
7/13/1990	3.50E-02							4.95E+00						
7/20/1990	5.50E-02							6.30E+00						
							Monthly Total (mCi)	1.13E+01						
							Conc. (uCi/ml)	8.04E-06						
							Sum of Fractions	0.00						
8/7/1990				6.00E-03								1.92E-01		
8/7/1990		5.90E-02								1.12E+00				
8/7/1990	7.20E-04	1.25E-04		3.12E-04				2.09E+00		2.80E-02		2.54E-01		
8/21/1990	3.06E-04	1.60E-04		2.76E-04	1.49E-03			2.60E+00		3.88E-03		1.43E-01	4.11E-01	
8/30/1990	3.79E-04	2.41E-03		1.18E-03				2.39E+00		1.30E+00		3.41E-01		
							Monthly Total (mCi)	7.08E+00		2.46E+00		9.30E-01	4.11E-01	
							Conc. (uCi/ml)	5.06E-06		1.76E-06		6.64E-07	2.94E-07	
							Sum of Fractions	0.04						
9/7/1990	1.30E-04			4.57E-06				1.32E-01						
9/21/1990	4.77E-04			3.51E-04				5.39E-01				1.14E-01		
							Monthly Total (mCi)	6.71E-01				1.14E-01		
							Conc. (uCi/ml)	4.79E-07				8.14E-08		
							Sum of Fractions	0.00						
10/4/1990	5.00E-03	1.80E-02		1.00E-03				4.01E-01		6.23E-01		3.70E-02		
10/24/1990	3.00E-03			2.00E-04				4.83E-01				1.00E-02		
11/2/1990	7.00E-04			2.00E-03				7.40E-02				2.70E-02		
11/14/1990	2.70E-04	1.10E-03		1.07E-04				1.11E+00		2.96E-01		6.00E-03		
11/16/1990	2.50E-02			3.00E-03				1.55E+00				1.79E-01		
							Monthly Total (mCi)	3.62E+00		9.19E-01		2.59E-01		
							Conc. (uCi/ml)	2.58E-06		6.56E-07		1.85E-07		
							Sum of Fractions	0.01						
12/26/1990				1.00E-03								4.30E-02		
12/26/1990	9.87E-05			7.48E-05				3.51E-01				8.70E-02		
12/26/1990	9.11E-05			6.14E-05				2.66E-01				5.10E-02		
							Monthly Total (mCi)	6.17E-01				1.81E-01		
							Conc. (uCi/ml)	4.41E-07				1.29E-07		
							Sum of Fractions	0.01						
1/15/1991	2.00E-03	7.90E-02	5.00E-03	3.00E-04	2.00E-03			2.48E-01		1.66E+00	8.60E-02	2.20E-02	4.00E-02	
1/23/1991		8.70E-03						2.53E+00						
1/25/1991	8.10E-05			4.39E-05				2.80E-01				1.04E-01		
							Monthly Total (mCi)	3.06E+00		1.66E+00	8.60E-02	1.26E-01	4.00E-02	
							Conc. (uCi/ml)	2.18E-06		1.19E-06	6.14E-08	9.00E-08	2.86E-08	
							Sum of Fractions	0.01						

Sewage Disposal

Sample Concentration (microcurie/ml)							Monthly Activity (millicurie) Concentration (microcurie/ml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	I-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	I-125	Cl-36	Ge-68
2/22/1991	4.60E-04	4.97E-03	1.46E-04	1.92E-04				1.71E+00		1.41E+00	4.00E-02	3.07E-01		
3/5/1991	5.38E-05			5.41E-05				1.20E-01				4.90E-02		
3/8/1991	2.09E-04	7.15E-04	2.08E-04	4.58E-04				6.01E-01		1.83E-01	5.70E-02	2.12E-01		
3/26/1991	1.54E-04			8.64E-05				9.14E-01				1.04E-01		
							Monthly Total (mCi)	3.35E+00		1.60E+00	9.70E-02	6.72E-01		
							Conc. (uCi/ml)	2.39E-06		1.14E-06	6.93E-08	4.80E-07		
							Sum of Fractions	0.03						
4/2/1991	9.16E-05	2.40E-03	5.27E-04	9.94E-05				3.95E-01		6.82E-01	1.45E-01	1.27E-01		
4/26/1991	1.96E-04		9.53E-04	7.64E-04	1.77E-03			1.21E+00			2.62E-01	2.67E-01	3.91E-01	
4/30/1991		4.29E-03	3.87E-04							1.22E+00	1.06E-01			
							Monthly Total (mCi)	1.61E+00		1.90E+00	5.13E-01	3.94E-01	3.91E-01	
							Conc. (uCi/ml)	1.15E-06		1.36E-06	3.66E-07	2.81E-07	2.79E-07	
							Sum of Fractions	0.02						
5/10/1991	1.82E-04			1.79E-04				7.91E-01				1.93E-01		
5/31/1991	1.86E-04							1.07E+00						
							Monthly Total (mCi)	1.86E+00				1.93E-01		
							Conc. (uCi/ml)	1.33E-06				1.38E-07		
							Sum of Fractions	0.01						
6/7/1991	9.16E-05			1.35E-04				6.10E-02				2.46E-01		
6/25/1991	4.67E-04		2.81E-04	4.46E-04				1.40E+00			7.70E-02	3.42E-01		
8/9/1991	1.00E-02		7.00E-03	9.00E-03				1.80E+00			1.09E-01	3.97E-01		
							Monthly Total (mCi)	3.26E+00			1.86E-01	9.85E-01		
							Conc. (uCi/ml)	2.33E-06			1.33E-07	7.04E-07		
							Sum of Fractions	0.04						
7/9/1991	2.50E-04	7.74E-04	6.27E-05	2.58E-04				2.20E+00		1.95E-01	1.30E-02	2.99E-01		
7/29/1991	2.00E-02	1.00E-03	2.00E-03	3.00E-03				3.28E+00		3.70E-02	4.50E-02	2.01E-01		
							Monthly Total (mCi)	5.48E+00		2.32E-01	5.80E-02	5.00E-01		
							Conc. (uCi/ml)	3.92E-06		1.66E-07	4.14E-08	3.57E-07		
							Sum of Fractions	0.02						
8/9/1991	1.00E-02		7.00E-03	9.00E-03				1.80E+00			1.09E-01	3.97E-01		
8/20/1991	6.00E-03		3.00E-03	1.00E-03				1.98E+00			3.70E-02	2.10E-02		
8/28/1991	9.00E-03	7.00E-04	1.00E-03	1.00E-03				1.99E+00		1.40E-02	2.50E-02	3.70E-02		
							Monthly Total (mCi)	5.76E+00		1.40E-02	1.71E-01	4.55E-01		
							Conc. (uCi/ml)	4.12E-06		1.00E-08	1.22E-07	3.25E-07		
							Sum of Fractions	0.02						
9/27/1991	1.60E-02	1.00E-03	3.00E-03	3.00E-03	9.00E-03		Monthly Total (mCi)	5.450		0.022	0.059	0.036	0.180	
							Conc. (uCi/ml)	3.89E-06		1.57E-08	4.21E-08	2.57E-08	1.29E-07	
							Sum of Fractions	0.00						
10/4/1991	3.00E-03		1.00E-02	4.00E-03			Monthly Total (mCi)	1.635			0.207	0.264		
							Conc. (uCi/ml)	1.17E-06			1.48E-07	1.89E-07		
							Sum of Fractions	0.01						

Sewage Disposal

Sample Concentration (microcurie/ml)							Monthly Activity (millicurie) Concentration (microcurie/ml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	I-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	I-125	Cl-36	Ge-68
11/8/1991	2.00E-03		2.00E-03	6.00E-03				4.13E-01			5.10E-02	3.13E-01		
11/19/1991	7.00E-03			1.00E-03				5.15E-01				3.70E-02		
							Monthly Total (mCi)	9.28E-01			5.10E-02	3.50E-01		
							Conc. (uCi/ml)	6.63E-07			3.64E-08	2.50E-07		
							Sum of Fractions	0.01						
12/10/1991	5.00E-03	7.00E-04		7.00E-03				9.58E-01		1.50E-02		3.26E-01		
12/20/1991	3.00E-03		5.00E-04					1.13E+00			9.00E-03			
							Monthly Total (mCi)	2.09E+00		1.50E-02	9.00E-03	3.26E-01		
							Conc. (uCi/ml)	1.49E-06		1.07E-08	6.43E-09	2.33E-07		
							Sum of Fractions	0.01						
1/10/1992	2.00E-03		6.00E-04	6.00E-04				4.75E-01			1.30E-02	1.30E-02		
1/18/1992	8.00E-03	1.00E-03	3.00E-03	4.10E-02	1.90E-02			2.44E+00		3.30E-02	7.50E-02	6.24E-01	2.89E-01	
1/28/1992	9.00E-03	5.00E-03	6.00E-04	1.00E-03				1.58E+00		9.50E-02	1.30E-02	2.10E-02		
							Monthly Total (mCi)	4.50E+00		1.28E-01	1.01E-01	6.58E-01	2.89E-01	
							Conc. (uCi/ml)	3.21E-06		9.14E-08	7.21E-08	4.70E-07	2.06E-07	
							Sum of Fractions	0.03						
2/7/1992	7.00E-03	1.20E-02	1.70E-02					2.36E+00		1.70E-01	6.47E-01			
2/19/1992	1.10E-02	5.70E-02	5.00E-03	4.00E-03				2.45E+00		1.09E+00	1.00E-01	2.46E-01		
							Monthly Total (mCi)	4.81E+00		1.26E+00	7.47E-01	2.46E-01		
							Conc. (uCi/ml)	3.44E-06		9.01E-07	5.34E-07	1.76E-07		
							Sum of Fractions	0.02						
3/12/1992	1.70E-02	2.50E-02	2.00E-03	1.10E-02			Monthly Total (mCi)	6.34E+00		9.59E-01	1.49E-01	8.23E-01		
							Conc. (uCi/ml)	4.53E-06		6.85E-07	1.06E-07	5.88E-07		
							Sum of Fractions	0.03						
4/10/1992	1.40E-02	5.00E-03	3.00E-03	5.00E-03			Monthly Total (mCi)	3.14E+00		2.14E-01	1.35E-01	3.09E-01		
							Conc. (uCi/ml)	2.24E-06		1.53E-07	9.64E-08	2.21E-07		
							Sum of Fractions	0.01						
5/1/1992	2.00E-02	2.31E-01	8.00E-03	2.00E-03	5.60E-02			6.91E+00	2.13E+00	7.20E-02	4.71E-01	1.19E-01	4.25E-01	
5/21/1992	1.40E-02	5.00E-03		3.00E-03				3.96E+00		1.09E-01		1.31E-01		
							Monthly Total (mCi)	1.09E+01	2.13E+00	1.81E-01	4.71E-01	2.50E-01	4.25E-01	
							Conc. (uCi/ml)	7.77E-06	1.52E-06	1.29E-07	3.36E-07	1.79E-07	3.04E-07	
							Sum of Fractions	0.02						
6/9/1992	1.40E-02	6.00E-03	1.70E-02	2.00E-03			Monthly Total (mCi)	4.74E+00		3.26E-01	9.36E-01	1.57E-01		
							Conc. (uCi/ml)	3.38E-06		2.33E-07	6.69E-07	1.12E-07		
							Sum of Fractions	0.01						
7/10/1992	1.30E-02	3.00E-03	3.00E-03	6.00E-04				5.65E+00		5.40E-02	4.10E-02	3.50E-02		
7/30/1992	7.80E-02	1.30E-02	2.90E-02	7.00E-03	2.18E-01			2.04E+01		2.00E-01	1.02E+00	5.12E-01	4.14E+00	
							Monthly Total (mCi)	2.60E+01		2.54E-01	1.06E+00	5.47E-01	4.14E+00	
							Conc. (uCi/ml)	1.86E-05		1.81E-07	7.58E-07	3.91E-07	2.96E-06	
							Sum of Fractions	0.04						
8/25/1992	1.30E-02	7.00E-03	2.00E-03	1.00E-03	2.80E-02		Monthly Total (mCi)	5.20E+00		2.12E-01	6.20E-02	1.03E-01	5.41E-01	
							Conc. (uCi/ml)	3.71E-06		1.51E-07	4.43E-08	7.36E-08	3.86E-07	
							Sum of Fractions	0.01						

Sewage Disposal

Sample Concentration (microcurielml)							Monthly Activity (millicurie) Concentration (microcurielml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	1-125	CI-36	Ge-68	Summary	H-3	C-14	S-35IP-33	P-32	1-125	CI-36	Ge-68
9/3/1992	7.00E-03	5.00E-03	6.00E-03	1.00E-03	2.10E-02		Monthly Total (mCi)	3.31E+00		2.23E-01	2.33E-01	1.56E-01	2.80E-01	
							Conc. (uCi/ml)	2.36E-06		1.59E-07	1.66E-07	1.11E-07	2.00E-07	
							Sum of Fractions	0.01						
10/2/1992	1.40E-02	2.50E-02	5.00E-03	1.00E-03			Monthly Total (mCi)	6.22E+00		1.76E+00	2.07E-01	1.40E-01		
							Conc. (uCi/ml)	4.45E-06		1.25E-06	1.48E-07	1.00E-07		
							Sum of Fractions	0.01						
11/12/1992	1.00E-02	7.00E-03	1.00E-03	2.00E-03			Monthly Total (mCi)	3.79E+00		8.30E-02	2.40E-02	1.29E-01		
							Conc. (uCi/ml)	2.70E-06		5.93E-08	1.71E-08	9.21E-08		
							Sum of Fractions	0.01						
12/18/1992	1.00E-02	3.00E-03	2.00E-03	2.00E-03	1.30E-02		Monthly Total (mCi)	3.84E+00		1.29E-01	1.24E-01	1.41E-01	2.58E-01	
							Conc. (uCi/ml)	2.74E-06		9.21E-08	8.86E-08	1.01E-07	1.84E-07	
							Sum of Fractions	0.01						
111811993	1.[illegible]DE-02	1.1OE-02	4.00E-04	2.00E-03	1.70E-02		Monthly Total (mCi)	6.08E+00		2.13E-01	3.00E-02	6.60E-01	1.69E-01	
							Conc. (uCi/ml)	4.34E-06		1.52E-07	2.14E-08	4.71E-07	1.21E-07	
							Sum of Fractions	0.03						
2/10/1993	1.50E-02	7.00E-03	5.00E-04	3.00E-03	2.70E-02		Monthly Total (mCi)	6.74E+00		2.96E-01	2.30E-02	4.67E-01	5.18E-01	
							Conc. (uCi/ml)	4.82E-06		2.11E-07	1.64E-08	3.34E-07	3.70E-07	
							Sum of Fractions	0.02						
3/4/1993	6.00E-03	2.30E-02	1.00E-03	1.00E-03			Monthly Total (mCi)	2.76E+00	4.19E-01	7.15E-01	6.80E-02	2.10E-01		
							Conc. (uCi/ml)	1.97E-06	2.99E-07	5.11E-07	4.86E-08	1.50E-07	0.00E+00	
							Sum of Fractions	0.01						
4/7/1993	1.00E-02	2.70E-02	1.00E-03	1.40E-02	4.90E-02			4.38E+00		1.56E+00	8.00E-02	3.42E+00	4.66E-01	
4/26/1993	1.80E-02	1.30E-02	7.00E-03	5.00E-03				8.15E+00		5.11E-01	2.55E-01	2.06E+00		
							Monthly Total (mCi)	1.25E+01		2.07E+00	3.35E-01	5.48E+00	4.66E-01	
							Conc. (uCi/ml)	8.95E-06		1.48E-06	2.39E-07	3.91E-06	3.33E-07	
							Sum of Fractions	0.20						
5/19/1993	9.00E-03	2.62E-01	2.00E-03	2.00E-03	2.70E-02		Monthly Total (mCi)	4.85E+00	4.60E-02	2.32E+00	8.40E-02	7.51E-01	4.16E-01	
							Conc. (uCi/ml)	3.47E-06	3.29E-08	1.66E-06	6.00E-08	5.36E-07	2.97E-07	
							Sum of Fractions	0.03						
6/14/1993	2.00E-01	2.00E-03	2.00E-03	2.00E-03			Monthly Total (mCi)	9.77E+00		1.41E-01	1.68E-01	1.12E+00		
							Conc. (uCi/ml)	6.98E-06		1.01E-07	1.20E-07	8.01E-07		
							Sum of Fractions	0.0[illegible]						
718119931	7.00E-03	4.00E-03	4.00E-03	3.00E-03			Monthly Total (mCi)	2.65E+00		2.68E-01	3.73E-01	4.75E-01		
							Conc. (uCi/ml)	1.89E-06		1.91E-07	2.66E-07	3.39E-07		
							Sum of Fractions	0.02						
8/3/1993	4.00E-03	2.00E-03	2.00E-03	8.00E-03				2.23E+00		1.58E-01	2.39E-01	1.17E+00		
8/31/1993	1.10E-02	2.00E-03	9.00E-03	4.00E-03				6.69E+00		7.80E-02	3.70E-01	1.04E+00		
							Monthly Total (mCi)	8.93E+00		2.36E-01	6.09E-01	2.21E+00		
							Conc. (uCi/ml)	6.38E-06		1.69E-07	4.35E-07	1.58E-06		
							Sum of Fractions	0.08						
9/27/1993	8.00E-03	4.00E-03	2.00E-04	3.00E-03			Monthly Total (mCi)	4.14E+00		4.83E-01	2.05E-01	8.56E-01		
							Conc. (uCi/ml)	2.96E-06		3.45E-07	1.46E-07	6.11E-07		
							Sum of Fractions	0.03						

Sewage Disposal

Sample Concentration (microcurieml)							Monthly Activity (millicurie)Concentration (microcurieml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	1-125	CI-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	1-125	CI-36	Ge-68
1119119931	8.00E-03	4.00E-03	6.00E-04	6.00E-03			Monthly Total (mCi)	3.71E+00		3.95E-01	1.20E-02	1.10E+00		
							Conc. (uCi/ml)	2.65E-06		2.82E-07	8.57E-09	7.86E-07		
							Sum of Fractions	0.04						
12/15/1993	2.00E-02	2.00E-03	1.00E-03	4.00E-03			Monthly Total (mCi)	8.02E+00		2.21E-01	7.50E-02	1.02E+00		
							Conc. (uCi/ml)	5.73E-06		1.58E-07	5.36E-08	7.29E-07		
							Sum of Fractions	0.04						
1/27/1994	9.00E-03	1.20E-02	1.00E-03	5.00E-03			Monthly Total (mCi)	5.10E+00		7.99E-01	6.90E-02	1.87E+00		
							Conc. (uCi/ml)	3.64E-06		5.71E-07	4.93E-08	1.33E-06		
							Sum of Fractions	0.07						
2/24/1994	8.00E-03	1.00E-03	1.00E-03	2.00E-03			Monthly Total (mCi)	4.88E+00		7.40E-02	1.23E-01	6.15E-01		
							Conc. (uCi/ml)	3.49E-06		5.29E-08	8.79E-08	4.39E-07		
							Sum of Fractions	0.02						
3/16/1994	1.60E-02	3.00E-03	2.00E-03	2.00E-03			Monthly Total (mCi)	7.13E+00		3.26E-01	1.44E-01	5.07E-01		
							Conc. (uCi/ml)	5.09E-06		2.33E-07	1.03E-07	3.62E-07		
							Sum of Fractions	0.02						
4/28/1994	2.50E-03	2.00E-03	5.00E-04	5.00E-04			Monthly Total (mCi)	1.98E+00		2.97E-01	3.00E-02	2.20E-01		
							Conc. (uCi/ml)	1.41E-06		2.12E-07	2.14E-08	1.57E-07		
							Sum of Fractions	001						
5/4/1994	2.50E-03	2.00E-03	5.00E-04	5.00E-04			Monthly Total (mCi)	1 98E+00		2.97E-01	3.00E-02	2 20E-01		
							Conc. (uCi/ml)	1.41E-06		2.12E-07	2.14E-08	1.57E-07		
							Sum of Fractions	0.01						
6/2/1994	7.00E-03	1.40E-02	1.00E-03	2.00E-03				3.44E+00	3.70E-01	5.18E-01	2.30E-01	7.36E-01		
6/30/1994	4.00E-03	4.00E-03	8.00E-04	1.00E-03				2.68E+00		3.63E-01	1.03E-01	3.62E-01		
							Monthly Total (mCi)	6.12E+00	3.70E-01	8.81E-01	3.33E-01	1.10E+00		
							Conc. (uCi/ml)	4.37E-06	2.64E-07	6.29E-07	2.38E-07	7.84E-07		
							Sum of Fractions	0.04						
8/24/1994	6.00E-03	5.50E-03	7.00E-04	1.00E-03			Monthly Total (mCi)	4.01E+00	1.10E-02	5.15E-02	3.40E-02	5.12E-01		
							Conc. (uCi/ml)	2.86E-06	7.86E-09	3.68E-08	2.43E-08	3.66E-07		
							Sum of Fractions	0.02						
11/3/1994	1.30E-02	6.00E-03	5.00E-04	1.00E-03		1.10E-02	Monthly Total (mCi)	7.51E+00	2.43E-01	3.55E-01	2.80E-02	6.43E-01		1.81E-01
							Conc. (uCi/ml)	5.37E-06	1.74E-07	2.54E-07	2.00E-08	4.59E-07		1.29E-07
							Sum of Fractions	0.02						
2/10/1995	1.10E-01	2.00E-03		1.00E-03				6.13E+00		1.20E-01		1.60E-01		
2/23/1995	1.50E-03		2.50E-04	5.00E-04				4.24E-01			1.60E-02	2.21E-01		
							Monthly Total (mCi)	6.56E+00		1.20E-01	1.60E-02	3.81E-01		
							Conc. (uCi/ml)	4.68E-06		8.57E-08	1.14E-08	2.72E-07		
							Sum of Fractions	0.01						
3/13/1995	1.50E-03		2.50E-04	5.00E-04			Monthly Total (mCi)	4.24E-01			1.60E-02	2.21E-01		
							Conc. (uCi/ml)	3.03E-07		0.00E+00	1.14E-08	1.58E-07		
							Sum of Fractions	0.01						
4/20/1995	9.00E-03	9.00E-03	2.10E-02	1.00E-03			Monthly Total (mCi)	4.86E+00		1.05E+00	1.02E+00	1.49E-01		
							Conc. (uCi/ml)	3.47E-06		7.47E-07	7.29E-07	1.06E-07		
							Sum of Fractions	0.01						

Sewage Disposal

Sample Concentration (microcurie/ml)							Monthly Activity (millicurie) Concentration (microcurie/ml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	I-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	I-125	Cl-36	Ge-68
5/9/1995	4.00E-03	2.00E-04		1.00E-03			Monthly Total (mCi)	1.41E+00		7.00E-03		4.78E-01		
							Conc. (uCi/ml)	1.00E-06		5.00E-09		3.41E-07		
							Sum of Fractions	0.02						
6/27/1995	1.20E-02	7.00E-03	7.00E-04	2.00E-03			Monthly Total (mCi)	6.53E+00		5.31E-01	4.10E-02	5.80E-02		
							Conc. (uCi/ml)	4.66E-06		3.79E-07	2.93E-08	4.14E-08		
							Sum of Fractions	0.00						
7/19/1995	2.33E-03	1.07E-02	5.00E-03	3.33E-04			Monthly Total (mCi)	1.73E+00		1.58E+00	9.76E-01	1.35E-01		
							Conc. (uCi/ml)	1.23E-06		1.13E-06	6.97E-07	9.62E-08		
							Sum of Fractions	0.01						
8/26/1995	2.33E-03	1.07E-02	5.00E-03	3.33E-04			Monthly Total (mCi)	1.73E+00		1.58E+00	9.76E-01	1.35E-01		
							Conc. (uCi/ml)	1.23E-06		1.13E-06	6.97E-07	9.62E-08		
							Sum of Fractions	0.01						
9/1/1995	2.33E-03	1.07E-02	5.00E-03	3.33E-04			Monthly Total (mCi)	1.73E+00		1.58E+00	9.76E-01	1.35E-01		
							Conc. (uCi/ml)	1.23E-06		1.13E-06	6.97E-07	9.62E-08		
							Sum of Fractions	0.01						
10/5/1995	7.00E-03	5.00E-03	6.00E-04	1.00E-03			Monthly Total (mCi)	3.87E+00		1.52E+00	2.30E-02	7.70E-02		
							Conc. (uCi/ml)	2.76E-06		1.08E-06	1.64E-08	5.50E-08		
							Sum of Fractions	0.00						
11/7/1995	4.00E-03	1.00E-03	2.00E-04	8.00E-04				1.24E+00	2.10E-02	3.10E-02	3.11E-01			
11/16/1995	2.09E-03	1.40E-03	1.89E-05	0.00E+00				6.57E-01	7.92E-03	2.27E-01	3.58E-04			
							Monthly Total (mCi)	1.90E+00	2.89E-02	2.58E-01	3.11E-01			
							Conc. (uCi/ml)	1.36E-06	2.07E-08	1.84E-07	2.22E-07			
							Sum of Fractions	0.00						
12/14/1995	3.89E-01	3.93E-03	9.04E-05	2.80E-04			Monthly Total (mCi)	5.45E+00		3.02E+00	4.70E-02	7.39E-01		
							Conc. (uCi/ml)	3.89E-06		2.16E-06	3.36E-08	5.28E-07		
							Sum of Fractions	0.03						
1/13/1996	1.10E-02	1.40E-02	1.00E-03	3.00E-03			Monthly Total (mCi)	6.83E+00	6.80E-02	1.40E+00	1.03E-01	1.10E-03		
							Conc. (uCi/ml)	4.88E-06	4.86E-08	9.96E-07	7.36E-08	7.86E-10		
							Sum of Fractions	0.00						
3/19/1996	6.00E-03	4.00E-03	8.00E-04	9.00E-04			Monthly Total (mCi)	5.80E+00		7.83E-01	9.10E-02	2.81E-01		
							Conc. (uCi/ml)	4.14E-06		5.59E-07	6.50E-08	2.01E-07		
							Sum of Fractions	0.01						
5/7/1996	1.20E-02	4.00E-03	8.00E-04	3.00E-03			Monthly Total (mCi)	6.92E+00		6.44E-01	1.22E-01	1.46E-01		
							Conc. (uCi/ml)	4.95E-06		4.60E-07	8.71E-08	1.04E-07		
							Sum of Fractions	0.01						
6/17/1996	9.13E-02	5.82E-03	4.54E-05	8.80E-03			Monthly Total (mCi)	1.70E+00		1.10E-01	8.60E-04	1.59E-01		
							Conc. (uCi/ml)	1.21E-06		7.86E-08	6.14E-10	1.14E-07		
							Sum of Fractions	0.01						
7/10/1996	5.41E-02	1.56E-02						9.46E-01		9.08E-02				
7/11/1996	3.57E-03	2.12E-03	1.51E-05	9.11E-04				2.64E+00		2.01E-01	8.60E-04	1.60E-01		
							Monthly Total (mCi)	3.59E+00		2.92E-01	8.60E-04	1.60E-01		
							Conc. (uCi/ml)	2.56E-06		2.08E-07	6.14E-10	1.15E-07		
							Sum of Fractions	0.01						

Sewage Disposal

Sample Concentration (microcurie/ml)							Monthly Activity (millicurie) Concentration (microcurie/ml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	I-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	I-125	Cl-36	Ge-68
8/20/1996	4.63E-03	6.21E-03	7.51E-05	2.26E-03			Monthly Total (mCi)	4.29E+00		2.31E+00	3.64E-02	8.13E-01		
							Conc. (uCi/ml)	3.06E-06		1.65E-06	2.60E-08	5.80E-07		
							Sum of Fractions	0.03						
10/3/1996	9.06E-03	6.73E-03	1.13E-03	1.21E-03		1.66E-02	Monthly Total (mCi)	7.96E+00	5.54E-01	6.84E-01	1.07E-01	3.67E-01		6.28E-02
							Conc. (uCi/ml)	5.68E-06	3.96E-07	4.89E-07	7.65E-08	2.62E-07		4.49E-08
							Sum of Fractions	0.02						
12/17/1996	1.02E-02	2.28E-03	1.55E-03	1.01E-03				6.55E+00		8.63E-02	1.17E-01	3.81E-02		
12/20/1996	4.49E-03	1.10E-03	1.96E-03	3.59E-04				1.36E+00		1.66E-01	7.41E-02	8.39E-02		
							Monthly Total (mCi)	7.91E+00		2.52E-01	1.91E-01	1.22E-01		
							Conc. (uCi/ml)	5.65E-06		1.80E-07	1.37E-07	8.72E-08		
							Sum of Fractions	0.01						
3/21/1997	1.13E-02	1.63E-03	2.62E-04	1.39E-03			Monthly Total (mCi)	5.61E+00		3.40E-01	1.49E-02	5.27E-02		
							Conc. (uCi/ml)	4.01E-06		2.43E-07	1.06E-08	3.77E-08		
							Sum of Fractions	0.00						
4/10/1997	4.58E-02			5.17E-03				1.39E+01				1.37E+00		
4/11/1997	3.44E-01	3.44E-03	1.11E-04	1.35E-02				6.52E+03		5.21E+01	2.10E+00	1.02E+00		
4/15/1997	7.15E-02	5.13E-02	1.04E-01	7.23E-03				2.20E+01	6.80E-01	2.23E+00	3.98E+00	6.17E-01		
							Monthly Total (mCi)	6.56E+03	6.80E-01	5.43E+01	6.08E+00	3.01E+00		
							Conc. (uCi/ml)	4.68E-03	4.86E-07	3.88E-05	4.35E-06	2.15E-06		
							Sum of Fractions	0.67						
7/24/1997	5.84E-02	6.53E-03		1.04E-02				3.37E+01		1.24E-01		5.91E-01		
7/25/1997	1.20E-02		1.80E-03	5.80E-03				1.14E+00			6.81E-02	4.14E-01		
							Monthly Total (mCi)	3.48E+01		1.24E-01	6.81E-02	1.01E+00		
							Conc. (uCi/ml)	2.49E-05		8.86E-08	4.87E-08	7.18E-07		
							Sum of Fractions	0.04						
8/7/1997	4.46E-02		1.11E-04	5.34E-03			Monthly Total (mCi)	1.01E+01			2.45E-01	1.42E+00		
							Conc. (uCi/ml)	7.23E-06			1.75E-07	1.01E-06		
							Sum of Fractions	0.05						
11/30/1997	6.67E-02	8.10E-03	8.47E-03	6.87E-03			Monthly Total (mCi)	6.84E+01	2.97E-01	7.87E-01	1.46E+00	1.92E+00		
							Conc. (uCi/ml)	4.89E-05	2.12E-07	5.62E-07	1.04E-06	1.37E-06		
							Sum of Fractions	0.09						
4/8/1998	1.76E-02		8.82E-03	3.01E-03				6.97E+00			5.46E-02	5.70E-01		
4/9/1998	8.72E-02	1.64E-01	2.38E-03	2.98E-02				3.98E+01		6.19E+00	4.50E-02	5.89E+00		
							Monthly Total (mCi)	4.68E+01		6.19E+00	9.96E-02	6.46E+00		
							Conc. (uCi/ml)	3.34E-05		4.42E-06	7.12E-08	4.61E-06		
							Sum of Fractions	0.24						
10/20/1998	6.84E-02	1.12E-01		2.73E-03				1.42E+01	1.06E+00	1.06E+00		5.17E-02		
10/23/1998	3.32E-02	5.20E-01		6.92E-03				8.78E+00		2.12E+00		1.18E+00		
10/27/1998	3.70E-02		1.94E-03	4.24E-03				1.40E+01			1.21E-01	4.80E-01		
10/30/1998	2.25E-01	5.92E-02						8.49E+00		1.12E+00				
							Monthly Total (mCi)	4.55E+01	1.06E+00	4.30E+00	1.21E-01	1.71E+00		
							Conc. (uCi/ml)	3.25E-05	7.57E-07	3.07E-06	8.65E-08	1.22E-06		
							Sum of Fractions	0.07						

Sewage Disposal

Sample Concentration (microcurielml)							Monthly Activity (millicurie) Concentration (microcurielml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	1-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	1-125	Cl-36	*Ge-68*
11/3/1998	1.43E-01	6.01E-02	4.75E-01					2.71E+00		1.14E+00	8.99E+00			
11/6/1998	8.52E-03			3.00E+00				3.41E+01				1.61E-01		
							Monthly Total (mCi)	3.68E+01		1.14E+00	8.99E+00	1.61E-01		
							Conc. (uCi/ml)	2.63E-05		8.14E-07	6.42E-06	1.15E-07		
							Sum of Fractions	0.08						
3/24/1999	5.15E-02		1.16E-01					3.56E+00			2.20E+00			
3/31/1999	4.20E-02			4.13E-02				7.15E+00			7.82E-01			
							Monthly Total (mCi)	1.07E+01			2.98E+00			
							Conc. (uCi/ml)	7.65E-06			2.13E-06			
							Sum of Fractions	0.02						
4/1/1999	2.22E-02			6.35E-03			Monthly Total (mCi)	1.26E+01				1.80E+00		
							Conc. (uCi/ml)	9.02E-06				1.29E-06		
							Sum of Fractions	0.07						
8/3/1999	2.05E-02	9.08E-03	4.44E-04	1.97E-02				4.28E+00		5.97E-02	1.68E-03	1.49E+00		
8/6/1999	3.31E-02		5.33E-04	1.00E-02				1.13E+01			1.01E-02	2.47E+00		
							Monthly Total (mCi)	1.56E+01		5.97E-02	1.18E-02	3.96E+00		
							Conc. (uCi/ml)	1.11E-05		4.26E-08	8.41E-09	2.83E-06		
							Sum of Fractions	0.14						
1/11/2000	8.01E-01	2.44E-02		1.91E-01				1.50E+01		4.62E-01		3.60E+00		
1/13/2000	3.17E-02	2.22E-03		1.04E-02				1.02E+01		4.20E-02		2.00E+00		
1/17/2000	4.92E-02	1.11E-03		5.70E-03				5.66E+00		2.10E-02		3.23E-01		
							Monthly Total (mCi)	3.09E+01		5.25E-01		5.93E+00		
							Conc. (uCi/ml)	2.21E-05		3.75E-07		4.24E-06		
							Sum of Fractions	0.21						
8/21/2000	3.93E-02	1.89E-03		2.93E-03				1.49E+01		3.74E-02		2.77E-01		
8/22/2000	3.78E-02			2.47E-03				1.58E+01				5.14E-01		
							Monthly Total (mCi)	3.06E+01		3.74E-02		7.91E-01		
							Conc. (uCi/ml)	2.19E-05		2.67E-08		5.65E-07		
							Sum of Fractions	0.03						
3/22/2001	9.29E-03	1.68E-02	1.01E-02	2.83E-03			Monthly Total (mCi)	7.03E+00		6.04E+00	1.92E-01	2.68E-01		
							Conc. (uCi/ml)	5.02E-06		4.32E-06	1.37E-07	1.91E-07		
							Sum of Fractions	0.02						
1/30/2002	9.57E-03	1.47E-03		9.10E-04			Monthly Total (mCi)	9.06E+00		1.67E-01		5.16E-02		
							Conc. (uCi/ml)	6.47E-06		1.20E-07		3.69E-08		
							Sum of Fractions	0.00						
5/30/2002	1.33E-02	8.51E-04	2.44E-04	8.86E-04			Monthly Total (mCi)	7.66E+00		1.93E-01	4.61E-03	1.85E-01		
							Conc. (uCi/ml)	5.47E-06		1.38E-07	3.29E-09	1.32E-07		
							Sum of Fractions	0.01						
9/12/2003	7.33E-03	2.96E-04	5.26E-05	1.26E-03			Monthly Total (mCi)	2.36E+00		7.94E-02	9.97E-04	2.43E-01		
							Conc. (uCi/ml)	1.68E-06		5.67E-08	7.12E-10	1.74E-07		
							Sum of Fractions	0.01						

Sewage Disposal

Sample Concentration (microcurie/ml)							Monthly Activity (millicurie) Concentration (microcurie/ml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	I-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	I-125	Cl-36	Ge-68
12/16/2003	6.29E-02	5.51E-04	0.00E+00	5.84E-02				8.69E+00		1.04E-02	0.00E+00	9.46E+00		
12/29/2003	1.11E-01	4.84E-02	2.52E-02	1.24E-02				3.49E+01		3.66E+00	2.50E-01	1.88E+00		
							Monthly Total (mCi)	4.36E+01		3.67E+00	2.50E-01	1.13E+01		
							Conc. (uCi/ml)	3.11E-05		2.62E-06	1.78E-07	8.10E-06		
							Sum of Fractions	0.41						
3/30/2004	1.44E-02	1.09E-03					Monthly Total (mCi)	4.61E+00		1.52E-01				
							Conc. (uCi/ml)	3.30E-06		1.08E-07				
							Sum of Fractions	0.00						
4/26/2004	6.31E-02	3.86E-03	3.05E-03				Monthly Total (mCi)	2.32E+01	6.08E-02	1.28E+00	3.50E-02			
							Conc. (uCi/ml)	1.66E-05	4.34E-08	9.18E-07	2.50E-08			
							Sum of Fractions	0.00						
6/4/2004	1.12E-02	1.64E-01	8.85E-04	1.32E-02			Monthly Total (mCi)	4.80E+00		1.07E+01	2.68E-02	4.00E+00		
							Conc. (uCi/ml)	3.43E-06		7.68E-06	1.91E-08	2.86E-06		
							Sum of Fractions	0.15						
8/25/2004	1.68E-03			1.19E-03				4.14E-01				4.49E-02		
8/25/2004	2.65E-03	6.47E-03	1.78E-03	7.64E-04				7.53E-01		1.72E+00	3.37E-02	8.68E-02		
							Monthly Total (mCi)	1.17E+00		1.72E+00	3.37E-02	8.68E-02		
							Conc. (uCi/ml)	8.33E-07		1.23E-06	2.41E-08	6.20E-08		
							Sum of Fractions	0.00						
2/23/2005	2.20E-03	2.64E-03	2.65E-04	3.90E-02			Monthly Total (mCi)	7.92E-01		7.92E-01	1.00E-02	2.21E+00		
							Conc. (uCi/ml)	5.66E-07		5.66E-07	7.17E-09	1.58E-06		
							Sum of Fractions	0.08						
5/17/2005	1.43E-02	2.37E-03	4.81E-03	4.90E-03			Monthly Total (mCi)	5.72E+00		8.50E-01	9.11E-02	1.85E-01		
							Conc. (uCi/ml)	4.08E-06		6.07E-07	6.50E-08	1.32E-07		
							Sum of Fractions	0.01						
8/3/2005	1.37E-02	5.07E-04		1.70E-04				5.19E+00		1.82E-01		1.70E-04		
8/23/2005	1.46E-02	4.96E-04		2.95E-04				4.69E+00		8.44E-02		1.67E-02		
							Monthly Total (mCi)	9.89E+00		2.67E-01		1.69E-02		
							Conc. (uCi/ml)	7.06E-06		1.90E-07		1.21E-08		
							Sum of Fractions	0.00						
12/7/2005	5.43E-03	7.00E-04	2.61E-04	1.41E-04			Monthly Total (mCi)	2.55E+00		3.17E-01	4.95E-03	1.87E-02		
							Conc. (uCi/ml)	1.82E-06		2.27E-07	3.53E-09	1.33E-08		
							Sum of Fractions	0.00						
5/26/2006	5.22E-03	1.26E-04						6.92E-01		7.14E-03				
5/30/2006	1.39E-03	1.16E-03		4.70E-04				3.26E-01		1.46E-01		2.67E-02		
							Monthly Total (mCi)	1.02E+00		1.53E-01		2.67E-02		
							Conc. (uCi/ml)	7.27E-07		1.09E-07		1.91E-08		
							Sum of Fractions	0.00						
9/20/2006	4.58E-03	1.06E-04						6.06E-01		6.00E-03				
9/30/2006	4.53E-03	1.41E-03						9.89E-01		1.57E-01	1.43E-01			
							Monthly Total (mCi)	1.59E+00		1.63E-01	1.43E-01			
							Conc. (uCi/ml)	1.14E-06		1.17E-07	1.02E-07			
							Sum of Fractions	0.00						

Sewage Disposal

Sample Concentration (microcurie/ml)							Monthly Activity (millicurie) Concentration (microcurie/ml) and Sum of Fractions Monthly Water Usage 1.4 X E9 ml (1.74E4 Gal/day)							
Disposal date	H-3	C-14/S-35 /P-33	P-32	1-125	Cl-36	Ge-68	Summary	H-3	C-14	S-35/P-33	P-32	1-125	Cl-36	Ge-68
10/25/2006	4.59E-03	1.08E-04						6.09E-01		8.17E-03				
10/26/2006	4.34E-03	1.41E-03						9.66E-01	4.54E-03	1.55E-01				
							Monthly Total (mCi)	1.58E+00	4.54E-03	1.63E-01				
							Conc. (uCi/ml)	1.13E-06	3.24E-09	1.16E-07				
							Sum of Fractions	0.00						
11/15/2006	1.71E-03	2.31E-05					Monthly Total (mCi)	2.59E-01		3.50E-03				
							Conc. (uCi/ml)	1.85E-07		2.50E-09				
							Sum of Fractions	0.00						
2/17/2007	6.84E-04	8.78E-04					Monthly Total (mCi)	2.25E-01		1.51E-01	2.44E-03			
							Conc. (uCi/ml)	1.60E-07		1.08E-07	1.74E-09			
							Sum of Fractions	0.00						
10/30/2007	9.40E-02	1.39E-02					Monthly Total (mCi)	2.02E+00	4.51E-01	1.08E-01				
							Conc. (uCi/ml)	1.44E-06	3.22E-07	7.72E-08				
							Sum of Fractions	0.00						
4/16/2008	2.06E-01						Monthly Total (mCi)	2.47E+01						
							Conc. (uCi/ml)	1.77E-05						
							Sum of Fractions	0.00						

FedEx Express US Airbill

FedEx Tracking Number 8663 9250 9587

Form ID No. 0215

SPH21

Recipient's Copy

RECIPIENT: PEEL HERE

1 From This portion can be removed for Recipient's records.

Date 1/23/09 FedEx Tracking Number 866392509587

Sender's Name John Jacobus Phone 301 594-4018

Company NIH/OD/ORS/DRS CAN8362498

Address 21 WILSON DR MSC6780 RM 116

Dept./Floor/Suite/Room

City BETHESDA State MD ZIP 20892-0001

2 Your Internal Billing Reference

3 To

Recipient's Name Dennis Lawyer Phone 610-337-5366

Company U.S. Nuclear Regulator Commission, Region I

Recipient's Address NMMS Branch II, Division Nuc Mat Safety

We cannot deliver to P.O. boxes or P.O. ZIP codes. Dept./Floor/Suite/Room

Address 475 Allendale Road

To request a package be held at a specific FedEx location, print FedEx address here.

City King of Prussia State PA ZIP 19406-1415

0384198894

8663 9250 9587

4a Express Package Service *Packages up to 150 lbs.*

- [ ] FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [x] FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- [ ] FedEx First Overnight — Earliest next business morning delivery to select locations.* Saturday Delivery NOT available.
- [ ] FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Express Saver — Third business day.* Saturday Delivery NOT available.

FedEx Envelope rate not available. Minimum charge: One-pound rate.

* To most locations.

4b Express Freight Service *Packages over 150 lbs.*

- [ ] FedEx 1Day Freight* — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

* Call for Confirmation: ** To most locations.

5 Packaging

- [ ] FedEx Envelope*
- [ ] FedEx Pak* — Includes FedEx Small Pak, FedEx Large Pak, and FedEx Sturdy Pak.
- [x] FedEx Box
- [ ] FedEx Tube
- [ ] Other

* Declared value limit $500.

6 Special Handling — Include FedEx address in Section 3.

- [ ] **SATURDAY Delivery** — Not available for FedEx Standard Overnight, FedEx First Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- [ ] **HOLD Weekday** at FedEx Location — Not available for FedEx First Overnight.
- [ ] **HOLD Saturday** at FedEx Location — Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

Does this shipment contain dangerous goods? One box must be checked.

- [x] No
- [ ] Yes — As per attached Shipper's Declaration
- [ ] Yes — Shipper's Declaration not required.
- [ ] Dry Ice — Dry ice, 9, UN 1845 ____ x ____ kg
- [ ] Cargo Aircraft Only

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging.

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below.

- [x] Sender — Acct. No. in Section 1 will be billed.
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

Obtain Recip. Acct. No. [ ]

Total Packages 1 Total Weight 5 lbs

Credit Card Auth.

†Our liability is limited to $100 unless you declare a higher value. See the current FedEx Service Guide for details.

8 Residential Delivery Signature Options If you require a signature, check Direct or Indirect.

- [ ] No Signature Required — Package may be left without obtaining a signature for delivery.
- [x] Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
- [ ] Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. *Fee applies.*

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143233

This is to acknowledge the receipt of your letter/application dated

1/22/2009, and to inform you that the initial processing which includes an administrative review has been performed.

TEM. 19-09760-02

☑ There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

_____.

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 143233.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader