Pfizer Inc
700 Chesterfield Pkwy West
Chesterfield, MO 63017-1732

Global Research & Development

April 1, 2009

Ms. Patricia J. Pelke
United States Nuclear Regulatory Commission,
Region III Materials Licensing Branch
2443 Warrenville Road, Suite 210
Lisle, IL 60532-4352

Subject: License Amendment Request to Remove the Newstead Avenue Site
(License Number 24-32439-01)

Dear Ms. Pelke:

This letter is to request an amendment to radioactive materials license number 24-32439-01 authorizing unrestricted release of the Newstead Avenue site. The facility is located at 645 South Newstead Avenue, St. Louis. MO 63110.

Licensed activities have ceased and the facility has undergone decommissioning. Decommissioning was conducted under the provisions of the Pfizer radioactive materials license and in accordance with a MARSSIM-based Decommissioning Work Plan. The enclosed Final Status Report provides conclusive evidence that the facility meets the criteria for unrestricted use specified in 10 CFR 20 Subpart E. Dose modeling indicates that the TEDE to an average member of the critical group is < 0.006 mrem/year (< 0.03% of the NRC release criterion of 25 mrem/yr) using the results of the survey unit with the highest average activity.

I have personally inspected the facility and verified that all licensed radioactive material and all radioactive markings have been removed from the site.

Real estate transaction for this site is pending upon being granted NRC unrestricted release and anything you can do to expedite amendment would be greatly appreciated.

Pfizer Inc
700 Chesterfield Pkwy West
Chesterfield, MO 63017-1732

Global Research & Development

I appreciate your time and efforts with this matter and look forward to hearing back from you. If you have any questions or concerns, please contact me at 636-247-2527.

Sincerely yours,

Kevin Sharkey

Kevin Sharkey
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Newstead Avenue Site Decommissioning Final Status Report

Pfizer Global Research and Development
645 South Newstead Ave.
St. Louis, MO 63110

NRC License Number 24-32439-01
Issued to Pharmacia Corporation
(Wholly Owned Subsidiary of Pfizer, Inc.)

March 24, 2009

Prepared by:
Chase Environmental Group, Inc.
109 Flint Road
Oak Ridge, TN 37830
865-481-8801

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March 24, 2009

Prepared:	Ken Gavlik	Radiological Engineer	Date:	3/24/09
Technical Review:	Patrick McDermott	Certified Health Physicist	Date:	3/30/09
Approved:	Dave Culp	Project Manager	Date:	3/30/09

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109 Flint Road
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APPENDICES

ACRONYMS

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
$DCGL_{EMC}$	Derived Concentration Guideline Level – Elevated Measurement Comparison
$DCGL_W$	Derived Concentration Guideline Level – Wilcoxon Rank Sum
DWP	Decommissioning Work Plan
DQA	Data Quality Assessment
DQO	Data Quality Objective
DSV	Default Screening Value
FSS	Final Status Survey
GSF	Gross Square Feet
HSA	Historical Site Assessment
LBGR	Lower Bound of the Gray Region
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
NRC	U.S. Nuclear Regulatory Commission
NIST	National Institute of Standards and Technology
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
RSO	Radiation Safety Officer
TEDE	Total Effective Dose Equivalent

1.0 Executive Summary

Pfizer Global Research and Development has decided to permanently cease licensed activities and decommission their St. Louis area satellite location at 645 South Newstead Ave, St. Louis, MO 63110. Facilities include research laboratories, offices, vivarium space, and other support areas. The site is being decommissioned for unrestricted use and offered for sale. Pfizer is requesting a license amendment to remove the site from radioactive materials license number 24-32439-01 issued to Pharmacia Corporation, a wholly owned subsidiary of Pfizer, Inc.

Radioactive materials used at the facility consisted of a variety of radionuclides for research. Primarily these included H-3, C-14, P-33, S-35 and I-125. Pfizer has conducted a historical site assessment and classified facility areas according to MARSSIM classifications. Based on an analysis of the default screening values, quantities used, physical forms, half-lives, and receipt and distribution records, H-3 and C-14 are the only nuclides of concern for decommissioning.

Pfizer was first authorized to use byproduct materials at the site under the current license on April 8, 2004.[1] Research activities involving radioactive materials ceased and all radioactive materials were shipped off-site in March 2009, prior to performing decommissioning activities discussed in this report. All radioactive waste generated as a result of remediation for ALARA purposes were packaged as radioactive waste and shipped off-site on March 23, 2009.

Pfizer procured Chase Environmental Group, Inc. (Chase) to perform decommissioning activities. Decommissioning was conducted under the provisions of the Pfizer radioactive materials license and in accordance with a project-specific Decommissioning Work Plan (DWP) and a Quality Assurance Project Plan (QAPP). On-site activities were performed from March 18 to 22, 2009.

The DWP was developed using the guidance provided in NUREG 1757, "Consolidated NMSS Decommissioning Guidance"; and NUREG 1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM). It provided the approach, methods, and techniques for the radiological decommissioning of impacted areas of the facility. Final status surveys were designed to implement the protocols and guidance provided in MARSSIM to demonstrate compliance with the default screening values (DSV) specified in NUREG 1757, Appendix B or generated using the default scenarios and parameters of the DandD code v.2.1. These methods ensured technically defensible data were generated to aid in determining whether or not the facility meets the release criteria for unrestricted use specified in 10 CFR 20 Subpart E.

Pfizer established conservative ALARA goals based on a combination of Pfizer operational limits and the release criteria for equipment and materials specified in FC 83-

[1] Research activities conducted by Monsanto date back to the mid 1970's.

23, "Guidelines for the Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Byproduct, Source, or Special Nuclear Material Licenses." Specifically, the following surface contamination limits were used for decommissioning activities:

- 5,000 dpm/100cm^2 total surface contamination (averaged over 1m^2)
- 15,000 dpm/100cm^2 maximum total surface contamination (limited to 100 cm^2)
- 200 dpm/100cm^2 removable surface contamination (each LSC channel)

Facility characterization surveys identified several locations on building structural surfaces with residual radioactivity above ALARA goals, but at a small fraction of the DSV. The highest result was 330K dpm/100cm^2 (8.9 % of the DSV). All surfaces with elevated activity were remediated, but several persistent areas were unable to be cleaned to below the ALARA goals and were left in place because they were a small fraction of the DSV and had very low levels of removable contamination.

This report presents sufficient data to support the conclusion that the facility meets the NRC release criteria. Final status surveys demonstrate that building structural surfaces and systems included in the scope of this report are orders of magnitude below release criteria and are suitable for unrestricted release. All final status surface contamination measurements were a small fraction of the DSVs. Based on the Building Occupancy Scenario of NRC DandD dose modeling software Version 2.1, **the Total Effective Dose Equivalent (TEDE) to an average member of the critical group is < 0.006 mrem/year (< 0.03% of the release criterion of 25 mrem/yr)** using the results of the survey unit with the highest average activity.

Pfizer requests that the NRC release the site for unrestricted use and amend radioactive materials license number 24-32439-01 to remove the site as an area of authorized usage of radioactive materials.

2.0 Site Descriptions and History

2.1 Historical Site Assessment

Pfizer contracted Chase to perform a Historical Site Assessment (HSA) in October 2008. The purpose of the HSA was to determine the current status of the facility including potential, likely, or known sources of radioactive contamination by gathering data from various sources. This data includes physical characteristics and location of the site as well as information determined from personnel interviews and found in site operating records, including radiological surveys.

Records reviewed included: radioactive materials licenses, license applications, amendment requests, meeting minutes, radiological surveys, radionuclide receipt and distribution records, incident reports, facility renovation records, blueprints, plans and design specifications. Personnel interviews included radiation safety, maintenance,

operations, and facilities personnel. The records review only included records in Pfizer's files dating back to 2003 and did not include Monsanto records that include operations since the beginning of radioactive materials usage at the site. However, there is a high degree of confidence in the knowledge of historical operations relevant to decommissioning because interviews included personnel with knowledge of historical operations conducted under the Monsanto license since its inception.

2.2 Ownership

The site is owned by Pfizer.

2.3 Potential Contaminants

Potential contaminants were determined from license files, including survey and materials receipt records and personnel interviews. Table 2-1 lists the nuclides used at the facility. This list was compiled through review of radionuclide receipt and distribution records, radioactive waste records, audit and survey records, and interviews with facility personnel.

Table 2-1 Radionuclides Used

Nuclide	Half Life (years)	Dispersible Form?	Half Life >120 days?
H-3	12.3 y	YES	YES
C-14	5730 y	YES	YES
P-33	24.4 d	YES	NO
S-35	87.9 d	YES	NO
I-125	60.2 d	YES	NO

All short-lived nuclides ($t_{1/2}$ < 120 days) were eliminated from consideration as nuclides of concern based on calculations of the potential residual activity that could remain as a result of their usage.[2] After considering quantities of radionuclides used, the locations of use, and the impact of radioactive decay, the nuclides of concern are H-3 and C-14.

Sealed sources used at the site include those found in analytical instruments. These instruments, along with the sources, have been relocated to other Pfizer licensed facilities. There has never been any indication of a leaking sealed source at the site.

2.4 License History

The facility operated under Broad Scope Type B license number 24-32439-01, Amendment 5, issued March 17, 2009 with an expiration date of April 30, 2014. Amendment 3

[2] For short-lived nuclides, the decay-corrected activities of all receipts of each nuclide in each room were summed. The surface contamination level resulting from evenly spreading one percent of the summed activities over an area of one square meter were calculated for each room and compared to the DSVs. If the resulting surface contamination was less than the DSV, then the nuclide was eliminated from consideration as a nuclide of concern. It should be noted that these nuclides would be detected and controlled at a fraction of their DSV using the survey protocols and ALARA goals designed for C-14.

possession limits and authorized uses are summarized in Table 2-2. Radioactive materials license files were reviewed to identify historical operations, nuclides used and quantities used. Essentially, licensed operations for research and development did not change over the history of the license. In fact, based on interviews, research operations did not change much over the history of operations at the site (dating back to the mid 1970's). Because the license authorizes usage at multiple sites, radioactive materials receipt and use records offered the most insight regarding potential nuclides of concern and quantities used at the Newstead site.

Table 2-2 Current Possession Limits and Uses[3]

Isotope	Physical Form	Possession Limit (mCi)	Authorized Usage
Atomic # 1-83	Any	100 mCi per nuclide, total not to exceed 5 Ci	R&D as defined 10CFR30.4 including animal studies
Hydrogen-3	Any	25 Ci	R&D as defined 10CFR30.4 including animal studies
Carbon-14	Any	5 Ci	R&D as defined 10CFR30.4 including animal studies
P-32	Any	3 Ci	R&D as defined 10CFR30.4 including animal studies
P-33	Any	2 Ci	R&D as defined 10CFR30.4 including animal studies
S-35	Any	5 Ci	R&D as defined 10CFR30.4 including animal studies
I-125	Any	500 mCi	R&D as defined 10CFR30.4 including animal studies
Ni-63	Foils or plated sources	no single source to exceed 15 mCi, 30 sources total	Gas chromatograph sample analysis
Cs-137	Sealed Source	2 sources not to exceed 2100 Ci each	Gammacell 40 irradiator for biological samples and small animals

Amendments were reviewed to evaluate how operations changed and the relevance to decommissioning. Amendments are described in Table 2-3.

[3] Possession limits are for all three St. Louis area Pfizer sites and are not specific to the Newstead Avenue site. For example, the Gammacell is not located at the Newstead Avenue site.

Table 2-3 License Amendment History

Amendment	Date	Description
5	3/17/09	Removed 800 North Lindbergh Blvd., Creve Coeur, MO facility from the license.
4	1/13/09	Added a new research building at the Chesterfield site.
3	7/5/2005	Changed name to Pharmacia Corporation, a wholly owned subsidiary of Pfizer, Inc.
2	4/1/2005	Changed name to Pharmacia LLC Changed wording on reporting of leaking sources
1	7/12/2004	Changed RSO
Original	4/8/2004	

2.5 Operational and Closeout Radiological Surveys

During the HSA, the radiological status of the facility was determined by reviewing historical survey records and interviewing Radiation Safety personnel. During operation, facility surfaces were maintained <200 dpm/100cm^2 removable surface contamination. The facility conducted routine periodic surveys, which were performed by researchers and Radiation Safety personnel. Laboratory closeout procedures were used when researchers completed experiments involving radioactive materials. In addition to removable contamination measurements, laboratory closeout procedures involved beta-gamma scan surveys using a pancake GM detector, low energy gamma scans using a low energy gamma scintillator, and gamma dose rate measurements using a micro-R meter.

In February 2005, the waste handling room walk-in hood was identified as having removable contamination up to 27K dpm/100cm^2 H-3 and 21K dpm/100cm^2 C-14 on the floor. The floor was decontaminated to <200 dpm/100cm^2 removable.

Three of the four fume hoods in Room 217 were removed in 2006. Structural surfaces in the laboratory were surveyed during and after removal of the hoods. The terminated ducts were surveyed as part of the final status survey discussed in this report.

Pfizer contracted Energy Solutions to perform characterization surveys in July and August 2008. The surveys included fume hoods and ducts for laboratory rooms 176, 177, 217 and 219C; the interstitial waste handling room; and roof vents and ducts for labs 174, 175, 176, and 177. Elevated activity above 5,000 dpm/100cm^2 total surface activity and 1,000 dpm/100cm^2 removable surface activity was identified in the Room 217 fume hood and exhaust duct, Room 176 fume hood exhaust duct, and Room 177 fume hood and exhaust duct. Direct measurements were taken with a Ludlum 2350-1 and 43-68 gas flow proportional probe. A summary of the maximum activity levels found for each area of elevated activity is presented in Table 2-4.

Table 2-4 Elevated Activity Identified by Energy Solutions

Location	Maximum Activity (dpm/100cm^2)	
	Total	Removable
Lab 177	7,279	2,294 – ^{3}H 1,160 – ^{14}C
Lab 176	9,050	Not Elevated
Lab 217	11,431	2,390 – ^{3}H 5,561– ^{14}C

2.6 Previous Decommissioning Activities

There have been no decommissioning activities conducted at the site.

3.0 Current/Future Use

Pfizer will offer the site for sale after achieving unrestricted release.

4.0 Impacted Building Description

The building was built in 1975 and an annex was added onto the west side in the early 1980's. The annex contains Rooms 170 to 178 on the first floor, a first floor interstitial area, offices 270 to 278 on the second floor and the west elevator. It is a two story building with a basement and interstitial spaces above each elevation for utilities and mechanical equipment. The main entrance to the building is on the north side second floor. The first floor is a vivarium with animal holding rooms, procedure rooms, labs and other support areas. The second floor historically contained animal facilities that have been converted to office, laboratory, and storage space. The basement houses mechanical equipment including exhaust fans and an inactive incinerator. The incinerator has never been used to incinerate radioactive materials or animals containing radioactive materials.

The building is a steel beam structure with concrete block walls and concrete floors. Laboratory and animal room floors have epoxy or vinyl sheet floor coverings. Offices are carpeted and mechanical room floors are sealed concrete.

Laboratory and animal areas are maintained at a negative pressure relative to office and common areas. Fume hood ventilation is accomplished by exhaust fans located in the basement for the original portion of the building, and on the roof for the annex.

Vacuum is supplied by a Nash tank-mounted vacuum pump located in first floor mechanical room 178. Researchers were required to use collection traps between radioactive materials and vacuum nozzles to prevent contamination of the central vacuum system. There has never been any radioactivity identified during maintenance of the vacuum system.

Laboratory drains are discharged into the sanitary sewer system at the east end of the building without treatment or retention. Sewer disposal of licensed material was not authorized in laboratory sinks. Liquid radioactive wastes were collected and disposed at a different site. A cleanout for the main laboratory drain line just prior to exiting the east end of building was surveyed as part of the final status survey.

Radioactive wastes were packaged and stored in the first floor interstitial area. Carcasses and compounds requiring refrigeration were stored in walk-in freezer room 127 on the first floor. Wastes were periodically shipped off-site via the shipping and receiving dock on the first floor.

A site plan is included as Appendix A.

5.0 Facility Release Criteria

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

6.0 Nuclides of Concern

After considering results of the HSA and scoping surveys, quantities and locations of usage, and the impact of radioactive decay, the nuclides of concern are C-14 and H-3.

7.0 Derived Concentration Guideline Levels

The NRC has published default screening values in NUREG 1757 for commonly used radionuclides. The nuclides of concern screening values for surfaces under default conditions (generic screening levels) from NUREG 1757, Volume 1, Appendix B are provided in Table 7-1.

Table 7-1 Default Screening Values for Nuclides of Concern

Isotope	Half-life	Radiation Type	Default Screening Value ($dpm/100cm^2$)
H-3	12.3 years	Beta	1.2E8
C-14	5730 years	Beta	3.7E6

The default screening values (DSV) are the basis for developing the derived concentration guideline levels (DCGL's) for the project. The DCGL is the radionuclide specific surface activity concentration that could result in a dose equal to the release criterion. $DCGL_W$ is the concentration limit if the residual activity is essentially evenly distributed over a large area. For this project, $DCGL_W$ is equal to the DSV. In the case

of non-uniform contamination, MARSSIM allows for evaluation of higher levels of activity over small areas using the $DCGL_{EMC}$. Due to the radiological cleanliness of the facility and Pfizer's conservative ALARA goal, small areas of elevated activity above the $DCGL_W$ are not considered. Additionally, due to Pfizer's conservative ALARA goal, application of the unity rule for multiple radionuclides is not required to demonstrate compliance with the release criteria. An important assumption of the dose model is that removable contamination is <10% of total contamination. Historical survey results as well as characterization, final status and QA survey results confirm that removable contamination levels are very low and meet this assumption. H-3 cannot be accurately detected directly by field instrumentation due to its low energy. Therefore, H-3 contamination was evaluated by removable contamination measurements only.

8.0 ALARA Goals

Pfizer established conservative ALARA goals based on operational removable contamination limits and the release criteria specified in FC 83-23, "Guidelines for the Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Byproduct, Source, or Special Nuclear Material Licenses." Specifically, the following surface contamination limits were used for decommissioning activities:

- 5,000 dpm/100cm^2 total surface contamination (averaged over 1m^2)
- 15,000 dpm/100cm^2 maximum total surface contamination (limited to 100 cm^2)
- 200 dpm/100cm^2 removable surface contamination (per LSC channel)

Because of the conservatism of the ALARA goals, these criteria were applied to gross beta measurements and the unity rule was not applied. The number of measurements required by MARSSIM to demonstrate compliance with the release criteria was calculated using the $DCGL_W$ and not the ALARA goal.

9.0 ALARA Analysis

Due to the extremely low doses associated with residual radioactivity at the facility, a quantitative ALARA analysis was not required. Default screening values were used to establish DCGLs. Furthermore, Pfizer routinely maintained all laboratory areas of the facility at levels less than 200 dpm/100cm^2 removable activity.

NUREG 1757, Volume 2, Appendix N states in part: "For ALARA during decommissioning, all licensees should use typical good-practice efforts such as floor and wall washing, removal of readily removable radioactivity in buildings or in soil areas, and other good housekeeping practices. In addition, licensees should provide a description in the FSSR [final status survey report] of how these practices were employed to achieve the final activity levels. In light of the conservatism in the building surface and surface soil generic screening levels developed by NRC, NRC staff presumes, absent information to the contrary, that licensees who remediate building surfaces or soil to the

generic screening levels do not need to provide analyses to demonstrate that these screening levels are ALARA. In addition, if residual radioactivity cannot be detected, it may be assumed that it has been reduced to levels that are ALARA. Therefore, the licensee may not need to conduct an explicit analysis to meet the ALARA requirement."

10.0 Project Management and Organization

Due to the radiological cleanliness of the facility and the relative simplicity of the final status survey design, a complex management organization was not required. Decommissioning operations were conducted under the same Pfizer management structure as current licensed activities. Chase Environmental Group, Inc. (Chase), a licensed D&D services provider, was contracted to perform all decommissioning activities. Chase conducted activities under the direction of the Pfizer Radiation Safety Officer. A Pfizer Project Manager was assigned to coordinate activities between Chase and Pfizer management. Decommissioning tasks were performed according to written plans and procedures approved by Pfizer management to ensure they provided adequate worker protection and complied with the facility radioactive materials license.

11.0 Training

Pfizer provided all contractors with radiation worker training required by the facility radioactive materials license. Chase provided training for D&D-specific programs, plans and procedures.

12.0 Radiation Safety and Health Program

Radiological work was performed according to the Pfizer radioactive materials license Radiation Safety Program under the management and supervision of the facility Radiation Safety Officer.

13.0 Environmental Monitoring Program

Due to the simplicity of this project, a project-specific environmental monitoring program was not required.

14.0 Radioactive Waste Management

All radioactive wastes generated during decommissioning were packaged in DOT-approved shipping containers and shipped to the Pfizer Chesterfield site.

15.0 Quality Assurance Program

Chase operated under a project-specific Quality Assurance Project Plan (QAPP) utilizing the guidelines of MARSSIM Section 9. The QAPP was developed and organized with emphasis given to maximizing worker safety, minimizing/eliminating off-site releases and minimizing overall project costs.

16.0 Survey Instrumentation

16.1 Instrument Calibration

Laboratory and portable field instruments were calibrated within the previous year with National Institute of Standards and Technology (NIST) traceable sources of the nuclides of concern. Portable instrument calibration records are included as Appendix C. Liquid scintillation counter records are maintained in Pfizer license files.

16.2 Functional Checks

Functional checks were performed at least daily when in use. The background, source check, and field measurement count times for radiation detection instrumentation were specified by procedure to ensure measurements were statistically valid. Background readings were taken as part of the daily instrument check and compared with the acceptance range for instrument and site conditions.

16.3 Determination of Counting Times and Minimum Detectable Concentrations

Minimum counting times for background determinations and measurement of total and removable contamination were chosen to provide a minimum detectable concentration (MDC) that met the DQOs. MARSSIM equations relative to building surfaces have been modified to convert to units of dpm/100cm^2. Count times and scanning rates are determined using the following equations:

16.3.1 Static Counting

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

Equation 1

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

Where:

MDC_{static} = minimum detectable concentration (dpm/100cm^2)
B_r = background count rate (counts per minute)
t_b = background count time (minutes)
t_s = sample count time (minutes)
E_{tot} = total detector efficiency for radionuclide emission of interest (cpm/dpm)
A = detector probe area (cm^2)

A typical static MDC calculation for the Ludlum Model 43-68 gas flow proportional detector is shown below:

$$MDC_{STATIC} = \frac{3 + 3.29\sqrt{(500)(1)\left(1+\frac{1}{1}\right)}}{(1)(0.13)\frac{126}{100}} = 653\,\text{dpm}/100\text{cm}^2$$

16.3.2 Ratemeter Scanning

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

Equation 2

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

Where:

MDC_{scan} = minimum detectable concentration (dpm/100 cm^2)
d' = desired performance variable (1.38)
b_i = background counts during the residence interval (counts)
i = residence interval (seconds)
p = surveyor efficiency (0.5)
E_{tot} = total detector efficiency for radionuclide emission of interest (cpm/dpm)
A = detector probe area (cm^2)

A typical MDC_{SCAN} calculation for the Ludlum 43-37 gas flow proportional detector is shown below:

$$\text{i} = 13.3\,\text{cm}\cdot\frac{\text{inch}}{2.54\,\text{cm}}\cdot\frac{\text{sec}}{80\,\text{inch}}\cdot = 0.065\,\text{sec}$$

$$\text{b}_\text{i} = 0.065\,\text{sec}\cdot\frac{1000\,\text{counts}}{\text{minute}}\cdot\frac{\text{minute}}{60\,\text{sec}} = 1.08\,\text{counts}$$

$$MDC_{SCAN} = \frac{1.38\sqrt{1.08}\left(\frac{60}{0.065}\right)}{\left(\sqrt{0.5}\right)(0.13)\left(\frac{582}{100}\right)} = 2474 \text{ dpm/100cm}^2$$

16.3.3 Smear Counting

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

Equation 3

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

Where:

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

Typical MDC calculations for H-3 and C-14 are shown below.

$$^{3}\text{H MDC}_{\text{SMEAR}} = \frac{3 + 3.29\sqrt{(12)(1)\left(1 + \frac{1}{1}\right)}}{(1)(0.40)} = 48 \text{ dpm}$$

$$^{14}\text{C MDC}_{\text{SMEAR}} = \frac{3 + 3.29\sqrt{(13)(1)\left(1 + \frac{1}{1}\right)}}{(1)(0.80)} = 25 \text{ dpm}$$

16.4 Instrumentation Specifications

The instrumentation used for facility decommissioning surveys is summarized in the following tables. Table 16-1 lists the standard features of each instrument such as probe size and efficiency. Table 16-2 lists the typical operational parameters such as scan rate, count time, and the associated Minimum Detectable Concentrations (MDC).

Table 16-1 Instrumentation Specifications

Detector Model	Detector Type	Detector Width	Detector Area	Meter Model	Window Thickness	Typical 4π Efficiency
Ludlum 43-68	Gas Flow Proportional	8.8 cm	126 cm^2	Ludlum 2241	0.8 mg/cm^2	13 % (C-14)
Ludlum 43-37 Floor Monitor	Gas Flow Proportional	13.3 cm	582 cm^2	Ludlum 2241	0.8 mg/cm^2	13 % (C-14)
Packard TriCarb	Liquid Scintillation	N/A	N/A	N/A	N/A	40% (H-3) 80% (C-14)

Table 16-2 Typical Instrument Operating Parameters and Sensitivities

Measurement Type	Detector Model	Max. Scan Rate[4]	Count Time	Background (cpm)	MDC ($dpm/100cm^2$)
Surface Scans	Ludlum 43-68	20 in./sec.	N/A	500	4,958 (C-14)
Surface Scans	Ludlum 43-37	80 in./sec.	N/A	1000	2,474 (C-14)
Total Surface Activity	Ludlum 43-68	N/A	60 sec.	500 (60 sec.)	653 (C-14)
Total Surface Activity	Ludlum 43-37	N/A	60 sec.	1000 (60 sec.)	198 (C-14)
Removable Activity	Packard TriCarb	N/A	60 sec.	12 (H-3) 13 (C-14)	48 (H-3) 25 (C-14)

16.5 Efficiency Determination

The ALARA goals are conservatively based on FC 83-23 criteria in which activities are determined using 4π instrument efficiency. MARSSIM protocols for building structures use ISO-7503-1 methodology that takes into account the texture of the surface and the 2π detector efficiency. Under MARSSIM, the default surface efficiency for beta emitters with maximum energies less than 400 KeV is conservatively set at 0.25, resulting in a total efficiency of approximately one half of the 4π efficiency. To reconcile this incongruity and to aid in data management, the 4π calibration efficiency was used to determine field measurement activities. However the calculated dose to demonstrate compliance with the facility release criteria for each survey unit was doubled to correct for the ISO- 7503-1 surface efficiency. This methodology was chosen because:

[4] Maximum scan rates were based on achieving MDC objectives. Actual scan rates were much slower.

- Application of the ISO-7503-1 surface efficiency would significantly impact final status survey time and data quality while providing no credible benefit. The impact would be in the form of slower scanning speeds, longer counting times and magnification of the variability of the natural background radioactivity present in some building materials.
- Structures being surveyed are primarily sheet metal, plastic, glass, vinyl, sheetrock and finished concrete that have smooth surfaces similar to the electroplated calibration source used to determine the 4π instrument efficiency.
- The MARSSIM default surface efficiency is conservatively based on structural surfaces usually encountered in decommissioning projects such as scabbled concrete and not on the structural surfaces usually encountered in a pristine laboratory environment.
- FC 83-23 criteria are not dose-based resulting in extreme conservatism for low energy beta emitters. For example, Co-60 would result in a modeled dose of 17.6 mrem/yr at the FC 83-23 criterion of 5,000 dpm/100 cm^2 (this is equivalent to 2.6E6 dpm/100cm^2 C-14).
- NUREG 1507 research indicates that ISO-7503-1 surface efficiencies for low energy beta emitters are overly conservative for typical decommissioning conditions and surface efficiencies closer to 0.5 are warranted. [5]
- The higher efficiencies apply only to the self-imposed ALARA goals that are orders of magnitude less than the DCGL. All final status dose results presented in this report are corrected to account for the ISO-7503-1 methodology.

17.0 Data Quality Objectives (DQO)

- Static measurements were taken to achieve an MDC_{static} of less than the ALARA goal of 5,000 dpm/100cm^2.
- Scanning was conducted at a rate to achieve an MDC_{scan} of less than 5,000 dpm/100cm^2.
- Removable contamination measurements were counted to achieve an MDC_{smear} of less than 200 dpm/100cm^2.
- Individual measurements were made to a 95% confidence interval.
- Decision error probability rates were set at 0.05 for both α and β.
- The null hypothesis (H_0) and alternate null hypothesis (H_A) are that of NUREG 1505 scenario A:
  H_0 is that the survey unit does not meet the release criteria
  H_A is that the survey unit meets the release criteria
- Quality assurance surveys were conducted at a rate of 5%.
- Characterization and remedial action support surveys were conducted under the same quality assurance criteria as final status surveys such that the data may be used as final status survey data to the maximum extent possible.

[5] Abelquist, Decommissioning Health Physics, p 228

Instrument operating parameters and methodologies were established to meet the DQOs. Additionally, investigation levels were developed to verify the assumptions for classifying survey units. If these investigation levels were exceeded, an investigation was performed to verify the initial assumptions behind the classification and determine the appropriate resolution. The established investigation levels are summarized in Table 17-1.

Table 17-1 Survey Investigation Levels[6]

Survey Unit Classification	Flag Direct Measurement or Sample Result When:	Flag Scanning Measurement Result When:	Flag Removable Measurement Result When:
All	>5,000 dpm/100cm^2	>5,000 dpm/100cm^2	> 200 gross dpm/100cm^2 in any channel

18.0 Area Classifications

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

18.1 Non-Impacted Area

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

- The east and west office areas on the second floor
- Structural surfaces above a two meter height
- Building exterior surfaces (except selected roof surfaces)
- Surface and subsurface soils of outside grounds
- Internal surfaces of positive pressure systems (air, nitrogen, gas, etc.)

Based on historical operations, a potential existed for residual contamination from spills or tracking on surfaces less than two meters in height. Thorough surveys of building and impacted area entrances/exits and ventilation exhausts were conducted during characterization to provide adequate assurance that any residual contamination was contained within the building structure. Additionally, all building exhausts were surveyed.

18.2 Impacted Areas

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

[6] Investigation levels were selected to be the same as the ALARA goals.

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

18.2.1 Class 1 Area

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

18.2.2 Class 2 Area

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

18.2.3 Class 3 Area

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

The radiological status of the facility was determined by reviewing historical survey records, interviewing Radiation Safety personnel and performing scoping surveys. The facility was maintained < 200 dpm/100cm^2 removable surface contamination. Direct measurements taken during routine surveys and closeout procedures demonstrate that the facility was maintained at a very small fraction of the default screening values. Extensive survey data were available to conclude that the facility met the NRC release criteria and that Class 3 was appropriate for all impacted areas.

18.3 Survey Units

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

Survey Unit Numbering Protocol

Each survey unit is assigned a unique number consisting of a four digit identifier consisting of one digit for the elevation, one digit for the classification and two digits as a numerical identifier in the event the first 2 digits are the same for two or more survey units. Elevation codes are: B=Basement, 1=1st Floor, 2=2nd Floor. The default numeric

identifier is 01. Example: 2301 is second floor, class 3. Structural surfaces survey unit classifications and designations are listed in tabular format in Table 18-1.

Table 18-1 Building Structural Survey Units

Survey Unit Number	Elevation	Class
B301	Basement	3
1301	First	3
1302	First Interstitial	3
2301	Second	3

Building systems survey units were arranged by building and system type. There are three types of systems – ventilation, vacuum drain. Additionally, the incinerator in the basement was surveyed as a system. Each system survey unit encompasses all of a certain type within the building. The building system survey units are presented in Table 18-2.

Table 18-2 Building Systems Survey Units

System	Survey Unit Number	Description
Drain	DR01	Sink drain traps, floor drains, roof drains, laboratory drain main cleanout
Incinerator	IN01	Incinerator kiln, scrubber and ash separation pan
Vacuum	VA01	Vacuum pump and nozzles
Ventilation	VE01	Fume hood exhaust ducts and fans, general ventilation exhausts, roof exhausts

19.0 Characterization Surveys

The survey protocol for building surfaces consisted of performing the scanning portion of the final status survey protocol, with judgmental smears and static measurements on areas of highest probability for residual radioactivity. Judgmental static measurements and smears were also taken on vertical surfaces as part of the Class 3 final status survey protocols described in section 21.3.5.

The purpose of scanning was to identify locations of elevated activity. The minimum scan percentages are presented in section 21.2. Scanning was performed by moving the probe over surfaces at a distance of approximately one centimeter and at a rate less than the maximum allowable scan rate necessary to achieve DQOs. Where elevated activity was identified, the surveyor stopped and re-scanned the suspect area at a slower rate to determine if the elevated activity was sustained. Where a sustained increase in the audible response was identified, a static measurement and smear were taken at the

location of highest activity and the boundary of the elevated area was marked to aid in locating the area for remedial actions. Each location of elevated activity was remediated as discussed in section 20.1. Based on contamination potential, at least ten locations in each survey unit were judgmentally selected to perform a static measurement and removable contamination measurement.

The survey protocol for building system surveys consisted of performing removable contamination measurements of internal surfaces of ventilation, vacuum and drain systems.

If the initial characterization survey results indicated that contamination was not present in excess of the ALARA goals, then data from the survey was used as part of the final status survey. For areas that were partially contaminated, the characterization survey data was used as part of the final status survey provided that 1) the data used was only from areas with contamination levels below the ALARA goals, and 2) decontamination work was controlled such that areas could not have become cross-contaminated.

Facility characterization surveys identified several locations on building structural surfaces with residual radioactivity above ALARA goals, but at a small fraction of the DSV. The highest result was 330K dpm/100cm^2 (8.9 % of the DSV). Where elevated areas were identified, the scan percentage was increased to 100% of surrounding accessible areas. Incinerator refractory materials exhibited elevated activity due to naturally-occurring radioactive materials. Because the results are a small fraction of the DSV, all activity is assumed to be residual licensed materials. Additionally, because occupancy is not feasible due to being a confined space, the incinerator results were not used to calculate potential future doses to occupants.

20.0 Remediation

20.1 Remediation Activities

Remediation methods included simple decontamination (i.e. wet wiping with a mild detergent and scrubbing/scouring) and removal of contaminated material. Remediation was performed until proven to be ineffective at further reduction of residual radioactivity. Pfizer made the decision to leave several areas of elevated activity in place instead of damaging epoxy floor coatings.

All remediation activities were authorized by the Pfizer RSO and conducted to control the spread of contamination and to maintain personnel exposures ALARA. Remediation performed on structural surfaces is summarized in Table 20-1. No remediation of systems was required.

Table 20-1 Remediated Surfaces and Structures

Survey Unit	Location/ Size (ft^2)	Maximum Activity ($dpm/100cm^2$)		Remediation Method	Post-Remediation Maximum Activity ($dpm/100cm^2$)	
		Total	Removable		Total	Removable
1301	Room 175 Floor (10)	45K	30 – ^3H 21 – ^{14}C	Scrubbed and Scoured	14,660	29 – ^3H 23 – ^{14}C
1301	Room 177 Floor (<1)	7K	41 – ^3H 10 – ^{14}C	Scrubbed and Scoured	6,151	16 – ^3H 20 – ^{14}C
1302	Waste Storage Room Floor (<1)	232K	64 – ^3H 197 – ^{14}C	Scrubbed and Scoured	27,360	16 – ^3H 19 – ^{14}C
2301	Room 204A Floor (10)	34K	22 – ^3H 11 – ^{14}C	Scrubbed and Scoured	14,127	28 – ^3H 13 – ^{14}C
2301	Room 204B Floor (5)	18K	17 – ^3H 20 – ^{14}C	Scrubbed and Scoured	14,275	26 – ^3H 22 – ^{14}C
2301	Room 219C Benchtop and Casework (20)	330K	13 – ^3H 28 – ^{14}C	Removed Benchtop and Drawers, Scrubbed and Scoured Remaining Casework	<MDC	13 – ^3H 14 – ^{14}C
2301	Room 219C Benchtop and Casework (10)	4K	19 – ^3H 16 – ^{14}C	Scrubbed and Scoured	<MDC	17 – ^3H 23 – ^{14}C
2301	Room 224 Floor (20)	34K	33 – ^3H 27 – ^{14}C	Scrubbed and Scoured	14,569	27 – ^3H 22 – ^{14}C

20.2 Remedial Action Surveys

Remedial action surveys were conducted in support of remediation activities to help determine when an area was ready for a final status survey and to provide updated estimates for final status survey planning. Remedial action surveys served to monitor the effectiveness of decontamination efforts and to ensure that surrounding areas were not cross-contaminated from remediation actions.

Remedial action surveys consist of scan surveys, direct measurements and removable contamination measurements. These were conducted following remediation activities to

establish the success or failure of decontamination efforts. Results of the survey were the decision basis for continued remediation or conduct of final status surveys. Remedial action surveys were designed to meet the objectives of the final status surveys and, to the extent allowed by MARSSIM, the results of the remedial action surveys were used to supplement the final status survey.

21.0 Design and Performance of Final Status Surveys

Final status surveys were performed using the Data Quality Objective (DQO) process to demonstrate that residual radioactivity in each survey unit satisfied the predetermined criteria for release for unrestricted use. Final status surveys were conducted by performing the appropriate combination of scan surveys, total activity measurements and removable activity measurements as discussed further in this section. All final status surveys were performed according to written instructions. Survey data were documented on survey maps and/or associated data information sheets.

21.1 Background Determination

The use of reference background areas or paired background comparisons was not necessary. Material and ambient background values were not significant in comparison to the DCGLs or ALARA goals. For direct measurements, an ambient background was determined for each survey, was subtracted from gross measurements, and was used to calculate the actual survey MDCs and associated count errors. Material-specific background determinations were not performed. Background was not subtracted from removable activity measurements and all results are reported in gross dpm/100cm^2.

21.2 Surface Scans

Scanning was used to identify locations within the survey unit that exceed the investigation level. Table 21-1 summarizes the minimum scan percentage of accessible building structural surfaces based on classification.

Table 21-1 Scan Survey Coverage by Classification

Structure	Class 3
Floors	20%
Fume Hoods	10%
Other Structures	10%

For surfaces that received less than 100% scan survey, the surfaces scanned were those with the highest potential to contain residual radioactivity at the discretion of the surveyor. The percentage of survey area scanned was, in some cases, increased based on suspected or actual elevated activity. If elevated activity was identified in excess of the ALARA goals, additional scans of surrounding surfaces were performed and an

evaluation was made regarding the decision to upgrade. No survey results indicated activity above the DCGL. Floor areas near building entrances and exits, and carpeted surfaces that could cause low levels of residual radioactivity to build up over time due to tracking, received a 100% scan survey regardless of the area classification.

If elevated activity was detected during the scan surveys, then the location was marked and total and removable surface activity measurements were taken to quantify the activity. However, these total surface activity measurements were in addition to the static measurements required for the Sign test.

21.3 Total Surface Activity Measurements

Direct surveys (static measurements) for total surface activity were taken on building surfaces in impacted areas utilizing instrumentation of the best geometry based on the surface at the survey location. Additionally, locations of elevated activity identified and marked during the scan survey received direct survey measurements. Static measurements were taken in impacted areas at each identified sample location. Scaler count times were determined to achieve the detection sensitivities stated in the DQOs. Field measurements were converted to activity concentrations using the following equation:

Equation 2

$$\text{Activity}\,(\text{dpm}/100\text{cm}^2) = \frac{cpm_{sample} - cpm_{background}}{E_{total} \cdot \frac{A}{100cm^2}}$$

21.3.1 Determining the Number of Samples

The minimum number of samples required for the Sign Test was calculated using equations in Section 5 of MARSSIM. A conservative estimate of the standard deviation of total surface activity measurements (2,500 dpm/100cm^2) was used. The LBGR was set at one half of the DCGL. The calculations performed to determine the required number of samples are provided below.

21.3.2 Determination of the Relative Shift

The number of required samples depends on the ratio involving the activity level to be measured relative to the variability in the concentration. The ratio to be used is called the Relative Shift, Δ/σ_S, and is defined in MARSSIM as:

Equation 3

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

Where:

DCGL = derived concentration guideline level (dpm/100cm^2)
LBGR = concentration at the lower bound of the gray region. The LBGR is the average concentration to which the survey unit should be cleaned in order to have an acceptable probability of passing the test (dpm/100cm^2)
σ_S = an estimate of the standard deviation of the residual radioactivity in the survey unit (dpm/100cm^2)

The actual calculation is provided below:

$$\Delta/\sigma_S = \frac{3.7E6 - 1.85E6}{2500} = 740$$

Since MARRSIM Table 5.5 does not include relative shifts above 3 and the number of samples required decreases with an increasing relative shift, the relative shift was conservatively set at 3.

21.3.3 Determination of Acceptable Decision Errors

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

21.3.4 Determination of Number of Data Points (Sign Test)

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

Equation 4

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{4\left(SignP - 0.5\right)^2}$$

Where:

N = number of samples needed in the survey unit
$Z_{1-\alpha}$ = percentile represented by the decision error α
$Z_{1-\beta}$ = percentile represented by the decision error β
SignP = estimated probability that a random measurement will be less than the DCGL when the survey unit median is actually at the LBGR
Note: SignP is determined from MARSSIM Table 5.4

MARSSIM recommends increasing the calculated number of measurements by 20% to ensure sufficient power of the statistical tests and to allow for possible data losses. MARSSIM Table 5.5 values include an increase of 20% of the calculated value. The approach for this project was to predetermine a number of samples to be applied to all survey units. This approach provides sufficient power for the statistical test while streamlining the survey planning process. The following calculations were made to determine this number:

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

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

Therefore, the determined number of samples per survey unit for the final status surveys for planning purposes was **14**.

21.3.5 Determination of Sample Locations

Class 3 survey locations are determined from computer selected randomly generated x and y coordinates. In laboratory areas, permanent counter tops and other horizontal surfaces that block floor surfaces were included as a replacement to the blocked floor surface. Likewise, fixed cabinetry faces and other permanent equipment were used to replace blocked wall surfaces. Internal surfaces of permanent furnishings (i.e., drawer or cabinetry interior surfaces) were not included in the systematic measurement location placement. However, these surfaces were included in the scan surveys. Additional total surface activity measurements were collected at each area of elevated activity identified during the scan surveys.

21.3.5.1 Determining Class 3 Sample Locations

Class 3 survey units generally consist of many rooms. Representing each room in a "fold-out" view to show all surfaces is difficult and time-consuming. The process to identify, map and locate measurement coordinates in survey units with

many rooms is complicated due to the noncontiguous nature of the survey unit once walls are "folded-out".

For the reasons above, the MARSSIM sample measurement locations (i.e., random static and wipe measurements) for Class 3 survey units were determined only on horizontal surfaces as determined on floor plans. This protocol increases the sample density on the surfaces with the highest probability for residual contamination (floors, benchtops, fume hood working surfaces, etc.). The appropriate percentage of all survey unit surfaces (including vertical surfaces) was scanned according to the survey unit classification.

As part of characterization, the survey technician judgmentally selected locations with the highest probability of contamination on vertical surfaces for a static measurement and smear, such as light switches, door knobs, door pulls, push plates, and other locations. These measurements were in addition to and were not included in the statistical analysis of the locations selected by MARSSIM protocols.

Maps were generated of the survey unit horizontal surfaces. Sample locations were determined using computer generated random x and y coordinates for each sample location. Each location was then plotted on the applicable survey map.

Maps of final status survey locations for all survey units are included in Appendix D.

21.4 Removable Contamination Measurements

Removable contamination measurements were collected by wiping an area of approximately 100 cm^2 on structural surfaces and inside building systems. The smears/swabs were counted to achieve the detection sensitivities stated in the DQOs. The liquid scintillation counter (LSC) was setup for dual label counting without background subtraction (gross dpm) for ^{3}H and ^{14}C.

21.5 Surveys of Building Mechanical System Internals

Surveys of various building system components were performed. Survey design for these systems is out of the scope of MARSSIM. For the purposes of identifying potential residual contamination within these systems, a survey protocol was established and is presented in Table 21-2.

Table 21-2 System Survey Coverage

Structure	Coverage
Vacuum Nozzles, Pumps, Accumulators	100%
Fume Hood Vent Ducts and Fans	100%
General Ventilation Exhaust Ducts and Fans	10%
Laboratory Drain Traps, Floor Drains and Laboratory Drain Main Cleanout	100%
Incinerator System Internal Surfaces[7]	100%

21.6 Data Validation

Field data were reviewed by the Project Manager and validated to ensure:

- Completeness of forms
- Proper types of surveys were performed
- The MDCs for measurements met the established data quality objectives
- Independent calculations were performed on a representative sample of data sheets
- Satisfactory instrument calibrations and daily functionality checks were performed as required

Additionally, all final status survey data were entered into the Final Status Survey Database. This provided the means to sort survey data, verify activity calculations, and to compute the associated MDC and counting errors. Once data entry for a survey unit was complete, a verification report was printed and compared to original data sheets to ensure correct data entry.

21.7 Survey Documentation

A survey package was developed for each survey unit containing the following:

- Survey Unit number (e.g., Building and Room Number, System Number, etc.)
- Survey Instruction Sheets
- General survey requirements
- Percentage of surfaces requiring scan surveys

[7] 100% of the accessible internal surfaces of the incinerator were scanned, static measurements and smears were taken at a frequency of one per square meter.

- Number of total and removable contamination measurements required Instrument requirements with associated MDCs, count times and scan rates
- Overview maps detailing survey locations and placement methodology
- Survey Data Sheets
- Any additional specific survey instruction
- Signature of Data Collector and Reviewer

To ensure proper data management and organization, a unique location code system was used so that survey data could be properly entered and organized in the Final Status Survey Database. A breakdown of the location code and specific code components are provided in Table 21-6.

Table 21-3 Location Code Description

A unique location code was assigned to each individual survey location to ensure proper data management of the survey results. The following format was used to ensure consistency throughout the final status survey process:

BBB-RRRR-SS-M-LLL

Where:

BBB:	Building Code. This field represents the building number. (3 characters)
RRRR:	Survey Unit Number. This is the assigned survey unit number. (4 characters)
SS:	Structural Surface Code. This field represents the structural surface such as floor, wall, ceiling, etc. (2 characters) B1 = Benchtop D1 = Sink Drain D2 = Floor Drain D3 = Sump D4 = Roof Drain D5 = Main Drain Cleanout F1 = Floor G1 = Ventilation Duct G2 = Ventilation Fan H1 = Fume Hood Vent H2 = Fume Hood Fan I1=Incinerator Surface V1 = Vacuum Nozzle V2 = Vacuum Pump
M:	Structural Material Code. This field represents the type of structural material on which a particular measurement is taken. Those materials with a potential to contain naturally-occurring radioactive materials are assigned a code, otherwise a material code of "M" is assigned. (1 character) C = Bare Concrete E = Epoxy Over Concrete F = Refractory Brick M = Miscellaneous R = Rug/Carpet T = Ceramic Tile V = Vinyl Sheet Floor
LLL:	Numerical Identifier. This field represents the survey location number. The field "001" means survey point location number 1. Numerical identifiers are unique within a survey unit. (3-characters)

22.0 Data Quality Assessment and Interpretation of Survey Results

The statistical guidance contained in Section 8 of MARSSIM was used to determine if areas are acceptable for unrestricted release and whether additional surveys or sample measurements were required.

22.1 Preliminary Data Review

A preliminary data review was performed for each survey unit to identify any patterns, relationships or anomalies. Additionally, measurement data were reviewed and compared with the DCGLs and investigation levels to confirm the correct classification of survey units. All calculations of means, standard deviations, minimum and maximum values and comparisons between survey data and investigation levels are presented in the following tables. Total beta surface activity reports for each survey unit are included as Appendix E. Reports for building systems surveys are presented in Appendix F.

Table 22-1 Structural Surfaces Total Beta Surface Activity Summary

Survey Unit	# of Sample Locations	Mean	MDC	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(dpm/100 cm^2)						
B301	14	344	432	257	-74	738	5,000	NO
1301	14	414	378	554	-72	1,863	5,000	NO
1302	14	175	395	79	58	340	5,000	NO
2301	14	209	391	407	-150	1,548	5,000	NO

Table 22-2 Building Structural Surfaces Removable ^{3}H Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(gross dpm/100 cm^2)					
B301	14	19	7	7	33	200	NO
1301	14	18	6	6	28	200	NO
1302	14	18	10	5	37	200	NO
2301	14	19	8	3	33	200	NO

Table 22-3 Building Structural Surfaces Removable ^{14}C Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(gross dpm/100 cm^2)					
B301	14	19	5	10	29	200	NO
1301	14	18	5	6	26	200	NO
1302	14	19	4	12	28	200	NO
2301	14	18	4	11	24	200	NO

Table 22-4 Building Systems Total Beta Surface Activity Summary

Survey Unit	# of Sample Locations	Mean	MDC	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(dpm/100 cm^2)						
IN01	10	2,768	344	3,184	-573	8,055	5,000	YES

Table 22-5 Building Systems Removable ^{3}H Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(gross dpm/100 cm^2)					
DR01	141	23	12	5	103	200	NO
IN01	10	21	8	11	36	200	NO
VA01	34	21	8	6	45	200	NO
VE01	103	26	44	3	452	200	YES

Table 22-6 Building Systems Removable ^{14}C Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(gross dpm/100 cm^2)					
DR01	141	18	5	9	42	200	NO
IN01	10	19	5	13	27	200	NO
VA01	34	19	6	9	30	200	NO
VE01	103	24	24	6	235	200	YES

22.2 Determining Compliance for Building Surfaces and Structures

Final status survey results were initially compared to the investigation levels. All total activity results and removable activity results on building structural surfaces were less than the investigation levels.

The Sign test is used to determine the minimum number of sample locations. Because all measurements are less than the DCGL, all survey units pass the Sign Test. Therefore, the null hypothesis can be rejected and all survey units meet the release criterion and are suitable for release for unrestricted use.

The results of the data quality assessment and calculations of the dose from each structural surface survey unit are presented in Table 22-7.

Table 22-7 Structural Surfaces Total Beta Surface Activity Dose Calculations

Survey Unit	Standard Deviation (dpm/100 cm^2)	# Samples Required	Actual # of Samples	Adequate # of Samples?	Mean (dpm/100 cm^2)	Calculated Annual TEDE[8] (mrem/yr)
B301	257	11	14	YES	344	0.005
1301	554	11	14	YES	414	0.006
1302	79	11	14	YES	175	0.002
2301	407	11	14	YES	209	0.003
					Maximum:	**0.006[9]**

22.3 Determining Compliance for Building Systems

Final status survey results were initially compared to the investigation levels. The geometry of ventilation, vacuum and drain system internals precluded scanning and total activity measurements. All total activity results were less than the investigation levels except for incinerator refractory materials which exhibited elevated activity due to naturally-occurring radioactive materials. Because the results are a small fraction of the DSV, all activity is assumed to be residual licensed materials. Additionally, because occupancy is not feasible due to being a confined space, the incinerator results were not used to calculate potential future doses to occupants. All removable surface activity measurements were compared directly to the investigation levels to determine if an area

[8] The TEDE shown is calculated by multiplying 25 mrem/yr by the ratio of the mean total surface activity to the C-14 DCGL of 3.7E6 dpm/100cm^2 and then multiplying by 2 to account for the ISO 7503-1 surface efficiency. See Section 16.5 for a discussion of efficiency determinations.

[9] Areas of elevated activity that were not remediated below the ALARA goal are not considered in determining the annual dose from residual activity because the elevated areas are a small fraction of the DSV, the areas are small, and removable contamination levels are insignificant (contamination is tightly bound in epoxy floor coatings).

required further examination. One removable contamination result in a fume hood vent duct in Room 177 was above the investigation level, but a very small fraction of the DSV. Pfizer decided not to remediate this location. Therefore, all systems survey units meet the release criteria and are suitable for release.

23.0 Quality Assurance Surveys

Quality assurance surveys consisted of re-performing the FSS protocol for building structural surfaces to achieve a minimum of 5% duplication of scans, static measurements and smears. Areas were judgmentally selected by the Project Manager.

23.1 QA Survey Results

All QA survey results were similar to FSS data and the conclusions were the same as those based on the initial surveys. QA survey results are presented in Appendix G and are summarized in the tables below.

Table 23-1 QA Survey Building Structural Surfaces Total Activity Summary

Survey Unit	# of Sample Locations	Mean	MDC	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(dpm/100 cm^2)						
QA01	10	502	366	235	260	1,083	5,000	NO

Table 23-2 QA Survey Building Structural Surfaces Removable ^{3}H Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(gross dpm/100 cm^2)					
QA01	10	18	10	8	37	200	NO

Table 23-3 QA Survey Building Structural Surfaces Removable ^{14}C Summary

Survey Unit	# of Sample Locations	Mean	Standard Deviation	Min.	Max.	Investigation Level	Any Result Exceeding Investigation Level?
		(gross dpm/100 cm^2)					
QA01	10	18	5	13	27	200	NO

24.0 References

- NRC Regulations 10 CFR 20 Subpart E
- NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM)
- NUREG-1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Decommissioning Surveys"
- NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions"
- NUREG 1757, Volume 1 "Consolidated NMSS Decommissioning Guidance," September, 2002
- USNRC Policy and Guidance Directive FC 83-23, "Guidelines for the Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Byproduct, Source, or Special Nuclear Material Licenses."
- ISO-7503-1, "Evaluation of Surface Contamination – Part 1: Beta Emitters and Alpha Emitters." 1988
- Energy Solutions, Hood and Duct Characterization Report CS-RSO-08-015, August 12, 2008
- Pfizer Newstead Avenue Site Decommissioning Work Plan
- Pfizer Newstead Avenue Site Decommissioning Quality Assurance Project Plan
- Pfizer Newstead Avenue Site Decommissioning Health and Safety Plan
- Pfizer Radioactive Materials License Number 24-32439-01

PARKING AREA

PROPERTY LINES

25' EASEMENT

PARKING AREA

2-STORY BUILDING

PARKING AREA

NEWSTEAD AVENUE

PROPERTY LINES

CLAYTON AVENUE

ARCHITECTURAL SYMBOLS

CONCRETE
CONC. BLOCK
ALUMINUM
STEEL
LOOSE INSULATION
GYPSUM DRYWALL
FIN. WD.
WD. BLOCK
RIGID BOARD INSULATION
PLYWOOD
GLASS
JT. CALKING

SITE PLAN

GRAPHIC SCALE

0' 15' 30' 60' 90'

N

REV	CEA	BY / DATE	DESCRIPTION	CHKD / APPD
1	3090	JUNE 10,'77	REVISED AS CIRCLED	
0	3090	DEC. 15,'76	ISSUED FOR CONSTRUCTION	

Monsanto MONSANTO COMPANY CORPORATE ENGINEERING DEPT. ST. LOUIS, MISSOURI

COMPANY EXEC. PLANT B.T.L.

HOLABIRD & ROOT
ARCHITECTS · ENGINEERS · PLANNERS
300 WEST ADAMS · CHICAGO · ILLINOIS
60606 312 726 5960

BIOLOGICAL TESTING LABORATORY
COMM. 11698

SITE PLAN & ARCHITECTURAL SYMBOLS

	BY	DATE	APPROVED	DATE	APPROVED	DATE
DRAWN	J.A.	12-15-76				
CHECKED	T.J.L.	12-15-76	[illegible]	12-15-76		
DESIGNED	J.B.	12-15-76	SCALE 1" = 30'			

C.E.A. NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
3090	785	D	74406	A	3	1

PRINTS ISSUED TO FIELD BY [illegible] DATE 6/10/77 REV. 1

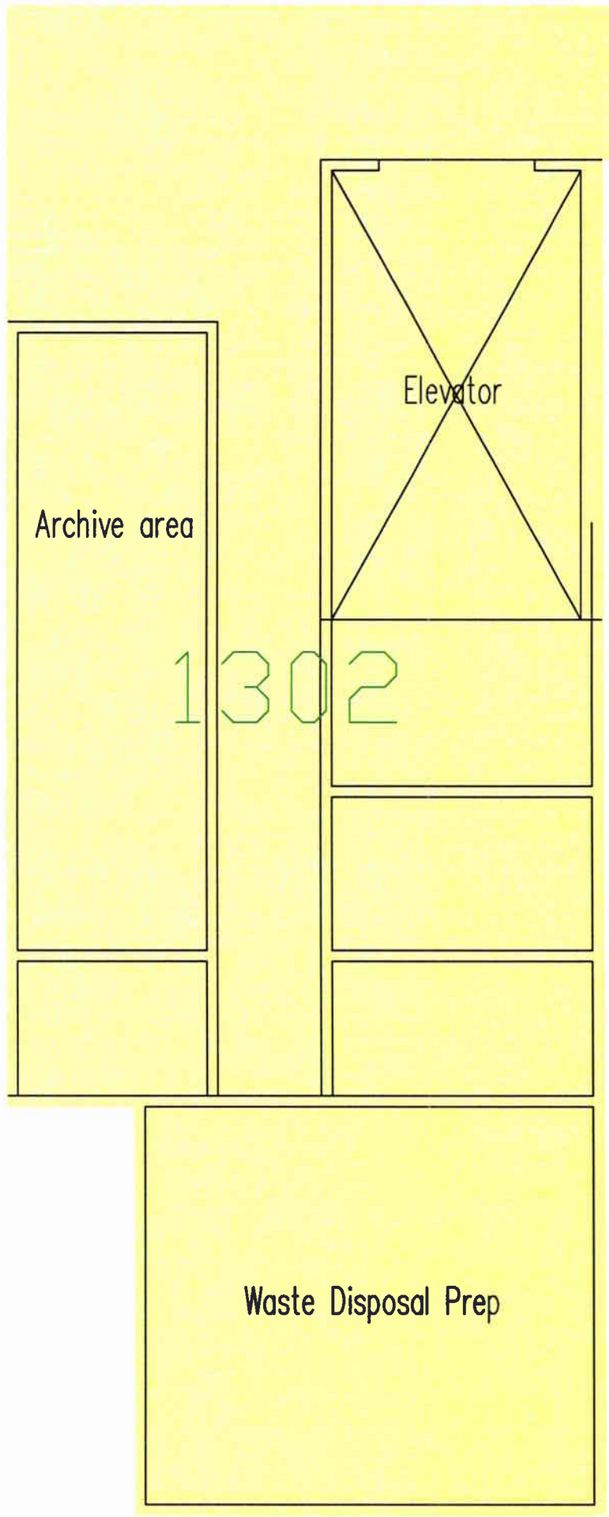
SCALING RULES

CE 315

Class 3

XX Survey Unit #

Pfizer Global Research and Development
Newstead Avenue Facility
Final Status Report

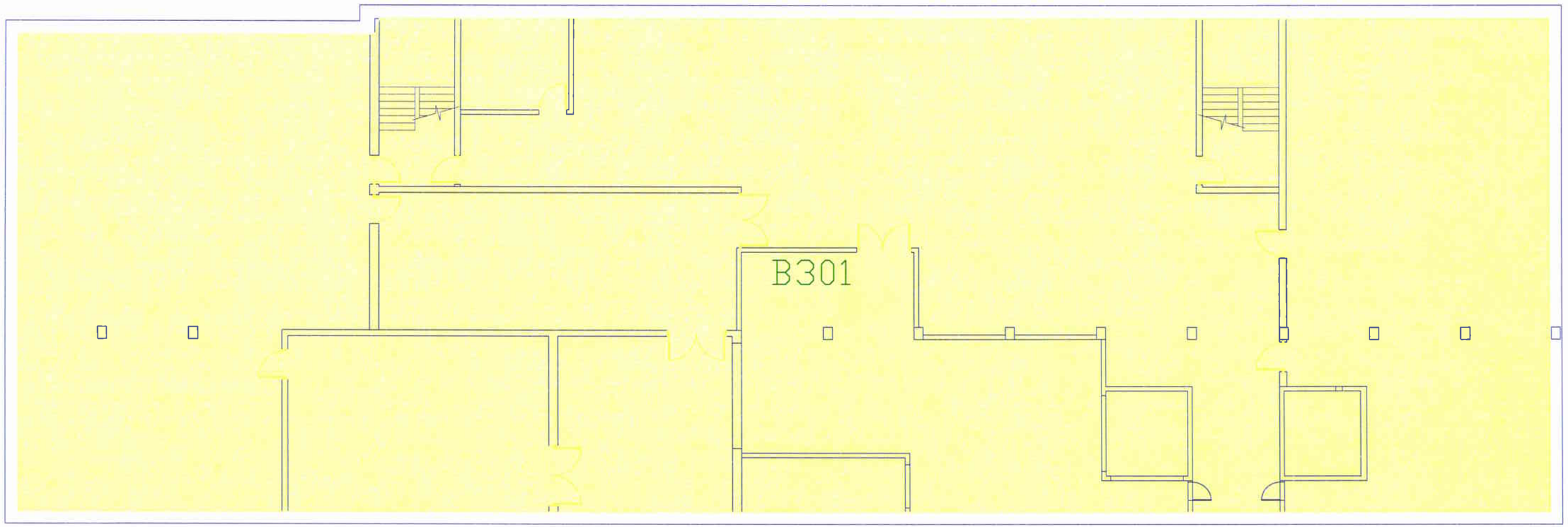


Class 3

XX Survey Unit #

Class 3

XX Survey Unit #



Class 3

XX Survey Unit #

Pfizer Global Research and Development
Newstead Avenue Site
Final Status Report

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER MACTEC INC ORDER NO. 20113194

Mfg. Ludlum Measurements, Inc. Model 2241-3 Serial No. 253346

Mfg. _____ Model _____ Serial No. _____

Cal. Date 13-Aug-08 Cal Due Date 13-Aug-09 Cal. Interval 1 Year Meterface NA

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 51 % Alt 700.8 mm Hg

☑ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☐ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation
☑ Audio ck. ☑ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set Comments V Input Sens. 35 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

COMMENTS:

	Det.1(cpm)	Det.2(cpm)	Det.3(cpm)	Det.4(cpm)
Deadtime Correction:	0µSec	0µSec	0µSec	0µSec
Calibration Constant:	100e-2	100e-2	100e-2	100e-2
Ratemeter Alarm:	50.0kcpm	50.0kcpm	50.0kcpm	50.0kcpm
Ratemeter Alert:	20.0kcpm	20.0kcpm	20.0kcpm	20.0kcpm
High Voltage:	900v	900v	900v	900v

Overload checked but not set.
firmware#: P-10-12

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
Digital			
Digital			

*Uncertainty within ± 10% C.F. within ± 20%

Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Ratemeter Readout	800K cpm		800 kcpm
	200K cpm		200 kcpm
	80K cpm		80.0 kcpm
	20K cpm		20.0 kcpm
	8K cpm		8.00 kcpm
	2K cpm		2.00 kcpm
	800 cpm		800 cpm
	200 cpm		200 cpm

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Scaler Readout	800K cpm		88041 (0)
	200K cpm		19948 (0)
	80K cpm		8004 (0)
	20K cpm		1995 (0)
	8K cpm		800 (0)
	2K cpm		200 (0)
	800 cpm		80 (0)
	200 cpm		20 (0)

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☐ Other _____

☑ m 500 S/N 38120 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 84260131

Calibrated By: Lenn Ortega Date 13-Aug-08

Reviewed By: Diana De Leon Date 13 Aug 08

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER MACTEC INC ORDER NO. 20113194

Mfg. Ludlum Measurements, Inc. Model 2241-3 Serial No. 253356

Mfg. _____ Model _____ Serial No. _____

Cal. Date 13-Aug-08 Cal Due Date 13-Aug-09 Cal. Interval 1 Year Meterface NA

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 51 % Alt 700.8 mm Hg

☑ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☐ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation
☑ Audio ck. ☑ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set Comments V Input Sens. 35 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

COMMENTS:

	Det.1(cpm)	Det.2(cpm)	Det.3(cpm)	Det.4(cpm)
Deadtime Correction:	0µSec	0µSec	0µSec	0µSec
Calibration Constant:	100e-2	100e-2	100e-2	100e-2
Ratemeter Alarm:	50.0kcpm	50.0kcpm	50.0kcpm	50.0kcpm
Ratemeter Alert:	20.0kcpm	20.0kcpm	20.0kcpm	20.0kcpm
High Voltage:	900v	900v	900v	900v

Overload checked but not set.
firmware#: P-10-12

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
Digital			
Digital			

*Uncertainty within ± 10% C.F. within ± 20% Range(s) Calibrated Electronically

Ratemeter Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Scaler Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	800K cpm		800 kc/m		800K cpm		79985 (c)
	200K cpm		200 kc/m		200K cpm		19990 (c)
	80K cpm		80.0 kc/m		80K cpm		7998 (c)
	20K cpm		20.0 kc/m		20K cpm		1999 (c)
	8K cpm		8.00 kc/m		8K cpm		800 (c)
	2K cpm		2.00 kc/m		2K cpm		200 (c)
	800 cpm		800 c/m		800 cpm		80 (c)
	200 cpm		200 c/m		200 cpm		20 (c)

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No: LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☐ Other _____

☑ m 500 S/N 38120 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 84260131

Calibrated By: Rena Ortega Date 13-Aug-08

Reviewed By: Dina De Rosa Date 13 Aug 08

FORM C22E 01/24/2007

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER MACTEC INC ORDER NO. 20113194

Mfg. Ludlum Measurements, Inc. Model 2241-3 Serial No. 253363

Mfg. _____ Model _____ Serial No. _____

Cal. Date 13-Aug-08 Cal Due Date 13-Aug-09 Cal. Interval 1 Year Meterface NA

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 51 % Alt 700.8 mm Hg

☑ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☐ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation
☑ Audio ck. ☑ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set Comments V Input Sens. 35 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

COMMENTS:

	Det.1(cpm)	Det.2(cpm)	Det.3(cpm)	Det.4(cpm)
Deadtime Correction:	0µSec	0µSec	0µSec	0µSec
Calibration Constant:	100e-2	100e-2	100e-2	100e-2
Ratemeter Alarm:	50.0kcpm	50.0kcpm	50.0kcpm	50.0kcpm
Ratemeter Alert:	20.0kcpm	20.0kcpm	20.0kcpm	20.0kcpm
High Voltage:	900v	900v	900v	900v

Overload checked but not set.
firmware#: P-10-12

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
Digital			
Digital			

*Uncertainty within ± 10% C.F. within ± 20% Range(s) Calibrated Electronically

	REFERENCE CAL POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Ratemeter Readout	800K cpm		799 kc/m
	200K cpm		200 kc/m
	80K cpm		79.9 kc/m
	20K cpm		20.0 kc/m
	8K cpm		8.00 kc/m
	2K cpm		2.00 kc/m
	800 cpm		800 c/m
	200 cpm		200 c/m

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Scaler Readout	800K cpm		79968 (0)
	200K cpm		20005 (0)
	80K cpm		7996 (0)
	20K cpm		2000 (0)
	8K cpm		800 (0)
	2K cpm		200 (0)
	800 cpm		80 (0)
	200 cpm		20 (0)

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☐ Other _____

☑ m 500 S/N 38120 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 84260131

Calibrated By: Leona Arteaga Date 13-Aug-08

Reviewed By: Diana DeLeon Date 13 Aug 08

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER MACTEC INC ORDER NO. 20113194

Mfg. Ludlum Measurements, Inc. Model 2241-3 Serial No. 253351

Mfg. _____ Model _____ Serial No. _____

Cal. Date 13-Aug-08 Cal Due Date 13-Aug-09 Cal. Interval 1 Year Meterface NA

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 51 % Alt 700.8 mm Hg

☑ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☐ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation
☑ Audio ck. ☑ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set Comments V Input Sens. 35 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

COMMENTS:

	Det.1 (cpm)	Det.2 (cpm)	Det.3 (cpm)	Det.4 (cpm)
Deadtime Correction:	0µSec	0µSec	0µSec	0µSec
Calibration Constant:	100e-2	100e-2	100e-2	100e-2
Ratemeter Alarm:	50.0kcpm	50.0kcpm	50.0kcpm	50.0kcpm
Ratemeter Alert:	20.0kcpm	20.0kcpm	20.0kcpm	20.0kcpm
High Voltage:	900v	900v	900v	900v

Overload checked but not set.
firmware#: F-10-12

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
Digital			
Digital			

*Uncertainty within ± 10% C.F. within ± 20% _____ Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Ratemeter Readout	800K cpm		800 kc/m
	200K cpm		200 kc/m
	80K cpm		800 kc/m
	20K cpm		20.0 kc/m
	8K cpm		8.00 kc/m
	2K cpm		2.00 kc/m
	800 cpm		800 c/m
	200 cpm		200 c/m

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Scaler Readout	800K cpm		80045 (0)
	200K cpm		19914 (0)
	80K cpm		8004 (0)
	20K cpm		1991 (0)
	8K cpm		800 (0)
	2K cpm		280 (0)
	800 cpm		80 (0)
	200 cpm		20 (0)

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☐ Other _____

☑ m 500 S/N 38120 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 84260131

Calibrated By: Lemuel Ortega Date 13-Aug-08

Reviewed By: Diane DeRosa Date 13 Aug 08

FORM C22E 01/24/2007

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-68 PROBE # PR190903

Owner: CHASE ENV

DATE: 12/12/08 **LOCATION:** Griffin Inst

TECH: Joanne Glenn **DATE LAST CAL EXPIRES:**

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

CABLE LENGTH: 6' **INPUT SENSITIVITY:** 2 mV.

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2241-3 **SERIAL #:** 253351 **CAL. DUE:** 08/13/09

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
99TC470-1814	Tc99 SS	37,300 dpm	08/03/99	23,300 cpm
99TH470-1815	Th230	30,000 dpm	04/11/06	15,200 cpm
2696-00	Pu239	18,500 dpm	07/18/06	9,390 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm
PX 726	C14	48,780 dpm	01/21/08	18,660 cpm

Condition: (●) Sat ( ) Unsat

Efficiencies from last cal.:

Pu: Th: Sr:

Tc ss: C14: Tc Ni:

As Found (AF) Efficiencies:

HV / Vernier:	Tc-99 Source Response Nickel (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Tc-99 Source Response Stainless Steel (CPM):		
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	A ch.	B ch.	Net Eff.
N/A											

Net A to B Xtalk: <10%	B to A Xtalk: <1%
	<1%

	Pu239	Tc99 Ni	Tc99 ss	Th-230	Sr90	C-14
AF CPM:						
AF 4 pi eff:						
AF 2 pi eff:						

Is as found efficiency within 20% of the efficiency from the last cal? ( ) Yes (●) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

α only HV
qp 12/12/08

PROBE #: PR190903
Date: 12/12/08

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
1100				4325		23.4%	1			
1150				4494		24.3%	0			
1200				4457		24.1%	2			
1250				4522		24.4%	0			

Alpha / Beta Bkg (cpm) 1

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
1200 /N/A	CPM:	4543			6321		
4 pi AL Efficiencies:		**24.55%**			**21.07%**		
2 pi AL Efficiencies:		***48.37%***			***41.58%***		

B + α HV
qp 12/12/08

PROBE #: PR190903
Date: 12/12/08

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
1500		4963	13.2%					46		
1550		7028	18.2%					252		
1600		8055	21.0%					215		
1650		9414	24.6%					255		
1700		9661	25.2%					262		
1750		9660	25.2%					256		

Alpha / Beta Bkg (cpm) 287

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
1700 / N/A	CPM:			9654		7582	4522
4 pi AL Efficiencies:				**25.11%**		**14.95%**	**42.85%**
2 pi AL Efficiencies:				***40.20%***		***39.09%***	***61.29%***

GRIFFIN INSTRUMENTS

REMARKS: Det 1, 1700V for a+b HV, Det 3, 1200V for alpha only HV. No previous cal data. Cal due 8/13/09 to match boxes. Client requested setup w/ 2 2241-3s, #253356 & 253351

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: 08/13/09

INSTRUMENT MARRIED WITH #

Performed/Reviewed by: Joanne Glenn Date: 12/12/2008 Entered by: ____ Initials

2 pi efficiencies denoted in italics. Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-68 PROBE # PR216394

Owner: CHASE ENV

DATE: 12/12/08 LOCATION: Griffin Inst

TECH: Joanne Glenn DATE LAST CAL EXPIRES: 08/13/09

REASON FOR CALIBRATION:

○ Due For Calibration ○ Repair (See Remarks) ◉ Other (See Remarks) ○ Due and Repair

CABLE LENGTH: 6' INPUT SENSITIVITY: 2 mV

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2241-3 SERIAL #: 253346 CAL. DUE: 08/13/09

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
99TC470-1814	Tc99 SS	37,300 dpm	08/03/99	23,300 cpm
99TH470-1815	Th230	30,000 dpm	08/03/99	15,200 cpm
2696-00	Pu239	18,500 dpm	07/18/06	9,390 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm
PX 726	C14	48,780 dpm	01/21/08	18,660 cpm

Condition: ◉ Sat ○ Unsat

Efficiencies from last cal.:

Pu:		Th:	21.70%	Sr:	
Tc ss:	25.45%	C14:	15.37%	Tc Ni:	

As Found (AF) Efficiencies:

α @ 12/12/08

HV / Vernier: B+L HV	Tc-99 Source Response Nickel (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Tc-99 Source Response Stainless Steel (CPM):		
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	A ch.	B ch.	Net Eff.
1250 / 1650				4946		26.71%	5	271		9818	25.60%

Net A to B Xtalk: <10%	B to A Xtalk: <1%
	<1%

	Pu239	Tc99 Ni	Tc99 ss	Th-230	Sr90	C-14
AF CPM:	4946		9818	6099	4592	7772
AF 4 pi eff:	26.71%		25.60%	20.31%	43.72%	15.38%
AF 2 pi eff:	*52.62%*		*40.97%*	*40.09%*	*62.54%*	*40.20%*

Is as found efficiency within 20% of the efficiency from the last cal? ◉ Yes ○ No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: PR216394
Date: 12/12/08

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
N/A										

ok **Alpha / Beta Bkg (cpm)** 5 271

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
1250 /1650	CPM:	4946		9818	6099	7772	4592
	4 pi AL Efficiencies:	**26.71%**		**25.60%**	**20.31%**	**15.38%**	**43.72%**
	2 pi AL Efficiencies:	***52.62%***		***40.97%***	***40.09%***	***40.20%***	***62.54%***

ok B+a HV cp 12/8/08

REMARKS: Det 1 = 1650 V for b+a HV, Det 3 = 1250V for alpha only HV. Cal due 8/13/09 to match box.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument Is Due For Next Calibration: **08/13/09**

INSTRUMENT MARRIED WITH **2241-3** **# 253346**

Performed/Reviewed by: Joanne Glenn **Date:** 12/12/2008 **Entered by:** JG **Initials**

2 pi efficiencies denoted in italics. **Calibrations performed to ANSI N323A-1997 standards.**

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-37 PROBE # PR259902

Owner: CHASE ENV

DATE: 12/12/08 **LOCATION:** Griffin Inst

TECH: Joanne Glenn **DATE LAST CAL EXPIRES:**

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

CABLE LENGTH: 6' **INPUT SENSITIVITY:** 2 mV

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2241-3 **SERIAL #:** 253346 **CAL. DUE:** 08/13/09

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
99TC470-1814	Tc99.SS	37,300 dpm	08/03/99	23,300 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm
PX 726	C14	48,780 dpm	01/21/08	18,660 cpm
99TH470-1815	Th230	30,000 dpm	04/11/06	15,200 cpm
2696-00	Pu239	18,500 dpm	07/18/06	9,390 cpm

Condition: (●) Sat ( ) Unsat

Efficiencies from last cal.:

Pu: Th: Sr:

Tc ss: C14: Tc Ni:

As Found (AF) Efficiencies:

HV / Vernier:	Tc-99 Source Response Nickel (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Tc-99 Source Response Stainless Steel (CPM):		
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	A ch.	B ch.	Net Eff.
N/A											

Net A to B Xtalk: <10%	B to A Xtalk: <1%
	<1%

	Pu239	Tc99 Ni	Tc99 ss	Th-230	Sr90	C-14
AF CPM:						
AF 4 pi eff:						
AF 2 pi eff:						

Is as found efficiency within 20% of the efficiency from the last cal? ( ) Yes (●) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: PR259902
Date: 12/12/08

α ONLY HV
gp 12/12/08

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
1150				4121		22.2%	5			
1200				4302		23.2%	6			
1250				4549		24.6%	2			
1300				4581		24.7%	4			
1350				4602		24.9%	4			

Alpha / Beta Bkg (cpm) 3

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
1300 / N/A	CPM:	4496			5944		
4 pi AL Efficiencies:		**24.29%**			**19.80%**		
2 pi AL Efficiencies:		***47.85%***			***39.09%***		

α + B HV
gp 12/12/08

PROBE #: PR259902
Date: 12/12/08

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
1700		9325	22.9%					780		
1750		10175	24.7%					980		
1800		10534	25.3%					1080		
1850		10530	25.3%					1096		
1900		10744	25.8%					1111		

Alpha / Beta Bkg (cpm) 1096

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
1850 / N/A	CPM:			10507		8670	5432
4 pi AL Efficiencies:				**25.23%**		**15.53%**	**43.88%**
2 pi AL Efficiencies:				***40.39%***		***40.59%***	***62.75%***

GRIFFIN INSTRUMENTS

REMARKS: Det 2 = 1850V for b+a HV, Det 4 = 1300V for alpha only HV. No previous cal data. Cal due 8/13/09 to match box.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument Is Due For Next Calibration: 08/13/09

INSTRUMENT MARRIED WITH 2241-3 # 253346

Performed/Reviewed by: Jerome Glenn Date: 12/12/2008 **Entered by:** ____ Initials

2 pi efficiencies denoted in italics.

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-37 PROBE # PR265548

Owner: CHASE ENV

DATE: 12/12/08 LOCATION: Griffin Inst

TECH: Joanne Glenn DATE LAST CAL EXPIRES:

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

CABLE LENGTH: 6' INPUT SENSITIVITY: 2 mV

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2241-3 SERIAL #: 253351 CAL. DUE: 08/13/09

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
99TC470-1814	Tc99-SS	37,300 dpm	08/03/99	23,300 cpm
99TH470-1815	Th230	30,000 dpm	04/11/06	15,200 cpm
2696-00	Pu239	18,500 dpm	07/18/06	9,390 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm
PX 726	C14	48,780 dpm	01/21/08	18,660 cpm

Condition: (●) Sat ( ) Unsat

Efficiencies from last cal.:

Pu: Th: Sr:

Tc ss: C14: Tc Ni:

As Found (AF) Efficiencies:

HV / Vernier:	Tc-99 Source Response Nickel (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Tc-99 Source Response Stainless Steel (CPM):		
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	A ch.	B ch.	Net Eff.
N/A											

Net A to B Xtalk: <10%	B to A Xtalk: <1%
	<1%

	Pu239	Tc99 Ni	Tc99 ss	Th-230	Sr90	C-14
AF CPM:						
AF 4 pi eff:						
AF 2 pi eff:						

Is as found efficiency within 20% of the efficiency from the last cal? ( ) Yes (●) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

B + α HV
@ 12/12/08

PROBE #: PR265548
Date: 12/12/08

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
1700		8363	21.0%					533		
1750		9984	24.2%					943		
1800		10334	24.7%					1124		
1850		10933	26.3%					1116		
1900		10551	25.2%					1138		

Alpha / Beta Bkg (cpm) 1116

HV / Vernier		Pu-239	Tc-99 NI	Tc-99 SS	Th-230	C-14	Sr-90
1850 /N/A	CPM:			10933		9470	5624
4 pi AL Efficiencies:				**26.32%**		**17.13%**	**45.62%**
2 pi AL Efficiencies:				***42.13%***		***44.77%***	***65.24%***

α only HV
@ 12/12/08

PROBE #: PR265548
Date: 12/12/08

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
1150				4625		25.0%	3			
1200				4741		25.6%	4			
1250				4800		25.9%	7			

Alpha / Beta Bkg (cpm) 0

HV / Vernier		Pu-239	Tc-99 NI	Tc-99 SS	Th-230	C-14	Sr-90
1200 /N/A	CPM:	4699			6608		
4 pi AL Efficiencies:		**25.40%**			**22.03%**		
2 pi AL Efficiencies:		***50.04%***			***43.47%***		

GRIFFIN INSTRUMENTS

REMARKS: Det 2, 1850V = a+b HV, Det 4, 1200V = alpha only HV. No previous cal data. Cal due 8/13/09 to match boxes. Client requested to be setup w/ 2241-3 #253351 & 253356.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

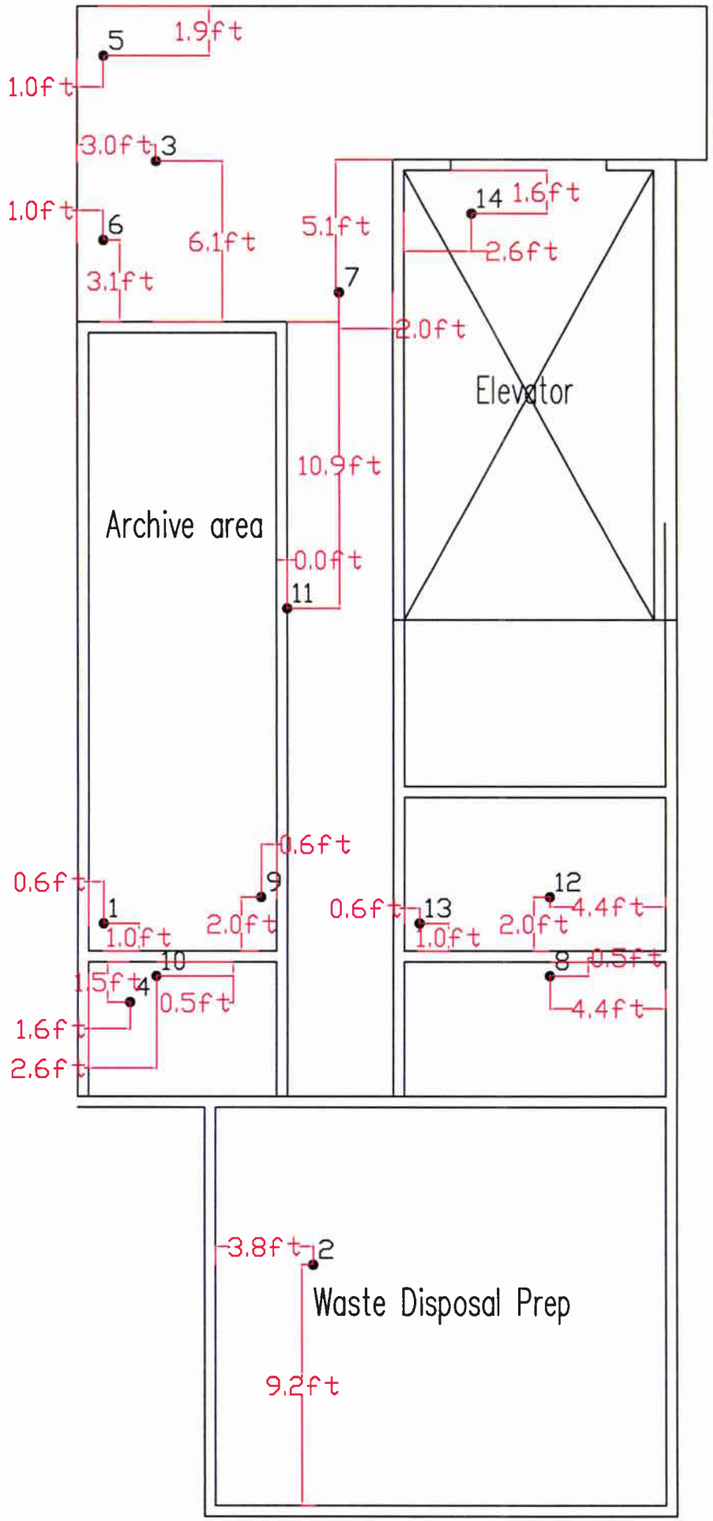
Date Instrument is Due For Next Calibration: 08/13/09

INSTRUMENT MARRIED WITH #

Performed/Reviewed by: Jeanne Glenn **Date:** 12/12/2008 **Entered by:** CR **Initials**

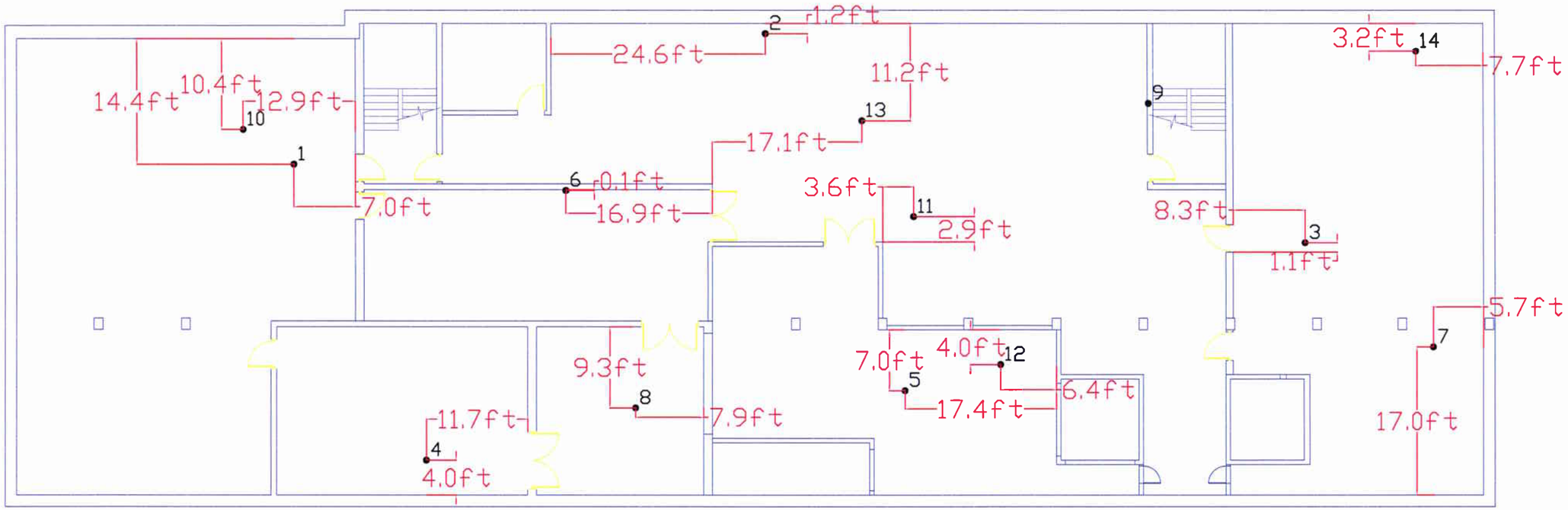
2 pi efficiencies denoted in italics. **Calibrations performed to ANSI N323A-1997 standards.**

Non-Impacted



• Sample Location

- Sample Location



- Sample Location

Pfizer Global Research and Development
Newstead Avenue Site
Final Status Survey Map

Structural Surfaces Survey Results

Building NSD Survey Unit 1301 Class 3

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-1301-F1-E-001	-31 ± 270	378	20 ± 9	48	16 ± 8	25
NSD-1301-F1-C-002	**1863** ± 364	378	19 ± 9	48	14 ± 7	25
NSD-1301-F1-E-003	175 ± 282	378	18 ± 8	48	**26** ± 10	25
NSD-1301-F1-C-004	**495** ± 299	378	27 ± 10	48	21 ± 9	25
NSD-1301-F1-C-005	**526** ± 301	378	19 ± 9	48	15 ± 8	25
NSD-1301-F1-E-006	**475** ± 298	378	15 ± 8	48	12 ± 7	25
NSD-1301-F1-C-007	165 ± 282	378	20 ± 9	48	14 ± 7	25
NSD-1301-F1-T-008	**1378** ± 343	378	6 ± 5	48	23 ± 9	25
NSD-1301-F1-V-009	227 ± 285	378	28 ± 10	48	6 ± 5	25
NSD-1301-F1-M-010	361 ± 292	378	16 ± 8	48	18 ± 8	25
NSD-1301-F1-E-011	-72 ± 268	378	10 ± 6	48	17 ± 8	25
NSD-1301-F1-E-012	93 ± 277	378	12 ± 7	48	24 ± 10	25
NSD-1301-F1-V-013	46 ± 275	378	26 ± 10	48	22 ± 9	25
NSD-1301-F1-E-014	88 ± 277	378	18 ± 8	48	19 ± 9	25
Summary for Survey Unit # 1301 (14 detail records)						
Average	414		18		18	
Minimum	-72		6		6	
Maximum	1863		28		26	
Standard Deviation	554		6		5	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Structural Surfaces Survey Results

Building NSD Survey Unit 1302 Class 3

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-1302-F1-C-001	207 ± 296	395	7 ± 5	48	16 ± 8	25
NSD-1302-F1-C-002	186 ± 295	395	15 ± 8	48	23 ± 9	25
NSD-1302-F1-C-003	340 ± 303	395	11 ± 7	48	21 ± 9	25
NSD-1302-F1-C-004	175 ± 294	395	27 ± 10	48	**28** ± 10	25
NSD-1302-F1-C-005	234 ± 297	395	25 ± 10	48	17 ± 8	25
NSD-1302-F1-C-006	260 ± 299	395	28 ± 10	48	15 ± 8	25
NSD-1302-F1-C-007	69 ± 288	395	18 ± 8	48	18 ± 8	25
NSD-1302-F1-C-008	58 ± 288	395	37 ± 12	48	20 ± 9	25
NSD-1302-F1-C-009	117 ± 291	395	13 ± 7	48	14 ± 7	25
NSD-1302-F1-C-010	80 ± 289	395	32 ± 11	48	18 ± 8	25
NSD-1302-F1-C-011	234 ± 297	395	8 ± 6	48	23 ± 9	25
NSD-1302-F1-C-012	180 ± 294	395	5 ± 4	48	22 ± 9	25
NSD-1302-F1-C-013	165 ± 293	395	13 ± 7	48	12 ± 7	25
NSD-1302-F1-C-014	143 ± 292	395	15 ± 8	48	23 ± 9	25
Summary for Survey Unit # 1302 (14 detail records)						
Average	175		18		19	
Minimum	58		5		12	
Maximum	340		37		28	
Standard Deviation	79		10		4	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Structural Surfaces Survey Results

Building NSD Survey Unit 2301 Class 3

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-2301-F1-T-001	**1548 ± 358**	391	18 ± 8	48	20 ± 9	25
NSD-2301-F1-E-002	103 ± 288	391	15 ± 8	48	22 ± 9	25
NSD-2301-F1-R-003	201 ± 293	391	18 ± 8	48	18 ± 8	25
NSD-2301-F1-E-004	46 ± 285	391	3 ± 3	48	15 ± 8	25
NSD-2301-F1-R-005	253 ± 296	391	29 ± 11	48	18 ± 8	25
NSD-2301-F1-R-006	315 ± 299	391	25 ± 10	48	11 ± 7	25
NSD-2301-F1-E-007	155 ± 291	391	33 ± 11	48	14 ± 7	25
NSD-2301-F1-E-008	98 ± 288	391	28 ± 10	48	17 ± 8	25
NSD-2301-F1-E-009	-83 ± 277	391	14 ± 7	48	24 ± 10	25
NSD-2301-F1-E-010	108 ± 288	391	20 ± 9	48	13 ± 7	25
NSD-2301-F1-E-011	-26 ± 281	391	10 ± 6	48	17 ± 8	25
NSD-2301-F1-E-012	108 ± 288	391	15 ± 8	48	23 ± 9	25
NSD-2301-F1-E-013	-150 ± 274	391	19 ± 9	48	16 ± 8	25
NSD-2301-F1-E-014	243 ± 295	391	22 ± 9	48	20 ± 9	25

Summary for Survey Unit # 2301 (14 detail records)

Average	209	19	18
Minimum	-150	3	11
Maximum	1548	33	24
Standard Deviation	407	8	4

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Structural Surfaces Survey Results

Building NSD Survey Unit B301 Class 3

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-B301-F1-C-001	101 ± 318	432	20 ± 9	48	21 ± 9	25
NSD-B301-F1-C-002	419 ± 333	432	25 ± 10	48	22 ± 9	25
NSD-B301-F1-C-003	**653** ± 345	432	25 ± 10	48	21 ± 9	25
NSD-B301-F1-C-004	-74 ± 309	432	7 ± 5	48	10 ± 6	25
NSD-B301-F1-C-005	53 ± 315	432	27 ± 10	48	22 ± 9	25
NSD-B301-F1-C-006	**706** ± 347	432	15 ± 8	48	22 ± 9	25
NSD-B301-F1-C-007	414 ± 333	432	22 ± 9	48	16 ± 8	25
NSD-B301-F1-C-008	**738** ± 349	432	14 ± 7	48	19 ± 9	25
NSD-B301-F1-C-009	239 ± 325	432	18 ± 8	48	21 ± 9	25
NSD-B301-F1-C-010	175 ± 321	432	9 ± 6	48	18 ± 8	25
NSD-B301-F1-C-011	117 ± 318	432	33 ± 11	48	11 ± 7	25
NSD-B301-F1-C-012	271 ± 326	432	21 ± 9	48	**29** ± 11	25
NSD-B301-F1-C-013	**451** ± 335	432	20 ± 9	48	13 ± 7	25
NSD-B301-F1-C-014	**547** ± 340	432	11 ± 7	48	19 ± 9	25
Summary for Survey Unit # B301 (14 detail records)						
Average	344		19		19	
Minimum	-74		7		10	
Maximum	738		33		29	
Standard Deviation	257		7		5	
Summary for Building # NSD (56 detail records)						
Avg	285		19		18	
Min	-150		3		6	
Max	1863		37		29	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit DR01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-DR01-D1-M-001			27 ± 10	48	20 ± 9	25
NSD-DR01-D2-M-002			16 ± 8	48	11 ± 7	25
NSD-DR01-D1-M-003			21 ± 9	48	18 ± 8	25
NSD-DR01-D2-M-004			23 ± 9	48	15 ± 8	25
NSD-DR01-D1-M-005			7 ± 5	48	18 ± 8	25
NSD-DR01-D1-M-006			18 ± 8	48	21 ± 9	25
NSD-DR01-D1-M-007			21 ± 9	48	9 ± 6	25
NSD-DR01-D2-M-008			15 ± 8	48	23 ± 9	25
NSD-DR01-D2-M-009			22 ± 9	48	21 ± 9	25
NSD-DR01-D2-M-010			28 ± 10	48	11 ± 7	25
NSD-DR01-D1-M-011			12 ± 7	48	**27** ± 10	25
NSD-DR01-D1-M-012			30 ± 11	48	17 ± 8	25
NSD-DR01-D1-M-013			30 ± 11	48	15 ± 8	25
NSD-DR01-D2-M-014			22 ± 9	48	13 ± 7	25
NSD-DR01-D2-M-015			22 ± 9	48	18 ± 8	25
NSD-DR01-D2-M-016			20 ± 9	48	13 ± 7	25
NSD-DR01-D2-M-017			22 ± 9	48	21 ± 9	25
NSD-DR01-D2-M-018			13 ± 7	48	14 ± 7	25
NSD-DR01-D2-M-019			**103** ± 20	48	**42** ± 13	25
NSD-DR01-D1-M-020			15 ± 8	48	23 ± 9	25
NSD-DR01-D1-M-021			11 ± 7	48	22 ± 9	25
NSD-DR01-D2-M-022			28 ± 10	48	16 ± 8	25
NSD-DR01-D2-M-023			10 ± 6	48	23 ± 9	25
NSD-DR01-D2-M-024			23 ± 9	48	**26** ± 10	25
NSD-DR01-D1-M-025			21 ± 9	48	20 ± 9	25
NSD-DR01-D1-M-026			20 ± 9	48	20 ± 9	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit DR01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-DR01-D1-M-027			17 ± 8	48	24 ± 10	25
NSD-DR01-D1-M-028			11 ± 7	48	**28** ± 10	25
NSD-DR01-D1-M-029			21 ± 9	48	17 ± 8	25
NSD-DR01-D1-M-030			16 ± 8	48	14 ± 7	25
NSD-DR01-D2-M-031			27 ± 10	48	14 ± 7	25
NSD-DR01-D2-M-032			**56** ± 15	48	17 ± 8	25
NSD-DR01-D2-M-033			10 ± 6	48	22 ± 9	25
NSD-DR01-D2-M-034			42 ± 13	48	13 ± 7	25
NSD-DR01-D2-M-035			17 ± 8	48	19 ± 9	25
NSD-DR01-D2-M-036			18 ± 8	48	18 ± 8	25
NSD-DR01-D2-M-037			29 ± 11	48	20 ± 9	25
NSD-DR01-D2-M-038			17 ± 8	48	12 ± 7	25
NSD-DR01-D1-M-039			18 ± 8	48	20 ± 9	25
NSD-DR01-D1-M-040			26 ± 10	48	17 ± 8	25
NSD-DR01-D1-M-041			25 ± 10	48	17 ± 8	25
NSD-DR01-D2-M-042			17 ± 8	48	14 ± 7	25
NSD-DR01-D2-M-043			14 ± 7	48	**27** ± 10	25
NSD-DR01-D2-M-044			32 ± 11	48	20 ± 9	25
NSD-DR01-D2-M-045			33 ± 11	48	12 ± 7	25
NSD-DR01-D2-M-046			7 ± 5	48	20 ± 9	25
NSD-DR01-D2-M-047			17 ± 8	48	15 ± 8	25
NSD-DR01-D2-M-048			7 ± 5	48	18 ± 8	25
NSD-DR01-D2-M-049			31 ± 11	48	21 ± 9	25
NSD-DR01-D2-M-050			25 ± 10	48	19 ± 9	25
NSD-DR01-D2-M-051			18 ± 8	48	**28** ± 10	25
NSD-DR01-D2-M-052			21 ± 9	48	16 ± 8	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit DR01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-DR01-D2-M-053			32 ± 11	48	24 ± 10	25
NSD-DR01-D1-M-054			27 ± 10	48	17 ± 8	25
NSD-DR01-D4-M-055			22 ± 9	48	16 ± 8	25
NSD-DR01-D4-M-056			19 ± 9	48	21 ± 9	25
NSD-DR01-D4-M-057			24 ± 10	48	21 ± 9	25
NSD-DR01-D4-M-058			21 ± 9	48	18 ± 8	25
NSD-DR01-D4-M-059			30 ± 11	48	12 ± 7	25
NSD-DR01-D4-M-060			31 ± 11	48	17 ± 8	25
NSD-DR01-D4-M-061			27 ± 10	48	14 ± 7	25
NSD-DR01-D4-M-062			37 ± 12	48	14 ± 7	25
NSD-DR01-D4-M-063			29 ± 11	48	23 ± 9	25
NSD-DR01-D4-M-064			31 ± 11	48	9 ± 6	25
NSD-DR01-D4-M-065			10 ± 6	48	**34 ± 11**	25
NSD-DR01-D4-M-066			32 ± 11	48	15 ± 8	25
NSD-DR01-D4-M-067			32 ± 11	48	14 ± 7	25
NSD-DR01-D4-M-068			14 ± 7	48	18 ± 8	25
NSD-DR01-D4-M-069			14 ± 7	48	18 ± 8	25
NSD-DR01-D4-M-070			24 ± 10	48	19 ± 9	25
NSD-DR01-D2-M-071			24 ± 10	48	15 ± 8	25
NSD-DR01-D2-M-072			21 ± 9	48	18 ± 8	25
NSD-DR01-D2-M-073			12 ± 7	48	14 ± 7	25
NSD-DR01-D2-M-074			23 ± 9	48	25 ± 10	25
NSD-DR01-D2-M-075			9 ± 6	48	12 ± 7	25
NSD-DR01-D2-M-076			25 ± 10	48	20 ± 9	25
NSD-DR01-D2-M-077			10 ± 6	48	10 ± 6	25
NSD-DR01-D2-M-078			19 ± 9	48	18 ± 8	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit DR01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-DR01-D2-M-079			16 ± 8	48	18 ± 8	25
NSD-DR01-D2-M-080			19 ± 9	48	18 ± 8	25
NSD-DR01-D2-M-081			14 ± 7	48	19 ± 9	25
NSD-DR01-D2-M-082			16 ± 8	48	13 ± 7	25
NSD-DR01-D2-M-083			10 ± 6	48	20 ± 9	25
NSD-DR01-D2-M-084			13 ± 7	48	19 ± 9	25
NSD-DR01-D2-M-085			28 ± 10	48	**28** ± 10	25
NSD-DR01-D1-M-086			19 ± 9	48	18 ± 8	25
NSD-DR01-D1-M-087			30 ± 11	48	**26** ± 10	25
NSD-DR01-D1-M-088			17 ± 8	48	**28** ± 10	25
NSD-DR01-D1-M-089			9 ± 6	48	12 ± 7	25
NSD-DR01-D1-M-090			40 ± 12	48	17 ± 8	25
NSD-DR01-D1-M-091			9 ± 6	48	13 ± 7	25
NSD-DR01-D1-M-092			13 ± 7	48	24 ± 10	25
NSD-DR01-D1-M-093			13 ± 7	48	14 ± 7	25
NSD-DR01-D1-M-094			22 ± 9	48	20 ± 9	25
NSD-DR01-D1-M-095			**56** ± 15	48	**29** ± 11	25
NSD-DR01-D1-M-096			9 ± 6	48	**27** ± 10	25
NSD-DR01-D1-M-097			11 ± 7	48	11 ± 7	25
NSD-DR01-D1-M-098			5 ± 4	48	10 ± 6	25
NSD-DR01-D1-M-099			17 ± 8	48	17 ± 8	25
NSD-DR01-D1-M-100			18 ± 8	48	17 ± 8	25
NSD-DR01-D1-M-101			25 ± 10	48	20 ± 9	25
NSD-DR01-D1-M-102			16 ± 8	48	15 ± 8	25
NSD-DR01-D1-M-103			22 ± 9	48	10 ± 6	25
NSD-DR01-D1-M-104			9 ± 6	48	21 ± 9	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit DR01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-DR01-D1-M-105			28 ± 10	48	15 ± 8	25
NSD-DR01-D1-M-106			31 ± 11	48	17 ± 8	25
NSD-DR01-D2-M-107			16 ± 8	48	19 ± 9	25
NSD-DR01-D2-M-108			23 ± 9	48	13 ± 7	25
NSD-DR01-D1-M-109			21 ± 9	48	22 ± 9	25
NSD-DR01-D1-M-110			26 ± 10	48	22 ± 9	25
NSD-DR01-D1-M-111			37 ± 12	48	18 ± 8	25
NSD-DR01-D1-M-112			19 ± 9	48	22 ± 9	25
NSD-DR01-D1-M-113			12 ± 7	48	18 ± 8	25
NSD-DR01-D1-M-114			38 ± 12	48	15 ± 8	25
NSD-DR01-D1-M-115			35 ± 12	48	13 ± 7	25
NSD-DR01-D1-M-116			25 ± 10	48	**30** ± 11	25
NSD-DR01-D1-M-117			10 ± 6	48	25 ± 10	25
NSD-DR01-D1-M-118			30 ± 11	48	14 ± 7	25
NSD-DR01-D1-M-119			22 ± 9	48	19 ± 9	25
NSD-DR01-D1-M-120			43 ± 13	48	17 ± 8	25
NSD-DR01-D1-M-121			24 ± 10	48	10 ± 6	25
NSD-DR01-D1-M-122			35 ± 12	48	13 ± 7	25
NSD-DR01-D1-M-123			24 ± 10	48	14 ± 7	25
NSD-DR01-D1-M-124			28 ± 10	48	22 ± 9	25
NSD-DR01-D1-M-125			27 ± 10	48	**28** ± 10	25
NSD-DR01-D1-M-126			21 ± 9	48	18 ± 8	25
NSD-DR01-D1-M-127			10 ± 6	48	22 ± 9	25
NSD-DR01-D1-M-128			17 ± 8	48	23 ± 9	25
NSD-DR01-D1-M-129			19 ± 9	48	15 ± 8	25
NSD-DR01-D1-M-130			41 ± 13	48	24 ± 10	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit DR01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-DR01-D1-M-131			25 ± 10	48	10 ± 6	25
NSD-DR01-D1-M-132			15 ± 8	48	25 ± 10	25
NSD-DR01-D1-M-133			10 ± 6	48	20 ± 9	25
NSD-DR01-D1-M-134			27 ± 10	48	19 ± 9	25
NSD-DR01-D1-M-135			37 ± 12	48	23 ± 9	25
NSD-DR01-D1-M-136			30 ± 11	48	14 ± 7	25
NSD-DR01-D1-M-137			17 ± 8	48	**29** ± 11	25
NSD-DR01-D1-M-138			48 ± 14	48	11 ± 7	25
NSD-DR01-D1-M-139			19 ± 9	48	19 ± 9	25
NSD-DR01-D5-M-140			36 ± 12	48	17 ± 8	25
NSD-DR01-D1-M-141			25 ± 10	48	10 ± 6	25
Summary for Survey Unit # DR01 (141 detail records)						
Average			23		18	
Minimum			5		9	
Maximum			103		42	
Standard Deviation			12		5	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit IN01 Class: N/A

Location Code	Total Beta Activity Measurements			Removable Activity Measurements			
				Tritium		Carbon-14	
	Activty		MDC	Activity	MDC	Activity	MDC
NSD-IN01-I1-F-001	**2988**	453	344	11 ± 7	48	16 ± 8	25
NSD-IN01-I1-F-002	**8055**	604	344	36 ± 12	48	13 ± 7	25
NSD-IN01-I1-F-003	**4660**	507	344	18 ± 8	48	**27** ± 10	25
NSD-IN01-I1-F-004	**5516**	533	344	22 ± 9	48	20 ± 9	25
NSD-IN01-I1-F-005	**6136**	551	344	32 ± 11	48	23 ± 9	25
NSD-IN01-I1-M-006	**1889**	413	344	21 ± 9	48	17 ± 8	25
NSD-IN01-I1-M-007	-284	319	344	17 ± 8	48	25 ± 10	25
NSD-IN01-I1-M-008	-217	322	344	24 ± 10	48	17 ± 8	25
NSD-IN01-I1-M-009	-573	305	344	16 ± 8	48	14 ± 7	25
NSD-IN01-I1-M-010	-490	309	344	17 ± 8	48	19 ± 9	25
Summary for Survey Unit # IN01 (10 detail records)							
Average	2768			21		19	
Minimum	-573			11		13	
Maximum	8055			36		27	
Standard Deviation	3184			8		5	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit VA01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-VA01-V1-M-001			22 ± 9	48	17 ± 8	25
NSD-VA01-V1-M-002			22 ± 9	48	14 ± 7	25
NSD-VA01-V1-M-003			45 ± 13	48	15 ± 8	25
NSD-VA01-V1-M-004			17 ± 8	48	17 ± 8	25
NSD-VA01-V1-M-005			23 ± 9	48	14 ± 7	25
NSD-VA01-V1-M-006			21 ± 9	48	18 ± 8	25
NSD-VA01-V1-M-007			20 ± 9	48	**27 ± 10**	25
NSD-VA01-V1-M-008			17 ± 8	48	**30 ± 11**	25
NSD-VA01-V1-M-009			27 ± 10	48	21 ± 9	25
NSD-VA01-V1-M-010			22 ± 9	48	22 ± 9	25
NSD-VA01-V1-M-011			7 ± 5	48	18 ± 8	25
NSD-VA01-V1-M-012			25 ± 10	48	21 ± 9	25
NSD-VA01-V1-M-013			19 ± 9	48	25 ± 10	25
NSD-VA01-V1-M-014			12 ± 7	48	**26 ± 10**	25
NSD-VA01-V1-M-015			15 ± 8	48	23 ± 9	25
NSD-VA01-V1-M-016			14 ± 7	48	16 ± 8	25
NSD-VA01-V1-M-017			21 ± 9	48	20 ± 9	25
NSD-VA01-V1-M-018			20 ± 9	48	22 ± 9	25
NSD-VA01-V1-M-019			22 ± 9	48	15 ± 8	25
NSD-VA01-V1-M-020			35 ± 12	48	11 ± 7	25
NSD-VA01-V1-M-021			15 ± 8	48	13 ± 7	25
NSD-VA01-V1-M-022			24 ± 10	48	10 ± 6	25
NSD-VA01-V1-M-023			14 ± 7	48	9 ± 6	25
NSD-VA01-V1-M-024			34 ± 11	48	14 ± 7	25
NSD-VA01-V1-M-025			19 ± 9	48	14 ± 7	25
NSD-VA01-V1-M-026			22 ± 9	48	**27 ± 10**	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit VA01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-VA01-V1-M-027			19 ± 9	48	13 ± 7	25
NSD-VA01-V1-M-028			23 ± 9	48	**28** ± 10	25
NSD-VA01-V1-M-029			14 ± 7	48	22 ± 9	25
NSD-VA01-V1-M-030			21 ± 9	48	**26** ± 10	25
NSD-VA01-V1-M-031			15 ± 8	48	22 ± 9	25
NSD-VA01-V1-M-032			32 ± 11	48	11 ± 7	25
NSD-VA01-V1-M-033			25 ± 10	48	**26** ± 10	25
NSD-VA01-V1-M-034			6 ± 5	48	**29** ± 11	25
Summary for Survey Unit # VA01 (34 detail records)						
Average			21		19	
Minimum			6		9	
Maximum			45		30	
Standard Deviation			8		6	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit VE01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-VE01-G1-M-001			16 ± 8	48	19 ± 9	25
NSD-VE01-G1-M-002			20 ± 9	48	21 ± 9	25
NSD-VE01-G1-M-003			27 ± 10	48	20 ± 9	25
NSD-VE01-G1-M-004			23 ± 9	48	19 ± 9	25
NSD-VE01-H1-M-005			25 ± 10	48	19 ± 9	25
NSD-VE01-G1-M-006			18 ± 8	48	21 ± 9	25
NSD-VE01-H1-M-007			12 ± 7	48	**28 ± 10**	25
NSD-VE01-G1-M-008			18 ± 8	48	20 ± 9	25
NSD-VE01-G1-M-009			14 ± 7	48	22 ± 9	25
NSD-VE01-G1-M-010			10 ± 6	48	15 ± 8	25
NSD-VE01-G1-M-011			26 ± 10	48	6 ± 5	25
NSD-VE01-G1-M-012			7 ± 5	48	20 ± 9	25
NSD-VE01-G1-M-013			15 ± 8	48	22 ± 9	25
NSD-VE01-G1-M-014			21 ± 9	48	16 ± 8	25
NSD-VE01-G1-M-015			5 ± 4	48	**27 ± 10**	25
NSD-VE01-G1-M-016			18 ± 8	48	10 ± 6	25
NSD-VE01-G1-M-017			29 ± 11	48	19 ± 9	25
NSD-VE01-H1-M-018			3 ± 3	48	24 ± 10	25
NSD-VE01-G1-M-019			33 ± 11	48	16 ± 8	25
NSD-VE01-G1-M-020			17 ± 8	48	21 ± 9	25
NSD-VE01-G1-M-021			21 ± 9	48	18 ± 8	25
NSD-VE01-G1-M-022			17 ± 8	48	17 ± 8	25
NSD-VE01-G1-M-023			13 ± 7	48	23 ± 9	25
NSD-VE01-G1-M-024			20 ± 9	48	13 ± 7	25
NSD-VE01-G1-M-025			27 ± 10	48	**28 ± 10**	25
NSD-VE01-G1-M-026			22 ± 9	48	16 ± 8	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit VE01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-VE01-G1-M-027			30 ± 11	48	16 ± 8	25
NSD-VE01-G1-M-028			30 ± 11	48	16 ± 8	25
NSD-VE01-G1-M-029			24 ± 10	48	14 ± 7	25
NSD-VE01-G1-M-030			27 ± 10	48	22 ± 9	25
NSD-VE01-G1-M-031			24 ± 10	48	16 ± 8	25
NSD-VE01-G1-M-032			23 ± 9	48	20 ± 9	25
NSD-VE01-G1-M-033			26 ± 10	48	25 ± 10	25
NSD-VE01-G1-M-034			26 ± 10	48	15 ± 8	25
NSD-VE01-G1-M-035			27 ± 10	48	16 ± 8	25
NSD-VE01-G1-M-036			19 ± 9	48	19 ± 9	25
NSD-VE01-G1-M-037			10 ± 6	48	**29 ± 11**	25
NSD-VE01-G1-M-038			25 ± 10	48	21 ± 9	25
NSD-VE01-G1-M-039			20 ± 9	48	18 ± 8	25
NSD-VE01-G1-M-040			23 ± 9	48	22 ± 9	25
NSD-VE01-H2-M-041			16 ± 8	48	11 ± 7	25
NSD-VE01-H2-M-042			24 ± 10	48	25 ± 10	25
NSD-VE01-H2-M-043			16 ± 8	48	**26 ± 10**	25
NSD-VE01-H1-M-044			8 ± 6	48	18 ± 8	25
NSD-VE01-G1-M-045			16 ± 8	48	24 ± 10	25
NSD-VE01-H1-M-046			30 ± 11	48	24 ± 10	25
NSD-VE01-H1-M-047			41 ± 13	48	18 ± 8	25
NSD-VE01-G1-M-048			3 ± 3	48	16 ± 8	25
NSD-VE01-H1-M-049			16 ± 8	48	18 ± 8	25
NSD-VE01-G1-M-050			11 ± 7	48	20 ± 9	25
NSD-VE01-H1-M-051			28 ± 10	48	14 ± 7	25
NSD-VE01-G1-M-052			14 ± 7	48	21 ± 9	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit VE01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-VE01-G1-M-053			27 ± 10	48	12 ± 7	25
NSD-VE01-H1-M-054			12 ± 7	48	12 ± 7	25
NSD-VE01-H1-M-055			15 ± 8	48	21 ± 9	25
NSD-VE01-H1-M-056			15 ± 8	48	**31** ± 11	25
NSD-VE01-G1-M-057			30 ± 11	48	24 ± 10	25
NSD-VE01-G1-M-058			13 ± 7	48	23 ± 9	25
NSD-VE01-H1-M-059			28 ± 10	48	**29** ± 11	25
NSD-VE01-G1-M-060			23 ± 9	48	19 ± 9	25
NSD-VE01-G1-M-061			20 ± 9	48	19 ± 9	25
NSD-VE01-H1-M-062			20 ± 9	48	13 ± 7	25
NSD-VE01-H1-M-063			6 ± 5	48	19 ± 9	25
NSD-VE01-G1-M-064			28 ± 10	48	9 ± 6	25
NSD-VE01-H1-M-065			5 ± 4	48	**26** ± 10	25
NSD-VE01-H1-M-066			24 ± 10	48	21 ± 9	25
NSD-VE01-G1-M-067			21 ± 9	48	**26** ± 10	25
NSD-VE01-G1-M-068			8 ± 6	48	13 ± 7	25
NSD-VE01-G1-M-069			5 ± 4	48	**28** ± 10	25
NSD-VE01-G1-M-070			15 ± 8	48	15 ± 8	25
NSD-VE01-H1-M-071			15 ± 8	48	**104** ± 20	25
NSD-VE01-H1-M-072			25 ± 10	48	20 ± 9	25
NSD-VE01-G1-M-073			27 ± 10	48	17 ± 8	25
NSD-VE01-G1-M-074			28 ± 10	48	22 ± 9	25
NSD-VE01-H1-M-075			**50** ± 14	48	**43** ± 13	25
NSD-VE01-G1-M-076			11 ± 7	48	21 ± 9	25
NSD-VE01-G1-M-077			40 ± 12	48	22 ± 9	25
NSD-VE01-G1-M-078			23 ± 9	48	16 ± 8	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD Survey Unit VE01 Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-VE01-G1-M-079			19 ± 9	48	14 ± 7	25
NSD-VE01-G1-M-080			22 ± 9	48	19 ± 9	25
NSD-VE01-G1-M-081			11 ± 7	48	13 ± 7	25
NSD-VE01-G1-M-082			14 ± 7	48	20 ± 9	25
NSD-VE01-G1-M-083			12 ± 7	48	18 ± 8	25
NSD-VE01-H1-M-084			7 ± 5	48	20 ± 9	25
NSD-VE01-H1-M-085			19 ± 9	48	22 ± 9	25
NSD-VE01-H2-M-086			30 ± 11	48	**26** ± 10	25
NSD-VE01-H2-M-087			23 ± 9	48	24 ± 10	25
NSD-VE01-H2-M-088			15 ± 8	48	20 ± 9	25
NSD-VE01-H2-M-089			27 ± 10	48	9 ± 6	25
NSD-VE01-H2-M-090			29 ± 11	48	20 ± 9	25
NSD-VE01-H2-M-091			24 ± 10	48	17 ± 8	25
NSD-VE01-H2-M-092			18 ± 8	48	24 ± 10	25
NSD-VE01-H2-M-093			21 ± 9	48	**28** ± 10	25
NSD-VE01-H1-M-094			32 ± 11	48	17 ± 8	25
NSD-VE01-H1-M-095			23 ± 9	48	16 ± 8	25
NSD-VE01-H1-M-096			23 ± 9	48	19 ± 9	25
NSD-VE01-H1-M-097			29 ± 11	48	20 ± 9	25
NSD-VE01-H1-M-098			45 ± 13	48	**30** ± 11	25
NSD-VE01-H1-M-099			**452** ± 42	48	**235** ± 30	25
NSD-VE01-H1-M-100			**61** ± 15	48	**74** ± 17	25
NSD-VE01-H1-M-101			**51** ± 14	48	**43** ± 13	25
NSD-VE01-H1-M-102			**70** ± 16	48	**31** ± 11	25
NSD-VE01-H1-M-103			6 ± 5	48	**51** ± 14	25

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Building Systems Final Status Survey Results

Building NSD — Survey Unit VE01 — Class: N/A

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
Summary for Survey Unit # VE01 (103 detail records)						
Average			26		24	
Minimum			3		6	
Maximum			452		235	
Standard Deviation			44		24	
Summary for Building # NSD (288 detail records)						
Avg	2768		24		21	
Min	-573		3		6	
Max	8055		452		235	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

Quality Assurance Survey Results

Building NSD Survey Unit QA01 Class 3

Location Code	Total Beta Activity Measurements		Removable Activity Measurements			
			Tritium		Carbon-14	
	Activty	MDC	Activity	MDC	Activity	MDC
NSD-QA01-F1-V-001	**478** ± 291	366	32 ± 11	48	14 ± 7	25
NSD-QA01-F1-V-002	**1083** ± 323	366	10 ± 6	48	17 ± 8	25
NSD-QA01-F1-E-003	**600** ± 298	366	24 ± 10	48	22 ± 9	25
NSD-QA01-F1-E-004	260 ± 278	366	15 ± 8	48	13 ± 7	25
NSD-QA01-F1-E-005	**526** ± 293	366	11 ± 7	48	14 ± 7	25
NSD-QA01-F1-E-006	**515** ± 293	366	8 ± 6	48	**27** ± 10	25
NSD-QA01-F1-E-007	**430** ± 288	366	37 ± 12	48	23 ± 9	25
NSD-QA01-F1-E-008	**531** ± 294	366	15 ± 8	48	13 ± 7	25
NSD-QA01-F1-E-009	319 ± 282	366	16 ± 8	48	18 ± 8	25
NSD-QA01-F1-E-010	281 ± 280	366	16 ± 8	48	19 ± 9	25
Summary for Survey Unit # QA01 (10 detail records)						
Average	502		18		18	
Minimum	260		8		13	
Maximum	1083		37		27	
Standard Deviation	235		10		5	
Summary for Building # NSD (10 detail records)						
Avg	502		18		18	
Min	260		8		13	
Max	1083		37		27	

Notes: All results reported in dpm/100cm^2.

Results greater than MDC are reported in bold type.

Results greater than the investigation level are reported in red type.

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