

### THE CATHOLIC UNIVERSITY OF AMERICA

Radiation Safety Office Washington, D.C. 20064 202-319-5206

# REACTOR DECOMMISSIONING REPORT & FINAL STATUS SURVEYS

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#### 1.0 BACKGROUND INFORMATION

#### 1.1 Facility History

The Aerojet General Nucleonics (AGN) Model AGN-201 reactor, Serial Number 101, came to The Catholic University of America (CUA) in October, 1957, under an educational grant from the Atomic Energy Commission following its around-the-world trip as a demonstration reactor under President Eisenhower's "Atoms for Peace Plan." It was primarily used as a training reactor for degree candidates within the University's Nuclear Science and Engineering Department. The original start up operation team for Baltimore Gas and Electric's Calvert Cliffs nuclear power plant was also trained on this reactor.

The application to acquire and possess an AGN-201 nuclear reactor was filed by CUA on July 10, 1957 and amended on August 23 and November 13, 1957. Pursuant to License No. R-31, issued November 15, 1957, an AGN-201 reactor, Serial No. 101, was acquired from the Aerojet-General Nucleonics Corporation. The original license was for a period of twenty years and specified a maximum thermal power of 0.1 watts. Initial criticality was achieved on November 20, 1957.

The license was renewed on March 14, 1979 which extended the operating authority to 1997. However, in March 1986 reactor status was changed to possession only. The reactor has been shut down since 1982.

#### 1.2 Facility Closure

The reactor was defueled on March 17, 1990 under a NRC approved defueling plan. The fuel was secured in safe storage on site.

By applications dated February 6, 1992, CUA requested authorization to decommission and dismantle the reactor and to dispose of the component parts, in accordance with the Decommissioning Plan for the AGN-201 Research Reactor submitted as part of the application.

On September 24, 1992 the Commission issued the order that approved the Decommissioning Plan and authorized decommissioning of the reactor in accordance with the application and Decommissioning Plan.

#### 1.3 CUA Schedules and Objectives

CUA has worked to an end of the year deadline for the completion of the decommissioning work necessary to meet the objectives outlined below. This revised deadline has been influenced by several factors, the most significant of which was the extensive planning and preparations required before receiving

#### 1.3 CUA Schedules and Objectives (con't)

authorization to ship the reactor fuel to an off site government facility. This shipment was completed on 9-12-94

In addition to the scheduler goals, CUA's Decommissioning Plan objectives are:

- To decontaminate and decommission the reactor room facility in order to permit release for "unrestricted" use.
- To accomplish the work in a safe and environmentally acceptable manner in accordance with all applicable federal and District laws and regulations
- 3. To minimize the volume of waste requiring burial.
- 4. To maintain exposures As Low As Reasonably Achievable (ALARA) and,
- 5. To meet the above objectives while performing the work in the most cost effective manner practicable.

#### 2.0 SITE DESCRIPTION

#### 2.1 Site Location

The 154 acre CUA main campus is located in the NE quadrant of the District of Columbia, bounded by Michigan Avenue, Harewood Road, Taylor Street, and John McCormick Avenue. Figure 1 locates this quadrant.

CUA was founded more than a century ago as a graduate institution and research center in the European tradition. The university enrolls approximately 3600 graduate students and 3000 undergraduates representing most of the states and more than 100 foreign countries. (Figure 2 shows a general layout of the main campus.)

The reactor has been permanently located in the Pangborn Building (Engineering and Architecture) in the north wing of the basement level since 1967. Figure 3 highlights the location of Pangborn Hall, on an older map for ease of reading.

#### 2.2 Facility Description

The licensed nuclear reactor facility area consists of one room in Pangborn Hall identified as Room B-16R. The AGN-201 reactor was designed to be a totally self-contained system. There was no auxiliary equipment associated with the reactor, nor was any ventilation system required. The reactor facility consists of a steel tank, approximately 7 feet in diameter by 13 feet high, which houses the reactor and its integral shielding. This facility was in a pit, 13 ft. by 13 ft. by 6.5 ft. deep, in the north end of the room. There is no

#### 2.2 Facility Description (con't)

floor drain in the reactor pit. This type of reactor was designed as a sealed system and, when operated, did not generate any gaseous or liquid radioactive effluent. Figure 4 shows B-16R and the surrounding areas.

Access to the reactor core could only be obtained from the top access plate to the thermal column and then only with the use of considerable heavy equipment and riggers to lift out the thermal column vessel and a second steel vessel containing the reactor core and its lead and graphite shielding. Access to the reactor core was never authorized in the operational tech specs.

The reactor has been stripped of all component parts such that only the steel tank remains in the pit. The reactor operating console has been disconnected and removed from the room. A catwalk around the tank perimeter and a safety railing around the pit remain in place.

#### 3.0 OPERATING HISTORY

#### 3.1 General Information

A review of the reactor operating logs, covering all operations at CUA (1957-1982) shows that the reactor was critical for approximately 610 hours, during which time approximately 971.9 watt-min (16.2 watt-hr) of thermal energy was generated.

The reactor was licensed at CUA for a thermal power level not to exceed 100 milliwatts. It has been operated intermittently at all licensed power levels. The average power level over all operating time at CUA (16.2 watts-hrs ÷ 610 hrs) is approximately 27 milliwatts (thermal). The reactor was last operated on December 4, 1982, for a total of 71 minutes.

#### 3.2 Operations Performed

The reactor was operated first by the Department of Nuclear Science and Engineering, and subsequently by the Department of Mechanical Engineering, for training nuclear engineering graduate students. The reactor usually was operated in conjunction with a Nuclear Reactor Laboratory course and used primarily for performing basic reactor physics experiments requiring a low flux level.

The inherent design features on this reactor, the low power level at which it was operated and the low accumulated running time precluded any significant buildup of fission products. No unusual problems have been identified during over 20 years of authorized operation.

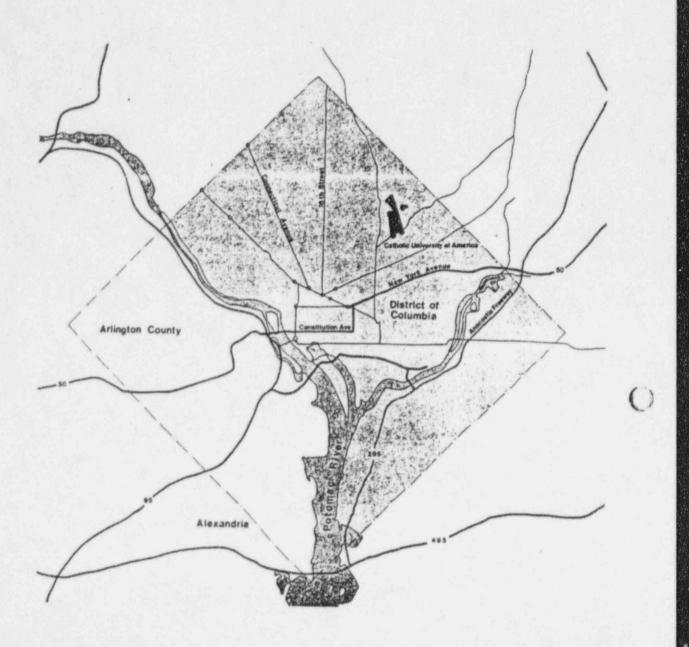
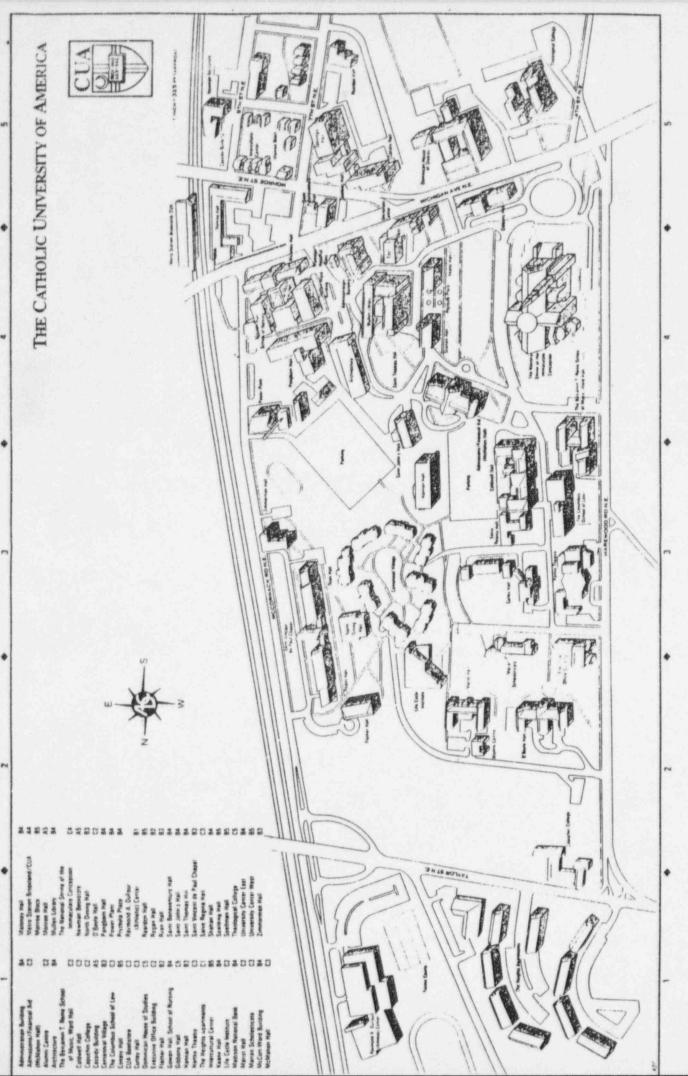


Fig. / Location of the Catholic University of America



FIGURE

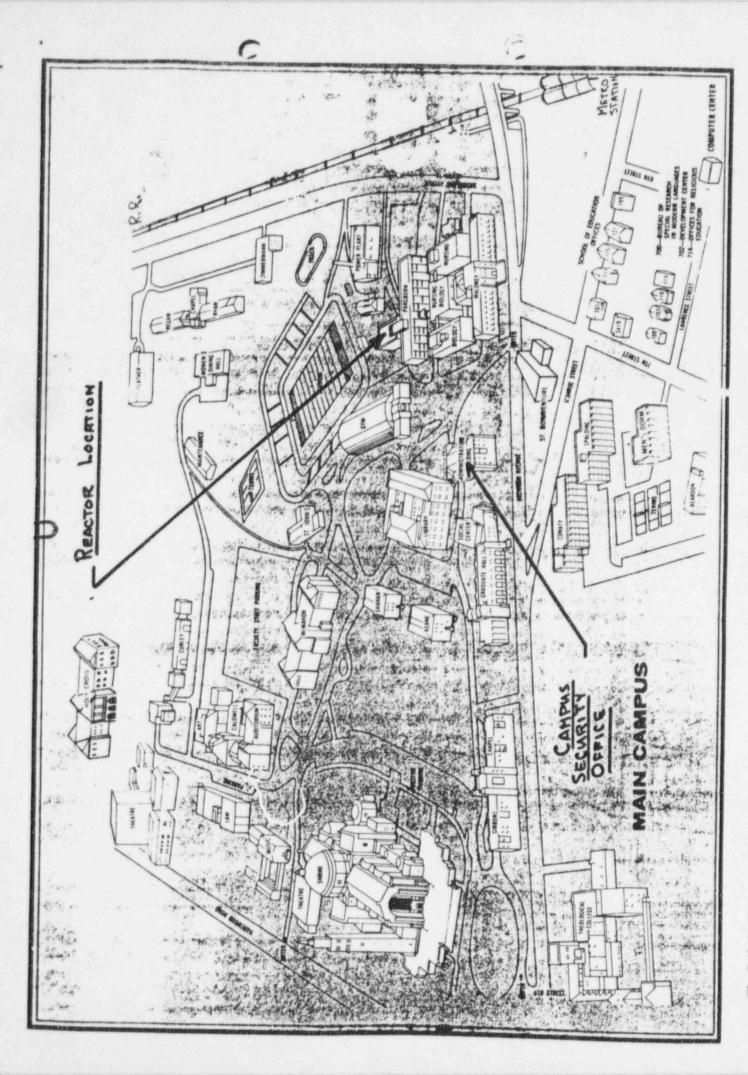


Figure 3

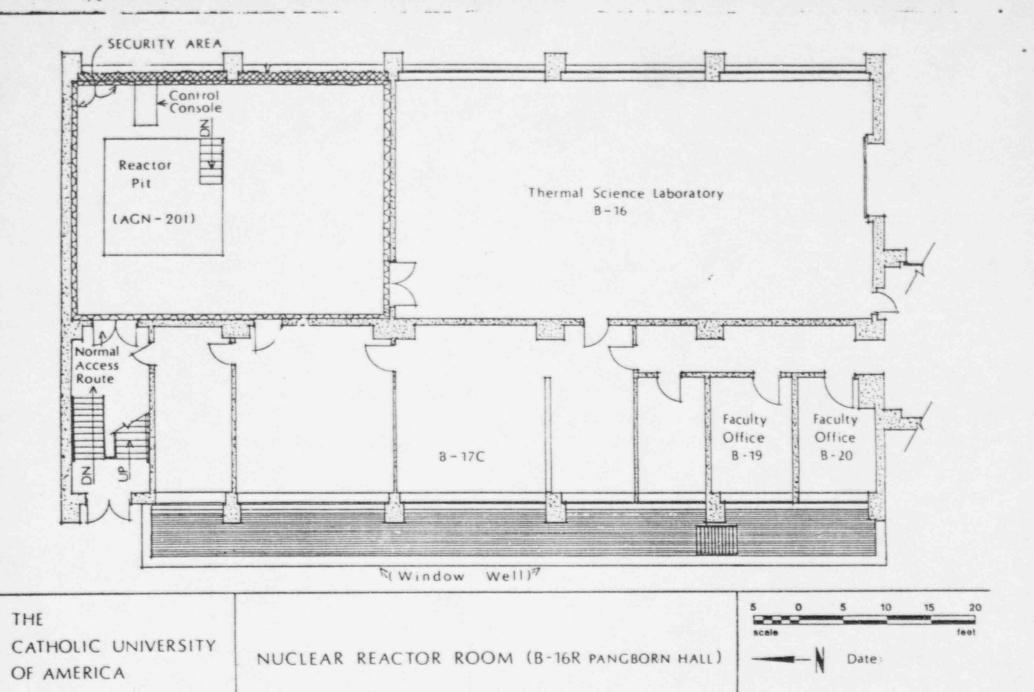


FIGURE 4

#### 4.0 DECOMMISSIONING METHODOLOGY

4.1 Objective Implementation and Decommissioning Activities

In order to realize the objectives defined in 1.3, CUA has planned and implemented decommissioning activities incorporating:

- Removal of the thermal shield, lead shielding, graphite reflector, fuel and all drive mechanicsms and associated reactor mechanical parts.
- Removal of all cinder blocks used for secruity enhancement.
- Removal of reactor console, furniture, and support equipment.
- Cleaning of all surfaces.

#### 4.2 Preliminary Surveys

Routine radiation surveys, required during reactor operations, have not detected any contamination. These surveys were continued subsequent to defueling and continued to show no evidence of contamination. All disassembled reactor components have been surveyed and dispositioned in accordance with the approved decommissioning plan. No fixed or removable contamination was identified.

Preliminary surveys taken for removable contaminiation on floors, upper surfaces and the reactor tank did not show any results above background.

#### 5.0 FINAL STATUS SURVEYS

#### 5.1 Survey Design

In preparation for the final status surveys, the reactor room has been divided into two subunits: (1) lower surfaces, comprised of floor surfaces, wall surfaces up to a height of 2 meters, and any other surface easily accessible to a technician standing on the floor; and (2) overhead surfaces, comprised of ceiling surfaces, wall surfaces more than 2 meters above the floor, and all other surfaces not described in (1).

The floors and lower walls have been divided, using a rectangular grid system, into one by one meter areas. In this report, the blocks formed in this manner are referred to as "survey blocks" and the corners of the blocks formed by the intersecting lines are referred to as "grid points."

#### 5.1 Survey Design (con't)

The reactor steel tank and its support structure are the only reactor components remaining in the room and remain in the pit previously described. The catwalk and pit railing remain in place for safety purposes. The surfaces have been divided into approximately 1 meter square blocks, using grid point locators, and surveyed.

#### 5.2 Final Status Surveys

The approved decommissioning plan described the following termination radiation surveys to be taken:

In the reactor facility, all surface areas larger than one square meter will be marked off in a grid of one meter square blocks. The survey will include a wipe sample of 100 cm² (nominal) taken within each block to identify removable contamination. Wipes for each grid location will be counted for alpha and beta contamination. Limits for removable contamination will be 200 dpm/100 cm² (beta/gamma) and 20 dpm/100cm² (alpha) (RG 1.86). A beta-gamma survey also will be performed centered on each block at a distance of one meter from the surface. Residual radioactivity will be considered acceptable if measurements so-made are not more than 5 uR/h above background, where the reference background value is obtained as the highest of corresponding measurements of similar structural material made elsewhere in Pangborn Hall.

In addition to the above described surveys, direct reading measurements for surface alpha and beta/gamma contamination were taken on lower surfaces.

Operating history, past routine surveys, preliminary scans, and the final status surveys described above, provide demonstrable evidence that there is no reason to suspect surface residual activity exceeding 25% of the guideline values on floor surfaces.

Therefore, a statistically significant number of grid blocks have been directly surveyed (at least 30 grid blocks) to assure reasonable coverage of these surfaces.

For upper surfaces, a minimum of 30 measurement locations were surveyed, biased to locations where radioactivity, if present, would be most likely to accumulate.

#### 5.3 Final Contamination Measurements

#### 5.3.1 Fixed Beta/Gamma Measurements

Fixed beta-gamma readings were taken within designated grid blocks. A static count for 1 minute was converted to dpm/100 cm<sup>2</sup> by taking the net counts and multiplying by a factor which corrects for 4 pi efficiency of the probe and the active area of the detector. Effective window area for this probe is approximately 12 cm<sup>2</sup>. The minimum detectable level, based on typical background counts of 20-40 cpm for this detector, is approximately 980-1200 dpm/100 cm<sup>2</sup>.

#### 5.3.2 Wipe Measurements

Wipe measurements (indirect surveys) were performed using numbered filter paper disks which were then placed in labeled smear booklets with the item/location recorded. Each wipe was counted in a low background gas proportional counting system. The minimum detectable activity calculated for this system as set up for processing these smears is approximately 10 dpm where there is a 5% chance that a smear with this activity will be counted as less than the MDA and a 5% chance that the smear with zero activity will be counted as exceeding the MDA.

#### 5.3.3 Fixed Alpha Measurements

Measurements for fixed alpha activity were performed in designated grid blocks. Static 1 minute counts were converted to disintegration rates (dpm/100 cm<sup>2</sup>)by multiplying the net CPM by a factor which corrected for the 4 pi efficiency of the probe and the active area of the detector. Effective window area for the alpha probe was approximately 50 cm<sup>2</sup>.

The minimum detection level for this alpha probe coupled to scaler/ratemeter and operated in the scaler mode is approximately 100 dpm/100 cm<sup>2</sup>

#### 5.4 Exposure Rates at 1 Meter From Floor and Lower Wall Surfaces

#### 5.4.1 Establishment of Background Radiation Exposure:

In order to insure that the final radiation survey is based upon appropriate levels of background radiation, an area of similar materials of construction and configuration, known to be free of any potential contamination were selected for measurement evaluation.

The same instruments used for the final survey were used to construct a series of background readings. These readings were then averaged for each selected area.

#### 5.4.2 Establishment of Decommissioning Area External Radiation Exposures

External radiation surveys were conducted in survey units identified in this report as the Reactor Room and Reactor Pit (Appendix A), and (Appendix B), respectively.

As described in 5.2 a reading was taken centered over each grid block at one meter above the surface using a micro-R scaled ratemeter. For those floor survey blocks adjacent to walks, the measurement was taken at the appropriate grid point which maintained a 1 meter distance from the wall.

#### 5.5 Instrumentation Used

Direct Radiation Measurements

Ludlum Instrumentation Corporation, Santa Fe, New Mexico

- Model 3 Survey Meter
- Model 12 Survey Meter
- Model 19 Micro R Survey Meter
- Model 43-2 Alpha Scintillation Detector
- Model 43-65 Alpha Scintillation Detector
- Model 44-9 "Pancake" G-M Detector
- Model 2221 Single Channel Analyzer, Scaler/Ratemeter

Indirect Measurements

Tennelec, Incorporated, Oak Ridge, Tennessee

- Model LB 5100 Low Background Counting System
- 6.0 Final Status Survey Results Compared to Compliances Criteria
  - 6.1 Final Status Survey Results

The final status survey results for the reactor room (Pangborn B16 R) and the reactor pit/reactor steel tank, located within this room, have been grouped separately and are attached to this report within Appendix A and Appendix B respectively.

#### 6.2 Compliance Criteria

The decommissioning criteria for surface contamination has been established in the decommissioning plan and NRC Regulatory Guide 1.86. The decommissioning criteria for external exposure measured at 1 meter from surfaces has also been established in the decommissioning plan and for this facility can not exceed 5 micro-R/hour gamma above background.

#### 6.3 Comparison of Final Status Survey Results to Compliance Criteria

The survey data in Appendix A and Appendix B verify that final residual surface contamination and external radiation levels measured at 1 meter from surfaces meet the acceptable compliance criteria as specified in the approved decommissioning plan and NRC Regulatory Guide 1.86 titled "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material.

The general surface activity and exposure rate guideline values are average values, above background, established for areas of survey unit surfaces and indoor exposure rates.

In order to compare survey data with the guideline limits, the mean of each type of measurement taken on lower surfaces, (reactor room and pit floors; reactor room walls up to two meters and all pit walls) has been calculated using all measurements taken on those lower surfaces.

Figures 5 and 6 illustrate this comparison.

#### SUMMARY SHEET RADIATION EXPOSURE RATE ANALYSIS (uR/hr at 1 Meter)

SURVEY UNIT

EXPOSURE RATE ABOVE COMPLIANCE BACKGROUND AT 1 METER LIMIT uR/hr

uR/hr

REACTOR ROOM	0.3	5
REACTOR PIT	0.0	5

## SUMMARY SHEET SURFACE CONTAMINATION ANALYSIS

DPM/100 CM2

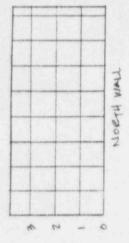
SURVEY	UNIT	REMOVABLE BETA	REMOVABLE ALPHA	FIXED BETA/GAMMA	FIXED ALPHA
1	LIMIT	200	20	5000	5000

DELCHOD DM	2	1	60	0
REACTOR RM	4	1	02	8

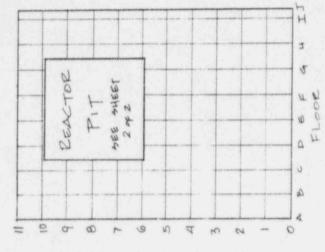
# APPENDIX A REACTOR ROOM FINAL STATUS SURVEYS

Reference: Grid Map A-1

			PAGE
*	Lower	Surfaces-Indirect Measurements	A1A8
*	Upper	Surfaces-Indirect Measurements	A9A11
*	Lower	Surfaces-Direct Measurements	A12A13
*	Lower	Surfaces-External Radiation at 1 Meter	A14A17

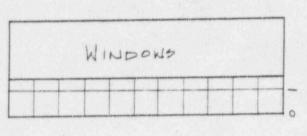


H-1 REACTOR BOOM GRID MAP



300d

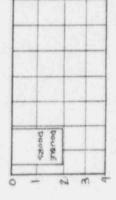
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## - REACTOR ROOM FLOOR - GRID BLOCKS MAPA-1

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		1.00		2	0.40	1.45	1.1111111	4.11/66/
		1.00	0	1	-0.40	0.40	1.1111111	1.176470
	4	1.00		2	0.60	1.90	1.556555/	4.11/64/
	5 %	1.00			-0.40	0.40	-1.1111111	1.17641
		1.00		0	-0.40	131,50	-1.2011111	-1.764703
	7	1.00	6.1	2	-0.40	1,40	-1.1111111	4.117647
		1.00			-0.40	41	-1.1111111	4.22/60
	,	1.00		. 0	-0.40	-0.67	-1.1111111	-1.764705
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FFF FACTOR & P

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THU NOV 17, 1994 Object or Area Surveyed GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW C / MV. WOOKS TIME ALPIA SAMPLE ALPHA BETA ALT A BETA BETA SN CODE (MIN.) COUNTS COUNTS CORRECTED Crit CFM CANALTA 1.00 0.60 0.40 1.6666667 1.1764706 COLUMN 1.00 -0.40 -0.60 1.1111111 -1.7647058 C 1.00 0 0 -0.40 1.1111111 -1.7647059 -0.60 1.00 1.5555557 -1.7647059 U 0.60 0.60 ........ 1.00 +0.40 0.40 1.1764706 1.00 0 0 -0.40 -0.50 -Limina 1.7647654 0.60 -1.11111111 1.00 Ü 0 -0.40 1.764/059 1.00 Ü -0.40 2.40 -1.1111111 7.0588235 1.00 -6.46 0.60 -1.11111111 1.7697059 1.00 6 0.40 0.60 1.1111111 1.7647(58 -1.7647059 1.00 0.60 -1.1111111 FRI NOV 18, 1994 GROUP A FINAL STATUS CHANES REACTOR ROOM: HOW D SURVEY BIRGAY. 574 ALTEA BETA AMALL ALPHA BETA Auron COLUMN SN CODE (MIN.) COUNTS COUNTS CHM CONNECTED CPM CURRECTLO D .0 Ü -0.40 -0.80 -1.7647059 1,00 -0.400.60 -1.7647059 1.00 1.656666/ 4.1176471 0.60 1.40 1.00 9.40 2.40 1.50 0.60 4.4949:04 .. 764/059 4.11/6473 0.40 1.40 0.40 2,40 ...... FRI NOV 18, 1994 GROUP A FINAL STATUS SURVEY-REACTOR ROOM: ROW E SURVEY PLOCKS SAMPLE TIME ALPHA BETA ALPEA BETA ALPHA COLUMN . BETA SN CODE (MIN.) COUNTS COUNTS CPM CHM CHERECTER COPRECTED 40 1.00 0 -0.40 . . 90 1.00 Đ -0.40 0.40 1.171 1.00 Ü -1.40 1.45 1.1111111 4.1.754/1 1.00 0 417 1.00 Ô -6.40 0.40 -1.111111. 1.1764/06 1.00 -0.40 0.40 -1.11111111 1.1764706

-0.40

-0.60

-1.1111111

1.764/059

1.00

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	GROUP A FINAL SAMPLE	TIME	ALPHA	BETA	F LURVLY BI ALFRA	ACCA	AJPRA	sETA
N	SN CODE	(MIN.)	COUNTS	COUNTS	CFM	CPM	CORRECTED	CORRECTED
-	0	1.00	0	3	-0.40	2.40	-1.1111111	7.0586235
-		1.00	. 0	1	-0.40	0.40	-1.2111111	1.1764706
-		1.00	-1151	2	0.00	1.40	1.666666/	4.1176471
-		1.00	6	2	-0.40	1.40	-1.1111111	4.11/64/1
-	4 .	1.00	. 0	. 1	-0.40	0.40	-1.1111111	1.1764/06
-	5	1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
7	6	1,00	Ú	4	-0.40	3.40	-1,1111111	10
	FE: NOV 18, 1							
AND THE PARTY OF T	GROUP A FINAL						22.610	
-	SAMPLE	TIME	A.F.A	BETA	ALPHA	ECTA	Allein	EETA
-	SN CODE	MIN.	COUNTS	COUNTS	CPM	CPM	CORRECTED	CONNECTED
-	-0	1.00		1	-0.45	0.40	-0.01111111	1.1764706
-		1,90			1.6	1.40	1	4.12 141
-		1.00		U	0.40	-0.60	-1.1111111	-1.764/059
productor	- 4	1.00	0	1	0.40	0.40	-1.1111011	1.1764796
	4	1.00			-0.40	0.40	-1.11.11.	1.1764/00
200	1	1.00	0	- 147	0.40	0.40	1.7111.17	
1000		1.06			-0.4	0.40	-1.1111111	1,1759700
		1,00						
		1,00			4	W 1 18 12	*******	1.175.27.25
100		1.2			79.	4.		
-	10	1.00		ō	9,60	-0.66	1.0000007	-1.7647059
-								
	FRI NOV 18, 1 GROUP A FINAL		DUTY PEACEON	DAAM. DAN	u cupully bi	nore		
	SAMPLE	TIME			ALPHA		AU DU A	AETA
-	SN CODE	(NIN.)	ALPHA COUNTS	BETA	CFM	BETA CHM	ALPHA	CORRECTED
	Sh CVIL	(11714.)	COUNTR	COUNTS	Vr.0	s.r.p	CORRECTED	I WARLET TIL
BACCHARIA.		1.00		0	0.60	-0.60	1.6666667	-1.7647059
10000 10000	0	1.00	*					1.1764706
	0	1.00	į	1	1.60	0.40	4.044444	*** ***
	0 1 2		2	1 2	1.60	0.40	1.1111111	4.11764/
	0 1 2 3	1.00	2 0 0	1 2 2				
	0 1 2 3	1.00		1 2 2 1	~(1,40	1,40	1.1111111	9.117547
	0 1 2 3 4 5	1.00 1.00 1.00	9	1 2 2 1 0	-0.40 -0.40	1.40	1.1111111	4.1176471 4.1176471
	0 1 2 3 4 5	1.00 1.00 1.00 1.00	9 0	2	-0.40 -0.40 -0.40	1.40 1.40 0.40 -0.60	1.1111111 -1.1111111 -1.1111121	4.1176471 4.1176471 1.1764706
	0 1 2 3 4 5 6	1.00 1.00 1.00 1.00	9 0 0	2	-0.40 -0.40 -0.40 -0.40	1.40 1.40 0.40	-1.1111111 -1.1111111 -1.1111111 -1.1111111	4.1176471 4.1176470 1.1764706 1.7647069 1.1764706
	0 1 2 3 4 5 6 7	1.00 1.00 1.00 1.00 1.00	0 0 0 0	2	-0.40 -0.40 -0.40 -0.40 -0.40 -0.60	1.40 1.40 0.40 -0.40 0.40 4.40	1.1111111 -1.1111111 -1.1111111 -1.1111111 -1.1111111	4.1176471 4.11764706 1.764706 1.764706 1.1764706 14.941176
	1 2 3 4 5 6	1.00 1.00 1.00 1.00 1.00 1.00	0 0 0 0	2	-0.40 -0.40 -0.40 -0.40 -0.40	1.40 1.40 0.40 -0.40 0.40	1.111111 -1.1111111 -1.1111111 -1.1111111 -1.1111111 6.6046664	4.1176471 4.1176470 1.1764706 1.7647069 1.1764706

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rki Nov .5, 1994 Object or Area Surveyed GROUP A FINAL STATUS SURVEY-REACTOR ROOM: NOW I SURVEY PLOCKS SAMPLE TIME ALPHA BETA ALPHA BLIA ALPHA BETA SN CODA (MIN.) COUNTS COUNTS CEM 0.04 CORRECTED CHRECTL - COLUMN -1.00 0 0 ~0.40 -0.60 -1.1111111 -1.7647059 1.00 2 -0.40 1.40 -1.11111111 4.1176471 1.00 0 0 -0.40 -0.60 -1.1111111 -1.7647059 1.00 0 1 -0.40 0.40 1.1111111 1.1764706 1.00 0 0 -0.40 -1.1111111 -0.6% -1.764/059 1.00 0.60 0.40 1.505555/ 1.1/69/06 1.00 0 -0.40 0.40 -1.1111111 1.1764/06 0.48 1.00 0 5 4.26 -1.1111111 12,9411/6 1.00 -0.40 1.40 \*\*\*\*\*\*\* 4.11/64 1 1.00 0.40 0.49 1.1111111 1.1764706 1.00 0.40 0.00 1.1111111 -1.7647059



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REACTOR ROOM WALLS

WED DEC 07, 1994 Object or Area Surveyed GROUP A NORTH WALL: LOWER SURFACES, LOWER 1 SQ. METER BLOCKS-REACTOR ROOM . PORTH -SAMPLE TIME ALPHA BETA ALPHA BETA ALFIA BECA O ROW -SN CODE (MIN.) COUNCE COUNTS CPM CPM CORRECTLO - CHELLS 1.65555t? -1.754/059 -0.60 1.00 0.60 1.1764706 0.50 0.40 1.6666667 1.00 0 2 1.40 4.1704/. 1.00 -0.40 1.00 0.60 0.40 1.thtabt 1.1/64/35 0.40 -1.11111111 1.1764706 1.00 -0 -0.40 -1.11111111 -1.7647019 1.00 -0 -0.40 -0.60 -1.11111111 3 7.0588235 1.00 -0.40 2.40 1.00 -0.40 -0.68 -1.1111111 -1.7647054 1.00 -0.40 0.40 -1.1111111 1.1766700 WED DEC 07, 1994 NORTH CROTY B NORTH WALL: LOWER SURFACES, THERE I SM. MITTER BURGE-FEW TOWN MOUNT 1 ROW SAMPLE TIME ALPEA BETA ALPHA BETA ALPHA -5.7A SN COLE (MIN.) COUNTS COUNTS 09.8 . . Chert C. 1 .... 1.00 11.40 i theets 1.1/54705 0.60 1.17647.6 1.00 0.40 0.45 0.63 10 1.00 -9.40 0.40 1.1769/00 0.50 4,0076470 1.40 1.00 -0.60 0.40 1.1/69/06 9.48 1.1754708 0.40 -0.40 0.40 1.1764/60

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WED DEC 07, 1994 Object or Area Surveyed GROUP C EAST WALL: LOWER SURFACES, LOWER 1 SQ. METER PLOCES KEACTOR RU # \_ EAST LANCE LINE ALFOR LLIN ALFOR blik ALVER BELL O ROW -SN C.TE MIN.) COUNTS COUNTS CPM CPM DEFECTED CURRECTE I+0,4,11,0 1.00 1.60 -0.60 4.444444 1.7647059 1.41 1.00 1.45 5.4944444 1.1764706 4.11111111 1.00 -0.40 0.40 ..1764/06 1,00 0.40 2.40 -1.1111111 7.0588235 1.00 0 -1.1111111 -0.40 -0.60 1.7647059 23 24 % -1.1111111 0 1.00 -0.40 0.40 1.1764706 25 1.00 0.60 -0.60 1.6666667 1.7647059 1.00 0.60 1.40 1.6566567 4.1176471 28 27 1.00 0 0 --0.40 -0.60 -1.1111111 -1.7647059 0 3 1.00 0.40 2.40 -1.11111111 7.0588235 26 29 1.00 C 0 -0.40 -0.60 -1.1111111 -1.7647059 I+0,4,1,0

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SMEA	Carried Control			CORD

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WED DEC 07. 1994 Object or Area Surveyed GROUP A SOUTH WALL: LOWER SURFACES. \_ SOUTH CAMPLE TIME ALFLA LIA ALTER Auton buch OROW SN CODE (Mik.) COUNTS COUNTS CPM CPM CORRECTED CORRECTED -A,0-> -1.11111111 2.40 7.0586.35 1.00 -0.4U 0.40 -1.1111111 1.1/64/06 1.00 0 -0.40 I,0 -1.2111111 1.00 0 -0.40 -0.60 -1.754 059 -2.2111111 1.40 4.1176471 1.00 -0.40 -1.1111111 1.00 -0.40 1.40 4.1176471 1.00 -0.40 0.40 1.1111111 1.1764706 1.00 -1.11111111 -1./54/059 -0.40 -0.50 1.40 1.6566667 4.1176471 1.00 0.60 1.00 0.60 1.40 1.66666c/ 4.11/04% ₩40 1EC 67, 1994 SOUTH GROUP B SOUTH WALL: LOWER SURFACES, UPPER 1 SQ. METER BLOCKS-REACTOR ROOM 1 ROW SAMPLE TIME ALPHA BETA ALPHA BETA ALPHA bile SN CODE (MIN.) COUNTS COUNTS CPM CHM CORRECTED CORRECTED A10 > 10 1.00 -0.60 4.444444 1.60 -1.7647059 I,O 1.00 44 -0.40 -0.50 -1.11111111 -1.7647059 1.00 -0.40 -1.1111111 0.40 1.1764706 1.00 -0.40 -1.1111111 1.1766 05 0.40 1.00 -0.40 1.40 -1.1111111 4.1176471 1.00 -0.40 0.1111111 1.90 4.117067 1.00 -0.40 1.40 \*1.1111111 4.11769/1 17 1.00 1.40 4.1176471 1.00 4.444444 1.00 46 -0.40 1.40 -1.1111111 4.1176471

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SMEAR	SURVEY	RECORD

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-21 CIVOL		aushACLS, AushA	BELA	ALPEN	SELA	6	52.6
ROW SN CW		COUNTS	COUNTS	CER	CPM	LikkLCIL	. Winz. lab
	ar THARS	222440	44444				
39	1.00	0	0	-0.40	-0.t.		-1.764-1.59
20	1.00	0	3	0.40	2.4	******	7.0000000
21	1.00	- 1 - 1	4	0.50	0.40	1.0000007	1,1764705
.2	1.00	0	. 0	-0.40	-0.to	4	1./69/134
23	1,60			1.60	-0.60	4.4604045	1.764 1059
24	1.00	0	1 14	-0.40	-0.50	1.1.1.111	1.764705+
25	1.00	3		0.60 2.60	0.40	.,000000/	4.11764705
27	1.00	ů,		6.45	0.40		1.1/04/00
26	1.00	0	î	-0.40	0.40	-1.1111111	1.1764705
29	1.00		1	0.6.	1.40	1,555655	9.1176471
300	1.60	0	2	2.4	1.4		4.1176471
WED DEC 07		D. HILDARLE	PENAL 1 22	Water a strike			
ZAMPLE	ST WALL: LOWE TIME	ALPHA	BETA . DW	ALPEA	PETA	ALPEA	BATA
SN COD		COUNTS	COUNTS	CrM	FRIN	(SHEETER	CONNECTED
DI 500		22.51(77)	691226	543	N.C.11		The State of Section
Secretarion (months and	1.00	0	1	-0.40	1,40	*****	4764
2	1.00	1	1	0.50	40	2.555557	1.1766706
3	1.65			-6.40	6,49	1	1.1/64705
NA N	\$460	. 0		0.40	1.40	on her	1.1764706
5	1.00	4	1.2	1.4.	1.40	-1.1111111	4,11764/1
	1.00	0	0	0.40	-0.60	-1-77111111	-1.764/054
7	1.00	0	- 1	-0.40	0.40	5.1141411	1.1764700
В	1.00	0	1	-0.40	0.40	-1.3111171	1.1764706
9	1.00	0	1	0.40	0.40	1.1111111	1.1764706
10	1.00	2	2	1.60	1.40	4.444444	4.1176471
11	1.00	0	3	-0.40	2,40	-1.1111111	7.0588235
DECEMBER OF THE PARTY OF THE PA							
	13.1	1					
		_	-				
	-	-	-		-		
	-	-		-			
	13/2 23			-	-		
			-	-			Chatta 12
Car remark to the care of the	and a	THE REAL PROPERTY AND ADDRESS OF THE PERSON NAMED IN COLUMN 1					
DELETE PROPERTY DESCRIPTION OF THE PERSON	· 图 · 图 · 图 · 图 · 图 · 图 · 图 · 图 · 图 · 图		Link Bylon			DETRINE	77 P. 1
PRINCE PROBLEM AND A CONTRACTOR	September 14 Section	n meaning	uk fir	ATH FIRE			
	Capacitation and protection of the Con-	THE RESIDENCE AND LABOUR DESCRIPTION	de la compa	AND RESIDENCE OF THE PARTY OF T		RESIDENCE AND ADDRESS OF THE PARTY AND ADDRESS	

Upper Surfaces-Indirect Measurements

SN	Reference to Grid	Area-Item Survey
1	A0	Top steam line
2	A0	Air line pipes
3	A0	Light fixture
4	A1	Air line valve
5	A2	Steam pipe
6	A4	Top of door leage
7	A5	Faucet
8	A5	Alarm bell
9	A5	Coiled wires
10	A8	Fire extinguisher
11	8A	ADT box
12	A8	Steam line support hanger
13	A9	Top of door ledge
14	A9	Exit sign
15	A10	Top of pipe hanger
16	C10	Power box
17	D2	Light fixture
18	D5	Light bulb fixture
19	13	Power line
20	14	Radiator
21	15	Air conditioner
22	17	Gas lines
23	110	valves
24	F10	Ceiling
25	В4	Ceiling
26	В9	Ceiling
27	G5	Ceiling
28	н7	Ceiling
29	12	Window sill

30	16	Window sill
31	18	Window frame
32	110	Window frame
33	E0	South wall above 2 meters
34	10	South wall above 2 meters

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## REACTOR ROOM UPPER SURFACES

	A Upper	Surfaces:	ALPHA	un veys-Cent. BETA	ing/Walls/S ALPHA	tructurals BETA	ALPHA	BETA
Chicken Control of the Control of th	CODE	(M)N./	COUNTS	COUNTS	CPM	CPM	CORRECTED	COMMECTED
1		1.00	0	6	-0.40	5.40	-3.1111111	15.882353
2		1.00	0	2	-0.40	1.40	-1.1111111	4.1176671
3		1.00	1	0	0.60	-0.60	1.6660667	-1.7647059
4		1.00	0	2	-0.40	1.40	-1.11111111	4.1176471
5	**	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
6		1.00	0	3	-0.40	2.40	-1.1111111	7.0566235
7		1,00		1	-0.46	0.40	1,11111111	1.1764704
0		1.00			-U.40	0.40	1.1111111	1.1769706
9		1.00	11.	2	0.00	1.40	1.6666667	4,1176471
10		1.00	3	2	2.60	1.40	7.2222222	4.1176471
11		1,90	0	1	0.40	0.40	1.1111111	1.1764706
12		1.00	0	2	9,40	1.90	1.1111111	4.1176471,
13		1,40		111	0.60	0.40	1.6666667	1.1/64/06
10		1.46			9.45	-0.60	1.1133311	1.7647(64
15		1,00			0.40	0.40	1,1111111	1.1764706
10		1.00	0		0.40	0.40	-1.1111111	1.1764706
17		1.00		3	0.60	2.40	1.6666667	7.0586235
10		1.00	1	2	0.60	1.40	1.666667	4.1176471
19		1.00	0	1	-0.40	0.40	1.11111111	1.1764706
20		1.00	0	1	0.40	2.40	-1.1111111	7.0586235
21		1.00	0	,	-0.40	1.40	-1.11111111	4.1176471
2.		00	0		0.40	1.40	-1.1111111	4.1176471
43		1.00			0.40	2.40	1.1111111	7.0580235
24		1.00	- 0		0.40	0.40	-1.1111111	1.1764706
25		1.00	0		-0.40	0.40	-1.1111111	1.1764706
28		1.00		i i	1.60	-0.60	4.6944469	
27		1.00	0	3	-0.40	2.40		-1.7647059
26		1.00	0	3	-0.40		-1.1111111	7.0588235
29		1.00	0	1	-0.40	1.40	-1.1111111	4.1176471
30		1.00	0	2	-0.40	0.40	-1.1111111	1.1764706
31		1.00	0	0		1.40	-1.1111111	4.1176471
32		1.00	1	1	0.40	-0.60	-1.1111111	-1.7647059
33		1.00	Ô	2		0.40	1.6666657	1.1764706
34		1.00	0	2	-0.40	1.40	-1.1111111	4.1176471
24		1.00	V	3	-0.40	2.40	-1.13111111	7,0586,75

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## DECONTAMINATION AND DECOMMISSIONING SURVEY DATA



Pangborn B-16R, Reactor Room A-1
BUILDING & AREA DRAWING No.

SURVEY	Ludlum 2221 Scaler/Ratemeter: Ludlum 44-9 Propiet DIRECTLY MEASURED						
DESIGNATION	COUNTS/1 M		DPM/100 CM <sup>2</sup>				
	GROSS	NET	BETA-GAMMA				
B~0	22	0 4					
D-0	30	0					
G-0	22 .	0	0				
H-0	30	0	0				
C-1	34	4	136				
F-1	24	0	0				
H-1	32	2	68				
E-2	31	1	34				
A-3	30	0	0				
D-3	24	0	0				
F-3	20	0	0				
H-3	28	0	0				
E-4	17	0	0				
G-4	27	0	0				
C-5	26	0	0				
F-5	22	0	0				
H-5	25	0	0				
A-6	36	6	204				
H-6	28	0	0				
A-10	31	1	34				
B-8	39	9	306				
H-8	26	0	0				
B-9	38	8	272				
D-10	31	1	34				
£=18	頻	16	844				

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#### DECONTAMINATION AND DECOMMISSIONING SURVEY DATA



Pangborn B16R, Reactor Room A-1
BUILDING & AREA DRAWING No.

SURVEY	Ludlum 2221	Scaler/Ratemete	er; Ludlum 43-65 Pr				
BLOCK DESIGNATION	DIRECTLY MEASURED						
DESIGNATION	Counts/1 M	in./Probe	DPM/100 cm				
	GROSS	NET	ALPHA				
B-0	3	0.	0				
D-0	6	2	13				
G-0	5 .	1	7				
H-0	9	5	34				
C-1	4	0	0				
F-1	6	2	13				
H-1	1	0	0				
E-2	5	1	7				
A-3	3	0	0				
D-3	10	6	40				
F-3	1	0	0				
H-3	6	2	13				
E-4	7	3	20				
G-4	5	1	7				
C-5	3	0	0				
F-5	9	5	33				
H-5	0	0	0				
A-6	6	2	13				
H-6	4	0	0				
A-10	7	3	20				
B-8	4	0	0				
H-8	4	0	0				
B-9	5	1	7				
D-10	1	0	0				
F-10	1	0	<u>o</u>				

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## RADIATION EXPOSURE RATE ANALYSIS Micro R/hr at 1 Meter

AREA Reactor Room, Pangborn Hall B16-R

INSTRUMENT Ludlum Model 19 S/N 82787

BACKGROUND-SIMILAR CONSTRUCTION: Pangborn B-16, 5.5 micro-R/hr

GRID POINT/BLOCK	MICRO-R/Hr
B 1*	6.0
B 2*	6.2
B 3*	6.0
B 4*	5.2
B 5*	6.0
в 6*	6.2
в 7*	6.8
B 8*	6.0
B 9*	7.0
B 10*	7.2
B 1	5.0
B 2	5.0
в 3	5.2
В 4	5.0
B 5	6.0
в 6	6.0
в 7	6.3
в 8	6.0
В 9	7.0

Note: \* = Measurement taken over gridpoint; remainder of readings taken over gridblock center as located by lower left gridpoint.

## RADIATION EXPOSURE RATE ANALYSIS Micro R/hr at 1 Meter

AREA Reactor Room, Pangborn Hall B16-R

INSTRUMENT Ludlum Model 19 S/N 82787

BACKGROUND-SIMILAR CONSTRUCTION: Pangborn B-16, 5.5 micro-R/hr

GRID POINT/BLOCK	MICRO-R/Hr
C 1*	5.7
B 1	5.0
B 2	5.0
В 3	5.2
В 4	5.0
B 5	6.0
В 6	6.0
B 7	6,3
B 8	6.0
В 9	7.0
C 1	5.0
C 2	5.2
C 3	5.5
C 4	5.5
C 5	5.2
C 10*	7.8
D 1*	5.0
D 1	5.0
D 2	5.0
D 3	4.7

Note: \* = Measurement taken over grid point; remainder of readings taken over grid block center as located by lower left grid point

## RADIATION EXPOSURE RATE ANALYSIS Micro R/hr at 1 Meter

AREA Reactor Room, Pangborn Hall B 16-R

INSTRUMENT Ludlum Model 19 S/N 82787

BACKGROUND-SIMILAR CONSTRUCTION: Pangborn B-16, 5.5 micro-R/hr

RID POINT/BLOCK	MICRO-R/Hr
D 4	4.5
D 5	5.0
D 10*	8.0
E 1*	5.0
E 1	5.0
E 2	5.5
E 3	5.5
E 4	5.5
E 5	5.0
E 10*	7.2
F 1*	5.0
F 1	5.7
F 2	5.7
F 3	5.5
F 4	5.0
F 5	5.2
F 10*	8.0
G 1*	5.2
G 1	5.5
G 2	5.2

Note: \* = Measurement taken over grid point; remainder of readings taken over grid block center as located by lower left grid point.

# RADIATION EXPOSURE RATE ANALYSIS Micro R/hr at 1 Meter

AREA Reactor Room, Pangborn Hall B16-R

INSTRUMENT Ludlum Model 19 S/N 82787

BACKGROUND-SIMILAR CONSTRUCTION: 5.5 micro R/hr

GRID POINT/BLOCK	MICRO-R/Hr
G 3	5.2
G 4	5.7
G 5	5.7
G 10	7.5
H 1*	5.5
н 1	6.0
н 2	5.2
н 3	5.7
H 4	5.7
н 5	6.0
н 6	7.0
H 7	7.0
н 8	7.0
н 9	7.2
I 10*	7.5

Note: \* = Measurement taken over grid point; remainder of readings taken over grid block center as located by lower left grid point.

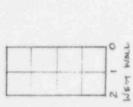
AVERAGED ROOM MEASUREMENTS: 5.8 uR/hr

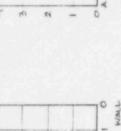
# APPENDIX B REACTOR PIT

Reference: Grid Map B-1

		PAGE
*	Floor Surfaces-Indirect & Direct Measurements	B1B3
*	Wall Surfaces-Indirect Measurements	B4B5
*	Structure Surfaces	B6B16
*	External Padiation Survey at 1 Meter	B17



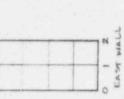






FLOOR





BugBorn RM. B-16 R REACTOR ROOM
TOECOMMISSIONING



Scale 1:100 (METERS)

0 3:5 6:6 6:4 14:0



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COUNTER NUMBER	BACKGROUND & B
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## - REACTOR PIT FLOOR GRID BLOCKS MAP B-1

Surveyed	TUE DEC 06,							
	GROUP A Flo							
-	EVWETE	11ME	ALPHA	BETA	MLPHA	REIN	ALPHA .	HETA
CHIEFTON COMMISSION	Sh Code	(MIN.)	COUNTS	COUNTS	CPR	CPM	CORRECTED	CORRECTE
		1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
-		1.00	1	3	0.60	2.40	1.6666667	7.0588235
MENNY.		1.00	1	0	0.60	-0.60	1.0000607	-1.7647059
-		1.00	. 1	3	0.60	2.40	1.6666667	7.0586235
		1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
		1.00	0	1	-0.40	0.40	-1.1111111	1.1764706
		1.00	C	U	0.40	-0.60	-1.1111111	1.764/059
		1.00		1	0.60	0.40	1.555055	1.1764/06
		1.00	- 6	0	1.60	-0.00	4.4444444	1.764/059
		1.00	1	1	0.60	0.40	1.665060/	1.1764706
		1.00	0	2	-0.40	1.40		4.1176471
		1.60	0	0	-0.40	-0.60	*******	1./64/059
		1,60	ŷ.		7.87	0.4	* * * * * * * * * * * * * * * * * * * *	4.2/04/40
		1,00			4.40	0.40	******	1.1/04/00
		2,00	9.		0.40	1.40	*******	4.11/04/1
		1.00	0	0	-1.40	-6.60		-1./64/059

#### DECONTAMINATION AND DECOMMISSIONING SURVEY DATA



Paneborn B-16R, Reactor Pit B-1
BUILDING & AREA DRAWING No.

BLOCK DESIGNATION COUNTS/1MIN./PROBE DPM/100 CM2 BETA-GAMMA  A-0 33 3 102 C-0 21 0 0 0 A-2 34 4 136 D-3 23 0 0	SURVEY	Ludlum 2221	THE REAL PROPERTY OF THE PERSON NAMED IN COLUMN TWO	er; Ludlum 44-9 Pro
A-0 33 3 102 C-0 21 0 0 A-2 34 4 136	BLOCK DESIGNATION			
A-0 33 3 102 C-0 21 0 0 A-2 34 4 136		COUNTS/1MIN.	/PROBE	
A-0     33     3     102       C-0     21     0     0       A-2     34     4     136		November and and an interest of the contract of		BETA-GAMMA
C-0 21 0 0 A-2 34 4 136	A=0	33	THE RESERVE THE PERSON NAMED IN COLUMN 2 I	102
A-2 34 4 136	Contraction and the second sec			THE RESERVE AND ADDRESS OF THE PARTY OF THE
The state of the s				
	NAME OF TAXABLE PARTY OF TAXABLE PARTY.			

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#### DECONTAMINATION AND DECOMMISSIONING SURVEY DATA



SHEET \_\_\_\_ of \_\_\_

Pangborn B16R, Reactor Pit B-1
BUILDING & AREA DRAWING No.

Ludlum 2221 Scaler/Ratemeter; Ludlum 43-65 Probe SURVEY BLOCK DESIGNATION DIRECTLY MEASURED DPM/100 cm2 Counts/1 Min./Probe GROSS NET ALPHA A-1 4 0 0 A-3 2 0 0 C-1 2 0 0 D-4 0 0

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- REACTOR PIT WALLS GRID MAP B-1

TUE DEC 06, 1994 Object or Area Surveyed GROUP A North Wall of the Reactor Pit NORTH SANFLE . . . . . . A-570 DEAR Button But Di. Seeli CPH SN CODE MIN.) COUNTS COUNTS CPM CORRECTED CORRECTED 1.00 0.60 2.40 1.6666667 7.0586235 -1.1111111 1.00 0 0 -0.40 -0.60 -1.7647059 1.00 1.60 0.40 4.444444 1.1764706 1.00 3 -0.40 2.40 -1.1111111 7.0588235 1.00 0 0 -1.11111111 -0.40 -0.60 -1.7647059 1.00 0 0 -0.40 -0.60 -1.1111111 -1.7647059 1.00 -0.40 1.40 -1.1111111 4.1176471 1.1764706 1.00 0 -0.40 0.40 -1.1111111 TUE DEC Ot. 1994 GROUP A Last Wall of the Relactor Fit EAST SAMPLE TIME ALPHA BETA ALLIG BETA ALPHA BETA COUNTS SN CODE (MIN.) COUNTS CPM CPM CORRECTED CORRECTED 1.00 0 -0.40 -1.1111111 4.1176471 1.40 1.00 0 -0.40 0.40 -1.11111111 1.1/64/05 0.60 U. 90 1.000000/ 1.1/64/06 1.00 0. -0.40 1.1764706 0.40 1.1111111 1.00 0.60 3.40 1.crttoo/ 10 1,08 0.40 0.40 11.11.11111 1.1/64/00 1.00 -0.40 -1.1111111 4.1176471 1.40

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ITH	SAMPLE	TIME (MIN.)	ALPHA	BETA	ALPHA	BETA	ALFHA	EETA
	SN CODE	(518.)	COUNTS	COUNTS	CPK	CPM	CORRECTED	CORRECTS
1	13	1.00	1	4	0.60	3.40	1,6666667	10
7	14	1.00	0	1	-0.40	0.40	-1.1111111	1.1764/06
	15	1.60	0	1	-0.40	0.40	-1.1111111	1.1764706
	16	1.00	1	1	0.60	0.40	1.6666667	1.1764706
-	17	1.00	4	2	3.60	1.40	10	4.1176471
	18 %	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
A	19	1,00	1	2	0.60	1.40	1.666667	4.1176471
	20	1.00	1	1	0.60	0.40	1.6666667	1.1764706
	TUE DEC 06, GROUP A West SAMPLE SN CODE		Reactor Pi ALPHA COUNTS	t BETA COUNTS	ALPHA CPM	RETA	ALFHA CORRECTED	BETA CORRECTEI
	GROUP A West	Wall of the TIME (MiN.)	ALPHA	BETA	CPM	CPM	CORRECTED	CORRECTE
	GROUP A West SAMPLE	Wall of the TIME (MiN.)	ALPHA	BETA COUNTS	CPM -0.40	0.40	CORRECTED	CORRECTEI
	GROUP A West SAMPLE	Wall of the TIME (Min.) 1.00	ALPHA COUNTS 0	BETA	-0.40 -0.40	0.40 -0.50	-1.1111111 -1.1111111	1.1764706 1.7647059
	GROUP A West SAMPLE	Wall of the TIME (MIN.) 1.00 1.00	ALPHA	BETA COUNTS	-0.40 -0.40 -0.40	0.40 -0.60 0.40	-1.1111111 -1.1111111 -1.1111111	1.1764706 1.764705 1.7647059
	GROUP A West SAMPLE	Wall of the TIME (MIN.) 1.00 1.00 1.00 1.00	ALPHA COUNTS 0 0 0 0 3	BETA COUNTS	-0.40 -0.40 -0.40 -0.40 2.60	0.40 -0.50 0.40 0.40	-1.2111111 -1.1111111 -1.1111111 -1.2222222	1.1764706 1.764706 1.764706 1.764706
	GROUP A West SAMPLE	Wall of the TIME (MIN.) 1.00 1.00 1.00 1.00	ALPHA COUNTS 0 0 0 0 0	BETA COUNTS	CPM -0.40 -0.40 -0.40 2.60	0.40 -0.60 0.40 0.40 2.40	-1.2111211 -1.2111211 -1.111111 -1.1111111 7.2222222 -1.1111111	1.1764706 1.764706 1.764706 1.764706 7.0560235
	GROUP A West SAMPLE	Wall of the TIME (Min.) 1.00 1.00 1.00 1.00 1.00	ALPHA COUNTS	BETA COUNTS	-0.40 -0.40 -0.40 -0.40 -0.40 -0.40	0.40 -0.00 0.40 0.40 2.40 2.40	-1.111111 -1.111111 -1.111111 -1.111111 -2.22222 -1.111111 -1.111111	1.1764706 1.764706 1.764706 1.1764706 7.0568235 7.0568235
	GROUP A West SAMPLE	Wall of the TIME (MIN.) 1.00 1.00 1.00 1.00	ALPHA COUNTS 0 0 0 0 0	BETA COUNTS	CPM -0.40 -0.40 -0.40 2.60	0.40 -0.60 0.40 0.40 2.40	-1.2111211 -1.2111211 -1.111111 -1.1111111 7.2222222 -1.1111111	1.1764706 1.764706 1.764706 1.764706 7.0560235

#### Reactor Structure Surveys

. Pit Rail, Reactor Room [13' side : circumference of pipe : 4.5" equivalent 1  $m^2$ =28 ft]

SN	Area-Item Survey
1	South Side Top Rail
2	South Side Mid Rail
3	North Side Top
4	North Side Mid
5	East Side Top
6	East Side Mid
7	West Side Top and Mid

## . Catwalk Railing (facing west)

SN	Area-Item Survey
8	Left Half Top
9	Left Half Mid
10	Number Not Used
11	Right Half Mid

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REACTOR STRUCTURES

MPLE TIME CODE (MIN.)  1.00 1.00 1.00 1.00 1.00 1.00 1.00 1	REACTOR ROOM ALPHA COUNTS	BETA COUNTS  9 0 0 4 1 0 BETA COUNTS	ALPHA CPM 0.60 -0.40 -0.40 1.60 -0.40 0.60 -0.60	8.40 0.60 0.60 0.60 0.60 0.60 0.40 0.60	ALPAA CORRECTED 1.7647059 -1.1764706 4.7058824 -1.1764706 1.764705 -1.1764706	14.705862 -1.7647059 -1.7647059 -1.7647059 -1.764705 -1.764705
1.00 1.00 1.00 1.00 1.00 1.00 1.00 PLE 1.ME CODE (K.N.)	REACTOR ROOM ALPHA COUNTS	BETA COUNCE	0.60 -0.40 -0.40 1.60 -0.40 0.60 -0.60	8.40 0.60 -0.60 -0.60 3.90 0.40 -0.60	2.7647059 -1.1764706 4.7058824 -1.1764706 1.7647059 -1.1764706	14.705/05/ -1.7647059 -1.7647059 -1.764706 -1.764706
1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00	REACTOR ROOM ALPHA COUNTS	BETA COUNCE	-0.40 -0.40 -0.40 -0.60 -0.60	0.60 -0.60 -0.60 3.90 0.40 -0.60	-1.1764706 4.7058824 -1.1764706 1.764705 -1.1764706	-1.7647059 -1.7647059 -1.764705 -1.764706 -1.7647059
1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,00	REACTOR ROOM ALPHA COUNTS	BETA COUNCE	-0.40 -0.40 -0.40 -0.60 -0.60	0.60 -0.60 -0.60 3.90 0.40 -0.60	-1.1764706 4.7058824 -1.1764706 1.764705 -1.1764706	-1.7647059 1.7647059 -1.764705 10 1.1764706 -1.7647059
1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	REACTOR ROOM ALPHA COUNTS	BETA COUNCE	1.60 -0.40 0.60 -0.40	-0.50 3.40 0.40 -0.60	4.7058824 1.1764706 1.7647059 1.1764706	1.7647059 1.7647059 1.1764706 -1.7647059
1.00 1.00 1.00 02, 1994 N PIT RAILING PPLE TIME CODE (K.N.)	REACTOR ROOM ALPHA COUNTS	BETA COUNCE	-0.40 0.60 -0.40	3.90 0.40 -0.60	-1.1764706 1.7647059 -1.1764706	-1.764/059 10 1.1764706 -1.7647059
C 02, 1994 N PIT MAILING - PLE TIME CODE (K.N.)	REACTOR ROOM ALPHA COUNTS	BETA COUNTS	0.60 0.60	0.46 -0.60	1.7647059 -1.1764706	1.17647059
1.00 1.00 0 02, 1994 N PIT RAILING - PPLE TIME CODE (K.N.)	REACTOR ROOM ALPHA COUNTS	BETA COUNCE	-0.40 ALE:A	-0.60	ALMA	-1.7647059
C 02, 1994 N PIT KALLING- MPLE T.ME CODE (M.N.)	REACTOR ROOM ALPHA COUNTS 0	BETA COUNCE	ALE: A	PETA	ALH:A	
N PIT KALLING -  IPLE TIME  CODE MIN. 1	ALPHA COUNTS	TONKOR				BLTV
N PIT KALLING -  IPLE TIME  CODE MIN. 1	ALPHA COUNTS	TONKOR				BITA
MPLE TIME CODE MIN.	ALPHA COUNTS	TONKOR				8174
CODE - MIN. 7	COUNTS	TONKOR				8178
1.00	0		CPM	CPM	CORRECTED	
		2				CORRECTED
1.00	2		-0.40	1.40	1.1764706	4.1176471
			0.60	0.40	1.7647059	1.1764706
C 02, 1994 B CATHALK HAILI MPLE TIME CODE (MIN.)	ALPHA	EST), REACTOR BETA COUNTS	KOOM ALPHA CPM	BETA CPM	ALPHA CORKECTED	HETA CORRECTED
		1	0.40	0.60	1.1111111	1.7647059
		0	-0.60	-0.40		-1.1764706
1.00	0	2	-0.60	1.60		4.7056624
W	PLE TIME CODE (MIN.) 1.00 1.00	PLE TIME ALPHA CODE (MIN.) COUNTS  1.00 1	PLE TIME ALPHA BETA CODE (MIN.) COUNTS COUNTS  1.00 1 1 1 1 1 1.00 0 0	PLE TIME ALPHA BETA ALPHA CODE (MIN.) COUNTS COUNTS CPM  1.00 1 1 0.40 1.00 0 0 -0.60	PLE TIME ALPHA BETA ALPHA BETA CODE (MIN.) COUNTS COUNTS CPM CPM  1.00 1 1 0.40 0.60 1.00 0 0 -0.60 -0.40	PLE TIME ALPHA BETA ALPHA BETA ALPHA CODE (MIN.) COUNTS COUNTS CPM CPM CORRECTED  1.00 1 1 0.40 0.60 1.1111111 1.00 0 0 -0.60 -0.40 1.6666667

## . Catwalk Platform (facing west)

SN	Area-Item Survey
12	Left Half
13	Left Half
14	Left half
15	Left Half
16	Right Half
17	Right Half
18	Right Half
19	Right half

## . Steps down into Pit

SN	Area-Item Survey
1	Left Side Runner
2	Right Side Runner
3	Steps: Top two
4	Steps: Mid two
5	Steps: Bottom Three

## . Catwalk Support Poles

SN	Area-Item Survey
6	North Pole Base
7	North Pole
8	East Pole base
9	East Pole
10	South Pole Base
11	South Pole
12	West Pole Base
13	West Pole

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SURVEYED BY	***************************************
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FEE EACTOR	· W

DATE

DATE \_\_ BACKGROUND &



FRI DEC 02, 1994 Object or Area Surveyed GROUP C CATWALK PLATFORM, (FACING WEST), REACTOR ROOM SAMPLE ALPHA TIME ALPHA BETA ALPHA BETA BETA CATWALK -SN CODE (MIN.) COUNTS COUNTS CHR CPM CORRECTED CORKECTED PLATFORM 1.00 -1.1111111 12 Ó -0.40 0.40 1.1764706 13 1.00 0 0 -0.40 -0.60 -1.1111111 -1.7647059 14 1.00 t 0 -0.40 -0.60 -1.1111111 -1.7647059 15 1.00 0 2 -0.40 1.40 -1.1111111 4.1176471 0 1.00 -0.40 -0.00 -1.1111111 1.7647059 1.00 6.50 4.40 1.66tett. 12.941176 1.00 -0.40 0.40 1...764/05 1.00 4.46466.4 1.60 3.40 ... 64 00 M.N LET 05, 1996 GHOLF & TIES DOWN INCO SERVICE PIX STAIRS TATEL TIME ALVER But i h 1410 Butlife dilla contra CHINE LFK OPM CUTABLE . UNRL . LL 31.60 0.00 ../89/429 1,00 2 -0.40 1.40 1.1.1.1.1 4.11/64/1 1.00 Ù. -0.40 -U. DU 1.11111111 1.7647059 1.00 0 -0.40 0.40 -1.1111111 1.1764/06 1.00 -0.40 0.40 -1.11111111 1.1764706 MAN DEC 05, 1994 GROUP B CATWALK SUPPORT FOLES CATWALK . SAMPLE TIME ALPHA ALPHA BETA BETA ALPHA DLIA POLES SW CODE (MIN.) COUNTS COUNTS CPH CPM CORRECTED CORRECTED 1.00 -0.40 -0.60 -1.1111111 -1.7647059 1.00 0 -0.40 0.40 -1.1111111 1.1764706 1.00 0 -0.40 2 -1.1111111 1.40 4.11/64/1 1.00 0 0 -0.40 -0.50 -1.1111111 1.7647059 10 1.00 0 0.60 -0.60 1.6666667 1.7647059 1.00 -0.40 -0.60 1.1111111 - .. /ta/USS 1.00 -0.40 0.40 -1.11111111 1.1764706 1.00 1.60 0.40 4.444444 1.1764700

#### . Reactor Tank (Shell), Top

SN	Area-Item Survey
14	Left Side First Quadrant
15	Left Side Second Quadrant
16	Right Side First Quadrant
17	Right Side Second Quadrant

## . Reactor Tank (Shell), Middle

SN	Area-Item Survey
6	Left Half Block 1
5	Left Half Block 2
4	left Half Block 3
3	Right Half Block 4
2	Right Half Block 5
1	Right Half Block 6

#### . Reactor Tank (Shell), Bottom

SN	Area-Item Survey
7	Left Half First Quadrant
8	Left Half Second Quadrant
9	Right Half First Quadrant
10	Right Half Second Quadrant

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IR -	SAMPLE	TIME	FACING WEST ALPHA	BETA	ALPila	A . 12	ALFOA	BLIA
, K	SN CODE	(MIN.)	COUNTS	COUNTE	BMT110	DM.	CURRECTED	CORRECT
-		Miller	000010	PARMYE			2 X X X X X X X X X X X X X X X X X X X	Ne V \$141 as as as
-	14	1.00	0	1	-0.40	V-90	-1.1111111	1.1764/08
	15	1.00	0	2	0.40	1.40	1.1111111	4.11764/1
	.6	1.00	0	1 2	-0.40	2.90		4.1.7647.
	. 17	1.00	1	1	0.60	0.40	1.6666667	1.1764706
mercum.								
WHO CHARLES AND	MON DEC 05, 1							
-	SHOUP A REACT						2000	
	SAMPLE	TIME	ALPHA	Fr. A	ALPHA	14.1	ALFIA	SEIA
	SN dobe	MIN.	COUNTS	COUNTE	CF#		. orresta	4 VIII
		1.00	0		6.40	0.60		-1.764/059
	. 6	1.0	. 0	U	0.4	1.1		4.1176471
		1.00	0		0.4	1.40		4.117547.
		1.00	- 0	- 0	0.40	1.36	1,1111111	1.764 054
CONTRACTOR IN CONTRACTOR		1.00	0	2	-0.40	1.40	-1.11.1111	4.1176471
		1.00	0	2	-0.40	1.40	1.1211.01	4,1176471
	MON DEC OS, 1 Group & RIA.: Sample		OTIOM 174.	GNELN , FACI BETA	NG WEST, CL ALPHA		AuroA	EZA
	GROUP E BIN.	or security					ALFOA	£ZIA Communic
	GROOF E REN. : SAMPLE	OR SHALLS TIME (MIN.)	ALPHA	BET.A	ACPHA CPM	:t t	. The The	COMMICSEL
	GROUP E RENCT SAMPLE SN OUTE	OR SHALLS TIME (MIN.) 1.00	ALPHA	BET.A	AUPHA	0.40	. **** "12" 1.5556557	1.1764706
	GROUP E REAL : SAMPLE EN OULE 7	TIME (MIN.) 1.00	ALPHA	BETA COUNTY	O.60	0.40	. rra Tal. 1.0006067 1311111	1.1764706 1.1764706
	GROUP E RENCT SAMPLE SN OUTE	OR SHALLS TIME (MIN.) 1.00	ALPHA	BET.A	ALPHA CPM 0.60	0.40	. **** "12" 1.5556557	1.1764706
	GROUP E REAL : SAMPLE EN OULE 7	OR SHALLS TIME (MIN.) 1.00	ALPHA COUNTS	BETA COUNTY	ALPHA CPM 0.60	0.40	. #82 %2 1.0006067 1311121 4.6404640	1.1764/06 1.1764/06
	GROUP E REAL : SAMPLE EN OULE 7	OR SHALLS TIME (MIN.) 1.00	ALPHA COUNTS	BETA COUNTY	ALPHA CPM 0.60	0.40	. #82 %2 1.0006067 1311121 4.6404640	1.1764/06 1.1764/06
	GROUP E REAL : SAMPLE EN OULE 7	OR SHALLS TIME (MIN.) 1.00	ALPHA COUNTS	BETA COUNTY	ALPHA CPM 0.60	0.40	. #82 %2 1.0006067 1311121 4.6404640	1.1764/06 1.1764/06 1.1764/06
	GROUP E REAL : SAMPLE EN OULE 7	OR SHALLS TIME (MIN.) 1.00	ALPHA COUNTS	BETA COUNTY	ALPHA CPM 0.60	0.40	. #82 %2 1.0006067 1311121 4.6404640	1.1764/06 1.1764/06
	GROUP E REAL : SAMPLE EN OULE 7	OR SHELLS TIME (MIN.) 1.00	ALPHA COUNTS	BETA COUNTY	ALPHA CPM 0.60	0.40	. #82 %2 1.0006067 1311121 4.6404640	1.1764/06 1.1764/06
	GROUP E REAL : SAMPLE EN OULE 7	OR SHELLS TIME (MIN.) 1.00	ALPHA COUNTS	BETA COUNTY	ALPHA CPM 0.60	0.40	. #82 %2 1.0006067 1311121 4.6404640	1.1764/06 1.1764/06

Section 1

## . Support Plate (on floor)

SN	Area-Item Survey
11	Outside Corner 1
12	Outside Corner 2
13	Outside Corner 3
14	Outside Corner 4
15	Inside First Half
16	Inside Second half

#### · Access Ports

SN	Area-	Item Survey	_
1	Outside	B.P. 2B	
2	Outside	B.P. 1B	
3	Outside	B.P. 3B	
4	Outside	B.P. 4B	
5	Inside	B.P. 2B	
6	Inside	B.P. 1B	
7	Inside	B.P. 3B	
8	Inside	B.P. 4B	



COUNTED BY DATE
SURVEYED BY DATE
COUNTER NUMBER BACKGROUND 8

Surveyed	MON DEC US.							
	GROUP C REAC					1.1 (0.4	#1 5011 #	Chiefa
7	SAMPLE	TIME	ALPHA	PETA	ALPHA	BETA	ALPHA	BEIA CORRECTE
-	EN CODE	(MIK.)	COUNTS	COUNTS	CPK	CPM	CORNECTED	CVERGULAN
D		1.00		3	-0.40	2.40	-1.1111111	7.0586235
	11	1.00	0		-0.40	0.40	-1.2111111	1.1764706
	12	1.00	0		-0.40	1.40	-1.1111111	4.1176471
	13	1.00	0		-0.40	0.40	-1.1111111	1.1764706
	14	1.00	0	0	-0.40	-0.60	-1.1111111	-1.7647059
	15		0		-0.40	0.40	-1.1111111	1.1764706
	16 .	1.00			0.40	0.40		
***************************************								
	MON DEC 05, 1	994						
NAME AND ADDRESS OF THE PERSON	GROUP A ACCES							
	SAMPLE	TIME	ALPHA	BETA	ALFEA	BETA	ALPHA	BETA
	SN CODE	(MIN.)	COUNTY	COUNTS	CHA	CFM	CORRECTED	CORRECTED
-		1.00	2	1	1.60	-0.60	4.444444	1.7647059
		1.00		3	1.60	4.42	4.4464666	12.941276
-	No. of Street,	1.00	- 0		-0.40	1.40	1.11111111	4,11764/1
CONTRACTOR OF STREET	4	1			1. 3.45	114	KRESKERS	44-54-607
-		1.00	0		-0,40	0.40	-1.1111111	1.1764/06
	0	1.00	1	1	0.60	0.40	1.6666667	1.1764706
	7	1.00	1 1	3	0.60	2.40	1.6666667	7.0588235
NAME OF TAXABLE PARTY.		1.00	0	0	-0.40	-0.60	-1.11111111	-1.7647059
				The state of the s			2-10-10-10-10-10-10-10-10-10-10-10-10-10-	
						-		of restriction of the second
			-		-		CONTRACTOR OF THE PARTY.	
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								of Landson and and an
			-	-	- AMPRICA - AMPR			
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#### . Access Ports

SN	Area-1	Item :	Survey
9	Outside	B.P.	2A
10	Outside	B.P.	1A
11	Outside	B.P.	3A
12	Outside	B.P.	4A
13	Inside	B.P.	2A
14	Inside	B.P.	1A
15	Inside	B.P.	3A

### . Glory Hole Access Port [11/4"]

SN		Aı	ea-I	tem Survey
16	S	W	Side	Outside
17	S	W	Side	Inside
18	N	E	Side	Outside
19	N	E	Side	Inside

COUNTED BY	DATE
SURVEYED BY	DATE
COUNTER NUMBER	BACKGROUND & B



ACCESS	SAMPLE SN CODE	TIME	ALPHA	BETA	ALPHA	BETA	ALPHA	PEA
		(M1N.)	COUNTS	COUNTS	CPM	CFM	CORRECTED	0.981001
PORTS								
	9	1.00	3		2.00	0.40	1.222222	1.1764/06
	10	1.00		4	0.50	1.40	1.666667	4.11/64/.
	-11	1.00	0	0	-0.40	-0.60	1.1111111	-1,7647059
	12	1.00	100	¥ .	0.60	1.40	1.0000007	4.1176471
	13	1.00	. 0	. 0	-0.40	-0.60	-1.1111111	-1.7647059
	14	1.00		2	0.40	1.40	1.1111111	4.1176471 7.0588235
		1.00				4.70	11700007	7,000023
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HOLE	EN CODE	MIN.	COUNTS	200828	C28	SEM	THE TIME	CORRECTA.
		1.00		2	-0,40	1.60	1.1212411	4,11 0471
		1.00			5.4	4131		2.98.19
	-	1.00			1,41	0.40		11647.5
	-	1.06			9.4		**************************************	1,7647019
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	1-1-				-			
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			-	-	-	-		Augustinian mark
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				- Annual	The second second		CONTRACTOR OF STREET	

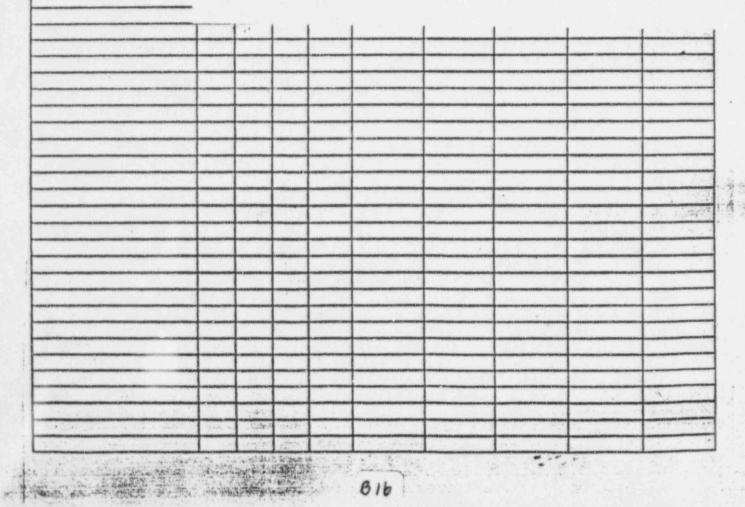
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COU	ITER	NUMB	ER	-	
E	FF.	FACTO	OR .	×	B

DATE	
DATE	And a second
BACKGROUND	x B



Mon JEC 05, 1994

Object or Area Su	rveyed	El	MPLE	TIME	ALPHA	BETA	ALPEA	F 10	ALFIA	FROM
	and the same of the same of	SN	COUR	MIN.	CUDATE	COUNCE	100	L.FK	Lyanti-Tim	1.800.122
WALL SAFE				1.00	0	1	0.4.	1,40		1.1764706
EAST	ACADIMITATION OF THE	2		1.00		4	0.40	3.4	********	10
- FLOOR	-	3		2.00	1 6	1	0.40	4.00	4.44.4144	7.0555335
	-	4		1.00	. 0	C	5.43	-0.50	1	-1,754/059
SAFE	American	. 5		1.00	. 0	0	0.40	0.50	1,1,11111	1.7647059
- F O	-	5				U	0.40	-0.60		-1.7547059
FLOOR	Semanara estar	. 9	2.1	1.00	U	U	0.40	1.10	-1.1111111	1.7547059
SAFE		Ł		1.60			0.40	9.40	-1.1111111	1.1764/00



# RADIATION EXPOSURE RATE ANALYSIS Micro R/hr at 1 Meter

AREA Reactor Pit

INSTRUMENT Ludlum Model 19 S/N 82787

BACKGROUND-SIMILAR CONSTRUCTION: Poured concrete wall\*, 5uR/hr

<sup>\*</sup> Similar pit not present on site

GRID POINT/BLOCK	MICRO-R/Hr
B 1*	4.0
B 2*	4.0
B 3*	4.0
C 1*	4.0
C 3*	4.0
D 1*	4.0
D 2*	4.0
D 3*	4.0

Note: \* = Measurement over grid point

Averaged Pit Measurements: 4.0 uR/hr