



TRIP REPORT

DATE: June 4, 2008
LOCATION: Walter Reed Army Medical Center (WRAMC), Washington, DC and
WRAMC Forest Glen Annex, Silver Spring, Maryland

CLIENT PARTICIPANTS:

Mr. David Burton, Walter Reed Army Medical Center, Health Physics Office
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CABRERA PARTICIPANTS: Joe Weismann and Mike Barsa

JMC Project No.: USA 2008-032

PURPOSE: Tour Diamond Ordnance Radiation Facility (DORF), WRAMC Forest Glen,
Building 516, in Support of Facility Decommissioning

SUMMARY

Cabrera Services, Inc. (CABRERA) was contracted through the U.S. Army Joint Munitions Command (JMC) to perform a site visit at the DORF and WRAMC Health Physics Office (HPO) to gather site information and records necessary to assess the current radiological condition of the facility and provide recommendations for performing decommissioning to current NRC standards. The site visit occurred on 9 May 2008.

The goal is to terminate the current Army Reactor Office (ARO) permit, vis a vis obtain full radiological unrestricted release to current NRC standards in support of the Base Realignment and Closure (BRAC) initiative for the WRAMC facilities. The DORF (Forest Glen Building 516) has been used by the WRAMC HPO as a radioactive waste processing and temporary storage facility, where hospital and research laboratory wastes are consolidated, held for decay, and repackaged for offsite disposal and/or treatment.

CABRERA recommends additional remediation of activated concrete surfaces in the Exposure Room and a full MARSSIM final status surveys in all areas of Bldg 516. This scenario represents the most cost-effective option for the Army to achieve prompt ARO Permit closure and allow turnover of the facility under BRAC.

TRIP DETAILS

Purpose

The purpose of the trip was to tour the DORF (Forest Glen Bldg. 516), as well as review current and historical documents to gain an understanding of the current status of the facility. Site visit activities began with researching historical and current records maintained in filing cabinets in the Health Physics Office (Building 41) at the WRAMC Main Post. Mr. Burton provided access to the current Army Reactor Office (ARO) permit, routine surveys, decommissioning records from the DORF reactor removal in 1977, and Army communications regarding re-investigation and oversight of the DORF facility.

Historical DORF Decommissioning Activities

The ARO permit was opened due to residual exposure rates in the Exposure Room of the DORF. The Rockwell decommissioning effort (Rockwell, 1980) was performed using criteria published in Table 1 of U.S. Atomic Energy Commission (AEC) Regulatory Guide 1.86 (RG 1.86), “Termination of Operating Licenses for Nuclear Reactors.” However, the activation products present in the concrete in the exposure room far exceeded the contamination-based criteria for beta and gamma emitters published in RG 1.86 (5,000 (average) /15,000 (max) dpm/100 cm²). Therefore, the limits used during the DORF decommissioning were amended to be exposure rate based for beta-gamma emitters as shown in Table 1.

Table 1. Contamination Limits Used During Rockwell Decommissioning of the DORF Facility (Rockwell, 1980)

| Contaminant | Total | Removable |
|---------------------|--|-------------------------------|
| Beta-Gamma Emitters | 0.1 mrad/hr average* and 0.3 mrad/hr maximum [†] at 1 cm with 7 mg/cm ² absorber | 100 dpm / 100 cm ² |
| Alpha Emitters | 100 dpm / 100 cm ² | 20 dpm / 100 cm ² |

* Measurements of average contaminant should not be averaged over more than 1 m². For objects of less surface area, the average should be derived for each such object.

[†] The maximum contamination level applies to an area of not more than 100 cm²

The Rockwell Report documented general area exposure rates up to 0.2 mR/hr (200 µR/hr) in the Exposure Room due to activation of the concrete walls, floor, and ceiling as described below:

“Radioactive materials and components that exceeded (Rockwell Report) Table 1 limits were removed from the facility. The limits in Table 2 were also met in areas except for the exposure room where, due to room geometry and the accumulative properties of activation products, the activity ranged from 0.08 – 0.24 mrd/hr as measured with a Technical Associates Mark III Cutie Pie – CP7M. The overall average was slightly higher than 0.1 mrad/hr. Individual pieces of concrete from the higher activity areas, when removed from the exposure room, indicated levels below 0.1 mrad/hr. The se activity levels were deemed acceptable by the contracting officer’s representative and by the United States Army Environmental Health Agency (USAEHA) radiation survey team.”
(Rockwell, 1980)

Core samples of the concrete structural materials confirmed that cobalt-60 (Co-60), Europium-152 (Eu-152), and Eu-154 were the principal activation products contributing to the elevated exposure rates. According to the Rockwell Report, the highest concentrations of these isotopes totaled 162 picocuries per gram (pCi/g) on the non-excavated north wall. After scabbling of the surface concrete up to depths of approximately 6 – 12 inches on the east wall, the highest concentrations of these isotopes totaled 39 pCi/g.

Army Reactor Office Permit

Follow-up surveys by the U.S. Army Research Laboratory (ARL) staff in 1997 confirmed that exposure rates in Exposure Room exceeded ambient background levels (~ 27 uR/hr general area;

ARL, 1997). At the time of these surveys, no additional radiological controls were in place at the DORF to prevent individuals from gaining access to this area and receiving an unintended personnel exposure. ARL Staff requested that the ARO a permit to the DORF so that additional controls and monitoring procedures could be implemented to prevent removal or disturbance of the activated concrete. As a result, ARO Permit DORF-97-1 was issued on 3 June, 1997 (copy provided as Attachment 1). The permit required posting of two signs on the basement level of the DORF (outside and within the exposure room) alerting personnel that the structural materials are slightly radioactive and providing the ARO Permit number and ARL contact information. In addition, ARL is required to perform annual inspections of the Exposure Room and file reports to the ARO. The signs and the reporting requirements shall remain in place until the ARO permit is terminated.

Current Regulations for Unrestricted Use

The current U.S. NRC regulation governing release of decommissioned facilities for unrestricted use is found in 10CFR20.1402 – *Radiological Criteria for Unrestricted Use*:

“A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.”

There are two primary differences between the current NRC decommissioning regulation and what was implemented for the DORF in 1980. The first of which being that license (or permit in the case of ARO) termination is based on comparison with a dose-based criterion of 25 mrem/yr from all applicable pathways to an average member of the critical group. This means those persons who are likely to receive the highest dose from occupying the facility post-decommissioning. The second difference being the ‘ALARA’ clause, requiring the licensee (permit holder) to remove as much contamination or radioactive material as is reasonable during the decommissioning.

DORF Walkdown and Site Survey

After copying applicable documentation from the HPO filing cabinets, site activities proceeded to the Forest Glen Annex of WRAMC to tour the DORF Building 516. The current facility is used by the HPO as a temporary radioactive waste ‘decay & storage’ facility that supports the research and hospital operations. The various rooms on the basement level are used to decay short-lived hospital and research nuclides until they may be shipped offsite as purely bio-medical wastes. Radionuclides currently being stored include Iodine-125,-131 (I-125, I-131), Chromium-51 (Cr-51), Phosphorus-32 (P-32), Sulfur-35 (S-35), Technicium-99m (Tc-99m), among others. A current radioactive waste inventory of DORF Bldg 516 (as of May 9, 2008) is provided as Attachment 2. These wastes are stored in drums, laboratory overpack containers, i.e. ‘lab-packs’, plastic trash bags, and boxes. Typical waste products also contain longer-lived nuclides like Carbon-14 (C-14, $T_{1/2} = 5700$ yrs) and Tritium (H-3, $T_{1/2} = 12.3$ yrs), but at the time of our visit neither of these nuclides were present in the inventory.

In addition to the containerized wastes, the DORF also has the following waste processing equipment that is known (or suspected) to be contaminated:

(2) Drum Compactors, an active unit on the Main Floor (blue) and a retired unit on the basement level. The retired unit is suspected to only have contamination on the impact head.

(1) Vial Crusher, which is used to separate the scintillation fluids from the glass and plastic vials. This unit is assumed to be contaminated and will require disposal. The exhaust of the crusher is vented through a series of filters (HEPA and charcoal) prior to its release outdoors.

(1) Inactive Radioactive Hood on the Main Floor. The exhaust from the hood was also vented through dual HEPA filters located on top of the hood assembly.

In addition to the waste processing equipment, there is an assortment of hazardous waste issues present within Bldg 516 primarily from the presence of lead. These include:

- Stacks of lead bricks that were previously used for shielding purposes within the facility.
- Several storage ‘pigs’, either in the form of enclosed solid lead or containing lead shot. The versions containing lead shot previously were filled with oil to fill the void space, but have since been drained. One of these units has damage resulting in loss of lead shot from the shield.
- Lead-lined drums used (or unused) by hospital staff for gamma-emitting treatment or diagnostic radionuclides.
- Lead-lined penetrations in the ceiling of the Exposure Room. These lines were used to run cabling for electronics and other reactor support components. Any additional remedial activities on the ceiling of the exposure room must include consideration for this lead.

CABRERA performed a thorough dose rate survey (with a Bicon MicroRem) of the DORF main floor and basement areas, with particular attention paid to the Exposure Room (diagrams provided in Attachment 3). Photographs were also taken to document current conditions (provided as Attachment 4). Both contact and general area (~1 meter above floor at least 30 cm from any wall) dose rate measurements were collected using a Bicon MicroRem meter provided by the WRMC HPO. Contact dose rates as high as 80 $\mu\text{rem/hr}$ were measured on the north and south walls adjacent to the new freezer. These surfaces appeared to be in the direct exposure fan pattern from the reactor pool opening and thus were likely irradiated at higher primary neutron fluence rates. No access was available along the western wall behind the Rad Storage Freezer. The gamma dose rates dropped on the walls and floor with distance to the former pool shield door (which was removed in 1977 and is now a solid concrete wall). No elevated dose rates were observed outside of the Exposure Room.

RECOMMENDATIONS

Based on the information and observations obtained during the site walk-down of the DORF (Forest Glen Bldg 516), the following recommendations are offered in support of ARO permit termination:

- Remove and package all legacy radioactive wastes and processing equipment for disposal at a licensed or permitted radioactive waste disposal facility. This includes the compactors, crusher, hoods, and legacy containerized wastes that remain at the DORF.

- Given the current state of the Exposure Room, additional remediation will be required in this area to support termination of the ARO permit in the near future, i.e. within the next 5-10 years.
- A decay-in-place option should only be considered if the ARL/ARO determines that permit termination is not a time-critical priority. The three principal activation products remaining have half-lives measured in years (Co-60, $T_{1/2} = 5.2$ yrs; Eu-152, $T_{1/2} = 13.5$ yr, and Eu-154, $T_{1/2} = 8.6$ yr), so this decision would require upkeep of the current ARO permit conditions until that time when conditions fall below 25 mrem/yr (current dose estimate is 57 – 70 mrem/yr from direct exposure alone)
- Remediation of the activated surfaces in the Exposure Room will be far more cost-effective than demolition of the entire Building 516 as radioactive waste. Concrete removal in the Exposure Room may be accomplished using penetrating hammers, scabblers, or diamond-tipped cutting devices.
- Removal should continue until the ambient exposure rates fall below a nominal 12 μ mrem/yr above background, which would allow a 2000 hr/year occupation by a critical group receptor and still fall below 25 mrem/yr. Provided that an average depth of 1-ft of additional concrete must be removed from all surfaces of the Exposure Room, this would lead to a waste volume of less than 50 cubic yards (assuming room dimensions of 20' x 15' x 8'). It must be noted that the actual volume will likely be far less than this value, given the previous remediation that has occurred and the uneven activation profile present.
- Independent of the Exposure Room, a full characterization/final status survey (FSS) should be performed in all other areas on the Main Level and Basement Level (after waste removal has occurred) using the guidance provided in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). All surveys should be designed as a FSS to take advantage of the possibility that many areas will pass in their current condition. These surveys should include the following:
 - All areas should be classified as MARSSIM Class 1;
 - 100% coverage scans of all accessible floors and lower walls (up to 2 meters) with gas-flow proportional detectors as well as focused scans using sodium iodide (NaI) detectors. Scans of upper walls and ceilings should be performed using engineering judgment based on potential for contamination;
 - Static measurements at predetermined locations (assume 15 per survey unit) using gas-flow proportional detectors;
 - Swipes for removable alpha/beta contamination at predetermined and select biased locations based on scan survey results;
 - Dose rate surveys.
 - Swipes or swabs from all sinks, sink traps, hoods, and ventilation system components (including filter housings and ductwork) within Building 516 that had direct or potential contact with RAM. Positive identification of radioactive material in these areas will lead to further characterization and potential remediation.

- It is recommended that the NRC Indoor Building Surface and Surface Soil Screening Values found in NUREG-5512 Tables 5-19 and 6-91, respectively, be used as the derived concentration guideline levels (DCGLs) for this project. This would preclude the need for derivation of site-specific DCGLs for the DORF.
- Perform a MARSSIM Class 1 FSS in the Exposure Room, post remediation. This FSS should include all of the components outlined above.
- All final status survey (FSS) activities should be presented in a summary report that may be submitted to the WRAMC HPO, ARL, ARO, and the U.S. NRC for review and approval.

ATTACHMENTS

ATTACHMENT 1 - ARO Permit DORF-97-1

ATTACHMENT 2 - Current RAM Inventory for DORF Facility

ATTACHMENT 3 - Results of Cabrera Dose Rate Survey, 9 May 2008

ATTACHMENT 4 - Photos of DORF Facility Current Conditions, 9 May 2008.

PERMIT FOR DIAMOND ORDNANCE RADIATION FACILITY (FOREST GLEN, MD)

Permit Number DORF-1-97

A. Pursuant to AR 50-7, the Director, U.S. Army Nuclear and Chemical Agency herein issues a possession permit for residual radioactive materials at the shutdown Diamond Ordnance Radiation Facility (DORF) at Forest Glen, MD. This permit is issued to the Director, U.S. Army Research Laboratory (ARL). Permit DORF-1-97 is effective 3 June 1997 and expires 2 June 2007.

B. The radioactive materials covered by this permit are those that:

1. are by product materials produced as a result of the DORF operations, and
2. are present at the DORF site, at locations where facility equipment, or materials were utilized.

C. This permit does not apply to radioactive materials that are or were licensed by the U. S. Atomic Energy Commission or Nuclear Regulatory Commission, radioactive materials not produced at the DORF, or radioactive materials that were removed from the DORF site as part of an authorized disposal or transfer.

D. Conditions for residual reactor radioactivity possession:

1. The Director, ARL, shall designate in writing a responsible individual for oversight of the DORF to ensure that all conditions of this permit are carried out. The Army Reactor Office (ARO) shall be informed of this designation.
2. ARL shall develop, document, and implement a plan with sufficient procedures to ensure that the residual radioactivity remains fixed in place and does not become loose or airborne. The plan should be commensurate with the scope and extent of radiation hazards from the DORF residual reactor radioactivity. The plan may be part of the activities performed by the Walter Reed Army Medical Center (WRAMC) staff. The plan shall be submitted to the ARO for review and approval. Compliance shall be ensured with applicable portions of Army Regulations, Titles 10 and 40 of the Code of Federal Regulations, and shall be designed to limit radiation exposure from DORF materials to levels that are as low as reasonably achievable, but no more than 100 mrem (1.0 mSv) per year to any member of the public. Data shall be available to support the effectiveness of the plan.

3. All areas that are controlled access for the purpose of protecting individuals from exposure to radiation or radioactive materials shall be appropriately posted in accordance with 10 CFR 20 and access limited, with any personnel entering those areas appropriately instructed and monitored.

4. The facility exposure room shall be conspicuously posted to indicate that any individual having safety concerns regarding the deactivated reactor facility may contact the ARL designee or the ARO. The posting shall contain the appropriate telephone numbers.

5. No radioactive wastes shall be produced except incidental amounts as part of decontamination and radioactivity monitoring operations. All radioactive wastes shall be properly labeled, handled, and disposed, in accordance with Army regulations.

6. No activities shall be conducted that would result in an annual release of airborne radioactivity in excess of the more restrictive of (1) 40 DAC-hours at concentrations specified in Title 10, Code of Federal Regulations, Part 20, Appendix B, Table 1, Column 3, or (2) the amount that would give a committed effective dose equivalent of 10 mrem (0.1 mSv) to the nearest person in the unrestricted area.

7. All radioactive material removed from the site shall be labeled, controlled, transported, handled, stored and disposed as required by existing regulations.

8. ARL staff shall provide immediate notification, followed by a detailed written report within 14 calendar days, to the ARO of any incident or condition relating to the DORF residual reactor radioactivity that:

a. caused or could have caused a release of radioactive material greater than the levels of item D.6, or exposure of a person to radiation hazards greater than 100 mrem (1 mSv) total effective dose equivalent in any one year,

b. created a significant change in the radiation or contamination levels at the site,

c. threatened or caused structural damage of the reactor structure, or

d. resulted in the controlled access area entrance of an unauthorized person.

9. ARL staff shall report any occurrence of substantial deviation from the articles of this permit. The initial report shall be made to the ARO within 7 calendar days of its discovery, followed by a detailed written report within 30 calendar days.

10. All reports of incidents, conditions or deviations shall include the following information related to the occurrence: chronological details, cause or reason, immediate actions taken, actions taken to prevent recurrence, and date when final corrective and preventive actions will be accomplished.

11. The reports and notifications required by this permit do not take the place of other notifications that other Federal or Army regulations may require. (For example, see 29 CFR 1910.96, AR 40-14, AR 385-11, and AR 385-40.)

12. DORF records regarding the residual reactor radioactivity shall be maintained by ARL staff, in addition to those that may be required by other documents. All records must be maintained for a period of at least 5 years. Records concerning radioactive material releases, records that are material to final contamination removal, and records detailing final contamination removal shall be maintained until at least 2 years after the final disposition of the residual reactor radioactivity, then transferred to the ARO. Any required radiation exposure records shall be a part of the official Army radiation exposure files.

— 13. An annual (calendar year) report shall be submitted to the ARO no later than May 1 of each year with at least the following information:

- a. Structural condition of the DORF building,
- b. Radiological condition of the DORF exposure room,
- c. Abnormal occurrences,
- d. Summary of any maintenance and repair activities related to the exposure room,
- e. Summary of any other significant activities involving the DORF residual reactor radioactivity, and
- f. Table of management oversight organization with names, titles, telephone numbers, and office designations.

★ E. HISTORY AND BACKGROUND

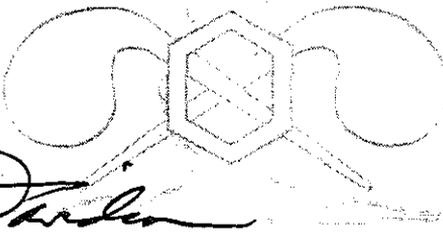
1. The DORF research reactor was last operated in September, 1977. In the time from the last shutdown into 1980, a decommissioning plan was implemented to remove all special nuclear material and remove all other radioactive material to accomplish a total and final decommissioning. These activities included removing the concrete reactor parapet and pouring additional concrete to form a continuous floor throughout the reactor building. The reactor decommissioning was reviewed by the Army Reactor Committee for Health and Safety and certified to be completed according to the regulations in existence at the time.

2. During a 1996 review by the ARO, the condition of the facility was questioned concerning its status relative to 1996 decommissioning standards. The one significant change since 1980 was a new requirement for the gamma radiation level to not exceed 5 mrem/hr at one meter from any surface in the facility (above background). The ARO requested a survey be performed at the DORF to verify

gamma radiation levels that are a result of residual reactor-produced isotopes. The result of this survey was reported to the ARO, indicating that the DORF exposure room has gamma radiation levels that easily exceeded background plus 5 rem/hr. The gamma radiation is a result of neutron activation of the structural concrete and is quite uniform throughout the exposure room concrete.

3. The current utilization of the DORF structure is for storage, processing, and packaging of short-lived radioactive waste from WRAMC. The WRAMC operations are performed under an existing NRC material license, 08-01738, and a DA Radiation Authorization, DARA 08-01-97. These licensed operations require that the DORF building be controlled access, with proper radiation safety postings and radiation exposure monitoring. As long as these licensed operations continue in the DORF building, no additional access control, posting, or radiation exposure monitoring is required. If the NRC and DARA operations cease at the DORF building, the holder of this permit must ensure that proper access control, radiation safety postings, and radiation exposure monitoring are implemented.

★ F. Final disposition of the DORF residual reactor radioactivity and release of the facility for unrestricted use requires approval from the Army Reactor Council, in accordance with AR 50-7. All activities involving the residual reactor radioactivity at the DORF must be in compliance with applicable sections of Titles 10 and 40 of the Code of Federal Regulations, AR 50-7 and AR 385-11.



Director, U.S. Army Nuclear and Chemical Agency

Listing of Container Contents of Waste Area by Isotope

Inventory From : 01/01/1990 to 05/09/2008

Walter Reed Army Medical Center
08-01738-02

| Isotope | Container # | Waste Code | Compound | PI | Received in Waste Area | Waste Activity | Decay Activity | On Hand Balance As of 05/09/08 | On Hand Container Bal |
|-------------------------------|----------------|------------|----------|-----|------------------------|----------------|----------------|--------------------------------|-----------------------|
| Cr-51 | 042051 | W040295 | | 221 | 07/23/2004 | 0.00000 | 0.00000 | 0.00000 mCi | 0.00000 |
| | 05SS02 | W050198 | | 221 | 04/15/2005 | 0.74000 | -0.74000 | 0.00000 mCi | 0.00000 |
| | 05SS03 | W050250 | | 221 | 05/18/2005 | 10.87000 | -10.87000 | 0.00000 mCi | 0.00000 |
| | 05SS04 | W050390 | | 221 | 09/28/2005 | 0.76060 | -0.76060 | 0.00000 mCi | 0.00000 |
| | 05SS06 | W050452 | | 221 | 12/14/2005 | 0.38100 | -0.38100 | 0.00000 mCi | 0.00000 |
| | 06SS01 | W060129 | | 221 | 05/11/2006 | 1.44000 | -1.44000 | 0.00000 mCi | 0.00000 |
| | 06SS02 | W060132 | | 221 | 05/11/2006 | 2.25000 | -2.25000 | 0.00000 mCi | 0.00000 |
| | 06SS03 | W060277 | | 221 | 09/12/2006 | 0.01000 | -0.01000 | 0.00000 mCi | 0.00000 |
| | 07SS01 | W070109 | | 221 | 03/15/2007 | 4.41800 | -4.41788 | 0.00012 mCi | 0.00012 |
| | 07SS02 | W070308 | | 221 | 09/14/2007 | 1.80000 | -1.79533 | 0.00467 mCi | 0.00467 |
| | 0811411 | W080128 | | 221 | 04/23/2008 | 0.59740 | -0.19704 | 0.40036 mCi | 0.40036 |
| | 08SS01 | W080014 | | 221 | 01/08/2008 | 1.63200 | -1.55485 | 0.07715 mCi | 0.07715 |
| Total Transactions for Cr-51 | | | | | : 12 | ===== | ===== | ===== | |
| | | | | | | 24.89900 | -24.41670 | 0.48230 mCi | |
| Eu-152 | 08GENER | W080140 | | 221 | 01/15/2008 | 0.00300 | -0.00005 | 0.00295 mCi | |
| | | W080142 | | 221 | 03/13/2008 | 0.00800 | -0.00006 | 0.00794 mCi | |
| | | W080144 | | 221 | 03/19/2008 | 0.00100 | -0.00001 | 0.00099 mCi | |
| | | W080146 | | 221 | 03/26/2008 | 0.00100 | -0.00001 | 0.00099 mCi | |
| | | W080148 | | 221 | 04/11/2008 | 0.00300 | -0.00001 | 0.00299 mCi | |
| | | W080150 | | 221 | 04/25/2008 | 0.00200 | 0.00000 | 0.00200 mCi | 0.01786 |
| Total Transactions for Eu-152 | | | | | : 6 | ===== | ===== | ===== | |
| | | | | | | 0.01800 | -0.00014 | 0.01786 mCi | |
| I-125 | 05SS02 | W050199 | | 221 | 04/15/2005 | 0.10000 | -0.10000 | 0.00000 mCi | 0.00000 |
| | 05SS03 | W050249 | | 221 | 05/18/2005 | 0.40000 | -0.40000 | 0.00000 mCi | 0.00000 |

Current
DORF
Rad Waste
Inventory

Listing of Container Contents of Waste Area by Isotope

Inventory From : 01/01/1990 to 05/09/2008

| Isotope | Container # | Waste Code | Compound | PI | Received in Waste Area | Waste Activity | Decay Activity | On Hand Balance As of 05/09/08 | On Hand Container Bal |
|------------------------------|----------------|------------|----------|------------|------------------------|----------------|----------------|--------------------------------|-----------------------|
| I-125 | 05SS04 | W050388 | | 221 | 09/28/2005 | 0.00100 | -0.00100 | 0.00000 mCi | 0.00000 |
| | 05SS05 | W050391 | | 221 | 09/28/2005 | 0.18000 | -0.18000 | 0.00000 mCi | 0.00000 |
| | 05SS06 | W050450 | | 221 | 12/14/2005 | 0.10000 | -0.10000 | 0.00000 mCi | 0.00000 |
| | 06SS01 | W060128 | | 221 | 05/11/2006 | 0.30000 | -0.29993 | 0.00007 mCi | 0.00007 |
| | 06SS02 | W060133 | | 221 | 05/11/2006 | 0.20000 | -0.19996 | 0.00004 mCi | 0.00004 |
| | 07SS01 | W070108 | | 221 | 03/15/2007 | 0.16700 | -0.16569 | 0.00131 mCi | 0.00131 |
| | 07SS02 | W070307 | | 221 | 09/14/2007 | 0.02000 | -0.01871 | 0.00129 mCi | 0.00129 |
| Total Transactions for I-125 | | | | | : 9 | ===== | ===== | ===== | |
| | | | | | | 1.46800 | -1.46528 | 0.00272 mCi | |
| I-131 | 08I-131 | W080104 | | 221 | 03/13/2008 | 3.00000 | -2.97795 | 0.02205 mCi | |
| | | W080105 | | 221 | 03/26/2008 | 1.00000 | -0.97746 | 0.02254 mCi | |
| | | W080137 | | 221 | 04/23/2008 | 1.00000 | -0.74820 | 0.25180 mCi | 0.29639 |
| | 08LINEN | W080106 | | 221 | 03/13/2008 | 2.00000 | -1.98530 | 0.01470 mCi | |
| | | W080107 | | 221 | 03/26/2008 | 2.00000 | -1.95492 | 0.04508 mCi | |
| | | W080138 | | 221 | 04/23/2008 | 2.00000 | -1.49639 | 0.50361 mCi | 0.56338 |
| | 08NUCMD | W080038 | | H01 | 02/07/2008 | 5.00000 | -4.99820 | 0.00180 mCi | |
| | | W080091 | | H01 | 03/13/2008 | 3.00000 | -2.97795 | 0.02205 mCi | |
| | | W080093 | | H01 | 03/19/2008 | 1.00000 | -0.98767 | 0.01233 mCi | |
| | | W080095 | | H01 | 03/26/2008 | 2.00000 | -1.95492 | 0.04508 mCi | |
| | | W080130 | | H01 | 04/11/2008 | 2.00000 | -1.82098 | 0.17902 mCi | |
| | | W080132 | | H01 | 04/25/2008 | 3.00000 | -2.10247 | 0.89753 mCi | 1.15780 |
| | 08SHARP | W080048 | | H01 | 02/07/2008 | 10.00000 | -9.99640 | 0.00360 mCi | |
| | | W080097 | | H01 | 02/25/2008 | 8.00000 | -7.98642 | 0.01358 mCi | |
| | | W080099 | | H01 | 03/13/2008 | 13.00000 | -12.90445 | 0.09555 mCi | |
| W080101 | | | H01 | 03/19/2008 | 6.00000 | -5.92603 | 0.07397 mCi | | |
| W080103 | | | H01 | 03/26/2008 | 4.00000 | -3.90985 | 0.09015 mCi | | |
| W080134 | | | H01 | 04/11/2008 | 13.00000 | -11.83640 | 1.16360 mCi | | |
| W080136 | | | H01 | 04/25/2008 | 5.00000 | -3.50411 | 1.49589 mCi | 2.93634 | |
| Total Transactions for I-131 | | | | | : 19 | ===== | ===== | ===== | |
| | | | | | | 86.00000 | -81.04608 | 4.95392 mCi | |
| Mo-99 | 08GENER | W080139 | | 221 | 01/15/2008 | 300.00000 | -300.00000 | 0.00000 mCi | |
| | | W080141 | | 221 | 03/13/2008 | 800.00000 | -799.99954 | 0.00046 mCi | |
| | | W080143 | | 221 | 03/19/2008 | 100.00000 | -99.99974 | 0.00026 mCi | |
| | | W080145 | | 221 | 03/26/2008 | 100.00000 | -99.99846 | 0.00154 mCi | |

Listing of Container Contents of Waste Area by Isotope

Inventory From : 01/01/1990 to 05/09/2008

| Isotope | Container # | Waste Code | Compound | PI | Received in Waste Area | Waste Activity | Decay Activity | On Hand Balance As of 05/09/08 | On Hand Container Bal |
|------------------------------|----------------|------------|----------|-----|------------------------|----------------|----------------|--------------------------------|-----------------------|
| Mo-99 | 08GENER | W080147 | | 221 | 04/11/2008 | 300.00000 | -299.74067 | 0.25933 mCi | |
| | | W080149 | | 221 | 04/25/2008 | 200.00000 | -194.11975 | 5.88025 mCi | 6.14185 |
| Total Transactions for Mo-99 | | | | | : | 6 | ===== | ===== | ===== |
| | | | | | | 1800.00000 | -1793.85815 | 6.14185 mCi | |
| P-32 | 05SS02 | W050197 | | 221 | 04/15/2005 | 0.20000 | -0.20000 | 0.00000 mCi | 0.00000 |
| | 05SS03 | W050251 | | 221 | 05/18/2005 | 5.00000 | -5.00000 | 0.00000 mCi | 0.00000 |
| | 05SS04 | W050387 | | 221 | 09/28/2005 | 1.30000 | -1.30000 | 0.00000 mCi | 0.00000 |
| | 05SS05 | W050392 | | 221 | 09/28/2005 | 0.76700 | -0.76700 | 0.00000 mCi | 0.00000 |
| | 05SS06 | W050451 | | 221 | 12/14/2005 | 9.30000 | -9.30000 | 0.00000 mCi | 0.00000 |
| | 06SS01 | W060127 | | 221 | 05/11/2006 | 0.10000 | -0.10000 | 0.00000 mCi | 0.00000 |
| | 06SS02 | W060131 | | 221 | 05/11/2006 | 0.20000 | -0.20000 | 0.00000 mCi | 0.00000 |
| | 06SS03 | W060276 | | 221 | 09/12/2006 | 0.35800 | -0.35800 | 0.00000 mCi | 0.00000 |
| | 07SS01 | W070107 | | 221 | 03/15/2007 | 1.92000 | -1.92000 | 0.00000 mCi | 0.00000 |
| | 07SS02 | W070306 | | 221 | 09/14/2007 | 0.60000 | -0.59999 | 0.00001 mCi | 0.00001 |
| Total Transactions for P-32 | | | | | : | 10 | ===== | ===== | ===== |
| | | | | | | 19.74500 | -19.74499 | 0.00001 mCi | |
| S-35 | 05SS03 | W050252 | | 221 | 05/18/2005 | 1.00000 | -0.99982 | 0.00018 mCi | 0.00018 |
| | 05SS04 | W050389 | | 221 | 09/28/2005 | 0.20000 | -0.19990 | 0.00010 mCi | 0.00010 |
| | 05SS05 | W050393 | | 221 | 09/28/2005 | 1.00000 | -0.99948 | 0.00052 mCi | 0.00052 |
| | 06SS01 | W060130 | | 221 | 05/11/2006 | 0.10000 | -0.09969 | 0.00031 mCi | 0.00031 |
| | 06SS02 | W060134 | | 221 | 05/11/2006 | 1.00000 | -0.99690 | 0.00310 mCi | 0.00310 |

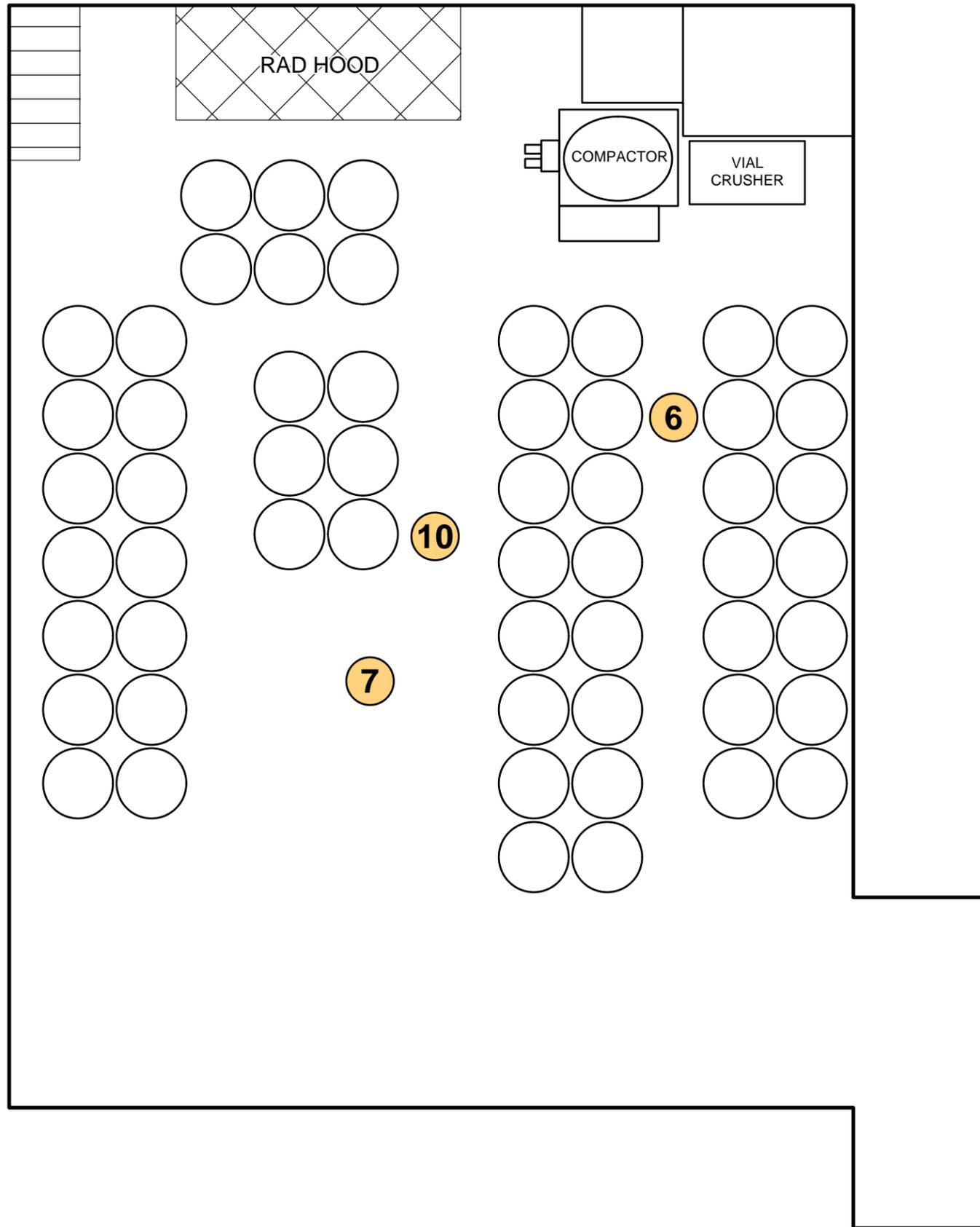
Listing of Container Contents of Waste Area by Isotope

Inventory From : 01/01/1990 to 05/09/2008

| Isotope | Container # | Waste Code | Compound | PI | Received in Waste Area | Waste Activity | Decay Activity | On Hand Balance As of 05/09/08 | On Hand Container Bal |
|-------------------------------|----------------|------------|----------|-----|---------------------------|-------------------|-------------------|-----------------------------------|--------------------------|
| Total Transactions for S-35 | | | | | : | 5 | 3.30000 | -3.29579 | 0.00421 mCi |
| Tc-99m | 08NUCMD | W080037 | | H01 | 02/07/2008 | 25.00000 | -25.00000 | 0.00000 mCi | |
| | | W080090 | | H01 | 03/13/2008 | 15.00000 | -15.00000 | 0.00000 mCi | |
| | | W080092 | | H01 | 03/19/2008 | 5.00000 | -5.00000 | 0.00000 mCi | |
| | | W080094 | | H01 | 03/26/2008 | 10.00000 | -10.00000 | 0.00000 mCi | |
| | | W080129 | | H01 | 04/11/2008 | 10.00000 | -10.00000 | 0.00000 mCi | |
| | | W080131 | | H01 | 04/25/2008 | 15.00000 | -15.00000 | 0.00000 mCi | 0.00000 |
| | 08SHARP | W080047 | | H01 | 02/07/2008 | 50.00000 | -50.00000 | 0.00000 mCi | |
| | | W080096 | | H01 | 02/25/2008 | 40.00000 | -40.00000 | 0.00000 mCi | |
| | | W080098 | | H01 | 03/13/2008 | 65.00000 | -65.00000 | 0.00000 mCi | |
| | | W080100 | | H01 | 03/19/2008 | 30.00000 | -30.00000 | 0.00000 mCi | |
| | | W080102 | | H01 | 03/26/2008 | 20.00000 | -20.00000 | 0.00000 mCi | |
| | | W080133 | | H01 | 04/11/2008 | 65.00000 | -65.00000 | 0.00000 mCi | |
| | | W080135 | | H01 | 04/25/2008 | 25.00000 | -25.00000 | 0.00000 mCi | 0.00000 |
| Total Transactions for Tc-99m | | | | | : | 13 | 375.00000 | -375.00000 | 0.00000 mCi |



DRAFT

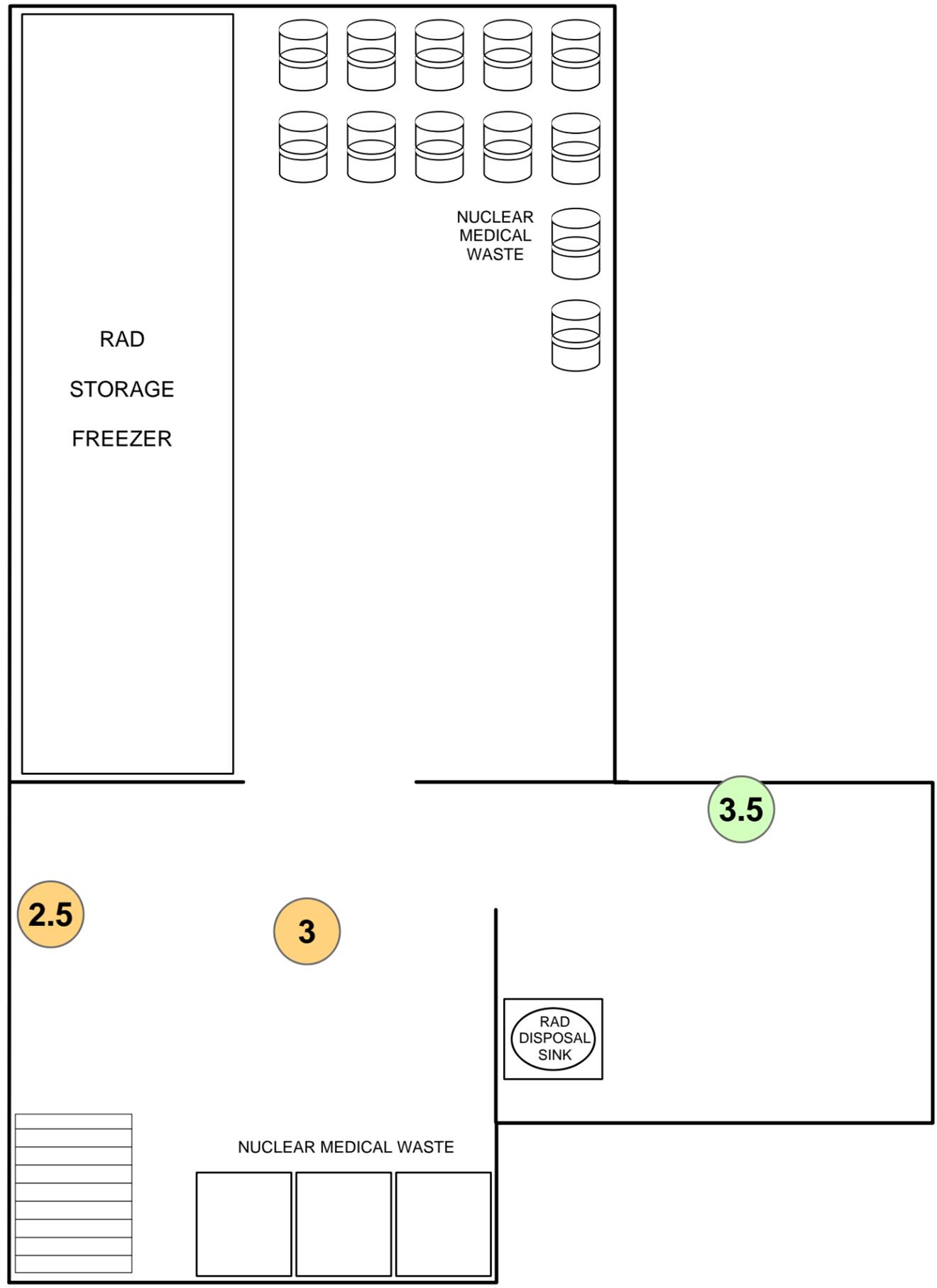


7

Survey Locations
General area, 1 meter
(urem/hr)

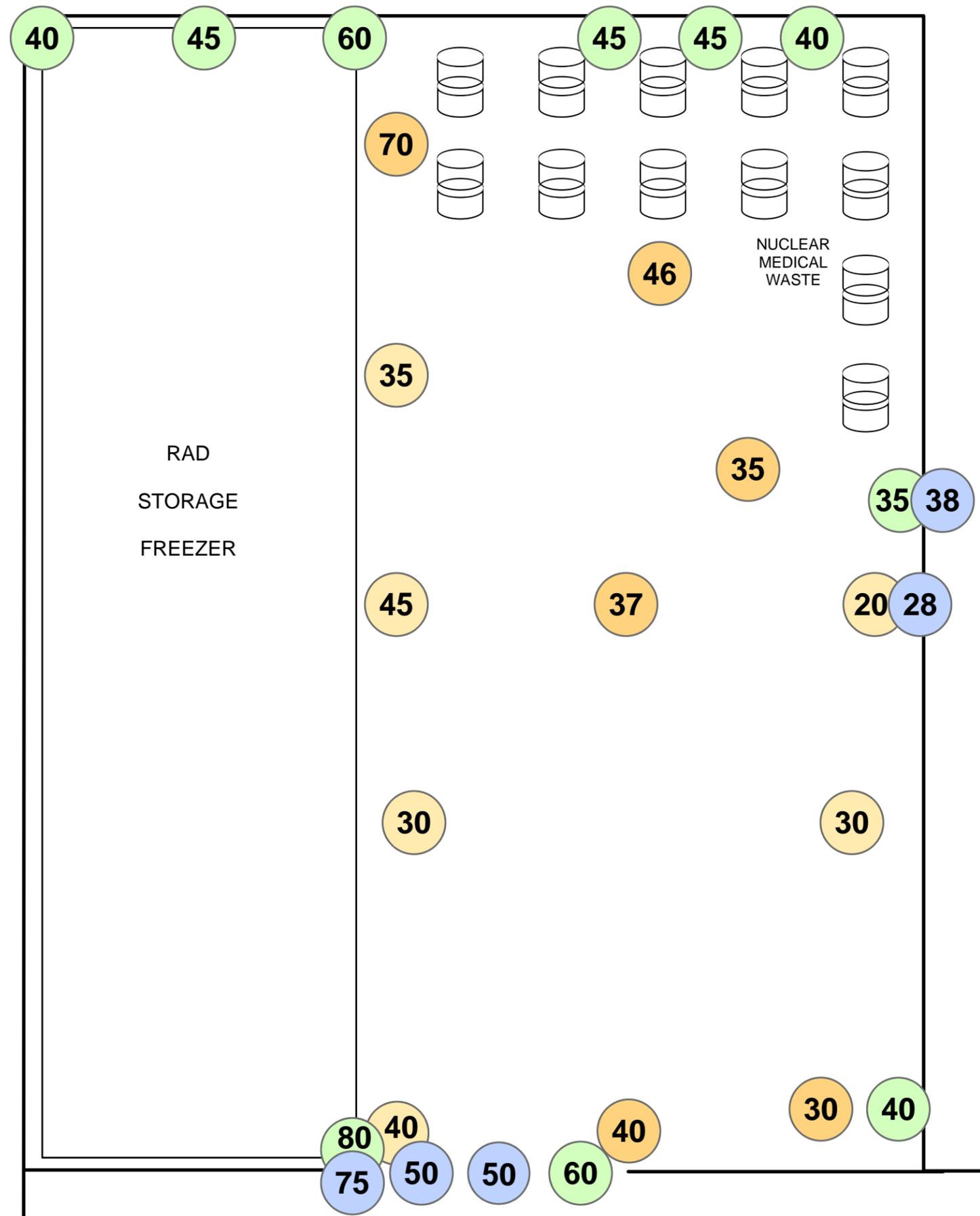
| REV | DATE | DESCRIPTION | BY |
|-----|------|-------------|----|
| | | | |
| | | | |
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| | |
|--|---|
|  CABRERA SERVICES 103 E. MT ROYAL AVE. BALTIMORE, MD 21202 |  U.S. ARMY JOINT MUNITIONS COMMAND ROCK ISLAND ARSENAL, ILLINOIS |
| | |
| REVIEWED BY: MB | PRELIMINARY DOSE RATE SURVEYS DORF BUILDING 516 MAIN FLOOR |
| CONTRACT # W52P1J-07-D-0026 | PROJECT # 08-3030.03 |
| SCALE: 0 0.5 1 2 3 Meters | DATE: 5/19/2008 |



- 3 Survey Locations
General area, 1 meter
(u_{rem}/hr)
- 3.5 Survey Locations
Walls 1 - 2 meters
(u_{rem}/hr)

| REV | DATE | DESCRIPTION | BY |
|---|------|---|-----------------|
| | | | |
| | | | |
|  CABRERA SERVICES 103 E. MT ROYAL AVE. BALTIMORE, MD 21202 | |  U.S. ARMY JOINT MUNITIONS COMMAND ROCK ISLAND ARSENAL, ILLINOIS | |
| PREPARED BY: KJ | | WALTER REED ARMY FOREST GLEN ANNEX MEDICAL CENTER MARYLAND | |
| REVIEWED BY: MB | | PRELIMINARY DOSE RATE SURVEYS DORF BUILDING 516 BASEMENT FLOOR | |
| CONTRACT # W52P1J-07-D-0026 | | PROJECT # 08-3030.03 | |
| SCALE: 0 0.375 0.75 1.5 2.25 Meters | | | DATE: 5/19/2008 |



- 
30 Survey Locations on Floor (urem/hr)
- 
35 Survey Locations, General area, 1 meter (urem/hr)
- 
40 Survey Locations, Walls 1 - 2 meters (urem/hr)
- 
75 Survey Locations, Walls > 2 meters (urem/hr)

| REV | DATE | DESCRIPTION | BY |
|---|------|---|----|
| | | | |
| | | | |
|  CABRERA SERVICES 103 E. MT ROYAL AVE. BALTIMORE, MD 21202 | |  U.S. ARMY JOINT MUNITIONS COMMAND ROCK ISLAND ARSENAL, ILLINOIS | |
| PREPARED BY: KJ | | WALTER REED ARMY FOREST GLEN ANNEX MEDICAL CENTER MARYLAND | |
| REVIEWED BY: MB | | PRELIMINARY DOSE RATE SURVEYS DORF BUILDING 516 EXPOSURE ROOM | |
| CONTRACT # | | PROJECT # | |
| W52P1J-07-D-0026 | | 08-3030.03 | |
| SCALE: 0 0.25 0.5 1 1.5 Meters | | DATE: 5/19/2008 | |



Main Floor – Waste Storage Drum Pallets



Main Floor – Vial Crusher Ventilation (in “Source” Room)



Main Floor – Refrigerator



Main Floor – Generator (in “Source” Room)



Main Floor – “Source” Room



Main Floor – Concrete Poured Into Pit Formerly Used to House Reactor



Main Floor – Nuclear Medicine Waste Drums



Main Floor – Vial Crusher



Lower Floor – Nuclear Medicine Waste Storage



Lower Floor – Lead Shielded Boxes and Concrete Blocks



Lower Floor – Nuclear Medicine Waste Storage



Lower Floor – Lead Shielded Boxes and Entrance to "Warm" Room



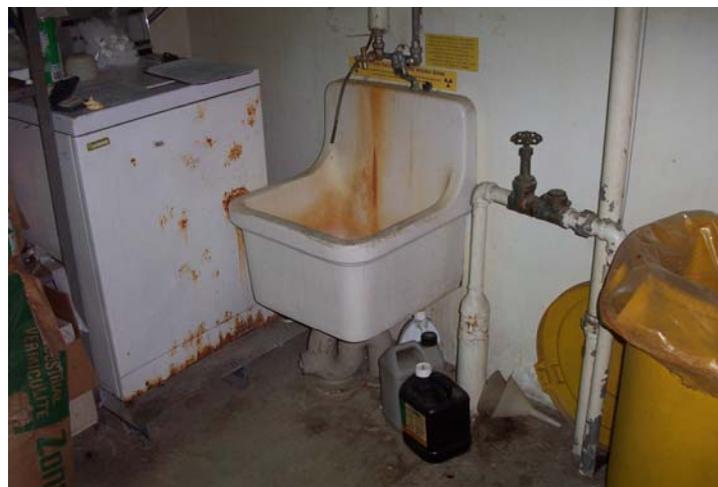
Lower Floor - Entrance to Exposure Room (left) and Entrance to "Warm" Room (right)



"Warm" Room - Chromium Bottle



"Warm" Room - Rad Waste Sink



"Warm" Room - Rad Waste Sink



Exposure Room – Track for Former Door



Exposure Room – Concrete Cores and Scabbling (East Wall)



Exposure Room – Nuclear Medicine Clothing Waste (North Wall)



Exposure Room – Ceiling



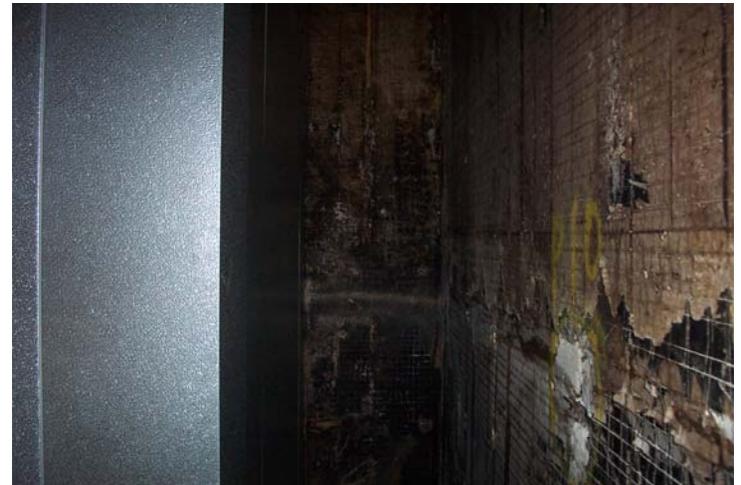
Exposure Room – Freezer (West side of room)



Exposure Room – Ceiling (steel bars)



Exposure Room – Titanium Pallets (South side of room, near entrance)



Exposure Room – Behind Freezer