MONSANTO

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MONSANTO COMPANY
AGRICULTURAL SECTOR
MYSTIC RESEARCH
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MYSTIC, CONNECTICUT 06355
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Br 2

February 16, 2011

Licensing Assistance Section
Nuclear Materials Safety Branch
US Nuclear Regulatory Commission, Region 1
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: License No. 06-28624-01
Docket No. 030-32126
Control No. ~~574145~~ 574454

**REQUEST FOR LICENSE TERMINATION**

Dear Sir or Madam:

The Monsanto facility in Mystic, Connecticut has ceased all activities involving radioactive materials, and is hereby requesting termination of license number 06-28624-01. Enclosed please find the following materials supporting this request for termination:

1. a completed NRC Form 314, Certificate of Disposition of Materials, signed by Dr. Steven E Reiser, Monsanto Mystic Site Lead,
2. a narrative discussion of the license history pertaining to the decommissioning information requirements in NUREG – 1757, and
3. a copy of the Final Status Survey Report for Monsanto Mystic, prepared by Integrated Environmental Management of Knoxville, Tennessee.

Per NUREG-1757 Vol. 1, Rev. 2 "Consolidated Decommissioning Guidance", Monsanto Mystic is in Decommissioning Group 2 and therefore no decommissioning plan is required.

All licensed materials have been removed from the site, either through decay-in-storage or through removal by licensed radioactive waste contractors. The final status survey results, with no credit taken for the background contributions, showed maximum C-14 counts (gross beta) of 3,740 dpm/100 $cm^2$ for scan measurements, 2,260 dpm/100 $cm^2$ for stationary measurements, and 4.7 dpm/100 $cm^2$ for removable activity. These results are a fraction of the most conservative applicable release criteria of 370,000 dpm/100$cm^2$ as specified in NUREG-1757.

We will retain control over restricted areas at Monsanto Mystic until such time that the license termination process has been completed. Decommissioning records will be retained indefinitely. Please contact me at (860) 572-5246 or Mr. David Miller (Monsanto ES&H Lead) at (860) 572-5255 for any questions or to request additional information.

Sincerely,

Christopher Bonin, Ph.D., Radiation Safety Officer

cc Steven E. Reiser, Ph.D., Monsanto Mystic Site Lead
David P. Miller, Monsanto Mystic ES&H

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

U.S. NUCLEAR REGULATORY COMMISSION

# CERTIFICATE OF DISPOSITION OF MATERIALS

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



| LICENSEE NAME AND ADDRESS | LICENSE NUMBER | DOCKET NUMBER |
|---|---|---|
| Monsanto Company Mystic Research Center<br>62 Maritime Drive<br>Mystic, CT 06355-1958 | 06-28624-01 | 030-32126 |
| | LICENSE EXPIRATION DATE<br>5/31/2012 | |

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

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

## B. DISPOSAL OF RADIOACTIVE MATERIAL

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

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

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

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

☐ a. Transfer of radioactive materials to the licensee listed below:

☑ b. Disposal of radioactive materials:

☑ 1. Directly by the licensee:

**All short-liverd radioactive waste was diposed following appropriate decay-in-storage**

☐ 2. By licensed disposal site:

☑ 3. By waste contractor:

**All long-lived radioactive waste was disposed via a licensed waste contractor**

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

## C. SURVEYS PERFORMED AND REPORTED

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

☑ a. the absence of licensed radioactive materials

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

☑ 2. A copy of the radiation survey results:

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

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

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

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

| NAME | TITLE | TELEPHONE *(Include Area Code)* | E-MAIL ADDRESS |
|---|---|---|---|
| David P. Miller | ES&H | (860) 572-5255 | david.p.miller@monsanto.com |

Mail all future correspondence regarding this license to:

**David P. Miller, Monsanto, 62 Maritime Drive, Mystic, CT 06355-1958**

## C. CERTIFYING OFFICIAL

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

| PRINTED NAME AND TITLE | SIGNATURE | DATE |
|---|---|---|
| Steven E. Reiser, Ph.D., Site Lead | | 2-14-11 |

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



574454

Monsanto Mystic
US NRC License No. 06-28624-01

**Narrative Discussion of Decommissioning Information in 10 CFR 30.35, 30.36, and 30.51**

The NRC Materials License (license number 06-28624-01) for the Mystic site was issued on April 20, 1992. The license allows possession of C-14 ($t_{½}$ = 5730 yr), H-3 ($t_{½}$ = 12.4 yr), S-35 ($t_{½}$ = 87.4 days), P-33 ($t_{½}$ = 25.4 days), and P-32 ($t_{½}$ = 14.3 days). Only P-32 has been extensively used here. P-33 and S-35 were both used on several occasions. For the long-lived isotopes, only C-14 was used from time to time. A small amount of tritium was on site (250 µCi), and was disposed in 2003, but it was never used in research. Records indicate that the cumulative quantity of C-14 and H-3 on site throughout the license period was approximately 1.4 millicuries.

10 CFR 30.35(g)(1) Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site:

**There have been no spills or other unusual occurrences involving the spread of contamination around the facility, equipment, or site.**

10 CFR 30.35(g)(2) As-Built Drawings

**As-built drawings of the facility floor plan are contained in the permanent decommissioning records and are available upon request.**

10 CFR 30.35(g)(3) Lists

(i) All areas designated and formerly designated as restricted areas:

**The following areas were designated as restricted areas at some time during the license period:**

**Room 116,**
**Room 134,**
**Room 135,**
**Room 143,**
**Room 201,**
**Room 202,**
**Room 206, and**
**Room 215.**

(ii) All areas outside of restricted areas that require documentation under 30.35(g)(1):

**No areas outside the restricted areas require documentation under 30.35(g)(1).**

(iii) All areas outside of restricted areas where current and previous wastes have been buried:

**No wastes were buried at the site.**

(iv) All areas outside of restricted areas that contain material such that, if the license expired, the licensee would be required to either decontaminate the area to meet the criteria for decommissioning in 10 CFR part 20, subpart E, or apply for approval for disposal under 10 CFR 20.2002.

**No areas require decontamination to meet the criteria for decommissioning.**

10 CFR 30.36 Notice of Cessation of Licensed Activities:

**Monsanto notified NRC of the decision to cease licensed activities in a letter dated December 21, 2010; as confirmed in a response from NRC dated January 3, 2011. A decommissioning plan is not required.**

10 CFR 30.51(a) Records of Receipt, Transfer and Disposal:

(1) Receipt records

**Receipt records for all radioactive materials possessed or disposed of in the last three years are available upon request.**

(2) Transfer records

**No radioactive materials were transferred to a different licensee.**

(3) Disposal Records

**During the license period all short-lived radioactive waste (P-32, P-33, and S-35) was decayed-in-storage prior to disposal. There were 5 (five) shipments of long-lived radioactive waste for disposal by licensed disposal facilities as follows:**

a. **June 6, 2001: Approximately 500 microcuries C-14 (one drum dry active waste, one drum scintillation vials) was sent to Perma-Fix of Florida via the licensed waste contractor Onyx Environmental Services, New Britain, CT, (860) 223-0550**
b. **August 13, 2001: Approximately 350 microcuries C-14 (one drum mixed waste) was sent to Perma-Fix of Florida via the licensed waste contractor Onyx Environmental Services, New Britain, CT, (860) 223-0550**

c. **April 4, 2003: Approximately 250 microcuries H-3 (one drum mixed waste consisting of one un-opened vial) was sent to Perma-Fix of Florida via the licensed waste contractor Onyx Environmental Services, New Britain, CT, (860) 223-0550**
d. **July 23, 2003: Approximately 5 microcuries Ba-133 (one drum consisting of a radioactive check source from a discarded liquid scintillation counter) was sent to Duratek of Tennessee via the licensed waste contractor Onyx Environmental Services / Veolia, New Britain, CT, (860) 223-0550**
e. **December 10, 2007: Approximately 550 microcuries C-14 (one drum dry active waste, one drum scintillation vials) was sent to Energy Solutions of Tennessee via the licensed waste contractor Triumvirate Environmental, Somerville, MA, (800) 966-9282**

**Records of these disposals will be retained with the decommissioning records.**

10 CFR 30.51(d) Records of Disposal under 20.2002, 20.2003, 20.2004, 20.2005, and 20.2103(b)(4):

**Monsanto did not dispose of any radioactive material under 20.2002, 20.2003, 20.2004, 20.2005, and 20.2103(b)(4).**

IEM

Integrated Environmental Management, Inc.

# Final Status Survey Report for Monsanto Mystic

The Monsanto Company

Report No. 2010024/G-1372

# Final Status Survey Report for Monsanto Mystic

Submitted to:

***Monsanto Company***
62 Maritime Drive
Mystic, Connecticut 06355
(860) 572-5255

by:

***Integrated Environmental Management, Inc.***
6700 Baum Drive, Suite 19
Knoxville, Tennessee 37919
(865) 588-9180

Report No. 2010024/G-1372
January 20, 2011

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# 11 APPENDICES

# 1 INTRODUCTION

This Final Status Survey Report (FSSR) for the Mystic Research Center (previously DEKALB Genetics) was prepared for the Monsanto Company (Monsanto). At the Mystic facility, agricultural biotechnology research and development using radionuclides for plant molecular biology research was performed. The facility was built and first occupied in 1992, at which time a research and development license from the U. S. Nuclear Regulatory Commission (USNRC) was secured. License No. 06-28624-01 authorizes possession and use of Hydrogen-3 (H-3), Carbon-14 (C-14), Phosphorus-32 (P-32), Phosphorus-33 (P-33) and Sulfur-35 (S-35) throughout the facility, although radionuclide use was confined to specific restricted areas in the Laboratory Building and the Headhouse. Throughout the license period, the primary isotope in use was P-32 in millicurie quantities, with the remainder used to a minimal degree or not at all.

Research with licensed radioactivity recently ceased at the site, thus Monsanto wishes to terminate License No. 06-2864-01. Pursuant to the flow chart in NUREG-1757, Monsanto *did not* possess sealed sources only, routine surveys indicated that residual contamination in the restricted areas is *less than* the screening values, and a decommissioning plan *is not* required by license condition.[1] Therefore, the appropriate decommissioning group for the Monsanto license is Group 2.

Also pursuant to NUREG-1757, one requirement for a Group 2 license termination is to perform a final status survey to demonstrate that residual radioactivity in the restricted areas where licensed radioactivity was used is acceptable for release for unrestricted use (i.e., without regard for radiological constituents).[2] Integrated Environmental Management, Inc. (IEM), a licensed radiological services firm, was contracted by Monsanto to perform and document the final status surveys of the various restricted areas at the Mystic Research Facility.

This FSSR describes the approach used to demonstrate the release status of the restricted areas. Included herein is a description of the organization that performed the work on Monsanto's behalf, the survey objectives and methodologies, quality control requirements, and how the data acquired were handled and reported. Representatives of Monsanto were given an opportunity to review a draft before the publication of this FSSR.

[1] U. S. Nuclear Regulatory Commission, NUREG-1757, "Consolidated Decommissioning Guidance", Vol. 1, Rev. 2, Figure 1.1, "Determining the Appropriate Decommissioning Group".

[2] NUREG-1757, Table 1.2, "Principal Regulatory Features of Decommissioning Groups".

# 2 FACILITY STATUS

## 2.1 Description of Facility

The Laboratory Building consists of offices and other administrative areas, laboratories and equipment rooms, and storage rooms. The areas of concern in the Laboratory Building are Rooms 201, 202, 206, 215, 116, 134, and 135. The Headhouse building is contiguous with the Laboratory Building and includes additional administrative areas, laboratories, and growth chambers. In the Headhouse, the only restricted area is Room 143.

Rooms 143, 201, 202, and 215 are the primary rooms in which activities using radioactive materials were conducted. The rooms contain lab benches and cabinets, research equipment, freezers, and sinks. There are no floor drains in the labs and the RSO reports that there were no spills. Chemical fume hoods were not used for isotope work except for the Room 206 hood, which is equipped with a HEPA filter and was used on several occasions for transferring aliquots of S-35.

Activities using radioactive materials were also conducted in the additional rooms previously noted, but to a lesser degree. Rooms 134 and 135 were used for the storage of radioactive material (i.e., staging for disposal as radioactive waste, or delay-for-decay storage pending conventional disposal).

Over the course of the license period, a room or portion of a room was typically designated as a restricted area for research involving radioisotopes. Most of the designated areas described below served as hot labs since the issue of License No. 06-28624-01 (see Appendix 11.1 for the configuration of each survey area):

| Building | Room (Survey Unit ID) | Floor Dimensions ($ft^2$) | Activity Performed | Equipment Used |
|---|---|---|---|---|
| Laboratory | 116 | 99.0 | Plant biotechnology research, including Southern blots, northern blots and restriction fragment length polymorphism assays | Pipettes, centrifuges, gel electrophoresis apparatus, imaging equipment, refrigerated storage and solid and liquid waste containers. |
| | 201 | 360.6 | | |
| | 202 #1 | 537.5 | | |
| | 202 #2 | 537.5 | | |
| | 215 E | 537.5 | | |
| | 215 W | 537.5 | | |
| | 206 | 537.5 | | Same as above plus a chemical fume hood for opening S-35 vials. |
| | 134 | 51.0 | Waste storage/staging area | None |
| | 135 | 51.0 | | |
| Headhouse | 143 | 184.8 | Plant biotechnology research, including Southern blots, northern blots and restriction fragment length polymorphism assays | Pipettes, centrifuges, gel electrophoresis apparatus, imaging equipment, refrigerated storage and solid and liquid waste containers. |

## 2.2 Contaminant Identification

USNRC License No. 06-28624-01 authorizes the possession, use, storage and disposal of various amounts of H-3, C-14, P-32/33 and S-35. All radioactive waste containing C-14 was disposed of via a waste vendor on December 10, 2007. One order was placed for an H-3-labeled compound, which was never opened and disposed of on April 4, 2003. Because the half-lives for P-32, P-33 and S-35 are short (i.e., 14.3, 25.3 and 87.4 days, respectively), any residual radioactivity present at the time operations with these isotopes ceased have decayed to negligible levels. Therefore, the Radionuclide of Concern (ROC) for the final status surveys is C-14 only.

There are also a number of generally-licensed or exempt-quantity sealed radiation sources present at the site. The following is a listing of each and their activity at the time of purchase:

| Description | Number | Initial Activity (µCi) | Radionuclide |
|---|---|---|---|
| Expired LSC Standard | 2 | 1 | H-3 |
| Expired LSC Standard | 1 | 1 | C-14 |
| Current LSC Standard | 1 | 0.2 | H-3 |
| Current LSC Standard | 1 | 0.1 | C-14 |
| Victoreen Model 190 G-M Detector internal check source | 6 | <1 | Cs-137 |
| Wallac 1409 LSC counter internal check source | 1 | 20 | Eu-152 |
| Expired NRD LLC "Staticmaster" static eliminator | 4 | 500 | Po-210 |

These sources, all of which are exempt from leak testing on the basis of activity, remain at the Mystic facility for in-house use or possible transfer elsewhere at some time in the future, with the record of disposition to be captured in the decommissioning file at that time. For the purposes of this report, however, the sealed radiation sources will not be considered further.

## 2.3 Results of Previous Surveys

During periods of use, routine contamination surveys were performed within the restricted areas as part of the Monsanto radiation protection program. All results were reported to be negative for residual radioactivity above a nominal 100 dpm/100 $cm^2$. Copies of the routine survey reports are being maintained by the RSO.

# 3 PROJECT OVERVIEW

## 3.1 Project Organization

The on-site portion of the final status survey was performed by Michael W. Kimbro. Mr. Kimbro served as the Project Manager and coordinated all project activities. Supporting Mr. Kimbro as the Project CHP and providing technical review of all deliverables was Carol D. Berger. Quality assurance input to the project was provided by IEM's Quality Assurance Officer, Cathryn Chang. Appendix 11.2 contains the resumes of the project team members. Appendix 11.3 contains the Field Activity Daily Logs for the on-site portion of the project.

Since License No. 06-28624-01 does not clearly authorize decommissioning, all of the on-site work was performed under the terms/conditions of IEM's radioactive material license (License No. MD-31-281-01 issued by the Maryland Department of the Environment). Reciprocal recognition of that license was received from the USNRC for the on-site portion of the work. Under the terms of the license, Mr. Kimbro served as the Project RSO and directed all work to ensure the radiation safety of all participants and observers during performance of the surveys.

## 3.2 Approach

The restricted areas in the Laboratory Building and the Headhouse were designated Class 1 survey units based upon contamination potential (i.e., previous use conditions). A total of 10 Class 1 survey units were designated in light of the 100 square-meter area limitation for indoor areas, regardless of continuity.

The final status survey included a combination of direct scans and stationary measurements for total (fixed plus removable) residual radioactivity using hand-held radiation detectors (i.e., alpha/beta scintillation detectors for measurement of equipment and walls, and a gas flow proportional counter with a large area probe for the floors) as described further in the following chapters. In addition, removable activity was assessed by collecting polyfoam smears (1.5-inch diameter) over the surface of concern, with each smear analyzed by the methodology of liquid scintillation. The assessment areas within each survey unit included the floors, walls up to a height of two (2) meters, bench tops, drawers, and various laboratory equipment.

# 4 RELEASE CRITERIA

## 4.1 Applicable Regulations

The Monsanto Company is currently licensed by the USNRC to possess the radioactivity of concern in the Laboratory Building and the Headhouse restricted areas. The USNRC established criteria for ensuring that facilities and property that were used for licensed operations presented negligible radiological risk to people and the environment once licensed operations cease. The radiation dose limit that the USNRC believed to present negligible risk is published in Title 10, Code of Federal Regulations, Part 20.1402:

> *"Decommissioning with license termination shall be limited to sites considered acceptable for unrestricted release where the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent to an average member of the critical group that does not exceed twenty-five millirem per year (25 mrem/yr), including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA)..."*

The level of residual radioactivity permissible in the Mystic facility restricted areas that would ensure compliance with USNRC's radiation dose objective may be determined by means of an exposure assessment. If the level of residual radioactivity in any of the survey units is less than the derived criteria from the exposure assessment, then they may be released for unrestricted use and the USNRC license terminated. These derived criteria are called Derived Concentration Guideline Levels or DCGLs[3]. However, the use of site-specific DCGLs for release of a site for unrestricted use requires regulatory approval of the exposure assessment methodology, assumptions and input parameters.

The USNRC has also prepared tables of screening criteria for reuse of facilities (structures) via exposure assessments that rely on highly conservative assumptions and parameters. These can be found in Tables H.1 and H.2 of NUREG-1757, Volume 2 and Tables 5.19 and 6.91 of NUREG 5512, Volume 3, respectively. If used in the place of site-specific DCGLs, the USNRC maintains the end result will be amply protective of human health and safety, thus regulatory approval for their use is not required.[4,5]

## 4.2 Derived Concentration Guideline Levels (DCGLs)

An analysis of the decommissioning flow chart shown in NUREG-1757, in light of existing information about the restricted areas at the Mystic Research Center shows that the decommissioning should follow a "Group 2" process since residual radioactivity potential is thought to be a small fraction of the aforementioned screening values. In addition, residual radioactivity on room surfaces was assumed to be surficial and non-volumetric. Because of previous general

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[3] U.S. Nuclear Regulatory Commission, Multi-agency Radiation Survey and Site Investigation Manual, NUREG-1575, Revision 1, August, 2000.

[4] U.S. Nuclear Regulatory Commission, *Consolidated Decommissioning Guidance Characterization, Survey, and Determination of Radiological Criteria*, Appendix H, NUREG 1757, Volume 2, Rev 1, September, 2006.

[5] U.S. Nuclear Regulatory Commission, *Residual Radioactive Contamination From Decommissioning - Parameter Analysis*, NUREG 5512, Volume 3, Draft, October, 1999.

laboratory cleaning practices, residual activity was likely to be fixed to the surfaces, rather than loose. Consequently, the fraction of removable activity was likely to be less than 10% of the total activity. The following are thus the applicable NUREG-1757 screening values:

- C-14 surface activity (fixed plus removable) - 3,700,000 dpm/100 $cm^2$
- C-14 surface activity (removable) - 370,000 dpm/100 $cm^2$

In order to ensure an element of conservatism in the final status survey process, the more limiting removable activity limit of 370,000 dpm/100 $cm^2$ was selected as the DCGL and used as input to the survey design and for comparison of data.

# 5 OBJECTIVES

## 5.1 Data Quality Objectives

The type and quantity of data obtained during the final status survey of the Mystic facility restricted areas were identified. In order to demonstrate to a reasonable degree of scientific certainty that the surfaces inside these areas may be released for unrestricted use, the following are the Data Quality Objectives (DQOs) for the project:

- Impacted areas are classified by contamination potential as Class 1.
- Statistical testing is based on the null hypothesis, which states that the residual radioactivity in the survey unit exceeds the dose-based DCGLs.
- The upper bound of the gray region is defined as the DCGL, and the lower bound of the gray region (LBGR) is adjusted for optimization purposes. For survey design purposes, the LBGR will be taken as "zero" before optimization efforts.
- The Type I decision error is defined as the probability of passing a survey unit that should fail. The Type II decision error is defined as the probability of failing a survey that should pass. Probability limits of 0.05 are assigned for both decision errors.
- The standard deviation is estimated for survey planning, but will be validated after assessment of the survey data.
- The relative shift is set at 1.5 for Class 1 survey units.
- The detection sensitivity for all measurement methods (i.e., scans, direct measurements and sample analysis) is less than or equal to the action limit of 370,000 dpm/100 $cm^2$ for low-energy beta emitters. For this project, the methods and procedures will be driven by instrument detection sensitivity.
- The minimum number of static measurements to be collected in a systematic pattern for Class 1 survey units is 18 when radionuclides present are not found in the background, as is the case for the Mystic facility restricted areas. This number may have been increased if small areas of elevated residual radioactivity were identified during the acquisition of data. The percent of scanning coverage for the Class 1 areas is 100%.
- The documentation requirements for the survey, including survey planning documentation, ensured support for the decision as to whether or not each survey unit met the applicable DCGLs.

Data acquired during the implementation of this final status survey was reviewed as shown in Chapter 8, below, to ensure they provide applicable and defensible support for the aforementioned DQOs.

### *5.2 Number of Measurements*

The number of stationary measurements made within each survey unit, as determined from the guidance set forth in MARSSIM, was 18 discrete and unique measurements. Greater than 18 reference measurements over similar materials are also required. Reference (background) measurements are found in Appendix 11.4 and summarized in Table 10.1.

# 6 INSTRUMENTATION

In general, the radiation detection instruments used for the Mystic facility final status surveys was selected and operated according to the type of analysis being performed, and to ensure sensitivities were sufficient to detect the contaminants of interest at pre-specified minimum detection requirements.

## 6.1 Selection Criteria

The selection of radiation detectors depended upon the type of survey, surface contour and survey area size. For all gross beta wall and equipment measurements, a 100 square centimeter alpha/beta scintillation detector (i.e., Ludlum Model 2224 with the Ludlum 43-89 detector) was used for both direct measurements and scans. For the floors, a large area gas flow proportional detector (i.e., Ludlum Model 2224 with the Ludlum 43-37 probe) was used.

All portable instruments were calibrated by a licensed commercial calibration service using National Institute of Standards and Technology (NIST) traceable sources and calibration equipment. Instrument calibrations include:

- high voltage calibration;
- discriminator threshold calibration;
- window calibration;
- alarm operation, verification;
- scaler calibration verification.

The calibration of the detectors include:

- operating voltage determination;
- calibration constant determination; and
- dead time correction determination.

Copies of the daily instrument checks and the calibration records are included in Appendix 11.5. Table 10.2 contains the nominal detection limits for each instrument. Appendix 11.4 shows the background count rates for various surface material types, which is summarized in Table 10.1.

## 6.2 Radiation Sources

All radiation sources used for on-site daily checks or efficiency determinations were representative of the instrument's response to the ROCs and traceable to NIST. The use and storage of the radiation sources used for instrument response checks and efficiency determination were controlled throughout the on-site portion of the project.

## 6.3 Response Checks

Periodic instrument response checks were conducted to assure constancy in instrument response, to verify the detector is operating properly, and to demonstrate that the measurement results are not

the result of detector contamination or failure. Instrument response was checked each day before the instrument is used. The check sources were used to duplicate the same type of radiation that is being measured with the particular instrument using a specified source-detector alignment that can be easily repeated.

### 6.4 Minimum Detectable Activity

Minimum Detectable Activity (MDA) is defined as the smallest amount or concentration of radioactive material that will yield a net positive count with a 5% probability of falsely interpreting background responses as true activity. The MDA is dependent upon count times, geometry, sample size, detector efficiency, background, and for scanning the scanning rate and the efficiency of the surveyor[6]. Experimental nominal detection sensitivities were calculated using the guidance in NUREG-1507. Actual MDAs were established at the project location once site-specific background levels were determined.

The MDA requirement for direct measurements, surface scans and removable activity measurements were set at 50% or less of the DCGL. Since the MDAs for scanning were well less of the applicable DCGL, the scanning MDAs did not effect the number of measurements or samples required to evaluate a specific survey unit for compliance with release criteria.

#### 6.4.1 Direct Gross Beta and Low-energy Beta Measurements

The equation used for calculating the MDA for direct gross beta and low-energy beta measurements is:

$$MDA = \frac{\frac{2.71}{t_s} + 3.29\sqrt{\frac{R_b}{t_s} + \frac{R_b}{t_b}}}{E \times \frac{A}{100}}$$

where MDA = Minimum detectable activity (dpm/100 $cm^2$), Rb = Background count rate (cpm), $t_b$ = Background count time (minutes), $t_s$ = Sample count time (minutes), A = Detector area ($cm^2$), and E = Detector efficiency (counts/disintegration).

#### 6.4.2 Gross Beta Scans

The equation used for calculating the MDA for beta scans ($MDA_{SCAN}$) is:

$$MDA_{SCAN} = \frac{d' \times \sqrt{b_i} \times \frac{60}{i}}{E_i \times E_S \times \sqrt{p} \times \frac{A}{100}}$$

where MDA = Minimum detectable activity (dpm/100$cm^2$), d' = Decision error taken from Attachment 2. (Assumed to be 1.38 from MARSSIM Table 6.5), I = Observation counting interval (scan speed divided by detector width), $b_I$ = Background count per observation interval, $E_I$ =

[6] U.S. Nuclear Regulatory Commission, *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*, NUREG/CR-1507, December, 1997.

Detector efficiency, $E_s$ = Surface efficiency, p = Surveyor efficiency (Assumed to be 50%), and A = Detector area ($cm^2$).[7,8]

[7] ISO-7503 recommends using a surface efficiency based on the type of radiation and radiation energy in the absence of experimentally derived values. A surface efficiency of 0.25 is recommended for alpha radiation and beta radiation with a maximum beta energy between 150 keV and 400 keV.

[8] International Organization for Standardization (ISO), *Evaluation of Surface Contamination*, ISO 7503, 1988.

# 7 PROCEDURE

The purpose of the final status survey was to collect sufficient data to support release of the laboratories for unrestricted use in accordance with guidance established by the USNRC. Specifically, the following general approach was used:

- Survey instrumentation was set up and response-checked to ensure proper operation.
- The Project Manger performed preliminary inspections of the areas to identify additional specific survey requirements.
- The facility was cleared of all loose equipment and materials to the maximum extent possible.
- The Project Manager developed survey packages for the survey areas.
- The Project Manager made survey measurements and analyzed samples using appropriate calibrated instruments and performed daily source and background checks before and after each day's work.
- Direct survey data collected during the project was recorded on survey maps prepared for each survey area.

The Project Manager and Project CHP reviewed the completed survey packages to verify that all required surveys have been performed and identified any areas exceeding the specific release criteria (none). This review also confirmed that the data has been recorded consistently and in a manner suitable for inclusion in this final status survey report.

## 7.1 Surface Scans

For each survey unit, gross beta scans were be performed over 100% of the accessible building surfaces (floors, benchtops, and walls up to two meters) using a alpha/beta scintillation detector and agas flow proportional detector, while listening to the audible output of the instrument.[9] Scans were designed to detect small areas of elevated residual radioactivity that may not be detected by the static measurements.

The detector was maintained within one (1) centimeter of the surface and scan speeds of five (5) centimeters per second were established and maintained such that contamination at levels of less than 50% of the DCGL were detectable. The scanning speed was determined based on the detection sensitivity of the instrument being used No locations of elevated direct activity were detected.

## 7.2 Stationary Beta Survey Measurements

Stationary gross beta measurements were performed on the structural surfaces of each survey unit. Measurements were conducted by integrating the total counts over a one (1) minute count time. Systematic measurement locations were determined following the guidance found in the MARSSIM.

[9] Although no alpha-emitting radiation sources were ever used at the Mystic facility, the instrumentation used for the surveys acquires both alpha and beta information simultaneously.

### *7.3 Removable Beta Activity Measurements*

Smears for removable radioactivity were acquired at each direct measurement location and analyzed for low energy beta radiation by liquid scintillation counting. This analysis ensured the detection of radioactivity at the action level of 370,000 dpm/100cm$^2$.

# 8 DATA HANDLING

## 8.1 Data Assessment

Once all surveys were complete, the data were evaluated to ensure that the residual radioactivity on building surfaces is less than the applicable DCGL.

## 8.2 Data Validation

The survey data were reviewed to verify that they are authentic, appropriately documented and technically defensible. The following requirements were confirmed:

- The instruments used to collect the data were capable of detecting the radiation of interest at or below the DCGL and less than 0.5 DCGL for the survey unit;
- The calibration of the instruments used to collect the data too place less than twelve months prior;
- Instrument response was checked with satisfactory results before the instrument was used;
- The MDAs and assumptions used to develop them were appropriate for the instruments and the survey methods used to collect the data;
- The final survey data set consisted of qualified measurements that were representative of the current facility status and collected as prescribed by the survey design; and
- The data were properly recorded.

No discrepancies were identified during the data review, thus the data set was deemed valid by both the Project Manager and the Project CHP.

# 9 RESULTS

## 9.1 Measurement Summary

The scan results for each survey unit are summarized in Table 10.3. Appendix 11.6 contains a listing of the stationary activity measurements and Table 10.4 contains a summary. Appendix 11.6 also contains a listing of the removable activity results.[10] Appendix 11.1 contains the individual survey packages and Appendix 11.7 contains the Certificate of Analysis from the off-site analytical laboratory. The following is a summary of these data over all survey units, with no credit taken for the background contributions:

- Maximum scan measurement result (gross beta) - 3,740 dpm/100 $cm^2$
- Maximum stationary measurement result (gross beta) - 2,260 dpm/100 $cm^2$
- Maximum removable C-14 activity (gross beta) - 4.7 dpm/100 $cm^2$

For all measurement types, even when background is included, no single result approached the DCGL of 370,000 dpm/100 $cm^2$ and all MDAs were well-below 50% of the DCGL.

## 9.2 Conclusions

On December 15 and 16, 2010, a final status survey of the radiologically restricted areas of the Monsanto Mystic Research Center was performed. The instruments and survey methodologies used were consistent with standard industry practice, with all results and supporting documentation included herein as attachments. All data quality objectives were met and the survey results reflect residual radioactivity that is well-below a fraction of the DCGL. Therefore, subject to regulatory approval, the Mystic Research Facility may be released for unrestricted use.

[10] The analytical methodology used for the smears automatically reports H-3 results along with the C-14 results. Therefore, both the data listing in Appendix 11.6 and the Certificates of Analysis in Appendix 11.7 reflect H-3 results, all of which are not distinguishable from the normal background activity of this radionuclide.

# *10 TABLES*

## Table 10.1 - Radiation Backgrounds for Selected Material Types

| Surface Type | Measurement Location | Average Background (cpm) |
|---|---|---|
| Ambient air (for metal and wood) | Laboratory Building 212 | 269 |
| Benchtops | Laboratory Building 212 | 249 |
| Cinder Block | Laboratory Building 212 | 374 |

## Table 10.2 - Survey Instrument Detection Limits

| Detector Model | Surface Type | Measurement Background (cpm)(1) | Detector Efficiency (c/dis)(2) | Scan Sensitivity (dpm/100cm$^2$) | |
|---|---|---|---|---|---|
| | | | | Scanning | Fixed |
| Floor Monitor | Tile Floor | 678±8.7 | 0.19 | 1,621 | 1,214 |
| 43-89 | Ambient air | 269±7.8 | 0.10 | n.a. | 766 |
| | Benchtop | 249±19.9 | | 4,771 | 737 |
| | Cinder Block | 374±22 | | 5,847 | 902 |

(1) Average of each individual type of material.
(2) Average of the daily efficiencies over the course of the survey effort.

## Table 10.3 - Scan Results

| Room Number | Scanning MDA (dpm/100 cm²) | Highest Scan Readings on Floor or Other Surface dpm/100 cm² | Results Greater than DCGL? |
|---|---|---|---|
| 201 | 5,847 | (1) | No |
| 202 (#2) | 5,847 | (1) | No |
| 202 (#1) | 5,847 | (1) | No |
| 206 | 5,847 | (1) | No |
| 135 | 5,847 | (1) | No |
| 134 | 5,847 | (1) | No |
| 143 | 5,847 | (1) | No |
| 116 | 5,847 | (1) | No |
| 215E | 5,847 | (1) | No |
| 215W | 5,847 | (1) | No |

(1) Not distinguishable from background (i.e., less than 3,740 cpm/100 cm²).

## Table 10.4 - Stationary (Static) Count Results

| Room No. | No. of Measurements | MDA (dpm) | Maximum Beta Activity (dpm) | Exceed DCGL? |
|---|---|---|---|---|
| 201 | 18 | 783 | 1100 | No |
| 202(#1) | 18 | 783 | 540 | No |
| 202(#2) | 18 | 783 | 2260 | No |
| 206 | 18 | 783 | 1170 | No |
| 134 | 18 | 793 | 860 | No |
| 135 | 18 | 793 | 1310 | No |
| 143 | 18 | 793 | 890 | No |
| 116 | 19 | 793 | 1680 | No |
| 215E | 18 | 793 | -10 | No |
| 215W | 18 | 793 | -50 | No |

1 - Survey results for all surfaces in the building were all below the applicable DCGL of 370,000 dpm/100 $cm^2$. See Appendix 11.6 for results.
2- Each static count was accumulated for one (1) minute.

# *11 APPENDICES*

# Appendix 11.1 - Survey Packages

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-1



12/15/10 1300

| | | | |
|---|---|---|---|
| Instrument/SN: Lud 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: / Time: |
| Instrument/SN Lud 43-89 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 201 | |
| Instrument/SN Ludlum 2224 #170347 w/ 43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

Area: Room 201

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 3.0772 | 2.4106 | 0.0000 | Systematic | Floor | 3.0772 | 2.4106 |
| 10.3156 | 2.4106 | 0.0000 | Systematic | Floor | 10.3156 | 2.4106 |
| 17.5540 | 2.4106 | 0.0000 | Systematic | Floor | 17.5540 | 2.4106 |
| 6.6964 | 8.6792 | 0.0000 | Systematic | Floor | 6.6964 | 8.6792 |
| 13.9348 | 8.6792 | 0.0000 | Systematic | Floor | 13.9348 | 8.6792 |
| 3.0772 | 14.9479 | 0.0000 | Systematic | Floor | 3.0772 | 14.9479 |
| 10.3156 | 14.9479 | 0.0000 | Systematic | Floor | 10.3156 | 14.9479 |
| 17.5540 | 14.9479 | 0.0000 | Systematic | Floor | 17.5540 | 14.9479 |
| 6.6452 | 0.0000 | 4.4206 | Systematic | Wall 4 | 11.8548 | 4.4206 |
| 13.8836 | 0.0000 | 4.4206 | Systematic | Wall 4 | 4.6164 | 4.4206 |
| 18.5000 | 2.6220 | 4.4206 | Systematic | Wall 3 | 16.8780 | 4.4206 |
| 18.5000 | 9.8604 | 4.4206 | Systematic | Wall 3 | 9.6396 | 4.4206 |
| 18.5000 | 17.0988 | 4.4206 | Systematic | Wall 3 | 2.4012 | 4.4206 |
| 13.6628 | 19.5000 | 4.4206 | Systematic | Wall 2 | 13.6628 | 4.4206 |
| 6.4244 | 19.5000 | 4.4206 | Systematic | Wall 2 | 6.4244 | 4.4206 |
| 0.0000 | 18.6860 | 4.4206 | Systematic | Wall 1 | 18.6860 | 4.4206 |
| 0.0000 | 11.4475 | 4.4206 | Systematic | Wall 1 | 11.4475 | 4.4206 |
| 0.0000 | 4.2091 | 4.4206 | Systematic | Wall 1 | 4.2091 | 4.4206 |

• 18 data points laid out according to MARSSIM protocols. Locations determined by Visual Sample Plan program in a systematic triangular pattern.

• 1-minute direct measurements taken for gross $\beta^-$

• 100% scans of floor benchtops, and walls < 2 meters detects No activity > bkg.

• Smears taken @ each data point location for liquid scintillation counting. SEE LSC print-out for smear results.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

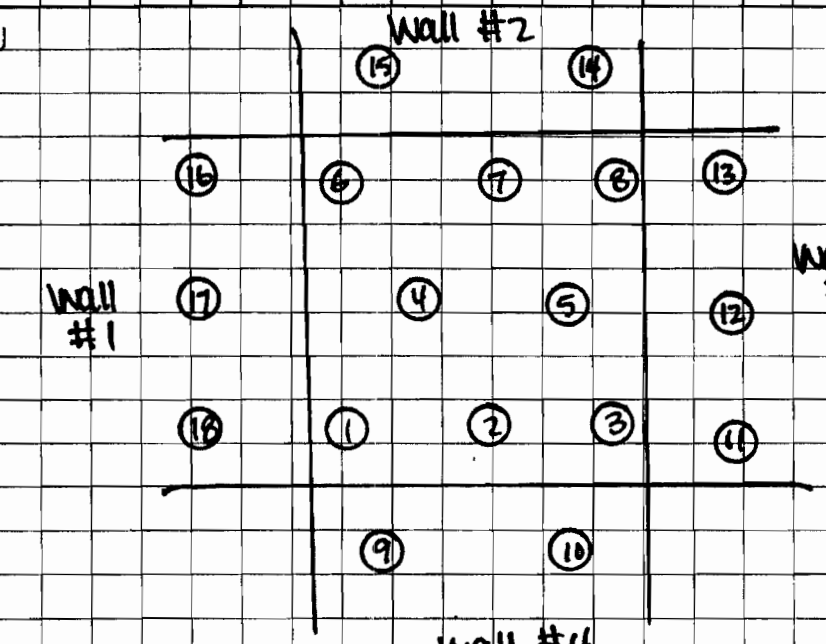
Survey Number 2010024.01-1



| | | | |
|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 12/15/10 Time: 1300 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Rm 201 | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

| | Gross counts/min | Material | Counts |
|---|---|---|---|
| 1 | 1 | bench top | 242 |
| 2 | 2 | floor tile | 248 |
| 3 | 3 | ↓ | 272 |
| 4 | 4 | bench top | 257 |
| 5 | 5 | floor tile | 294 |
| 6 | 6 | ↓ | 282 |
| 7 | 7 | | 280 |
| 8 | 8 | ↓ | 297 |
| 9 | 9 | drywall | 240 |
| 10 | 10 | glass | 265 |
| 11 | 11 | drywall | 244 |
| 12 | 12 | ↓ | 268 |
| 13 | 13 | ↓ | 233 |
| 14 | 14 | 1/3 hood | 251 |
| 15 | 15 | drywall | 298 |
| 16 | 16 | cinder block | 369 |
| 17 | 17 | ↓ | 374 |
| 18 | 18 | ↓ | 366 |

(1-minute direct)




• All wall measurements taken @ a height of 4'5"

• Map is not to scale. See page 1 for location coordinates.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-2



| | | | | |
|---|---|---|---|---|
| Instrument/SN: Ludlum 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/15/10 | Time: 1400 |
| Instrument/SN Ludlum 4389 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 202 (survey unit #2) | | |
| Instrument/SN Ludlum 2224 #170347 w/ 43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [illegible] | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | | |

Area: Room 202 part2

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 1.7043 | 0.0728 | 0.0000 | Systematic | Floor | 1.7043 | 0.0728 |
| 7.6599 | 0.0728 | 0.0000 | Systematic | Floor | 7.6599 | 0.0728 |
| 4.6821 | 5.2305 | 0.0000 | Systematic | Floor | 4.6821 | 5.2305 |
| 10.6378 | 5.2305 | 0.0000 | Systematic | Floor | 10.6378 | 5.2305 |
| 1.7043 | 10.3883 | 0.0000 | Systematic | Floor | 1.7043 | 10.3883 |
| 7.6599 | 10.3883 | 0.0000 | Systematic | Floor | 7.6599 | 10.3883 |
| 4.6821 | 15.5460 | 0.0000 | Systematic | Floor | 4.6821 | 15.5460 |
| 10.6378 | 15.5460 | 0.0000 | Systematic | Floor | 10.6378 | 15.5460 |
| 1.7043 | 20.7037 | 0.0000 | Systematic | Floor | 1.7043 | 20.7037 |
| 7.6599 | 20.7037 | 0.0000 | Systematic | Floor | 7.6599 | 20.7037 |
| 1.1012 | 0.0000 | 4.5585 | Systematic | Wall 4 | 11.3988 | 4.5585 |
| 7.0569 | 0.0000 | 4.5585 | Systematic | Wall 4 | 5.4431 | 4.5585 |
| 12.5000 | 0.5125 | 4.5585 | Systematic | Wall 3 | 20.9875 | 4.5585 |
| 12.5000 | 6.4681 | 4.5585 | Systematic | Wall 3 | 15.0319 | 4.5585 |
| 12.5000 | 12.4237 | 4.5585 | Systematic | Wall 3 | 9.0763 | 4.5585 |
| 12.5000 | 18.3794 | 4.5585 | Systematic | Wall 3 | 3.1206 | 4.5585 |
| 9.6650 | 21.5000 | 4.5585 | Systematic | Wall 2 | 9.6650 | 4.5585 |
| 3.7094 | 21.5000 | 4.5585 | Systematic | Wall 2 | 3.7094 | 4.5585 |

- 18 data points laid out according to MARSSIM protocals. Locations determined by Visual Sample Plan program in a systematic triangular pattern.
- 1-minute direct measurements taken for gross β

- 100% scans of floor, benchtops, and walls < 2 meters detects no activity > bkg.

- Smears taken @ each data point location for liquid scintillation counting. SEE LSC print-out for smear results.

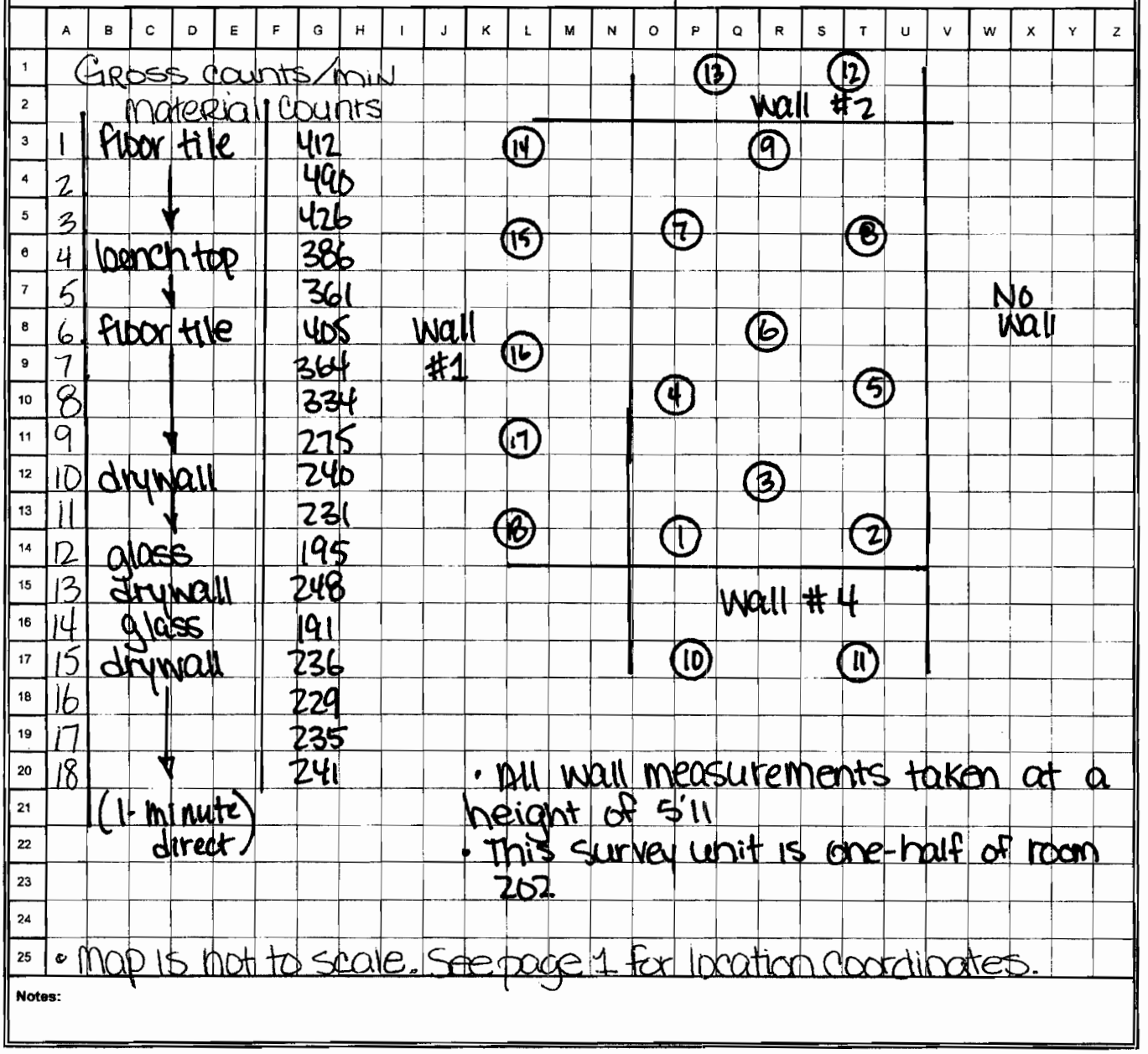
Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-2



| | | | | | |
|---|---|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 12/15/10 | Time: 1400 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Rm 202 (unit #2) | | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | | |




Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01 - 3



| | | | | |
|---|---|---|---|---|
| Instrument/SN: Ludlum 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/15/10 | Time: 1500 |
| Instrument/SN Ludlum 43-89 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 202 (Survey Unit #1) | | |
| Instrument/SN Ludlum 2224 #170347 w/ 43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [illegible] | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | | |

Area: Room 202 part 1

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 3.3762 | 1.2027 | 0.0000 | Systematic | Floor | 3.3762 | 1.2027 |
| 9.3260 | 1.2027 | 0.0000 | Systematic | Floor | 9.3260 | 1.2027 |
| 0.4012 | 6.3554 | 0.0000 | Systematic | Floor | 0.4012 | 6.3554 |
| 6.3511 | 6.3554 | 0.0000 | Systematic | Floor | 6.3511 | 6.3554 |
| 12.3010 | 6.3554 | 0.0000 | Systematic | Floor | 12.3010 | 6.3554 |
| 3.3762 | 11.5082 | 0.0000 | Systematic | Floor | 3.3762 | 11.5082 |
| 9.3260 | 11.5082 | 0.0000 | Systematic | Floor | 9.3260 | 11.5082 |
| 0.4012 | 16.6609 | 0.0000 | Systematic | Floor | 0.4012 | 16.6609 |
| 6.3511 | 16.6609 | 0.0000 | Systematic | Floor | 6.3511 | 16.6609 |
| 12.3010 | 16.6609 | 0.0000 | Systematic | Floor | 12.3010 | 16.6609 |
| 5.9378 | 0.0000 | 5.3809 | Systematic | Wall 4 | 6.5622 | 5.3809 |
| 11.8877 | 0.0000 | 5.3809 | Systematic | Wall 4 | 0.6123 | 5.3809 |
| 10.8128 | 21.5000 | 5.3809 | Systematic | Wall 2 | 10.8128 | 5.3809 |
| 4.8630 | 21.5000 | 5.3809 | Systematic | Wall 2 | 4.8630 | 5.3809 |
| 0.0000 | 20.4131 | 5.3809 | Systematic | Wall 1 | 20.4131 | 5.3809 |
| 0.0000 | 14.4632 | 5.3809 | Systematic | Wall 1 | 14.4632 | 5.3809 |
| 0.0000 | 8.5133 | 5.3809 | Systematic | Wall 1 | 8.5133 | 5.3809 |
| 0.0000 | 2.5635 | 5.3809 | Systematic | Wall 1 | 2.5635 | 5.3809 |

- 18 data points laid out according to MARSSIM protocals. Locations determined by Visual Sample Plan program in a systematic triangular pattern.
- 1-minute direct measurements taken for gross β

- 100% scans of floor, benchtops, and walls < 2 meters detects no activity > bkg.

- Smears taken @ each data point location for liquid scintillation counting. See LSC print-out for smear results.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

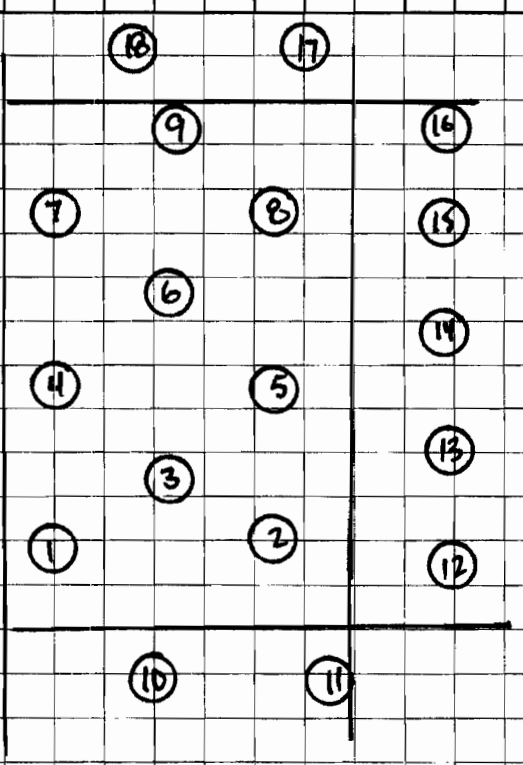
Survey Number 2010024.01-3



| | | | | | |
|---|---|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 2/15/10 | Time: 1500 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Room 202 (Survey Unit #2) | | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ inches ☐ feet ☐ centimeters | | |

| | Material | Counts |
|---|---|---|
| 1 | floor tile | 263 |
| 2 | ↓ | 243 |
| 3 | ↓ | 258 |
| 4 | bench top | 243 |
| 5 | floor tile | 269 |
| 6 | ↓ | 260 |
| 7 | bench top | 221 |
| 8 | 1/5 hood | 209 |
| 9 | floor tile | 264 |
| 10 | drywall | 196 |
| 11 | metal door | 241 |
| 12 | drywall | 248 |
| 13 | ↓ | 231 |
| 14 | cinder block | 318 |
| 15 | metal cab. | 188 |
| 16 | drywall | 221 |
| 17 | ↓ | 236 |
| 18 | metal cab. | 202 |

Gross counts/min
(1-minute direct)




- All wall measurements taken at a height of 2'
- This survey unit is one-half of Room 202

• Map is not to scale. See page 1 for location coordinates.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-4



| | | | |
|---|---|---|---|
| Instrument/SN: Lud 2224 # 125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/15/10 Time: 1600 |
| Instrument/SN Lud 43 89 # 132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 206 | |
| Instrument/SN Ludlum 2224 # 170347 w/ 43-37 # 177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

Area: Room 206

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 2.3165 | 1.2511 | 0.0000 | Systematic | Floor | 2.3165 | 1.2511 |
| 11.6310 | 1.2511 | 0.0000 | Systematic | Floor | 11.6310 | 1.2511 |
| 20.9456 | 1.2511 | 0.0000 | Systematic | Floor | 20.9456 | 1.2511 |
| 6.9737 | 9.3178 | 0.0000 | Systematic | Floor | 6.9737 | 9.3178 |
| 16.2883 | 9.3178 | 0.0000 | Systematic | Floor | 16.2883 | 9.3178 |
| 2.3165 | 17.3844 | 0.0000 | Systematic | Floor | 2.3165 | 17.3844 |
| 11.6310 | 17.3844 | 0.0000 | Systematic | Floor | 11.6310 | 17.3844 |
| 20.9456 | 17.3844 | 0.0000 | Systematic | Floor | 20.9456 | 17.3844 |
| 1.9991 | 0.0000 | 0.4620 | Systematic | Wall 4 | 23.0009 | 0.4620 |
| 11.3136 | 0.0000 | 0.4620 | Systematic | Wall 4 | 13.6864 | 0.4620 |
| 20.6282 | 0.0000 | 0.4620 | Systematic | Wall 4 | 4.3718 | 0.4620 |
| 25.0000 | 4.9427 | 0.4620 | Systematic | Wall 3 | 16.5573 | 0.4620 |
| 25.0000 | 14.2573 | 0.4620 | Systematic | Wall 3 | 7.2427 | 0.4620 |
| 22.9282 | 21.5000 | 0.4620 | Systematic | Wall 2 | 22.9282 | 0.4620 |
| 13.6136 | 21.5000 | 0.4620 | Systematic | Wall 2 | 13.6136 | 0.4620 |
| 4.2991 | 21.5000 | 0.4620 | Systematic | Wall 2 | 4.2991 | 0.4620 |
| 0.0000 | 16.4845 | 0.4620 | Systematic | Wall 1 | 16.4845 | 0.4620 |
| 0.0000 | 7.1700 | 0.4620 | Systematic | Wall 1 | 7.1700 | 0.4620 |

- 18 data points laid out according to MARSSIM protocols. Locations determined by Visual Sample Plan program in a systematic triangular pattern.
- 1-minute direct measurements taken for gross $\beta^-$

- 100% scans of floors, benchtops, and walls below 2 meters detects NO Activity > background.

- Smears taken @ each data point location for liquid scintillation counting. SEE LSC print-out for smear results.

Notes:

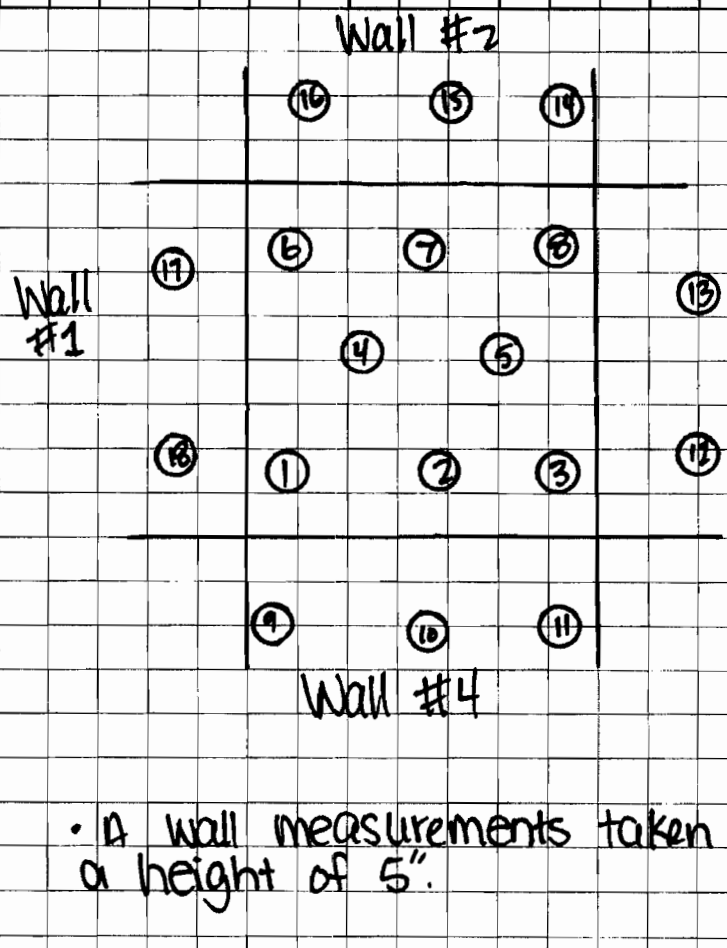
**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-4



| | | | | | |
|---|---|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 12/15/10 | Time: 1600 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Rm 206 | | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ inches ☐ feet ☐ centimeters | | |

| | | | |
|---|---|---|---|
| 1 | | Gross counts/min | |
| 2 | | material | counts |
| 3 | 1 | floor tile | 274 |
| 4 | 2 | ↓ | 285 |
| 5 | 3 | bench top | 243 |
| 6 | 4 | floor tile | 276 |
| 7 | 5 | bench top | 232 |
| 8 | 6 | floor tile | 275 |
| 9 | 7 | ↓ | 278 |
| 10 | 8 | ↓ | 266 |
| 11 | 9 | drywall | 241 |
| 12 | 10 | ↓ | 231 |
| 13 | 11 | ↓ | 239 |
| 14 | 12 | glass | 199 |
| 15 | 13 | drywall | 245 |
| 16 | 14 | ↓ | 253 |
| 17 | 15 | 1/s hood | 250 |
| 18 | 16 | drywall | 233 |
| 19 | 17 | ↓ | 239 |
| 20 | 18 | cinder block | 381 |
| 21 | | (1-minute | |
| 22 | | direct) | |
| 23 | | | |
| 24 | | | |




• A wall measurements taken at a height of 5".

• Map is not to scale. See page 1 for location coordinates.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01 - 5

Page 1 of 2

| | | | | | |
|---|---|---|---|---|---|
| Instrument/SN: Lud 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/16/10 | Time: 0900 |
| Instrument/SN Lud 43-89 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 135 | | |
| Instrument/SN iudlum 2224 #170347 w/ 43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro/Michael Kimbro | | Survey Checked By (Signature): | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | | |

Area: Room 135

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 2.8243 | 3.0029 | 0.0000 | Systematic | Floor | 2.8243 | 3.0029 |
| 0.9247 | 6.2930 | 0.0000 | Systematic | Floor | 0.9247 | 6.2930 |
| 4.7239 | 6.2930 | 0.0000 | Systematic | Floor | 4.7239 | 6.2930 |
| 3.4546 | 0.0000 | 2.0460 | Systematic | Wall 4 | 2.5454 | 2.0460 |
| 6.0000 | 1.2538 | 2.0460 | Systematic | Wall 3 | 7.2462 | 2.0460 |
| 6.0000 | 5.0529 | 2.0460 | Systematic | Wall 3 | 3.4471 | 2.0460 |
| 5.6479 | 8.5000 | 2.0460 | Systematic | Wall 2 | 5.6479 | 2.0460 |
| 1.8487 | 8.5000 | 2.0460 | Systematic | Wall 2 | 1.8487 | 2.0460 |
| 0.0000 | 6.5495 | 2.0460 | Systematic | Wall 1 | 6.5495 | 2.0460 |
| 0.0000 | 2.7504 | 2.0460 | Systematic | Wall 1 | 2.7504 | 2.0460 |
| 1.5550 | 0.0000 | 5.3362 | Systematic | Wall 4 | 4.4450 | 5.3362 |
| 5.3542 | 0.0000 | 5.3362 | Systematic | Wall 4 | 0.6458 | 5.3362 |
| 6.0000 | 3.1533 | 5.3362 | Systematic | Wall 3 | 5.3467 | 5.3362 |
| 6.0000 | 6.9525 | 5.3362 | Systematic | Wall 3 | 1.5475 | 5.3362 |
| 3.7483 | 8.5000 | 5.3362 | Systematic | Wall 2 | 3.7483 | 5.3362 |
| 0.0000 | 8.4491 | 5.3362 | Systematic | Wall 1 | 8.4491 | 5.3362 |
| 0.0000 | 4.6499 | 5.3362 | Systematic | Wall 1 | 4.6499 | 5.3362 |
| 0.0000 | 0.8508 | 5.3362 | Systematic | Wall 1 | 0.8508 | 5.3362 |

• 18 data points laid out according to MARSSIM protocals. Locations determined by Visual Sample Plan program in a systematic triangular pattern.

• 1-minute direct measurements taken for gross $\beta^-$

• 100% scans of floor, benchtops, and walls < 2 meters detects NO activity > bkg.

• smears taken @ each data point location for liquid scintillation counting. See LSC results (print-out).

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

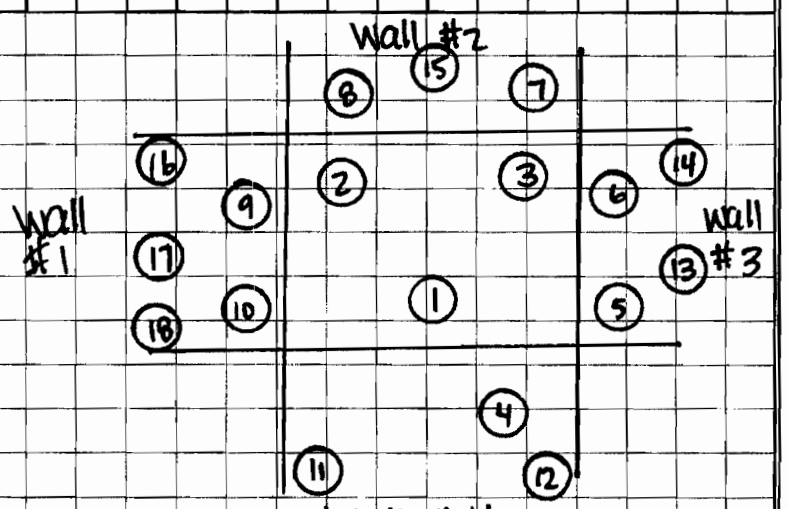
Survey Number 2010024.01-5



12/16/10 0100

| | | | |
|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: / Time: |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Room 135 | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ inches ☐ feet ☐ centimeters | |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | | Gross counts/min | | | | | |
| 2 | | Material | | | | | counts |
| 3 | 1 | concrete floor | | | | | 264 |
| 4 | 2 | ↓ | | | | | 304 |
| 5 | 3 | ↓ | | | | | 288 |
| 6 | 4 | plexiglass | | | | | 201 |
| 7 | 5 | cinder block | | | | | 388 |
| 8 | 6 | ↓ | | | | | 368 |
| 9 | 7 | drywall | | | | | 249 |
| 10 | 8 | ↓ | | | | | 255 |
| 11 | 9 | metal door | | | | | 195 |
| 12 | 10 | cinder block | | | | | 393 |
| 13 | 11 | ↓ | | | | | 402 |
| 14 | 12 | ↓ | | | | | 379 |
| 15 | 13 | ↓ | | | | | 392 |
| 16 | 14 | ↓ | | | | | 388 |
| 17 | 15 | drywall | | | | | 256 |
| 18 | 16 | cinder block | | | | | 384 |
| 19 | 17 | metal door | | | | | 201 |
| 20 | 18 | cinder block | | | | | 397 |
| 21 | | (1-minute | | | | | |
| 22 | | direct) | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |




- Lower wall measurements taken @ a height of 2'.
- upper wall measurements taken @ a height of 5'4"

- Map is not to scale. See page 1 for location coordinates.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-6



| | | | | | |
|---|---|---|---|---|---|
| Instrument/SN: Lud 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/16/10 | Time: 1000 |
| Instrument/SN Lud 43-89 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 134 | | |
| Instrument/SN Iudlum 2224 #170347 w/ 43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | | |

Area: Room 134

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 1.1371 | 2.2415 | 0.0000 | Systematic | Floor | 1.1371 | 2.2415 |
| 4.9362 | 2.2415 | 0.0000 | Systematic | Floor | 4.9362 | 2.2415 |
| 3.0367 | 5.5317 | 0.0000 | Systematic | Floor | 3.0367 | 5.5317 |
| 3.0942 | 0.0000 | 1.7983 | Systematic | Wall 4 | 2.9058 | 1.7983 |
| 6.0000 | 0.8934 | 1.7983 | Systematic | Wall 3 | 7.6066 | 1.7983 |
| 6.0000 | 4.6926 | 1.7983 | Systematic | Wall 3 | 3.8074 | 1.7983 |
| 6.0000 | 8.4918 | 1.7983 | Systematic | Wall 3 | 0.0082 | 1.7983 |
| 2.2090 | 8.5000 | 1.7983 | Systematic | Wall 2 | 2.2090 | 1.7983 |
| 0.0000 | 6.9099 | 1.7983 | Systematic | Wall 1 | 6.9099 | 1.7983 |
| 0.0000 | 3.1107 | 1.7983 | Systematic | Wall 1 | 3.1107 | 1.7983 |
| 1.1947 | 0.0000 | 5.0885 | Systematic | Wall 4 | 4.8053 | 5.0885 |
| 4.9938 | 0.0000 | 5.0885 | Systematic | Wall 4 | 1.0062 | 5.0885 |
| 6.0000 | 2.7930 | 5.0885 | Systematic | Wall 3 | 5.7070 | 5.0885 |
| 6.0000 | 6.5922 | 5.0885 | Systematic | Wall 3 | 1.9078 | 5.0885 |
| 4.1086 | 8.5000 | 5.0885 | Systematic | Wall 2 | 4.1086 | 5.0885 |
| 0.3095 | 8.5000 | 5.0885 | Systematic | Wall 2 | 0.3095 | 5.0885 |
| 0.0000 | 5.0103 | 5.0885 | Systematic | Wall 1 | 5.0103 | 5.0885 |
| 0.0000 | 1.2111 | 5.0885 | Systematic | Wall 1 | 1.2111 | 5.0885 |

- 18 data points laid out according to MARSSIM protocals. Locations determined by Visual Sample Plan program in a systematic triangular pattern.
- 1-minute direct measurements taken for gross $\beta^-$

- 100% scans of floor, benchtops, and walls < 2 meters detects no activity > bkg.

- Smears taken @ each data point location for liquid scintillation counting. See LSC print out for smear results.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

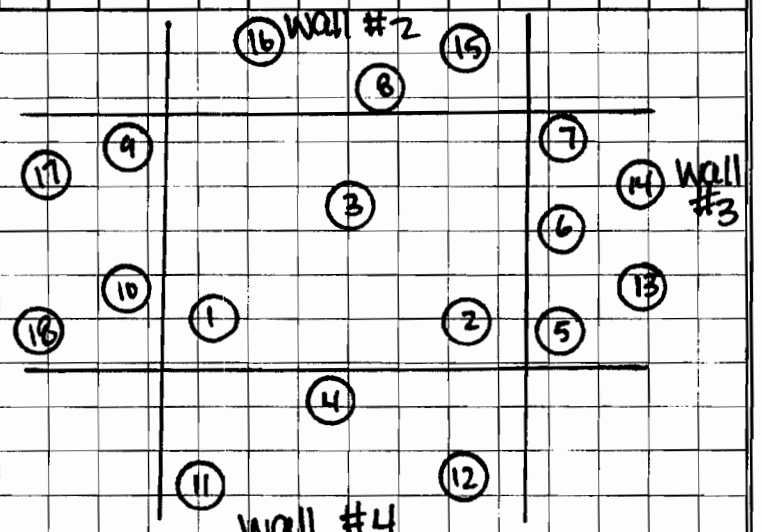
Survey Number 2010024.01-6



| | | | |
|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 12/16/10 Time: 1600 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Rm 134 | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ inches ☐ feet ☐ centimeters | |

| | Material | Counts |
|---|---|---|
| 1 | tile floor | 330 |
| 2 | | 304 |
| 3 | | 314 |
| 4 | cinder block | 338 |
| 5 | drywall | 215 |
| 6 | | 224 |
| 7 | | 219 |
| 8 | | 220 |
| 9 | cinder block | 357 |
| 10 | | 344 |
| 11 | | 339 |
| 12 | metal door | 191 |
| 13 | drywall | 202 |
| 14 | | 218 |
| 15 | | 209 |
| 16 | | 234 |
| 17 | cinder block | 349 |
| 18 | | 299 |

(1-minute direct)




- Lower wall measurements taken at a height of 1'9"
- Upper wall measurements taken at a height of 5'

- Map is not to scale. See page 1 for location coordinates.

Notes:

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-7



| | | | |
|---|---|---|---|
| Instrument/SN: Ludlum 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/16/10 Time: 1100 |
| Instrument/SN Ludlum 43-89 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 143 | |
| Instrument/SN Ludlum 2224 #170347 w/ 43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

Area: Room 143a

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 6.4211 | 2.3024 | 0.0000 | Systematic | Floor | 6.2725 | 2.4510 |
| 2.4399 | 9.1980 | 0.0000 | Systematic | Floor | 2.2913 | 9.3466 |
| 10.4023 | 9.1980 | 0.0000 | Systematic | Floor | 10.2537 | 9.3466 |
| 6.4211 | 16.0936 | 0.0000 | Systematic | Floor | 6.2725 | 16.2422 |
| 1.5308 | -0.1486 | 5.2100 | Systematic | Wall 4 | 11.6177 | 5.2100 |
| 9.4932 | -0.1486 | 5.2100 | Systematic | Wall 4 | 3.6554 | 5.2100 |
| 13.1486 | 4.1584 | 5.2100 | Systematic | Wall 3 | 17.1930 | 5.2100 |
| 6.4544 | 21.3514 | 5.2100 | Systematic | Wall 2 | 6.3058 | 5.2100 |
| 0.1486 | 19.6948 | 5.2100 | Systematic | Wall 1 | 19.8434 | 5.2100 |
| 0.1486 | 11.7324 | 5.2100 | Systematic | Wall 1 | 11.8810 | 5.2100 |
| 0.1486 | 3.7700 | 5.2100 | Systematic | Wall 1 | 3.9186 | 5.2100 |

Area: Room 143b

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 14.8767 | 17.2714 | 0.0000 | Systematic | Floor | 1.5037 | 6.2758 |
| 22.8391 | 17.2714 | 0.0000 | Systematic | Floor | 9.4661 | 6.2758 |
| 16.9122 | 21.2481 | 4.3094 | Systematic | Wall 1 | 3.5392 | 4.3094 |
| 24.8746 | 21.2481 | 4.3094 | Systematic | Wall 1 | 11.5016 | 4.3094 |
| 26.4487 | 14.8599 | 4.3094 | Systematic | Wall 2 | 6.3882 | 4.3094 |
| 22.3507 | 10.9955 | 4.3094 | Systematic | Wall 3 | 4.0980 | 4.3094 |
| 14.3883 | 10.9955 | 4.3094 | Systematic | Wall 3 | 12.0604 | 4.3094 |

- 18 data points laid out according to MARSSIM protocals. Locations determined by Visual Sample Plan program in a systematic triangular pattern.
- 1-minute direct measurements taken for gross β

- 100% scans of floor, benchtops, and walls < 2 meters detects no activity > bkg.

- Smears taken @ each data point location for liquid scintillation counting. SEE LSC print-out for smear results.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-7

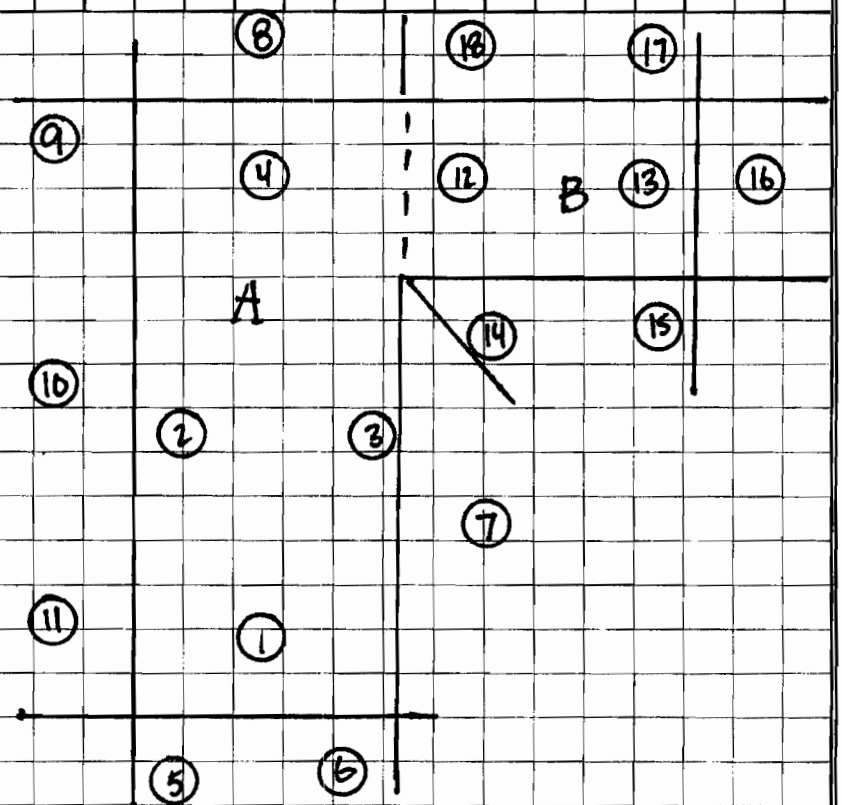


| | | | |
|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 12/16/10 Time: 1100 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Rm 143 | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final States Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

Gross counts/min

| | Material | Counts |
|---|---|---|
| 1 | Floor tile | 275 |
| 2 | | 252 |
| 3 | | 251 |
| 4 | | 270 |
| 5 | Cinder block | 354 |
| 6 | | 338 |
| 7 | drywall | 208 |
| 8 | | 194 |
| 9 | cinder block | 360 |
| 10 | | 345 |
| 11 | | 339 |
| 12 | tile floor | 290 |
| 13 | | 297 |
| 14 | drywall | 222 |
| 15 | | 194 |
| 16 | | 216 |
| 17 | | 210 |
| 18 | | 214 |

(1-minute direct)




- A Area wall measurements taken @ a height of 5'3"
- B Area wall measurements taken @ a height of 4'4"

- Map is not to scale. See page 1 for location coordinates.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-8



| | | | |
|---|---|---|---|
| Instrument/SN: Ludlum 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/16/10 Time: 1200 |
| Instrument/SN Ludlum 43-89 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Room 116 | |
| Instrument/SN Ludlum 2224 #170347 w/ 43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

Area: Room 116

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 2.6762 | 0.4325 | 0.0000 | Systematic | Floor | 2.6762 | 0.4325 |
| 8.3370 | 0.4325 | 0.0000 | Systematic | Floor | 8.3370 | 0.4325 |
| 5.5066 | 5.3349 | 0.0000 | Systematic | Floor | 5.5066 | 5.3349 |
| 2.6762 | 10.2373 | 0.0000 | Systematic | Floor | 2.6762 | 10.2373 |
| 8.3370 | 10.2373 | 0.0000 | Systematic | Floor | 8.3370 | 10.2373 |
| 5.1199 | 0.0000 | 0.5639 | Systematic | Wall 4 | 3.8801 | 0.5639 |
| 9.0000 | 1.7807 | 0.5639 | Systematic | Wall 3 | 9.2193 | 0.5639 |
| 9.0000 | 7.4415 | 0.5639 | Systematic | Wall 3 | 3.5585 | 0.5639 |
| 6.8977 | 11.0000 | 0.5639 | Systematic | Wall 2 | 6.8977 | 0.5639 |
| 1.2369 | 11.0000 | 0.5639 | Systematic | Wall 2 | 1.2369 | 0.5639 |
| 0.0000 | 6.5761 | 0.5639 | Systematic | Wall 1 | 6.5761 | 0.5639 |
| 0.0000 | 0.9153 | 0.5639 | Systematic | Wall 1 | 0.9153 | 0.5639 |
| 2.2895 | 0.0000 | 5.4663 | Systematic | Wall 4 | 6.7105 | 5.4663 |
| 7.9503 | 0.0000 | 5.4663 | Systematic | Wall 4 | 1.0497 | 5.4663 |
| 9.0000 | 4.6111 | 5.4663 | Systematic | Wall 3 | 6.3889 | 5.4663 |
| 9.0000 | 10.2719 | 5.4663 | Systematic | Wall 3 | 0.7281 | 5.4663 |
| 4.0673 | 11.0000 | 5.4663 | Systematic | Wall 2 | 4.0673 | 5.4663 |
| 0.0000 | 9.4065 | 5.4663 | Systematic | Wall 1 | 9.4065 | 5.4663 |
| 0.0000 | 3.7457 | 5.4663 | Systematic | Wall 1 | 3.7457 | 5.4663 |

- 19 data points laid out according to MARSSIM protocals. Locations determined by Visual Sample Plan program in a systematic triangular pattern.
- 1-minute direct measurements taken for gross $\beta^-$

- 100% scans of floor, benchtops, and walls < 2 meters detects no activity > bkg.

- Smears taken @ each data point location for liquid scintillation counting. SEE LSC print-out for smear results.

Notes:

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-9



| | | | |
|---|---|---|---|
| Instrument/SN: Lud 2224 #125667 | Calibration Due: 03-03-2011 | Site Name: Monsanto | Date: 12/16/10 Time: 1300 |
| Instrument/SN Lud 4389 #132117 | Calibration Due: 03-03-2011 | Location: Mystic Complex Rm 215 east | |
| Instrument/SN Lud 2224 #170347 W/43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

Area: Room 215 east

| X Coord | Y Coord | Z Coord | Type | Surface | LX | LY |
|---|---|---|---|---|---|---|
| 7.5539 | 0.7719 | 0.0000 | Systematic | Floor | 7.5539 | 0.7719 |
| 3.6252 | 7.5767 | 0.0000 | Systematic | Floor | 3.6252 | 7.5767 |
| 11.4826 | 7.5767 | 0.0000 | Systematic | Floor | 11.4826 | 7.5767 |
| 7.5539 | 14.3814 | 0.0000 | Systematic | Floor | 7.5539 | 14.3814 |
| 3.6252 | 21.1862 | 0.0000 | Systematic | Floor | 3.6252 | 21.1862 |
| 11.4826 | 21.1862 | 0.0000 | Systematic | Floor | 11.4826 | 21.1862 |
| 7.5539 | 27.9909 | 0.0000 | Systematic | Floor | 7.5539 | 27.9909 |
| 3.6252 | 34.7957 | 0.0000 | Systematic | Floor | 3.6252 | 34.7957 |
| 11.4826 | 34.7957 | 0.0000 | Systematic | Floor | 11.4826 | 34.7957 |
| 7.5539 | 41.6005 | 0.0000 | Systematic | Floor | 7.5539 | 41.6005 |
| 6.3220 | 0.0000 | 5.3981 | Systematic | Wall 4 | 6.1780 | 5.3981 |
| 12.5000 | 1.6795 | 5.3981 | Systematic | Wall 3 | 41.3205 | 5.3981 |
| 12.5000 | 9.5369 | 5.3981 | Systematic | Wall 3 | 33.4631 | 5.3981 |
| 12.5000 | 17.3944 | 5.3981 | Systematic | Wall 3 | 25.6056 | 5.3981 |
| 12.5000 | 25.2518 | 5.3981 | Systematic | Wall 3 | 17.7482 | 5.3981 |
| 12.5000 | 33.1093 | 5.3981 | Systematic | Wall 3 | 9.8907 | 5.3981 |
| 12.5000 | 40.9668 | 5.3981 | Systematic | Wall 3 | 2.0332 | 5.3981 |
| 6.6758 | 43.0000 | 5.3981 | Systematic | Wall 2 | 6.6758 | 5.3981 |

- 18 data points laid out according to MARSSIM protocols. Locations determined by Visual Sample Plan program in a systematic triangular pattern.
- 1-minute direct measurements taken for gross β

- 100% scans of floors, benchtops, and walls < 2 meters detects no activity > background.

- Smears taken @ each data point location for liquid scintillation counting. See LSC print-out for smear results.

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-9



| | | | |
|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 12/16/10 Time: 1300 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex Rm 215 east | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Gross counts/min | | | | | | | | | | | | | | | | Wall #2 | | | | | | | | |
| 2 | | Material | | | | counts | | | | | | | | | | | | | 18 | | | | | | | |
| 3 | 1 | benchtop | | | | 231 | | | | | | | | | | | | | 10 | | | | | | | |
| 4 | 2 | ↓ | | | | 196 | | | | | | | | | | | 8 | | | | | 9 | | 17 | | |
| 5 | 3 | ↓ | | | | 214 | | | | | No | | | | | | | | | 7 | | | | 16 | Wall | |
| 6 | 4 | floor tile | | | | 207 | | | | | Wall | | | | | | | | | | | | | | #3 | |
| 7 | 5 | benchtop | | | | 206 | | | | | | | | | | | 5 | | | | | 6 | | 15 | | |
| 8 | 6 | ↓ | | | | 200 | | | | | | | | | | | | | | 4 | | | | 14 | | |
| 9 | 7 | floor tile | | | | 266 | | | | | | | | | | | | | | | | | | | | |
| 10 | 8 | ↓ | | | | 235 | | | | | | | | | | | 2 | | | | | 3 | | 13 | | |
| 11 | 9 | ↓ | | | | 252 | | | | | | | | | | | | | | | | | | | | |
| 12 | 10 | benchtop | | | | 208 | | | | | | | | | | | | | | 1 | | | | 12 | | |
| 13 | 11 | metal face | | | | 193 | | | | | | | | | | | | | | | | | | | | |
| 14 | 12 | drywall | | | | 188 | | | | | | | | | | | | | 11 | | | | | | | |
| 15 | 13 | ↓ | | | | 202 | | | | | | | | | | | | Wall #4 | | | | | | | | |
| 16 | 14 | ↓ | | | | 195 | | | | | | | | | | | | | | | | | | | | |
| 17 | 15 | glass | | | | 188 | | | | | | | | | | | | | | | | | | | | |
| 18 | 16 | glass | | | | 192 | | | | | | | | | | | | | | | | | | | | |
| 19 | 17 | drywall | | | | 210 | | | | | | | | | | | | | | | | | | | | |
| 20 | 18 | drywall | | | | 208 | | | | | | | | | | | | | | | | | | | | |
| 21 | | (1-minute | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | direct) | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | • Map is not to scale. See page 1 for location coordinates. | | | | | | | | | | | | | | | | | | | | | | | | | |

• All wall measurements taken @ a height of 5'5"

• This survey unit is one-half of Room 215

Notes:

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-10

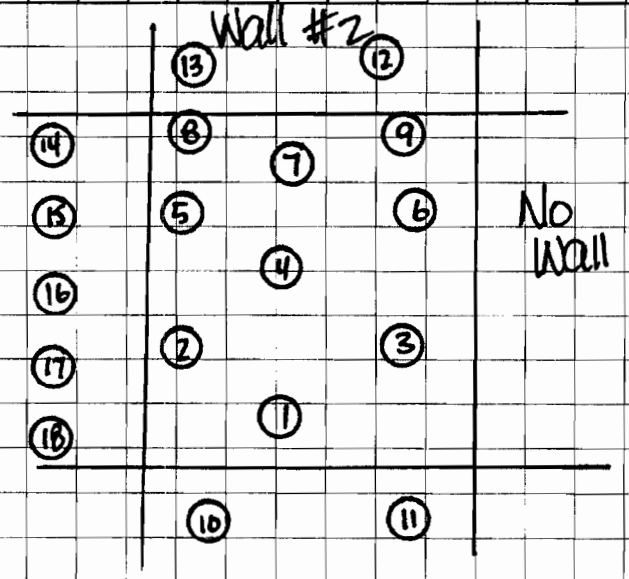


| | | | | | |
|---|---|---|---|---|---|
| Instrument/SN: SEE | Calibration Due: SEE | Site Name: Monsanto | Date: 12/16/10 | Time: 1400 |
| Instrument/SN PREVIOUS | Calibration Due: PREVIOUS | Location: Mystic Complex 215 West | | |
| Instrument/SN PAGE | Calibration Due: PAGE | Purpose: Final Status Survey | | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): [signature] | | |
| ☒ Battery OK ☒ HV OK ☒ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | | |

Gross counts/min

| | Material | Counts |
|---|---|---|
| 1 | floor tile | 273 |
| 2 | ↓ | 270 |
| 3 | bench top | 223 |
| 4 | floor tile | 249 |
| 5 | | 269 |
| 6 | | 258 |
| 7 | | 229 |
| 8 | | 236 |
| 9 | ↓ | 231 |
| 10 | drywall | 221 |
| 11 | metal face | 203 |
| 12 | metal face | 209 |
| 13 | drywall | 206 |
| 14 | ↓ | 211 |
| 15 | | 214 |
| 16 | ↓ | 218 |
| 17 | metal door | 199 |
| 18 | metal face | 202 |

(1-minute direct)




- All wall measurements taken @ a height of 2'4"
- This survey unit is one-half of room 215.

• Map is not to scale. See page 1 for location coordinates.

Notes:

# Appendix 11.2 - Qualifications of the Project Team

# *Michael W. Kimbro - Project Manager*

## *Professional Qualifications*

Mr. Kimbro has over 23 years of experience in the radiation protection field, with emphasis on decontamination, decommissioning, site surveillance and applied health physics. His extensive field and management experience, design capabilities, training expertise, interpersonal skills, and technical abilities in the decontamination, decommissioning, and radiation protection fields are accompanied by excellent qualifications in project coordination, regulatory compliance, site characterization and radiological oversight and verification for U. S. Department of Energy, U. S. Army Corps of Engineers and U. S. Nuclear Regulatory Commission (or Agreement State) licensee sites.

## *Education*

Santa Fe Community College, Gainesville, FL 1983, 1985-86

St. John's River Community College, Palatka, FL 1984-85

Miami-Dade Community College, Homestead, FL 1991

Florida Community College at Jacksonville, FL, Jacksonville, FL 1993

Columbus State Community College, Columbus, OH 1994-1996, 1999, 2001

Multiagency Radiation Survey and Site Investigation Manual (MARSSIM) Implementation and Design Course (40 hours), 2003.

Occupational Health and Safety Technologist Course (40 hours), 1996.

40-Hour OSHA HAZWOPER (29 CFR 1910.120) Training (2001) and eight-hour OSHA Annual Refresher (29 CFR 1910.120), current through 2009.

Asbestos Abatement Contractors/Supervisor Training (40 hours), 2002.

Hazardous and Radioactive Material/Waste Transportation Certification Training, 2008

## *Registrations/Certifications*

Registered Radiation Protection Technologist (RRPT), National Registry of Radiation Protection Technologists.

Authorized User - Maryland Department of the Environment Radioactive Materials License No. MD-31-281-01.

Hazardous Material/Waste Transportation Training, current through 2011

Radioactive Material Transportation Training, current through 2011.

ANSI-Qualified 3.1 Senior Health Physics Technician (continual since 1989)

U. S. Department of Energy "L" Security Clearance (*expired*).

Department of Energy Radiological Control Technician Qualification, 2003-2007.

***Experience and Background***

2008-Present *Project Manager and Health Physics Technician, Integrated Environmental Management, Inc., Knoxville, Tennessee* - Duties include decontamination work plans and Final Status Survey Plan development and performance, with particular emphasis on MARSSIM style surveys, radioactive waste packaging and transportation, radiation safety program instruction and audits, surveillance activities, site characterization and risk assessment, report preparation, cost/schedule assessment, research/analysis, and general health physics duties. Mr. Kimbro serves as the Program Manager for IEM's instrumentation rental program. Mr. Kimbro is also qualified as a Health Physics Technician pursuant to Radiation Safety Procedure No. RSP-006, "Training and Qualification of Radiation Protection Personnel".

2006-2007 *Senior Health Physics Technician, Various DOE, FUSRAP, Commercial Power Facilities, and University Sites* - Performed HP support activities in varying capacities. Projects included final status surveys, decontamination and decommissioning, and power reactor refueling/maintenance.

2006 *Remediation Field Coordinator, Key West Naval Base Remediation Project, Key West, Florida* - Scheduled and produced daily activity/man-power reports for the heating, ventilation, air conditioning (HVAC), and plumbing remediation during the Hurricane Wilma remediation of over 500 properties at the Key West Naval Base.

2002-2005 *Corporate Health Physics Specialist, Safety and Ecology Corporation, Knoxville, Tennessee* - Provided corporate Health Physics oversight, radiological engineering, and project development on numerous remediation projects nationwide. Corporate lead for radiologically related training projects. Involved in all aspects of D&D projects from proposal stage, to planning, performance, and final reports. Served on various project management teams as radiological issues representative. Authored numerous plans, procedures, work instructions and technical basis documents for corporate interest and clients. Served as primary Emergency Responder concerning radiological issues.

2001-2002 *Senior Radiological Controls Technician, British Nuclear Fuels Ltd., Oak Ridge, Tennessee* - Provided operational Health Physics and Industrial Hygiene support during the Three Building D&D Project (K-29, K-31, and K-33) at the East Tennessee Technology Park.

1993-2001 *Radiation Safety Specialist/Technical Support, Battelle Memorial Institute, Columbus, Ohio* - Provided operational Health Physics, ALARA, and technical support services for active Research and Development (R&D) projects as well as support to D&D activities at the BMI King Avenue and West Jefferson sites.

1987-1993 *Health Physics Technician, Various Commercial Nuclear Power Facilities* - Provided operational Health Physics coverage in varying capacities at 10 nuclear power facilities during 19 refueling and/or maintenance outages throughout the United States.

***Awards***

Safety and Ecology Corporation, Professional Services Employee of the Year, 2004

***Example Project Descriptions***

*Project Manager for the radiological characterization, decontamination, and Final Status Survey of a facility that manufactured thorium fluoride for use as an optical surfacing product.* Conducted radiation and contamination surveys to determine the extent and the magnitude of the radiological contamination. Prepared the state approved decontamination work plan and contributed to the state approved Final Status Survey Plan. Served as field Health Physicist during the decontamination and Final Status Survey. Coordinated the disposal of all waste generated during decontamination. Prepared the Final Status Survey Report in support license termination activities.

*Health Physicist/Project Manager for the radiological Characterization/Final Status Survey at a USDA research facility.* Prepared the USDA approved Characterization and Final Status Survey Plans. Served as field Health Physicist during the Final Status Survey. Segregated radioactive waste and recommended acceptable disposal methods to client. Prepared the Final Status Survey Report in support license termination activities.

*Site Health Physicist/Assistant RSO for the expedited release surveys of a former government research reactor site.* Designed the Expedited Release/ Final Status Survey of the former reactor site in accordance with MARSSIM guidance using Visual Sample Plan program. Directed the data collection operations including building and material scans, direct measurements, smear collections, and material background determination. Responsible for the radiation detection equipment quality control. Contributed to all final reports and documentation.

*Project Manager for the sealed sources services of various manufacturing clients.* Developed work plans in regard to client's regulatory needs. Conducted sealed source leak tests, radiological dose surveys and assessments based on sealed source and X-Ray producing machine exposure rates, audited regulatory compliance issues, and reported such findings.

*Project Manager for the radiological Final Status Survey and waste disposal at a medical teaching university.* Prepared the NRC approved Final Status Survey Plan. Served as field Health Physicist during the Final Status Survey. Coordinated the disposal of all waste generated during decontamination. Prepared the Final Status Survey Report in support license termination activities.

*Project Manager/ Certified Shipper for numerous disposal activities.* Responsible for DOT/IATA compliance issues regarding the transportation of radiative waste and sources.

*ALARA Specialist/Technical Support for the decommissioning project of the hot cell facility, the sub-critical assembly building, and the research reactor building at Battelle Memorial Institute's West Jefferson North Site.* These buildings, in particular, the fourteen hot cells were contaminated with an estimated 4,000 curies of mixed fission and activation products, as well as fuel residues and transuranics. Contributed to work plans and processes involving the off-load of numerous hot cells. Duties included pre and post-job reviews of activities, internal and external dose assessments, and shielding calculations for dose reduction.. Development of lessons learned documentation, pre-job exposure

estimates, and exposure trending/ALARA goal reports. Prepared RWPs, including ALARA considerations for work packages.

*Radiation Safety Services Technician for active Research and Development at Battelle Memorial Institute's Columbus, OH campus.* Provided radiologically related technical support in the development of research study protocols including briefing and training research staff in specific radiation protection controls for each study. Client confidentiality limits study descriptions. Laboratory isotopes used include, but not limited to C-14, H-3, I-131, I-125, P-32, Ni-63, Tc-99m and Re-188. Provided routine radiological surveillance and surveys, as well as providing coverage for active studies, including radiolabeling of solutions and pharmaceutical. Performed 100's of radioactive source leak tests on sealed sources and laboratory equipment.

*Radiological Specialist/Sample Coordinator for the Excess Material Project at the East Tennessee Technology Park (formerly the K-25 site), Oak Ridge, TN.* Served as the Health Physics liaison between employer and client, Bechtel Jacobs Company. Authored radiological project plans and compliance documents. Provided radiological/ALARA engineering, as well as oversight for wasted handling and loading operations. Served as the sample coordinator for the radiological characterization of material. This encompassed over 4,000 samples and/or radiological surveys and associated data reports. Additionally, served as project QA specialist responsible for project assessments and audits, as well as trending and implementation of corrective actions of deficiencies.

*Health Physicist/Project Manager for the radiological characterization, decontamination, and Final Status Survey of a research facility contaminated with Germanium-68.* Conducted contamination surveys to determine the extent and the magnitude of the radiological contamination.. Served as field Health Physicist during the decontamination and Final Status Survey. Coordinated the disposal of all waste generated during decontamination. Prepared the Final Status Survey Report in support license termination activities.

*Field Health Physicist for the risk assessment survey of warehouse facility with elevated levels of Naturally Occurring Radioactive Materials (NORM).* Performed radiation and contamination surveys of the warehouse facility including the collection of sample media for radioactive analysis.

*Project Manager/Field Health Physicist for the risk assessment survey of former electrical power generating station.* Performed radiation surveys of the facility. Documented findings and provided client with exposure assessments.

*Radiological Engineer/ALARA Specialist at for the New Hydrofracture Facility D&D at the Oak Ridge National Laboratory.* The facility was contaminated with an abundance of isotopes including Cs-137, Sr-90, and transuranics. Contributed to the work plans and processes used for the safe dismantlement of the facility. Developed ALARA goals and exposure reduction methods. Provided radiological oversight as well as personnel and day to day activity management as a part of the project management team.

*Project Manager for Radiation Worker training for corporate employer.* Responsible for the development of lesson plans, test and answer development, grading, records

management, ensuring the proper maintenance and integrity of examination test banks and quality assurance of all documentation. Instructor for over thirty classroom sessions.

*Health Physics Specialist at the abandoned Gulf Nuclear radioactive source manufacturing facility in Webster, TX.* Acted as liaison/corporate representative between employer and the client, Shaw/US Army Corps of Engineers during the health physics support transition phase from one subcontractor to another. Performed interviews with management and operations personnel to establish project status and to assist in the operations planning phase. Additionally, performed procedural audits and instrumentation/ source inventory and training,

*Health Physics Lead for the MARSSIM type final status survey of a facility machining Magnesium/Thorium alloys at Sermatech Power Solutions, Inc. (a.k.a. Airfoils Technologies Florida, Inc) in Boynton Beach, FL.* Served as primary interface with the client and state regulators on the performance of survey activities. Compiled all data and authored the Final Status Survey Report for license termination.

*Health Physics Lead for the characterization and MARSSIM final status survey of laboratory facilities contaminated with Sr-90 and Am-241 at the Oak Ridge Institute for Science and Education.* Provided health physics operational support for decontamination activities, as well as serving as primary client interface.

*Senior Health Physics Technician at the DOE Hanford Site K-Reactor Basin Closure Project.* Provide operational HP coverage for the removal of debris (including fuel handling equipment) and sludge from the reactor basins (fuel pools) as part of bulk containerization activities.

*Health Physics Technician at the University of Washington (Seattle) Research Reactor.* Performed MARSSIM type Final Status Survey of the reactor building and associated buildings in support of license termination.

*Procedure writer for Knoxville, TN engineering firm, S&ME.* Reviewed firm's laboratory and radioactive source user program and authored complete radiological procedures compliant with the Tennessee Bureau of Environmental Health Services, Division of Radiological Health.

*Senior Health Physics technician at the US Army Corps of Engineers St. Louis Airport Project Site, the Hazelwood Interim Storage Site, and the Latty Avenue Vicinity Properties.* Identified areas requiring remediation by use of gamma walk-over surveys using Trimble Global Positioning Systems and collection of environmental media.. Guided excavation activities based on these results.

*Radiological Emergency Responder at the Norfolk Southern Railyard in Elkhart, IN.* Responded to unknown condition identified radiation by detection system alarm. Identified the cause of the alarm, identified the contaminant and magnitude, and remediated the effected area.

*Industrial Hygiene Technician at the Environmental Management Waste Management Facility in Oak Ridge, TN.* Performed Beryllium sampling and packaged samples for lab analysis.

Radiological Emergency First Responder at multiple nuclear sites.

*Senior Radiological Controls Technician at the East Tennessee Technology Park's Three Building Project.* Provided operational HP and Industrial Hygiene support for the BNFL SuperCompactor and other D&D operations. Served as HP representative during scheduling/planning of SuperCompactor maintenance shut-down.

Senior Health Physics Technician for the characterization/scoping of the Ford Nuclear Reactor at the University of Michigan

*ANSI Qualified 3.1 Senior Health Physics Technician at numerous commercial power facilities.* Provided operational Health Physics coverage for most of any number of tasks common to commercial reactor refueling and maintenance. These tasks include, but not limited to refueling floor operations such reactor head removal and replacement, refueling/fuel movement, reactor head inspection, cavity decontamination. Additionally, provided coverage for steam generator inspections and tube plugging, valve and piping replacements, reactor coolant pump repair and/or replacement. Provided coverage for balance of plant operations including waste processing, transportation, auxiliary building activities, and turbine deck operations.

Developed numerous business proposals for nuclear decommissioning and decontamination projects including job walk downs, cost estimation, scheduling, and technical content of proposals.

# Carol D. Berger - Project CHP

## Professional Qualifications

Ms. Berger has over 33 years experience in nuclear and radiological activities with emphasis in strategic planning, radiation dosimetry, instrumentation, and applied health physics. As a co-founder of Integrated Environmental Management, Inc. (**IEM**), Ms. Berger is actively involved in performance of radiological dose assessments, regulatory interactions, site decommissioning, program evaluations, program development, pathway analyses, risk assessments, dosimetry evaluations, assessment and control of sources of non-ionizing radiations, waste management programs, environmental monitoring programs, and detection and quantification of low-levels of radioactivity.

## Education

M.S., Health Physics, San Diego State University, San Diego, California; 1979

M.S., Radiation Physics, San Diego State University, San Diego, California; 1977

B.S., Physics/Chemistry, San Diego State University, San Diego, California; 1972

## Certifications

Certified Health Physicist (Comprehensive), American Board of Health Physics, 1983 (Re-certified through 2011)

Alternate Radiation Safety Officer - Maryland Department of the Environment Radioactive Materials License No. MD-31-281-01.

Authorized User - Maryland Department of the Environment Radioactive Materials License No. MD-31-281-01.

Radiation Health Physicist Registration - Cabinet for Health Services, Commonwealth of Kentucky, Certificate No. 3013.

Maryland Department of the Environment - Service Registration No. 358-000.

U. S. Department of Energy "Q" Security Clearance (*expired*).

## Experience and Background

1994-Present *President and Founder, Integrated Environmental Management, Inc., Gaithersburg, Maryland.* Provides high-quality strategic environmental management services to commercial and government clients. As a member of the client's response team, works with clients to promote an understanding of what is required to achieve and/or maintain compliance in the eyes of all pertinent regulatory agencies, individually or jointly; develop an overall strategy for achieving compliance and reduce liabilities in a technically-sound, legally-defensible, and fiscally-conservative business manner; recommend specific solutions that are compatible with the client's operating philosophy; and provide insights into future regulatory issues and their impact as input to the client's long-range business planning and cost forecasting process.

1989-1994 *Senior Technical Consultant, IT Corporation/Nuclear Sciences, Washington, D.C.* - Performed health physics consulting for government and commercial facilities in Internal and External Dosimetry; Radiation Monitoring; Environmental Monitoring; Instrumentation; Emergency Response and Preparedness; Site Decommissioning; Radioactive Waste Management; Radiation Risk Assessment; Training; Licensing and Regulatory Negotiations; and Non-ionizing Radiation

1986-1989 *Senior Health Physicist, IT Radiological Sciences Laboratory, Knoxville, Tennessee* - Performed health physics consulting for government and commercial facilities in Internal and External Dosimetry; Radiation Monitoring; Environmental Monitoring; Applied Health Physics; Instrumentation; Radioactive Waste Management; Training; and Non-ionizing Radiation.

1983-1986 *Radiation Dosimetry Group Leader, Oak Ridge National Laboratory, Oak Ridge, Tennessee.* Responsible for internal and external dose assessment and programs for ORNL employees, visitors and contractors. Experience included Internal and External Dose Assessment; Monitoring Program Design and Implementation; Instrumentation Development; Site Characterizations; Personnel Management; and Training.

1978-1983 *Internal Dose Group Leader, Oak Ridge National Laboratory, Oak Ridge, Tennessee.* Responsible for development of the ORNL Whole Body Counter Facility for detection and quantification of the actinides in-vivo. Experience included: Internal Dose Assessment; Monitoring Program Design and Implementation; Instrumentation Development; Special Studies; Personnel Management; and Training.

1978-1986 *Adjunct Faculty, Oak Ridge Associated Universities, Oak Ridge, Tennessee* - Professional training courses and general classes in the following health physics and radiation protection areas: Internal Dose Assessment; In-vivo Monitoring and Bioassay Methodologies; Instrumentation, and Applied Health Physics.

1979-1980 *Health Physics and Dosimetry Task Group Member, President's Commission on the Accident at Three Mile Island, Washington, D.C.* Tasks included: Internal Dose Assessment from Whole Body Counting Results; Estimates of Source Term from in-plant Monitoring Systems; Atmospheric Dispersion Modeling and Population Dose Assessment; and Development of Health Physics Sequence of Events.

## Professional Society Membership

American Academy of Health Physics (President, 1995; Executive Committee, 1995-1997; Chair of Strategic Planning Committee, 1997; Chair of Professional Standards and Ethics Committee, 2003-2006)

National Council on Radiation Protection and Measurements (Program Area Committee 2
on Operational Radiation Safety, which serves as a national resource for information on operational radiation safety and formulates guidance regarding the application of operational radiation safety principles, 2008-2011)

Health Physics Society (Fellow Member, 2006; Publications Committee, 1999-2001)

Baltimore-Washington Chapter, Health Physics Society (Treasurer, 1993-1994, Board of Directors, 1998-2000)

### Publications

Over 30 professional publications; over 40 oral presentations; over 100 technical reports; over 25 training courses taught.

### Other/Past Appointments/Awards

American Academy of Health Physics - Third recipient of the *Joyce B. Davis Memorial Award* for professional achievement and ethical behavior in the practice of health physics (July, 2006, Providence, Rhode Island).

East Tennessee Chapter - Health Physics Society (President, 1986; President-Elect, 1985; Secretary, 1981-1982).

San Diego Chapter - Health Physics Society (Charter member).

American Board of Health Physics, Comprehensive Panel of Examiners (1989-1993).

ANSI Standards Committee (ANSI N13.41) on Multiple Dosimetry; Chair of Reaffirmation Working Group (2007 to present).

ANSI Standards Committee (ANSI N13.41) on Multiple Badging; 1986 to 1996 (Chairman, PlanCo-59 Working Group, 1990 to 1996).

ANSI Standards Committee (ANSI N13.39) on Internal Dosimetry Programs (1994 to 2001).

ASTM Task Group E-10.04.27 "Transuranic Wound Analysis" (1986 to 2000).

National Council on Radiation Protection and Measurements (NCRP) Scientific Committee 46-10, "Assessment of Occupational Exposures from Internal Emitters" (1989-1995).

Purdue University, Health Sciences Advisory Council for the School of Health Sciences (1995-1998).

DOE/IAEA Whole Body Counter Intercalibration Committee (1980-1986).

Consultant to Knoxville Academy of Medicine, Mass Casualty Simulation (1984-1985).

Consultant to the National Cancer Institute to Evaluate Devices and Techniques to Determine Previous Radiation Exposure under Public Law 98-54 (Award for participation presented by Oak Ridge Associated Universities in April, 1988.).

Steering Committee Member, U. S. Department of Energy Task Group on the Education of Future Health Physicists (1989-1991).

Technical reviewer and referee for Health Physics, Nuclear Technology, and Radiation Protection Management.

# *Cathryn N. Chang - Quality Assurance Officer*

## *Professional Qualifications*

Ms. Chang has over 15 years of experience in accounting, general business and quality assurance management. As the Business Manager and Quality Assurance Officer for Integrated Environmental Management, Inc. (**IEM**), Ms. Chang ensures the business of the company is managed in an effective and streamlined fashion, and in compliance with ISO 9001:2008 international quality standards. As such, Ms. Chang is responsible for ensuring all business functions are performed accurately, promptly and to the satisfaction of both **IEM** and its clients. Her skills in these areas, and her commitment to ensuring products and deliverables meet all quality standards benefit her dual position with the firm.

## *Education*

B.S., *Business Administration & Psychology*, University of Oregon, Eugene, Oregon, August 1996

*Individual Income Taxes*, Montgomery College, Rockville, Maryland, May 2005

*Employment Law From A To Z* , Certificate of Successful Completion, Rockville, Maryland, October 2006

## *Certifications and Licenses*

Notary Public of the State of Maryland, Montgomery County (2005 - Present)

## *Experience and Background*

2009-Present *Business Manager, Integrated Environmental Management, Inc., 975 Russell Avenue, Ste A, Gaithersburg, MD 20878, (240) 631-8992* - In this position, Ms. Chang coordinates and oversees all business operations of the company, including accounting functions (see "*Accounting Manager*" descriptions below), financial reporting, quality assurance, business insurance, tax and regulatory agency compliance, contract management, IT requirements, human resources, office management, etc. Because of Ms. Chang's extensive knowledge of the company, solid background in Business Administration and a habit for excellence, **IEM** and all relevant parties can rest assured that business needs will be addressed in the most dedicated manner possible.

2005-Present *Quality Assurance Officer, Integrated Environmental Management, Inc., 975 Russell Avenue, Ste A, Gaithersburg, MD 20878, (240) 631-8992* - In this position, Ms. Chang has the authority to implement all provisions of the company's Quality Management System and to take corrective actions when work under any business process fails to meet procedures or quality objectives. Ms. Chang has a solid understanding of both domestic (NQA-1) and international (ISO) standards for quality and, in 2007, she received an award from the President of **IEM** for successfully leading the company's efforts to secure certification of its consulting, nuclear services, instrumentation program and corporate (management) systems to

the ISO 9001:2008 international quality standards. Maintaining the highest quality and the certification to the ISO standards at **IEM** are the priorities of this position.

2004-2009 *Accounting Manager, Integrated Environmental Management, Inc., 8 Brookes Avenue, Ste 205, Gaithersburg, MD 20878, (240) 631-8992* - In this position, Ms. Chang is fully responsible for all aspects of accounting, including monthly invoicing and payment tracking, semi-monthly payroll, weekly payables, monthly bank reconciliations, routine cash flow monitoring, financial reporting, tax agency and government agency (DCAA) compliancy, and all other financial related activities. Ms. Chang also provides timely response on and quality assurance oversight for all financial documents submitted to and transmitted out of the office, including reviews and approves bids/proposals and contracts in regard to their financial and tax requirements, and serves as financial and contracting officer for major **IEM** projects.

2003-2004 *Accounting Manager, Wok on the Web.Com, Inc., Rockville, Maryland* - In this position, Ms. Chang was actively involved in this start-up venture, including setting up payroll, organizing files, communicating with website developers regarding specific report or field, translating and drafting marketing materials to Chinese for newspapers and affiliates. When business started to operate, Ms. Chang took full charge of all accounting tasks, including A/P, A/R, G/L, payroll, tax payments, cash flow monitoring and projection, and financial reporting.

1999-2001 *Associate, Medical Care Management Corporation (MCMC), Bethesda, Maryland* - In this position, Ms. Chang managed and supervised the completion of all accounting processes, including input, generate and approve large mailing of medical case invoices; making collection efforts; process payments to hundreds of vendors and medical consultants; follow-up payments from clients and to vendors; process monthly payroll; setup and maintain merchant account; reconcile bank statements and monitor cash flow; generate financial reports to the company President and tax accountant, etc. Ms. Chang was also involved in office management, including maintaining inventories for office supplies and storage items, wrote general office procedural protocols, as well as many financial protocols. Ms. Chang successfully trained assistants and replacements to use financial software, and to follow intricate project procedures to achieve accuracy and timeliness.

1997-1999 *Accounting Manager, USL Financials, Inc., Vienna, Virginia* - In this position, Ms. Chang managed all accounting processes, including processing payroll, prioritizing payables and communicate with vendors, billing invoices and tracking payments, reconciling bank statements, making general ledger adjustments, etc. Ms. Chang also performed human resources functions, such as selecting and administrating company medical insurance, maintaining personnel records, etc. Ms. Chang also extensively participated in the software testing of USL Financials 3.3, 3.4 and 4.0 Releases, and provided back-up support to daily users.

1996-1997 *Finance Officer, Systems of Excellence, Inc., McLean, Virginia* - In this position, Ms. Chang managed all financial information, such as A/P, A/R, P/R, vendor and customer lists, bank account reconciliation, etc. Financial reports were generated on a regular basis to assist upper management in cash flow forecast and expense

control. Ms. Chang also performed human resources functions, such as maintaining personnel files, evaluating health insurance benefits, communicate company policies to employees, etc.

1992-1996 *Accountant & Office Assistant, University of Housing, University of Oregon, Eugene, Oregon* - In the Business Office, Ms. Chang assisted accountants to maintain a computerized accounting system for A/P and A/R, participated in monthly and annual accounts reconciliation. Ms. Chang assisted Catering Office by taking event orders, communicate customer needs with kitchen staff, assigning another student work, etc. Ms. Chang also facilitated the training of a new accountant and new student office assistants before graduating from the school with honor.

### *Membership and Awards*

The American Institute of Professional Bookkeepers (Member, 2004 - Present)

Performance Award 2006 (Integrated Environmental Management, Inc., March 28, 2006)

Performance Award 2007 (Integrated Environmental Management, Inc., March 29, 2007)

Timely Appreciation of Performance (TAP) Award 2008 (Integrated Environmental Management, Inc., January 10, 2008)

President's Performance Award 2008 (Integrated Environmental Management, Inc., March 5, 2008)

President's Performance Award 2009 (Integrated Environmental Management, Inc., September 20, 2009)

# Appendix 11.3 - Field Activity Daily Logs

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
FIELD ACTIVITY DAILY LOG

| | |
|---|---|
| Facility: Monsanto Mystic Complex | |
| Date: 12-15-2010 | Job/Task Number: 2010024.01 |
| Client Name: Monsanto Company | |
| Address of Work Site: 62 Maritime Drive Mystic, Ct 06355 | |
| Description of Work: Final Status Survey | |
| Arrived on site at (insert date and time): 12-15-2010 / 0900 | Departed site at (insert date and time): 12/15/2010 - 1700 |

**DESCRIPTION OF DAILY ACTIVITIES AND EVENTS**

0900- Arrive @ Monsanto site. Meet David Miller.
Process in Monsanto Security
0915- Unpack equipment and tour facility.
1000- Perform instrumentation QA source checks.
measure Rooms and design 2 surveys to replace
to with previously inaccurate measurements.
1300- Begin area scans of surfaces.
1500- Detected naturally occuring radioactive product
in the hood of room 201. Zirconium
Silicate beads)
Advised David Miller to store the container in non-Rad Area.
1600- Continued scanning and static measurements
in labs.
1700- Exited Monsanto property for the day.

N/A

Unusual Occurrences (list): None

Client or Regulator Activity Requests or Special Orders (list): None

Changes in the Project Scope (list): None

Important Decisions: None

Important Telephone Calls and Interactions: Called Carol Berger. Notified her of progress and naturally radioactive product.

Weather Conditions: 30's F and Sunny

Visitors on Site (list): ☐ Visitor log attached N/A

Attachments: ☐ H&S Report ☐ Tailgate Safety Training Form ☐ Additional pages ☐ Other (specify) N/A

| | |
|---|---|
| Name (print): Michael Kimbro | Signature: Michael Kimbro |

Distribution: N/A

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**
FIELD ACTIVITY DAILY LOG

| | |
|---|---|
| Facility: Monsanto Mystic Complex | |
| Date: 12-16-2010 | Job/Task Number: 2010024.01 |
| Client Name: Monsanto Company | |
| Address of Work Site: 62 Maritime drive Mystic, CT 06355 | |
| Description of Work Final Status Survey | |
| Arrived on site at (insert date and time): 12-15-2010 / 0830 | Departed site at (insert date and time): 12-15-2010 / 1530 |

**DESCRIPTION OF DAILY ACTIVITIES AND EVENTS**

0830 - Arrived @ Monsanto Site. Started instrumentation QA source checks.
0850 - Started Final Status Surveys of laboratory rooms.

1440 - Packaged equipment for shipment.
1500 - debriefed with David Miller (Monsanto) as to present survey results. Similar results to come later.
1530 - exited Monsanto site. Traveled to FedEx to ship equipment to Knoxville. Traveled to airport (Providence)

N/A

Unusual Occurrences (list): NONE

Client or Regulator Activity Requests or Special Orders (list): NONE

Changes in the Project Scope (list): NONE

Important Decisions: none

Important Telephone Calls and Interactions: none

Weather Conditions: 30's F and sunny

Visitors on Site (list): ☐ Visitor log attached N/A

Attachments: ☐ H&S Report ☐ Tailgate Safety Training Form ☐ Additional pages ☐ Other (specify) N/A

| | |
|---|---|
| Name (print): Michael Kimbro | Signature: Michael Kimbro |

Distribution: N/A

# Appendix 11.4 - Radiation Background for Different Media

**INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.**

RADIOLOGICAL SURVEY FORM

Survey Number 2010024.01-11

Page 1 of 1

| | | | |
|---|---|---|---|
| Instrument/SN: LUD 2224 #125607 | Calibration Due: 03-03-2011 | Site Name: Monsanto Mystic | Date: 12/15/10 Time: 1200 |
| Instrument/SN W/43-89 #132117 | Calibration Due: 03-03-2011 | Location: ROOM 212 | |
| Instrument/SN LUD 2224 #170347 W/43-37 #177476 | Calibration Due: 06-09-2011 | Purpose: ESTABLISH MATERIAL BACKGROUNDS | |
| Survey Performed By (Signature): Michael Kimbro / Michael Kimbro | | Survey Checked By (Signature): | |
| ☑ Battery OK ☑ HV OK ☑ Source Check OK | | Grid Dimensions: NA x NA ☐ meters ☐ feet ☐ inches ☐ centimeters | |

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | F | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | •(10) 1-MINute counts to establish material backgrounds: | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 43-89 PROBE | | | | | | | 43-89 PROBE | | | | | 43-89 PROBE | | | | | | | | 43-37 PROBE | | | | | |
| 3 | CINDER BLOCK | | | | | | | AIR | | | | | BENCHTOP | | | | | | | | TILE OVER BLOCK | | | | | |
| 4 | 381 | | | | | | | 256 | | | | | 242 | | | | | | | | 694 | | | | | |
| 5 | 369 | | | | | | | 263 | | | | | 243 | | | | | | | | 675 | | | | | |
| 6 | 388 | | | | | | | 265 | | | | | 271 | | | | | | | | 674 | | | | | |
| 7 | 379 | | | | | | | 281 | | | | | 257 | | | | | | | | 690 | | | | | |
| 8 | 402 | | | | | | | 271 | | | | | 232 | | | | | | | | 681 | | | | | |
| 9 | 374 | | | | | | | 272 | | | | | 231 | | | | | | | | 681 | | | | | |
| 10 | 318 | | | | | | | 264 | | | | | 243 | | | | | | | | 679 | | | | | |
| 11 | 393 | | | | | | | 273 | | | | | 280 | | | | | | | | 670 | | | | | |
| 12 | 368 | | | | | | | 280 | | | | | 266 | | | | | | | | 665 | | | | | |
| 13 | 366 | | | | | | | 266 | | | | | 221 | | | | | | | | 676 | | | | | |
| 14 | 3738 | | | | | | | 2691 | | | | | 2486 | | | | | | | | 6785 | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | 374 cpm | | | | | | | 269 cpm | | | | | 249 cpm | | | | | | | | 679 cpm | | | | | |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | |

Notes:

# Appendix 11.5 - Instrumentation Records

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
## CONTAMINATION SURVEY INSTRUMENT DATA SHEET

| Project No: 2010024.001 | | | Detector | | | Meter | | |
|---|---|---|---|---|---|---|---|---|
| Site Location/Background Location: Monsanto mystic / Room 202 | | | Type: ludlum 43-89 | Serial No. 132117 | Probe Area (cm²) 100 | Type: ludlum 2224 | Serial No: 125607 | Operating Voltage: 750V |
| Check Source No: Tc 2399-98 | | | Check Source No: NA | | | Check Source No: NA | | |
| Radionuclide: Tc-99 | Activity: 20,000 dpm | Date: 8-10-98 | Radionuclide: | Activity: NA | Date: | Radionuclide: | Activity: NA | Date: |

| Date | Start of Shift Background (cpm for a ___ minute count) | | | | | | | | End of Shift Background (cpm for a ___ minute count) | | | | | | | | Daily Source Check (α) | | Daily Source Check (β) | | MDA** - Scaler Mode (dpm) | | Bat. OK | HV OK | Initials |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpha | | | | Beta | | | | Alpha | | | | Beta | | | | Source (cpm) | Eff. | Source (cpm) | Eff. | α | β | | | |
| | 1 | 2 | 3 | Av. | 1 | 2 | 3 | Av. | 1 | 2 | 3 | Av. | 1 | 2 | 3 | Av. | | | | | | | | | |
| 2010 12/15 | ✓ | N/A | | ✓ | 256 | 265 | 271 | 264 | ✓ | N/A | | ✓ | 280 | 266 | 273 | 273 | N/A | | 2259 | .10 | NA | 783 | ✓ | ✓ | MK |
| 12/16 | ✓ | N/A | | ✓ | 281 | 263 | 269 | 271 | ✓ | N/A | | ✓ | 271 | 259 | 265 | 265 | N/A | | 2284 | .10 | NA | 793 | ✓ | ✓ | MK |

$$** \quad MDA = \frac{2.71 + 4.65\sqrt{BKG_{avg} \times t}}{t \times E \times \frac{A}{100}}$$

where MDA = the activity level (dpm/100 cm²), $BKG_{avg}$ = the background count rate for this measurement type (cpm), t = the measurement duration (min), E = instrument efficiency, and A = probe area (cm²).

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
## CONTAMINATION SURVEY INSTRUMENT DATA SHEET

| Project No: 2010024.001 | | | Detector | | | Meter | | |
|---|---|---|---|---|---|---|---|---|
| Site Location/Background Location: Monsanto Mystic / Room 202 | | | Type: Ludlum 43-37 | Serial No. 177476 | Probe Area (cm²) 582 | Type: Ludlum 2224 | Serial No: 170347 | Operating Voltage: 1700 V |
| Check Source No: 2399-98 | | | Check Source No: NA | | | Check Source No: NA | | |
| Radionuclide: Tc-99 | Activity: 20,000 dpm | Date: 08-10-98 | Radionuclide: | Activity: NA | Date: | Radionuclide: | Activity: NA | Date: |

| Date | Start of Shift Background (cpm for a 1 minute count) | | | | | | | | End of Shift Background (cpm for a 1 minute count) | | | | | | | | Daily Source Check (α) | | Daily Source Check (β) | | MDA** - Scaler Mode (dpm) | | Bat. OK | HV OK | Initials |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpha | | | | Beta | | | | Alpha | | | | Beta | | | | Source (cpm) | Eff. | Source (cpm) | Eff. | α | β | | | |
| | 1 | 2 | 3 | Av. | 1 | 2 | 3 | Av. | 1 | 2 | 3 | Av. | 1 | 2 | 3 | Av. | | | | | | | | | |
| 2010 12/15 | — | N/A | | — | 694 | 665 | 681 | 680 | — | N/A | | — | 674 | 679 | 680 | 681 | N/A | | 4573 | .19 | NA | * | ✓ | ✓ | MK |
| 12/16 | — | N/A | | — | 681 | 675 | 673 | 676 | — | N/A | | — | 670 | 688 | 671 | 676 | N/A | | 4553 | .19 | NA | * | ✓ | ✓ | MK |
| | | | | | | | | | | | | | | | | | N/A | | | | | | | | |

** $MDA = \frac{2.71 + 4.65\sqrt{BKG_{avg} \times t}}{t \times E \times \frac{A}{100}}$

* floor monitor used for scanning only. Ludlum 43-68 Probe used for 1-minute static measurements.

where MDA = the activity level (dpm/100 cm²), $BKG_{avg}$ = the background count rate for this measurement type (cpm), t = the measurement duration (min), E = instrument efficiency, and A = probe area (cm²).

GRIFFIN INSTRUMENTS

# CALIBRATION CERTIFICATE FOR 2224 SERIAL# 125607

Owner: IEM

DATE: 03/03/10 LOCATION: Griffin Inst

TECH: Joanne Glenn DATE LAST CAL EXPIRES: 02/11/10

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

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 114512 CAL. DUE: 09/05/10

[x] Audio Response [x] Geotropism CABLE LENGTH: 39"

CONDITION: Sat AF MECHANICAL ZERO: <0 AL MECHANICAL ZERO: 0

NEW BATTERIES: ( ) Yes (●) No BATTERY CHECK: Sat

| HV (+/-10%) | AS FOUND HV | AS LEFT HV | WINDOW SETTINGS: | A.F. | A.L. |
|---|---|---|---|---|---|
| 500 V: | 495 | 500 | BT (3.5 mV +/- 1 mV): | 3.5 | A.F. |
| 1000 V: | 975 | 1000 | BW (30 mV +/-3 mV): | 30 | A.F. |
| 1500 V: | 1475 | 1500 | AT (120 mV +/-10 mV): | 120 | A.F. |

| | RATE METER | | | | | | SCALER | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SCALE | RATE CPM | AS FOUND | % ERROR | AS LEFT | % ERROR | AS FOUND | % ERROR | AS LEFT | % ERROR |
| x.1 or x1 | 100 | 100 | 0.0% | A.F. | | | | | |
| | 250 | 250 | 0.0% | A.F. | | 250 | 0.0% | A.F. | |
| | 400 | 400 | 0.0% | A.F. | | | | | |
| x1 or x10 | 1000 | 1000 | 0.0% | A.F. | | | | | |
| | 2500 | 2500 | 0.0% | A.F. | | | | | |
| | 4000 | 4000 | 0.0% | A.F. | | | | | |
| x10 or x100 | 10K | 10 K | 0.0% | A.F. | | | | | |
| | 25K | 25 K | 0.0% | A.F. | | | | | |
| | 40K | 40 K | 0.0% | A.F. | | | | | |
| x100 or x1000 | 100K | 100 K | 0.0% | A.F. | | | | | |
| | 250K | 250 K | 0.0% | A.F. | | | | | |
| | 400K | 400 K | 0.0% | A.F. | | | | | |

Is the As Found Data Within 20% of the Set Point?: (●) Yes ( ) No

Overload Light: (●) Adjusted ( ) Not Adj.

REMARKS:

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

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

Date Instrument Is Due For Next Calibration: 03/03/11

INSTRUMENT MARRIED WITH 43-89 # PR132117

Performed/Reviewed by: Joanne Glenn Date: 3/3/2010 Entered by: JG Initials



Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

# CALIBRATION CERTIFICATE FOR 43-89 PROBE # PR132117

Owner: IEM

DATE: 03/03/10 LOCATION: Griffin Inst

TECH: Joanne Glenn DATE LAST CAL EXPIRES: 02/11/10

REASON FOR CALIBRATION:

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

CABLE LENGTH: 39" INPUT SENSITIVITY: dual

## NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2224 SERIAL #: 125607 CAL. DUE: 03/03/11

## NIST TRACEABLE SOURCES USED

| Source Number | Isotope | 4 pi Activity | Assay Date | 2 pi Activity |
|---|---|---|---|---|
| 00TC470-0654 | Tc99 SS | 17,300 dpm | 06/15/09 | 10,800 cpm |
| 94TH470-1593 | Th230 | 16,700 dpm | 06/16/09 | 8,170 cpm |
| 2696-00 | Pu239 | 18,500 dpm | 12/02/09 | 9,370 cpm |
| 2697-00 | Sr90 | 12,200 dpm | 03/01/00 | 8,530 cpm |

Efficiencies from last cal.:

Condition: (•) Sat ( ) Unsat

Pu: Th: 15.65% Sr:

Tc ss: 8.53% C14: Tc Ni:

As Found (AF) Efficiencies:

| HV / Vernier: | Tc-99 Source Response Nickel (CPM): | | | Pu-239 Source Response (CPM): | | | Background (CPM): | | Tc-99 Source Response Stainless Steel (CPM): | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A ch. | B ch. | Net Eff. | A ch. | B ch. | Net Eff. | A ch. | B ch. | A ch. | B ch. | Net Eff. |
| 750 / N/A | | | | 3395 | 414 | 18.35% | 0 | 246 | 9 | 1878 | 9.43% |

| Net A to B Xtalk: <10% | B to A Xtalk: <1% |
|---|---|
| 4.7% | <1% |

| | Pu239 | Tc99 Ni | Tc99 ss | Th-230 | Sr90 | C-14 |
|---|---|---|---|---|---|---|
| AF CPM: | 3395 | | 1878 | 2898 | 2826 | |
| AF 4 pi eff: | 18.35% | | 9.43% | 17.35% | 26.91% | |
| *AF 2 pi eff:* | *36.23%* | | *15.11%* | *35.47%* | *38.48%* | |

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

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

**GRIFFIN INSTRUMENTS**

**PROBE #: PR132117**
Date: 03/03/10

# PLATEAU AND SET POINT DATA

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

**Alpha / Beta Bkg (cpm)** 0 246

| HV / Vernier | | Pu-239 | Tc-99 Ni | Tc-99 SS | Th-230 | C-14 | Sr-90 |
|---|---|---|---|---|---|---|---|
| 750 / N/A | CPM: | 3395 | | 1878 | 2898 | | 2826 |
| | **4 pi AL Efficiencies:** | **18.35%** | | **9.43%** | **17.35%** | | **26.91%** |
| | ***2 pi AL Efficiencies:*** | ***36.16%*** | | ***15.11%*** | ***35.47%*** | | ***38.48%*** |

REMARKS:

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

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

Date Instrument is Due For Next Calibration: **03/03/11**

**INSTRUMENT MARRIED WITH** **2224** **# 125607**

**Performed/Reviewed by:** Joanne Glenn **Date:** 3/3/2010 **Entered by:** _____ **Initials**

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

GRIFFIN INSTRUMENTS

# CALIBRATION CERTIFICATE FOR 2224 SERIAL# 170347

Owner: IEM

DATE: 06/09/10 LOCATION: Griffin Inst

TECH: Joanne Glenn DATE LAST CAL EXPIRES: 07/01/10

Reason For Calibration: ○ Due For Calibration ○ Repair (See Remarks)

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

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 114512 CAL. DUE: 09/05/10

☑ Audio Response ☑ Geotropism CABLE LENGTH: 6'

CONDITION: Sat AF MECHANICAL ZERO: 0 AL MECHANICAL ZERO: 0

NEW BATTERIES: ○ Yes ◉ No BATTERY CHECK: Sat

| HV (+/-10%) | AS FOUND HV | AS LEFT HV | WINDOW SETTINGS: | A.F. | A.L. |
|---|---|---|---|---|---|
| 500 V: | 0 | 500 | BT (3.5 mV +/- 1 mV): | 0 | 3.5 |
| 1000 V: | 0 | 1000 | BW (30 mV +/-3 mV): | 0 | 30 |
| 1500 V: | 0 | 1495 | AT (120 mV +/-10 mV): | 0 | 120 |

| | | RATE METER | | | | | SCALER | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SCALE | RATE CPM | AS FOUND | | % ERROR | AS LEFT | % ERROR | AS FOUND | % ERROR | AS LEFT | % ERROR |
| x.1 or x1 | 100 | 0 | | 100.0% | 100 | 0.0% | | | | |
| | 250 | 0 | | 100.0% | 250 | 0.0% | 0 | 100.0% | 250 | 0.0% |
| | 400 | 0 | | 100.0% | 400 | 0.0% | | | | |
| x1 or x10 | 1000 | 0 | | 100.0% | 1000 | 0.0% | | | | |
| | 2500 | 0 | | 100.0% | 2500 | 0.0% | | | | |
| | 4000 | 0 | | 100.0% | 4000 | 0.0% | | | | |
| x10 or x100 | 10K | 0 | K | 100.0% | 10K | 0.0% | | | | |
| | 25K | 0 | K | 100.0% | 25K | 0.0% | | | | |
| | 40K | 0 | K | 100.0% | 40K | 0.0% | | | | |
| x100 or x1000 | 100K | 0 | K | 100.0% | 100K | 0.0% | | | | |
| | 250K | 0 | K | 100.0% | 250K | 0.0% | | | | |
| | 400K | 0 | K | 100.0% | 400K3 | 0.0% | | | | |

Is the As Found Data Within 20% of the Set Point?: ○ Yes ◉ No

Overload Light: ○ Adjusted ◉ Not Adj.

REMARKS: Meter screamed when powered up and had no response - re-soldered wire to back of C connector.

Does Instrument Meet Final Acceptance Criteria?: ◉ Yes ○ No

Calibration Sticker Attached?: ◉ Yes ○ No

Date Instrument is Due For Next Calibration: 06/09/11

INSTRUMENT MARRIED WITH 43-37 # PR177476

Performed/Reviewed by: Joanne Glenn Date: 6/9/2010 Entered by: ____ Initials



Calibrations performed to ANSI N323A-1997 standards

# CALIBRATION CERT CATE FOR 43-37 PR( # PR177476

**Owner:** IEM

**DATE:** 06/09/10 **LOCATION:** Griffin Inst

**TECH:** Joanne Glenn **DATE LAST CAL EXPIRES:** 07/01/10

**REASON FOR CALIBRATION:**

- **Due For Calibration** **Repair (See Remarks)** **Other (See Remarks)** **Due and Repair**

**CABLE LENGTH:** 6' **INPUT SENSITIVITY:** dual

**NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION**

**MODEL:** 2224 **SERIAL #:** 170347 **CAL. DUE:** 06/09/11

**NIST TRACEABLE SOURCES USED**

| Source Number | Isotope | 4 pi Activity | Assay Date | 2 pi Activity |
|---|---|---|---|---|
| 00TC470-0654 | Tc99 SS | 17,300 dpm | 06/15/09 | 10,800 cpm |
| 94TH470-1593 | Th230 | 16,700 dpm | 06/16/09 | 8,170 cpm |
| 2696-00 | Pu239 | 18,500 dpm | 12/02/09 | 9,370 cpm |
| 2697-00 | Sr90 | 12,200 dpm | 03/01/00 | 8,530 cpm |
| PX 726 | C14 | 48,780 dpm | 01/21/08 | 18,660 cpm |

**Efficiencies from last cal.:**

**Condition:** • **Sat** **Unsat**

**Pu:** **Th:** 17.50% **Sr:**

**Tc ss:** 18.90% **C14:** **Tc Ni:**

**As Found (AF) Efficiencies:**

| HV / Vernier: | Tc-99 Source Response Nickel (CPM): | | | Pu-239 Source Response (CPM): | | | Background (CPM): | | Tc-99 Source Response Stainless Steel (CPM): | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A ch. | B ch. | Net Eff. | A ch. | B ch. | Net Eff. | A ch. | B ch. | A ch. | B ch. | Net Eff. |
| 1700 / N/A | | | | 3235 | 925 | 17.48% | 1 | 641 | 4 | 4270 | 20.98% |

| Net A to B Xtalk: <10% | B to A Xtalk: <1% |
|---|---|
| 8.1% | <1% |

| | Pu239 | Tc99 Ni | Tc99 ss | Th-230 | Sr90 | C-14 |
|---|---|---|---|---|---|---|
| **AF CPM:** | 3235 | | 4270 | 2647 | 3696 | 6223 |
| **AF 4 pi eff:** | **17.48%** | | **20.98%** | **15.84%** | **32.05%** | **11.44%** |
| ***AF 2 pi eff:*** | ***34.51%*** | | ***33.60%*** | ***32.39%*** | ***45.84%*** | ***29.91%*** |

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

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

**GRIFFIN INSTRUMENTS**

**PROBE #: PR177476**
Date: 06/09/10

# PLATEAU AND SET POINT DATA

| HV / Vernier: | Tc-99 Source Response SS (CPM): | | | Pu-239 Source Response (CPM): | | | Background (CPM): | | Net A to B Xtalk: <10% | B to A Xtalk: <1% |
|---|---|---|---|---|---|---|---|---|---|---|
| | A ch. | B ch. | Net Eff. | A ch. | B ch. | Net Eff. | A ch. | B ch. | | |
| 1600 | 5 | 3178 | 16.8% | 1923 | 407 | 10.4% | 1 | 271 | 6.6% | <1% |
| 1650 | 1 | 4156 | 21.3% | 2398 | 637 | 13.0% | 1 | 467 | 6.6% | <1% |
| 1700 | 9 | 4312 | 21.2% | 3356 | 1007 | 18.1% | 8 | 644 | 9.8% | <1% |
| 1750 | 73 | 3428 | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**Alpha / Beta Bkg (cpm)** 3 671

| HV / Vernier | | Pu-239 | Tc-99 Ni | Tc-99 SS | Th-230 | C-14 | Sr-90 |
|---|---|---|---|---|---|---|---|
| 1700 / N/A | **CPM:** | 3356 | | 4363 | 3058 | | 3997 |
| **4 pi AL Efficiencies:** | | **18.12%** | | **21.34%** | **18.29%** | | **34.89%** |
| ***2 pi AL Efficiencies:*** | | ***35.71%*** | | ***34.19%*** | ***37.39%*** | | ***49.91%*** |

REMARKS:

Does Instrument Meet Final Acceptance Criteria?: • Yes No

Calibration Sticker Attached?: • Yes No

Date Instrument is Due For Next Calibration: **06/09/11**

**INSTRUMENT MARRIED WITH** **2224** **# 170347**

**Performed/Reviewed by:** Joanne Glenn **Date:** 6/9/2010 **Entered by:** ____ **Initials**

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

# Appendix 11.6 - Data Listing

## *Stationary Beta Survey Data (MARSSIM)*

| | |
|---|---|
| IEM Job No.: | 2010024 |
| IEM Task No.: | 1 |
| Purpose of survey: | FSS |
| Survey performed by: | Michael Kimbro |
| Date of survey: | 12/16/2010 0:00 |
| Data captured by: | Michael Kimbro |
| Date of data capture: | 16-Dec-10 |
| Date of QC check: | |
| QC check by: | |
| Instrument Type: | Lud 2224 w/ 43-89 probe |
| Detector Serial No.: | 132117 |
| Meter Serial No.: | 125607 |
| Detector Area (cm2): | 100 |
| DCGL (dpm/100cm2): | 3,700,000 |
| Check Source No: | 2399.98 |
| Activity (dpm): | 20,000 |
| Source count rate (cpm): | 2,284 |
| Efficiency (dpm/cpm): | 0.1 |
| Background Location: | Room 212 |
| Background counts: | 271 |
| Background ct. time (min) | 1 |
| Background rate (cpm): | 271 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 215 East | 231 | 1 | 231 | -40 | 2310 | -400 | | | |
| 2 | Room 215 East | 196 | 1 | 196 | -75 | 1960 | -750 | | | |
| 3 | Room 215 East | 214 | 1 | 214 | -57 | 2140 | -570 | | | |
| 4 | Room 215 East | 207 | 1 | 207 | -64 | 2070 | -640 | | | |
| 5 | Room 215 East | 206 | 1 | 206 | -65 | 2060 | -650 | | | |
| 6 | Room 215 East | 200 | 1 | 200 | -71 | 2000 | -710 | | | |
| 7 | Room 215 East | 266 | 1 | 266 | -5 | 2660 | -50 | | | |
| 8 | Room 215 East | 235 | 1 | 235 | -36 | 2350 | -360 | | | |
| 9 | Room 215 East | 252 | 1 | 252 | -19 | 2520 | -190 | | | |
| 10 | Room 215 East | 208 | 1 | 208 | -63 | 2080 | -630 | | | |
| 11 | Room 215 East | 193 | 1 | 193 | -78 | 1930 | -780 | | | |
| 12 | Room 215 East | 188 | 1 | 188 | -83 | 1880 | -830 | | | |
| 13 | Room 215 East | 202 | 1 | 202 | -69 | 2020 | -690 | | | |
| 14 | Room 215 East | 195 | 1 | 195 | -76 | 1950 | -760 | | | |
| 15 | Room 215 East | 188 | 1 | 188 | -83 | 1880 | -830 | | | |
| 16 | Room 215 East | 192 | 1 | 192 | -79 | 1920 | -790 | | | |
| 17 | Room 215 East | 210 | 1 | 210 | -61 | 2100 | -610 | | | |
| 18 | Room 215 East | 208 | 1 | 208 | -63 | 2080 | -630 | | | |
| | | | | | *214* | *2106.11111* | *-603.88889* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *219.280612* | *219.280612* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *2660* | *-50* | *0* | *0* | |
| | | | | | *Min:* | *1880* | *-830* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Survey Data (MARSSIM)*

| | |
|---|---|
| IEM Job No.: | 2010024 |
| IEM Task No.: | 1 |
| Purpose of survey: | FSS |
| Survey performed by: | Michael Kimbro |
| Date of survey: | 12/15/2010 0:00 |
| Data captured by: | Michael Kimbro |
| Date of data capture: | 15-Dec-10 |
| Date of QC check: | |
| QC check by: | |
| Instrument Type: | Lud 2224 w/ 43-89 probe |
| Detector Serial No.: | 132117 |
| Meter Serial No.: | 125607 |
| Detector Area (cm2): | 100 |
| DCGL (dpm/100cm2): | 3,700,000 |
| Check Source No: | 2399.98 |
| Activity (dpm): | 20,000 |
| Source count rate (cpm): | 2,259 |
| Efficiency (dpm/cpm): | 0.1 |
| Background Location: | Room 212 |
| Background counts: | 264 |
| Background ct. time (min) | 1 |
| Background rate (cpm): | 264 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 206 | 274 | 1 | 274 | 10 | 2740 | 100 | | | |
| 2 | Room 206 | 285 | 1 | 285 | 21 | 2850 | 210 | | | |
| 3 | Room 206 | 243 | 1 | 243 | -21 | 2430 | -210 | | | |
| 4 | Room 206 | 276 | 1 | 276 | 12 | 2760 | 120 | | | |
| 5 | Room 206 | 232 | 1 | 232 | -32 | 2320 | -320 | | | |
| 6 | Room 206 | 275 | 1 | 275 | 11 | 2750 | 110 | | | |
| 7 | Room 206 | 278 | 1 | 278 | 14 | 2780 | 140 | | | |
| 8 | Room 206 | 266 | 1 | 266 | 2 | 2660 | 20 | | | |
| 9 | Room 206 | 241 | 1 | 241 | -23 | 2410 | -230 | | | |
| 10 | Room 206 | 231 | 1 | 231 | -33 | 2310 | -330 | | | |
| 11 | Room 206 | 239 | 1 | 239 | -25 | 2390 | -250 | | | |
| 12 | Room 206 | 199 | 1 | 199 | -65 | 1990 | -650 | | | |
| 13 | Room 206 | 245 | 1 | 245 | -19 | 2450 | -190 | | | |
| 14 | Room 206 | 253 | 1 | 253 | -11 | 2530 | -110 | | | |
| 15 | Room 206 | 250 | 1 | 250 | -14 | 2500 | -140 | | | |
| 16 | Room 206 | 233 | 1 | 233 | -31 | 2330 | -310 | | | |
| 17 | Room 206 | 239 | 1 | 239 | -25 | 2390 | -250 | | | |
| 18 | Room 206 | 381 | 1 | 381 | 117 | 3810 | 1170 | | | |
| | | | | | *Mean:* | *2577.77778* | *-62.222222* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *377.258775* | *377.258775* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *3810* | *1170* | *0* | *0* | |
| | | | | | *Min:* | *1990* | *-650* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Survey Data (MARSSIM)*

| | |
|---|---|
| **IEM Job No.:** | 2010024 |
| **IEM Task No.:** | 1 |
| **Purpose of survey:** | FSS |
| **Survey performed by:** | Michael Kimbro |
| **Date of survey:** | 12/15/2010 0:00 |
| **Data captured by:** | Michael Kimbro |
| **Date of data capture:** | 15-Dec-10 |
| **Date of QC check:** | |
| **QC check by:** | |
| **Instrument Type:** | Lud 2224 w/ 43-89 probe |
| **Detector Serial No.:** | 132117 |
| **Meter Serial No.:** | 125607 |
| **Detector Area (cm2):** | 100 |
| **DCGL (dpm/100cm2):** | 3,700,000 |
| **Check Source No:** | 2399.98 |
| **Activity (dpm):** | 20,000 |
| **Source count rate (cpm):** | 2,259 |
| **Efficiency (dpm/cpm):** | 0.1 |
| **Background Location:** | Room 212 |
| **Background counts:** | 264 |
| **Background ct. time (min)** | 1 |
| **Background rate (cpm):** | 264 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 202 unit 2 | 412 | 1 | 412 | 148 | 4120 | 1480 | | | |
| 2 | Room 202 unit 2 | 490 | 1 | 490 | 226 | 4900 | 2260 | | | |
| 3 | Room 202 unit 2 | 426 | 1 | 426 | 162 | 4260 | 1620 | | | |
| 4 | Room 202 unit 2 | 386 | 1 | 386 | 122 | 3860 | 1220 | | | |
| 5 | Room 202 unit 2 | 361 | 1 | 361 | 97 | 3610 | 970 | | | |
| 6 | Room 202 unit 2 | 405 | 1 | 405 | 141 | 4050 | 1410 | | | |
| 7 | Room 202 unit 2 | 364 | 1 | 364 | 100 | 3640 | 1000 | | | |
| 8 | Room 202 unit 2 | 334 | 1 | 334 | 70 | 3340 | 700 | | | |
| 9 | Room 202 unit 2 | 275 | 1 | 275 | 11 | 2750 | 110 | | | |
| 10 | Room 202 unit 2 | 240 | 1 | 240 | -24 | 2400 | -240 | | | |
| 11 | Room 202 unit 2 | 231 | 1 | 231 | -33 | 2310 | -330 | | | |
| 12 | Room 202 unit 2 | 195 | 1 | 195 | -69 | 1950 | -690 | | | |
| 13 | Room 202 unit 2 | 248 | 1 | 248 | -16 | 2480 | -160 | | | |
| 14 | Room 202 unit 2 | 191 | 1 | 191 | -73 | 1910 | -730 | | | |
| 15 | Room 202 unit 2 | 236 | 1 | 236 | -28 | 2360 | -280 | | | |
| 16 | Room 202 unit 2 | 229 | 1 | 229 | -35 | 2290 | -350 | | | |
| 17 | Room 202 unit 2 | 235 | 1 | 235 | -29 | 2350 | -290 | | | |
| 18 | Room 202 unit 2 | 241 | 1 | 241 | -23 | 2410 | -230 | | | |
| | | | | | *Mean:* | *3055* | *415* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *916.542416* | *916.542416* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *4900* | *2260* | *0* | *0* | |
| | | | | | *Min:* | *1910* | *-730* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Survey Data (MARSSIM)*

| | |
|---|---|
| IEM Job No.: | 2010024 |
| IEM Task No.: | 1 |
| Purpose of survey: | FSS |
| Survey performed by: | Michael Kimbro |
| Date of survey: | 12/15/2010 0:00 |
| Data captured by: | Michael Kimbro |
| Date of data capture: | 15-Dec-10 |
| Date of QC check: | |
| QC check by: | |
| Instrument Type: | Lud 2224 w/ 43-89 probe |
| Detector Serial No.: | 132117 |
| Meter Serial No.: | 125607 |
| Detector Area (cm2): | 100 |
| DCGL (dpm/100cm2): | 3,700,000 |
| Check Source No: | 2399.98 |
| Activity (dpm): | 20,000 |
| Source count rate (cpm): | 2,259 |
| Efficiency (dpm/cpm): | 0.1 |
| Background Location: | Room 212 |
| Background counts: | 264 |
| Background ct. time (min) | 1 |
| Background rate (cpm): | 264 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 202 unit 1 | 263 | 1 | 263 | -1 | 2630 | -10 | | | |
| 2 | Room 202 unit 1 | 243 | 1 | 243 | -21 | 2430 | -210 | | | |
| 3 | Room 202 unit 1 | 258 | 1 | 258 | -6 | 2580 | -60 | | | |
| 4 | Room 202 unit 1 | 243 | 1 | 243 | -21 | 2430 | -210 | | | |
| 5 | Room 202 unit 1 | 269 | 1 | 269 | 5 | 2690 | 50 | | | |
| 6 | Room 202 unit 1 | 260 | 1 | 260 | -4 | 2600 | -40 | | | |
| 7 | Room 202 unit 1 | 221 | 1 | 221 | -43 | 2210 | -430 | | | |
| 8 | Room 202 unit 1 | 209 | 1 | 209 | -55 | 2090 | -550 | | | |
| 9 | Room 202 unit 1 | 264 | 1 | 264 | 0 | 2640 | 0 | | | |
| 10 | Room 202 unit 1 | 196 | 1 | 196 | -68 | 1960 | -680 | | | |
| 11 | Room 202 unit 1 | 241 | 1 | 241 | -23 | 2410 | -230 | | | |
| 12 | Room 202 unit 1 | 248 | 1 | 248 | -16 | 2480 | -160 | | | |
| 13 | Room 202 unit 1 | 231 | 1 | 231 | -33 | 2310 | -330 | | | |
| 14 | Room 202 unit 1 | 318 | 1 | 318 | 54 | 3180 | 540 | | | |
| 15 | Room 202 unit 1 | 188 | 1 | 188 | -76 | 1880 | -760 | | | |
| 16 | Room 202 unit 1 | 221 | 1 | 221 | -43 | 2210 | -430 | | | |
| 17 | Room 202 unit 1 | 236 | 1 | 236 | -28 | 2360 | -280 | | | |
| 18 | Room 202 unit 1 | 202 | 1 | 202 | -62 | 2020 | -620 | | | |
| | | | | | *Mean:* | *2395* | *-245* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *313.392256* | *313.392256* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *3180* | *540* | *0* | *0* | |
| | | | | | *Min:* | *1880* | *-760* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Survey Data (MARSSIM)*

| | |
|---|---|
| **IEM Job No.:** | 2010024 |
| **IEM Task No.:** | 1 |
| **Purpose of survey:** | FSS |
| **Survey performed by:** | Michael Kimbro |
| **Date of survey:** | 12/15/2010 0:00 |
| **Data captured by:** | Michael Kimbro |
| **Date of data capture:** | 15-Dec-10 |
| **Date of QC check:** | |
| **QC check by:** | |
| **Instrument Type:** | Lud 2224 w/ 43-89 probe |
| **Detector Serial No.:** | 132117 |
| **Meter Serial No.:** | 125607 |
| **Detector Area (cm2):** | 100 |
| **DCGL (dpm/100cm2):** | 3,700,000 |
| **Check Source No:** | 2399.98 |
| **Activity (dpm):** | 20,000 |
| **Source count rate (cpm):** | 2,259 |
| **Efficiency (dpm/cpm):** | 0.1 |
| **Background Location:** | Room 212 |
| **Background counts:** | 264 |
| **Background ct. time (min)** | 1 |
| **Background rate (cpm):** | 264 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 201 | 242 | 1 | 242 | -22 | 2420 | -220 | | | |
| 2 | Room 201 | 248 | 1 | 248 | -16 | 2480 | -160 | | | |
| 3 | Room 201 | 272 | 1 | 272 | 8 | 2720 | 80 | | | |
| 4 | Room 201 | 257 | 1 | 257 | -7 | 2570 | -70 | | | |
| 5 | Room 201 | 294 | 1 | 294 | 30 | 2940 | 300 | | | |
| 6 | Room 201 | 282 | 1 | 282 | 18 | 2820 | 180 | | | |
| 7 | Room 201 | 280 | 1 | 280 | 16 | 2800 | 160 | | | |
| 8 | Room 201 | 297 | 1 | 297 | 33 | 2970 | 330 | | | |
| 9 | Room 201 | 240 | 1 | 240 | -24 | 2400 | -240 | | | |
| 10 | Room 201 | 265 | 1 | 265 | 1 | 2650 | 10 | | | |
| 11 | Room 201 | 244 | 1 | 244 | -20 | 2440 | -200 | | | |
| 12 | Room 201 | 268 | 1 | 268 | 4 | 2680 | 40 | | | |
| 13 | Room 201 | 233 | 1 | 233 | -31 | 2330 | -310 | | | |
| 14 | Room 201 | 251 | 1 | 251 | -13 | 2510 | -130 | | | |
| 15 | Room 201 | 298 | 1 | 298 | 34 | 2980 | 340 | | | |
| 16 | Room 201 | 369 | 1 | 369 | 105 | 3690 | 1050 | | | |
| 17 | Room 201 | 374 | 1 | 374 | 110 | 3740 | 1100 | | | |
| 18 | Room 201 | 366 | 1 | 366 | 102 | 3660 | 1020 | | | |
| | | | | | *Mean:* | *2822.22222* | *182.222222* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *448.875137* | *448.875137* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *3740* | *1100* | *0* | *0* | |
| | | | | | *Min:* | *2330* | *-310* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Data (MARSSIM)*

| | |
|---|---|
| IEM Job No.: | 2010024 |
| IEM Task No.: | 1 |
| Purpose of survey: | FSS |
| Survey performed by: | Michael Kimbro |
| Date of survey: | 12/16/2010 0:00 |
| Data captured by: | Michael Kimbro |
| Date of data capture: | 16-Dec-10 |
| Date of QC check: | |
| QC check by: | |
| Instrument Type: | Lud 2224 w/ 43-89 probe |
| Detector Serial No.: | 132117 |
| Meter Serial No.: | 125607 |
| Detector Area (cm2): | 100 |
| DCGL (dpm/100cm2): | 3,700,000 |
| Check Source No: | 2399.98 |
| Activity (dpm): | 20,000 |
| Source count rate (cpm): | 2,284 |
| Efficiency (dpm/cpm): | 0.1 |
| Background Location: | Room 212 |
| Background counts: | 271 |
| Background ct. time (min) | 1 |
| Background rate (cpm): | 271 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 143 | 330 | 1 | 330 | 59 | 3300 | 590 | | | |
| 2 | Room 143 | 275 | 1 | 275 | 4 | 2750 | 40 | | | |
| 3 | Room 143 | 252 | 1 | 252 | -19 | 2520 | -190 | | | |
| 4 | Room 143 | 251 | 1 | 251 | -20 | 2510 | -200 | | | |
| 5 | Room 143 | 270 | 1 | 270 | -1 | 2700 | -10 | | | |
| 6 | Room 143 | 354 | 1 | 354 | 83 | 3540 | 830 | | | |
| 7 | Room 143 | 338 | 1 | 338 | 67 | 3380 | 670 | | | |
| 8 | Room 143 | 208 | 1 | 208 | -63 | 2080 | -630 | | | |
| 9 | Room 143 | 194 | 1 | 194 | -77 | 1940 | -770 | | | |
| 10 | Room 143 | 360 | 1 | 360 | 89 | 3600 | 890 | | | |
| 11 | Room 143 | 345 | 1 | 345 | 74 | 3450 | 740 | | | |
| 12 | Room 143 | 339 | 1 | 339 | 68 | 3390 | 680 | | | |
| 13 | Room 143 | 290 | 1 | 290 | 19 | 2900 | 190 | | | |
| 14 | Room 143 | 297 | 1 | 297 | 26 | 2970 | 260 | | | |
| 15 | Room 143 | 222 | 1 | 222 | -49 | 2220 | -490 | | | |
| 16 | Room 143 | 194 | 1 | 194 | -77 | 1940 | -770 | | | |
| 17 | Room 143 | 216 | 1 | 216 | -55 | 2160 | -550 | | | |
| 18 | Room 143 | 210 | 1 | 210 | -61 | 2100 | -610 | | | |
| | | | | | *214* | *2747.22222* | *37.2222222* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *591.20819* | *591.20819* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *3600* | *890* | *0* | *0* | |
| | | | | | *Min:* | *1940* | *-770* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Data (MARSSIM)*

| | |
|---|---|
| **IEM Job No.:** | 2010024 |
| **IEM Task No.:** | 1 |
| **Purpose of survey:** | FSS |
| **Survey performed by:** | Michael Kimbro |
| **Date of survey:** | 12/16/2010 0:00 |
| **Data captured by:** | Michael Kimbro |
| **Date of data capture:** | 16-Dec-10 |
| **Date of QC check:** | |
| **QC check by:** | |
| **Instrument Type:** | Lud 2224 w/ 43-89 probe |
| **Detector Serial No.:** | 132117 |
| **Meter Serial No.:** | 125607 |
| **Detector Area (cm2):** | 100 |
| **DCGL (dpm/100cm2):** | 3,700,000 |
| **Check Source No:** | 2399.98 |
| **Activity (dpm):** | 20,000 |
| **Source count rate (cpm):** | 2,284 |
| **Efficiency (dpm/cpm):** | 0.1 |
| **Background Location:** | Room 212 |
| **Background counts:** | 271 |
| **Background ct. time (min)** | 1 |
| **Background rate (cpm):** | 271 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 135 | 264 | 1 | 264 | -7 | 2640 | -70 | | | |
| 2 | Room 135 | 304 | 1 | 304 | 33 | 3040 | 330 | | | |
| 3 | Room 135 | 288 | 1 | 288 | 17 | 2880 | 170 | | | |
| 4 | Room 135 | 201 | 1 | 201 | -70 | 2010 | -700 | | | |
| 5 | Room 135 | 388 | 1 | 388 | 117 | 3880 | 1170 | | | |
| 6 | Room 135 | 368 | 1 | 368 | 97 | 3680 | 970 | | | |
| 7 | Room 135 | 249 | 1 | 249 | -22 | 2490 | -220 | | | |
| 8 | Room 135 | 255 | 1 | 255 | -16 | 2550 | -160 | | | |
| 9 | Room 135 | 195 | 1 | 195 | -76 | 1950 | -760 | | | |
| 10 | Room 135 | 393 | 1 | 393 | 122 | 3930 | 1220 | | | |
| 11 | Room 135 | 402 | 1 | 402 | 131 | 4020 | 1310 | | | |
| 12 | Room 135 | 379 | 1 | 379 | 108 | 3790 | 1080 | | | |
| 13 | Room 135 | 392 | 1 | 392 | 121 | 3920 | 1210 | | | |
| 14 | Room 135 | 388 | 1 | 388 | 117 | 3880 | 1170 | | | |
| 15 | Room 135 | 256 | 1 | 256 | -15 | 2560 | -150 | | | |
| 16 | Room 135 | 384 | 1 | 384 | 113 | 3840 | 1130 | | | |
| 17 | Room 135 | 201 | 1 | 201 | -70 | 2010 | -700 | | | |
| 18 | Room 135 | 397 | 1 | 397 | 126 | 3970 | 1260 | | | |
| | | | | | *Mean:* | *3168.88889* | *458.888889* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *781.573743* | *781.573743* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *4020* | *1310* | *0* | *0* | |
| | | | | | *Min:* | *1950* | *-760* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Data (MARSSIM)*

| | |
|---|---|
| **IEM Job No.:** | 2010024 |
| **IEM Task No.:** | 1 |
| **Purpose of survey:** | FSS |
| **Survey performed by:** | Michael Kimbro |
| **Date of survey:** | 12/16/2010 0:00 |
| **Data captured by:** | Michael Kimbro |
| **Date of data capture:** | 16-Dec-10 |
| **Date of QC check:** | |
| **QC check by:** | |
| **Instrument Type:** | Lud 2224 w/ 43-89 probe |
| **Detector Serial No.:** | 132117 |
| **Meter Serial No.:** | 125607 |
| **Detector Area (cm2):** | 100 |
| **DCGL (dpm/100cm2):** | 3,700,000 |
| **Check Source No:** | 2399.98 |
| **Activity (dpm):** | 20,000 |
| **Source count rate (cpm):** | 2,284 |
| **Efficiency (dpm/cpm):** | 0.1 |
| **Background Location:** | Room 212 |
| **Background counts:** | 271 |
| **Background ct. time (min)** | 1 |
| **Background rate (cpm):** | 271 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 134 | 330 | 1 | 330 | 59 | 3300 | 590 | | | |
| 2 | Room 134 | 304 | 1 | 304 | 33 | 3040 | 330 | | | |
| 3 | Room 134 | 314 | 1 | 314 | 43 | 3140 | 430 | | | |
| 4 | Room 134 | 338 | 1 | 338 | 67 | 3380 | 670 | | | |
| 5 | Room 134 | 215 | 1 | 215 | -56 | 2150 | -560 | | | |
| 6 | Room 134 | 224 | 1 | 224 | -47 | 2240 | -470 | | | |
| 7 | Room 134 | 219 | 1 | 219 | -52 | 2190 | -520 | | | |
| 8 | Room 134 | 220 | 1 | 220 | -51 | 2200 | -510 | | | |
| 9 | Room 134 | 357 | 1 | 357 | 86 | 3570 | 860 | | | |
| 10 | Room 134 | 344 | 1 | 344 | 73 | 3440 | 730 | | | |
| 11 | Room 134 | 339 | 1 | 339 | 68 | 3390 | 680 | | | |
| 12 | Room 134 | 191 | 1 | 191 | -80 | 1910 | -800 | | | |
| 13 | Room 134 | 202 | 1 | 202 | -69 | 2020 | -690 | | | |
| 14 | Room 134 | 218 | 1 | 218 | -53 | 2180 | -530 | | | |
| 15 | Room 134 | 209 | 1 | 209 | -62 | 2090 | -620 | | | |
| 16 | Room 134 | 234 | 1 | 234 | -37 | 2340 | -370 | | | |
| 17 | Room 134 | 349 | 1 | 349 | 78 | 3490 | 780 | | | |
| 18 | Room 134 | 299 | 1 | 299 | 28 | 2990 | 280 | | | |
| | | | | | *Mean:* | *2725.55556* | *15.5555556* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *617.939862* | *617.939862* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *3570* | *860* | *0* | *0* | |
| | | | | | *Min:* | *1910* | *-800* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

## *Stationary Beta Data (MARSSIM)*

| | |
|---|---|
| **IEM Job No.:** | 2010024 |
| **IEM Task No.:** | 1 |
| **Purpose of survey:** | FSS |
| **Survey performed by:** | Michael Kimbro |
| **Date of survey:** | 12/16/2010 0:00 |
| **Data captured by:** | Michael Kimbro |
| **Date of data capture:** | 16-Dec-10 |
| **Date of QC check:** | |
| **QC check by:** | |
| **Instrument Type:** | Lud 2224 w/ 43-89 probe |
| **Detector Serial No.:** | 132117 |
| **Meter Serial No.:** | 125607 |
| **Detector Area (cm2):** | 100 |
| **DCGL (dpm/100cm2):** | 3,700,000 |
| **Check Source No:** | 2399.98 |
| **Activity (dpm):** | 20,000 |
| **Source count rate (cpm):** | 2,284 |
| **Efficiency (dpm/cpm):** | 0.1 |
| **Background Location:** | Room 212 |
| **Background counts:** | 271 |
| **Background ct. time (min)** | 1 |
| **Background rate (cpm):** | 271 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 116 | 200 | 1 | 200 | -71 | 2000 | -710 | | | |
| 2 | Room 116 | 280 | 1 | 280 | 9 | 2800 | 90 | | | |
| 3 | Room 116 | 245 | 1 | 245 | -26 | 2450 | -260 | | | |
| 4 | Room 116 | 271 | 1 | 271 | 0 | 2710 | 0 | | | |
| 5 | Room 116 | 291 | 1 | 291 | 20 | 2910 | 200 | | | |
| 6 | Room 116 | 221 | 1 | 221 | -50 | 2210 | -500 | | | |
| 7 | Room 116 | 231 | 1 | 231 | -40 | 2310 | -400 | | | |
| 8 | Room 116 | 212 | 1 | 212 | -59 | 2120 | -590 | | | |
| 9 | Room 116 | 439 | 1 | 439 | 168 | 4390 | 1680 | | | |
| 10 | Room 116 | 198 | 1 | 198 | -73 | 1980 | -730 | | | |
| 11 | Room 116 | 206 | 1 | 206 | -65 | 2060 | -650 | | | |
| 12 | Room 116 | 210 | 1 | 210 | -61 | 2100 | -610 | | | |
| 13 | Room 116 | 385 | 1 | 385 | 114 | 3850 | 1140 | | | |
| 14 | Room 116 | 291 | 1 | 291 | 20 | 2910 | 200 | | | |
| 15 | Room 116 | 392 | 1 | 392 | 121 | 3920 | 1210 | | | |
| 16 | Room 116 | 384 | 1 | 384 | 113 | 3840 | 1130 | | | |
| 17 | Room 116 | 193 | 1 | 193 | -78 | 1930 | -780 | | | |
| 18 | Room 116 | 378 | 1 | 378 | 107 | 3780 | 1070 | | | |
| 19 | Room 116 | 379 | 1 | 379 | 108 | 3790 | 1080 | | | |
| | | | | | | *2845.26316* | *135.263158* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *822.613507* | *822.613507* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *4390* | *1680* | *0* | *0* | |
| | | | | | *Min:* | *1930* | *-780* | *0* | *0* | |
| | | | | | *No. Measurements:* | *19* | *19* | *0* | *0* | |

## *Stationary Beta Survey Data (MARSSIM)*

| | |
|---|---|
| IEM Job No.: | 2010024 |
| IEM Task No.: | 1 |
| Purpose of survey: | FSS |
| Survey performed by: | Michael Kimbro |
| Date of survey: | 12/16/2010 0:00 |
| Data captured by: | Michael Kimbro |
| Date of data capture: | 16-Dec-10 |
| Date of QC check: | |
| QC check by: | |
| Instrument Type: | Lud 2224 w/ 43-89 probe |
| Detector Serial No.: | 132117 |
| Meter Serial No.: | 125607 |
| Detector Area (cm2): | 100 |
| DCGL (dpm/100cm2): | 3,700,000 |
| Check Source No: | 2399.98 |
| Activity (dpm): | 20,000 |
| Source count rate (cpm): | 2,284 |
| Efficiency (dpm/cpm): | 0.1 |
| Background Location: | Room 212 |
| Background counts: | 271 |
| Background ct. time (min) | 1 |
| Background rate (cpm): | 271 |

**Map or Drawing**

**See Survey Package**

**Survey Results**

| Location # | Survey Unit No. | Gross counts | Count Time (min) | Gross rate (cpm) | Net rate (cpm) | Gross (dpm/100cm2) | Net (dpm/100 cm2) | Gross DCGL Flag | Net DCGL Flag | Comments and notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Room 215 west | 273 | 1 | 273 | 2 | 2730 | 20 | | | |
| 2 | Room 215 west | 270 | 1 | 270 | -1 | 2700 | -10 | | | |
| 3 | Room 215 west | 223 | 1 | 223 | -48 | 2230 | -480 | | | |
| 4 | Room 215 west | 249 | 1 | 249 | -22 | 2490 | -220 | | | |
| 5 | Room 215 west | 269 | 1 | 269 | -2 | 2690 | -20 | | | |
| 6 | Room 215 west | 258 | 1 | 258 | -13 | 2580 | -130 | | | |
| 7 | Room 215 west | 229 | 1 | 229 | -42 | 2290 | -420 | | | |
| 8 | Room 215 west | 236 | 1 | 236 | -35 | 2360 | -350 | | | |
| 9 | Room 215 west | 231 | 1 | 231 | -40 | 2310 | -400 | | | |
| 10 | Room 215 west | 221 | 1 | 221 | -50 | 2210 | -500 | | | |
| 11 | Room 215 west | 203 | 1 | 203 | -68 | 2030 | -680 | | | |
| 12 | Room 215 west | 209 | 1 | 209 | -62 | 2090 | -620 | | | |
| 13 | Room 215 west | 206 | 1 | 206 | -65 | 2060 | -650 | | | |
| 14 | Room 215 west | 211 | 1 | 211 | -60 | 2110 | -600 | | | |
| 15 | Room 215 west | 214 | 1 | 214 | -57 | 2140 | -570 | | | |
| 16 | Room 215 west | 218 | 1 | 218 | -53 | 2180 | -530 | | | |
| 17 | Room 215 west | 199 | 1 | 199 | -72 | 1990 | -720 | | | |
| 18 | Room 215 west | 202 | 1 | 202 | -69 | 2020 | -690 | | | |
| | | | | | *214* | *2289.44444* | *-420.55556* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *SD:* | *248.701858* | *248.701858* | *#DIV/0!* | *#DIV/0!* | |
| | | | | | *Max:* | *2730* | *20* | *0* | *0* | |
| | | | | | *Min:* | *1990* | *-720* | *0* | *0* | |
| | | | | | *No. Measurements:* | *18* | *18* | *0* | *0* | |

# REMOVABLE H-3 AND C-14 MEASUREMENT RESULTS

***Tritium and C-14 Smear Results***

| Survey Unit | Smear No. | H-3 | C-14 |
|---|---|---|---|
| | | | 2.61 |
| 201 | 1 | 17.03 | 0.00 |
| 201 | 2 | 17.28 | 0.00 |
| 201 | 3 | 5.92 | 0.00 |
| 201 | 4 | 16.99 | 1.00 |
| 201 | 5 | 17.27 | 1.73 |
| 201 | 6 | 10.57 | 0.00 |
| 201 | 7 | 7.23 | 0.00 |
| 201 | 8 | 16.77 | 0.00 |
| 201 | 9 | 27.19 | 1.70 |
| 201 | 10 | 13.04 | 0.00 |
| 201 | 11 | 18.76 | 0.00 |
| 201 | 12 | 18.19 | 0.00 |
| 201 | 13 | 5.81 | 0.00 |
| 201 | 14 | 9.43 | 0.00 |
| 201 | 15 | 11.35 | 1.46 |
| 201 | 16 | 4.50 | 0.00 |
| 201 | 17 | 11.09 | 0.00 |
| 201 | 18 | 19.17 | 0.00 |
| 202 | 19 | 11.00 | 0.00 |
| 202 | 20 | 16.76 | 0.00 |
| 202 | 21 | 7.83 | 0.12 |
| 202 | 22 | 7.92 | 2.59 |
| 202 | 23 | 14.82 | 0.00 |
| 202 | 24 | 17.02 | 0.18 |
| 202 | 25 | 16.42 | 0.00 |
| 202 | 26 | 5.92 | 0.28 |
| 202 | 27 | 16.69 | 0.00 |
| 202 | 28 | 16.51 | 0.00 |
| 202 | 29 | 13.83 | 0.00 |
| 202 | 30 | 13.91 | 0.00 |
| 202 | 31 | 13.18 | 0.00 |
| 202 | 32 | 8.94 | 0.00 |
| 202 | 33 | 13.17 | 0.00 |
| 202 | 34 | 9.40 | 1.53 |
| 202 | 35 | 2.18 | 2.61 |
| 202 | 36 | 8.38 | 0.64 |
| 202W | 37 | 18.52 | 0.00 |
| 202W | 38 | 14.89 | 0.00 |
| 202W | 39 | 13.84 | 0.00 |
| 202W | 40 | 11.13 | 0.00 |
| 202W | 41 | 9.05 | 0.00 |
| 202W | 42 | 11.21 | 0.00 |
| 202W | 43 | 12.13 | 0.00 |
| 202W | 44 | 7.25 | 0.00 |
| 202W | 45 | 15.77 | 4.70 |
| 202W | 46 | 13.93 | 0.93 |
| 202W | 47 | 6.92 | 0.00 |
| 202W | 48 | 21.95 | 0.00 |
| 202W | 49 | 11.38 | 0.78 |
| 202W | 50 | 14.36 | 0.00 |
| 202W | 51 | 10.73 | 0.00 |
| 202W | 52 | 8.69 | 0.94 |
| 202W | 53 | 9.45 | 0.00 |
| 202W | 54 | 7.51 | 1.20 |
| 206 | 55 | 8.25 | 0.00 |
| 206 | 56 | 3.69 | 0.00 |
| 206 | 57 | 12.10 | 0.00 |

# REMOVABLE H-3 AND C-14 MEASUREMENT RESULTS

| Survey Unit | Smear No. | H-3 | C-14 |
|---|---|---|---|
| 206 | 58 | 14.96 | 0.00 |
| 206 | 59 | 25.50 | 0.00 |
| 206 | 60 | 5.35 | 0.00 |
| 206 | 61 | 13.29 | 0.00 |
| 206 | 62 | 15.80 | 0.00 |
| 206 | 63 | 7.76 | 0.71 |
| 206 | 64 | 12.43 | 0.00 |
| 206 | 65 | 17.44 | 0.00 |
| 206 | 66 | 21.40 | 0.00 |
| 206 | 67 | 11.77 | 0.00 |
| 206 | 68 | 8.10 | 0.00 |
| 206 | 69 | 16.83 | 0.09 |
| 206 | 70 | 10.76 | 0.00 |
| 206 | 71 | 17.73 | 0.00 |
| 206 | 72 | 9.05 | 0.00 |
| 135 | 73-1 | 39.87 | 0.00 |
| 135 | 74-2 | 134.44 | 0.00 |
| 135 | 75-3 | 56.36 | 0.00 |
| 135 | 76-4 | 36.75 | 0.00 |
| 135 | 77-5 | 36.65 | 0.00 |
| 135 | 78-6 | 21.40 | 0.00 |
| 135 | 79-7 | 23.95 | 0.00 |
| 135 | 80-8 | 23.00 | 0.00 |
| 135 | 81-9 | 38.69 | 0.00 |
| 135 | 82-10 | 39.95 | 0.00 |
| 135 | 83-11 | 31.27 | 0.00 |
| 135 | 84-12 | 27.16 | 0.00 |
| 135 | 85-13 | 24.73 | 0.00 |
| 135 | 86-14 | 20.96 | 0.00 |
| 135 | 87-15 | 28.49 | 0.00 |
| 135 | 88-16 | 26.95 | 0.00 |
| 135 | 89-17 | 23.26 | 0.00 |
| 135 | 90-18 | 23.13 | 0.00 |
| 134 | 91 | 13.89 | 0.00 |
| 134 | 92 | 9.44 | 1.51 |
| 134 | 93 | 12.77 | 0.00 |
| 134 | 94 | 14.43 | 0.00 |
| 134 | 95 | 13..97 | 0.00 |
| 134 | 96 | 7.37 | 0.00 |
| 134 | 97 | 7.44 | 0.00 |
| 134 | 98 | 10.62 | 0.00 |
| 134 | 99 | 12.63 | 0.00 |
| 134 | 100 | 16.54 | 0.00 |
| 134 | 101 | 11.87 | 0.00 |
| 134 | 102 | 6.47 | 0.00 |
| 134 | 103 | 15.51 | 0.00 |
| 134 | 104 | 12.05 | 0.00 |
| 134 | 105 | 14.01 | 0.00 |
| 134 | 106 | 6.77 | 0.00 |
| 134 | 107 | 20.86 | 0.00 |
| 134 | 108 | 7.01 | 0.00 |
| 143 | 109 | 13.79 | 0.00 |
| 143 | 110 | 18.16 | 0.00 |
| 143 | 111 | 13.98 | 0.66 |
| 143 | 112 | 11.13 | 0.00 |
| 143 | 113 | 6.96 | 1.32 |
| 143 | 114 | 2.71 | 0.00 |
| 143 | 115 | 6.63 | 4.08 |
| 143 | 116 | 10.80 | 0.00 |
| 143 | 117 | 3.65 | 0.00 |

# REMOVABLE H-3 AND C-14 MEASUREMENT RESULTS

| Survey Unit | Smear No. | H-3 | C-14 |
|---|---|---|---|
| 143 | 118 | 15.04 | 0.00 |
| 143 | 119 | 14.60 | 0.61 |
| 143 | 120 | 11.72 | 0.00 |
| 143 | 121 | 20.28 | 0.00 |
| 143 | 122 | 11.43 | 0.00 |
| 143 | 123 | 14.15 | 0.43 |
| 143 | 124 | 9.65 | 0.00 |
| 143 | 125 | 15.51 | 0.00 |
| 143 | 126 | 14.81 | 0.00 |
| 116 | 127 | 12.45 | 0.32 |
| 116 | 128 | 6.09 | 0.82 |
| 116 | 129 | 12.95 | 0.00 |
| 116 | 130 | 13.51 | 0.73 |
| 116 | 131 | 14.96 | 0.00 |
| 116 | 132 | 6.42 | 0.00 |
| 116 | 133 | 12.07 | 0.00 |
| 116 | 134 | 18.10 | 0.00 |
| 116 | 135 | 11.44 | 0.00 |
| 116 | 136 | 11.27 | 0.00 |
| 116 | 137 | 16.80 | 0.00 |
| 116 | 138 | 8.99 | 0.00 |
| 116 | 139 | 12.16 | 1.96 |
| 116 | 140 | 8.63 | 0.00 |
| 116 | 141 | 2.19 | 0.00 |
| 116 | 142 | 7.94 | 0.00 |
| 116 | 143 | 21.64 | 0.00 |
| 116 | 144 | 9.55 | 0.00 |
| 116 | 145 | 17.52 | 1.31 |
| 215E | 146 | 9.19 | 0.00 |
| 215E | 147 | 19.31 | 0.00 |
| 215E | 148 | 10.06 | 0.00 |
| 215E | 149 | 13.66 | 0.00 |
| 215E | 150 | 18.80 | 0.00 |
| 215E | 151 | 14.85 | 1.86 |
| 215E | 152 | 10.94 | 0.00 |
| 215E | 153 | 9.10 | 0.00 |
| 215E | 154 | 11.67 | 0.00 |
| 215E | 155 | 9.55 | 0.00 |
| 215E | 156 | 7.77 | 0.00 |
| 215E | 157 | 12.38 | 0.00 |
| 215E | 158 | 18.17 | 0.00 |
| 215E | 159 | 7.52 | 1.27 |
| 215E | 160 | 13.04 | 4.00 |
| 215E | 161 | 6.87 | 0.00 |
| 215E | 162 | 18.10 | 0.00 |
| 215E | 163 | 10.93 | 0.00 |
| 215W | 164 | 25.53 | 0.00 |
| 215W | 165 | 11.92 | 0.00 |
| 215W | 166 | 16.39 | 0.00 |
| 215W | 167 | 15.97 | 0.00 |
| 215W | 168 | 15.49 | 0.00 |
| 215W | 169 | 10.40 | 0.00 |
| 215W | 170 | 16.60 | 0.00 |
| 215W | 171 | 15.92 | 0.00 |
| 215W | 172 | 28.77 | 0.00 |
| 215W | 173 | 14.13 | 0.21 |
| 215W | 174 | 25.54 | 0.00 |
| 215W | 175 | 15.77 | 2.26 |
| 215W | 176 | 28.74 | 0.00 |
| 215W | 177 | 6.74 | 2.70 |

# REMOVABLE H-3 AND C-14 MEASUREMENT RESULTS

| Survey Unit | Smear No. | H-3 | C-14 |
|---|---|---|---|
| 215W | 178 | 22.90 | 0.00 |
| 215W | 179 | 11.69 | 0.00 |
| 215W | 180 | 13.38 | 0.00 |
| 215W | 181 | 3.55 | 0.00 |
| Mean | | 15.17 | 0.27 |
| SD | | 11.81 | 0.75 |
| Minimum | | 2.18 | 0.00 |
| Max | | 134.44 | 4.70 |
| N | | 180 | 181 |

# Appendix 11.7 - Certificates of Analysis

sahci

200 North Cedar Road – New Lenox, Illinois 60451-1751 – (800) 383-0468 or (815) 485-6161 – FAX (815) 485-4433 – Email sahci@sahci.com – Home Page www.sahci.com

December 29, 2010

Carol D. Berger
President
Integrated Environmental Management, Inc.
8 Brookes Avenue, Suite 205
Gaithersburg, MD 20877

**Subject: Sample Analysis for $^{3}H$ and $^{14}C$ Detection**

Dear Ms. Berger:

Per your request we have completed the analysis of the sample wipes (163) that you provided. All samples were analyzed on December 29, 2010 using a Packard Liquid Scintillation Counter, Model U1900, Serial No. 101464. Each sample was counted for five (5) minutes. The DPM results for tritium and C-14 are provided on the attached document.

If you have further questions or need additional information please feel free to contact me or Glenn Huber at 1-800-383-0468.

Sincerely,
Stan Huber Consultants, Inc.

James Hatten
Radiation Safety Officer, SAHCI

Enclosure

IEM Wipe Analysis 12/29/2010

| Instrument Identification: | Manufacturer | Model | Serial | Analyze Date | BKG H3 cpm | BKG C14 cpm | H3 Eff | C14 Eff |
|---|---|---|---|---|---|---|---|---|
| LSC | Packard | U1900 | 101464 | 12/29/2010 | 15.68 | 24.35 | 62.35 | 92.26 |

**Protocol Information:** H3 Window: 0-12 keV, C14 Window: 12-156 keV, Count time: 5 minutes

| Sample # | H3 DPM | C14 DPM |
|---|---|---|
| 1 | 17.03 | 0.00 |
| 2 | 17.28 | 0.00 |
| 3 | 5.92 | 0.00 |
| 4 | 16.99 | 1.00 |
| 5 | 17.27 | 1.73 |
| 6 | 10.57 | 0.00 |
| 7 | 7.23 | 0.00 |
| 8 | 16.77 | 0.00 |
| 9 | 27.19 | 1.70 |
| 10 | 13.04 | 0.00 |
| 11 | 18.76 | 0.00 |
| 12 | 18.19 | 0.00 |
| 13 | 5.81 | 0.00 |
| 14 | 9.43 | 0.00 |
| 15 | 11.35 | 1.46 |
| 16 | 4.50 | 0.00 |
| 17 | 11.09 | 0.00 |
| 18 | 19.17 | 0.00 |
| 19 | 11.00 | 0.00 |
| 20 | 16.76 | 0.00 |
| 21 | 7.83 | 0.12 |
| 22 | 7.92 | 2.59 |
| 23 | 14.82 | 0.00 |
| 24 | 17.02 | 0.18 |
| 25 | 16.42 | 0.00 |
| 26 | 5.92 | 0.28 |
| 27 | 16.69 | 0.00 |
| 28 | 16.51 | 0.00 |
| 29 | 13.83 | 0.00 |
| 30 | 13.91 | 0.00 |
| 31 | 13.18 | 0.00 |
| 32 | 8.94 | 0.00 |
| 33 | 13.17 | 0.00 |
| 34 | 9.40 | 1.53 |
| 35 | 2.18 | 2.61 |
| 36 | 8.38 | 0.64 |
| 37 | 18.52 | 0.00 |
| 38 | 14.89 | 0.00 |
| 39 | 13.84 | 0.00 |
| 40 | 11.13 | 0.00 |
| 41 | 9.05 | 0.00 |
| 42 | 11.21 | 0.00 |
| 43 | 12.13 | 0.00 |
| 44 | 7.25 | 0.00 |
| 45 | 15.77 | 4.70 |
| 46 | 13.93 | 0.93 |
| 47 | 6.92 | 0.00 |
| 48 | 21.95 | 0.00 |
| 49 | 11.38 | 0.78 |
| 50 | 14.36 | 0.00 |
| 51 | 10.73 | 0.00 |
| 52 | 8.69 | 0.94 |

IEM Wipe Analysis 12/29/2010

| Sample # | H3 DPM | C14 DPM |
|---|---|---|
| 53 | 9.45 | 0.00 |
| 54 | 7.51 | 1.20 |
| 55 | 8.25 | 0.00 |
| 56 | 3.69 | 0.00 |
| 57 | 12.10 | 0.00 |
| 58 | 14.96 | 0.00 |
| 59 | 25.50 | 0.00 |
| 60 | 5.35 | 0.00 |
| 61 | 13.29 | 0.00 |
| 62 | 15.80 | 0.00 |
| 63 | 7.76 | 0.71 |
| 64 | 12.43 | 0.00 |
| 65 | 17.44 | 0.00 |
| 66 | 21.40 | 0.00 |
| 67 | 11.77 | 0.00 |
| 68 | 8.10 | 0.00 |
| 69 | 16.83 | 0.09 |
| 70 | 10.76 | 0.00 |
| 71 | 17.73 | 0.00 |
| 72 | 9.05 | 0.00 |
| 91 | 13.89 | 0.00 |
| 92 | 9.44 | 1.51 |
| 93 | 12.77 | 0.00 |
| 94 | 14.43 | 0.00 |
| 95 | 13..97 | 0.00 |
| 96 | 7.37 | 0.00 |
| 97 | 7.44 | 0.00 |
| 98 | 10.62 | 0.00 |
| 99 | 12.63 | 0.00 |
| 100 | 16.54 | 0.00 |
| 101 | 11.87 | 0.00 |
| 102 | 6.47 | 0.00 |
| 103 | 15.51 | 0.00 |
| 104 | 12.05 | 0.00 |
| 105 | 14.01 | 0.00 |
| 106 | 6.77 | 0.00 |
| 107 | 20.86 | 0.00 |
| 108 | 7.01 | 0.00 |
| 109 | 13.79 | 0.00 |
| 110 | 18.16 | 0.00 |
| 111 | 13.98 | 0.66 |
| 112 | 11.13 | 0.00 |
| 113 | 6.96 | 1.32 |
| 114 | 2.71 | 0.00 |
| 115 | 6.63 | 4.08 |
| 116 | 10.80 | 0.00 |
| 117 | 3.65 | 0.00 |
| 118 | 15.04 | 0.00 |
| 119 | 14.60 | 0.61 |
| 120 | 11.72 | 0.00 |
| 121 | 20.28 | 0.00 |
| 122 | 11.43 | 0.00 |
| 123 | 14.15 | 0.43 |
| 124 | 9.65 | 0.00 |
| 125 | 15.51 | 0.00 |
| 126 | 14.81 | 0.00 |

| Sample # | H3 DPM | C14 DPM |
|---|---|---|
| 127 | 12.45 | 0.32 |
| 128 | 6.09 | 0.82 |
| 129 | 12.95 | 0.00 |
| 130 | 13.51 | 0.73 |
| 131 | 14.96 | 0.00 |
| 132 | 6.42 | 0.00 |
| 133 | 12.07 | 0.00 |
| 134 | 18.10 | 0.00 |
| 135 | 11.44 | 0.00 |
| 136 | 11.27 | 0.00 |
| 137 | 16.80 | 0.00 |
| 138 | 8.99 | 0.00 |
| 139 | 12.16 | 1.96 |
| 140 | 8.63 | 0.00 |
| 141 | 2.19 | 0.00 |
| 142 | 7.94 | 0.00 |
| 143 | 21.64 | 0.00 |
| 144 | 9.55 | 0.00 |
| 145 | 17.52 | 1.31 |
| 146 | 9.19 | 0.00 |
| 147 | 19.31 | 0.00 |
| 148 | 10.06 | 0.00 |
| 149 | 13.66 | 0.00 |
| 150 | 18.80 | 0.00 |
| 151 | 14.85 | 1.86 |
| 152 | 10.94 | 0.00 |
| 153 | 9.10 | 0.00 |
| 154 | 11.67 | 0.00 |
| 155 | 9.55 | 0.00 |
| 156 | 7.77 | 0.00 |
| 157 | 12.38 | 0.00 |
| 158 | 18.17 | 0.00 |
| 159 | 7.52 | 1.27 |
| 160 | 13.04 | 4.00 |
| 161 | 6.87 | 0.00 |
| 162 | 18.10 | 0.00 |

sahci

200 North Cedar Road – New Lenox, Illinois 60451-1751 – (800) 383-0468 or (815) 485-6161 – FAX (815) 485-4433 – Email sahci@sahci.com – Home Page www.sahci.com

January 12, 2011

Carol D. Berger
President
Integrated Environmental Management, Inc.
8 Brookes Avenue, Suite 205
Gaithersburg, MD 20877

**Subject: Sample Analysis for $^{3}H$ and $^{14}C$ Detection**

Dear Ms. Berger:

Per your request we have completed the analysis of the sample wipes (18) that you provided. All samples were analyzed on January 12, 2011 using a Packard Liquid Scintillation Counter, Model U1900, Serial No. 101464. Each sample was counted for five (5) minutes. The DPM results for tritium and C-14 are provided on the attached document.

If you have further questions or need additional information please feel free to contact me or Glenn Huber at 1-800-383-0468.

Sincerely,
Stan Huber Consultants, Inc.

James Hatten
Radiation Safety Officer, SAHCI

Enclosure

IEM Wipe Analysis 1/12/2011

| Instrument Identification: | Manufacturer | Model | Serial | Analyze Date | BKG H3 cpm | BKG C14 cpm | H3 Eff | C14 Eff |
|---|---|---|---|---|---|---|---|---|
| LSC | Packard | U1900 | 101464 | 01/12/2011 | 15.73 | 23.87 | 63.53 | 95.05 |

**Protocol Information:** H3 Window: 0-12 keV, C14 Window: 12-156 keV, Count time: 5 minutes

| Sample # | H3 DPM | C14 DPM |
|---|---|---|
| 1 | 39.87 | 0.00 |
| 2 | 134.44 | 0.00 |
| 3 | 56.36 | 0.00 |
| 4 | 36.75 | 0.00 |
| 5 | 36.64 | 0.00 |
| 6 | 21.40 | 0.00 |
| 7 | 23.95 | 0.00 |
| 8 | 23.00 | 0.00 |
| 9 | 38.69 | 0.00 |
| 10 | 39.95 | 0.00 |
| 11 | 31.27 | 0.00 |
| 12 | 27.16 | 0.00 |
| 13 | 24.73 | 0.00 |
| 14 | 20.96 | 0.00 |
| 15 | 28.49 | 0.00 |
| 16 | 26.95 | 0.00 |
| 17 | 23.26 | 0.00 |
| 18 | 23.13 | 0.00 |

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD



Reference No

| | | |
|---|---|---|
| (1) Client Name MONSANTO | (7) Samples Shipment Date 12/23/2010 | (5) Bill to: IEM |
| (2)Collected By: Michael Kimbro | (8) Lab Destination Stan Huber Consult. | 975 Russell Ave Suite A |
| (3) Job/Task No: 2010 024.001 | (9) Lab Contact Joel Ahrweiler | Gaithersburg, MD |
| (4) Project Manager: Michael Kimbro | (12) IEM Technical Contact/Phone CAROL BERGER 240-631-8990 | (10) Report to: Carol Berger |
| (6) Purchase Order No. | (13) Carrier/Waybill No. 8738 0042 7990 | |
| (11) Required Report Date 30 days | | |

## ONE CONTAINER PER LINE

| (14) Sample Number | (15) Sample Description/Type | (16) Date/Time Collected | (17) Container Type | (18) Sample Volume | (19) Preservative | (20) Requested Testing Program |
|---|---|---|---|---|---|---|
| 2010024.001 | styrofoam | 12/16/10/1500 | Plastic bag | SMEAR 100 cm² each | NONE | H-3, C-14 LSC |
| (1-181) | smears | | | | | Counting, |
| | | | | | | Specifications |
| | | | | | | on file |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

(23) Special Instructions

(24) Possible Hazard Identification
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

(25) Sample Disposal
Return to Client ☐ Disposal by Lab ☑ Archive _____ months

(26) Turnaround Time Required: Normal ☑ Rush ☐

(27) QC Level: I ☐ II ☐ III ☐ Project Specific _____

| | |
|---|---|
| (28) Relinquished by: (signature, date, time): Michael Kimbro 12/28/2010 1300 | Received by: (signature, date, time) Joel Ahrweiler 12/28/10 |
| Relinquished by: (signature, date, time): | Received by: (signature, date, time) (SAHCX) |
| Relinquished by: (signature, date, time): | Received by: (signature, date, time) |

(See Reverse for Instructions)

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD



Reference No

| | | |
|---|---|---|
| (1) Client Name MONSANTO | (7) Samples Shipment Date 1/10/2011 | (5) Bill to: IEM - SEE PO |
| (2)Collected By: David Miller | (8) Lab Destination SAHCI | |
| (3) Job/Task No: 2010024.01 | (9) Lab Contact J. AHRNEILER | |
| (4) Project Manager: M. KIMBRO | (12) IEM Technical Contact/Phone C BERGER | (10) Report to: IEM - SEE PO |
| (6) Purchase Order No. 1024.1.1 | (13) Carrier/Waybill No. 210/631-8944 | |
| (11) Required Report Date SEE PO | | |

## ONE CONTAINER PER LINE

| (14) Sample Number | (15) Sample Description/Type | (16) Date/Time Collected | (17) Container Type | (18) Sample Volume | (19) Preservative | (20) Requested Testing Program |
|---|---|---|---|---|---|---|
| 1 | SWEAR | Jan 10 2011 11:17am | N.A. | N.A. | N.A | 3 |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |

(23) Special Instructions

(24) Possible Hazard Identification
Non-hazard ☒ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

(25) Sample Disposal
Return to Client ☐ Disposal by Lab ☒ Archive _____ months

(26) Turnaround Time Required: Normal ☐ Rush ☒

(27) QC Level: I ☒ II ☐ III ☐ Project Specific _____

(28) Relinquished by: (signature, date, time): [signature] 1/10/11 [illegible]

Received by: (signature, date, time) [signature] 1/11/11 (Sahci)

Relinquished by: (signature, date, time):

Received by: (signature, date, time)

Relinquished by: (signature, date, time):

Received by: (signature, date, time)

(See Reverse for Instructions)

# INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
# ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD



Reference No

| | | |
|---|---|---|
| (1) Client Name MONSANTO | (7) Samples Shipment Date | (5) Bill to: IEM - SEE PO |
| (2) Collected By: | (8) Lab Destination SAHCI | |
| (3) Job/Task No: 2D10024.01 | (9) Lab Contact J. AARDENER | |
| (4) Project Manager: M KIMBRO | (12) IEM Technical Contact/Phone C BERGER 248/631-8790 | (10) Report to: IEM - SEE PO |
| (6) Purchase Order No. 1024.1.1 | (13) Carrier/Waybill No. | |
| (11) Required Report Date SEE PO | | |

## ONE CONTAINER PER LINE

| (14) Sample Number | (15) Sample Description/Type | (16) Date/Time Collected | (17) Container Type | (18) Sample Volume | (19) Preservative | (20) Requested Testing Program |
|---|---|---|---|---|---|---|
| 10 | SHEAR | Jan 10 2011 16:15 | N.A. | N.A. | N.A | 3H 14C |
| 11 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 12 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 13 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 14 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 15 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 16 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 17 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 18 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |

(23) Special Instructions

(24) Possible Hazard Identification
Non-hazard ☒ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

(25) Sample Disposal
Return to Client ☐ Disposal by Lab ☒ Archive _____ months

(26) Turnaround Time Required: Normal ☐ Rush ☒

(27) QC Level: I ☒ II ☐ III ☐ Project Specific _____

| | |
|---|---|
| (28) Relinquished by: (signature, date, time): [signature] | Received by: (signature, date, time) [signature] 1/14/11 (SAHCI) |
| Relinquished by: (signature, date, time): | Received by: (signature, date, time) |
| Relinquished by: (signature, date, time): | Received by: (signature, date, time) |

(See Reverse for Instructions)

This report was prepared under the direction of
The Monsanto Company Radiation Safety Officer

by

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Integrated Environmental Management, Inc.
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This is to acknowledge the receipt of your letter/application dated
LTR 2/16/2011 / NRC 314 DTD 2/14/2011, and to inform you that the initial processing which includes an administrative review has been performed.

☑ TERMINATION 06-28624-01
There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

_____.

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 574454.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader