# DR. MODESTO IRIARTE TECHNOLOGICAL MUSEUM (FORMER BONUS FACILITY)

## 2012 ANNUAL RADIOLOGICAL SURVEY REPORT

## RINCON
## PUERTO RICO

**DRAFT**
**January 2013**

**FOR THE PUERTO RICO ELECTRIC POWER AUTHORITY**

This page intentionally left blank.

# DRAFT

# DR. MODESTO IRIARTE TECHNOLOGICAL MUSEUM
# 2012 ANNUAL RADIOLOGICAL SURVEY REPORT

RINCON, PUERTO RICO

January 2013

---

Prepared for:

**Puerto Rico Electric Power Authority**

---

Prepared by:

**URS Corporation**
As Prime Contractor

And

**MMG, LLC**
As Subcontractor

This page intentionally left blank.

# Contents



# List of Tables



# List of Appendices

# Acronyms and Abbreviations

| | |
|---|---|
| CFR | Code of Federal Regulations |
| DOE | U.S. Department of Engergy |
| Dome | BONUS Enclosed Domed Building |
| dpm/100cm$^2$ | disintegrations per minute per 100 centimeters squared |
| Dup | Duplicate |
| MDA | Minimum Detectable Activity |
| MMG | MMG, LLC |
| NA | Not Applicable |
| QA | quality assurance |
| QC | quality control |
| RCM | Radiological Control Manager |
| rem | roentgen equivalent in man |
| RPD | Relative Percent Difference |
| RWP | Radiological Work Permit |
| SAP | Sampling and Analysis Plan |
| SOP | Standard Operating Procedure |
| µR/hour | micro-Roentgen per hour |

# 1.0 INTRODUCTION

MMG, LLC (MMG) conducted the comprehensive annual survey at the Dr. Modesto Iriarte Technological Museum (former BONUS Facility) during the dates of 29 – 31 October 2012 with support from PREPA personnel. This survey was conducted in accordance with the Sampling and Analysis Plan (SAP) for the BONUS Facility prepared by the U.S. Department of Energy (DOE) (or DOE contractor) as amended by a 16 January 2001 Memorandum from Webb to Alvarado. The survey was also altered, as presented below in this report, in consideration of the covering of contamination areas/surfaces by paint and/or concrete, the shielding (concrete floor) placed on the Basement Level, the verification survey performed in January 2005 (refer to 22 February 2005 Memorandum entitled: *2004 Annual Survey and Verification Survey for Basement Floor*), and subsequent annual surveys. This report is organized in accordance with Section 6.2 of the SAP. The sampling and inspection results are discussed below.

This page intentionally left blank.

# 2.0 PURPOSE

The purpose of this effort was to conduct an annual radiological survey - to ensure that exposure to employees, the public and the environment to levels of ionizing radiation are as low as reasonably achievable and demonstrate that levels of radioactivity at the facility remain within the criteria that support the basis for continued use as a museum.

This page intentionally left blank.

# 3.0 LOCATION

This sampling and inspection effort focused on the BONUS Enclosed Domed Building (Dome). Surveys and inspections were performed on the (1) exterior of the entombment (concrete monolith where the entombed reactor vessel resides), (2) Main Level, and (3) Basement Level. Table 1 provides a list of specific survey locations.

**Table 1. Survey Locations and Results**

| Sampling Location | Sample Number | Dose Rate (µR/hour) | Total Contamination (dpm/100 $cm^2$) | Removable Contamination (dpm/100 $cm^2$) | Comments |
|---|---|---|---|---|---|
| **Routine Sampling** | | | | | |
| Pipe Chase Face | 1 | 5 | <MDA | <MDA | Monolith Top |
| Pipe Chase Face | 2 | 4 | <MDA | <MDA | Monolith Top |
| Pipe Chase Face | 3 | 5 | <MDA | <MDA | Monolith Top |
| Pipe Chase Face | 4 | 4 | <MDA | <MDA | Monolith Top |
| Top Plug Face #1 | 5 | 5 | <MDA | <MDA | Monolith Top |
| Top Plug Face #1 | 6 | 5 | <MDA | <MDA | Monolith Top |
| Top Plug Face #1 | 7 | 5 | <MDA | <MDA | Monolith Top |
| Top Plug Face #2 | 8 | 5 | <MDA | <MDA | Monolith Top |
| Top Plug Face #2 | 9 | 7 | <MDA | <MDA | Monolith Top |
| Top Plug Face #2 | 10 | 4 | <MDA | <MDA | Monolith Top |
| Top Plug Face #3 | 11 | 5 | <MDA Dup=<MDA | <MDA | Monolith Top |
| Top Plug Face #3 | 12 | 5 Dup=5 | <MDA | <MDA | Monolith Top |
| Top Plug Face #3 | 13 | 4 | <MDA | <MDA | Monolith Top |
| Top Plug Face #4 | 14 | 5 | <MDA | <MDA | Monolith Top |
| Top Plug Face #4 | 15 | 4 | <MDA | <MDA | Monolith Top |
| Top Plug Face #4 | 16 | 5 | <MDA | <MDA | Monolith Top |
| Top Plug Top Surface | 17 | 4 | <MDA | <MDA | Monolith Top |
| Top Plug Top Surface | 18 | 4 | <MDA | <MDA Dup=<MDA | Monolith Top |
| Top Plug Top Surface | 19 | 4 | 875 | <MDA | Monolith Top |
| Main Floor Water Column | 20 | 4 | <MDA | <MDA | Main Level-Controlled Area |
| Main Floor Water Column | 21 | 3 | <MDA | <MDA | Main Level-Controlled Area |
| Instrument Thimble #1 | 22 | 5 | <MDA Dup=<MDA | <MDA | Main Level-Controlled Area |
| Instrument Thimble #2 | 23 | 5 | <MDA | <MDA | Main Level-Controlled Area |
| Instrument Thimble #3 | 24 | 5 | <MDA | <MDA | Main Level-Controlled Area |
| Pipe Chase Ext Hatch | 25 | 5 | <MDA | <MDA | Main Level-Controlled Area |
| Instrument Thimble #4 | 26 | 5 | <MDA | <MDA | Main Level-Controlled Area |
| Fuel Pool Purif. Floor, area | 27 | 16 | 16,550 | <MDA | Main Level-Controlled Area |
| Fuel Pool Purif. Floor, area | 27A | 4 | <MDA | <MDA | Main Level-Controlled Area. Taken to define elevated area associated with 27 and 28. |
| Fuel Pool Purif Floor, area | 27B | 4 | <MDA | <MDA | Main Level-Controlled Area. Taken to define elevated area associated with 27 and 28. |
| Fuel Pool Purif. Floor (CM005) | 28 | 14 | 71,828 Dup=76,622 | <MDA Dup=<MDA | Main Level-Controlled Area |

## Table 1 (Continued)

| Sampling Location | Sample Number | Dose Rate (µR/hour) | Total Contamination (dpm/100 $cm^2$) | Removable Contamination (dpm/100 $cm^2$) | Comments |
|---|---|---|---|---|---|
| **Routine Sampling (continued)** | | | | | |
| Side of Liq. Waste Ret. Tank #1 | 30 | 18 | 1,001 | <MDA | Basement Level, Att. A – Fig.s 4 and 6 |
| Side of Liq. Waste Ret. Tank #2 | 31 | 15 Dup=15 | 1,668 | <MDA | Basement Level, Att. A – Fig.s 4, 5, and 6 |
| F.W. Heater Room (Wall) | 40A | 12 Dup=12 | 6,086 Dup=6,587 | <MDA Dup=<MDA | Basement Level, Att. A – Fig. 9 |
| F.W. Heater Room (Wall) | 40B | 10 | <MDA | <MDA | Basement Level, Att. A – Fig. 9 |
| Vapor Sphere Room | 42 | 4 | <MDA | <MDA | Basement Level |
| Vapor Sphere Room | 43 | 3 | <MDA | <MDA | Basement Level |
| Condenser Room Entry Wall (Block) | 50A | 5 | <MDA | <MDA | Basement Level, Att. A – Fig. 11 |
| Condenser Room Entry Wall (Concrete) | 50B | 5 | <MDA | <MDA | Basement Level, Att. A – Fig. 11 |
| **Additional Sampling Locations** | | | | | |
| Main Floor-Zone 1 | 65 | 5 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 2 | 66 | 5 Dup=5 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 3 | 67 | 5 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 4 | 68 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 5 | 69 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 6 | 72 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 7 | 73 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 8 | 74 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 9 | 75 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 9 Smear | 9A | NA | NA | <MDA | Main Level-Public Access |
| Main Floor-Zone 9 Smear | 9B | NA | NA | <MDA | Main Level-Public Access |
| Main Floor-Zone 9 Smear | 9C | NA | NA | <MDA | Main Level-Public Access |
| Main Floor-Zone 10 | 76 | 4 Dup=4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 11 | 77 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |

## Table 1 (Continued)

| Sampling Location | Sample Number | Dose Rate (µR/hour) | Total Contamination (dpm/100 $cm^2$) | Removable Contamination (dpm/100 $cm^2$) | Comments |
|---|---|---|---|---|---|
| **Additional Sampling Locations (Continued)** | | | | | |
| Main Floor-Zone 12 | 78 | 4 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 14 | 79 | 5 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Main Floor-Zone 13 | 80 | 5 | NA | <1000dpm/100$cm^2$ | Main Level-Public Access. Masslin Smear |
| Basement Floor-Zone 1 | 70 | 6 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 2 | 71 | 5 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 3 | 81 | 5 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 4 | 89 | 6 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 5 | 90 | 4 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 6 | 91 | 7 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 7 | 92 | 4 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 8 | 93 | 5 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 9 | 94 | 4 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 10 | 95 | 5 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 11 | 96 | 4 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 12 | 97 | 3 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 13 | 98 | 5 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 14 | 99 | 4<br>Dup=4 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 15 | 100 | 3 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 16 | 101 | 4 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 17 | 102 | 5 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |
| Basement Floor-Zone 18 | 103 | 5 | NA | <1000dpm/100$cm^2$ | Basement Level Masslin Smear |

## Table 1 (Continued)

| Sampling Location | Sample Number | Dose Rate (µR/hour) | Total Contamination (dpm/100 $cm^2$) | Removable Contamination (dpm/100 $cm^2$) | Comments |
|---|---|---|---|---|---|
| **Additional Sampling Locations (Continued)** | | | | | |
| Basement Floor-Condenser Room Debris | CR-1 | 5 | <MDA | <MDA | Basement Level |
| Basement Floor-Debris | D-1 | 5<br>Dup=5 | <MDA | <MDA | Basement Level |

dpm/100 $cm^2$ = disintegrations per minute per 100 centimeters squared
Dup = Duplicate
MDA = Minimum Detectable Activity
NA = Not Applicable
µR/hour = micro-Roentgen per hour

# 4.0 PHYSICAL CONDITION

Appendix C provides a copy of the facility inspection checklist used during the annual survey. Findings and observations are provided below.

- **Site Surveillance Features:** Asphalt of the access road and parking area is in fair and usable condition (Appendix A, Figures 34, 35, and 37). The motor of the entrance gate was not operational at the time of the survey, but was manually operated by the attending guard (Appendix A, Figure35). The security guard controlled access into the gated facility and kept log of visitors. The Dome monolith plaques were in fair condition. The fence surrounding the property is functional at controlling access, however, there are several places where the barbed wire is missing (Figures 36 through 38). No immediate action is necessary.
- **Dome-Entombed Concrete Monolith and Monolith Penetrations:** Inspection of the Concrete Monolith (Appendix A, Figures 5 and 6) area revealed superficial cracks throughout the surface of the structure (Appendix A, Figure 1). Superficial cracks are also present along the base of the "top plug" of the concrete monolith top (Appendix A, Figures 2 and 3). All dose rate measurements taken around the structure were not significantly different from background measurements taken. No immediate action is necessary. Oil/grease was observed on the top of the Concrete Monolith due to dripping from the crane system above (Appendix A, Figure 4). It is recommended that drip pans/pads be placed at those locations where oil/grease is accumulating on the Concrete Monolith.
- **Dome-External Piping Systems:** Inspection of accessible external piping systems revealed no significant indications of deterioration. Some areas of flaking paint were noted. No immediate action is necessary.
- **Dome-Basement Level:** Corrosion is evident on all metal surfaces within approximately 6 in. of the floor, including contaminated surfaces. However, the concrete floor cover (installed in late 2004) covers all floor areas and bases of metallic structures/equipment where surface contamination was present, which is preventing contact with previously accessible contaminated and corroding surfaces. Only surface fissures/cracks were noted in the concrete floor covering (Appendix A, Figure 17). Control measures (fixed with paint and concrete layer in some places), which were previously implemented, were inspected and do not require maintenance at this time. Ongoing and routine assessment of accessible surfaces in the basement is recommended to evaluate the continued effectiveness of the concrete cover flooring and control measures (e.g., paint) emplaced on previous contamination areas. Access to areas with historical removable contamination is being effectively controlled (Appendix A, Figures 19 and 21). No immediate action is necessary.

  Residue, which has built up within the large chamber in the Condenser Room, was observed on the floor of the Condenser Room (Appendix A, Figure 25). The residue clings to the interior surface of the chamber until its weight causes it to fall off and some has exited the chamber through its open doors (Appendix A, Figure 24). Radiological survey was performed on the loose material and it was determined to have no discernible elevated radiation or radioactive contamination levels (see below). No immediate action is necessary.

- **Dome-Basement Level Flooding:** Inspection of this level revealed no standing water on the floors. Storm water drains appear to be functioning properly, but silt/mud remains in the sump (Appendix A, Figure 20). PREPA personnel indicate that water does accumulate in the sump, but evaporates leaving silt/mud behind. Sampling and removal of silt/mud should be planned within the next two to three years (repeat from 2011), which would increase the capacity of the sump to retain water until it evaporates.

  In 2011 it was reported that rainwater infiltration was occurring in two places: 1) due to tears/holes in the rubber gasket around the exterior base of the Dome and 2) deterioration of the metal frame of the Basement Level loading door. PREPA implemented corrective action on these two issues by installing a new gasket around the exterior base of the Dome (Appendix A, Figures 30 and 31) and by sealing the metal frame of the Basement Level loading door with expanding foam sealer (Appendix A, Figures 32 and 33). The corrective actions appear to be effective as no signs of recent or active infiltration were observed (Appendix A, Figures 22 and 26).
- **Dome-Main Level:** The Main Level (Controlled Area) is that portion of the Main Level that is not accessible to the public (Appendix A, Figure 4). The two historical contamination sites remain covered with floor tiles; the tile work is in good condition and is effective in reducing the dose levels. One area adjacent to the north side of the Monolith is also covered with lead bricks (Appendix A, Figure 13), which is effective in reducing elevated dose rate levels in this area. Ongoing and routine assessment of the floor tile and lead bricks in this area is recommended. There is also no discernable evidence of work and/or damage affecting the control measures (floor tiles) on the Main Level, Museum Area (Appendix A, Figures 7 through 12). The safety guard along the railing, which protects from falls to the Basement Level below, is in good condition (Appendix A, Figure 16) and access control signs are properly placed along the railing. However, the gate within the railing system, which provides access from the Museum Area to the Controlled Area, has no lock (Appendix A, Figure 14). It is recommended that a pad lock be placed where appropriate on the Main Level rail system access door.
- **Dome-Mezzanine Level:** Access to ladders and stairways leading to the mezzanine level are being effectively maintained and controlled (Appendix A, Figure 16). The structure appears sound and in good condition. No immediate action is necessary.
- **Dome-Exterior:** Inspection of the Dome structure (Appendix A, Figure 28) did not reveal any significant structural discrepancies, although the paint on the Dome shell has faded and is flaking in spots. The metallic pass-through portal at the northern entrance still shows signs of significant corrosion (Appendix A, Figure 29) and flaking paint. The southern entrance portal is in good condition (Appendix A, Figure 15) as it is within the museum entrance and protected from the elements. It is recommended that corrosion control coating and new paint be applied to the north entrance pass-through portal to prevent any structural or mechanical damage to the entrance door mechanism. PREPA has awarded a contract to paint the Dome-Exterior for execution in 2013.
- **Surrounding Land:** Inspection the surrounding land within approximately 0.25 miles of the site revealed no significant changing features or activities that might affect site security. The beach immediately adjacent to the site continues to be a popular surfing location. The adjacent lighthouse and surrounding scenic overlook continues to be a

popular place for the local population and vacationers to watch the sun set. No immediate action is necessary.

- **General Site Upkeep:** The buildings and grounds appear well maintained and the grass had been recently mowed (Appendix A, Figures 34 and 35). No immediate action is necessary.
- **Site Security:** A security guard was present at all times during the survey. No immediate action is necessary.
- **Erosion:** Inspection of the surrounding property and slopes to the beach revealed no significant changes or signs of excessive erosion. Dense vegetation on the slopes from the facility to the beach appears to be effectively controlling erosion (Appendix A, Figure 38). No immediate action is necessary.

This page intentionally left blank.

# 5.0 DIRECT RADIATION MONITORING

The Table 1 presents direct radiation monitoring results for this survey. Appendix B provides survey records and sketches depicting survey locations for the direct radiation monitoring conducted during this annual comprehensive survey. Direct radiation measurements were taken with a Ludlum Micro-R Meter, Model 19, at 30 cm from the source or survey location. Table 2 summarizes these results.

**Table 2. Summary of Direct Radiation Monitoring Results**

| Location | Dose Rate at 30 cm from Source (µR/hour) | | | Expected Exposure Rate[a] | | Annual Dose Limits (rem/year) | |
|---|---|---|---|---|---|---|---|
| | Min. (µR/hour) | Ave. (µR/hour) | Max. (µR/hour) | Max. Exposure (hour/year) | Rate (rem/year) | Rad Worker | Visitor |
| Monolith Top | 4 | 4.7 | 7 | 416 | 0.003 | 2 | NA |
| Main Level (Controlled Area) | 3 | 6.4 | 16 | 416 | 0.007 | 2 | NA |
| Main Level (Public Access) | 4 | 4.4 | 5 | 2,080 (employee) | 0.010 | 2 | NA |
| | | | | 832 (visitor) | 0.004 | NA | 0.1 |
| Basement Level | 3 | 5.9 | 18 | 416 | 0.007 | 2 | NA |

rem = roentgen equivalent in man

[a]Based conservatively on the maximum-recorded dose rate at a conservative exposure scenario. For example, exposure level for the Monolith top would be 7 µR/hour × (1 rem/1,000,000 µR) × (8 hours/1 week) × (52 weeks/1 year) = 0.003 rem/year.

The results summarized in the Table 2 indicate that there are no Radiation Areas in the BONUS Facility as defined in Title 10 Part 835 of the Code of Federal Regulations (10 CFR 835), which is 0.005 rem/hour at 30 cm or 5,000 µR/hour at 30 cm for the dose rate measurements conducted at BONUS). The highest dose rates recorded at 30 cm in the BONUS Facility are well below the limit defining a radiation area. The radiation levels exhibited throughout the facility do not approach annual dose limits for radiological workers or site visitors based on conservative exposure scenarios summarized in the table above.

Instrument calibrations and daily response check records (pre-survey and post-survey each day of use) are maintained at the BONUS facility. Appendix D provides a copy of instrument calibration sheets. Duplicate field measurements were also made at a rate of 5% of the routine measurements and are summarized in Table 3. All quality assurance (QA)/quality control (QC) checks performed within acceptable limits.

## Table 3. Summary of Direct Radiation Monitoring Quality Control

| Location | Result (µR/hour) | | RPD (%) | Comments |
|---|---|---|---|---|
| | Initial | Duplicate | | |
| 12 | 5 | 5 | 0 | Very good |
| 31 | 15 | 15 | 0 | Very good |
| 40A | 12 | 12 | 0 | Very good |
| 66 | 5 | 5 | 0 | Very good |
| 76 | 4 | 4 | 0 | Very good |
| 99 | 4 | 4 | 0 | Very good |
| D-1 | 5 | 5 | 0 | Very good |

RPD = Relative Percent Difference = [(Sample – Duplicate)/((Sample + Duplicate)/2)] × 100

# 6.0 CONTAMINATION LEVEL MONITORING

Table 1 presents contamination level monitoring results for this survey. Appendix B provides contamination survey records and sketches depicting survey locations for the surface contamination measurements conducted during this annual comprehensive survey. Measurements were taken with a Ludlum 44-9 probe coupled to a Ludlum 2221 Scaler/Ratemeter. Total surface and removable contamination surveys were conducted in accordance with Standard Operating Procedures (SOPs) PBR-11.3.1 and 11.4.1. Contamination level results are summarized below.

**Concrete Monolith**

There are no radioactive Contamination Areas (as defined in 10 CFR 835) associated with the exterior of the Concrete Monolith structure. Smear samples were collected from the surface of the Concrete Monolith to assess transferable or removable surface beta/gamma contamination. None of the smear samples exhibited removable contamination above the MDA. One survey locations exhibited total surface contamination levels above the MDA (location 19 at 875 dpm/100 $cm^2$. This value is well below the survey action level for total surface beta/gamma contamination (5,000 dpm/100 $cm^2$). It is recommended that the Concrete Monolith Top be designated as a Controlled Area due to the presence of slightly elevated fixed surface beta/gamma contamination levels. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the Concrete Monolith surface) work is performed on this level without review and approval by the Radiological Control Manager (RCM). Job-specific Radiological Work Permits (RWPs) may be required for any future intrusive work on the Concrete Monolith Top.

**Main Level (Controlled Area)**

There are no radioactive Contamination Areas associated with the controlled area (inside the railing and Plexiglas) of the Main Level. Smear samples were collected from the floor surface of the Main Level (controlled area) to assess transferable or removable surface beta/gamma contamination. None of the smear samples exhibited removable contamination above MDA. However, two planned survey locations, 27 and 28, had total surface beta/gamma contamination levels above the 5,000 dpm/100 $cm^2$ action level (16,550 and 71,828 dpm/100 $cm^2$, respectively). It is recommended that the Main Level (controlled area) remain designated as a Controlled Area due to the presence of elevated fixed surface beta/gamma contamination and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4 (modify posting to avoid alarming visitors – current posting is acceptable). Administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface) work is performed in this area without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area.

**Main Level (Public Access Area)**

The Main Level (public access area) was evaluated for transferable/removable surface contamination only (i.e., only smear samples were performed). These results and previous surveys indicate that there are no radioactive Contamination Areas associated with the public

access area (outside the railing and Plexiglas) of the Main Level. Masslin samples (survey locations 65-69 and 72-80) were collected from the floor surface of the Main Level (public access area) to assess transferable or removable surface beta/gamma contamination. Masslin smear samples exhibited no removable contamination above MDA or 1,000 dpm/100 $cm^2$, except location 75 showed slightly elevated levels on the masslin sample (representing Zone 9, approximately 500 $ft^2$ area). Zone was further evaluated by collected on three discrete smear samples from the floor (Appendix B, survey sketch). All three smears exhibited no removable contamination above MDA or 1,000 dpm/100 $cm^2$. Historically, fixed surface contamination does exist on the concrete floor of the Main Level (public access area), but has been shielded by the placement of tiles in this area (Appendix A, Figure 10). Despite the fact that fixed contamination has been shielded with floor tiles, it is recommended that this area remain a Controlled Area. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area. It is recommended that at least three distinct smear samples be collected from Zone 9 (location 75) prior to masslin sampling during the 2013 annual survey.

**Basement Level**

Since the Basement Level floor has been covered with approximately 4-in of concrete, all floor sampling locations on this level were evaluated for transferable/removable surface contamination only (i.e., only smear samples/masslin were performed). Masslin samples (survey locations 70, 71, 81, and 89-103) were collected from the floor surface of the Basement Level to assess transferable or removable surface beta/gamma contamination. Masslin smear samples exhibited no removable contamination above MDA or 1,000 dpm/100 $cm^2$. In addition to the masslin samples performed on the floor throughout the level, total and removable contamination was assessed on other surfaces (other than floor) that have been covered with paint and/or concrete due to historical removable contamination (survey locations 30, 31,40A, 40B, 50A, and 50B). None of the smear samples from these locations exhibited removable contamination above MDA. However, one of these survey locations, 40A (Appendix A, Figure 9), had total surface beta/gamma contamination levels above the 5,000 dpm/100 $cm^2$ action level (6,086 dpm/100 $cm^2$). Two additional survey locations, 30 and 31, exhibited a total surface contamination level above MDA, but well below the 5,000 dpm/100 $cm^2$ action level. Based on these results, there are no radioactive Contamination Areas associated with the Basement Level.

Two additional survey locations (42 and 43) were evaluated in the Vapor Sphere Room where a tank was historically used for radioactive waste/material storage (a sign indicating radioactive material storage was also present on the door). These survey locations were taken from on top of the newer concrete floor. Both removable and total surface readings at these two locations were below MDA.

In addition to the planned survey locations, PREPA personnel pointed out two locations where debris had accumulated:

- Residue, which has built up within the large chamber in the Condenser Room, was observed on the floor of the Condenser Room as mentioned above (Appendix A, Figure

25). The "chunks" of residue were scanned/frisked resulting in no discernible elevated levels of radioactivity. A confirmatory discrete sampling location (location CR-1) was evaluated both removable and total surface contamination and found to be below MDA.

- During the re-sealing of the metal framing of the Basement Level loading door, old sealing was removed and accumulated inside on the Basement Level floor (Appendix A, Figure 23). The debris items were scanned/frisked resulting in no discernible elevated levels of radioactivity. A confirmatory discrete sampling location (location D-1) was evaluated for both removable and total surface contamination and found to be below MDA.

Recommendations for access control and posting of this area are provided below:

- Proposed public access area in Basement Level – Despite the fact that fixed contamination has been shielded with the added concrete flooring in the basement, it is recommended that the proposed public access area in the Basement Level remain designated as a controlled area. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area.
- Proposed non-public access area in the Basement Level – Despite the fact that elevated removable surface contamination levels have been fixed through control measures, it is recommended that the proposed non-public access areas in the Basement Level remain designated as a controlled area and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4 (modify posting to avoid alarming visitors). The non-public access areas are those portions of the Liquid Waste Pump Room/F.W. Heater Room and Retention Tank Room that will be partitioned off as "no public access". Those portions of these rooms that will allow public access will be controlled as stated in the previous bullet. Administrative procedures should be in place to ensure that no intrusive (disturbing the floor or wall surfaces) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area.

## Contamination Survey QA/QC

Instrument calibration records and daily response check records (pre- and post-survey daily checks) are maintained at the BONUS facility. Appendix D provides a copy of instrument calibration records. Duplicate field measurements were also made at a rate of 5% and are summarized in Table 4.

**Table 4. Summary of Contamination Level Monitoring Quality Control**

| Location | Result (dpm/100 $cm^2$) | | RPD (%) | Comments |
|---|---|---|---|---|
| | Initial | Duplicate | | |
| 11 (Total Surface) | <MDA | <MDA | NA | Good |
| 18 (Removable) | <MDA | <MDA | NA | Good |
| 22 (Total Surface) | <MDA | <MDA | NA | Good |
| 28 (Total Surface & | 71,828 | 76,622 | 6% | Good |
| Removable) | <MDA | <MDA | NA | Good |
| 40A (Total Surface & | 6,086 | 6,587 | 8% | Good |
| Removable) | <MDA | <MDA | NA | Good |

RPD =[(Sample – Duplicate)/[(Sample + Duplicate)/2)]] × 100

Contamination survey QA/QC checks are acceptable.

# 7.0 LABORATORY DATA

There were no radiological laboratory data generated to support this survey. However, Appendix E includes asbestos monitoring data collected within the facility in 2012. There are no additional recommendations for the facility radiological monitoring and protection associated with the 2012 asbestos monitoring results.

This page intentionally left blank.

# 8.0 SUMMARY OF RECOMMENDATIONS

Based on previous surveys and the 2012 Annual Survey results presented above, the following recommendations are provided:

- No "general" RWPs are required for non-intrusive, routine activities (surveys, tours, etc.) at the Facility. Activities that may disturb floors, walls, and/or other potentially contaminated surfaces should be written in a brief planning document and submitted to the RCM for review. As noted in the bullets below, job-specific RWPs may be required for any future intrusive work in the facility.
- Physical Condition:
    - Oil/grease is dripping from the crane system onto the Concrete Monolith top (Appendix A, Figure 4). It is recommended that drip pans/pads be placed at those locations where oil/grease is accumulating on the Concrete Monolith.
    - Storm water drains appear to be functioning properly in the Basement Level, but the sump is filling with silt/mud (Appendix A, Figure 20). Sampling and removal of silt/mud should be planned within the next two to three years (repeat from 2011).
    - The metallic pass-through portal at the northern entrance shows signs of significant corrosion (Appendix A, Figure 29) and flaking paint. It is recommended that corrosion control coating and new paint be applied to the north entrance pass-through portal to prevent any structural or mechanical damage to the entrance door mechanism (repeat from 2011).
    - The gate within the railing system, which provides access from the Museum Area to the Controlled Area, has no lock (Appendix A, Figure 14). It is recommended that a pad lock be placed where appropriate on the Main Level rail system access door.
- Concrete Monolith: It is recommended that the Concrete Monolith Top remain designated as a controlled area due to the presence of elevated fixed surface beta/gamma contamination levels. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the Concrete Monolith surface) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work on the Concrete Monolith Top.
- Main Level (non-public access area): It is recommended that the Main Level (controlled area) remain designated as a controlled area due to the presence of elevated fixed surface beta/gamma contamination and exposure rates and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4 (modify posting to avoid alarming visitors – current posting is acceptable). Administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area.
- Main Level (public access area): Despite the fact that fixed contamination has been shielded with floor tiles, it is recommended that the Main Level (public access area) remain a controlled area. Marking/posting of this area is not required; however,

administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area. Due to a masslin sample with with slightly elevated readings, it is also recommended that at least three distinct smear samples be collected from Zone 9 (location 75) prior to masslin sampling during the 2013 annual survey.

- Proposed public access area in Basement Level: Despite the fact that fixed contamination has been shielded with the added concrete flooring in the basement, it is recommended that the proposed public access area in the Basement Level remain designated as a controlled area. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area.
- Proposed non-public access area in the Basement Level – Despite the fact that elevated removable surface contamination levels have been fixed through control measures, it is recommended that the non-public access areas in the Basement Level remain designated as a controlled area and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4 (modify posting to avoid alarming visitors). The non-public access areas are those portions of the Liquid Waste Pump Room/F.W. Heater Room and Retention Tank Room that will be partitioned off as "no public access". Those portions of these rooms that will allow public access will be controlled as stated in the previous bullet. Administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface or control measures) work is performed on this level without review and approval by the RCM. Job-specific RWPs may be required for any future intrusive work in this area.
- Per SOP PBR-11.1.4, routine surveys are required to ensure removable contamination remains below action levels. For this purpose, it is recommended that the annual comprehensive survey and quarterly surveys continue to be repeated. Quarterly surveys should focus on public access areas in close proximity to historical removable contamination areas (F.W. Heater Room/Liquid Waste Pump Room and Retention Tank Room).

This page intentionally left blank.

# APPENDIX A
# PHOTOS

This page intentionally left blank.

**Figure 1. Entombment Top (North Side) – Surface Cracks (Typical)**

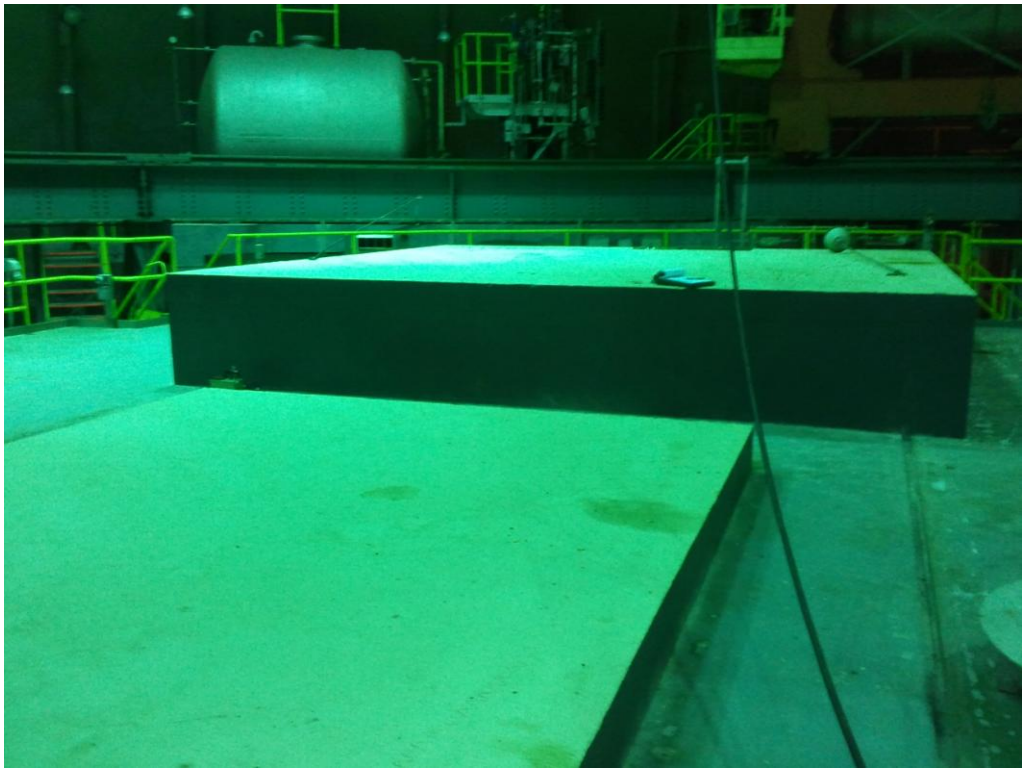


**Figure 2. Entombment Top (Top Plug)**


**Figure 3. Entombment Top (Top Plug) – Surface Cracks (Typical)**

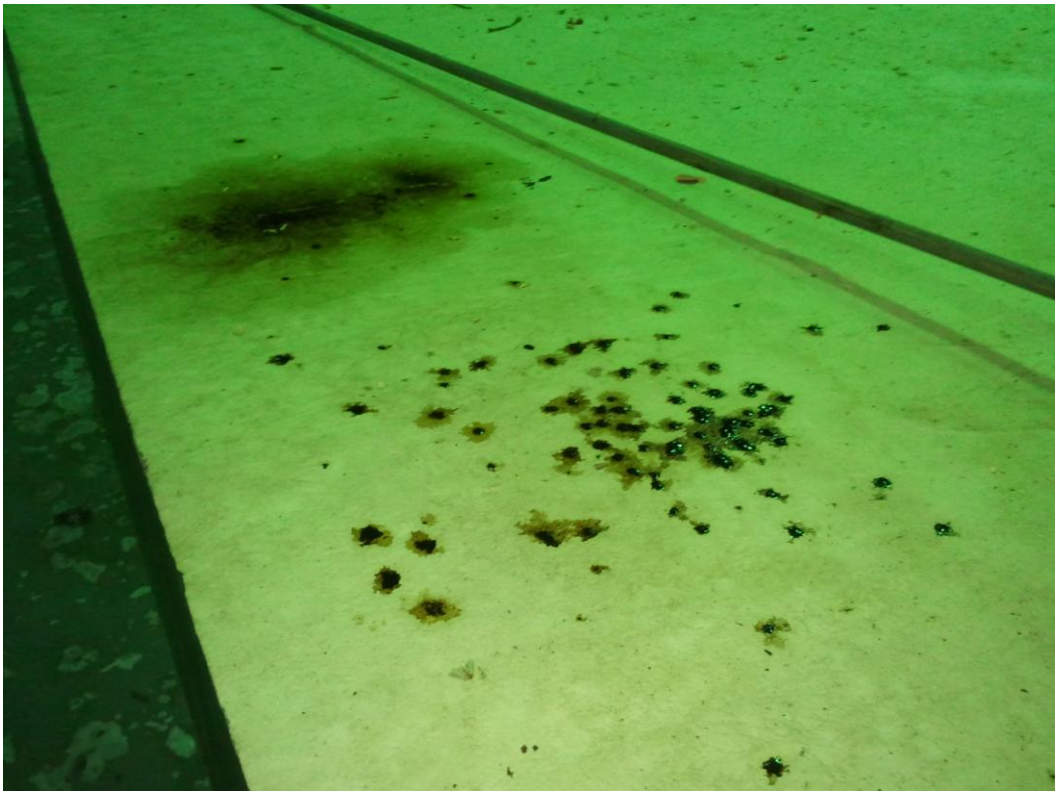


**Figure 4. Entombment Top (Top Plug) – Oil Drip/Stains from Overhead Crane**

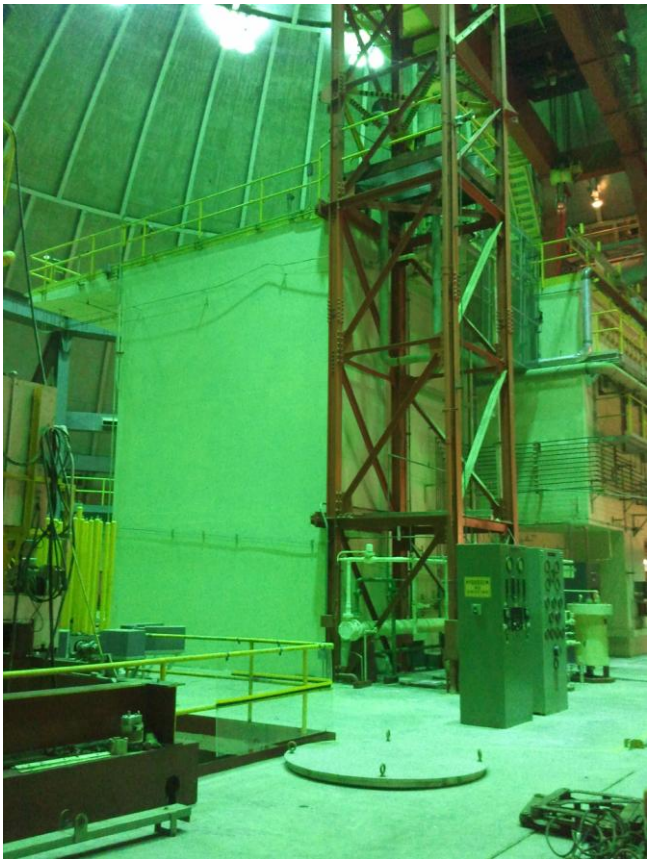


**Figure 5. Entombment (Northeast Side)**

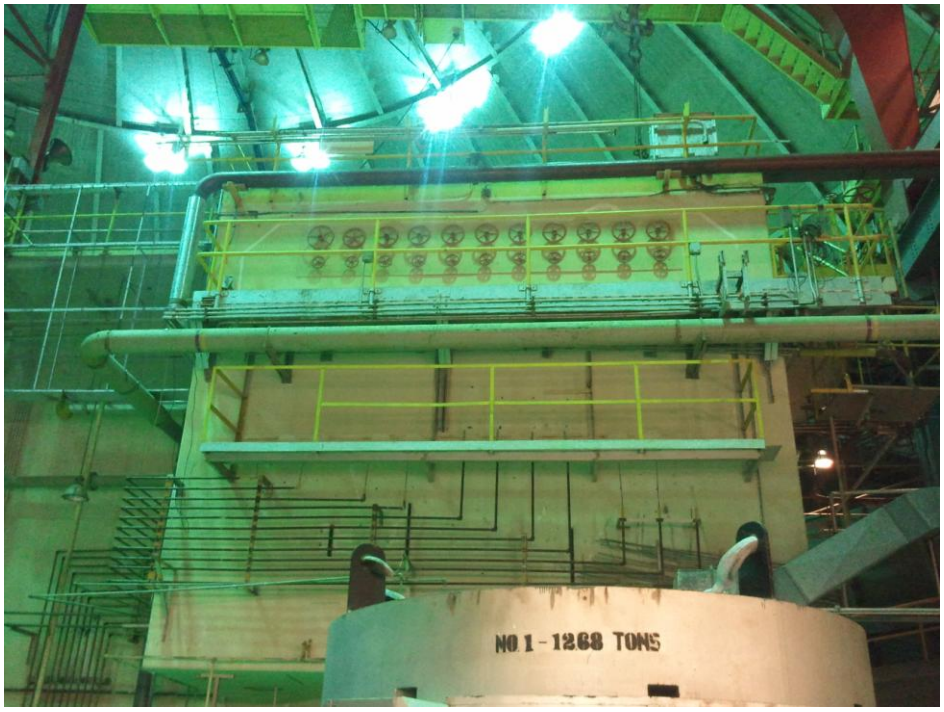



**Figure 6. Entombment (North Side)**

**Figure 7. Main Level (North Side) – Overhead View**

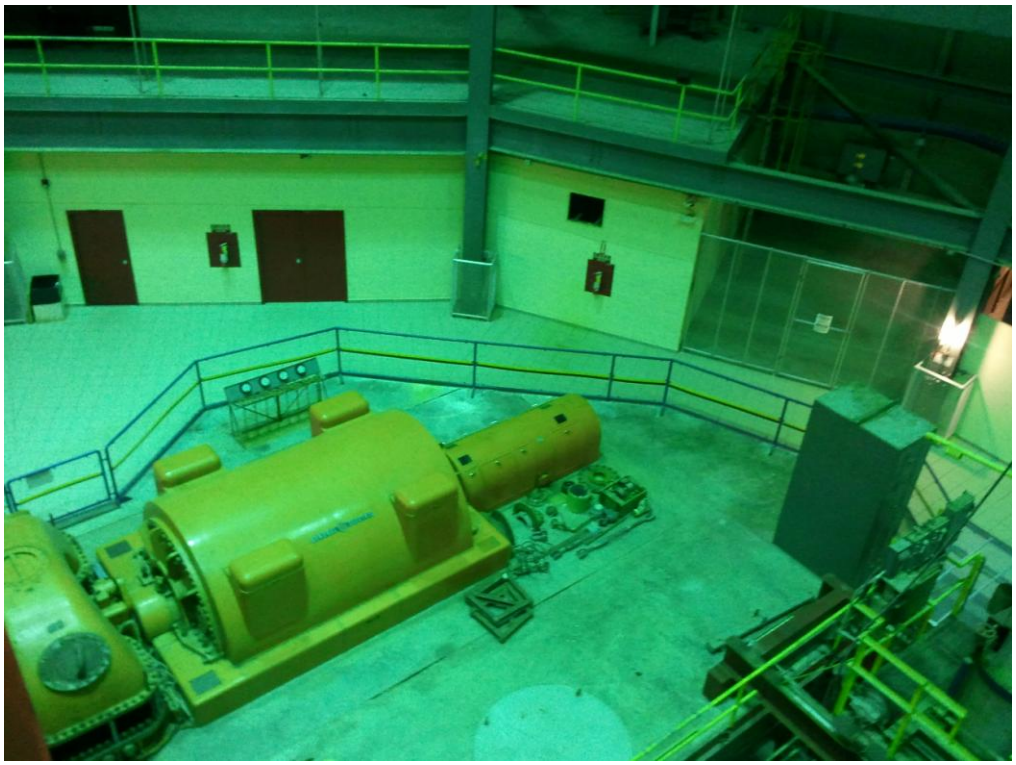


**Figure 8. Main Level (Northeast Side) – Overhead View**

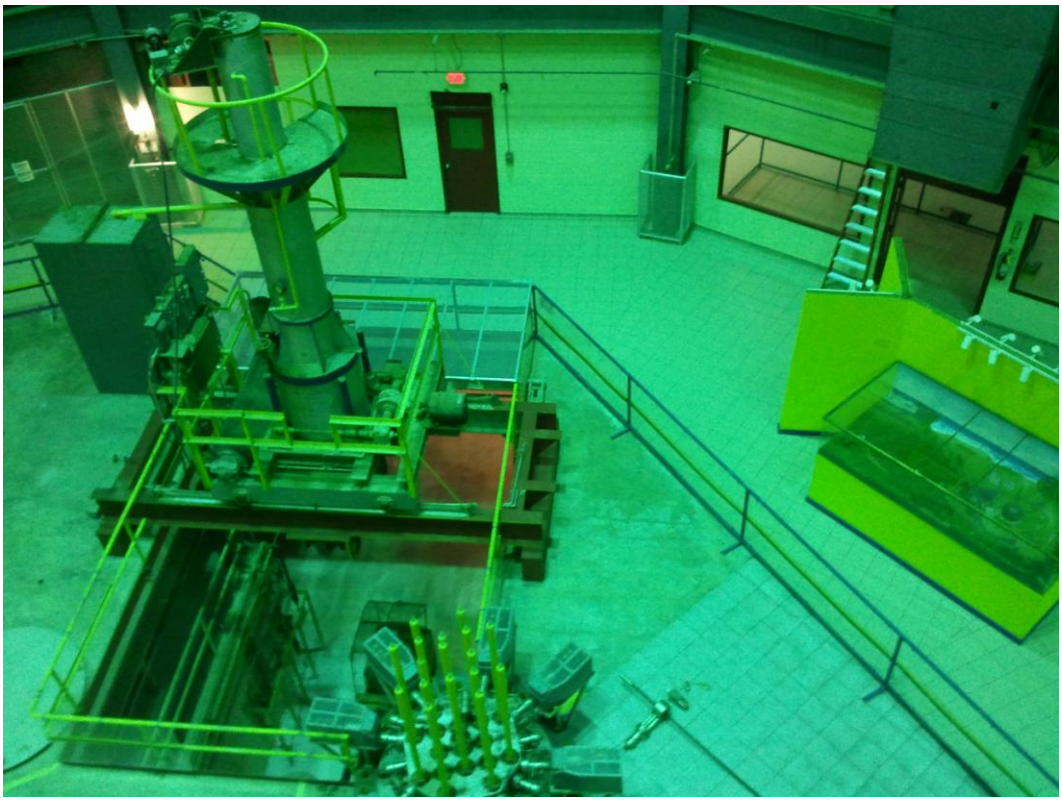


**Figure 9. Main Level (East Side) – Overhead View**

**Figure 10. Main Level (Southeast Side) – Overhead View**

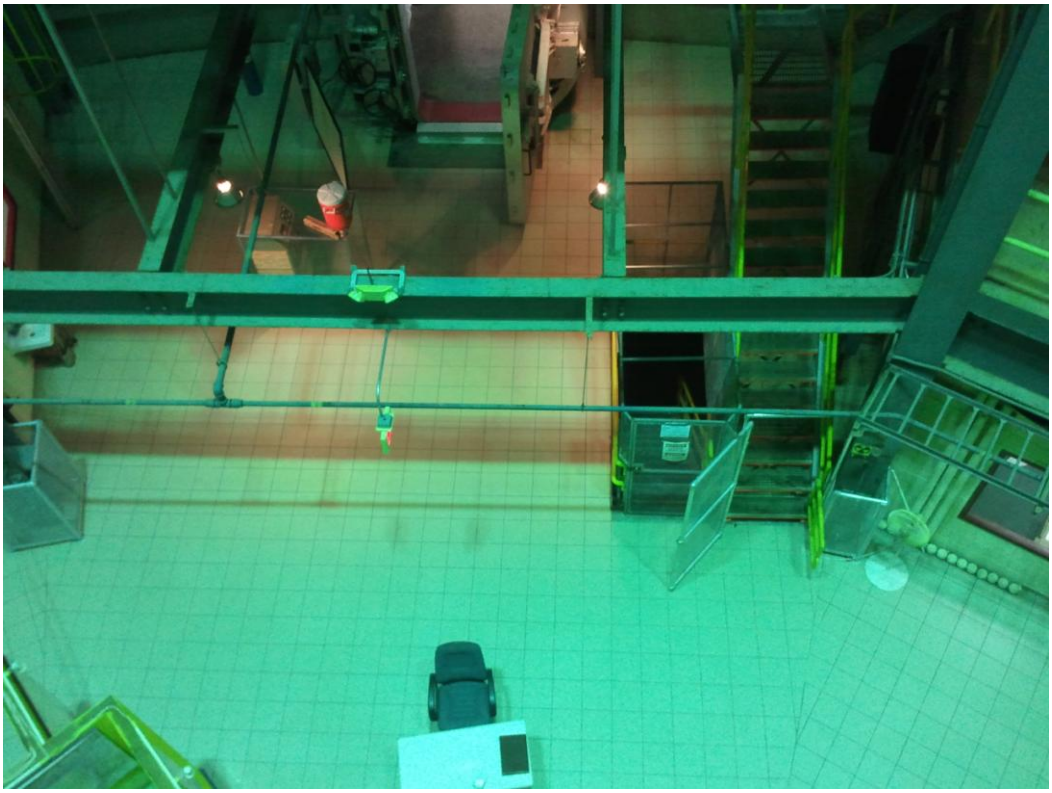


**Figure 11. Main Level (South Side) – Overhead View**

**Figure 12. Main Level (Controlled Area) – Tiles Over Fixed Surface Contamination**

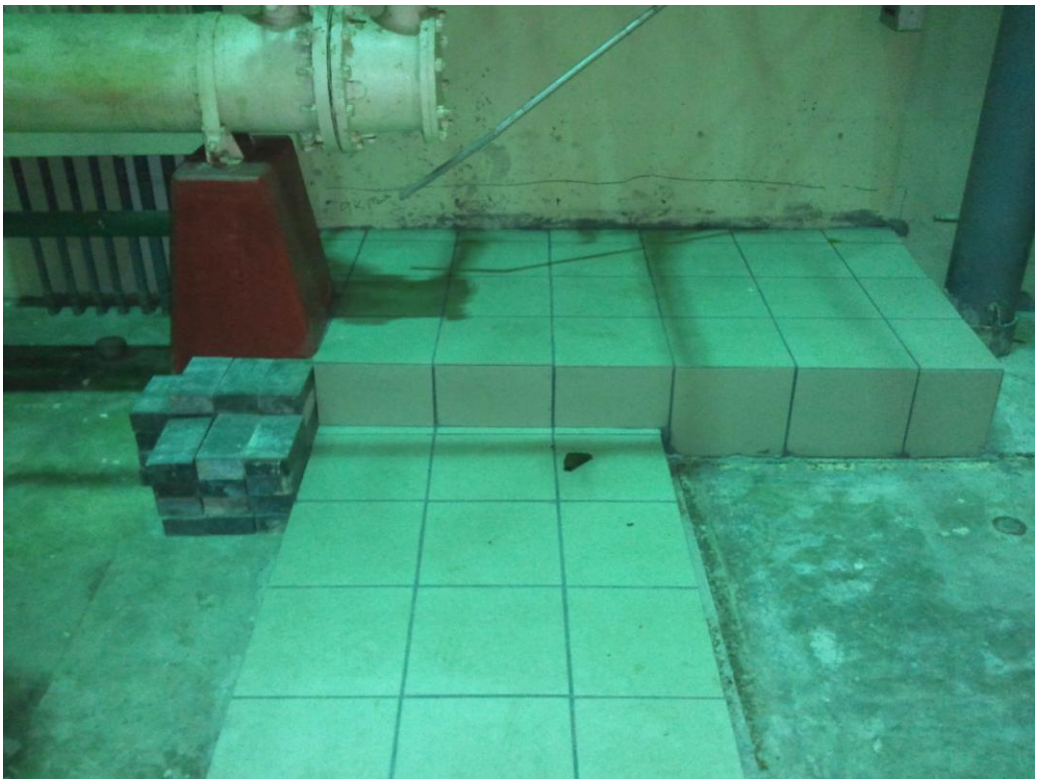


**Figure 13. Main Level (Controlled Area) – Shielding with Concrete and Lead Bricks**

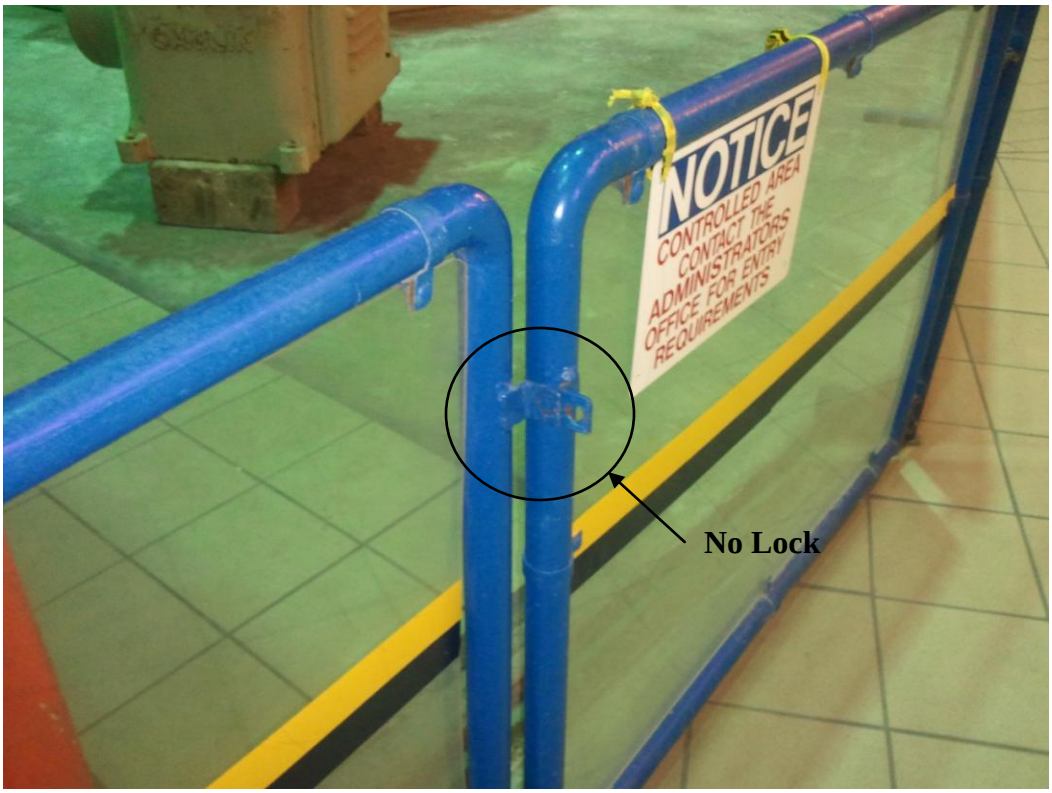



**Figure 14. Main Level (Controlled Area) – Gate Access to Controlled Area**

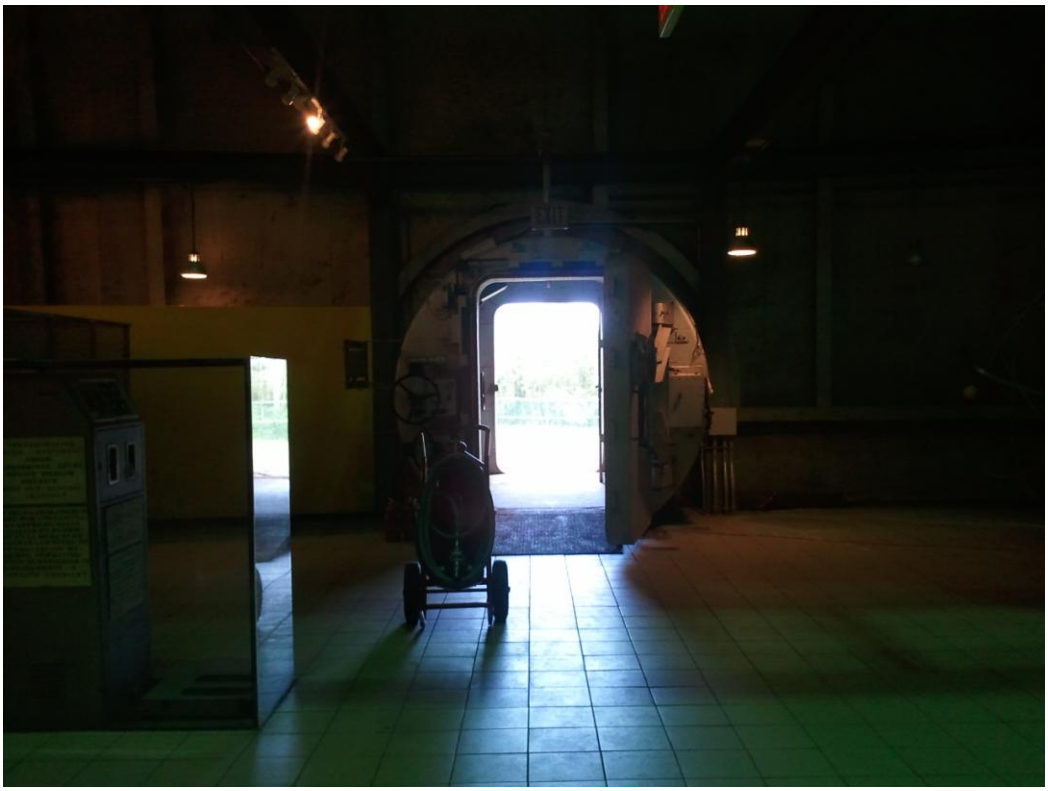


**Figure 15. Main Level (Museum Area) – South Entrance**

**Figure 16. Main Level (Museum Area) – Ladder to Mezzanine Locked-Out**

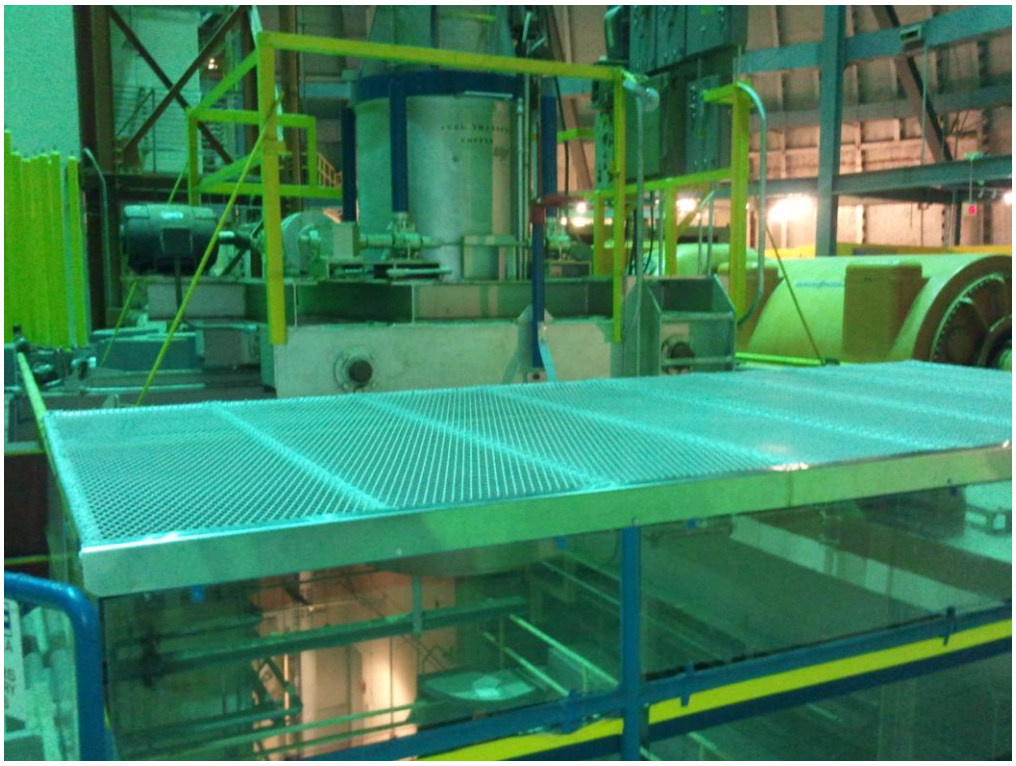


**Figure 16. Main Level (Museum Area) – Guard Over Opening to Basement Level**

**Figure 17. Basement Level – Cracks in Concrete Floor (Typical)**

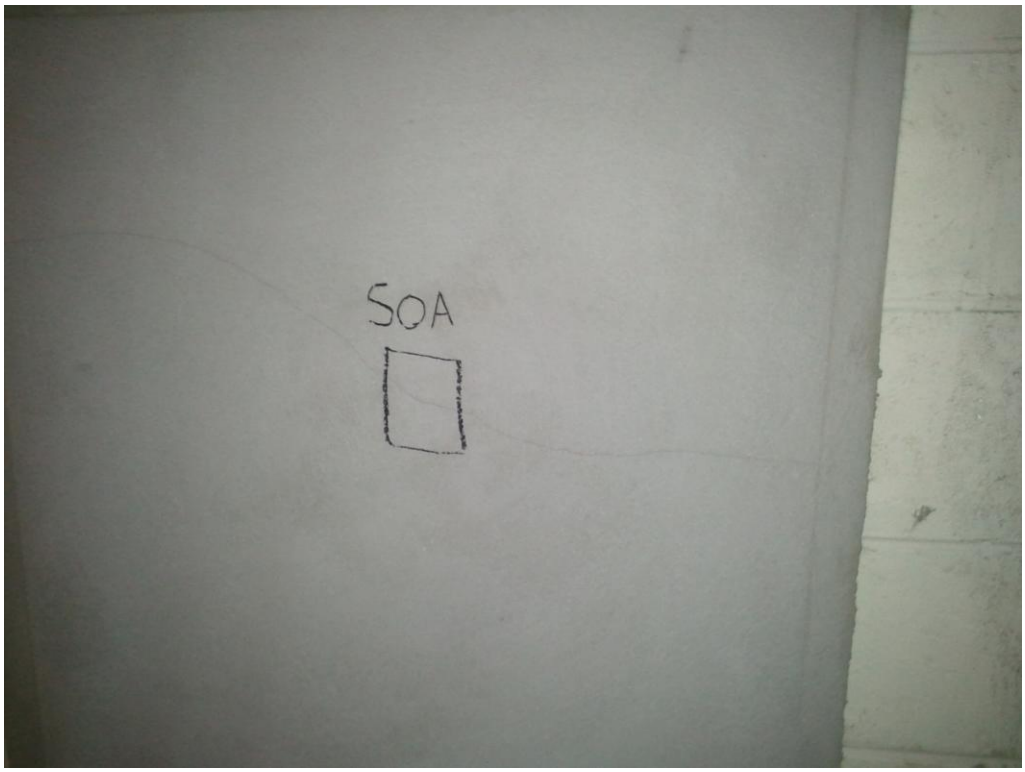



**Figure 18. Basement Level – Sample Location 50A (Small Crack in Concrete Shielding)**

**Figure 19. Basement Level – Concrete Filled Sink**

**Figure 20. Basement Level – Lowest Point in Basement with No Standing Water**


**Figure 21. Basement Level – New Asbestos Containing Material Sign in Room Where Sampling Locations 40A and 40B are Located**

**Figure 22. Basement Level – Loading Access Door (No Signs of Leak through Door)**

**Figure 23. Basement Level – Loading Access Door (Debris from Old Seal Material)**

**Figure 24. Basement Level – Condenser Room (North Side Access)**

**Figure 25. Basement Level – Condenser Room (Debris from Condenser on Floor)**

**Figures 26A and 26B. Basement Level – Beneath North Entrance (No Signs of Recent Water Leak into Basement Level)**

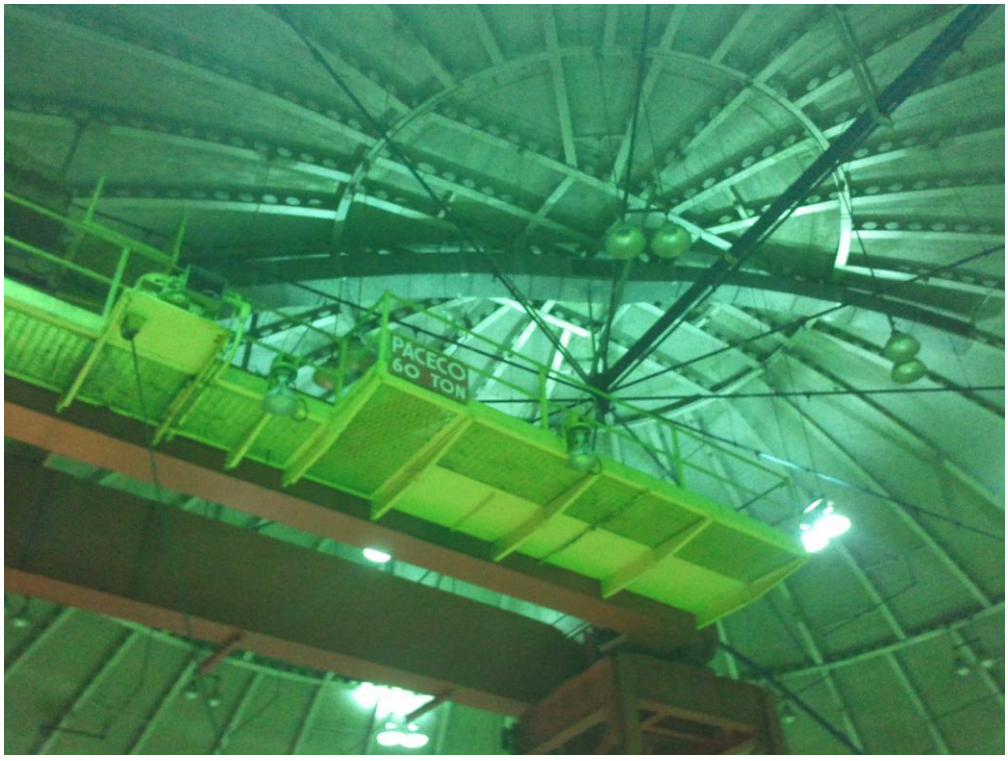



**Figure 27. Dome Structure – Interior with Fire Suppression Piping**


**Figures 28A and 28B. Dome Structure – Exterior**

**Figure 29. Dome Structure – North Entrance (Exterior with Significant Corrosion)**

**Figures 30A and 30B. Dome Structure – Flexible Gasket/Seal**

**Figure 31. Dome Structure – Flexible Gasket/Seal (Retains Water in Some Locations)**

**Figure 32. Exterior Structure – Basement Loading Access Door**

**Figures 33A, 33B, and 33C. – Basement Loading Access Door (New Expanding Foam Seal to Prevent Rain Water from Entering the Basement Level)**

**Figure 34. Ancillary Buildings**

**Figure 35. Grounds, Guard Shack and Entrance Gate**

**Figure 36. Fence – North Side**

**Figure 37. Fence – South Side**

**Figures 38A, 38B, and 38C. Fence – West (Beach) Side**

**Figure 39. Ancillary Building – Previous Water Tank Overflow has been Shut-Off (No Standing Water)**

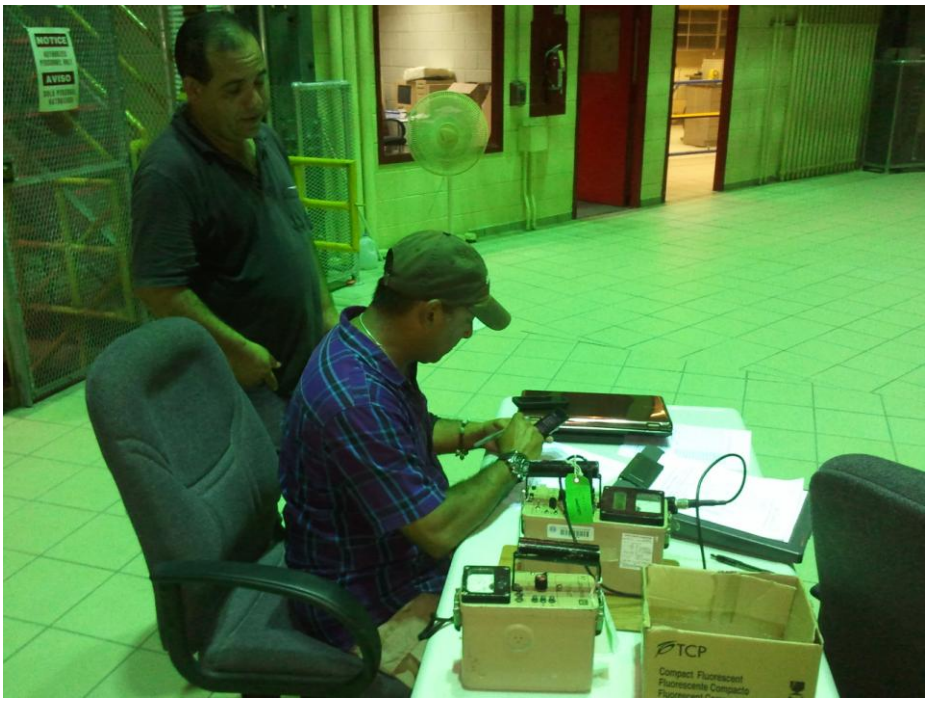



**Figure 40. Personnel Performing Instrument Response Checks**

# APPENDIX B
# ANNUAL SURVEY CONTAMINATION SURVEY FORMS AND SKETCHES

This page intentionally left blank.

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 29 Oct 2012 0920hr Task Number NA

Specific Area of Survey: Entombed Building-North Side MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5 / 2 | 47 | 812 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 1 | North Side | See | 46 | See | <MDA |
| 2 | North Side | Smear | 46 | Smear | <MDA |
| 3 | North Side | Data | 53 | Data | <MDA |
| 4 | North Side | | 56 | | <MDA |
| 24 | North Side | | 39 | | <MDA |
| 26 | North Side | | 49 | | <MDA |
| NA | | | | | |

Survey Technician: A. Luca

Reviewed By: C. Webb

*MDA is total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP**
**(former BONUS REACTOR FACILITY) Rincón, Puerto Rico**

## RADIOLOGICAL SURVEY REPORT (MAP)

| SITE: Entombed Reactor Building | Time: 0925 hrs | Date: Yr 12 Mo 10 Dy 29 |
|---|---|---|
| Task: Comprehensive Survey | RWP: NA | |

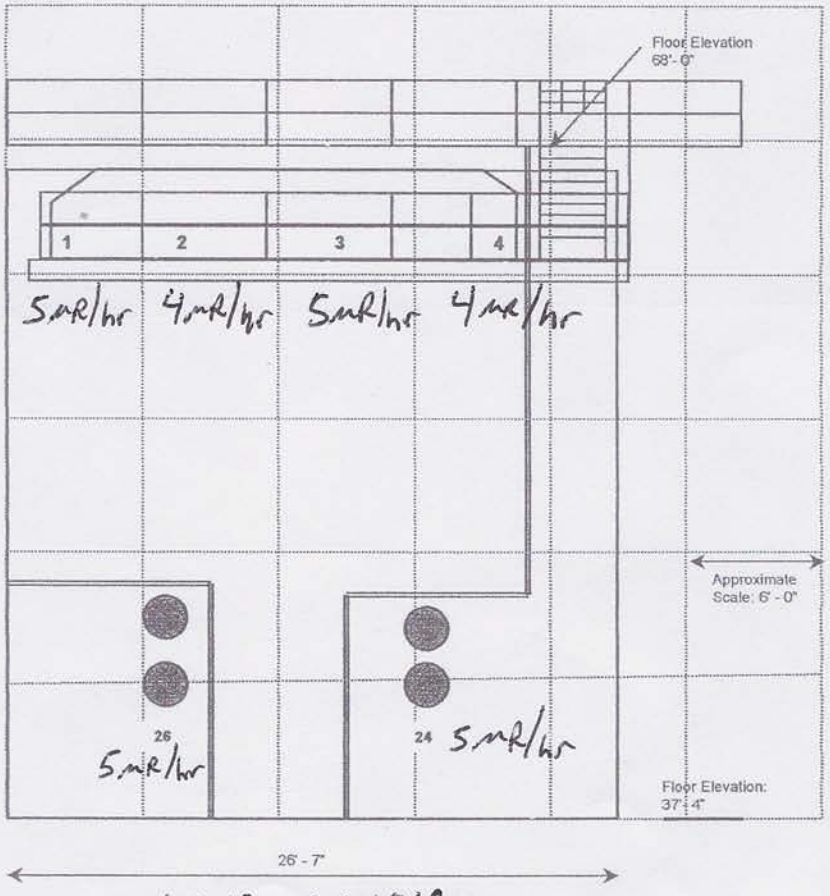
Map key: ° = Sample Location ☐ = Air Sampler Location _ = Core Sample

Dose Rate Abbreviations: CT/WB/GA, where CT = Contract, WB = Whole Body, GA = General Area

Building: Entombed Reactor Building Location: North Side

Sketch: **Entombment System - North View**

1 = Sample Locations




Instruments (Model and Serial Numbers): Model 19 # 148190

Survey Technician(s): A. Luca + C. Webb

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/29/12 0940hrs Task Number NA

Specific Area of Survey: Entombed Building-NoruthWest Side MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5 / 2 | 47 | 812 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 5 | Top Plug Face | see | 54 | see | <MDA |
| 6 | Top Plug Face | Smear | 46 | Smear | <MDA |
| 7 | Top Plug Face | Data | 42 | Data | <MDA |
| 8 | Top Plug Face | | 65 | | <MDA |
| 9 | Top Plug Face | | 60 | | <MDA |
| 10 | Top Plug Face | | 60 | | <MDA |
| 11 | Top Plug Face | | 55 | | <MDA |
| 12 | Top Plug Face | | 55 | | <MDA |
| 13 | Top Plug Face | | 49 | | <MDA |
| 14 | Top Plug Face | | 53 | | <MDA |
| 15 | Top Plug Face | | 64 | | <MDA |
| 16 | Top Plug Face | | 51 | | <MDA |
| 17 | Top Plug – Top Surface | | 50 | | <MDA |
| 18 | Top Plug – Top Surface | | 48 | | <MDA |
| 19 | Top Plug – Top Surface | | 68 | | 875 |
| 11dup | duplicate | NA | 58 | NA | <MDA |

Survey Technician: A. Luca

Reviewed By: C. Webb

*MDA is total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**
**Rincón, Puerto Rico**

## RADIOLOGICAL SURVEY REPORT (MAP)

| SITE: Entombed Reactor Building | Time: 0955hrs | Date: Yr 12 Mo 10 Dy 29 |
|---|---|---|
| Task: Comprehensive Survey | RWP: NA | |

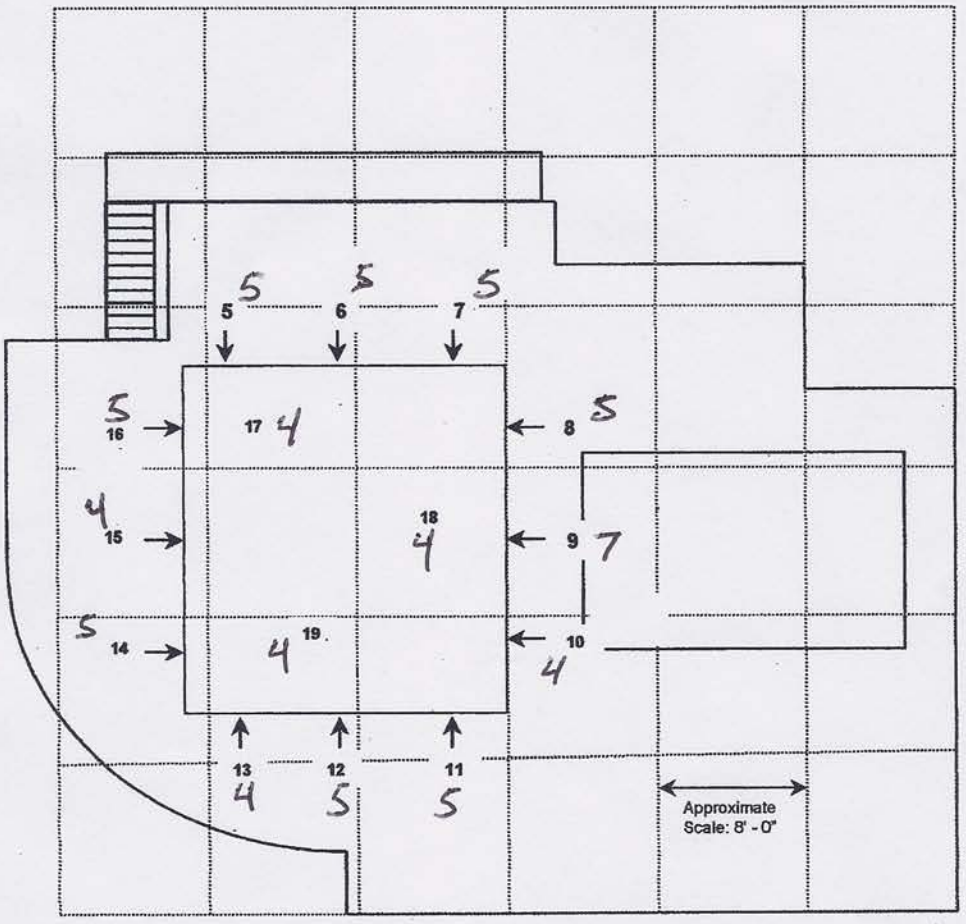
Map key: ° = Sample Location ☐ = Air Sampler Location _ = Core Sample

Dose Rate Abbreviations: CT/WB/GA, where CT = Contract, WB = Whole Body, GA = General Area

Building: Entombed Reactor Building Location: Entombment System – Top (Plan View)

Sketch:

1 = Sample Locations




12 dup = 5

in MR/hr

Instruments (Model and Serial Numbers): Model 19 #148190

Survey Technician(s): A. Lea + C. Webb

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/30/12 0910 hrs Task Number NA

Specific Area of Survey: Entombed Building-South Side MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5/2 | 65 | 950 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 22 | South Side | see smear Data | 39 | see smear Data | <MDA |
| 22dup | duplicate | NA | 37 | NA | <MDA |
| NA | | | | | |

Survey Technician: A. Lucca

Reviewed By: C. Webb

*MDA is total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP**
**(former BONUS REACTOR FACILITY) Rincón, Puerto Rico**

## RADIOLOGICAL SURVEY REPORT (MAP)

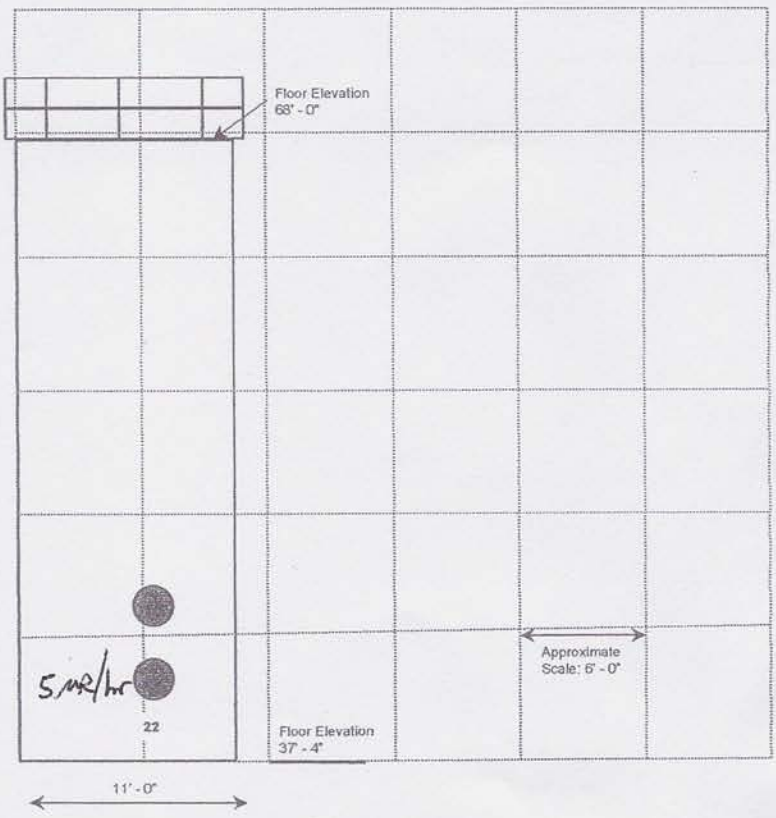
| SITE: Entombed Reactor Building | Time: 1500hrs | Date: Yr 12 Mo 10 Dy 29 |
|---|---|---|
| Task: Comprehensive Survey | RWP: NA | |

Map key: ° = Sample Location ☐ = Air Sampler Location _ = Core Sample

Dose Rate Abbreviations: CT/WB/GA, where CT = Contract, WB = Whole Body, GA = General Area

Building: Entombed Reactor Building Location: South Side

Sketch:




Instruments (Model and Serial Numbers): Model 19 # 148190

Survey Technician(s): I. Figueroa + C. Webb

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/30/12 0915 hrs Task Number NA

Specific Area of Survey: Entombed Building-SouthWest Side MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5 / 2 | 65 | 950 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 23 | SouthWest Side | see Smear Data | 35 | See Smear Data | <MDA |
| NA | | | | | |
| NA | | | | | |

Survey Technician: A. Lucca

Reviewed By: C. Webb

*MDA is total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**
**Rincón, Puerto Rico**

## RADIOLOGICAL SURVEY REPORT (MAP)

| SITE: Entombed Reactor Building | Time: 1505hrs | Date: Yr 12 Mo 10 Dy 29 |
|---|---|---|
| Task: Comprehensive Survey | RWP: NA | |

Map key: ° = Sample Location ☐ = Air Sampler Location _ = Core Sample

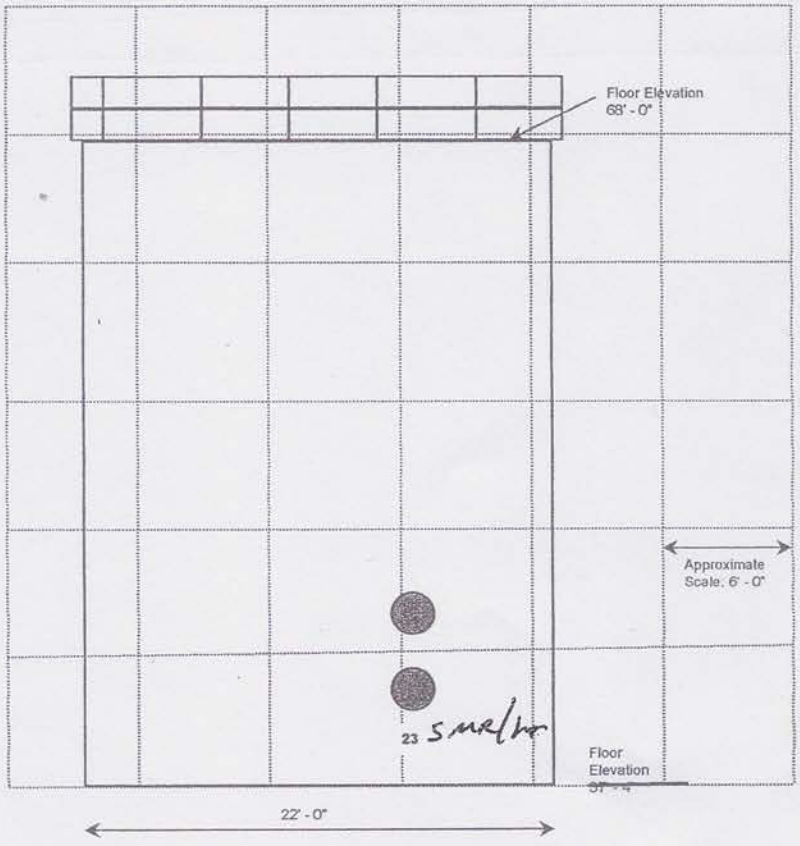
Dose Rate Abbreviations: CT/WB/GA, where CT = Contract, WB = Whole Body, GA = General Area

Building: Entombed Reactor Building Location: SouthWest Side

Sketch:

**Entombment System - Southwest View**

1 = Sample Locations




Instruments (Model and Serial Numbers): Model 19 # 148190

Survey Technician(s): I. Figueroa + C. Webb

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/30/12 0950 Task Number NA

Specific Area of Survey: Entombed Building-NoruthWest Side MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5 / 2 | 65 | 950 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 25 | NorthWest Side | See Smear Data | 37 | See Smear Data | < MDA |
| NA | | | | | |
| NA | | | | | |

Survey Technician: A. Lucca

Reviewed By: C. Webb

*MDA is total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**
**Rincón, Puerto Rico**

## RADIOLOGICAL SURVEY REPORT (MAP)

| SITE: Entombed Reactor Building | Time: 1510 hrs | Date: Yr 12 Mo 10 Dy 29 |
|---|---|---|
| Task: Comprehensive Survey | RWP: NA | |

Map key: ° = Sample Location ☐ = Air Sampler Location _ = Core Sample

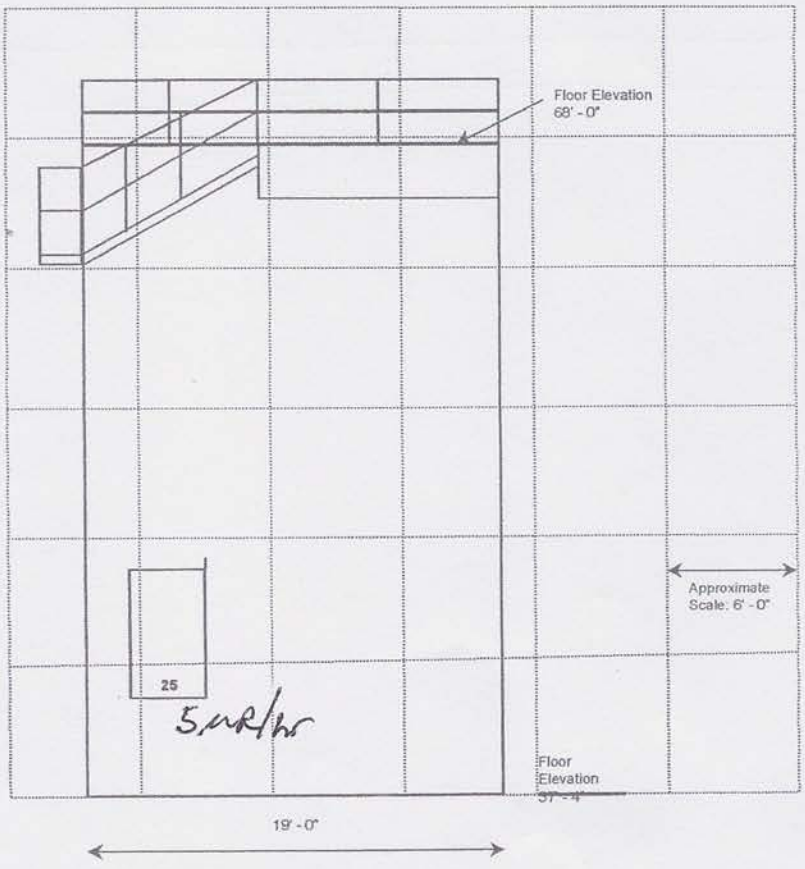
Dose Rate Abbreviations: CT/WB/GA, where CT = Contract, WB = Whole Body, GA = General Area

Building: Entombed Reactor Building Location: NorthWest Side

Sketch:

**Entombment System - Northwest View**

1 = Sample Locations




Instruments (Model and Serial Numbers): Model 19 #148190

Survey Technician(s): F. Figueroa + C. Webb

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/30/12 0840hrs Task Number NA

Specific Area of Survey: Entombed Building-Main Floor MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. Type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5 / 2 | 65 | 950 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 20 | Main Floor | NA | 56 | NA | <MDA |
| 21 | Main Floor | See Smear | 67 | See Smear | <MDA |
| 27 | Main Floor | Data | 462 | Data | 16,550 |
| 28 | Main Floor | | 1,788 | | 71,828 |
| 27A | Main Floor | | 67 | | <MDA |
| 27B | Main Floor | | 59 | | <MDA |
| 28 Dup | Main Floor | | 1,903 | | 76,622 |
| NA | | | | | |

Survey Technician: A. Lucca

Reviewed By: C. Webb

*MDA is total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/29/12 1510 hrs Task Number NA

Specific Area of Survey: Entombed Building-Main Floor MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. Type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 10 / 1 | 52 | 158 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 65 | Main Floor-Masslin (Zone 1) | 41 | NA | < MDA | NA |
| 66 | Main Floor-Masslin (Zone 2) | 31 | | < MDA | |
| 67 | Main Floor-Masslin (Zone 3) | 55 | | < MDA | |
| 68 | Main Floor-Masslin (Zone 4) | 41 | | < MDA | |
| 69 | Main Floor-Masslin (Zone 5) | 35 | | < MDA | |
| 72 | Main Floor-Masslin ( Zone 6) | 35 | | < MDA | |
| 73 | Main Floor-Masslin (Zone 7) | 47 | | < MDA | |
| 74 | Main Floor-Masslin (Zone 8) | 37 | | < MDA | |
| 75 | Main Floor-Masslin Zone 9) | 77* | | < MDA | |
| 76 | Main Floor-Masslin (Zone 10) | 58 | | < MDA | |
| 77 | Main Floor-Masslin (Zone 11) | 48 | | < MDA | |
| 78 | Main Floor-Masslin (Zone 12) | 52 | | < MDA | |
| 79 | Main Floor-Masslin (Zone 14) | 50 | | < MDA | |
| 80 | Main Floor-Masslin (Zone 13) | 38 | | < MDA | |

Survey Technician: J. Reyes

Reviewed By: C. Webb

*MDA < 200 dpm/100cm² (cannot be quantified due to large are survey).

*This cpm activity is equivalent to the MDA established for smears at 100cm² area. Since the area where the masslin wipe was taken (Zone 9) is approximately 500 ft², the activity on the masslin in dpm/100 cm² is expected to be well below MDA. However, smear samples will be taken from this zone for confirmation.

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**
**Rincón, Puerto Rico**

## RADIOLOGICAL SURVEY REPORT (MAP)

| SITE: Entombed Reactor Building | Time: 1440 | Date: Yr 12 Mo 10 Dy 29 |
|---|---|---|
| Task: Comprehensive Survey | RWP: NA | |

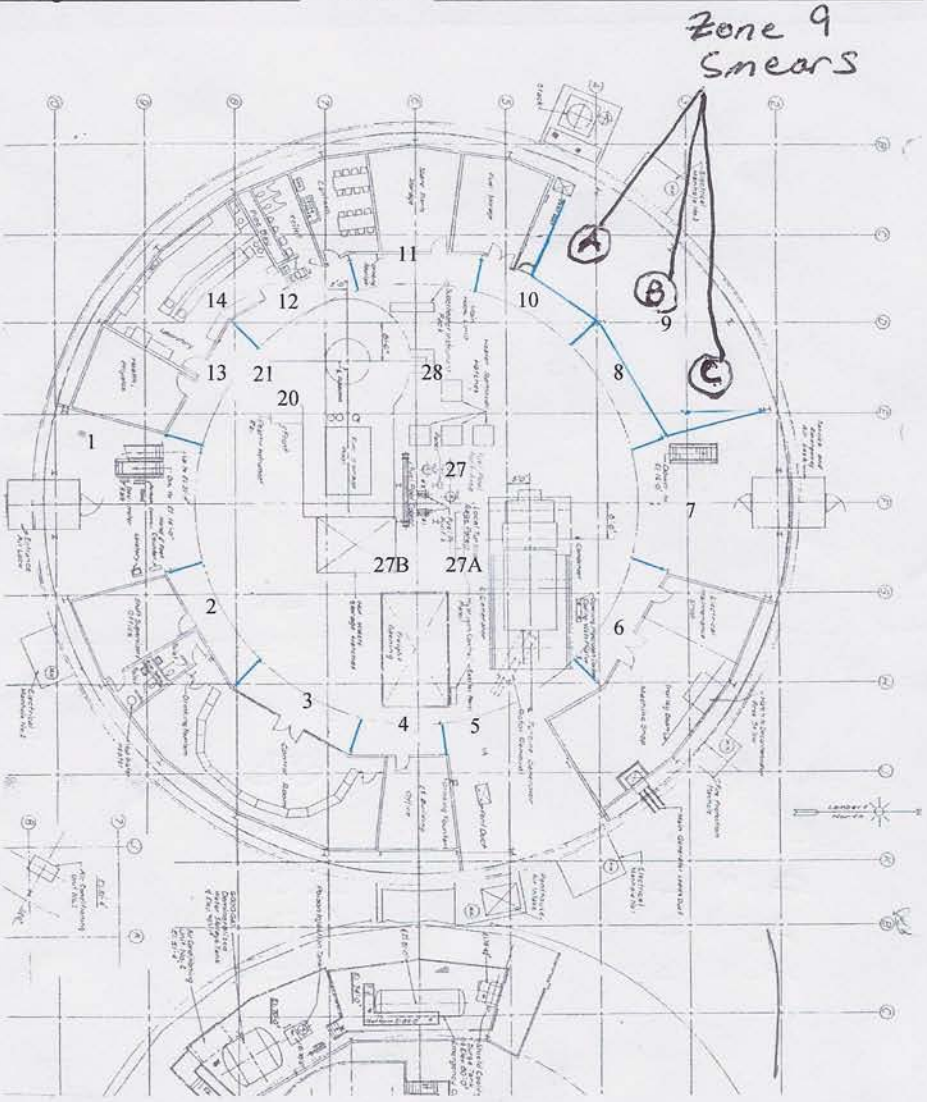
Map key: ° = Sample Location ☐ = Air Sampler Location _ = Core Sample

Dose Rate Abbreviations: CT/WB/GA, where CT = Contract, WB = Whole Body, GA = General Area

Building: Entombed Reactor Building Location: Main Floor

Sketch:

| | No. | µR/hr |
|---|---|---|
| Zone 1= | 65 | 5 |
| Zone 2= | 66 | 5 |
| Zone 3= | 67 | 5 |
| Zone 4= | 68 | 4 |
| Zone 5= | 69 | 4 |
| Zone 6= | 72 | 4 |
| Zone 7= | 73 | 4 |
| Zone 8= | 74 | 4 |
| Zone 9= | 75 | 4 |
| Zone 10= | 76 | 4 |
| Zone 11= | 77 | 4 |
| Zone 12= | 78 | 4 |
| Zone 13= | 80 | 5 |
| Zone 14= | 79 | 5 |
| Zone 2 = | | 5 dup |
| Zone 10 = | | 4 dup |
| | 20 | 4 |
| | 21 | 3 |
| | 27 | 16 |
| | 28 | 14 |
| | 27A | 4 |
| | 27B | 4 |




Instruments (Model and Serial Numbers): Model 19 #148190

Survey Technician(s): J. Reyes + C. Webb



Rev 3 (10/12)

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/30/12 1315 hrs Task Number NA

Specific Area of Survey: Entombed Building-Basement Floor MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. Type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5 / 2 | 43 | 771 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 30 | Basement Floor-Side of Tank #1 | See Smear | 67 | See | 1,001 |
| 31 | Basement Floor-Side of Tank #2 | Data | 83 | Smear | 1,668 |
| 40A | Basement Floor-Wall (4" from floor) | | 189 | Data | 6,086 |
| 40B | Basement Floor-Wall (4" from floor) | | 51 | | <MDA |
| 42 | Basement Floor | | 42 | | <MDA |
| 43 | Basement Floor | | 43 | | <MDA |
| 50A | Basement Floor-Wall (block) | | 44 | | <MDA |
| 50B | Basement Floor-Wall (concrete) | | 36 | | <MDA |
| 40A Dup | Basement Floor-Wall (4" from floor) | NA | 201 | NA | 6,587 |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |

Survey Technician: E. Figueroa

Reviewed By: C. Webb

*MDA is total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/31/12 1115 hrs Task Number NA

Specific Area of Survey: Entombed Building-Basement Floor MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. Type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 10 / 1 | 49 | 155 |
| | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 70 | Masslin - Zone 1 | 34 | N/A | < MDA | N/A |
| 71 | Masslin - Zone 2 | 66 | | < MDA | |
| 81 | Masslin - Zone 3 | 55 | | < MDA | |
| 89 | Masslin - Zone 4 | 49 | | < MDA | |
| 90 | Masslin – Zone 5 | 49 | | < MDA | |
| 91 | Masslin – Zone 6 | 51 | | < MDA | |
| 92 | Masslin – Zone 7 | 47 | | < MDA | |
| 93 | Masslin – Zone 8 | 42 | | < MDA | |
| 94 | Masslin – Zone 9 | 43 | | < MDA | |
| 95 | Masslin – Zone 10 | 38 qmy 10/31/12 | | < MDA | |
| 96 | Masslin – Zone 11 | 41 | | < MDA | |
| 97 | Masslin – Zone 12 | 40 | | < MDA | |
| 98 | Masslin – Zone 13 | 41 | | < MDA | |

Survey Technician: A. Lugo + I. Figueroa

Reviewed By: C. Webb

*MDA < 200 dpm/100 cm² (cannot be quantified due to large area survey).

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/31/12 1135 hrs Task Number NA

Specific Area of Survey: Entombed Building-Basement Floor MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. Type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading (cpm) | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 10 / 1 | 49 | 155 |
| | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 99 | Masslin – Zone 14 | 44 | N/A | <MDA | N/A |
| 100 | Masslin – Zone 15 | 39 | | <MDA | |
| 101 | Masslin – Zone 16 | 42 | | <MDA | |
| 102 | Masslin – Zone 17 | 47 | | <MDA | |
| 103 | Masslin – Zone 18 | 40 | | <MDA | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |

Survey Technician: A. Lucca + I. Figueroa

Reviewed By: C. Webb

*MDA < 200 dpm/100 cm² (cannot be quantified due to large area survey).

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/31/12 0915hrs Task Number NA

Specific Area of Survey: Basement Level MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E x CF

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E x CF

| Inst. Type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 5/2 | 44 | 786 |
| Ludlum2221 (smear counter) | 11 | 3/23/13 | 11 | 11 | 3/23/13 | 16 % | 10/1 | 49 | 155 |

**SURVEY DATA** **Survey Map Attached ☑ Yes ☐ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| CR-1 | Rust Piece | 43 | 39 | <MDA | <MDA |
| D-1 | Old door insulation foam | NA | 37 | NA | <MDA |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |

Survey Technician: A. Lucca

Reviewed By: C. Webb

*MDA is removable/total in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**
**Rincón, Puerto Rico**

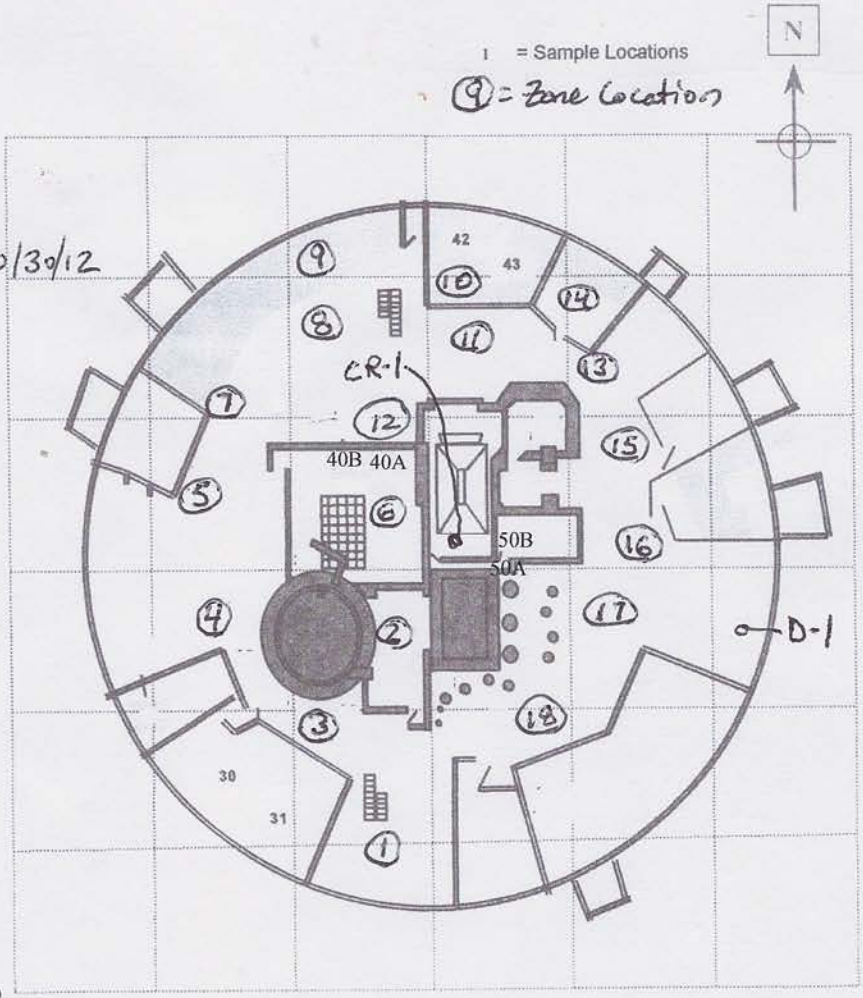
## RADIOLOGICAL SURVEY REPORT (MAP)

| SITE: Entombed Reactor Building | Time: 14:45 | Date: Yr 12 Mo 10 Dy 30 (CW 10/30/12) |
|---|---|---|
| Task: Comprehensive Survey | RWP: NA | |

Building: Entombed Reactor Building  Location: Basement Floor

Sketch:

| | No. | µR/hr |
|---|---|---|
| Zone 1= | ~~71~~ 70 | 6 |
| Zone 2= | ~~80~~ 71 | 5 |
| Zone 3= | 81 | 5 |
| Zone 4 = | 89 | 6 |
| Zone 5 = | 90 | 4 |
| Zone 6 = | 91 | 7 (@ 10/30/12) |
| Zone 7 = | 92 | 4 |
| Zone 8 = | 93 | 3 |
| Zone 9 = | 94 | 4 |
| Zone10 = | 95 | 5 |
| Zone11 = | 96 | 4 |
| Zone12 = | 97 | 3 |
| Zone13 = | 98 | 5 |
| Zone14 = | 99 | 4 |
| Zone15 = | 100 | 3 |
| Zone16 = | 101 | 4 |
| Zone17 = | 102 | 5 |
| Zone18 = | 103 | 3 |
| | 30 | 10 |
| | 31 | 15 |
| | 40A | 12 |
| | 40A Dup | 12 |
| | 40B | 10 |
| | 42 | 4 |
| | 43 | 3 |
| | 50A | 5 |
| | 50B | 5 |
| Zone 14 dup | | 4 |
| 31 dup | | 15 |
| CR-1 | | 5 |
| D-1 | | 5 |
| D-1 | | 5 dup |




Instruments (Model and Serial Numbers): Model 19 #148190

Survey Technician(s): A. Lucca + J. Reyes

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM** **Year 2012 Comprehensive Survey**

Notes:

Entombment Top

$$MDA = \left( \frac{2.71}{5} + 3.3\sqrt{\frac{47}{5} + \frac{47}{2}} \right) \cdot 6.67 = 812 \text{ dpm/100cm2}$$

$$MDA_{cpm} = \left( \frac{MDA}{6.67} \cdot .16 \right) + Bck_{cpm} = \left( \frac{812}{6.67} \cdot .16 \right) + 47 = 66 \text{ cpm}$$

Smear Count Station - Main Level Entrance

$$*MDA = \left( \frac{2.71}{10} + 3.3\sqrt{\frac{52}{10} + \frac{52}{1}} \right) \cdot 1 = 158 \text{ dpm/100 cm2}$$

$$*MDA_{cpm} = (158) \cdot (.16) + 52 = 77 \text{ cpm}$$

*This is also location for scanning Masslin, smear samples.

Date: 10/29/12

Prepared By: C. Webb

Reviewed By: D. Jenkins

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM** **Year 2012 Comprehensive Survey**

Notes:

Main Level - Restricted Access Area

$$MDA = \left( \frac{\frac{2.71}{5} + 3.3\sqrt{\frac{65}{5} + \frac{65}{2}}}{.16} \right) \cdot 6.67 = 950 \text{ dpm/100cm}^2$$

$$MDA_{cpm} = \left( \frac{950}{6.67} \cdot .16 \right) + 65 = 88 \text{ cpm}$$

Smear Station - counting at Main Level Entrance

$$MDA = \left( \frac{\frac{2.71}{10} + 3.3\sqrt{\frac{48}{10} + \frac{48}{1}}}{.16} \right) \cdot 1 = 152 \text{ dpm/100cm}^2$$

$$MDA_{cpm} = (152) \cdot (.16) + 48 = 72 \text{ cpm}$$

Basement Level Background Area

$$MDA = \left( \frac{\frac{2.71}{5} + 3.3\sqrt{\frac{43}{5} + \frac{43}{2}}}{.16} \right) \cdot 6.67 = 771 \frac{\text{dpm}}{100\text{cm}^2}$$

$$MDA_{cpm} = \left[ \left( \frac{771}{6.67} \right) \cdot .16 \right] + 43 = 61 \text{ cpm}$$

After performing measurements at locations 40A and 40B, personnel frisked hands and feet. No readings discernable above background.

Date: 10/30/12

Prepared By: E. Webb

Reviewed By: D. Jenkins

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM** **Year 2012 Comprehensive Survey**

Notes:

Basement Level Background Area

$$MDA = \left( \frac{\frac{2.71}{5} + 3.3\sqrt{\frac{44}{5} + \frac{44}{2}}}{.16} \right) \cdot 6.67 = 786 \text{ dpm/100cm}^2$$

$$MDA_{cpm} = \left( \frac{786}{6.67} \right) \cdot .16 + 44 = 63 \text{ cmp}$$

Smear + Mass/in Count Station - Main Level Entrance

$$MDA = \left( \frac{\frac{2.71}{5} + 3.3\sqrt{\frac{49}{10} + \frac{49}{1}}}{.16} \right) \cdot 1 = 155 \text{ dpm/100cm2}$$

$$MDA_{cpm} = (155) \cdot .16 + 49 = 74 \text{ cpm}$$

Surveyed (scan/frisk) Loose material on floor of Condenser Room on Basement Level. No readings discernable above background. One static B/G total measurent recorded (CR-1) on largest piece of material + one removeable B/G smear collected (~400 cm² area) from this piece. All readings below MDA. This material is releasable.

Surveyed (scan/frisk) foam material removed from Basement Level cargo door. No readings discernable above background. one static B/G total measurement recorded (D-1). All readings below MDA. This material is releaseable.

Date: 10/31/12

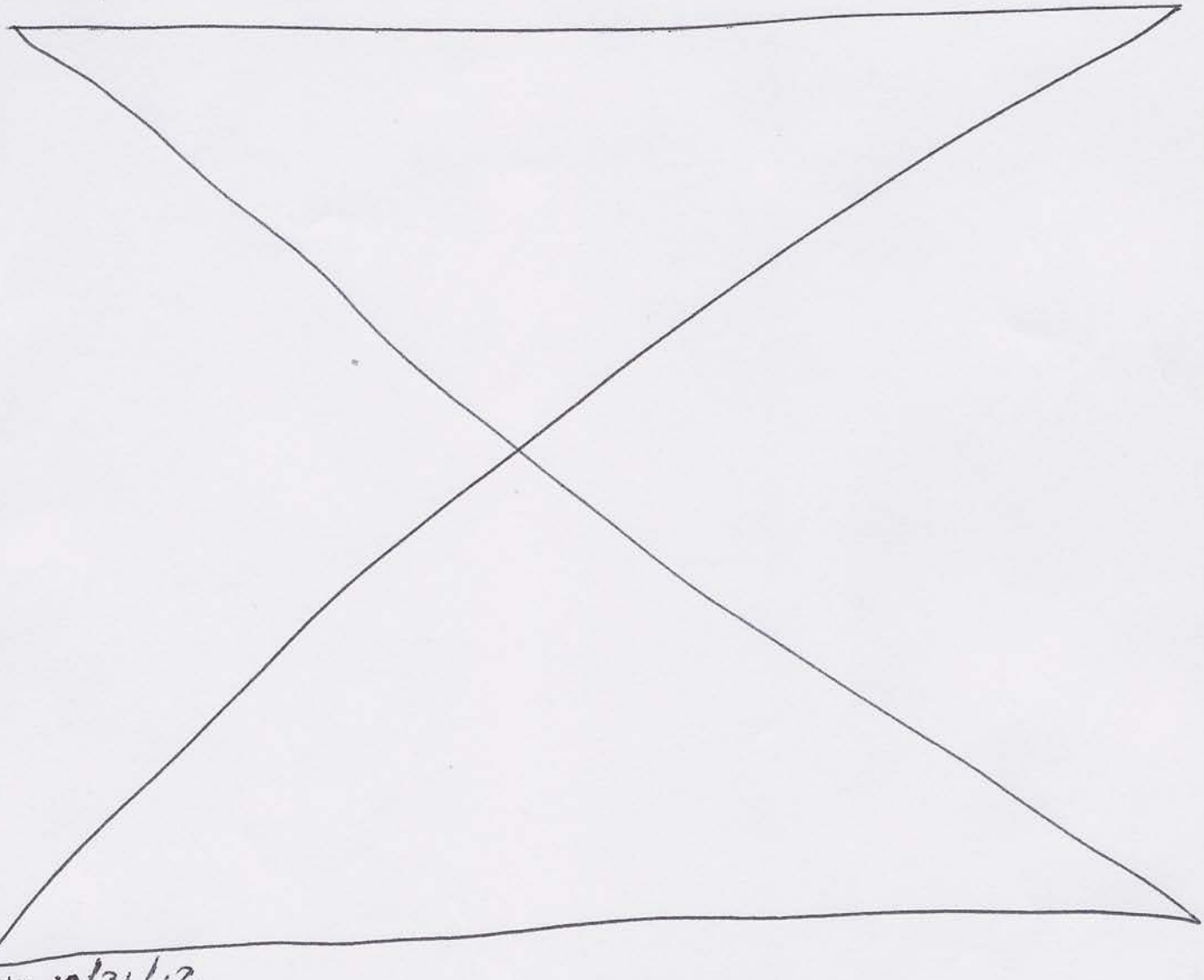
Prepared By: C. Webb

Reviewed By: D. Jenkins

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM** **Year 2012 Comprehensive Survey**

Notes: Performed general survey of the Condenser Room on Basement Level. Spot-checks on condenser performed with Ludlum 2221 + 44-9 probe. Internal + external surfaces were scanned. No readings discernable above background. This was not a 100% or Comprehensive survey.



Date: 10/31/12

Prepared By: C. Webb

Reviewed By: D. Jenkins

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/29/12 1405 Task Number NA

Specific Area of Survey: Smears MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 10/1 | 52 | 158 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☐ Yes ☒ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| → | Smear | | NA | | NA |
| 1 | " | 42 | | < MDA | |
| 2 | " | 45 | | < MDA | |
| 3 | " | 43 | | < MDA | |
| 4 | " | 56 | | < MDA | |
| 5 | " | 53 | | < MDA | |
| 6 | " | 42 | | < MDA | |
| 7 | " | 43 | | < MDA | |
| 8 | " | 54 | | < MDA | |
| 9 | " | 49 | | < MDA | |
| 10 | " | 37 | | < MDA | |
| 11 | " | 35 | | < MDA | |
| 12 | " | 41 | | < MDA | |
| 13 | " | 58 | | < MDA | |
| 14 | " | 46 | | < MDA | |
| 15 | " | 45 | | < MDA | |
| 16 | " | 44 | | < MDA | |

Survey Technician: A. Luca

Reviewed By: C. Webb

*MDA is removable in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/29/12 1430 Task Number NA

Specific Area of Survey: Smears MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading | MDA* dpm/100 cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 10 / 1 | 52 | 158 |
| NA | | / / | | | / / | % | / | | |

**SURVEY DATA** **Survey Map Attached ☐ Yes ☒ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| | Smears | | | | |
| 17 | " | 47 | NA | <MDA | |
| 18a | " | 46 | | <MDA | ~~<MDA~~ cw 10/29/12 |
| 18B | duplicate 1' count | 53 | | <MDA | ~~<MDA~~ cw 10/29/12 |
| 19 | " | 43 | | <MDA | ~~<MDA~~ cw 10/29/12 |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |

Survey Technician: A Luca

Reviewed By: C. Webb

*MDA is removable in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/~~29~~30/12 10:30 Task Number N/A

Specific Area of Survey: Smears CW 10/30/12 MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 10 1 | 48 | 152 |
| | | / / | | | / / | % | / | | ~~dt~~ CW 10/30/12 |

**SURVEY DATA** **Survey Map Attached ☐ Yes ☒ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 9A | SMEAR | 47 | N/A | < MDA | N/A |
| 9B | " | 33 | | < MDA | |
| 9C | " | 32 | | < MDA | |
| 20 | " | 43 | | < MDA | |
| 21 | " | 42 | | < MDA | |
| 22 | " | 37 | | < MDA | |
| 23 | " | 45 | | < MDA | |
| 24 | " | 48 | | < MDA | |
| 25 | " | 41 | | < MDA | |
| 26 | " | 52 | | < MDA | |
| 27 | " | 44 | | < MDA | |
| 27A | " | 38 | | < MDA | |
| 27b | " | 46 | | < MDA | |
| 28a | " | 42 | | < MDA | |
| 28a | DUPLICATE CONT. | 56 | | < MDA | |
| 30 | SMEAR | 52 | | < MDA | |
| 31 | " | 48 | | < MDA | |

Survey Technician: A. LUCCA

Reviewed By: C. WEBB

CW 10/29/12

*MDA is removable in dpm/100 cm²

**TECHNOLOGICAL MUSEUM DR. MODESTO IRIARTE BEAUCHAMP (former BONUS REACTOR FACILITY)**

**Rincón, Puerto Rico** **CONTAMINATION SURVEY FORM**

Project: BONUS - MMG Date/Time 10/30/12 1305 hrs Task Number N/A

Specific Area of Survey: Smears MDA=((2.71/Tbkg + 3.3sqrt(Bkg/Tbkg+Bkg/Ts))/E

Purpose of Survey: Year 2012 Comprehensive Survey A=(Sample-Bkg)/E

| Inst. type | Serial # | Cal. due date | Probe type | Serial # | Cal. due date | Efficiency | Ct. Time Tbkg/Ts (minutes) | Bkgd Reading | MDA* dpm/100cm² |
|---|---|---|---|---|---|---|---|---|---|
| Ludlum 2221 | 149991 | 3/23/13 | 44-9 | 154535 | 3/23/13 | 16 % | 10 / 1 | 48 | 152 |
| | | / / | | | / / | % | / | | cal 10/30/12 |

**SURVEY DATA** **Survey Map Attached ☐ Yes ☒ No**

| No. | Description/Location | Gross Counts in CPM βγ Removable | Gross Counts in CPM βγ Total | Contamination in dpm/100 cm² βγ Removable | Contamination in dpm/100 cm² βγ Total |
|---|---|---|---|---|---|
| 40A | Smears | 41 | NA | < MDA | NA |
| 40A Dup | " | 39 | | < MDA | |
| 40B | " | 29 | | < MDA | |
| 42 | " | 31 | | < MDA | |
| 43 | " | 57 | | < MDA | |
| 50A | " | 48 | | < MDA | |
| 50B | " | 50 | | < MDA | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |
| NA | | | | | |

Survey Technician: A. Lucca

Reviewed By: C. Webb

*MDA is removable in dpm/100 cm²



CW 10/30/12 CW 10/30/12

# APPENDIX C
# PHYSICAL CONDITION – INSPECTION CHECKLIST

This page intentionally left blank.

## Inspection Checklist
## BONUS Decommissioned Facility, Rincón, Puerto Rico

Date of This Inspection/Revision: 29-31 October 2012
Last Inspection: 4 August 2011
Inspectors: A. Luca and C. Webb
Next Inspection (Planned): Summer 2013

| No. | Item | Issue | Action/Notes |
|---|---|---|---|
| 1 | Specific site surveillance features | See attached table. | Inspect. See page 3/3. |
| 2 | Dome—entombed concrete monolith and monolith penetrations | Structural defects or degradation can result in loss of containment of radioactive materials. | Inspect for possible indications of structural problems, such as cracking, staining, and spalling. Notes: No change - minor surficial cracks. |
| 3 | Dome— external piping systems | Systems were flushed during decommissioning. Incidental contamination remains, which may be released if systems corrode or otherwise fail. | Inspect for possible indications of deterioration, such as peeling and blistering paint, staining, and flaking. Notes: No noticeable change. No signs of leak or discharge. |
| 4 | Dome—Basement Level | Some areas contain radiological contamination in excess of DOE standards; the general public is not allowed access to contaminated areas. | Note condition of access control barricades. Notes: Good condition - new asbestos sign on door of Ancillary Water Pump Room. |
| 5 | Dome—Basement Level flooding | Water accumulating in Basement Level may mobilize and redistribute surface contamination. | Inspect for gasket and storm water drains. Notes: Gasket has been replaced - no water accumulation. Some water accumulating on gasket. |
| 6 | Dome—Main Level | Some areas contain radiological contamination in excess of DOE standards; the general public is not allowed access to contaminated areas. | Note condition of access control barricades, ceramic floor tile, and lead blocks; note general housekeeping. Notes: No change - controls in good condition. |
| 7 | Dome—Mezzanine Level | Some areas contain radiological contamination in excess of DOE standards; the general public is not allowed access to contaminated areas. | Note condition of access control to mezzazine; note general housekeeping. Notes: Gate to mezzanine stairs was locked. Access to ladder - behind locked safe. |
| 8 | Dome— exterior | Building should appear well maintained | Visually inspect. Notes: Paint faded (color), but dome surface protected. |

| | | | |
|---|---|---|---|
| 9 | Surrounding land | New or changing features or activities adjacent to the site may affect site security. | Note changes within 0.25 mile (400 m) of site.<br>Notes: No apparent changes, Lighthouse park has been repaired/updated + is open. |
| 10 | General site upkeep | Building should appear well maintained. | Observe and evaluate changes in site conditions.<br>Notes: Good - grass needs to be mowed. Grass was mowed during survey. Good. |
| 11 | Site security | Security guard should be stationed at site at all times. | Ensure security guard is present.<br>Notes: Guard was present. |
| 12 | Erosion | Ensure that hill slopes and beach adjacent to site are not actively eroding in a way that could adversely affect the Facility. | Evaluate erosional features on adjacent slopes and beach.<br>Notes: No noticeable erosion on beach. |

## Checklist Of Site Specific Surveillance Features
## BONUS Decommissioned Facility, Rincón, Puerto Rico

| Feature | Comment |
|---|---|
| Access road and parking area | Asphalt – No change. some broken asphalt, but functional. |
| Entrance gate | Motor-operated – motor is not operational, but guard was present and maintained key+lock for gate. |
| Access through security gate | Note security of site; sign-in required on log sheet<br>Guard required sign-in on log sheet + recorded pertinent information. |
| Security fence | Chain-link, topped with three strands of barbed wire<br>Fence has some damage, but no holes/gaps. Barbed wire is down in some sections. |
| Dome—monolith plaques | Visually inspect – monolith structural integrity has not changed + plaques are in good condition. - in English + Spanish. |

# APPENDIX D
# CALIBRATION SHEETS

This page intentionally left blank.

Designer and Manufacturer of Scientific and Industrial Instruments

# CERTIFICATE OF CALIBRATION

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

CUSTOMER PUERTO RICO ELECTRIC PWR AUTH ORDER NO. 20196202/375034

Mfg. Ludlum Measurements, Inc. Model 2221 Serial No. 149991

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR / 154535

Cal. Date 23-Mar-12 Cal Due Date 23-Mar-13 Cal. Interval 1 Year Meterface 202-159

eck mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 30 % Alt 759.8 mm Hg

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

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☑ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☑ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck.,(Min. Volt) 4.4 VDC
☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

trument Volt Set 900 V Input Sens. 50 mV Det. Oper. 900 V at 50 mV Threshold Dial Ratio 100 = 10 mV

☑ HV Readout (2 points) Ref./Inst. 500 / 502 V Ref./Inst. 2000 / 2011 V

**OMMENTS:**

r90Y90:sn:5281,ACT:99,198dpm,EFF:24.09% 4pi
ct:23,954cpm,bg:56,sct:23,898cpm
s137:sn:0745,act:172,018dpm, EFF:0.16% 4pi (gamma)
ct:342cpm,bg:56cpm,sct:286cpm
s137:sn:158-112,ACT:6,156dpm EFF:20.79% 4pi (BCF4)
ct:1,336cpm,bg:56cpm,sct:1,280cpm
o60:sn:0886:ACT:7,891dpm, EFF:14.68% 4pi (BCF6)
ct:1,215cpm,bg:56cpm,sct:1,159cpm
i63:sn:0909,ACT:243,756dpm EFF:0.10% 4pi
ct:322cpm,bg:56cpm,sct:266cpm

All efficiencies taken at 1/4" from surface of detector.
Cs137:sn:2008 reads≈3,085cpm 1/4" from surface.
Sr90Y90:sn:342-09 reads≈13,908cpm 1/4" from surfacs.
Firmware:261010

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

| RANGE/MULTIPLIER | REFERENCE CAL. POINT | INSTRUMENT REC'D "AS FOUND READING" | INSTRUMENT METER READING* |
|---|---|---|---|
| x1K | 400kcpm | 400 | 400 |
| x1K | 100kcpm | 100 | 100 |
| x100 | 40kcpm | 400 | 400 |
| x100 | 10kcpm | 100 | 100 |
| x10 | 4kcpm | 400 | 400 |
| x10 | 1kcpm | 100 | 100 |
| x1 | 400cpm | 400 | 400 |
| x1 | 100cpm | 100 | 100 |
| | | | |
| | | | |

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

| | REFERENCE CAL. POINT | INSTRUMENT RECEIVED | INSTRUMENT METER READING* |
|---|---|---|---|
| ital adout | 400kcpm | 40011 (Q) | 40011 (Q) |
| | 40kcpm | 4001 | 4001 |
| | 4kcpm | 400 | 400 |
| | 400cpm | 40 | 40 |
| | 40cpm | 4 | 4 |

| | REFERENCE CAL. POINT | INSTRUMENT RECEIVED | INSTRUMENT METER READING* |
|---|---|---|---|
| Log Scale | 500kcpm | 500K | 500K |
| | 50kcpm | 50K | 50K |
| | 5kcpm | 5K | 5K |
| | 500cpm | 500 | 500 |
| | 50cpm | 50 | 50 |

um Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978

State of Texas Calibration License No. LO-1963

**eference Instruments and/or Sources:** ☐ 73410 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646 ☐ 70897 ☐ Ra-226 S/N Y982
-137 Gamma S/N ☐ 1162 ☑ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☑ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 94940 ☐ Oscilloscope S/N ☑ Multimeter S/N 78401031

alibrated By: Date 23-MAR-12

eviewed By: Date 23 Mar 12

is certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.
)RM C22A 10/24/2011 Page 1 of 2

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

Designer and Manufacturer
of
Scientific and Industrial
Instruments

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

# *CONVERSION CHART*

Customer PUERTO RICO ELECTRIC PWR AUTH Date 23-Mar-12 Order #. 20196202/375034

Model 2221 Serial No. 149991 Detector Model 44-9 Serial No. PR154535

Source Cs-137 194.6 mCi Cs-137 20 mCi High Voltage 900 V

Input Sensitivity 50 mV

| Reference Point | "As Found" Readings (CPM): Analog | Range/Scale | After Adjustment Readings (CPM): Analog | Range/Scale |
|---|---|---|---|---|
| 150 mR/hr | 360 | X1K | 360 | X1K |
| 50 mR/hr | 155 | X1K | 155 | X1K |
| 15 mR/hr | 50 | X1K | 50 | X1K |
| 5 mR/hr | 180 | X100 | 180 | X100 |
| 1.5 mR/hr | 50 | X100 | 50 | X100 |
| 1.0 mR/hr | 340 | X10 | 340 | X10 |

| Reference Point | "As Found" Readings: Digital | Count Time | After Adjustment Readings: Digital | Count Time |
|---|---|---|---|---|
| 150 mR/hr | 36242 | 6 Sec | 36242 | 6 Sec |
| 50 mR/hr | 15210 | | 15210 | |
| 15 mR/hr | 5266 | | 5266 | |
| 5 mR/hr | 1805 | | 1805 | |
| 1.5 mR/hr | 546 | | 546 | |
| 1.0 mR/hr | 348 | | 348 | |

Signature: [signature] [signature] Date 23-MAR-12

Designer and Manufacturer of Scientific and Industrial Instruments

# CERTIFICATE OF CALIBRATION

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

CUSTOMER PUERTO RICO ELECTRIC PWR AUTH ORDER NO. 20196202/~~375035~~ 375034 60

Mfg. Ludlum Measurements, Inc. Model 19 Serial No. 148190

Mfg. _____ Model _____ Serial No. _____

Cal. Date 23-Mar-12 Cal Due Date 23-Mar-13 Cal. Interval 1 Year Meterface 202-016

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 30 % Alt 699.8 mm Hg

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

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck, (Min. Volt) 2.2 VDC
☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 525 V Input Sens. 32 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

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

**COMMENTS:**
s137≈1uci checksource sn:2008 reads:≈290uR/hr with checksource label placed against the dimple in front f instrument can.

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

| RANGE/MULTIPLIER | REFERENCE CAL. POINT | INSTRUMENT REC'D "AS FOUND READING" | INSTRUMENT METER READING* |
|---|---|---|---|
| 5000 | 4000 uR/hr | 3950 | 4000 |
| 5000 | 1000 uR/hr | 950 | 1000 |
| 500 | 400 uR/hr = 76,000 cpm | 395 | 400 |
| 500 | 100 uR/hr | 95 | 100 |
| 250 | 200 uR/hr = 38,000 cpm | 210 | 200 |
| 250 | 100 uR/hr | 110 | 100 |
| 50 | 7600 cpm | 40 | 40 |
| 50 | 1900 cpm | 10 | 10 |
| 25 | 3800 cpm | 20 | 20 |
| 25 | 950 cpm | 5 | 5 |

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

50, 25 **Range(s) Calibrated Electronically**

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

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

**Reference Instruments and/or Sources:** ☐ 73410 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646 ☐ 70897 ☐ Ra-226 S/N Y982
Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☑ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

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

☑ Ram 500 S/N 94940 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 78401031

Calibrated By: _____ Date 23-Mar-12

Reviewed By: _____ Date 23 Mar 12




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

# APPENDIX E
# ASBESTOS MONITORING DATA

This page intentionally left blank.

# ENVIRONMENTAL HEALTH & SAFETY SERVICES

PMB 142, 400 CALLE CALAF, SAN JUAN, PUERTO RICO, 00918
PHONE NUMBER: 787-855-1901 FAX NUMBER: 787-858-2646

ASBESTOS AIR MONITORING PCM ANALYSIS REPORT
NIOSH 7400 A RULES, ISSUE 2, REVISION 3



**Client:** A.E.E. Protección Ambiental
**Address:** Santurce, Puerto Rico
**Project:** A.E.E. Bonus, Rincón

**Sampling Date:** 05/16/12
**Project No.:** RA

| SAMPLE ID / FILTER ID | AMBIENT SAMPLE LOCATION / PERSONAL SAMPLE: NAME, S.S. # / ACTIVITY | TYPE | FLOW RATE (l/min) / TIME | SAMPLE VOLUME (liters) | AVG. BLANK COUNT | TOTAL FIELDS COUNTED | TOTAL FIBERS COUNTED | FIBER DENSITY (f/mm²) | M.F.C. (f/cc) | L.O.D. (f/cc) | R.F.C. (f/cc) | 8HR. T.W.A. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RA 120516 BN01 | FIELD BLANK | FB | | | 0.0 | 100 | 0.0 | 0.0 | | | | |
| RA 120516 BN02 | FIELD BLANK | FB | | | 0.0 | 100 | 0.0 | 0.0 | | | | |
| RA 120516 BN03 | BONUS PLANT MAIN BLDG. GROUND LEVEL, EAST CORNER NEAR ENTRANCE, AREA SAMPLE | BG | 10.00 / 120.0 | 1200.0 | 0.0 | 100 | 2.5 | 3.2 | 0.001 | 0.002 | <0.002 | |
| RA 120516 BN04 | BONUS PLANT MAIN BLDG. BASEMENT NORTHWEST CORNER PIPE ROOM, AREA SAMPLE | BG | 10.00 / 120.0 | 1200.0 | 0.0 | 100 | 6.0 | 7.6 | 0.002 | 0.002 | 0.002 | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Type= BG-Background; EX-Exposure; OS-Outside; PP-Preparation; RM-Removal; CE-Cleaning; CL-Clearance; FB-Field Blank; PR-Personal; EL-Excursion Limit
M.F.C.---Measured Fiber Concentration R.F.C.---Reported Fiber Concentration L.O.D.---Limit of Detection T.W.A.---Time Weighted Average

Microscope #: EHSS 800 Rotometers #: RT-27 HV-141 Num. Samples: 4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Collected By: | Carmen del Pilar Colón EQB#10960243MS | Date: | 05/16/12 | Analyzed By: | Carmen P. Colón EQB#10960243MS | Date: | 05/16/12 |
| Delivery By: | N/A | Date: | N/A | PCM Report Delivery By: | Carmen P. Colón EQB#10960243MS | Date: | 05/16/12 |
| Received By: | N/A | Date: | N/A | PCM Report Received By: | Brenda Aponte | Date: | 05/16/12 |
| Reviewed By: | Carmen P. Colón EQB#10960243MS | Date: | 05/16/12 | Comments: | | | |