FINAL

Combined Summary Report:
Radioactive Materials Handling Facility Building Surveys

Santa Susana Field Laboratory

Ventura County, California

Contract Number 114579

Prepared for:

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List of Acronyms, Abbreviations, and Units of Measurement

Am	Americium (e.g., ^{241}Am)
ANSI	American National Standards Institute
Bq/cm^2	Becquerel per square centimeter
Boeing	The Boeing Company
CABRERA	Cabrera Services, Inc.
CDPH	California Department of Public Health
cm	centimeter
cm/sec	centimeters per second
cm^2	square centimeters
Co	Cobalt (e.g., ^{60}Co)
cpm	counts per minute
Cs	Cesium (e.g., ^{137}Cs)
DOE	U. S. Department of Energy
dpm	disintegration per minute
DQO	Data Quality Objective
EDA	Exploratory Data Analysis
EDE	Effective Dose Equivalent
EPA	U. S. Environmental Protection Agency
ETEC	Energy Technology Engineering Center
Eu	Europium (e.g. ^{154}Eu)
Fe	Iron (e.g., ^{55}Fe)
FSP	Field Sampling Plan
GFPC	gas-flow proportional counting
H	Hydrogen (e.g., ^{3}H or tritium)
HPS	Health Physics Society
K	Potassium (e.g., ^{40}K)
Kr	Krypton (e.g., ^{85}Kr)
LSC	Liquid Scintillation Counting
m	meter
m^2	square meters
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mCi	millicurie
MDC	Minimum Detectable Concentration
Mn	Manganese (e.g., ^{54}Mn)
ml	milliliter
mrem/yr	millirem per year
Ni	Nickel (e.g., ^{59}Ni)
Na	Sodium (e.g., ^{22}Na)
NASA	National Aeronautics and Space Administration
NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute of Standards and Technology
NRC	U. S. Nuclear Regulatory Commission
Pb	Lead (e.g., ^{206}Pb)
pCi/g	picocurie per gram
Po	Polonium (e.g., ^{210}Po)

Pu	Plutonium (e.g., ^{238}Pu)
QC	Quality Control
Ra	Radium (e.g., ^{226}Ra)
RCRA	Resource Conservation and Recovery Act
RMDF	Radioactive Materials Disposal Facility
RMHF	Radioactive Materials Handling Facility
Sr	Strontium (e.g., ^{90}Sr)
SSFL	Santa Susana Field Laboratory
TEDE	Total Effective Dose Equivalent
Th	Thorium (e.g., ^{232}Th)
TPU	Total Propagated Uncertainty
U	Uranium (e.g., ^{238}U)
U.S.C.	United States Code
WRS	Wilcoxon Rank Sum
µR/hr	microremRoentgen per hour
µrem/yr	microrem per year
µSv/yr	microsievert per year

EXECUTIVE SUMMARY

This report presents the results of the radiological surveys performed of Buildings 4022, 4075, 4563, 4621, 4658, 4665, and 4688, which are part of the Radioactive Materials Handling Facility (RMHF) at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The survey was performed in April, May, and August, 2007 by Cabrera Services, Inc. (CABRERA). The purpose of the survey was to collect data to determine whether the levels of residual radioactivity in the buildings are sufficiently low to be protective of public health and safety and justify building material release. The buildings are radiologically impacted and scheduled to be demolished.

Exposed interior surfaces of each building, with the exception of the concrete foundation, were divided into 20 survey units from which survey data were collected. Survey data were also collected from areas outside the survey units, primarily from building exteriors such as roofs, ventilation exits, and entry doors.

Scan and static measurements of alpha- and beta/gamma-emitting surface residual radioactivity; smear samples analyzed for removable alpha and beta radioactivity and tritium; and volumetric samples of building materials were collected and analyzed. Instrument-specific values based on actual field conditions were used to establish a priori minimum detectable concentration (MDC) values for scan and static measurements prior to instrument use. Eighteen investigations were performed of locations identified with residual radioactivity above one or more action levels. Investigated locations were remediated by physically removing and disposing as low-level radioactive waste, the building material containing the elevated residual radioactivity.

Measurements confirmed surface residual radioactivity to be below the levels given in Regulatory Guide 1.86 and U.S. Department of Energy (DOE) Order 5400.5. Based on the measured surface and volumetric residual radioactivity levels, the disposal of the building demolition debris as decommissioned material will result in an incremental dose above background less than millirem per year (1.0 mrem/yr) total effective dose equivalent (TEDE).

With the exception of concrete foundations and building roofs, the building materials from Building 4075, 4563, 4621, 4658, and 4665 are suitable for release. Survey data show that the residual radioactivity, either surficially or volumetrically, will result in a dose less than or equal to 1.0 mrem/yr TEDE, which is protective of public health and safety and justifies building material release. The concrete foundations were outside the survey scope and the investigation of the building roofs concluded that additional survey data would be needed in order to determine their suitability for release.

Insufficient survey data were collected from Buildings 4022 and 4688 to determine their suitability for release. Data collected from Building 4022 was limited due to relatively high levels of background radiation encountered primarily on the west side of the building. Spot checks of Building 4688 revealed significant levels of beta-emitting residual radioactivity on several of the support columns. Due to the extensive nature of the elevated residual radioactivity at Building 4688, Boeing directed that survey activities be discontinued.

Recommendations regarding appropriate radiological controls for the demolition of Building 4022 are found in Appendix A.

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1.0 INTRODUCTION AND SITE BACKGROUND

This report presents the results of the radiological surveys performed of Buildings 4022, 4075, 4563, 4621, 4658, 4665, and 4688, which are part of the RMHF at the SSFL in Ventura County, California. The survey was performed in April, May, and August 2007 by CABRERA in accordance with the*: Radioactive Materials Handling Facility Building Surveys Field Sampling Plan* (FSP) (CABRERA, 2007). The purpose of the survey was to collect data to determine whether the levels of residual radioactivity in the buildings are sufficiently low to be protective of public health and safety and justify building material release.

The Boeing Company (Boeing) contracted with CABRERA to perform the survey. Boeing operates Area IV of the SSFL for the DOE. Under the authority of the Atomic Energy Act [42 United States Code (U.S.C.) 201 et seq.], DOE is responsible for establishing a comprehensive health, safety, and environmental program for managing facilities. As an Agreement State under the Atomic Energy Act, the State of California has jurisdiction over non-DOE radiological activities at the SSFL. Data of sufficient type, quantity, and quality were needed to satisfactorily demonstrate to the California Department of Public Health (CDPH), formerly the Department of Health Services, that:

- The levels of residual radioactivity in the buildings are sufficiently low to be protective of public health and safety and justify building material release, and
- Once the buildings are demolished, the debris can be designated as decommissioned material for subsequent disposal at the Kettleman Hills landfill.

1.1 Historical Background and Radiological Overview

The *Historical Site Assessment of Area IV, Santa Susana Field Laboratory, Ventura County, California* (Sapere, 2005) describes the historical background of SSFL and its buildings. In the late 1940s, North American Aviation acquired land in the Simi Hills between the Simi and San Fernando Valleys. That land, now known as SSFL, was used primarily for the testing of rocket engines. Atomics International, a division of North American Aviation, was formed in 1955 and part of Area IV at SSFL was set aside and used for nuclear reactor development and testing. In 1984 Atomics International merged with Rocketdyne. Boeing purchased Rocketdyne in 1996. Area IV of the SSFL is used for DOE-sponsored activities. Boeing, the National Aeronautics and Space Administration (NASA), and the U.S. Department of Defense have used the balance of the SSFL for rocket and laser testing.

Activities in Area IV started in the mid 1950s: until 1964 these activities were primarily related to sodium-cooled nuclear power plant development and development of space power systems with sodium and potassium as coolants. The Energy Technology Engineering Center (ETEC), originally known as the Liquid Metal Engineering Center) was formed in the mid 1960s as an Atomic Energy Commission (now DOE) laboratory for the development of liquid metal heat transfer systems in support of the Liquid Metal Fast Breeder Reactor Program. Nuclear operations at Area IV included 10 nuclear research reactors, seven critical facilities, the Hot Laboratory, the Nuclear Materials Development Facility, the RMHF, and various test and nuclear material storage areas. All nuclear operations ended in 1988. Since that time DOE-funded activities have focused on decontamination and decommissioning of the ETEC facilities.

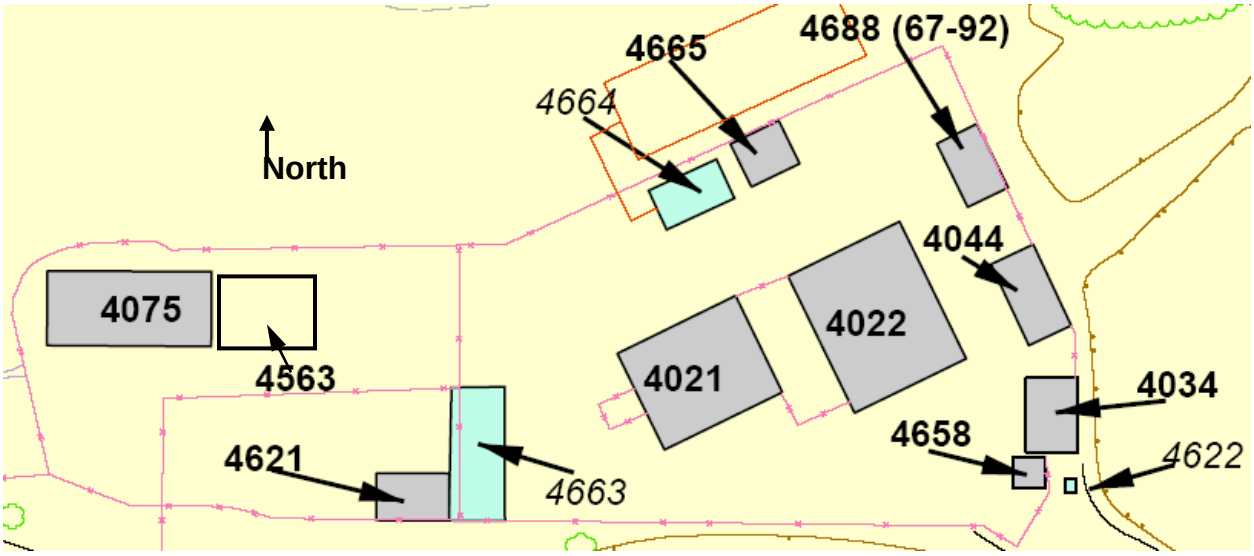
The RMHF has been in continuous operation as a storage and handling facility for radioactive materials and waste since the late 1950s. Although nuclear operations at the SSFL ended in

1988, the RMHF has continued to support decommissioning and decontamination activities. Buildings 4021, 4022 and 4621 of the RMHF are Resource Conservation and Recovery Act (RCRA) permitted facilities. Operations include waste characterization, limited treatment, packaging, and temporary storage of radioactive and mixed waste. The RMHF is radiologically contaminated from past operations, including the storage of both new fuel and irradiated fuel.

The prior name for the RMHF had been the Radioactive Materials Disposal Facility (RMDF). This was a misnomer since the facility was at no time used as a disposal site for radioactive waste. It was always used as a staging facility for receipt and shipment of nuclear fuel, and later, receipt and shipment of radioactive waste. Therefore in the mid 1990s the name was changed to the Radioactive Materials Handling Facility to better reflect its true purpose.

The RMHF building locations are shown in Figure 1.1. The buildings included in the scope of this project are Buildings 4022, 4075, 4563, 4621, 4658, 4665, and 4688.

Figure 1.1 SSFL RMHF Buildings



(Source: Figure 2-2, Volume 1, Sapere 2005)

1.1.1 Building 4022

Building 4022, shown in Figure 1.1.1, is a 3,900 square-foot high bay metal building located near the east end of the RMHF. The building was constructed in 1959 and houses a bridge crane and below-grade vaults used for the storage of nuclear fuel, high-level radioactive wastes, and other waste from onsite decommissioning activities. The building was most recently used as a storage area for wastes from decommissioning activities throughout the site.

Radioactive materials handled in Building 4022 were primarily in the form of mixed fission products and fuels. Multiple incidents associated with Building 4022 have occurred involving radioactive contamination.

- On December 29, 1965, drums of contaminated sodium exploded in a rain storm and burned the outside of the building.
- On May 21, 1967, a drum of uranium carbide sludge exploded on a truck outside of the building, contaminating asphalt and evaporator equipment. Contamination levels

ranged from 300 to 5,000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Decontamination of the asphalt and equipment was successful.

- On May 21, 1967, a 55-gallon drum containing uranium metal under calcium carbonate was found burning in the RMHF storage yard. Workers, believing the drum was likely to explode, fired three rifle shots into the drum to relieve any pressure. The fire was successfully extinguished and the drum was left outside to cool overnight. It was then moved to Building 4021 for storage.
- On May 22, 1978, the sump pump stopped working and contaminated liquid flowed out of a holdup tank, contaminating asphalt, which later contaminated eight truck tires placed on the pavement. Both the tires and the asphalt were decontaminated.
- On August 14, 1979, a shipping box loaded on a waste truck leaked radioactive liquid containing Cesium-137 (^{137}Cs) and Strontium-90 (^{90}Sr) on the asphalt outside the RMHF. The area was successfully decontaminated shortly after the incident.

Figure 1.1.1 SSFL Building 4022

1.1.2 Building 4075

Building 4075, shown in Figure 1.1.2, is a 2,160 square-foot steel building located on the northwest corner of the RMHF. The building was constructed in 1971 and served as a storage area for radioactive waste prior to shipment to disposal sites. In approximately 2001, building use was discontinued.

Possible contaminants include uranium, thorium, plutonium radionuclides and mixed fission products. On August 15, 1988, a forklift driver punctured a drum of radioactive sand. The sand spilled out onto the floor. Surveys indicated that no detectable contamination occurred as a result.

Figure 1.1.2 SSFL Building 4075

1.1.3 Building 4563

Building 4563, shown in Figure 1.1.3, is a 1,130 square-foot covered storage area located along the northern border of the RMHF just east of Building 4075. It is no longer designated as Building 4563, but simply as the "covered storage area neighboring Building 4075." The covered storage area was constructed in 1958 and used to store radioactive waste pending shipment to a disposal facility.

Figure 1.1.3 SSFL Building 4563

The most probable contaminants of concern are uranium, thorium, plutonium radionuclides and mixed fission products. There are no reported incidents associated with Building 4563 which may have involved radioactive contamination.

1.1.4 Building 4621

Building 4621, shown in Figure 1.1.4, is a 640 square-foot small metal structure located along the south border of the RMHF. The building was constructed in the middle 1960s and used to store contaminated equipment materials.

Figure 1.1.4 SSFL Building 4621

Radioactive material was stored in the building, primarily in the form of mixed fission products from various site wastes. Use authorization included the storage of Krypton-85 (^{85}Kr) gas. On September 4, 1975, a 132 millicurie (mCi) Radium-226 (^{226}Ra) source was discovered lying on the ground outside Building 4621. The source was not labeled, nor was it in a shielded container. Following its discovery, the source was properly marked and stored in a secure condition.

1.1.5 Building 4658

Building 4658, shown in Figure 1.1.5, is a small, 180 square-foot structure located at the east end of the RMHF adjacent to the vehicle entrance gate. The building was constructed in the early 1980s and served as a guard shack for the RMHF throughout most of the 1980s. In the late 1980s, security measures no longer required the use of the guard shack as an entrance to the facility and its use was discontinued.

Radioactive materials were not managed specifically in this building. There are no reported incidents associated with Building 4563 which may have involved radioactive contamination.

Figure 1.1.5 SSFL Building 4658

1.1.6 Building 4665

Building 4665, shown in Figure 1.1.6, is a small, 480 square-foot building located on the northern border of the RMHF north of Building 4022. The building was constructed in the middle 1960s and was used as an oxidation facility for the RMHF. The building was most recently used as a non-radioactive material storage area.

Figure 1.1.6 SSFL Building 4665

Radioactive waste and material may have been stored or handled at this facility. The most probable contaminants of concern are uranium, thorium, plutonium radionuclides and mixed

fission products. There are no reported incidents associated with Building 4665 which may have involved radioactive contamination.

1.1.7 Building 4688

Building 4688, shown in Figure 1.1.7, is a 630 square-foot shed-type storage structure with no walls. It is located on the east border of the RMHF just north of Building 4044. The building was constructed in approximately 1962 and likely used to support sodium cleaning activities. The structure was used primarily as protection against the rain and sun. Its most recent use was as a non-radioactive storage area.

Figure 1.1.7 SSFL Building 4688

Radioactive material may have been stored under this structure. The most probable contaminants of concern are uranium, thorium, plutonium radionuclides and mixed fission products. There are no reported incidents associated with Building 4688 which may have involved radioactive contamination.

1.2 Release Criteria

The release criteria established for this project were two-fold:

(1) Surface residual radioactivity must meet the levels given in Table 1 of U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors* (NRC, 1974) and Table IV-1 of DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE, 1993).

(2) Disposal of the building material at the Kettleman Hills landfill must result in a dose to a member of the public or landfill worker no greater than 100 mrem/yr.

The release criteria and their application are further explained in the following sections.

1.2.1 Surface Residual Radioactivity

Table 1 of Regulatory Guide 1.86 and Table IV-1 of DOE Order 5400.5 establish limits for surface contamination of existing structures by alpha- and beta/gamma-emitting radionuclides. A simplified, consolidated version of these tables is given as Table 1.2.1. Measurements of gross alpha- and beta/gamma-emitting surface residual radioactivity were compared to the most limiting values given in Table 1.2.2. The limits for alpha- and beta/gamma-emitting radionuclides were applied independently of each other.

1.2.2 Dose to a Member of the Public

The ultimate disposition of the buildings, as presently planned, is demolition. The building demolition debris was originally intended to be disposed as decommissioned material at the Kettleman Hills landfill. The landfill permit allows the receipt of radioactive material "…*whose disposal would not result in "significant" radioactive contamination as specified in California Health and Safety Code, Part 9, Chapter 5, Article 1*." For purposes of this requirement, the CDPH interprets this requirement to mean the disposal of the decommissioned material is not likely to expose a member of the public to ionizing radiation greater than 100 millirem per year (mrem/yr).

Table 1.2.2 Allowable Surface Residual Radioactivity (in dpm/100 cm^2)

***Radionuclides of Concern*[(a)]**	***Average*[(b)]**	***Maximum*[(c)]**	***Removable***
Transuranics, ^{226}Ra, ^{228}Th	100	300	20
Th-natural, ^{232}Th, ^{90}Sr, ^{232}U, ^{232}Th	1,000	3,000	200
U-natural, ^{235}U, ^{238}U, and associated decay products	5,000	15,000	1,000
Beta-gamma emitters ^{22}Na, ^{40}K, ^{54}Mn, ^{55}Fe, ^{59}Ni, ^{60}Co, ^{63}Ni, ^{134}Cs, ^{137}Cs, ^{152}Eu, ^{154}Eu	5,000	15,000	1,000
Tritium	N/A	N/A	10,000

Notes:
(a) Listed radionuclides are limited to those identified as radionuclides of concern for this project (see Table 2.1).
(b) Averaged over an area of not more than 1 m^2.
(c) Applies to an area of not more than 100 cm^2.

A dose assessment was necessary to meet this criterion for the disposal of the decommissioned material at the Kettleman Hills landfill. For such a scenario, American National Standards Institute (ANSI)/Health Physics Society (HPS) N13.12-1999, *Surface and Volume Radioactivity Standards for Clearance* (ANSI, 1999) provides guidance for protecting the public and the environment from radiation exposure. The standard specifies a primary radiation dose criterion of 1.0 mrem/yr TEDE for the clearance of materials that may contain residual radioactivity. In setting the primary dose criterion during development of the standard, several alternative individual dose levels were considered. After careful review of these alternatives, the consensus was that a primary dose criterion of 1.0 mrem/yr TEDE would be protective of public health, provide consistency with international guidance, and provide values that would be reasonable for application of field instruments for most radionuclides, under most situations.

Therefore, surface and volumetric residual radioactivity values for alpha- and beta/gamma-emitting radionuclides from ANSI/HPS N13.12-1999 or a second document, NUREG-1640, *Radiological Assessments for Clearance of Materials for Nuclear Facilities* (NRC, 2003), were used to assess the dose to a member of the public. Both documents assess the potential radiation exposures to an average member of the critical group. Screening levels established in ANSI/HPS N13.12-1999 and normalized effective dose equivalents (EDEs) established in NUREG-1640 were primarily derived using an analysis of potential doses resulting from scenarios involving volume and surface sources of contamination and the results of other modeling studies for recycling and landfill disposal, including considerations regarding the conservative nature of the modeling results. The values given in those documents represent an incremental dose above background less than or equal to 1.0 mrem/yr TEDE. The Table 1.2.2

activity levels are generally less than the 1.0 mrem/yr limits established by ANSI N13.12 and, therefore, if met, will result in doses from decommissioned material less than 1.0 mrem/yr. This is discussed further and illustrated in Section 2.3.2.

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2.0 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) were developed to define the purpose of the radiological survey, clarify what data should be collected to satisfy the purpose, and specify the performance requirements for the quality of information to be obtained from the data.

2.1 Step 1 – State the Problem

Buildings 4022, 4075, 4563, 4621, 4658, 4665, and 4688 are radiologically impacted buildings scheduled to be demolished. The building demolition debris was originally intended to be disposed as decommissioned material at the Kettleman Hills landfill. Data were needed to determine whether the levels of residual radioactivity in the buildings are sufficiently low so as to be protective of public health and safety and justify building material release. The primary decision maker is Boeing.

2.2 Step 2 – Identify the Decision

The principal study question, based on the dose criterion given in Section 1.2.2, is: "Will the residual radioactivity in the building material result in an incremental dose above background to an average member of the critical group less than or equal to 1.0 mrem/yr TEDE?" The critical group is the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances resulting from the building material release.

The following alternative actions result from resolution of the principle study question:

- If the residual radioactivity results in a dose less than or equal to 1.0 mrem/yr TEDE, then the building material is considered suitable for release.
- If the residual radioactivity results in a dose greater than 1.0 mrem/yr TEDE, then the primary decision maker is consulted to determine further action. Such action may include recommendations for remediation, additional survey data collection, and/or the calculation of incremental risk or dose.

Based on the principal study question and the alternative actions listed above, the decision statement was: Determine whether or not the residual radioactivity results in an incremental dose above background to an average member of the critical group less than or equal to 1.0 mrem/yr TEDE.

The decision was formulated into statistical hypotheses defined in Scenario A of NUREG-1505, *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys* (NRC, 1997). The state that is presumed to exist in reality is expressed as the null hypothesis (denoted by $\mathbf{H_o}$). For this scenario, the null hypothesis is:

$\mathbf{H_o}$: The residual radioactivity results in a dose greater than 1.0 mrem/yr TEDE.

For the given null hypothesis, the alternative hypothesis (denoted as $\mathbf{H_a}$), which is an expression of what is believed to be the state of reality if the null hypothesis is not true, is:

$\mathbf{H_a}$: The residual radioactivity results in a dose less than or equal to 1.0 mrem/yr TEDE.

As the null and alternative hypotheses were applied here, building material is not considered suitable for release unless the survey data show that the residual radioactivity results in a dose less than or equal to 1.0 mrem/yr TEDE.

Values from ANSI/HPS N13.12-1999 are given as gross activity concentrations for groupings of radionuclides with similar scenario modeling results. Values from NUREG-1640 are given as radionuclide-specific concentrations. Values from both sets were compared to each other and to action level values to validate a dose equivalency (see Section 2.3.2). The gross activity concentration values from ANSI/HPS N13.12-1999 were used to satisfy the decision statement. The values from NUREG-1640 were also used for comparative purposes (see Section 4.2).

2.3 Step 3 – Identify Inputs to the Decision

2.3.1 Radionuclides of Concern

Boeing and DOE identified radionuclides of concern for the SSFL in the *Approved Sitewide Release Criteria for Remediation of Radiological Facilities at the SSFL* (Rocketdyne, 1999). These radionuclides are listed in Table 2.3.1. The potentially affected media are building materials found on exposed interior building surfaces, which primarily consist of structural steel and sheet metal.

Table 2.3.1 Radionuclides of Concern

Transuranic	***Fission***	***Source/Uranium***	***Natural***	***Activation***
^{241}Am	^{134}Cs	^{228}Th	^{40}K	^{60}Co
^{238}Pu	^{137}Cs	^{232}Th	^{226}Ra	^{55}Fe
^{239}Pu	^{90}Sr	^{234}U		^{54}Mn
^{240}Pu		^{235}U		^{22}Na
^{241}Pu		^{238}U		^{59}Ni
^{242}Pu				^{63}Ni
				^{152}Eu
				^{154}Eu
				^{3}H

2.3.2 Action Levels

Action levels, shown in Table 2.3.2, were established to cause further evaluation of identified areas of elevated surface residual radioactivity. Their rationale is discussed below. Since the action levels are near background concentrations, the consequences of making a decision error are biased toward collecting additional survey data.

Table 2.3.2 Action Levels[(a)]

Type of Emission	***Scan Measurements***	***Static Measurements***	***Removable Measurements***
Alpha	300 dpm/100 cm^2 [(b)]	100 dpm/100 cm^2	20 dpm/100 cm^2
Beta/Gamma	3,750 dpm/100 cm^2 [(c)]	5,000 dpm/100 cm^2	1,000 dpm/100 cm^2

Notes:
(a) Values given are distinguishable from background.
(b) Value corresponds to the maximum allowable surface residual radioactivity for the most-restrictive group of alpha emitters; reference Table 1.2.2.
(c) Value corresponds to 0.75 times the beta static measurement action level.

There are no action levels for volumetric residual radioactivity or removable tritium (^{3}H) surface residual radioactivity. Samples were collected to verify the historical information, which does not suggest the presence of this type of residual radioactivity.

The action levels shown in Table 2.3.2 for the detection of surface residual radioactivity by scanning are alternative action levels that were instituted based on field conditions encountered. The action level for alpha scan measurements corresponds to the maximum allowable surface residual radioactivity for the most-restrictive group of alpha emitters; see Table 1.2.2. Scanning to detect alpha activity at 100 dpm/100 cm^2 is not practical since it basically results in a scan speed so slow as to approximate a series of static measurements side by side in order to obtain an observation interval sufficiently long to detect enough counts to register on the meter. Originally, there was no action level for alpha scan measurements because of the difficulty of achieving MDCs near background concentrations. This was not considered a practical detriment since, based on the nature and source of the radionuclides of concern, it was thought highly unlikely that alpha-emitters would be present in the absence of detectable beta/gamma-emitters. However, initial survey results showed this assumption was not reliable and an action level for alpha scan measurements was instituted.

The original action level for beta scan measurements established in Section 2.3 of the FSP (CABRERA, 2007) was based on a z-score greater than 3.0, which could not be practically applied. In its place, an action level for beta scan measurements was instituted that corresponds to 0.75 times the beta static measurement action level. The reason for the lower scan versus static measurement action level was the increased detection uncertainty inherent in the scanning process. A lower scan measurement action level results in a higher certainty that areas above the static measurement action level were consistently detected.

The action levels for static and removable measurements of alpha- and beta/gamma-emitting surface residual radioactivity are based on the allowable levels for average and removable surface residual radioactivity given in Table 1.2.2. The action levels for alpha-emitters corresponds to the most limiting value given in Table 1.2.2 and is for ^{226}Ra, Thorium-228 (^{228}Th), transuranics, and other similar alpha-emitting radionuclides. The action levels for beta/gamma emitters are based on the set of values given in the table for beta/gamma-emitters.

The action levels for static measurements of surface residual radioactivity correspond to an incremental dose above background less than or equal to 1.0 mrem/yr, applying either values from ANSI/HPS N13.12-1999 or NUREG-1640 for alpha- and beta/gamma-emitting radionuclides. To illustrate, the screening levels, given in Table 1 of ANSI/HPS N13.12-1999, are 600 dpm/100 cm^2 for ^{226}Ra, thorium, associated decay chain, and transuranic radionuclides; and 6,000 dpm/100 cm^2 for uranium and high-dose beta/gamma-emitters. These two values are given as the most limiting surface screening values protective of 1.0 mrem/yr. Likewise, Table 2.1 of NUREG-1640 identifies the radionuclide of concern with the most restrictive EDE as alpha-emitting Thorium-232 (^{232}Th), with a value of 46 microsieverts per year (μSv/yr) per becquerel per square centimeter (Bq/cm^2), or 0.77 microrem per year (μrem/yr) per dpm/100 cm^2. The beta/gamma-emitter with the most restrictive EDE is Cobalt-60 (^{60}Co), with a value of 10 μSv/yr per Bq/cm^2 (0.16 μrem/yr per dpm/100 cm^2). Assuming both alpha- and beta/gamma-emitting components of the surface residual radioactivity are present at the action level concentrations, the sum of the resulting doses is limited to 1.0 mrem/yr, as shown in Table 2.3.2.

2.3.3 Measurement Inputs

Static measurements of alpha- and beta/gamma-emitting surface residual radioactivity were used as quantitative inputs to the principal study question. Qualitative inputs to the principal study

question included scan measurements; smear samples analyzed for gross alpha and beta radioactivity and tritium; and volumetric samples of building materials.

Table 2.3.3 Dose Equivalency

Type of Emission	*Static Measurement Action Level (dpm/100 cm^2)*	*ANSI/HPS N13.12-1999*		*NUREG-1640*	
		Screening Level (dpm/100 cm^2 per mrem/yr)	*Dose (mrem/yr)*	*EDE (µrem/yr per dpm/100 cm^2)*	*Dose (mrem/yr)*
Alpha	100	600	0.2	0.77 (^{232}Th)	0.1
Beta/Gamma	5,000	6,000	0.8	0.16 (^{60}Co)	0.8
		Total:	1.0	Total:	0.9

2.4 Step 4 – Define the Study Boundaries

The target population was the alpha- and beta/gamma-emitting surface residual radioactivity concentrations of the radionuclides of concern. Survey data were collected from exposed interior surfaces of each building with the exception of the concrete foundation, which was outside the scope of the project. Biased portions of the building exterior such as roofs, ventilation exits, and entry doors were also surveyed. These surfaces constitute the impacted areas, which were considered to have been susceptible to radioactive contamination from building activities.

Decisions were made on two fundamental levels:

- Localized areas - the decision to collect additional data was made for discrete areas with measurement results that exceeded the action level.
- Survey unit – each building composes several survey units based on similar physical characteristics and potential for residual radioactivity. A decision was made for each survey unit as to the suitability of building material release or, alternatively, the need for remediation, additional data collection, and/or calculation of incremental risk or dose.

2.5 Step 5 – Develop a Decision Rule

The decision statement resulted in the decision rules, listed in Table 2.6, for data collection and analysis using the statistical test and retrospective power analysis. No action was required where the logical alternative to the action given in Table 2.6 was not listed.

2.6 Step 6 – Specify Limits on Decision Errors

The two principal decision errors, based on the principal study question, are:

- Deciding residual radioactivity results in a dose less than or equal to 1.0 mrem/yr TEDE when, in fact, it does not (called a Type I decision error); and
- Deciding residual radioactivity results in a dose greater than 1.0 mrem/yr TEDE, when, in fact, it does not (called a Type II decision error).

Neither type of decision error is desirable. A Type I decision error is defined as the probability of passing a survey unit that should fail. The consequence of a Type I decision error are that material with elevated surface residual radioactivity is not properly remediated, but disposed at a local landfill or recycled. The potential exists for a resulting dose to demolition and disposal workers which exceeds 1.0 mrem/yr TEDE. A Type II decision error is defined as the

probability of failing a survey that should pass. The consequences of a Type II decision error are the collection of additional data and/or unnecessary remediation.

A decision error rate of 0.05 (5%) was applied for both Type I and Type II errors for the statistical test. Decision error rates associated with the calculation of instrument MDCs and the number of static measurements were also set at 0.05 (5%).

Table 2.6 Decision Rules

Parameter	***IF***	***THEN***
Scan Measurements	Areas identified with residual radioactivity exceeding 300 dpm/100 cm^2 alpha, or 3,750 dpm/100 cm^2 beta,	Select one or more biased measurement locations in each identified area; collect: ▪ alpha and beta static measurements, and ▪ alpha/beta smear sample.
Static Measurements	Residual radioactivity exceeds 100 dpm/100 cm^2 alpha or 5,000 dpm/100 cm^2 beta,	Perform 100% scan coverage (if not already done) of 4 m^2 area around measurement; select four biased measurement locations; collect: ▪ alpha and beta static measurements, and ▪ alpha/beta smear samples. Step out as needed to define area; compare results to Table 1.2.1 values.
Removable Measurements	Removable residual radioactivity exceeds 20 dpm/100 cm^2 alpha or 1,000 dpm/100 cm^2 beta,	
Surface Residual Radioactivity	Average, maximum, or removable levels exceed allowable values in Table 1.2.1,	Consult Boeing to determine further action, if any.
Background Reference Area	Material background radioactivity is suspect cause of static measurements above action levels,	Select background reference area with similar radiological and physical characteristics; perform alpha and beta static measurements at random measurement locations.
Statistical Test	No background reference area identified	Use Sign statistical test.
	Background reference area identified,	Use Wilcoxon Rank Sum (WRS) and Quantile statistical tests.
Null Hypothesis	Rejected (i.e., dose not limited to 1.0 mrem/yr),	Recommend building material release.
	Not rejected,	Perform retrospective power analysis.
Retrospective Power Analysis	Sufficient power achieved by statistical test,	Recommend remediation and/or the calculation of incremental risk or dose.
	Insufficient power achieved by statistical test,	Collect additional survey data.

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3.0 DATA COLLECTION

The data inputs collected according to project DQOs and survey data collection requirements are quantitative and qualitative in nature. Both probability-based (random and random-start, systematic) and judgmental (biased) methods were used to collect data, as described in the survey design in Section 3.0 of the FSP (CABRERA, 2007). The data were reviewed, verified, and validated during and after collection. Data were quantitatively analyzed for direct comparison to action levels and qualitatively reviewed to determine further investigation during the project. A summary of the data collected is given in Table 3.0. Complete results are found in Appendix B.

3.1 Survey Units

Exposed interior surfaces of each building, with the exception of the concrete foundation, were divided into survey units with similar physical characteristics and potential for residual radioactivity. Survey data were collected from a total of 20 survey units. Survey data were also collected from areas outside the survey units, primarily from building exteriors such as roofs, ventilation exits, and entry doors.

3.1.1 Building 4022

The east wall of Building 4022 composed a single survey unit. The building was originally divided into several survey units. However, due to relatively high levels of background radiation encountered primarily on the west side of the building, the full survey scope was reduced to the single east wall survey unit.

A limited amount of survey data was also collected from other building surfaces (i.e., north, south, and west walls; ceiling; and building crane). However, the data collected were not sufficient for data evaluation and statistical analysis to be performed and a separate decision to be made as to suitability for release. The data were used as the basis for recommendations regarding appropriate radiological controls for the demolition of the building (see Appendix A).

3.1.2 Building 4075

Building 4075 was divided into five survey units. The ceiling, and the north, south, east, and west walls each compose a single survey unit. Survey data were also collected from exterior doors, door tracks, vents, and roof surfaces.

3.1.3 Building 4563

Building 4563 was divided into two survey units: the structural steel posts and beams supporting the roof, and the ceiling or underside of the roof. Survey data were also collected from roof surfaces.

3.1.4 Building 4621

Building 4621 was divided into five survey units. The ceiling, and the north, south, east, and west walls each compose a single survey unit. Survey data were also collected from exterior doors, vents, and roof surfaces.

3.1.5 Building 4658

Building 4658 was divided into two survey units. The floor and lower walls below 2 meters (m) compose one survey unit. The upper walls and ceiling compose the second survey unit. Survey data were also collected from exterior doors, vents, and roof surfaces.

Table 3.0 Summary of Data Collected

Bldg	*Description*	*Scan Coverage (m^2)*	*Static Measure-ments*	*Alpha/Beta Smears*	*Tritium Smears*	*Sheet Metal Samples*	*Area(s) Identified For Investigation*
Survey Units							
4022	East Wall	58	17	84	3	1	2[(a)]
4075	North Wall	51	18	18	3	---	7
	East Wall	21	15	15	3	1	---
	South Wall	50	18	18	3	---	2
	West Wall	21	15	15	3	---	2
	Ceiling	22	21	21	3	1	---
4563	Posts/Beams	27	15	15	12	---	4[(a)]
	Ceiling	12	15	15	3	---	2[(a)]
4621	North Wall	22	18	18	3	1	---
	East Wall	13	16	16	3	---	1
	South Wall	22	18	18	3	---	---
	West Wall	16	16	16	3	---	1
	Ceiling	18	15	15	3	1	1
4658	Floor/Lwr Walls	33	18	18	9	---	---
	Uppr Walls/Ceil	3	14	14	6	---	---
4665	North Wall	17	15	15	3	---	1
	East Wall	14	15	15	3	---	---
	South Wall	17	15	15	3	1	1
	West Wall	14	15	15	3	---	---
	Ceiling	3	16	16	3	1	---
Areas Outside Survey Units[(b)]							
4022	North Wall	---	1	41	3	1	---
	South Wall	---	1	41	3	1	---
	West Wall	---	2	42	3	2	1[(a)]
	Ceiling	---	---	40	3	---	---
	Crane	---	---	40	---	N/A	---
4075	Ext Walls	6	---	1	---	---	1
	Ext Roof	22	---	5	---	---	1[(c)]
4563	Ext Roof	13	---	---	---	1	1[(c)]
4621	Ext Walls	4	---	---	---	---	---
	Ext Roof	1	5	---	---	---	1[(c)]
4658	Ext Walls	6	---	---	---	---	---
	Ext Roof	2	---	2	---	---	1[(c)]
4665	Ext Walls	5	---	---	---	---	---
	Ext Roof	---	10	---	---	---	1[(c)]
4688	Ext Roof	---	4	---	---	1	1[(c)]

Notes:
(a) Survey investigations discontinued due to a change in survey protocol near the end of the project.
(b) Areas from which biased data were collected; no statistical analysis performed on data.
(c) A single investigation was performed of building roof surfaces.

3.1.6 Building 4665

Building 4665 was divided into five survey units. The ceiling, and the north, south, east, and west walls each compose a single survey unit. Survey data were also collected from exterior doors, vents, and roof surfaces.

3.1.7 Building 4688

There were no survey units for Building 4688. Only a limited amount of survey data was collected from roof surfaces. Spot checks of the building revealed significant levels of beta-emitting residual radioactivity on several of the support columns. Due to the extensive nature of the elevated residual radioactivity, Boeing directed that survey activities be discontinued.

3.2 Survey and Sampling

Survey and sampling were performed in accordance with the decision rules in Table 2.5 and as described in this section. Quality control measures implemented as part of the data collection process are discussed in Section 5.0.

3.2.1 Exposure Rate Measurements

The RMHF, where the buildings are located, is an active radiologically controlled area. Background radiation levels changed regularly due to ongoing work inside the area. Exposure rates were monitored daily. Unusual (i.e., unexplained) exposure rate conditions were investigated and actions to mitigate their impact on health and safety, as well as building survey activities, were taken.

General area exposure rate measurements were performed using a Bicron MicroRem® tissue-equivalent scintillation detector. The measurements were taken using the "slow" response time constant setting. The detector was positioned at approximately waist-height in the area of interest and allowed to stabilize prior to recording the measurement (approximately 30 seconds).

3.2.2 Scan Measurements

Scan measurements were performed to locate radiation anomalies that might indicate areas with elevated residual radioactivity where further data collection was warranted. The scan coverage was 100% of exposed interior building surfaces up to 2 m above the floor. Over 2 m above the floor, the scan coverage was a minimum of 10% of the exposed interior building surfaces. Where less than 100% scan coverage was specified, the areas with the highest potential for elevated residual radioactivity within the survey unit, based on professional judgment, were selected for scanning. Scan measurement data are summarized in Table 3.2.2.

Scan measurements were performed using a Ludlum Model 43-93 100 cm^2 dual phosphor scintillation detector with a Ludlum Model 2360 alpha/beta data logger. The area to be scanned was divided into one square meter grids. Scan measurements of each grid were performed by moving the detector approximately 1 centimeter (cm) above the surface of interest at a scan rate of 15 centimeters per second (cm/sec). Activity at the beta scan measurement action level was readily detected at that scan rate. Alpha scan measurements relied on the instrument's audible unique "alpha" click, which allowed the surveyor – using the normal scanning speed of 15 cm/sec or less – to stop when a series of "alpha" clicks (i.e., more than one in close sequence) was heard and perform a static count at the location. This method was sufficient to consistently identify areas above the alpha scan measurement action level. One-minute alpha and beta scaler

counts were collected at the location of highest radioactivity within the grid and the reading was recorded. The measurement location was selected based on the judgment of the surveyor.

Hand drawn maps were used to document measurement locations. Gross counts per minute counts per minute (cpm) were converted to net dpm/100 cm^2 by subtracting the daily instrument background response check value and dividing the difference by the total efficiency (see Section 5.2).

Table 3.2.2 Summary of Scan Measurement Data

Bldg	*Description*	*Scan Coverage (m^2)*	*High (net)*[a] *(dpm/100 cm^2)*		*Areas to Investigate*	
			Alpha	*Beta*	*Alpha*	*Beta*
Survey Units						
4022	East Wall	58	153	6,932	---	1[b]
4075	North Wall	51	1,407	50,616	6	1
	East Wall	21	252	2,543	---	---
	South Wall	50	415	2,283	2	---
	West Wall	21	1,198	799	2	---
	Ceiling	22	73	360	---	---
4563	Posts/Beams	27	661	1,685	1[b]	---
	Ceiling	12	84	644	---	---
4621	North Wall	22	118	2,253	---	---
	East Wall	13	51	6,425	---	1
	South Wall	22	113	2,270	---	---
	West Wall	16	559	2,507	1	---
	Ceiling	18	65	4,899	---	1
4658	Floor/Lower Walls	33	49	551	---	---
	Upper Walls/Ceil	3	17	701	---	---
4665	North Wall	17	46	17,555	---	1
	East Wall	14	84	833	---	---
	South Wall	17	53	4,551	---	1
	West Wall	14	150	2,382	---	---
	Ceiling	3	34	2,213	---	---
Areas Outside Survey Units						
4075	Ext Non-Roof	6	500	1,753	1	---
	Ext Roof	22	452	899	[c]	---
4563	Ext Roof	13	473	1,253	[c]	---
4621	Ext Non-Roof	4	118	782	---	---
	Ext Roof	1	405	517	[c]	---
4658	Ext Non-Roof	6	93	144	---	---
	Ext Roof	2	388	764	[c]	---
4665	Ext Non-Roof	5	203	2,240	---	---

Notes:

(a) Pre-remediation one-minute net count values; gross cpm converted to net dpm/100 cm^2 by subtracting daily instrument background response check value and dividing difference by the total efficiency (see Section 5.2).

(b) Survey investigation not performed due to change in survey protocol near end of project.

(c) Numerous locations identified on building roof surface.

Nineteen non-roof locations in Buildings 4022, 4075, 4563, 4621, and 4665 were identified with residual radioactivity above the action level for scan measurements given in Table 2.3.2. Thirteen locations exceeded the action level for alpha scan measurements. Six locations exceeded the action level for beta/gamma scan measurements. Numerous roof locations on Buildings 4075, 4563, 4621, and 4658 were also identified to exceed the alpha scan measurement action level. These areas were investigated and remediated as described in Sections 3.3 and 3.4.

3.2.3 Static Measurements

Static measurements were performed using a Ludlum Model 43-93 100 cm^2 dual phosphor scintillation detector with a Ludlum Model 2360 alpha/beta data logger. Static measurements were performed by placing the detector on the surface to be measured, taking one-minute alpha and beta scaler counts, and recording the readings. Static measurement data are summarized in Table 3.2.3.

Static measurements were collected at 14 or more measurement locations in each survey unit. The number of measurement locations was calculated as described in Section 3.2.2 of the FSP (CABRERA, 2007). A random-start systematic pattern was used to select measurement locations. The starting location was determined by a random selection process. Subsequent locations were distributed around the starting location in a systematic pattern across the survey unit. Hand drawn maps were used to document measurement locations. Gross counts were converted to net dpm/100 cm^2 by subtracting the daily instrument background response check value and dividing the difference by the total efficiency (see Section 5.2).

Five non-roof locations in Buildings 4563 and one non-roof location in Building 4621 exceeded the action level for alpha static measurements. No locations exceeded the action level for beta/gamma static measurements. Numerous roof locations on Buildings 4621, 4665, and 4688 also exceeded the alpha static measurement action level. These areas were investigated and remediated as described in Sections 3.3 and 3.4. Field conversion of static measurements did not result in the identification of two alpha static measurements, both 101 dpm/100 cm^2, which were slightly above the action level of 100 dpm/100 cm^2 (due to variations in instrument efficiency and background). Consequently, these locations were not flagged for investigation.

Table 3.2.3 Summary of Static Measurement Data

Bldg	*Description*	*Number of Measure-ments*	*Net Alpha*[a] *(dpm/100 cm²)*			*Net Beta*[a] *(dpm/100 cm²)*			*Areas to Investigate*	
			Low	*High*	*MDC*	*Low*	*High*	*MDC*	*Alpha*	*Beta*
Survey Units										
4022	East Wall	17	-17	101	131	-105	3,850	880	1[c]	---
4075	North Wall	18	0	84	51	-471	517	895	---	---
	East Wall	15	0	101	51	-621	207	895	1[b]	---
	South Wall	18	0	65	51	-506	287	895	---	---
	West Wall	15	-34	17	162	-414	506	843	---	---
	Ceiling	21	0	51	51	-621	34	898	---	---
4563	Posts/Beams	15	0	242	123	-483	573	780	3[c]	---
	Ceiling	15	16	113	48	-169	719	821	2[c]	---
4621	North Wall	18	-16	129	123	67	1,045	780	1[c]	---
	East Wall	16	0	68	51	-438	918	1,018	---	---
	South Wall	18	0	101	51	-11	724	813	1[b]	---
	West Wall	16	0	68	51	-315	301	1,018	---	---
	Ceiling	15	0	65	48	292	831	793	---	---
4658	Floor/Lwr Walls	18	-34	51	162	-586	253	813	---	---
	Uppr Walls/Ceil	14	-34	17	162	-483	816	813	---	---
4665	North Wall	15	-16	32	123	169	1,753	809	---	---
	East Wall	15	0	32	48	315	1,101	803	---	---
	South Wall	15	0	48	48	562	2,056	803	---	---
	West Wall	15	-16	48	123	573	1,775	809	---	---
	Ceiling	16	0	48	48	640	2,562	803	---	---
Areas Outside Survey Units										
4022	North Wall	1	84	84	189	256	256	924	---	---
	South Wall	1	85	85	131	803	803	880	---	---
	West Wall	2	34	137	189	517	531	924	1[c]	---
4621	Ext Roof	5	254	407	130	630	890	1,028	[d]	---
4665	Ext Roof	10	271	390	51	1,918	3,918	919	[d]	---
4688	Ext Roof	4	237	356	130	342	712	1,028	[d]	---

Notes:
(a) Pre-remediation one-minute net count values collected at random-start, systematically distributed locations; gross counts converted to net dpm/100 cm^2 by subtracting daily instrument background response check value and dividing difference by the total efficiency (see Section 5.2).
(b) Field conversion of results did not identify this location as exceeding the static measurement action level.
(c) Survey investigations not performed due to change in survey protocol near the end of the project.
(d) Numerous locations identified on building roof surface.

3.2.4 Smear Samples – Alpha/Beta

Alpha/beta smear samples were collected from building surfaces over an area of approximately 100 cm^2 each. A smear sample was collected at each static measurement location and analyzed onsite for removable alpha and beta radioactivity using a Ludlum Model 43-10-1 dual phosphor ZnS(Ag) alpha/beta scintillation detector with a Ludlum Model 2929 alpha/beta scaler using a two-minute count time. The alpha/beta smear sample results are summarized in Table 3.2.4.

Gross counts were converted to net dpm/100 cm^2 by subtracting the daily instrument background response check value and dividing the difference by the total efficiency (see Section 5.2).

No locations were identified that exceeded the action level for alpha or beta removable measurements.

Table 3.2.4 Summary of Alpha/Beta Smear Sample Data

Bldg	*Description*	*Number of Samples*	*Net Alpha*[(a)] *(dpm/100 cm^2)*			*Net Beta*[(a)] *(dpm/100 cm^2)*			*Areas to Investigate*	
			Low	*High*	*MDC*	*Low*	*High*	*MDC*	*Alpha*	*Beta*
Survey Units										
4022	East Wall	84	-1	6	14	-38	93	198	---	---
4075	North Wall	18	-1	5	13	-59	28	211	---	---
	East Wall	15	0	2	12	-66	55	210	---	---
	South Wall	18	0	2	12	-60	60	210	---	---
	West Wall	15	-1	2	13	-86	50	211	---	---
	Ceiling	21	0	2	12	-87	33	210	---	---
4563	Posts/Beams	15	0	5	12	-61	75	209	---	---
	Ceiling	15	0	5	12	-61	43	209	---	---
4621	North Wall	18	-1	2	13	-45	75	209	---	---
	East Wall	16	-1	2	13	-34	58	209	---	---
	South Wall	18	-1	2	13	-73	58	209	---	---
	West Wall	16	-1	2	13	-73	48	209	---	---
	Ceiling	15	-1	2	13	-29	20	209	---	---
4658	Floor/Lwr Walls	18	0	2	12	-47	41	206	---	---
	Uppr Walls/Ceil	14	0	2	12	-47	19	206	---	---
4665	North Wall	15	0	2	12	-41	19	211	---	---
	East Wall	15	0	2	12	-41	25	211	---	---
	South Wall	15	0	2	12	-85	25	211	---	---
	West Wall	15	0	2	12	-63	96	211	---	---
	Ceiling	16	0	2	12	-57	41	211	---	---
Areas Outside Survey Units										
4022	North Wall	41	-1	3	14	-42	65	197	---	---
	South Wall	41	-1	7	14	-35	98	198	---	---
	West Wall	42	-1	5	14	-57	65	197	---	---
	Ceiling	40	0	5	12	-8	133	197	---	---
	Crane	40	0	3	12	-38	55	197	---	---
4075	Ext Walls	1	2	2	13	-10	-10	208	---	---
	Ext Roof	5	2	15	13	23	61	208	---	---
4658	Ext Roof	2	0	2	12	-36	2	206	---	---

Note:
(a) Pre-remediation one-minute net count values; gross counts were converted to net dpm/100 cm^2 by subtracting the daily instrument background response check value and dividing the difference by the total efficiency (see Section 5.2).

3.3 Survey Investigations

Eighteen investigations were performed of locations identified with residual radioactivity above one or more action levels given in Table 2.3.2. Seventeen investigations were performed of non-roof locations in Buildings 4075, 4621, and 4665, as shown in Table 3.2.3. The protocol for investigating non-roof locations consisted of scanning the immediate area around the elevated activity (a minimum of four square meters) and taking a series of static measurements around the area of elevated activity to define its size. An alpha/beta smear was also collected. Additional step-outs were performed as necessary to define the area. Professional judgment was used to investigate adjacent areas in order to provide reasonable assurance that other undiscovered areas of elevated residual radioactivity did not exist within the survey unit. Seven non-roof locations in Building 4621 and 4563 were not investigated by direction of Boeing due to a change in survey protocol near the end of the project. A single investigation was initiated of building roofs which exhibited near uniform levels of radioactivity above the action level for alpha scan and static measurements. The investigation consisted of limited random and biased scan and/or static measurements, smear and/or sheet metal samples (discussed in Section 3.6) from the roofs of Buildings 4075, 4563, 4568, 4621, 4665, and 4688. The investigation of the building roofs concluded that additional survey data would be needed in order to determine their suitability for release.

3.4 Remediation

Boeing was consulted to determine further actions regarding areas where residual radioactivity exceeded the action levels. Investigated locations, shown in Table 3.4, were remediated by physically removing the building material containing the elevated residual radioactivity. No action was taken to remediate building roofs or locations in Buildings 4621 and 4563 where residual radioactivity exceeded the alpha static measurement action level.

Table 3.4 Investigation and Remediation Summary

Bldg	*Survey Unit*	*Investigation ID*	*High (net)*[(a)] *(dpm/100 cm²)*		*Size of Elevated Area (m²)*
			Alpha	*Beta*	
4075	North Wall	A	102	945	0.05
		B	271	3,548	0.06
		C	271	2,644	0.06
		D	220	2,521	0.19
		E	237	2,507	0.19
		F	254	2,438	0.04
		G	102	1,507	0.10
	South Wall	A	254	2,795	0.03
		B	237	2,041	0.12
	West Wall	A	305	2,356	0.07
		B	220	2,479	0.12
	Ext Wall	N/A	321	2,609	0.12
4621	East Wall	N/A	236	2,563	0.05
	West Wall	N/A	84	2,839	0.05
	Ceiling	N/A	101	2,667	0.37

Bldg	*Survey Unit*	*Investigation ID*	*High (net)*[(a)] *(dpm/100 cm²)*		*Size of Elevated Area (m²)*
			Alpha	*Beta*	
4665	North Wall	B	48	2,022	0.21
	South Wall	A	97	14,281	0.06

Note:
(a) Pre-remediation one-minute net count values; gross counts were converted to net dpm/100 cm^2 by subtracting the daily instrument background response check value and dividing the difference by the total efficiency (see Section 5.2).

3.5 Background Reference Areas

No background reference areas were established and no representative material background measurements were performed since material background radioactivity was not the suspect cause for alpha and beta/gamma static measurements above the action levels. However instrument backgrounds were subtracted for scan, static and smear measurements.

3.6 Supplemental Sampling

Samples were collected and analyzed for volumetric residual radioactivity and for removable tritium surface residual radioactivity. There are no corresponding action levels. The samples were collected to verify the historical information, which did not suggest the presence of these types of residual radioactivity.

3.6.1 Smear Samples – Tritium

Fifteen tritium smear samples were collected from the various wall and ceiling surfaces in each building. Each smear sample was collected over an area of approximately 100 cm^2 using a moistened paper smear and placed in 20 milliliter (ml) liquid scintillation counting (LSC) vials containing 5 ml of de-ionized water. The tritium smears were sent offsite for analysis.

The tritium smear sample results, along with total propagated uncertainty (TPU) and MDC, are summarized in Table 3.6.1. All samples reported tritium concentrations below the MDC. There are no action levels for removable tritium surface residual radioactivity; however the allowable removable surface contamination level is 10,000 dpm/100cm^2 (Table 1.2.2). The sample results verify the historical information that does not suggest the presence of this type of residual radioactivity.

Table 3.6.1 Summary of Tritium Smear Sample Data

Bldg	*Smear Samples*	*Results (dpm/100 cm²)*				
		Low	*Mean*	*High*	*TPU*[(a)(b)]	*MDC*[(a)]
4022	15	-3.3	-0.2	2.0	60.2	10.7
4075	15	-142.1	-12.8	4.0	6.7	10.9
4563	15	-9.1	-2.4	3.8	10.2	16.9
4621	15	-6.0	0.5	17.3	11.3	17.8
4658	15	-19.8	-9.6	4.0	7.3	12.2
4665	15	-2.9	0.2	4.9	6.7	11.1

Notes:
(a) TPU and MDC values are from highest reported sample result.
(b) TPU reported at 2 sigma.

3.6.2 Sheet Metal Samples

Samples of roof and wall sheet metal representative of exposed interior building surfaces were collected. Each sample was approximately 0.1 m^2 in size. The sheet metal samples were sent offsite for analysis. Samples were cut up into strips by the laboratory and acid-etched to remove surface material in accordance with the laboratory's approved procedures. Both the metal piece and the leachate were analyzed by gamma spectroscopy; gas-flow proportional counting (GFPC) for ^{90}Sr; LSC for Plutonium-241 (^{241}Pu); and alpha spectroscopy for isotopic Polonium (Po), U, Th, and Pu.

The sheet metal results are summarized in Table 3.6.2-1. The complete results are found in Appendix C. Eight of the 13 samples analyzed reported one or more radionuclides at concentrations above their sample-specific MDC. With the exception of the Building 4658 roof sample and the Bldg 4022 north wall sample, the reported results were all less than two times their respective MDC value. The Bldg 4022 north wall sample reported ^{234}U at a concentration of 3.87 picocuries per gram (pCi/g) (MDC: 0.05 pCi/g). The Building 4658 roof sample is discussed below.

Table 3.6.2-1 Laboratory Analytical Results of Sheet Metal Samples

Radio-nuclide	*Radio-analytical Technique*	*Target MDC (pCi/g)*	*No. of Results*	*No. > MDC*	*Highest Reported Value (pCi/g)*			
					Result	*TPU*[a]	*Actual MDC*	*Sample Location*[b]
^{40}K	Gamma Spec	---	25	0	2.3	3.4	5.6	B 4022 W wall
^{90}Sr	GFPC	1	13	0	0.13	0.12	0.24	B 4665 roof
^{137}Cs	Gamma Spec	0.1	25	1	0.24	0.15	0.23	B 4665 roof[c]
^{210}Po	Alpha Spec	0.1	13	3	46.3[d]	7.4	0.1	B 4658 roof[e]
^{226}Ra[f]	Gamma Spec	---	25	0	0.22	0.3	0.5	B 4665 roof
^{228}Th	Alpha Spec	0.1	13	1	0.46	0.12	0.14	B 4658 roof[e]
^{230}Th	Alpha Spec	0.1	13	3	0.33	0.1	0.08	B 4658 roof[e]
^{232}Th	Alpha Spec	0.1	13	4	0.37	0.11	0.05	B 4658 roof[e]
^{234}U	Alpha Spec	0.1	13	2	3.87	0.77	0.05	B 4022 N wall
^{235}U	Alpha Spec	0.1	13	2	0.29	0.43	0.72	B 4022 E wall
^{238}U	Alpha Spec	0.1	13	2	0.389	0.092	0.03	B 4658 roof[e]
^{238}Pu	Alpha Spec	0.1	13	0	0.0025	0.009	0.01	B 4022 W wall
^{239}Pu	Alpha Spec	0.1	13	0	0.0063	0.0080	0.0105	B 4621 wall
^{241}Pu	LSC	20	13	0	0.21	0.75	1.26	B 4075 wall

Notes:
(a) TPU reported at 2 sigma.
(b) Sample results reported are from leachate analysis unless otherwise noted.
(c) Sample results reported are from metal piece analysis.
(d) Next highest value is 0.067 pCi/g (TPU: 0.05 pCi/g; MDC: 0.06 pCi/g) from the Building 4665 roof.
(e) Sample results reported are from rust analysis.
(f) Reported based on progeny ^{214}Bi concentration, assuming secular equilibrium.

Unlike the other 12 samples of sheet metal cut from building wall and roof locations, a sample was collected of rust scrapped from the plate metal roof of Building 4658. While not representative of radionuclide concentrations on building roof surfaces, the sample was particularly useful to understand a survey observation: alpha counts were observed to be consistently higher on building roofs, particularly on rusted areas of the roof. A sample of rust

was collected specifically based on that observation. The Building 4658 roof was selected because of the large rusted areas on the roof and the relative ease of scrapping the rust from a flat surface rather than the corrugated sheet metal surface of the other building roofs.

Seven radionuclides were identified in the Building 4658 roof rust sample at concentrations significantly above sample-specific MDCs. A comparison of results of the rust sample to those of the sheet metal samples is given in Table 3.6.2-2. There appears to be a preferential affinity of Th and U isotopes to adhere in some manner to rusted surfaces. Perhaps the easily removable rust contained a sizable fraction of wind-blown dirt. Soil has approximately 1 pCi/g of U and Th and their decay products. This may account for the fractional pCi/g seen in Table 3.6.2.-2. Of particular note is the reported concentration of 46.3 pCi/g of ^{210}Po. The radionuclide ^{210}Po has a 140-day half-life and is found naturally as part of the uranium decay series, and specifically as the progeny of ^{210}Bi, which decays by beta emission to ^{210}Po, which in turn decays by alpha emission to the stable isotope Lead-206 (^{206}Pb). The reported sample concentration of ^{210}Po, however, is not consistent with the concentrations of other radionuclides in the uranium decay series, which were found to be 0.2 to 0.4 pCi/g. This suggests a source of ^{210}Po (or a parent) in addition to the natural decay of U. While the results of the rust sample are illustrative and informative, caution should be used when drawing anything other than purely qualitative conclusions.

Table 3.6.2.-2 Comparison of Building 4658 Roof Sample Results

Radio-nuclide	***Bldg 4658 Roof Sample Concentration (pCi/g)***	***Next Highest Sample Concentration (pCi/g)***
^{210}Po	46.3	0.067
^{228}Th	0.46	0.028
^{230}Th	0.33	0.065
^{232}Th	0.37	0.018
^{234}U	0.419	0.022
^{235}U	0.024	0.009
^{238}U	0.389	0.032

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4.0 DATA EVALUATION

Data were evaluated to determine whether or not the residual radioactivity will result in an incremental dose above background to an average member of the critical group less than or equal to 1.0 mrem/yr TEDE, based on the dose criterion given in Section 1.2.2. As applied here, the building material is not considered suitable for release unless the survey data show that the residual radioactivity results in a dose less than or equal to 1.0 mrem/yr TEDE.

4.1 Exploratory Data Analysis

The data were evaluated using exploratory data analysis (EDA), which uses statistical tools to investigate data sets in order to understand their important characteristics. Summary statistics provided numerical values for measures of central tendency (e.g., mean, median), variation (e.g., standard deviation), and spread (e.g., minimum, maximum). Data evaluation and statistical analysis were performed and a separate decision was made for each of the 20 survey units as to its suitability for release. The survey data collected from areas outside the survey units were evaluated qualitatively and no statistical analysis of the data was performed. Static measurement data are summarized in Tables 4.1-1 and 4.1-2.

Table 4.1-1 Summary of Alpha Static Measurement Data

Bldg	*Description*	*Number of Measurements*	*Statistical Value (dpm/100 cm^2)*					
			Mean	*Std Dev*	*Median*	*Min*	*Max*	*Range*
Survey Units								
4022	East Wall	17	45	33	51	-17	101	118
4075	North Wall	18	29	20	33	0	84	84
	East Wall	15	33	27	34	0	101	101
	South Wall	18	20	17	17	0	65	65
	West Wall	15	-12	22	-17	-34	17	51
	Ceiling	21	17	19	17	0	51	51
4563	Posts/Beams	15	60	68	32	0	242	242
	Ceiling	15	51	30	48	16	113	97
4621	North Wall	18	15	34	16	-16	129	145
	East Wall	16	25	21	25	0	68	68
	South Wall	18	23	25	17	0	101	101
	West Wall	16	23	19	17	0	68	68
	Ceiling	15	27	18	16	0	65	65
4658	Flr/Lwr Walls	18	-12	26	-17	-34	51	84
	Up Walls/Ceil	14	-16	17	-17	-34	17	51
4665	North Wall	15	-1	21	-16	-16	32	48
	East Wall	15	16	14	16	0	32	32
	South Wall	15	18	17	16	0	48	48
	West Wall	15	13	21	16	-16	48	65
	Ceiling	16	20	18	24	0	48	48

Exploratory Dose Equivalent was used to understand the characteristics of the data populations as well as to validate assumptions underlying the statistical test, which are that the data are symmetric, statistically independent, and have no trends. For a normally distributed population, a range larger than five times the standard deviation is unusual, except for larger data sets. None

of the populations have an unusually large range. Large differences between the mean and the median are an indication of the skewness (i.e., non-symmetry) in the data. Skewness is a function of the difference between the mean and the median relative to the standard deviation. None of the populations appear to be skewed based on the similar values for the mean and median and relatively large standard deviations, except for the alpha static measurement population for the Building 4665 North Wall. At the lower end of the population distribution, nine of the 15 measurements are zero counts, or -16 dpm/100 cm^2. At the upper end, three measurements are 3 counts, or 32 dpm/100 cm^2. The mean is zero and the median is -16 dpm/100 cm^2. The apparent skewness is not of concern for two reasons. First, the range of counts is very small (0 to 3 counts) and second, the upper end of the distribution is within the expected background variability for alpha measurements.

Table 4.1-2 Summary of Beta Static Measurement Data

Bldg	*Description*	*Number of Measurements*	*Statistical Value (dpm/100 cm^2)*					
			Mean	*Std Dev*	*Median*	*Min*	*Max*	*Range*
Survey Units								
4022	East Wall	17	1,109	1,071	776	-105	3,850	3,955
4075	North Wall	18	73	267	96	-471	517	988
	East Wall	15	-270	216	-287	-621	207	828
	South Wall	18	-80	231	-75	-506	287	793
	West Wall	15	144	256	161	-414	506	920
	Ceiling	21	-282	211	-241	-621	34	655
4563	Posts/Beams	15	-75	299	-146	-483	573	1,056
	Ceiling	15	382	259	472	-169	719	888
4621	North Wall	18	673	310	674	67	1,045	978
	East Wall	16	189	379	137	-438	918	1,356
	South Wall	18	277	192	230	-11	724	736
	West Wall	16	-4	208	-41	-315	301	616
	Ceiling	15	557	176	539	292	831	539
4658	Flr/Lwr Walls	18	-125	245	-63	-586	253	839
	Up Walls/Ceil	14	82	435	-29	-483	816	1,299
4665	North Wall	15	938	477	955	169	1,753	1,584
	East Wall	15	720	244	708	315	1,101	787
	South Wall	15	1,287	455	1,258	562	2,056	1,494
	West Wall	15	1,254	402	1,258	573	1,775	1,202
	Ceiling	16	1,548	612	1,489	640	2,562	1,921

4.2 Surface Residual Radioactivity Release Criterion

Static measurements of alpha- and beta/gamma-emitting surface residual radioactivity were compared to the limits for surface contamination of existing structures by alpha- and beta/gamma-emitting radionuclides given in Table 1.2.2. The limits for alpha- and beta/gamma-emitting radionuclides were applied independently. The results, shown in Table 4.2, are a statistical sampling representative of the surface area in the survey unit. They show the levels of residual radioactivity in each survey unit are below the allowable concentrations in Table 1.2.2.

Table 4.2 Measured vs. Allowable Levels of Surface Residual Radioactivity

Bldg	*Description*	*Measured Values (dpm/100 cm²)*							*Meets Table 1.1 Levels?*
		Average		*Maximum*		*Removable*[(a)]			
		Alpha	*Beta*	*Alpha*	*Beta*	*Alpha*	*Beta*	*Tritium*	
Table 1.1 Value[(b)]		100	5,000	300	15,000	20	1,000	10,000	N/A
4022	East Wall	45	1,109	101	3,850	6	93	2.0	Yes
4075	North Wall	29	73	84	517	5	28	4.0	Yes
	East Wall	33	-270	101	207	2	55		Yes
	South Wall	20	-80	65	287	2	60		Yes
	West Wall	-12	144	17	506	2	50		Yes
	Ceiling	17	-282	51	34	2	33		Yes
4563	Posts/Beams	60	-75	242	573	5	75	3.8	Yes
	Ceiling	51	382	113	719	5	43		Yes
4621	North Wall	15	673	129	1,045	2	75	17.3	Yes
	East Wall	25	189	68	918	2	58		Yes
	South Wall	23	277	101	724	2	58		Yes
	West Wall	23	-4	68	301	2	48		Yes
	Ceiling	27	557	65	831	2	20		Yes
4658	Flr/Lower Walls	-12	-125	51	253	2	41	4.0	Yes
	Up Walls/Ceiling	-16	82	17	816	2	19		Yes
4665	North Wall	-1	938	32	1,753	2	19	4.9	Yes
	East Wall	16	720	32	1,101	2	25		Yes
	South Wall	18	1,287	48	2,056	2	25		Yes
	West Wall	13	1,254	48	1,775	2	96		Yes
	Ceiling	20	1,548	48	2,562	2	41		Yes

Notes:
(a) Highest measured value; tritium results compiled by building
(b) Most limiting value for each type of emission.

4.3 Dose Release Criterion

Surface and volumetric residual radioactivity values for alpha- and beta/gamma-emitting radionuclides from ANSI/HPS N13.12-1999 (ANSI, 1999) and NUREG-1640 (NRC, 2003) were used to assess the dose to a member of the public.

4.3.1 Surface Residual Radioactivity

The results, shown in Table 4.3.1, show the incremental doses above background from surface residual radioactivity in each survey unit is less than 1 mrem/yr TEDE. The doses were calculated based on most limiting alpha and beta/gamma surface screening values of 600 dpm/100 cm^2 and 6,000 dpm/100 cm^2, respectively, from ANSI/HPS N13.12-1999, Table 1; and on the most restrictive EDE of alpha-emitting ^{232}Th (0.77 µrem/yr per dpm/100 cm^2) and beta/gamma-emitting ^{60}Co (0.16 µrem/yr per dpm/100 cm^2) from NUREG-1640, Table 2.1. The dose conversion values from ANSI/HPS N13.12-1999 or NUREG-1640 represent a dose of 1 mrem/yr TEDE. As is evident from Table 4.3.1, the resultant doses are comparable.

As a note of explanation, the results in Table 4.3.1 represent an analysis of potential doses that could result from scenarios involving volume and surface sources of contamination and the

results of other modeling studies for recycling and landfill disposal, including considerations regarding the conservative nature of the modeling results. It is not appropriate to sum, average, or otherwise manipulate the results in aggregate.

Table 4.3.1 Incremental Dose Contribution from Surface Residual Radioactivity

Bldg	*Description*	*Highest Value*[a] *(dpm/100 cm²)*		*Incremental Dose (mrem/yr)*					
				ANSI/HPS N13.12-1999[b]			*NUREG-1640*[c]		
		Alpha	*Beta*	*Alpha*	*Beta*	*Total*[d]	*Alpha*	*Beta*	*Total*[d]
4022	East Wall	101	3,850	0.2	0.6	0.8	0.1	0.6	0.7
4075	North Wall	84	517	0.1	0.1	0.2	0.1	0.1	0.1
	East Wall	101	207	0.2	0.0	0.2	0.1	0.0	0.1
	South Wall	65	287	0.1	0.0	0.2	0.1	0.0	0.1
	West Wall	17	506	0.0	0.1	0.1	0.0	0.1	0.1
	Ceiling	51	34	0.1	0.0	0.1	0.0	0.0	0.0
4563	Posts/Beams	242	573	0.4	0.1	0.5	0.2	0.1	0.3
	Ceiling	113	719	0.2	0.1	0.3	0.1	0.1	0.2
4621	North Wall	129	1,045	0.2	0.2	0.4	0.1	0.2	0.3
	East Wall	68	918	0.1	0.2	0.3	0.1	0.1	0.2
	South Wall	101	724	0.2	0.1	0.3	0.1	0.1	0.2
	West Wall	68	301	0.1	0.1	0.2	0.1	0.0	0.1
	Ceiling	65	831	0.1	0.1	0.2	0.1	0.1	0.2
4658	Flr/Lwr Walls	51	253	0.1	0.0	0.1	0.0	0.0	0.1
	Up Walls/Ceil	17	816	0.0	0.1	0.2	0.0	0.1	0.1
4665	North Wall	32	1,753	0.1	0.3	0.3	0.0	0.3	0.3
	East Wall	32	1,101	0.1	0.2	0.2	0.0	0.2	0.2
	South Wall	48	2,056	0.1	0.3	0.4	0.0	0.3	0.4
	West Wall	48	1,775	0.1	0.3	0.4	0.0	0.3	0.3
	Ceiling	48	2,562	0.1	0.4	0.5	0.0	0.4	0.4

Note:
(a) Static measurement results.
(b) Dose calculated by dividing the highest measured value by the most limiting alpha and beta/gamma surface screening values of 600 dpm/100 cm^2 and 6,000 dpm/100 cm^2, respectively, from ANSI/HPS N13.12-1999 (ANSI 1999), Table 1. The Table 1 values represent 1 mrem/yr TEDE.
(c) Dose calculated by multiplying the highest measured value by the most restrictive EDE of alpha-emitting ^{232}Th (0.77 µrem/yr per dpm/100 cm^2) and beta/gamma-emitting ^{60}Co (0.16 µrem/yr per dpm/100 cm^2) from NUREG-1640 (NRC, 2003), Table 2.1. The product is divided by 1,000 to convert µrem/yr to mrem/yr.
(d) Total may not appear to equal sum of alpha and beta dose component due to round-off error.

4.3.2 Volumetric Residual Radioactivity

For illustrative purposes, the highest reported results for the roof and wall sheet metal samples (Table 4.4 were used to assess potential dose to a member of the public from volumetric residual radioactivity using the radionuclide-specific EDEs given in Table 2.1 of NUREG-1640. Assuming the concentration of radioactivity in the leachate is representative of the volumetric concentration of radioactivity in the sheet metal, the disposal of the building demolition debris as decommissioned material represents an incremental dose above background less than 1.0 mrem/yr TEDE.

4.4 Statistical Test

A statistical test is used to test the truth of the null and alternative hypotheses given in Section 2.2. It does not need to be performed when the survey data clearly show that the residual radioactivity will not result in a dose greater than 1.0 mrem/yr TEDE, such as in this instance. Every measurement in the data population is below the screening values from ANSI/HPS N13.12-1999 and the most restrictive EDEs from NUREG-1640. Therefore, no statistical test was applied. The null hypothesis is rejected, meaning the residual radioactivity will result in a dose limited to 1.0 mrem/yr TEDE. The decision that the survey unit (i.e., building material) is suitable for release can be made with sufficient confidence and without further analysis.

Table 4.4 Incremental Dose Contribution from Volumetric Residual Radioactivity

Radio-nuclide	***Highest Value*** [a] ***(pCi/g)***	***Sample Location*** [b]	***NUREG-1640***	
			EDE (µrem/yr per pCi/g)	***Dose*** [c] ***(mrem/yr)***
^{90}Sr	0.13	Bldg 4665 roof	5.55	0.0
^{137}Cs	0.24	Bldg 4665 roof	226	0.1
^{210}Po	0.067	Bldg 4665 roof	23.3	0.0
^{228}Th	0.008	Bldg 4621 roof	666	0.0
^{230}Th	0.009	Bldg 4075 wall	99.9	0.0
^{232}Th	0.0027	Bldg 4688 roof	444	0.0
^{234}U	0.0073	Bldg 4075 roof	85.1	0.0
^{235}U	0.0071	Bldg 4075 roof	122	0.0
^{238}U	0.0041	Bldg 4665 wall	77.7	0.0
^{238}Pu	0	Bldg 4688 roof	115	0.0
^{239}Pu	0.0063	Bldg 4621 wall	122	0.0
^{241}Pu	0.21	Bldg 4075 wall	2.26	0.0

Note:
(a) Laboratory analytical results of sheet metal samples.
(b) Results of the rust sample collected from the Building 4658 are excluded since the results are not representative of building surfaces.
(c) Dose calculated by multiplying the highest measured value by the EDE from NUREG-1640, Table 2.1. The product is divided by 1,000 to convert µrem/yr to mrem/yr.

4.5 Retrospective Power Analysis

A retrospective power analysis was performed as described in Appendix I.9 of the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM, EPA, 2000). The utility of a retrospective power analysis is found in verifying a sufficient number of samples were collected in the event a statistical test is not performed. The statistical test provides no useful information when every measurement in the data population is less than the screening value (or most restrictive EDE). The probability of rejecting the null hypothesis is always 100% and the question regarding whether a sufficient number of samples were collected will remain unless answered by a power analysis.

Calculation assumptions used to construct the power analysis, given in Table 4.5-1, are from Sections 2.3.3 and 2.6 of the FSP (CABRERA, 2007). They are based on the most limiting surface screening values given in Table 1 of ANSI/HPS N13.12-1999 for alpha- and beta/gamma-

emitters protective of 1.0 mrem/yr, and assume a decision error rate of 0.05 (5%) for both Type I and Type II errors for the statistical test.

Table 4.5-1 Retrospective Power Analysis Assumptions

Parameter	*Value*
Upper Bound of Gray Region	600 dpm/100 cm^2 alpha 6,000 dpm/100 cm^2 beta/gamma
Lower Bound of Gray Region	0 dpm/100 cm^2
Type I Error (false positive)	0.05
Type II Error (false negative)	0.05

The results, shown in Table 4.5-2, indicate that the number of measurements collected per survey unit was greater than the minimum number required to assure sufficient statistical power to the test.

Table 4.5-2 Retrospective Power Analysis by Survey Unit

Bldg	*Description*	*Actual Std Dev (dpm/100 cm^2)*		*Number Required*		*Number Collected*	*Sufficient?*
		Alpha	*Beta*	*Alpha*	*Beta*		
4022	East Wall	33	1,071	13	13	17	Yes
4075	North Wall	20	267	13	13	18	Yes
	East Wall	27	216	13	13	15	Yes
	South Wall	17	231	13	13	18	Yes
	West Wall	22	256	13	13	15	Yes
	Ceiling	19	211	13	13	21	Yes
4563	Posts/Beams	68	299	13	13	15	Yes
	Ceiling	30	259	13	13	15	Yes
4621	North Wall	34	310	13	13	18	Yes
	East Wall	21	379	13	13	16	Yes
	South Wall	25	192	13	13	18	Yes
	West Wall	19	208	13	13	16	Yes
	Ceiling	18	176	13	13	15	Yes
4658	Flr/Lower Walls	26	245	13	13	18	Yes
	Up Walls/Ceiling	17	435	13	13	14	Yes
4665	North Wall	21	477	13	13	15	Yes
	East Wall	14	244	13	13	15	Yes
	South Wall	17	455	13	13	15	Yes
	West Wall	21	402	13	13	15	Yes
	Ceiling	18	612	13	13	16	Yes

5.0 QUALITY CONTROL

Survey data collection activities were performed in a controlled, deliberate manner by trained individuals with calibrated instruments following written procedures and/or protocols. Data were recorded and reviewed, and documentation is auditable. Instrumentation capable of detecting the radiation types and energies of interest were selected, calibrated, and maintained for survey data collection (see Appendix D).

5.1 Precision, Accuracy, Representativeness, Comparability, and Completeness

Quality control (QC) measures were implemented to ensure data met known and suitable data quality criteria, i.e., precision, accuracy, representativeness, comparability, and completeness. Variables related to data precision and accuracy was monitored by instrument response checks designed to monitor the performance of the instrumentation used to collect the data. Duplicate analyses were performed by the analytical laboratory and the results compared. The representativeness of the data was ensured by the use of standardized data collection methods and techniques established in written procedures, listed in Table 5.1. Routine monitoring of surveyor performance and environmental factors was performed to ensure data comparability. The type and quantity of collected data were reviewed against project DQOs (see Section 2.0) to ensure data completeness.

Table 5.1 CABRERA Operating Procedures Used for Survey Data Collection

Number	*Title*
OP-001	Radiological Surveys
OP-005	Volumetric and Material Sampling
OP-008	Chain of Custody
OP-009	Use and Control of Radioactive Check Sources
OP-020	Operation of Contamination Survey Meters
OP-023	Operation of Micro-R Meters

5.2 Field Survey Instrumentation

Commercially available radiation detection and measurement instrumentation were selected based on reliable operation, detection sensitivity, operating characteristics, and expected performance in the field. Table 5.2 lists the types of field instrumentation used.

Table 5.2 Field Instrumentation

Measurement Type	*Detector Type*	*Effective Detector Area and Window Density*	*Instrument Model*	*Detector Model*
Exposure Rate Static	Tissue-equiv. scintillation	N/A	Bicron MicroRem®	N/A
Alpha/Beta Scan/Static	Dual phosphor scintillation	100 cm^2 1.2 mg/cm^2 aluminized mylar	Ludlum 2360	Ludlum 43-93
Alpha/Beta Smears	ZnS(Ag) scintillation	2” (5.1cm) diameter 0.4 mg/cm^2	Ludlum 2929	Ludlum 43-10-1

5.2.1 Calibration and Maintenance

Survey instruments were calibrated prior to use. Radiation detection instruments were calibrated for the radiation types and energies of interest. Radioactive sources used for calibration purposes

are traceable to the National Institute of Standards and Technology (NIST). Instrumentation was inspected prior to use to ensure its proper working condition, and properly protected against inclement weather conditions in the operation.

5.2.2 Instrument Response

Instrument response checks were conducted to assure constancy in instrument response, to verify the detector was operating properly, and to demonstrate that measurement results were not the result of detector contamination. Instrument response was checked before and after instrument use each day data were collected. A check source was used that emits the same type of radiation (i.e., alpha, beta, and/or gamma) as the radiation being measured and that gives a similar instrument response. The response check was performed at a set location using a specified source-detector alignment that could easily be repeated.

Prior to initial instrument use, at least 10 measurements were made using a source representative of the radiation types and energies of interest. At least 10 one-minute measurements were also made with the source removed to determine the instrument's expected response to ambient background. Background was monitored qualitatively to assess daily variations that may have impacted instrument MDCs. From the initial source measurements, the mean of the observed count rate was calculated. The acceptance criterion was ± 20% of the mean of the initial source counts. Source checks were monitored using a control chart, with control limits set at ± 20% of the average count rate. For the alpha/beta smear counter, the acceptance criterion for each channel was set at ± 2σ or 3σ from the mean. If an alpha/beta counting system channel falls outside 2σ of the mean but is within 3σ of the mean, the source check was repeated.

5.2.3 Detection Sensitivity

The detection sensitivities of field instrumentation are shown in Table 5.2.3. The results shown are based on representative count times, background counts and instrument and surface efficiencies. Instrument-specific values based on actual field conditions were used to establish a priori MDC values for scan and static measurements prior to instrument use. The MDC values were calculated as described in Section 4.2.4 of the FSP (Cabrera, 2007).

Table 5.2.3 Representative Field Instrumentation Detection Sensitivities

Detector Model	*Type of Emission*	*Count Time (min)*	*Back-ground (cpm)*	*Instrument Efficiency (cpm/dpm)*	*Scan MDC*[(a)] *(dpm/100 cm²)*	*Static MDC*[(b)] *(dpm/100 cm²)*
Ludlum 43-93	Alpha	1	1	0.24	N/A	130[(c)]
Ludlum 43-93	Beta	1	210	0.16	3,650[(c,d)]	880[(c)]
Ludlum 43-10-1	Alpha	2	<1	0.38[(e)]	N/A	10
Ludlum 43-10-1	Beta	2	60	0.18[(e)]	N/A	150

Notes:
(a) Scan MDC is calculated per MARSSIM Equation 6-10 and assumes a surveyor efficiency of 0.5, and a value of 1.38 for acceptable false indications.
(b) Static MDC is calculated per MARSSIM Equation 6-7.
(c) Based on conservative surface efficiencies for alpha and beta of 0.25 and 0.50, respectively.
(d) Assumes a reduced total efficiency of 0.06 (based on source-to-detector distance of 1 cm), and an observation interval of 1 second, which results from a scan speed of 15 cm (approximately one detector width) per second.
(e) 4π detection efficiency assumed; i.e., surface efficiency equals unity.

The instrument efficiency, i.e., the ratio between the net count rate of the instrument and the 2π surface emission rate of a radiation source, was determined by counting the source with the detector in a fixed position from the source (reproducible geometry). A jig was used to create the reproducible geometry and a source to detector distance of 1 cm was used for scan measurements. For static measurements, the detector was placed on contact with the source. A surface efficiency of 0.5 was used for beta-emitting radiations. A value of 0.25 was used for alpha-emitting radiations. These values were established based on surface geometry considerations. The surface efficiency is the ratio between the number of radiation particles emerging from the measurement surface of the area being surveyed (the source) and the total number of radiation particles being released within that source per unit time.

5.3 Analytical Laboratory Performance

Paragon Analytics is certified by a state that is authorized to provide National Environmental Laboratory Accreditation Program (NELAP) certification. Three types of QC samples were analyzed to evaluate laboratory performance:

- Laboratory control samples to evaluate potential bias in the measurement results.
- Replicate samples to precision and the effectiveness of sample preparation techniques.
- Reagent blank samples to evaluate the potential for laboratory contamination.

The analytical laboratory reviewed the data for consistency and reasonableness and determined program requirements had been satisfied. The QC sample results are found with the laboratory analytical data in Appendix C.

5.4 Data Quality Assessment

Survey data were verified to be reliable, appropriately documented, and technically defensible. Specifically, the following conclusions were made:

- The instruments used to collect the data were capable of detecting the radiation types and energies of interest at or below the action levels.
- The calibration of the instruments used to collect the data was current and radioactive sources used for calibration were NIST traceable.
- Instrument response was checked before and after instrument use each day data were collected.
- The MDCs and the assumptions used to develop them were appropriate for the instruments and the survey methods used to collect the data.
- The survey methods used to collect the data were appropriate for the media and types of radiation being measured.
- The custody of samples collected for laboratory analysis was tracked from the point of collection until final results were obtained.
- The survey data consist of qualified measurement results that are representative of the area of interest and collected as prescribed by the survey design.

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6.0 SUMMARY AND CONCLUSION

The purpose of the survey was to collect data to verify the levels of residual radioactivity in the buildings are sufficiently low to be protective of public health and safety and to justify building material release.

The release criteria established for this project were two-fold:

(1) Surface residual radioactivity must meet the levels given in Table 1 of NRC Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors* (NRC, 1974) and Table IV-1 of DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE, 1993).

(2) Disposal of the building material at the Kettleman Hills landfill must result in a dose to a member of the public or landfill worker no greater 100 mrem/yr.

6.1 Surface Residual Radioactivity

Measurements of alpha- and beta/gamma-emitting surface residual radioactivity were compared to the allowable limits for surface contamination of existing structures by alpha- and beta/gamma-emitting radionuclides given in Regulatory Guide 1.86 (NRC, 1974) and DOE Order 5400.5 (DOE, 1993), as summarized in Table 1.2.2. The limits for alpha- and beta/gamma-emitting radionuclides were applied independently. The results show the levels of surface residual radioactivity in each survey unit meet the allowable concentrations.

6.2 Dose to a Member of the Public

The results show the incremental doses above background from surface residual radioactivity in each survey unit is less than 1.0 mrem/yr TEDE. The doses were calculated from the highest reported results and based on the most limiting alpha and beta/gamma surface screening values of 600 dpm/100 cm^2 and 6,000 dpm/100 cm^2, respectively, from ANSI/HPS N13.12-1999, Table 1; and the most restrictive EDE of alpha-emitting ^{232}Th (0.77 μrem/yr per dpm/100 cm^2) and beta/gamma-emitting ^{60}Co (0.16 μrem/yr per dpm/100 cm^2) from NUREG-1640, Table 2.1. The results using dose conversion values from either ANSI/HPS N13.12-1999 or NUREG-1640 are comparable.

For illustrative purposes, the highest reported results for the roof and wall sheet metal samples were used to assess potential dose to a member of the public from volumetric residual radioactivity using the radionuclide-specific EDEs given in Table 2.1 of NUREG-1640. The disposal of the building demolition debris as decommissioned material represents an incremental dose above background less than 1.0 mrem/yr TEDE, assuming volumetrically distributed radioactivity.

6.3 Conclusion

With the exception of concrete foundations and building roofs, the building materials from Building 4075, 4563, 4621, 4658, and 4665 are suitable for release. Survey data show that the residual radioactivity, either surficially or volumetrically, will result in a dose less than or equal to 1.0 mrem/yr TEDE, which is protective of public health and safety and justifies building material release. The concrete foundations were outside the survey scope and the investigation of the building roofs concluded that additional survey data would be needed in order to determine their suitability for release.

Insufficient survey data were collected from Buildings 4022 and 4688 to determine their suitability for release. Data collected from Building 4022 was limited due to relatively high levels of background radiation encountered primarily on the west side of the building. Spot checks of Building 4688 revealed significant levels of beta-emitting residual radioactivity on several of the support columns. Due to the extensive nature of the elevated residual radioactivity at Building 4688, Boeing directed that survey activities be discontinued.

Recommendations regarding appropriate radiological controls for the demolition of Building 4022 are found in Appendix A.

7.0 REFERENCES

The following works were consulted in preparing this report.

ANSI, August, 1999. *Surface and Volume Radioactivity Standards for Clearance*, American National Standards Institute/Health Physics Society N13.12-1999.

Cabrera Services Inc., April, 2007. *Field Sampling Plan: Radioactive Materials Handling Facility Building Surveys*, Cabrera Services, Inc., Final.

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NRC, 1997. *A Proposed Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys*, NUREG-1505, United States Nuclear Regulatory Commission.

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Appendix A:
Radiological Controls Recommendations for the Demolition of Building 4022

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Early in the project, relatively high exposure rates – up to 140 microremRoentgen per hour (µR/hr) - were identified primarily along the west wall of Building 4022. A floor-to-ceiling survey of the west wall of Building 4022 was performed (see next page). The survey consisted of exposure rate and alpha and beta static measurements and was performed to determine whether shielding or other alternative approaches could be used to reduce high background levels in the building. Boeing decided, based on the results of the survey, that Building 4022 could not be satisfactorily surveyed as originally proposed. Consequently, the survey of Building 4022 was redesigned, in part, to collect data upon which recommendations regarding radiological controls for the demolition of the building could be made.

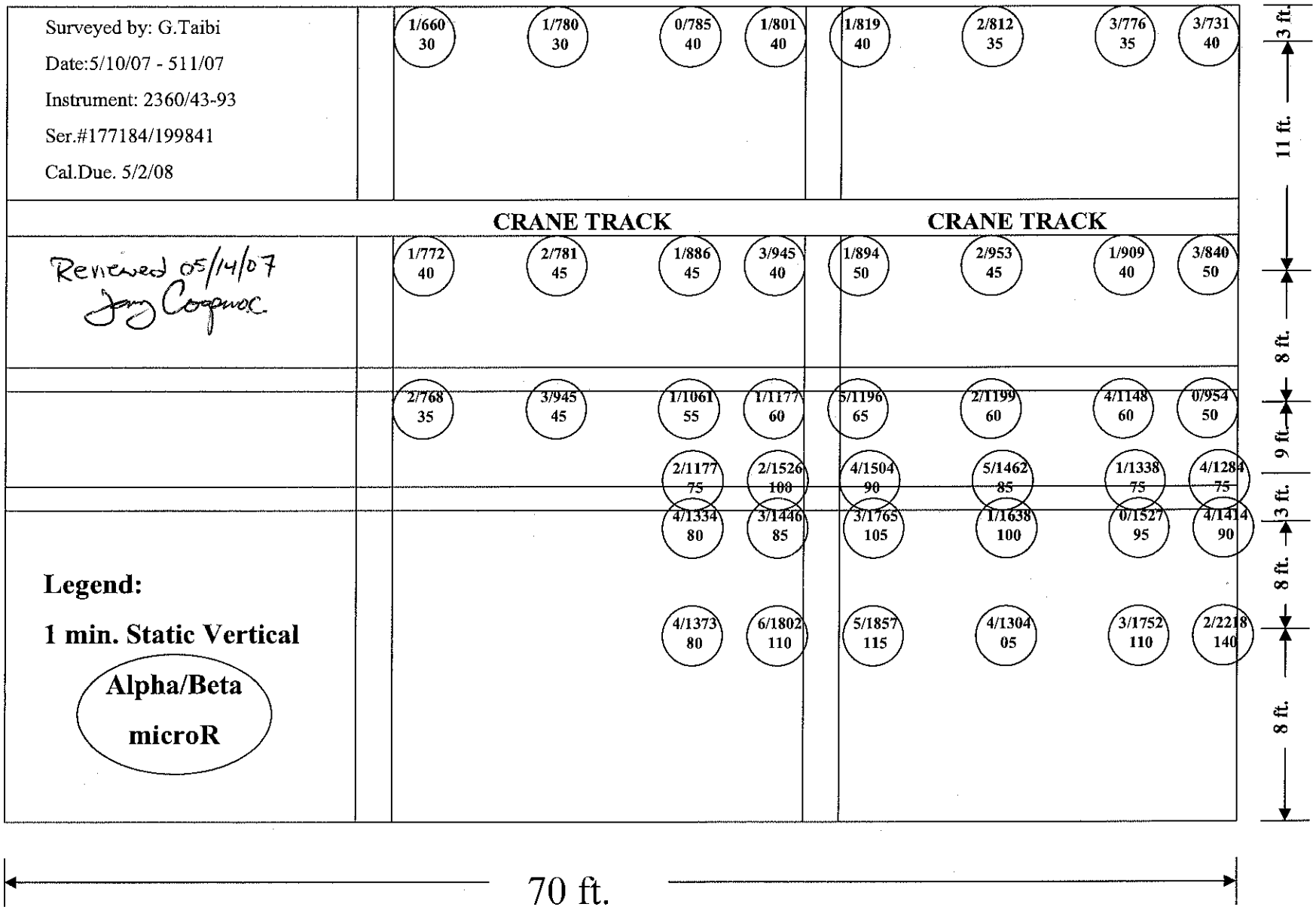
Due to the high background levels, static measurements were limited to the east wall. The survey protocols described in the FSP (CABRERA, 2007) were used to complete the east wall survey as originally scoped. Scan coverage consisted of 100% up to 2 m and 10% of the upper wall above 2 m. The wall was scanned in 1 m^2 grids. Each grid was scanned, followed by one-minute alpha and beta static measurements performed at the location of highest radioactivity within the grid. The measurement location was selected based on the judgment of the surveyor.

A comprehensive survey for removable contamination was performed of the entire building (except the floor, which was outside the survey scope) with particular focus on horizontal surfaces. Forty or more smears were collected from each wall, the ceiling, and the bridge crane, and analyzed for removable alpha and beta radioactivity. A total of 15 swipes were collected from various building surfaces and analyzed for tritium. Five samples of sheet metal from the building walls were also collected to assist with assessment of fixed plus removable contamination and sent to Paragon Analytics for laboratory analysis. The protocols for collecting and analyzing the samples were the same as those used for samples already collected from other RMHF buildings. No survey data were collected from building exterior surfaces above 2 m, including the roof and the exhaust stack on the southeast corner of the building.

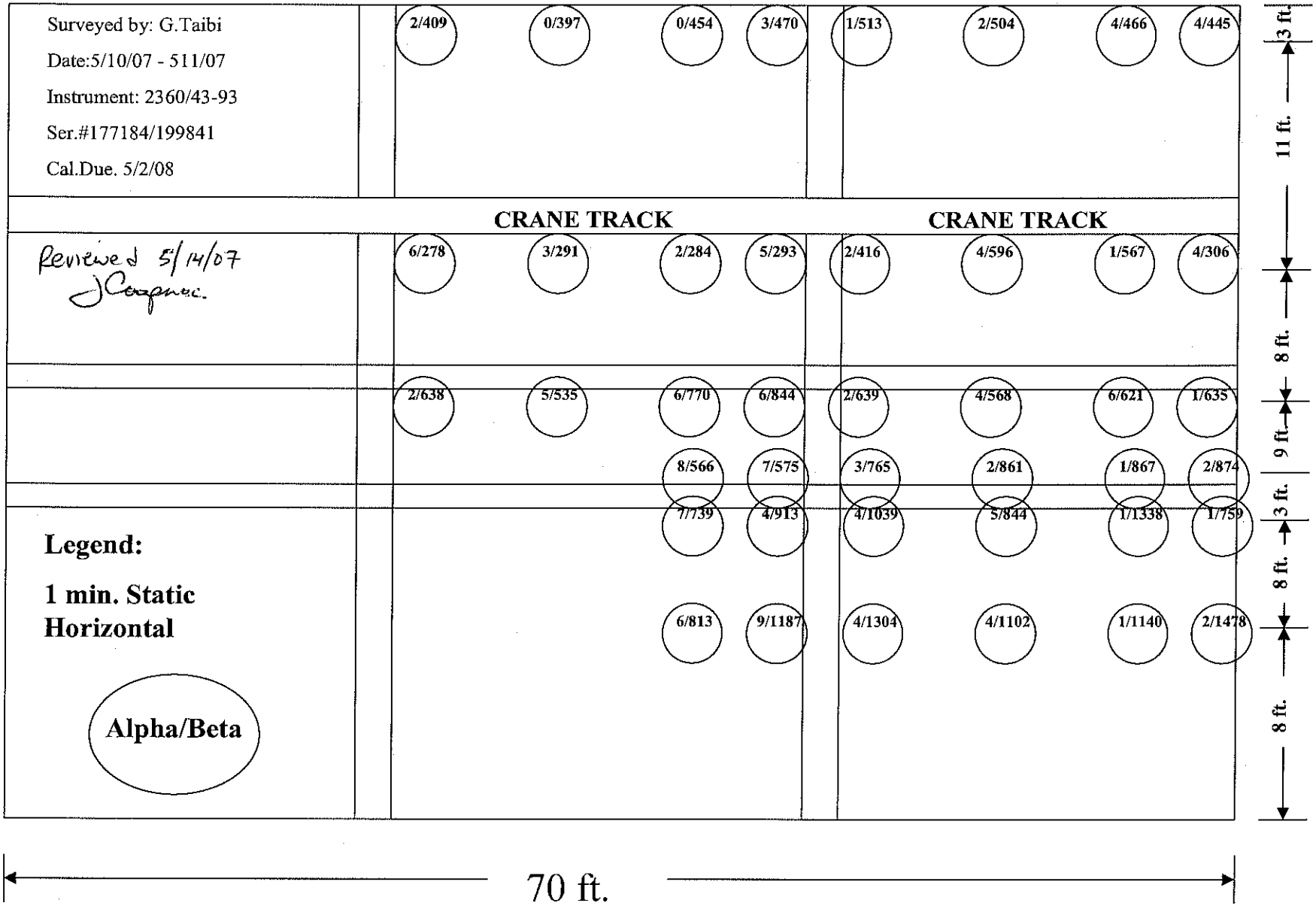
Measurements of fixed and removable surface residual radioactivity were found to be below the acceptable levels for surface contamination of existing structures by alpha- and beta/gamma-emitting radionuclides (see Section 4.2). The laboratory analytical results of the tritium smears and the sheet metal samples (see Section 3.6) did not reveal radioactive contamination of such a nature as to require specific special radiological controls during building dismantlement and demolition activities. The presence of residual radioactivity on the roof of Building 4022 is expected based on the residual radioactivity identified on the roofs of other RMHF buildings.

A radiological survey of the building roof and exhaust stack should be performed prior to the dismantlement and demolition of Building 4022 to determine the necessity for any localized radiological controls. However, for the balance of the building, no radiological controls are recommended beyond those routinely applied in an active radiologically controlled area.

Building 4022 West Wall



Building 4022 West Wall



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Appendix B:
Field Survey Data

This appendix presents the scan measurements, static measurements, and smear sample results. The field survey data are also found electronically on CD in Microsoft® Excel format.

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Scan Data Summary

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Bldg	Location	Scan Coverage (m^2)	Lowest Measured Value				Highest Measured Value				Investigations Performed	
			Gross (cpm)		Net (dpm/100 cm^2)		Gross (cpm)		Net (dpm/100 cm^2)			
			Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Survey Units												
4022	East Wall	58	0	186	0	-1,137	9	775	153	6,932	0	1*
4075	North Wall	51	0	179	-8	-94	87	3,678	1,407	50,616	6	1
	East Wall	21	0	148	-8	-543	16	361	252	2,543	0	0
	South Wall	50	0	180	-8	-80	26	343	415	2,283	2	0
	West Wall	21	0	193	-8	109	71	303	1,198	799	2	0
	Ceiling	22	0	195	-12	-399	5	261	73	360	0	0
4563	Posts/Beams	27	1	152	-34	-438	42	307	661	1,685	1*	0
	Ceiling	12	0	204	-17	-241	6	281	84	644	0	0
4621	North Wall	22	0	214	0	-345	7	440	118	2,253	0	0
	East Wall	13	0	221	0	-264	3	803	51	6,425	0	1
	South Wall	22	0	205	-16	-528	8	454	113	2,270	0	0
	West Wall	16	1	201	0	-836	34	445	559	2,507	1	0
	Ceiling	18	0	236	0	-191	4	689	65	4,899	0	1
4658	Flr/Lwr Walls	33	0	136	0	-507	3	209	49	551	0	0
	Up Walls/Ceil	3	0	174	0	43	1	284	17	701	0	0
4665	North Wall	17	0	245	-5	187	3	1,756	46	17,555	0	1
	East Wall	14	0	231	0	86	5	296	84	833	0	0
	South Wall	17	0	217	-11	112	4	612	53	4,551	0	1
	West Wall	14	0	275	-11	764	10	419	150	2,382	0	0
	Ceiling	3	1	299	17	868	2	416	34	2,213	0	0
Areas Outside Survey Units (no statistical data analysis performed)												
4075	Ext Walls	6	6	215	81	-124	32	382	500	1,753	1	0
	Ext Roof	22	9	254	129	315	29	306	452	899	1	0
4563	Ext Roof	13	4	229	68	379	28	305	473	1,253	1	0
4621	Ext Walls	4	1	226	17	-46	7	298	118	782	0	0
	Ext Roof	1	24	275	405	517	24	275	405	517	1	0
4658	Ext Walls	6	0	188	-25	-259	7	223	93	144	0	0
	Ext Roof	2	16	272	236	500	25	295	388	764	1	0
4665	Ext Walls	5	4	290	68	1,075	12	375	203	2,240	0	0
	Ext Roof	10	16	330	263	1,918	23	476	381	3,918	1	0

Scan Data Summary

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		Instrument Data - Lowest Measured Value						Instrument Data - Highest Measured Value					
		Survey	Instrument	Efficiency (cpm/dpm)		Background (cpm)		Survey	Instrument	Efficiency (cpm/dpm)		Background (cpm)	
Bldg	Location	Date	S/N	Alpha	Beta	Alpha	Beta	Date	S/N	Alpha	Beta	Alpha	Beta
						Survey Units							
4022	East Wall	05/24/07	177184	0.236	0.146	0.0	269.0	05/24/07	177184	0.236	0.146	0.0	269.0
4075	North Wall	05/01/07	168043	0.246	0.138	0.5	185.5	05/01/07	168043	0.246	0.138	0.5	185.5
	East Wall	05/01/07	168043	0.246	0.138	0.5	185.5	05/01/07	168043	0.246	0.138	0.5	185.5
	South Wall	05/01/07	168043	0.246	0.138	0.5	185.5	05/01/07	168043	0.246	0.138	0.5	185.5
	West Wall	05/01/07	168043	0.246	0.138	0.5	185.5	05/01/07	184954	0.237	0.174	0.0	233.5
	Ceiling	05/09/07	184954	0.237	0.174	0.7	229.7	05/09/07	184954	0.237	0.174	0.7	229.7
4563	Posts/Beams	05/21/07	177184	0.236	0.146	3.0	184.0	05/17/07	177184	0.236	0.146	3.0	184.0
	Ceiling	05/21/07	184954	0.237	0.174	1.0	225.0	05/21/07	184954	0.237	0.174	1.0	225.0
4621	North Wall	05/16/07	184954	0.237	0.174	0.0	244.0	05/16/07	184954	0.237	0.174	0.0	244.0
	East Wall	05/16/07	184954	0.237	0.174	0.0	244.0	05/16/07	184954	0.237	0.174	0.0	244.0
	South Wall	05/16/07	177171	0.248	0.178	1.0	252.0	05/16/07	177171	0.248	0.178	1.0	252.0
	West Wall	05/16/07	177184	0.236	0.146	1.0	262.0	05/16/07	177184	0.236	0.146	1.0	262.0
	Ceiling	05/17/07	177171	0.248	0.178	0.0	253.0	05/17/07	177171	0.248	0.178	0.0	253.0
4658	Flr/Lwr Walls	05/02/07	168043	0.246	0.138	0.0	171.0	05/03/07	168043	0.246	0.138	0.0	171.0
	Up Walls/Ceil	05/02/07	168043	0.246	0.138	0.0	171.0	05/02/07	184954	0.237	0.174	0.0	223.0
4665	North Wall	05/10/07	184954	0.237	0.174	0.3	228.7	05/10/07	184954	0.237	0.174	0.3	228.7
	East Wall	05/09/07	184954	0.237	0.174	0.0	223.5	05/14/07	184954	0.237	0.174	0.0	223.5
	South Wall	05/09/07	177171	0.248	0.178	0.7	207.0	05/09/07	177171	0.248	0.178	0.7	207.0
	West Wall	05/09/07	177171	0.248	0.178	0.7	207.0	05/09/07	177171	0.248	0.178	0.7	207.0
	Ceiling	05/14/07	184954	0.237	0.174	0.0	223.5	05/14/07	184954	0.237	0.174	0.0	223.5
						Areas Outside Survey Units (no statistical data analysis performed)							
4075	Ext Walls	05/10/07	177171	0.248	0.178	1.0	226.0	05/10/07	177171	0.248	0.178	1.0	226.0
	Ext Roof	05/10/07	177171	0.248	0.178	1.0	226.0	05/10/07	177171	0.248	0.178	1.0	226.0
4563	Ext Roof	05/21/07	184954	0.237	0.174	0.0	196.0	05/21/07	184954	0.237	0.174	0.0	196.0
4621	Ext Walls	05/17/07	184954	0.237	0.174	0.0	230.0	05/17/07	184954	0.237	0.174	0.0	230.0
	Ext Roof	05/17/07	184954	0.237	0.174	0.0	230.0	05/17/07	184954	0.237	0.174	0.0	230.0
4658	Ext Walls	05/03/07	184954	0.237	0.174	1.5	210.5	05/03/07	184954	0.237	0.174	1.5	210.5
	Ext Roof	05/04/07	184954	0.237	0.174	2.0	228.5	05/04/07	184954	0.237	0.174	2.0	228.5
4665	Ext Walls	05/15/07	187184	0.236	0.146	0.0	211.5	05/15/07	187184	0.236	0.146	0.0	211.5
	Ext Roof	05/10/07	177184	0.236	0.146	0.5	190.0	05/10/07	177184	0.236	0.146	0.5	190.0

Scan Data Summary

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Bldg	Location	Notes/Comments
		Survey Units
4022	East Wall	*not investigated, project discontinued; multiple instruments used
4075	North Wall	mulitple instruments used
	East Wall	mulitple instruments used
	South Wall	mulitple instruments used
	West Wall	mulitple instruments used
	Ceiling	
4563	Posts/Beams	mulitple instruments used; * no investigation performed due to changed criteria
	Ceiling	
4621	North Wall	
	East Wall	
	South Wall	
	West Wall	
	Ceiling	
4658	Flr/Lwr Walls	mulitple instruments used; * no investigation performed due to changed criteria
	Up Walls/Ceil	
4665	North Wall	
	East Wall	
	South Wall	multiple instruments used
	West Wall	multiple instruments used
	Ceiling	
		Areas Outside Survey Units (no statistical data analysis performed)
4075	Ext Walls	
	Ext Roof	
4563	Ext Roof	
4621	Ext Walls	
	Ext Roof	
4658	Ext Walls	
	Ext Roof	
4665	Ext Walls	
	Ext Roof	investigation data

Roof Investigation Data Summary

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Bldg	No. of Data Points	Maximum Value Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta	Instrument Data (Post-Remediation) Survey Date	Instrument S/N	Efficiency (cpm/dpm) Alpha	Efficiency (cpm/dpm) Beta	Background (cpm) Alpha	Background (cpm) Beta
4563	13	28	305	473	1,253	05/21/07	184954	0.237	0.174	0.0	196.0
4621	5	25	305	407	1,103	05/11/07	177184	0.236	0.146	1.0	224.5
4688	4	22	292	356	925	05/11/07	177184	0.236	0.146	1.0	224.5
4658	2	25	295	388	764	05/04/07	184954	0.237	0.174	2.0	228.5
4665	10	23	476	381	3,918	05/10/07	177184	0.236	0.146	0.5	190.0

Non-Roof Investigation Data Summary

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Bldg	Investigation Location	ID	Investigation Maximum Value: Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta	Elevated Area (m^2)	Instrument Data: Survey Date	Instrument S/N	Efficiency (cpm/dpm) Alpha	Efficiency (cpm/dpm) Beta	Background (cpm) Alpha	Background (cpm) Beta
4075	North Wall	A	9	271	102	945	0.05	05/14/07	177184	0.236	0.146	3	202
	North Wall	B	19	461	271	3,548	0.06	05/14/07	177184	0.236	0.146	3	202
	North Wall	C	19	395	271	2,644	0.06	05/14/07	177184	0.236	0.146	3	202
	North Wall	D	16	386	220	2,521	0.19	05/14/07	177184	0.236	0.146	3	202
	North Wall	E	17	385	237	2,507	0.19	05/14/07	177184	0.236	0.146	3	202
	North Wall	F	18	380	254	2,438	0.04	05/14/07	177184	0.236	0.146	3	202
	North Wall	G	9	312	102	1,507	0.10	05/14/07	177184	0.236	0.146	3	202
	South Wall	A	18	406	254	2,795	0.03	05/14/07	177184	0.236	0.146	3	202
	South Wall	B	17	351	237	2,041	0.12	05/14/07	177184	0.236	0.146	3	202
	West Wall	A	21	374	305	2,356	0.07	05/14/07	177184	0.236	0.146	3	202
	West Wall	B	16	383	220	2,479	0.12	05/14/07	177184	0.236	0.146	3	202
	Ext Wall	n/a	19	440	321	2,609	0.12	05/17/07	184954	0.237	0.174	0	213
4621	East Wall	n/a	14	436	236	2,563	0.05	05/17/07	184954	0.237	0.174	0	213
	West Wall	n/a	7	457	84	2,839	0.05	05/18/07	184954	0.237	0.174	2	210
	Ceiling	n/a	6	444	101	2,667	0.37	05/21/07	184954	0.237	0.174	0	212
4665	North Wall	B	3	397	48	2,022	0.21	05/15/07	177171	0.248	0.178	0	217
	South Wall	A	6	1,488	97	14,281	0.06	05/15/07	177171	0.248	0.178	0	217

Static Measurement Data - Building 4075

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North Wall

Ludlum 2360 S/N: 193652
Ludlum 43-93 S/N: PR199836
Date Collected: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.234	0.147
Surface Efficiency:	0.250	0.500
Background (cpm):	3	195
MDC (dpm/100 cm^2):	189	924

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
41	5	234	84	256
Count	1	1	1	1
Minimum	5	234	84	256
Maximum	5	234	84	256
Range	0	0	0	0
Median	5.0	234	84.0	256
Mean	5.0	234	84.0	256
Std Dev	n/a	n/a	n/a	n/a

East Wall

Ludlum 2360 S/N: 193652
Ludlum 43-93 S/N: PR199836
Date Collected: 08/14/07

	Alpha	Beta
Instrument Efficiency:	0.234	0.147
Surface Efficiency:	0.250	0.500
Background (cpm):	1	176
MDC (dpm/100 cm^2):	131	880

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
8*	4	203	67	-105
9*	4	263	67	593
10	3	459	34	3,850
11	6	291	85	1,565
13*	5	219	84	81
14*	3	391	50	2,081
16	4	386	51	2,857
19	2	283	17	1,456
23	4	191	51	204
25	4	203	51	367
26	2	247	17	966
27	1	204	0	381
31	2	303	17	1,728
32	5	233	68	776
35	0	199	-17	313
36	2	278	17	1,388
43*	6	242	101	349
Count	17	17	17	17
Minimum	0	191	-17	-105
Maximum	6	459	101	3850
Range	6	268	118	3955
Median	4.0	247	51.3	776
Mean	3.4	270	44.9	1109
Std Dev	1.7	77	32.7	1071

* static measurements collected with the following instrument:

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832

	Alpha	Beta
Instrument Efficiency:	0.238	0.172
Surface Efficiency:	0.250	0.500
Background (cpm):	0	212
MDC (dpm/100 cm^2):	50	822

Static Measurement Data - Building 4075

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South Wall

Ludlum 2360 S/N: 193652
Ludlum 43-93 S/N: PR199836
Date Collected: 08/14/07

	Alpha	Beta
Instrument Efficiency:	0.234	0.147
Surface Efficiency:	0.250	0.500
Background (cpm):	1	176
MDC (dpm/100 cm^2):	131	880

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
41	8	254	85	803
Count	1	1	1	1
Minimum	8	254	85	803
Maximum	8	254	85	803
Range	0	0	0	0
Median	8.0	254	85.5	803
Mean	8.0	254	85.5	803
Std Dev	n/a	n/a	n/a	n/a

West Wall

Ludlum 2360 S/N: 193652
Ludlum 43-93 S/N: PR199836
Date Collected: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.234	0.147
Surface Efficiency:	0.250	0.500
Background (cpm):	3	195
MDC (dpm/100 cm^2):	189	924

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
41	11	233	137	517
42	5	234	34	531
Count	2	2	2	2
Minimum	5	233	34	517
Maximum	11	234	137	531
Range	6	1	103	14
Median	8.0	234	85.5	524
Mean	8.0	234	85.5	524
Std Dev	4.2	1	72.5	10

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North Wall

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/07/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	0	259
MDC (dpm/100 cm^2):	51	895

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1*	1	278	16	517
2	2	271	34	138
3*	1	249	16	191
4	1	242	17	-195
5	2	301	34	483
6*	2	243	32	124
7	0	242	0	-195
8*	4	261	65	326
9*	0	221	0	-124
10	2	288	34	333
11	2	251	34	-92
12	5	218	84	-471
13	1	275	17	184
14	2	265	34	69
15	2	244	34	-172
16	2	286	34	310
17	1	265	17	69
18	1	244	17	-172
Count	18	18	18	18
Minimum	0	218	0	-471
Maximum	5	301	84	517
Range	5	83	84	988
Median	2.0	256	33.0	96
Mean	1.7	258	28.7	73
Std Dev	1.2	23	20.4	267

East Wall

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/07/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	0	259
MDC (dpm/100 cm^2):	51	895

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	1	277	17	207
2	3	232	51	-310
3	1	225	17	-391
4	2	223	34	-414
5	0	239	0	-230
6	3	250	51	-103
7	2	215	34	-506
8	2	235	34	-276
9	1	234	17	-287
10	4	249	68	-115
11	0	205	0	-621
12	2	233	34	-299
13	6	234	101	-287
14	1	217	17	-483
15	1	264	17	57
Count	15	15	15	15
Minimum	0	205	0	-621
Maximum	6	277	101	207
Range	6	72	101	828
Median	2.0	234	33.8	-287
Mean	1.9	235	32.6	-270
Std Dev	1.6	19	26.7	216

* static measurements collected with the following instrument:

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	0	232
MDC (dpm/100 cm^2):	48	830

Static Measurement Data - Building 4075

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South Wall

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/07/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	0	259
MDC (dpm/100 cm^2):	51	895

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1*	1	251	16	213
2*	4	241	65	101
3	2	252	34	-80
4*	1	227	16	-56
5	0	284	0	287
6*	1	223	16	-101
7	2	242	34	-195
8	0	225	0	-391
9*	2	251	32	213
10	2	273	34	161
11	1	269	17	115
12	2	215	34	-506
13	0	253	0	-69
14	0	235	0	-276
15	1	228	17	-356
16	2	236	34	-264
17	0	258	0	-11
18	1	239	17	-230
Count	18	18	18	18
Minimum	0	215	0	-506
Maximum	4	284	65	287
Range	4	69	65	793
Median	1.0	242	16.9	-75
Mean	1.2	245	20.3	-80
Std Dev	1.1	19	17.4	231

West Wall

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/04/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	2	229
MDC (dpm/100 cm^2):	162	843

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	3	262	17	379
2	1	273	-17	506
3	0	219	-34	-115
4	2	232	0	34
5	0	232	-34	34
6	3	267	17	437
7	1	243	-17	161
8	1	222	-17	-80
9	2	251	0	253
10	0	229	-34	0
11	0	245	-34	184
12	0	272	-34	494
13	0	253	-34	276
14	3	230	17	11
15	3	193	17	-414
Count	15	15	15	15
Minimum	0	193	-34	-414
Maximum	3	273	17	506
Range	3	80	51	920
Median	1.0	243	-16.9	161
Mean	1.3	242	-12.4	144
Std Dev	1.3	22	21.6	256

* static measurements collected with the following instrument:

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	0	232
MDC (dpm/100 cm^2):	48	830

Static Measurement Data - Building 4075

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Ceiling

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/09/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	0	261
MDC (dpm/100 cm^2):	51	898

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	1	264	17	34
2	2	214	34	-540
3	0	251	0	-115
4	1	263	17	23
5	3	207	51	-621
6	0	249	0	-138
7	2	229	34	-368
8	0	222	0	-448
9	0	217	0	-506
10	1	248	17	-149
11	1	213	17	-552
12	3	240	51	-241
13	0	235	0	-299
14	0	214	0	-540
15	3	241	51	-230
16	0	260	0	-11
17	2	217	34	-506
18	0	258	0	-34
19	2	251	34	-115
20	0	242	0	-218
21	0	231	0	-345
Count	21	21	21	21
Minimum	0	207	0	-621
Maximum	3	264	51	34
Range	3	57	51	655
Median	1.0	240	16.9	-241
Mean	1.0	236	16.9	-282
Std Dev	1.1	18	19.2	211

Static Measurement Data - Building 4563

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Posts/Beams

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	1	204
MDC (dpm/100 cm^2):	123	780

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1W	4	178	48	-292
2W	3	205	32	11
3N	3	189	32	-169
4N	1	255	0	573
5N	2	191	16	-146
6N	11	232	161	315
7N	8	207	113	34
8N	3	174	32	-337
1E	1	172	0	-360
2E	16	239	242	393
3E	1	185	0	-213
4E	4	198	48	-67
5S	7	195	97	-101
6S	4	179	48	-281
7S	3	161	32	-483
Count	15	15	15	15
Minimum	1	161	0	-483
Maximum	16	255	242	573
Range	15	94	242	1,056
Median	3.0	191	32.3	-146
Mean	4.7	197	60.2	-75
Std Dev	4.2	27	67.5	299

Ceiling

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179864
Date Collected: 05/22/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	0	227
MDC (dpm/100 cm^2):	48	821

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	2	260	32	371
2	7	260	113	371
3	3	273	48	517
4	1	272	16	506
5	3	227	48	0
6	1	284	16	640
7	4	284	65	640
8	2	280	32	596
9	3	243	48	180
10	4	212	65	-169
11	1	291	16	719
12	3	269	48	472
13	3	275	48	539
14	3	247	48	225
15	7	238	113	124
Count	15	15	15	15
Minimum	1	212	16	-169
Maximum	7	291	113	719
Range	6	79	97	888
Median	3.0	269	48.4	472
Mean	3.1	261	50.5	382
Std Dev	1.8	23	29.8	259

Static Measurement Data - Building 4621

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North Wall

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	1	204
MDC (dpm/100 cm^2):	123	780

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	9	294	129	1,011
2	1	220	0	180
3	0	212	-16	90
4	2	260	16	629
5	1	253	0	551
6	2	210	16	67
7	2	262	16	652
8	2	254	16	562
9	2	267	16	708
10	1	259	0	618
11	1	265	0	685
12	3	291	32	978
13	2	292	16	989
14	0	266	-16	697
15	3	291	32	978
16	0	263	-16	663
17	0	294	-16	1,011
18	4	297	48	1,045
Count	18	18	18	18
Minimum	0	210	-16	67
Maximum	9	297	129	1,045
Range	9	87	145	978
Median	2.0	264	16.1	674
Mean	1.9	264	15.2	673
Std Dev	2.1	28	33.9	310

East Wall

Ludlum 2360 S/N: 177184
Ludlum 43-93 S/N: PR199841
Date Collected: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.236	0.146
Surface Efficiency:	0.250	0.500
Background (cpm):	0	235
MDC (dpm/100 cm^2):	51	1,018

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	4	245	68	137
2	0	277	0	575
3	2	227	34	-110
4	3	274	51	534
5	2	234	34	-14
6	1	203	17	-438
7	1	218	17	-233
8	0	252	0	233
9	2	269	34	466
10	2	291	34	767
11	1	240	17	68
12	2	254	34	260
13	0	245	0	137
14	3	228	51	-96
15	0	222	0	-178
16	1	302	17	918
Count	16	16	16	16
Minimum	0	203	0	-438
Maximum	4	302	68	918
Range	4	99	68	1,356
Median	1.5	245	25.4	137
Mean	1.5	249	25.4	189
Std Dev	1.2	28	20.5	379

Static Measurement Data - Building 4621

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South Wall

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	0	212
MDC (dpm/100 cm^2):	51	813

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	1	235	17	264
2	3	211	51	-11
3	2	217	34	57
4	0	232	0	230
5	1	225	17	149
6	6	275	101	724
7	1	259	17	540
8	2	248	34	414
9	2	248	34	414
10	1	250	17	437
11	0	239	0	310
12	1	232	17	230
13	1	231	17	218
14	1	230	17	207
15	0	226	0	161
16	0	218	0	69
17	0	220	0	92
18	2	254	34	483
Count	18	18	18	18
Minimum	0	211	0	-11
Maximum	6	275	101	724
Range	6	64	101	736
Median	1.0	232	16.9	230
Mean	1.3	236	22.5	277
Std Dev	1.5	17	24.6	192

West Wall

Ludlum 2360 S/N: 177184
Ludlum 43-93 S/N: PR199841
Date Collected: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.236	0.146
Surface Efficiency:	0.250	0.500
Background (cpm):	0	235
MDC (dpm/100 cm^2):	51	1,018

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	248	0	178
2	2	223	34	-164
3	2	216	34	-260
4	4	234	68	-14
5	1	225	17	-137
6	1	257	17	301
7	2	252	34	233
8	0	245	0	137
9	0	230	0	-68
10	2	257	34	301
11	1	219	17	-219
12	1	221	17	-192
13	2	212	34	-315
14	3	235	51	0
15	1	229	17	-82
16	0	252	0	233
Count	16	16	16	16
Minimum	0	212	0	-315
Maximum	4	257	68	301
Range	4	45	68	616
Median	1.0	232	16.9	-41
Mean	1.4	235	23.3	-4
Std Dev	1.1	15	19.4	208

Static Measurement Data - Building 4621

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Ceiling

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/17/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	0	211
MDC (dpm/100 cm^2):	48	793

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	2	276	32	730
2	4	245	65	382
3	1	259	16	539
4	0	264	0	596
5	1	252	16	461
6	1	275	16	719
7	1	285	16	831
8	2	259	32	539
9	1	247	16	404
10	1	255	16	494
11	3	280	48	775
12	1	237	16	292
13	3	282	48	798
14	3	244	48	371
15	1	248	16	416
Count	15	15	15	15
Minimum	0	237	0	292
Maximum	4	285	65	831
Range	4	48	65	539
Median	1.0	259	16.1	539
Mean	1.7	261	26.9	557
Std Dev	1.1	16	17.9	176

Static Measurement Data - Building 4658

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Floor and Lower Walls

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/03/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	2	212
MDC (dpm/100 cm^2):	162	813

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	3	177	17	-402
2	4	166	34	-529
3	5	212	51	0
4	2	234	0	253
5	1	208	-17	-46
6	0	175	-34	-425
7	1	176	-17	-414
8	1	223	-17	126
9	3	228	17	184
10	0	207	-34	-57
4W	1	203	-17	-103
5W	0	203	-34	-103
6W	0	206	-34	-69
7W	1	161	-17	-586
4E	1	201	-17	-126
5E	0	208	-34	-46
6E	0	218	-34	69
7E	0	214	-34	23
Count	18	18	18	18
Minimum	0	161	-34	-586
Maximum	5	234	51	253
Range	5	73	84	839
Median	1.0	207	-16.9	-63
Mean	1.3	201	-12.2	-125
Std Dev	1.5	21	25.8	245

Upper Walls and Ceiling

Ludlum 2360 S/N: 184954
Ludlum 43-93 S/N: PR199832
Date Collected: 05/03/07

	Alpha	Beta
Instrument Efficiency:	0.237	0.174
Surface Efficiency:	0.250	0.500
Background (cpm):	2	212
MDC (dpm/100 cm^2):	162	813

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1C	1	224	-17	138
2C	2	254	0	483
3C	2	269	0	655
4C	1	232	-17	230
5C	2	275	0	724
6C	0	283	-34	816
1N	1	191	-17	-241
2N	3	212	17	0
1W	0	189	-34	-264
2W	0	207	-34	-57
3W	0	180	-34	-368
1E	1	170	-17	-483
2E	2	184	0	-322
3E	0	198	-34	-161
Count	14	14	14	14
Minimum	0	170	-34	-483
Maximum	3	283	17	816
Range	3	113	51	1,299
Median	1.0	210	-16.9	-29
Mean	1.1	219	-15.7	82
Std Dev	1.0	38	16.8	435

Static Measurement Data - Building 4665

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North Wall

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/14/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	1	220
MDC (dpm/100 cm^2):	123	809

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	235	-16	169
2	0	240	-16	225
3	0	288	-16	764
4	0	274	-16	607
5	3	258	32	427
6	0	271	-16	573
7	2	304	16	944
8	0	358	-16	1,551
9	3	337	32	1,315
10	3	306	32	966
11	0	335	-16	1,292
12	0	305	-16	955
13	0	344	-16	1,393
14	1	321	0	1,135
15	2	376	16	1,753
Count	15	15	15	15
Minimum	0	235	-16	169
Maximum	3	376	32	1,753
Range	3	141	48	1,584
Median	0.0	305	-16.1	955
Mean	0.9	303	-1.1	938
Std Dev	1.3	42	20.6	477

East Wall

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	0	217
MDC (dpm/100 cm^2):	48	803

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	2	280	32	708
2	0	266	0	551
3	1	270	16	596
4	0	280	0	708
5	2	310	32	1,045
6	1	248	16	348
7	1	245	16	315
8	1	313	16	1,079
9	1	287	16	787
10	0	315	0	1,101
11	2	265	32	539
12	0	289	0	809
13	0	299	0	921
14	2	269	32	584
15	2	280	32	708
Count	15	15	15	15
Minimum	0	245	0	315
Maximum	2	315	32	1,101
Range	2	70	32	787
Median	1.0	280	16.1	708
Mean	1.0	281	16.1	720
Std Dev	0.8	22	13.6	244

Static Measurement Data - Building 4665

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South Wall

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	0	217
MDC (dpm/100 cm^2):	48	803

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	276	0	663
2	1	332	16	1,292
3	3	360	48	1,607
4	3	329	48	1,258
5	1	296	16	888
6	2	297	32	899
7	1	296	16	888
8	1	350	16	1,494
9	2	267	32	562
10	0	398	0	2,034
11	0	366	0	1,674
12	0	327	0	1,236
13	1	400	16	2,056
14	2	354	32	1,539
15	0	325	0	1,213
Count	15	15	15	15
Minimum	0	267	0	562
Maximum	3	400	48	2,056
Range	3	133	48	1,494
Median	1.0	329	16.1	1,258
Mean	1.1	332	18.3	1,287
Std Dev	1.1	41	17.1	455

West Wall

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/14/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	1	220
MDC (dpm/100 cm^2):	123	809

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	2	337	16	1,315
2	2	310	16	1,011
3	2	278	16	652
4	1	291	0	798
5	1	271	0	573
6	2	368	16	1,663
7	1	332	0	1,258
8	0	321	-16	1,135
9	1	305	0	955
10	4	365	48	1,629
11	1	359	0	1,562
12	4	377	48	1,764
13	4	361	48	1,584
14	0	321	-16	1,135
15	2	378	16	1,775
Count	15	15	15	15
Minimum	0	271	-16	573
Maximum	4	378	48	1,775
Range	4	107	65	1,202
Median	2.0	332	16.1	1,258
Mean	1.8	332	12.9	1,254
Std Dev	1.3	36	21.3	402

Static Measurement Data - Building 4665

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Ceiling

Ludlum 2360 S/N: 177171
Ludlum 43-93 S/N: PR179869
Date Collected: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.248	0.178
Surface Efficiency:	0.250	0.500
Background (cpm):	0	217
MDC (dpm/100 cm^2):	48	803

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	0	445	0	2,562
2	3	402	48	2,079
3	0	326	0	1,225
4	2	279	32	697
5	2	331	32	1,281
6	0	331	0	1,281
7	0	274	0	640
8	2	276	32	663
9	1	347	16	1,461
10	3	352	48	1,517
11	0	411	0	2,180
12	2	379	32	1,820
13	1	326	16	1,225
14	2	356	32	1,562
15	0	406	0	2,124
16	2	435	32	2,449
Count	16	16	16	16
Minimum	0	274	0	640
Maximum	3	445	48	2,562
Range	3	171	48	1,921
Median	1.5	350	24.2	1,489
Mean	1.3	355	20.2	1,548
Std Dev	1.1	54	18.2	612

Static Measurement Data - Other Areas

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Building 4621 - Exterior Roof

Ludlum 2360 S/N: 177184
Ludlum 43-93 S/N: PR199841
Date Collected: 05/11/07

	Alpha	Beta
Instrument Efficiency:	0.236	0.146
Surface Efficiency:	0.250	0.500
Background (cpm):	1	240
MDC (dpm/100 cm^2):	130	1,028

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	16	296	254	767
2	20	302	322	849
3	23	287	373	644
4	25	286	407	630
5	16	305	254	890
Count	5	5	5	5
Minimum	16	286	254	630
Maximum	25	305	407	890
Range	9	19	153	260
Median	20.0	296	322.0	767
Mean	20.0	295	322.0	756
Std Dev	4.1	9	68.8	118

Building 4665 - Exterior Roof

Ludlum 2360 S/N: 177184
Ludlum 43-93 S/N: PR199841
Date Collected: 05/10/07

	Alpha	Beta
Instrument Efficiency:	0.236	0.146
Surface Efficiency:	0.250	0.500
Background (cpm):	0	190
MDC (dpm/100 cm^2):	51	919

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	20	330	339	1,918
2	18	374	305	2,521
3	18	356	305	2,274
4	22	387	373	2,699
5	17	347	288	2,151
6	17	341	288	2,068
7	16	441	271	3,438
8	20	476	339	3,918
9	23	361	390	2,342
10	19	436	322	3,370
Count	10	10	10	10
Minimum	16	330	271	1,918
Maximum	23	476	390	3,918
Range	7	146	119	2,000
Median	18.5	368	313.6	2,432
Mean	19.0	385	322.0	2,670
Std Dev	2.3	49	38.3	677

Static Measurement Data - Other Areas

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Building 4688 - Exterior Roof

Ludlum 2360 S/N: 177184
Ludlum 43-93 S/N: PR199841
Date Collected: 05/11/07

	Alpha	Beta
Instrument Efficiency:	0.236	0.146
Surface Efficiency:	0.250	0.500
Background (cpm):	1	240
MDC (dpm/100 cm^2):	130	1,028

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	22	266	356	356
2	15	265	237	342
3	18	287	288	644
4	18	292	288	712
Count	4	4	4	4
Minimum	15	265	237	342
Maximum	22	292	356	712
Range	7	27	119	370
Median	18.0	277	288.1	500
Mean	18.3	278	292.4	514
Std Dev	2.9	14	48.7	192

Smear Sample Data - Building 4022

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Building 4022 - Lower North Wall

Ludlum 2929 S/N: 171590
Ludlum 43-10-1 S/N: PR174813
Date Counted: 06/25/07

	Alpha	Beta
Instrument Efficiency:	0.395	0.271
Surface Efficiency:	1.000	1.000
Background (cpm):	0.3	53.5
MDC (dpm/100 cm^2):	14	137

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	1	57	2	13
2	0	51	-1	-9
3	0	52	-1	-6
4	0	62	-1	31
5	1	64	2	39
6	0	50	-1	-13
7	0	54	-1	2
8	0	55	-1	6
9	1	51	2	-9
10	1	53	2	-2
11	0	49	-1	-17
12	0	42	-1	-42
13	0	52	-1	-6
14	0	48	-1	-20
15	0	51	-1	-9
16	1	60	2	24
17	1	61	2	28
18	1	55	2	6
19	1	50	2	-13
20	1	59	2	20
Count	20	20	20	20
Minimum	0	42	-1	-42
Maximum	1	64	2	39
Range	1	22	3	81
Median	0.0	53	-0.8	-4
Mean	0.5	54	0.4	1
Std Dev	0.5	5	1.3	20

Building 4022 - Upper North Wall

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm^2):	12	197

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
21	0	71	0	31
22	0	66	0	6
23	1	76	3	55
24	0	78	0	65
25	0	71	0	31
26	1	72	3	36
27	1	75	3	50
28	0	67	0	11
29	1	68	3	16
30	0	66	0	6
31	0	74	0	45
32	0	72	0	36
33	0	74	0	45
34	0	63	0	-8
35	0	78	0	65
36	0	64	0	-3
37	0	71	0	31
38	1	61	3	-18
39	1	71	3	31
40	1	59	3	-28
41	1	69	3	21
Count	21	21	21	21
Minimum	0	59	0	-28
Maximum	1	78	3	65
Range	1	19	3	93
Median	0.0	71	-0.3	31
Mean	0.4	70	0.8	25
Std Dev	0.5	5	1.4	26

Smear Sample Data - Building 4022

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Building 4022 - Lower East Wall #1

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/14/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.0	65.0
MDC (dpm/100 cm2):	8	198

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm2) Alpha	Net (dpm/100 cm2) Beta
1	0	84	0	93
2	0	83	0	88
3	1	71	3	29
4	0	66	0	5
5	1	69	3	20
6	1	64	3	-5
7	0	70	0	24
8	1	78	3	63
9	0	68	0	15
10	0	70	0	24
11	1	64	3	-5
12	0	68	0	15
13	0	67	0	10
14	2	65	6	0
15	0	68	0	15
16	1	78	3	63
17	1	63	3	-10
18	1	75	3	49
19	1	66	3	5
20	1	69	3	20
Count	20	20	20	20
Minimum	0	63	0	-10
Maximum	2	84	6	93
Range	2	21	6	102
Median	1.0	69	2.8	17
Mean	0.6	70	1.7	26
Std Dev	0.6	6	1.7	30

Building 4022 - Lower East Wall #2

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/14/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.0	65.0
MDC (dpm/100 cm^2):	8	198

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
21	1	79	3	68
22	0	71	0	29
23	0	68	0	15
24	1	71	3	29
25	0	68	0	15
26	0	72	0	34
27	1	69	3	20
28	2	64	6	-5
29	0	63	0	-10
30	0	66	0	5
31	0	61	0	-20
32	0	66	0	5
33	1	75	3	49
34	0	62	0	-15
35	0	66	0	5
36	1	68	3	15
37	1	62	3	-15
38	0	64	0	-5
39	0	59	0	-29
40	1	70	3	24
41	0	65	0	0
42	1	61	3	-20
43	1	65	3	0
Count	23	23	23	23
Minimum	0	59	0	-29
Maximum	2	79	6	68
Range	2	20	6	98
Median	0.0	66	0.0	5
Mean	0.5	67	1.3	8
Std Dev	0.6	5	1.6	23

Smear Sample Data - Building 4022

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Building 4022 - Middle East Wall

Ludlum 2929 S/N: 171590
Ludlum 43-10-1 S/N: PR174813
Date Counted: 06/25/07

	Alpha	Beta
Instrument Efficiency:	0.395	0.271
Surface Efficiency:	1.000	1.000
Background (cpm):	0.3	53.5
MDC (dpm/100 cm2):	14	137

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm2) Alpha	Net (dpm/100 cm2) Beta
1	0	56	-1	9
2	0	54	-1	2
3	1	56	2	9
4	1	56	2	9
5	0	59	-1	20
7	0	61	-1	28
8	1	48	2	-20
9	1	52	2	-6
11	1	61	2	28
14	1	55	2	6
Count	10	10	10	10
Minimum	0	48	-1	-20
Maximum	1	61	2	28
Range	1	13	3	48
Median	1.0	56	1.8	9
Mean	0.6	56	0.8	8
Std Dev	0.5	4	1.3	15

Building 4022 - Upper East Wall #1

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm^2):	12	197

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
6	1	64	3	-3
10	0	73	0	40
11	1	75	3	50
12	0	63	0	-8
13	0	61	0	-18
15	1	61	3	-18
16	1	59	3	-28
17	0	67	0	11
18	0	60	0	-23
19	0	61	0	-18
20	0	62	0	-13
21	1	66	3	6
22	0	57	0	-38
23	1	62	3	-13
24	0	74	0	45
Count	15	15	15	15
Minimum	0	57	0	-38
Maximum	1	75	3	50
Range	1	18	3	88
Median	0.0	62	-0.3	-13
Mean	0.4	64	0.8	-2
Std Dev	0.5	6	1.4	27

Smear Sample Data - Building 4022

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Building 4022 - Upper East Wall #2

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm2):	12	197

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm2) Alpha	Net (dpm/100 cm2) Beta
25	1	67	3	11
26	0	66	0	6
27	0	65	0	1
28	0	67	0	11
29	0	77	0	60
30	1	65	3	1
31	0	75	0	50
32	0	71	0	31
33	1	66	3	6
34	0	67	0	11
35	1	66	3	6
36	0	68	0	16
37	0	68	0	16
38	1	67	3	11
39	1	71	3	31
40	1	62	3	-13
Count	16	16	16	16
Minimum	0	62	0	-13
Maximum	1	77	3	60
Range	1	15	3	73
Median	0.0	67	-0.3	11
Mean	0.4	68	0.9	16
Std Dev	0.5	4	1.4	19

Building 4022 - Lower South Wall

Ludlum 2929 S/N: 171590
Ludlum 43-10-1 S/N: PR174813
Date Counted: 06/25/07

	Alpha	Beta
Instrument Efficiency:	0.395	0.271
Surface Efficiency:	1.000	1.000
Background (cpm):	0.3	53.5
MDC (dpm/100 cm^2):	14	137

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	1	50	2	-13
2	1	67	2	50
3	3	52	7	-6
4	1	51	2	-9
5	0	58	-1	17
6	1	54	2	2
7	0	53	-1	-2
8	1	53	2	-2
9	0	53	-1	-2
10	0	44	-1	-35
11	1	55	2	6
12	1	52	2	-6
13	0	51	-1	-9
14	1	57	2	13
15	1	59	2	20
16	1	62	2	31
17	2	57	4	13
18	0	60	-1	24
19	0	56	-1	9
20	1	55	2	6
Count	20	20	20	20
Minimum	0	44	-1	-35
Maximum	3	67	7	50
Range	3	23	8	85
Median	1.0	55	1.8	4
Mean	0.8	55	1.3	5
Std Dev	0.8	5	1.9	18

Smear Sample Data - Building 4022

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Building 4022 - Upper South Wall

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/14/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.0	65.0
MDC (dpm/100 cm^2):	8	198

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
21	1	73	3	39
22	0	65	0	0
23	0	77	0	59
24	2	63	6	-10
25	1	69	3	20
26	1	68	3	15
27	2	85	6	98
28	1	66	3	5
29	1	66	3	5
30	2	67	6	10
31	1	84	3	93
32	0	71	0	29
33	1	79	3	68
34	1	71	3	29
35	1	66	3	5
36	1	62	3	-15
37	1	68	3	15
38	1	80	3	73
39	1	68	3	15
40	1	65	3	0
41	1	65	3	0
Count	21	21	21	21
Minimum	0	62	0	-15
Maximum	2	85	6	98
Range	2	23	6	112
Median	1.0	68	2.8	15
Mean	1.0	70	2.8	26
Std Dev	0.5	7	1.5	33

Building 4022 - Lower West Wall

Ludlum 2929 S/N: 171590
Ludlum 43-10-1 S/N: PR174813
Date Counted: 06/25/07

	Alpha	Beta
Instrument Efficiency:	0.395	0.271
Surface Efficiency:	1.000	1.000
Background (cpm):	0.3	53.5
MDC (dpm/100 cm^2):	14	137

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	1	59	2	20
2	1	50	2	-13
3	0	63	-1	35
4	1	54	2	2
5	1	44	2	-35
6	0	49	-1	-17
7	1	59	2	20
8	1	56	2	9
9	1	63	2	35
10	1	51	2	-9
11	0	49	-1	-17
12	0	46	-1	-28
13	0	67	-1	50
14	1	47	2	-24
15	1	70	2	61
16	0	48	-1	-20
17	1	61	2	28
18	1	58	2	17
19	1	62	2	31
20	0	56	-1	9
Count	20	20	20	20
Minimum	0	44	-1	-35
Maximum	1	70	2	61
Range	1	26	3	96
Median	1.0	56	1.8	9
Mean	0.7	56	0.9	8
Std Dev	0.5	7	1.2	27

Smear Sample Data - Building 4022

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Building 4022 - Upper West Wall

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm^2):	12	197

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
21	1	73	3	40
22	1	69	3	21
23	1	76	3	55
24	0	70	0	26
25	1	63	3	-8
26	0	64	0	-3
27	0	60	0	-23
28	0	67	0	11
29	1	65	3	1
30	1	66	3	6
31	0	64	0	-3
32	2	67	5	11
33	1	78	3	65
34	1	68	3	16
35	0	70	0	26
36	0	78	0	65
37	1	65	3	1
38	0	68	0	16
39	0	65	0	1
40	1	77	3	60
41	1	53	3	-57
42	0	68	0	16
Count	22	22	22	22
Minimum	0	53	0	-57
Maximum	2	78	5	65
Range	2	25	6	122
Median	1.0	68	2.5	14
Mean	0.6	68	1.4	16
Std Dev	N/A	N/A	N/A	N/A

Building 4022 - Ceiling #1

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm^2):	12	197

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	63	0	-8
2	1	70	3	26
3	0	68	0	16
4	1	76	3	55
5	1	77	3	60
6	1	74	3	45
7	1	68	3	16
8	0	92	0	133
9	0	67	0	11
10	1	64	3	-3
11	1	71	3	31
12	0	72	0	36
13	1	66	3	6
14	0	86	0	104
15	0	78	0	65
16	1	87	3	109
17	1	87	3	109
18	0	76	0	55
19	1	81	3	80
20	0	80	0	75
Count	20	20	20	20
Minimum	0	63	0	-8
Maximum	1	92	3	133
Range	1	29	3	141
Median	1.0	75	2.5	50
Mean	0.6	75	1.3	51
Std Dev	0.5	8	1.4	41

Smear Sample Data - Building 4022

Building 4022 - Ceiling #2

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm^2):	12	197

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
21	1	80	3	75
22	0	82	0	84
23	1	83	3	89
24	0	81	0	80
25	1	72	3	36
26	0	65	0	1
27	0	71	0	31
28	2	66	5	6
29	0	66	0	6
30	1	74	3	45
31	0	79	0	70
32	0	65	0	1
33	1	70	3	26
34	0	74	0	45
35	1	63	3	-8
36	0	68	0	16
37	0	79	0	70
38	1	74	3	45
39	0	71	0	31
40	0	66	0	6
Count	20	20	20	20
Minimum	0	63	0	-8
Maximum	2	83	5	89
Range	2	20	6	98
Median	0.0	72	-0.3	33
Mean	0.5	72	1.0	38
Std Dev	0.6	6	1.7	31

Building 4022 - Crane #1

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm^2):	12	197

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	71	0	31
2	1	76	3	55
3	0	66	0	6
4	0	75	0	50
5	0	70	0	26
6	1	60	3	-23
7	1	65	3	1
8	1	63	3	-8
9	0	63	0	-8
10	1	73	3	40
11	0	66	0	6
12	1	65	3	1
13	0	68	0	16
14	1	73	3	40
15	0	74	0	45
16	0	67	0	11
17	0	70	0	26
18	1	61	3	-18
19	0	73	0	40
20	0	57	0	-38
Count	20	20	20	20
Minimum	0	57	0	-38
Maximum	1	76	3	55
Range	1	19	3	93
Median	0.0	68	-0.3	14
Mean	0.4	68	0.8	15
Std Dev	0.5	5	1.4	26

Smear Sample Data - Building 4022

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Building 4022 - Crane #2

Ludlum 2929 S/N: 147736
Ludlum 43-10-1 S/N: PR150788
Date Counted: 08/15/07

	Alpha	Beta
Instrument Efficiency:	0.360	0.205
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	64.7
MDC (dpm/100 cm^2):	12	197

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
21	1	71	3	31
22	1	62	3	-13
23	1	63	3	-8
24	0	70	0	26
25	0	66	0	6
26	0	75	0	50
27	0	62	0	-13
28	0	70	0	26
29	0	60	0	-23
30	1	69	3	21
31	1	74	3	45
32	0	58	0	-33
33	1	71	3	31
34	1	64	3	-3
35	1	70	3	26
36	1	63	3	-8
37	1	67	3	11
38	1	72	3	36
39	1	72	3	36
40	0	63	0	-8
Count	20	20	20	20
Minimum	0	58	0	-33
Maximum	1	75	3	50
Range	1	17	3	83
Median	1.0	68	2.5	16
Mean	0.6	67	1.4	12
Std Dev	0.5	5	1.4	24

Smear Sample Data - Building 4075

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North Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/08/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	58.8
MDC (dpm/100 cm^2):	13	211

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	2	58	5	-4
2	1	56	2	-15
3	0	51	-1	-43
4	1	52	2	-37
5	0	56	-1	-15
6	1	54	2	-26
7	0	50	-1	-48
8	0	50	-1	-48
9	0	53	-1	-32
10	0	56	-1	-15
11	1	56	2	-15
12	1	61	2	12
13	0	56	-1	-15
14	0	48	-1	-59
15	0	64	-1	28
16	0	56	-1	-15
17	0	52	-1	-37
18	0	55	-1	-21
Count	18	18	18	18
Minimum	0	48	-1	-59
Maximum	2	64	5	28
Range	2	16	5	87
Median	0.0	56	-0.5	-18
Mean	0.4	55	0.5	-23
Std Dev	0.6	4	1.6	22

East Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/09/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58.0
MDC (dpm/100 cm^2):	12	210

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	56	0	-11
2	0	55	0	-16
3	0	61	0	16
4	0	58	0	0
5	1	46	2	-66
6	0	60	0	11
7	0	65	0	38
8	0	55	0	-16
9	0	50	0	-44
10	0	61	0	16
11	0	62	0	22
12	0	68	0	55
13	0	61	0	16
14	0	55	0	-16
15	1	52	2	-33
Count	15	15	15	15
Minimum	0	46	0	-66
Maximum	1	68	2	55
Range	1	22	3	120
Median	0.0	58	-0.3	0
Mean	0.1	58	0.1	-2
Std Dev	0.4	6	0.9	32

Smear Sample Data - Building 4075

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South Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/09/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58.0
MDC (dpm/100 cm^2):	12	210

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	61	0	16
2	0	55	0	-16
3	0	53	0	-27
4	0	56	0	-11
5	0	50	0	-44
6	0	49	0	-49
7	0	58	0	0
8	0	63	0	27
9	0	50	0	-44
10	0	65	0	38
11	0	55	0	-16
12	0	50	0	-44
13	1	52	2	-33
14	1	69	2	60
15	0	66	0	44
16	0	63	0	27
17	1	47	2	-60
18	0	59	0	5
Count	18	18	18	18
Minimum	0	47	0	-60
Maximum	1	69	2	60
Range	1	22	3	120
Median	0.0	56	-0.3	-14
Mean	0.2	57	0.2	-7
Std Dev	0.4	7	1.0	36

West Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/08/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	58.8
MDC (dpm/100 cm^2):	13	211

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	68	-1	50
2	1	48	2	-59
3	1	56	2	-15
4	0	49	-1	-54
5	0	43	-1	-86
6	0	50	-1	-48
7	0	48	-1	-59
8	0	55	-1	-21
9	0	61	-1	12
10	0	54	-1	-26
11	0	58	-1	-4
12	0	53	-1	-32
13	0	54	-1	-26
14	1	65	2	34
15	0	48	-1	-59
Count	15	15	15	15
Minimum	0	43	-1	-86
Maximum	1	68	2	50
Range	1	25	3	137
Median	0.0	54	-0.5	-26
Mean	0.2	54	0.0	-26
Std Dev	0.4	7	1.1	37

Smear Sample Data - Building 4075

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Ceiling

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/09/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58
MDC (dpm/100 cm^2):	12	210

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	0	53	0	-27
2	0	50	0	-44
3	0	58	0	0
4	0	64	0	33
5	1	56	2	-11
6	0	57	0	-5
7	0	46	0	-66
8	0	52	0	-33
9	0	52	0	-33
10	0	51	0	-38
11	0	57	0	-5
12	0	46	0	-66
13	0	59	0	5
14	0	42	0	-87
15	1	56	2	-11
16	1	47	2	-60
17	0	45	0	-71
18	0	49	0	-49
19	1	55	2	-16
20	1	51	2	-38
21	0	50	0	-44
Count	21	21	21	21
Minimum	0	42	0	-87
Maximum	1	64	2	33
Range	1	22	3	120
Median	0.0	52	-0.3	-33
Mean	0.2	52	0.4	-32
Std Dev	0.4	5	1.1	30

Smear Sample Data - Building 4563

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Posts/Beams

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/22/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	57.2
MDC (dpm/100 cm^2):	12	209

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1W	0	64	0	37
2W	0	71	0	75
3N	1	56	2	-7
4N	0	55	0	-12
5N	0	46	0	-61
6N	0	63	0	32
7N	0	57	0	-1
8N	0	64	0	37
1E	0	52	0	-28
2E	1	54	2	-17
3E	1	64	2	37
4E	1	66	2	48
5S	2	52	5	-28
6S	1	47	2	-56
7S	1	58	2	4
Count	15	15	15	15
Minimum	0	46	0	-61
Maximum	2	71	5	75
Range	2	25	5	137
Median	0.0	57	-0.3	-1
Mean	0.5	58	1.1	4
Std Dev	0.6	7	1.7	40

Ceiling

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/22/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	57.2
MDC (dpm/100 cm^2):	12	209

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	1	57	2	-1
2	1	61	2	21
3	1	63	2	32
4	1	52	2	-28
5	1	55	2	-12
6	0	46	0	-61
7	0	52	0	-28
8	0	55	0	-12
9	0	58	0	4
10	0	62	0	26
11	1	65	2	43
12	1	62	2	26
13	2	51	5	-34
14	1	65	2	43
15	1	51	2	-34
Count	15	15	15	15
Minimum	0	46	0	-61
Maximum	2	65	5	43
Range	2	19	5	104
Median	1.0	57	2.4	-1
Mean	0.7	57	1.7	-1
Std Dev	0.6	6	1.6	32

Smear Sample Data - Building 4621

North Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	57.3
MDC (dpm/100 cm^2):	13	209

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	56	-1	-7
2	0	56	-1	-7
3	0	68	-1	58
4	0	62	-1	26
5	0	49	-1	-45
6	0	64	-1	37
7	0	60	-1	15
8	1	64	2	37
9	0	53	-1	-23
10	0	71	-1	75
11	1	59	2	9
12	1	54	2	-18
13	1	57	2	-2
14	0	60	-1	15
15	0	60	-1	15
16	0	63	-1	31
17	0	58	-1	4
18	0	63	-1	31
Count	18	18	18	18
Minimum	0	49	-1	-45
Maximum	1	71	2	75
Range	1	22	3	120
Median	0.0	60	-0.5	15
Mean	0.2	60	0.1	14
Std Dev	0.4	5	1.1	29

East Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	57.3
MDC (dpm/100 cm^2):	13	209

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	64	-1	37
2	1	60	2	15
3	1	57	2	-2
4	0	57	-1	-2
5	0	51	-1	-34
6	0	53	-1	-23
7	1	68	2	58
8	0	61	-1	20
9	0	60	-1	15
10	1	58	2	4
11	0	57	-1	-2
12	1	54	2	-18
13	0	54	-1	-18
14	1	59	2	9
15	0	57	-1	-2
16	0	55	-1	-13
Count	16	16	16	16
Minimum	0	51	-1	-34
Maximum	1	68	2	58
Range	1	17	3	93
Median	0.0	57	-0.5	-2
Mean	0.4	58	0.5	3
Std Dev	0.5	4	1.3	23

Smear Sample Data - Building 4621

South Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	57.3
MDC (dpm/100 cm^2):	13	209

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	0	68	-1	58
2	0	56	-1	-7
3	0	53	-1	-23
4	0	54	-1	-18
5	0	45	-1	-67
6	1	58	2	4
7	0	44	-1	-73
8	1	58	2	4
9	0	57	-1	-2
10	0	67	-1	53
11	0	55	-1	-13
12	0	62	-1	26
13	0	47	-1	-56
14	0	54	-1	-18
15	1	60	2	15
16	0	62	-1	26
17	0	54	-1	-18
18	0	59	-1	9
Count	18	18	18	18
Minimum	0	44	-1	-73
Maximum	1	68	2	58
Range	1	24	3	131
Median	0.0	57	-0.5	-4
Mean	0.2	56	-0.1	-6
Std Dev	0.4	7	1.0	36

West Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	57.3
MDC (dpm/100 cm^2):	13	209

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	0	47	-1	-56
2	0	66	-1	48
3	0	55	-1	-13
4	1	57	2	-2
5	0	61	-1	20
6	1	58	2	4
7	0	56	-1	-7
8	1	57	2	-2
9	1	44	2	-73
10	1	56	2	-7
11	0	46	-1	-62
12	0	54	-1	-18
13	0	52	-1	-29
14	0	61	-1	20
15	1	63	2	31
16	1	60	2	15
Count	16	16	16	16
Minimum	0	44	-1	-73
Maximum	1	66	2	48
Range	1	22	3	120
Median	0.0	57	-0.5	-4
Mean	0.4	56	0.6	-8
Std Dev	0.5	6	1.3	34

Smear Sample Data - Building 4621

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Ceiling

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/21/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	57.3
MDC (dpm/100 cm^2):	13	209

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	0	54	-1	-18
2	0	57	-1	-2
3	0	59	-1	9
4	0	61	-1	20
5	0	55	-1	-13
6	0	57	-1	-2
7	0	53	-1	-23
8	1	53	2	-23
9	1	58	2	4
10	0	56	-1	-7
11	1	54	2	-18
12	0	52	-1	-29
13	0	53	-1	-23
14	0	57	-1	-2
15	0	58	-1	4
Count	15	15	15	15
Minimum	0	52	-1	-29
Maximum	1	61	2	20
Range	1	9	3	49
Median	0.0	56	-0.5	-7
Mean	0.2	56	0.0	-8
Std Dev	0.4	3	1.1	14

Smear Sample Data - Building 4658

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Floor and Lower Walls

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/07/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	55.6
MDC (dpm/100 cm^2):	12	206

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1F	0	55	0	-3
2F	0	60	0	24
3F	0	56	0	2
4F	1	53	2	-14
5F	0	62	0	35
6F	1	56	2	2
7F	1	50	2	-31
8F	1	57	2	8
9F	0	59	0	19
10F	1	51	2	-25
4W	0	65	0	51
5W	0	57	0	8
6W	0	47	0	-47
7W	0	52	0	-20
4E	0	54	0	-9
5E	0	48	0	-42
6E	0	55	0	-3
7E	0	52	0	-20
Count	18	18	18	18
Minimum	0	47	0	-47
Maximum	1	65	2	51
Range	1	18	3	98
Median	0.0	55	-0.3	-3
Mean	0.3	55	0.5	-4
Std Dev	0.5	5	1.2	26

Upper Walls and Ceiling

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/07/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	55.6
MDC (dpm/100 cm^2):	12	206

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1C	0	55	0	-3
2C	0	47	0	-47
3C	1	51	2	-25
4C	0	56	0	2
5C	0	49	0	-36
6C	1	56	2	2
1N	1	59	2	19
2N	1	59	2	19
1W	0	58	0	13
2W	0	55	0	-3
3W	1	55	2	-3
1E	0	56	0	2
2E	0	55	0	-3
3E	0	56	0	2
Count	14	14	14	14
Minimum	0	47	0	-47
Maximum	1	59	2	19
Range	1	12	3	66
Median	0.0	56	-0.3	-1
Mean	0.4	55	0.7	-4
Std Dev	0.5	4	1.3	19

Smear Sample Data - Building 4621

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North Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58.5
MDC (dpm/100 cm^2):	12	211

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	55	0	-19
2	1	62	2	19
3	1	51	2	-41
4	1	57	2	-8
5	0	61	0	14
6	1	52	2	-36
7	0	54	0	-25
8	0	71	0	68
9	0	51	0	-41
10	0	54	0	-25
11	0	63	0	25
12	0	65	0	36
13	1	52	2	-36
14	0	62	0	19
15	0	56	0	-14
Count	15	15	15	15
Minimum	0	51	0	-41
Maximum	1	71	2	68
Range	1	20	3	109
Median	0.0	56	-0.3	-14
Mean	0.3	58	0.6	-4
Std Dev	0.5	6	1.3	33

East Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58.5
MDC (dpm/100 cm^2):	12	211

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	1	57	2	-8
2	1	56	2	-14
3	1	63	2	25
4	1	57	2	-8
5	0	59	0	3
6	0	51	0	-41
7	0	55	0	-19
8	1	58	2	-3
9	0	63	0	25
10	0	56	0	-14
11	0	52	0	-36
12	0	59	0	3
13	0	53	0	-30
14	0	57	0	-8
15	0	59	0	3
Count	15	15	15	15
Minimum	0	51	0	-41
Maximum	1	63	2	25
Range	1	12	3	66
Median	0.0	57	-0.3	-8
Mean	0.3	57	0.6	-8
Std Dev	0.5	3	1.3	19

Smear Sample Data - Building 4621

South Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58.5
MDC (dpm/100 cm^2):	12	211

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	62	0	19
2	0	55	0	-19
3	0	63	0	25
4	0	60	0	8
5	1	58	2	-3
6	1	56	2	-14
7	0	59	0	3
8	0	45	0	-74
9	0	54	0	-25
10	1	55	2	-19
11	1	61	2	14
12	0	56	0	-14
13	0	43	0	-85
14	1	50	2	-46
15	1	58	2	-3
Count	15	15	15	15
Minimum	0	43	0	-85
Maximum	1	63	2	25
Range	1	20	3	109
Median	0.0	56	-0.3	-14
Mean	0.4	56	0.8	-15
Std Dev	0.5	6	1.3	32

West Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58.5
MDC (dpm/100 cm^2):	12	211

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	50	0	-46
2	0	53	0	-30
3	0	47	0	-63
4	0	53	0	-30
5	0	59	0	3
6	0	52	0	-36
7	1	57	2	-8
8	0	76	0	96
9	0	63	0	25
10	0	51	0	-41
11	0	56	0	-14
12	1	51	2	-41
13	0	57	0	-8
14	0	60	0	8
15	1	54	2	-25
Count	15	15	15	15
Minimum	0	47	0	-63
Maximum	1	76	2	96
Range	1	29	3	158
Median	0.0	54	-0.3	-25
Mean	0.2	56	0.3	-14
Std Dev	0.4	7	1.1	38

Smear Sample Data - Building 4621

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Ceiling

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/15/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	58.5
MDC (dpm/100 cm^2):	12	211

	Gross (cpm)		Net (dpm/100 cm^2)	
Location	Alpha	Beta	Alpha	Beta
1	0	55	0	-19
2	0	50	0	-46
3	1	56	2	-14
4	0	59	0	3
5	0	54	0	-25
6	0	60	0	8
7	1	58	2	-3
8	0	66	0	41
9	0	55	0	-19
10	0	55	0	-19
11	0	48	0	-57
12	1	53	2	-30
13	0	57	0	-8
14	0	56	0	-14
15	1	52	2	-36
16	0	62	0	19
Count	16	16	16	16
Minimum	0	48	0	-57
Maximum	1	66	2	41
Range	1	18	3	98
Median	0.0	56	-0.3	-16
Mean	0.3	56	0.4	-14
Std Dev	0.4	4	1.2	24

Smear Sample Data - Areas Outside Survey Units

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Building 4075 - Exterior Wall

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/10/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	56.8
MDC (dpm/100 cm^2):	13	208

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
6	1	55	2	-10
Count	1	1	1	1
Minimum	1	55	2	-10
Maximum	1	55	2	-10
Range	0	0	0	0
Median	1.0	55	2.1	-10
Mean	1.0	55	2.1	-10
Std Dev	N/A	N/A	N/A	N/A

Building 4075 - Exterior Roof

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/10/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.2	56.8
MDC (dpm/100 cm^2):	13	208

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	6	66	15	50
2	3	68	7	61
3	1	62	2	28
4	4	61	10	23
5	4	64	10	39
Count	5	5	5	5
Minimum	1	61	2	23
Maximum	6	68	15	61
Range	5	7	13	38
Median	4.0	64	10.0	39
Mean	3.6	64	8.9	40
Std Dev	1.8	3	4.8	16

Smear Sample Data - Areas Outside Survey Units

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Building 4658 - Exterior Roof

Ludlum 2929 S/N: 152268
Ludlum 43-10-1 S/N: PR156426
Date Counted: 05/07/07

	Alpha	Beta
Instrument Efficiency:	0.381	0.183
Surface Efficiency:	1.000	1.000
Background (cpm):	0.1	55.6
MDC (dpm/100 cm^2):	12	206

Location	Gross (cpm) Alpha	Gross (cpm) Beta	Net (dpm/100 cm^2) Alpha	Net (dpm/100 cm^2) Beta
1	0	49	0	-36
2	1	56	2	2
Count	2	2	2	2
Minimum	0	49	0	-36
Maximum	1	56	2	2
Range	1	7	3	38
Median	0.5	53	1.0	-17
Mean	0.5	53	1.0	-17
Std Dev	0.7	5	1.9	27

Appendix C
Laboratory Analytical Results

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This appendix presents the results of laboratory analyses performed of the tritium smear samples and sheet metal samples. The laboratory analytical results are reported in five sample lots, which are summarized in this appendix and found in a single electronic data file presented in Microsoft® Excel format, on CD. The full reports, including QC sample results, are found electronically on CD in Adobe® Acrobat® .pdf format. A description of each laboratory work order is provided in the table below.

Description of Laboratory Work Order File Contents

Laboratory Work Order	Sample Lot Description	Number of Samples	Date Sent to Lab	Tritium	Gamma Spectroscopy	Isotopic Uranium	Isotopic Plutonium	Isotopic Thorium	Isotopic Polonium	^{241}Pu	^{90}Sr
0705143	Smear Samples from Buildings 4075, 4563, 4621, 4658, and 4665	38	5/18/07	✓							
0705144	Sheet Metal Samples from Buildings 4075, 4621, 4665, and 4688	7	5/22/07		✓	✓	✓	✓	✓	✓	✓
0705159	Smear Samples from Buildings 4075, 4563, 4621, 4658, and 4665	37	5/22/07	✓							
0708171	Smear Samples from Buildings 4022	15	8/17/07	✓							
0708172	Sheet Metal Samples from Building 4022; Metal Plate Roof Rust Sample from Building 4658	6	8/17/07		✓	✓	✓	✓	✓	✓	✓

Laboratory Analytical Report - Sheet Metal

Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
B 4022 N wall (leach)	0708172-11	SMP	Ac-228	713R9	SOLID	pCi/g	-0.47	U	0.97	1.99	
B 4022 E wall (leach)	0708172-7	SMP	Ac-228	713R9	SOLID	pCi/g	-0.42	U	0.55	1.01	
B 4665 wall (leach)	0705144-9	SMP	Ac-228	713R9	SOLID	pCi/g	-0.13	U	0.43	0.77	
B 4621 wall	0705144-4	SMP	Ac-228	713R9	SOLID	pCi/g	-0.05	U,G	0.22	0.49	
B 4621 roof	0705144-3	SMP	Ac-228	713R9	SOLID	pCi/g	-0.01	U,G	0.28	0.54	
B 4022 S wall (leach)	0708172-10	SMP	Ac-228	713R9	SOLID	pCi/g	0	U	1	1.9	
B 4075 wall	0705144-6	SMP	Ac-228	713R9	SOLID	pCi/g	0	U,G	0.61	1.1	
B 4022 W wall (N)	0708172-3	SMP	Ac-228	713R9	SOLID	pCi/g	0.01	U	0.25	0.51	
B 4022 W wall (S)	0708172-2	SMP	Ac-228	713R9	SOLID	pCi/g	0.02	U,G	0.11	0.2	
B 4022 N wall	0708172-5	SMP	Ac-228	713R9	SOLID	pCi/g	0.02	U,G	0.25	0.44	
B 4075 roof (leach)	0705144-12	SMP	Ac-228	713R9	SOLID	pCi/g	0.03	U	0.54	0.93	
B 4022 E wall	0708172-1	SMP	Ac-228	713R9	SOLID	pCi/g	0.05	U,G	0.18	0.34	
B 4621 wall (leach)	0705144-11	SMP	Ac-228	713R9	SOLID	pCi/g	0.05	U	0.46	0.79	
B 4665 wall	0705144-2	SMP	Ac-228	713R9	SOLID	pCi/g	0.06	U,G	0.52	1	
B 4075 roof	0705144-5	SMP	Ac-228	713R9	SOLID	pCi/g	0.08	U,G	0.62	1.18	
B 4621 roof (leach)	0705144-10	SMP	Ac-228	713R9	SOLID	pCi/g	0.13	U	0.46	0.78	
B 4665 roof (leach)	0705144-8	SMP	Ac-228	713R9	SOLID	pCi/g	0.17	U	0.43	0.74	
B 4688 roof (leach)	0705144-14	SMP	Ac-228	713R9	SOLID	pCi/g	0.21	U	0.5	0.85	
B 4022 S wall	0708172-4	SMP	Ac-228	713R9	SOLID	pCi/g	0.23	U	0.38	0.65	
B 4075 wall (leach)	0705144-13	SMP	Ac-228	713R9	SOLID	pCi/g	0.24	U	0.36	0.6	
B 4688 roof	0705144-7	SMP	Ac-228	713R9	SOLID	pCi/g	0.28	U,G	0.42	0.7	
B 4665 roof	0705144-1	SMP	Ac-228	713R9	SOLID	pCi/g	0.35	U,G	0.48	0.78	
B 4022 W wall (N) (leach)	0708172-9	SMP	Ac-228	713R9	SOLID	pCi/g	0.5	U	1.1	1.9	
B 4022 W wall (S) (leach)	0708172-8	SMP	Ac-228	713R9	SOLID	pCi/g	0.6	U	1.1	1.8	
B 4658 Plate Metal Roof	0708172-6	SMP	Ac-228	713R9	SOLID	pCi/g	0.74	U,G	0.7	1.12	
B 4665 roof	0705144-1	SMP	Bi-212	713R9	SOLID	pCi/g	-1.5	U,G	1.7	3.3	
B 4022 W wall (N)	0708172-3	SMP	Bi-212	713R9	SOLID	pCi/g	-0.7	U	1.1	2.4	
B 4621 roof	0705144-3	SMP	Bi-212	713R9	SOLID	pCi/g	-0.7	U,G	0.85	1.9	
B 4075 roof	0705144-5	SMP	Bi-212	713R9	SOLID	pCi/g	-0.7	U,G	1.7	3.6	
B 4022 E wall (leach)	0708172-7	SMP	Bi-212	713R9	SOLID	pCi/g	-0.3	U	1.4	2.6	
B 4621 wall (leach)	0705144-11	SMP	Bi-212	713R9	SOLID	pCi/g	-0.3	U	1.2	2.1	
B 4665 wall	0705144-2	SMP	Bi-212	713R9	SOLID	pCi/g	0	U,G	1.8	3.4	
B 4022 W wall (S) (leach)	0708172-8	SMP	Bi-212	713R9	SOLID	pCi/g	0.1	U	2.5	4.8	
B 4022 W wall (S)	0708172-2	SMP	Bi-212	713R9	SOLID	pCi/g	0.12	U,G	0.38	0.66	
B 4665 wall (leach)	0705144-9	SMP	Bi-212	713R9	SOLID	pCi/g	0.2	U	1.2	2.1	
B 4022 E wall	0708172-1	SMP	Bi-212	713R9	SOLID	pCi/g	0.24	U,G	0.69	1.25	
B 4075 wall	0705144-6	SMP	Bi-212	713R9	SOLID	pCi/g	0.3	U,G	2.2	3.9	
B 4621 roof (leach)	0705144-10	SMP	Bi-212	713R9	SOLID	pCi/g	0.6	U	1.2	1.9	
B 4075 wall (leach)	0705144-13	SMP	Bi-212	713R9	SOLID	pCi/g	0.6	U	1.3	2.2	
B 4621 wall	0705144-4	SMP	Bi-212	713R9	SOLID	pCi/g	0.62	U,G	0.71	1.09	
B 4022 S wall	0708172-4	SMP	Bi-212	713R9	SOLID	pCi/g	0.65	U	0.98	1.63	
B 4022 N wall (leach)	0708172-11	SMP	Bi-212	713R9	SOLID	pCi/g	0.7	U	3.5	6.3	
B 4022 W wall (N) (leach)	0708172-9	SMP	Bi-212	713R9	SOLID	pCi/g	0.8	U	3.4	6.2	
B 4022 N wall	0708172-5	SMP	Bi-212	713R9	SOLID	pCi/g	0.82	U,G	0.9	1.46	
B 4075 roof (leach)	0705144-12	SMP	Bi-212	713R9	SOLID	pCi/g	0.9	U	1.4	2.4	
B 4688 roof (leach)	0705144-14	SMP	Bi-212	713R9	SOLID	pCi/g	1	U	1.4	2.4	
B 4665 roof (leach)	0705144-8	SMP	Bi-212	713R9	SOLID	pCi/g	1	U	1.2	2	

Laboratory Analytical Report - Sheet Metal

Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
B 4658 Plate Metal Roof	0708172-6	SMP	Bi-212	713R9	SOLID	pCi/g	1.1	U,G	2.2	3.8	
B 4688 roof	0705144-7	SMP	Bi-212	713R9	SOLID	pCi/g	1.3	U,G	1.1	1.5	
B 4022 S wall (leach)	0708172-10	SMP	Bi-212	713R9	SOLID	pCi/g	3.1	U	3.4	5.3	
B 4022 W wall (N) (leach)	0708172-9	SMP	Bi-214	713R9	SOLID	pCi/g	-0.45	U,J	0.54	1.09	
B 4665 roof	0705144-1	SMP	Bi-214	713R9	SOLID	pCi/g	-0.32	U,G,J	0.32	0.58	
B 4658 Plate Metal Roof	0708172-6	SMP	Bi-214	713R9	SOLID	pCi/g	-0.21	U,G,J	0.41	0.74	
B 4621 wall	0705144-4	SMP	Bi-214	713R9	SOLID	pCi/g	-0.11	U,G,J	0.12	0.27	
B 4621 roof	0705144-3	SMP	Bi-214	713R9	SOLID	pCi/g	-0.1	U,G,J	0.14	0.3	
B 4075 wall	0705144-6	SMP	Bi-214	713R9	SOLID	pCi/g	-0.08	U,G,J	0.41	0.72	
B 4688 roof	0705144-7	SMP	Bi-214	713R9	SOLID	pCi/g	-0.07	U,G,J	0.19	0.38	
B 4022 N wall (leach)	0708172-11	SMP	Bi-214	713R9	SOLID	pCi/g	-0.04	U,J	0.53	0.98	
B 4022 E wall	0708172-1	SMP	Bi-214	713R9	SOLID	pCi/g	-0.03	U,G,J	0.12	0.23	
B 4022 N wall	0708172-5	SMP	Bi-214	713R9	SOLID	pCi/g	-0.02	U,G,J	0.15	0.26	
B 4022 W wall (S)	0708172-2	SMP	Bi-214	713R9	SOLID	pCi/g	0.006	U,G,J	0.071	0.12	
B 4022 W wall (N)	0708172-3	SMP	Bi-214	713R9	SOLID	pCi/g	0.01	U,J	0.18	0.33	
B 4022 E wall (leach)	0708172-7	SMP	Bi-214	713R9	SOLID	pCi/g	0.02	U,J	0.28	0.48	
B 4621 roof (leach)	0705144-10	SMP	Bi-214	713R9	SOLID	pCi/g	0.05	U,J	0.23	0.39	
B 4022 S wall	0708172-4	SMP	Bi-214	713R9	SOLID	pCi/g	0.06	U,J	0.22	0.39	
B 4075 wall (leach)	0705144-13	SMP	Bi-214	713R9	SOLID	pCi/g	0.07	U,J	0.26	0.44	
B 4665 wall (leach)	0705144-9	SMP	Bi-214	713R9	SOLID	pCi/g	0.07	U,J	0.26	0.44	
B 4075 roof	0705144-5	SMP	Bi-214	713R9	SOLID	pCi/g	0.08	U,G,J	0.28	0.5	
B 4621 wall (leach)	0705144-11	SMP	Bi-214	713R9	SOLID	pCi/g	0.08	U,J	0.29	0.48	
B 4075 roof (leach)	0705144-12	SMP	Bi-214	713R9	SOLID	pCi/g	0.08	U,J	0.27	0.45	
B 4022 W wall (S) (leach)	0708172-8	SMP	Bi-214	713R9	SOLID	pCi/g	0.09	U,J	0.51	0.92	
B 4688 roof (leach)	0705144-14	SMP	Bi-214	713R9	SOLID	pCi/g	0.17	U,J	0.31	0.52	
B 4022 S wall (leach)	0708172-10	SMP	Bi-214	713R9	SOLID	pCi/g	0.18	U,J	0.59	1.04	
B 4665 wall	0705144-2	SMP	Bi-214	713R9	SOLID	pCi/g	0.19	U,G,J	0.23	0.36	
B 4665 roof (leach)	0705144-8	SMP	Bi-214	713R9	SOLID	pCi/g	0.22	U,J	0.3	0.5	
B 4022 N wall (leach)	0708172-11	SMP	Cs-137	713R9	SOLID	pCi/g	-0.15	U	0.22	0.47	
B 4022 W wall (S) (leach)	0708172-8	SMP	Cs-137	713R9	SOLID	pCi/g	-0.07	U	0.21	0.41	
B 4075 roof (leach)	0705144-12	SMP	Cs-137	713R9	SOLID	pCi/g	-0.06	U	0.1	0.19	
B 4621 roof (leach)	0705144-10	SMP	Cs-137	713R9	SOLID	pCi/g	-0.06	U	0.078	0.14	
B 4022 N wall	0708172-5	SMP	Cs-137	713R9	SOLID	pCi/g	-0.04	U,G	0.061	0.12	
B 4621 wall (leach)	0705144-11	SMP	Cs-137	713R9	SOLID	pCi/g	-0.03	U	0.088	0.16	
B 4621 wall	0705144-4	SMP	Cs-137	713R9	SOLID	pCi/g	-0.02	U,G	0.056	0.12	
B 4665 wall (leach)	0705144-9	SMP	Cs-137	713R9	SOLID	pCi/g	-0.01	U	0.083	0.15	
B 4022 S wall	0708172-4	SMP	Cs-137	713R9	SOLID	pCi/g	-0.01	U	0.092	0.18	
B 4022 S wall (leach)	0708172-10	SMP	Cs-137	713R9	SOLID	pCi/g	-0.01	U	0.24	0.47	
B 4688 roof (leach)	0705144-14	SMP	Cs-137	713R9	SOLID	pCi/g	-0.01	U	0.092	0.16	
B 4075 wall (leach)	0705144-13	SMP	Cs-137	713R9	SOLID	pCi/g	0	U	0.092	0.16	
B 4022 W wall (N) (leach)	0708172-9	SMP	Cs-137	713R9	SOLID	pCi/g	0.02	U	0.23	0.44	
B 4075 roof	0705144-5	SMP	Cs-137	713R9	SOLID	pCi/g	0.02	U,G	0.13	0.25	
B 4022 W wall (S)	0708172-2	SMP	Cs-137	713R9	SOLID	pCi/g	0.034	U,G	0.032	0.05	
B 4621 roof	0705144-3	SMP	Cs-137	713R9	SOLID	pCi/g	0.035	U,G	0.061	0.11	
B 4665 wall	0705144-2	SMP	Cs-137	713R9	SOLID	pCi/g	0.05	U,G	0.13	0.23	
B 4665 roof (leach)	0705144-8	SMP	Cs-137	713R9	SOLID	pCi/g	0.05	U	0.1	0.17	
B 4022 E wall	0708172-1	SMP	Cs-137	713R9	SOLID	pCi/g	0.057	U,G	0.055	0.08	

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Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
B 4022 E wall (leach)	0708172-7	SMP	Cs-137	713R9	SOLID	pCi/g	0.07	U	0.1	0.17	
B 4688 roof	0705144-7	SMP	Cs-137	713R9	SOLID	pCi/g	0.089	U,G	0.09	0.14	
B 4075 wall	0705144-6	SMP	Cs-137	713R9	SOLID	pCi/g	0.1	U,G	0.14	0.24	
B 4022 W wall (N)	0708172-3	SMP	Cs-137	713R9	SOLID	pCi/g	0.117	U	0.094	0.13	
B 4658 Plate Metal Roof	0708172-6	SMP	Cs-137	713R9	SOLID	pCi/g	0.17	U,G	0.18	0.29	
B 4665 roof	0705144-1	SMP	Cs-137	713R9	SOLID	pCi/g	0.24	LT,G	0.15	0.23	Yes
B 4075 roof	0705144-5	SMP	K-40	713R9	SOLID	pCi/g	-0.7	U,G	2.1	4.3	
B 4022 S wall (leach)	0708172-10	SMP	K-40	713R9	SOLID	pCi/g	-0.6	U	3.7	7.3	
B 4022 W wall (N)	0708172-3	SMP	K-40	713R9	SOLID	pCi/g	-0.4	U	1.3	2.7	
B 4665 roof (leach)	0705144-8	SMP	K-40	713R9	SOLID	pCi/g	-0.2	U	1.7	3	
B 4022 N wall	0708172-5	SMP	K-40	713R9	SOLID	pCi/g	-0.11	U,G	0.82	1.5	
B 4621 roof	0705144-3	SMP	K-40	713R9	SOLID	pCi/g	-0.11	U,G	0.73	1.56	
B 4022 S wall	0708172-4	SMP	K-40	713R9	SOLID	pCi/g	-0.1	U	1.2	2.5	
B 4621 wall (leach)	0705144-11	SMP	K-40	713R9	SOLID	pCi/g	-0.1	U	1.8	3.1	
B 4075 wall	0705144-6	SMP	K-40	713R9	SOLID	pCi/g	0	U,G	2.1	3.8	
B 4688 roof (leach)	0705144-14	SMP	K-40	713R9	SOLID	pCi/g	0	U	1.8	3.2	
B 4688 roof	0705144-7	SMP	K-40	713R9	SOLID	pCi/g	0.1	U,G	1.4	2.7	
B 4075 roof (leach)	0705144-12	SMP	K-40	713R9	SOLID	pCi/g	0.1	U	2.2	3.7	
B 4621 wall	0705144-4	SMP	K-40	713R9	SOLID	pCi/g	0.14	U,G	0.87	1.71	
B 4621 roof (leach)	0705144-10	SMP	K-40	713R9	SOLID	pCi/g	0.2	U	1.4	2.4	
B 4022 E wall	0708172-1	SMP	K-40	713R9	SOLID	pCi/g	0.23	U,G	0.65	1.19	
B 4022 W wall (S)	0708172-2	SMP	K-40	713R9	SOLID	pCi/g	0.23	U,G	0.49	0.85	
B 4075 wall (leach)	0705144-13	SMP	K-40	713R9	SOLID	pCi/g	0.7	U	1.7	2.9	
B 4022 E wall (leach)	0708172-7	SMP	K-40	713R9	SOLID	pCi/g	0.8	U	2.1	3.5	
B 4665 wall (leach)	0705144-9	SMP	K-40	713R9	SOLID	pCi/g	1	U	1.9	3.1	
B 4022 N wall (leach)	0708172-11	SMP	K-40	713R9	SOLID	pCi/g	1.2	U	3.6	6.4	
B 4022 W wall (S) (leach)	0708172-8	SMP	K-40	713R9	SOLID	pCi/g	1.4	U	3.7	6.4	
B 4658 Plate Metal Roof	0708172-6	SMP	K-40	713R9	SOLID	pCi/g	1.5	U,G	2.5	4.3	
B 4665 roof	0705144-1	SMP	K-40	713R9	SOLID	pCi/g	1.5	U,G	1.9	3.1	
B 4665 wall	0705144-2	SMP	K-40	713R9	SOLID	pCi/g	2.2	U,G	1.8	2.4	
B 4022 W wall (N) (leach)	0708172-9	SMP	K-40	713R9	SOLID	pCi/g	2.3	U	3.4	5.6	
B 4022 W wall (S) (leach)	0708172-8	SMP	Pa-234m	713R9	SOLID	pCi/g	-11	U	23	50	
B 4022 S wall (leach)	0708172-10	SMP	Pa-234m	713R9	SOLID	pCi/g	-6	U	29	59	
B 4022 E wall	0708172-1	SMP	Pa-234m	713R9	SOLID	pCi/g	-4.5	U,G	5.6	13.2	
B 4688 roof (leach)	0705144-14	SMP	Pa-234m	713R9	SOLID	pCi/g	-3	U	11	19	
B 4022 N wall	0708172-5	SMP	Pa-234m	713R9	SOLID	pCi/g	-2	U,G	7.4	13.8	
B 4665 roof (leach)	0705144-8	SMP	Pa-234m	713R9	SOLID	pCi/g	-2	U	15	27	
B 4022 W wall (N)	0708172-3	SMP	Pa-234m	713R9	SOLID	pCi/g	-1.9	U	7.9	17.4	
B 4022 W wall (S)	0708172-2	SMP	Pa-234m	713R9	SOLID	pCi/g	-1.1	U,G	3.4	6.6	
B 4621 roof (leach)	0705144-10	SMP	Pa-234m	713R9	SOLID	pCi/g	-0.2	U	10	18.1	
B 4075 roof (leach)	0705144-12	SMP	Pa-234m	713R9	SOLID	pCi/g	0	U	12	21	
B 4621 wall (leach)	0705144-11	SMP	Pa-234m	713R9	SOLID	pCi/g	0.4	U	10	17.6	
B 4658 Plate Metal Roof	0708172-6	SMP	Pa-234m	713R9	SOLID	pCi/g	1	U,G	23	40	
B 4665 wall (leach)	0705144-9	SMP	Pa-234m	713R9	SOLID	pCi/g	1	U	15	27	
B 4621 wall	0705144-4	SMP	Pa-234m	713R9	SOLID	pCi/g	1.1	U,G	6.8	13.7	
B 4621 roof	0705144-3	SMP	Pa-234m	713R9	SOLID	pCi/g	2	U,G	5	9.5	
B 4688 roof	0705144-7	SMP	Pa-234m	713R9	SOLID	pCi/g	2.5	U,G	10	19.9	

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Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
B 4022 N wall (leach)	0708172-11	SMP	Pa-234m	713R9	SOLID	pCi/g	3	U	27	51	
B 4665 wall	0705144-2	SMP	Pa-234m	713R9	SOLID	pCi/g	5	U,G	15	28	
B 4075 roof	0705144-5	SMP	Pa-234m	713R9	SOLID	pCi/g	5	U,G	14	26	
B 4665 roof	0705144-1	SMP	Pa-234m	713R9	SOLID	pCi/g	7	U,G	15	26	
B 4075 wall (leach)	0705144-13	SMP	Pa-234m	713R9	SOLID	pCi/g	8	U	11	18	
B 4022 W wall (N) (leach)	0708172-9	SMP	Pa-234m	713R9	SOLID	pCi/g	9	U	30	54	
B 4022 S wall	0708172-4	SMP	Pa-234m	713R9	SOLID	pCi/g	10	U	12	19	
B 4075 wall	0705144-6	SMP	Pa-234m	713R9	SOLID	pCi/g	16	U,G	18	29	
B 4022 E wall (leach)	0708172-7	SMP	Pa-234m	713R9	SOLID	pCi/g	17	U	14	22	
B 4075 roof	0705144-5	SMP	Pb-211	713R9	SOLID	pCi/g	-3.3	U,G	2.8	5.9	
B 4022 W wall (N) (leach)	0708172-9	SMP	Pb-211	713R9	SOLID	pCi/g	-3.1	U	4.4	8.9	
B 4665 wall	0705144-2	SMP	Pb-211	713R9	SOLID	pCi/g	-1.7	U,G	2.1	4.5	
B 4075 roof (leach)	0705144-12	SMP	Pb-211	713R9	SOLID	pCi/g	-1.7	U	2.1	3.7	
B 4621 roof (leach)	0705144-10	SMP	Pb-211	713R9	SOLID	pCi/g	-1.3	U	1.5	2.7	
B 4665 roof	0705144-1	SMP	Pb-211	713R9	SOLID	pCi/g	-0.8	U,G	2	3.7	
B 4022 N wall	0708172-5	SMP	Pb-211	713R9	SOLID	pCi/g	-0.7	U,G	1.1	2	
B 4022 E wall (leach)	0708172-7	SMP	Pb-211	713R9	SOLID	pCi/g	-0.6	U	1.9	3.3	
B 4075 wall (leach)	0705144-13	SMP	Pb-211	713R9	SOLID	pCi/g	-0.4	U	1.7	2.9	
B 4022 S wall (leach)	0708172-10	SMP	Pb-211	713R9	SOLID	pCi/g	-0.3	U	4.3	8.1	
B 4688 roof	0705144-7	SMP	Pb-211	713R9	SOLID	pCi/g	-0.2	U,G	1.7	3.2	
B 4621 wall (leach)	0705144-11	SMP	Pb-211	713R9	SOLID	pCi/g	-0.2	U	1.5	2.6	
B 4022 W wall (N)	0708172-3	SMP	Pb-211	713R9	SOLID	pCi/g	-0.1	U	1.3	2.5	
B 4621 roof	0705144-3	SMP	Pb-211	713R9	SOLID	pCi/g	-0.1	U,G	0.8	1.63	
B 4665 wall (leach)	0705144-9	SMP	Pb-211	713R9	SOLID	pCi/g	-0.1	U	1.6	2.9	
B 4022 E wall	0708172-1	SMP	Pb-211	713R9	SOLID	pCi/g	0.08	U,G	0.93	1.74	
B 4022 W wall (S)	0708172-2	SMP	Pb-211	713R9	SOLID	pCi/g	0.08	U,G	0.54	0.95	
B 4621 wall	0705144-4	SMP	Pb-211	713R9	SOLID	pCi/g	0.09	U,G	0.97	1.87	
B 4075 wall	0705144-6	SMP	Pb-211	713R9	SOLID	pCi/g	0.1	U,G	2.6	4.6	
B 4658 Plate Metal Roof	0708172-6	SMP	Pb-211	713R9	SOLID	pCi/g	0.7	U,G	3	5.1	
B 4022 S wall	0708172-4	SMP	Pb-211	713R9	SOLID	pCi/g	0.8	U	1.5	2.5	
B 4022 W wall (S) (leach)	0708172-8	SMP	Pb-211	713R9	SOLID	pCi/g	1.4	U	3.8	6.7	
B 4665 roof (leach)	0705144-8	SMP	Pb-211	713R9	SOLID	pCi/g	1.7	U	1.7	2.7	
B 4688 roof (leach)	0705144-14	SMP	Pb-211	713R9	SOLID	pCi/g	1.8	U	1.7	2.7	
B 4022 N wall (leach)	0708172-11	SMP	Pb-211	713R9	SOLID	pCi/g	3.7	U	4.2	6.8	
B 4075 wall	0705144-6	SMP	Pb-212	713R9	SOLID	pCi/g	-0.13	U,G	0.26	0.47	
B 4665 roof (leach)	0705144-8	SMP	Pb-212	713R9	SOLID	pCi/g	-0.13	U	0.21	0.36	
B 4022 W wall (N) (leach)	0708172-9	SMP	Pb-212	713R9	SOLID	pCi/g	-0.1	U	0.33	0.61	
B 4665 wall (leach)	0705144-9	SMP	Pb-212	713R9	SOLID	pCi/g	-0.1	U	0.19	0.32	
B 4022 S wall (leach)	0708172-10	SMP	Pb-212	713R9	SOLID	pCi/g	-0.08	U	0.34	0.62	
B 4022 N wall	0708172-5	SMP	Pb-212	713R9	SOLID	pCi/g	-0.07	U,G	0.11	0.2	
B 4022 E wall (leach)	0708172-7	SMP	Pb-212	713R9	SOLID	pCi/g	-0.06	U	0.15	0.27	
B 4022 S wall	0708172-4	SMP	Pb-212	713R9	SOLID	pCi/g	0	U	0.11	0.2	
B 4621 roof	0705144-3	SMP	Pb-212	713R9	SOLID	pCi/g	0	U,G	0.084	0.15	
B 4621 roof (leach)	0705144-10	SMP	Pb-212	713R9	SOLID	pCi/g	0	U	0.15	0.26	
B 4688 roof (leach)	0705144-14	SMP	Pb-212	713R9	SOLID	pCi/g	0	U	0.18	0.31	
B 4022 E wall	0708172-1	SMP	Pb-212	713R9	SOLID	pCi/g	0.006	U,G	0.064	0.12	
B 4022 W wall (S)	0708172-2	SMP	Pb-212	713R9	SOLID	pCi/g	0.006	U,G	0.043	0.08	

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Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
B 4621 wall	0705144-4	SMP	Pb-212	713R9	SOLID	pCi/g	0.016	U,G	0.089	0.16	
B 4022 W wall (N)	0708172-3	SMP	Pb-212	713R9	SOLID	pCi/g	0.02	U	0.11	0.2	
B 4075 wall (leach)	0705144-13	SMP	Pb-212	713R9	SOLID	pCi/g	0.04	U	0.18	0.3	
B 4688 roof	0705144-7	SMP	Pb-212	713R9	SOLID	pCi/g	0.07	U,G	0.13	0.22	
B 4075 roof (leach)	0705144-12	SMP	Pb-212	713R9	SOLID	pCi/g	0.07	U	0.16	0.26	
B 4621 wall (leach)	0705144-11	SMP	Pb-212	713R9	SOLID	pCi/g	0.08	U	0.18	0.3	
B 4075 roof	0705144-5	SMP	Pb-212	713R9	SOLID	pCi/g	0.12	U,G	0.18	0.31	
B 4665 wall	0705144-2	SMP	Pb-212	713R9	SOLID	pCi/g	0.13	U,G	0.16	0.27	
B 4022 N wall (leach)	0708172-11	SMP	Pb-212	713R9	SOLID	pCi/g	0.17	U	0.36	0.62	
B 4665 roof	0705144-1	SMP	Pb-212	713R9	SOLID	pCi/g	0.25	U,G	0.19	0.3	
B 4022 W wall (S) (leach)	0708172-8	SMP	Pb-212	713R9	SOLID	pCi/g	0.26	U	0.36	0.59	
B 4658 Plate Metal Roof	0708172-6	SMP	Pb-212	713R9	SOLID	pCi/g	0.69	G	0.3	0.41	Yes
B 4022 W wall (N) (leach)	0708172-9	SMP	Pb-214	713R9	SOLID	pCi/g	-0.36	U,J	0.5	0.96	
B 4022 N wall (leach)	0708172-11	SMP	Pb-214	713R9	SOLID	pCi/g	-0.3	U,J	0.45	0.88	
B 4665 wall	0705144-2	SMP	Pb-214	713R9	SOLID	pCi/g	-0.11	U,G,J	0.22	0.43	
B 4688 roof	0705144-7	SMP	Pb-214	713R9	SOLID	pCi/g	-0.06	U,G,J	0.16	0.31	
B 4665 roof	0705144-1	SMP	Pb-214	713R9	SOLID	pCi/g	-0.03	U,G,J	0.2	0.35	
B 4022 N wall	0708172-5	SMP	Pb-214	713R9	SOLID	pCi/g	-0.02	U,G,J	0.12	0.22	
B 4621 wall (leach)	0705144-11	SMP	Pb-214	713R9	SOLID	pCi/g	-0.01	U,J	0.19	0.32	
B 4022 W wall (N)	0708172-3	SMP	Pb-214	713R9	SOLID	pCi/g	0	U,J	0.15	0.28	
B 4621 wall	0705144-4	SMP	Pb-214	713R9	SOLID	pCi/g	0	U,G,J	0.11	0.21	
B 4022 W wall (S)	0708172-2	SMP	Pb-214	713R9	SOLID	pCi/g	0.008	U,G,J	0.063	0.11	
B 4022 E wall	0708172-1	SMP	Pb-214	713R9	SOLID	pCi/g	0.009	U,G,J	0.098	0.18	
B 4075 roof	0705144-5	SMP	Pb-214	713R9	SOLID	pCi/g	0.03	U,G,J	0.26	0.47	
B 4075 roof (leach)	0705144-12	SMP	Pb-214	713R9	SOLID	pCi/g	0.04	U,J	0.27	0.46	
B 4022 E wall (leach)	0708172-7	SMP	Pb-214	713R9	SOLID	pCi/g	0.05	U,J	0.26	0.43	
B 4022 W wall (S) (leach)	0708172-8	SMP	Pb-214	713R9	SOLID	pCi/g	0.06	U,J	0.45	0.8	
B 4621 roof	0705144-3	SMP	Pb-214	713R9	SOLID	pCi/g	0.09	U,G,J	0.13	0.22	
B 4665 roof (leach)	0705144-8	SMP	Pb-214	713R9	SOLID	pCi/g	0.11	U,J	0.17	0.29	
B 4075 wall (leach)	0705144-13	SMP	Pb-214	713R9	SOLID	pCi/g	0.14	U,J	0.26	0.43	
B 4688 roof (leach)	0705144-14	SMP	Pb-214	713R9	SOLID	pCi/g	0.15	U,J	0.18	0.29	
B 4022 S wall	0708172-4	SMP	Pb-214	713R9	SOLID	pCi/g	0.18	U,J	0.15	0.21	
B 4022 S wall (leach)	0708172-10	SMP	Pb-214	713R9	SOLID	pCi/g	0.18	U,J	0.46	0.8	
B 4658 Plate Metal Roof	0708172-6	SMP	Pb-214	713R9	SOLID	pCi/g	0.19	U,G,J	0.27	0.44	
B 4075 wall	0705144-6	SMP	Pb-214	713R9	SOLID	pCi/g	0.21	U,G,J	0.28	0.45	
B 4621 roof (leach)	0705144-10	SMP	Pb-214	713R9	SOLID	pCi/g	0.23	J,TI	0.15	0.23	
B 4665 wall (leach)	0705144-9	SMP	Pb-214	713R9	SOLID	pCi/g	0.26	U,J	0.27	0.43	
B 4075 roof (leach)	0705144-12	SMP	Po-210	714R10	SOLID	pCi/g	-0.04	U	0.054	0.13	
B 4621 roof (leach)	0705144-10	SMP	Po-210	714R10	SOLID	pCi/g	-0.03	U	0.054	0.11	
B 4621 wall (leach)	0705144-11	SMP	Po-210	714R10	SOLID	pCi/g	-0.01	U	0.028	0.06	
B 4665 wall (leach)	0705144-9	SMP	Po-210	714R10	SOLID	pCi/g	0	U	0.037	0.08	
B 4688 roof (leach)	0705144-14	SMP	Po-210	714R10	SOLID	pCi/g	0.016	U	0.046	0.09	
B 4075 wall (leach)	0705144-13	SMP	Po-210	714R10	SOLID	pCi/g	0.032	LT	0.039	0.02	Yes
B 4665 roof (leach)	0705144-8	SMP	Po-210	714R10	SOLID	pCi/g	0.067	LT	0.05	0.06	Yes
B 4022 S wall (leach)	0708172-10	SMP	Po-210	714R11	SOLID	pCi/g	-0.01	U	0.13	0.2	
B 4022 N wall (leach)	0708172-11	SMP	Po-210	714R11	SOLID	pCi/g	-0.01	U	0.12	0.16	
B 4022 W wall (N) (leach)	0708172-9	SMP	Po-210	714R11	SOLID	pCi/g	-0.01	U	0.1	0.14	

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B 4022 W wall (S) (leach)	0708172-8	SMP	Po-210	714R11	SOLID	pCi/g	0	U	0.11	0.09	
B 4022 E wall (leach)	0708172-7	SMP	Po-210	714R11	SOLID	pCi/g	0.041	U	0.088	0.14	
B 4658 Plate Metal Roof	0708172-6	SMP	Po-210	714R11	SOLID	pCi/g	46.3		7.4	0.1	Yes
B 4621 roof (leach)	0705144-10	SMP	Pu-238	714R10	SOLID	pCi/g	-0	U	0.007	0.01	
B 4665 wall (leach)	0705144-9	SMP	Pu-238	714R10	SOLID	pCi/g	-0	U	0.007	0.01	
B 4621 wall (leach)	0705144-11	SMP	Pu-238	714R10	SOLID	pCi/g	-0	U	0.008	0.01	
B 4075 wall (leach)	0705144-13	SMP	Pu-238	714R10	SOLID	pCi/g	-0	U	0.009	0.01	
B 4665 roof (leach)	0705144-8	SMP	Pu-238	714R10	SOLID	pCi/g	-0	U	0.008	0.01	
B 4075 roof (leach)	0705144-12	SMP	Pu-238	714R10	SOLID	pCi/g	0	U	0.008	0.01	
B 4688 roof (leach)	0705144-14	SMP	Pu-238	714R10	SOLID	pCi/g	0	U	0.008	0.01	
B 4022 S wall (leach)	0708172-10	SMP	Pu-238	714R11	SOLID	pCi/g	-0	U	0.009	0.01	
B 4022 N wall (leach)	0708172-11	SMP	Pu-238	714R11	SOLID	pCi/g	0	U	0.008	0.01	
B 4022 W wall (N) (leach)	0708172-9	SMP	Pu-238	714R11	SOLID	pCi/g	0	U	0.01	0.01	
B 4022 E wall (leach)	0708172-7	SMP	Pu-238	714R11	SOLID	pCi/g	0.002	U	0.008	0.01	
B 4658 Plate Metal Roof	0708172-6	SMP	Pu-238	714R11	SOLID	pCi/g	0.002	U	0.008	0	
B 4022 W wall (S) (leach)	0708172-8	SMP	Pu-238	714R11	SOLID	pCi/g	0.003	U	0.009	0.01	
B 4688 roof (leach)	0705144-14	SMP	Pu-239	714R10	SOLID	pCi/g	-0	U	0.008	0.01	
B 4075 wall (leach)	0705144-13	SMP	Pu-239	714R10	SOLID	pCi/g	-0	U	0.009	0.01	
B 4075 roof (leach)	0705144-12	SMP	Pu-239	714R10	SOLID	pCi/g	0.001	U	0.008	0.01	
B 4665 roof (leach)	0705144-8	SMP	Pu-239	714R10	SOLID	pCi/g	0.002	U	0.008	0.01	
B 4665 wall (leach)	0705144-9	SMP	Pu-239	714R10	SOLID	pCi/g	0.003	U	0.007	0.01	
B 4621 roof (leach)	0705144-10	SMP	Pu-239	714R10	SOLID	pCi/g	0.003	U	0.007	0.01	
B 4621 wall (leach)	0705144-11	SMP	Pu-239	714R10	SOLID	pCi/g	0.006	U	0.008	0.01	
B 4022 N wall (leach)	0708172-11	SMP	Pu-239	714R11	SOLID	pCi/g	-0	U	0.008	0.02	
B 4022 E wall (leach)	0708172-7	SMP	Pu-239	714R11	SOLID	pCi/g	-0	U	0.008	0.02	
B 4022 W wall (N) (leach)	0708172-9	SMP	Pu-239	714R11	SOLID	pCi/g	-0	U	0.01	0.01	
B 4022 S wall (leach)	0708172-10	SMP	Pu-239	714R11	SOLID	pCi/g	-0	U	0.009	0.01	
B 4658 Plate Metal Roof	0708172-6	SMP	Pu-239	714R11	SOLID	pCi/g	0	U	0.008	0.02	
B 4022 W wall (S) (leach)	0708172-8	SMP	Pu-239	714R11	SOLID	pCi/g	0.003	U	0.009	0.01	
B 4665 roof (leach)	0705144-8	SMP	Pu-241	704R8	SOLID	pCi/g	-0.11	U	0.74	1.25	
B 4621 wall (leach)	0705144-11	SMP	Pu-241	704R8	SOLID	pCi/g	-0.08	U	0.7	1.18	
B 4621 roof (leach)	0705144-10	SMP	Pu-241	704R8	SOLID	pCi/g	0.06	U	0.65	1.1	
B 4075 roof (leach)	0705144-12	SMP	Pu-241	704R8	SOLID	pCi/g	0.09	U	0.69	1.16	
B 4665 wall (leach)	0705144-9	SMP	Pu-241	704R8	SOLID	pCi/g	0.12	U	0.63	1.05	
B 4688 roof (leach)	0705144-14	SMP	Pu-241	704R8	SOLID	pCi/g	0.17	U	0.72	1.21	
B 4075 wall (leach)	0705144-13	SMP	Pu-241	704R8	SOLID	pCi/g	0.21	U	0.75	1.26	
B 4658 Plate Metal Roof	0708172-6	SMP	Pu-241	704R9	SOLID	pCi/g	-2.1	U	3.6	6.3	
B 4022 S wall (leach)	0708172-10	SMP	Pu-241	704R9	SOLID	pCi/g	-1.3	U	1.9	3.4	
B 4022 W wall (S) (leach)	0708172-8	SMP	Pu-241	704R9	SOLID	pCi/g	-1.2	U	2	3.4	
B 4022 E wall (leach)	0708172-7	SMP	Pu-241	704R9	SOLID	pCi/g	-1.1	U	1.8	3.2	
B 4022 W wall (N) (leach)	0708172-9	SMP	Pu-241	704R9	SOLID	pCi/g	-0.8	U	2.1	3.7	
B 4022 N wall (leach)	0708172-11	SMP	Pu-241	704R9	SOLID	pCi/g	-0.7	U	1.8	3.1	
B 4075 wall	0705144-6	SMP	Ra-226	713R9	SOLID	pCi/g	-1.2	U,G	3.2	5.6	
B 4665 roof (leach)	0705144-8	SMP	Ra-226	713R9	SOLID	pCi/g	-1.2	U	2	3.5	
B 4621 wall (leach)	0705144-11	SMP	Ra-226	713R9	SOLID	pCi/g	-1	U	1.7	3	
B 4688 roof (leach)	0705144-14	SMP	Ra-226	713R9	SOLID	pCi/g	-1	U	1.8	3	
B 4075 roof	0705144-5	SMP	Ra-226	713R9	SOLID	pCi/g	-0.8	U,G	1.8	3.4	

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Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
B 4022 E wall (leach)	0708172-7	SMP	Ra-226	713R9	SOLID	pCi/g	-0.6	U	2.2	3.8	
B 4665 wall (leach)	0705144-9	SMP	Ra-226	713R9	SOLID	pCi/g	-0.6	U	2	3.5	
B 4022 E wall	0708172-1	SMP	Ra-226	713R9	SOLID	pCi/g	-0.26	U,G	0.69	1.33	
B 4022 W wall (N)	0708172-3	SMP	Ra-226	713R9	SOLID	pCi/g	-0.1	U	1.1	2	
B 4022 N wall	0708172-5	SMP	Ra-226	713R9	SOLID	pCi/g	-0.1	U,G	1.2	2.1	
B 4621 wall	0705144-4	SMP	Ra-226	713R9	SOLID	pCi/g	0.04	U,G	0.75	1.39	
B 4022 W wall (S)	0708172-2	SMP	Ra-226	713R9	SOLID	pCi/g	0.15	U,G	0.56	0.94	
B 4022 S wall	0708172-4	SMP	Ra-226	713R9	SOLID	pCi/g	0.2	U	1.1	2	
B 4665 roof	0705144-1	SMP	Ra-226	713R9	SOLID	pCi/g	0.2	U,G	2.4	4.2	
B 4075 roof (leach)	0705144-12	SMP	Ra-226	713R9	SOLID	pCi/g	0.5	U	2.3	3.8	
B 4621 roof	0705144-3	SMP	Ra-226	713R9	SOLID	pCi/g	0.6	U,G	1.1	1.9	
B 4665 wall	0705144-2	SMP	Ra-226	713R9	SOLID	pCi/g	0.7	U,G	2.1	3.6	
B 4022 S wall (leach)	0708172-10	SMP	Ra-226	713R9	SOLID	pCi/g	1	U	4.1	7.1	
B 4688 roof	0705144-7	SMP	Ra-226	713R9	SOLID	pCi/g	1.1	U,G	1.5	2.4	
B 4621 roof (leach)	0705144-10	SMP	Ra-226	713R9	SOLID	pCi/g	1.1	U	1.9	3.1	
B 4022 W wall (S) (leach)	0708172-8	SMP	Ra-226	713R9	SOLID	pCi/g	1.2	U	3	5.2	
B 4022 N wall (leach)	0708172-11	SMP	Ra-226	713R9	SOLID	pCi/g	1.5	U	3.6	6.1	
B 4075 wall (leach)	0705144-13	SMP	Ra-226	713R9	SOLID	pCi/g	1.8	U	2	3.3	
B 4022 W wall (N) (leach)	0708172-9	SMP	Ra-226	713R9	SOLID	pCi/g	2.4	U	4.1	7	
B 4658 Plate Metal Roof	0708172-6	SMP	Ra-226	713R9	SOLID	pCi/g	3.1	U,G	3.4	5.6	
B 4022 N wall (leach)	0708172-11	SMP	Sr-90	724R10	SOLID	pCi/g	-0.05	U	0.12	0.28	
B 4022 W wall (N) (leach)	0708172-9	SMP	Sr-90	724R10	SOLID	pCi/g	-0.02	U	0.12	0.3	
B 4022 S wall (leach)	0708172-10	SMP	Sr-90	724R10	SOLID	pCi/g	0.03	U	0.16	0.36	
B 4022 W wall (S) (leach)	0708172-8	SMP	Sr-90	724R10	SOLID	pCi/g	0.08	U	0.14	0.3	
B 4022 E wall (leach)	0708172-7	SMP	Sr-90	724R10	SOLID	pCi/g	0.09	U	0.13	0.27	
B 4658 Plate Metal Roof	0708172-6	SMP	Sr-90	724R10	SOLID	pCi/g	0.09	U	0.16	0.35	
B 4075 wall (leach)	0705144-13	SMP	Sr-90	724R9	SOLID	pCi/g	-0.04	U	0.1	0.24	
B 4621 wall (leach)	0705144-11	SMP	Sr-90	724R9	SOLID	pCi/g	-0.01	U	0.063	0.14	
B 4621 roof (leach)	0705144-10	SMP	Sr-90	724R9	SOLID	pCi/g	0.008	U	0.096	0.22	
B 4665 wall (leach)	0705144-9	SMP	Sr-90	724R9	SOLID	pCi/g	0.012	U	0.098	0.22	
B 4688 roof (leach)	0705144-14	SMP	Sr-90	724R9	SOLID	pCi/g	0.02	U	0.11	0.24	
B 4075 roof (leach)	0705144-12	SMP	Sr-90	724R9	SOLID	pCi/g	0.08	U	0.1	0.22	
B 4665 roof (leach)	0705144-8	SMP	Sr-90	724R9	SOLID	pCi/g	0.13	U	0.12	0.24	
B 4075 wall (leach)	0705144-13	SMP	Th-228	714R10	SOLID	pCi/g	-0	U	0.008	0.02	
B 4665 wall (leach)	0705144-9	SMP	Th-228	714R10	SOLID	pCi/g	0	U	0.004	0.01	
B 4665 roof (leach)	0705144-8	SMP	Th-228	714R10	SOLID	pCi/g	5E-04	U	0.008	0.02	
B 4075 roof (leach)	0705144-12	SMP	Th-228	714R10	SOLID	pCi/g	0.002	U	0.009	0.02	
B 4621 wall (leach)	0705144-11	SMP	Th-228	714R10	SOLID	pCi/g	0.002	U	0.006	0.01	
B 4688 roof (leach)	0705144-14	SMP	Th-228	714R10	SOLID	pCi/g	0.004	U	0.009	0.02	
B 4621 roof (leach)	0705144-10	SMP	Th-228	714R10	SOLID	pCi/g	0.008	U	0.012	0.02	
B 4022 E wall (leach)	0708172-7	SMP	Th-228	714R11	SOLID	pCi/g	-0.01	U	0.024	0.06	
B 4022 N wall (leach)	0708172-11	SMP	Th-228	714R11	SOLID	pCi/g	0.007	U	0.026	0.05	
B 4022 S wall (leach)	0708172-10	SMP	Th-228	714R11	SOLID	pCi/g	0.015	U	0.025	0.05	
B 4022 W wall (N) (leach)	0708172-9	SMP	Th-228	714R11	SOLID	pCi/g	0.022	U	0.028	0.05	
B 4022 W wall (S) (leach)	0708172-8	SMP	Th-228	714R11	SOLID	pCi/g	0.028	U	0.027	0.05	
B 4658 Plate Metal Roof	0708172-6	SMP	Th-228	714R11	SOLID	pCi/g	0.46	M3	0.14	0.12	Yes
B 4075 roof (leach)	0705144-12	SMP	Th-230	714R10	SOLID	pCi/g	-0.01	U	0.007	0.03	

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B 4688 roof (leach)	0705144-14	SMP	Th-230	714R10	SOLID	pCi/g	-0.01	U	0.008	0.02	
B 4665 roof (leach)	0705144-8	SMP	Th-230	714R10	SOLID	pCi/g	-0	U	0.01	0.03	
B 4665 wall (leach)	0705144-9	SMP	Th-230	714R10	SOLID	pCi/g	-0	U	0.009	0.02	
B 4621 roof (leach)	0705144-10	SMP	Th-230	714R10	SOLID	pCi/g	-0	U	0.01	0.03	
B 4621 wall (leach)	0705144-11	SMP	Th-230	714R10	SOLID	pCi/g	-0	U	0.008	0.02	
B 4075 wall (leach)	0705144-13	SMP	Th-230	714R10	SOLID	pCi/g	0.009	U	0.012	0.03	
B 4022 N wall (leach)	0708172-11	SMP	Th-230	714R11	SOLID	pCi/g	0.016	U	0.026	0.05	
B 4022 W wall (S) (leach)	0708172-8	SMP	Th-230	714R11	SOLID	pCi/g	0.032	U	0.03	0.05	
B 4022 E wall (leach)	0708172-7	SMP	Th-230	714R11	SOLID	pCi/g	0.043	U	0.032	0.05	
B 4022 W wall (N) (leach)	0708172-9	SMP	Th-230	714R11	SOLID	pCi/g	0.063	LT	0.034	0.05	Yes
B 4022 S wall (leach)	0708172-10	SMP	Th-230	714R11	SOLID	pCi/g	0.065	LT	0.035	0.05	Yes
B 4658 Plate Metal Roof	0708172-6	SMP	Th-230	714R11	SOLID	pCi/g	0.33		0.1	0.08	Yes
B 4621 wall (leach)	0705144-11	SMP	Th-232	714R10	SOLID	pCi/g	-0	U	0.003	0.01	
B 4621 roof (leach)	0705144-10	SMP	Th-232	714R10	SOLID	pCi/g	0	U	0.005	0.01	
B 4075 roof (leach)	0705144-12	SMP	Th-232	714R10	SOLID	pCi/g	6E-04	U	0.005	0.01	
B 4665 wall (leach)	0705144-9	SMP	Th-232	714R10	SOLID	pCi/g	8E-04	U	0.004	0	
B 4075 wall (leach)	0705144-13	SMP	Th-232	714R10	SOLID	pCi/g	0.001	U	0.004	0.01	
B 4665 roof (leach)	0705144-8	SMP	Th-232	714R10	SOLID	pCi/g	0.003	U	0.005	0.01	
B 4688 roof (leach)	0705144-14	SMP	Th-232	714R10	SOLID	pCi/g	0.003	U	0.004	0.01	
B 4022 E wall (leach)	0708172-7	SMP	Th-232	714R11	SOLID	pCi/g	0.01	U	0.011	0.02	
B 4022 W wall (N) (leach)	0708172-9	SMP	Th-232	714R11	SOLID	pCi/g	0.01	LT	0.009	0.01	Yes
B 4022 S wall (leach)	0708172-10	SMP	Th-232	714R11	SOLID	pCi/g	0.011	U	0.013	0.02	
B 4022 N wall (leach)	0708172-11	SMP	Th-232	714R11	SOLID	pCi/g	0.015	LT	0.012	0.01	Yes
B 4022 W wall (S) (leach)	0708172-8	SMP	Th-232	714R11	SOLID	pCi/g	0.018	LT	0.014	0.02	Yes
B 4658 Plate Metal Roof	0708172-6	SMP	Th-232	714R11	SOLID	pCi/g	0.37		0.11	0.05	Yes
B 4022 W wall (S) (leach)	0708172-8	SMP	Th-234	713R9	SOLID	pCi/g	-6	U	13	24	
B 4658 Plate Metal Roof	0708172-6	SMP	Th-234	713R9	SOLID	pCi/g	-4.3	U,G	5.7	10.1	
B 4075 wall (leach)	0705144-13	SMP	Th-234	713R9	SOLID	pCi/g	-3	U	4.9	8.5	
B 4022 W wall (N)	0708172-3	SMP	Th-234	713R9	SOLID	pCi/g	-1.8	U	2.7	5.5	
B 4022 N wall	0708172-5	SMP	Th-234	713R9	SOLID	pCi/g	-1.6	U,G	2.1	3.7	
B 4022 E wall	0708172-1	SMP	Th-234	713R9	SOLID	pCi/g	-1.5	U,G	2	3.9	
B 4688 roof	0705144-7	SMP	Th-234	713R9	SOLID	pCi/g	-1.5	U,G	3.4	6.7	
B 4621 roof	0705144-3	SMP	Th-234	713R9	SOLID	pCi/g	-0.8	U,G	2.3	4.4	
B 4075 roof (leach)	0705144-12	SMP	Th-234	713R9	SOLID	pCi/g	-0.6	U	6.4	11	
B 4022 S wall (leach)	0708172-10	SMP	Th-234	713R9	SOLID	pCi/g	0	U	12	22	
B 4022 W wall (S)	0708172-2	SMP	Th-234	713R9	SOLID	pCi/g	0.1	U,G	1.3	2.3	
B 4665 roof	0705144-1	SMP	Th-234	713R9	SOLID	pCi/g	0.1	U,G	3.7	6.3	
B 4621 wall	0705144-4	SMP	Th-234	713R9	SOLID	pCi/g	0.2	U,G	2.1	3.8	
B 4621 wall (leach)	0705144-11	SMP	Th-234	713R9	SOLID	pCi/g	0.5	U	5.6	9.3	
B 4665 wall	0705144-2	SMP	Th-234	713R9	SOLID	pCi/g	0.6	U,G	4.5	8.2	
B 4022 S wall	0708172-4	SMP	Th-234	713R9	SOLID	pCi/g	0.65	U	0.63	1	
B 4665 wall (leach)	0705144-9	SMP	Th-234	713R9	SOLID	pCi/g	0.7	U	4.6	7.8	
B 4022 N wall (leach)	0708172-11	SMP	Th-234	713R9	SOLID	pCi/g	1.1	U	7.2	12.7	
B 4022 E wall (leach)	0708172-7	SMP	Th-234	713R9	SOLID	pCi/g	2.2	U	7.9	13.3	
B 4075 roof	0705144-5	SMP	Th-234	713R9	SOLID	pCi/g	2.2	U,G	8.7	15.5	
B 4022 W wall (N) (leach)	0708172-9	SMP	Th-234	713R9	SOLID	pCi/g	2.7	U	7.5	12.9	
B 4665 roof (leach)	0705144-8	SMP	Th-234	713R9	SOLID	pCi/g	2.7	U	6	9.9	

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B 4621 roof (leach)	0705144-10	SMP	Th-234	713R9	SOLID	pCi/g	3.4	U	4.3	7.1	
B 4075 wall	0705144-6	SMP	Th-234	713R9	SOLID	pCi/g	4.2	U,G	4.9	7.9	
B 4688 roof (leach)	0705144-14	SMP	Th-234	713R9	SOLID	pCi/g	4.3	U	6.1	10	
B 4022 S wall (leach)	0708172-10	SMP	Tl-208	713R9	SOLID	pCi/g	-0.1	U	0.22	0.44	
B 4022 E wall (leach)	0708172-7	SMP	Tl-208	713R9	SOLID	pCi/g	-0.08	U	0.16	0.28	
B 4022 W wall (N) (leach)	0708172-9	SMP	Tl-208	713R9	SOLID	pCi/g	-0.07	U	0.24	0.47	
B 4022 N wall (leach)	0708172-11	SMP	Tl-208	713R9	SOLID	pCi/g	-0.06	U	0.28	0.53	
B 4022 W wall (S) (leach)	0708172-8	SMP	Tl-208	713R9	SOLID	pCi/g	-0.05	U	0.24	0.45	
B 4665 roof	0705144-1	SMP	Tl-208	713R9	SOLID	pCi/g	-0.04	U,G	0.12	0.21	
B 4022 E wall	0708172-1	SMP	Tl-208	713R9	SOLID	pCi/g	-0.03	U,G	0.041	0.09	
B 4022 W wall (N)	0708172-3	SMP	Tl-208	713R9	SOLID	pCi/g	-0.02	U	0.08	0.16	
B 4621 wall (leach)	0705144-11	SMP	Tl-208	713R9	SOLID	pCi/g	-0.01	U	0.13	0.21	
B 4022 N wall	0708172-5	SMP	Tl-208	713R9	SOLID	pCi/g	-0.01	U,G	0.063	0.11	
B 4688 roof	0705144-7	SMP	Tl-208	713R9	SOLID	pCi/g	-0.01	U,G	0.097	0.19	
B 4022 W wall (S)	0708172-2	SMP	Tl-208	713R9	SOLID	pCi/g	-0	U,G	0.034	0.06	
B 4621 wall	0705144-4	SMP	Tl-208	713R9	SOLID	pCi/g	-0	U,G	0.073	0.14	
B 4621 roof (leach)	0705144-10	SMP	Tl-208	713R9	SOLID	pCi/g	0	U	0.13	0.22	
B 4075 wall (leach)	0705144-13	SMP	Tl-208	713R9	SOLID	pCi/g	0.01	U	0.14	0.23	
B 4665 roof (leach)	0705144-8	SMP	Tl-208	713R9	SOLID	pCi/g	0.01	U	0.15	0.26	
B 4665 wall	0705144-2	SMP	Tl-208	713R9	SOLID	pCi/g	0.02	U,G	0.12	0.22	
B 4621 roof	0705144-3	SMP	Tl-208	713R9	SOLID	pCi/g	0.02	U,G	0.061	0.11	
B 4075 roof (leach)	0705144-12	SMP	Tl-208	713R9	SOLID	pCi/g	0.04	U	0.15	0.25	
B 4665 wall (leach)	0705144-9	SMP	Tl-208	713R9	SOLID	pCi/g	0.04	U	0.13	0.23	
B 4022 S wall	0708172-4	SMP	Tl-208	713R9	SOLID	pCi/g	0.052	U	0.089	0.15	
B 4075 roof	0705144-5	SMP	Tl-208	713R9	SOLID	pCi/g	0.06	U,G	0.15	0.27	
B 4688 roof (leach)	0705144-14	SMP	Tl-208	713R9	SOLID	pCi/g	0.06	U	0.13	0.22	
B 4075 wall	0705144-6	SMP	Tl-208	713R9	SOLID	pCi/g	0.11	U,G	0.17	0.28	
B 4658 Plate Metal Roof	0708172-6	SMP	Tl-208	713R9	SOLID	pCi/g	0.17	U,G	0.17	0.28	
B 4621 roof (leach)	0705144-10	SMP	U-234	714R10	SOLID	pCi/g	0.003	U	0.008	0.02	
B 4665 roof (leach)	0705144-8	SMP	U-234	714R10	SOLID	pCi/g	0.005	U	0.007	0.01	
B 4075 wall (leach)	0705144-13	SMP	U-234	714R10	SOLID	pCi/g	0.006	U	0.008	0.01	
B 4688 roof (leach)	0705144-14	SMP	U-234	714R10	SOLID	pCi/g	0.006	U	0.008	0.01	
B 4621 wall (leach)	0705144-11	SMP	U-234	714R10	SOLID	pCi/g	0.006	U	0.007	0.01	
B 4665 wall (leach)	0705144-9	SMP	U-234	714R10	SOLID	pCi/g	0.007	U	0.008	0.01	
B 4075 roof (leach)	0705144-12	SMP	U-234	714R10	SOLID	pCi/g	0.007	U	0.008	0.01	
B 4022 W wall (S) (leach)	0708172-8	SMP	U-234	714R11	SOLID	pCi/g	0	U	0.021	0.06	
B 4022 W wall (N) (leach)	0708172-9	SMP	U-234	714R11	SOLID	pCi/g	0.009	U	0.018	0.04	
B 4022 E wall (leach)	0708172-7	SMP	U-234	714R11	SOLID	pCi/g	0.021	U	0.021	0.03	
B 4022 S wall (leach)	0708172-10	SMP	U-234	714R11	SOLID	pCi/g	0.022	U	0.023	0.03	
B 4658 Plate Metal Roof	0708172-6	SMP	U-234	714R11	SOLID	pCi/g	0.419		0.097	0.03	Yes
B 4022 N wall (leach)	0708172-11	SMP	U-234	714R11	SOLID	pCi/g	3.87		0.77	0.05	Yes
B 4022 S wall (leach)	0708172-10	SMP	U-235	713R9	SOLID	pCi/g	-1.06	U	0.94	1.9	
B 4022 W wall (N) (leach)	0708172-9	SMP	U-235	713R9	SOLID	pCi/g	-0.84	U	0.88	1.73	
B 4022 N wall	0708172-5	SMP	U-235	713R9	SOLID	pCi/g	-0.54	U,G	0.32	0.61	
B 4075 wall	0705144-6	SMP	U-235	713R9	SOLID	pCi/g	-0.33	U,G	0.71	1.27	
B 4665 wall	0705144-2	SMP	U-235	713R9	SOLID	pCi/g	-0.29	U,G	0.36	0.77	
B 4658 Plate Metal Roof	0708172-6	SMP	U-235	713R9	SOLID	pCi/g	-0.25	U,G	0.9	1.58	

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Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
B 4621 roof	0705144-3	SMP	U-235	713R9	SOLID	pCi/g	-0.2	U,G	0.22	0.46	
B 4022 W wall (N)	0708172-3	SMP	U-235	713R9	SOLID	pCi/g	-0.18	U	0.3	0.6	
B 4665 wall (leach)	0705144-9	SMP	U-235	713R9	SOLID	pCi/g	-0.18	U	0.55	0.94	
B 4075 roof (leach)	0705144-12	SMP	U-235	713R9	SOLID	pCi/g	-0.12	U	0.54	0.93	
B 4621 wall	0705144-4	SMP	U-235	713R9	SOLID	pCi/g	-0.04	U,G	0.21	0.4	
B 4665 roof (leach)	0705144-8	SMP	U-235	713R9	SOLID	pCi/g	-0.04	U	0.57	0.98	
B 4022 E wall	0708172-1	SMP	U-235	713R9	SOLID	pCi/g	-0.02	U,G	0.18	0.33	
B 4621 wall (leach)	0705144-11	SMP	U-235	713R9	SOLID	pCi/g	-0.01	U	0.53	0.9	
B 4022 N wall (leach)	0708172-11	SMP	U-235	713R9	SOLID	pCi/g	0.03	U	0.99	1.77	
B 4022 W wall (S)	0708172-2	SMP	U-235	713R9	SOLID	pCi/g	0.05	U,G	0.15	0.25	
B 4688 roof	0705144-7	SMP	U-235	713R9	SOLID	pCi/g	0.07	U,G	0.31	0.56	
B 4688 roof (leach)	0705144-14	SMP	U-235	713R9	SOLID	pCi/g	0.12	U	0.59	0.99	
B 4022 W wall (S) (leach)	0708172-8	SMP	U-235	713R9	SOLID	pCi/g	0.2	U	0.9	1.58	
B 4075 roof	0705144-5	SMP	U-235	713R9	SOLID	pCi/g	0.2	U,G	0.6	1.04	
B 4621 roof (leach)	0705144-10	SMP	U-235	713R9	SOLID	pCi/g	0.21	U	0.41	0.68	
B 4665 roof	0705144-1	SMP	U-235	713R9	SOLID	pCi/g	0.22	U,G	0.56	0.94	
B 4075 wall (leach)	0705144-13	SMP	U-235	713R9	SOLID	pCi/g	0.22	U	0.38	0.62	
B 4022 S wall	0708172-4	SMP	U-235	713R9	SOLID	pCi/g	0.27	U	0.26	0.4	
B 4022 E wall (leach)	0708172-7	SMP	U-235	713R9	SOLID	pCi/g	0.29	U	0.43	0.72	
B 4075 wall (leach)	0705144-13	SMP	U-235	714R10	SOLID	pCi/g	-0	U	0.008	0.01	
B 4621 roof (leach)	0705144-10	SMP	U-235	714R10	SOLID	pCi/g	0.002	U	0.01	0.01	
B 4688 roof (leach)	0705144-14	SMP	U-235	714R10	SOLID	pCi/g	0.002	U	0.008	0.01	
B 4665 wall (leach)	0705144-9	SMP	U-235	714R10	SOLID	pCi/g	0.002	U	0.007	0.01	
B 4665 roof (leach)	0705144-8	SMP	U-235	714R10	SOLID	pCi/g	0.003	U	0.008	0.01	
B 4621 wall (leach)	0705144-11	SMP	U-235	714R10	SOLID	pCi/g	0.004	U	0.007	0.01	
B 4075 roof (leach)	0705144-12	SMP	U-235	714R10	SOLID	pCi/g	0.007	LT	0.008	0.01	Yes
B 4022 E wall (leach)	0708172-7	SMP	U-235	714R11	SOLID	pCi/g	-0	U	0.019	0.03	
B 4022 W wall (N) (leach)	0708172-9	SMP	U-235	714R11	SOLID	pCi/g	-0	U	0.02	0.03	
B 4022 W wall (S) (leach)	0708172-8	SMP	U-235	714R11	SOLID	pCi/g	0.004	U	0.02	0.05	
B 4022 S wall (leach)	0708172-10	SMP	U-235	714R11	SOLID	pCi/g	0.006	U	0.021	0.02	
B 4022 N wall (leach)	0708172-11	SMP	U-235	714R11	SOLID	pCi/g	0.009	U	0.038	0.05	
B 4658 Plate Metal Roof	0708172-6	SMP	U-235	714R11	SOLID	pCi/g	0.024	LT	0.019	0.02	Yes
B 4621 wall (leach)	0705144-11	SMP	U-238	714R10	SOLID	pCi/g	-0	U	0.006	0.01	
B 4621 roof (leach)	0705144-10	SMP	U-238	714R10	SOLID	pCi/g	-0	U	0.008	0.01	
B 4075 roof (leach)	0705144-12	SMP	U-238	714R10	SOLID	pCi/g	2E-04	U	0.007	0.01	
B 4075 wall (leach)	0705144-13	SMP	U-238	714R10	SOLID	pCi/g	2E-04	U	0.007	0.01	
B 4688 roof (leach)	0705144-14	SMP	U-238	714R10	SOLID	pCi/g	0.003	U	0.007	0.01	
B 4665 roof (leach)	0705144-8	SMP	U-238	714R10	SOLID	pCi/g	0.004	U	0.007	0.01	
B 4665 wall (leach)	0705144-9	SMP	U-238	714R10	SOLID	pCi/g	0.004	U	0.006	0.01	
B 4022 W wall (S) (leach)	0708172-8	SMP	U-238	714R11	SOLID	pCi/g	0.008	U	0.018	0.04	
B 4022 N wall (leach)	0708172-11	SMP	U-238	714R11	SOLID	pCi/g	0.009	U	0.032	0.03	
B 4022 S wall (leach)	0708172-10	SMP	U-238	714R11	SOLID	pCi/g	0.017	U	0.02	0.03	
B 4022 W wall (N) (leach)	0708172-9	SMP	U-238	714R11	SOLID	pCi/g	0.023	U	0.025	0.04	
B 4022 E wall (leach)	0708172-7	SMP	U-238	714R11	SOLID	pCi/g	0.032	LT	0.025	0.02	Yes
B 4658 Plate Metal Roof	0708172-6	SMP	U-238	714R11	SOLID	pCi/g	0.389		0.092	0.03	Yes

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B 4022 E wall	0708172-1	DUP	Ac-228	713R9	SOLID	pCi/g	-0.11	U,G	0.2	0.38
B 4658 Plate Metal Roof	0708172-6	DUP	Ac-228	713R9	SOLID	pCi/g	0.77	U,G	0.87	1.38
B 4022 E wall (leach)	0708172-7	DUP	Ac-228	713R9	SOLID	pCi/g	-0.29	U	0.91	1.85
Bldg 4075 roof	0705144-5	DUP	Ac-228	713R9	SOLID	pCi/g	-0.67	U,G	0.62	1.37
Bldg 4665 roof (leach)	0705144-8	DUP	Ac-228	713R9	SOLID	pCi/g	-0.2	U	0.59	1.04
LABQC	GS070906-2	MB	Ac-228	713R9	SOLID	pCi/g	0.07	U	0.14	0.25
LABQC	GS070906-3	MB	Ac-228	713R9	SOLID	pCi/g	-0.09	U	0.29	0.54
LABQC	GS070920-3	MB	Ac-228	713R9	SOLID	pCi/g	0.08	U	0.56	0.97
LABQC	GS070522-2	MB	Ac-228	713R9	SOLID	pCi/g	-0.06	U	0.31	0.64
LABQC	GS070524-1	MB	Ac-228	713R9	SOLID	pCi/g	0.24	U	0.44	0.74
LABQC	GS070906-2	LCS	Am-241	713R9	SOLID	pCi/g	1000	P	120	0
LABQC	GS070906-3	LCS	Am-241	713R9	SOLID	pCi/g	920	P	110	20
LABQC	GS070920-3	LCS	Am-241	713R9	SOLID	pCi/g	111	P	13	2
LABQC	GS070522-2	LCS	Am-241	713R9	SOLID	pCi/g	950	P	110	10
LABQC	GS070524-1	LCS	Am-241	713R9	SOLID	pCi/g	95	P	11	2
B 4022 E wall	0708172-1	DUP	Bi-212	713R9	SOLID	pCi/g	0.57	U,G	0.61	0.97
B 4658 Plate Metal Roof	0708172-6	DUP	Bi-212	713R9	SOLID	pCi/g	0.8	U,G	2.5	4.5
B 4022 E wall (leach)	0708172-7	DUP	Bi-212	713R9	SOLID	pCi/g	-0.5	U	3.4	6.6
Bldg 4075 roof	0705144-5	DUP	Bi-212	713R9	SOLID	pCi/g	-0.2	U,G	1.5	3.1
Bldg 4665 roof (leach)	0705144-8	DUP	Bi-212	713R9	SOLID	pCi/g	-0.5	U	1.4	2.5
LABQC	GS070906-2	MB	Bi-212	713R9	SOLID	pCi/g	0.12	U	0.45	0.79
LABQC	GS070906-3	MB	Bi-212	713R9	SOLID	pCi/g	-0.02	U	0.86	1.57
LABQC	GS070920-3	MB	Bi-212	713R9	SOLID	pCi/g	1.6	U	1.6	2.5
LABQC	GS070522-2	MB	Bi-212	713R9	SOLID	pCi/g	0.5	U	1	1.9
LABQC	GS070524-1	MB	Bi-212	713R9	SOLID	pCi/g	0	U	1.2	2.1
B 4022 E wall	0708172-1	DUP	Bi-214	713R9	SOLID	pCi/g	-0.032	U,G,J	0.092	0.168
B 4658 Plate Metal Roof	0708172-6	DUP	Bi-214	713R9	SOLID	pCi/g	0.62	U,G,J	0.46	0.67
B 4022 E wall (leach)	0708172-7	DUP	Bi-214	713R9	SOLID	pCi/g	0.44	U,J	0.62	1.03
Bldg 4075 roof	0705144-5	DUP	Bi-214	713R9	SOLID	pCi/g	-0.11	U,G,J	0.29	0.56
Bldg 4665 roof (leach)	0705144-8	DUP	Bi-214	713R9	SOLID	pCi/g	0.08	U,J	0.33	0.55
LABQC	GS070906-2	MB	Bi-214	713R9	SOLID	pCi/g	-0.01	U,J	0.1	0.18
LABQC	GS070906-3	MB	Bi-214	713R9	SOLID	pCi/g	0	U,J	0.18	0.31
LABQC	GS070920-3	MB	Bi-214	713R9	SOLID	pCi/g	-0.02	U,J	0.31	0.54
LABQC	GS070522-2	MB	Bi-214	713R9	SOLID	pCi/g	-0.19	U,J	0.22	0.45
LABQC	GS070524-1	MB	Bi-214	713R9	SOLID	pCi/g	0.27	U,J	0.29	0.47
LABQC	GS070906-2	LCS	Co-60	713R9	SOLID	pCi/g	541	P	63	2
LABQC	GS070906-3	LCS	Co-60	713R9	SOLID	pCi/g	463	P	54	2
LABQC	GS070920-3	LCS	Co-60	713R9	SOLID	pCi/g	54.9	P	6.4	0.2
LABQC	GS070522-2	LCS	Co-60	713R9	SOLID	pCi/g	379	P	44	1
LABQC	GS070524-1	LCS	Co-60	713R9	SOLID	pCi/g	38.9	P	4.6	0.1
B 4022 E wall	0708172-1	DUP	Cs-137	713R9	SOLID	pCi/g	0.034	U,G	0.054	0.09
B 4658 Plate Metal Roof	0708172-6	DUP	Cs-137	713R9	SOLID	pCi/g	0.32	LT,G,TI	0.21	0.28
B 4022 E wall (leach)	0708172-7	DUP	Cs-137	713R9	SOLID	pCi/g	0	U	0.26	0.49
Bldg 4075 roof	0705144-5	DUP	Cs-137	713R9	SOLID	pCi/g	0.09	U,G	0.14	0.23
Bldg 4665 roof (leach)	0705144-8	DUP	Cs-137	713R9	SOLID	pCi/g	0.11	U	0.12	0.19
LABQC	GS070906-2	LCS	Cs-137	713R9	SOLID	pCi/g	388	P,M3	45	2
LABQC	GS070906-3	LCS	Cs-137	713R9	SOLID	pCi/g	376	P,M3	44	2

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LABQC	GS070920-3	LCS	Cs-137	713R9	SOLID	pCi/g	39.4	P	4.6	0.3
LABQC	GS070522-2	LCS	Cs-137	713R9	SOLID	pCi/g	373	P,M3	44	2
LABQC	GS070524-1	LCS	Cs-137	713R9	SOLID	pCi/g	36.6	P	4.3	0.2
LABQC	GS070906-2	MB	Cs-137	713R9	SOLID	pCi/g	-0.027	U	0.034	0.066
LABQC	GS070906-3	MB	Cs-137	713R9	SOLID	pCi/g	0.011	U	0.06	0.106
LABQC	GS070920-3	MB	Cs-137	713R9	SOLID	pCi/g	-0.06	U	0.11	0.2
LABQC	GS070522-2	MB	Cs-137	713R9	SOLID	pCi/g	0.019	U	0.072	0.135
LABQC	GS070524-1	MB	Cs-137	713R9	SOLID	pCi/g	0.059	U	0.097	0.161
B 4022 E wall	0708172-1	DUP	K-40	713R9	SOLID	pCi/g	-0.04	U,G	0.6	1.11
B 4658 Plate Metal Roof	0708172-6	DUP	K-40	713R9	SOLID	pCi/g	3.9	G	2.6	3.3
B 4022 E wall (leach)	0708172-7	DUP	K-40	713R9	SOLID	pCi/g	0.5	U	3.5	6.5
Bldg 4075 roof	0705144-5	DUP	K-40	713R9	SOLID	pCi/g	-0.3	U,G	2.3	4.6
Bldg 4665 roof (leach)	0705144-8	DUP	K-40	713R9	SOLID	pCi/g	-1.3	U	2	3.5
LABQC	GS070906-2	MB	K-40	713R9	SOLID	pCi/g	-0.1	U	0.56	1.02
LABQC	GS070906-3	MB	K-40	713R9	SOLID	pCi/g	-0.42	U	0.86	1.66
LABQC	GS070920-3	MB	K-40	713R9	SOLID	pCi/g	-1.3	U	1.9	3.4
LABQC	GS070522-2	MB	K-40	713R9	SOLID	pCi/g	0.5	U	1.2	2.1
LABQC	GS070524-1	MB	K-40	713R9	SOLID	pCi/g	0.5	U	1.8	3
B 4022 E wall	0708172-1	DUP	Pa-234m	713R9	SOLID	pCi/g	-2	U,G	5.7	10.8
B 4658 Plate Metal Roof	0708172-6	DUP	Pa-234m	713R9	SOLID	pCi/g	-9	U,G	17	39
B 4022 E wall (leach)	0708172-7	DUP	Pa-234m	713R9	SOLID	pCi/g	9	U	24	44
Bldg 4075 roof	0705144-5	DUP	Pa-234m	713R9	SOLID	pCi/g	16	U,G	18	28
Bldg 4665 roof (leach)	0705144-8	DUP	Pa-234m	713R9	SOLID	pCi/g	6	U	11	19
LABQC	GS070906-2	MB	Pa-234m	713R9	SOLID	pCi/g	-0.6	U	3.9	7.4
LABQC	GS070906-3	MB	Pa-234m	713R9	SOLID	pCi/g	8.6	U	8.5	13.5
LABQC	GS070920-3	MB	Pa-234m	713R9	SOLID	pCi/g	14	U	14	23
LABQC	GS070522-2	MB	Pa-234m	713R9	SOLID	pCi/g	5.6	U	8.8	15
LABQC	GS070524-1	MB	Pa-234m	713R9	SOLID	pCi/g	12	U	16	26
B 4022 E wall	0708172-1	DUP	Pb-211	713R9	SOLID	pCi/g	-0.11	U,G	0.82	1.48
B 4658 Plate Metal Roof	0708172-6	DUP	Pb-211	713R9	SOLID	pCi/g	1.9	U,G	2.8	4.7
B 4022 E wall (leach)	0708172-7	DUP	Pb-211	713R9	SOLID	pCi/g	-1.3	U	4.2	8.2
Bldg 4075 roof	0705144-5	DUP	Pb-211	713R9	SOLID	pCi/g	1.8	U,W,G	1.9	3
Bldg 4665 roof (leach)	0705144-8	DUP	Pb-211	713R9	SOLID	pCi/g	-1.9	U	2.2	3.9
LABQC	GS070906-2	MB	Pb-211	713R9	SOLID	pCi/g	-0.04	U	0.61	1.09
LABQC	GS070906-3	MB	Pb-211	713R9	SOLID	pCi/g	-0.1	U	1.2	2.1
LABQC	GS070920-3	MB	Pb-211	713R9	SOLID	pCi/g	-0.8	U	1.8	3.3
LABQC	GS070522-2	MB	Pb-211	713R9	SOLID	pCi/g	-0.1	U	1.5	2.8
LABQC	GS070524-1	MB	Pb-211	713R9	SOLID	pCi/g	-1.1	U	1.8	3.3
B 4022 E wall	0708172-1	DUP	Pb-212	713R9	SOLID	pCi/g	-0.006	U,G	0.078	0.137
B 4658 Plate Metal Roof	0708172-6	DUP	Pb-212	713R9	SOLID	pCi/g	0.38	U,G	0.29	0.44
B 4022 E wall (leach)	0708172-7	DUP	Pb-212	713R9	SOLID	pCi/g	-0.19	U	0.36	0.67
Bldg 4075 roof	0705144-5	DUP	Pb-212	713R9	SOLID	pCi/g	0.15	U,G	0.17	0.28
Bldg 4665 roof (leach)	0705144-8	DUP	Pb-212	713R9	SOLID	pCi/g	-0.19	U	0.22	0.37
LABQC	GS070906-2	MB	Pb-212	713R9	SOLID	pCi/g	0.029	U	0.065	0.109
LABQC	GS070906-3	MB	Pb-212	713R9	SOLID	pCi/g	0	U	0.11	0.2
LABQC	GS070920-3	MB	Pb-212	713R9	SOLID	pCi/g	0	U	0.17	0.29
LABQC	GS070522-2	MB	Pb-212	713R9	SOLID	pCi/g	0.01	U	0.12	0.21

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LABQC	GS070524-1	MB	Pb-212	713R9	SOLID	pCi/g	-0.07	U	0.2	0.34
B 4022 E wall	0708172-1	DUP	Pb-214	713R9	SOLID	pCi/g	-0.018	U,G,J	0.096	0.17
B 4658 Plate Metal Roof	0708172-6	DUP	Pb-214	713R9	SOLID	pCi/g	0.09	U,G,J	0.34	0.6
B 4022 E wall (leach)	0708172-7	DUP	Pb-214	713R9	SOLID	pCi/g	0.04	U,J	0.47	0.84
Bldg 4075 roof	0705144-5	DUP	Pb-214	713R9	SOLID	pCi/g	-0.04	U,G,J	0.23	0.44
Bldg 4665 roof (leach)	0705144-8	DUP	Pb-214	713R9	SOLID	pCi/g	-0.18	U,J	0.29	0.5
LABQC	GS070906-2	MB	Pb-214	713R9	SOLID	pCi/g	0.075	U,J	0.068	0.107
LABQC	GS070906-3	MB	Pb-214	713R9	SOLID	pCi/g	-0.06	U,J	0.14	0.26
LABQC	GS070920-3	MB	Pb-214	713R9	SOLID	pCi/g	0.04	U,J	0.23	0.39
LABQC	GS070522-2	MB	Pb-214	713R9	SOLID	pCi/g	0.16	U,J	0.14	0.22
LABQC	GS070524-1	MB	Pb-214	713R9	SOLID	pCi/g	0.3	U,J	0.22	0.35
Bldg 4665 roof (leach)	0705144-8	DUP	Po-210	714R10	SOLID	pCi/g	0.007	U	0.036	0.055
LABQC	PL070531-1	LCS	Po-210	714R10	SOLID	pCi/g	9.6	P	1.5	0.1
LABQC	PL070531-1	MB	Po-210	714R10	SOLID	pCi/g	-0.013	U	0.032	0.061
B 4022 E wall (leach)	0708172-7	DUP	Po-210	714R11	SOLID	pCi/g	0.03	U	0.1	0.08
B 4658 Plate Metal Roof	0708172-6	DUP	Po-210	714R11	SOLID	pCi/g	52.7		8.2	0.1
LABQC	PL070924-1	LCS	Po-210	714R11	SOLID	pCi/g	19.7	P	3.3	0.1
LABQC	PL070925-1	LCS	Po-210	714R11	SOLID	pCi/g	22.5	P,Y1	3.5	0.1
LABQC	PL070924-1	MB	Po-210	714R11	SOLID	pCi/g	-0.015	U	0.074	0.14
LABQC	PL070925-1	MB	Po-210	714R11	SOLID	pCi/g	-0.008	U	0.068	0.104
Bldg 4665 roof (leach)	0705144-8	DUP	Pu-238	714R10	SOLID	pCi/g	0.0019	U	0.0082	0.011
LABQC	AS070531-2	MB	Pu-238	714R10	SOLID	pCi/g	-0.0004	U	0.0075	0.01
B 4658 Plate Metal Roof	0708172-6	DUP	Pu-238	714R11	SOLID	pCi/g	-0.0038	U	0.0092	0.017
B 4022 E wall (leach)	0708172-7	DUP	Pu-238	714R11	SOLID	pCi/g	-0.0009	U	0.0096	0.014
LABQC	AS070925-3	MB	Pu-238	714R11	SOLID	pCi/g	0.0055	B3	0.0091	0.005
LABQC	AS070925-7	MB	Pu-238	714R11	SOLID	pCi/g	-0.0016	U	0.0082	0.015
Bldg 4665 roof (leach)	0705144-8	DUP	Pu-239	714R10	SOLID	pCi/g	0.0065	U	0.0082	0.011
LABQC	AS070531-2	LCS	Pu-239	714R10	SOLID	pCi/g	1.79	P	0.32	0.01
LABQC	AS070531-2	MB	Pu-239	714R10	SOLID	pCi/g	-0.0004	U	0.0075	0.01
B 4658 Plate Metal Roof	0708172-6	DUP	Pu-239	714R11	SOLID	pCi/g	0	U	0.0092	0.02
B 4022 E wall (leach)	0708172-7	DUP	Pu-239	714R11	SOLID	pCi/g	0	U	0.0096	0.007
LABQC	AS070925-3	LCS	Pu-239	714R11	SOLID	pCi/g	2.5	P	0.41	0.02
LABQC	AS070925-7	LCS	Pu-239	714R11	SOLID	pCi/g	2.51	P	0.44	0.02
LABQC	AS070925-3	MB	Pu-239	714R11	SOLID	pCi/g	0	U	0.009	0.02
LABQC	AS070925-7	MB	Pu-239	714R11	SOLID	pCi/g	-0.0024	U	0.0082	0.017
Bldg 4665 roof (leach)	0705144-8	DUP	Pu-241	704R8	SOLID	pCi/g	-0.1	U	0.69	1.16
LABQC	P1070608-1	LCS	Pu-241	704R8	SOLID	pCi/g	38.9	P	7	1.2
LABQC	P1070608-1	MB	Pu-241	704R8	SOLID	pCi/g	0.21	U	0.67	1.12
B 4658 Plate Metal Roof	0708172-6	DUP	Pu-241	704R9	SOLID	pCi/g	0.3	U	4.1	7
B 4022 E wall (leach)	0708172-7	DUP	Pu-241	704R9	SOLID	pCi/g	-1.2	U	2	3.5
LABQC	P1070925-1	LCS	Pu-241	704R9	SOLID	pCi/g	228	P	41	6
LABQC	P1070925-3	LCS	Pu-241	704R9	SOLID	pCi/g	113	P	20	3
LABQC	P1070925-1	MB	Pu-241	704R9	SOLID	pCi/g	0.6	U	3.9	6.7
LABQC	P1070925-3	MB	Pu-241	704R9	SOLID	pCi/g	-1	U	1.8	3.1
B 4022 E wall	0708172-1	DUP	Ra-226	713R9	SOLID	pCi/g	0.09	U,G	0.93	1.61
B 4658 Plate Metal Roof	0708172-6	DUP	Ra-226	713R9	SOLID	pCi/g	1.2	U,G	2.7	4.6
B 4022 E wall (leach)	0708172-7	DUP	Ra-226	713R9	SOLID	pCi/g	-1.7	U	3	5.6

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Bldg 4075 roof	0705144-5	DUP	Ra-226	713R9	SOLID	pCi/g	0.6	U,G	2	3.5
Bldg 4665 roof (leach)	0705144-8	DUP	Ra-226	713R9	SOLID	pCi/g	-0.3	U	2.4	4
LABQC	GS070906-2	MB	Ra-226	713R9	SOLID	pCi/g	0.11	U	0.57	0.97
LABQC	GS070906-3	MB	Ra-226	713R9	SOLID	pCi/g	-1.3	U	1.4	2.6
LABQC	GS070920-3	MB	Ra-226	713R9	SOLID	pCi/g	0.2	U	2	3.4
LABQC	GS070522-2	MB	Ra-226	713R9	SOLID	pCi/g	-1.1	U	1.2	2.4
LABQC	GS070524-1	MB	Ra-226	713R9	SOLID	pCi/g	-0.3	U	2.3	3.9
B 4022 E wall (leach)	0708172-7	DUP	Sr-90	724R10	SOLID	pCi/g	0.06	U	0.13	0.28
LABQC	SR071003-2	LCS	Sr-90	724R10	SOLID	pCi/g	4.5	P	1.1	0.3
LABQC	SR071004-2	LCS	Sr-90	724R10	SOLID	pCi/g	4.1	P	1	0.3
LABQC	SR071003-2	MB	Sr-90	724R10	SOLID	pCi/g	0.05	U	0.13	0.29
LABQC	SR071004-2	MB	Sr-90	724R10	SOLID	pCi/g	0.03	U	0.11	0.23
Bldg 4665 roof (leach)	0705144-8	DUP	Sr-90	724R9	SOLID	pCi/g	0.06	U	0.1	0.22
LABQC	SR070606-3	LCS	Sr-90	724R9	SOLID	pCi/g	4.4	P	1.1	0.4
LABQC	SR070606-3	MB	Sr-90	724R9	SOLID	pCi/g	-0.09	U	0.12	0.28
Bldg 4665 roof (leach)	0705144-8	DUP	Th-228	714R10	SOLID	pCi/g	0.003	U	0.012	0.027
LABQC	AS070531-1	MB	Th-228	714R10	SOLID	pCi/g	0.0017	U	0.0066	0.013
B 4658 Plate Metal Roof	0708172-6	DUP	Th-228	714R11	SOLID	pCi/g	0.47	M3	0.13	0.11
B 4022 E wall (leach)	0708172-7	DUP	Th-228	714R11	SOLID	pCi/g	-0.017	U	0.03	0.07
LABQC	AS070925-4	MB	Th-228	714R11	SOLID	pCi/g	0.012	U	0.044	0.086
LABQC	AS070925-8	MB	Th-228	714R11	SOLID	pCi/g	0.015	U	0.021	0.04
Bldg 4665 roof (leach)	0705144-8	DUP	Th-230	714R10	SOLID	pCi/g	-0.0065	U	0.0098	0.029
LABQC	AS070531-1	LCS	Th-230	714R10	SOLID	pCi/g	1	P	0.17	0.02
LABQC	AS070531-1	MB	Th-230	714R10	SOLID	pCi/g	-0.0059	U	0.0068	0.014
B 4658 Plate Metal Roof	0708172-6	DUP	Th-230	714R11	SOLID	pCi/g	0.344		0.099	0.078
B 4022 E wall (leach)	0708172-7	DUP	Th-230	714R11	SOLID	pCi/g	0	U	0.027	0.059
LABQC	AS070925-4	LCS	Th-230	714R11	SOLID	pCi/g	2.07	P	0.37	0.06
LABQC	AS070925-8	LCS	Th-230	714R11	SOLID	pCi/g	2.25	P	0.38	0.05
LABQC	AS070925-4	MB	Th-230	714R11	SOLID	pCi/g	0.02	U	0.031	0.058
LABQC	AS070925-8	MB	Th-230	714R11	SOLID	pCi/g	0.025	U	0.027	0.05
Bldg 4665 roof (leach)	0705144-8	DUP	Th-232	714R10	SOLID	pCi/g	0.0014	U	0.0051	0.004
LABQC	AS070531-1	MB	Th-232	714R10	SOLID	pCi/g	0.0002	U	0.0021	0.005
B 4658 Plate Metal Roof	0708172-6	DUP	Th-232	714R11	SOLID	pCi/g	0.372		0.099	0.048
B 4022 E wall (leach)	0708172-7	DUP	Th-232	714R11	SOLID	pCi/g	0.017	LT	0.013	0.013
LABQC	AS070925-4	MB	Th-232	714R11	SOLID	pCi/g	0.016	B3	0.013	0.007
LABQC	AS070925-8	MB	Th-232	714R11	SOLID	pCi/g	0.015	U	0.013	0.02
B 4022 E wall	0708172-1	DUP	Th-234	713R9	SOLID	pCi/g	-1.3	U,G	1.5	2.8
B 4658 Plate Metal Roof	0708172-6	DUP	Th-234	713R9	SOLID	pCi/g	-0.9	U,G	7	13
B 4022 E wall (leach)	0708172-7	DUP	Th-234	713R9	SOLID	pCi/g	0.6	U	8.2	14.6
Bldg 4075 roof	0705144-5	DUP	Th-234	713R9	SOLID	pCi/g	-1.6	U,G	4.7	8.7
Bldg 4665 roof (leach)	0705144-8	DUP	Th-234	713R9	SOLID	pCi/g	0.3	U	6.8	11.4
LABQC	GS070906-2	MB	Th-234	713R9	SOLID	pCi/g	0.2	U	1.6	2.7
LABQC	GS070906-3	MB	Th-234	713R9	SOLID	pCi/g	-0.8	U	2.3	4.1
LABQC	GS070920-3	MB	Th-234	713R9	SOLID	pCi/g	-1.1	U	8	13.7
LABQC	GS070522-2	MB	Th-234	713R9	SOLID	pCi/g	0.2	U	3.1	5.7
LABQC	GS070524-1	MB	Th-234	713R9	SOLID	pCi/g	2.3	U	4.5	7.4
B 4022 E wall	0708172-1	DUP	Tl-208	713R9	SOLID	pCi/g	-0.016	U,G	0.05	0.09

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B 4658 Plate Metal Roof	0708172-6	DUP	Tl-208	713R9	SOLID	pCi/g	0.14	U,G	0.22	0.36
B 4022 E wall (leach)	0708172-7	DUP	Tl-208	713R9	SOLID	pCi/g	-0.09	U	0.3	0.56
Bldg 4075 roof	0705144-5	DUP	Tl-208	713R9	SOLID	pCi/g	-0.01	U,G	0.13	0.25
Bldg 4665 roof (leach)	0705144-8	DUP	Tl-208	713R9	SOLID	pCi/g	0.04	U	0.15	0.25
LABQC	GS070906-2	MB	Tl-208	713R9	SOLID	pCi/g	0.014	U	0.035	0.06
LABQC	GS070906-3	MB	Tl-208	713R9	SOLID	pCi/g	-0.045	U	0.073	0.136
LABQC	GS070920-3	MB	Tl-208	713R9	SOLID	pCi/g	0.04	U	0.16	0.28
LABQC	GS070522-2	MB	Tl-208	713R9	SOLID	pCi/g	-0.008	U	0.08	0.158
LABQC	GS070524-1	MB	Tl-208	713R9	SOLID	pCi/g	-0.02	U	0.14	0.25
Bldg 4665 roof (leach)	0705144-8	DUP	U-234	714R10	SOLID	pCi/g	0.012	U	0.013	0.022
LABQC	AS070531-2	LCS	U-234	714R10	SOLID	pCi/g	1.84	P	0.33	0.02
LABQC	AS070531-2	MB	U-234	714R10	SOLID	pCi/g	0.0025	U	0.0069	0.013
B 4658 Plate Metal Roof	0708172-6	DUP	U-234	714R11	SOLID	pCi/g	0.313		0.082	0.029
B 4022 E wall (leach)	0708172-7	DUP	U-234	714R11	SOLID	pCi/g	0.022	U	0.025	0.034
LABQC	AS070925-3	LCS	U-234	714R11	SOLID	pCi/g	2.34	P	0.42	0.04
LABQC	AS070925-7	LCS	U-234	714R11	SOLID	pCi/g	4.12	P	0.71	0.04
LABQC	AS070925-3	MB	U-234	714R11	SOLID	pCi/g	0.034	B3	0.022	0.025
LABQC	AS070925-7	MB	U-234	714R11	SOLID	pCi/g	0.026	U	0.024	0.029
B 4022 E wall	0708172-1	DUP	U-235	713R9	SOLID	pCi/g	-0.19	U,G	0.25	0.45
B 4658 Plate Metal Roof	0708172-6	DUP	U-235	713R9	SOLID	pCi/g	0.06	U,G	0.54	1
B 4022 E wall (leach)	0708172-7	DUP	U-235	713R9	SOLID	pCi/g	0.1	U	1	1.8
Bldg 4075 roof	0705144-5	DUP	U-235	713R9	SOLID	pCi/g	0	U,G	0.45	0.83
Bldg 4665 roof (leach)	0705144-8	DUP	U-235	713R9	SOLID	pCi/g	0.5	U	0.46	0.88
LABQC	GS070906-2	MB	U-235	713R9	SOLID	pCi/g	0	U	0.19	0.32
LABQC	GS070906-3	MB	U-235	713R9	SOLID	pCi/g	-0.14	U	0.36	0.64
LABQC	GS070920-3	MB	U-235	713R9	SOLID	pCi/g	-0.01	U	0.47	0.81
LABQC	GS070522-2	MB	U-235	713R9	SOLID	pCi/g	-0.37	U	0.3	0.65
LABQC	GS070524-1	MB	U-235	713R9	SOLID	pCi/g	-0.12	U	0.57	0.98
Bldg 4665 roof (leach)	0705144-8	DUP	U-235	714R10	SOLID	pCi/g	0.001	U	0.011	0.021
LABQC	AS070531-2	MB	U-235	714R10	SOLID	pCi/g	-0.0012	U	0.0081	0.014
B 4658 Plate Metal Roof	0708172-6	DUP	U-235	714R11	SOLID	pCi/g	0.008	U	0.017	0.034
B 4022 E wall (leach)	0708172-7	DUP	U-235	714R11	SOLID	pCi/g	0.006	U	0.025	0.034
LABQC	AS070925-3	MB	U-235	714R11	SOLID	pCi/g	0.008	U	0.013	0.021
LABQC	AS070925-7	MB	U-235	714R11	SOLID	pCi/g	-0.001	U	0.02	0.026
Bldg 4665 roof (leach)	0705144-8	DUP	U-238	714R10	SOLID	pCi/g	0.023	LT	0.017	0.021
LABQC	AS070531-2	LCS	U-238	714R10	SOLID	pCi/g	1.84	P	0.33	0.02
LABQC	AS070531-2	MB	U-238	714R10	SOLID	pCi/g	0.0013	U	0.0069	0.011
B 4658 Plate Metal Roof	0708172-6	DUP	U-238	714R11	SOLID	pCi/g	0.32		0.084	0.029
B 4022 E wall (leach)	0708172-7	DUP	U-238	714R11	SOLID	pCi/g	0.008	U	0.022	0.041
LABQC	AS070925-3	LCS	U-238	714R11	SOLID	pCi/g	2.38	P	0.43	0.04
LABQC	AS070925-7	LCS	U-238	714R11	SOLID	pCi/g	4.03	P	0.7	0.03
LABQC	AS070925-3	MB	U-238	714R11	SOLID	pCi/g	0.034	U	0.025	0.036
LABQC	AS070925-7	MB	U-238	714R11	SOLID	pCi/g	0.012	U	0.017	0.029

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T01	0705143-1	SMP	H-3	704R8	WIPE	pCi/sample	-2.3	U	3.5	6.1	
T02	0705143-2	SMP	H-3	704R8	WIPE	pCi/sample	-1.3	U	4	6.9	
T03	0705143-3	SMP	H-3	704R8	WIPE	pCi/sample	-2.5	U	3.3	5.8	
T04	0705143-4	SMP	H-3	704R8	WIPE	pCi/sample	-1.4	U	3.7	6.3	
T05	0705143-5	SMP	H-3	704R8	WIPE	pCi/sample	1.8	U	3.3	5.5	
T06	0705143-6	SMP	H-3	704R8	WIPE	pCi/sample	-2.2	U	3.6	6.3	
T07	0705159-1	SMP	H-3	704R8	WIPE	pCi/sample	0.4	U	3	5.1	
T08	0705159-2	SMP	H-3	704R8	WIPE	pCi/sample	0.4	U	3.2	5.4	
T09	0705143-9	SMP	H-3	704R8	WIPE	pCi/sample	-3	U	3.9	6.8	
T10	0705143-10	SMP	H-3	704R8	WIPE	pCi/sample	-0.6	U	3.5	6	
T11	0705143-11	SMP	H-3	704R8	WIPE	pCi/sample	-1	U	3	5.2	
T12	0705143-12	SMP	H-3	704R8	WIPE	pCi/sample	-8.9	U	6.3	11	
T13	0705159-3	SMP	H-3	704R8	WIPE	pCi/sample	-2.6	U	7.5	12.9	
T14	0705159-4	SMP	H-3	704R8	WIPE	pCi/sample	0.6	U	3	5.1	
T15	0705143-15	SMP	H-3	704R8	WIPE	pCi/sample	1.3	U	3.1	5.2	
T16	0705143-16	SMP	H-3	704R8	WIPE	pCi/sample	-1.1	U	3.1	5.4	
T17	0705143-17	SMP	H-3	704R8	WIPE	pCi/sample	-1.9	U	3.3	5.7	
T18	0705159-5	SMP	H-3	704R8	WIPE	pCi/sample	-3.4	U	3.2	5.7	
T19	0705143-19	SMP	H-3	704R8	WIPE	pCi/sample	-4	U	4.2	7.3	
T20	0705159-6	SMP	H-3	704R8	WIPE	pCi/sample	1.1	U	3.7	6.3	
T21	0705143-21	SMP	H-3	704R8	WIPE	pCi/sample	-1.6	U	3.7	6.3	
T22	0705159-7	SMP	H-3	704R8	WIPE	pCi/sample	-6.1	U	5.3	9.3	
T23	0705143-23	SMP	H-3	704R8	WIPE	pCi/sample	-2.9	U	3.4	5.9	
T24	0705143-24	SMP	H-3	704R8	WIPE	pCi/sample	-64	U,M	28	49	
T25	0705143-25	SMP	H-3	704R8	WIPE	pCi/sample	-3	U	3.1	5.5	
T26	0705143-26	SMP	H-3	704R8	WIPE	pCi/sample	-3.3	U	3.6	6.2	
T27	0705143-27	SMP	H-3	704R8	WIPE	pCi/sample	-1	U	3.6	6.1	
T28	0705143-28	SMP	H-3	704R8	WIPE	pCi/sample	1.4	U	3.6	6	
T29	0705143-29	SMP	H-3	704R8	WIPE	pCi/sample	1.8	U	3	4.9	
T30	0705143-30	SMP	H-3	704R8	WIPE	pCi/sample	1.7	U	3.1	5.1	
T31	0705143-31	SMP	H-3	704R8	WIPE	pCi/sample	-0.9	U	3.6	6.2	
T32	0705143-32	SMP	H-3	704R8	WIPE	pCi/sample	-0.5	U	3.8	6.5	
T33	0705143-33	SMP	H-3	704R8	WIPE	pCi/sample	0.1	U	3.7	6.2	
T34	0705159-8	SMP	H-3	704R8	WIPE	pCi/sample	-0.7	U	3.4	5.9	
T35	0705143-35	SMP	H-3	704R8	WIPE	pCi/sample	1.9	U	4.5	7.5	
T36	0705143-36	SMP	H-3	704R8	WIPE	pCi/sample	1.3	U	3.3	5.6	
T37	0705143-37	SMP	H-3	704R8	WIPE	pCi/sample	1.7	U	3.5	5.8	
T38	0705159-9	SMP	H-3	704R8	WIPE	pCi/sample	-0.4	U	3	5.1	
T39	0705159-10	SMP	H-3	704R8	WIPE	pCi/sample	-0.7	U	3	5.1	
T40	0705143-40	SMP	H-3	704R8	WIPE	pCi/sample	-0.3	U	3	5.1	
T41	0705143-41	SMP	H-3	704R8	WIPE	pCi/sample	2.2	U	3	5	
T42	0705159-11	SMP	H-3	704R8	WIPE	pCi/sample	-0.9	U	2.8	4.8	
T43	0705159-12	SMP	H-3	704R8	WIPE	pCi/sample	-1.3	U	2.9	5	
T44	0705143-44	SMP	H-3	704R8	WIPE	pCi/sample	0	U	3.6	6.1	
T45	0705143-45	SMP	H-3	704R8	WIPE	pCi/sample	-0.3	U	3.5	6	
T46	0705159-13	SMP	H-3	704R8	WIPE	pCi/sample	0.1	U	3	5	
T47	0705159-14	SMP	H-3	704R8	WIPE	pCi/sample	-0.1	U	3	5	

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Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
T48	0705159-15	SMP	H-3	704R8	WIPE	pCi/sample	-0.5	U	3	5.1	
T49	0705159-16	SMP	H-3	704R8	WIPE	pCi/sample	-1.6	U	3	5.1	
T50	0705159-17	SMP	H-3	704R8	WIPE	pCi/sample	-2.7	U	3.1	5.4	
T51	0705159-18	SMP	H-3	704R8	WIPE	pCi/sample	0.3	U	3.2	5.5	
T52	0705159-19	SMP	H-3	704R8	WIPE	pCi/sample	-1.2	U	3.4	5.8	
T53	0705159-20	SMP	H-3	704R8	WIPE	pCi/sample	0.5	U	3.3	5.5	
T54	0705159-21	SMP	H-3	704R8	WIPE	pCi/sample	-0.4	U	2.9	4.9	
T55	0705159-22	SMP	H-3	704R8	WIPE	pCi/sample	-2.5	U	2.9	5.1	
T56	0705159-23	SMP	H-3	704R8	WIPE	pCi/sample	-0.1	U	3.1	5.3	
T57	0705143-57	SMP	H-3	704R8	WIPE	pCi/sample	7.8	U	5.1	8	
T58	0705159-24	SMP	H-3	704R8	WIPE	pCi/sample	0.6	U	2.9	4.9	
T59	0705159-25	SMP	H-3	704R8	WIPE	pCi/sample	0.4	U	3.1	5.2	
T60	0705143-60	SMP	H-3	704R8	WIPE	pCi/sample	2.7	U	4.5	7.5	
T61	0705159-26	SMP	H-3	704R8	WIPE	pCi/sample	-1.8	U	5.1	8.7	
T62	0705143-62	SMP	H-3	704R8	WIPE	pCi/sample	0.1	U	3.2	5.4	
T63	0705159-27	SMP	H-3	704R8	WIPE	pCi/sample	-1.8	U	3.2	5.5	
T64	0705159-28	SMP	H-3	704R8	WIPE	pCi/sample	1.7	U	4.6	7.6	
T65	0705159-29	SMP	H-3	704R8	WIPE	pCi/sample	-0.5	U	2.9	5	
T66	0705159-30	SMP	H-3	704R8	WIPE	pCi/sample	-1	U	4.2	7.2	
T67	0705159-31	SMP	H-3	704R8	WIPE	pCi/sample	-0.4	U	3.1	5.4	
T68	0705159-32	SMP	H-3	704R8	WIPE	pCi/sample	-4	U	5.8	10	
T69	0705159-33	SMP	H-3	704R8	WIPE	pCi/sample	-0.6	U	3.7	6.3	
T70	0705159-34	SMP	H-3	704R8	WIPE	pCi/sample	-0.8	U	3.4	5.8	
T71	0705159-35	SMP	H-3	704R8	WIPE	pCi/sample	-0.2	U	2.9	4.9	
T72	0705159-36	SMP	H-3	704R8	WIPE	pCi/sample	-2.7	U	4.9	8.5	
T73	0705143-73	SMP	H-3	704R8	WIPE	pCi/sample	1.6	U	4	6.7	
T74	0705143-74	SMP	H-3	704R8	WIPE	pCi/sample	-1.8	U	3.4	5.9	
T75	0705159-37	SMP	H-3	704R8	WIPE	pCi/sample	-4.1	U	3.9	6.9	
T76	0708171-1	SMP	H-3	704R9	WIPE	pCi/sample	-0.6	U	2.7	4.6	
T77	0708171-2	SMP	H-3	704R9	WIPE	pCi/sample	-1.5	U	2.8	4.9	
T78	0708171-3	SMP	H-3	704R9	WIPE	pCi/sample	-0.4	U	2.5	4.4	
T79	0708171-4	SMP	H-3	704R9	WIPE	pCi/sample	0.9	U	2.6	4.4	
T80	0708171-5	SMP	H-3	704R9	WIPE	pCi/sample	-0.9	U	2.8	4.8	
T81	0708171-6	SMP	H-3	704R9	WIPE	pCi/sample	0.6	U	2.6	4.4	
T82	0708171-7	SMP	H-3	704R9	WIPE	pCi/sample	0.6	U	2.9	4.8	
T83	0708171-8	SMP	H-3	704R9	WIPE	pCi/sample	-0.1	U	2.6	4.5	
T84	0708171-9	SMP	H-3	704R9	WIPE	pCi/sample	0	U	2.6	4.4	
T85	0708171-10	SMP	H-3	704R9	WIPE	pCi/sample	-0.8	U	2.6	4.4	
T86	0708171-11	SMP	H-3	704R9	WIPE	pCi/sample	0	U	2.8	4.7	
T87	0708171-12	SMP	H-3	704R9	WIPE	pCi/sample	0.5	U	2.7	4.5	
T88	0708171-13	SMP	H-3	704R9	WIPE	pCi/sample	0.4	U	2.4	4.1	
T89	0708171-14	SMP	H-3	704R9	WIPE	pCi/sample	0.1	U	2.4	4.1	
T90	0708171-15	SMP	H-3	704R9	WIPE	pCi/sample	-0.4	U	2.4	4.1	

Laboratory Analytical Report - Smears QC

Page 1 of 1

Sample ID	Laboratory ID	QC Type	Analyte	Analytical Method	Sample Matrix	Reporting Units	Result	Data Flag	TPU	MDC	> MDC
LABQC	3H070608-1	LCS	H-3	704R8	WIPE	pCi/sample	111	P	18	5	Yes
LABQC	3H070608-1	LCSD	H-3	704R8	WIPE	pCi/sample	106	P	17	5	Yes
LABQC	3H070608-1	MB	H-3	704R8	WIPE	pCi/sample	-1.1	U	2.8	4.8	
LABQC	3H070608-2	LCS	H-3	704R8	WIPE	pCi/sample	109	P	17	5	
LABQC	3H070608-2	LCSD	H-3	704R8	WIPE	pCi/sample	110	P	18	5	
LABQC	3H070608-2	MB	H-3	704R8	WIPE	pCi/sample	0.1	U	2.9	4.9	
LABQC	3H070613-1	LCS	H-3	704R8	WIPE	pCi/sample	112	P	18	6	
LABQC	3H070613-1	LCSD	H-3	704R8	WIPE	pCi/sample	103	P	17	6	
LABQC	3H070613-1	MB	H-3	704R8	WIPE	pCi/sample	-2.8	U	3.3	5.7	
LABQC	3H070613-2	LCS	H-3	704R8	WIPE	pCi/sample	109	P	18	5	
LABQC	3H070613-2	LCSD	H-3	704R8	WIPE	pCi/sample	113	P	18	5	
LABQC	3H070613-2	MB	H-3	704R8	WIPE	pCi/sample	0.3	U	3.1	5.3	
LABQC	3H070912-1	LCS	H-3	704R9	WIPE	pCi/sample	105	P	17	4	
LABQC	3H070912-1	LCSD	H-3	704R9	WIPE	pCi/sample	100	P	16	4	
LABQC	3H070912-1	MB	H-3	704R9	WIPE	pCi/sample	0.1	U	2.4	4.1	

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Appendix D:
Field Survey Instrumentation QC Data

This appendix presents the field survey instrumentation calibration and source certificates, efficiency calculations, chi-squared calculations, and daily response check data. It is found electronically on CD in Adobe® Acrobat® .pdf format.

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Certificate of Calibration

Ratemeter Certificate of Calibration

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 130
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2360 Serial No.: 184954

All Ranges Calibrated Electronically; Ludlum Pulser Generator Serial No.: ☐97743 ☑201932

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 481-3 - Calibration of Radiation Detection Instruments & Devices

☑Mechanical ck. ☑Meter Zeroed ☑Electropism ck. ☐~~F/S Response~~ ck. ☐Audio ck.
☐~~Threshold~~ ck. High Voltage ck. ☑500v ☑1000v ☑1500v ☑Battery ck. (min 4.4 vdc)
Alpha Threshold.: 120 mV Beta Threshold.: 2.5 mV Beta Window.: 80 mV
Internal Calibration Date Reset ☑ Instrument found within tolerance (+/- 10%) Yes ☑ No ☐

Reference Setting	Instrument "As Found Reading"	Instrument Meter Reading
400 Kcpm	+/-10%	400Kcpm
100 Kcpm		100Kcpm
40 Kcpm		40Kcpm
10 Kcpm		10Kcpm
4 Kcpm		4Kcpm
1 Kcpm		1Kcpm
400 cpm		400cpm
100 cpm		100cpm

Reference Setting	Instrument "As Found Reading"	Integrated Counts (1-minute count)
400 Kcpm	+/-10%	399506
40 Kcpm		39951
4 Kcpm		3995
400 cpm		399

Calibrated By: Calibration Date: 4/16/07

Calibration Due: 4/16/08

Reviewed By: Date: 4/16/07

Certificate of Calibration

Voltage Plateau Form

Environmental Restoration Group, Inc.
3009 Washington St. N.E., Suite 150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 43-93 Serial No.: PR 199532

Counter Mfg.: Ludlum Model: 2360 Serial No.: 184954

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 48 1-3 - Calibration of Radiation Detection Instruments & Devices

Alpha Threshold: 120 mV Beta Threshold: 3.5 mV Beta Window: 35 mV

Detector geometry to source: ☑ Face, ☐ Side, ☐ Below, ☐ Other:

Distance to source: ☑ Contact, ☐ 6 Inches, ☐ Other:

Alpha Source : ☑ Th230 @ 13,300 dpm (1/19/07) src 4098-03 ☐ Other:

Beta Source: ☑ Tc99 @ 17,800 dpm (1/15/07) src 4099-03 ☐ Other:

Count Time: 1 minute(s)

High Voltage	Alpha Source Counts		Beta Source Counts		Background Counts	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
650	1684	422	5	628	1	158
700	2373	511	7	1934	1	267
725	2807	646	6	2799	1	336
750	2952	798	6	3336	2	418

Comments: Recommended Operating High Voltage: 700 volts

Calibrated By: Date: 4/16/07

Calibration Due: 4/16/08

Reviewed By: Date: 4/16/07

ERG Form L03B

Certificate of Calibration

2 Channel Scaler Certificate of Calibration

Environmental Restoration Group, Inc
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2929 Serial No.: 152268

All Ranges Calibrated Electronically; Ludlum Pulser Generator Serial No.: 97743 ☐ 201932 ☑

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NVLAP Registration No. 481-3 - Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☑ ~~Meter Zeroed~~ ☐ ~~Gain stpt. ck.~~ ☐ ~~Lin. Response ck.~~ ☑ Audio ck.
☐ ~~THR/WIN ck.~~ High Voltage ck. ☑ 500v ☑ 1000v ☑ 1500v ☐ ~~Battery ck. (min 4.4 vdc)~~

Alpha Threshold.: 125 mV Beta Threshold.: 4 mV Beta Window.: 50 mV

Voltage setting: 650 volts = 3.50 on HV Dial (Pot.)

Instrument found within tolerance (+/- 10%) ☑ Yes ☐ No

Reference Setting	Alpha Channel Digital Readout		Beta Channel Digital Readout	
	Instrument "As Found Reading"	Integrated Counts (1-minute count)	Instrument "As Found Reading"	Integrated Counts (1-minute count)
400 Kcpm	+/-10%	399311	+/-10%	399318
40 Kcpm		39934		39938
4 Kcpm		3993		3994
400 cpm		399		399

Calibrated By: [signature] Calibration Date: 4-16-07

Calibration Due: 4-16-08

Reviewed By: [signature] Date: 4/16/07

Certificate of Calibration

Voltage Plateau Form

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 798-4224

Detector Mfg.: Ludlum Model: 43-10-1 Serial No.: PR156426

Counter Mfg.: Ludlum Model: 2929 Serial No.: 152268

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NAMP&S Registration No. 43153 - Calibration of Radiation Detection Instruments & Devices

Alpha Threshold: 175 mV Beta Threshold: 4 mV Beta Window: 50 mV

Geometry / Distance to source: In planchet Cable Length: 1.39 inch ☐ Other:

Alpha Source : ☑ Th230 @ 13,300 dpm (1/19/07) sn: 4696-03 ☐ Other:

Beta Source: ☑ Tc99 @ 17,800 dpm (1/15/07) sn: 4039-03 ☐ Other:

Count Time: 1 minute(s)

High Voltage	Alpha Source Counts		Beta Source Counts		Background Counts		Pot. Setting
	Alpha	Beta	Alpha	Beta	Alpha	Beta	
650	2273	269	2	247	1	5	2.70
700	3745	181	6	1153	1	20	2.90
750	4330	197	1	2164	1	41	3.10
800	4734	239	9	3767	0	61	3.30
→ 850	4770	362	5	3373	2	76	3.50
900	4839	446	5	5890	3	76	3.70

Comments: Recommended Operating High Voltage: 850 volts

Calibrated By: [signature] Calibration Date: 4-16-07

Calibration Due: 4-16-08

Reviewed By: [signature] Date: 4/16/07

Certificate of Calibration

Ratemeter Certificate of Calibration

ERG
Environmental Restoration Group, Inc.
8909 Washington St. N.E. Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2360 Serial No.: 177184

All Ranges Calibrated Electronically: Ludlum Pulser Generator Serial No.: ☐ 97743 ☑ 201932

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 481-3 - Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☑ Meter Zeroed ☐ Geotropism ck. ☐ ~~F/S~~ response ck. ☑ Audio ck.
☐ ~~Alpha/Beta ck.~~ High Voltage ck. ☑ 500v ☐ 1000v ☑ 1500v ☑ Battery ck. (min 4.4 vdc)
Alpha Threshold: 120 mV Beta Threshold: 4 mV Beta Window: 30 mV
Internal Calibration Date Reset ☑ Instrument found within tolerance (+/- 10%) Yes ☑ No ☐

Reference Setting	Instrument "As Found Reading"	Instrument Meter Reading
400 Kcpm	+/- 10%	400 Kcpm
100 Kcpm		100 Kcpm
40 Kcpm		40 Kcpm
10 Kcpm		10 Kcpm
4 Kcpm		4 Kcpm
1 Kcpm		1 Kcpm
400 cpm		400 cpm
100 cpm		100 cpm

Reference Setting	Instrument "As Found Reading"	Integrated Counts (1-minute count)
400 Kcpm	+/- 10%	400190
40 Kcpm		39952
4 Kcpm		3995
400 cpm		400

Calibrated By: [signature] Calibration Date: 5-1-07

Calibration Due: 5-1-08

Reviewed By: [signature] Date: 5/1/07

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. 325-235-4
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 267200/308203

Mfg. Ludlum Measurements, Inc. Model 2929 Serial No. 171590

Mfg. Ludlum Measurements, Inc. Model 43-10-1 Serial No. PR174813

Cal. Date 7-Dec-06 Cal Due Date 7-Dec-07 Cal. Interval 1 Year Meterface 202-014

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 71 °F RH 21 % Alt 708.8 mm H

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

☑ Mechanical ck. ☑ Window Operation

☑ Audio ck.

☑ Meter Zeroed Alpha Sensitivity 175 mV Beta Sensitivity 4 mV Beta Window 50 mV

☑ 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 900 V = 3.70 on High Voltage dial. High Voltage set with detector connected.

☑ HV Readout (2 points) Ref./Inst. 500 / 502 V Ref./Inst. 2000 / 2010 V

COMMENTS:

4Pi EFFICIENCIES FOR THE FOLLOWING SOURCES:TH-230,Ni-63,TC-99,Sr90y90.

TH-230:#121495 act.19,800dpm ct.7781cpm 34% 4Pi
Ni-63:#4017 act.289,787dpm ct. 4417cpm -Bg67 ct.4350cpm 1.5% 4Pi
TC-99:#5296 act.33,200dpm ct. 11180cpm -Bg67 ct.11113cpm 33% 4Pi
Sr90y90:#4016 act.58,429dpm ct. 22121cpm -Bg ct.22054cpm 38% 4Pi

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

Alpha Channel Digital Readout	REFERENCE CAL POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400K cpm	40070	40070
	40K cpm	4007	4007
	4K cpm	400	400
	400 cpm	40	40
	40 cpm	4	4

Beta/Gamma Channel Digital Readout	REFERENCE CAL POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400K cpm	40073	40073
	40K cpm	4011	4011
	4K cpm	400	400
	400 cpm	40	40
	40 cpm	4	4

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

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 ☐ 781

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-3

☑ Alpha S/N PU-239#5283 15.9Kcpm ☑ Beta S/N TC-99#5296 C14#1131-51 ☐ Other

☑ m 500 S/N 54683 ☐ Oscilloscope S/N ☑ Multimeter S/N 70602489

Calibrated By: Dwaine Jackson Date 7-Dec-06

Reviewed By: Rhonda Hurst Date 7 Dec 06

AC Inst. Only ☐ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed

Designer and Manufacturer
of
Scientific and Industrial
Instruments

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

Bench Test Data For Detector

Detector 43-10-1 Serial No. PR174813 Order #. 267200/308203

Customer CABRERA SERVICES Alpha Input Sensitivity 175 mV

Counter 2929 Serial No. 171590 Beta Input Sensitivity 4 mV

Count Time 1Minute Beta Window 50 mV

Other Distance Source to Detector TRAY

High Voltage	Background		Isotope Pu-239 Size 15.9Kdpm		Isotope Tc-99 Size 29,700dpm		Isotope C14 Size 123,636dpm	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
850	0	48	10615	316	19	9254	0	13483
875	1	62	10884	298	15	10284	1	17516
900	0	67	10894	312	15	11180	1	21537
925	0	70	11030	326	11	11832	0	25753

☐ Gas Proportional detector count rate decreased ≤ 10% after 15 hour static test using 39" cable.

☐ Gas proportional detector count rate decreased ≤ 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature Duane Jackson Date 7-Dec-06

Certificate of Calibration

Ratemeter Certificate of Calibration

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2360 Serial No.: 177171

All Ranges Calibrated Electronically; Ludlum Pulser Generator Serial No.: ☐ 97743 ☑ 201932

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☑ Meter Zeroed ☑ Geotropism ck. ☐ ~~PFS Response~~ ck. ☑ Audio ck.

☐ ~~THROUN ck.~~ High Voltage ck. ☑ 500v ☑ 1000v ☑ 1500v ☑ Battery ck. (min 4.4 vdc)

Alpha Threshold.: 120 mV Beta Threshold.: 4 mV Beta Window.: 30 mV

Internal Calibration Date Reset ☑ Instrument found within tolerance (+/- 10%) Yes ☑ No ☐

Reference Setting	Instrument "As Found Reading"	Instrument Meter Reading
400 Kcpm	+/- 10%	400 Kcpm
100 Kcpm		100 Kcpm
40 Kcpm		40 Kcpm
10 Kcpm		10 Kcpm
4 Kcpm		4 Kcpm
1 Kcpm		1 Kcpm
400 cpm		400 cpm
100 cpm		100 cpm

Reference Setting	Instrument "As Found Reading"	Integrated Counts (1-minute count)
400 Kcpm	+/- 10%	399660
40 Kcpm		39967
4 Kcpm		3997
400 cpm		400

Calibrated By: [signature] Calibration Date: 5-1-07

Calibration Due: 5-1-08

Reviewed By: [signature] Date: 5/1/07

ERG Form 1.02C

Certificate of Calibration

Voltage Plateau Form

ERG
Environmental Restoration Group, Inc.
3809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 43-93 Serial No.: PR179869

Counter Mfg.: Ludlum Model: 2366 Serial No.: 177171

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

Alpha Threshold: 120 mV Beta Threshold: 4 mV Beta Window: 35 mV

Detector geometry to source: ☑ Face, ☐ Side, ☐ Below, ☐ Other:

Distance to source: ☑ Contact, ☐ 6 Inches, ☐ Other:

Alpha Source: ☑ Th230 @ 13,360 dpm (1/19/07) sn: 4098-03 ☐ Other:

Beta Source: ☑ Tc99 @ 17,800 dpm (1/15/07) sn: 4099-03 ☐ Other:

Count Time: 1 minute(s)

High Voltage	Alpha Source Counts		Beta Source Counts		Background Counts	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
700	1959	397	34	939	2	144
750	2764	517	44	2239	2	255
775	2848	630	50	2709	4	264
800	2972	796	55	2921	2	332

Comments: Recommended Operating High Voltage: 775 volts

Calibrated By: [signature] Calibration Date: 5-1-07

Calibration Due: 5-1-08

Reviewed By: [signature] Date: 5/2/07

ERG Form 1.03B

Certificate of Calibration

Voltage Plateau Form

ERG
Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 43-93 Serial No.: PR179861

Counter Mfg.: Ludlum Model: 2360 Serial No.: 168043

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

Alpha Threshold: 120 mV Beta Threshold: 4 mV Beta Window: 30 mV

Detector geometry to source: ☑ Face, ☐ Side, ☐ Below, ☐ Other:

Distance to source: ☑ Contact, ☐ 6 Inches, ☐ Other:

Alpha Source : ☑ Th230 @ 13,300 dpm (1/19/07) sn: 4098-03 ☐ Other:

Beta Source: ☑ Tc99 @ 17,800 dpm (1/15/07) sn: 4099-03 ☐ Other:

Count Time: 1 minute(s)

High Voltage	Alpha Source Counts		Beta Source Counts		Background Counts	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
700	1354	247	2	49	0	39
750	2526	237	5	674	2	94
800	2714	365	1	1552	2	156
825	2844	810	5	2518	4	239
850	2884	1033	7	2786	1	323

Comments: Recommended Operating High Voltage: 825 volts

Calibrated By: [signature] Calibration Date: 4-16-07

Calibration Due: 4-16-08

Reviewed By: [signature] Date: 4/16/07

ERG Form 1.03B

Certificate of Calibration

Ratemeter Certificate of Calibration

ERG
Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2360 Serial No.: 168043

All Ranges Calibrated Electronically; Ludlum Pulser Generator Serial No.: ☐ 97743 ☑ 201932

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 - Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☑ Meter Zeroed ☑ Geotropism ck. ☐ ~~F/S Response~~ ck. ☑ Audio ck.

☐ ~~PHR/WIN ck.~~ High Voltage ck. ☑ 500v ☑ 1000v ☑ 1500v ☑ Battery ck. (min 4.4 vdc)

Alpha Threshold.: 120 mV Beta Threshold.: 4 mV Beta Window.: 30 mV

Internal Calibration Date Reset ☑ Instrument found within tolerance (+/- 10%) Yes ☑ No ☐

Reference Setting	Instrument "As Found Reading"	Instrument Meter Reading
400 Kcpm	+/- 10%	400 Kcpm
100 Kcpm		100 Kcpm
40 Kcpm		40 Kcpm
10 Kcpm		10 Kcpm
4 Kcpm		4 Kcpm
1 Kcpm		1 Kcpm
400 cpm		400cpm
100 cpm		100cpm

Reference Setting	Instrument "As Found Reading"	Integrated Counts (1-minute count)
400 Kcpm	+/- 10%	399562
40 Kcpm		39965
4 Kcpm		3997
400 cpm		400

Calibrated By: [signature] Calibration Date: 4-16-07

Calibration Due: 4-16-08

Reviewed By: [signature] Date: 4/16/07

ERG Form 1.02C

Designer and Manufacturer of Scientific and Industrial Instruments

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.

CERTIFICATE OF CALIBRATION

CUSTOMER ENVIRONMENTAL RESTORATION GROUP ORDER NO. 265517/307193

lg. Thermo Model MICRO REM Serial No. 1535

Mfg. ____ Model ____ Serial No. ____

Cal. Date 3-Nov-06 Cal Due Date 3-Nov-07 Cal. Interval 1 Year Meterface 0-200µrem

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 23 % Atl 708.8 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 ☐ Geotropism
☐ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) ____ 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 ____ V Input Sens. ____ mV Det. Oper. ____ V at ____ mV Threshold Dial Ratio ____ = ____ mV

☐ HV Readout (2 points) Ref./Inst. ____ / ____ V Ref./Inst. ____ / ____ V

COMMENTS:

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*
x1000	150 mR/hr	150	150
x1000	50 mR/hr	45	45
x100	15 mR/hr	150	150
x100	5 mR/hr	48	48
x10	1500 µR/hr	150	150
x10	500 µR/hr	50	50
x1	150 µR/hr	155	150
x1	100 µR/hr	100	100
x0.1	15 µR/hr	150	150
x0.1			

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

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

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-384 ☐ 1122 ☐ 781

Cs-137 Gamma S/N ☐ 1162 ☑ G112 ☑ M965 ☐ 5105 ☐ T1008 ☐ T879 ☐ E562 ☑ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ____ ☐ Beta S/N ____ ☐ Other ____

☐ m 500 S/N ____ ☐ Oscilloscope S/N ____ ☐ Multimeter S/N ____

Calibrated By: Duane Jackson Date 3-Nov-06

Viewed By: Rhonda Harris Date 3 Nov 06

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.
FORM C22A 06/02/2006

AC Inst Only ☐ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed: ____

EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Beta Standard

S.O.# 6481
P.O.# 06-735

Description of Standard:

Model No. DNS-12sp Serial No. 2889-01 Isotope Tc-99

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi beta emission rate was measured using an internal gas flow proportional chamber. Absolute counting of beta particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated beta source S/N 4002-02.

Measurement Result:

The observed beta count rate from the surface of the disc per minute (cpm) on the calibration date was:

11,700 ± 467

The total disintegration rate (dpm) assuming 25 % backscatter of beta particles from the surface of the disc, was:

18,700 ± 748 (0.00842 μCi)

The uncertainty of the measurement is 4 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by: Anthony W. Toth

Calibration Technician: Art Reust Q.A. Representative: Anthony W. Toth

Calibration Date: 6-14-2006 Reviewed Date: 6-15-06

7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 262-2694 Fax (505) 262-2698
www.eberlineservices.com

EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Alpha Standard

S.O.# 6396
P.O.# 06-456

Description of Standard:

Model No. DNS-11 Serial No. 5648-06 Isotope Th-230

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi alpha emission rate was measured using an internal gas flow proportional chamber. Absolute counting of alpha particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated alpha source S/N 4001-02.

Measurement Result:

The observed alpha particles emitted from the surface of the disc per minute (cpm) on the calibration date was:

8,780 ± 263

The total disintegration rate (dpm) assuming 1.5% backscatter of alpha particles from the surface of the disc, was:

17,300 ± 518 (0.00779 μCi)

The uncertainty of the measurement is 3 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by:

Calibration Technician: Art Reust Q.A. Representative: Anthony W. Toth

Calibration Date: 2-28-2006 Reviewed Date: 2-28-06

Analytical Services
7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 345-3461 Fax (505) 761-5416
Toll Free (866) RAD-LABS (723-5227)
www.eberlineservices.com

Certificate of Calibration

Ratemeter Certificate of Calibration

ERG
Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2360 Serial No.: 193652

All Ranges Calibrated Electronically: Ludlum Pulser Generator Serial No.: ☐ 97743 ☑ 201932

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No: 481-3 - Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☑ Meter Zeroed ☑ Geotropism ck. ☐ F/S Response ck. ☑ Audio ck.

☐ THR/WIN ck. High Voltage ck. ☑ 500v ☑ 1000v ☑ 1500v ☑ Battery ck. (min 4.4 vdc)

Alpha Threshold.: 120 mV Beta Threshold.: 4 mV Beta Window.: 30 mV

Internal Calibration Date Reset ☑ Instrument found within tolerance (+/- 10%) Yes ☑ No ☐

Reference Setting	Instrument "As Found Reading"	Instrument Meter Reading
400 Kcpm	+/- 10%	400 Kcpm
100 Kcpm	+/- 10%	100 Kcpm
40 Kcpm	+/- 10%	40 Kcpm
10 Kcpm	+/- 10%	10 Kcpm
4 Kcpm	+/- 10%	4 Kcpm
1 Kcpm	+/- 10%	1 Kcpm
400 cpm	+/- 10%	400 cpm
100 cpm	+/- 10%	100 cpm

Reference Setting	Instrument "As Found Reading"	Integrated Counts (1-minute count)
400 Kcpm	+/- 10%	399913
40 Kcpm	+/- 10%	39955
4 Kcpm	+/- 10%	3997
400 cpm	+/- 10%	400

Calibrated By: [signature] Calibration Date: 8-9-07

Calibration Due: 8-9-08

Reviewed By: [signature] Date: 8/9/07

ERG Form 1.02C

Certificate of Calibration

Voltage Plateau Form

ERG
Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 43-93 Serial No.: PR199836

Counter Mfg.: Ludlum Model: 2360 Serial No.: 193652

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997
NMRCB Registration No. 481-5 • Calibration of Radiation Detection Instruments & Devices

Alpha Threshold: 120 mV Beta Threshold: 4 mV Beta Window: 30 mV

Detector geometry to source: ☑ Face, ☐ Side, ☐ Below, ☐ Other:

Distance to source: ☑ Contact, ☐ 6-Inches, ☐ Other:

Alpha Source: ☑ Th230 @ 13,300 dpm (1/19/07) sn. 4098-03 ☐ Other:

Beta Source: ☑ Tc99 @ 17,800 dpm (1/15/07) sn: 4099-03 ☐ Other:

Count Time: 1 Minute

High Voltage	Alpha Source Counts		Beta Source Counts		Background Counts	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
600	2302	310	4	844	0	71
650	2694	348	3	1737	1	144
→ 675	2782	522	3	2706	2	236
700	2941	861	3	3511	0	333

Comments: Recommended Operating High Voltage: 675 volts

Calibrated By: Calibration Date: 8-9-07

Calibration Due: 8-9-08

Reviewed By: Date: 8/9/07

ERG Form 1 03/0

Certificate of Calibration

2 Channel Scaler Certificate of Calibration

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 2929 Serial No.: 147736

All Ranges Calibrated Electronically; Ludlum Pulser Generator Serial No.: 97743 ☐ 201932 ☑

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

☑ Mechanical ck. ☐ Meter Zeroed ☐ Geotropism ck. ☐ F/S Response ck. ☑ Audio ck.

☐ THR/WIN ck. High Voltage ck. ☑ 500v ☑ 1000v ☑ 1500v ☑ Battery ck. (min 4.4 vdc)

Alpha Threshold.: 170 mV Beta Threshold.: 4.0 mV Beta Window.: 50 mV

Voltage setting: 750 volts = 4.00 on HV Dial (Pot.)

Instrument found within tolerance (+/- 10%) ☑ Yes ☐ No

Reference Setting	Alpha Channel Digital Readout		Beta Channel Digital Readout	
	Instrument "As Found Reading"	Integrated Counts (1-minute count)	Instrument "As Found Reading"	Integrated Counts (1-minute count)
400 Kcpm	+/- 10%	399430	+/- 10%	399444
40 Kcpm	+/- 10%	39948	+/- 10%	39946
4 Kcpm	+/- 10%	3995	+/- 10%	3995
400 cpm	+/- 10%	400	+/- 10%	399

Calibrated By: [signature] Calibration Date: 8-9-07

Calibration Due: 8-9-08

Reviewed By: [signature] Date: 8-9-07

Certificate of Calibration

Voltage Plateau Form

ERG
Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 43-10-1 Serial No.: PR150788

Counter Mfg.: Ludlum Model: 2929 Serial No.: 147736

This calibration conforms to the requirements and acceptable calibration conditions of ANSI N323A - 1997.
NMRCB Registration No. 481-3 • Calibration of Radiation Detection Instruments & Devices

Alpha Threshold: 170 mV Beta Threshold: 4 mV Beta Window: 50 mV

Geometry / Distance to source: In planchett Cable Length: ☑ 39 inch ☐ Other:

Alpha Source: ☑ Th230 @ 13,300 dpm (1/19/07) sn: 4098-03 ☐ Other:

Beta Source: ☑ Tc99 @ 17,800 dpm (1/15/07) sn: 4099-03 ☐ Other:

Count Time: 1 minute(s)

High Voltage	Alpha Source Counts		Beta Source Counts		Background Counts		Pot. Setting
	Alpha	Beta	Alpha	Beta	Alpha	Beta	
600	2576	470	1	617	0	14	3.42
650	4000	339	6	1934	0	38	3.60
700	4587	341	5	2967	1	60	3.80
750	4823	479	5	3897	0	75	4.00
800	4868	730	7	4810	1	88	4.20

Comments: Recommended Operating High Voltage: 750 volts

Calibrated By: Calibration Date: 8-9-07

Calibration Due: 8-9-08

Reviewed By: Date: 8-9-07

ERG Form 1.03C

EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Beta Standard

S.O.# 6652
P.O.# 07-870

Description of Standard:

Model No. DNS-12 Serial No. 5803-07 Isotope Tc-99

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi beta emission rate was measured using an internal gas flow proportional chamber. Absolute counting of beta particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated beta source S/N 4002-02.

Measurement Result:

The observed beta count rate from the surface of the disc per minute (cpm) on the calibration date was:

8,710 ± 261

The total disintegration rate (dpm) assuming 25 % backscatter of beta particles from the surface of the disc, was:

13,900 ± 417 (0.00627 μCi)

The uncertainty of the measurement is 3 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by:

Calibration Technician: Q.A. Manager: Anthony W. Toth

Calibration Date: 7-26-2007 Reviewed Date: 7-26-07

Source Manufacturing Lab
7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 761-5413 Fax (505) 761-5416
areust@eberlineservices.com

EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Alpha Standard

S.O.# 6652
P.O.# 07-870

Description of Standard:

Model No. DNS-11 Serial No. 5802-07 Isotope Th-230

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi alpha emission rate was measured using an internal gas flow proportional chamber. Absolute counting of alpha particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated alpha source S/N 4001-02.

Measurement Result:

The observed alpha particles emitted from the surface of the disc per minute (cpm) on the calibration date was:

6,640 ± 265

The total disintegration rate (dpm) assuming 1.5% backscatter of alpha particles from the surface of the disc, was:

13,100 ± 523 (0.00589 μCi)

The uncertainty of the measurement is 4 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by: Steven Sanborn

Calibration Technician: Art Reust Q.A. Manager: Anthony W. Toth

Calibration Date: 7-25-2007 Reviewed Date: 7-26-07

Source Manufacturing Lab
7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 761-5413 Fax (505) 761-5416
areust@eberlineservices.com

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	4/24/2007	9.193E-06	1.15	**17300**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
0.2	6591.1	**0.381**	

	Background Counts, cpm	Source plus Background Counts, cpm
	0.1	6492
	0.1	6679
	0.1	6544
	0.35	6625
	0.3	6605
	0.15	6633
	0.35	6722
	0.1	6532
	0.2	6512
	0.1	6567
Average	0.2	6591.1

For:

Instrument/Probe	Ludlum 2929 w 43-10-1
Serial numbers	152268/156426

By:

Name	Date Performed
Jennifer C.Burns	4/24/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME
Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	4/24/2007	3.285E-06	0.86	**18700**

Source µCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	µCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	µCi Based Calculated Efficiency, cpm/dpm
56.2	3486.5	**0.183**	

	Background Counts, cpm	Source plus Background Counts, cpm
	57.75	3490
	56.35	3616
	55.25	3517
	57.95	3485
	57.3	3395
	53.4	3371
	55.7	3497
	56	3502
	55.05	3511
	57.2	3481
Average	56.2	3486.5

For:

Instrument/Probe Serial numbers	Ludlum 2929 w 43-10-1
	152268/156426

By:

Name	Date Performed
Jennifer C.Burns	4/24/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/4/2007	9.193E-06	1.18	**17300**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
0.9	4239.3	**0.245**	

For:

Instrument/Probe Serial numbers	Model 2360 / Pr 43-93
	#168043/ Pr #179861

By:

Name	Date Performed
Jennifer C. Burns	5/4/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	0	4408
	1	4199
	0	4273
	0	4188
	1	4194
	0	4307
	3	4250
	2	4158
	2	4225
	0	4191
Average	0.9	4239.3

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/4/2007	9.193E-06	1.18	17300

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
0.7	1674.9	0.097	

For:

Instrument/Probe Serial numbers	Model 2360	Pr 43-93
	#168043/ Pr #179861	

By:

Name	Date Performed
Jennifer C. Burns	5/4/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	1	1740
	0	1646
	1	1623
	0	1631
	0	1746
	0	1667
	1	1679
	1	1700
	1	1615
	2	1702
Average	0.7	1674.9

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME
Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/4/2007	3.285E-06	0.89	18700

Source µCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	µCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	µCi Based Calculated Efficiency, cpm/dpm
184.0	2528.6	0.125	

	Background Counts, cpm	Source plus Background Counts, cpm
	193	2567
	175	2436
	196	2567
	165	2410
	175	2588
	184	2599
	205	2601
	199	2511
	168	2566
	180	2441
Average	184.0	2528.6

For:

Instrument/Probe Serial numbers		
	Model 2360	Pr 43-93
	#168043/ Pr #179861	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/4/2007	3.285E-06	0.89	18700

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
185.5	1891.2	0.091	

For:

Instrument/Probe Serial numbers		
Model 2360	Pr 43-93	
#168043/ Pr #179861		

By:

Name	Date Performed
Boeing SSFL RMHF Building Survey	

	Background Counts, cpm	Source plus Background Counts, cpm
	196	1879
	181	1851
	191	1964
	207	1893
	182	1910
	186	1823
	167	1898
	179	1901
	177	1960
	189	1833
Average	185.5	1891.2

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/4/2007	9.193E-06	1.18	**17300**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
1.4	4093.6	**0.237**	

	Background Counts, cpm	Source plus Background Counts, cpm
	2	4136
	0	4156
	1	4117
	2	4135
	1	4118
	3	4005
	3	4062
	1	4025
	1	4140
	0	4042
Average	1.4	4093.6

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#184954/ Pr #199832	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/3/2007	9.193E-06	1.18	**17300**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
0.7	1333.7	**0.077**	

For:

Instrument/Probe	Model #2360	Pr #43-93
Serial numbers	#184954/ Pr #199832	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	0	1312
	0	1253
	0	1282
	1	1344
	0	1340
	2	1404
	2	1390
	1	1301
	0	1334
	1	1377
Average	0.7	1333.7

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME
Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/3/2007	3.285E-06	0.88	18700

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
237.5	3493.4	0.174	

	Background Counts, cpm	Source plus Background Counts, cpm
	236	3369
	251	3513
	246	3611
	220	3425
	261	3523
	216	3416
	240	3570
	236	3495
	222	3480
	247	3532
Average	237.5	3493.4

For:		
Instrument/Probe Serial numbers	Model #2360	Pr #43-93
	#184954/ Pr #199832	

By:	Name	Date Performed
	Jennifer C. Burns	5/3/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/3/2007	3.285E-06	0.88	**18700**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
230.9	2454.7	**0.119**	

For:

Instrument/Probe Serial numbers	Model #2360	Pr #43-93
	#184954/ Pr #199832	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	211	2474
	226	2443
	218	2453
	255	2418
	244	2356
	204	2459
	261	2504
	223	2544
	220	2464
	247	2432
Average	230.9	2454.7

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/3/2007	9.193E-06	1.18	**17300**

Source µCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	µCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	µCi Based Calculated Efficiency, cpm/dpm
1.2	4076.5	**0.236**	

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#177184/ #199841	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	1	4074
	0	4127
	1	4032
	0	4186
	1	3980
	3	3995
	0	4117
	2	4069
	2	3969
	2	4216
Average	1.2	4076.5

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/7/2007	9.193E-06	1.19	**17300**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
1.1	1690.3	**0.098**	

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#177184/ #199841	

By:

Name	Date Performed
Jennifer C. Burns	5/7/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	0	1758
	1	1549
	3	1748
	0	1655
	2	1637
	0	1698
	1	1723
	3	1675
	0	1767
	1	1693
Average	1.1	1690.3

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/3/2007	3.285E-06	0.88	**18700**

Source µCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	µCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	µCi Based Calculated Efficiency, cpm/dpm
220.4	2948.4	**0.146**	

	Background Counts, cpm	Source plus Background Counts, cpm
	218	2918
	221	3043
	198	2957
	213	2895
	208	3026
	235	2885
	240	2976
	247	2909
	224	2853
	200	3022
Average	220.4	2948.4

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#177184/ #199841	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/7/2007	3.285E-06	0.90	18700

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
217.1	2139.8	0.103	

	Background Counts, cpm	Source plus Background Counts, cpm
	208	2165
	224	2117
	216	2213
	214	2154
	221	2090
	215	2186
	230	2083
	194	2194
	237	2124
	212	2072
Average	217.1	2139.8

For:

Instrument/Probe Serial numbers		
	Model 2360	Pr 43-93
	#177184/ #199841	

By:

Name	Date Performed
Jennifer C. Burns	5/7/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/3/2007	9.193E-06	1.18	17300

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
1.3	4295.8	0.248	

	Background Counts, cpm	Source plus Background Counts, cpm
	0	4307
	1	4299
	1	4181
	3	4279
	0	4376
	2	4338
	2	4210
	0	4406
	1	4367
	3	4195
Average	1.3	4295.8

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#177171/ #179869	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
17,300	7.54E+04	5/3/2007	9.193E-06	1.18	**17300**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
1.5	1669.8	**0.096**	

	Background Counts, cpm	Source plus Background Counts, cpm
	1	1627
	3	1661
	1	1598
	1	1617
	0	1673
	3	1710
	2	1659
	2	1676
	2	1748
	0	1729
Average	1.5	1669.8

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#177171/#179869	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/3/2007	3.285E-06	0.88	**18700**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
218.0	3544.3	**0.178**	

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#177171/ #179869	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	203	3663
	221	3590
	235	3509
	206	3523
	216	3472
	230	3661
	213	3592
	228	3434
	210	3417
	218	3582
Average	218.0	3544.3

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
18,700	2.11E+05	5/3/2007	3.285E-06	0.88	**18700**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
228.6	2660.2	**0.130**	

	Background Counts, cpm	Source plus Background Counts, cpm
	215	2604
	224	2730
	238	2556
	250	2609
	218	2629
	233	2699
	250	2702
	205	2724
	232	2664
	221	2685
Average	228.6	2660.2

For:

Instrument/Probe	Model 2360	Pr 43-93
Serial numbers	#177171/ #179869	

By:

Name	Date Performed
Jennifer C. Burns	5/3/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

07-1016.00 Boeing RMHF Bldg Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5802-7	7/25/2007

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
13100	7.54E+04	8/13/2007	9.193E-06	0.05	**13100**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
0.1	4717.3	**0.360**	

	Background Counts, cpm	Source plus Background Counts, cpm
	0.15	4636
	0.25	4664
	0.05	4883
	0.2	4760
	0.2	4745
	0.1	4679
	0.05	4722
	0.1	4710
	0.05	4656
	0.1	4718
Average	0.1	4717.3

For:

Instrument/Probe	Ludlum 2929 w 43-10-1
Serial numbers	147736/PR150788

By:

Name	Date Performed
Kathy Corbett	8/13/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

07-1016.00 Boeing RMHF Bldg Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	5803-7	7/26/2007

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
13900	2.11E+04	8/13/2007	3.285E-05	0.05	13900

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
64.7	2916.4	0.205	

	Background Counts, cpm	Source plus Background Counts, cpm
	67.1	3018
	68.75	2836
	68.2	2932
	61.85	2899
	63.9	2873
	63.15	2880
	62.55	2988
	64.6	2881
	64.85	2892
	62.15	2965
Average	64.7	2916.4

For:

Instrument/Probe	Ludlum 2929 w 43-10-1
Serial numbers	147736/PR150788

By:

Name	Date Performed
Kathy Corbett	8/13/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

07-1016.00 Boeing RMHF Bldg Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Th-230	5802-7	7/25/2007

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
13100	7.54E+04	8/13/2007	9.193E-06	0.05	**13100**

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
3.0	3070.8	**0.234**	

	Background Counts, cpm	Source plus Background Counts, cpm
	2	3028
	7	2982
	7	3176
	2	3093
	1	2965
	2	2990
	2	3128
	3	3059
	1	3087
	3	3200
Average	3.0	3070.8

For:

Instrument/Probe	Ludlum 2360 w 43-93
Serial numbers	193652/PR199836

By:

Name	Date Performed
Kathy Corbett	8/13/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME

07-1016.00 Boeing RMHF Bldg Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION DATE:
Tc-99	5803-7	7/26/2007

Initial Source DPM	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	DPM on Date Efficiency Performed
13900	2.11E+04	8/13/2007	3.285E-05	0.05	13900

Source μCi	half life, yrs	Decay-to-Date	lamda, yr-1	decay, yrs	μCi on Date Efficiency Performed

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	μCi Based Calculated Efficiency, cpm/dpm
196.2	2233.7	0.147	

	Background Counts, cpm	Source plus Background Counts, cpm
	207	2210
	179	2272
	229	2318
	225	2220
	157	2231
	225	2284
	217	2224
	171	2210
	168	2224
	184	2144
Average	196.2	2233.7

For:

Instrument/Probe	Ludlum 2360 w 43-93
Serial numbers	193652/PR199836

By:

Name	Date Performed
Kathy Corbett	8/13/2007

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME
Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION
Tc-99	2889-01	6/14/2006

Initial Source DPM	half life, yrs	ecay-to-Da	lamda, yr-1	decay, yrs	DPM on Date Efficiency
18,700	2.11E+05	4/24/2007	3.285E-06	0.86	18700

Source µCi	half life, yrs	ecay-to-Da	lamda, yr-1	decay, yrs	µCi on Date Efficiency

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	µCi Based Calculated Efficiency, cpm/dpm
52.3	5126.3	0.271	

For:		
trument/Pr	Ludlum 2929 w 43-10-1	
erial numbe	171590/174813	

By:	Name	Date Performed
	Bachir badaoui	10/25/2007

	Background Counts, cpm	Source plus Background Counts, cpm
	55.6	5176
	52.6	5154
	50.75	4957
	56.15	5059
	52	5220
	52.65	5146
	49.05	5191
	49.55	5084
	52.9	5123
	51.9	5153
Average	52.3	5126.3

Note: Original calculation values cannot be found. However, a new calculation was performed.

Instrument Efficiency Calculator (Rev 2)

PROJECT NAME
Boeing SSFL RMHF Building Survey

ISOTOPE	SOURCE ID #:	SOURCE CREATION
Th-230	5648-06	2/28/2006

Initial Source DPM	half life, yrs	ecay-to-Da	lamda, yr-1	decay, yrs	DPM on Date
17,300	7.54E+04	4/24/2007	9.193E-06	1.15	17300

Source µCi	half life, yrs	ecay-to-Da	lamda, yr-1	decay, yrs	µCi on Date Efficiency

Average background counts, cpm	Average Source plus background counts, cpm	DPM Based Calculated Efficiency, cpm/dpm	µCi Based Calculated Efficiency, cpm/dpm
0.3	6831.7	0.395	

For:		
ıstrument/Prob	Ludlum 2929 w 43-10-1	
Serial numbers	171590/174813	

By:

Name	Date Performed
Bachir Badaoui	10/25/20007

	Backgrou nd Counts, cpm	Source plus Background Counts, cpm
	0.4	6825
	0.25	6782
	0.3	6986
	0.4	6941
	0.2	6801
	0.35	6898
	0.25	6652
	0.05	6833
	0.2	6790
	0.35	6809
Average	0.3	6831.7

Note: Original calculation values cannot be found. However, a new calculation was performed.

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	6492	57.85	3346.623
2	6679	-129.15	16679.72
3	6544	5.85	34.2225
4	6625	-75.15	5647.522
5	6605	-55.15	3041.522
6	6633	-83.15	6913.922
7	6722	-172.15	29635.62
8	6532	17.85	318.6225
9	6512	37.85	1432.623
10	6567	-17.15	294.1225
11	6601	-51.15	2616.322
12	6325	224.85	50557.52
13	6288	261.85	68565.42
14	6497	52.85	2793.123
15	6543	6.85	46.9225
16	6523	26.85	720.9225
17	6630	-80.15	6424.022
18	6482	67.85	4603.623
19	6633	-83.15	6913.922
20	6564	-14.15	200.2225
Sum total	130997		210786.6
X_m	6549.85		

Instrument/Detector	Model 2929/Pr 43-10-1
Serial # / Serial#	152268/156426
Date Performed	24-Apr-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 32.18

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	3490	-27.5	756.25
2	3616	-153.5	23562.25
3	3517	-54.5	2970.25
4	3485	-22.5	506.25
5	3395	67.5	4556.25
6	3371	91.5	8372.25
7	3497	-34.5	1190.25
8	3502	-39.5	1560.25
9	3511	-48.5	2352.25
10	3481	-18.5	342.25
11	3439	23.5	552.25
12	3485	-22.5	506.25
13	3381	81.5	6642.25
14	3370	92.5	8556.25
15	3453	9.5	90.25
16	3549	-86.5	7482.25
17	3393	69.5	4830.25
18	3419	43.5	1892.25
19	3441	21.5	462.25
20	3455	7.5	56.25
Sum total	69250		77239
X_m	3462.5		

Instrument/Detector	Model 2929/Pr 43-10-1
Serial # / Serial#	152268/156426
Date Performed	24-Apr-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 22.31

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	4408	-163.4	26699.56
2	4199	45.6	2079.36
3	4273	-28.4	806.56
4	4188	56.6	3203.56
5	4194	50.6	2560.36
6	4307	-62.4	3893.76
7	4250	-5.4	29.16
8	4158	86.6	7499.56
9	4225	19.6	384.16
10	4191	53.6	2872.96
11	4235	9.6	92.16
12	4303	-58.4	3410.56
13	4229	15.6	243.36
14	4156	88.6	7849.96
15	4307	-62.4	3893.76
16	4204	40.6	1648.36
17	4131	113.6	12904.96
18	4328	-83.4	6955.56
19	4345	-100.4	10080.16
20	4261	-16.4	268.96
Sum total	84892		97376.8
X_m	4244.6		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#168043/ #179861
Date Performed	4-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 22.94

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	1740	-64	4096
2	1646	30	900
3	1623	53	2809
4	1631	45	2025
5	1746	-70	4900
6	1667	9	81
7	1679	-3	9
8	1700	-24	576
9	1615	61	3721
10	1702	-26	676
11	1692	-16	256
12	1597	79	6241
13	1751	-75	5625
14	1702	-26	676
15	1633	43	1849
16	1700	-24	576
17	1674	2	4
18	1704	-28	784
19	1640	36	1296
20	1678	-2	4
Sum total	33520		37104
X_m	1676		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#168043/ #179861
Date Performed	4-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 22.14

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	2567	-47.7	2275.29
2	2436	83.3	6938.89
3	2567	-47.7	2275.29
4	2410	109.3	11946.49
5	2588	-68.7	4719.69
6	2599	-79.7	6352.09
7	2601	-81.7	6674.89
8	2511	8.3	68.89
9	2566	-46.7	2180.89
10	2441	78.3	6130.89
11	2423	96.3	9273.69
12	2595	-75.7	5730.49
13	2470	49.3	2430.49
14	2554	-34.7	1204.09
15	2453	66.3	4395.69
16	2442	77.3	5975.29
17	2535	-15.7	246.49
18	2531	-11.7	136.89
19	2573	-53.7	2883.69
20	2524	-4.7	22.09
Sum total	50386		81862.2
X_m	2519.3		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#168043/ #179861
Date Performed	4-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 32.49

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	1879	6.45	41.6025
2	1851	34.45	1186.803
3	1964	-78.55	6170.102
4	1893	-7.55	57.0025
5	1910	-24.55	602.7025
6	1823	62.45	3900.003
7	1898	-12.55	157.5025
8	1901	-15.55	241.8025
9	1960	-74.55	5557.702
10	1833	52.45	2751.003
11	1876	9.45	89.3025
12	1951	-65.55	4296.802
13	1883	2.45	6.0025
14	1845	40.45	1636.203
15	1867	18.45	340.4025
16	1835	50.45	2545.203
17	1850	35.45	1256.703
18	1825	60.45	3654.203
19	1924	-38.55	1486.103
20	1941	-55.55	3085.802
Sum total	37709		39062.95
X_m	1885.45		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#168043/ #179861
Date Performed	4-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 20.72

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	4136	-90.15	8127.023
2	4156	-110.15	12133.02
3	4117	-71.15	5062.323
4	4135	-89.15	7947.723
5	4118	-72.15	5205.623
6	4005	40.85	1668.722
7	4062	-16.15	260.8225
8	4025	20.85	434.7225
9	4140	-94.15	8864.223
10	4042	3.85	14.8225
11	3965	80.85	6536.722
12	3924	121.85	14847.42
13	3878	167.85	28173.62
14	3949	96.85	9379.922
15	3994	51.85	2688.422
16	4035	10.85	117.7225
17	4010	35.85	1285.222
18	4055	-9.15	83.7225
19	4159	-113.15	12802.92
20	4012	33.85	1145.822
Sum total	80917		126780.6
X_m	4045.85		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#184954/ #199832
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 31.34

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	1312	17.25	297.5625
2	1253	76.25	5814.063
3	1282	47.25	2232.563
4	1344	-14.75	217.5625
5	1340	-10.75	115.5625
6	1404	-74.75	5587.563
7	1390	-60.75	3690.563
8	1301	28.25	798.0625
9	1334	-4.75	22.5625
10	1377	-47.75	2280.063
11	1350	-20.75	430.5625
12	1287	42.25	1785.063
13	1263	66.25	4389.063
14	1325	4.25	18.0625
15	1334	-4.75	22.5625
16	1266	63.25	4000.563
17	1297	32.25	1040.063
18	1401	-71.75	5148.063
19	1330	-0.75	0.5625
20	1395	-65.75	4323.063
Sum total	26585		42213.75
X_m	1329.25		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#184954/ #199832
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 31.76

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	3369	117.65	13841.52
2	3513	-26.35	694.3225
3	3611	-124.35	15462.92
4	3425	61.65	3800.723
5	3523	-36.35	1321.322
6	3416	70.65	4991.423
7	3570	-83.35	6947.222
8	3495	-8.35	69.7225
9	3480	6.65	44.2225
10	3532	-45.35	2056.622
11	3428	58.65	3439.823
12	3553	-66.35	4402.322
13	3515	-28.35	803.7225
14	3533	-46.35	2148.322
15	3446	40.65	1652.423
16	3491	-4.35	18.9225
17	3546	-59.35	3522.422
18	3453	33.65	1132.323
19	3326	160.65	25808.42
20	3508	-21.35	455.8225
Sum total	69733		92614.55
X_m	3486.65		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#184954/ #199832
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 26.56

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	2474	-11.9	141.61
2	2443	19.1	364.81
3	2453	9.1	82.81
4	2418	44.1	1944.81
5	2356	106.1	11257.21
6	2459	3.1	9.61
7	2504	-41.9	1755.61
8	2544	-81.9	6707.61
9	2464	-1.9	3.61
10	2432	30.1	906.01
11	2485	-22.9	524.41
12	2427	35.1	1232.01
13	2547	-84.9	7208.01
14	2497	-34.9	1218.01
15	2495	-32.9	1082.41
16	2375	87.1	7586.41
17	2539	-76.9	5913.61
18	2333	129.1	16666.81
19	2537	-74.9	5610.01
20	2460	2.1	4.41
Sum total	49242		70219.8
X_m	2462.1		

Instrument/Detector	Model #2360/ Pr 43-93
Serial # / Serial#	#184954/ #199832
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 28.52

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	4074	-2.75	7.5625
2	4127	-55.75	3108.063
3	4032	39.25	1540.563
4	4186	-114.75	13167.56
5	3980	91.25	8326.563
6	3995	76.25	5814.063
7	4117	-45.75	2093.063
8	4069	2.25	5.0625
9	3969	102.25	10455.06
10	4216	-144.75	20952.56
11	4024	47.25	2232.563
12	4080	-8.75	76.5625
13	3978	93.25	8695.563
14	4051	20.25	410.0625
15	4106	-34.75	1207.563
16	4139	-67.75	4590.063
17	4114	-42.75	1827.563
18	4141	-69.75	4865.063
19	3999	72.25	5220.063
20	4028	43.25	1870.563
Sum total	81425		96465.75
X_m	4071.25		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177184/ #199841
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 23.69

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	1758	-66.3	4395.69
2	1549	142.7	20363.29
3	1748	-56.3	3169.69
4	1655	36.7	1346.89
5	1637	54.7	2992.09
6	1698	-6.3	39.69
7	1723	-31.3	979.69
8	1675	16.7	278.89
9	1767	-75.3	5670.09
10	1693	-1.3	1.69
11	1670	21.7	470.89
12	1749	-57.3	3283.29
13	1752	-60.3	3636.09
14	1662	29.7	882.09
15	1687	4.7	22.09
16	1625	66.7	4448.89
17	1681	10.7	114.49
18	1660	31.7	1004.89
19	1734	-42.3	1789.29
20	1711	-19.3	372.49
Sum total	33834		55262.2
X_m	1691.7		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177184/ #199841
Date Performed	7-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 32.67

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	2918	20.9	436.81
2	3043	-104.1	10836.81
3	2957	-18.1	327.61
4	2895	43.9	1927.21
5	3026	-87.1	7586.41
6	2885	53.9	2905.21
7	2976	-37.1	1376.41
8	2909	29.9	894.01
9	2853	85.9	7378.81
10	3022	-83.1	6905.61
11	2907	31.9	1017.61
12	2977	-38.1	1451.61
13	2912	26.9	723.61
14	2908	30.9	954.81
15	3055	-116.1	13479.21
16	2867	71.9	5169.61
17	2821	117.9	13900.41
18	3010	-71.1	5055.21
19	2840	98.9	9781.21
20	2997	-58.1	3375.61
Sum total	58778		95483.8
X_m	2938.9		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177184/ #199841
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 32.49

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	2165	-36.9	1361.61
2	2117	11.1	123.21
3	2213	-84.9	7208.01
4	2154	-25.9	670.81
5	2090	38.1	1451.61
6	2186	-57.9	3352.41
7	2083	45.1	2034.01
8	2194	-65.9	4342.81
9	2124	4.1	16.81
10	2072	56.1	3147.21
11	2038	90.1	8118.01
12	2171	-42.9	1840.41
13	2112	16.1	259.21
14	2122	6.1	37.21
15	2161	-32.9	1082.41
16	2157	-28.9	835.21
17	2077	51.1	2611.21
18	2130	-1.9	3.61
19	2034	94.1	8854.81
20	2162	-33.9	1149.21
Sum total	42562		48499.8
X_m	2128.1		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177184/ #199841
Date Performed	7-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 22.79

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	4307	-16.85	283.9225
2	4299	-8.85	78.3225
3	4181	109.15	11913.72
4	4279	11.15	124.3225
5	4376	-85.85	7370.223
6	4338	-47.85	2289.623
7	4210	80.15	6424.022
8	4406	-115.85	13421.22
9	4367	-76.85	5905.923
10	4195	95.15	9053.522
11	4277	13.15	172.9225
12	4296	-5.85	34.2225
13	4335	-44.85	2011.523
14	4126	164.15	26945.22
15	4381	-90.85	8253.723
16	4393	-102.85	10578.12
17	4289	1.15	1.3225
18	4272	18.15	329.4225
19	4155	135.15	18265.52
20	4321	-30.85	951.7225
Sum total	85803		124408.6
X_m	4290.15		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177171/ #179869
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 29.00

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	1627	52.25	2730.063
2	1661	18.25	333.0625
3	1598	81.25	6601.563
4	1617	62.25	3875.063
5	1673	6.25	39.0625
6	1710	-30.75	945.5625
7	1659	20.25	410.0625
8	1676	3.25	10.5625
9	1748	-68.75	4726.563
10	1729	-49.75	2475.063
11	1757	-77.75	6045.063
12	1676	3.25	10.5625
13	1678	1.25	1.5625
14	1752	-72.75	5292.563
15	1761	-81.75	6683.063
16	1739	-59.75	3570.063
17	1622	57.25	3277.563
18	1656	23.25	540.5625
19	1645	34.25	1173.063
20	1601	78.25	6123.063
Sum total	33585		54863.75
X_m	1679.25		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177171/ #179869
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Th-230

X^2 = 32.67

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	3663	-98.75	9751.563
2	3590	-25.75	663.0625
3	3509	55.25	3052.563
4	3523	41.25	1701.563
5	3472	92.25	8510.063
6	3661	-96.75	9360.563
7	3592	-27.75	770.0625
8	3434	130.25	16965.06
9	3417	147.25	21682.56
10	3582	-17.75	315.0625
11	3482	82.25	6765.063
12	3552	12.25	150.0625
13	3655	-90.75	8235.563
14	3602	-37.75	1425.063
15	3643	-78.75	6201.563
16	3594	-29.75	885.0625
17	3659	-94.75	8977.563
18	3603	-38.75	1501.563
19	3583	-18.75	351.5625
20	3469	95.25	9072.563
Sum total	71285		116337.8
X_m	3564.25		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177171/ #179869
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 32.64

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	2604	68.15	4644.423
2	2730	-57.85	3346.622
3	2556	116.15	13490.82
4	2609	63.15	3987.923
5	2629	43.15	1861.923
6	2699	-26.85	720.9225
7	2702	-29.85	891.0225
8	2724	-51.85	2688.422
9	2664	8.15	66.4225
10	2685	-12.85	165.1225
11	2710	-37.85	1432.622
12	2733	-60.85	3702.722
13	2704	-31.85	1014.422
14	2709	-36.85	1357.922
15	2739	-66.85	4468.922
16	2729	-56.85	3231.922
17	2559	113.15	12802.92
18	2656	16.15	260.8225
19	2761	-88.85	7894.322
20	2541	131.15	17200.32
Sum total	53443		85230.55
X_m	2672.15		

Instrument/Detector	Model 2360/Pr 43-93
Serial # / Serial#	#177171/ #179869
Date Performed	3-May-07
Count time interval (minutes)	1
Source Used	Tc-99

X^2 = 31.90

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	4636	67.1	4502.41
2	4664	39.1	1528.81
3	4883	-179.9	32364.01
4	4760	-56.9	3237.61
5	4745	-41.9	1755.61
6	4679	24.1	580.81
7	4722	-18.9	357.21
8	4710	-6.9	47.61
9	4656	47.1	2218.41
10	4718	-14.9	222.01
11	4768	-64.9	4212.01
12	4743	-39.9	1592.01
13	4593	110.1	12122.01
14	4680	23.1	533.61
15	4704	-0.9	0.81
16	4754	-50.9	2590.81
17	4708	-4.9	24.01
18	4598	105.1	11046.01
19	4602	101.1	10221.21
20	4739	-35.9	1288.81
Sum total	94062		90445.8
X_m	4703.1		

Instrument/Detector	Ludlum 2929/43-10-1
Serial # / Serial#	147736/PR150788
Date Performed	13-Aug-07
Count time interval (minutes)	1
Source Used	Th-230, S/N 5802-07

X^2 = 19.23

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	3018	-113.35	12848.22
2	2836	68.65	4712.823
3	2932	-27.35	748.0225
4	2899	5.65	31.9225
5	2873	31.65	1001.723
6	2880	24.65	607.6225
7	2988	-83.35	6947.222
8	2881	23.65	559.3225
9	2892	12.65	160.0225
10	2965	-60.35	3642.122
11	2868	36.65	1343.223
12	2836	68.65	4712.823
13	2854	50.65	2565.423
14	2928	-23.35	545.2225
15	2968	-63.35	4013.222
16	2874	30.65	939.4225
17	2921	-16.35	267.3225
18	2935	-30.35	921.1225
19	2838	66.65	4442.223
20	2907	-2.35	5.5225
Sum total	58093		51014.55
X_m	2904.65		

Instrument/Detector	Ludlum 2929/43-10-1
Serial # / Serial#	147736/PR150788
Date Performed	13-Aug-07
Count time interval (minutes)	1
Source Used	Tc-99, S/N 5803-7

X^2 = 17.56

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	3028	48.8	2381.44
2	2982	94.8	8987.04
3	3176	-99.2	9840.64
4	3093	-16.2	262.44
5	2965	111.8	12499.24
6	2990	86.8	7534.24
7	3128	-51.2	2621.44
8	3059	17.8	316.84
9	3087	-10.2	104.04
10	3200	-123.2	15178.24
11	3055	21.8	475.24
12	3072	4.8	23.04
13	3094	-17.2	295.84
14	2990	86.8	7534.24
15	3111	-34.2	1169.64
16	3081	-4.2	17.64
17	3157	-80.2	6432.04
18	3077	-0.2	0.04
19	3113	-36.2	1310.44
20	3078	-1.2	1.44
Sum total	61536		76985.2
X_m	3076.8		

Instrument/Detector	Ludlum 2360/43-93
Serial # / Serial#	193652/PR199836
Date Performed	13-Aug-07
Count time interval (minutes)	1
Source Used	Th-230, S/N 5802-07

X^2 = 25.02

Note: Accept χ^2 if between 8.91 and 32.8

Equipment Chi-Square Distribution Worksheet

Count No.	X_i	X_m-X_i	$(X_m-X_i)^2$
1	2210	16	256
2	2272	-46	2116
3	2318	-92	8464
4	2220	6	36
5	2231	-5	25
6	2284	-58	3364
7	2224	2	4
8	2210	16	256
9	2224	2	4
10	2144	82	6724
11	2090	136	18496
12	2278	-52	2704
13	2252	-26	676
14	2239	-13	169
15	2165	61	3721
16	2193	33	1089
17	2197	29	841
18	2276	-50	2500
19	2287	-61	3721
20	2206	20	400
Sum total	44520		55566
X_m	2226		

Instrument/Detector	Ludlum 2360/43-93
Serial # / Serial#	193652/PR199836
Date Performed	13-Aug-07
Count time interval (minutes)	1
Source Used	Tc-99, S/N 5803-7

X^2 = 24.96

Note: Accept χ^2 if between 8.91 and 32.8

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2929	Detector:	43-10-1	Calibration Date:	4/16/2007
Serial #:	152268	Serial #:	156426	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.3810	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	20	20	1	0.19	0.11	6590.9	74.72
Beta	0.1834	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	1000	20	1	56.20	1.42	3430.3	66.73

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
4/26/2007	1	1150	6618	3550	0.1	57.5	6618.0	3492.5	PASS	PASS	PASS	PASS	9.85	156	Yes	Yes		JB
4/26/2007	0	1152	6670	3474	0.0	57.6	6670.0	3416.4	PASS	PASS	PASS	PASS	7.87	156	Yes	Yes		JB
4/27/2007	2	1175	6461	3471	0.1	58.8	6460.9	3412.3	PASS	PASS	PASS	PASS	10.67	157	Yes	Yes		KC
4/27/2007	3	1130	6564	3380	0.2	56.5	6563.9	3323.5	PASS	PASS	PASS	PASS	11.30	154	Yes	Yes		KC
4/30/2007	2	1117	6479	3561	0.1	55.9	6478.9	3505.2	PASS	PASS	PASS	PASS	10.67	154	Yes	Yes		JB
4/30/2007	2	1107	6633	3593	0.1	55.4	6632.9	3537.7	PASS	PASS	PASS	PASS	10.67	153	Yes	Yes		JB
5/1/2007	6	1123	6623	3496	0.3	56.2	6622.7	3439.9	PASS	PASS	PASS	PASS	12.72	154	Yes	Yes		JB
5/1/2007	2	1180	6537	3401	0.1	59.0	6536.9	3342.0	PASS	PASS	PASS	PASS	10.67	156	Yes	Yes		JB
5/2/2007	4	1164	6600	3452	0.2	58.2	6599.8	3393.8	PASS	PASS	PASS	PASS	11.83	157	Yes	Yes		JB
5/2/2007	7	1178	6630	3483	0.4	58.9	6629.7	3424.1	PASS	PASS	PASS	PASS	13.11	157	Yes	Yes		JB
5/3/2007	2	1170	6560	3558	0.1	58.5	6559.9	3499.5	PASS	PASS	PASS	PASS	10.67	157	Yes	Yes		JB
5/3/2007	1	1111	6602	3584	0.1	55.6	6602.0	3528.5	PASS	PASS	PASS	PASS	9.85	153	Yes	Yes		JB
5/4/2007	0	1152	6558	3569	0.0	57.6	6558.0	3511.4	PASS	PASS	PASS	PASS	7.87	156	Yes	Yes		JB
5/4/2007	2	1105	6532	3520	0.1	55.3	6531.9	3464.8	PASS	PASS	PASS	PASS	10.67	153	Yes	Yes		KC
5/7/2007	1	1111	6596	3507	0.1	55.6	6596.0	3451.5	PASS	PASS	PASS	PASS	9.85	153	Yes	Yes		JB
5/7/2007	2	1101	6471	3484	0.1	55.1	6470.9	3429.0	PASS	PASS	PASS	PASS	10.67	153	Yes	Yes		JB
5/8/2007	3	1175	6636	3603	0.2	58.8	6635.9	3544.3	PASS	PASS	PASS	PASS	11.30	157	Yes	Yes		JB
5/8/2007	1	1114	6473	3418	0.1	55.7	6473.0	3362.3	PASS	PASS	PASS	PASS	9.85	154	Yes	Yes		JB
5/9/2007	2	1160	6509	3485	0.1	58.0	6508.9	3427.0	PASS	PASS	PASS	PASS	10.67	156	Yes	Yes		JB
5/9/2007	2	1130	6577	3355	0.1	56.5	6576.9	3298.5	PASS	PASS	PASS	PASS	10.67	154	Yes	Yes		JB
5/10/2007	3	1135	6519	3403	0.2	56.8	6518.9	3346.3	PASS	PASS	PASS	PASS	11.30	155	Yes	Yes		JB
5/10/2007	5	1160	6461	3494	0.3	58.0	6460.8	3436.0	PASS	PASS	PASS	PASS	12.30	156	Yes	Yes		JB
5/11/2007	1	1098	6571	3468	0.1	54.9	6571.0	3413.1	PASS	PASS	PASS	PASS	9.85	153	Yes	Yes		JB
5/11/2007	2	1084	6594	3435	0.1	54.2	6593.9	3380.8	PASS	PASS	PASS	PASS	10.67	152	Yes	Yes		JB
5/14/2007	1	1151	6477	3516	0.1	57.6	6477.0	3458.5	PASS	PASS	PASS	PASS	9.85	156	Yes	Yes		JB
5/14/2007	3	1105	6538	3363	0.2	55.3	6537.9	3307.8	PASS	PASS	PASS	PASS	11.30	153	Yes	Yes		JB
5/15/2007	1	1169	6560	3604	0.1	58.5	6560.0	3545.6	PASS	PASS	PASS	PASS	9.85	157	Yes	Yes		JB
5/15/2007	3	1121	6539	3540	0.2	56.1	6538.9	3484.0	PASS	PASS	PASS	PASS	11.30	154	Yes	Yes		JB
5/16/2007	4	1118	6514	3604	0.2	55.9	6513.8	3548.1	PASS	PASS	PASS	PASS	11.83	154	Yes	Yes		JB
5/16/2007	2	1162	6452	3506	0.1	58.1	6451.9	3447.9	PASS	PASS	PASS	PASS	10.67	156	Yes	Yes		JB
5/17/2007	3	1211	6510	3499	0.2	60.6	6509.9	3438.5	PASS	FAIL	PASS	PASS	11.30	159	Yes	Yes		JB
5/17/2007	2	1152	6510	3499	0.1	57.6	6509.9	3441.4	PASS	PASS	PASS	PASS	10.67	156	Yes	Yes		JB
5/17/2007	0	1107	6508	3468	0.0	55.4	6508.0	3412.7	PASS	PASS	PASS	PASS	7.87	153	Yes	Yes		JB
5/18/2007	3	1097	6630	3608	0.2	54.9	6629.9	3553.2	PASS	PASS	PASS	PASS	11.30	152	Yes	Yes		JB
5/18/2007	2	1080	6518	3455	0.1	54.0	6517.9	3401.0	PASS	PASS	PASS	PASS	10.67	151	Yes	Yes		JB
5/21/2007	3	1146	6400	3488	0.2	57.3	6399.9	3430.7	PASS	PASS	QUESTION	PASS	11.30	155	Yes	Yes		JB
5/21/2007	3	1146	6483	3488	0.2	57.3	6482.9	3430.7	PASS	PASS	PASS	PASS	11.30	155	Yes	Yes		JB
5/21/2007	2	1072	6554	3461	0.1	53.6	6553.9	3407.4	PASS	PASS	PASS	PASS	10.67	151	Yes	Yes		JB
5/22/2007	2	1144	6486	3526	0.1	57.2	6485.9	3468.8	PASS	PASS	PASS	PASS	10.67	155	Yes	Yes		JB
5/22/2007	4	1103	6476	3370	0.2	55.2	6475.8	3314.9	PASS	PASS	PASS	PASS	11.83	153	Yes	Yes		JB
5/23/2007	2	1142	6504	3527	0.1	57.1	6503.9	3469.9	PASS	PASS	PASS	PASS	10.67	155	Yes	Yes		JB
5/23/2007	3	1141	6453	3527	0.2	57.1	6452.9	3470.0	PASS	PASS	PASS	PASS	11.30	155	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	4/16/2007
Serial #:	184954	Serial #:	199832	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.2365	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	75	1	1	1.40	1.07	4092.2	55.04
Beta	0.1741	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	3750	1	1	237.50	14.59	3255.9	65.95

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
5/3/2007	2	212	4050	3424	2.0	212.0	4048.0	3212.0	PASS	PASS	PASS	PASS	40.50	406	Yes	Yes		JB
5/3/2007	1	209	4137	3408	1.0	209.0	4136.0	3199.0	PASS	PASS	PASS	PASS	32.35	404	Yes	Yes		KC
5/4/2007	2	229	4115	3538	2.0	229.0	4113.0	3309.0	PASS	PASS	PASS	PASS	40.50	422	Yes	Yes		JB
5/4/2007	2	228	4106	3485	2.0	228.0	4104.0	3257.0	PASS	PASS	PASS	PASS	40.50	421	Yes	Yes		KC
5/7/2007	0	259	4142	3391	0.0	259.0	4142.0	3132.0	PASS	PASS	PASS	PASS	12.68	447	Yes	Yes		JB
5/7/2007	0	215	4125	3397	0.0	215.0	4125.0	3182.0	PASS	PASS	PASS	PASS	12.68	409	Yes	Yes		JB
5/8/2007	1	243	4032	3394	1.0	243.0	4031.0	3151.0	PASS	PASS	PASS	PASS	32.35	434	Yes	Yes		JB
5/8/2007	0	232	4187	3441	0.0	232.0	4187.0	3209.0	PASS	PASS	PASS	PASS	12.68	424	Yes	Yes		JB
5/9/2007	0	261	4119	3510	0.0	261.0	4119.0	3249.0	PASS	PASS	PASS	PASS	12.68	449	Yes	Yes		JB
5/9/2007	1	218	4095	3410	1.0	218.0	4094.0	3192.0	PASS	PASS	PASS	PASS	32.35	412	Yes	Yes		JB
5/9/2007	1	210	4144	3502	1.0	210.0	4143.0	3292.0	PASS	PASS	PASS	PASS	32.35	404	Yes	Yes		JB
5/10/2007	1	246	4043	3534	1.0	246.0	4042.0	3288.0	PASS	PASS	PASS	PASS	32.35	436	Yes	Yes		JB
5/10/2007	0	218	4137	3401	0.0	218.0	4137.0	3183.0	PASS	PASS	PASS	PASS	12.68	412	Yes	Yes		JB
5/10/2007	0	222	4161	3482	0.0	222.0	4161.0	3260.0	PASS	PASS	PASS	PASS	12.68	415	Yes	Yes		JB
5/11/2007	2	222	4022	3469	2.0	222.0	4020.0	3247.0	PASS	PASS	PASS	PASS	40.50	415	Yes	Yes		JB
5/11/2007	0	233	4107	3433	0.0	233.0	4107.0	3200.0	PASS	PASS	PASS	PASS	12.68	425	Yes	Yes		JB
5/14/2007	0	238	4122	3567	0.0	238.0	4122.0	3329.0	PASS	PASS	PASS	PASS	12.68	429	Yes	Yes		JB
5/14/2007	0	209	4023	3440	0.0	209.0	4023.0	3231.0	PASS	PASS	PASS	PASS	12.68	404	Yes	Yes		JB
5/15/2007	0	244	4002	3535	0.0	244.0	4002.0	3291.0	PASS	PASS	PASS	PASS	12.68	435	Yes	Yes		JB
5/15/2007	0	225	4137	3465	0.0	225.0	4137.0	3240.0	PASS	PASS	PASS	PASS	12.68	418	Yes	Yes		JB
5/16/2007	1	211	4167	3523	1.0	211.0	4166.0	3312.0	PASS	PASS	PASS	PASS	32.35	405	Yes	Yes		JB
5/16/2007	0	216	4176	3456	0.0	216.0	4176.0	3240.0	PASS	PASS	PASS	PASS	12.68	410	Yes	Yes		JB
5/17/2007	0	213	4076	3475	0.0	213.0	4076.0	3262.0	PASS	PASS	PASS	PASS	12.68	407	Yes	Yes		JB
5/17/2007	0	221	4201	3456	0.0	221.0	4201.0	3235.0	PASS	PASS	PASS	PASS	12.68	414	Yes	Yes		JB
5/18/2007	2	210	3995	3560	2.0	210.0	3993.0	3350.0	PASS	PASS	PASS	PASS	40.50	404	Yes	Yes		JB
5/18/2007	0	207	4073	3399	0.0	207.0	4073.0	3192.0	PASS	*QUESTION*	PASS	PASS	12.68	402	Yes	Yes		JB
5/18/2007	0	227	4073	3399	0.0	227.0	4073.0	3172.0	PASS	PASS	PASS	PASS	12.68	420	Yes	Yes		JB
5/21/2007	0	212	4074	3598	0.0	212.0	4074.0	3386.0	PASS	PASS	PASS	PASS	12.68	406	Yes	Yes		JB
5/21/2007	1	247	4190	3556	1.0	247.0	4189.0	3309.0	PASS	PASS	PASS	PASS	32.35	437	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	4/16/2007
Serial #:	184954	Serial #:	199832	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.0771	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	N/A	1	1	0.70	0.82	1333.0	47.51
Beta	0.1189	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	N/A	1	1	230.90	19.46	2223.8	58.32

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
5/3/2007	1	242	1312	2421	1.0	242.0	1311.0	2179.0	PASS	PASS	PASS	PASS	99.32	634	Yes	Yes		JB
5/3/2007	2	245	1428	2386	2.0	245.0	1426.0	2141.0	PASS	PASS	PASS	PASS	124.33	638	Yes	Yes		KC
5/4/2007	0	245	1242	2405	0.0	245.0	1242.0	2160.0	PASS	PASS	PASS	PASS	38.93	638	Yes	Yes		JB
5/4/2007	0	229	1275	2421	0.0	229.0	1275.0	2192.0	PASS	PASS	PASS	PASS	38.93	617	Yes	Yes		KC
5/7/2007	1	210	1425	2511	1.0	210.0	1424.0	2301.0	PASS	PASS	PASS	PASS	99.32	592	Yes	Yes		JB
5/7/2007	1	224	1389	2364	1.0	224.0	1388.0	2140.0	PASS	PASS	PASS	PASS	99.32	611	Yes	Yes		JB
5/8/2007	1	243	1375	2384	1.0	243.0	1374.0	2141.0	PASS	PASS	PASS	PASS	99.32	635	Yes	Yes		JB
5/8/2007	0	200	1420	2441	0.0	200.0	1420.0	2241.0	PASS	PASS	PASS	PASS	38.93	579	Yes	Yes		JB
5/9/2007	2	227	1389	2460	2.0	227.0	1387.0	2233.0	PASS	PASS	PASS	PASS	124.33	615	Yes	Yes		JB
5/9/2007	1	212	1425	2358	1.0	212.0	1424.0	2146.0	PASS	PASS	PASS	PASS	99.32	595	Yes	Yes		JB
5/9/2007	0	207	1406	2347	0.0	207.0	1406.0	2140.0	PASS	PASS	PASS	PASS	38.93	588	Yes	Yes		JB
5/10/2007	0	222	1266	2404	0.0	222.0	1266.0	2182.0	PASS	PASS	PASS	PASS	38.93	608	Yes	Yes		JB
5/10/2007	1	235	1408	2486	1.0	235.0	1407.0	2251.0	PASS	PASS	PASS	PASS	99.32	625	Yes	Yes		JB
5/10/2007	0	207	1419	2348	0.0	207.0	1419.0	2141.0	PASS	PASS	PASS	PASS	38.93	588	Yes	Yes		JB
5/11/2007	1	249	1420	2534	1.0	249.0	1419.0	2285.0	PASS	PASS	PASS	PASS	99.32	643	Yes	Yes		JB
5/11/2007	1	202	1412	2456	1.0	202.0	1411.0	2254.0	PASS	PASS	PASS	PASS	99.32	581	Yes	Yes		JB
5/14/2007	0	239	1242	2579	0.0	239.0	1242.0	2340.0	PASS	PASS	PASS	PASS	38.93	630	Yes	Yes		JB
5/14/2007	0	233	1405	2404	0.0	233.0	1405.0	2171.0	PASS	PASS	PASS	PASS	38.93	622	Yes	Yes		JB
5/15/2007	1	226	1419	2462	1.0	226.0	1418.0	2236.0	PASS	PASS	PASS	PASS	99.32	613	Yes	Yes		JB
5/15/2007	0	223	1409	2385	0.0	223.0	1409.0	2162.0	PASS	PASS	PASS	PASS	38.93	609	Yes	Yes		JB
5/16/2007	1	208	1334	2534	1.0	208.0	1333.0	2326.0	PASS	PASS	PASS	PASS	99.32	589	Yes	Yes		JB
5/16/2007	2	225	1405	2389	2.0	225.0	1403.0	2164.0	PASS	PASS	PASS	PASS	124.33	612	Yes	Yes		JB
5/17/2007	0	229	1347	2503	0.0	229.0	1347.0	2274.0	PASS	PASS	PASS	PASS	38.93	617	Yes	Yes		JB
5/17/2007	1	229	1323	2388	1.0	229.0	1322.0	2159.0	PASS	PASS	PASS	PASS	99.32	617	Yes	Yes		JB
5/18/2007	0	224	1376	2467	0.0	224.0	1376.0	2243.0	PASS	PASS	PASS	PASS	38.93	611	Yes	Yes		JB
5/18/2007	0	211	1253	2392	0.0	211.0	1253.0	2181.0	PASS	PASS	PASS	PASS	38.93	594	Yes	Yes		JB
5/21/2007	0	241	1388	2497	0.0	241.0	1388.0	2256.0	PASS	PASS	PASS	PASS	38.93	633	Yes	Yes		JB
5/21/2007	0	201	1337	2478	0.0	201.0	1337.0	2277.0	PASS	PASS	PASS	PASS	38.93	580	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	5/1/2008
Serial #:	177184	Serial #:	199841	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.2356	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	75	1	1	1.20	1.03	4075.3	85.56
Beta	0.1459	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	3750	1	1	220.40	16.50	2728.0	74.49

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail				α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	MDA α (dpm)	MDA β (dpm)				
5/7/2007	1	250	4044	2936	1.0	250.0	4043.0	2686.0	PASS	PASS	PASS	PASS	32.49	525	Yes	Yes		JB
5/7/2007	1	214	4150	2870	1.0	214.0	4149.0	2656.0	PASS	PASS	PASS	PASS	32.49	487	Yes	Yes		JB
5/8/2007	2	203	4055	2936	2.0	203.0	4053.0	2733.0	PASS	PASS	PASS	PASS	40.67	475	Yes	Yes		JB
5/8/2007	1	209	4149	2811	1.0	209.0	4148.0	2602.0	PASS	PASS	PASS	PASS	32.49	482	Yes	Yes		JB
5/9/2007	1	238	4112	2939	1.0	238.0	4111.0	2701.0	PASS	PASS	PASS	PASS	32.49	513	Yes	Yes		JB
5/9/2007	1	200	4053	3044	1.0	200.0	4052.0	2844.0	PASS	PASS	PASS	PASS	32.49	472	Yes	Yes		JB
5/10/2007	0	190	3974	2809	0.0	190.0	3974.0	2619.0	PASS	PASS	PASS	PASS	12.74	460	Yes	Yes		JB
5/10/2007	1	190	3980	2880	1.0	190.0	3979.0	2690.0	PASS	PASS	PASS	PASS	32.49	460	Yes	Yes		JB
5/11/2007	1	240	3996	2975	1.0	240.0	3995.0	2735.0	PASS	PASS	PASS	PASS	32.49	515	Yes	Yes		JB
5/11/2007	1	209	4062	2884	1.0	209.0	4061.0	2675.0	PASS	PASS	PASS	PASS	32.49	482	Yes	Yes		JB
5/14/2007	3	202	4026	2959	3.0	202.0	4023.0	2757.0	PASS	PASS	PASS	PASS	46.95	474	Yes	Yes		JB
5/14/2007	1	204	4055	2836	1.0	204.0	4054.0	2632.0	PASS	PASS	PASS	PASS	32.49	476	Yes	Yes		JB
5/15/2007	0	209	4004	3019	0.0	209.0	4004.0	2810.0	PASS	PASS	PASS	PASS	12.74	482	Yes	Yes		JB
5/15/2007	0	214	4044	2870	0.0	214.0	4044.0	2656.0	PASS	PASS	PASS	PASS	12.74	487	Yes	Yes		JB
5/16/2007	1	208	3994	2917	1.0	208.0	3993.0	2709.0	PASS	PASS	PASS	PASS	32.49	481	Yes	Yes		JB
5/16/2007	1	218	4009	2840	1.0	218.0	4008.0	2622.0	PASS	PASS	PASS	PASS	32.49	491	Yes	Yes		JB
5/17/2007	2	230	4008	2875	2.0	230.0	4006.0	2645.0	PASS	PASS	PASS	PASS	40.67	504	Yes	Yes		JB
5/17/2007	1	218	3912	2854	1.0	218.0	3911.0	2636.0	PASS	PASS	PASS	PASS	32.49	491	Yes	Yes		JB
5/18/2007	0	236	3969	2870	0.0	236.0	3969.0	2634.0	PASS	PASS	PASS	PASS	12.74	511	Yes	Yes		JB
5/18/2007	2	241	4009	2833	2.0	241.0	4007.0	2592.0	PASS	PASS	PASS	PASS	40.67	516	Yes	Yes		JB
5/21/2007	0	235	3988	2886	0.0	235.0	3988.0	2651.0	PASS	PASS	PASS	PASS	12.74	509	Yes	Yes		JB
5/21/2007	2	220	3939	2850	2.0	220.0	3937.0	2630.0	PASS	PASS	PASS	PASS	40.67	494	Yes	Yes		JB
5/22/2007	1	226	3991	2849	1.0	226.0	3990.0	2623.0	PASS	PASS	PASS	PASS	32.49	500	Yes	Yes		JB
5/22/2007	1	209	4038	2837	1.0	209.0	4037.0	2628.0	PASS	PASS	PASS	PASS	32.49	482	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	5/1/2008
Serial #:	177184	Serial #:	199841	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.0976	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	N/A	1	1	1.10	1.20	1689.2	66.17
Beta	0.1028	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	N/A	1	1	217.10	11.94	1922.7	56.90

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
5/8/2007	1	214	1634	2119	1.0	214.0	1633.0	1905.0	PASS	PASS	PASS	PASS	78.38	691	Yes	Yes		JB
5/8/2007	2	220	1734	2188	2.0	220.0	1732.0	1968.0	PASS	PASS	PASS	PASS	98.11	700	Yes	Yes		JB
5/9/2007	2	198	1635	2187	2.0	198.0	1633.0	1989.0	PASS	PASS	PASS	PASS	98.11	666	Yes	Yes		JB
5/9/2007	2	214	1610	2200	2.0	214.0	1608.0	1986.0	PASS	PASS	PASS	PASS	98.11	691	Yes	Yes		JB
5/10/2007	1	232	1673	2124	1.0	232.0	1672.0	1892.0	PASS	PASS	PASS	PASS	78.38	718	Yes	Yes		JB
5/10/2007	3	213	1574	2064	3.0	213.0	1571.0	1851.0	PASS	PASS	PASS	PASS	113.26	690	Yes	Yes		JB
5/11/2007	2	235	1601	2228	2.0	235.0	1599.0	1993.0	PASS	PASS	PASS	PASS	98.11	723	Yes	Yes		JB
5/11/2007	1	225	1621	2090	1.0	225.0	1620.0	1865.0	PASS	PASS	PASS	PASS	78.38	708	Yes	Yes		JB
5/14/2007	0	232	1602	2142	0.0	232.0	1602.0	1910.0	PASS	PASS	PASS	PASS	30.72	718	Yes	Yes		JB
5/14/2007	1	236	1585	2179	1.0	236.0	1584.0	1943.0	PASS	PASS	PASS	PASS	78.38	724	Yes	Yes		JB
5/15/2007	0	198	1589	2258	0.0	198.0	1589.0	2060.0	PASS	PASS	PASS	*QUESTION*	30.72	666	Yes	Yes		JB
5/15/2007	0	198	1589	2188	0.0	198.0	1589.0	1990.0	PASS	PASS	PASS	PASS	30.72	666	Yes	Yes		JB
5/15/2007	2	208	1597	2138	2.0	208.0	1595.0	1930.0	PASS	PASS	PASS	PASS	98.11	682	Yes	Yes		JB
5/16/2007	3	199	1596	2186	3.0	199.0	1593.0	1987.0	PASS	PASS	PASS	PASS	113.26	668	Yes	Yes		JB
5/16/2007	2	212	1581	2168	2.0	212.0	1579.0	1956.0	PASS	PASS	PASS	PASS	98.11	688	Yes	Yes		JB
5/17/2007	2	220	1615	2186	2.0	220.0	1613.0	1966.0	PASS	PASS	PASS	PASS	98.11	700	Yes	Yes		JB
5/17/2007	1	226	1620	2127	1.0	226.0	1619.0	1901.0	PASS	PASS	PASS	PASS	78.38	709	Yes	Yes		JB
5/18/2007	1	218	1620	2252	1.0	218.0	1619.0	2034.0	PASS	PASS	PASS	PASS	78.38	697	Yes	Yes		JB
5/18/2007	1	204	1653	2066	1.0	204.0	1652.0	1862.0	PASS	PASS	PASS	PASS	78.38	676	Yes	Yes		JB
5/21/2007	0	217	1710	2073	0.0	217.0	1710.0	1856.0	PASS	PASS	PASS	PASS	30.72	696	Yes	Yes		JB
5/21/2007	0	231	1725	2170	0.0	231.0	1725.0	1939.0	PASS	PASS	PASS	PASS	30.72	717	Yes	Yes		JB
5/22/2007	0	220	1653	2112	0.0	220.0	1653.0	1892.0	PASS	PASS	PASS	PASS	30.72	700	Yes	Yes		JB
5/22/2007	0	236	1695	2147	0.0	236.0	1695.0	1911.0	PASS	PASS	PASS	PASS	30.72	724	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	5/1/2007
Serial #:	177171	Serial #:	179869	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.2482	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	75	1	1	1.30	1.16	4294.5	79.94
Beta	0.1779	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	3750	1	1	218.00	10.56	3326.3	89.02

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
5/7/2007	0	232	4273	3620	0.0	232.0	4273.0	3388.0	PASS	PASS	PASS	PASS	12.09	415	Yes	Yes		JB
5/7/2007	1	199	4272	3483	1.0	199.0	4271.0	3284.0	PASS	PASS	PASS	PASS	30.83	386	Yes	Yes		JB
5/8/2007	0	225	4363	3580	0.0	225.0	4363.0	3355.0	PASS	PASS	PASS	PASS	12.09	409	Yes	Yes		JB
5/8/2007	1	220	4209	3530	1.0	220.0	4208.0	3310.0	PASS	PASS	PASS	PASS	30.83	405	Yes	Yes		JB
5/9/2007	0	221	4237	3623	0.0	221.0	4237.0	3402.0	PASS	PASS	PASS	PASS	12.09	406	Yes	Yes		JB
5/9/2007	0	199	4180	3367	0.0	199.0	4180.0	3168.0	PASS	PASS	PASS	PASS	12.09	386	Yes	Yes		JB
5/9/2007	2	201	4366	3509	2.0	201.0	4364.0	3308.0	PASS	PASS	PASS	PASS	38.59	388	Yes	Yes		JB
5/10/2007	0	221	4236	3498	0.0	221.0	4236.0	3277.0	PASS	PASS	PASS	PASS	12.09	406	Yes	Yes		JB
5/10/2007	0	234	4291	3565	0.0	234.0	4291.0	3331.0	PASS	PASS	PASS	PASS	12.09	417	Yes	Yes		JB
5/10/2007	2	218	4187	3586	2.0	218.0	4185.0	3368.0	PASS	PASS	PASS	PASS	38.59	403	Yes	Yes		JB
5/11/2007	1	212	4185	3598	1.0	212.0	4184.0	3386.0	PASS	PASS	PASS	PASS	30.83	398	Yes	Yes		JB
5/11/2007	1	207	4330	3584	1.0	207.0	4329.0	3377.0	PASS	PASS	PASS	PASS	30.83	393	Yes	Yes		JB
5/14/2007	1	220	4228	3596	1.0	220.0	4227.0	3376.0	PASS	PASS	PASS	PASS	30.83	405	Yes	Yes		JB
5/14/2007	1	233	4371	3549	1.0	233.0	4370.0	3316.0	PASS	PASS	PASS	PASS	30.83	416	Yes	Yes		JB
5/15/2007	0	217	4259	3585	0.0	217.0	4259.0	3368.0	PASS	PASS	PASS	PASS	12.09	402	Yes	Yes		JB
5/15/2007	0	209	4230	3622	0.0	209.0	4230.0	3413.0	PASS	PASS	PASS	PASS	12.09	395	Yes	Yes		JB
5/16/2007	1	205	4197	3676	1.0	205.0	4196.0	3471.0	PASS	PASS	PASS	PASS	30.83	391	Yes	Yes		JB
5/16/2007	0	225	4349	3501	0.0	225.0	4349.0	3276.0	PASS	PASS	PASS	PASS	12.09	409	Yes	Yes		JB
5/17/2007	0	211	4198	3592	0.0	211.0	4198.0	3381.0	PASS	PASS	PASS	PASS	12.09	397	Yes	Yes		JB
5/17/2007	3	221	4381	3416	3.0	221.0	4378.0	3195.0	PASS	PASS	PASS	PASS	44.55	406	Yes	Yes		JB
5/18/2007	0	201	4206	3726	0.0	201.0	4206.0	3525.0	PASS	PASS	PASS	*QUESTION*	12.09	388	Yes	Yes		JB
5/18/2007	0	201	4206	3689	0.0	201.0	4206.0	3488.0	PASS	PASS	PASS	PASS	12.09	388	Yes	Yes		JB
5/18/2007	0	214	4323	3556	0.0	214.0	4323.0	3342.0	PASS	PASS	PASS	PASS	12.09	400	Yes	Yes		JB
5/21/2007	1	204	4219	3631	1.0	204.0	4218.0	3427.0	PASS	PASS	PASS	PASS	30.83	390	Yes	Yes		JB
5/21/2007	1	222	4436	3587	1.0	222.0	4435.0	3365.0	PASS	PASS	PASS	PASS	30.83	407	Yes	Yes		JB
5/22/2007	0	227	4395	3621	0.0	227.0	4395.0	3394.0	PASS	PASS	PASS	PASS	12.09	411	Yes	Yes		JB
5/22/2007	0	203	4396	3508	0.0	203.0	4396.0	3305.0	PASS	PASS	PASS	PASS	12.09	390	Yes	Yes		JB
5/23/2007	1	231	4379	3688	1.0	231.0	4378.0	3457.0	PASS	PASS	PASS	PASS	30.83	414	Yes	Yes		JB
5/23/2007	1	226	4384	3597	1.0	226.0	4383.0	3371.0	PASS	PASS	PASS	PASS	30.83	410	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	5/1/2007
Serial #:	177171	Serial #:	179869	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.0984	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	N/A	1	1	1.50	1.08	1668.3	48.44
Beta	0.1300	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	N/A	1	1	226.60	14.79	2431.6	63.45

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail				α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	MDA α (dpm)	MDA β (dpm)				
5/7/2007	1	203	1797	2512	1.0	203.0	1796.0	2309.0	PASS	PASS	QUESTION	PASS	79.36	533	Yes	Yes		JB
5/7/2007	1	203	1750	2512	1.0	203.0	1749.0	2309.0	PASS	PASS	PASS	PASS	79.36	533	Yes	Yes		JB
5/7/2007	0	234	1718	2645	0.0	234.0	1718.0	2411.0	PASS	PASS	PASS	PASS	31.11	570	Yes	Yes		JB
5/8/2007	2	222	1725	2530	2.0	222.0	1723.0	2308.0	PASS	PASS	PASS	PASS	99.34	556	Yes	Yes		JB
5/8/2007	1	213	1656	2544	1.0	213.0	1655.0	2331.0	PASS	PASS	PASS	PASS	79.36	545	Yes	Yes		JB
5/9/2007	1	229	1760	2675	1.0	229.0	1759.0	2447.0	PASS	PASS	PASS	PASS	79.36	565	Yes	Yes		JB
5/9/2007	2	205	1758	2569	2.0	205.0	1756.0	2364.0	PASS	PASS	PASS	PASS	99.34	535	Yes	Yes		JB
5/9/2007	1	223	1720	2614	1.0	223.0	1719.0	2391.0	PASS	PASS	PASS	PASS	79.36	557	Yes	Yes		JB
5/10/2007	1	230	1724	2779	1.0	230.0	1723.0	2549.0	PASS	PASS	PASS	PASS	79.36	566	Yes	Yes		JB
5/10/2007	1	224	1739	2669	1.0	224.0	1738.0	2445.0	PASS	PASS	PASS	PASS	79.36	559	Yes	Yes		JB
5/10/2007	1	220	1586	2583	1.0	220.0	1585.0	2363.0	PASS	PASS	PASS	PASS	79.36	554	Yes	Yes		JB
5/11/2007	2	208	1595	2530	2.0	208.0	1593.0	2322.0	PASS	PASS	PASS	PASS	99.34	539	Yes	Yes		JB
5/11/2007	0	237	1705	2677	0.0	237.0	1705.0	2440.0	PASS	PASS	PASS	PASS	31.11	574	Yes	Yes		JB
5/14/2007	1	244	1650	2602	1.0	244.0	1649.0	2358.0	PASS	PASS	PASS	PASS	79.36	562	Yes	Yes		JB
5/14/2007	0	219	1581	2640	0.0	219.0	1581.0	2421.0	PASS	PASS	PASS	PASS	31.11	553	Yes	Yes		JB
5/15/2007	0	221	1614	2684	0.0	221.0	1614.0	2463.0	PASS	PASS	PASS	PASS	31.11	555	Yes	Yes		JB
5/15/2007	0	226	1584	2706	0.0	226.0	1584.0	2480.0	PASS	PASS	PASS	PASS	31.11	561	Yes	Yes		JB
5/16/2007	0	226	1598	2654	0.0	226.0	1598.0	2428.0	PASS	PASS	PASS	PASS	31.11	561	Yes	Yes		JB
5/16/2007	1	236	1617	2580	1.0	236.0	1616.0	2344.0	PASS	PASS	PASS	PASS	79.36	573	Yes	Yes		JB
5/17/2007	0	209	1660	2532	0.0	209.0	1660.0	2323.0	PASS	PASS	PASS	PASS	31.11	540	Yes	Yes		JB
5/17/2007	0	231	1596	2635	0.0	231.0	1596.0	2404.0	PASS	PASS	PASS	PASS	31.11	567	Yes	Yes		JB
5/18/2007	0	208	1630	2630	0.0	208.0	1630.0	2422.0	PASS	PASS	PASS	PASS	31.11	539	Yes	Yes		JB
5/18/2007	2	236	1579	2616	2.0	236.0	1577.0	2380.0	PASS	PASS	PASS	PASS	99.34	573	Yes	Yes		JB
5/21/2007	1	227	1593	2637	1.0	227.0	1592.0	2410.0	PASS	PASS	PASS	PASS	79.36	562	Yes	Yes		JB
5/21/2007	2	200	1585	2563	2.0	200.0	1583.0	2363.0	PASS	PASS	PASS	PASS	99.34	529	Yes	Yes		JB
5/22/2007	1	235	1575	2593	1.0	235.0	1574.0	2358.0	PASS	PASS	PASS	PASS	79.36	572	Yes	Yes		JB
5/22/2007	0	213	1605	2671	0.0	213.0	1605.0	2458.0	PASS	PASS	PASS	PASS	31.11	545	Yes	Yes		JB
5/23/2007	0	203	1623	2656	0.0	203.0	1623.0	2453.0	PASS	PASS	PASS	PASS	31.11	533	Yes	Yes		JB
5/23/2007	1	210	1640	2623	1.0	210.0	1639.0	2413.0	PASS	PASS	PASS	PASS	79.36	542	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	4/16/2007
Serial #:	168043	Serial #:	179861	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.2450	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	75	1	1	0.90	1.10	4238.4	74.72
Beta	0.1254	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	3750	1	1	184.00	13.69	2344.6	68.03

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
5/7/2007	0	198	4174	2652	0.0	198.0	4174.0	2454.0	PASS	PASS	PASS	PASS	12.25	546	Yes	Yes		JB
5/7/2007	0	177	4150	2445	0.0	177.0	4150.0	2268.0	PASS	PASS	PASS	PASS	12.25	518	Yes	Yes		JB
5/8/2007	0	210	4156	2652	0.0	210.0	4156.0	2442.0	PASS	PASS	PASS	PASS	12.25	562	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2360	Detector:	43-93	Calibration Date:	4/16/2007
Serial #:	168043	Serial #:	179861	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.0968	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	N/A	1	1	0.70	0.67	1674.2	46.80
Beta	0.0912	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	N/A	1	1	185.50	11.08	1705.7	50.12

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
5/7/2007	0	182	1735	1967	0.0	182.0	1735.0	1785.0	PASS	PASS	PASS	PASS	31.00	721	Yes	Yes		JB
5/7/2007	0	206	1756	1903	0.0	206.0	1756.0	1697.0	PASS	PASS	PASS	PASS	31.00	765	Yes	Yes		JB
5/8/2007	0	205	1756	1989	0.0	205.0	1756.0	1784.0	PASS	PASS	PASS	PASS	31.00	763	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Counting Instrument:	Ludlum Model 2929	Detector:	Ludlum Model 43-10-1	Calibration Date:	8/9/2007
Serial #:	147736	Serial #:	PR150788	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100				

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.3600	Th-230	5802-7	13,100	7/25/2007	7.54E+04	13,100	20	20	1	0.13	0.07	4717.2	70.57
Beta	0.2050	Tc-99	5803-7	13,900	7/26/2007	2.11E+05	13,900	1000	20	1	64.71	2.51	2851.7	57.99

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
8/14/2007	0	1299	4723	3001	0.0	65.0	4723.0	2936.1	PASS	PASS	PASS	PASS	8.33	147	Yes	Yes		
8/14/2007	0	1289	4704	2870	0.0	64.5	4704.0	2805.6	PASS	PASS	PASS	PASS	8.33	147	Yes	Yes		
8/15/2007	2	1293	4710	2863	0.1	64.7	4709.9	2798.4	PASS	PASS	PASS	PASS	11.29	147	Yes	Yes		
8/15/2007	5	1288	4620	2835	0.3	64.4	4619.8	2770.6	PASS	PASS	PASS	PASS	13.02	147	Yes	Yes		
8/16/2007	2	1372	4701	2925	0.1	68.6	4700.9	2856.4	PASS	PASS	PASS	PASS	11.29	151	Yes	Yes		
8/16/2007	4	1260	4611	2853	0.2	63.0	4610.8	2790.0	PASS	PASS	PASS	PASS	12.52	145	Yes	Yes		
8/17/2007	2	1311	4724	2963	0.1	65.6	4723.9	2897.5	PASS	PASS	PASS	PASS	11.29	148	Yes	Yes		

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 5)

Counting Instrument:	2929	Detector:	43-10-1	Calibration Date:	12/7/2007
Serial #:	171590	Serial #:	174813	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100			NRC 6 Mo Cal. Due Date?	OK

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.3949	Th-230	5648-06	17,300	2/28/2006	7.54E+04	17,300	20	20	1	0.28	0.11	6831.4	93.15
Beta	0.2713	Tc-99	2889-01	18,700	6/14/2006	2.11E+05	18,700	1000	20	1	52.32	2.29	5074.0	76.19

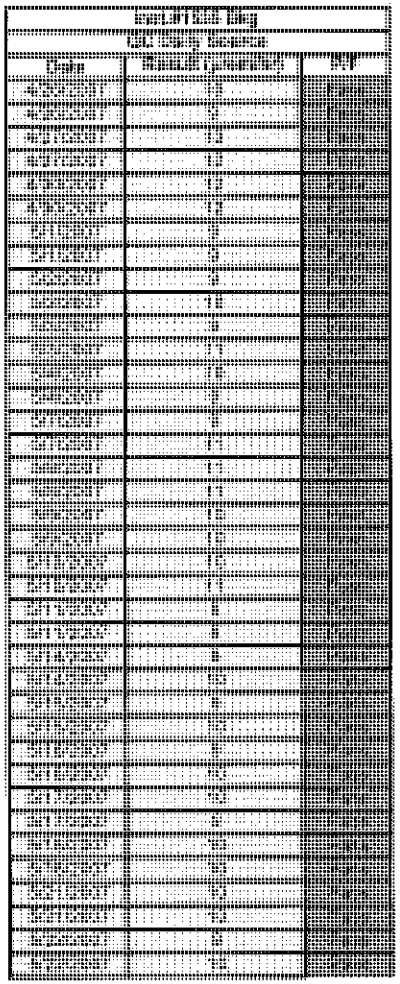
Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
6/12/2007	5	1038	6646	5042	0.3	51.9	6645.8	4990.1	PASS	PASS	PASS	PASS	11.87	101	Yes	Yes		JB
6/12/2007	6	1043	6682	5141	0.3	52.2	6681.7	5088.9	PASS	PASS	PASS	PASS	12.27	101	Yes	Yes		JB
6/13/2007	5	1038	6687	5040	0.3	51.9	6686.8	4988.1	PASS	PASS	PASS	PASS	11.87	101	Yes	Yes		JB
6/15/2007	2	1068	6650	5102	0.1	53.4	6649.9	5048.6	PASS	PASS	PASS	PASS	10.30	102	Yes	Yes		JB
6/15/2007	2	1002	6776	5042	0.1	50.1	6775.9	4991.9	PASS	PASS	PASS	PASS	10.30	99	Yes	Yes		JB
6/19/2007	4	1080	6985	5062	0.2	54.0	6984.8	5008.0	PASS	PASS	PASS	PASS	11.42	102	Yes	Yes		JB
6/19/2007	6	1068	6733	5086	0.3	53.4	6732.7	5032.6	PASS	PASS	PASS	PASS	12.27	102	Yes	Yes		JB
6/20/2007	3	1029	6884	5026	0.2	51.5	6883.9	4974.6	PASS	PASS	PASS	PASS	10.90	100	Yes	Yes		JB
6/20/2007	5	971	6700	4971	0.3	48.6	6699.8	4922.5	PASS	PASS	PASS	PASS	11.87	98	Yes	Yes		JB
6/21/2007	4	1013	6817	4996	0.2	50.7	6816.8	4945.4	PASS	PASS	PASS	PASS	11.42	99	Yes	Yes		JB
6/21/2007	7	995	6747	5101	0.4	49.8	6746.7	5051.3	PASS	PASS	PASS	PASS	12.65	99	Yes	Yes		JB
6/22/2007	6	1032	6783	5001	0.3	51.6	6782.7	4949.4	PASS	PASS	PASS	PASS	12.27	100	Yes	Yes		JB
6/22/2007	9	1041	6694	4994	0.5	52.1	6693.6	4942.0	PASS	PASS	PASS	PASS	13.32	101	Yes	Yes		JB
6/25/2007	5	1069	6656	5034	0.3	53.5	6655.8	4980.6	PASS	PASS	PASS	PASS	11.87	102	Yes	Yes		JB
6/25/2007	3	1027	6721	5055	0.2	51.4	6720.9	5003.7	PASS	PASS	PASS	PASS	10.90	100	Yes	Yes		JB
6/27/2007	4	1092	6710	4999	0.2	54.6	6709.8	4944.4	PASS	PASS	PASS	PASS	11.42	103	Yes	Yes		JB
6/27/2007	3	1082	6747	5066	0.2	54.1	6746.9	5011.9	PASS	PASS	PASS	PASS	10.90	102	Yes	Yes		JB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Counting Instrument:	Ludlum Model 2360	Detector:	Ludlum Model 43-93	Calibration Date:	8/9/2007
Serial #:	193652	Serial #:	PR199836	12 month calibration:	OK
Detector Active Area or Area Covered by Smear (cm^2):	100				

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	$T_{1/2}$ (yr)	Source Decayed Activity	Required MDA (DPM/100cm^2)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Semple Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm
Alpha	0.2340	Th-230	5802-7	13,100	7/25/2007	7.54E+04	13,100	75	1	1	3.00	2.21	3067.8	80.85
Beta	0.1470	Tc-99	5803-7	13,900	7/26/2007	2.11E+05	13,900	3750	1	1	196.20	27.28	2037.5	44.48

Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail				α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	MDA α (dpm)	MDA β (dpm)				
8/14/2007	1	176	3015	2190	1.0	176.0	3014.0	2014.0	PASS	PASS	PASS	PASS	32.70	440	Yes	Yes		
8/14/2007	1	191	3065	2232	1.0	191.0	3064.0	2041.0	PASS	PASS	PASS	PASS	32.70	458	Yes	Yes		
8/15/2007	3	195	3015	2261	3.0	195.0	3012.0	2066.0	PASS	PASS	PASS	PASS	47.26	462	Yes	Yes		
8/15/2007	3	187	3111	2225	3.0	187.0	3108.0	2038.0	PASS	PASS	PASS	PASS	47.26	453	Yes	Yes		
8/16/2007	1	206	3139	2236	1.0	206.0	3138.0	2030.0	PASS	PASS	PASS	PASS	32.70	475	Yes	Yes		
8/16/2007	2	205	3112	2297	2.0	205.0	3110.0	2092.0	PASS	PASS	PASS	PASS	40.94	474	Yes	Yes		



Inst.#1535 Bkg		Source Ser. #	N/A
Initial Source Readings		Nuclide	N/A
Date	Result (µrem/hr)		
4/24/2007	13		
4/24/2007	12		
4/24/2007	13		
4/24/2007	11		
4/24/2007	10		
4/24/2007	9		
4/24/2007	13		
4/24/2007	10		
4/24/2007	11		
4/24/2007	9		
	Average		
	11		

Inst.#1535 Source	
QC Daily Source	
Date	Result (µrem/hr)
4/24/2007	1000
4/24/2007	1100
4/27/2007	1100
4/27/2007	1100
4/28/2007	1000
4/30/2007	1100
5/1/2007	1100
5/3/2007	1000
5/4/2007	1100
5/7/2007	1100
5/7/2007	1000
5/8/2007	1100
5/8/2007	1100
5/9/2007	1100
5/10/2007	1100
5/10/2007	1100
5/11/2007	1100
5/11/2007	1100
5/14/2007	1100
5/14/2007	1100
5/15/2007	1100
5/15/2007	1100
5/16/2007	1100
5/16/2007	1100
5/17/2007	1100
5/17/2007	1100
5/18/2007	1100
5/18/2007	1100
5/21/2007	1100
5/21/2007	1100
5/22/2007	1100
5/22/2007	1100

Inst.#1535 Source		Source Ser. #	1134
Initial Source Readings		Nuclide	Cs-137
Date	Result (µrem/hr)		
4/24/2007	1000		
4/24/2007	1100		
4/24/2007	1100		
4/24/2007	1000		
4/24/2007	1000		
4/24/2007	1100		
4/24/2007	1100		
4/24/2007	1000		
4/24/2007	1100		
4/24/2007	1100		
	Average		
	1060		