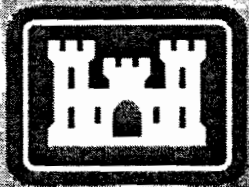


# TECHNICAL PROJECT PLANNING FOR THE WALTER REED ARMY MEDICAL CENTER (WRAMC)

USACE (Baltimore District)

23 June 2011

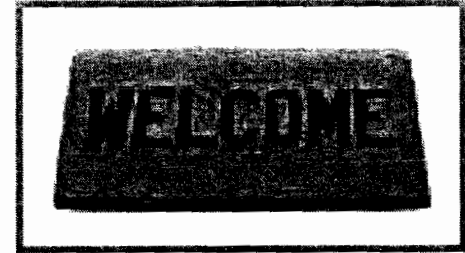


US Army Corps of Engineers  
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# Opening Remarks

- Welcome
- Schedule:
  - ▶ Commence at 0900
  - ▶ Break at noon for lunch
  - ▶ Reconvene at 1300 (if required)
- Introductions
  - ▶ Project Team Members
  - ▶ NRC representatives
  - ▶ Facilitator
- Read Ahead(handout)



# TPP Agenda

- Review of “Case Study” Forest Glen Surveys
- Discussion of WRAMC Main Post
- Discussion of DORF
- Additional Questions and Discussion Items
- Path Forward
- Closing Remarks
- Adjourn



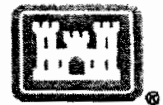
# Meeting Guidelines

- Group rules and communications during meeting
- Developed by the attendees for their meeting
- Examples
  - ▶ All communication is respectful
  - ▶ Stay on schedule
  - ▶ Stay on topic



# TPP Objectives

- Information needs
- Decisions to be made
- Questions to be answered
- Outcomes
  - ▶ What do you envision at the end of this TPP meeting?
  - ▶ What do you envision for the end state of the DORF?



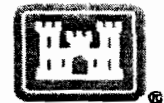
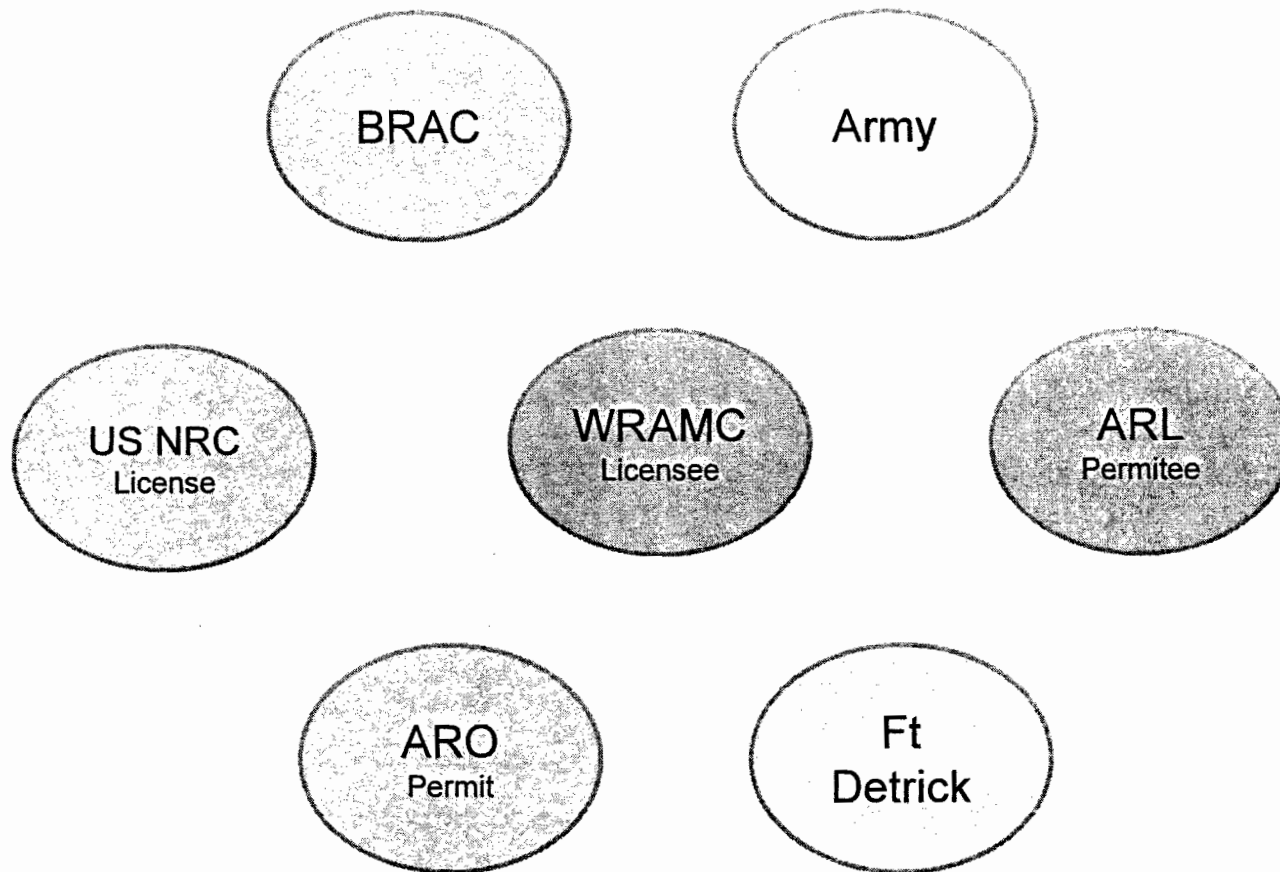
# History

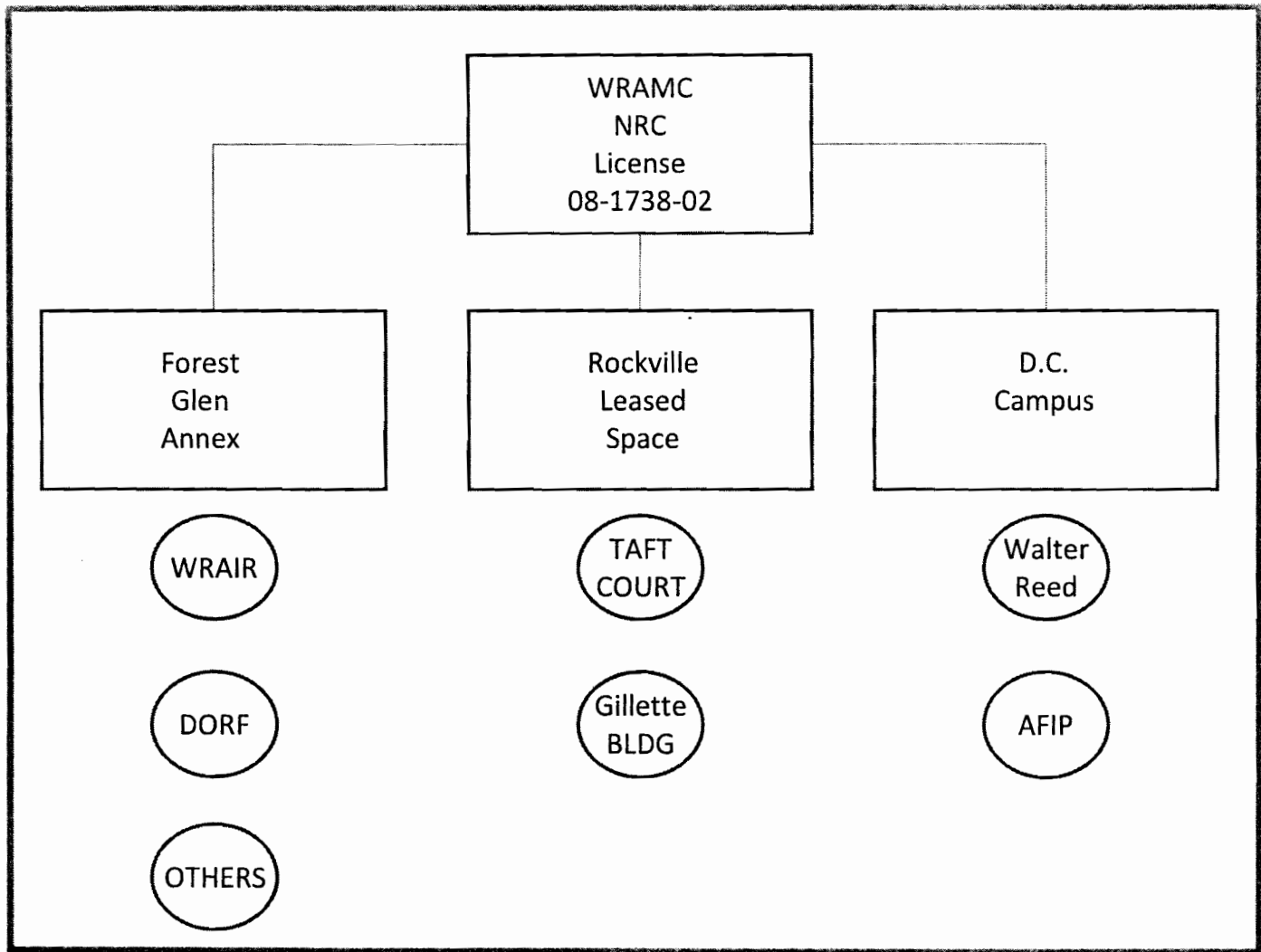


- BRAC Decision 2005
  - ▶ Close WRAMC Main Post
  - ▶ Transfer Forest Glen to Fort Detrick (discretionary decision)
- Must terminate WRAMC NRC License 08-1738-02
- All locations where NRC-licensed material has been used throughout WRAMC's history must be either:
  - ▶ Transferred to another NRC License (i.e. WRAIR/NMRC) or
  - ▶ Decommissioned IAW NRC requirements and subject to NRC final approval (i.e. Forest Glen, leased locations, Main Post)
- WRAMC approaching this sequentially, as seen on next slides.

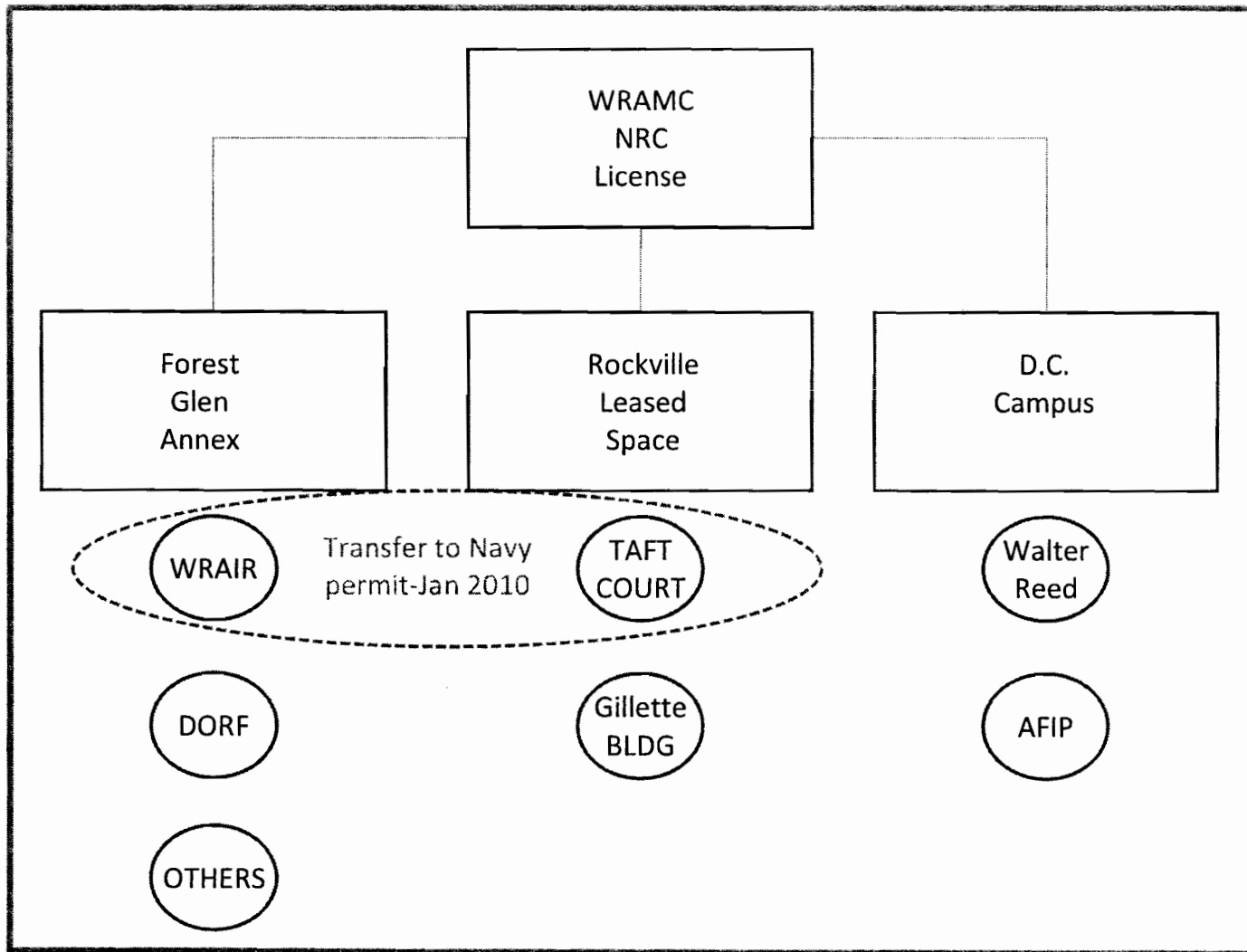


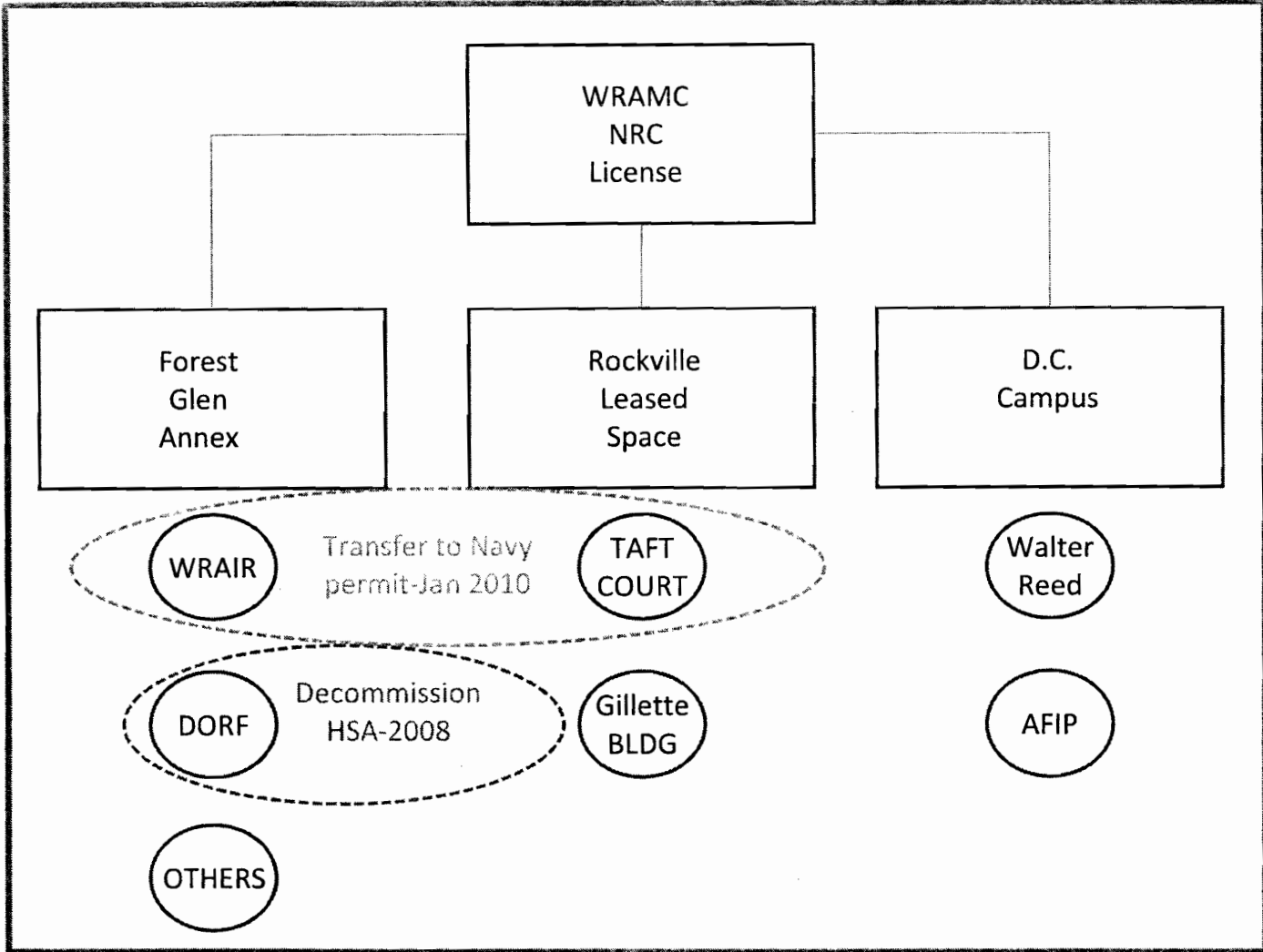
# Stakeholders

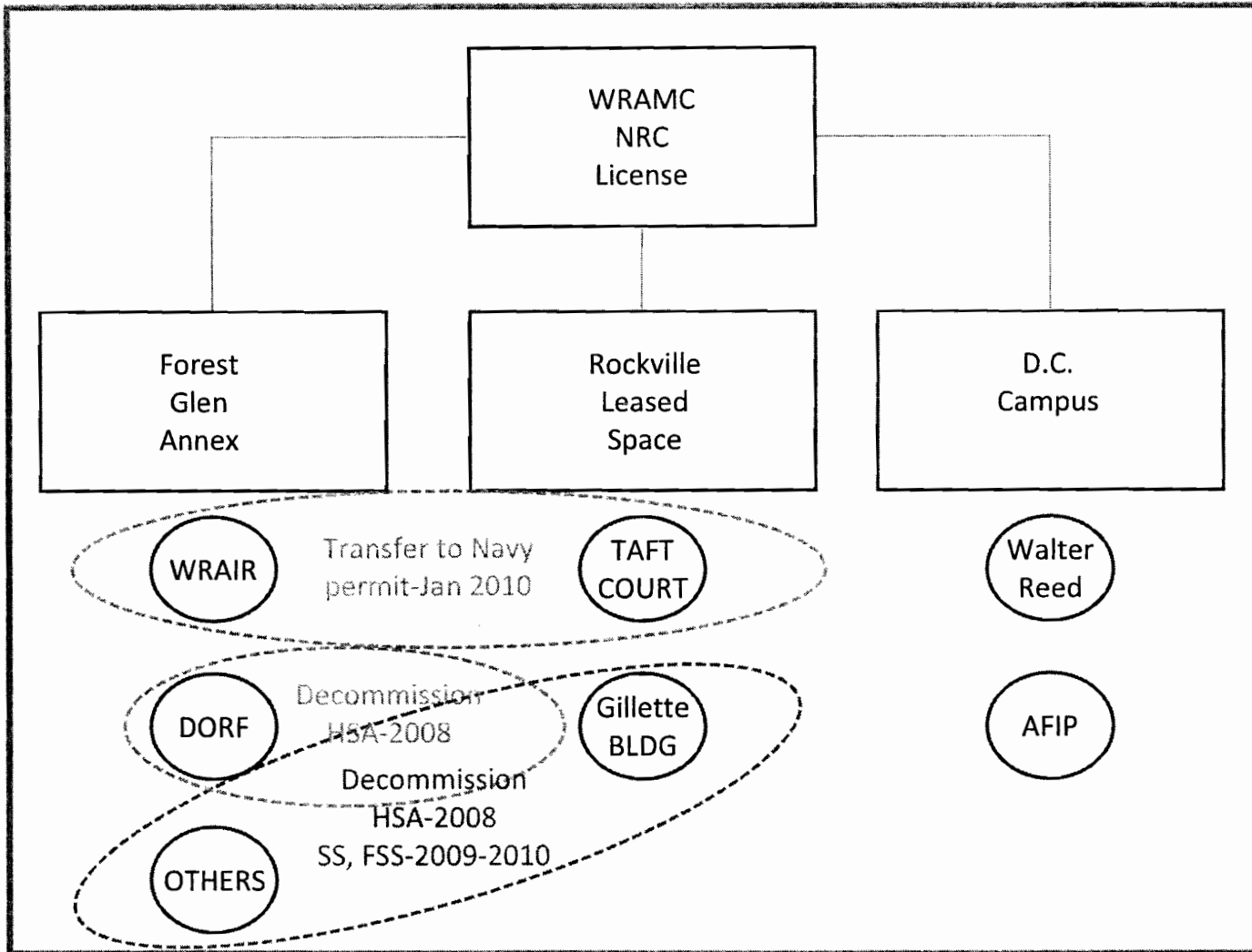


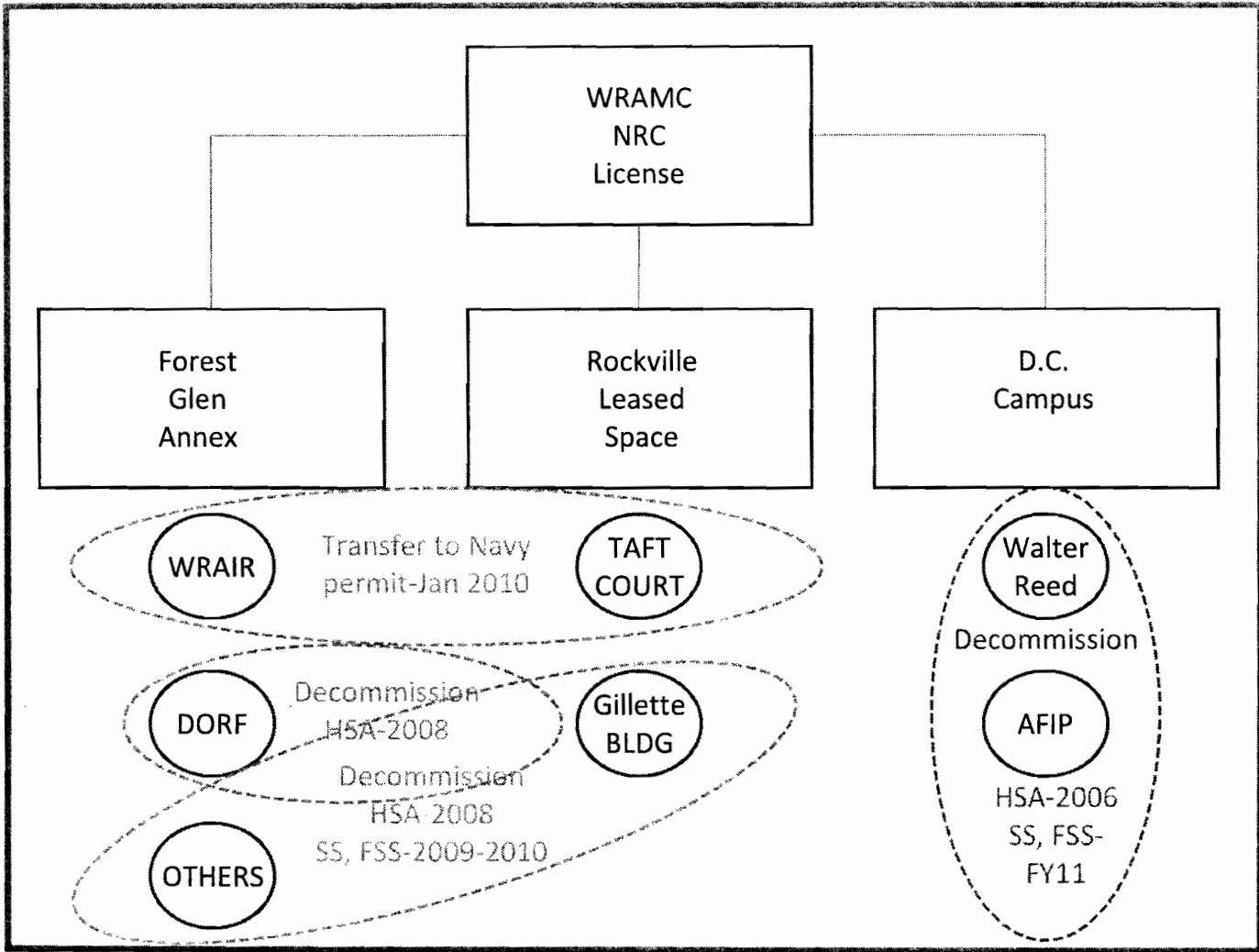












# Case Study

## Recent Work at Forest Glen



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# Forest Glen Licenses and Army Radiation Authorizations

- NRC License No. 08-01738-02, Expiration Date 30 April 2015 – addresses all of WRAMC
- ARA No. 08-01-15, Expiration Date 30 November 2015
- Terminated NRC License No. 08-01738-03, terminated on 17 August 2004
- U.S. Army Reactor Office Reactor Permit No. DORF-1-97



# General Framework

- Performed in accordance with NUREG 1757 guidance
- MARSSIM (NUREG 1575) methodology served as framework
- Instrument sensitivities verified in accordance with NUREG 1507



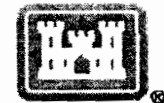
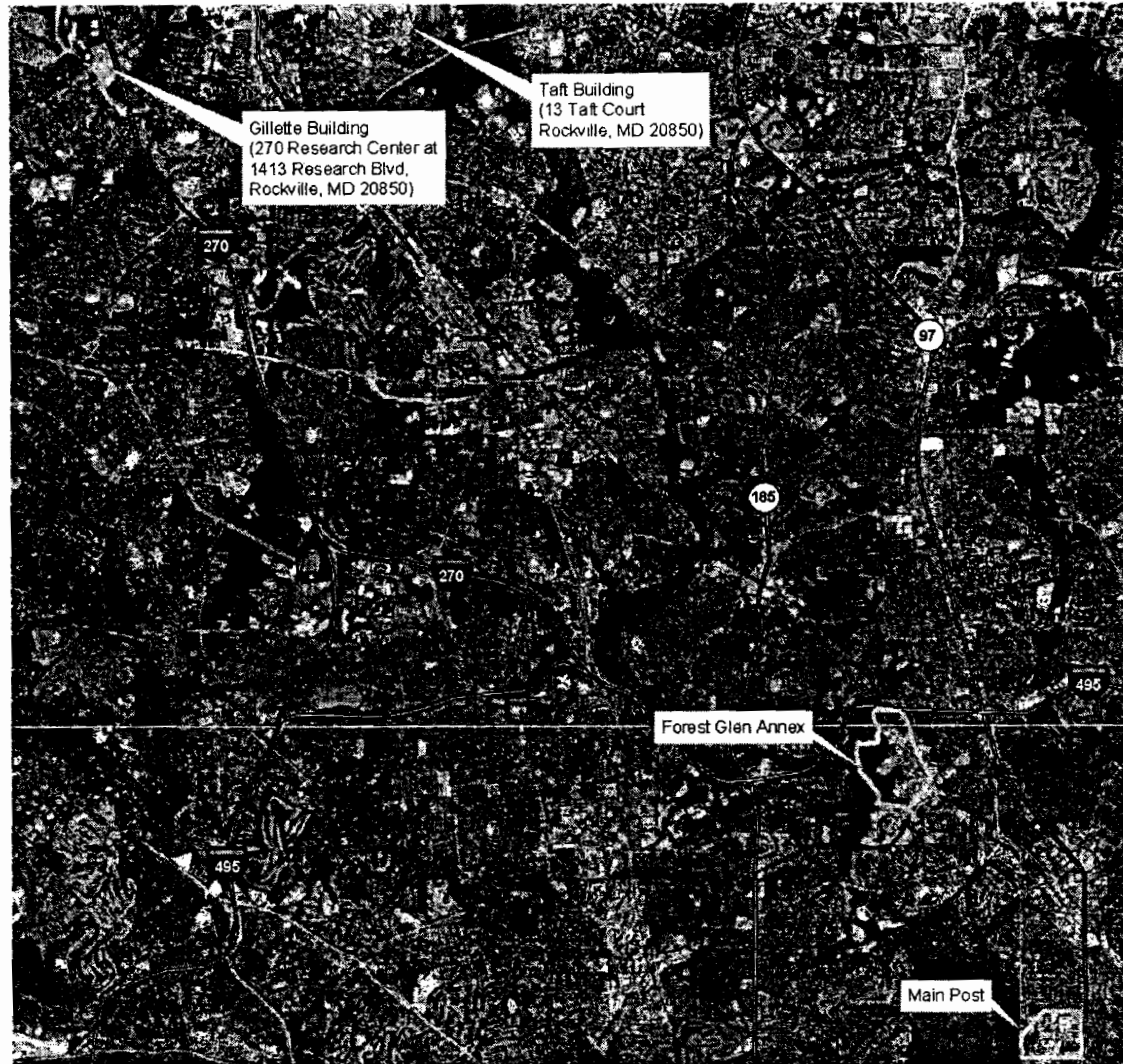
# Historical Site Assessment (HSA)

- HSA Addressed...
  - ▶ Forest Glen Facility
  - ▶ DORF at Forest Glen
  - ▶ WRAIR Research Labs
  - ▶ Taft Court (Rickman Building)
  - ▶ Gillette Building
- Seventeen buildings/areas throughout the WRAMC Forest Glen Annex and leased facilities in Rockville, MD investigated








# Overview Map





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-  Former Buildings
-  Existing Buildings
-  Site Outline

REV	DATE	DESCRIPTION	BY

 CHARLENE DEBICES 502 E. MT. ROYAL AVE. BALTIMORE, MD 21202	 U.S. ARMY ENGINEER DISTRICT, BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND
<b>HISTORICAL SITE ASSESSMENT          BUILDINGS INVESTIGATED</b>	
CONTRACT # W912 02 08 D 0003 SCALE: 5/2015 003 008 009	PROJECT # 08-380123 DATE: 8/12/2008

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# HSA Conceptual Site Model

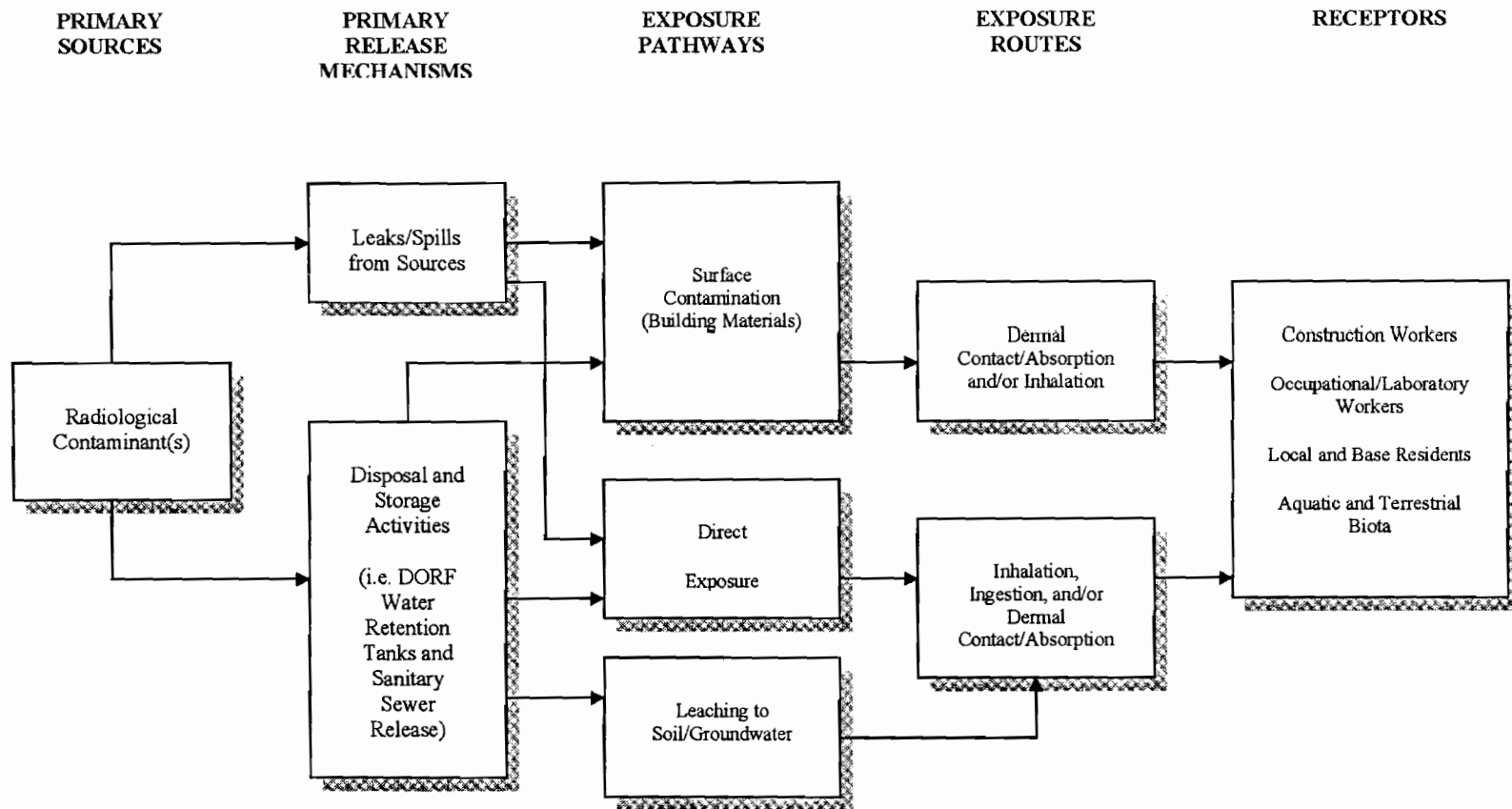


FIGURE 5-5: CONCEPTUAL SITE MODEL (CSM) FOR WRAMC

# Screening of Radionuclides

- Generally, radionuclides with half-lives less than 1 year not considered
- Some short-lived radionuclides retained that were currently in use or stored
- Specific radionuclide usage was associated with different areas and buildings



# Radionuclides Considered

Radionuclide	Use/Source	Name	Half Life	Decay Type	RCOPC?
Am-241	NRC-2704	americium-241	432.2 yr	alpha	Y
Am-241	sealed source	americium-241	432.2 yr	alpha	-
Ba-133	any	barium-133	10.53 yr	electron capture	Y
Ba-133	sealed source	barium-133	10.53 yr	electron capture	-
C-14	any	carbon-14	5730 yr	beta emission	Y
C-14	organic compound	carbon-14	5730 yr	beta emission	Y
C-14	unsealed	carbon-14	5730 yr	beta emission	Y
Ca-45	any	calcium-45	163.8 day	beta emission	Y
Ca-45	unsealed	calcium-45	163.8 day	beta emission	Y
Cd-109	any	cadmium-109	462.3 day	electron capture	-
Cd-109	gas chromatography	cadmium-109	462.3 day	electron capture	-
Ce-141	any	cerium-141	32.5 day	beta emission	-
Cl-36	any	chlorine-36	3x10 <sup>5</sup> yr	beta emission	Y
Co-57	any	cobalt-57	271 day	electron capture	-
Co-57	sealed source	cobalt-57	271 day	electron capture	-
Co-60	sealed source	cobalt-60	5.272 yr	beta emission	-
Co-60	activation product	cobalt-60	5.272 yr	beta emission	Y
Cr-51	any	chromium-51	27.7 day	electron capture	Y
Cr-51	liquid	chromium-51	27.7 day	electron capture	Y

Continued next slide...



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# Radionuclides Considered

Radionuclide	Use/Source	Name	Half Life	Decay Type	RCOPC?
Cr-51	sodium chromate	chromium-51	27.7 day	electron capture	Y
Cs-137	3M 6D6C-CA	cesium-137	30.2 yr	beta emission	-
Cs-137	amer nuc corp	cesium-137	30.2 yr	beta emission	-
Cs-137	any	cesium-137	30.2 yr	beta emission	Y
Cs-137	sealed source	cesium-137	30.2 yr	beta emission	-
Cs-141	any	cesium-141	24.9 sec	beta emission	-
Eu-152	activation product	europium-152	13.4 yr	beta emission, electron capture	Y
Eu-154	activation product	europium-154	8.5 yr	beta emission, electron capture	Y
Fe-59	any	iron-59	44.51 day	beta emission	-
Ga-67	any	gallium-67	78.25 hr	electron capture	-
Gd-153	sealed source	gadolinium-153	241.6 day	electron capture	-
H-3	any	tritium	12.26 yr	beta emission	Y
H-3	gas chromatography	tritium	12.26 yr	beta emission	Y
H-3	organic compound	tritium	12.26 yr	beta emission	Y
H-3	thymidine	tritium	12.26 yr	beta emission	Y
H-3	unsealed	tritium	12.26 yr	beta emission	Y
Hg-203	-	mercury-203	46.6 day	beta emission	-
I-123	AECL	iodine-123	13.1 hr	electron capture	-
I-123	any	iodine-123	13.1 hr	electron capture	-
I-125	AECL	iodine-125	59.9 day	electron capture	-

Continued next slide...



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# Radionuclides Considered

Radionuclide	Use/Source	Name	Half Life	Decay Type	RCOPC?
I-125	any	iodine-125	59.9 day	electron capture	Y
I-125	samples	iodine-125	59.9 day	electron capture	Y
I-125	unsealed	iodine-125	59.9 day	electron capture	Y
I-129	any	iodine-129	1.6x10 <sup>7</sup> y	beta emission, electron capture	Y
I-129	sealed source	iodine-129	1.6x10 <sup>7</sup> y	beta emission, electron capture	-
I-131	any	iodine-131	8.04 day	beta emission	Y
In-111	any	indium-111	2.8 day	electron capture	-
Ir-192	any	iridium-192	73.83 day	beta emission	-
K-42	-	potassium-42	12.36 hr	beta emission	-
Mn-54	any	manganese-54	312 day	electron capture	-
Mo-99	any	molybdenum-99	65.94 hr	beta emission	-
Na-22	any	sodium-22	2.605 yr	positron emission, electron capture	-
Nb-95	any	niobium-95	34.98 day	beta emission	-
Ni-63	foils	nickel-63	100 yr	beta emission	Y
Ni-63	sealed source	nickel-63	100 yr	beta emission	-
P-32	any	phosphorus-32	14.28 day	beta emission	Y
P-32	organic compound	phosphorus-32	14.28 day	beta emission	Y
P-32	unsealed	phosphorus-32	14.28 day	beta emission	Y
P-33	any	phosphorus-33	25.3 day	beta emission	Y
P-33	unsealed	phosphorus-33	25.3 day	beta emission	Y

Continued next slide...



# Radionuclides Considered

Radionuclide	Use/Source	Name	Half Life	Decay Type	RCOPC?
<b>Pu-239</b>	<b>calibration source</b>	<b>plutonium-239</b>	<b>2.4x10<sup>4</sup> yr</b>	<b>alpha</b>	<b>Y</b>
<b>Ra-226</b>	<b>sealed source</b>	<b>radium-226</b>	<b>1600 yr</b>	<b>beta emission</b>	<b>-</b>
<b>Rb-86</b>	<b>any</b>	<b>rubidium-86</b>	<b>18.63 day</b>	<b>beta emission</b>	<b>-</b>
<b>Ru-103</b>	<b>any</b>	<b>ruthenium-103</b>	<b>39.24 day</b>	<b>beta emission</b>	<b>-</b>
<b>S-35</b>	<b>any</b>	<b>sulfur-35</b>	<b>87.2 day</b>	<b>beta emission</b>	<b>Y</b>
<b>S-35</b>	<b>unsealed</b>	<b>sulfur-35</b>	<b>87.2 day</b>	<b>beta emission</b>	<b>Y</b>
<b>Sb-125</b>	<b>any</b>	<b>antimony-125</b>	<b>2.76 yr</b>	<b>beta emission</b>	<b>-</b>
<b>Sc-46</b>	<b>any</b>	<b>scandium-46</b>	<b>83.8 day</b>	<b>beta emission</b>	<b>-</b>
<b>Se-75</b>	<b>any</b>	<b>selenium-75</b>	<b>118.5 day</b>	<b>electron capture</b>	<b>-</b>
<b>Sr-85</b>	<b>any</b>	<b>strontium-85</b>	<b>64.8 day</b>	<b>electron capture</b>	<b>-</b>
<b>Sr-89</b>	<b>any</b>	<b>strontium-89</b>	<b>50.52 day</b>	<b>beta emission</b>	<b>-</b>
<b>Sr-90</b>	<b>sealed source</b>	<b>strontium-90</b>	<b>29 yr</b>	<b>beta emission</b>	<b>-</b>
<b>Ta-182</b>	<b>any</b>	<b>tantalum-182</b>	<b>114.5 day</b>	<b>beta emission</b>	<b>-</b>
<b>Tc-99m</b>	<b>any</b>	<b>technetium-99m</b>	<b>6.01 hr</b>	<b>isomeric transition</b>	<b>Y</b>
<b>Tc-99m</b>	<b>liquid</b>	<b>technetium-99m</b>	<b>6.01 hr</b>	<b>isomeric transition</b>	<b>Y</b>
<b>Tl-201</b>	<b>any</b>	<b>thallium-201</b>	<b>3 day</b>	<b>electron capture</b>	<b>-</b>
<b>Tl-204</b>	<b>any</b>	<b>thallium-204</b>	<b>3.78 yr</b>	<b>beta emission, electron capture</b>	<b>-</b>
<b>U-238</b>	<b>any</b>	<b>Uranium-238</b>	<b>4.46x10<sup>9</sup> y</b>	<b>alpha</b>	<b>Y</b>
<b>Xe-127</b>	<b>any</b>	<b>xenon-127</b>	<b>36.3 day</b>	<b>electron capture</b>	<b>-</b>
<b>Xe-133</b>	<b>any</b>	<b>xenon-133</b>	<b>5.25 day</b>	<b>beta emission</b>	<b>-</b>
<b>Yb-169</b>	<b>any</b>	<b>ytterbium-169</b>	<b>32 day</b>	<b>electron capture</b>	<b>-</b>
<b>Zn-65</b>	<b>any</b>	<b>zinc-65</b>	<b>243.8 day</b>	<b>positron emission, electron capture</b>	<b>-</b>



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# Classification by Contamination Potential

TABLE 3-1: HSA RADIOLOGICAL RISK CATEGORIES

Category	Description
Impacted (Additional Surveys Needed)	There is a reasonable probability that the building or area was impacted by radiological activities
Non-Impacted	There is a very low probability that building/area was impacted radiologically during operations. This was determined either through:  a) No documented use of RAM; or  b) Records indicate that area was used for radiological operations or storage, but survey records exist documenting decontamination, decommissioning, final/close-out survey, and/or free release.



# Information Sources

- WRAMC operating history records
- Minutes of the Radiation Control Committee (RCC)
- Routine radiological surveys performed by the WRAMC HPO
- Final status survey reports and records of disposal of radioactive waste
- Physical tours and interviews
- Off-installation sources including NRC, USACHPPM, ARL, and USANCA/ARO



# WRAMC Regulation 40-10

- WRAMC enacted in 1974
- requirements for periodic (weekly/monthly) surveys of areas/rooms using RAM
- Requires immediate decontamination of areas found to exceed 200 dpm/100cm<sup>2</sup>.



# Building/Area Classification

TABLE 5-2: LIST OF BUILDINGS/AREAS WITH RAM USE AT WRAMC FOREST GLEN ANNEX AND FACILITIES IN ROCKVILLE, MD

Building	Building Area (sq.ft.)	Original Structure Name	Department(s) / RAM Use(s)	Current Tenant and Conditions	Impacted or Non-Impacted	Radionuclides Used	Radionuclides Retained as RCOPCS <sup>3</sup>	Rooms With Historical RAM Presence	Non-Impacted Rooms	Impacted Rooms
101	224983	Former Dormitory for National Seminary Park	Portable Lead Paint Analyzer	Abandoned, building/land turned over to Montgomery County	Non-Impacted	Cd-109, H-3	None	1082	All	None
149A	800	Bunker	Health Physics Office Storage	Abandoned, building/land turned over to Montgomery County	Non-Impacted	All	None	All (Only one room)	All	None
188	2685	WRAMC, Health Physics Office	Former use by Health Physics Office	Abandoned, building/land turned over to Montgomery County	Non-Impacted	All	None	8, 9. Conference. Exits. Floors. Restrooms	All	None
500	20806	WRAIR	WRAIR Research Labs	WRAIR Administration	Non-Impacted	Am-241, Ba-133, C-14, Ca-45, Cr-51, Cs-137, H-3, I-125, I-131, K-42, Na-22, Ni-63, P-32, P-33, Ra-226, Rb-86, S-35, Sb-125, Se-75, Sr-90	None	11, 29, 30, 31, 34, 35, 36, 37, 38, 39, 40, 41, 42, 63, 66, 67, 68, 69, 70, 71, 72, 74, 75, 78, 1B-1, 41A, 63B, 71A, B-1, Basement, Hall 1, Hall 2	All	None
501	15305	WRAIR	WRAIR Research Labs	WRAIR Pilot Bioproduction Facility	Non-Impacted	P-32, P-33, S-35	None	23	All	None
503 <sup>1</sup>	137761	WRAIR	WRAIR Research Labs	WRAIR Research Labs	Impacted	C-14, Ca-45, Cr-51, Cs-137, H-3, I-125, P-32, P-33, S-35	C-14, Ca-45, Cr-51, Cs-137, H-3, I-125, P-32, P-33, S-35	2E12, 3E12, 3E14, 3E18, 1E22, 1E24, 3E24, 1E26, 1N40, 2N22, 2N24, 2N34, 2N42, 2N47, 2N48, 2N58, 2N69, 2N80, 2S18, 2W02, 2W106, 2W18, 2W23, 3N38, 3N54, 3N66, 3W08, 3W10, 3W110, 3W16, 3W22, 3W26, 3W40, 3W50, 3W71, elevators, exits, floor 1, floor 2, floor 3, floor G, GW04, GW05B, GW72	2N22, 2S18, 3N54, 3W08, 3W10, 3W22, and 3W40	2E12, 3E12, 3E14, 3E18, 1E22, 1E24, 3E24, 1E26, 1N40, 2N24, 2N34, 2N42, 2N47, 2N48, 2N58, 2N69, 2N80, 2W02, 2W106, 2W18, 2W23, 3N38, 3N66, 3W110, 3W16, 3W26, 3W50, 3W71, elevators, exits, floor 1, floor 2, floor 3, floor G, GW04, GW05B, GW72

# Building/Area Classification

Building	Building Area (sq.ft.)	Original Structure Name	Department(s)/ RAM Use(s)	Current Tenant and Conditions	Impacted or Non-Impacted	Radionuclides Used	Radionuclides Retained as RCOPCS <sup>3</sup>	Rooms With Historical RAM Presence	Non-Impacted Rooms	Impacted Rooms
504 <sup>2</sup>	Unknown	Unknown	Unknown	None, Demolished	Non-Impacted	All	None	Unknown	All	None
506	3403	WRAIR	WRAIR Research Labs	Abandoned	Non-Impacted	Ra-226	None	back cubicle, chemical room, counting room, main lab sink	All	None
508	8593	WRAIR	WRAIR Research Labs	Viral Con Projects	Non-Impacted	C-14, Ca-45, Cr-51, H-3, I-125, I-131, P-32, P-33, Rb-86, S-35, Zn-65	None	1, 2, 4, 7, 10, 14, 17, 18, 19, 20, 21, 106, 114, 115, 116, 117, 124, 136, 137, 108A, hallways	All	None
509 <sup>2</sup>	36442 (formerly)	WRAMC, Health Physics Office	Health Physics Office Waste Storage	None, Demolished	Non-Impacted	All	None	Unknown	All	None
511	58488	WRAIR	Animal Medical Research Facility	Animal Research	Impacted	C-14, Co-57, H-3, Hg-203, I-125, I-131, P-32, S-35	C-14, H-3	114	All, except for 114	114
512	9885	WRAIR	Veterinary Quarantine, Medical Research Facility	Hospital, Allergen Extract Lab, Pharmacy	Impacted	C-14, H-3	C-14, H-3	4, 6, 30	All except for 4, 6, 30	Any original rooms/hallways in vicinity of former Rooms 4, 6, and 30
513	775	WRAMC, Health Physics Office	Source range for calibration of instruments at DORF	General non-radiological storage, used by WRAMC HPO	Non-Impacted	All	None	All (Only one room)	All	None



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# Building/Area Classification

Building	Building Area (sq. ft.)	Original Structure Name	Department(s) / RAM Use(s)	Current Tenant and Conditions	Impacted or Non-Impacted	Radionuclides Used	Radionuclides Retained as RCOPCs <sup>3</sup>	Rooms With Historical RAM Presence	Non-Impacted Rooms	Impacted Rooms
516	3051	DORF	Radiation Experiments	Used by WRAMC HIPO as a temporary radioactive waste decay and storage facility	Impacted	Am-241, Ba-133, C-14, Co-45, Co-109, Co-141, Cl-36, Co-57, Co-60, Cr-51, Cs-137, Eu-152, Eu-154, Fe-59, Ga-67, Gd-153, H-3, I-123, I-125, I-129, I-131, I-131, Ir-192, Mn-54, Mo-99, Na-22, Nb-95, Ni-63, P-32, P-33, Pu-239, Ra-226, Rb-86, Ru-103, S-35, Sb-125, Sc-46, Se-75, Sr-85, Sr-89, Sr-90, Ta-182, Tc-99m, Tl-201, Tl-204, U-238, Xe-127, Xe-133, Yb-169, Zn-65	Am-241, Ba-133, C-14, Co-45, Cl-36, Co-60, Cr-51, Cs-137, Eu-152, Eu-154, H-3, I-125, I-129, I-131, Ni-63, P-32, P-33, Pu-239, S-35, Tc-99m, U-238	Lower Floor, Main Floor, Mezzanine Level, Truck, Exposure Room	None	All
516 (outside)	2335	Water Retention Tanks	Holdup Tanks for Water from DORF Pool and Wash Sink	WRAMC HIPO Decay and Storage Facility	Non-Impacted	C-14, H-3	C-14, H-3	All	All	None
Taft <sup>1</sup>	19223	Taft Court (Rickman Building)	WRAIR Medical Research Labs	WRAIR Medical Research Labs	Impacted	C-14, Co-45, Cr-51, Cs-137, H-3, I-125, P-32, S-35	C-14, Co-45, Cr-51, Cs-137, H-3, I-125, P-32, S-35	4, 5, 6, 7, 9, 10, 11, 14, 15, 16, 18, 20, 21, 24, 129, break, exits, floors (Only Rooms 15 and 20 currently contain RAM)		4, 5, 6, 7, 9, 10, 11, 14, 15, 16, 18, 20, 21, 24, 129, break, exits, floors
Gillette	101552	Gillette Building	WRAIR Medical Research Labs	WRAIR Medical Research Labs	Impacted	Co-57, Co-60, Cr-51, Cs-137, H-3, I-125, I-129, Ni-63, Tc-99m	H-3, Co-60, Cs-137, I-129, Ni-63	14, 1066, 1082, 1097, 1110, 1205, 1206, 1207, 2143, 1086A, exits, floors	14, 1066, 1082, 1097, 1110, 1086A, exits, floors	1205, 1206, 1207, and 2143

Notes

1 - Building 503 and the Taft Building, although Impacted, are slated to continue using RAM under new license/licensee.

2 - Buildings 504 and 509 would be considered Impacted, but since they were demolished, and Building 503 (an Impacted building) has been built within their footprints, they essentially have now become part of the footprint for Building 503, and any future investigations should treat them as such.

3 - Generally only radionuclides with half-lives greater than 1 year were retained as RCOPCs, unless documentation showed presence in an active laboratory or storage area.

# HSA Output

Building Number	Impacted Rooms	Preliminary MARSSIM Classification
503	2E12, 3E12, 3E14, 3E18, 1E22, 1E24, 3E24, 1E26, 1N40, 2N24, 2N34, 2N42, 2N47, 2N48, 2N58, 2N69, 2N80, 2W02, 2W106, 2W18, 2W23, 3N38, 3N66, 3W110, 3W16, 3W26, 3W50, 3W71, elevators, exits, floor 1, floor 2, floor 3, floor G, GW04, GW05B, GW72	None – Routine
511	114	Class 3
512	4, 6, 30	Class 3
516 (DORF)	Main, Lower, Mezzanine, Truck, Exposure Room	Class 1
Gillette	1205, 1206, 1207, 2143	Class 3
Taft	4, 5, 6, 7, 9, 10, 11, 14, 15, 16, 18, 20, 21, 24, 129, break, exits, floors	None – Routine





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Impacted Buildings  
 Site Outline

REV	DATE	DESCRIPTION	BY

 CARRERA SERVICES 100 E. BY BOWLING BALTIMORE, MD 21202	 U.S. ARMY ENGINEER DISTRICT, BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND	
		PREPARED BY: KJ REVISIONS BY: MB
HISTORICAL SITE ASSESSMENT IMPACTED BUILDINGS AT THE WRAMC FOREST GLEN ANNEX		
CONTRACT # W912 02 09-0-0380	PROJECT # 09-28001.01	FIGURE # 5 - 3
SCALE: 0 05M 000 000 000	DATE: 8/10/2009	

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# Post-HSA Determinations

- Buildings/areas identified as non-impacted changed to impacted
- Close out surveys performed by WRAMC HPO deemed sufficient to support release
  - ▶ 188, WRAMC Health Physics Office
  - ▶ 508, WRAIR



# Scoping Surveys

- Additional Scoping Surveys were not performed
- Numerous surveys previously performed by HPO satisfied need for Scoping Surveys
- Additional data was not necessary to plan characterization/final status surveys



# NUREG 1757 Decom. Group

- HSA indicates that all impacted facilities likely fall into Decommissioning Group 2, with exception of DORF
- Group 2 facilities already meet Subpart E requirements
- Screening criteria used to demonstrate of Subpart E compliance



# 1757 Group 2 Characteristics

- May have residual radiological contamination present in building surfaces and soil
- Typically possess historical records of material receipt, use, and disposal
- A DP is not required because worker cleanup activities and procedures are consistent with those approved for routine operations, and no dose analysis is required



# Survey Approach

- All areas likely meet Subpart E criteria
- Perform Characterization Surveys
- Design Characterization Surveys IAW MARSSIM final status survey requirements
- Output supports Group 2 Decommissioning final survey



# Constraint – Renovation

- Extensive renovation in buildings to be surveyed
  - ▶ new tile, carpeting, wall/room addition and/or removal, painting, cabinetry, roof material and plumbing
- Approach relies on past RAM control practices
- Limited tile/carpet removal performed



# Beta/Gamma Screening Criteria

**Table 1-3: Acceptable License Termination Screening Values for Building Surface Contamination and System Surface Contamination**

RCOPC	Radioactivity Type	NUREG/CR-5512 Volume 3 Table 5.19 $P_{crit}$ 0.90 (dpm/100 cm <sup>2</sup> ) - fixed	NUREG/CR-5512 Volume 3 Table 5.19 $P_{crit}$ 0.90 (dpm/100 cm <sup>2</sup> ) - removable	NUREG-1757 Volume 1 Table B.1 (dpm/100 cm <sup>2</sup> ) - fixed	NUREG-1757 Volume 1 Table B.1 (dpm/100 cm <sup>2</sup> ) - removable	NUREG-1757 Volume 1 Table B.2 (pCi/g)
<sup>3</sup> H	low-energy beta	1.24E+08	1.24E+07	1.2E+08	1.2E+07	1.1E+02
<sup>14</sup> C	low-energy beta	3.67E+06	3.67E+05	3.7E+06	3.7E+05	1.2E+01
<sup>129</sup> I	low-energy beta	3.47E+04	3.47E+03	3.5E+04	3.5E+03	5.0E-01
<sup>57</sup> Co	gamma	2.11E+05	2.11E+04	unlisted	unlisted	1.5E+02
<sup>60</sup> Co	Beta/gamma	7.05E+03	7.05E+02	7.1E+03	7.1E+02	3.8E+00
<sup>63</sup> Ni	low-energy beta	1.82E+06	1.82E+05	1.8 E+06	1.8 E+05	2.1 E+03
<sup>137</sup> Cs	beta	2.80 E+04	2.80 E+03	2.8 E+04	2.8 E+03	1.1 E+01

# DCGLs

Table 1-5: DCGL Values for Forest Glen Final Status Survey

	Alpha (based on DU) dpm/100 cm <sup>2</sup>		Beta (based on <sup>60</sup> Co) dpm/100 cm <sup>2</sup>		Low-energy Beta ( <sup>3</sup> H) dpm/100 cm <sup>2</sup>	Low-energy Beta ( <sup>14</sup> C) dpm/100 cm <sup>2</sup>	Low-energy Beta ( <sup>63</sup> Ni) dpm/100 cm <sup>2</sup>	Low-energy Beta ( <sup>129</sup> I) dpm/100 cm <sup>2</sup>
	Total	Removable	Total	Removable	Removable	Removable	Removable	Removable
DCGL	101	10.1	7050	705	1.2E+07	3.7E+05	1.8E+05	3.5E+03

Note: Removable DCGLs are 10% of total.



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# Instrument Selection

**Table 2-1: Survey Meters and Detector Probes used for Final Status Survey**

<b>Ratemeter / Probe</b>	<b>Detector Type</b>	<b>Radiation Sensitivity</b>	<b>Ratemeter / Probe Serial Numbers</b>	<b>Calibration Due Date</b>	<b>Instrument Detection Sensitivity, alpha/beta (dpm/100 cm<sup>2</sup>)</b>
Ludlum Model 2360 / 43-68	Gas Proportional	Alpha, Beta (Direct)	184906 / 116721	9/17/2010	51/442
Ludlum Model 2360 / 43-68	Gas Proportional	Alpha, Beta (Direct)	225241 / 160790	9/17/2010	51/442
Ludlum Model 2360 / 43-37	Gas Proportional	Alpha, Beta (Direct)	145474 / 066273	9/17/2010	20/210
Ludlum Model 2929 / 43-10-1	Smear Counter	Alpha, Beta (Removable)	152275 / 155350	9/17/2010	9.5/151
Ludlum Model 19	Exposure Rate	Gamma	167164	9/17/2010	N/A

# Scope of Surveys

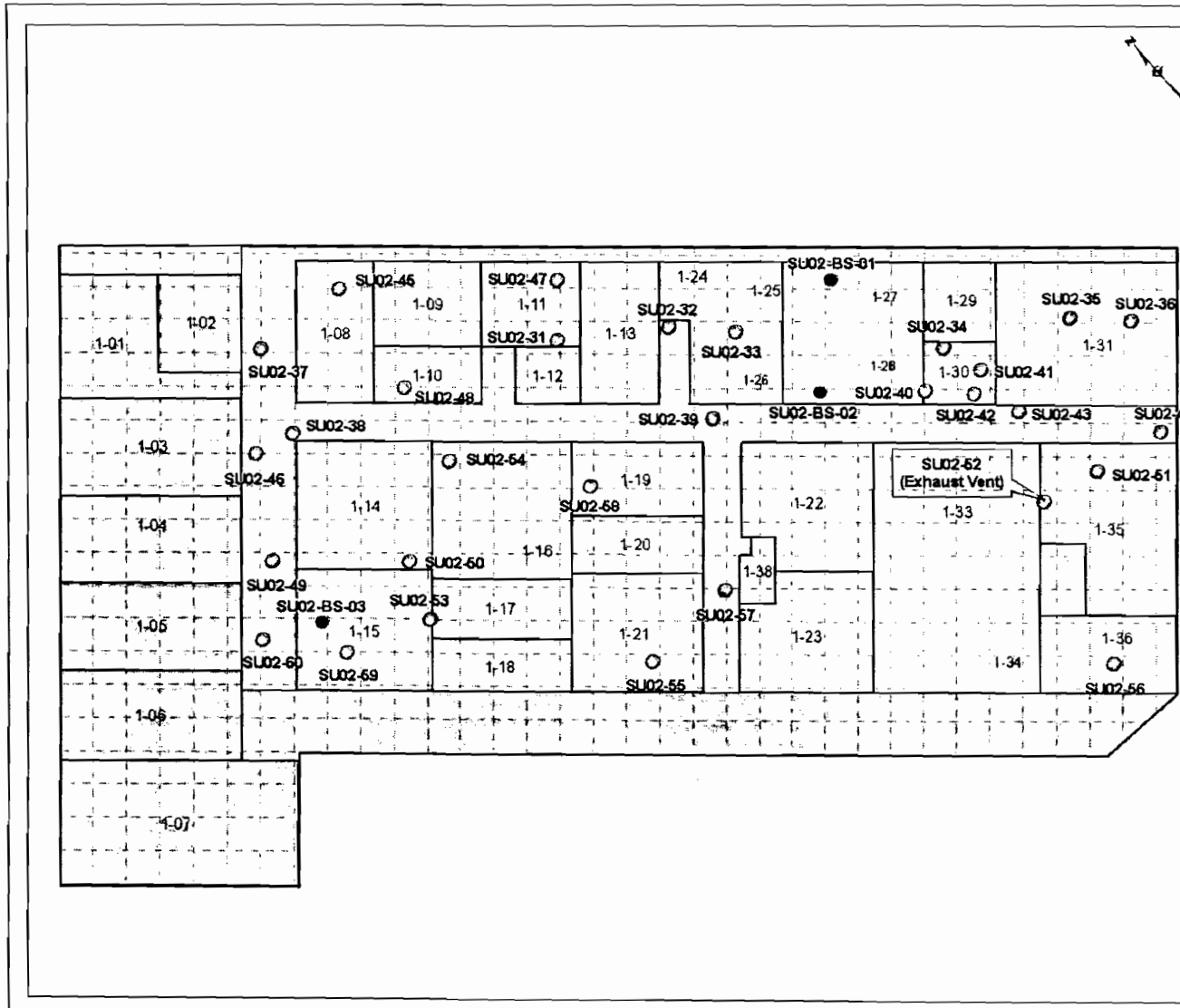
Table 7-1: Radiological Survey Summary

Building Number	Direct Radioactivity Scan Survey		Integrated Direct Radioactivity Measurements		Smear Samples	
	Radioactivity Type	Percent Coverage	Radioactivity Type	Quantity	Radioactivity Type	Quantity
511 (SU01)	alpha, beta, gamma	6%	alpha, beta	45 (30 random, 15 bias)	alpha, beta, low energy beta ( <sup>3</sup> H)	45 <sup>a</sup> 31 (30 random, 1 bias)
512 (SU02)	alpha, beta, gamma	5%	alpha, beta	62 (29 random-surface, 30 random-subsurface 3 bias)	alpha, beta, low energy beta ( <sup>3</sup> H),	62 <sup>a</sup> 31 (30 random, 1 bias)
Gillette (SU03)	alpha, beta, gamma	5.75%	alpha, beta	33 (30 random, 3 bias)	alpha, beta, low energy beta ( <sup>3</sup> H)	33 <sup>a</sup> 33 (30 random, 3 bias)

<sup>a</sup> Random/bias in the same proportions as the integrated measurements.

<sup>b</sup> 11 different building surface types were encountered, and 5 measurements were taken with each instrument (2 instruments).





ID	X Coordinate	Y Coordinate
SU02-31	1297486 925	487305 946
SU02-32	1297500 652	487296 465
SU02-33	1297507 765	487289 146
SU02-34	1297529 866	487266 486
SU02-35	1297547 029	487257 330
SU02-36	1297563 561	487250 947
SU02-37	1297452 461	487334 490
SU02-38	1297447 591	487321 834
SU02-39	1297496 554	487281 755
SU02-40	1297523 523	487263 479
SU02-41	1297531 869	487260 360
SU02-42	1297528 742	487258 260
SU02-43	1297532 047	487251 954
SU02-44	1297545 951	487235 548
SU02-45	1297467 273	487333 346
SU02-46	1297441 593	487323 186
SU02-47	1297492 813	487312 653
SU02-48	1297464 830	487315 901
SU02-49	1297432 661	487309 383
SU02-50	1297448 059	487295 805
SU02-51	1297535 030	487237 413
SU02-52	1297525 970	487239 242
SU02-53	1297444 801	487287 170
SU02-54	1297462 544	487303 219
SU02-55	1297465 568	487260 322
SU02-56	1297517 517	487214 110
SU02-57	1297480 857	487261 113
SU02-58	1297476 014	487286 402
SU02-59	1297431 869	487291 752
SU02-60	1297423 688	487301 488
SU02-BS-01	1297523 926	487285 530
SU02-BS-02	1297511 545	487274 009
SU02-BS-03	1297432 247	487287 786

- Legend**
- Biased Sample Locations
  - Biased Sample Locations (Drain)
  - Random Sample Locations
  - New addition per 1997 - 2000 renovation

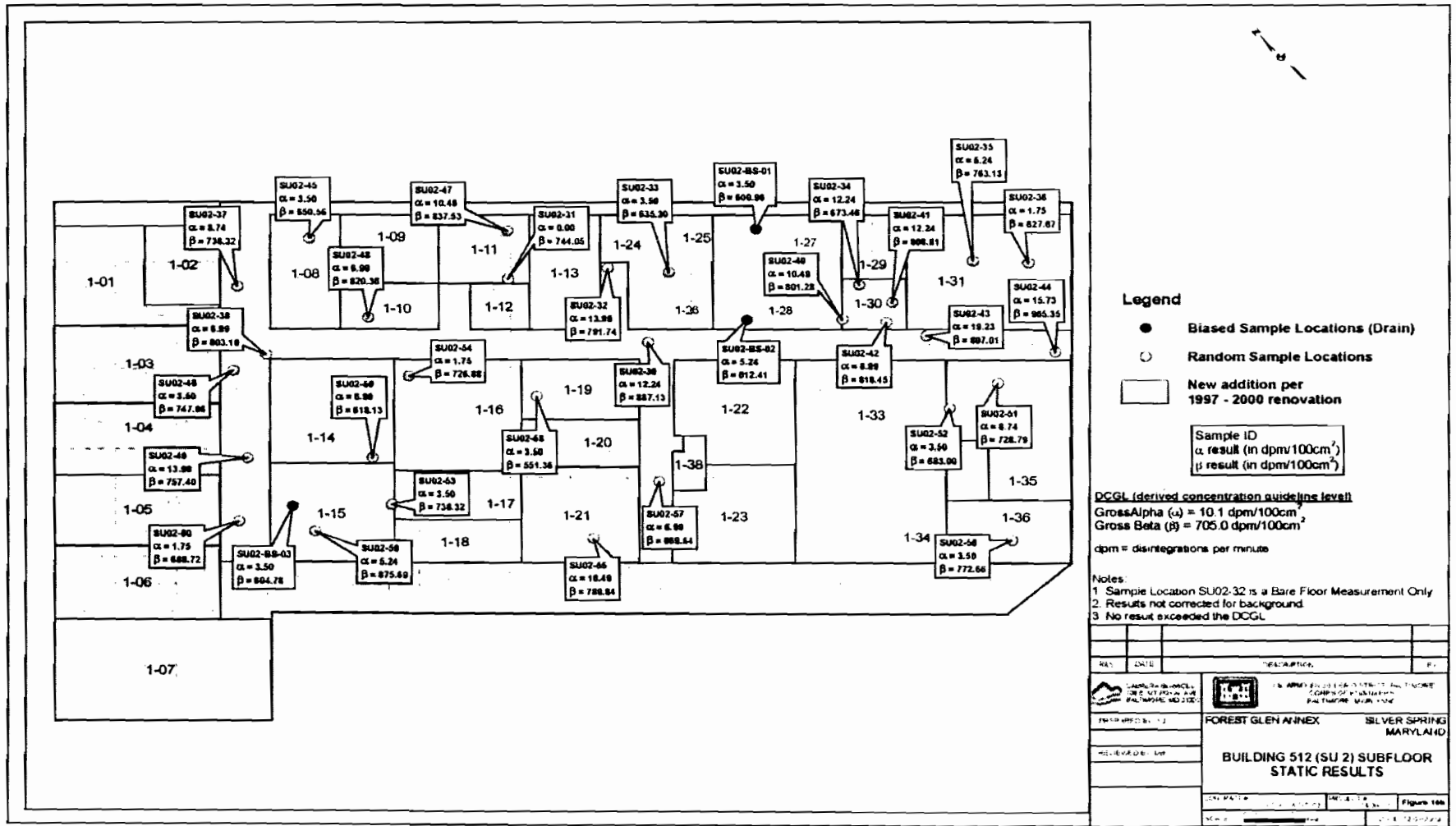
REV	DATE	DESCRIPTION	BY

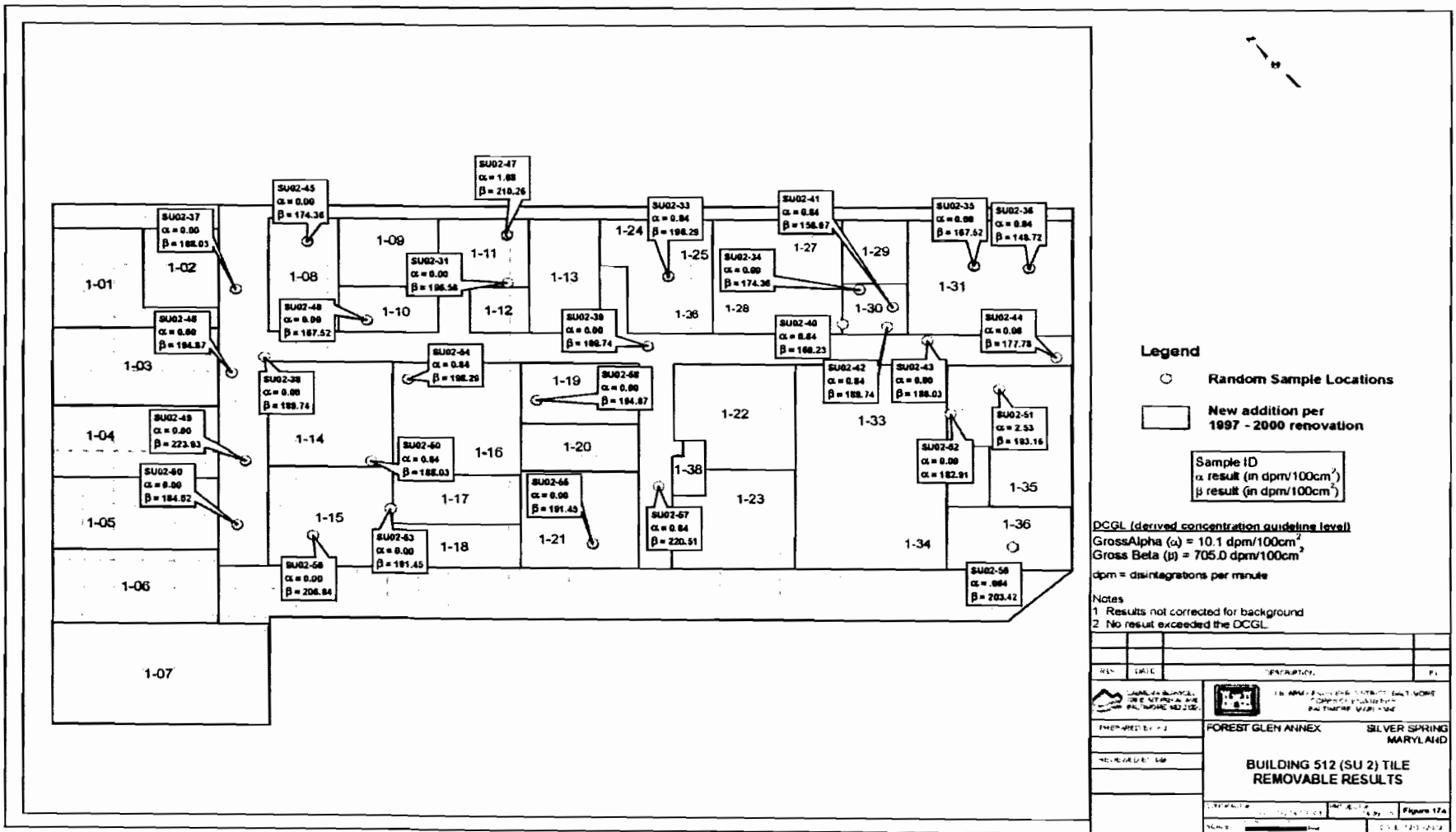
  

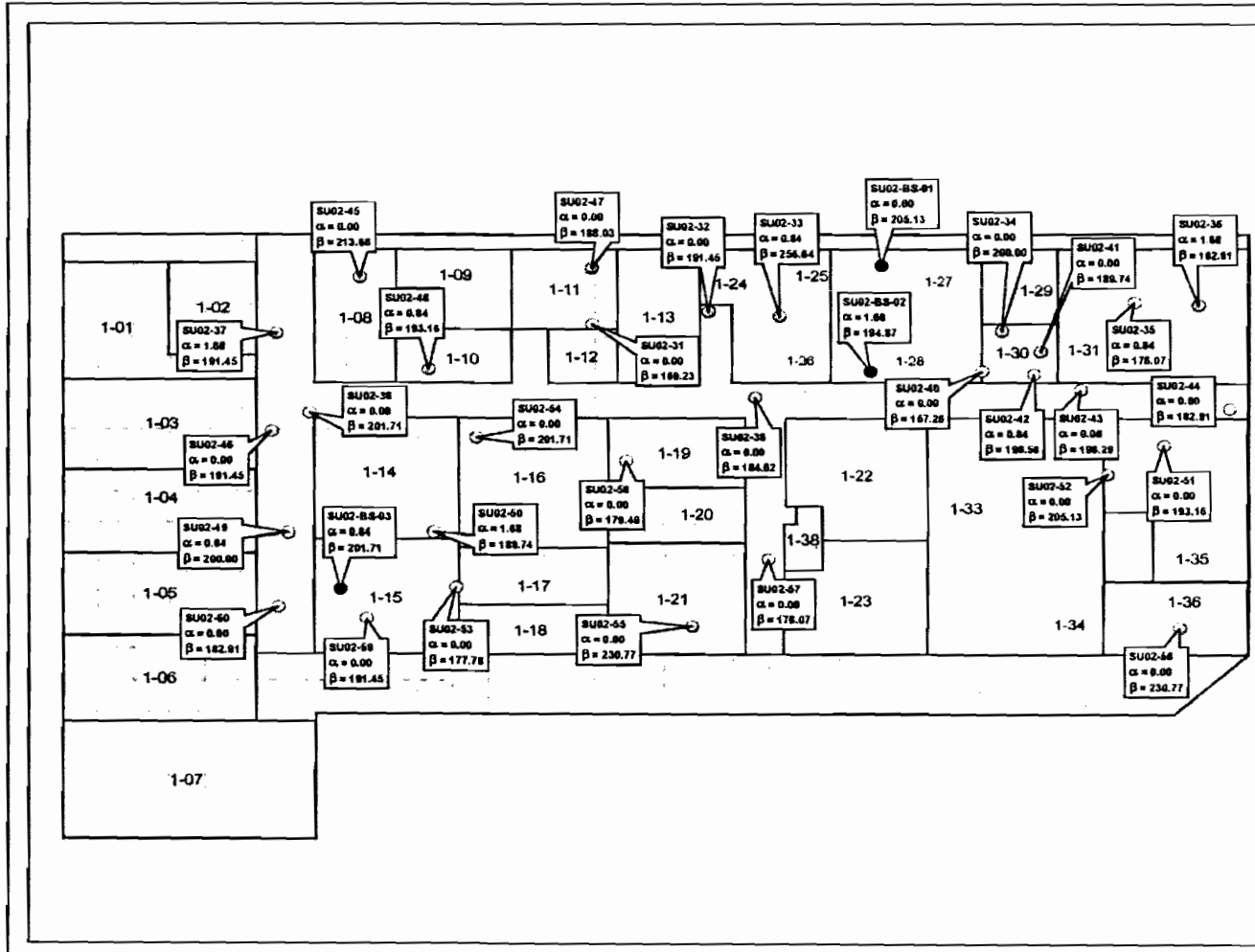
 CARNEVA & DRIVE, INC. 803 E. 80TH AVE. BALTIMORE, MD 21202	 U.S. ARMY ENGINEER DISTRICT, BALTIMORE BOARD OF ENGINEERS BALTIMORE, MARYLAND	
		PREPARED BY: KJ REVIEWED BY: MB
CONTRACT # W8 CDG 08 0-0203	PROJECT # 08-380004	FIGURE # 15
SCALE: 1/8" = 1'-0"	DATE: 12/01/2008	

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**Legend**

- Biased Sample Locations (Drain)
- Random Sample Locations
- New addition per 1997 - 2000 renovation

Sample ID  
 $\alpha$  result (in dpm/100cm<sup>2</sup>)  
 $\beta$  result (in dpm/100cm<sup>2</sup>)

**DCGL (derived concentration guideline level)**

Gross Alpha ( $\alpha$ ) = 10.1 dpm/100cm<sup>2</sup>

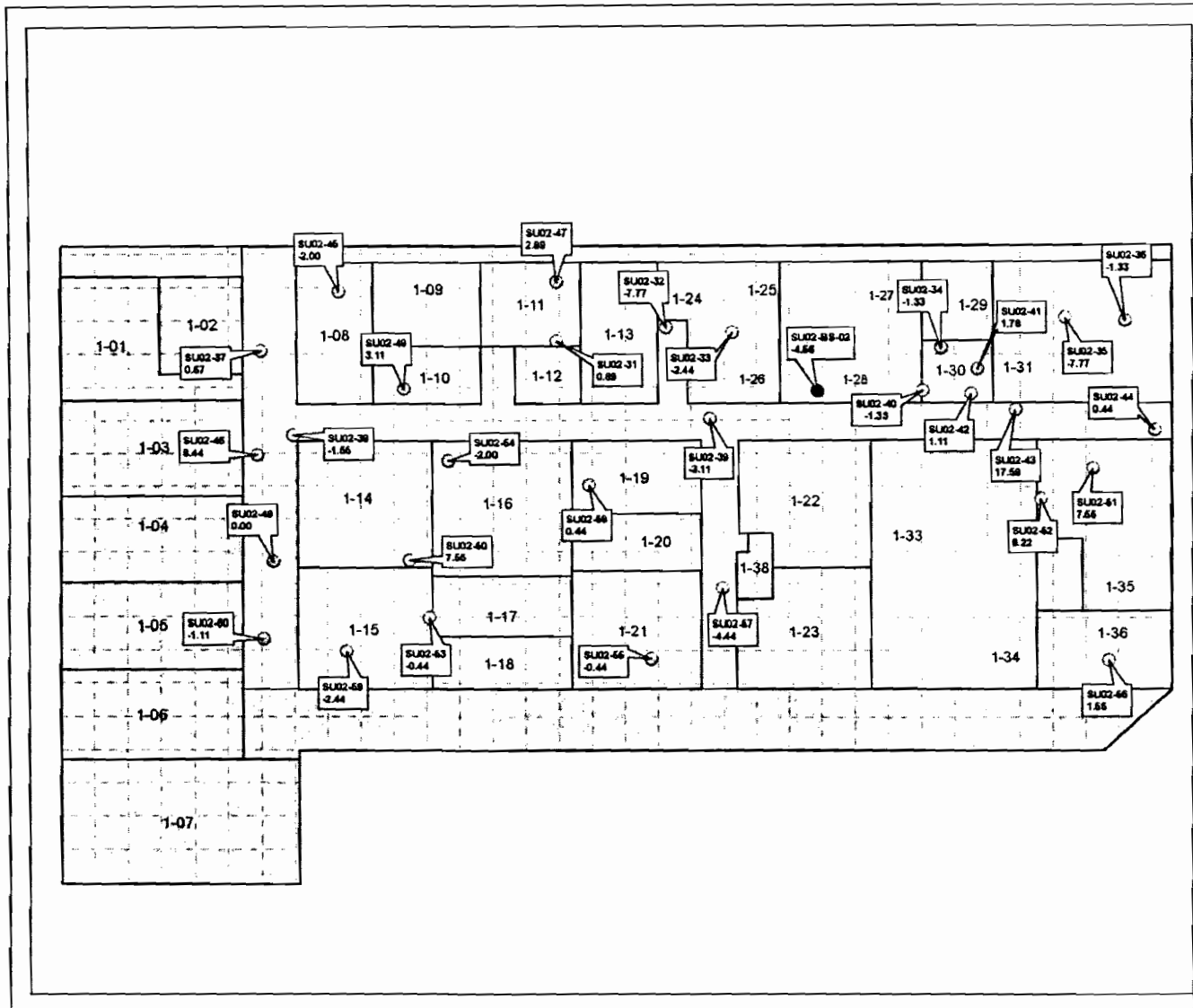
Gross Beta ( $\beta$ ) = 705.0 dpm/100cm<sup>2</sup>

dpm = disintegrations per minute

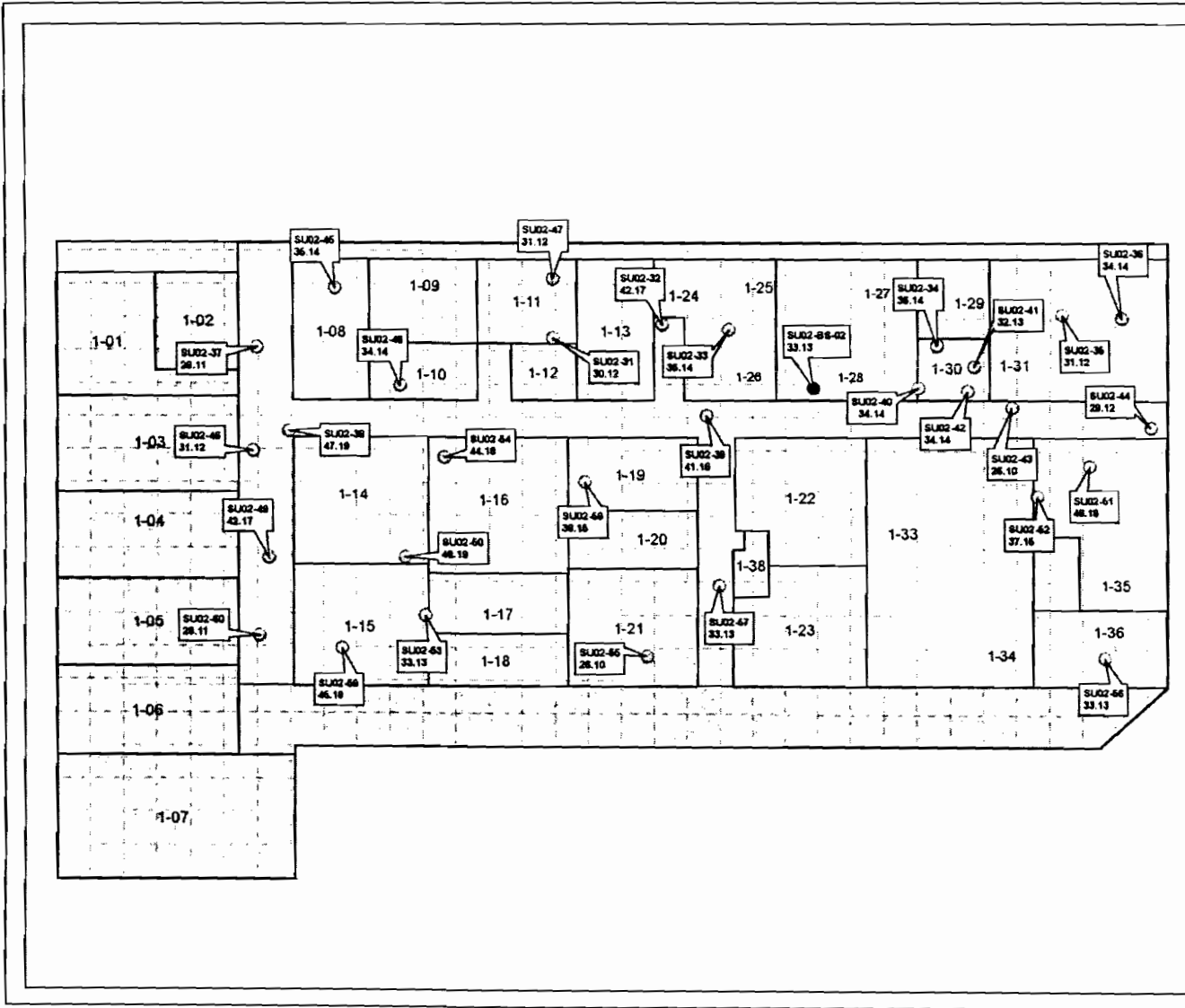
**Notes:**

1. Sample Location SU02-32 is a Bare Floor Measurement Only
2. Results not corrected for background.
3. No result exceeded the DCGL.

REV.	DATE	DESCRIPTION	P.
PREPARED BY	DATE	PROJECT	LOCATION
		FOREST GLEN ANNEX	SILVER SPRING MARYLAND
<b>BUILDING 512 (SU 2) SUBFLOOR REMOVABLE RESULTS</b>			
CONTRACT #	PROJECT #	FIGURE #	
		17b	







**Legend**

- Biased Sample Locations (Drain)
- Random Sample Locations
- New addition per 1997 - 2000 renovation

Sample ID  
<sup>14</sup>C - Carbon-14 results dpm/100cm<sup>2</sup>

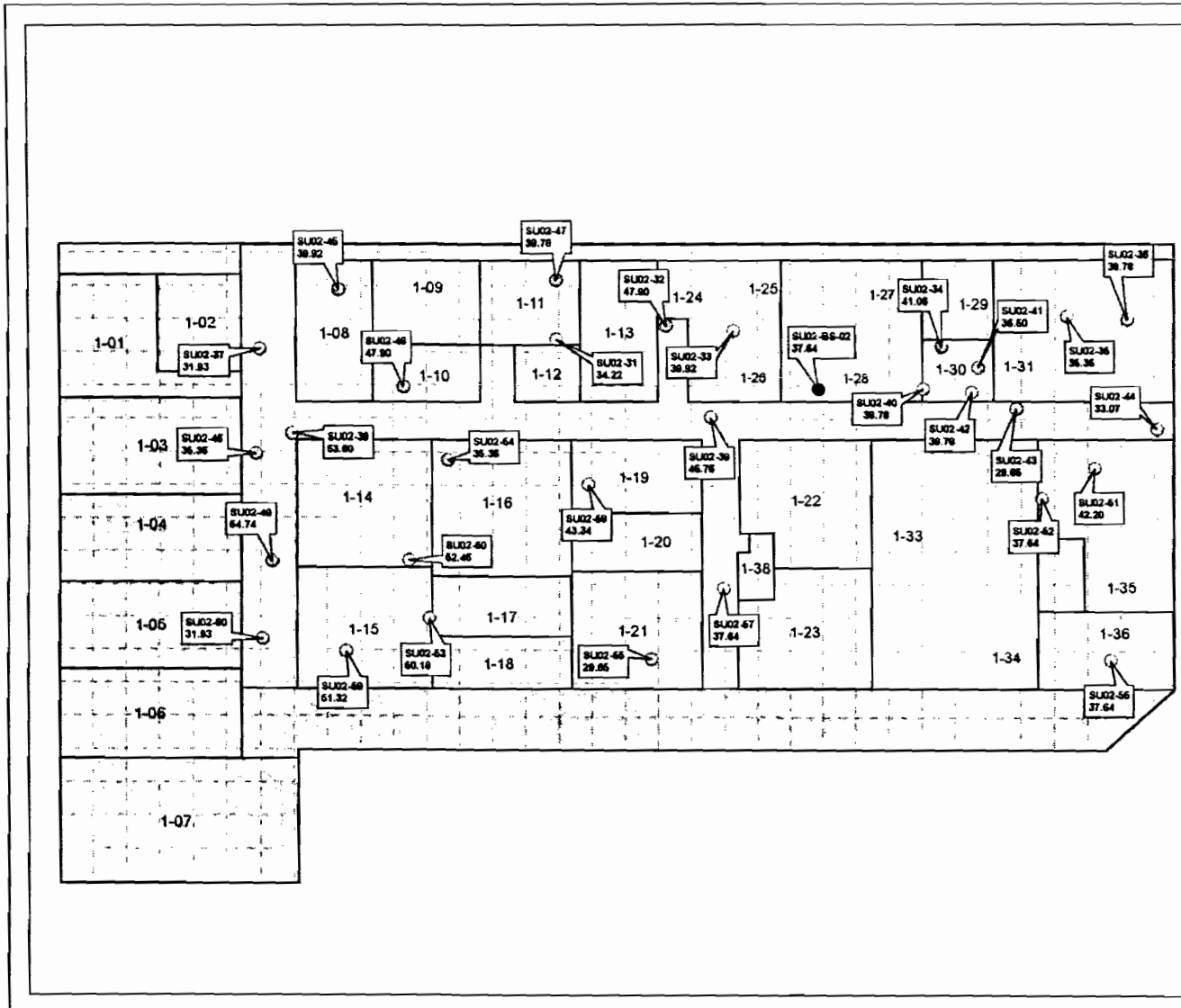
DCGL (derived concentration guideline level)  
 Carbon-14 (<sup>14</sup>C) = 3.7E+05 dpm/100cm<sup>2</sup>

Note: No result exceeded the DCGL

REV	DATE	DESCRIPTION	BY

	PREPARED BY: <b>FOREST GLEN ANNEX</b>	PROJECT # <b>SILVER SPRING</b>
	REVIEWED BY: <b>MARYLAND</b>	<b>BUILDING 512 (SU 2)</b>
CONTRACT # <b> </b>	PROJECT # <b> </b>	DATE <b>12/1/2009</b>
SCALE <b> </b>	<b>Figure 10b</b>	<b> </b>



**Legend**

- Biased Sample Locations (Drain)
- Random Sample Locations
- New addition per 1997 - 2000 renovation

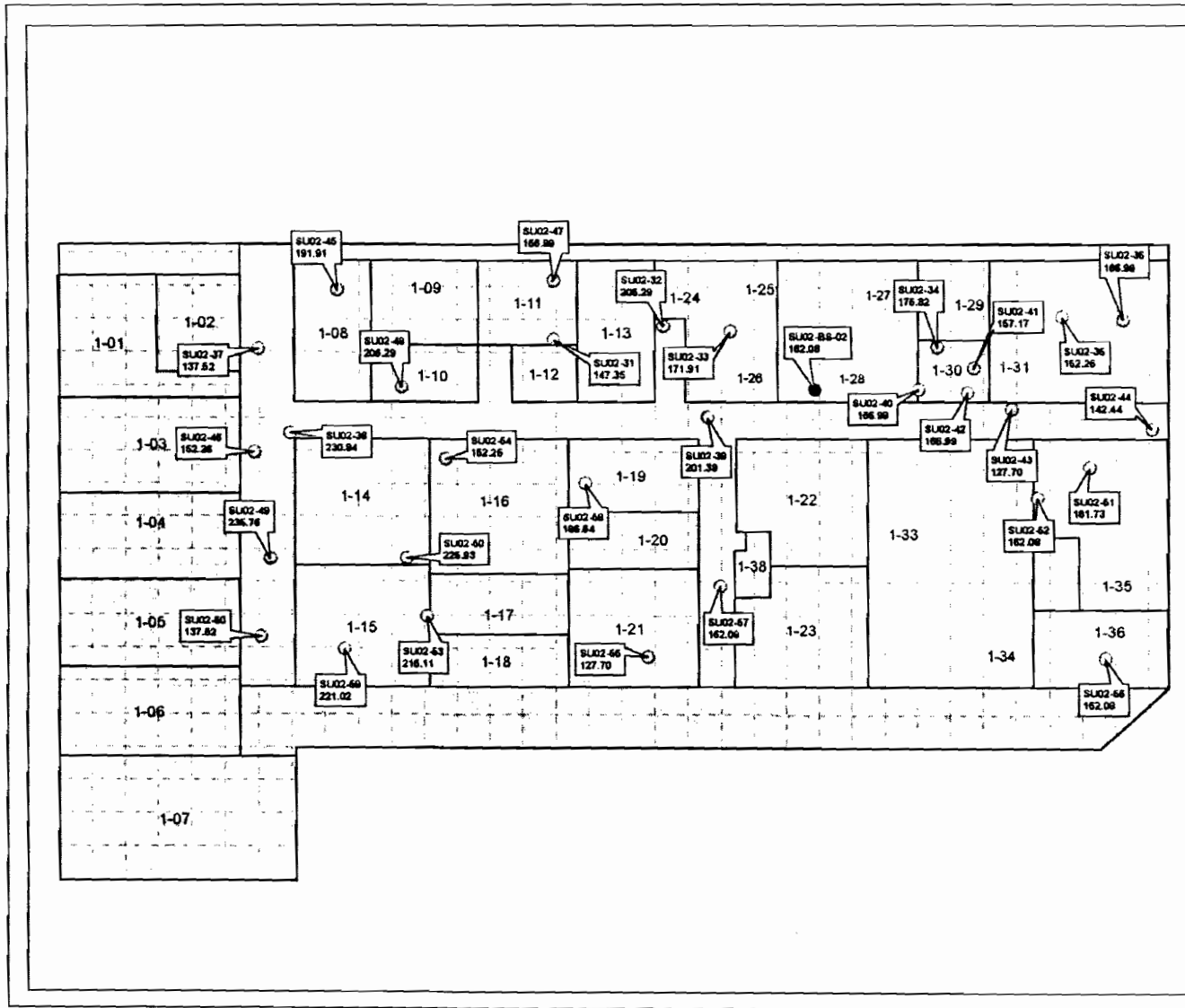
Sample ID  
 129I - Iodine-129 results dpm/100cm<sup>2</sup>

DCGL (derived concentration guideline level)  
 Iodine-129 (<sup>129</sup>I) = 1.8E+05 dpm/100cm<sup>2</sup>

Note: No result exceeded the DCGL.

REV	DATE	DESCRIPTION	BY

	U.S. ARMY ENGINEER CENTER - BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND
PREPARED BY: J... REVIEWED BY: ME	FOREST GLEN ANNEX      SILVER SPRING MARYLAND  <b>BUILDING 512 (SU 2)          IODINE-129 RESULTS</b>
CONTRACT NO. 15-00-0000000000 SCALE: 1/8" = 1'-0"	PROJECT NO. 15-00-0000000000 FIGURE 18C DATE: 12/15/09



**Legend**

- Biased Sample Locations (Drain)
- Random Sample Locations
- New addition per 1997 - 2000 renovation

Sample ID  
<sup>63</sup>Ni - Nickel-63 results dpm/100cm<sup>3</sup>

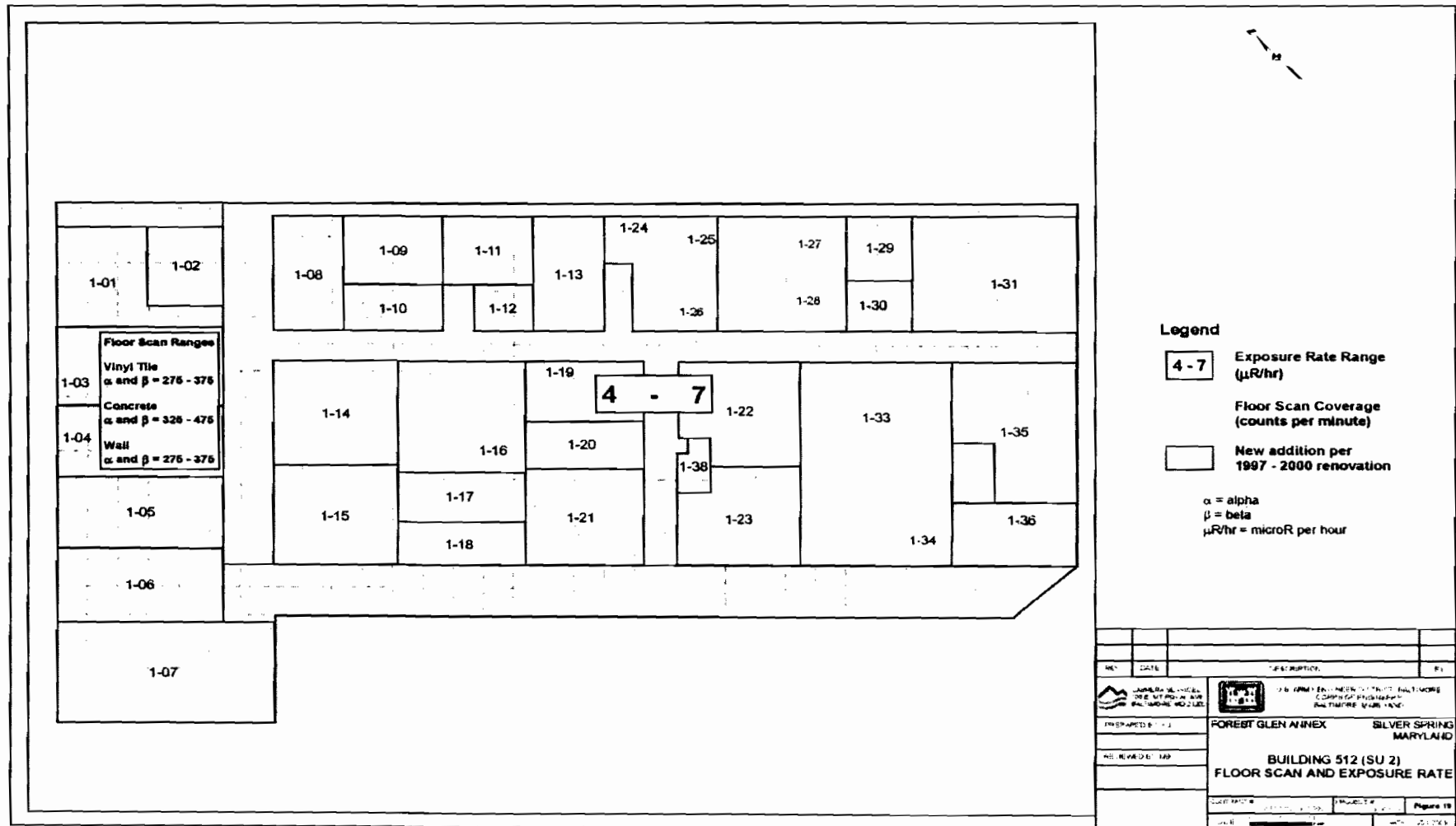
DCGL (derived concentration guideline level)  
 Nickel-63 (<sup>63</sup>Ni) = 3.5E+03 dpm/100cm<sup>3</sup>

Note: No result exceeded the DCGL

REV	DATE	DESCRIPTION	BY

	FOREST GLEN ANNEX SILVER SPRING MARYLAND
PREPARED BY: AS	REVIEWED BY: MB
<b>BUILDING 512 (SU 2)          NICKEL-63 RESULTS</b>	
CONTRACT NO. W512CZ00000002	PROJECT NO. 512SU2
SCALE: AS SHOWN	DATE: 10/1/2006



# Results Relative to DCGLs

- All measurements in all areas < DCGL
- Building 511 SOR results equaled 3% of the DCGLs
- Building 512 equaled 5% of the DCGLs
- Gillette Building equaled 3% of the DCGLs



# Output Recommendations

- Buildings 511, 512, and Gillette meet Subpart E based on survey results
- Building 503 and Taft Building have ongoing RAM use; transfer license
- All other buildings/areas suitable for unrestricted release based on previous data
- Some DORF buildings do not meet Group 2 criteria and require DP and more work



# WRAMC Main Post



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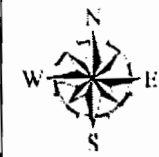
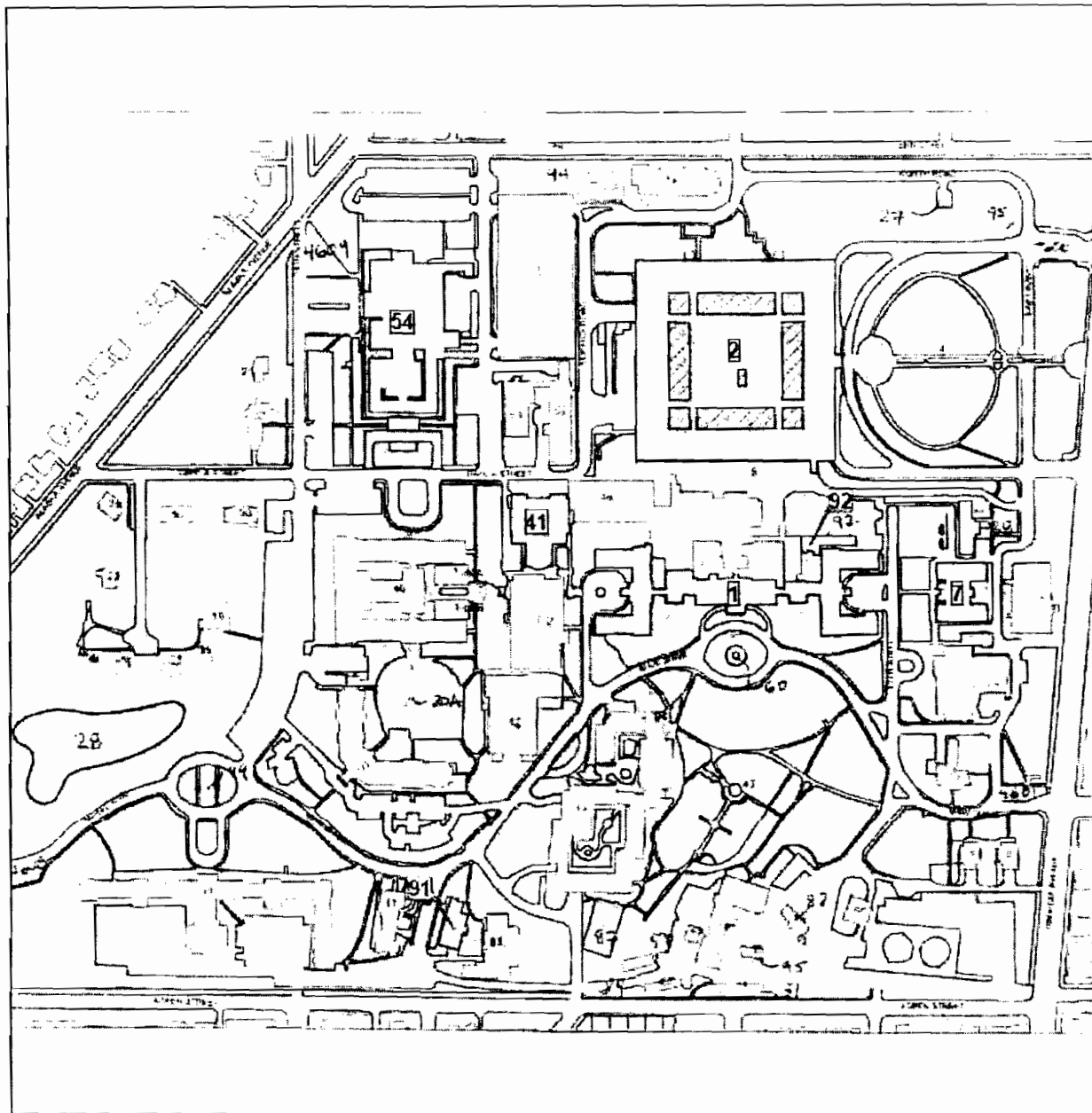
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

# Main Post – Impacted Buildings

Building Number	Original Structure Name	Department(s) / RAM Use(s)	Current Tenant and Conditions
1	Walter Reed General Hospital	Original Hospital Building – Nuclear Medicine, Oncology, Others	WRAMC Administration and post support
2	Heaton Pavilion	Current Hospital Building - Nuclear Medicine, Radiation Oncology, Department of Clinical Investigation (DCI) Research Labs	Same
7	Barracks	DCI - Research Labs	Building extensively renovated over its history. DCI still active in one lab.
38	Guardhouse	DCI – Research Labs	Building recently gutted. Slated for renovation. No access available.
41	Red Cross Building	Health Physics Office (HPO) – Rad Waste Storage and Calibration sources	Same
54	Armed Forces Institute of Pathology (AFIP)	AFIP - Research Labs	Same. However, several floors extensively renovated. RAM usage continues in several labs.
91	Former Regional Dental Lab	U.S. Army Institute of Dental Research – Research Labs	Directorate of Information Management / Industrial Hygiene
92	Nuclear Medicine Clinic	Nuclear Medicine Clinic connected to east wing of original hospital	Photo Lab. Renovated in 1984.





**Legend**

-  Impacted Building
-  WRAMC Buildings
-  Hospital Units

MAP OF IMPACTED BUILDINGS  
AT WRAMC MAIN POST

Water Reed Army Medical Center  
Washington, D.C.

Date: August, 2006  
Project #: 60-3123-03  
File Name: 060806  
Prepared by: S.Pangloss

Figure 6-1



# HSA RCOPC List

Nuclide	Name	Half-Life	Notes Regarding Future Surveys
C-14	Carbon-14	5700 y	Primary RCOPC
Ca-45	Calcium-45	162.2 d	May still be present in small quantities
H-3	Hydrogen-3 (tritium)	12.3 y	Primary RCOPC
I-129	Iodine-129	1.57E+7 y	Potential radioimmunoassay kit nuclide
Ra-226	Radium-226	1600 y	Potential historical nuclear medicine usage in Bldg. 1 and Bldg. 92.
U-238	Uranium-238	4.47E+9 y	Potential uranyl acetate use in labs containing electron microscopes. Uranyl acetate is non-licensed material so it is not noted on Authorizations or Protocol documents.



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