Prepared by
Oak Ridge Associated
Universities

Prepared for
U.S. Nuclear
Regulatory
Commission's
Region V Office

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Enforcement

CONFIRMATORY SURVEY OF THE MEDICAL CENTER RESEARCH FACILITY UNITED STATES VETERANS ADMINISTRATION LONG BEACH, CALIFORNIA

E. J. DEMING

Radiological Site Assessment Program
Manpower Education, Research, and Training Division

FINAL REPORT
JULY 1986

CONFIRMATORY SURVEY
OF THE
MEDICAL CENTER RESEARCH FACILITY
UNITED STATES VETERANS ADMINISTRATION
LONG BEACH, CALIFORNIA

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Safeguards & Materials Programs Branch
Division of Inspection Programs
Office of Inspection and Enforcement
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July 1986

This report is based on work performed under Interagency Agreement DOE No. 40-816-83 NRC Fin. No. A-9076-3 between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy. Oak Ridge Associated Universities performs complementary work under contract number DE-AC05-760R00033 with the U. S. Department of Energy.

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CONFIRMATORY SURVEY
OF THE
MEDICAL CENTER RESEARCH FACILITY
UNITED STATES VETERANS ADMINISTRATION
LONG BEACH, CALIFORNIA

INTRODUCTION AND SITE HISTORY

The "old research facility", a series of seven interconnected buildings, located on the northwest corner of the Veterans Administration Medical Center (VAMC) Long Beach property, were used as a research and diagnostic treatment facility from the early 1950's until 1985. Activities in these buildings involved the use of C-14, H-3, Sr-90 and other radionuclides for group III medical diagnosis and small animal research.* Operations were terminated in June 1985 and the facility was decontaminated. A close-out survey report was prepared for the Nuclear Regulatory Commission (NRC) by Stan A. Huber Consultants, Inc., of New Lenox, Illinois.[1] The buildings are scheduled for demolition following release from NRC licensing restrictions.

At the request of the NRC, Region V, the Radiological Site Assessment Program (RSAP) of Oak Ridge Associated Universities (ORAU) conducted a radiological survey to confirm the facility status relative to the NRC criteria for release for unrestricted use.

SITE DESCRIPTION

The VAMC is located at 5901 East Seventh Street in Long Beach California (Figure 1). The "old research facility" is on the northwest corner of the property along Pine Road. The facility consists of seven buildings, herein referred to as "Ramps", connected by a main corridor (Figure 2). Ramp 1 is the southernmost building and each building to the north is numbered in succession ending with Ramp 7. Each ramp consists of a main hallway and

*Most Group III radionuclides have short half-lives and have decayed to negligible levels.

numerous rooms used for research, storage, etc. Ramp 7 was also used as an animal research facility and contained several rooms equipped for operating equipment, a large autoclave, and animal housing.

Several smaller "outbuildings" exist on the site and were used for storage of gas cylinders, trash, and radioactive waste. These buildings were generally portable metal structures.

During the decontamination procedure all contaminated materials, equipment, drain lines, and ventilation ductwork were removed from the facility for disposal.

SURVEY PROCEDURES

Document Review

ORAU reviewed the close-out survey report for the facility and supporting documentation prepared by Stan A. Huber Consultants, Inc.

Data for maximum GM survey meter readings and wipe (smear) tests were presented for floors, lower walls, counter surfaces, drawers, ceilings, exhaust stacks, roof surfaces, drains, and sewer lines.

Measurements before decontamination ranged from <0.1 mR/h to 10 mR/h measured in a fume hood on Ramp 3, Room 20. The summary of locations where radioactive waste was removed does not mention the removal of the fume hood. It is noted that Ramp 7, Room 17, had initial GM readings of 1.8 mR/h at various locations; however, the report does not provide additional details or measurements taken at these locations following decontamination.

Wipe test results for H-3, C-14 and "high beta" are presented for each Ramp and every room, but no summary of the results are reported, i.e. range, locations of elevated dpm, and smear results following decontamination efforts.

Data for the soil samples, collected following removal of the sewer main between Ramp 6 and Ramp 7 and from the Sr-90 pit, are not reported except to

say that the levels were "below action levels". Additionally, no final measurements are reported for the area under Rooms 16-17, (Ramp 3) where drain lines and soil were removed.

In general, the contractor's report does not adequately summarize the status of the site relative to NRC guidelines. The decontamination guidelines are not included in the summary, and no comparison of contractor data to guidelines is presented.

Facility Survey

Gridding

Confirmatory measurements were referenced to the grid system (1 m x 1 m) established by the licensee's contractor.

Measurement of Total and Removable Contamination

Gamma and beta-gamma scans were performed on floors, lower walls and counter tops using NaI(Tl) gamma scintillation detectors and "pancake" GM beta-gamma detectors, coupled to scalers/ratemeters with audible indicators. Locations of elevated direct radiation were noted for further investigation.

Approximately 10% of the grid blocks on the floor and lower walls in each room and hallway of each of the seven ramps, and the outbuildings were randomly selected for surface contamination measurements. In each grid block surveyed, direct measurements of beta-gamma contamination levels were systematically performed at the center and four equidistant points, midway between the center and block corners. Smears for removable contamination were performed at the location in each grid block where the highest direct reading was obtained. Total and removable contamination levels were also measured at 77 locations on the upper walls, ceilings, and miscellaneous objects of Ramps 1-7 and 6 locations on the upper walls and ceilings of the "outbuildings".

Direct measurements and/or smears were obtained from locations identified by the surface scans, and from sinks and drain lines, where accessible. In

addition, 7 smears and direct measurements were collected from stacks on Ramp roofs. The roofs were also gamma scanned using NaI(Tl) scintillation detectors and GM beta-gamma detectors.

A walkover surface scan of the area outside of the facility (within the fenced area) was performed using NaI(Tl) scintillation detectors. Beta-gamma scans were also performed on all walkways and building access points outside of the facility, within the fenced area. Twelve soil samples were collected and exposure rate measurements were made outside of the facility (Figure 2). A soil sample was collected from Room 20, Ramp 3, where the contaminated floor and subfloor soil had been removed.

Two sediment samples were collected from the sewer system servicing the "old research facility" (Figure 2).

Background Samples and Measurements

Samples of surface soil were collected and background exposure rates were measured at 4 offsite locations in the Long Beach area to provide baseline radionuclide soil concentrations and exposure rates for comparison purposes. The locations of the baseline samples are shown on Figure 1.

Sample Analysis and Interpretation of Results

Soil samples were analyzed by gamma spectroscopy, and the spectra were reviewed for identifiable photopeaks attributable to VAMC operations. Smears for the determination of removable contamination were analyzed for gross beta concentrations, H-3, and C-14. Additional information concerning major instrumentation, sampling equipment, and analytical procedures is provided in Appendices A and B.

Results were compared with NRC guidelines, established for release of facilities for unrestricted use. These guidelines are presented in Appendix C.

RESULTS

Beta-Gamma and Gamma Surface Scans

Surface scans identified several locations of elevated beta-gamma contamination, requiring further decontamination efforts by the licensee's contractor.

Gamma scans of inside and outside areas indicated no elevated exposure rate levels above the background rate of approximately 11 to 13 μR/h.

Contamination Measurements

Building Surfaces

Results of total and removable contamination measurements on building floors/lower walls, and upper walls/ceilings are summarized in Table 1. Two locations of elevated beta contamination were previously identified by the ORAU surface scans and decontaminated further by the licensee's contractor. The total contamination measurements for the floors/lower walls ranged from <380 dpm/100 cm^2 to 1850 dpm/100 cm^2 and the maximum average for any grid block was 990 dpm/100 cm^2. The maximum removable contamination on the floor/lower walls was 14 dpm/100 cm^2 gross beta, 18 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3. Ramp 6 total contamination measurements were calculated using the counting efficiency for C-14, since the history of use for this area was predominately H-3 and C-14. For Ramp 6, the total contamination measurements for the floors/lower walls ranged from <1330 dpm/100 cm^2 to 12200 dpm/100 cm^2. The maximum removable contamination on the floor/lower walls was 9 dpm/100 cm^2 gross beta, 68 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3.

The total contamination measurements for the upper walls/ceilings ranged from <380 dpm/100 cm^2 to 574 dpm/100 cm^2 and the average was <380 dpm/100 cm^2. The maximum removable contamination on the upper walls/ceilings was 14 dpm/100 cm^2 gross beta, 20 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3. The Ramp 6 total contamination measurements for the

upper walls/ceilings were all less than the minimum detectable activity, i.e. <1330 dpm/100 cm^2. The maximum removable contamination for the upper walls/ceilings was 9 dpm/100 cm^2 gross beta, <16 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3.

Roofs

Results of contamination measurements on roof surfaces and ventilation stacks are also presented in Table 1. All total contamination measurements were less than 1790 dpm/100 cm^2, and the maximum removable beta-gamma contamination was <5 dpm/100 cm^2 gross beta, <16 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3.

Miscellaneous

Results of single-location contamination measurements on miscellaneous objects and surfaces are also presented in Table 1. The total contamination measurements ranged from <380 dpm/100 cm^2 to 2390 dpm/100 cm^2. The maximum removable contamination was 11 dpm/100 cm^2 gross beta, <16 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3. Ramp 6 total contamination measurements ranged from <1330 dpm/100 cm^2 to 12000 dpm/100 cm^2 and the maximum average for any grid block was 2980 dpm/100 cm^2. The maximum removable contamination was 270 dpm/100 cm^2 gross beta, 95 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3.

Outbuildings

Results of total and removable contamination measurements on the floors/lower walls, ceilings/upper walls, and roofs are also summarized in Table 1. The total contamination measurements for the floors/lower walls ranged from <380 dpm/100 cm^2 to 1850 dpm/100 cm^2 and the maximum average for any grid block was 930 dpm/100 cm^2. The maximum removable contamination was 13 dpm/100 cm^2 gross beta, <16 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3.

The total contamination measurements for the upper walls/ceilings were all less than 380 dpm/100 cm^2, and the removable contamination was <5 dpm/100 cm^2 gross beta, <16 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3.

The total contamination measurements for the roofs were all less than 380 dpm/100 cm^2 and the removable contamination was 8 dpm/100 cm^2 gross beta, <16 dpm/100 cm^2 C-14, and <32 dpm/100 cm^2 H-3.

Sewer System

The radionuclide concentrations measured in two sediment samples, collected from the VAMC sewer system, are presented in Table 2. The radionuclide concentrations do not differ significantly from baseline soil samples, except the natural products (Ra-226, U-238, etc.) are slightly elevated. No identifiable photopeaks attributed to radionuclides used in the facility were detected.

Soil

The radionuclide concentrations in twelve soil samples collected around the outside of the research facility, are presented in Table 3. These concentrations are within normal background ranges for the baseline samples from the Long Beach area (Table 4).

COMPARISON OF RESULTS WITH GUIDELINES

NRC surface contamination guideline's for release of facilities for unrestricted use are outlined in Appendix C. Since the facility had a history of Sr-90 use, the more restrictive criteria have been applied except for Ramp 6, in which H-3 and C-14 were the principle radionuclides used. The acceptable surface contamination levels for the category containing Sr-90 are:

Total Beta-Gamma Contamination (dpm/100 cm^2)		Beta-Gamma Removable Contamination (dpm/100 cm^2)
Average	Maximum	
1000	3000	200

Total beta-gamma measurements were within these guidelines except for a few areas in Ramp 6. During the survey the contaminated areas in Ramp 6 were direct counted, then covered with a thin sheet of paper and recounted. The paper reduced the countrates to background levels, indicating that the contaminant was emitting only low-energy beta and therefore was not Sr-90. For Ramp 6 the guidelines applied were:

Total Beta-Gamma Contamination (dpm/100 cm^2)		Beta-Gamma Removable Contamination (dpm/100 cm^2)
Average	Maximum	
5000	15000	1000

Since the contaminant for this area was determined to be a low-energy beta, a second counting efficiency was determined using a C-14 source, and the contamination levels were calculated using the lower efficiency. The total beta-gamma measurements in Ramp 6, using the methods described above,were within the NRC guidelines.

SUMMARY

On May 13 through 23, 1986, ORAU performed a confirmatory survey of the "old research facility" of the Veterans Administration Medical Center at Long Beach, California. The survey included surface gamma and beta-gamma scans, measurement of direct and removable contamination levels, and measurement of radionuclides in soil and sewer sediment samples. The findings support the close-out surveys performed by the licensee's contractor, and confirm that the radiological conditions satisfy the NRC guidelines established for release for unrestricted use.

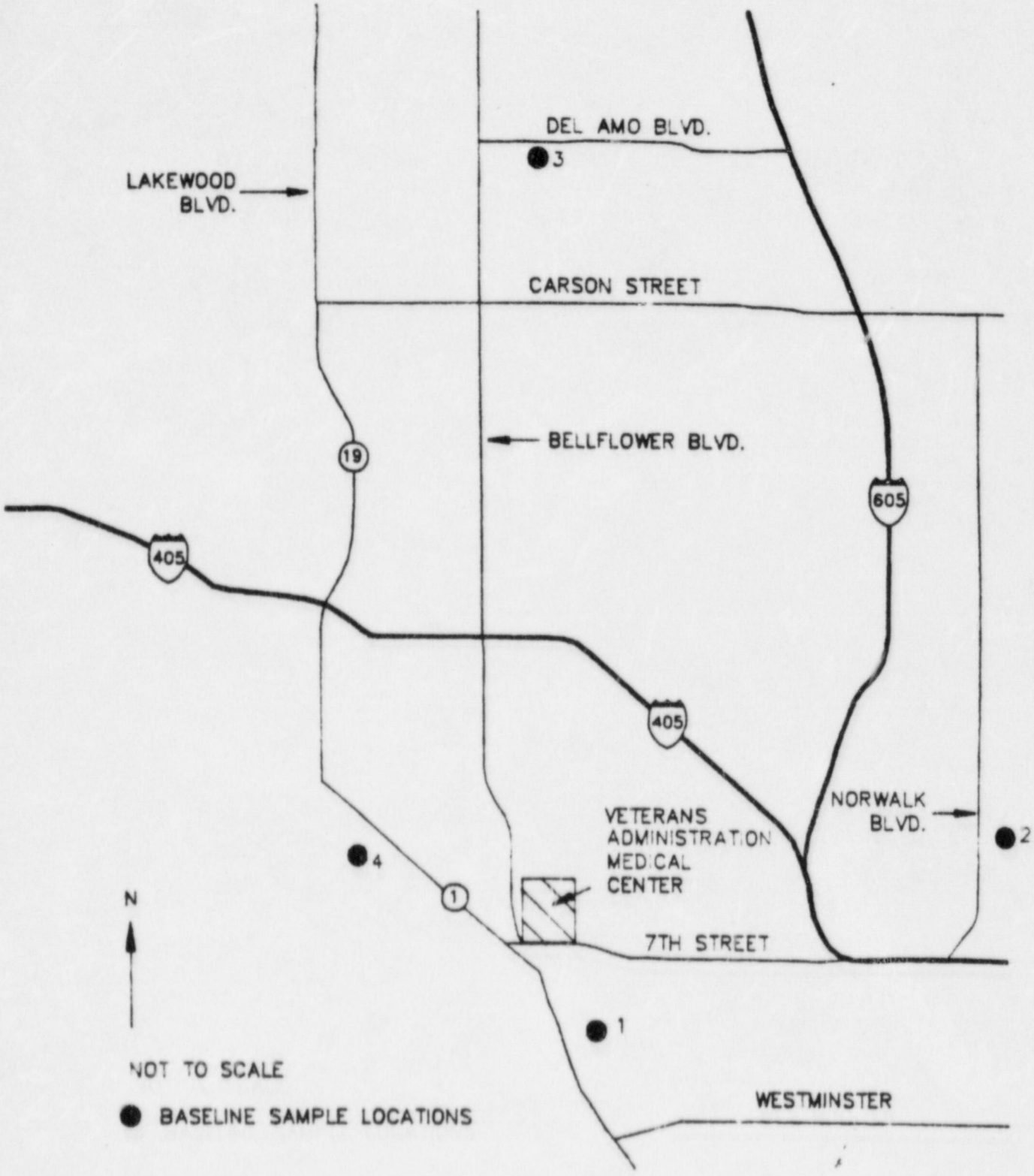

FIGURE 1: Map of Long Beach Area Indicating Location of the Veterans Administration Medical Center and Background Sample Sites

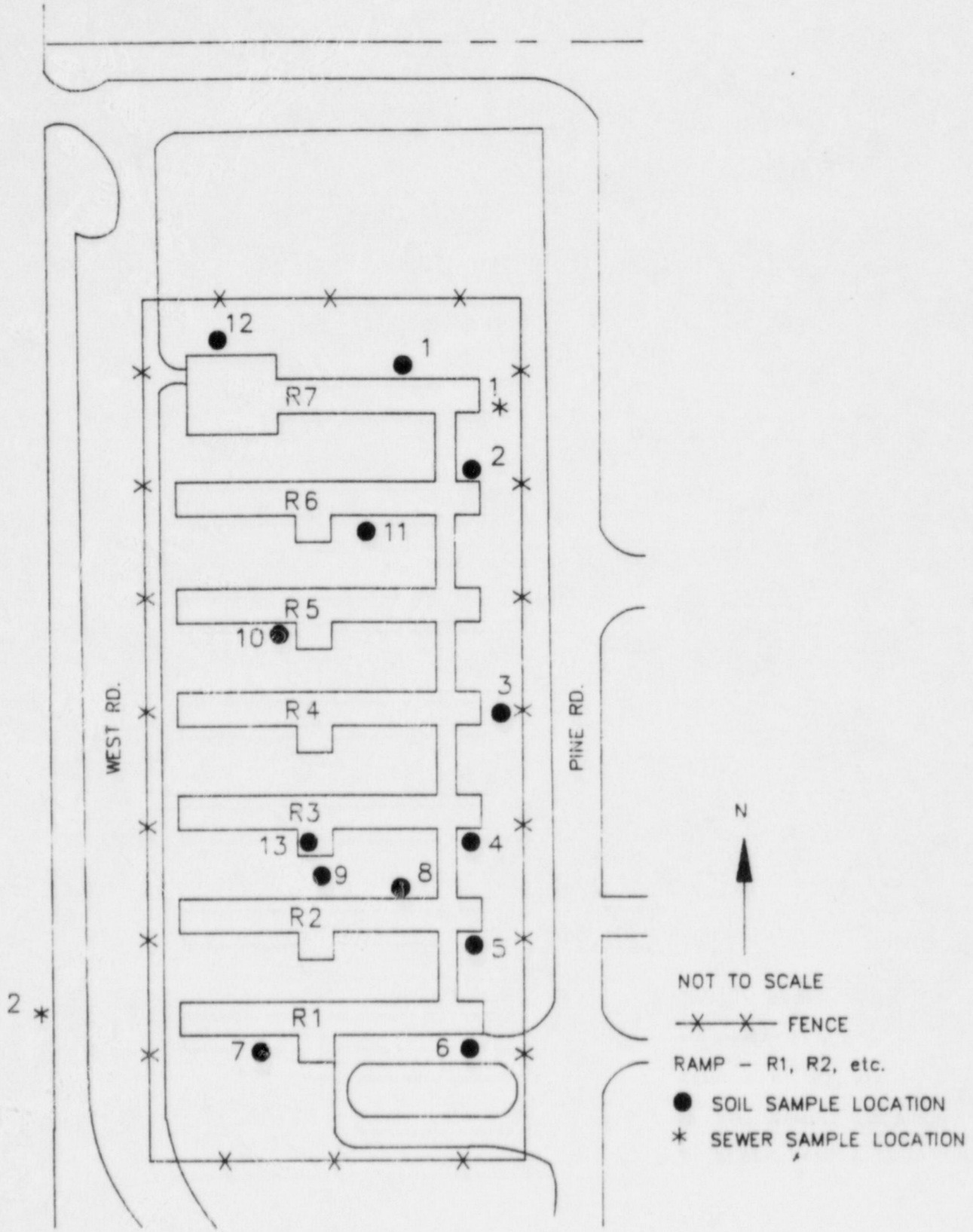

FIGURE 2: Plan View of the Old Research Facility Indicating Soil and Sewer Sample Locations

TABLE 1

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
VETERANS ADMINISTRATION MEDICAL CENTER
LONG BEACH, CALIFORNIA

Location		Number Readings	Total-Beta Gamma ($dpm/100\ cm^2$)		Number Smears	Removable Beta-Gamma ($dpm/100\ cm^2$)		
Ramp	Area		Highest Grid Block Average	Range of Measurements		H-3	C-14	Gross Beta
1	Floors & Lower Walls	315	<380	<380 - 830	63	<32	<16	14
	Upper Walls & Ceilings	6	<380	<380 - 580	6	<32	18	9
	Roofs	1	<380	<380	1	<32	<16	<5
	Miscellaneous	0	a	a	8	<32	<16	12
2	Floors & Lower Walls	440	<380	<380 - 800	88	<32	<16	13
	Upper Walls & Ceilings	5	<380	<380 - 510	5	<32	<16	8
	Roofs	1	<380	<380	1	<32	<16	<5
	Miscellaneous	3	<380	<380	3	<32	<16	<5
3	Floors & Lower Walls	359	800[c]	<380 1120	72	<32	<16	14
	Upper Walls & Ceilings	9	<380	<380 - 420	9	<32	<16	14
	Roofs	2	890	<380 - 1790	2	<32	<16	<5
	Miscellaneous	11	<380	<380 - 770	2	<32	<16	11
4	Floors & Lower Walls	308	820[c]	<380 1440	62	<32	<16	<5
	Upper Walls & Ceilings	9	<380	<380	13	<32	20	12
	Roofs	1	<380	<380	1	<32	<16	<5
	Miscellaneous	3	670	<380 - 2390	7	<32	<16	8
5	Floors & Lower Walls	372	830[c]	<380 - 1050	75	<32	18	10
	Upper Walls & Ceilings	6	<380	<380	6	<32	<16	<5
	Roofs	1	<380	<380	1	<32	<16	<5
	Miscellaneous	0	a	a	8	<32	<16	<5

TABLE 1 (Continued)

SUMMARY OF SURFACE CONTAMINATION MEASUREMENTS
VETERANS ADMINISTRATION MEDICAL CENTER
LONG BEACH, CALIFORNIA

Location		Number Readings	Total-Beta Gamma ($dpm/100\ cm^2$)		Number Smears	Removable Beta-Gamma ($dpm/100\ cm^2$)		
Ramp	Area		Highest Grid Block Average	Range of Measurements		H-3	C-14	Gross Beta
6[b]	Floors & Lower Walls	376	2980[c]	<1330 - 12200	75	<32	68	9
	Upper Walls & Ceilings	5	<1330	<1330	5	<32	<16	9
	Roofs	1	<1330	<1330	1	<32	<16	<5
	Miscellaneous	9	1560	<1330 - 12000	9	<32	95	265
7	Floors & Lower Walls	377	990[c]	<380 - 1850	76	<32	18	13
	Upper Walls & Ceilings	8	<380	<380 - 450	8	<32	<16	8
	Roofs	1	380	380	1	<32	<16	<5
	Miscellaneous	1	<380	<380	4	<32	<16	8
Outbuildings								
	Floors & Lower Walls	45	930[c]	<380 - 1850	9	<32	<16	13
	Upper Walls & Ceilings	6	<380	<380	6	<32	<16	<5
	Roofs	2	<380	<380	2	<32	<16	8

[a]No measurements taken.
[b]Ramp 6 calculations for total contamination performed using C-14 counting efficiency.
[c]Average value reported was the maximum calculated for the individual grid block.

TABLE 2

RADIONUCLIDE CONCENTRATIONS IN SEWER SEDIMENT SAMPLES
VETERANS ADMINISTRATION MEDICAL CENTER
LONG BEACH, CALIFORNIA

Sample[a] Number	Radionuclide Concentrations (pCi/g)			
	Co-60	Cs-137	Ra-226	U-238
1	<0.06	0.28 ± 0.18[b]	1.07 ± 0.48	7.28 ± 1.16
2	<0.06	<0.05	10.0 ± 2.3	3.63 ± 0.91

[a]Refer to Figure 2.
[b]Errors are 2σ based on counting statistics.

TABLE 3

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
VETERANS ADMINISTRATION MEDICAL CENTER
LONG BEACH, CALIFORNIA

Sample[a] Number	Radionuclide Concentrations (pCi/g)			
	Co-60	Cs-137	Ra-226	U-238
1	<0.05	0.16 ± 0.10[b]	0.64 ± 0.15	<0.50
2	<0.05	0.09 ± 0.08	0.73 ± 0.28	1.97 ± 2.25
3	<0.06	0.15 ± 0.16	0.86 ± 0.27	1.49 ± 1.74
4	<0.05	0.29 ± 0.08	0.75 ± 0.21	<0.61
5	<0.06	0.10 ± 0.10	0.86 ± 0.24	<0.77
6	<0.04	0.09 ± 0.12	0.68 ± 0.23	<0.51
7	<0.07	<0.04	0.90 ± 0.19	<0.70
8	<0.06	0.29 ± 0.10	0.63 ± 0.19	1.08 ± 0.88
9	0.29 ± 0.15	0.16 ± 0.12	0.63 ± 0.19	<0.80
10	<0.06	0.12 ± 0.08	0.76 ± 0.17	0.55 ± 0.55
11	<0.06	<0.06	0.66 ± 0.19	1.75 ± 1.50
12	0.10 ± 0.07	0.24 ± 0.08	0.59 ± 0.18	1.66 ± 0.59
13[c]	<0.04	<0.05	0.58 ± 0.22	0.79 ± 1.17

[a]Refer to Figure 2.
[b]Errors are 2σ based on counting statistics.
[c]Sample collected in excavated area from under floor in Room 20, Ramp 3.

TABLE 4

RADIONUCLIDE CONCENTRATIONS IN BACKGROUND SOIL SAMPLES
VETERANS ADMINISTRATION MEDICAL CENTER
LONG BEACH, CALIFORNIA

Sample[a] Number	Radionuclide Concentrations (pCi/g)			
	Co-60	Cs-137	Ra-226	U-238
1	<0.06	0.31 ± 0.1[b]	0.85 ± 0.38	1.50 ± 2.0
2	<0.07	<0.06	0.91 ± 0.26	<0.60
3	<0.04	0.34 ± 0.13	0.69 ± 0.20	<0.60
4	0.20 ± 0.15	0.19 ± 0.09	0.93 ± 0.27	1.26 ± 1.78

[a]Refer to Figure 1.
[b]Errors are 2σ based on counting statistics.

REFERENCES

1. Close-out Radiation Survey - Decommissioning Project, Veterans Administration Medical Center, Long Beach, California. May 1, 1986, prepared by Stan A. Huber Consultants, Inc., New Lenox, Illinois.

APPENDIX A

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

APPENDIX A

Major Sampling and Analytical Equipment

The display or description of a specific product is not to be construed as an endorsement of that product or its manufacturer by the authors or their employer.

A. Direct Radiation Measurements

Eberline PRM-6
Portable Ratemeter
(Eberline, Sante Fe, NM)

Victoreen Gamma Scintillator (NaI) Probe
Model 489-55
(Victoreen, Inc., Cleveland, OH)

Eberline RASCAL
Portable Scaler/Ratemeter
Model PRS-1
(Eberline, Santa Fe, NM)

Eberline Beta/Gamma Pancake Probe
Model HP-260
(Eberline, Santa Fe, NM)

Reuter-Stokes Pressurized Ionization Chamber
Model RSS-111
(Reuter-Stokes, Cleveland, OH)

B. Laboratory Analyses

Ge(Li) Detectors (2)
Model LGCC2220-SD, 23% efficiency
(Princeton Gamma-Tech, Princeton, NJ)

Used in conjunction with:
Lead Shields, SPG-16
(Applied Physical Technology, Smyrna, GA)

High-Purity Germanium Detector
Model GMX-23195-S, 23% efficiency
(EG&G ORTEC, Oak Ridge, TN)

Used in conjunction with:
Lead Shield, G-16
(Gamma Products Inc., Palos Hills, IL)

Multichannel Analyzer
ND-66/ND-680 System
(Nuclear Data, Inc., Schaumburg, IL)

Automatic Low-Background Alpha-Beta Counter
Model LB5110-2080
(Tennelec, Inc., Oak Ridge, TN)

LSC Sample Oxidizer
Model Oxi-One
(Radiomatic, Inc., Tampa, FL)

Packard Liquid Scintillation Counter
Model Tri-carb 300
(Packard Instruments Company, Downers Grove, IL)

APPENDIX B

MEASUREMENT AND ANALYTICAL PROCEDURES

APPENDIX B

Measurement and Analytical Procedures

Gamma Scintillation Measurement

Walkover surface scans and measurements of gamma exposure rates were performed using Eberline Model PRM-6 portable ratemeters with Victoreen Model 489-55 gamma scintillation probes containing 3.2 cm x 3.8 cm NaI(Tl) scintillation probes. Count rates were converted to exposure rates (μR/h) using factors determined by comparing the response of the scintillation detector with that of a Reuter Stokes model RSS-111 pressurized ionization chamber at representative onsite locations.

Soil and Sediment Sample Analysis

Gamma Spectrometry

Soil samples were dried, mixed, and a portion placed in a 0.5 L Marinelli beaker. The quantity placed in each beaker was chosen to reproduce the calibrated counting geometry and ranged from 600 to 800 g of soil. Net soil weights were determined and the samples counted using intrinsic germanium and Ge(Li) detectors coupled to a Nuclear Data Model ND-680 pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system.

Each spectra was scanned for identifiable photopeaks which could be attributed to Veterans Administration Medical Center opertions.

Sediment samples were dried, mixed, and an aliquot was placed in a polyethelene tube for analysis using an intrinsic germanium well detector coupled to a Nuclear Data Model ND-680 pulse height analyzer system. The sample spectra was analyzed using the routine described above.

Smear Sample Analyses

Gross Beta

Smear samples were counted for gross beta using a Tennelec Model LB-5110 low background proportional counter.

Tritium and Carbon-14

The smears were cut into small pieces and direct counted in a Packard Tri-carb 300 Liquid Scintillation Counter. Blanks and samples with elevated levels were combusted in a Radiomatic Oxi-one Combustor to separate the H-3 and C-14 components, which were then placed into a liquid scintillation solution for direct counting in the Packard LS Counter.

Errors and Detection Limits

The uncertainties associated with the analytical data presented in the tables of this report, represent the 95% (2σ) confidence levels based only on counting statistics. Other sources of error associated with the sampling and analyses introduce an additional uncertainty of ± 6 to 10% in the results.

Calibration and Quality Assurance

Laboratory and field survey procedures are documented in manuals developed specifically for the Oak Ridge Associated Universities Radiological Site Assessment Program.

With the exception of the measurements conducted with portable gamma scintillation survey meters, instruments were calibrated using NBS-traceable standards. The calibration procedures for the portable gamma instruments are performed by comparison with an NBS calibrated pressurized ionization chamber.

Quality control procedures on all instruments included daily background and check-source measurements to confirm equipment operation within acceptable statistical fluctuations. The ORAU laboratory participates in the EPA and EML Quality Assurance Program.

APPENDIX C

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Division of Fuel Cycle & Material Safety
Washington, D.C. 20555

July 1982

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

   a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

   b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of

the survey report shall be filed with the Division of Fuel Cycle and Material Safety, USNRC, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. They survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223 Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.