

UNIVERSITY OF VIRGINIA
NUCLEAR REACTOR FACILITY

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May 19, 2003

Docket 50-62

United States Nuclear Regulatory Commission
Mail Stop O12-G13
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2783

Attention: Mr. Daniel E. Hughes, Project Manager
Operating Reactor Improvements Program

Subject: Transmittal of University of Virginia Reactor Decommissioning Project
Continuing Characterization Summaries: Reactor Plant Stack Summary,
Mezzanine Crawl Space Summary, Pond Sediment Summary

References: 1. Amendment No. 26 to Amended Facility Operating License No. R-66 for
the University of Virginia Research Reactor
2. Docket 50-62

Dear Mr. Hughes,

The referenced amendment which approves the decommissioning plan for the University of Virginia Research Reactor calls for the licensee to submit reports of any characterization surveys performed that were not part of the license amendment application. We are pleased to transmit for your information three enclosed continuing characterization summaries, prepared for the University of Virginia by CH2M HILL and its subcontractor, Safety and Ecology Corporation. They are: Reactor Plant Stack Summary, Mezzanine Crawl Space Summary, and Pond Sediment Summary.


A020

May 19, 2003

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If you have any questions regarding this transmittal, please contact me at (434) 982-5446.

Sincerely,

A handwritten signature in black ink, appearing to read 'Robert Mulder', written over a large, stylized circular flourish.

Robert Mulder
Reactor Director
University of Virginia

Enclosures: UVAP Continuing Characterization: Reactor Plant Stack Summary
UVAP Continuing Characterization: Mezzanine Crawl Space Summary
UVAP Continuing Characterization: Pond Sediment Summary

c: Ralph Allen, Chair Reactor Decommissioning Committee
Stephen Holmes, NRC

UVAP Continuing Characterization: Pond Sediment Summary

A pond, covering a surface area of approximately 1600 m² and ranging in depth from approximately 2 to 4 m, is located just to the south of the University of Virginia Reactor Facility. During Reactor Facility operation this pond received discharges from certain laboratory drains, floor drains, and other sources of non-sanitary wastewater from the building. Run off from the adjacent land areas drain directly into this pond; an overflow from the nearby storm drain also empties into the pond.

The pond was drained to expose and permit the sediments to dry for improved access and to facilitate radiological monitoring and sediment sampling. Thickness of sediments varied from a fraction of a meter to 2 meters depending on location.

Survey grid corners were marked, dividing the pond into 10-meter square sections and referenced to the centerline of the dam spillway. Sections containing greater than 25% pond surface were numbered 1 thru 22, starting in the southeastern corner section (Figure 1). Surface gamma scans were initially performed in each 10-meter square section to identify locations of elevated direct radiation. The results were logged per 1.5-meter wide lanes with the highest to lowest noted readings. See attached survey UVAP-0245. Any discernable localized increase readings were denoted on the map and physically flagged for bias sampling.

Gamma scans of the drainage stream from the pond were performed for approximately 20 m below the spillway release point. Samples of sediment were obtained at 3 locations considered representative of the average stream conditions.

Samples were obtained from 16 statistical sample points and 18 biased sample locations (Figure 1).

A 2-inch diameter bucket auger and 2-inch PVC piping was used to collect samples. Continuous sampling was performed from surface to 6 inches beyond the interface of sediment/original soil or to auger refusal, whichever occurred first. Samples were placed in plastic bags or jars with each sample representing 6-12 inches of sediment depth. To the extent possible, a plastic sleeve was utilized to maintain an open sampling hole. Sampling tools were cleaned and surveyed for contamination, following each sample collection.

Samples of the pond sediments were screened by the on site gamma spectroscopy system, and ranged from 0.3 pCi/g to 4.0 pCi/g Cs-137. One sample indicated Co-60 at 1.6 pCi/g. Results are shown in Table 1.

Background sediment samples were obtained from the nearby Ragged Mountain Reservoir, upstream on the drainage feeding into the pond, and the soft rock face and fill dirt in the upper parking area. They were screened by the on site gamma spectroscopy system and results are shown in Table 2.

Samples from the UVAR pond, UVAR drainage and Ragged Mountain Reservoir were scanned for indication of increased direct gamma levels. Boreholes were gamma logged initially at 6", then at 12" intervals to the borehole bottom. Some locations did require insertion of a sealed tube to maintain the borehole open during gamma logging.

Based on the on site gamma screening, gamma logging and direct beta readings, six of the highest activity samples were sent to the off site laboratory for analysis. Gamma spectroscopy and 10 CFR Part 61 analyses for transuranics, Sr-90, and other hard-to-detect radionuclides were performed. Results ranged from 2.08 pCi/g to 3.46 pCi/g for Cs-137, no detectable Co-60 above MDC¹ level, 1.29 pCi/g to 3.61 pCi/g Ra-226, 2.42pCi/g to 4.77pCi/g Th-232, and Pu-241 at 15.8pCi/g. Results are shown in Table 3.

¹ MDC is Minimal Detectable Concentration

UVAP Continuing Characterization: Pond Sediment Summary

Two background samples were also submitted to the off-site laboratory for analysis. Results are shown in Table 4.

The remaining unanalyzed samples (those not sent to the offsite laboratory) were retained and stored under chain of custody.

Based on the results of off site laboratory analyses, surface measurements, and gamma borehole logs, the levels and ratios of facility-derived contaminants were determined and no areas in the pond were identified to require remediation. This survey satisfies the continuing characterization requirements of Area 13 and 14 from the characterization report, Appendix A of the University of Virginia Reactor Decommissioning Plan.

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UVAP Continuing Characterization: Pond Sediment Summary

Pond Sediment Samples

(On site results)

Table 1

Sample number	Interval	Gamma Logging	Core Scan	Gamma Spectroscopy							
				K-40	Cs-137	Co-60	Pb-212	Pb-214	U-238	Th-232	Ac-228
	Inches	CPM	CPM	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm
UVA-PD-002	0 to 6	7842	22#	28.6			3.7	1.8			2.3
UVA-PD-002DUP	0 to 6	*7120	80+	22.3			2.3	2.6			
UVA-PD-003	0 to 6	*6760	50+	15.8			1.2	1.1			
UVA-PD-004	0 to 6	*7028	60+	38.5	0.6		2.5				2.9
UVA-PD-005-1	0 to 6	6795		13.2	0.6		2.2	1.7			
UVA-PD-005-2	6 to 18	7648	160+	21.1			3.3	2.9			2.7
UVA-PD-005-3	18 to 30	6654		29.5			2.2	1.5			2.2
UVA-PD-005B1-1	0 to 6	7518		11.2	0.8		2.5	2.8			
UVA-PD-005B1-2	6 to 18	8625	200+	39.6			3.7	2.3			3.3
UVA-PD-005B1-3	18 to 30	7568		40.6			3.9	2.9			3.3
UVA-PD-005B2-1	0 to 6	7518		12.6	0.9		2.4	1.5			
UVA-PD-005B2-2	6 to 18	8625	180+	12.4	0.6		2.5	3.1			
UVA-PD-005B2-3	18 to 30	7568		24.2			2.1	0.9			1.8
UVA-PD-005B3-1	0 to 6	8347		23.3	0.3		1.8	1.3			2.1
UVA-PD-005B3-2	6 to 18	7984	17#	13.5	0.4		1.7	1.1			1.7
UVA-PD-006-1	0 to 6	6686		4.2	0.3		0.8	0.7			
UVA-PD-006-2	6 to 18	8118		30.2			4.2	3.1			
UVA-PD-006-3	18 to 30	6699	20#	64.1			4.5	9.6			
UVA-PD-006-4	30 to 42	7419		37.7			3.6	2.8			
UVA-PD-007-1	0 to 6	5243		23.9	0.6		5.1	1.8			
UVA-PD-007-2	6 to 18	5463		22.1			3.4	2.5			
UVA-PD-007-3	18 to 30	6102		15.9			1.7	1.5			
UVA-PD-007-4	30 to 42	7075	140+	22.5			2.4	2.2			
UVA-PD-007B1-1	0 to 6	*7252	20+	8.4	1.0		2.8	1.8			
UVA-PD-007B2-1	0 to 6	4186			0.9		3.3	3.8			
UVA-PD-007B2-2	6 to 18	4867		22.0			3.1	2.3			2.8
UVA-PD-007B2-3	18 to 30	5689	14#	21.2			2.3	2.4	3.9		
UVA-PD-008-1	0 to 6	6938		8.8			2.2	3.7			
UVA-PD-008-2	6 to 18	7173	50+	39.0			3.3	2.8	1.6		
UVA-PD-008-3	18 to 30	6936		31.2			2.1	1.6			1.8
UVA-PD-008B1-1	0 to 6	*6459		14.6	0.5		2.1	2.0			
UVA-PD-008B1-2	6 to 18	*7846	100+	33.7			2.9	2.4			
UVA-PD-008B2-1	0 to 6	4440		4.1	0.2		0.9	0.6			0.7

* Denotes no PVC liner used for gamma logging

Denotes 44-9 Beta /Gamma probe readings

+ Denotes 43-68 Beta/Gamma probe reading

Gamma Spectroscopy results are considered qualitative for screening purposes due to being counted in a

Non-standard preparations of sample for homogeneous mixture and drying.

UVAP Continuing Characterization: Pond Sediment Summary

Pond Sediment Samples

(Offsite Laboratory)

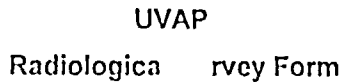
Table 3

Sample number	Interval	Gamma Spectroscopy and Part 61 results pCi/g									
	in										
	Inches	Ni-63	Pu-238	Pu-239/40	Pu-241	Am-241	Cm-242	Cm-244	C-14	Tc-99	H-3
UVA-PD-005B1-2	6 to 18	-4.68E-02	3.30E-03	6.60E-03	7.22E-01	4.71E-03	0.00E+00	0.00E+00	2.05E-01	-8.77E-02	1.44E+02
Qualifier/MDA		U/ 9.19E-01	U/ 1.98E-02	U/ 2.33E-02	J/ 6.79E-01	U/ 1.28E-02	U/ 1.84E-02	U/ 1.29E-02	U/ 7.99E-01	U/ 7.47E-01	J/ 4.67E+01
UVA-PD-11B1-3	18 to 30	3.06E+00	1.74E-02	2.08E-02	6.81E-01	9.33E-03	0.00E+00	0.00E+00	2.75E-02	4.83E-02	2.59E+02
Qualifier/MDA		J/ 9.63E-01	J/ 1.18E-02	J/ 2.07E-02	U/ 7.09E-01	U/ 2.48E-02	U/ 2.02E-02	U/ 1.42E-02	U/ 8.11E-01	U/ 7.68E-01	J/ 9.07E+01
UVA-PD-012-3	18 to 30	1.07E+00	1.69E-02	3.56E-03	9.53E-01	2.00E-02	-1.43E-02	0.00E+00	3.24E-01	-8.78E-02	1.33E+02
Qualifier/MDA		J/ 9.02E-01	U/ 2.13E-02	U/ 2.13E-02	J/ 7.77E-01	J/ 1.35E-02	U/ 3.44E-02	U/ 1.37E-02	U/ 7.84E-01	U/ 7.63E-01	J/ 5.34E+01
UVA-PD-012B2-2	6 to 18	1.59E-01	0.00E+00	2.64E-02	1.31E+01	8.66E-02	0.00E+00	4.37E-02	-1.32E-01	-8.48E-02	5.75E+01
Qualifier/MDA		U/ 8.17E-01	U/ 1.19E-01	U/ 2.49E-01	J/ 8.83	U/ 1.17E-01	U/ 1.69E-01	U/ 1.18E-01	U/ 8.00E-01	U/ 7.60E-01	J/ 3.24E+01
UVA-PD-013B-1	0 to 6	2.29E+01	1.23E-01	0.00E+00	1.58E+01	0.00E+00	0.00E+00	0.00E+00	-1.90E-02	5.94E-01	1.10E+01
Qualifier/MDA		8.73E-01	U/ 2.67E-01	U/ 1.28E-01	1.06E+01	U/ 1.28E-01	U/ 1.85E-01	U/ 1.29E-01	U/ 8.09E-01	U/ 8.04E-01	U/ 8.96E+01
UVA-PD-021B-2	6 to 18	1.24E-01	6.92E-03	-1.54E-03	1.07E+00	-1.34E-03	0.00E+00	0.00E+00	2.24E-01	-2.04E-01	5.32E+01
Qualifier/MDA		U/ 8.35E-01	U/ 1.84E-02	U/ 2.17E-02	J/ 8.91E-01	U/ 3.20E-02	U/ 2.61E-02	U/ 1.83E-02	U/ 8.10E-01	U/ 7.55E-01	J/ 4.96E+01
Sample number	Interval	Gamma Spectroscopy and Part 61 results pCi/g									
	in										
	Inches	Co-60	Cs-137	K-40	Ra-226	Th-232	U-238DHP	I-129L	Sr-90	Fe-55	
UVA-PD-005B1-2	6 to 18	1.32E-02	9.80E-02	3.63E+01	2.02E+00	2.64E+00	2.97E+00	-6.47E-03	5.58E-02	-5.58E+01	
Qualifier/ MDA		U/ 1.48E-01	U/ 1.54E-01	1.18	2.37E-01	6.59E-01	1.43	U/ 2.05E-01	U/ 6.05E-01	U/ 2.03E+01	
UVA-PD-11B1-3	18 to 30	1.11E-01	2.22E+00	3.62E+01	3.29E+00	4.77E+00	not	1.73E-01	1.09E-01	-3.95E+01	
Qualifier/ MDA		U/ 3.08E-01	2.73E-01	1.82	4.80E-01	1.35	Detected	U/ 5.06E-01	U/ 7.22E-01	U/ 1.80E+01	
UVA-PD-012-3	18 to 30	2.23E-02	2.08E+00	2.78E+01	1.69E+00	2.42E+00	2.92E+00	4.33E-02	1.50E-01	-2.60E+01	
Qualifier/ MDA		U/ 1.52E-01	1.18E-01	9.26E-01	2.18E-01	6.00E-01	1.31	U/ 2.16E-01	U/ 6.45E-01	U/ 1.55E+01	
UVA-PD-012B2-2	6 to 18	2.99E-02	-1.62E-02	3.04E+01	1.50E+00	3.01E+00	not	1.21E-01	3.14E-01	-3.42E+01	
Qualifier/ MDA		U/ 1.46E-01	U/ 1.24E-01	1.27	1.96E-01	5.58E-01	Detected	U/ 2.65E-01	U/ 6.01E-01	U/ 2.03E+01	
UVA-PD-013B-1	0 to 6	9.53E-01	3.46E+00	2.13E+01	3.61E+00	4.16E+00	not	-2.30E-01	4.27E-02	-4.21E+01	
Qualifier/ MDA		U/ 6.12E-01	3.18E-01	3.17	5.28E-01	1.53	Detected	U/ 4.54E-01	U/ 8.64E-01	U/ 1.79E+01	
UVA-PD-021B-2	6 to 18	3.89E-02	2.71E-02	2.88E+01	1.29E+00	2.51E+00	not	-1.05E-01	8.76E-01	-4.94E+01	
Qualifier/ MDA		U/ 1.36E-01	U/ 1.22E-01	1.13	1.95E-01	5.57E-01	Detected	U/ 2.16E-01	J/ 6.17E-01	U/ 1.34E+01	
J Qualifier - No U qualifier has been assigned and result is below the reporting limit, contractual required detection limit, or report value is estimated.											
U Qualifier - Analyzed for, but the result is less than the MDC/MDA. Total uncertainty or gamma scan software did not identify the nuclide.											
MDC/MDA- The Minimum Detectable Concentration / Minimum Detectable Activity											

UVAP Continuing Characterization: Pond Sediment Summary

Creek Background, Upstream (Offsite Laboratory) Table 4

Sample number	Interval	Gamma Spectroscopy and Part 61 results pCi/g									
	in										
	Inches	Ni-63	Pu-238	Pu-239/40	Pu-241	Am-241	Cm-244	Am-243	C-14	Tc-99	H-3
UVA-BKGSL-001	0 to 6	0.00	5.75E-03	5.00E-03	1.20	3.28E-02	3.29E-02	3.50e-02	6.50	1.08E-01	0.00E+00
Qualifier/ MDA		U/ 1.00	U/ 4.0e-02	U/ 1.0e-02	1.08	U/ 5.00E-02	U/ 5.0e-02	3.0e-02	4.09	U/ 1.50e-01	U/ 3.09
UVA-BKGSL-002	0 to 6	-4.01E-01	3.30E-02	8.99E-03	0.65	2.00E-01	4.45E-02	5.10e-2	3.00	5.54E-02	1.85E+00
Qualifier/ MDA		U/ 9.2e-01	U/ 5.0e-02	U 4.0e-02	U/ 1.17	5.00E-02	4.0e-02	3.0e-02	2.51	U/ 1.60e-01	U/ 3.59
		Co-60	Cs-137	K-40	Fe-55	Th-232	U-238DHP	I-129	Sr-90	Th-230	
UVA-BKGSL-001	0 to 6	1.36E-01	2.77E-01	2.26E+01	-9.25E-01	1.61E+00	1.58E+00	-2.38E-01	-4.93E-02	3.26	
Qualifier/ MDA		U/ 2.70e-01	2.30e-01	1.69	U/ 1.57	3.0e-02	9.0e-02	U/ 5.4e-01	U/ 1.40e-01	2.0e-02	
UVA-BKGSL-002	0 to 6	2.45E-02	3.81E-02	2.93E+01	4.09E-01	1.92E+00	1.55E+00	1.22E-01	2.12E-01	1.55	
Qualifier/ MDA		U/ 1.20e-01	U/ 1.30e-01	1.11	U/ 1.22	2.0e-02	8.0e-02	U/ 4.0e-01	1.90e-01	3.0e-02	
U Qualifier - Analyzed for, but the result is less than the MDC/MDA. Total uncertainty or gamma scan software did not identify the nuclide.											
MDC/MDA- The Minimum Detectable Concentration / Minimum Detectable Activity											



Radiological Survey Form

Form SEC-RP-21.2 Rev.0



CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____

SHEET NO. 1

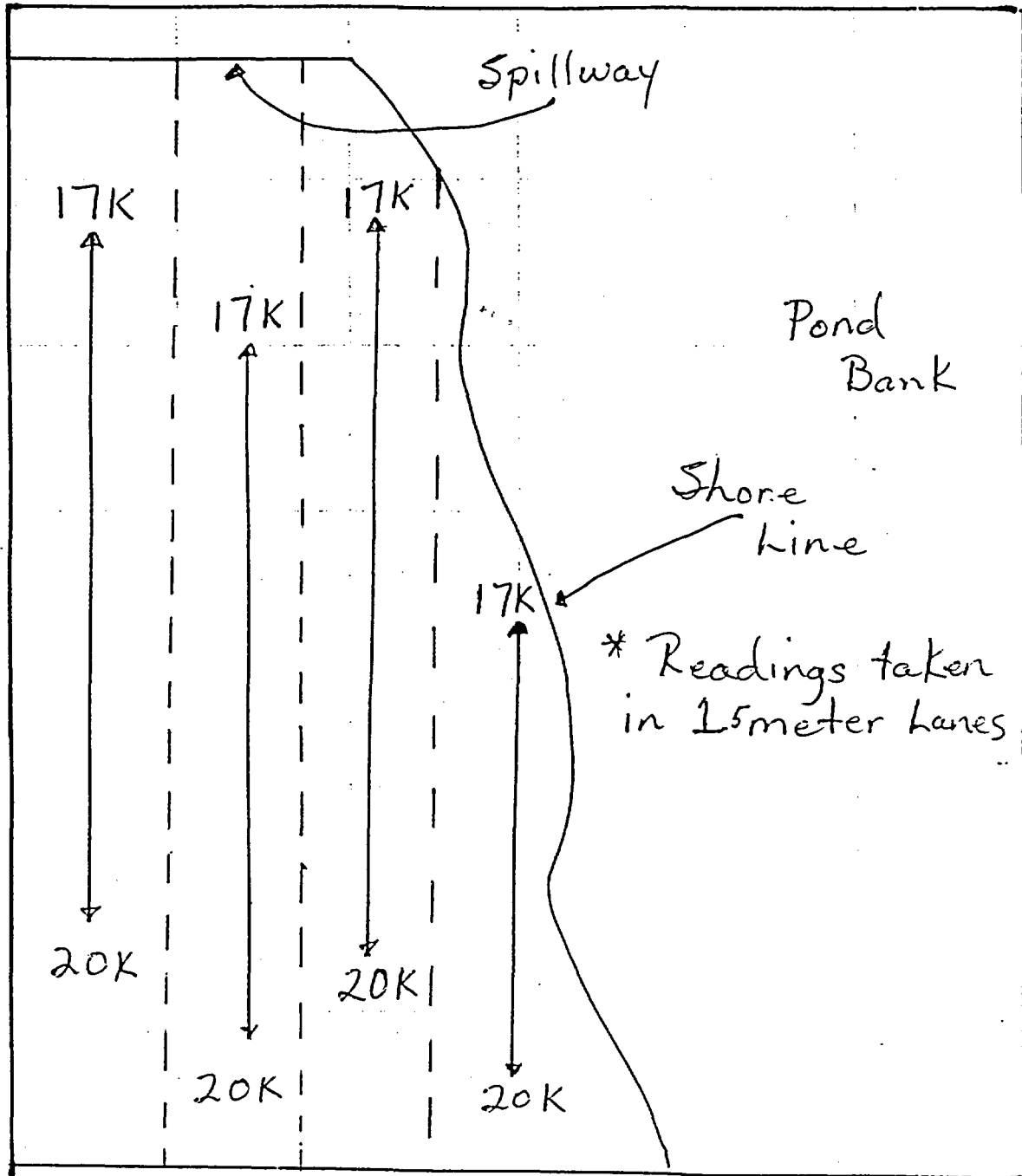
PROJECT UVA - Characterization of Pond Sediments

JOB NO. _____

SUBJECT Surface Gramma Scan CALCULATION NO. _____

FILE NO. _____

Grid # 1





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Hright DATE 09-17-02 CHECKED BY _____

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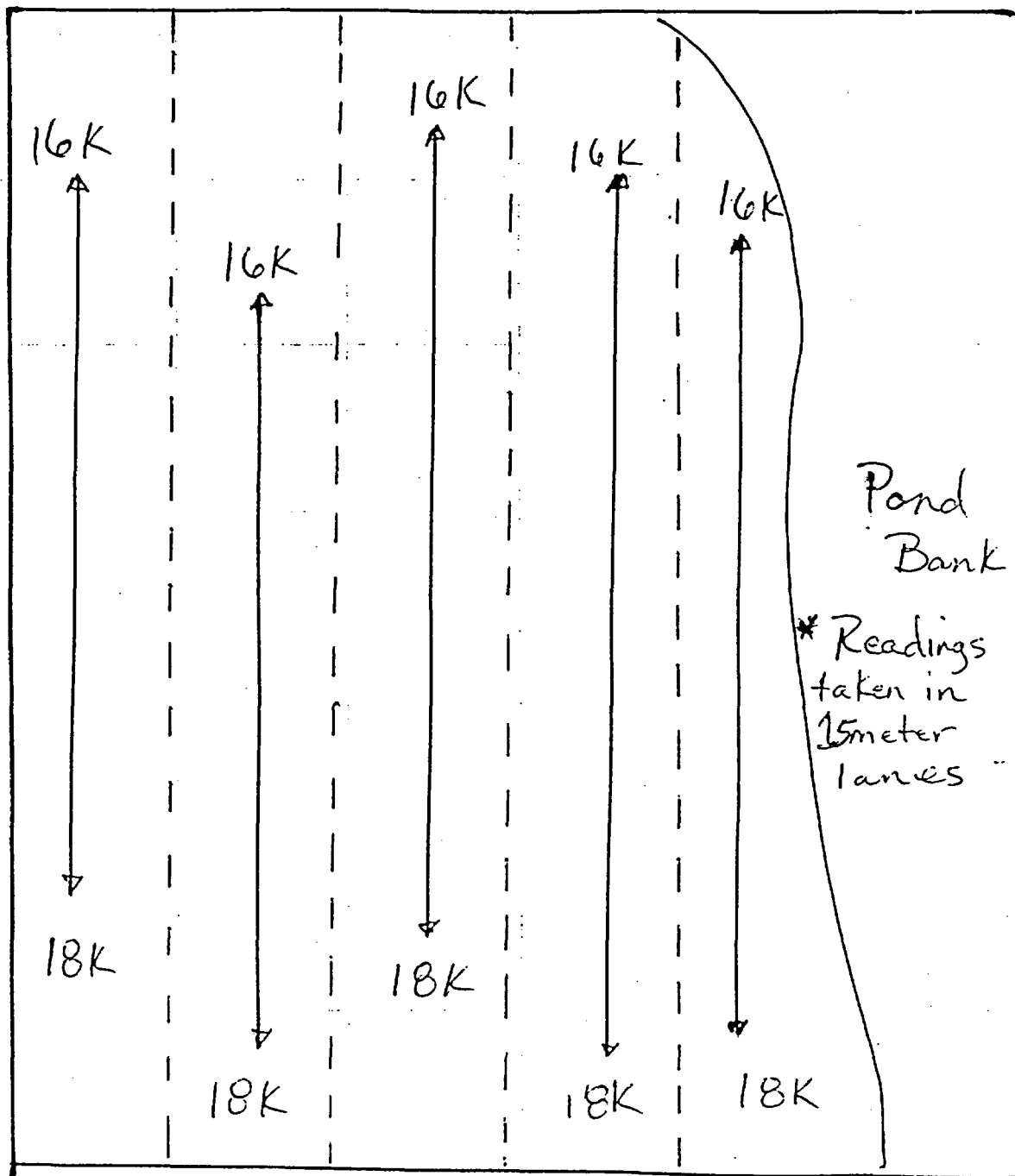
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JOB NO. _____

SUBJECT Surface Gamma Scan CALCULATION NO. _____

FILE NO. _____

Grid # 2





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY

Michael T. Wright

DATE

09-17-02

CHECKED BY

SHEET NO.

3

PROJECT

UVA Characterization of Pond Sediments

JOB NO.

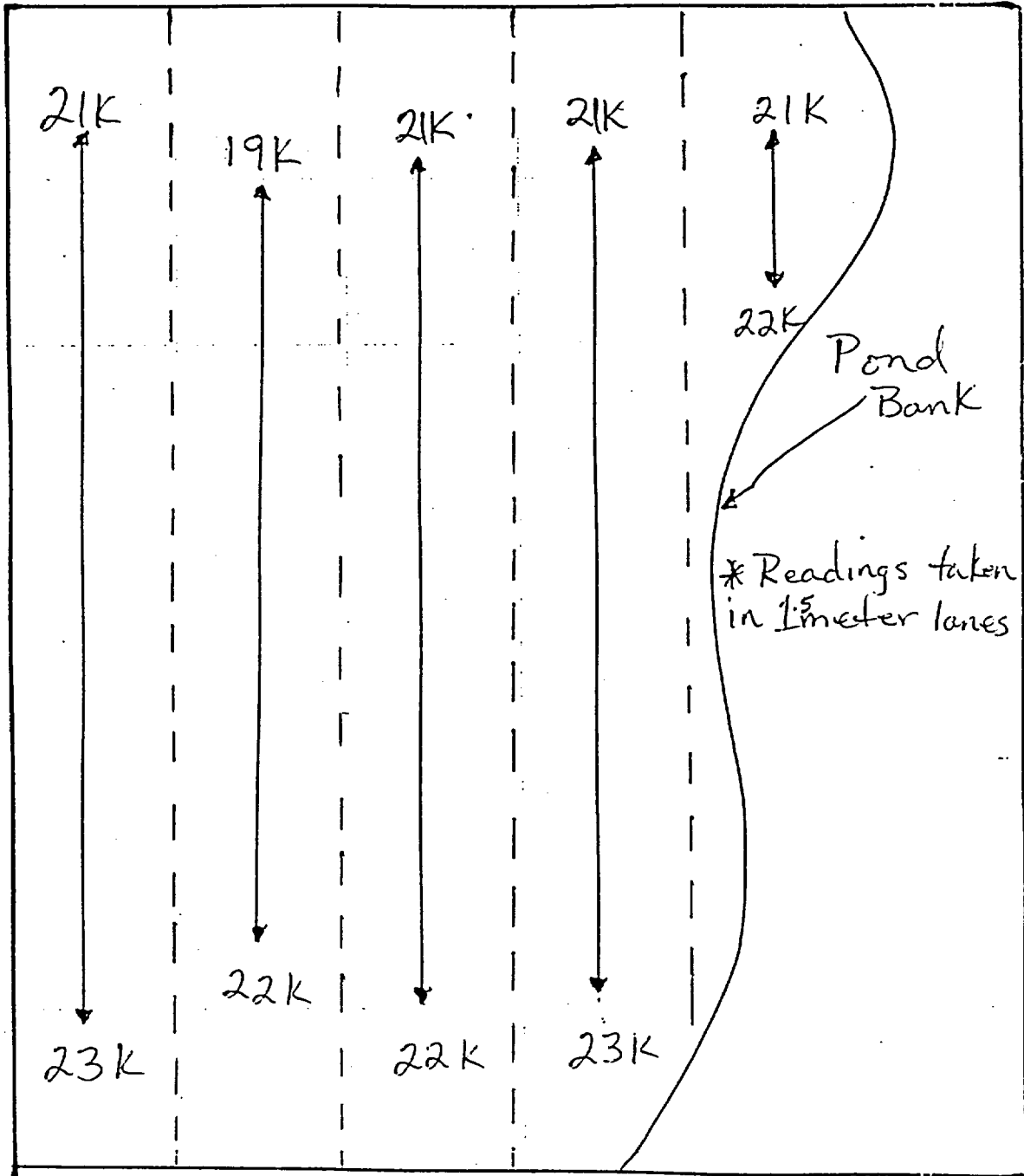
SUBJECT

Surface Gramma Scan

CALCULATION NO.

FILE NO.

Grid # 3





CALCULATION SHEET

DATE 09-19-02

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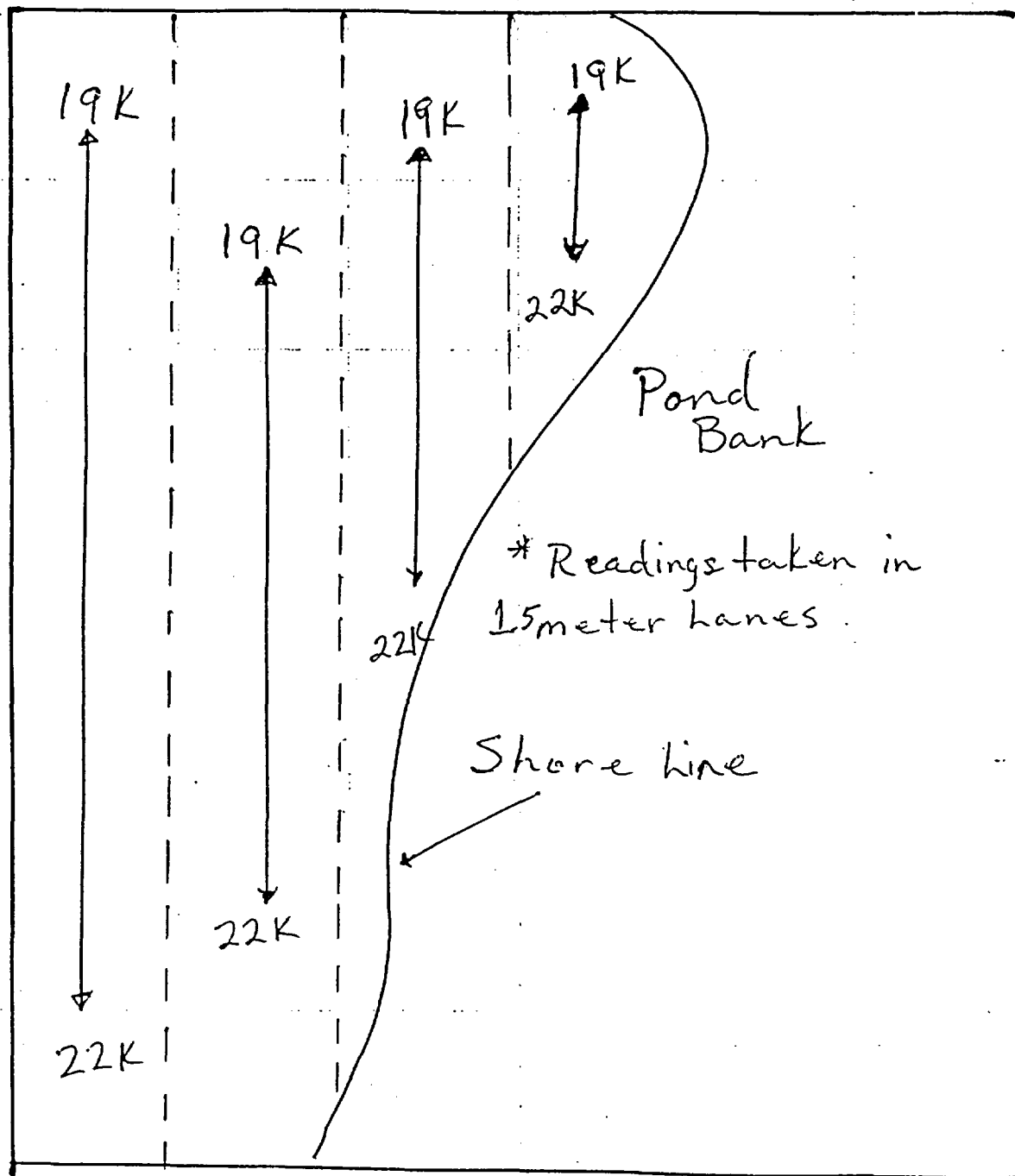
PROJECT UVA-Characterization of Pond Sediments

JOB NO. _____

SUBJECT Surface Gamma Scan CALCULATION NO. _____

FILE NO. _____

Grid # 4





CALCULATION SHEET

DATE 09-19-02

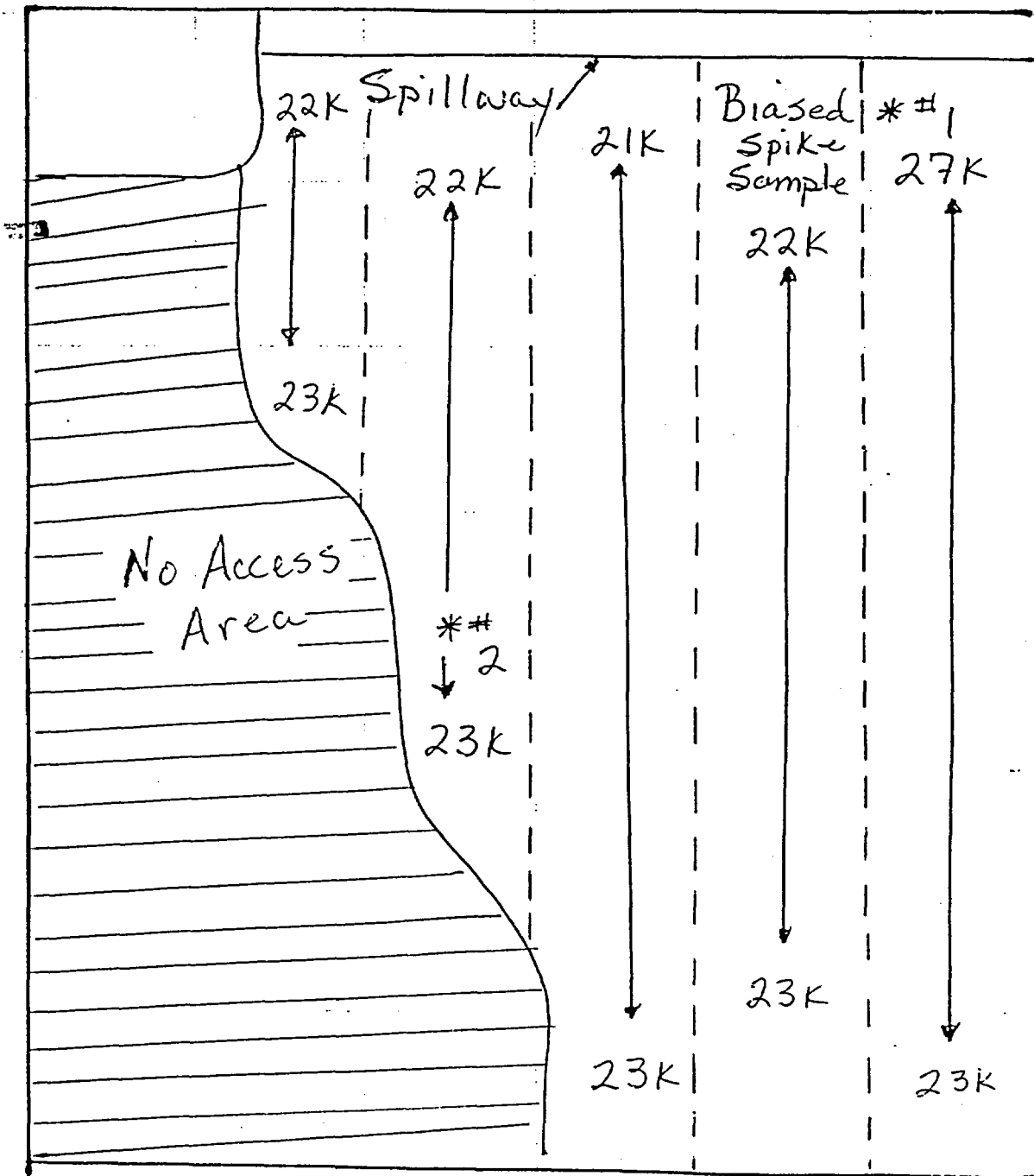
DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____ SHEET NO. 5

PROJECT UVA - Characterization of Pond Sediments JOB NO. _____

SUBJECT Surface Gramma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 5

* Readings taken in
1.5 meter lanes



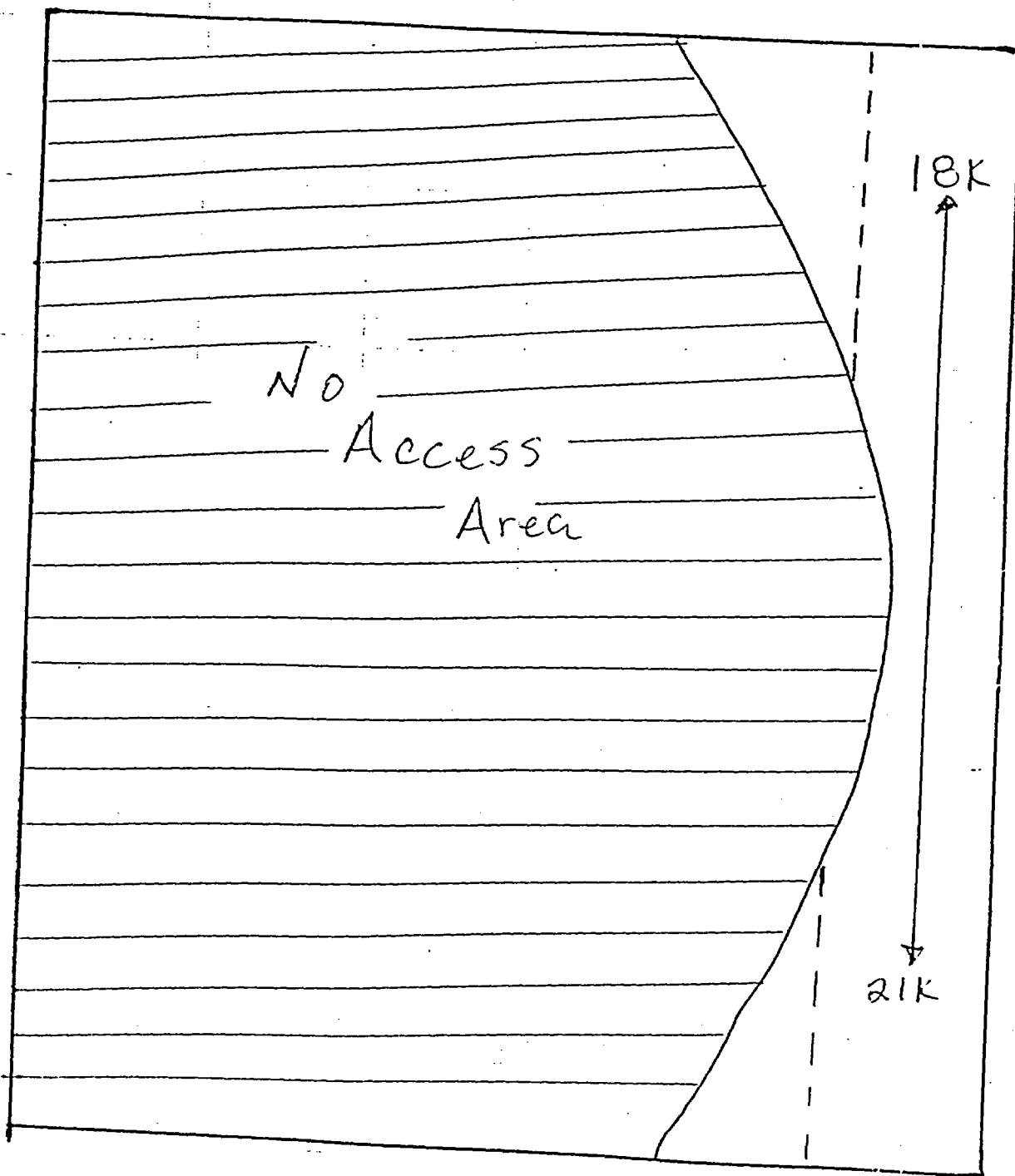


CALCULATION SHEET

DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____
PROJECT UVA - Characterization of Pond Sediments SHEET NO. 6
SUBJECT Surface Gamma Scan JOB NO. _____
CALCULATION NO. _____ FILE NO. _____

Grid # 6

* Readings taken in
1.5 meter lanes





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Wright

DATE 09-17-02

CHECKED BY _____

SHEET NO. 7

PROJECT UVA - Characterization of Pond Sediments

JOB NO. _____

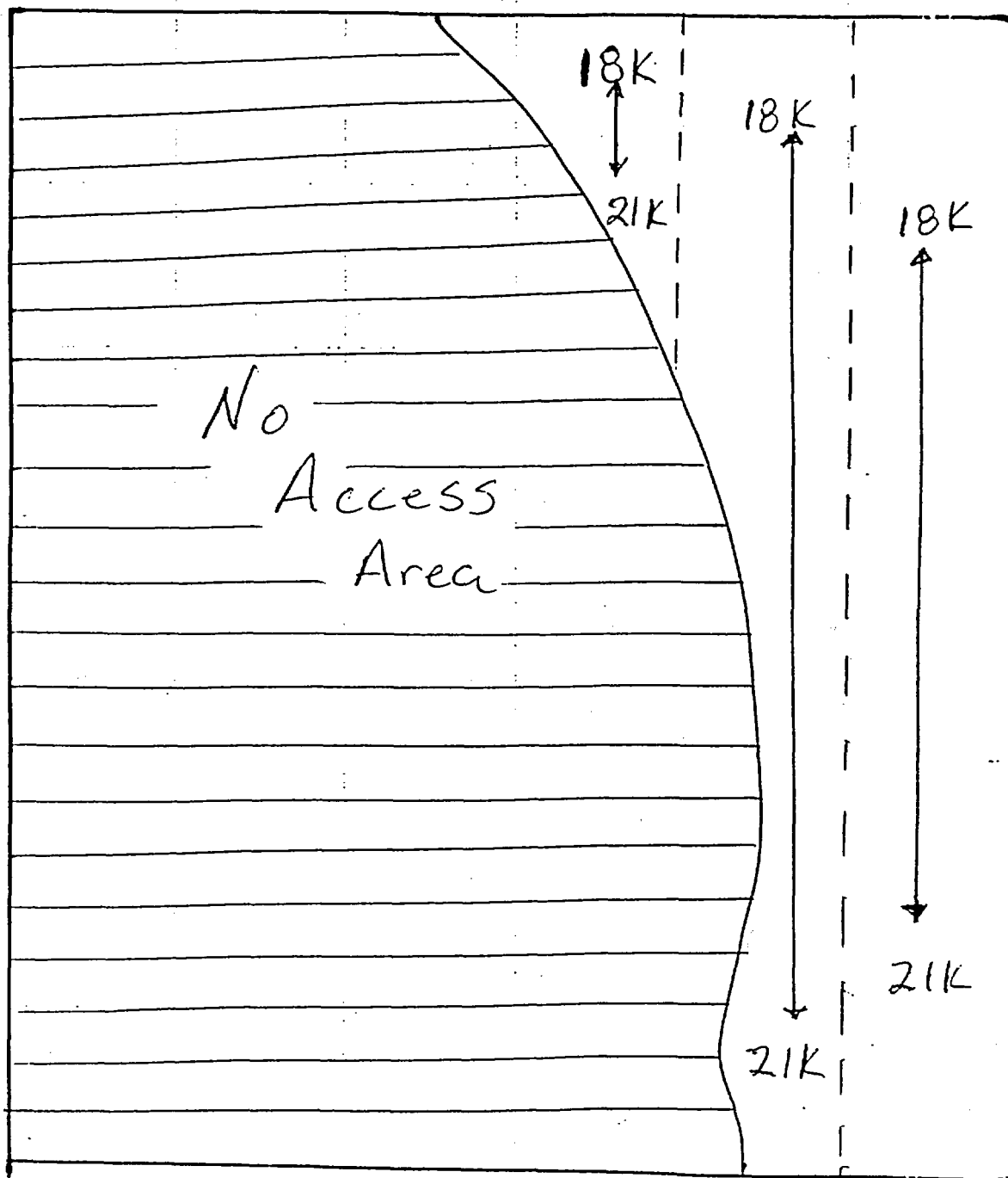
SUBJECT Surface Gamma Scan

CALCULATION NO. _____

FILE NO. _____

Grid # 7

* Readings taken in 1.5 meter lanes





CALCULATION SHEET

DATE 09-19-02

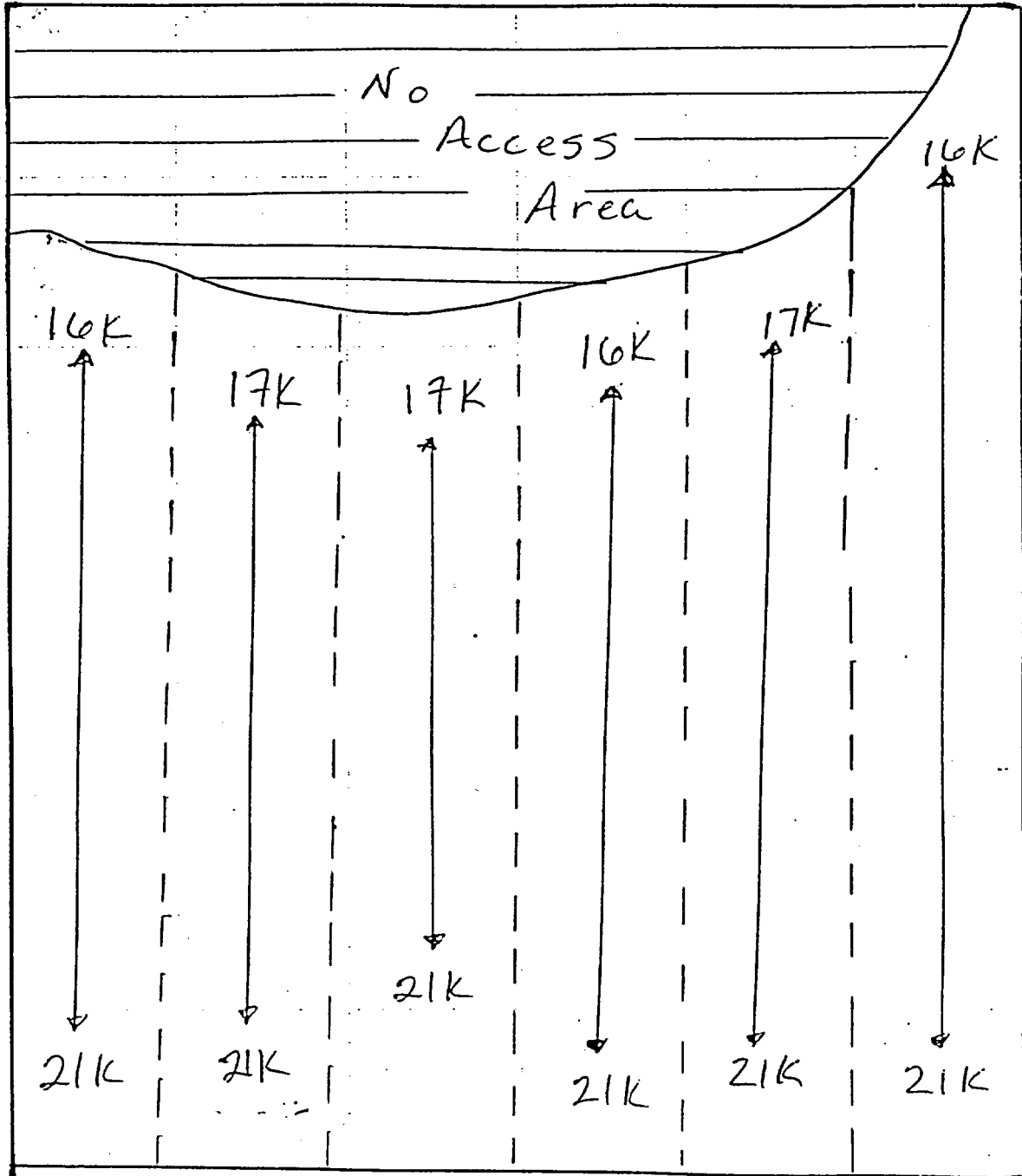
DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____ SHEET NO. 8

PROJECT UVA - Characterization of Pond Sediments JOB NO. _____

SUBJECT Surface Gramma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 8

* Readings taken in 15 meter lanes





CALCULATION SHEET

DATE 09-19-02

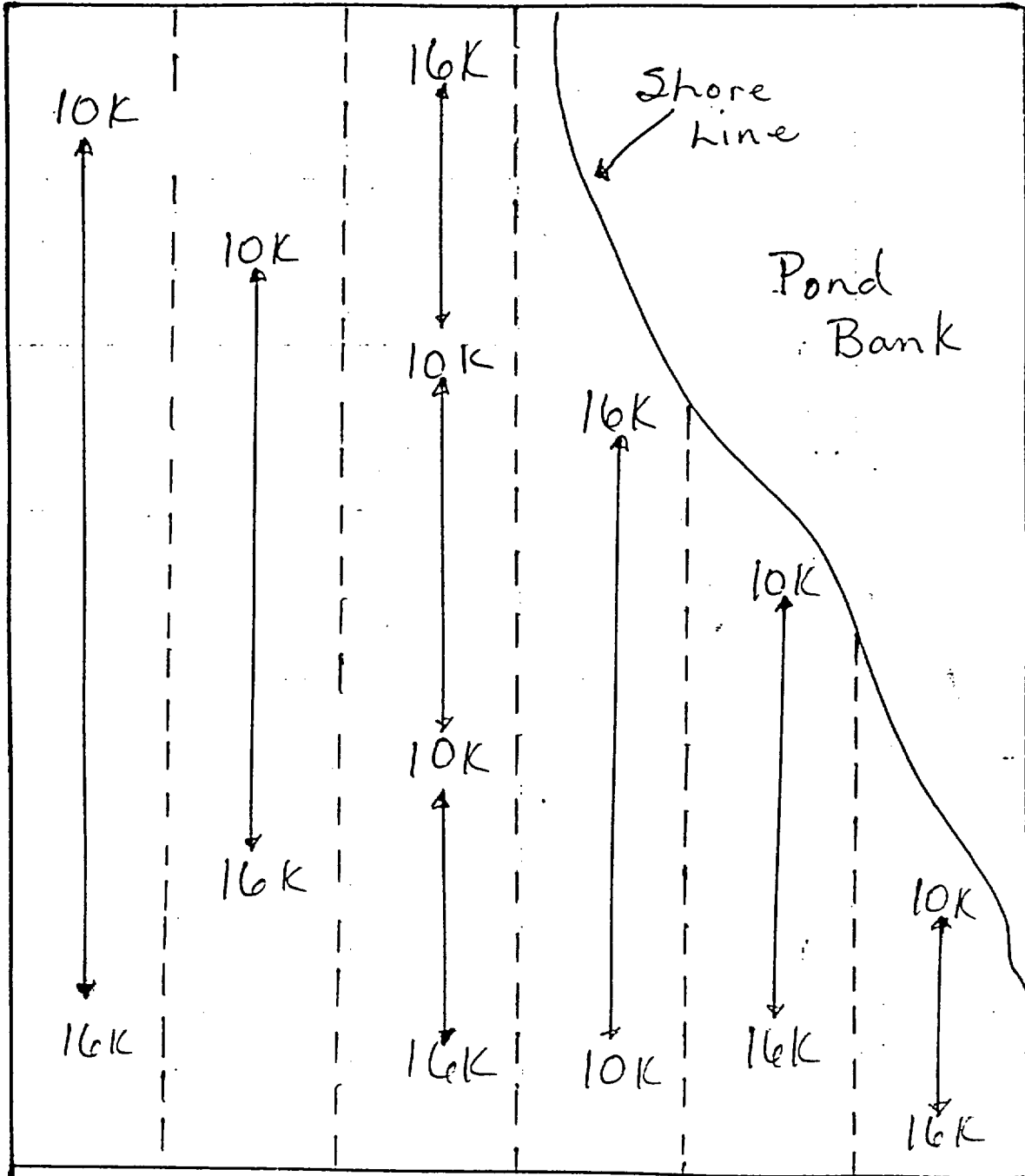
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PROJECT UVA-Characterization of Pond Sediments JOB NO. _____

SUBJECT Surface Gamma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 9

* Readings taken 1.5 meter lanes





CALCULATION SHEET

DATE 09-19-02

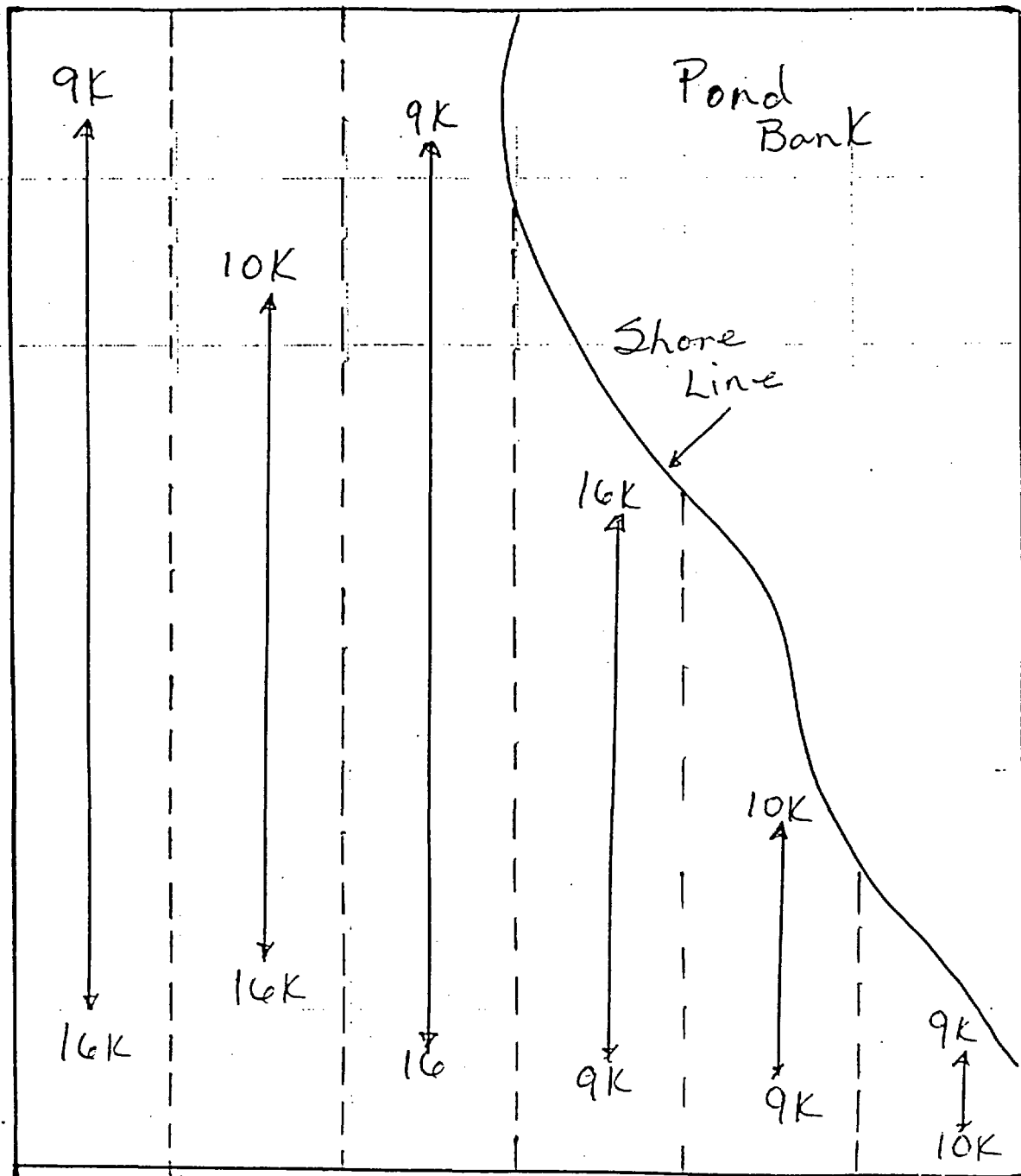
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PROJECT UVA - Characterization of Pond Sediments JOB NO. _____

SUBJECT Surface Gramma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 10

*Readings taken in
15 meter lanes





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Wright

DATE 09-17-02 CHECKED BY _____

SHEET NO. 11

PROJECT UVA Characterization of Pond Sediments

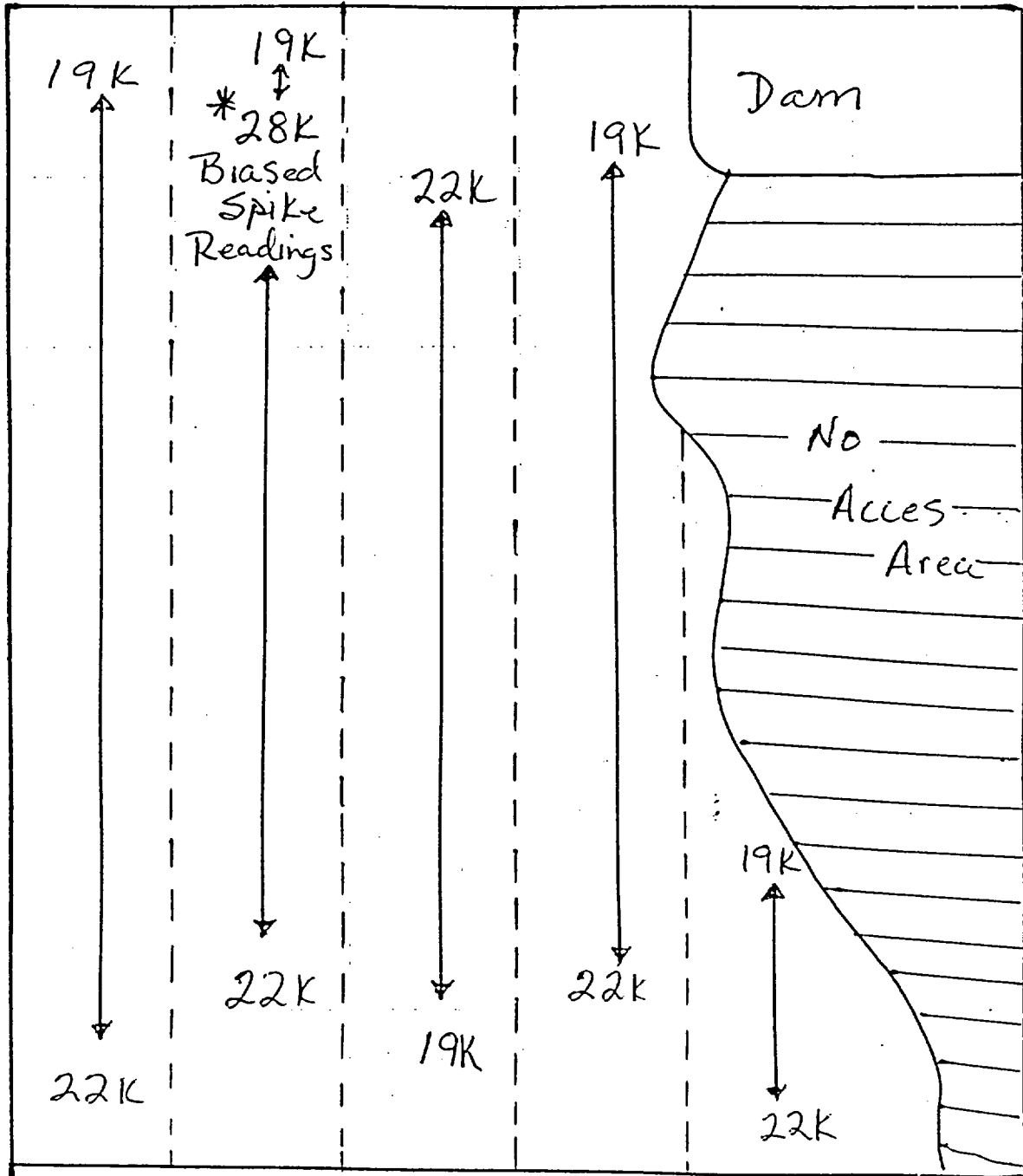
JOB NO. _____

SUBJECT Surface Gamma Scan CALCULATION NO. _____

FILE NO. _____

Grid # 11

*Readings taken in 1.5 meter lanes





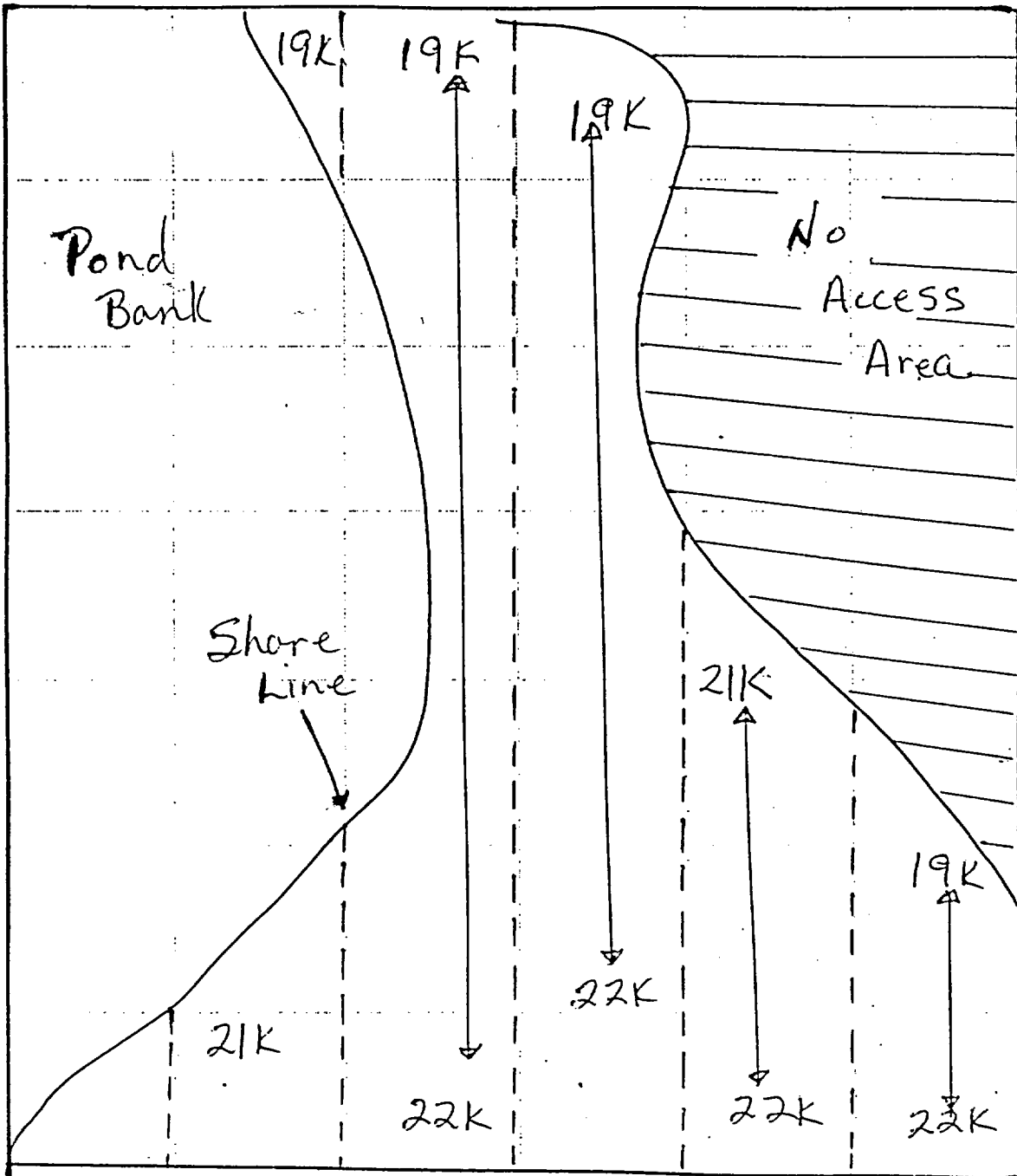
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DATE 09-19-02

DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____ SHEET NO. 1a
PROJECT UVA - Characterization of Pond Sediments JOB NO. _____
SUBJECT Surface Gamma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 12

*Readings taken in 1.5 meter lanes





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____

SHEET NO. 13

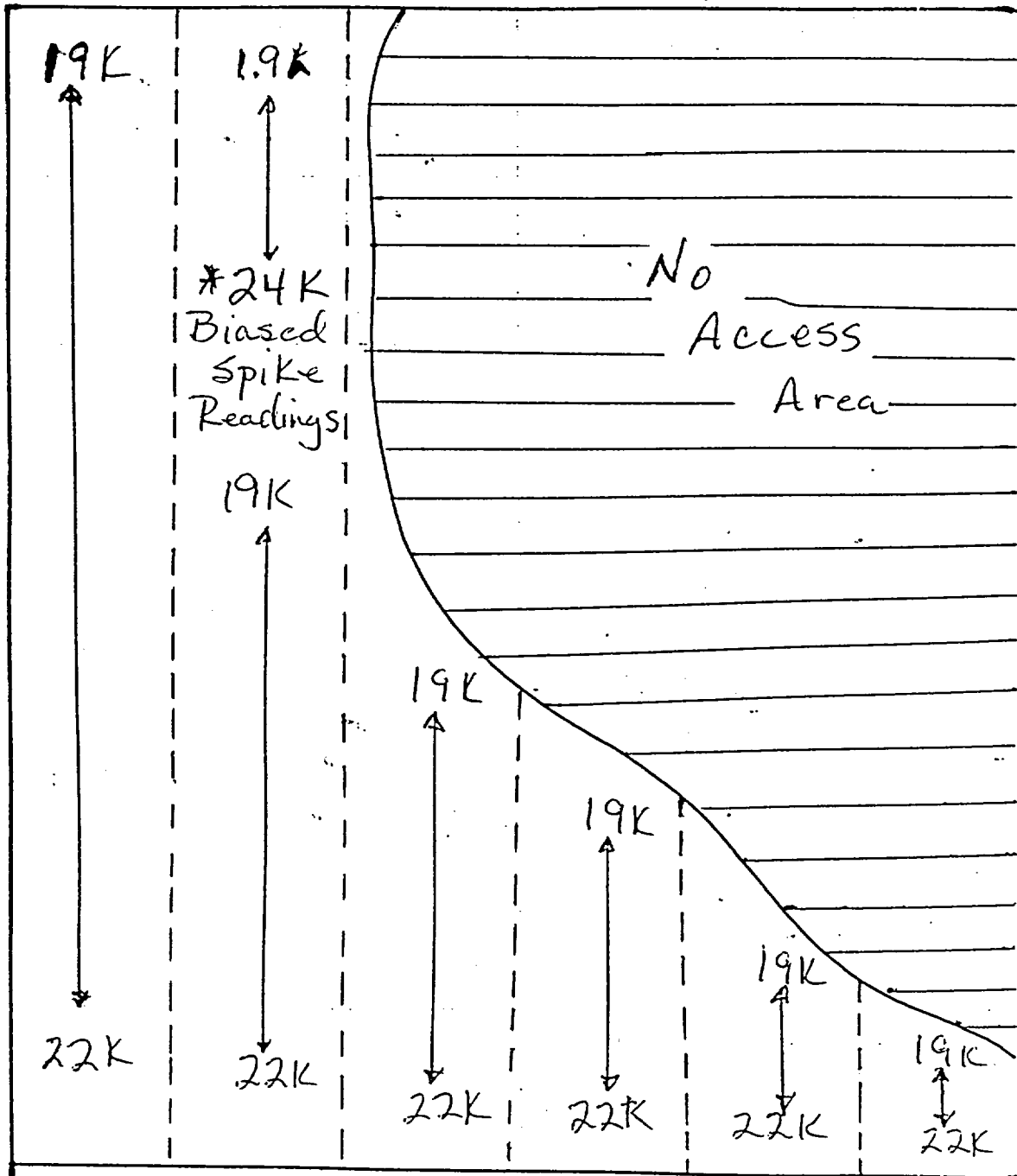
PROJECT UVA - Characterization of Pond Sediments

JOB NO. _____

SUBJECT Surface Gamma Scan CALCULATION NO. _____

FILE NO. _____

Grid # 13 * Readings taken in 1.5 meter lanes





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____

SHEET NO. 14

PROJECT UVA Characterization

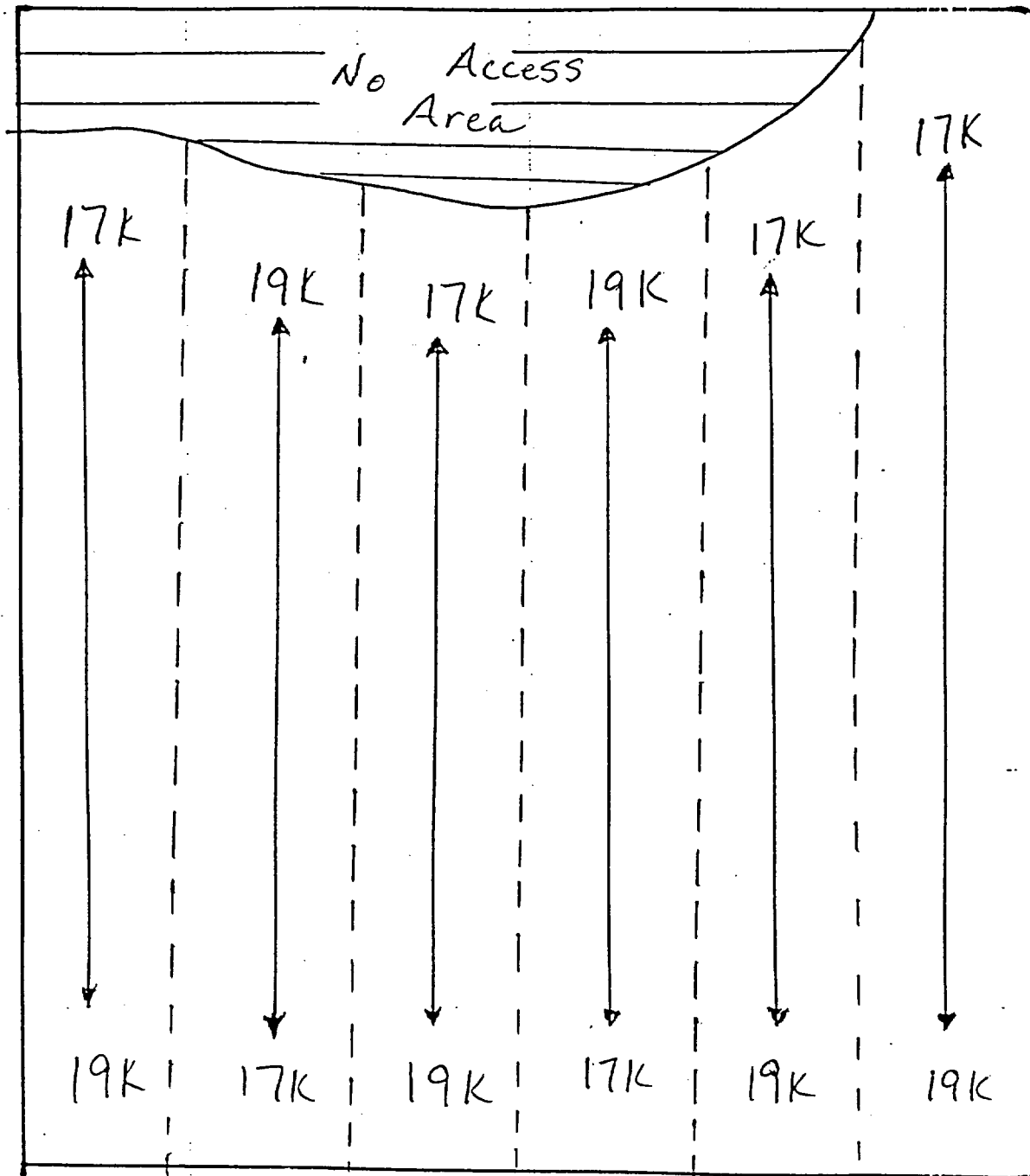
JOB NO. _____

SUBJECT Surface Gamma Scan CALCULATION NO. _____

FILE NO. _____

Grid # 14

*Readings taken in ⁵meter lanes





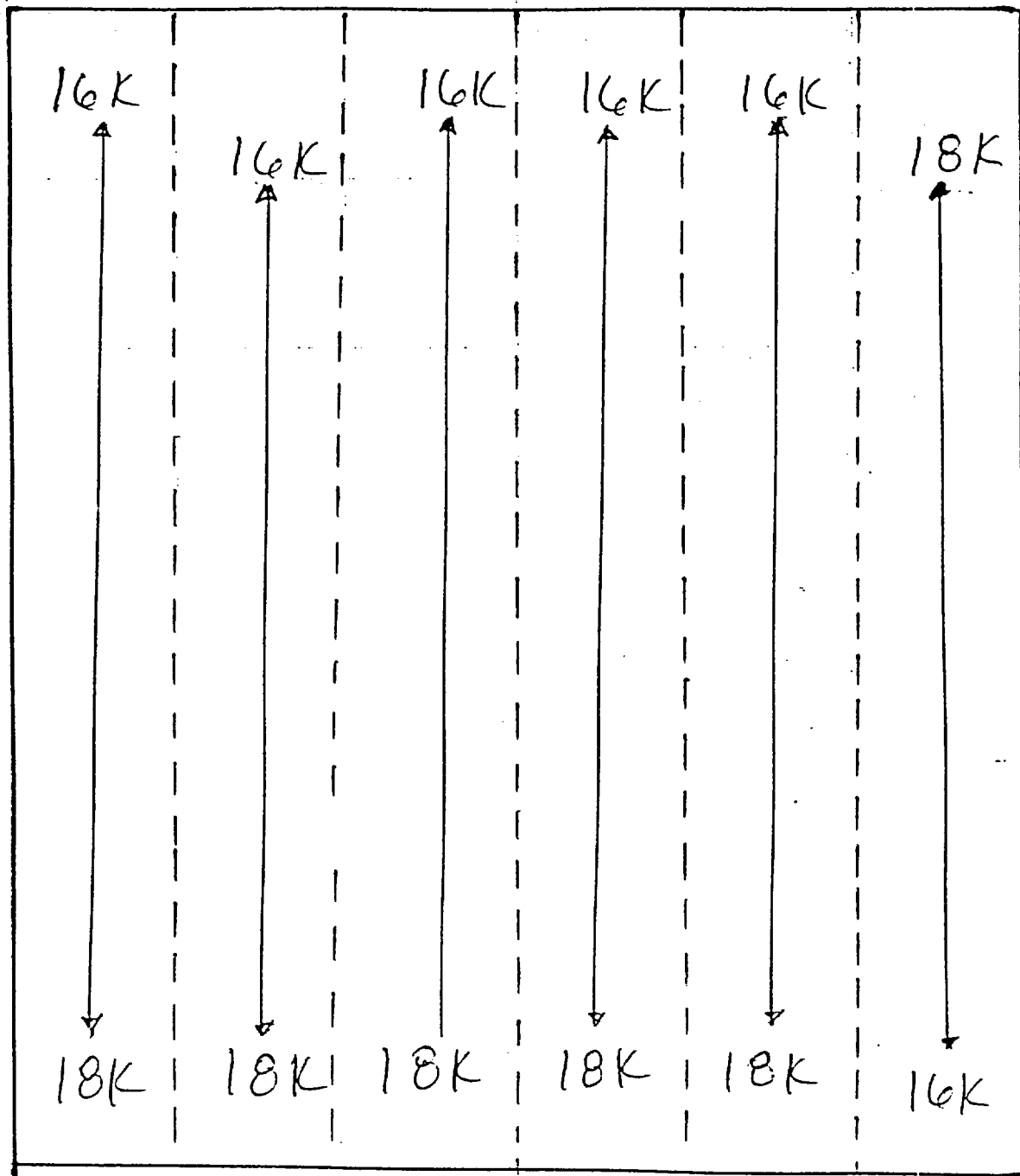
CALCULATION SHEET

DATE 09-19-07DESIGNED BY Michael T. Hright DATE 09-17-02 CHECKED BY _____SHEET NO. 15PROJECT UVA - Characterization of Pond Sediments

JOB NO. _____

SUBJECT Surface Gamma Scan

CALCULATION NO. _____ FILE NO. _____

Grid # 15 *Readings taken in 1st meter lanes



CALCULATION SHEET

DATE 09-19-02

DESIGNED BY

Michael T. Wright

DATE

09-17-02

CHECKED BY

SHEET NO.

16

PROJECT

UVA - Characterization of Pond Sediments

JOB NO.

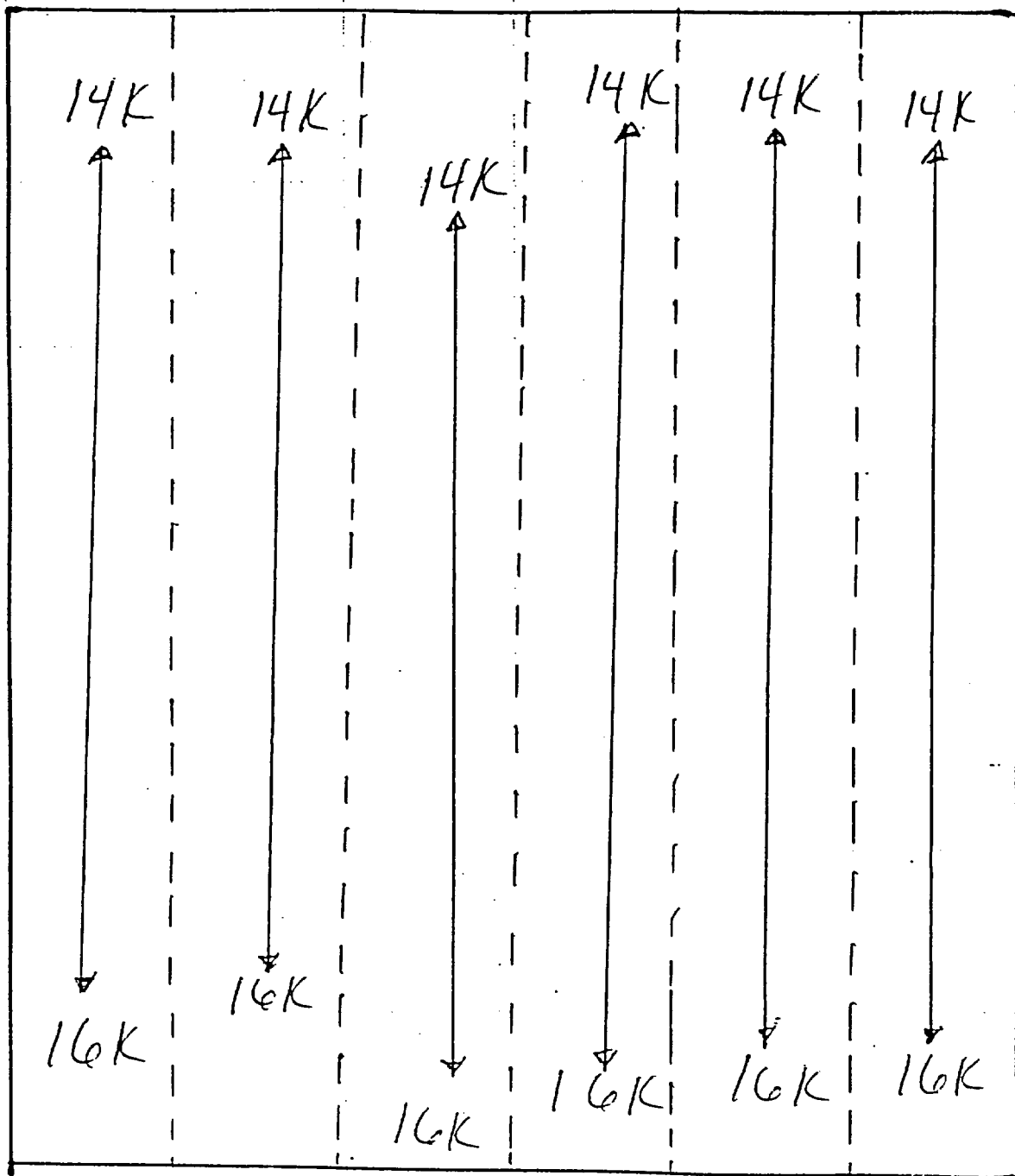
SUBJECT

Surface Gamma Scan

CALCULATION NO.

FILE NO.

Grid # 16 *Reading taken in 1⁵ meter lanes



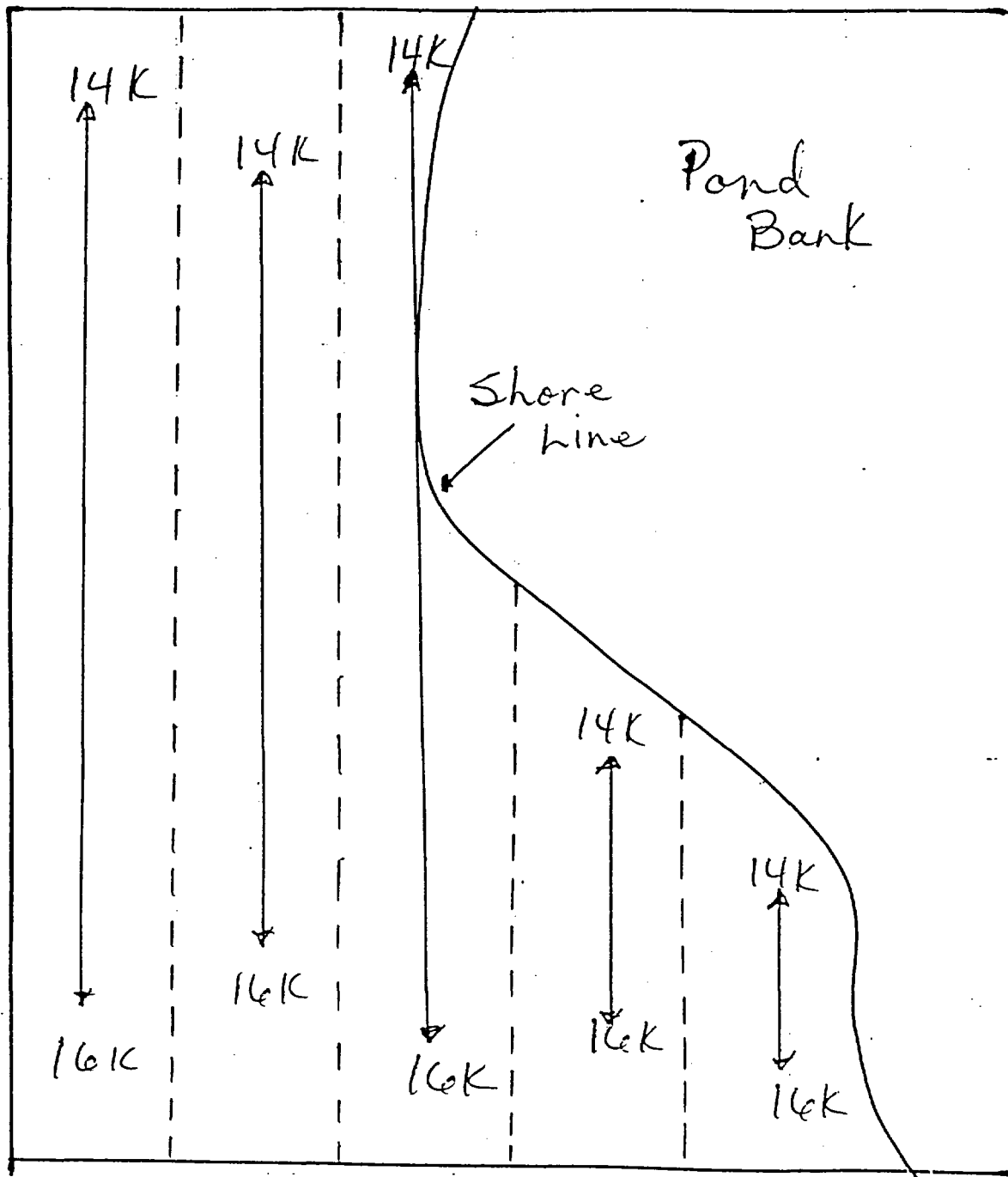


CALCULATION SHEET

DATE 09-19-02

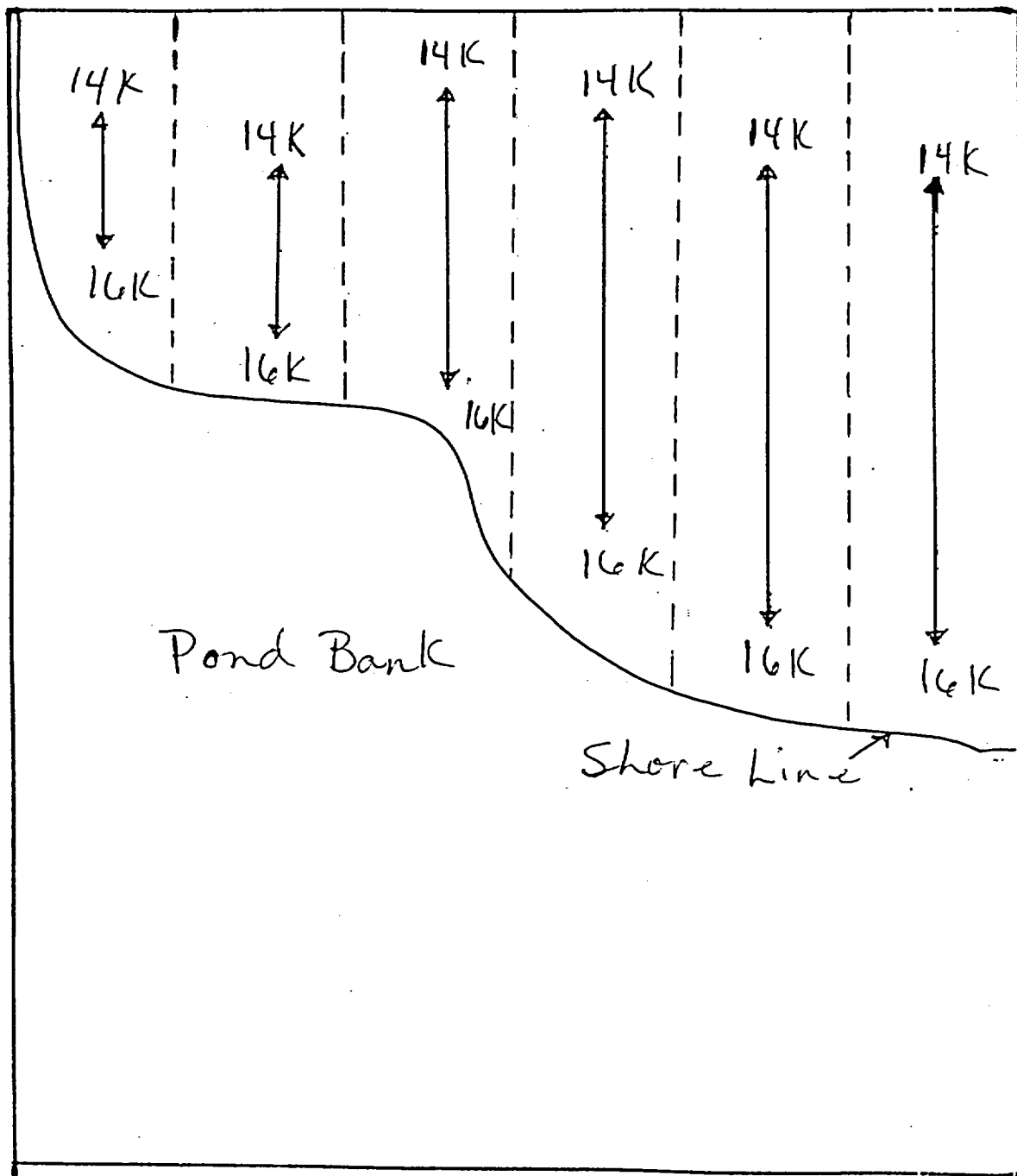
DESIGNED BY Michael T. Hright DATE 09-17-02 CHECKED BY _____ SHEET NO. 17
PROJECT UVA - Characterization of Pond Sediments JOB NO. _____
SUBJECT Surface Gamma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 17 * Readings taken in 1 meter lanes





CALCULATION SHEET

DATE 09-19-02DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____ SHEET NO. 18PROJECT UVA-Characterization of Pond Sediments JOB NO. _____SUBJECT Surface Gamma Scan CALCULATION NO. _____ FILE NO. _____Grid # 18* Readings taken in 1⁵ meter lanes



CALCULATION SHEET

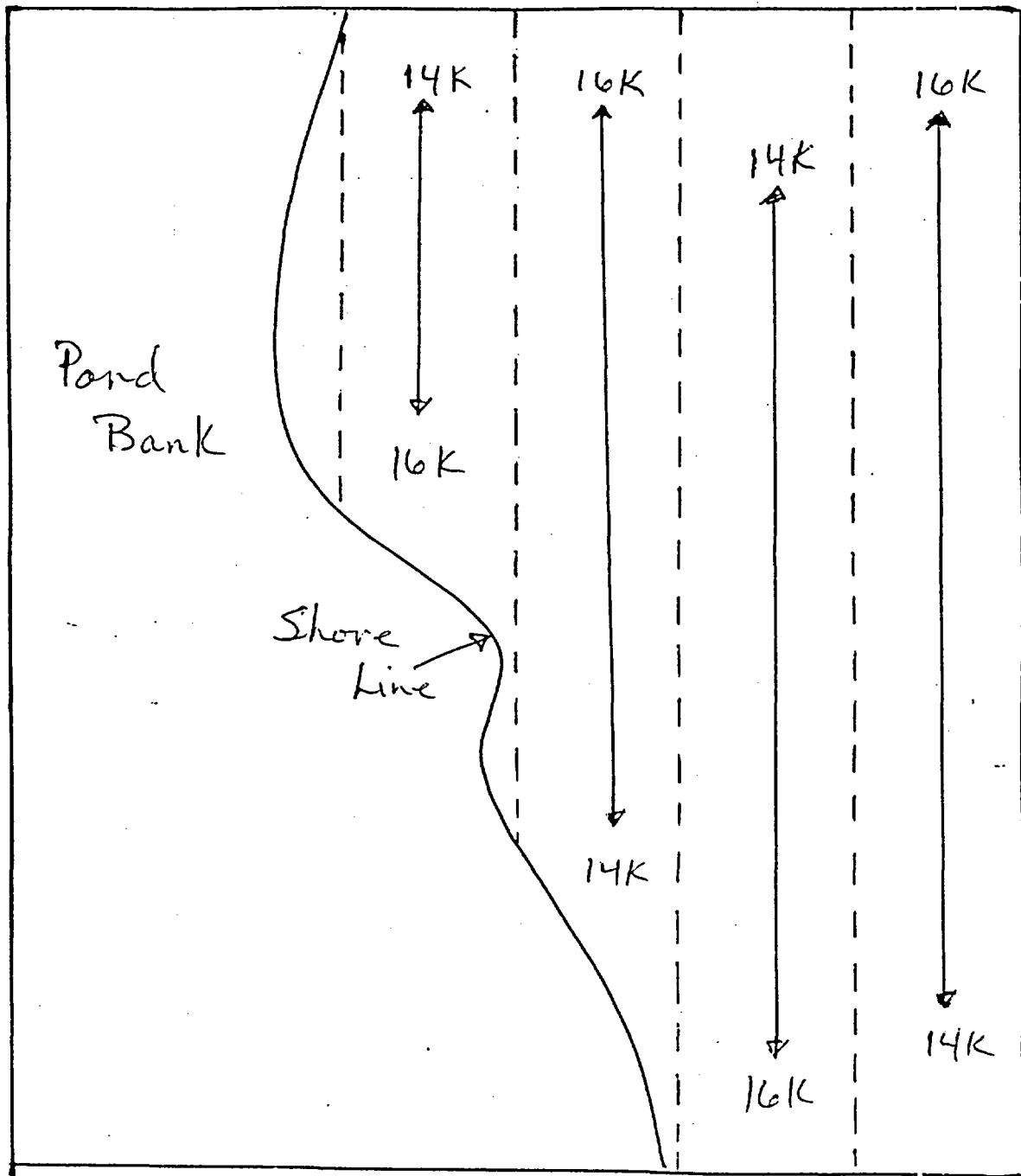
DATE 09-19-02

DESIGNED BY Michael T. Wright DATE 09-17-02 CHECKED BY _____ SHEET NO. 19

PROJECT UVA - Characterization of Pond Sediments JOB NO. _____

SUBJECT Surface Gramma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 19 * Readings taken in 1.5 meter Lanes





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Hright

DATE 09-17-02

CHECKED BY _____

SHEET NO. 20

PROJECT UVA - Characterization of Pond Sediments

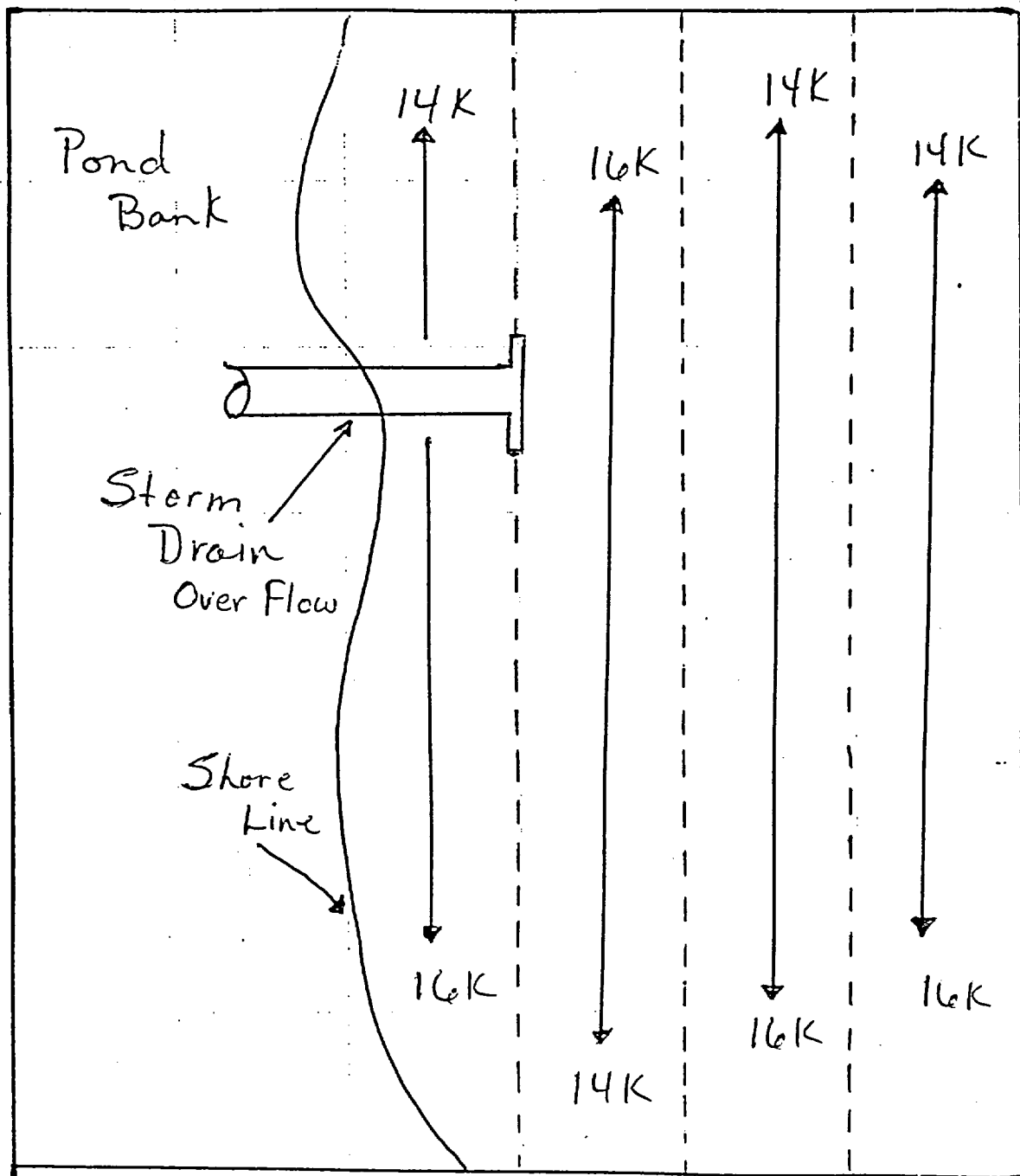
JOB NO. _____

SUBJECT Surface Gamma Scan

CALCULATION NO. _____ FILE NO. _____

Grid # 20

Readings taken in 1.5 meter lanes





CALCULATION SHEET

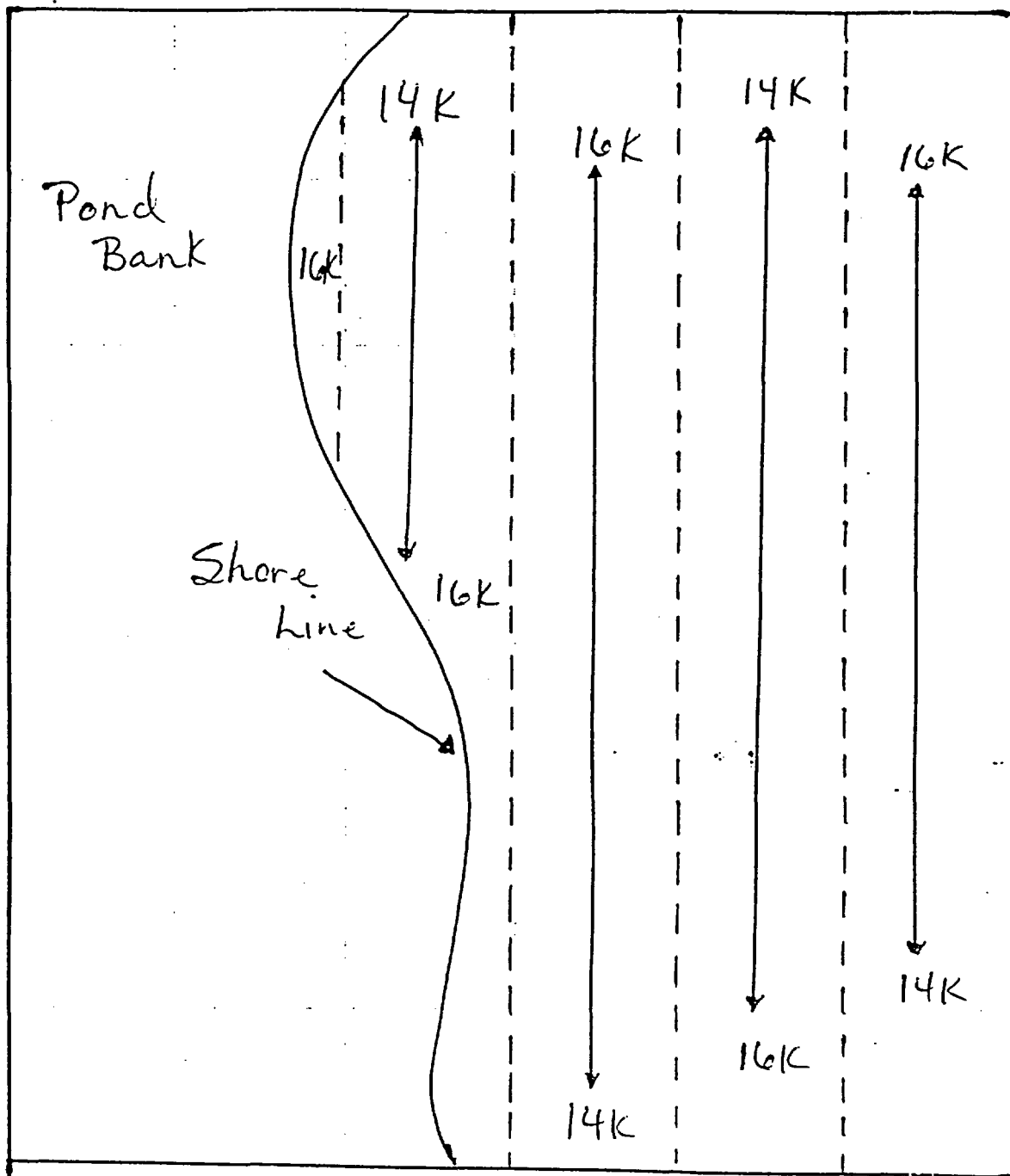
DATE 09-19-02

DESIGNED BY Michael T. Hight DATE 09-17-02 CHECKED BY _____ SHEET NO. 21

PROJECT UVA - Characterization of Pond Sediments JOB NO. _____

SUBJECT Surface Gamma Scan CALCULATION NO. _____ FILE NO. _____

Grid # 21 * Readings taken in 1.5 meter lanes





CALCULATION SHEET

DATE 09-19-02

DESIGNED BY Michael T. Wright

DATE 09-17-02

CHECKED BY _____

SHEET NO. 22

PROJECT UVA - Characterization of Pond Sediments

JOB NO. _____

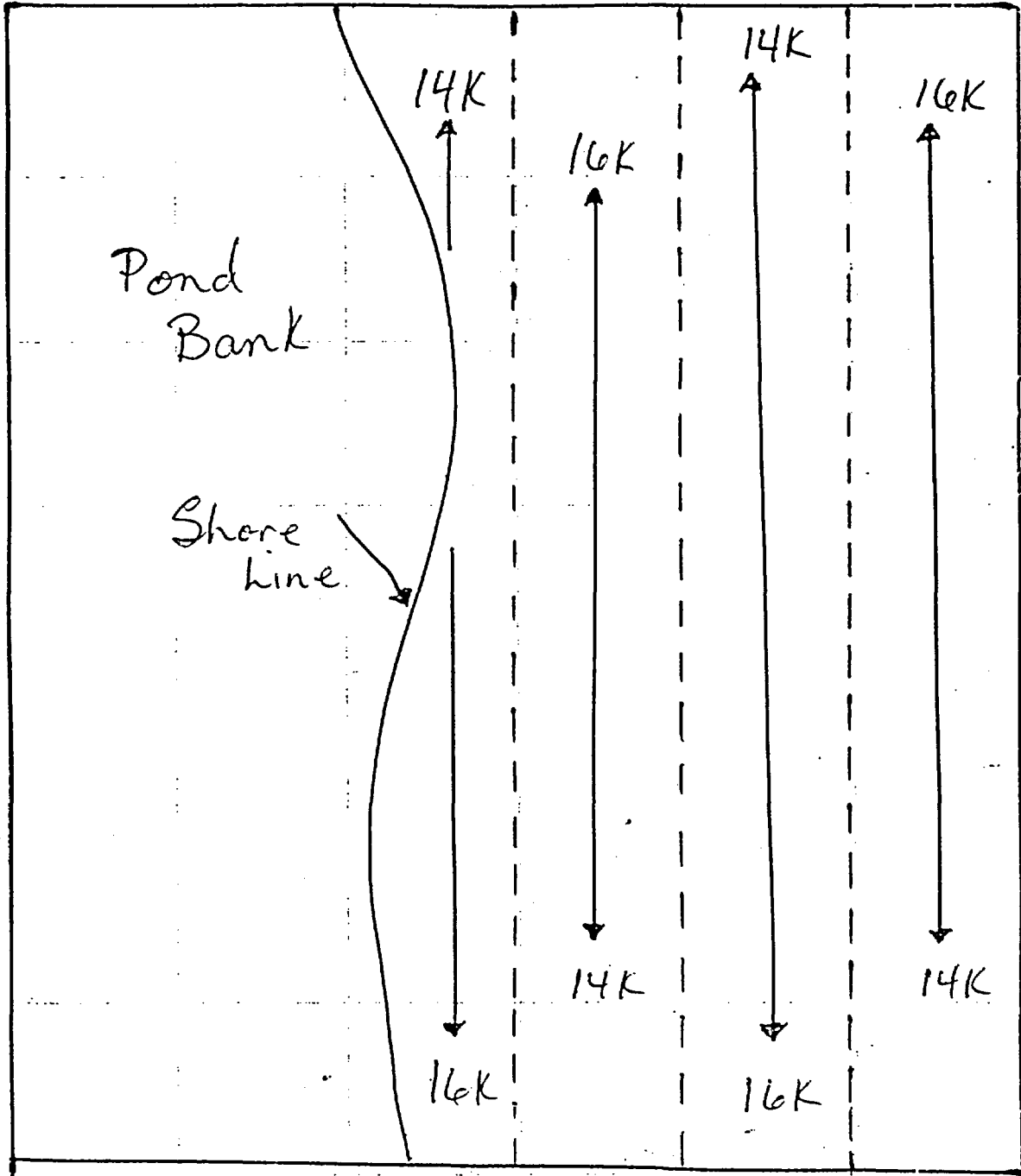
SUBJECT Surface Gramma Scan

CALCULATION NO. _____

FILE NO. _____

Grid # 22

* Readings taken in 1.5 meter lanes



UVAP Continuing Characterization: Mezzanine Crawl Space Summary

The Mezzanine Crawl Space is located on the mezzanine level of the UVAR facility. Access to the area is located in the main stairwell. The room is classified as a class 2 area with approximately 100-m² surface area. The room contains concrete block walls, precast concrete panel ceiling with steel support beams and a dirt floor.

A reference Grid system was used for this survey. The grid was set at 1-meter intervals with the grid starting location being the southwest corner of the room.

1. Surface Scan Surveys

Scans of wall, overhead and other surfaces were performed using a Ludlum Model 43-68 handheld 125 cm² gas proportional detector with a Ludlum Model 2221 ratemeter/scaler. Scanning was accomplished by moving the detector over the surface at a speed of approximately 10 cm per second (approximately 4 inches per second). The distance between the detector and the surface was maintained at a practical minimum, consistent with surface conditions.

Gamma scans were performed using a Ludlum Model 44-10 handheld sodium iodide detector with a Ludlum Model 2221 ratemeter/scaler. The scan was performed by moving the detector in a serpentine pattern, while advancing at a speed of approximately 0.5 m per second. The distance between the detector and surface was maintained within 5 cm.

The count rate was monitored by means of the audible signal output, and when an increase in instrument response above the ambient level was noted, the surveyor paused for several seconds to confirm the conditions. The observed lowest to highest range was recorded on the associated survey map. Two slightly elevated readings were noted during the scan of the dirt floor and marked for soil sampling. No other increases were noted above ambient levels during all other scan. See attached surveys UVAP-0570, 0573 and 0574

2. Integrated Direct Surface Beta Radioactivity Measurements

Measurements of surface alpha-plus-beta radioactivity was performed using a Ludlum Model 43-68 handheld 125 cm² gas proportional detector coupled to a Ludlum Model 2221 ratemeter/scaler. The expected alpha activity is minimal, <10% and all detected counts are considered to from beta activity. Counts were integrated for a one-minute counting interval. Two measurements were performed. The first was a surface measurement, performed in the typical manner (i.e., with the detector face uncovered); this measurement included contributions from beta particles emitted from the surface and interactions of ambient gamma photons with the detector. The second measurement was performed at the same location with the detector face covered by a layer of wood approximately 1.27 cm (½-inch thick). The detector response for this second measurement is representative of the contribution from gamma radiation only. The difference between measurements with an uncovered (unshielded) detector and covered (shielded) detector represents the level of beta activity. Measurements were performed at elevated locations as

UVAP Continuing Characterization: Mezzanine Crawl Space Summary

identified by scans and at locations representative of the general surface area. Results for these static readings ranged from 286 dpm/100cm² to 2195 dpm/100cm².

3. Smear Sample Collection and Analysis

Smear samples for removable activity were collected by wiping a 5 cm (2-inch) diameter cloth disc over approximately 100 cm² (15.5 in²) areas of the surface, while applying moderate pressure. Smear samples were obtained at each location of direct surface activity measurement. Smear samples were counted for alpha and beta radioactivity on a Tennelec automatic gas proportional counter. All smear results were less than MDA for beta (22.99 dpm/100cm²) and alpha (19.04 dpm/100cm²).

4. Volumetric Sample Collection and Analysis

Soil samples were obtained by hand auguring, at 9 locations in the dirt floor, 0 to 6-inches in depth. Samples were submitted for on site gamma isotopic analyses. No facility related activity was detected. The samples were placed on a chain of custody and stored onsite. See Table 1 for results.

5. Conclusions

Based on results of these surveys, no remediation is required. The mezzanine crawl space is ready for Final Status Survey.

UVAP Continuing Characterization: Mezzanine Crawl Space Summary

Mezzanine Crawl Space Soil Results

(On site results)

Table 1

Sample number	Interval	Gamma Logging	Gamma Spectroscopy								
		44-10	K-40	Cs-137	Co-60	Pb-212	Bi-214	Pb-214	Ra-226	Ac-228	U-238
	Inches	CPM	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm
MCS-001	0 to 6	30321	29.5			2.57	1.25	1.61		2.40	3.75
MCS-002	0 to 6	24011	31.8			2.08	1.06	1.09	2.50	1.89	
MCS-003	0 to 6	28003	28.4			2.24	1.26	1.30	5.08	1.92	1.88
MCS-004	0 to 6	27307	29.8			2.41	1.27	1.35	3.80	2.20	2.41
MCS-005	0 to 6	31210	26.9			4.83	1.58	2.10	4.81	4.70	2.36
MCS-006	0 to 6	27724	23.8			3.21	1.62	1.52	6.67	2.75	2.30
MCS-007	0 to 6	32095	28.6			4.05	1.42	1.59	4.94	3.91	
MCS-008	0 to 6	27586	26.7			3.73	1.63	1.99	3.56	3.85	1.69
MCS-009	0 to 6	36346	21.9			4.16	1.95	1.90	3.10	3.95	2.22

Note 1: Gamma Spectroscopy results are considered qualitative for screening purposes due to being counted in a

Non-standard preparations of sample for homogeneous mixture and drying.



UVAP

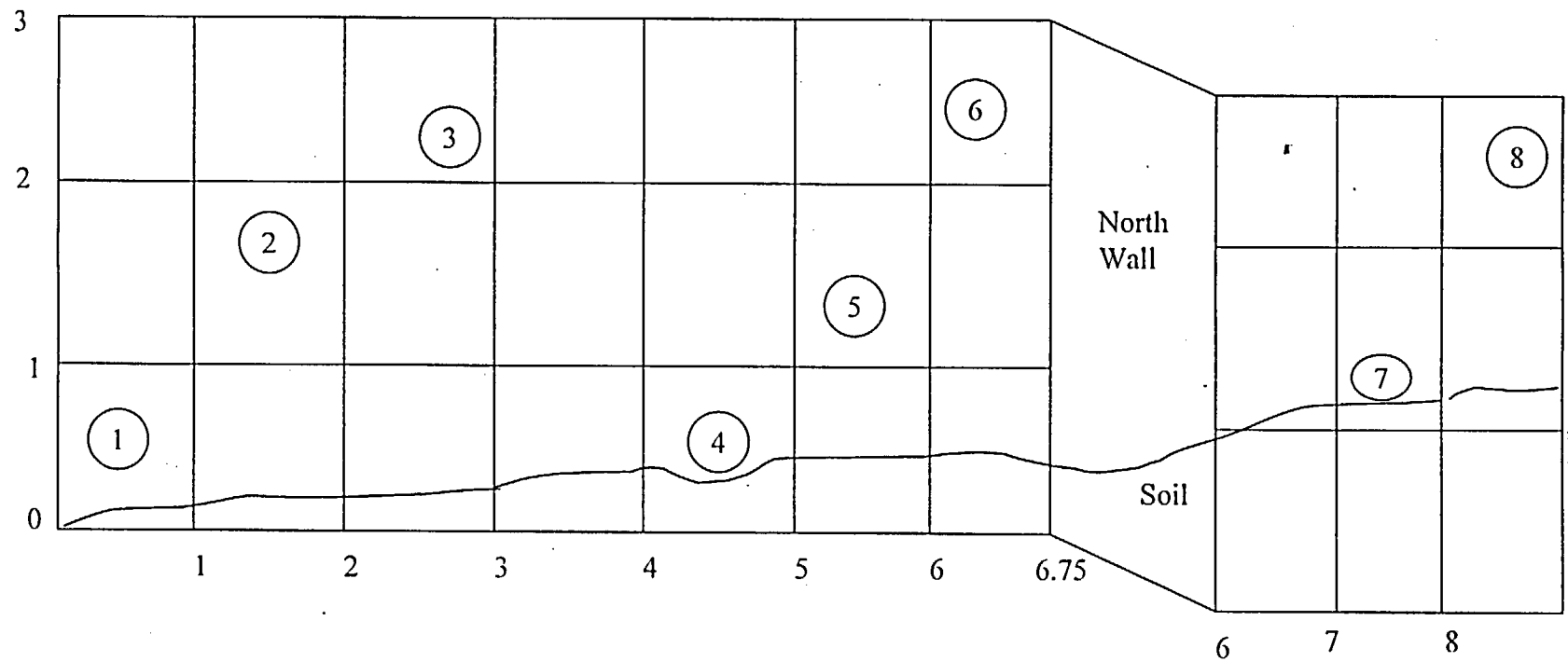
Radiological Survey Form

Location:	RWP#NWP	Survey #	Survey Type:	Page 1 of 7											
Nuclear Reactor Facility Inside		UVAP 0573	Characterization Survey												
Comments:	Surveyed By:	Date:	Instrument	Serial #	Cal. Due	Probe	Area	Serial #	Cal. Due	α Eff.	β Eff.	α Bkg.	β Bkg.	α L _e	β L _e
Survey of the Mezzanine Crawl Space	Alice Thompson	03/12/03	Tennelec	64052	5/15/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Jason Strand	03/11/03	M-2221	172035	5/3/03	43-68	126	116719	4/8/03	n/a	0.111	n/a	n/a	n/a	n/a
	Brad Myers	03/11/03	M-12	180422	4/5/03	44-9	15	116820	4/5/03	n/a	0.15	n/a	n/a	n/a	n/a
Bkg in CPM, L _e in CPM	Reviewed By:	Date:													
	Frank Myers	03/12/03													
Key: \bigcirc = Smear xxx to xxx = Direct Frisk \triangle = air sample B = beta dose rate in mR/d/hr --X--X-- = Boundary SOP = Step Off Pad x/y = contact/12" dose rate # = General dose rate															

Smears				Alpha/Beta Scan				Static Counts							
Gross CPM		DPM/100cm ²		Gross CPM		Audible		Counts per Minute		DPM/100cm ²					
No.	α	β		No.	β	yes/no	pass/fail	No.	Unsh	Shielded	Net	β L _e			
1	See			1	400-500			1	433	304	922	290	West Wall	N 0.5, E 0.0, Z 0.5	
2	Attached			2	350-450			2	420	272	1058	275	West Wall	N 1.7, E 0.1, Z 1.5	
3	Report			3	400-500			3	468	270	1416	274	West Wall	N 2.9, E 0.2, Z 2.1	
4				4	500-600			4	530	312	1559	294	West Wall	N 4.5, E 0.4, Z 0.5	
5				5	450-550			5	475	313	1158	295	West Wall	N 5.3, E 0.6, Z 1.2	
6				6	400-500			6	445	291	1101	284	West Wall	N 6.2, E 0.7, Z 2.2	
7				7	400-500			7	476	315	1151	296	West Wall	N 7.3, E 3.9, Z 1.25	
8				8	400-500			8	447	296	1080	287	West Wall	N 8.8, E 4.7, Z 2.6	
9				9	500-600			9	604	387	1552	328	North Wall	N 6.5, E 1.4, Z 0.9	
10				10	450-550			10	507	336	1223	305	North Wall	N 6.2, E 2.3, Z 2.2	
11				11	500-600			11	575	324	1795	300	North Wall	N 7.9, E 6.4, Z 1.6	
12				12	400-500			12	475	297	1273	287	North Wall	N 7.2, E 7.4, Z 2.4	
13				13	450-500			13	535	323	1516	299	North Wall	N 5.9, E 8.4, Z 1	
14				14	500-600			14	573	341	1659	308	East Wall	N 5.4, E 7.9, Z 0.9	
15				15	450-550			15	530	325	1466	300	East Wall	N 4.5, E 7.4, Z 1.8	
16				16	400-500			16	462	300	1158	289	East Wall	N 3.9, E 7.1, Z 2.2	
17				17	550-650			17	651	344	2195	309	East Wall	N 1.9, E 6.8, Z 0.5	
18				18	450-550			18	531	318	1523	297	East Wall	N 0.3, E 6.4, Z 1.8	
19				19	350-450			19	433	259	1244	268	South Wall	N 0, E 6.1, Z 0.3	
20				20	350-450			20	394	276	844	277	South Wall	N 0, E 5.5, Z 1.5	
QC				QC	350-450			QC	360	288	515	283	South Wall	N 0, E 5.5, Z 1.5	
21				21	250-300			21	308	268	286	273	South Wall	N 0, E 4.6, Z 2.3	
22				22	350-450			22	402	295	765	286	South Wall	N 0, E 2.3, Z 0.8	
23				23	350-450			23	384	242	1015	259	South Wall	N 0, E 1.2, Z 1.7	
24				24	350-450			24	407	261	1044	269	South Wall	N 0, E 0.8, Z 2.1	
25				25	350-400			25	402	307	679	292	Ceiling	N 5.6, E 3.7, Z 3	
26				26	350-400			26	401	304	694	290	Ceiling	N 6.5, E 5.5, Z 3	
27				27	325-375			27	365	305	429	291	Ceiling	N 6.5, E 7.5, Z 3	
28				28	275-325			28	332	295	265	286	Ceiling	N 4.5, E 6.5, Z 3	
29				29	300-350			29	357	271	615	274	Ceiling	N 4.5, E 4.5, Z 3	
30				30	325-375			30	373	315	415	296	Ceiling	N 2.5, E 4.5, Z 3	
31				31	325-375			31	357	296	436	287	Ceiling	N 1.5, E 5.5, Z 3	
32				32	350-400			32	383	253	930	265	Ceiling	N 2.5, E 6.5, Z 3	
33				33	350-400			33	408	331	551	303	Ceiling	N 4.5, E 1.5, Z 3	
34				34	350-400			34	364	284	572	281	Ceiling	N 2.5, E 2.5, Z 3	
35				35	350-400			35	365	263	729	270	Ceiling	N 1.5, E 0.5, Z 3	
QC				QC	350-400			QC	372	309	450	293	Ceiling	N 1.5, E 0.5, Z 3	

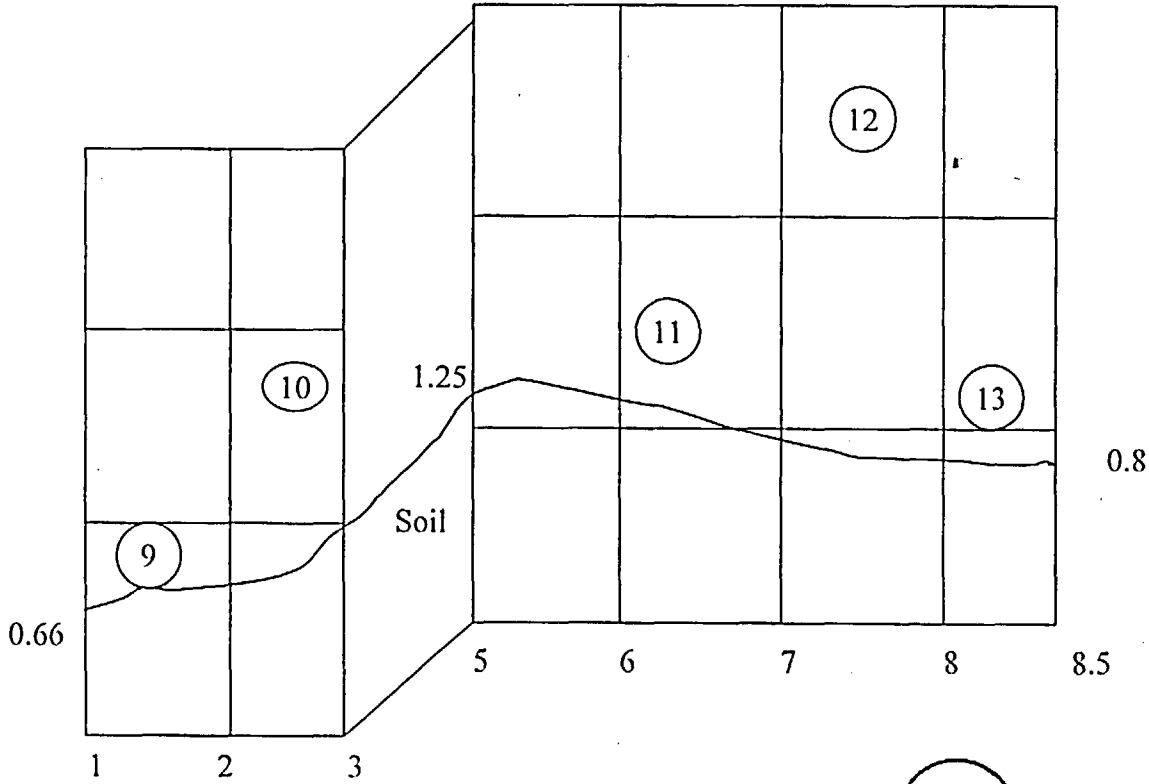
COPY

Mezzanine Crawl Space West Wall



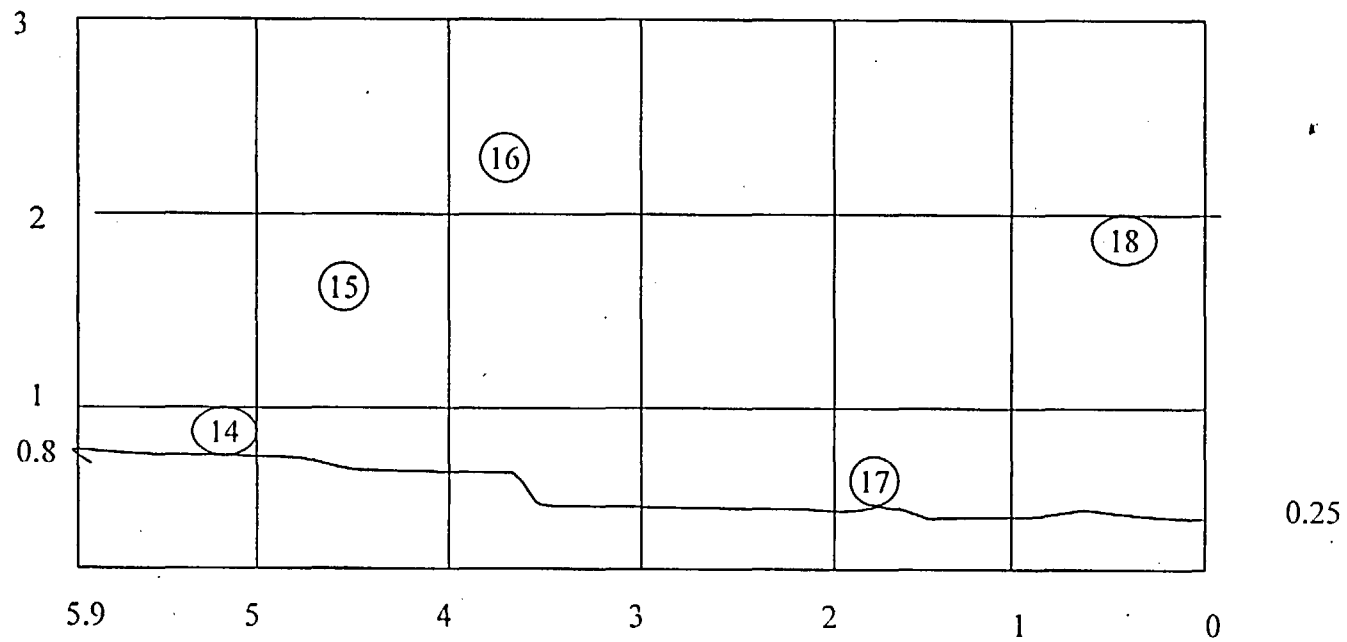
COPY

Mezzanine Crawl Space North Wall



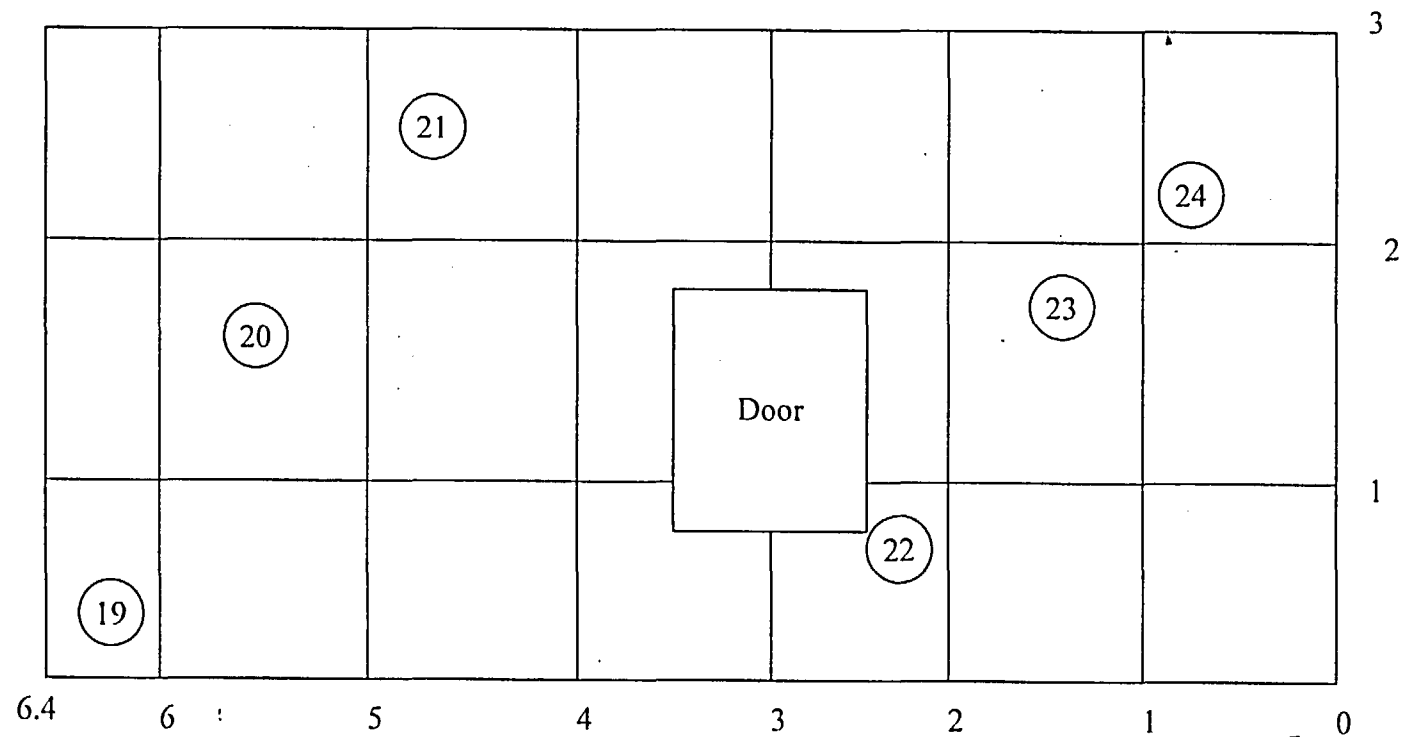
COPY

Mezzanine Crawl Space East wall



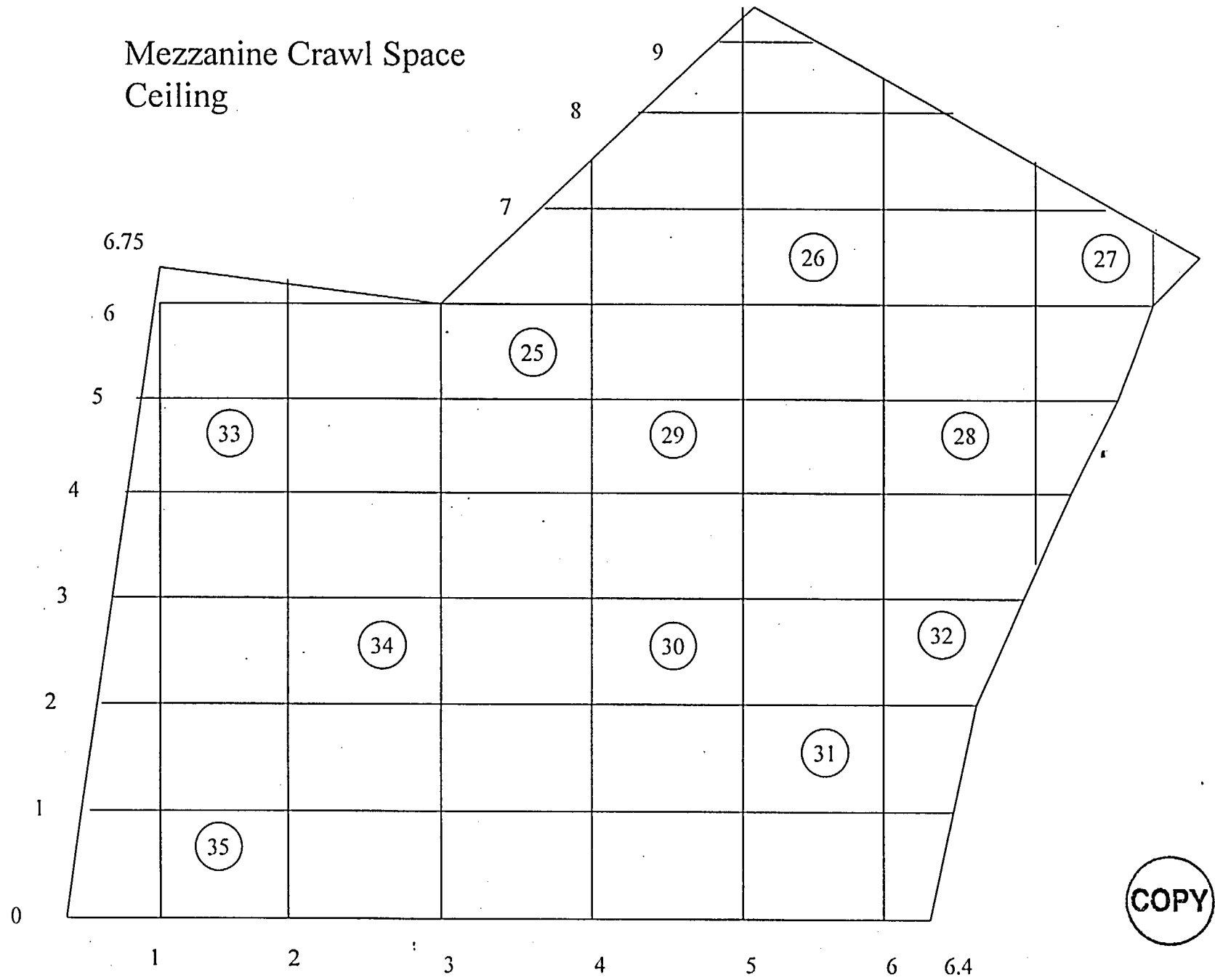
COPY

Mezzanine Crawl Space South Wall

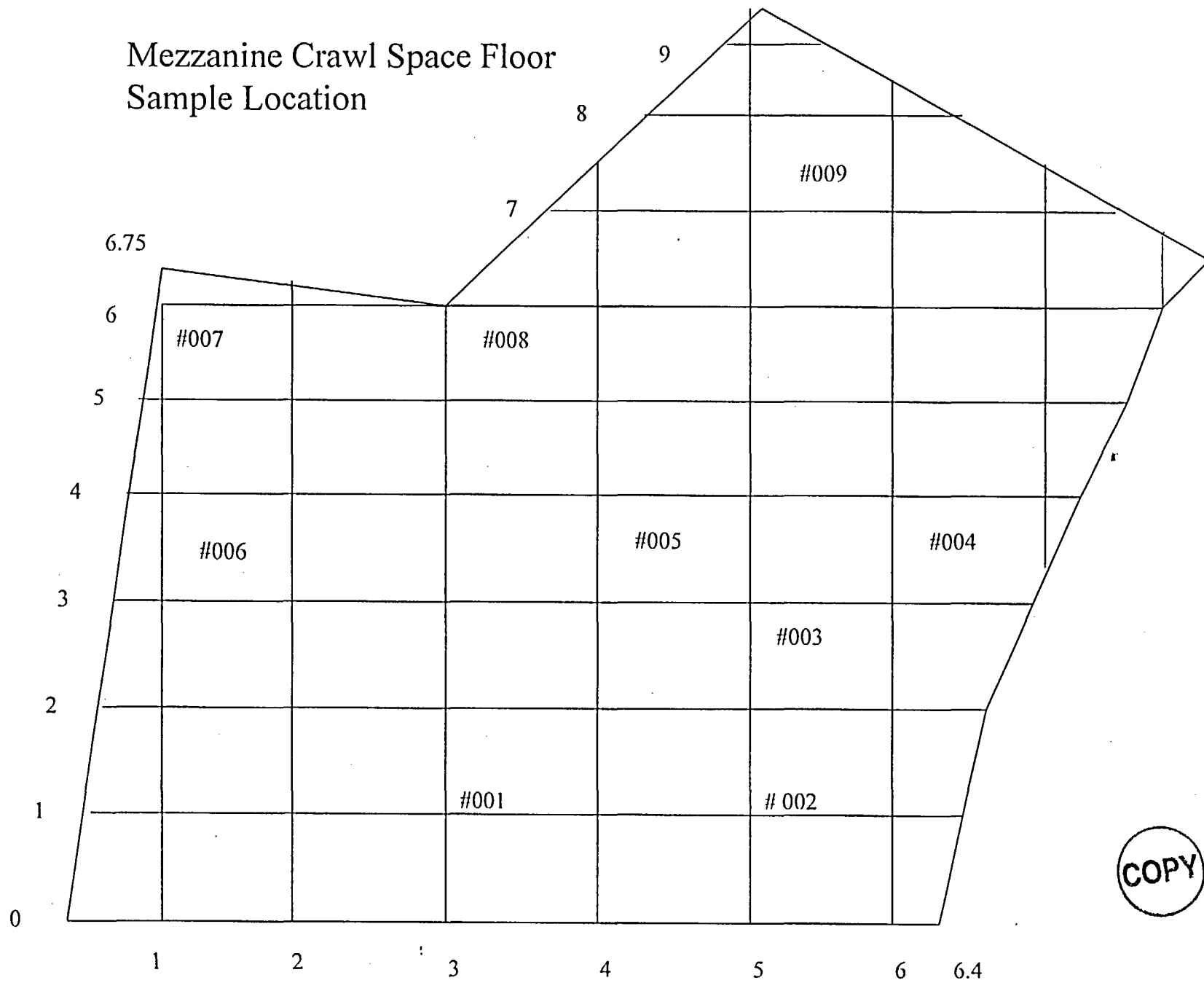


COPY

Mezzanine Crawl Space Ceiling



Mezzanine Crawl Space Floor Sample Location



COPY

LB5100-W Low Background Counting System – Smear Analysis

Date: 3/12/95
 Counting Unit id: 1
 Data file name: C:\LBXL\UNIT1\SME1B022.XLD
 Batch Ended: 3/12/95 10:36
 Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 10.00
 Beta activity action level (DPM): 50.00
 Certainty level for MDA and flags: 95.00%
 High Voltage Setting: 1350

Application Revision: 3

Application Version: Standard

Batch ID: UVAP 0573

Carrier	Alpha Activity				Beta Activity				Count	Alpha	Beta	Completion
	DPM	σ	flags	MDA	DPM	σ	flags	MDA	time (min)	CPM	CPM	Date - Time
1	-1.727	3.89	<MDA	19.04	7.25	6.51	<AL	22.99	1.00	-0.445	2.24	3/12/95 9:54
2	-1.727	3.89	<MDA	19.04	-2.48	3.26	<MDA	22.99	1.00	-0.445	-0.77	3/12/95 9:55
3	-1.727	3.89	<MDA	19.04	4.01	5.63	<MDA	22.99	1.00	-0.445	1.24	3/12/95 9:56
4	6.036	5.50	At AL	19.04	4.01	5.63	<MDA	22.99	1.00	1.555	1.24	3/12/95 9:58
5	-1.727	3.89	<MDA	19.04	4.01	5.63	<MDA	22.99	1.00	-0.445	1.24	3/12/95 9:59
6	-1.727	3.89	<MDA	19.04	16.98	8.63	<AL	22.99	1.00	-0.445	5.24	3/12/95 10:00
7	2.154	3.89	<MDA	19.04	10.49	7.28	<AL	22.99	1.00	0.555	3.24	3/12/95 10:01
8	-1.727	3.89	<MDA	19.04	4.01	5.63	<MDA	22.99	1.00	-0.445	1.24	3/12/95 10:02
9	-1.727	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	-0.445	0.24	3/12/95 10:03
10	2.154	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	0.555	0.24	3/12/95 10:04
11	-1.727	3.89	<MDA	19.04	16.98	8.63	<AL	22.99	1.00	-0.445	5.24	3/12/95 10:06
12	-1.727	3.89	<MDA	19.04	20.23	9.24	<AL	22.99	1.00	-0.445	6.24	3/12/95 10:07
13	-1.727	3.89	<MDA	19.04	13.74	7.98	<AL	22.99	1.00	-0.445	4.24	3/12/95 10:08
14	2.154	3.89	<MDA	19.04	-5.73	3.27	<MDA	22.99	1.00	0.555	-1.77	3/12/95 10:09
15	-1.727	3.89	<MDA	19.04	13.74	7.98	<AL	22.99	1.00	-0.445	4.24	3/12/95 10:10
16	-1.727	3.89	<MDA	19.04	-2.48	3.26	<MDA	22.99	1.00	-0.445	-0.77	3/12/95 10:12
17	2.154	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	0.555	0.24	3/12/95 10:13
18	-1.727	3.89	<MDA	19.04	7.25	6.51	<AL	22.99	1.00	-0.445	2.24	3/12/95 10:14
19	13.799	7.79	At AL	19.04	13.74	7.98	<AL	22.99	1.00	3.555	4.24	3/12/95 10:15
20	-1.727	3.89	<MDA	19.04	7.25	6.51	<AL	22.99	1.00	-0.445	2.24	3/12/95 10:16
96	6.036	5.50	At AL	19.04	0.76	4.60	<MDA	22.99	1.00	1.555	0.24	3/12/95 10:17
21	2.154	3.89	<MDA	19.04	16.98	8.63	<AL	22.99	1.00	0.555	5.24	3/12/95 10:19
22	-1.727	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	-0.445	0.24	3/12/95 10:20
23	2.154	3.89	<MDA	19.04	-2.48	3.26	<MDA	22.99	1.00	0.555	-0.77	3/12/95 10:21
24	2.154	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	0.555	0.24	3/12/95 10:22
25	9.918	6.74	At AL	19.04	4.01	5.63	<MDA	22.99	1.00	2.555	1.24	3/12/95 10:23
26	2.154	3.89	<MDA	19.04	7.25	6.51	<AL	22.99	1.00	0.555	2.24	3/12/95 10:24

Alpha efficiency log file: th230ab
 Alpha Efficiency: 25.76%
 Alpha to Beta Crosstalk: 26.65%
 Alpha Background (CPM): 0.445
 Alpha Correction Factor: 1.000

Beta efficiency log file: tc99ab
 Beta Efficiency: 30.83%
 Beta into Alpha Crosstalk: 0.10%
 Beta Background (CPM): 1.765
 Beta Correction Factor: 1.000

COPY

LB5100-W Low Background Counting System – Smear Analysis

Date: 3/12/95
 Counting Unit id: 1
 Data file name: C:\LBXL\UNIT1\SME1B022.XLD
 Batch Ended: 3/12/95 10:36
 Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 10.00
 Beta activity action level (DPM): 50.00
 Certainty level for MDA and flags: 95.00%
 High Voltage Setting: 1350

Application Revision: 3

Application Version: Standard

Batch ID: UVAP 0573

Carrier	Alpha Activity				Beta Activity				Count	Alpha	Beta	Completion
	DPM	σ	flags	MDA	DPM	σ	flags	MDA	time (min)	CPM	CPM	Date - Time
27	2.154	3.89	<MDA	19.04	4.01	5.63	<MDA	22.99	1.00	0.555	1.24	3/12/95 10:26
28	-1.727	3.89	<MDA	19.04	-2.48	3.26	<MDA	22.99	1.00	-0.445	-0.77	3/12/95 10:27
29	6.036	5.50	At AL	19.04	0.76	4.60	<MDA	22.99	1.00	1.555	0.24	3/12/95 10:28
30	2.154	3.89	<MDA	19.04	-2.48	3.26	<MDA	22.99	1.00	0.555	-0.77	3/12/95 10:29
31	2.154	3.89	<MDA	19.04	7.25	6.51	<AL	22.99	1.00	0.555	2.24	3/12/95 10:30
32	-1.727	3.89	<MDA	19.04	13.74	7.98	<AL	22.99	1.00	-0.445	4.24	3/12/95 10:32
33	-1.727	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	-0.445	0.24	3/12/95 10:33
34	-1.727	3.89	<MDA	19.04	4.01	5.63	<MDA	22.99	1.00	-0.445	1.24	3/12/95 10:34
35	9.918	6.74	At AL	19.04	7.25	6.51	<AL	22.99	1.00	2.555	2.24	3/12/95 10:35
95	-1.727	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	-0.445	0.24	3/12/95 10:36

Alpha efficiency log file: th230ab

Alpha Efficiency: 25.76%

Alpha to Beta Crosstalk: 26.65%

Alpha Background (CPM): 0.445

Alpha Correction Factor: 1.000

Beta efficiency log file: tc99ab

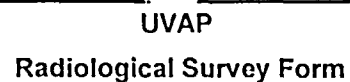
Beta Efficiency: 30.83%

Beta into Alpha Crosstalk: 0.10%

Beta Background (CPM): 1.765

Beta Correction Factor: 1.000

COPY

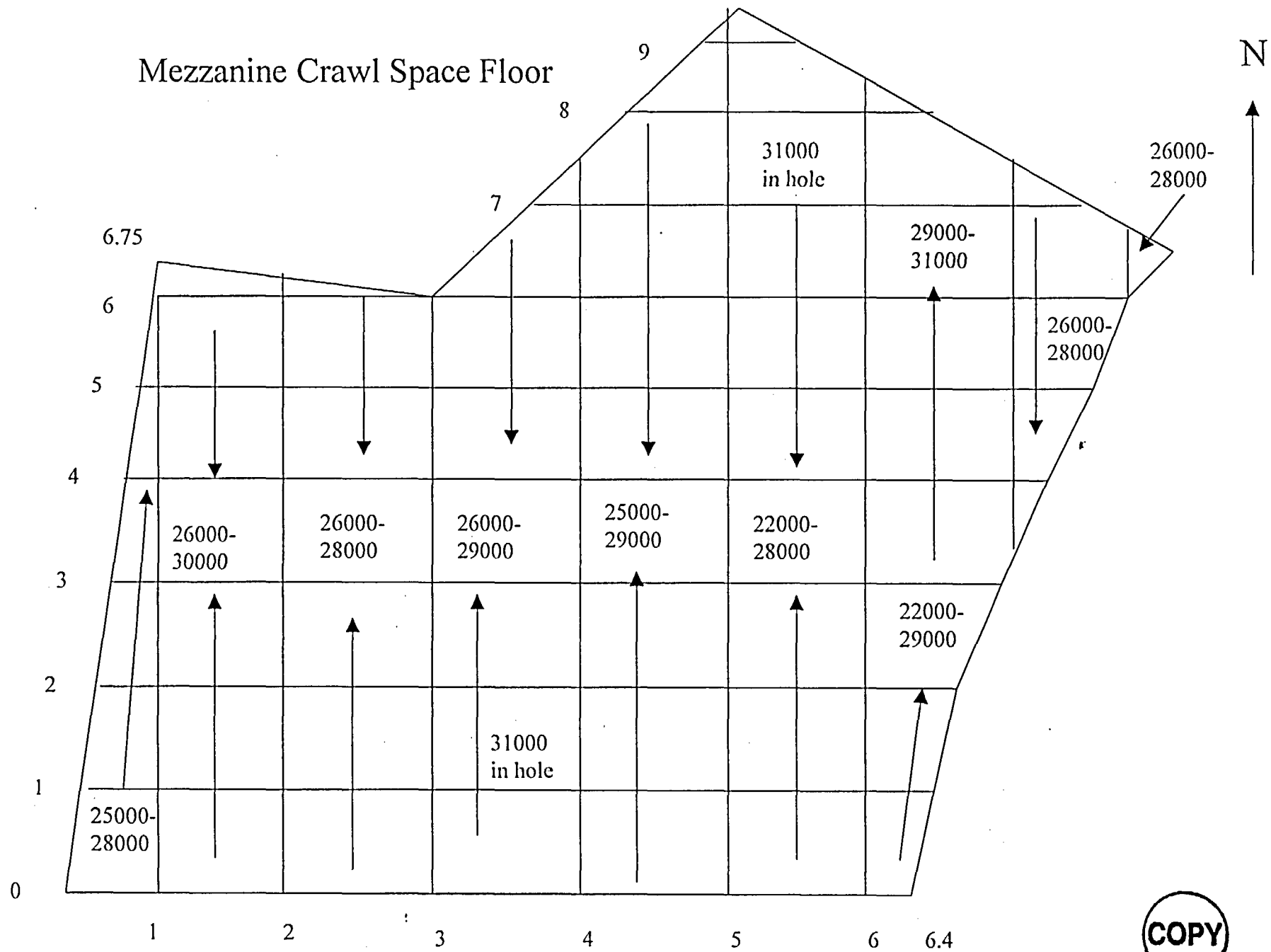


Radiological Survey Form

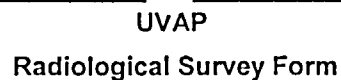
[illegible]

Form SEC-RP-21.2 Rev 0

Mezzanine Crawl Space Floor



COPY

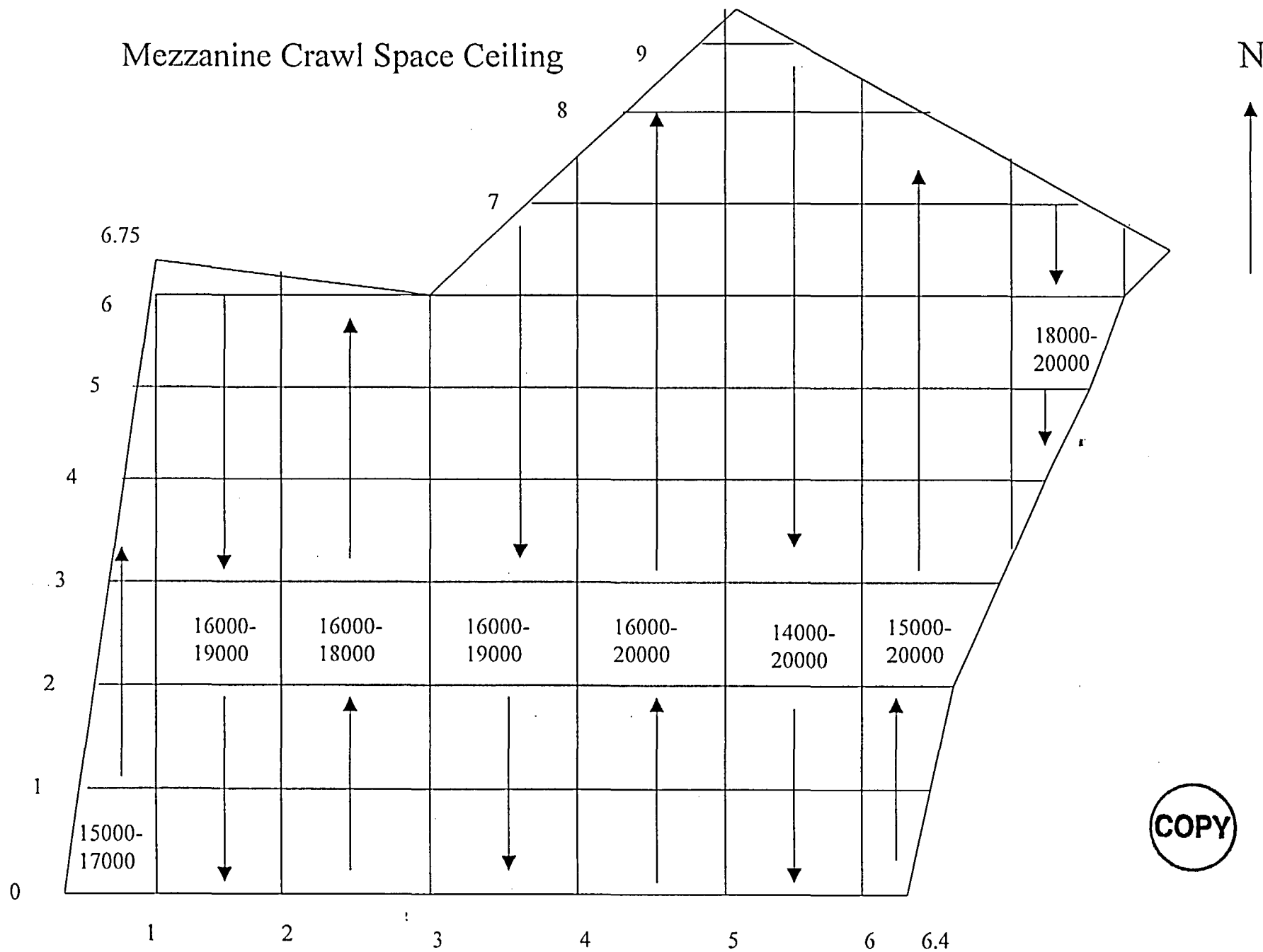


Radiological Survey Form

[illegible]

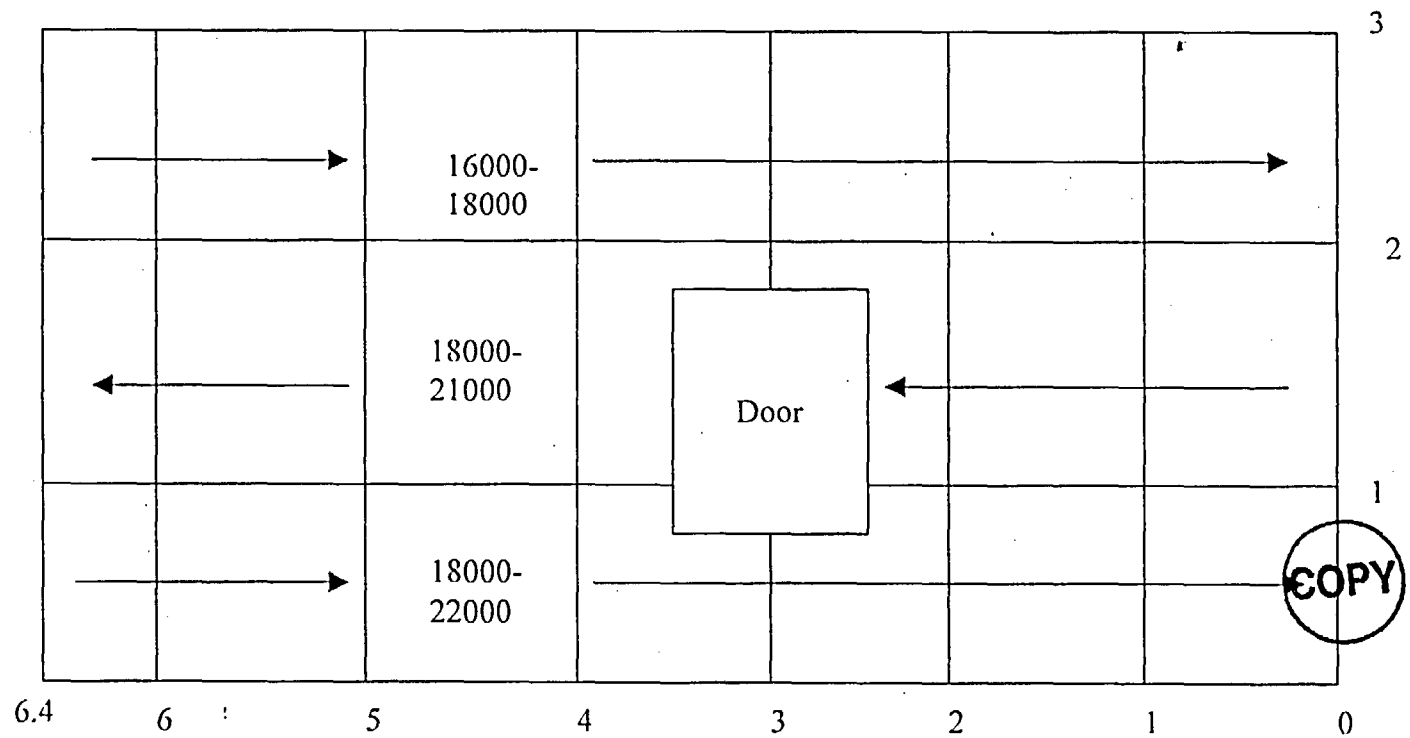
COPY

Mezzanine Crawl Space Ceiling



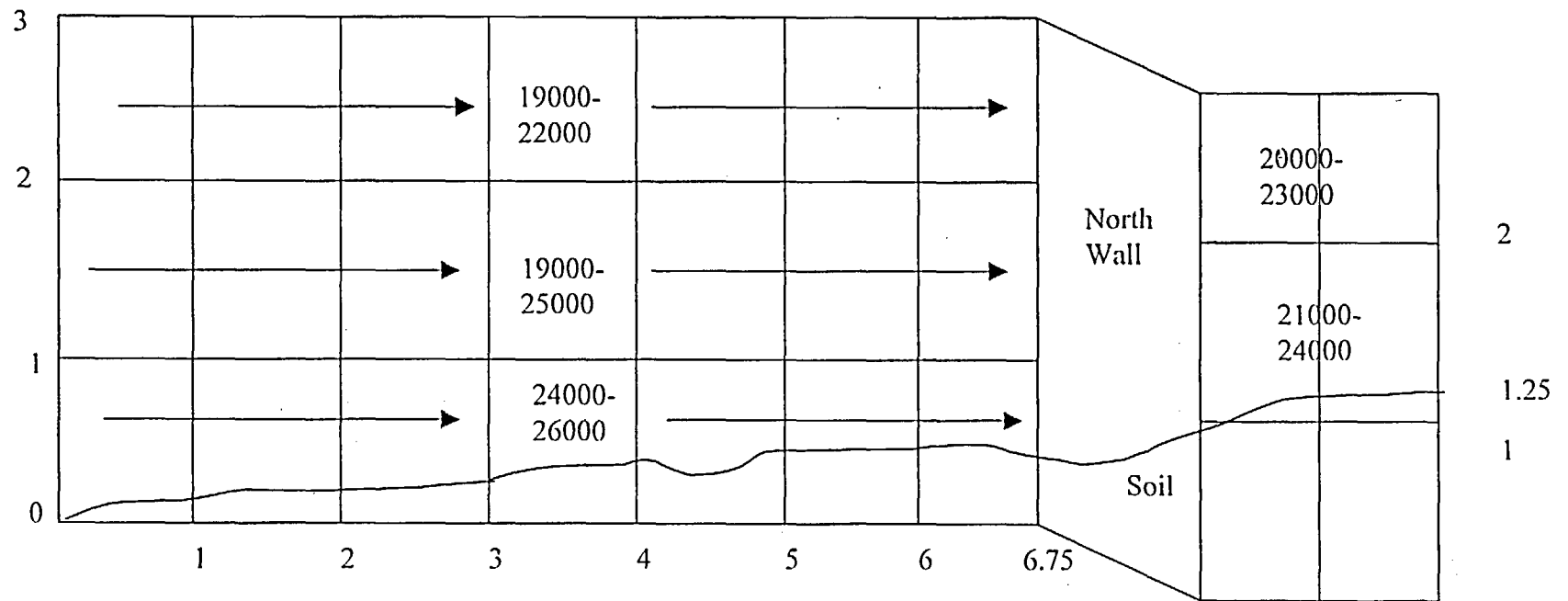
COPY

Mezzanine Crawl Space South Wall



Gamma Scan with 44-10 probe

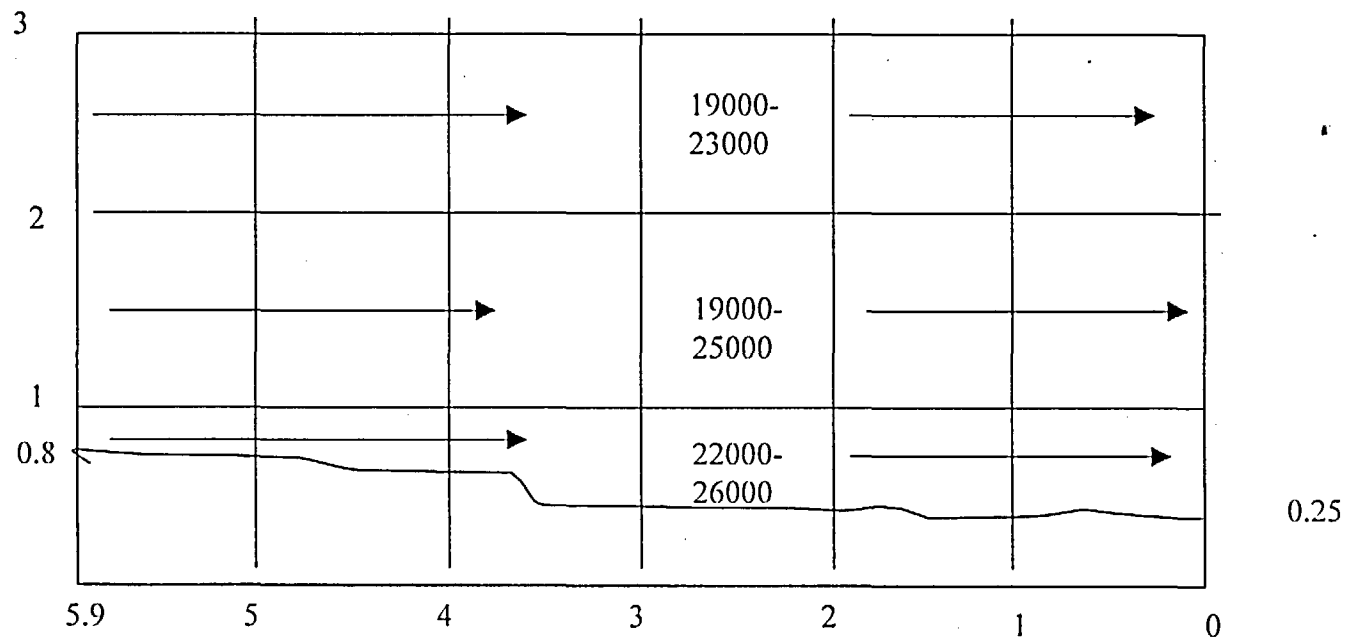
Mezzanine Crawl Space West Wall



Gamma Scan with 44-10 probe

COPY

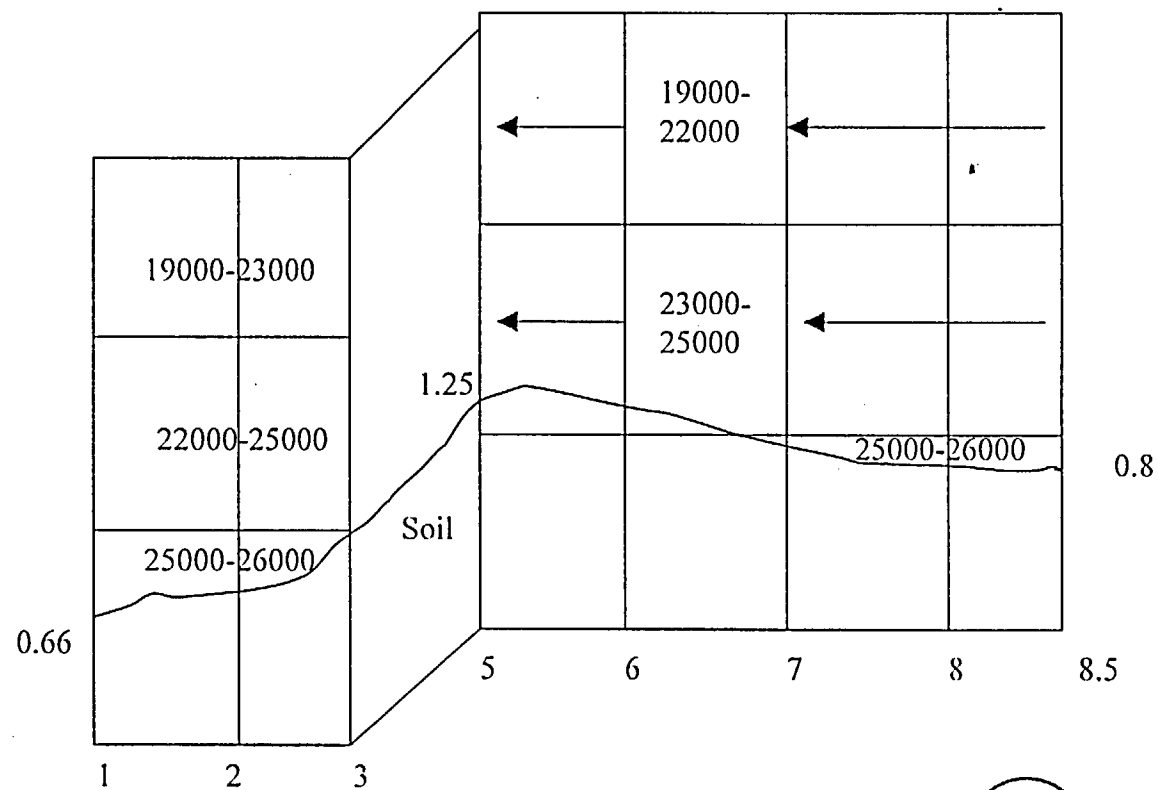
Mezzanine Crawl Space East wall



Gamma Scan with 44-10 probe

COPY

Mezzanine Crawl Space North Wall



Gamma Scan with 44-10 probe

COPY

UVAP Continuing Characterization: Reactor Plant Stack Summary

The University of Virginia Reactor (UVAR) Facility plant stack is located on the east side of the Reactor Confinement Building. The plant stack is 58-feet in total height running from the Mezzanine floor to 4-feet above the Confinement Building. The plant stack is made out of red brick and contains two duct liners; one 14-inch diameter made of transite and one 8-inch diameter made of terracotta. The 14-inch duct is the exhaust from the fume hoods in room M019, the hot cell, the beam port closures, and the bulk access facility. The 8-inch duct is the exhaust flue from the boiler and was replaced in approximately 1992 with a new metal duct running along the outside of the plant stack. The plant stack also contains the air inlet and exhaust ducting to the reactor room. The Characterization survey included the 14-inch duct, 8-inch duct, reactor room exhaust inlet, and top plenum area. A flue brush was used to obtain a volumetric sample from the interior of the 8-inch flue running the length of the plant stack. The HEPA filter and associated ducting, inline from the hot laboratory Room M019 fume hoods exhaust, was removed and discarded.

Co-60 has been determined to be the major facility related contaminant. The Decommissioning Plan provides a Derived Concentration Guideline Level (DCGL) of 7100 dpm/100cm² total activity and 710 dpm/100cm² removable activity for Co-60.

1. Surface Scan Surveys

Scans of surfaces at the inlet and exhaust of the each flue, reactor room exhaust inlet, and plenum area were performed using a Ludlum Model 43-68 handheld 125 cm² gas proportional detector with a Ludlum Model 2221 ratemeter/scaler. Scanning was accomplished by moving the detector over the surface at a speed of approximately 10 cm per second (approximately 4 inches per second). The distance between the detector and the surface was maintained at a practical minimum, consistent with surface conditions.

Gamma scans were performed using a Ludlum Model 44-10 handheld sodium iodide detector with a Ludlum Model 2221 ratemeter/scaler. The scan was performed by moving the detector in a serpentine pattern, while advancing at a speed of approximately 0.5 m per second. The distance between the detector and surface was maintained within 5 cm.

The count rate was monitored by means of the audible signal output, and when an increase in instrument response above the ambient level was noted, the surveyor paused for several seconds to confirm the conditions and marked the location for activity determination by static count. The observed lowest to highest range was recorded on the associated survey map. See survey UVAP-0400 and UVAP-0571.

The beta/alpha scans ranged from 263 cpm to 982 cpm. The gamma scans ranged from 7400 cpm to 17,800 cpm.

2. Integrated Direct Surface Beta Radioactivity Measurements

Measurements of surface alpha-plus-beta radioactivity was performed using a Ludlum Model 43-68 handheld 125 cm² gas proportional detector coupled to a Ludlum Model 2221 ratemeter/scaler. The expected alpha activity is minimal, <10% and all

UVAP Continuing Characterization: Reactor Plant Stack Summary

detected counts are considered to from beta activity. Counts were integrated for a one-minute counting interval. Two measurements were performed. The first was a surface measurement, performed in the typical manner (i.e., with the detector face uncovered); this measurement included contributions from beta particles emitted from the surface and interactions of ambient gamma photons with the detector. The second measurement was performed at the same location with the detector face covered by a layer of wood approximately 1.27 cm (½-inch thick). The detector response for this second measurement is representative of the contribution from gamma radiation only. The difference between measurements with an uncovered (unshielded) detector and covered (shielded) detector represents the level of beta activity. Measurements were performed at elevated locations as identified by scans and at locations representative of the general surface area. Direct integrated readings ranged from 136 dpm/100cm² to 3146 dpm/100cm².

3. Smear Sample Collection and Analysis

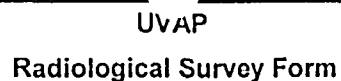
Smear samples for removable activity were collected by wiping a 5 cm (2-inch) diameter cloth disc over approximately 100 cm² (15.5 in²) areas of the surface, while applying moderate pressure. Smear samples were obtained at each location of direct surface activity measurement. Smear samples were counted for alpha and beta radioactivity on a Tennelec automatic gas proportional counter. Smear sample activity ranged from <MDA (22.99 dpm/100cm²) to 124 dpm/100cm².

4. Ducting Survey

A volumetric sample was obtained utilizing a cleaning brush pulled through the 8-inch boiler flue. Swabs were obtained from the inlet and outlets of both the 8 and 14-inch ducts. These samples were submitted for on site gamma isotopic analyses. Results from the swab obtained from the top of the 14-inch duct indicated the presence of U-238 at detectable levels. All other samples indicated no reactor facility related isotopes. Gamma spectroscopy reports are attached. Samples were managed under chain-of-custody procedures and stored for additional counting or offsite analysis.

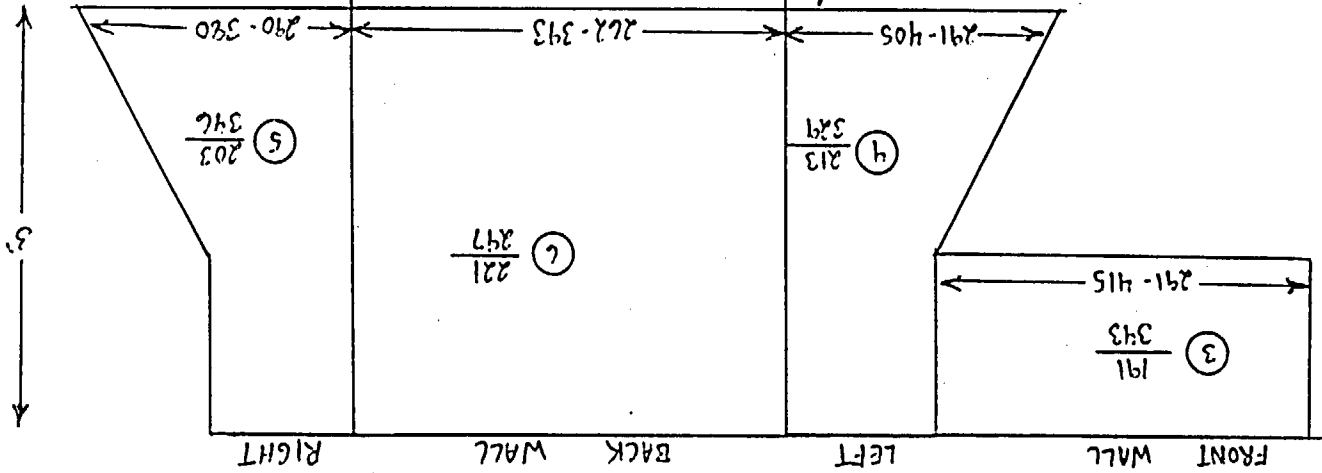
5. Conclusions

Static surveys and the volumetric sample did not indicate facility related activity above the DCGL. Based on results of these surveys, no remediation is required. The plant stack and associated ventilation is ready for Final Status Survey. This survey satisfies the continuing characterization requirements of Area 3 from the characterization report, Appendix A of the University of Virginia Reactor Decommissioning Plan.

[illegible]

COPY

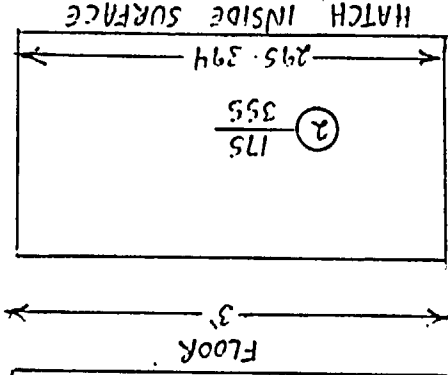
REACTOR ROOM VENTILATION EXHAUST DUCT INTERNAL SURFACES



INTERNAL SCAN OF DUCT WITH
44-10 PROBE
7400-8600 CFM

SCAN OF HATCH INTERIOR
WITH 44-10 PROBE
8400-9400 CFM

① - SURVEY POINT
- SHIELDED 1 MIN. DIRECT
- UNSHIELDED 1 MIN. DIRECT
- SCAN



COPY

LB5100-W Low Background Counting System -- Smear Analysis

Date: 3/11/95
 Counting Unit id: 1
 Data file name: C:\LBXL\UNIT1\SMI1B020.XLD
 Batch Ended: 3/11/95 11:32
 Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 10.00
 Beta activity action level (DPM): 50.00
 Certainty level for MDA and flags: 95.00%
 High Voltage Setting: 1350

Application Revision: 3
 Application Version: Standard

Batch ID: UVAP 0571

Carrier	Alpha Activity				Beta Activity				Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
	DPM	σ	flags	MDA	DPM	σ	flags	MDA				
1	-1.727	3.89	<MDA	19.04	13.74	7.98	<AL	22.99	1.00	-0.445	4.24	3/11/95 11:25
2	-1.727	3.89	<MDA	19.04	13.74	7.98	<AL	22.99	1.00	-0.445	4.24	3/11/95 11:27
3	2.154	3.89	<MDA	19.04	-5.73	3.27	<MDA	22.99	1.00	0.555	-1.77	3/11/95 11:28
4	2.154	3.89	<MDA	19.04	16.98	8.63	<AL	22.99	1.00	0.555	5.24	3/11/95 11:29
5	-1.727	3.89	<MDA	19.04	10.49	7.28	<AL	22.99	1.00	-0.445	3.24	3/11/95 11:30
6	-1.727	3.89	<MDA	19.04	20.23	9.24	<AL	22.99	1.00	-0.445	6.24	3/11/95 11:31
96	-1.727	3.89	<MDA	19.04	20.23	9.24	<AL	22.99	1.00	-0.445	6.24	3/11/95 11:32

Alpha efficiency log file: th230ab
 Alpha Efficiency: 25.76%
 Alpha to Beta Crosstalk: 26.65%
 Alpha Background (CPM): 0.445
 Alpha Correction Factor: 1.000

Beta efficiency log file: tc99ab
 Beta Efficiency: 30.83%
 Beta into Alpha Crosstalk: 0.10%
 Beta Background (CPM): 1.765
 Beta Correction Factor: 1.000

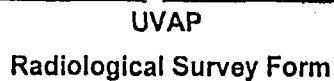


UVAP

Radiological Survey Form

Location:		RWP#W/P		Survey #				Survey Type: <i>CHARACTERIZATION</i>				Page 1 of 2				
Nuclear Reactor Facility outside				UVAP 0400				Unrestricted (Free) Release <i>fr</i>								
Comments:		Surveyed By: Date:		Instrument	Serial #	Cal. Due	Probe	Area	Serial #	Cal. Due	α Eff.	β Eff.	α Bkg.	β Bkg.	α L _c	β
Survey of the Reactor Facilities Exhaust Flues		Alice Thompson <i>AT</i> 12/18/02		Tennelec	64052	5/15/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n
		Bobby Leigh <i>BL</i> 12/17/02		M-2221	172051	4/8/03	43-68	126	116718	4/8/03	n/a	0.222	n/a	n/a	n/a	n
		Jason Strand <i>JS</i> 12/17/02		M-2221	172017	4/2/03	44-10	n/a	186956	4/3/03	n/a	n/a	n/a	n/a	n/a	n
		Reviewed By: Date:		M-2221	172020	10/30/03	PSL4	3	93027	10/30/03	n/a	n/a	n/a	n/a	n/a	n
Bkg in CPM, L _c in CPM		Frank Myers 12/19/02		<i>F. L. B. Myers</i>												
Key:		○ = Smear xxx to xx = Direct Frisk		△ = air sample		B = beta dose rate in mRad/hr		--X--X-- = Boundary		SOP = Step Off Pad		x/y = contact/12" dose rate		# = General dose r		

[illegible]



Radiological Survey Form

Location:	RWP#NWP	Survey #	Survey Type:	Page 1 of 2
Nuclear Reactor Facility outside		UVAP 0400	Characterization Survey	

Comments:	Surveyed By:	Date:	Instrument	Serial #	Cal. Due	Probe	Aroa	Serial #	Cal. Due	α Eff.	β Eff.	α Bkg.	β Bkg	αL_c
Survey of the Reactor Facilities Exhaust Flues	Alice Thompson	12/18/02	Tennelec	64052	5/15/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Bobby Leigh	12/17/02	M-2221	172051	4/8/03	43-68	126	116718	4/8/03	n/a	0.111	n/a	n/a	n/a
	Jason Strand	12/17/02	M-2221	172017	4/2/03	44-10	n/a	186956	4/3/03	n/a	n/a	n/a	n/a	n/a
Bkg in CPM, L_c in CPM	Reviewed By: Frank Myers	Date: 12/19/02	M-2221	172020	10/30/03	PSL4	3	93027	10/30/03	n/a	n/a	n/a	n/a	n/a

Key: ○ = Smear xxx to xx = Direct Frisk △ = air sample B = beta dose rate in mRad/hr --X-- = Boundary SOP = Step Off Pad x/y = contact/12" dose rate # = General dose

[illegible]

TOP OF STACK
INSIDE PLENUM
TOP VIEW

FLUE OPENINGS AT BOTTOM
OF STACK

8" 598-674 ALPHA/BETA SCAN

⑨ $\frac{434}{453}$

14" 613-982 ALPHA/BETA SCAN

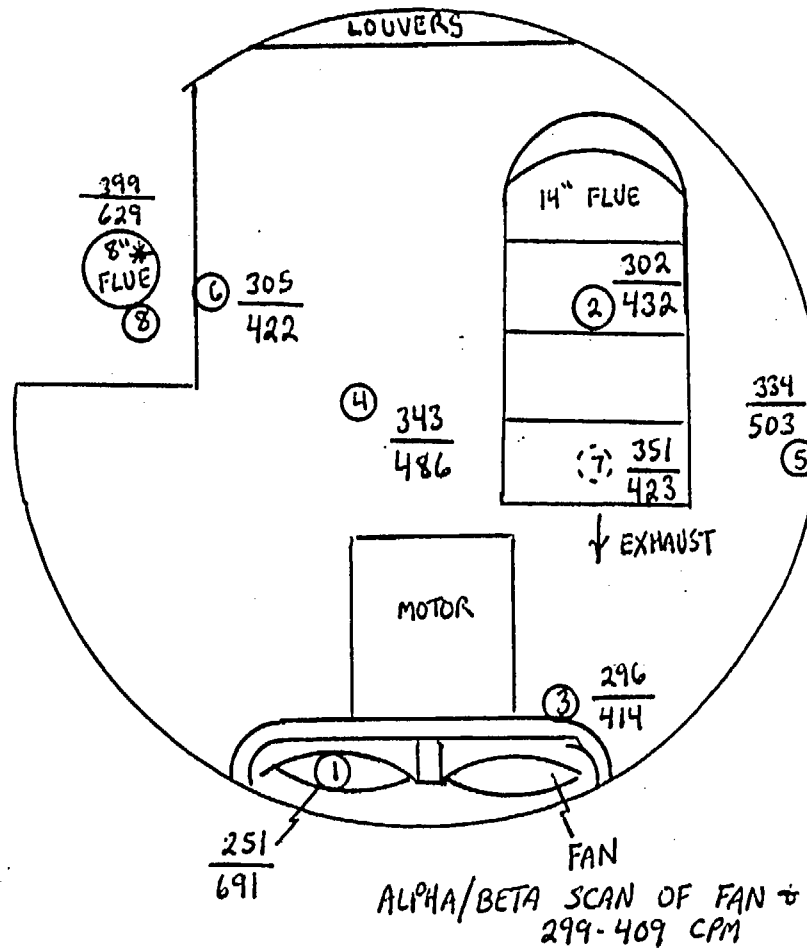
⑩ $\frac{448}{453}$

ALPHA/BETA SCAN OF CEILING
405-450 CPM

ALPHA/BETA SCAN OF FLOOR
427-465 CPM

ALPHA/BETA SCAN OF WALLS
455-528 CPM

* OUTSIDE OF PLENUM CHAMBER



GAMMA SCAN INSIDE 14" FLUE
14,400-17,800 CPM

GAMMA SCAN OF ALL SURFACES
IN PLENUM 8600-14900 CPM,

ALPHA/BETA SCAN OF 14" FLUE EXTER
390-441 CPM

ALPHA/BETA SCAN OF 14" FLUE INTER
395-446 CPM

— $\frac{\text{SHIELDED}}{\text{UNSHIELDED}}$ ALPHA/BETA
DIRECT READING

⑧ - SURVEY POINT

6'
4' DEEP

LB5100-W Low Background Counting System -- Smear Analysis

Date: 12/18/94
 Counting Unit id: 1
 Data file name: C:\LBXL\UNIT1\SMERID039.XLD
 Batch Ended: 12/18/94 10:40
 Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 10.00
 Beta activity action level (DPM): 50.00
 Certainty level for MDA and flags: 95.00%
 High Voltage Setting: 1350

Application Revision: 3

Application Version: Standard

Batch ID: UVAP 0400

Carrier	Alpha Activity				Beta Activity				Count time (min)	Alpha CPM	Beta CPM	Completion Date-Time
	DPM	σ	flags	MDA	DPM	σ	flags	MDA				
1	33.207	11.73	>AL	19.04	124.03	21.51	>AL	22.99	1.00	8.555	38.24	12/18/94 10:28
2	-1.727	3.89	<MDA	19.04	10.49	7.28	<AL	22.99	1.00	-0.445	3.24	12/18/94 10:30
3	-1.727	3.89	<MDA	19.04	7.25	6.51	<AL	22.99	1.00	-0.445	2.24	12/18/94 10:31
4	6.036	5.50	A,AL	19.04	0.76	4.60	<MDA	22.99	1.00	1.555	0.24	12/18/94 10:32
5	2.154	3.89	<MDA	19.04	0.76	4.60	<MDA	22.99	1.00	0.555	0.24	12/18/94 10:33
6	-1.727	3.89	<MDA	19.04	4.01	5.63	<MDA	22.99	1.00	-0.445	1.24	12/18/94 10:34
7	2.154	3.89	<MDA	19.04	7.25	6.51	<AL	22.99	1.00	0.555	2.24	12/18/94 10:35
8	2.154	3.89	<MDA	19.04	20.23	9.24	<AL	22.99	1.00	0.555	6.24	12/18/94 10:37
9	-1.727	3.89	<MDA	19.04	-5.73	3.27	<MDA	22.99	1.00	-0.445	-1.77	12/18/94 10:38
10	-1.727	3.89	<MDA	19.04	-2.48	3.26	<MDA	22.99	1.00	-0.445	-0.77	12/18/94 10:39
96	-1.727	3.89	<MDA	19.04	4.01	5.63	<MDA	22.99	1.00	-0.445	1.24	12/18/94 10:40

Alpha efficiency log file: th230ab

Alpha Efficiency: 25.76%

Alpha to Beta Crosstalk: 26.65%

Alpha Background (CPM): 0.445

Alpha Correction Factor: 1.000

Beta efficiency log file: tc99ab

Beta Efficiency: 30.83%

Beta into Alpha Crosstalk: 0.10%

Beta Background (CPM): 1.765

Beta Correction Factor: 1.000

Sample ID	Date Received	Date Analyzed	Batch ID	Lab ID	Volume Analyzed	Volume Unit	Sample Type	Analyte	Result	Error	Units	Method	MDA	Qualifier	Instrument Type
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	K-40	18.48	5.30	pCi/G	GSS	8.14		GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	CO-60			pCi/G	GSS	0.49	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	CS-137			pCi/G	GSS	0.47	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	PB-212	0.29	0.25	pCi/G	GSS	0.56	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	BI-214	-0.15	0.38	pCi/G	GSS	0.96	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	PB-214			pCi/G	GSS	1.01	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	RA-226			pCi/G	GSS	9.29	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	AC-228			pCi/G	GSS	2.15	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	PA-234M			pCi/G	GSS	76.60	U	GammaSpec
UVA-CD-034		12/16/02	IVA-TCS-04	SEC	122.00	g	REG	U-238			pCi/G	GSS	9.14	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	K-40	-9.82	19.35	pCi/G	GSS	49.60	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	CO-60			pCi/G	GSS	2.08	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	CS-137			pCi/G	GSS	2.30	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	PB-212			pCi/G	GSS	4.23	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	BI-214			pCi/G	GSS	6.14	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	PB-214			pCi/G	GSS	5.97	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	RA-226			pCi/G	GSS	52.10	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	AC-228			pCi/G	GSS	9.59	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	PA-234M			pCi/G	GSS	477.00	U	GammaSpec
UVA-CD-038		01/07/03	IVA-TCS-04	SEC	19.60	g	REG	U-238			pCi/G	GSS	47.40	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	K-40	-2.44	23.22	pCi/G	GSS	57.50	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	CO-60			pCi/G	GSS	3.31	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	CS-137			pCi/G	GSS	3.76	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	PB-212			pCi/G	GSS	5.11	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	BI-214			pCi/G	GSS	7.94	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	PB-214			pCi/G	GSS	7.15	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	RA-226			pCi/G	GSS	59.90	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	AC-228			pCi/G	GSS	13.10	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	PA-234M			pCi/G	GSS	467.00	U	GammaSpec
UVA-CD-037		01/07/03	IVA-TCS-04	SEC	16.60	g	REG	U-238	4.52	16.63	pCi/G	GSS	39.70	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	K-40	-6.39	22.17	pCi/G	GSS	55.90	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	CO-60			pCi/G	GSS	2.87	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	CS-137			pCi/G	GSS	3.24	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	PB-212			pCi/G	GSS	4.98	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	BI-214			pCi/G	GSS	7.37	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	PB-214			pCi/G	GSS	6.76	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	RA-226			pCi/G	GSS	62.50	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	AC-228			pCi/G	GSS	12.20	U	GammaSpec

Sample ID	Date Received	Date Analyzed	Batch ID	Lab ID	Volume Analyzed	Volume Unit	Sample Type	Analyte	Result	Error	Units	Method	MDA	Qualifier	Instrument Type
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	PA-234M			pCi/G	GSS	544.00	U	GammaSpec
UVA-CD-035		01/07/03	IVA-TCS-04	SEC	16.90	g	REG	U-238			pCi/G	GSS	55.30	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	K-40	2.05	22.26	pCi/G	GSS	54.20	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	CO-60			pCi/G	GSS	2.65	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	CS-137			pCi/G	GSS	3.19	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	PB-212			pCi/G	GSS	4.73	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	BI-214			pCi/G	GSS	7.38	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	PB-214			pCi/G	GSS	7.25	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	RA-226			pCi/G	GSS	60.20	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	AC-228			pCi/G	GSS	9.97	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	PA-234M			pCi/G	GSS	629.00	U	GammaSpec
UVA-CD-036		01/07/03	IVA-TCS-04	SEC	17.20	g	REG	U-238			pCi/G	GSS	53.60	U	GammaSpec

***** G A M M A S P E C T R U M A N A L Y S I S *****

ISOCs Report Generator ISOCSAN.TPL 2/26/96
Report Generated On : 3/31/03 1:25:34 PM

Spectrum File Name : C:\PCNT2K\CAMFILES\tunasoil\TCS00049.CNF
Sample Title : tuna can soil
Sample Identification : UVA-CD-034
Sample Type : tcs
Desc. 1 : Exhaust Flue debris (Hot cell.Rx Room,HP Lab)
Desc. 2 :
Desc. 3 :
Desc. 4 :

Peak Locate Threshold : 4.00
Peak Locate Range (in channels) : 150 - 8192
Peak Area Range (in channels) : 150 - 8192
Identification Energy Tolerance : 1.500 FWHM

Sample Size : 1.220E+002 Grams

Note: For Point Source, report UNIT = none.

Sample Taken On : 12/16/02 3:00:38 PM
Acquisition Started : 12/16/02 3:24:38 PM

Live Time : 1800.0 seconds
Real Time : 1800.6 seconds

Energy Calibration Used Done On : 10/16/02
Efficiency / Geometry ID : tuna can
Efficiency Calibration Used Done On : 10/16/02

***** P E A K L O C A T E R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Locate Performed on: 3/31/2003 1:25:33 PM

Peak Locate From Channel: 150

Peak Locate To Channel: 8192

Peak Search Sensitivity: 4.00

Peak No.	Centroid Channel	Centroid Uncertainty	Energy (keV)	Peak Significance
1	309.04	0.3074	77.28	4.53
2	952.75	0.2803	238.36	4.04
3	1179.43	0.2658	295.09	4.19
4	1405.03	0.2415	351.54	4.51
5	2434.23	0.2180	609.09	4.61
6	5839.80	0.1393	1461.30	8.15

? = Adjacent peak noted

Errors quoted at 2.000 sigma

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Analysis Performed on: 3/31/2003 1:25:33 PM

Peak Analysis From Channel: 150

Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	305-	313	309.04	77.28	0.69	4.23E+001	26.96	7.27E+001
2	947-	959	952.75	238.36	0.88	4.17E+001	28.32	8.03E+001
3	1174-	1185	1179.43	295.09	0.54	5.43E+001	21.88	3.47E+001
4	1397-	1415	1405.03	351.54	1.34	7.61E+001	26.24	4.39E+001
5	2426-	2442	2434.23	609.09	1.46	7.61E+001	21.06	1.79E+001
6	5827-	5851	5839.80	1461.30	1.98	2.24E+002	31.12	9.40E+000

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: tuna can soil
 Nuclide Library Used: C:\GENIE2K\CAMFILES\uva.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/Gram)	Activity Uncertainty
K-40	0.995	1460.81*	10.67	1.84799E+001	5.30280E+000
PB-212	0.604	74.81	9.60		
		77.11*	17.50	-3.79777E-001	4.89489E-001
		87.20	6.30		
		238.63*	44.60	2.89697E-001	2.53128E-001
		300.09	3.41		
BI-214	0.409	609.31*	46.30	-1.47318E-001	3.78789E-001
		768.36	5.04		
		1120.29	15.10		
		1764.49	15.80		

* = Energy line found in the spectrum.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.500 FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/Gram)	Wt mean Activity Uncertainty
K-40	0.995	1.847987E+001	5.302805E+000
PB-212	0.604	2.896970E-001	2.531278E-001
BI-214	0.409	-1.473177E-001	3.787886E-001
X PB-214	0.792		

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 3/31/2003 1:25:33 PM
 Peak Locate From Channel: 150
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty
3	295.09	-8.5415E-003	-146.01
4	351.54	-2.2846E-002	-65.29

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000 sigma

***** G A M M A S P E C T R U M A N A L Y S I S *****

ISOCs Report Generator ISOCsAN.TPL 2/26/96
Report Generated On : 3/31/03 1:26:04 PM

Spectrum File Name : C:\PCNT2K\CAMFILES\tunasoil\TCS00083.CNF
Sample Title : tuna can soil
Sample Identification : UVA-CD-036
Sample Type : tcs
Desc. 1 : 8" Flue bottom swipe
Desc. 2 :
Desc. 3 :
Desc. 4 :

Peak Locate Threshold : 4.00
Peak Locate Range (in channels) : 150 - 8192
Peak Area Range (in channels) : 150 - 8192
Identification Energy Tolerance : 1.500 FWHM

Sample Size : 1.720E+001 Grams

Note: For Point Source, report UNIT = none.

Sample Taken On : 12/17/03 10:00:17 AM
Acquisition Started : 1/7/03 9:42:17 AM

Live Time : 1800.0 seconds
Real Time : 1800.4 seconds

Energy Calibration Used Done On : 10/16/02
Efficiency / Geometry ID : tuna can
Efficiency Calibration Used Done On : 10/16/02

***** P E A K L O C A T E R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Locate Performed on: 3/31/2003 1:26:03 PM

Peak Locate From Channel: 150

Peak Locate To Channel: 8192

Peak Search Sensitivity: 4.00

Peak No.	Centroid Channel	Centroid Uncertainty	Energy (keV)	Peak Significance
1	1405.66	0.2454	351.70	4.67
2	5839.73	0.1700	1461.28	5.24

? = Adjacent peak noted

Errors quoted at 2.000 sigma

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Analysis Performed on: 3/31/2003 1:26:03 PM

Peak Analysis From Channel: 150

Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	1398-	1413	1405.66	351.70	0.83	5.50E+001	21.28	2.90E+001
2	5829-	5849	5839.73	1461.28	0.38	1.02E+002	20.54	1.68E+000

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: tuna can soil
 Nuclide Library Used: C:\GENIE2K\CAMFILES\uva.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/Gram)	Activity Uncertainty
K-40	0.995	1460.81*	10.67	2.04515E+000	2.22558E+001

* = Energy line found in the spectrum.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 1.500 FWHM
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/Gram)	Wt mean Activity Uncertainty
K-40	0.995	2.045146E+000	2.225584E+001

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 3/31/2003 1:26:03 PM
 Peak Locate From Channel: 150
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty
1	351.70	-3.4610E-002	-35.35

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000 sigma

***** G A M M A S P E C T R U M A N A L Y S I S *****

ISOCS Report Generator ISOCSAN.TPL 2/26/96
Report Generated On : 3/31/03 1:26:57 PM

Spectrum File Name : C:\PCNT2K\CAMFILES\tunasoil\TCS00084.CNF
Sample Title : tuna can soil
Sample Identification : UVA-CD-035
Sample Type : tcs
Desc. 1 : 14" Flue bottom swipe
Desc. 2 :
Desc. 3 :
Desc. 4 :

Peak Locate Threshold : 4.00
Peak Locate Range (in channels) : 150 - 8192
Peak Area Range (in channels) : 150 - 8192
Identification Energy Tolerance : 1.500 FWHM

Sample Size : 1.690E+001 Grams

Note: For Point Source, report UNIT = none.

Sample Taken On : 12/17/03 10:20:59 AM
Acquisition Started : 1/7/03 10:16:59 AM

Live Time : 1800.0 seconds
Real Time : 1800.4 seconds

Energy Calibration Used Done On : 10/16/02
Efficiency / Geometry ID : tuna can
Efficiency Calibration Used Done On : 10/16/02

***** P E A K L O C A T E R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Locate Performed on: 3/31/2003 1:26:56 PM

Peak Locate From Channel: 150

Peak Locate To Channel: 8192

Peak Search Sensitivity: 4.00

Peak No.	Centroid Channel	Centroid Uncertainty	Energy (keV)	Peak Significance
1	5840.09	0.1703	1461.37	5.35

? = Adjacent peak noted

Errors quoted at 2.000 sigma

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Analysis Performed on: 3/31/2003 1:26:56 PM

Peak Analysis From Channel: 150

Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	5831-	5851	5840.09	1461.37	1.41	9.45E+001	20.07	3.50E+000

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000 sigma

***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: tuna can soil
Nuclide Library Used: C:\GENIE2K\CAMFILES\uva.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/Gram)	Activity Uncertainty
K-40	0.993	1460.81*	10.67	-6.38920E+000	2.21669E+001

* = Energy line found in the spectrum.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.500 FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000 sigma

 ***** INTERFERENCE CORRECTED REPORT *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/Gram)	Wt mean Activity Uncertainty
K-40	0.993	-6.389198E+000	2.216689E+001

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000 sigma

***** UNIDENTIFIED PEAKS *****

Peak Locate Performed on: 3/31/2003 1:26:56 PM
 Peak Locate From Channel: 150
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty
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All peaks were identified.

***** G A M M A S P E C T R U M A N A L Y S I S *****

ISOCS Report Generator ISOCSAN.TPL 2/26/96
Report Generated On : 3/31/03 1:27:40 PM

Spectrum File Name : C:\PCNT2K\CAMFILES\tunasoil\TCS00085.CNF
Sample Title : tuna can soil
Sample Identification : UVA-CD-037
Sample Type : tcs
Desc. 1 : 14" flue top swipe
Desc. 2 :
Desc. 3 :
Desc. 4 :

Peak Locate Threshold : 4.00
Peak Locate Range (in channels) : 150 - 8192
Peak Area Range (in channels) : 150 - 8192
Identification Energy Tolerance : 1.500 FWHM

Sample Size : 1.660E+001 Grams

Note: For Point Source, report UNIT = none.

Sample Taken On : 12/17/03 5:00:40 PM
Acquisition Started : 1/7/03 10:49:40 AM

Live Time : 1800.0 seconds
Real Time : 1800.4 seconds

Energy Calibration Used Done On : 10/16/02
Efficiency / Geometry ID : tuna can
Efficiency Calibration Used Done On : 10/16/02

***** P E A K L O C A T E R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Locate Performed on: 3/31/2003 1:27:39 PM

Peak Locate From Channel: 150

Peak Locate To Channel: 8192

Peak Search Sensitivity: 4.00

Peak No.	Centroid Channel	Centroid Uncertainty	Energy (keV)	Peak Significance
1	253.01	0.3183	63.26	4.30
2	5839.91	0.1755	1461.32	4.59

? = Adjacent peak noted

Errors quoted at 2.000 sigma

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Analysis Performed on: 3/31/2003 1:27:39 PM

Peak Analysis From Channel: 150

Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	250-	259	253.01	63.26	0.62	6.03E+001	22.91	3.47E+001
2	5829-	5849	5839.91	1461.32	0.52	9.82E+001	20.68	4.82E+000

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: tuna can soil
 Nuclide Library Used: C:\GENIE2K\CAMFILES\uva.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/Gram)	Activity Uncertainty
K-40	0.994	1460.81*	10.67	-2.44294E+000	2.32154E+001
U-238	1.000	63.29*	3.80	4.52436E+000	1.66306E+001

* = Energy line found in the spectrum.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.500 FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000 sigma

***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/Gram)	Wt mean Activity Uncertainty
K-40	0.994	-2.442935E+000	2.321542E+001
U-238	1.000	4.524360E+000	1.663057E+001

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 3/31/2003 1:27:39 PM
Peak Locate From Channel: 150
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty
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All peaks were identified.

***** G A M M A S P E C T R U M A N A L Y S I S *****

ISOCS Report Generator
Report Generated On

ISOCSAN.TPL 2/26/96
: 3/31/03 1:29:04 PM

Spectrum File Name : C:\PCNT2K\CAMFILES\tunasoil\TCS00086.CNF
Sample Title : tuna can soil
Sample Identification : UVA-CD-038
Sample Type : tcs
Desc. 1 : 8" Flue top swipe
Desc. 2 :
Desc. 3 :
Desc. 4 :

Peak Locate Threshold : 4.00
Peak Locate Range (in channels) : 150 - 8192
Peak Area Range (in channels) : 150 - 8192
Identification Energy Tolerance : 1.500 FWHM

Sample Size : 1.960E+001 Grams

Note: For Point Source, report UNIT = none.

Sample Taken On : 12/17/03 5:00:52 PM
Acquisition Started : 1/7/03 11:24:52 AM

Live Time : 1800.0 seconds
Real Time : 1800.4 seconds

Energy Calibration Used Done On : 10/16/02
Efficiency / Geometry ID : tuna can
Efficiency Calibration Used Done On : 10/16/02

***** P E A K L O C A T E R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Locate Performed on: 3/31/2003 1:29:03 PM

Peak Locate From Channel: 150

Peak Locate To Channel: 8192

Peak Search Sensitivity: 4.00

Peak No.	Centroid Channel	Centroid Uncertainty	Energy (keV)	Peak Significance
1	5840.17	0.1793	1461.39	4.55

? = Adjacent peak noted

Errors quoted at 2.000 sigma

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: LABSOCS

Sample Title: tuna can soil

Peak Analysis Performed on: 3/31/2003 1:29:03 PM

Peak Analysis From Channel: 150

Peak Analysis To Channel: 8192

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	5830-	5851	5840.17	1461.39	1.24	8.99E+001	20.29	7.12E+000

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: tuna can soil
 Nuclide Library Used: C:\GENIE2K\CAMFILES\uva.NLB

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/Gram)	Activity Uncertainty
K-40	0.993	1460.81*	10.67	-9.82204E+000	1.93491E+001

* = Energy line found in the spectrum.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.500 FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/Gram)	Wt mean Activity Uncertainty
K-40	0.993	-9.822043E+000	1.934912E+001

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 3/31/2003 1:29:03 PM
 Peak Locate From Channel: 150
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty
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All peaks were identified.