GEORGIA INSTITUTE OF TECHNOLOGY
RESEARCH REACTOR
DECOMMISSIONING PROJECT
RADIOLOGICAL CHARACTERIZATION REPORT

NES DOCUMENT NO. 82A9087

May, 1998

Prepared by:
NES, Inc.
44 Shelter Rock Road
Danbury, CT 06810

Book 2 of 3

PART B of a/b

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Southeast Wall of Containment
Date: 10/8/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

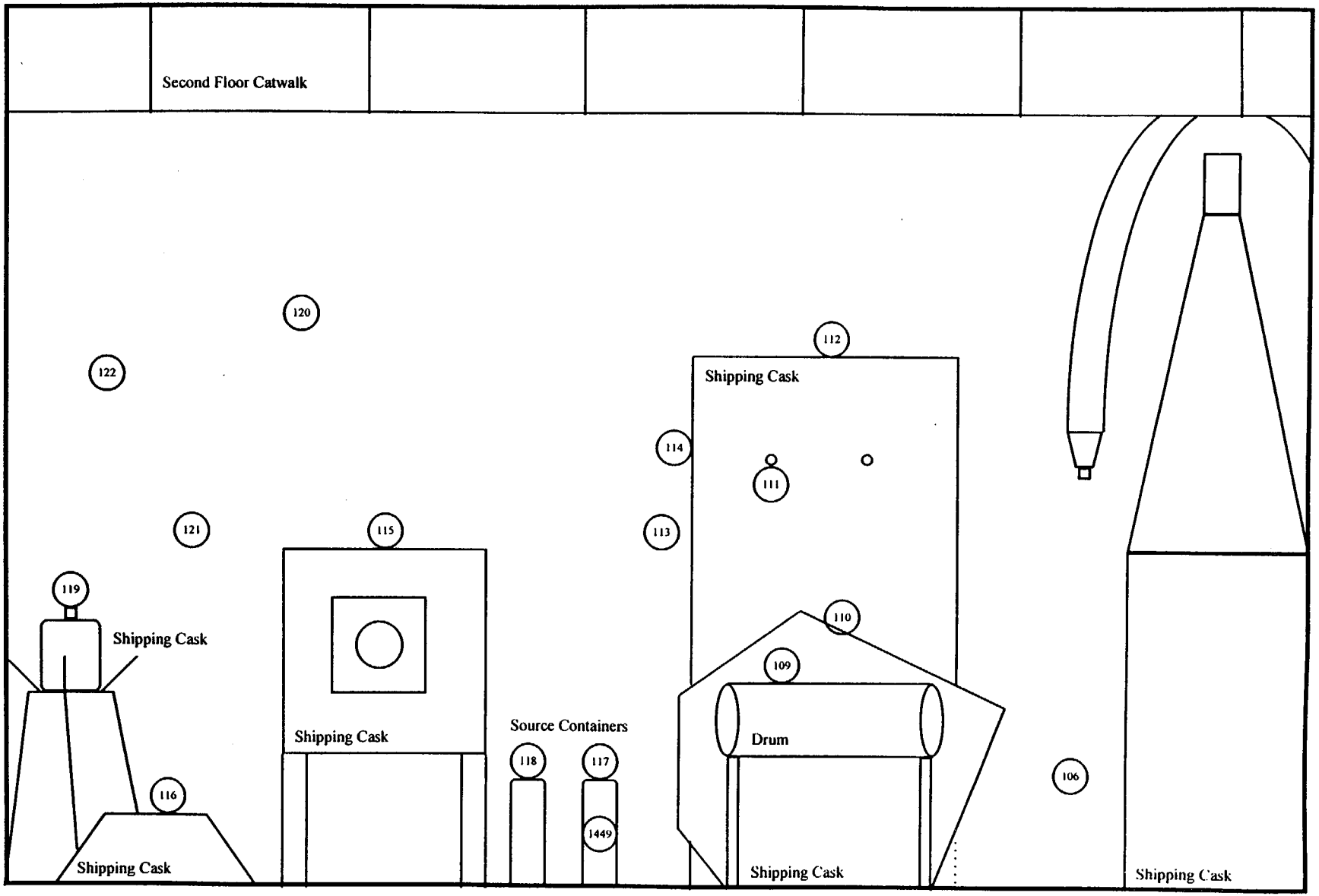
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
97	0	17
98	1	17
99	3	17
100	1	17
101	19	17
102	1	17
103	35	17
104	12	17
105	26	17
107	1	17
108	26	17
1445	37	17
1446	67	17
1447	260	17
1448	104	17

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: [signature] Date: 1/14/98

First Floor- South Wall of Containment

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

- Enter all time in minutes
- Enter all dates as m/d/y
- Enter efficiency in decimal form (i.e., 28.3% = 0.283)
- Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- South Wall of Containment

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: Nat Lyn Date: 1/5/98

Reviewed By: [illegible] Date: [illegible]

Direct Alpha Data Sheet

Survey Type: -
Project Title: Georgia Tech Charactenzation Survey
Survey Unit Location: First Floor- South Wall of Containment
Date: 10 9.97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 — Serial #: 50062
Probe: AC-3 — Serial #: 408951

Efficiency: 7.70%
MDA: 289

NT= None Taken

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
106	3	3	-44	122	289
109	3	3	-44	122	289
110	4	4	-22	129	289
111	3	3	-44	122	289
112	4	4	-22	129	289
113	1	1	-88	106	289
114	12	12	154	178	289
115	3	3	-44	122	289
116	3	3	-44	122	289
117	1	1	-88	106	289
118	9	9	88	161	289
119	13	13	176	183	289
120	6	6	22	143	289
121	6	6	22	143	289
122	6	6	22	143	289
1449	NT				

Individual Completing Form: [signature] Date: 1/5/98

Reviewed By: Gerard M Toomey Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- South Wall of Containment	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	44	
n_s =	15	
x_{avg} =	3	
Maximum value in population =	176	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	3
n_s =	15
$\Sigma(x_{avg} - x_i)^2$ =	89895
s_x =	80

Calculation Sheet

Survey Unit: First Floor- South Wall of Containment

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	3
$t_{1-\alpha,df}$ =	1.761
s_x =	80
n_s =	15
μ_α =	39

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pat Fryr Date: 1/5/98

Reviewed by: Gerard M Tourney Date: 1/14/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- South Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2243

NT= None Taken

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
106	720	720	14876	1843	2243
109	1070	1070	25545	2156	2243
110	615	615	11675	1739	2243
111	679	679	13626	1803	2243
112	621	621	11858	1745	2243
113	304	304	2195	1383	2243
114	581	581	10639	1704	2243
115	340	340	3292	1429	2243
116	463	463	7042	1575	2243
117	345	345	3445	1435	2243
118	381	381	4542	1479	2243
119	351	351	3627	1443	2243
120	382	382	4572	1480	2243
121	528	528	9023	1647	2243
122	276	276	1341	1347	2243
1449	NT				

Individual Completing Form: Pat Fry Date: 1/14/98
Reviewed By: Gerard M Tourney Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	First Floor- South Wall of Containment	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	127298	
n_s =	15	
x_{avg} =	8487	
Maximum value in population =	25545	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	8487
n_s =	15
$\Sigma(x_{avg} - x_i)^2$ =	584311635
s_x =	6460

Calculation Sheet

Survey Unit: First Floor- South Wall of Containment

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	8487
$t_{1-\alpha,df}$ =	1.761
s_x =	6460
n_s =	15
μ_α =	11424

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 1/5/98

Reviewed by: [signature] Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- South Wall of Containment
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
106	0	13
109	0	13
110	0	13
111	0	13
112	0	13
113	0	13
114	0	13
115	3	13
116	0	13
117	0	13
118	0	13
119	0	13
120	0	13
121	3	13
122	3	13
1449	113	13

Individual Completing Form: Date [illegible] — Date: 1/5/98
Reviewed By: Gerald M Tourney — Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- South Wall of Containment
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

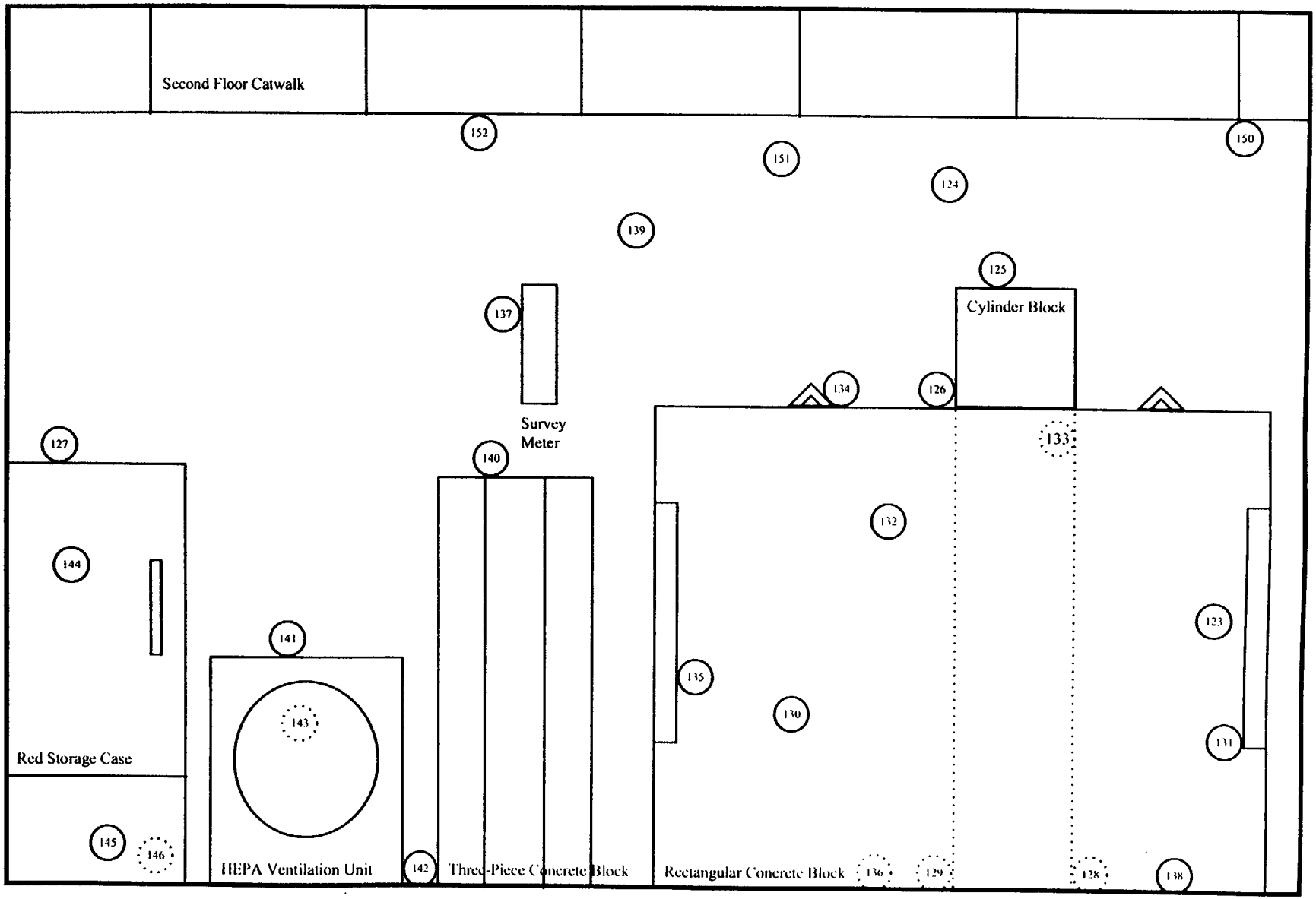
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
106	3	17
109	1	17
110	10	17
111	0	17
112	5	17
113	12	17
114	0	17
115	0	17
116	3	17
117	3	17
118	0	17
119	3	17
120	0	17
121	1	17
122	1	17
1449	1724	17

Individual Completing Form: Peter Fry — Date: 1/5/98
Reviewed By: Gerard M Tourney — Date: 1/14/98

First Floor- East Wall of Containment

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations
Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

- Enter all time in minutes
- Enter all dates as m/d/y
- Enter efficiency in decimal form (i.e.. 28.3% = 0.283)
- Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- East Wall of Containment

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: Gerard McTourney Date: 6/14/98

Direct Alpha Data Sheet

Survey Type: -
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Containment
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
123	4	4	-22	129	289
124	1	1	-88	106	289
125	5	5	0	136	289
126	3	3	-44	122	289
127	4	4	-22	129	289
128	1	1	-88	106	289
129	2	2	-66	114	289
130	4	4	-22	129	289
131	1	1	-88	106	289
132	6	6	22	143	289
133	1	1	-88	106	289
134	4	4	-22	129	289
135	1	1	-88	106	289
136	0	0	-110	96	289
137	11	11	132	173	289
138	2	2	-66	114	289
139	2	2	-66	114	289
140	0	0	-110	96	289
141	2	2	-66	114	289
142	7	7	44	149	289
143	12	12	154	178	289
144	3	3	-44	122	289
145	2	2	-66	114	289
146	9	9	88	161	289
150	3	3	-44	122	289
151	3	3	-44	122	289
152	4	4	-22	129	289

Individual Completing Form: Date: 12/30/97
Reviewed By: Gerard M Tierney Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- East Wall of Containment	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-836	
n_s =	27	
x_{avg} =	-31	
Maximum value in population =	154	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-31
n_s =	27
$\Sigma(x_{avg} - x_i)^2$ =	120283
s_x =	68

Calculation Sheet

Survey Unit: First Floor- East Wall of Containment

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-31
$t_{1-\alpha,df}$ =	1.706
s_x =	68
n_s =	27
μ_α =	-9

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Peter TM Date: 12/30/97

Reviewed by: Gerard M Toumey Date: 1/14/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit Location: First Floor- East Wall of Containment
Date: 10-9-97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
2: Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
123	285	285	1616	1359	2243
124	1279	1279	31916	2322	2243
125	400	400	5121	1502	2243
126	800	800	17314	1919	2243
127	531	531	9114	1650	2243
128	501	501	8200	1618	2243
129	455	455	6798	1566	2243
130	483	483	7651	1598	2243
131	507	507	8383	1624	2243
132	842	842	18595	1958	2243
133	875	875	19601	1988	2243
134	872	872	19509	1985	2243
135	480	480	7560	1594	2243
136	560	560	9998	1681	2243
137	355	355	3749	1448	2243
138	410	410	5426	1514	2243
139	371	371	4237	1467	2243
140	594	594	11035	1717	2243
141	3423	3423	97272	3612	2243
142	6007	6007	176040	4719	2243
143	20259	20259	610486	8553	2243
144	404	404	5243	1507	2243
145	391	391	4847	1491	2243
146	814	814	17741	1932	2243
150	166	166	-2012	1192	2243
151	114	114	-3597	1111	2243
152	354	354	3719	1446	2243

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: Gerard M Tourney Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following
Survey Unit	First Floor- East Wall of Containment	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	1105562
n_s =	27
x_{avg} =	40947
Maximum value in population =	610486 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	40947
n_s =	27
$\Sigma(x_{avg} - x_i)^2$ =	371395942069
s_x =	119518

Calculation Sheet

Survey Unit: First Floor- East Wall of Containment

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	40947
$t_{1-\alpha,df}$ =	1.706
s_x =	119518
n_s =	27
μ_α =	80187

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/30/97

Reviewed by: Gerard M Tierney Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Containment
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
123	0	13
124	0	13
125	0	13
126	0	13
127	0	13
128	3	13
129	0	13
130	0	13
131	0	13
132	3	13
133	0	13
134	0	13
135	0	13
136	0	13
137	0	13
138	3	13
139	0	13
140	0	13
141	3	13
142	0	13
143	3	13
144	0	13
145	3	13
146	0	13
150	0	13
151	0	13
152	0	13

Individual Completing Form: Peter [illegible] — Date: 12/30/97
Reviewed By: Gerard M. Pouley — Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Containment
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

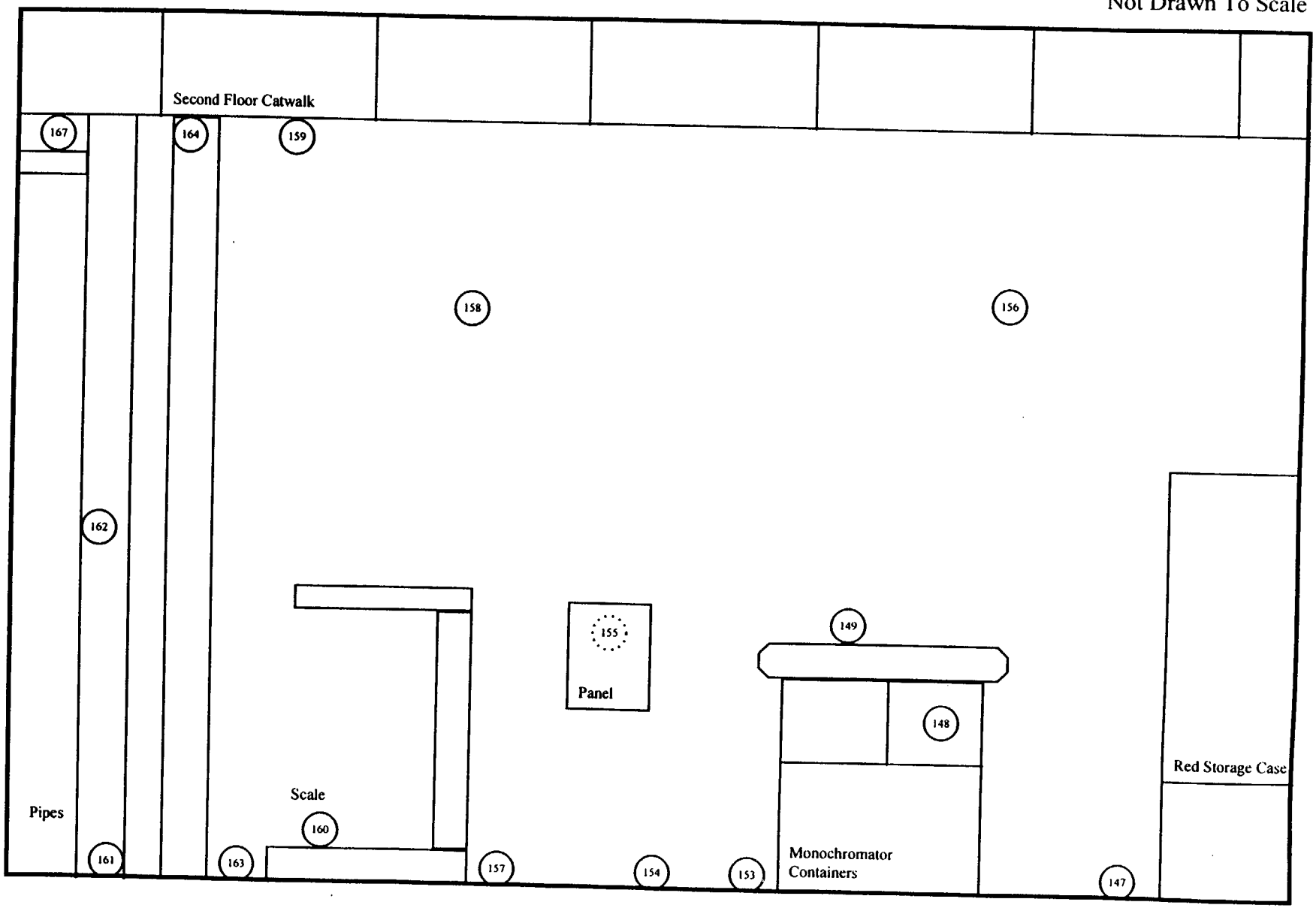
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
123	1	17
124	0	17
125	1	17
126	1	17
127	3	17
128	10	17
129	3	17
130	0	17
131	5	17
132	3	17
133	19	17
134	0	17
135	1	17
136	0	17
137	3	17
138	5	17
139	0	17
140	5	17
141	0	17
142	0	17
143	636	17
144	0	17
145	7	17
146	3	17
150	0	17
151	1	17
152	0	17

Individual Completing Form: [signature] — Date: 12/30/97
Reviewed By: Gerard M Tourney — Date: 1/14/98

First Floor- East Wall of Containment

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations
Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\ (a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- East Wall of Containment

SURVEY TYPE:	1	(direct alpha)
METER:	L2220	
SERIAL #:	50061	
PROBE #:	43-65	
SERIAL #:	63291	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:40
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	18.00%
a = Probe Area (cm) =	63
MDA (dpm/100 cm^2) =	116

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	19:49
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	19:49
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: Nate Fry Date: 1/5/98

Reviewed By: [illegible] Date: 1/5/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 50061 Efficiency: 18.00%
Probe: 43-65 Serial #: 63291 MDA: 116

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
147	6	6	9	57	116
148	1	1	-35	42	116
149	2	2	-26	46	116
153	4	4	-9	52	116
154	7	7	18	60	116
155	20	20	132	86	116
156	3	3	-18	49	116
157	1	1	-35	42	116
158	2	2	-26	46	116
159	3	3	-18	49	116
160	1	1	-35	42	116
161	5	5	0	55	116
162	2	2	-26	46	116
163	3	3	-18	49	116
164	4	4	-9	52	116
167	2	2	-26	46	116

Individual Completing Form: [signature] Date: 1/5/98

Reviewed By: [signature] Date: 1/9/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- East Wall of Containment	
Date	10/9/97	
Meter	L2220	
Serial #	50061	
Probe	43-65	
Serial #	63291	
MDA	116	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-122	
n_s =	16	
x_{avg} =	-8	
Maximum value in population =	132	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-8
n_s =	16
$\Sigma(x_{avg} - x_i)^2$ =	24414
s_x =	40

Calculation Sheet

Survey Unit: First Floor- East Wall of Containment

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-8
$t_{1-\alpha,df}$ =	1.753
s_x =	40
n_s =	16
μ_α =	10

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 1/5/98

Reviewed by: [signature] Date: [illegible]

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823
Probe: 44-9 Serial #: 11150

Efficiency: 21.87%
MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
147	898	898	20302	2008	2243
148	340	340	3292	1429	2243
149	348	348	3536	1439	2243
153	572	572	10364	1694	2243
154	513	513	8566	1631	2243
155	441	441	6371	1550	2243
156	205	205	-823	1249	2243
157	449	449	6615	1559	2243
158	206	206	-793	1250	2243
159	93	93	-4237	1077	2243
160	321	321	2713	1405	2243
161	1132	1132	27435	2207	2243
162	303	303	2164	1382	2243
163	82	82	-4572	1059	2243
164	85	85	-4481	1064	2243
167	57	57	-5335	1016	2243

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	First Floor- East Wall of Containment	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	71117	
n_s =	16	
x_{avg} =	4445	
Maximum value in population =	27435	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	4445
n_s =	16
$\Sigma(x_{avg} - x_i)^2$ =	1237972359
s_x =	9085

Calculation Sheet

Survey Unit: First Floor- East Wall of Containment

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	4445
$t_{1-\alpha,df}$ =	1.753
s_x =	9085
n_s =	16
μ_α =	8426

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: _____ Date: 1/5/98

Reviewed by: _____ Date: 1/[illegible]/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- East Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
147	0	13
148	0	13
149	3	13
153	0	13
154	3	13
155	0	13
156	0	13
157	0	13
158	0	13
159	0	13
160	0	13
161	0	13
162	0	13
163	0	13
164	0	13
167	0	13

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/11/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- East Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

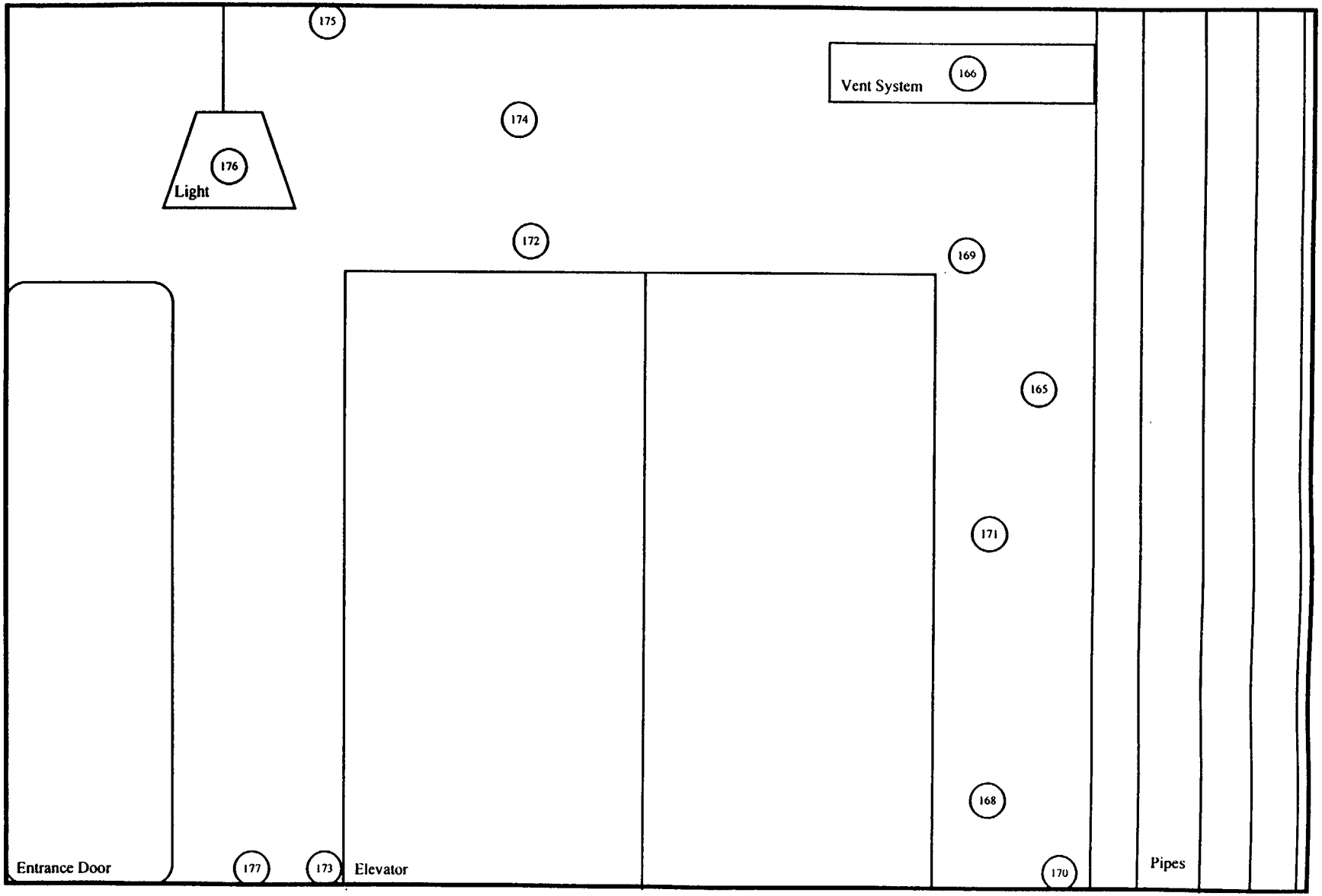
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
147	0	17
148	1	17
149	5	17
153	1	17
154	5	17
155	3	17
156	0	17
157	1	17
158	3	17
159	0	17
160	7	17
161	21	17
162	3	17
163	1	17
164	5	17
167	0	17

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/14/98

First Floor- North Wall of Containment

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- North Wall of Containment

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	10:27
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	10:27
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: _____ Date: 1/6/98

Reviewed By: _____ Date: 1/6/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- North Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
165	2	2	-66	114	289
166	4	4	-22	129	289
168	5	5	0	136	289
169	11	11	132	173	289
170	2	2	-66	114	289
171	9	9	88	161	289
172	2	2	-66	114	289
173	2	2	-66	114	289
174	2	2	-66	114	289
175	1	1	-88	106	289
176	8	8	66	156	289
177	2	2	-66	114	289

Individual Completing Form: Patrick [illegible] Date: 1/6/98

Reviewed By: [illegible] Date: [illegible]

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	First Floor- North Wall of Containment	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-220
n_s =	12
x_{avg} =	-18
Maximum value in population =	132 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-18
n_s =	12
$\Sigma(x_{avg} - x_i)^2$ =	59856
s_x =	74

Calculation Sheet

Survey Unit: First Floor- North Wall of Containment

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-18
$t_{1-\alpha,df}$ =	1.796
s_x =	74
n_s =	12
μ_α =	20

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 1/6/98

Reviewed by: [signature] Date: [illegible]

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- North Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823
Probe: 44-9 Serial #: 11150

Efficiency: 21.87%
MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
165	105	105	-3871	1097	2243
166	94	94	-4207	1079	2243
168	394	394	4938	1495	2243
169	74	74	-4816	1045	2243
170	102	102	-3963	1092	2243
171	506	506	8352	1623	2243
172	81	81	-4603	1057	2243
173	401	401	5152	1503	2243
174	128	128	-3170	1134	2243
175	138	138	-2865	1149	2243
176	176	176	-1707	1207	2243
177	134	134	-2987	1143	2243

Individual Completing Form: Date: 1/5/98
Reviewed By: Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following
Survey Unit	First Floor- North Wall of Containment	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-13747
n_s =	12
x_{avg} =	-1146
Maximum value in population =	**8352 (dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-1146
n_s =	12
$\Sigma(x_{avg} - x_i)^2$ =	227797987
s_x =	4551

Calculation Sheet

Survey Unit: First Floor- North Wall of Containment

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-1146
$t_{1-\alpha,df}$ =	1.796
s_x =	4551
n_s =	12
μ_α =	1213

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 1/6/98

Reviewed by: [signature] Date: 1/7/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- North Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

Efficiency: 28.35%
MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
165	0	13
166	0	13
168	0	13
169	0	13
170	0	13
171	0	13
172	0	13
173	3	13
174	0	13
175	0	13
176	0	13
177	0	13

Individual Completing Form: [signature] Date: 1/6/98

Reviewed By: [signature] Date: 1/6/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- North Wall of Containment
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

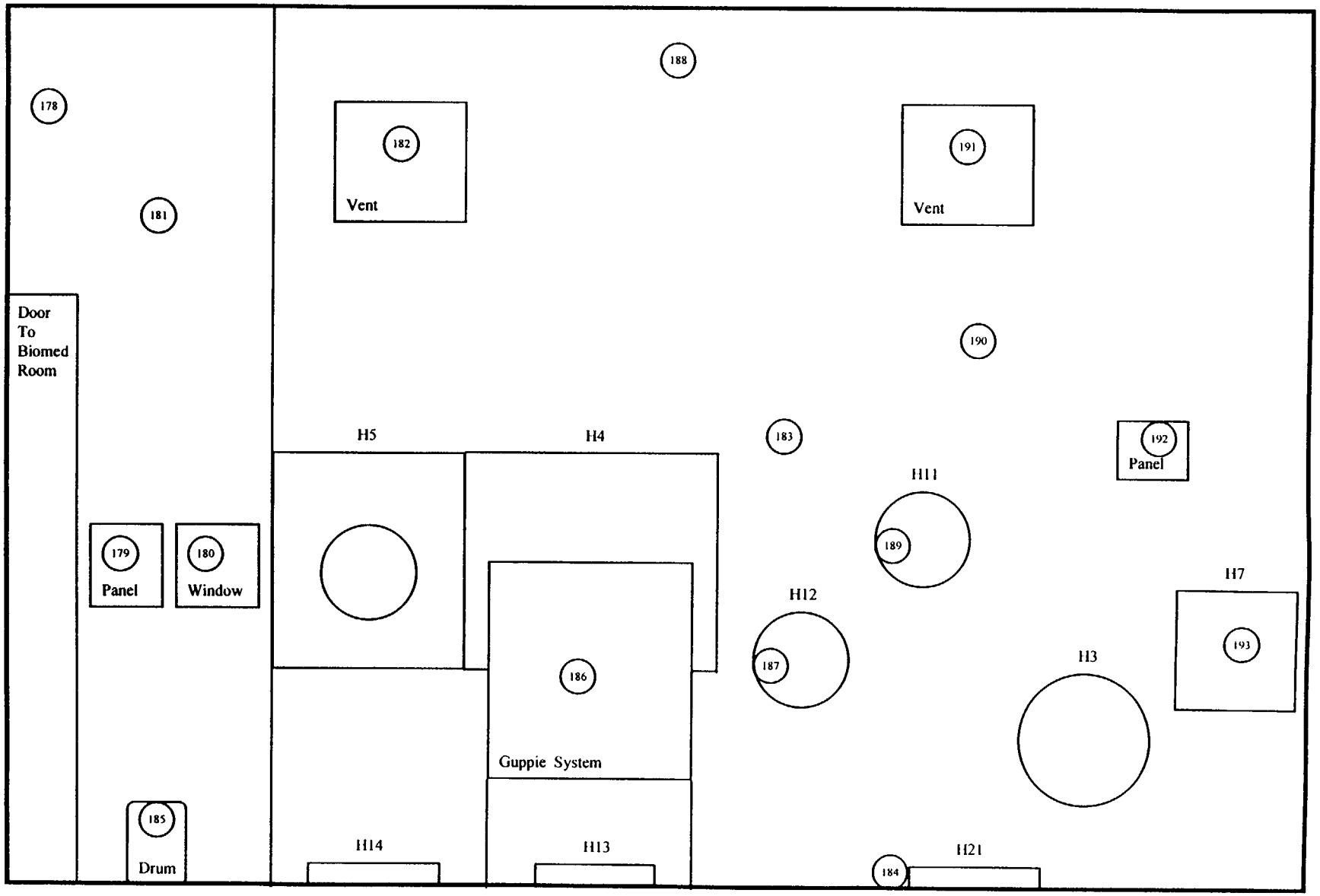
Instrument
Model: LB 5100 W — Serial # 13795 — Efficiency 43.45%
Probe: N/A — Serial # N/A — MDA 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
165	5	17
166	1	17
168	12	17
169	7	17
170	3	17
171	7	17
172	0	17
173	5	17
174	5	17
175	1	17
176	3	17
177	5	17

Individual Completing Form: [signature] Date: 1/6/98
Reviewed By: [signature] Date: 1/14/98

First Floor- North Wall of Reactor

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations
Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- North Wall of Reactor

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7.30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	11:08
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	11:08
Rb = Background rate (cpm) =	.2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 1/6/98

Reviewed By: Gerard M Tierney Date: 1/14/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- North Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
178	3	3	-44	122	289
179	2	2	-66	114	289
180	4	4	-22	129	289
181	2	2	-66	114	289
182	12	12	154	178	289
183	2	2	-66	114	289
184	1	1	-88	106	289
185	4	4	-22	129	289
186	11	11	132	173	289
187	14	14	198	188	289
188	3	3	-44	122	289
189	3	3	-44	122	289
190	3	3	-44	122	289
191	21	21	352	220	289
192	9	9	88	161	289
193	8	8	66	156	289

Individual Completing Form: _____ Date: 1/6/98

Reviewed By: _____ Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	First Floor- North Wall of Reactor	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	484
n_s =	16
x_{avg} =	30
Maximum value in population =	352 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	30
n_s =	16
$\Sigma(x_{avg} - x_i)^2$ =	231232
s_x =	124

Calculation Sheet

Survey Unit: First Floor- North Wall of Reactor

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	30
$t_{1-\alpha,df}$ =	1.753
s_x =	124
n_s =	16
μ_α =	84

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Peter Fry Date: 1/6/99

Reviewed by: Date: 1/7/99

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- North Wall of Reactor
Date: 10-9-97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220
Probe: 44-9
Serial #: 52823
Serial #: 11150
Efficiency: 21.87%
MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
178	144	144	-2683	1159	2243
179	248	248	488	1309	2243
180	293	293	1859	1369	2243
181	164	164	-2073	1189	2243
182	124	124	-3292	1127	2243
183	108	108	-3780	1102	2243
184	407	407	5335	1510	2243
185	100	100	-4024	1089	2243
186	586	586	10791	1709	2243
187	5316	5316	154976	4450	2243
188	675	675	13504	1799	2243
189	278	278	1402	1349	2243
190	306	306	2256	1386	2243
191	318	318	2622	1401	2243
192	1086	1086	26033	2169	2243
193	528	528	9023	1647	2243

Individual Completing Form: [signature] Date: 1/6/98
Reviewed By: Gerard M Toumey Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- North Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
178	0	13
179	0	13
180	0	13
181	0	13
182	0	13
183	0	13
184	0	13
185	0	13
186	0	13
187	3	13
188	0	13
189	0	13
190	3	13
191	3	13
192	0	13
193	0	13

Individual Completing Form: [signature] Date: 1/6/98
Reviewed By: [signature] Date: 1/9/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- North Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

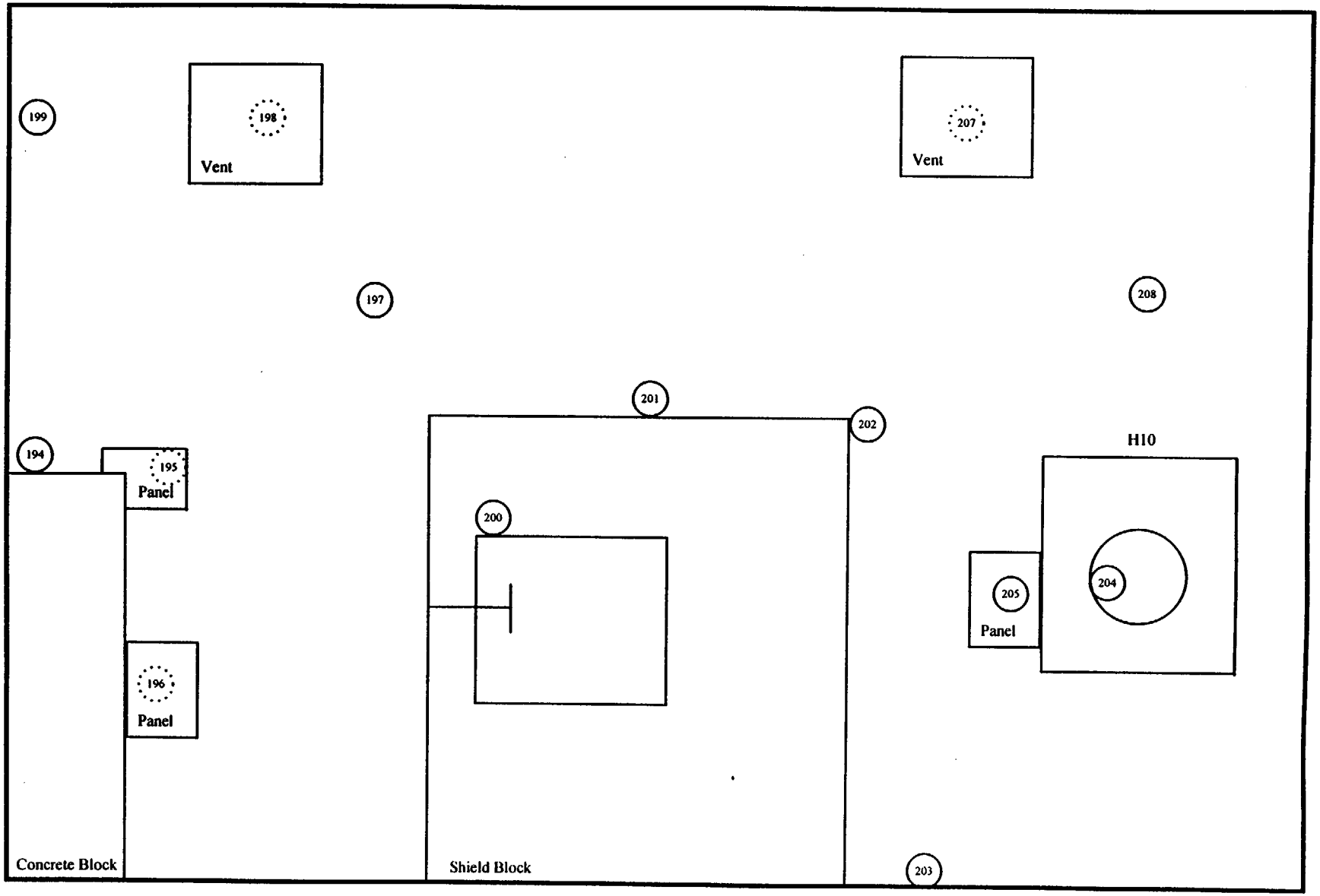
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm²)	MDA (dpm/100 cm²)
178	0	17
179	14	17
180	1	17
181	0	17
182	92	17
183	23	17
184	19	17
185	14	17
186	7	17
187	97	17
188	5	17
189	19	17
190	10	17
191	26	17
192	5	17
193	19	17

Individual Completing Form: [signature] Date: 7/6/98
Reviewed By: [signature] Date: 1/11/98

First Floor- Southeast Wall of Reactor

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- Southeast Wall of Reactor

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/8/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	230
Date background was taken =	10/8/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	230
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2234

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	11:12
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	11:12
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/23/97

Reviewed By: [signature] Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Southeast Wall of Reactor
Date: 10/8/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
194	7	7	44	149	289
195	5	5	0	136	289
196	5	5	0	136	289
197	33	33	616	266	289
198	18	18	286	207	289
199	4	4	-22	129	289
200	1	1	-88	106	289
201	2	2	-66	114	289
202	2	2	-66	114	289
203	4	4	-22	129	289
204	1	1	-88	106	289
205	1	1	-88	106	289
207	18	18	286	207	289
208	7	7	44	149	289

Individual Completing Form: Pat Fogan Date: 12/23/97

Reviewed By: [illegible] Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- Southeast Wall of Reactor	
Date	10/8/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	836	
n_s =	14	
x_{avg} =	60	
Maximum value in population =	616	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	60
n_s =	14
$\Sigma(x_{avg} - x_i)^2$ =	529912
s_x =	202

Calculation Sheet

Survey Unit: First Floor- Southeast Wall of Reactor

Survey Type: 1

This sheet uses the following equation to determine the 95% Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	60
$t_{1-\alpha,df}$ =	1.771
s_x =	202
n_s =	14
μ_α =	156

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/23/97

Reviewed by: [signature] Date: [illegible]

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Southeast Wall of Reactor
Date: 10-8-97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA screadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2234

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
194	1186	1186	29142	2248	2234
195	1086	1086	26094	2167	2234
196	1285	1285	32160	2326	2234
197	320	320	2743	1401	2234
198	306	306	2317	1383	2234
199	1265	1265	31550	2310	2234
200	505	505	8383	1620	2234
201	483	483	7712	1595	2234
202	409	409	5456	1510	2234
203	184	184	-1402	1216	2234
204	357	357	3871	1448	2234
205	409	409	5456	1510	2234
207	340	340	3353	1426	2234
208	347	347	3567	1435	2234

Individual Completing Form: [signature] Date: 12/23/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	First Floor- Southeast Wall of Reactor	
Date	10/8/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2234	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	160402	
n_s =	14	
x_{avg} =	11457	
Maximum value in population =	32160	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	11457
n_s =	14
$\Sigma(x_{avg} - x_i)^2$ =	1965143944
s_x =	12295

Calculation Sheet

Survey Unit: First Floor- Southeast Wall of Reactor

Survey Type: 2

This sheet uses the following equation to determine the 95% Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	11457
$t_{1-\alpha,df}$ =	1.771
s_x =	12295
n_s =	14
μ_α =	17276

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/23/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Southeast Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
194	3	13
195	0	13
196	0	13
197	0	13
198	3	13
199	0	13
200	0	13
201	0	13
202	0	13
203	0	13
204	0	13
205	0	13
207	0	13
208	0	13

Individual Completing Form: Peter [illegible] — Date: 12/23/97
Reviewed By: [illegible] — Date: 1/11/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Southeast Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

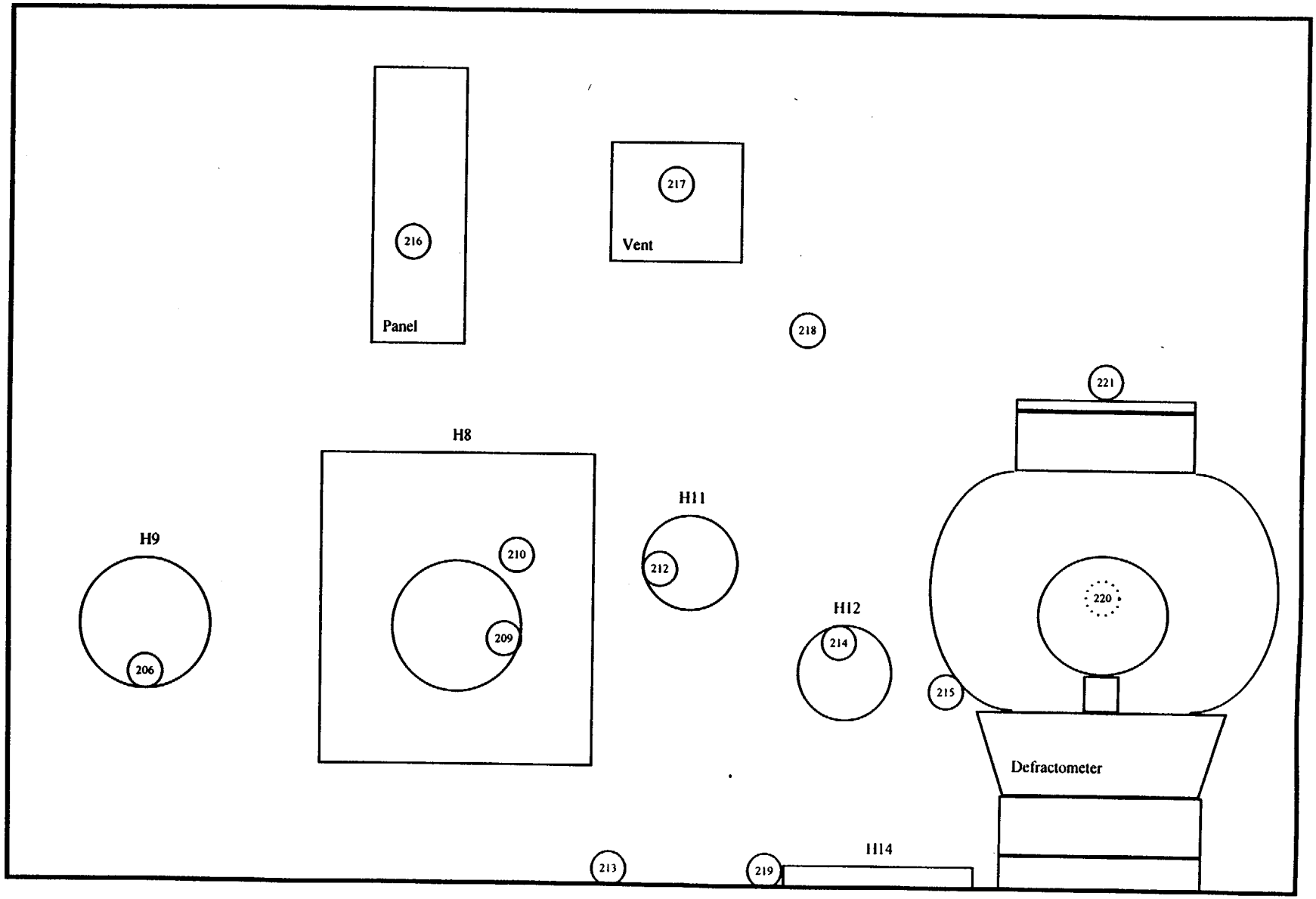
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
194	12	17
195	5	17
196	3	17
197	12	17
198	16	17
199	3	17
200	1	17
201	0	17
202	1	17
203	3	17
204	3	17
205	1	17
207	21	17
208	1	17

Individual Completing Form: [signature] Date: 12/23/97
Reviewed By: [signature] Date: 1/11/98

First Floor- South Wall of Reactor

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- South Wall of Reactor

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50061	
PROBE #:	43-65	
SERIAL #:	63291	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:40
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	18.00%
a = Probe Area (cm) =	63
MDA (dpm/100 cm^2) =	116

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	12:14
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	12:14
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/29/97

Reviewed By: [signature] Date: 1/1/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- South Wall of Reactor
Date: 10/9/97

Notes.
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50061 Efficiency: 18.00%
Probe: 43-65 Serial #: 63291 MDA: 116

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
206	0	0	-44	39	116
209	2	2	-26	46	116
210	4	4	-9	52	116
212	2	2	-26	46	116
213	0	0	-44	39	116
214	3	3	-18	49	116
215	2	2	-26	46	116
216	4	4	-9	52	116
217	8	8	26	62	116
218	4	4	-9	52	116
219	0	0	-44	39	116
220	1	1	-35	42	116
221	2	2	-26	46	116

Individual Completing Form: [signature] Date: 12/29/97

Reviewed By: Gerard M Tourney Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- South Wall of Reactor	
Date	10/9/97	
Meter	L2221	
Serial #	50061	
Probe	43-65	
Serial #	63291	
MDA	116	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-290	
n_s =	13	
x_{avg} =	-22	
Maximum value in population =	26	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-22
n_s =	13
$\Sigma(x_{avg} - x_i)^2$ =	4512
s_x =	19

Calculation Sheet

Survey Unit: First Floor- South Wall of Reactor

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-22
$t_{1-\alpha,df}$ =	1.782
s_x =	19
n_s =	13
μ_α =	-12

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Peter Fopp Date: 12/29/97

Reviewed by: Gerard M Tourney Date: 1/14/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- South Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
206	333	333	3079	1420	2243
209	147	147	-2591	1163	2243
210	260	260	854	1325	2243
212	132	132	-3048	1140	2243
213	368	368	4146	1463	2243
214	3502	3502	99680	3651	2243
215	284	284	1585	1357	2243
216	4132	4132	118884	3947	2243
217	4492	4492	129858	4106	2243
218	178	178	-1646	1210	2243
219	348	348	3536	1439	2243
220	220	220	-366	1270	2243
221	432	432	6097	1540	2243

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: Gerard M Tracey Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following
Survey Unit	First Floor- South Wall of Reactor	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	360068	
n_s =	13	
x_{avg} =	27698	
Maximum value in population =	129858	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	27698
n_s =	13
$\Sigma(x_{avg} - x_i)^2$ =	31058045404
s_x =	50874

Calculation Sheet

Survey Unit: First Floor- South Wall of Reactor

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	27698
$t_{1-\alpha,df}$ =	1.782
s_x =	50874
n_s =	13
μ_α =	52842

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pat Fry Date: 1/14/98

Reviewed by: Gerard M Tourney Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- South Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm²)	MDA (dpm/100 cm²)
206	0	13
209	0	13
210	3	13
212	7	13
213	0	13
214	3	13
215	0	13
216	0	13
217	3	13
218	0	13
219	0	13
220	0	13
221	7	13

Individual Completing Form: Date Tyler — Date: 12/29/97
Reviewed By: Gerald M Tourney — Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- South Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

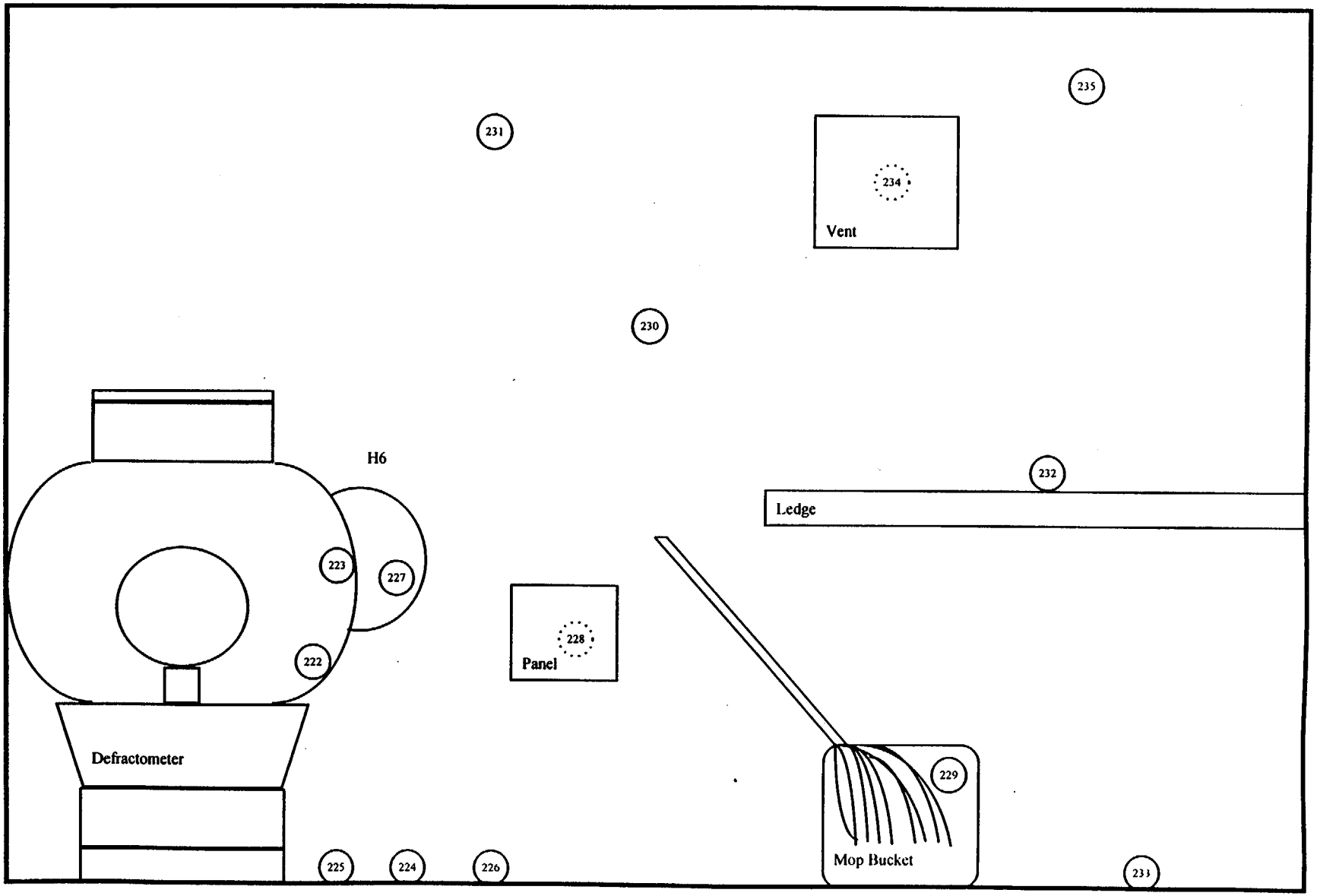
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
206	3	17
209	21	17
210	26	17
212	21	17
213	26	17
214	537	17
215	5	17
216	5	17
217	40	17
218	14	17
219	0	17
220	7	17
221	14	17

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: Gerard M Tourney Date: 6/14/98

First Floor- Southwest Wall of Reactor

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- Southwest Wall of Reactor

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	12:14
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	12:14
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: Nat Inr Date: 12/29/97

Reviewed By: [illegible] Date: [illegible]

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Southwest Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7.70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
222	2	2	-66	114	289
223	8	8	66	156	289
224	0	0	-110	96	289
225	0	0	-110	96	289
226	2	2	-66	114	289
227	1	1	-88	106	289
228	1	1	-88	106	289
229	2	2	-66	114	289
230	1	1	-88	106	289
231	4	4	-22	129	289
232	3	3	-44	122	289
233	0	0	-110	96	289
234	4	4	-22	129	289
235	8	8	66	156	289

Individual Completing Form: [signature] Date: 12/29/97

Reviewed By: [signature] Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- Southwest Wall of Reactor	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-748	
n_s =	14	
x_{avg} =	-53	
Maximum value in population =	66	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-53
n_s =	14
$\Sigma(x_{avg} - x_i)^2$ =	44254
s_x =	58

Calculation Sheet

Survey Unit: First Floor- Southwest Wall of Reactor

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-53
$t_{1-\alpha,df}$ =	1.771
s_x =	58
n_s =	14
μ_α =	-25

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/29/97

Reviewed by: [signature] Date: [illegible]

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Southwest Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
222	227	227	-152	1280	2243
223	92	92	-4268	1075	2243
224	184	184	-1463	1219	2243
225	152	152	-2439	1171	2243
226	155	155	-2347	1175	2243
227	96	96	-4146	1082	2243
228	156	156	-2317	1177	2243
229	144	144	-2683	1159	2243
230	195	195	-1128	1235	2243
231	118	118	-3475	1118	2243
232	166	166	-2012	1192	2243
233	208	208	-732	1253	2243
234	72	72	-4877	1042	2243
235	100	100	-4024	1089	2243

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: [signature] Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	First Floor- Southwest Wall of Reactor	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-36063	
n_s =	14	
x_{avg} =	-2576	
Maximum value in population =	-152	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-2576
n_s =	14
$\Sigma(x_{avg} - x_i)^2$ =	26606691
s_x =	1431

Calculation Sheet

Survey Unit: First Floor- Southwest Wall of Reactor

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-2576
$t_{1-\alpha,df}$ =	1.771
s_x =	1431
n_s =	14
μ_α =	-1899

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/29/97

Reviewed by: [signature] Date: 1/ 85

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Southwest Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
222	0	13
223	0	13
224	3	13
225	0	13
226	0	13
227	0	13
228	0	13
229	0	13
230	0	13
231	0	13
232	0	13
233	0	13
234	0	13
235	0	13

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: [signature] Date:

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Southwest Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

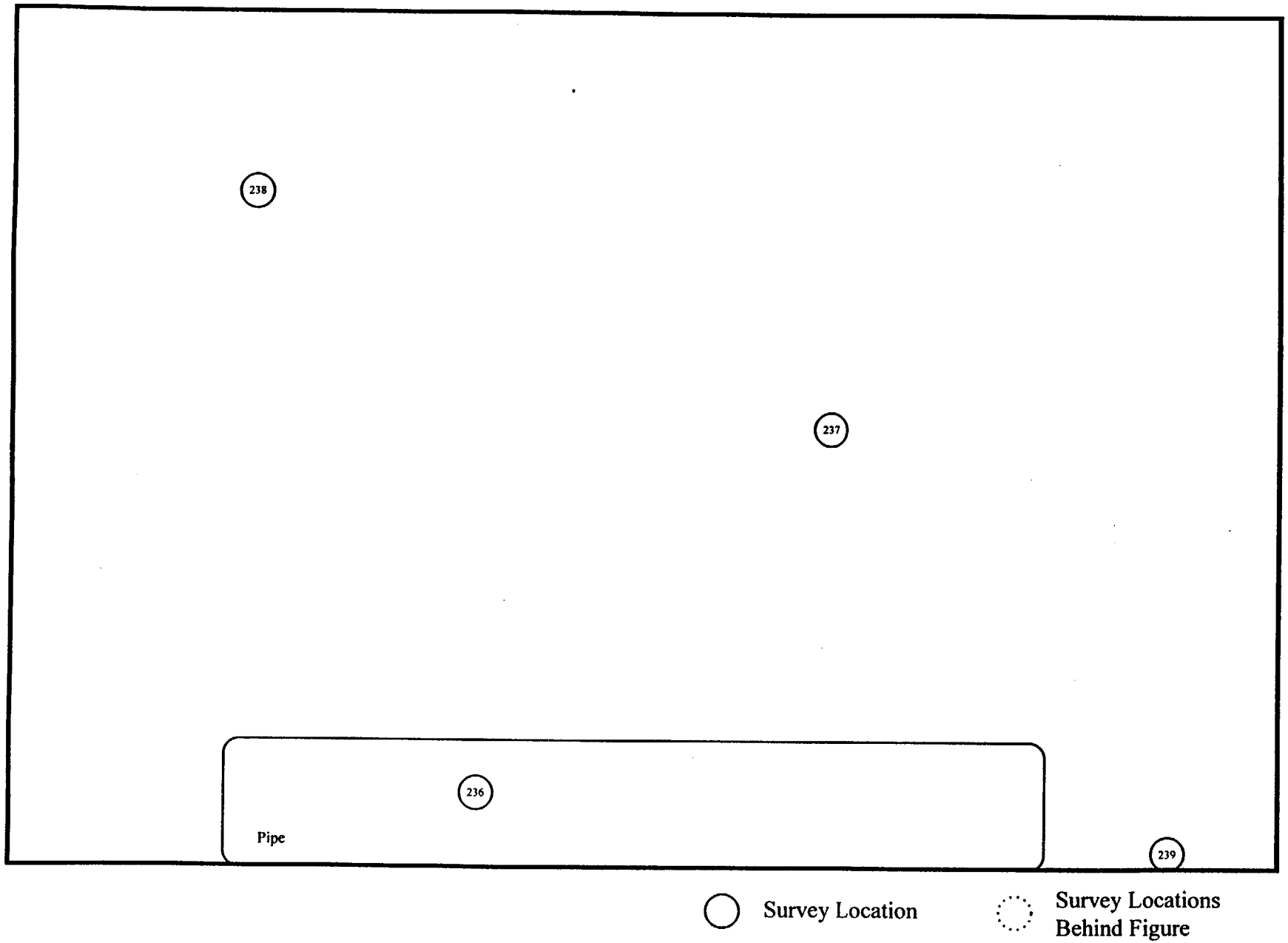
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
222	0	17
223	0	17
224	10	17
225	14	17
226	1	17
227	5	17
228	0	17
229	10	17
230	5	17
231	1	17
232	5	17
233	1	17
234	1	17
235	3	17

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: [signature] Date: 1/1/98

First Floor- East Wall of Reactor

Elevation View
Not Drawn To Scale



F-130

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- East Wall of Reactor

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: _____ Date: 1/5/98

Reviewed By: _____ Date: 1/7/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7.70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
236	2	2	-66	114	289
237	8	8	66	156	289
238	0	0	-110	96	289
239	0	0	-110	96	289

Individual Completing Form: [signature] Date: 1/5/98

Reviewed By: [signature] Date: 1/11/98

Calculation Sheet

SURVEY TYPE: 1

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Survey Unit	First Floor- East Wall of Reactor
Date	10/9/97
Meter	L2221
Serial #	50062
Probe	AC-3
Serial #	408951
MDA	289
Survey Type	Direct Alpha
Guideline Value	100 (dpm/100 cm2)

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-220
n_s =	4
x_{avg} =	-55
Maximum value in population =	**66 (dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-55
n_s =	4
$\Sigma(x_{avg} - x_i)^2$ =	20812
s_x =	83

Calculation Sheet

Survey Unit: First Floor- East Wall of Reactor

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-55
$t_{1-\alpha,df}$ =	2.353
s_x =	83
n_s =	4
μ_α =	43

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 1/5/98

Reviewed by: [signature] Date: 1/11/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
236	227	227	-152	1280	2243
237	92	92	-4268	1075	2243
238	184	184	-1463	1219	2243
239	152	152	-2439	1171	2243

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	First Floor- East Wall of Reactor	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-8322	
n_s =	4	
x_{avg} =	-2081	
Maximum value in population =	-152	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-2081
n_s =	4
$\Sigma(x_{avg} - x_i)^2$ =	9014098
s_x =	1733

Calculation Sheet

Survey Unit: First Floor- East Wall of Reactor

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-2081
$t_{1-\alpha,df}$ =	2.353
s_x =	1733
n_s =	4
μ_α =	-42

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 4/5/98

Reviewed by: [signature] Date: [illegible]

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Reactor
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
236	0	13
237	0	13
238	0	13
239	0	13

Individual Completing Form: Nate [illegible] — Date: 1/5/98
Reviewed By: Gerard M Kearney — Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- East Wall of Reactor
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

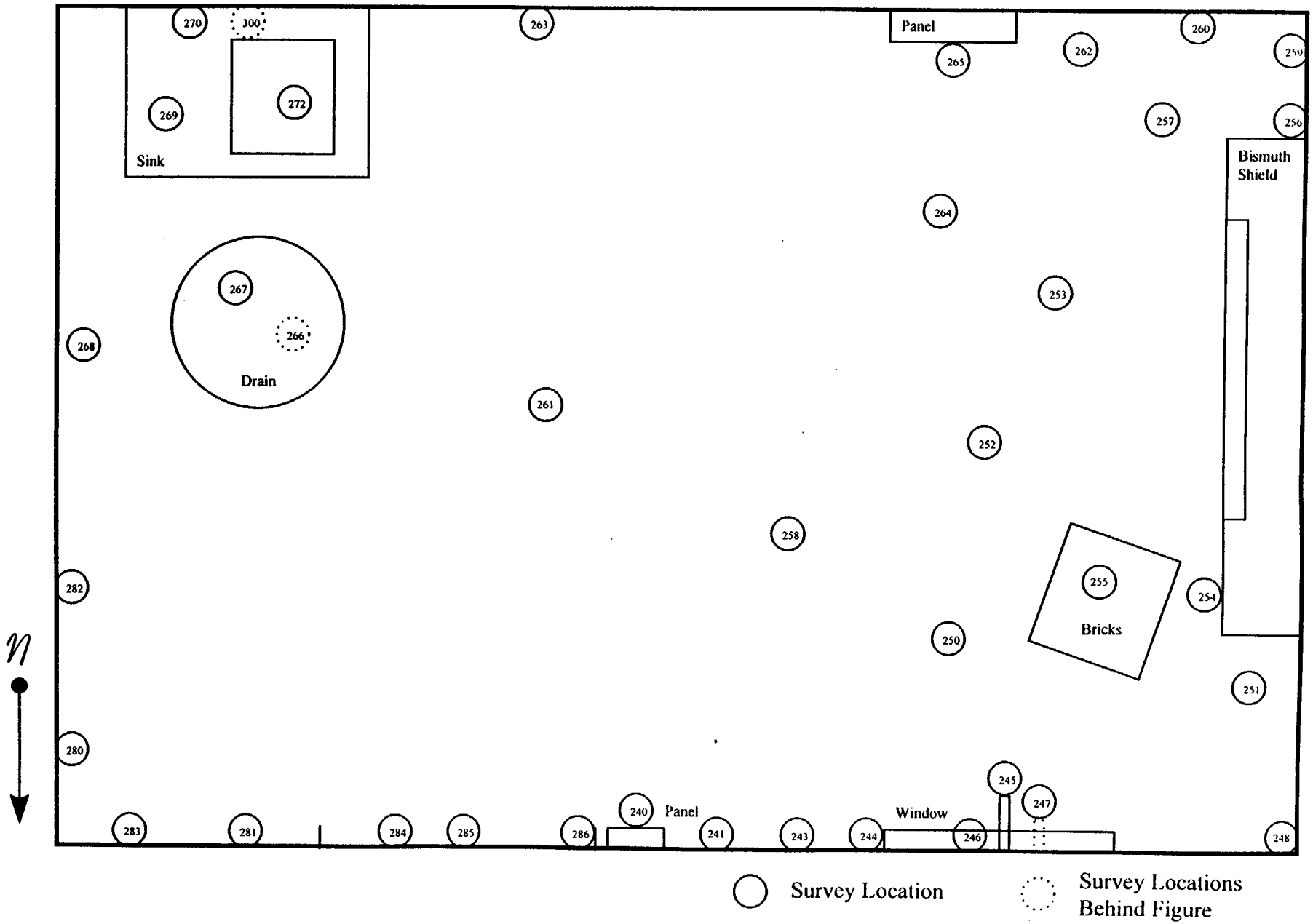
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
236	1	17
237	0	17
238	0	17
239	5	17

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/16/98

First Floor- Biomedical Irradiation Facility

Top View
Not Drawn To Scale



MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- Biomedical Irradiation Facility

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	5	
Date background was taken =	10/9/97	
Time background was taken =	7:30	
Rb = Background rate (cpm) =	5	
e = Probe Efficiency =	7.70%	
a = Probe Area (cm) =	59	
MDA (dpm/100 cm^2) =	289	

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	232	
Date background was taken =	10/9/97	
Time background was taken =	7:30	
Rb = Background rate (cpm) =	232	
e = Probe Efficiency =	21.87%	
a = Probe Area (cm) =	15	
MDA (dpm/100 cm^2) =	2243	

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	0.7	
Date background was taken =	10/9/97	
Time background was taken =	14:36	
Rb = Background rate (cpm) =	0.07	
e = Probe Efficiency =	28.35%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	13	

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	18.3	
Date background was taken =	10/9/97	
Time background was taken =	14:36	
Rb = Background rate (cpm) =	2	
e = Probe Efficiency =	43.45%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	17	

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: [signature] Date: 1/11/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Biomedical Irradiation Facility
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
240	3	3	-44	122	289
241	3	3	-44	122	289
243	6	6	22	143	289
244	6	6	22	143	289
245	2	2	-66	114	289
246	3	3	-44	122	289
247	4	4	-22	129	289
248	2	2	-66	114	289
250	2	2	-66	114	289
251	4	4	-22	129	289
252	2	2	-66	114	289
253	1	1	-88	106	289
254	3	3	-44	122	289
255	3	3	-44	122	289
256	0	0	-110	96	289
257	3	3	-44	122	289
258	2	2	-66	114	289
259	5	5	0	136	289
260	4	4	-22	129	289
261	7	7	44	149	289
262	0	0	-110	96	289
263	0	0	-110	96	289
264	1	1	-88	106	289
265	5	5	0	136	289
266	0	0	-110	96	289
267	0	0	-110	96	289
268	0	0	-110	96	289
269	1	1	-88	106	289
270	4	4	-22	129	289
272	1	1	-88	106	289
280	2	2	-66	114	289
281	3	3	-44	122	289
282	2	2	-66	114	289
283	4	4	-22	129	289
284	3	3	-44	122	289
285	4	4	-22	129	289
286	4	4	-22	129	289
300	4	4	-22	129	289

Individual Completing Form: Peter [illegible] Date: 12/30/97

Reviewed By: Gerard M Kearney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following	1 for direct alpha
Survey Unit	First Floor- Biomedical Irradiation Facility		2 for direct beta/gamma
Date	10/9/97		3 for removable alpha
Meter	L2221		4 for removable beta/gamma
Serial #	50062		5 for exposure data at 1 cm
Probe	AC-3		6 for exposure data at 1 meter
Serial #	408951		
MDA	289		
Survey Type	Direct Alpha		
Guideline Value	100 (dpm/100 cm2)		

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-1826
n_s =	38
x_{avg} =	-48
Maximum value in population =	**44 (dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-48
n_s =	38
$\Sigma(x_{avg} - x_i)^2$ =	60140
s_x =	40

Calculation Sheet

Survey Unit: First Floor- Biomedical Irradiation Facility

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-48
$t_{1-\alpha,df}$ =	1.697
s_x =	40
n_s =	38
μ_α =	-37

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/30/97

Reviewed by: [signature] Date: 1/16/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Biomedical Irradiation Facility
Date: 12/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
240	245	245	396	1305	2243
241	260	260	854	1325	2243
243	59	59	-5274	1019	2243
244	212	212	-610	1259	2243
245	182	182	-1524	1216	2243
246	160	160	-2195	1183	2243
247	266	266	1036	1333	2243
248	208	208	-732	1253	2243
250	250	250	549	1312	2243
251	406	406	5304	1509	2243
252	336	336	3170	1424	2243
253	292	292	1829	1368	2243
254	151	151	-2469	1169	2243
255	142	142	-2743	1155	2243
256	145	145	-2652	1160	2243
257	296	296	1951	1373	2243
258	168	168	-1951	1195	2243
259	208	208	-732	1253	2243
260	257	257	762	1321	2243
261	147	147	-2591	1163	2243
262	264	264	975	1331	2243
263	308	308	2317	1388	2243
264	300	300	2073	1378	2243
265	288	288	1707	1362	2243
266	459	459	6920	1571	2243
267	459	459	6920	1571	2243
268	383	383	4603	1482	2243
269	477	477	7468	1591	2243
270	298	298	2012	1375	2243
272	219	219	-396	1269	2243
280	240	240	244	1298	2243
281	232	232	0	1287	2243
282	228	228	-122	1281	2243
283	205	205	-823	1249	2243
284	157	157	-2286	1178	2243
285	153	153	-2408	1172	2243
286	166	166	-2012	1192	2243
300	47	47	-5639	998	2243

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: Gerard M Burney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following	1 for direct alpha
Survey Unit	First Floor- Biomedical Irradiation Facility		2 for direct beta/gamma
Date	10/9/97		3 for removable alpha
Meter	L2220		4 for removable beta/gamma
Serial #	52823		5 for exposure data at 1 cm
Probe	44-9		6 for exposure data at 1 meter
Serial #	11150		
MDA	2243		
Survey Type	Direct Beta/Gamma		
Guideline Value	5000 (dpm/100 cm2)		

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	12681
n_s =	38
x_{avg} =	334
Maximum value in population =	7468 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	334
n_s =	38
$\Sigma(x_{avg} - x_i)^2$ =	348494787
s_x =	3069

Calculation Sheet

Survey Unit: First Floor- Biomedical Irradiation Facility

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	334
$t_{1-\alpha,df}$ =	1.697
s_x =	3069
n_s =	38
μ_α =	1179

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pat [illegible] Date: 12/30/97

Reviewed by: Gerard M Tourney Date: 1/16/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Biomedical Irradiation Facility
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
240	0	13
241	0	13
243	0	13
244	0	13
245	0	13
246	0	13
247	0	13
248	0	13
250	0	13
251	0	13
252	0	13
253	0	13
254	0	13
255	0	13
256	0	13
257	0	13
258	0	13
259	0	13
260	0	13
261	0	13
262	0	13
263	0	13
264	0	13
265	0	13
266	0	13
267	0	13
268	0	13
269	0	13
270	0	13
272	3	13
280	0	13
281	0	13
282	0	13
283	0	13
284	0	13
285	0	13
286	0	13
300	0	13

Individual Completing Form: Pat [illegible] — Date: 12/30/97
Reviewed By: Gerard M Tourney — Date: 1/15/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Biomedical Irradiation Facility
Date: 10/9/97

Notes
1) Place total counts directly from meter. Activity column will correct for background
2) Information for instrument and background taken directly from the MDA spreadsheet

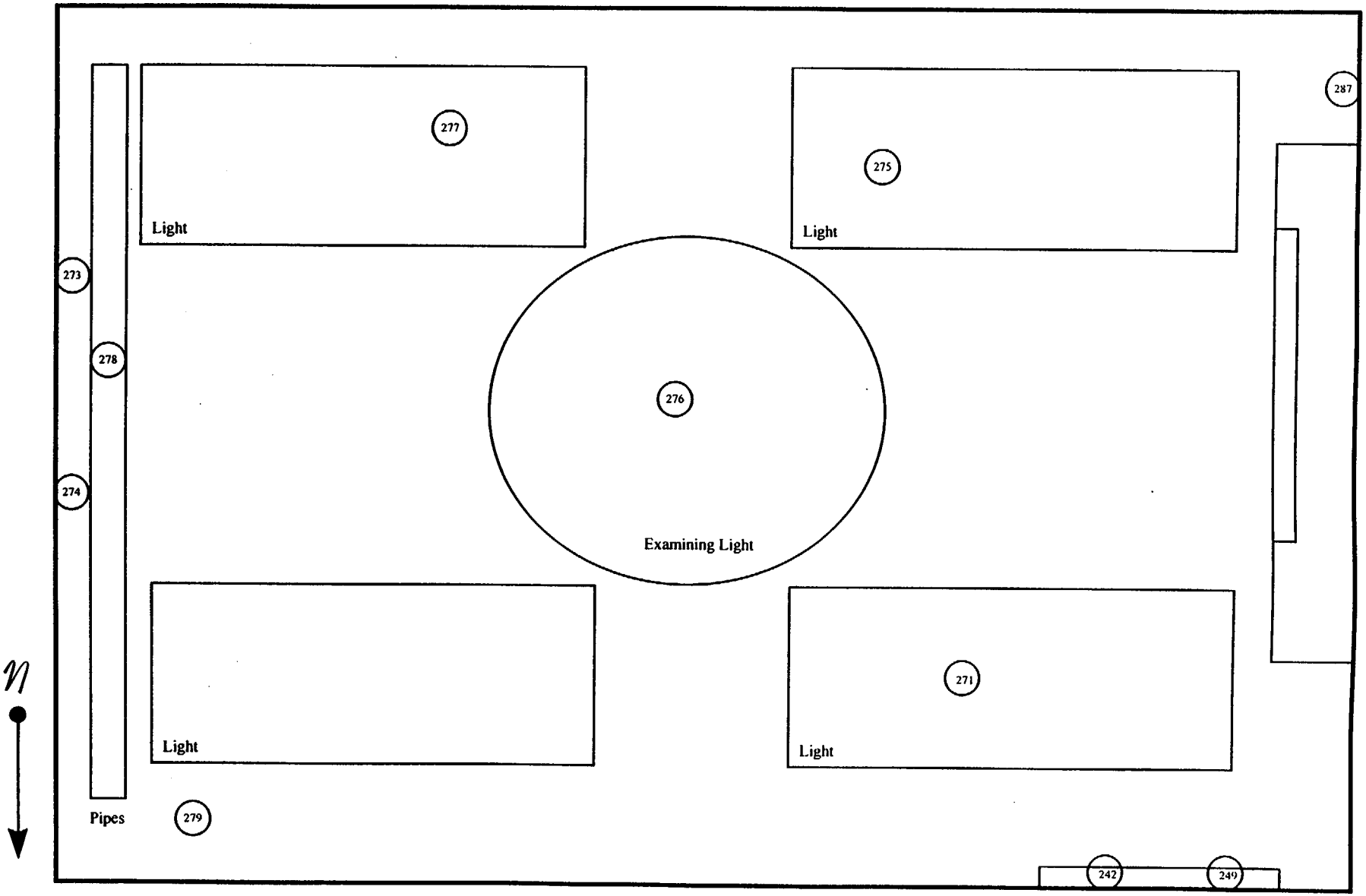
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
240	0	17
241	0	17
243	1	17
244	5	17
245	5	17
246	3	17
247	5	17
248	3	17
250	10	17
251	3	17
252	3	17
253	7	17
254	7	17
255	5	17
256	1	17
257	10	17
258	7	17
259	1	17
260	0	17
261	3	17
262	1	17
263	0	17
264	1	17
265	3	17
266	3	17
267	0	17
268	7	17
269	1	17
270	3	17
272	0	17
280	3	17
281	0	17
282	5	17
283	1	17
284	3	17
285	5	17
286	0	17
300	3	17

Individual Completing Form: [signature] — Date: 12/30/97
Reviewed By: [signature] — Date: 1/14/98

First Floor- Biomedical Irradiation Facility

Ceiling
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- Biomedical Irradiation Facility, Ceiling

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	232
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	232
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2243

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	14:36
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	14:36
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: [signature] Date: 1/5/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Biomedical Irradiation Facility, Ceiling
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7 70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
242	1	1	-88	106	289
249	4	4	-22	129	289
271	2	2	-66	114	289
273	2	2	-66	114	289
274	1	1	-88	106	289
275	2	2	-66	114	289
276	3	3	-44	122	289
277	4	4	-22	129	289
278	2	2	-66	114	289
279	10	10	110	167	289
287	3	3	-44	122	289

Individual Completing Form: Pat Fox Date: 12/30/97

Reviewed By: Date: 1/4/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	First Floor- Biomedical Irradiation Facility, Ceiling	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-462
n_s =	11
x_{avg} =	-42
Maximum value in population =	110 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-42
n_s =	11
$\Sigma(x_{avg} - x_i)^2$ =	30448
s_x =	55

Calculation Sheet

Survey Unit: First Floor- Biomedical Irradiation Facility, Ceiling

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-42
$t_{1-\alpha,df}$ =	1.812
s_x =	55
n_s =	11
μ_α =	-12

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/30/97

Reviewed by: [signature] Date: 1/6/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Biomedical Irradiation Facility. Ceiling
Date: 10-9-97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2243

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
242	67	67	-5030	1033	2243
249	951	951	21917	2055	2243
271	281	281	1494	1353	2243
273	259	259	823	1324	2243
274	239	239	213	1297	2243
275	242	242	305	1301	2243
276	152	152	-2439	1171	2243
277	163	163	-2103	1187	2243
278	157	157	-2286	1178	2243
279	172	172	-1829	1201	2243
287	266	266	1036	1333	2243

Individual Completing Form: Pat [signature] Date: 12/30/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following
Survey Unit	First Floor- Biomedical Irradiation Facility, Ceiling	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2243	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	12101
n_s =	11
x_{avg} =	1100
Maximum value in population =	21917 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	1100
n_s =	11
$\Sigma(x_{avg} - x_i)^2$ =	515407011
s_x =	7179

Calculation Sheet

Survey Unit: First Floor- Biomedical Irradiation Facility, Ceiling

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	1100
$t_{1-\alpha,df}$ =	1.812
s_x =	7179
n_s =	11
μ_α =	5022

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/30/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit / Location: First Floor- Biomedical Radiation Facility Ceiling
Date: 10-9-97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
242	0	13
249	0	13
271	0	13
273	0	13
274	0	13
275	0	13
276	0	13
277	0	13
278	0	13
279	3	13
287	0	13

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: Gerard McInerney Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Biomedical Irradiation Facility, Ceiling
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

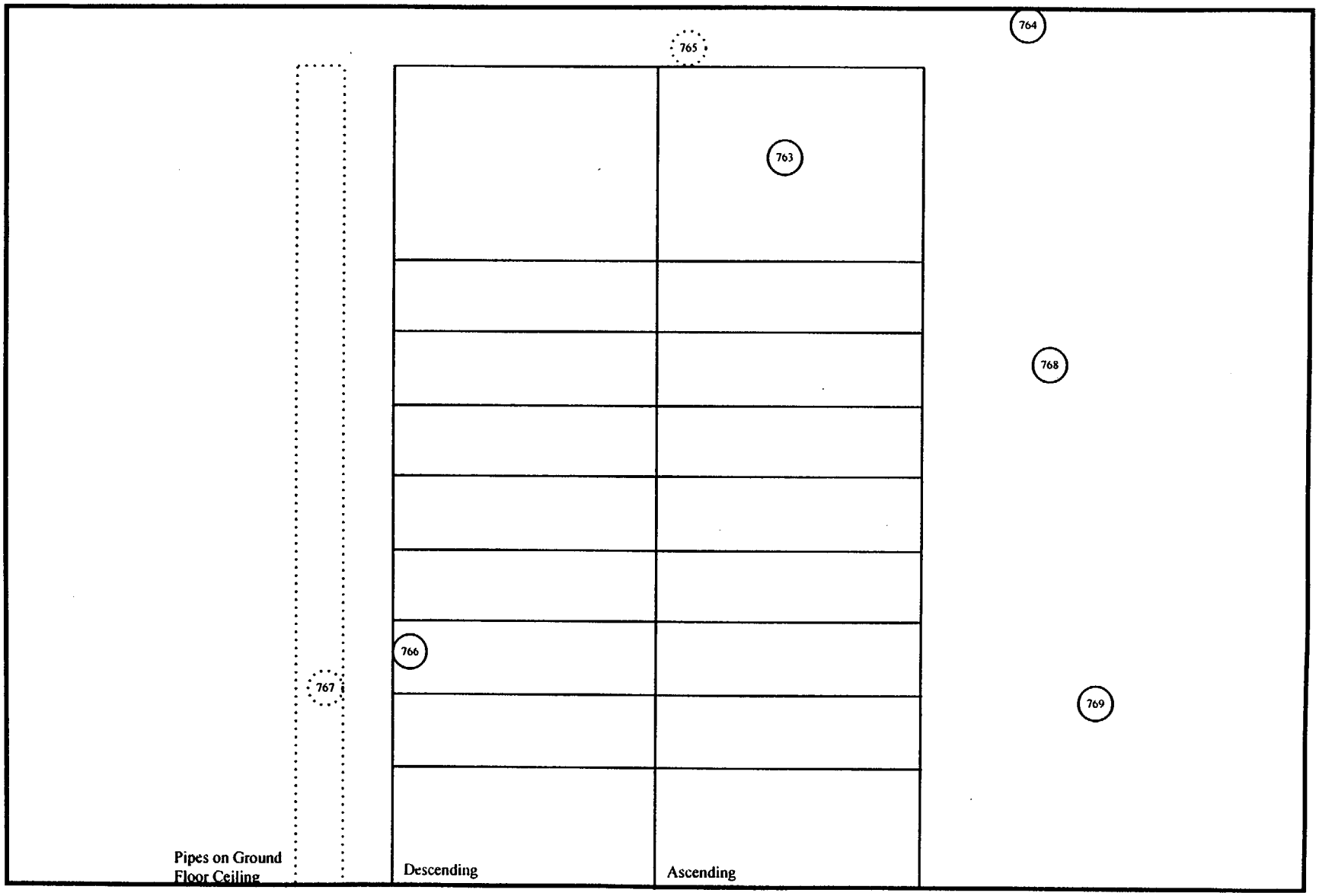
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
242	1	17
249	1	17
271	0	17
273	1	17
274	0	17
275	0	17
276	26	17
277	7	17
278	3	17
279	5	17
287	12	17

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: [signature] Date:

Stairs From First Floor to Ground Floor

Top View
Not Drawn To Scale



N

Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Stairs From First Floor to Ground Floor

SURVEY TYPE:	1	(direct alpha)
METER:	L2220	
SERIAL #:	50061	
PROBE #:	43-65	
SERIAL #:	63291	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	5	
Date background was taken =	10/10/97	
Time background was taken =	8:00	
Rb = Background rate (cpm) =	5	
e = Probe Efficiency =	18.00%	
a = Probe Area (cm) =	63	
MDA (dpm/100 cm^2) =	116	

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	156	
Date background was taken =	10/10/97	
Time background was taken =	8:00	
Rb = Background rate (cpm) =	156	
e = Probe Efficiency =	21.87%	
a = Probe Area (cm) =	15	
MDA (dpm/100 cm^2) =	1854	

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	0.7	
Date background was taken =	10/10/97	
Time background was taken =	15:03	
Rb = Background rate (cpm) =	0.07	
e = Probe Efficiency =	28.35%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	13	

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	18.3	
Date background was taken =	10/10/97	
Time background was taken =	15:03	
Rb = Background rate (cpm) =	2	
e = Probe Efficiency =	43.45%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	17	

Individual Completing Form: [signature] Date: 12/31/97

Reviewed By: Gerard M Tracey Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Stairs From First Floor to Ground Floor
Date: 10/10/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 50061 Efficiency: 18.00%
Probe: 43-65 Serial #: 53291 MDA: 116

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
763	3	3	-18	49	116
764	3	3	-18	49	116
765	0	0	-44	39	116
766	0	0	-44	39	116
767	2	2	-26	46	116
768	2	2	-26	46	116
769	3	3	-18	49	116

Individual Completing Form: Peter [illegible] Date: 12/31/97

Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Stairs From First Floor to Ground Floor	
Date	10/10/97	
Meter	L2220	
Serial #	50061	
Probe	43-65	
Serial #	63291	
MDA	116	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-194	
n_s =	7	
x_{avg} =	-28	
Maximum value in population =	-18	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-28
n_s =	7
$\Sigma(x_{avg} - x_i)^2$ =	820
s_x =	12

Calculation Sheet

Survey Unit: Stairs From First Floor to Ground Floor

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-28
$t_{1-\alpha,df}$ =	1.943
s_x =	12
n_s =	7
μ_α =	-19

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pat [illegible] Date: 12/31/97

Reviewed by: Gerard M [illegible] Date: 1/15/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Stairs From First Floor to Ground Floor
Date: 10/10/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21 87%
Probe: 44-9 Serial #: 11150 MDA: 1854

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
763	416	416	7926	1429	1854
764	224	224	2073	1165	1854
765	380	380	6828	1383	1854
766	234	234	2378	1180	1854
767	140	140	-488	1028	1854
768	192	192	1097	1115	1854
769	192	192	1097	1115	1854

Individual Completing Form: Date: 12/31/97
Reviewed By: Date: 1/4/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Stairs From First Floor to Ground Floor	
Date	10/10/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	1854	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	20911	
n_s =	7	
x_{avg} =	2987	
Maximum value in population =	7926	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	2987
n_s =	7
$\Sigma(x_{avg} - x_i)^2$ =	59573104
s_x =	3151

Calculation Sheet

Survey Unit: Stairs From First Floor to Ground Floor

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	2987
$t_{1-\alpha,df}$ =	1.943
s_x =	3151
n_s =	7
μ_α =	5301

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: [signature] Date: 1/6/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Stairs From First Floor to Ground Floor
Date: 10/10/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
763	0	13
764	0	13
765	0	13
766	0	13
767	3	13
768	0	13
769	0	13

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/1/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Stairs From First Floor to Ground Floor
Date: 10/10/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

Efficiency: 43.45%
MDA: 17

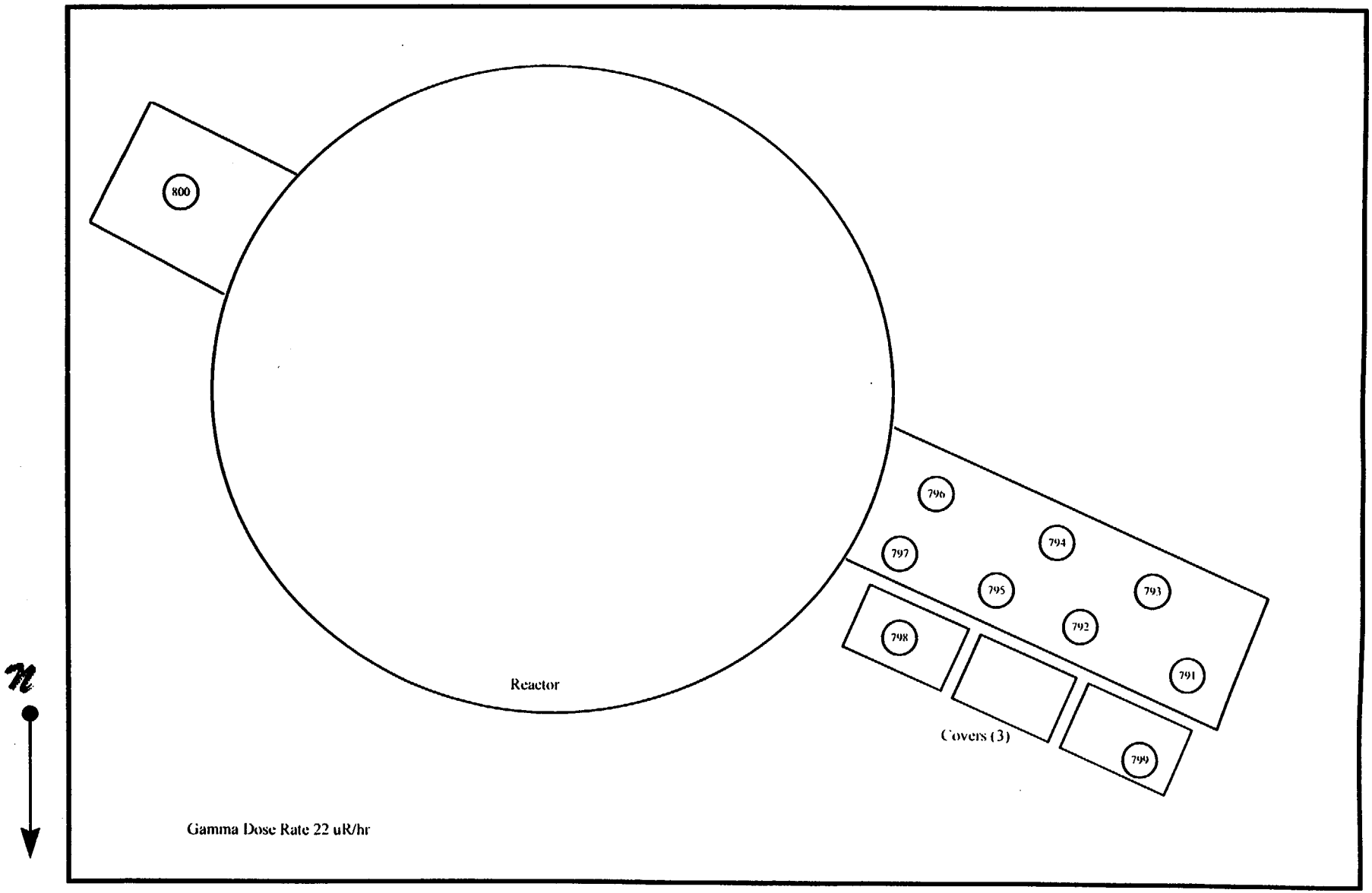
Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
763	1	17
764	1	17
765	14	17
766	5	17
767	0	17
768	1	17
769	5	17

Individual Completing Form: Nate Fuqua Date: 12/31/97

Reviewed By: Date: 1/11/98

First Floor- Irradiation Tunnels

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- Irradiation Tunnels

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	48409	
PROBE #:	43-65	
SERIAL #:	62385	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	5	
Date background was taken =	10/14/97	
Time background was taken =	7:45	
Rb = Background rate (cpm) =	5	
e = Probe Efficiency =	18.00%	
a = Probe Area (cm) =	59	
MDA (dpm/100 cm^2) =	123	

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	230	
Date background was taken =	10/14/97	
Time background was taken =	7:45	
Rb = Background rate (cpm) =	230	
e = Probe Efficiency =	21.87%	
a = Probe Area (cm) =	15	
MDA (dpm/100 cm^2) =	2234	

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	0.7	
Date background was taken =	10/10/97	
Time background was taken =	10:26	
Rb = Background rate (cpm) =	0.07	
e = Probe Efficiency =	28.35%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	13	

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	18.3	
Date background was taken =	10/10/97	
Time background was taken =	10:26	
Rb = Background rate (cpm) =	2	
e = Probe Efficiency =	43.45%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	17	

Individual Completing Form: [signature] Date: 12/22/97

Reviewed By: Gerard M Tierney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: -
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Irradiation Tunnels
Date: 10 14/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 48409 Efficiency: 18.00%
Probe: 43-65 Serial #: 62385 MDA: 123

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
791	2	2	-28	49	123
792	0	0	-47	41	123
793	0	0	-47	41	123
794	1	1	-38	45	123
795	0	0	-47	41	123
796	1	1	-38	45	123
797	1	1	-38	45	123
798	1	1	-38	45	123
799	1	1	-38	45	123
800	0	0	-47	41	123

Individual Completing Form: Pat [illegible] Date: 12/22/97

Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- Irradiation Tunnels	
Date	10/14/97	
Meter	L2221	
Serial #	48409	
Probe	43-65	
Serial #	62385	
MDA	123	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-406	
n_s =	10	
x_{avg} =	-41	
Maximum value in population =	-28	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-41
n_s =	10
$\Sigma(x_{avg} - x_i)^2$ =	358
s_x =	6

Calculation Sheet

Survey Unit: First Floor- Irradiation Tunnels
Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-41
$t_{1-\alpha,df}$ =	1.833
s_x =	6
n_s =	10
μ_α =	-37

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/22/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Irradiation Tunnels
Date: 10:14-97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2234

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
791	200	200	-914	1239	2234
792	182	182	-1463	1213	2234
793	340	340	3353	1426	2234
794	377	377	4481	1472	2234
795	372	372	4329	1466	2234
796	300	300	2134	1375	2234
797	365	365	4115	1457	2234
798	271	271	1250	1337	2234
799	387	387	4786	1484	2234
800	656	656	12986	1778	2234

Individual Completing Form: Pat [illegible] Date: 12/22/97
Reviewed By: Gerard M Tierney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	First Floor- Irradiation Tunnels	
Date	10/14/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2234	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	35057	
n_s =	10	
x_{avg} =	3506	
Maximum value in population =	12986	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	3506
n_s =	10
$\Sigma(x_{avg} - x_i)^2$ =	144730325
s_x =	4010

Calculation Sheet

Survey Unit: First Floor- Irradiation Tunnels
Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	3506
$t_{1-\alpha,df}$ =	1.833
s_x =	4010
n_s =	10
μ_α =	5830

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Nate [illegible] Date: 12/22/97

Reviewed by: Gerald M. Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Irradiation Tunnels
Date: 10/10/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
791	0	13
792	0	13
793	0	13
794	0	13
795	0	13
796	0	13
797	3	13
798	0	13
799	0	13
800	3	13

Individual Completing Form: Pat Jor — Date: 12/22/97
Reviewed By: [illegible] — Date: 1/11/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Irradiation Tunnels
Date: 10/10/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

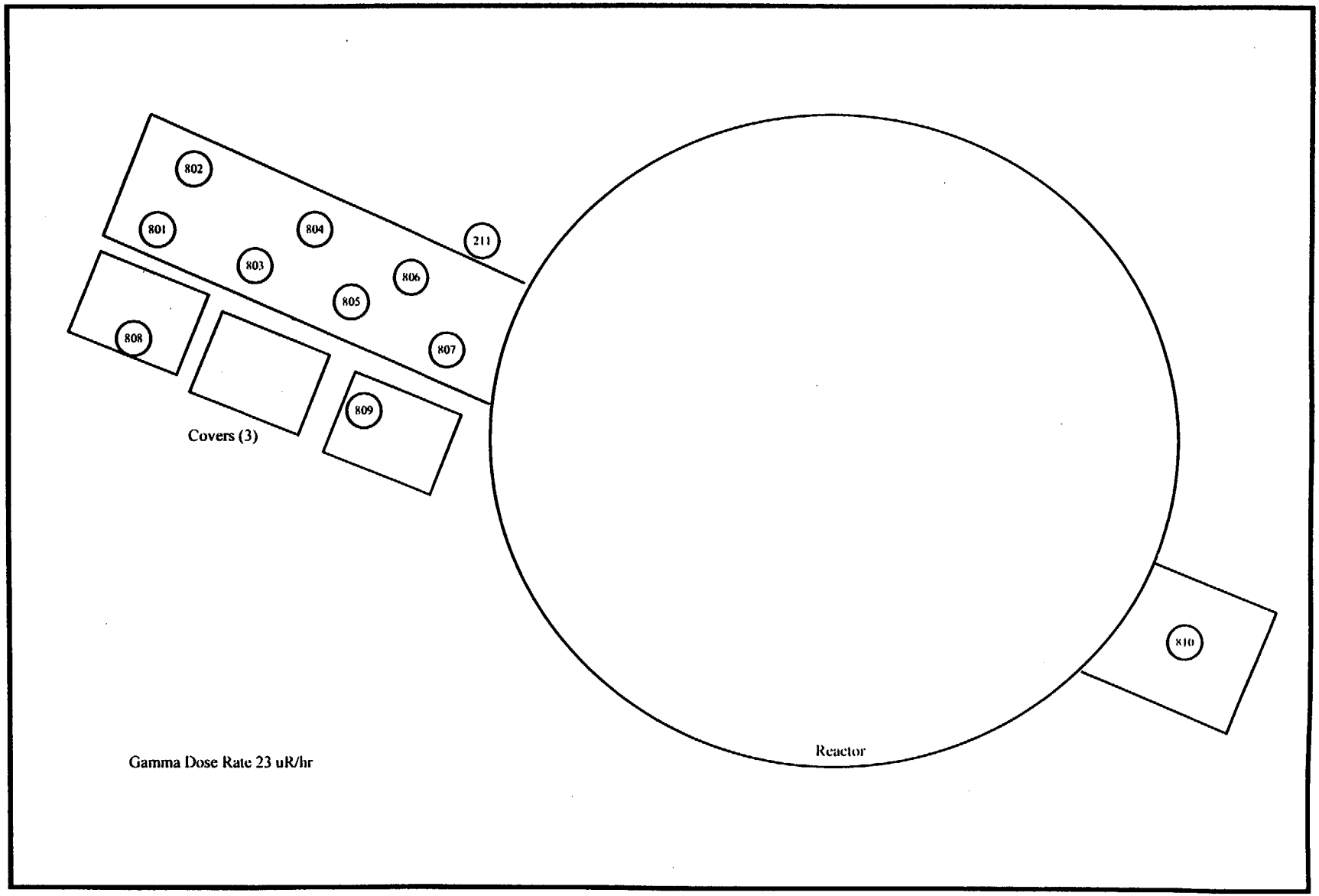
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
791	5	17
792	56	17
793	16	17
794	3	17
795	19	17
796	21	17
797	141	17
798	5	17
799	3	17
800	3	17

Individual Completing Form: [signature] Date: 12/22/97
Reviewed By: [signature] Date: [illegible]

First Floor- Irradiation Tunnels

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

- Enter all time in minutes
- Enter all dates as m/d/y
- Enter efficiency in decimal form (i.e., 28.3% = 0.283)
- Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- Irradiation Tunnels

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	48409
PROBE #:	43-65
SERIAL #:	62385
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/14/97
Time background was taken =	7:45
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	18.00%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	123

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	230
Date background was taken =	10/14/97
Time background was taken =	7:45
Rb = Background rate (cpm) =	230
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2234

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/16/97
Time background was taken =	16:49
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/16/97
Time background was taken =	16:49
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/22/97

Reviewed By: [signature] Date: 1/16/98

Direct Alpha Data Sheet

Survey Type: *
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- irradiation Tunnels
Date: 10.14:97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 48409 Efficiency: 18.00%
Probe: 43-65 Serial #: 62385 MDA: 123

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
211	8	8	28	67	123
801	0	0	-47	41	123
802	0	0	-47	41	123
803	0	0	-47	41	123
804	0	0	-47	41	123
805	0	0	-47	41	123
806	1	1	-38	45	123
807	0	0	-47	41	123
808	1	1	-38	45	123
809	0	0	-47	41	123
810	0	0	-47	41	123

Individual Completing Form: [signature] Date: 12/22/97

Reviewed By: [signature] Date: 1/16/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	First Floor- Irradiation Tunnels	
Date	10/14/97	
Meter	L2221	
Serial #	48409	
Probe	43-65	
Serial #	62385	
MDA	123	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-424	
n_s =	11	
x_{avg} =	-39	
Maximum value in population =	28	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-39
n_s =	11
$\Sigma(x_{avg} - x_i)^2$ =	5003
s_x =	22

Calculation Sheet

Survey Unit: First Floor- Irradiation Tunnels

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-39
$t_{1-\alpha,df}$ =	1.812
s_x =	22
n_s =	11
μ_α =	-27

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 6/22/97

Reviewed by: [signature] Date: 1/16/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit-Location: First Floor- Irradiation Tunnels
Date: 10/14/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2234

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
211	320	320	2743	1401	2234
801	348	348	3597	1436	2234
802	352	352	3719	1441	2234
803	340	340	3353	1426	2234
804	480	480	7621	1592	2234
805	390	390	4877	1488	2234
806	366	366	4146	1459	2234
807	356	356	3841	1446	2234
808	336	336	3231	1421	2234
809	570	570	10364	1690	2234
810	491	491	7956	1604	2234

Individual Completing Form: [signature] Date: 12/22/97
Reviewed By: Gerard M Toumey Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	First Floor- Irradiation Tunnels	
Date	10/14/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2234	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	55448	
n_s =	11	
x_{avg} =	5041	
Maximum value in population =	10364	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	5041
n_s =	11
$\Sigma(x_{avg} - x_i)^2$ =	60994943
s_x =	2470

Calculation Sheet

Survey Unit: First Floor- Irradiation Tunnels
Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	5041
$t_{1-\alpha,df}$ =	1.812
s_x =	2470
n_s =	11
μ_α =	6390

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/22/97

Reviewed by: [signature] Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor Irradiation Tunnels
Date: 10/16/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
211	0	13
801	0	13
802	0	13
803	0	13
804	0	13
805	3	13
806	0	13
807	3	13
808	0	13
809	0	13
810	3	13

Individual Completing Form: [signature] Date: 12/22/97
Reviewed By: [signature] Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): First Floor- Irradiation Tunnels
Date: 10/10/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

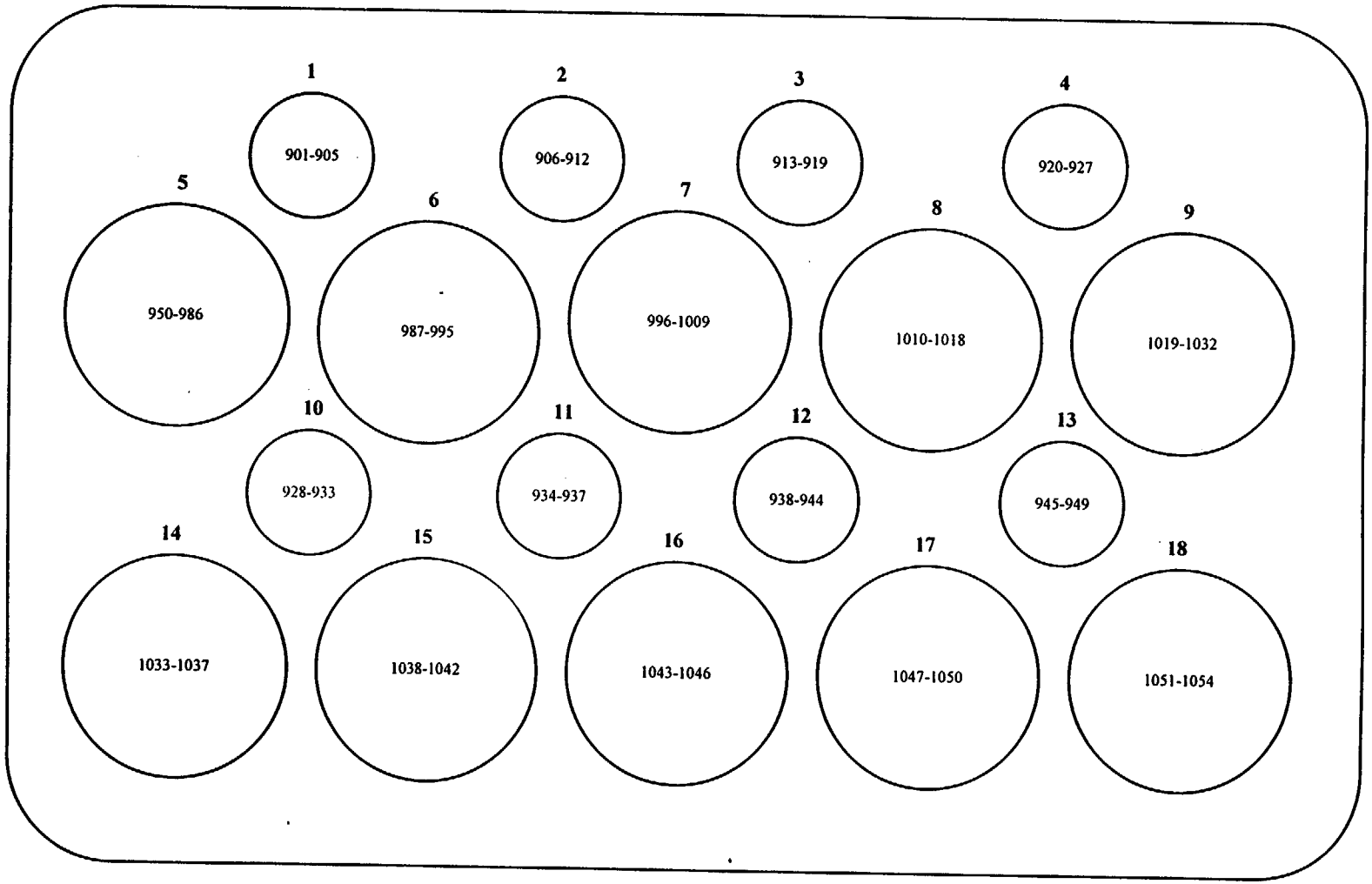
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
211	1	17
801	3	17
802	7	17
803	12	17
804	33	17
805	44	17
806	30	17
807	63	17
808	10	17
809	0	17
810	12	17

Individual Completing Form: Date: 12/22/97
Reviewed By: Date: 1/1/98

First Floor- Plug Storage Area

Elevation View
Not Drawn To Scale



Survey Locations are Shown Within the Plug

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor- Plug Storage Area

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/15/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/15/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 1/5/98

Reviewed By: [signature] Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Plug Storage Area
Date: 10/15/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Senal #: 13795
Serial #: N/A

Efficiency: 28.35%
MDA: 13

NT= No smears taken due to high dose levels
Note: All survey points not taken (NT) were assigned to equipment in storage plugs for idenitfication purposes.

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
901	0	13
902	0	13
903	0	13
904	0	13
905	0	13
906	3	13
907	17	13
908	412	13
909	10	13
910	42	13
911	113	13
912	1707	13
913	3	13
914	3	13
915	14	13
916	3	13
917	7	13
918	7	13
919	17	13
920	0	13
921	264	13
922	10	13
923	102	13
924	21	13
925	3	13
926	0	13
927	0	13
928	39	13
929	3	13
930	0	13
931	7	13
932	7	13
933	0	13
934	17	13
935	3	13
936	3	13
937	7	13
938	3	13
939	3	13
940	7	13
941	0	13
942	0	13
943	3	13
944	0	13
945	0	13
946	0	13
947	3	13
948	0	13
949	0	13
950	NT	13
951	NT	13
952	NT	13
953	NT	13
954	NT	13
955	NT	13
956	NT	13
957	NT	13
958	NT	13
959	NT	13
960	NT	13
961	NT	13
962	NT	13
963	NT	13
964	NT	13
965	NT	13
966	NT	13
967	NT	13
968	NT	13
969	NT	13
970	NT	13
971	NT	13
972	NT	13
973	NT	13
974	NT	13
975	NT	13
976	NT	13
977	NT	13
978	NT	13
979	NT	13
980	NT	13
981	NT	13
982	NT	13
983	NT	13
984	NT	13
985	NT	13
986	NT	13
987	0	13
988	81	13
989	NT	13
990	NT	13
991	NT	13
992	NT	13
993	0	13
994	3	13
995	0	13
996	3	13
997	NT	13
998	NT	13
999	NT	13
1000	NT	13
1001	NT	13
1002	NT	13
1003	NT	13
1004	NT	13
1005	NT	13
1006	NT	13
1007	3	13
1008	0	13
1009	3	13
1010	0	13
1011	NT	13
1012	130	13
1013	NT	13
1014	NT	13
1015	NT	13
1016	7	13
1017	7	13
1018	0	13
1019	7	13
1020	NT	13
1021	NT	13
1022	NT	13
1023	NT	13
1024	NT	13
1025	NT	13
1026	NT	13
1027	NT	13
1028	NT	13
1029	NT	13
1030	3	13
1031	0	13
1032	3	13
1033	7	13
1034	10	13
1035	0	13
1036	0	13
1037	0	13
1038	10	13
1039	0	13
1040	0	13
1041	0	13
1042	0	13
1043	0	13
1044	0	13
1045	0	13
1046	7	13
1047	0	13
1048	0	13
1049	7	13
1050	10	13
1051	0	13
1052	0	13
1053	0	13
1054	0	13

Individual Completing Form: _____ Date: _____

Reviewed By: [illegible signature] Date: 11/19/99

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor- Plug Storage Area
Date: 10/15/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

NT= No smears taken due to high dose levels
Note: All survey points not taken (NT) were assigned to equipment in storage plugs for identification purposes.

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
901	42	17
902	1	17
903	3	17
904	1	17
905	72	17
906	28	17
907	389	17
908	10840	17
909	389	17
910	654	17
911	2134	17
912	87610	17
913	187	17
914	104	17
915	63	17
916	42	17
917	145	17
918	44	17
919	90	17
920	67	17
921	8690	17
922	350	17
923	3280	17
924	555	17
925	281	17
926	86	17
927	95	17
928	244	17
929	115	17
930	44	17
931	58	17
932	138	17
933	19	17
934	136	17
935	155	17
936	53	17
937	90	17
938	16	17
939	129	17
940	28	17
941	19	17
942	26	17
943	12	17
944	30	17
945	1	17
946	19	17
947	12	17
948	16	17
949	44	17
950	NT	17
951	NT	17
952	NT	17
953	NT	17
954	NT	17
955	NT	17
956	NT	17
957	NT	17
958	NT	17
959	NT	17
960	NT	17
961	NT	17
962	NT	17
963	NT	17
964	NT	17
965	NT	17
966	NT	17
967	NT	17
968	NT	17
969	NT	17
970	NT	17
971	NT	17
972	NT	17
973	NT	17
974	NT	17
975	NT	17
976	NT	17
977	NT	17
978	NT	17
979	NT	17
980	NT	17
981	NT	17
982	NT	17
983	NT	17
984	NT	17
985	NT	17
986	NT	17
987	40	17
988	1678	17
989	NT	17
990	NT	17
991	NT	17
992	NT	17
993	35	17
994	14	17
995	14	17
996	58	17
997	NT	17
998	NT	17
999	NT	17
1000	NT	17
1001	NT	17
1002	NT	17
1003	NT	17
1004	NT	17
1005	NT	17
1006	NT	17
1007	33	17
1008	19	17
1009	40	17
1010	42	17
1011	NT	17
1012	2514	17
1013	NT	17
1014	NT	17
1015	NT	17
1016	157	17
1017	148	17
1018	90	17
1019	30	17
1020	NT	17
1021	NT	17
1022	NT	17
1023	NT	17
1024	NT	17
1025	NT	17
1026	NT	17
1027	NT	17
1028	NT	17
1029	NT	17
1030	74	17
1031	49	17
1032	37	17
1033	35	17
1034	51	17
1035	28	17
1036	21	17
1037	10	17
1038	104	17
1039	72	17
1040	63	17
1041	0	17
1042	21	17
1043	42	17
1044	10	17
1045	10	17
1046	37	17
1047	44	17
1048	42	17
1049	95	17
1050	28	17
1051	51	17
1052	23	17
1053	5	17
1054	14	17

Individual Completing Form: _____ Date: _____

Reviewed By: [illegible] Date: 1/19/99

Exposure Survey of Storage Plugs

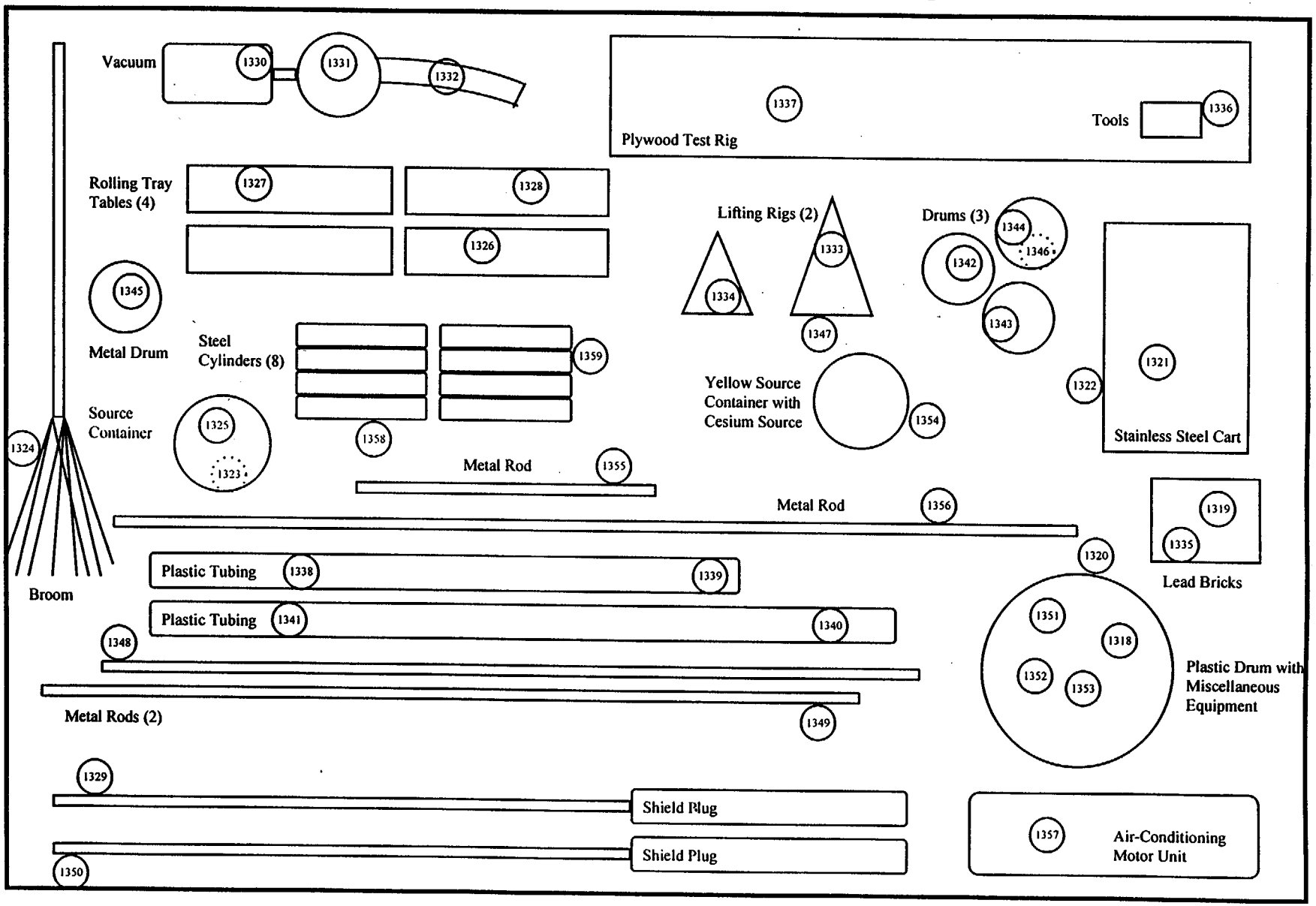
Taken at 1-foot intervals (in mR/hr)

	Plug 1	Plug 2	Plug 3	Plug 4	Plug 5	Plug 6	Plug 7	Plug 8	Plug 9
Cover	2.2	4.0	0.6	0.4	24.8	15.8	1.0	4.0	0.2
1	4.0	1.2	0.7	3.2	26.3	37.5	1.6	17.3	0.2
2	12.8	9.3	4.5	18.0	149.8	114.0	7.7	131.6	0.8
3	16.2	27.5	44.0	58.1	93.9	185.6	47.1	212.8	5.6
4	41.9	51.0	106.0	103.6	117.8	175.2	57.8	227.1	29.0
5	51.4	47.8	38.0	107.9	235.2	218.5	45.0	114.2	23.1
6	65.3	47.5	38.0	65.5	135.0	146.9	28.7	19.7	19.5
7	61.5	44.3	26.7	61.1	127.7	55.0	21.3	16.2	12.6
8	59.0	36.0	19.2	56.8	98.4	47.8	15.0	14.2	8.0

	Plug 10	Plug 11	Plug 12	Plug 13	Plug 14	Plug 15	Plug 16	Plu 17	Plug 18
Cover	1.4	0.4	0.2	0.2	1.3	1.0	0.4	0.4	0.2
1	6.5	1.8	0.7	0.2	1.1	12.1	1.2	1.3	0.2
2	22.1	12.9	4.7	1.6	5.5	67.0	5.3	3.7	0.8
3	42.1	42.5	30.7	13.0	47.4	174.4	19.8	22.4	5.0
4	55.9	72.4	78.6	32.3	46.1	220.7	30.5	23.2	8.5
5	64.5	66.9	95.7	26.0	61.9	63.0	24.5	19.9	12.1
6	92.0	66.2	51.2	14.0	174.5	42.2	20.0	12.0	9.0
7	173.5	38.7	43.8	12.8	169.0	24.5	12.4	6.8	4.6
8	60.5	20.8	20.0	4.5	182.4	21.7	10.9	4.5	2.7

First Floor- Equipment in Front of Plug Storage Area

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

Inventory of Equipment Placed in Front of Plug Storage Area		
	Smear	Tritium Smear
Broom	1324	215
Air-conditioning Motor Unit	1357	292
Large Plywood Test Rig	1337	211
Rolling Tray Table	1327	212
Rolling Tray Table	1328	
Rolling Tray Table	1329	213
Rolling Tray Table	1326	216
Stainless Steel Cart	1320-1321	217
	1322 (wheels)	218, 219
Black 5-Gallon Bucket wiht Miscellaneous Equipment	1351-1354	
Shield Plug	1349	208
Shield Plug	1350	214
Metal Pole	1348	
Metal Pole	1318-1319	
Vacuum	1330	
	Inside:1331	
	Inside Hose:	277
Black 5-gallon bucket	1942	274
Black 5-gallon bucket	1943	275
Black 5-gallon bucket	1944	
	Bottom: 1946	
Metal drum	1945	276
Plastic Tubing- 8 ft length, 6 in diameter	1338	
	1339	273
Cement Source Container	Outside: 1325	
	Inside: 1323	278
Yellow Source Container	Cs Source Still Inside	
Metal Tube- 2 ft length	1355	289
Thirty Lead Bricks	1335	290
Tools	1336	209
Lifting Rig- 1 ft height	1334	210
Lifting Rig- 2 ft height	1340	280
	1341	
Plastic Tubing- 9 ft length	1340	291
	1341	
Metal Pole- 10 ft length	1356	279
Stack of Steel Cylinders (8)	1358	
	1359	

Inventory of Materials in Storage Plugs		
	Contents	Smear
Plug 1	Outer Surface	901
	Empty	
	Inner Surface	902-905
Plug 2	Outer Surface	906
	Graphite cylinder - 1 1/2 ft length, 3 in diameter	907
	Graphite cylinder- 6 ft length, 6 in diameter	908,911
	Inner Surface	909,910,912
Plug 3	Outer Surface	913
	Graphite square block- 2in. x 2 in. x 4 in.	914
	Graphite square block- 4 in. x 4 in. x 4 in.	915
	Graphite cylinder- 5 ft length, 6 in diameter	916
	Inner Surface	917-919
Plug 4	Outer Surface	920
	Graphite cylinder- 4 ft length, 6 in diameter	921
	Graphite square block- 4 in x 4 in	922
	Metal Rod- 3 ft length, 1 cm diameter	923
	Metal Rod- 3 ft length, 1 cm diameter	924
	Inner Surface	925-927
Plug 5	Outer Surface	950
	Dummy Element- 8 ft length	951
	Dummy Element- 8 ft length	952
	Dummy Element- 8 ft length	953
	Dummy Element- 8 ft length	954
	Dummy Element- 8 ft length	955
	Wire cord	956
	Dummy Element End	957
	Steel Rod- 6 ft length, 1 in diameter	958
	Dummy Element- 8 ft length	959
	Steel Rod- 1 1/2 ft length, 1 in diameter	960
	Steel Rod- 1 1/2 ft length, 1 in diameter	961
	Steel Rod- 1 1/2 ft length, 1 in diameter	962
	Steel Rod- 1 1/2 ft length, 2 in diameter	963
	Steel Rod- 1 1/2 ft length, 2 in diameter	964
	Steel Rod- 3 ft length, 2 in diameter	965
	Dummy Element End	966
	Graphite cylinder- 8 in length, 2 in diameter	967
	Steel Rod- 1 1/2 ft length, 1 in diameter	968
	Steel Rod- 1 1/2 ft length, 2 in diameter	969
	Steel Rod- 1 1/2 ft length, 1 in diameter	970
	Rod Attached to Fuel Element End- 2 ft length	971
	Steel Rod- 1 1/2 ft length, 2 in diameter	972
	Common Flux wire- 2 ft length	973

	Xenon Flux wire- 2 ft length	974
	Argon Flux wire- 2 ft length	975
	Common Flux wire- 2 ft length	976
	Metal Rod Attached to wire- 5 ft length	977
	Dummy Element End	978
	Dummy Element End	979
	Lead Cylinder-2 in length, 2 in diameter	980
	Hollow rectangular block- 2 ft length by 2 in diameter	981
	Steel Rod- 1 1/2 ft length, 1 in diameter	982
	Steel Rod- 1 1/2 ft length, 1 in diameter	983
	Steel Rod- 1 1/2 ft length, 1 in diameter	984
	Steel Rod- 1 1/2 ft length, 1 in diameter	985
	Dummy Element End	986
	No Smears were taken on inner surface of Plug 5 due to high dose levels.	
Plug 6	Outer Surface	987
	Graphite cylinder- 4 ft length, 8 in diameter	988
	Graphite cylinder- 4 ft length, 8 in diameter	989
	Graphite cylinder- 4 ft length, 4 in diameter	990
	Graphite cylinder- 4 ft length, 4 in diameter	991
	Steel Rod Attached to Thinner Steel Rod	992
	Inner Surface	993-995
Plug 7	Outer Surface	996
	Dummy Element- 8 ft length	997
	Dummy Element- 8 ft length	998
	Metal Rod with square openings- 7 ft length	999
	Metal Rod with square openings- 7 ft length	1000
	Shielding Plug- 3 ft length	1001
	Shielding Plug- 3 ft length	1002
	Shielding Plug- 3 ft length	1003
	Shielding Plug- 3 ft length	1004
	Shielding Plug- 3 ft length	1005
	Shielding Plug- 3 ft length	1006
	Inner Surface	1007-1009
Plug 8	Outer Surface	1010
	Graphite Cylinder- 6 ft length, 6 in diameter	1011
	Graphite Cylinder- 6 ft length, 6 in diameter	1012
	Graphite Cylinder- 6 ft length, 6 in diameter	1013
	Graphite Cylinder- 6 ft length, 3 in diameter	1014
	Graphite Cylinder, wrapped in Plastic- 6 ft length, 3 in diameter	1015
	Inner Surface	1016-1018
Plug 9	Outer Surface	1019
	Metal Coils- 5 ft length, 5 in diamater	1020
	Metal Coils- 5 ft length, 5 in diamater	1021
	Solid Metal Rod- 6 ft length	1022

	Two Attached Aluminum Rods- 3 ft length, 5 in diameter	1023
	Metal Rod with 7 in circular end- 4 ft length, 2 in diameter	1024
	Three Metal rods attached at the ends to metal plates	
	-3 ft length, Rods:1 in diameter, Plates:1 ft diameter	1025
	Dummy Element End	1026
	Metal Gripper- 5 ft length	1027
	Metal Rod with cylindrical end- 8 ft length, 2 in diameter	1028
	Metal Gripper- 5 ft length	1029
	Inner Surface	1030-1032
Plug 10	Outer Surface	928
	Steel cylinder- 5 ft length, 4 in diameter	929
	Steel cylinder- 5 ft length, 4 in diameter	930
	Inner Surface	931-933
Plug 11	Outer Surface	934
	Empty	
	Inner Surface	935-937
Plug 12	Outer Surface	938
	Graphite rectangular block- 3 ft length, 4 in diameter	939
	Graphite cylinder- 5 ft length, 4 in diameter	940
	Graphite cylinder- 5 ft length, 4 in diameter	941
	Inner Surface	942-944
Plug 13	Outer Surface	945
	Aluminum Rod with circular ends- 4 ft length, 4 in diameter	946
	Inner Surface	947-949
Plug 14	Outer Surface	1033
	Metal cylinder- 6 ft length, 8 in diameter	1034
	Inner Surface	1035-1037
Plug 15	Outer Surface	1038
	Metal cylinder- 6 ft length, 8 in diameter	1039
	Inner Surface	1040-1042
Plug 16	Outer Surface	1043
	Empty	
	Inner Surface	1044-1046
Plug 17	Outer Surface	1047
	Empty	
	Inner Surface	1048-1050
Plug 18	Outer Surface	1051
	Empty	
	Inner Surface	1052-1054

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor - Equipment in Front of Plug Storage Area

SURVEY TYPE:	3	(removable alpha)	SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W		METER:	LB 5100 W	
SERIAL #:	13795		SERIAL #:	13795	
PROBE #:	N/A		PROBE #:	N/A	
SERIAL #:	N/A		SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)	GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1	Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10	Tb = Background Time (min) =	10
Background counts in Tb =	0.7	Background counts in Tb =	18.3
Date background was taken =	10/20/97	Date background was taken =	10/20/97
Time background was taken =	15:16	Time background was taken =	15:16
Rb = Background rate (cpm) =	0.07	Rb = Background rate (cpm) =	2
e = Probe Efficiency =	28.35%	e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100	a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13	MDA (dpm/100 cm^2) =	17

Individual Completing Form: Patsy Lopez Date: 1/5/98

Reviewed By: Gerard M. Torrey Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor - Equipment in Front of Plug Storage Area
Date: 10/20/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1318	14	13
1319	0	13
1320	0	13
1321	0	13
1322	3	13
1323	3	13
1324	0	13
1325	0	13
1326	0	13
1327	0	13
1328	0	13
1329	0	13
1330	0	13
1331	0	13
1332	0	13
1333	0	13
1334	0	13
1335	0	13
1336	0	13
1337	0	13
1338	3	13
1339	0	13
1340	0	13
1341	0	13
1342	0	13
1343	0	13
1344	0	13
1345	0	13
1346	0	13
1347	3	13
1348	7	13
1349	3	13
1350	14	13
1351	7	13
1352	10	13
1353	0	13
1354	0	13
1355	3	13
1356	14	13
1357	3	13
1358	0	13
1359	0	13

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/15/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor - Equipment in Front of Plug Storage Area
Date: 10/20/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1318	150	17
1319	12	17
1320	7	17
1321	12	17
1322	14	17
1323	111	17
1324	7	17
1325	1	17
1326	35	17
1327	16	17
1328	10	17
1329	0	17
1330	30	17
1331	1	17
1332	3	17
1333	7	17
1334	14	17
1335	23	17
1336	14	17
1337	21	17
1338	309	17
1339	33	17
1340	0	17
1341	12	17
1342	5	17
1343	5	17
1344	3	17
1345	0	17
1346	0	17
1347	7	17
1348	90	17
1349	171	17
1350	127	17
1351	37	17
1352	109	17
1353	1	17
1354	14	17
1355	10	17
1356	185	17
1357	104	17
1358	16	17
1359	42	17

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/17/98

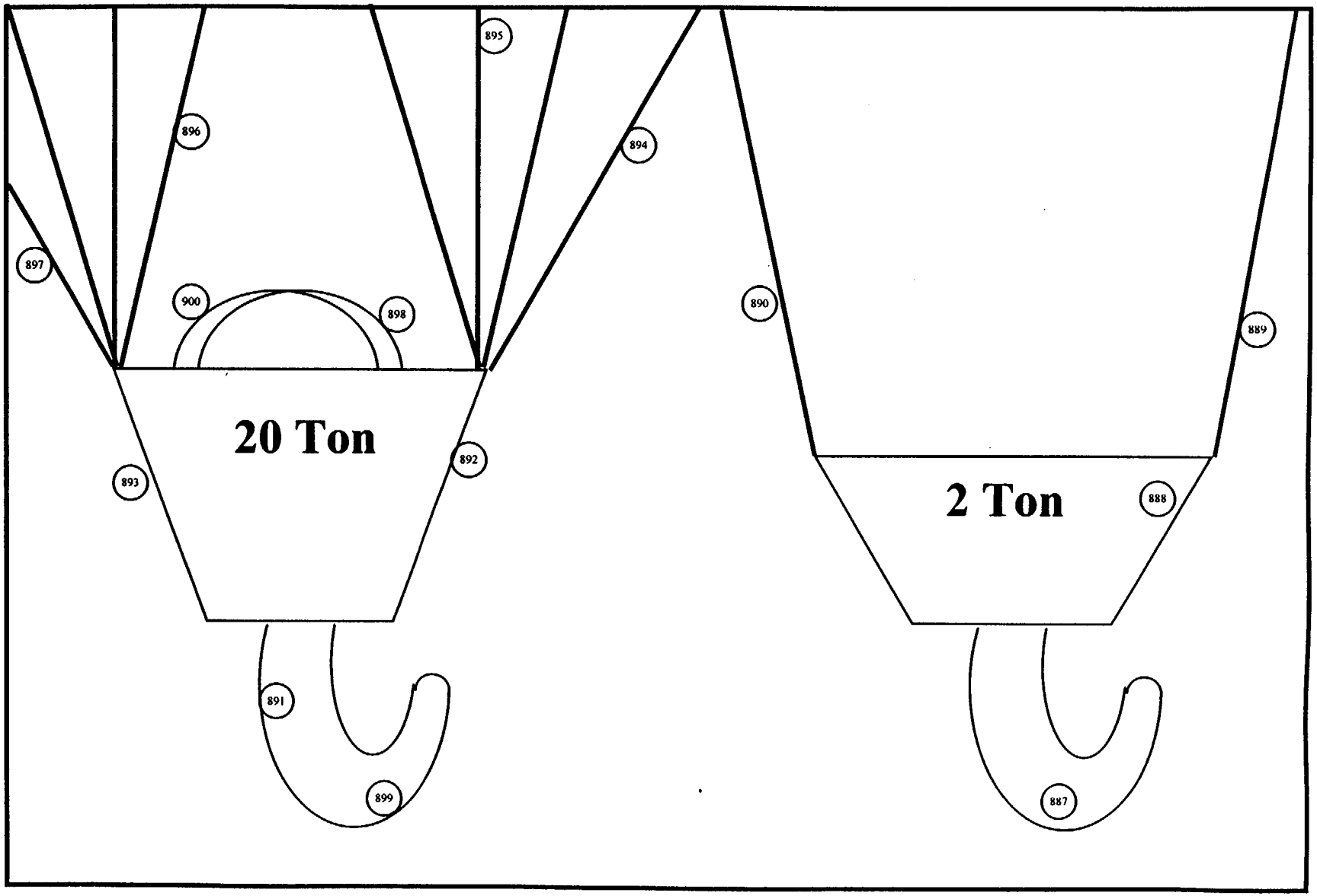
Exposure Survey of Equipment in Plug Storage Area

Smear Number	Exposure (in mR/hr)
911	20.0
917	40.0
918	0.2
919	2.5
921	30.0
928	Front: 55.7; Rear: 114.5
929	Front: 82.0; Rear: 111.9
938	Front: 66.9; Rear: 47.5
939	Front: 85.7; Rear: 21.5
940	Front: 0.4; Rear: 0.1
945	Front: 49.5; Rear:0.1
950	38.0
951	125.0
952	40.0
953	100.0
954	21.0
955	30.0
956	3.0
957	3.0
958	3.5
959	12.0
960	0.7
961	0.7
962	0.5
963	0.6
964	0.6
965	20.5
966	2.6
967	1.0
968	0.6
969	0.6
970	0.6
971	1.5
972	2.0
973	2.2
974	2.3
975	1.2
976	2.6
977	1.1 R/hr
978	4.3
979	3.5
980	3.0
981	2.0
982	1.6

983	1.6
984	1.6
985	6.0
986	3.0
988	243.0
989	241.0
990	308.0
991	317.0
997	29.9
998	28.6
999	20.6
1000	29.3
1001	6.6 (Top Right of Plug)
1002	28 (Top Middle of Plug)
1003	63 (Top Left of Plug)
	Cylinder: 12.1
	67.0
1039	174.4
	220.0
	63.0
	42.2

Overhead Cranes

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/Ts + 3.29(Rb/Tb + Rb/Ts)1/2}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Overhead Cranes

SURVEY TYPE:	1	(direct alpha)
METER:	L2220	
SERIAL #:	50061	
PROBE #:	43-65	
SERIAL #:	63291	
GUIDELINE VALUE:	100	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/20/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	18.00%
a = Probe Area (cm) =	63
MDA (dpm/100 cm2) =	116

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	231
Date background was taken =	10/20/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	231
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm2) =	2238

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/20/97
Time background was taken =	11:51
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/20/97
Time background was taken =	11:51
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm2) =	17

Individual Completing Form: Peter [illegible] Date: 12/23/97

Reviewed By: Gerard M [illegible] Date: 1/16/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Overhead Cranes
Date: 10/20/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 50061 Efficiency: 18.00%
Probe: 43-65 Serial #: 63291 MDA: 116

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm2)	Uncertainty (95% Confidence Level) (dpm/100 cm2)	MDA (dpm/100 cm2)
887	0	0	-44	39	116
888	0	0	-44	39	116
889	0	0	-44	39	116
890	0	0	-44	39	116
891	2	2	-26	46	116
892	1	1	-35	42	116
893	2	2	-26	46	116
894	1	1	-35	42	116
895	1	1	-35	42	116
896	0	0	-44	39	116
897	0	0	-44	39	116
898	1	1	-35	42	116
899	2	2	-26	46	116
900	2	2	-26	46	116

Individual Completing Form: Date Lyn Date: 12/23/97

Reviewed By: Date: 1/1/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Overhead Cranes	
Date	10/20/97	
Meter	L2220	
Serial #	50061	
Probe	43-65	
Serial #	63291	
MDA	116	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

xavg 1/ns * E(xi)

Where

xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

E(xi) =	**-508**	
ns =	**14**	
xavg =	**-36**	
Maximum value in population =	**-26**	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$Sx = \frac{(E(xavg - xi)2)1/2}{(ns - 1)1/2}$$

Where

sx = standard deviation
xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

xavg =	**-36**
ns =	**14**
ΣY`Y*ε Z `xΔθ Ξ	**788**
sx =	**8**

Calculation Sheet

Survey Unit: Overhead Cranes

Survey Type: 1

This sheet uses the following equation to determine the 95% Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μα Ξ value compared to guideline value to determine 95% Confidence Level
xavg = calculated mean for a survey unit
t1-",df = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
sx = standard deviation of measurements in a survey unit
ns = number of measurements within a survey unit used to determine xavg and sx

xavg =	**-36**
t1-",df =	**1.771**
sx =	**8**
ns =	**14**
μα Ξ	**-32**

*Note: for values of t1-a ,df not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/23/97

Reviewed by: [signature] Date: 1/11/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Overhead Cranes
Date: 10/20/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823
Probe: 44-9 Serial #: 11150

Efficiency: 21.87%
MDA: 2238

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm2)	Uncertainty (95% Confidence Level) (dpm/100 cm2)	MDA (dpm/100 cm2)
887	162	162	-2103	1184	2238
888	164	164	-2042	1187	2238
889	248	248	518	1308	2238
890	242	242	335	1299	2238
891	210	210	-640	1255	2238
892	240	240	274	1297	2238
893	60	60	-5213	1019	2238
894	192	192	-1189	1229	2238
895	127	127	-3170	1130	2238
896	110	110	-3688	1103	2238
897	135	135	-2926	1143	2238
898	142	142	-2713	1154	2238
899	288	288	1738	1361	2238
900	155	155	-2317	1174	2238

Individual Completing Form: [signature] Date: 12/23/97
Reviewed By: Gerard M Fodenley Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Overhead Cranes	
Date	10/20/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2238	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

xavg 1/ns * E(xi)

Where

xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

E(xi) =	**-23136**	
ns =	**14**	
xavg =	**-1653**	
Maximum value in population =	**1738**	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$Sx = \frac{(E(xavg - xi)2)1/2}{(ns - 1)1/2}$$

Where

sx = standard deviation
xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

xavg =	**-1653**
ns =	**14**
ΣY`Y'ε Z `xΔθ Ξ	**47774020**
sx =	**1917**

Calculation Sheet

Survey Unit: Overhead Cranes

Survey Type: 2

This sheet uses the following equation to determine the 95% Confidence Level. (NUREG/CR-5849)

μα Ξ xavg + t1-",df [sx/(ns)1/

Where

μα Ξ value compared to guideline value to determine 95% Confidence Level

xavg = calculated mean for a survey unit

t1-",df = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

sx = standard deviation of measurements in a survey unit

ns = number of measurements within a survey unit used to determine xavg and sx

xavg =	**-1653**
t1-",df =	**1.771**
sx =	**1917**
ns =	**14**
μα Ξ	**-746**

*Note: for values of t1-a ,df not on the table, the nearest greater value is used

Individual Completing Form: Pete Fry Date: 12/23/97

Reviewed by: Gerard M Tourney Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Overhead Cranes
Date: 10/20/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm2)	MDA (dpm/100 cm2)
887	0	13
888	3	13
889	0	13
890	3	13
891	0	13
892	0	13
893	0	13
894	0	13
895	0	13
896	0	13
897	0	13
898	0	13
899	0	13

Individual Completing Form: [signature] Date: 12/23/97
Reviewed By: [signature] Date: [illegible]

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Overhead Cranes
Date: 10/20/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm2)	MDA (dpm/100 cm2)
887	10	17
888	3	17
889	5	17
890	5	17
891	0	17
892	0	17
893	1	17
894	3	17
895	1	17
896	1	17
897	3	17
898	10	17
899	0	17

Individual Completing Form: Peter Fox Date: 12/23/97
Reviewed By: [illegible] Date: [illegible]

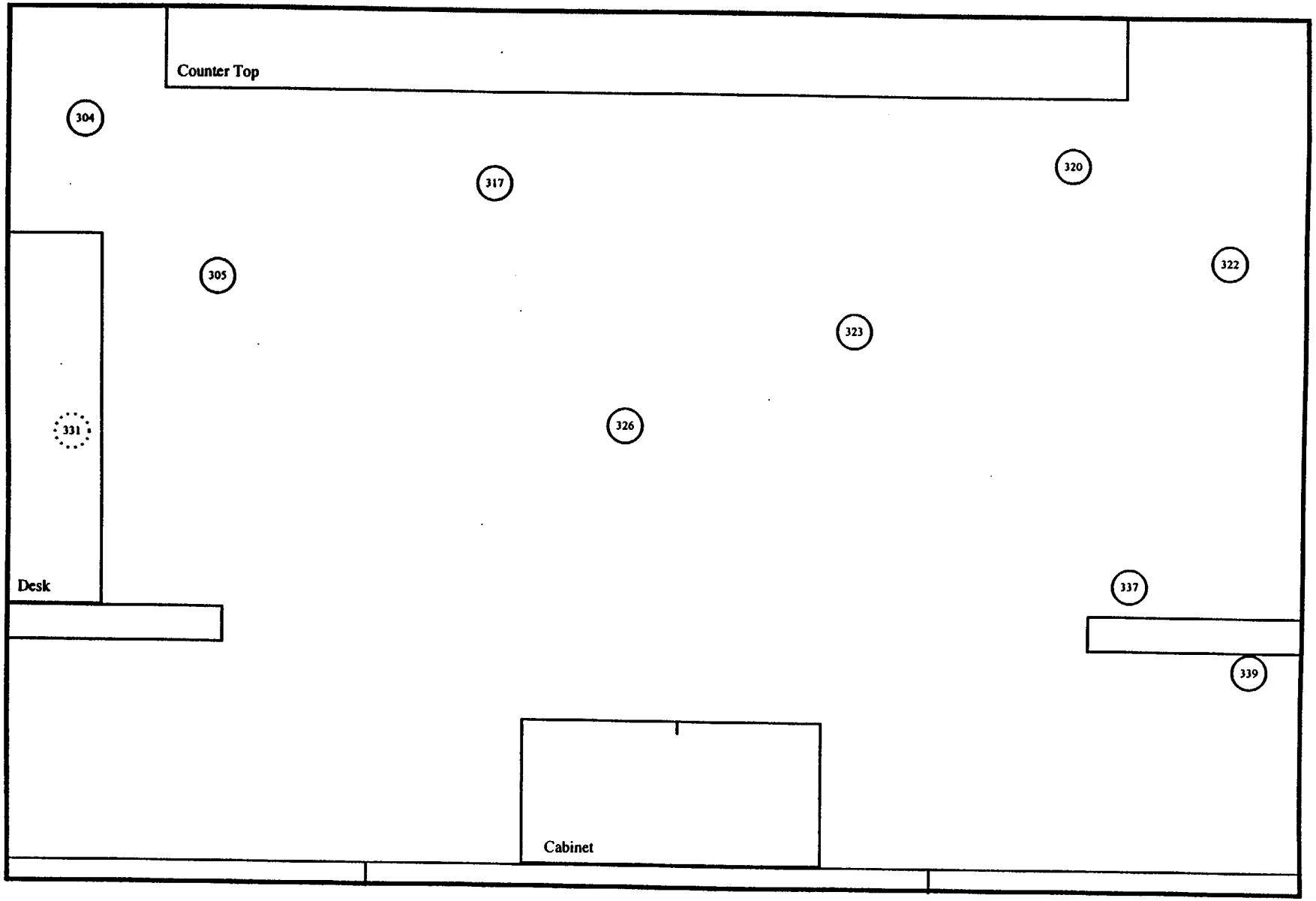
Second Floor Survey Data Summary

Survey Location	No. of Survey Points	Range of Activity (dpm/100 cm^2) Direct Alpha	MDA	Beta-Gamma	MDA	Removable Alpha	MDA	Beta-Gamma	MDA
Inner Area of Control Room	10	-88 to 22	289	-2439 to 1646	2663	0 to 3	13	0 to 7	17
NE Wall of Inner Area of Control Room	9	-22 to 44	289	-3018 to 1006	2663	0 to 3	13	0 to 7	17
NW Wall of Inner Area of Control Room	5	-88 to 66	289	-2225 to 732	2663	0 to 3	13	0 to 12	17
SE Wall of Inner Area of Control Room	11	-110 to 66	289	-3323 to 183	2663	0	13	0 to 10	17
Control Room, Ceiling	9	-110 to 286	289	-2317 to 2134	2663	0 to 3	13	0 to 7	17
Windows of Control Room	7	-88 to 22	289	-1981 to 3018	2663	0	13	0 to 7	17
Outer Area of Control Room	62	-110 to 286	289	-4115 to 5914	2663	0 to 3	13	0 to 14	17
Area West of Control Room	10	-88 to 44	289	-5274 to 4237	2663	0 to 3	13	0 to 14	17
Area East of Control Room	9	-110 to 44	289	-6920 to 2195	2663	0 to 3	13	0 to 10	17
Area East of Reactor Top	4	-66 to -44	289	-6310 to -488	2663	0	13	0 to 14	17
Catwalk	61	-110 to 220	289	-7865 to 6462	2663	0 to 7	13	0 to 21	17
Air-Conditioning Unit	48	-110 to 638	289	-6798 to -1280	2663	0 to 3	13	0 to 10	17
Top of Crane Bridge	9	None Taken	-	None Taken	-	0 to 3	13	1 to 26	17
Northeast Wall of Containment	7	-66 to -22	289	-6219 to -2743	2663	0	13	0 to 7	17

Shading represent areas where activities are above acceptable limits in
U.S. Nuclear Regulatory Guide 1.86, "Termination for Operating License for Nuclear Reactors," June 1974.

Second Floor- Inner Area of Control Room

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\ (a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Inner Area of Control Room

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/31/97

Reviewed By: [signature] Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Inner Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7 70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
304	5	5	0	136	289
305	2	2	-66	114	289
317	2	2	-66	114	289
320	4	4	-22	129	289
322	2	2	-66	114	289
323	2	2	-66	114	289
326	1	1	-88	106	289
331	3	3	-44	122	289
337	6	6	22	143	289
339	1	1	-88	106	289

Individual Completing Form: _____ Date: 12/31/97

Reviewed By: _____ Date: 1/1/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Second Floor- Inner Area of Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-484
n_s =	10
x_{avg} =	-48
Maximum value in population =	22 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-48
n_s =	10
$\Sigma(x_{avg} - x_i)^2$ =	12392
s_x =	37

Calculation Sheet

Survey Unit: Second Floor- Inner Area of Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-48
$t_{1-\alpha,df}$ =	1.833
s_x =	37
n_s =	10
μ_α =	-26

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: [signature] Date: 1/11/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Inner Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220
Probe: 44-9

Serial #: 52823
Serial #: 11150

Efficiency: 21.87%
MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
304	294	294	-1128	1494	2663
305	355	355	732	1565	2663
317	311	311	-610	1514	2663
320	286	286	-1372	1484	2663
322	285	285	-1402	1483	2663
323	251	251	-2439	1441	2663
326	306	306	-762	1508	2663
331	263	263	-2073	1456	2663
337	385	385	1646	1599	2663
339	304	304	-823	1506	2663

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: Gerard M Tokiney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Second Floor- Inner Area of Control Room	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2663	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-8231	
n_s =	10	
x_{avg} =	-823	
Maximum value in population =	**1646**	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-823
n_s =	10
$\Sigma(x_{avg} - x_i)^2$ =	13466699
s_x =	1223

Calculation Sheet

Survey Unit: Second Floor- Inner Area of Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-823
$t_{1-\alpha,df}$ =	1.833
s_x =	1223
n_s =	10
μ_α =	-114

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Inner Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

Efficiency: 28.35%
MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
304	0	13
305	0	13
317	0	13
320	3	13
322	0	13
323	0	13
326	0	13
331	0	13
337	0	13
339	0	13

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Inner Area of Control Room
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

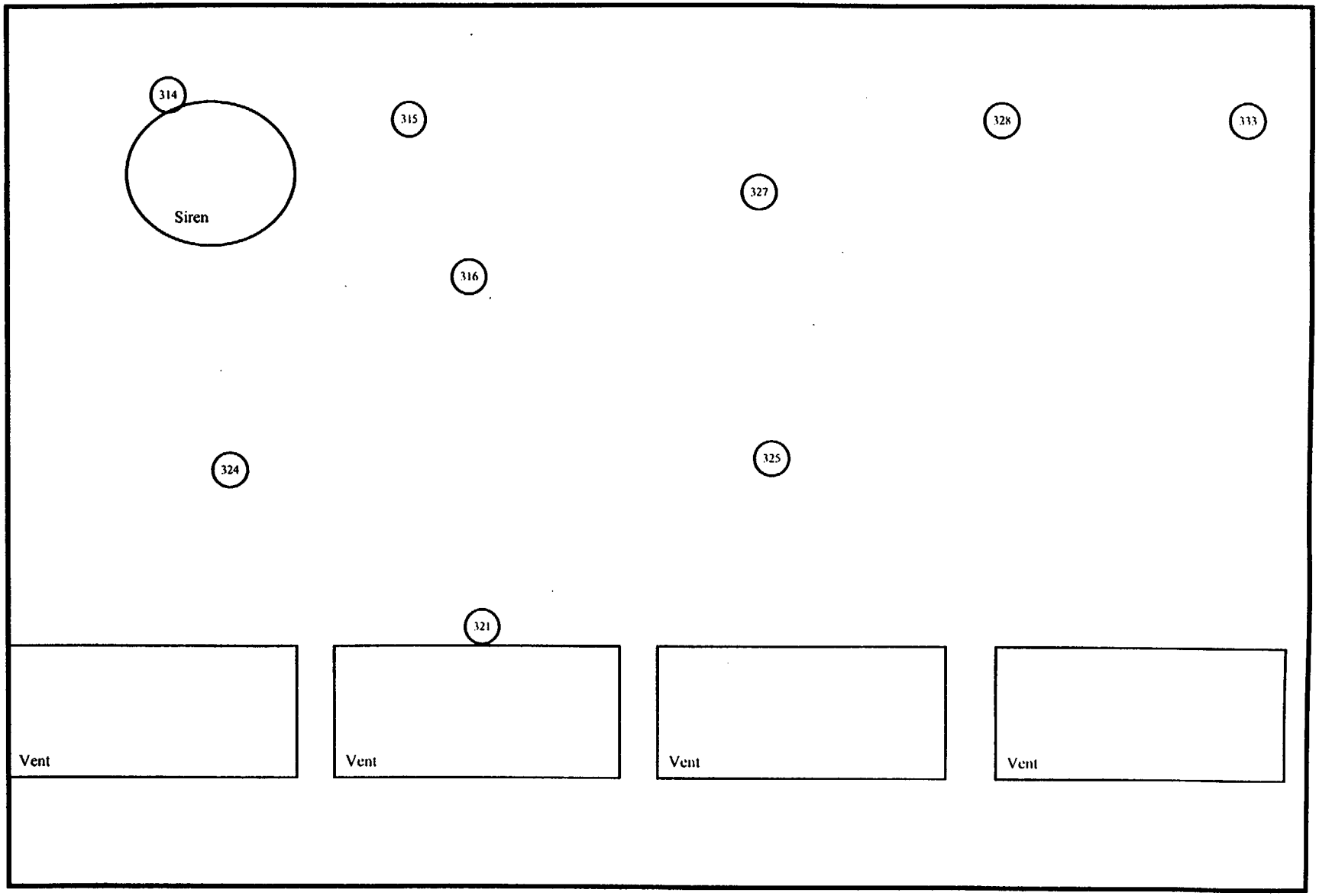
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
304	3	17
305	7	17
317	3	17
320	0	17
322	3	17
323	0	17
326	0	17
331	3	17
337	1	17
339	3	17

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Second Floor- Northeast Wall of Inner Area of Control Room

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Northeast Wall of Inner Area of Control Room

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	15:53
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	15:53
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: Peter Fogg — Date: 1/5/98

Reviewed By: Gerard M Courney — Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Northeast Wall of Inner Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
314	6	6	22	143	289
315	7	7	44	149	289
316	6	6	22	143	289
321	6	6	22	143	289
324	5	5	0	136	289
325	5	5	0	136	289
327	4	4	-22	129	289
328	6	6	22	143	289
333	6	6	22	143	289

Individual Completing Form: _____ Date: 1/5/98

Reviewed By: _____ Date: 1/[illegible]/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	Second Floor- Northeast Wall of Inner Area of Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	132
n_s =	9
x_{avg} =	15
Maximum value in population =	44 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	15
n_s =	9
$\Sigma(x_{avg} - x_i)^2$ =	2905
s_x =	19

Calculation Sheet

Survey Unit: Second Floor- Northeast Wall of Inner Area of Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	15
$t_{1-\alpha,df}$ =	1.860
s_x =	19
n_s =	9
μ_α =	27

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: _____ Date: 12/31/97

Reviewed by: _____ Date: _____

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Northeast Wall of Inner Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220
Probe: 44-9

Serial #: 52823
Serial #: 11150

Efficiency: 21.87%
MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
314	335	335	122	1542	2663
315	232	232	-3018	1418	2663
316	292	292	-1189	1491	2663
321	364	364	1006	1575	2663
324	268	268	-1920	1462	2663
325	258	258	-2225	1450	2663
327	321	321	-305	1526	2663
328	304	304	-823	1506	2663
333	323	323	-244	1528	2663

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following
Survey Unit	Second Floor- Northeast Wall of Inner Area of Control Room	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2663	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-8596
n_s =	9
x_{avg} =	-955
Maximum value in population =	**1006 (dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-955
n_s =	9
$\Sigma(x_{avg} - x_i)^2$ =	12805745
s_x =	1265

Calculation Sheet

Survey Unit: Second Floor- Northeast Wall of Inner Area of Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-955
$t_{1-\alpha,df}$ =	1.860
s_x =	1265
n_s =	9
μ_α =	-171

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pat Fox Date: 12/31/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Northeast Wall of Inner Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

Efficiency: 28.35%
MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
314	0	13
315	0	13
316	3	13
321	0	13
324	0	13
325	0	13
327	0	13
328	0	13
333	0	13

Individual Completing Form: Pat Fogg Date: 1/5/99

Reviewed By: [illegible] Date: 1/11/99

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Northeast Wall of Inner Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

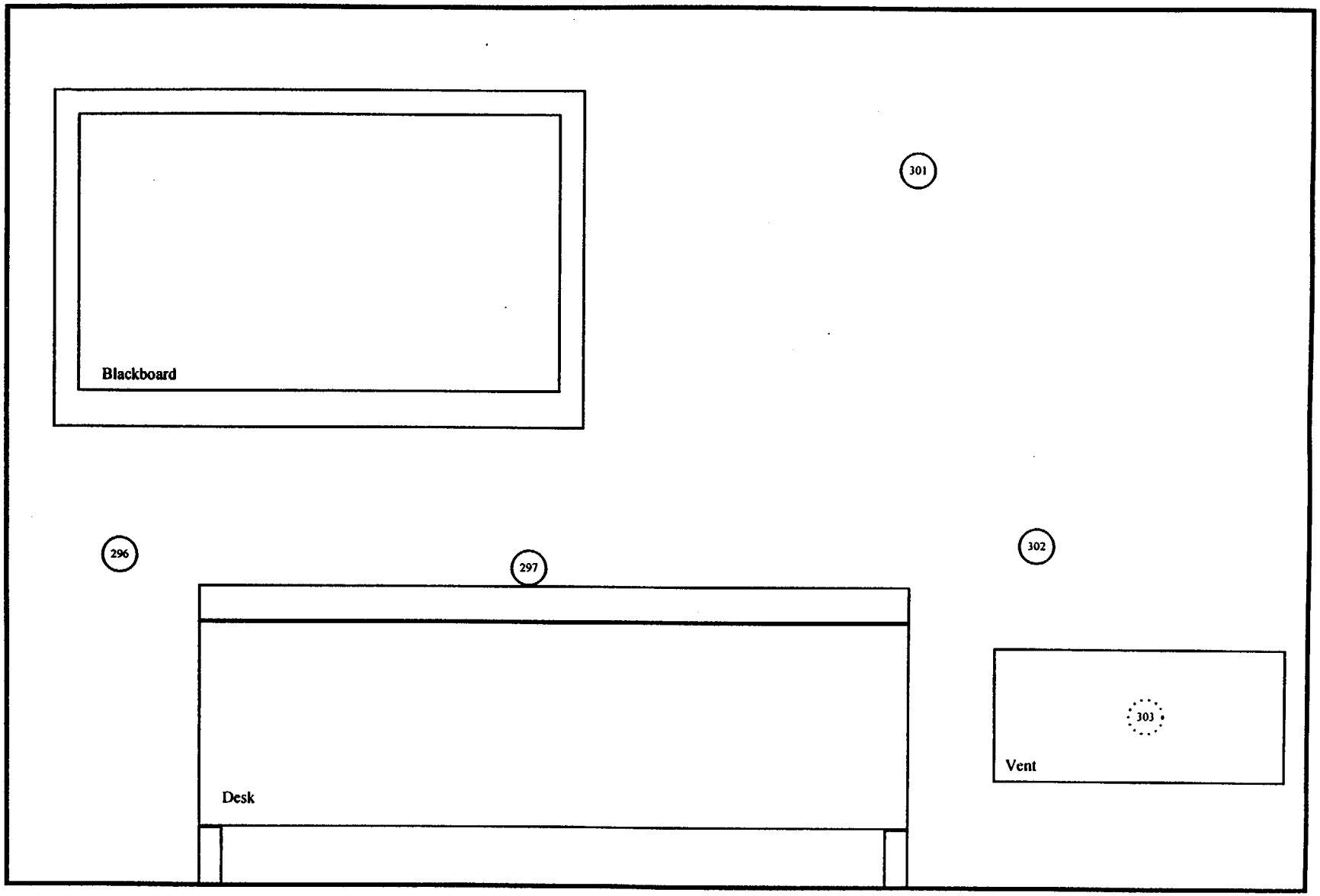
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
314	0	17
315	0	17
316	0	17
321	0	17
324	0	17
325	0	17
327	5	17
328	7	17
333	0	17

Individual Completing Form: Pat Lopez Date: 1/5/98
Reviewed By: Date:

Second Floor- Northwest Wall of Inner Area in Control Room

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\ (a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Northwest Wall of Inner Area in Control Room

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 1/5/98

Reviewed By: Gerard M Toomey Date: 1/14/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Northwest Wall of Inner Area in Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
296	1	1	-88	106	289
297	3	3	-44	122	289
301	8	8	66	156	289
302	2	2	-66	114	289
303	2	2	-66	114	289

Individual Completing Form: Pat Lopez Date: 1/5/98

Reviewed By: Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	Second Floor- Northwest Wall of Inner Area in Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-198
n_s =	5
x_{avg} =	-40
Maximum value in population =	**66 (dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-40
n_s =	5
$\Sigma(x_{avg} - x_i)^2$ =	14908
s_x =	61

Calculation Sheet

Survey Unit: Second Floor- Northwest Wall of Inner Area in Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-40
$t_{1-\alpha,df}$ =	2.132
s_x =	61
n_s =	5
μ_α =	18

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 1/5/98

Reviewed by: [signature] Date: [illegible]

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Northwest Wall of Inner Area in Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
296	258	258	-2225	1450	2663
297	272	272	-1799	1487	2663
301	271	271	-1829	1486	2663
302	293	293	-1158	1492	2663
303	355	355	732	1565	2663

Individual Completing Form: Patty Fox Date: 1/5/98
Reviewed By: Gerard M Rodney Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following
Survey Unit	Second Floor- Northwest Wall of Inner Area in Control Room	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2663	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-6279
n_s =	5
x_{avg} =	-1256
Maximum value in population =	732 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-1256
n_s =	5
$\Sigma(x_{avg} - x_i)^2$ =	5523887
s_x =	1175

Calculation Sheet

Survey Unit: Second Floor- Northwest Wall of Inner Area in Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-1256
$t_{1-\alpha,df}$ =	2.132
s_x =	1175
n_s =	5
μ_α =	-136

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Patricia Lopez Date: 1/5/98

Reviewed by: Merrill M Torney Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Northwest Wall of Inner Area in Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
296	0	13
297	0	13
301	3	13
302	0	13
303	0	13

Individual Completing Form: Pat Fox Date: 1/5/98
Reviewed By: [illegible] Date: 1/7/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Northwest Wall of Inner Area in Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

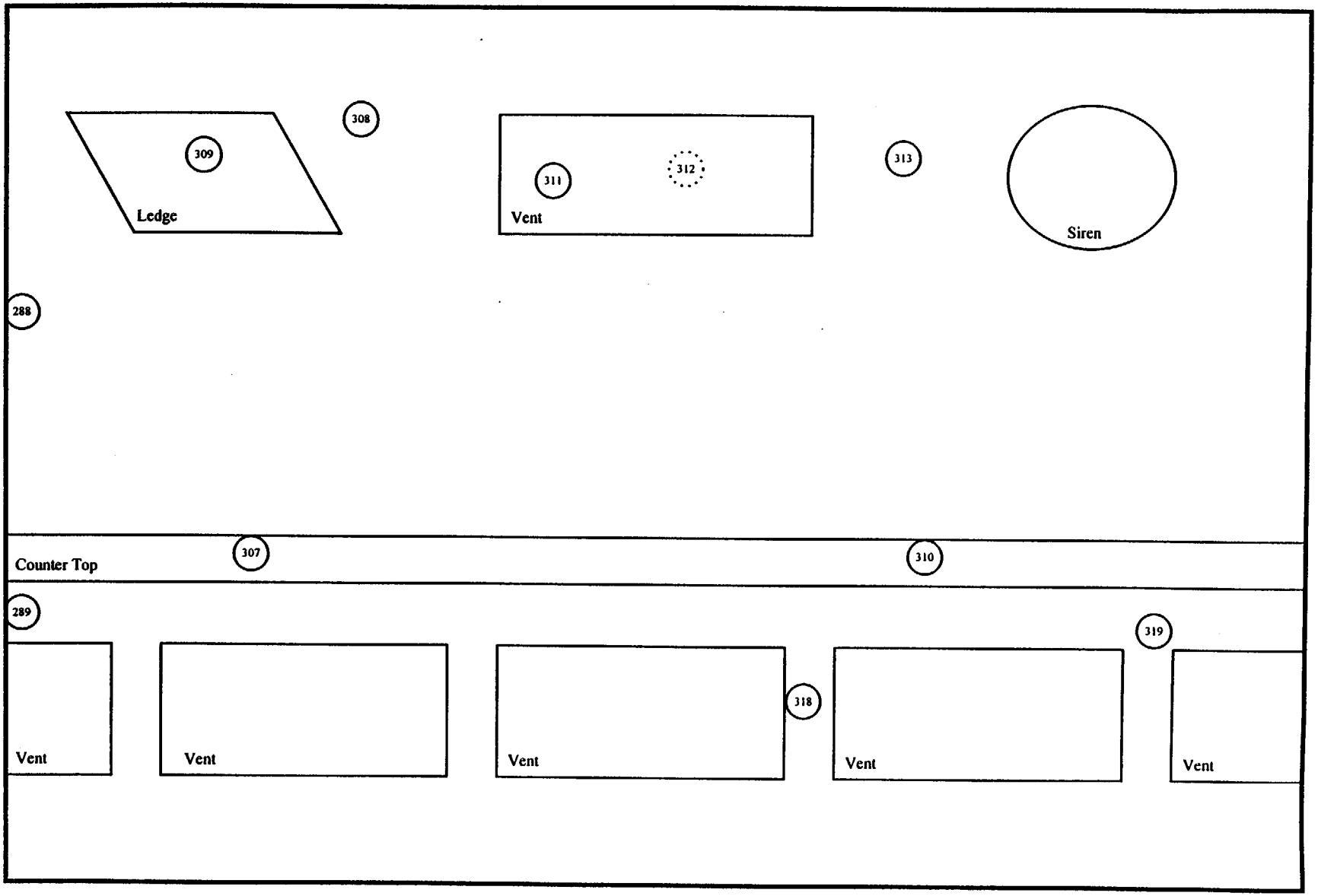
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
296	0	17
297	12	17
301	0	17
302	1	17
303	7	17

Individual Completing Form: Pat Lge Date: 1/5/98
Reviewed By: Date: 1/11/98

Second Floor- Southeast Wall of Inner Area in Control Room

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Southeast Wall of Inner Area in Control Room

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: Pat Lopez Date: 12/31/97

Reviewed By: Gerard M Tourney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Southeast Wall of Inner Area in Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
288	6	6	22	143	289
289	7	7	44	149	289
307	0	0	-110	96	289
308	5	5	0	136	289
309	2	2	-66	114	289
310	2	2	-66	114	289
311	8	8	66	156	289
312	8	8	66	156	289
313	6	6	22	143	289
318	2	2	-66	114	289
319	6	6	22	143	289

Individual Completing Form: Peter Lopez Date: 12/31/97

Reviewed By: [signature] Date: 1/11/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	Second Floor- Southeast Wall of Inner Area in Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-66
n_s =	11
x_{avg} =	-6
Maximum value in population =	**66 (dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-6
n_s =	11
$\Sigma(x_{avg} - x_i)^2$ =	36872
s_x =	61

Calculation Sheet

Survey Unit: Second Floor- Southeast Wall of Inner Area in Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-6
$t_{1-\alpha,df}$ =	1.812
s_x =	61
n_s =	11
μ_α =	27

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Date: 12/31/97

Reviewed by: Date: 1/11/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Southeast Wall of Inner Area in Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
288	328	328	-91	1534	2663
289	337	337	183	1544	2663
307	333	333	61	1540	2663
308	306	306	-762	1508	2663
309	285	285	-1402	1483	2663
310	273	273	-1768	1468	2663
311	222	222	-3323	1405	2663
312	319	319	-366	1523	2663
313	264	264	-2042	1457	2663
318	313	313	-549	1516	2663
319	307	307	-732	1509	2663

Individual Completing Form: Peter Lopez Date: 12/31/97
Reviewed By: Bernard M Trinity Date: 1/15/98

Calculation Sheet

SURVEY TYPE: 2

Survey Unit	Second Floor- Southeast Wall of Inner Area in Control Room
Date	10/9/97
Meter	L2220
Serial #	52823
Probe	44-9
Serial #	11150
MDA	2663
Survey Type	Direct Beta/Gamma
Guideline Value	5000 (dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-10791
n_s =	11
x_{avg} =	-981
Maximum value in population =	183 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-981
n_s =	11
$\Sigma(x_{avg} - x_i)^2$ =	11314866
s_x =	1064

Calculation Sheet

Survey Unit: Second Floor- Southeast Wall of Inner Area in Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-981
$t_{1-\alpha,df}$ =	1.812
s_x =	1064
n_s =	11
μ_α =	-400

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Peter Fogg Date: 12/31/97

Reviewed by: Bernard M Toomey Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Southeast Wall of Inner Area of Control Room
Date: 10/9/97

Notes
1) Place total counts directly from meter. Activity column will correct for background
2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A
Serial #: 13795
Serial #: N/A
Efficiency: 28.35%
MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
288	0	13
289	0	13
307	0	13
308	0	13
309	0	13
310	0	13
311	0	13
312	0	13
313	0	13
318	0	13
319	0	13

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/15/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Southeast Wall of Inner Area in Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

Efficiency: 43.45%
MDA: 17

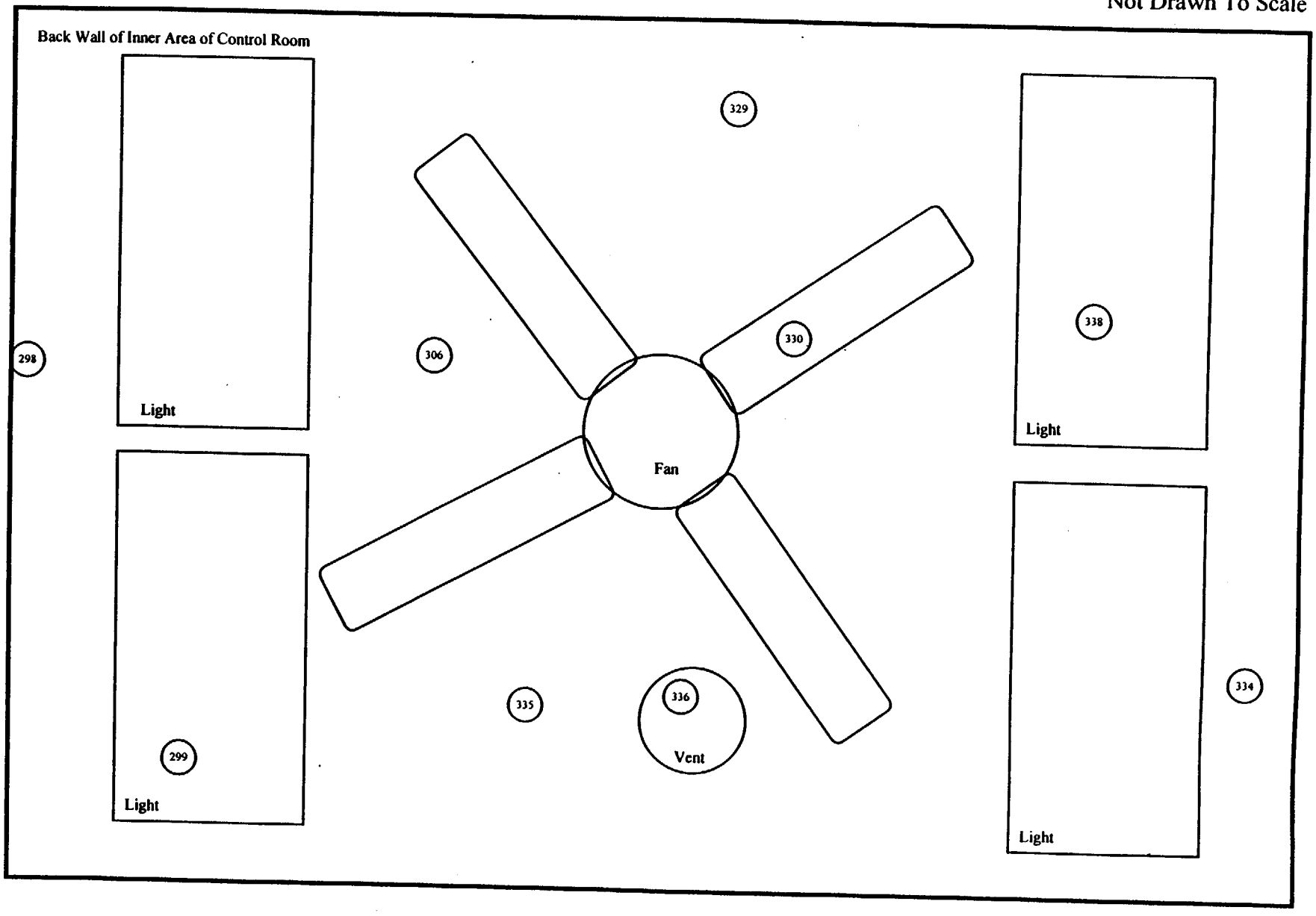
Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
288	1	17
289	10	17
307	0	17
308	5	17
309	0	17
310	1	17
311	0	17
312	1	17
313	0	17
318	3	17
319	0	17

Individual Completing Form: Pat [illegible]
Reviewed By: [illegible]

Date: 12/31/97
Date: [illegible]

Second Floor-Control Room

Ceiling
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

- Enter all time in minutes
- Enter all dates as m/d/y
- Enter efficiency in decimal form (i.e., 28.3% = 0.283)
- Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Control Room, Ceiling

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	15:53
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	15:53
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [illegible] Date: 12/29/97

Reviewed By: Gerard M Tourney Date: 1/14/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Control Room, Ceiling
Date: 10/9/97

Notes:
(1) Place total counts directly from meter .Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7.70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
298	18	18	286	207	289
299	0	0	-110	96	289
306	3	3	-44	122	289
329	6	6	22	143	289
330	0	0	-110	96	289
334	7	7	44	149	289
335	3	3	-44	122	289
336	6	6	22	143	289
338	1	1	-88	106	289

Individual Completing Form: Patr [illegible] Date: 12/29/97

Reviewed By: [illegible] Date: 1/[illegible]/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Second Floor- Control Room, Ceiling	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-22	
n_s =	9	
x_{avg} =	-2	
Maximum value in population =	**286**	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-2
n_s =	9
$\Sigma(x_{avg} - x_i)^2$ =	120464
s_x =	123

Calculation Sheet

Survey Unit: Second Floor- Control Room, Ceiling
Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-2
$t_{1-\alpha,df}$ =	1.860
s_x =	123
n_s =	9
μ_α =	74

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/29/97

Reviewed by: [signature] Date: [illegible]

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Control Room, Ceiling
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823
Probe: 44-9 Serial #: 11150

Efficiency: 21 87%
MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
298	347	347	488	1556	2663
299	255	255	-2317	1446	2663
306	355	355	732	1565	2663
329	299	299	-975	1500	2663
330	354	354	701	1564	2663
334	325	325	-183	1530	2663
335	308	308	-701	1510	2663
336	401	401	2134	1616	2663
338	297	297	-1036	1497	2663

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: [signature] Date: 1/14/98

Calculation Sheet

SURVEY TYPE: 2

Survey Unit	Second Floor- Control Room, Ceiling
Date	10/9/97
Meter	L2220
Serial #	52823
Probe	44-9
Serial #	11150
MDA	2663
Survey Type	Direct Beta/Gamma
Guideline Value	5000 (dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-1157
n_s =	9
x_{avg} =	-129
Maximum value in population =	2134 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-129
n_s =	9
$\Sigma(x_{avg} - x_i)^2$ =	13587888
s_x =	1303

Calculation Sheet

Survey Unit: Second Floor- Control Room, Ceiling
Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-129
$t_{1-\alpha,df}$ =	1.860
s_x =	1303
n_s =	9
μ_α =	679

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/29/97

Reviewed by: Gerard M Tourney Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Control Room, Ceiling
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
298	0	13
299	0	13
306	0	13
329	0	13
330	3	13
334	0	13
335	0	13
336	0	13
338	0	13

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: [signature] Date: [illegible]

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Control Room. Ceiling
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

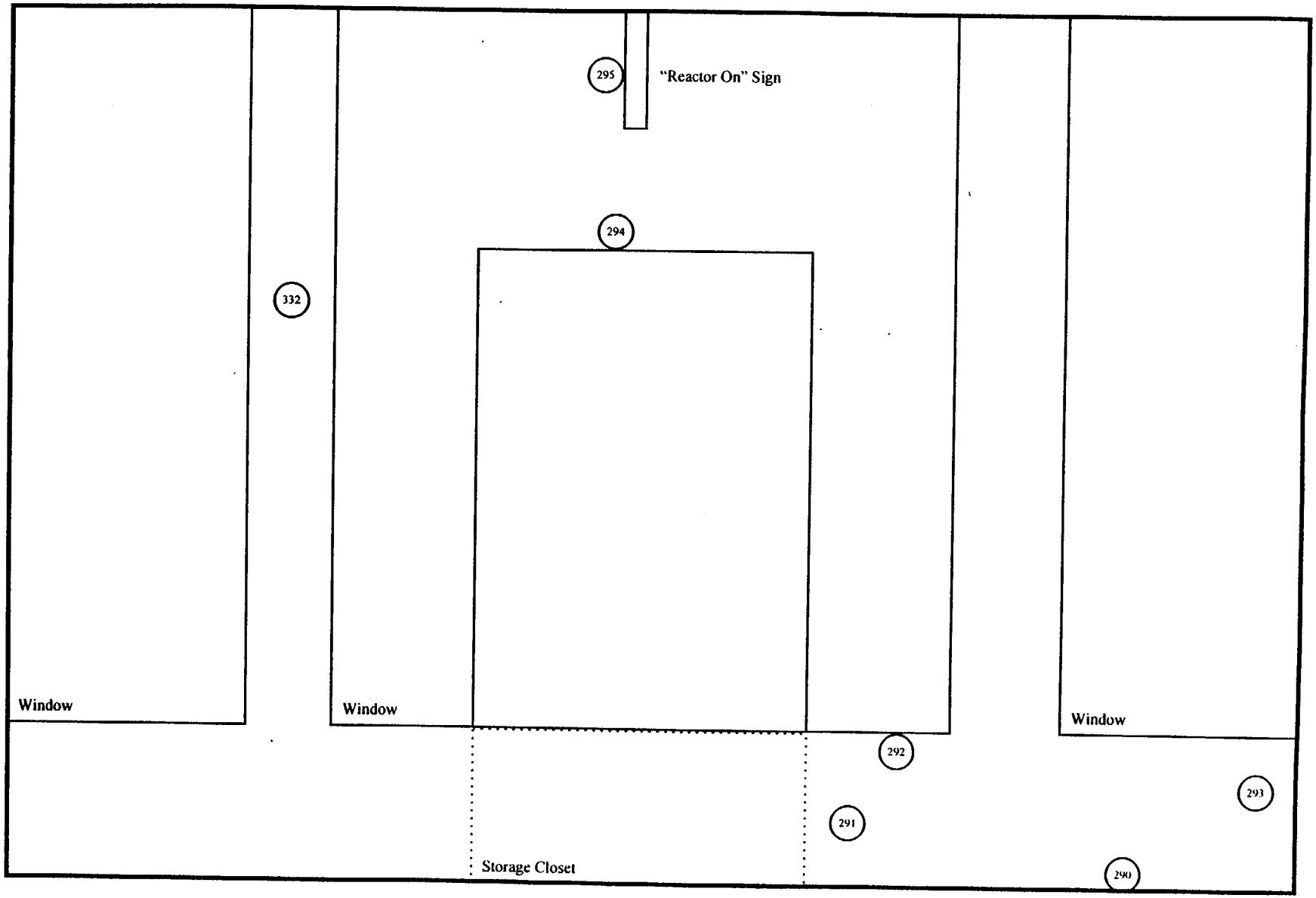
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
298	1	17
299	3	17
306	1	17
329	0	17
330	3	17
334	3	17
335	7	17
336	7	17
338	0	17

Individual Completing Form: [signature] Date: 12/29/97
Reviewed By: [signature] Date: 1/11/98

Second Floor- Windows of the Control Room

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Windows of the Control Room

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: Pat Fry Date: 12/31/97
Reviewed By: Gerard M Tolmey Date: 1/14/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Windows of the Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7.70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
290	2	2	-66	114	289
291	3	3	-44	122	289
292	6	6	22	143	289
293	1	1	-88	106	289
294	5	5	0	136	289
295	5	5	0	136	289
332	5	5	0	136	289

Individual Completing Form: [signature] Date: 12/31/97

Reviewed By: [signature] Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Second Floor- Windows of the Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-176	
n_s =	7	
x_{avg} =	-25	
Maximum value in population =	22	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-25
n_s =	7
$\Sigma(x_{avg} - x_i)^2$ =	10095
s_x =	41

Calculation Sheet

Survey Unit: Second Floor- Windows of the Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-25
$t_{1-\alpha,df}$ =	1.943
s_x =	41
n_s =	7
μ_α =	5

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: [signature] Date: 1/11/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Windows of the Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220
Probe: 44-9
Serial #: 52823
Serial #: 11150
Efficiency: 21.87%
MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
290	291	291	-1219	1490	2663
291	360	360	884	1571	2663
292	430	430	3018	1648	2663
293	295	295	-1097	1495	2663
294	365	365	1036	1576	2663
295	318	318	-396	1522	2663
332	266	266	-1981	1460	2663

Individual Completing Form: [illegible] Date: 12/31/97
Reviewed By: Gerard M Tourney Date: 1/14/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Second Floor- Windows of the Control Room	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2663	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	245	
n_s =	7	
x_{avg} =	35	
Maximum value in population =	3018	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	35
n_s =	7
$\Sigma(x_{avg} - x_i)^2$ =	17725048
s_x =	1719

Calculation Sheet

Survey Unit: Second Floor- Windows of the Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	35
$t_{1-\alpha,df}$ =	1.943
s_x =	1719
n_s =	7
μ_α =	1297

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: Gerard M Tourney Date: 1/14/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Windows of the Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
290	0	13
291	0	13
292	0	13
293	0	13
294	0	13
295	0	13
332	0	13

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: Gerard M Tourney Date: 1/14/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Windows of the Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

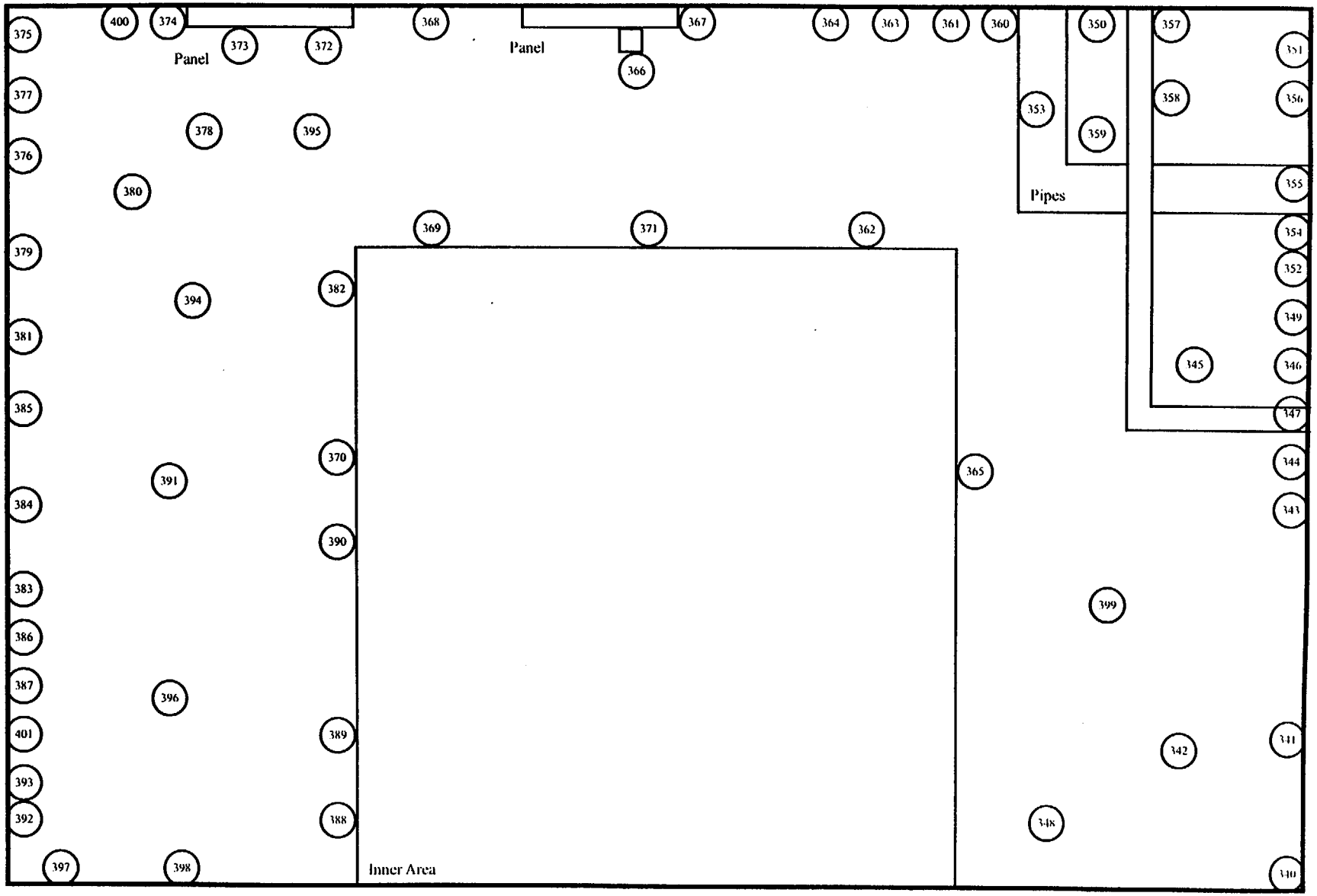
Efficiency: 43.45%
MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
290	3	17
291	5	17
292	7	17
293	3	17
294	7	17
295	0	17
332	5	17

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/1/98

Second Floor- Outer Area of Control Room

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Outer Area of Control Room

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: [signature] Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Outer Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7.70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
340	6	6	22	143	289
341	18	18	286	207	289
342	13	13	176	183	289
343	4	4	-22	129	289
344	15	15	220	193	289
345	2	2	-66	114	289
346	10	10	110	167	289
347	2	2	-66	114	289
348	0	0	-110	96	289
349	4	4	-22	129	289
350	4	4	-22	129	289
351	4	4	-22	129	289
352	3	3	-44	122	289
353	3	3	-44	122	289
354	2	2	-66	114	289
355	8	8	66	156	289
356	4	4	-22	129	289
357	1	1	-88	106	289
358	11	11	132	173	289
359	8	8	66	156	289
360	8	8	66	156	289
361	5	5	0	136	289
362	4	4	-22	129	289
363	8	8	66	156	289
364	4	4	-22	129	289
365	10	10	110	167	289
366	6	6	22	143	289
367	6	6	22	143	289
368	5	5	0	136	289
369	1	1	-88	106	289
370	2	2	-66	114	289
371	9	9	88	161	289
372	3	3	-44	122	289
373	3	3	-44	122	289
374	4	4	-22	129	289
375	4	4	-22	129	289
376	3	3	-44	122	289
377	4	4	-22	129	289
378	4	4	-22	129	289
379	3	3	-44	122	289
380	7	7	44	149	289
381	3	3	-44	122	289
382	4	4	-22	129	289
383	4	4	-22	129	289
384	0	0	-110	96	289
385	3	3	-44	122	289
386	5	5	0	136	289
387	4	4	-22	129	289
388	4	4	-22	129	289
389	0	0	-110	96	289
390	4	4	-22	129	289
391	1	1	-88	106	289
392	3	3	-44	122	289
393	3	3	-44	122	289
394	0	0	-110	96	289
395	3	3	-44	122	289
396	4	4	-22	129	289
397	0	0	-110	96	289
398	4	4	-22	129	289
399	3	3	-44	122	289
400	4	4	-22	129	289
401	4	4	-22	129	289

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: [signature] Date: 1/4/98

Calculation Sheet

SURVEY TYPE:	1
Survey Unit	Second Floor- Outer Area of Control Room
Date	10/9/97
Meter	L2221
Serial #	50062
Probe	AC-3
Serial #	408951
MDA	289
Survey Type	Direct Alpha
Guideline Value	100 (dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-550
n_s =	62
x_{avg} =	-9
Maximum value in population =	286 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-9
n_s =	62
$\Sigma(x_{avg} - x_i)^2$ =	360542
s_x =	77

Calculation Sheet

Survey Unit: Second Floor- Outer Area of Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-9
$t_{1-\alpha,df}$ =	1.671
s_x =	77
n_s =	62
μ_α =	7

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/30/97

Reviewed by: [signature] Date: 1/11/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Outer Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
340	377	377	1402	1590	2663
341	273	273	-1768	1468	2663
342	525	525	5914	1748	2663
343	281	281	-1524	1478	2663
344	383	383	1585	1596	2663
345	355	355	732	1565	2663
346	395	395	1951	1610	2663
347	285	285	-1402	1483	2663
348	361	361	914	1572	2663
349	276	276	-1677	1472	2663
350	307	307	-732	1509	2663
351	340	340	274	1548	2663
352	427	427	2926	1645	2663
353	309	309	-671	1511	2663
354	341	341	305	1549	2663
355	402	402	2164	1618	2663
356	356	356	762	1566	2663
357	362	362	945	1573	2663
358	348	348	518	1557	2663
359	343	343	366	1551	2663
360	371	371	1219	1583	2663
361	353	353	671	1563	2663
362	232	232	-3018	1418	2663
363	299	299	-975	1500	2663
364	308	308	-701	1510	2663
365	314	314	-518	1517	2663
366	298	298	-1006	1498	2663
367	274	274	-1738	1470	2663
368	395	395	1951	1610	2663
369	384	384	1616	1598	2663
370	214	214	-3567	1395	2663
371	196	196	-4115	1372	2663
372	379	379	1463	1592	2663
373	435	435	3170	1654	2663
374	357	357	793	1567	2663
375	344	344	396	1552	2663
376	321	321	-305	1526	2663
377	328	328	-91	1534	2663
378	474	474	4359	1695	2663
379	384	384	1616	1598	2663
380	444	444	3445	1663	2663
381	379	379	1463	1592	2663
382	285	285	-1402	1483	2663
383	468	468	4176	1689	2663
384	350	350	579	1559	2663
385	392	392	1859	1607	2663
386	410	410	2408	1626	2663
387	409	409	2378	1625	2663
388	225	225	-3231	1409	2663
389	339	339	244	1547	2663
390	377	377	1402	1590	2663
391	315	315	-488	1519	2663
392	266	266	-1981	1460	2663
393	315	315	-488	1519	2663
394	273	273	-1768	1468	2663
395	323	323	-244	1528	2663
396	408	408	2347	1624	2663
397	377	377	1402	1590	2663
398	208	208	-3749	1387	2663
399	318	318	-396	1522	2663
400	328	328	-91	1534	2663
401	348	348	518	1557	2663

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: [signature] Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Second Floor- Outer Area of Control Room	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2663	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	22587	
n_s =	62	
x_{avg} =	364	
Maximum value in population =	5914	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	364
n_s =	62
$\Sigma(x_{avg} - x_i)^2$ =	241124175
s_x =	1988

Calculation Sheet

Survey Unit: Second Floor- Outer Area of Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	364
$t_{1-\alpha,df}$ =	1.671
s_x =	1988
n_s =	62
μ_α =	786

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pat [illegible] Date: 12/30/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Outer Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
340	3	13
341	0	13
342	3	13
343	0	13
344	0	13
345	0	13
346	0	13
347	0	13
348	0	13
349	3	13
350	0	13
351	0	13
352	0	13
353	0	13
354	3	13
355	0	13
356	0	13
357	0	13
358	0	13
359	0	13
360	0	13
361	0	13
362	0	13
363	0	13
364	0	13
365	0	13
366	0	13
367	0	13
368	0	13
369	0	13
370	0	13
371	0	13
372	0	13
373	0	13
374	0	13
375	0	13
376	3	13
377	0	13
378	0	13
379	0	13
380	0	13
381	3	13
382	0	13
383	0	13
384	0	13
385	0	13
386	0	13
387	0	13
388	0	13
389	0	13
390	0	13
391	3	13
392	0	13
393	0	13
394	0	13
395	3	13
396	3	13
397	0	13
398	3	13
399	0	13
400	3	13
401	0	13

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: [signature] Date: 1/1/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Outer Area of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

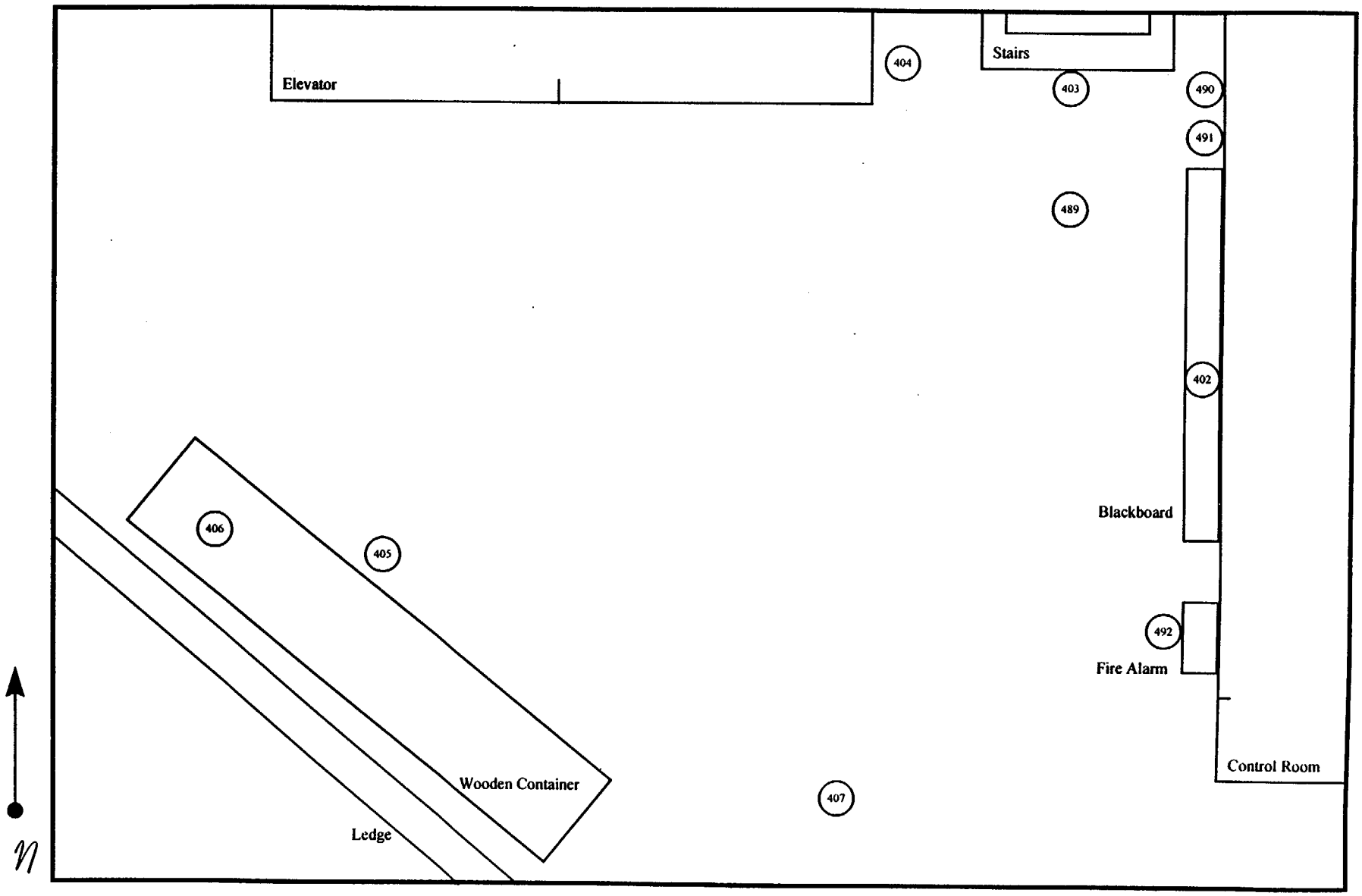
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
340	1	17
341	1	17
342	1	17
343	3	17
344	5	17
345	3	17
346	0	17
347	1	17
348	0	17
349	0	17
350	0	17
351	1	17
352	3	17
353	1	17
354	10	17
355	5	17
356	1	17
357	0	17
358	7	17
359	5	17
360	5	17
361	1	17
362	7	17
363	5	17
364	14	17
365	1	17
366	10	17
367	3	17
368	1	17
369	3	17
370	1	17
371	0	17
372	0	17
373	3	17
374	5	17
375	3	17
376	1	17
377	5	17
378	0	17
379	0	17
380	10	17
381	0	17
382	10	17
383	0	17
384	3	17
385	0	17
386	1	17
387	1	17
388	0	17
389	0	17
390	0	17
391	3	17
392	1	17
393	0	17
394	0	17
395	3	17
396	3	17
397	1	17
398	0	17
399	10	17
400	0	17
401	0	17

Individual Completing Form: Pat Fry Date: 12/30/97
Reviewed By: [illegible] Date: 1/1-98

Second Floor- Area West of Control Room

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Area West of Control Room

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: Gerard M Courney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area West of Control Room
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
402	1	1	-88	106	289
403	3	3	-44	122	289
404	4	4	-22	129	289
405	3	3	-44	122	289
406	6	6	22	143	289
407	1	1	-88	106	289
489	2	2	-66	114	289
490	1	1	-88	106	289
491	7	7	44	149	289
492	6	6	22	143	289

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: [signature] Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Second Floor- Area West of Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-352	
n_s =	10	
x_{avg} =	-35	
Maximum value in population =	44	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-35
n_s =	10
$\Sigma(x_{avg} - x_i)^2$ =	22458
s_x =	50

Calculation Sheet

Survey Unit: Second Floor- Area West of Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-35
$t_{1-\alpha,df}$ =	1.833
s_x =	50
n_s =	10
μ_α =	-6

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pete [illegible] Date: 12/30/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzabon Survey
Survey Unit (Location): Second Floor- Area West of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823
Probe: 44-9 Serial #: 11150

Efficiency: 21.87%
MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
402	317	317	-427	1521	2663
403	361	361	914	1572	2663
404	393	393	1890	1608	2663
405	340	340	274	1548	2663
406	470	470	4237	1691	2663
407	341	341	305	1549	2663
489	207	207	-3780	1386	2663
490	191	191	-4268	1365	2663
491	212	212	-3627	1392	2663
492	158	158	-5274	1321	2663

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: [signature] Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2
Survey Unit	Second Floor- Area West of Control Room
Date	10/9/97
Meter	L2220
Serial #	52823
Probe	44-9
Serial #	11150
MDA	2663
Survey Type	Direct Beta/Gamma
Guideline Value	5000 (dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-9756
n_s =	10
x_{avg} =	-976
Maximum value in population =	4237 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-976
n_s =	10
$\Sigma(x_{avg} - x_i)^2$ =	86666572
s_x =	3103

Calculation Sheet

Survey Unit: Second Floor- Area West of Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-976
$t_{1-\alpha,df}$ =	1.833
s_x =	3103
n_s =	10
μ_α =	823

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/30/97

Reviewed by: [signature] Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area West of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
402	0	13
403	0	13
404	0	13
405	0	13
406	0	13
407	3	13
489	0	13
490	0	13
491	0	13
492	0	13

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: [signature] Date: 1/15/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area West of Control Room
Date: 10/9/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

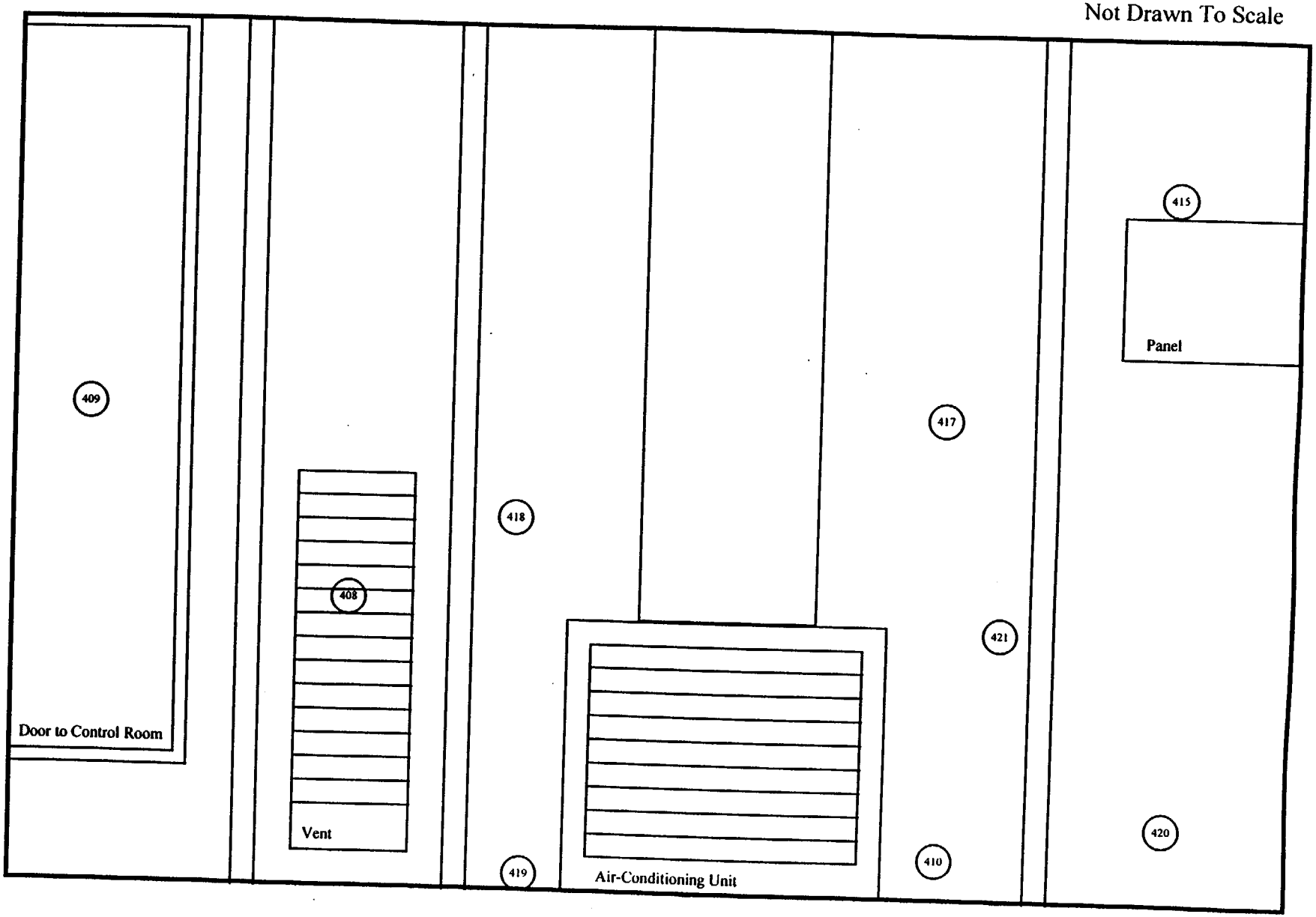
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
402	14	17
403	1	17
404	3	17
405	0	17
406	3	17
407	1	17
489	5	17
490	1	17
491	5	17
492	1	17

Individual Completing Form: Pat Tony — Date: 12/30/97
Reviewed By: Gerard M Tourney — Date: 1/15/98

Second Floor- Area East of Control Room

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\ (a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Area East of Control Room

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	17:49
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	17:49
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/31/97

Reviewed By: Gerard M Tourney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7 70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
408	6	6	22	143	289
409	7	7	44	149	289
410	4	4	-22	129	289
415	6	6	22	143	289
417	0	0	-110	96	289
418	2	2	-66	114	289
419	0	0	-110	96	289
420	4	4	-22	129	289
421	2	2	-66	114	289

Individual Completing Form: Pat Lopez Date: 12/31/97

Reviewed By: Date: 1/1/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Second Floor- Area East of Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-308	
n_s =	9	
x_{avg} =	-34	
Maximum value in population =	44	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-34
n_s =	9
$\Sigma(x_{avg} - x_i)^2$ =	26244
s_x =	57

Calculation Sheet

Survey Unit: Second Floor- Area East of Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-34
$t_{1-\alpha,df}$ =	1.860
s_x =	57
n_s =	9
μ_α =	2

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: [signature] Date: 1/1/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823
Probe: 44-9 Serial #: 11150

Efficiency: 21.87%
MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
408	273	273	-1768	1468	2663
409	119	119	-6462	1267	2663
410	104	104	-6920	1246	2663
415	119	119	-6462	1267	2663
417	402	402	2164	1618	2663
418	317	317	-427	1521	2663
419	403	403	2195	1619	2663
420	320	320	-335	1524	2663
421	376	376	1372	1589	2663

Individual Completing Form: Pat [illegible] Date: 12/31/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Second Floor- Area East of Control Room	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2663	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-16643	
n_s =	9	
x_{avg} =	-1849	
Maximum value in population =	2195	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-1849
n_s =	9
$\Sigma(x_{avg} - x_i)^2$ =	115428366
s_x =	3798

Calculation Sheet

Survey Unit: Second Floor- Area East of Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-1849
$t_{1-\alpha,df}$ =	1.860
s_x =	3798
n_s =	9
μ_α =	506

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Peter Fagan Date: 12/31/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

Efficiency: 28.35%
MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
408	0	13
409	0	13
410	0	13
415	3	13
417	0	13
418	0	13
419	0	13
420	3	13
421	0	13

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: Gerard M Tourny Date: 1/15/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

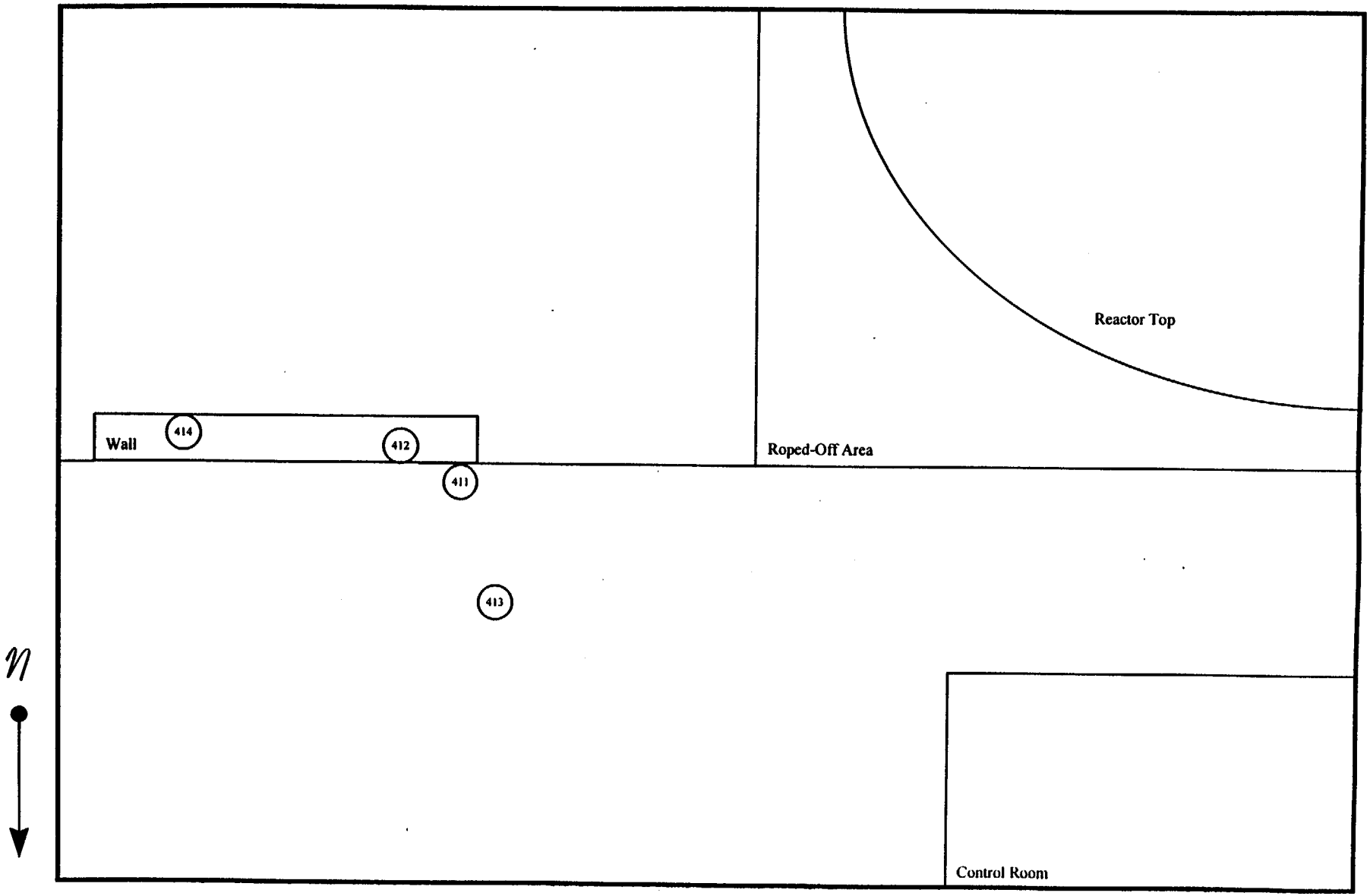
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
408	10	17
409	10	17
410	0	17
415	5	17
417	5	17
418	1	17
419	1	17
420	0	17
421	1	17

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/1/98

Second Floor- Area East of Reactor Top

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Area East of Reactor Top

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/29/97

Reviewed By: Gerard M Courney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Reactor Top
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7.70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
411	2	2	-66	114	289
412	3	3	-44	122	289
413	2	2	-66	114	289
414	3	3	-44	122	289

Individual Completing Form: Patrick Lopez Date: 12/29/97

Reviewed By: [illegible] Date: 1/1 98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Second Floor- Area East of Reactor Top	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-220	
n_s =	4	
x_{avg} =	-55	
Maximum value in population =	-44	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-55
n_s =	4
$\Sigma(x_{avg} - x_i)^2$ =	484
s_x =	13

Calculation Sheet

Survey Unit: Second Floor- Area East of Reactor Top

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-55
$t_{1-\alpha,df}$ =	2.353
s_x =	13
n_s =	4
μ_α =	-40

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/29/97

Reviewed by: [signature] Date: 1/11/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Reactor Top
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
411	315	315	-488	1519	2663
412	140	140	-5822	1297	2663
413	287	287	-1341	1485	2663
414	124	124	-6310	1274	2663

Individual Completing Form: Peter Lopez Date: 12/29/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Second Floor- Area East of Reactor Top	
Date	10/9/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2663	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-13961	
n_s =	4	
x_{avg} =	-3490	
Maximum value in population =	-488	(dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-3490
n_s =	4
$\Sigma(x_{avg} - x_i)^2$ =	27020829
s_x =	3001

Calculation Sheet

Survey Unit: Second Floor- Area East of Reactor Top

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-3490
$t_{1-\alpha,df}$ =	2.353
s_x =	3001
n_s =	4
μ_α =	41

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: [signature] Date: 1/16/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Reactor Top
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Probe: N/A

Serial #: 13795
Serial #: N/A

Efficiency: 28.35%
MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
411	0	13
412	0	13
413	0	13
414	0	13

Individual Completing Form: Patrick Lyle
Date: 12/29/97

Reviewed By: [illegible]
Date: [illegible]

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Area East of Reactor Top
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

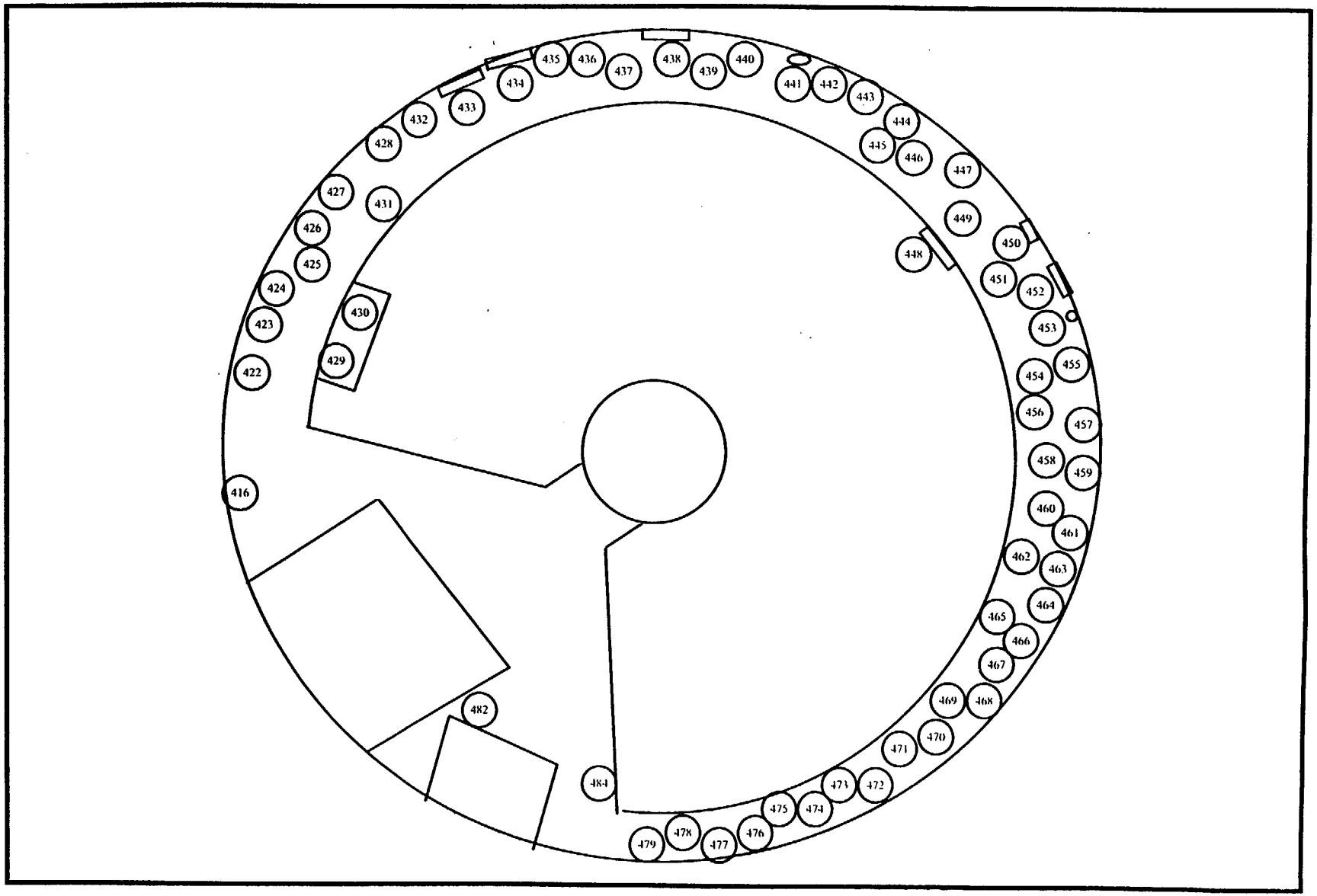
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
411	0	17
412	0	17
413	3	17
414	14	17

Individual Completing Form: _____ Date: 12/29/97
Reviewed By: _____ Date: 1/1/98

Second Floor- Catwalk

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

N

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\ (a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Catwalk

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	18:28
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	18:28
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: Daphne Fox Date: 12/30/97

Reviewed By: Gerard M. Barney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Catwalk
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062
Probe: AC-3 Serial #: 408951

Efficiency: 7 70%
MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
416	2	2	-66	114	289
422	8	8	66	156	289
423	7	7	44	149	289
424	2	2	-66	114	289
425	0	0	-110	96	289
426	3	3	-44	122	289
427	7	7	44	149	289
428	2	2	-66	114	289
429	2	2	-66	114	289
430	9	9	88	161	289
431	3	3	-44	122	289
432	10	10	110	167	289
433	8	8	66	156	289
434	4	4	-22	129	289
435	15	15	220	193	289
436	2	2	-66	114	289
437	5	5	0	136	289
438	8	8	66	156	289
439	3	3	-44	122	289
440	8	8	66	156	289
441	6	6	22	143	289
442	4	4	-22	129	289
443	4	4	-22	129	289
444	2	2	-66	114	289
445	3	3	-44	122	289
446	4	4	-22	129	289
447	10	10	110	167	289
448	10	10	110	167	289
449	3	3	-44	122	289
450	6	6	22	143	289
451	2	2	-66	114	289
452	2	2	-66	114	289
453	2	2	-66	114	289
454	3	3	-44	122	289
455	3	3	-44	122	289
456	3	3	-44	122	289
457	10	10	110	167	289
458	3	3	-44	122	289
459	0	0	-110	96	289
460	4	4	-22	129	289
461	4	4	-22	129	289
462	3	3	-44	122	289
463	2	2	-66	114	289
464	0	0	-110	96	289
465	1	1	-88	106	289
466	1	1	-88	106	289
467	0	0	-110	96	289
468	4	4	-22	129	289
469	0	0	-110	96	289
470	6	6	22	143	289
471	1	1	-88	106	289
472	2	2	-66	114	289
473	8	8	66	156	289
474	2	2	-66	114	289
475	6	6	22	143	289
476	2	2	-66	114	289
477	3	3	-44	122	289
478	4	4	-22	129	289
479	5	5	0	136	289
482	2	2	-66	114	289
484	0	0	-110	96	289

Individual Completing Form: [signature] Date: 12/30/97

Reviewed By: [signature] Date: 1/12/98

Calculation Sheet

SURVEY TYPE:	1
Survey Unit	Second Floor- Catwalk
Date	10/9/97
Meter	L2221
Serial #	50062
Probe	AC-3
Serial #	408951
MDA	289
Survey Type	Direct Alpha
Guideline Value	100 (dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-1254
n_s =	61
x_{avg} =	-21
Maximum value in population =	220 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-21
n_s =	61
$\Sigma(x_{avg} - x_i)^2$ =	288349
s_x =	69

Calculation Sheet

Survey Unit: Second Floor- Catwalk
Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-21
$t_{1-\alpha,df}$ =	1.671
s_x =	69
n_s =	61
μ_α =	-6

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Pat [signature] Date: 12/30/97

Reviewed by: [signature] Date: 1/13/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Catwalk
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm²)	Uncertainty (95% Confidence Level) (dpm/100 cm²)	MDA (dpm/100 cm²)
416	97	97	-7133	1236	2663
422	338	338	213	1545	2663
423	464	464	4054	1685	2663
424	419	419	2683	1636	2663
425	423	423	2804	1641	2663
426	520	520	5761	1743	2663
427	543	543	6482	1766	2663
428	498	498	5091	1720	2663
429	434	434	3140	1653	2663
430	493	493	4938	1715	2663
431	473	473	4329	1694	2663
432	483	483	4633	1705	2663
433	465	465	4085	1686	2663
434	410	410	2408	1626	2663
435	521	521	5792	1744	2663
436	479	479	4512	1700	2663
437	382	382	1555	1595	2663
438	419	419	2683	1636	2663
439	493	493	4938	1715	2663
440	477	477	4451	1698	2663
441	180	180	-4603	1351	2663
442	221	221	-3353	1404	2663
443	143	143	-5731	1301	2663
444	172	172	-4847	1340	2663
445	148	148	-5578	1308	2663
446	189	189	-4329	1362	2663
447	93	93	-7255	1230	2663
448	82	82	-7590	1214	2663
449	100	100	-7042	1240	2663
450	87	87	-7438	1222	2663
451	111	111	-6706	1256	2663
452	73	73	-7865	1201	2663
453	118	118	-6493	1266	2663
454	118	118	-6493	1266	2663
455	92	92	-7285	1229	2663
456	142	142	-5761	1299	2663
457	99	99	-7072	1239	2663
458	105	105	-6889	1248	2663
459	81	81	-7621	1213	2663
460	74	74	-7834	1202	2663
461	93	93	-7255	1230	2663
462	115	115	-6584	1262	2663
463	112	112	-6676	1258	2663
464	106	106	-6859	1249	2663
465	94	94	-7225	1232	2663
466	75	75	-7804	1204	2663
467	83	83	-7560	1216	2663
468	192	192	-4237	1366	2663
469	156	156	-5335	1319	2663
470	177	177	-4694	1347	2663
471	240	240	-2774	1428	2663
472	191	191	-4268	1365	2663
473	190	190	-4298	1364	2663
474	175	175	-4755	1344	2663
475	213	213	-3597	1394	2663
476	98	98	-7103	1237	2663
477	170	170	-4908	1337	2663
478	289	289	-1280	1488	2663
479	144	144	-5700	1302	2663
482	233	233	-2987	1419	2663
484	164	164	-5091	1329	2663

Individual Completing Form: [signature] Date: 12/30/97
Reviewed By: [signature] Date: 1/1-/98

Calculation Sheet

SURVEY TYPE: 2

Survey Unit	Second Floor- Catwalk
Date	10/9/97
Meter	L2220
Serial #	52823
Probe	44-9
Serial #	11150
MDA	2663
Survey Type	Direct Beta/Gamma
Guideline Value	5000 (dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-171376
n_s =	61
x_{avg} =	-2809
Maximum value in population =	6462 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-2809
n_s =	61
$\Sigma(x_{avg} - x_i)^2$ =	1404320451
s_x =	4838

Calculation Sheet

Survey Unit: Second Floor- Catwalk
Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-2809
$t_{1-\alpha,df}$ =	1.671
s_x =	4838
n_s =	61
μ_α =	-1774

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: Peter [illegible] Date: 12/30/97
Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Catwalk
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
416	0	13
422	0	13
423	0	13
424	0	13
425	0	13
426	0	13
427	0	13
428	0	13
429	0	13
430	0	13
431	0	13
432	7	13
433	0	13
434	0	13
435	0	13
436	0	13
437	0	13
438	0	13
439	0	13
440	0	13
441	0	13
442	0	13
443	0	13
444	0	13
445	0	13
446	0	13
447	0	13
448	0	13
449	0	13
450	3	13
451	3	13
452	0	13
453	0	13
454	3	13
455	7	13
456	0	13
457	0	13
458	0	13
459	0	13
460	0	13
461	0	13
462	0	13
463	0	13
464	0	13
465	0	13
466	0	13
467	0	13
468	0	13
469	0	13
470	0	13
471	0	13
472	0	13
473	0	13
474	0	13
475	3	13
476	0	13
477	0	13
478	0	13
479	0	13
482	0	13
484	0	13

Individual Completing Form: Pat [signature] — Date: 12/30/97
Reviewed By: [signature] — Date: 1/12/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Catwalk
Date: 10/9/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

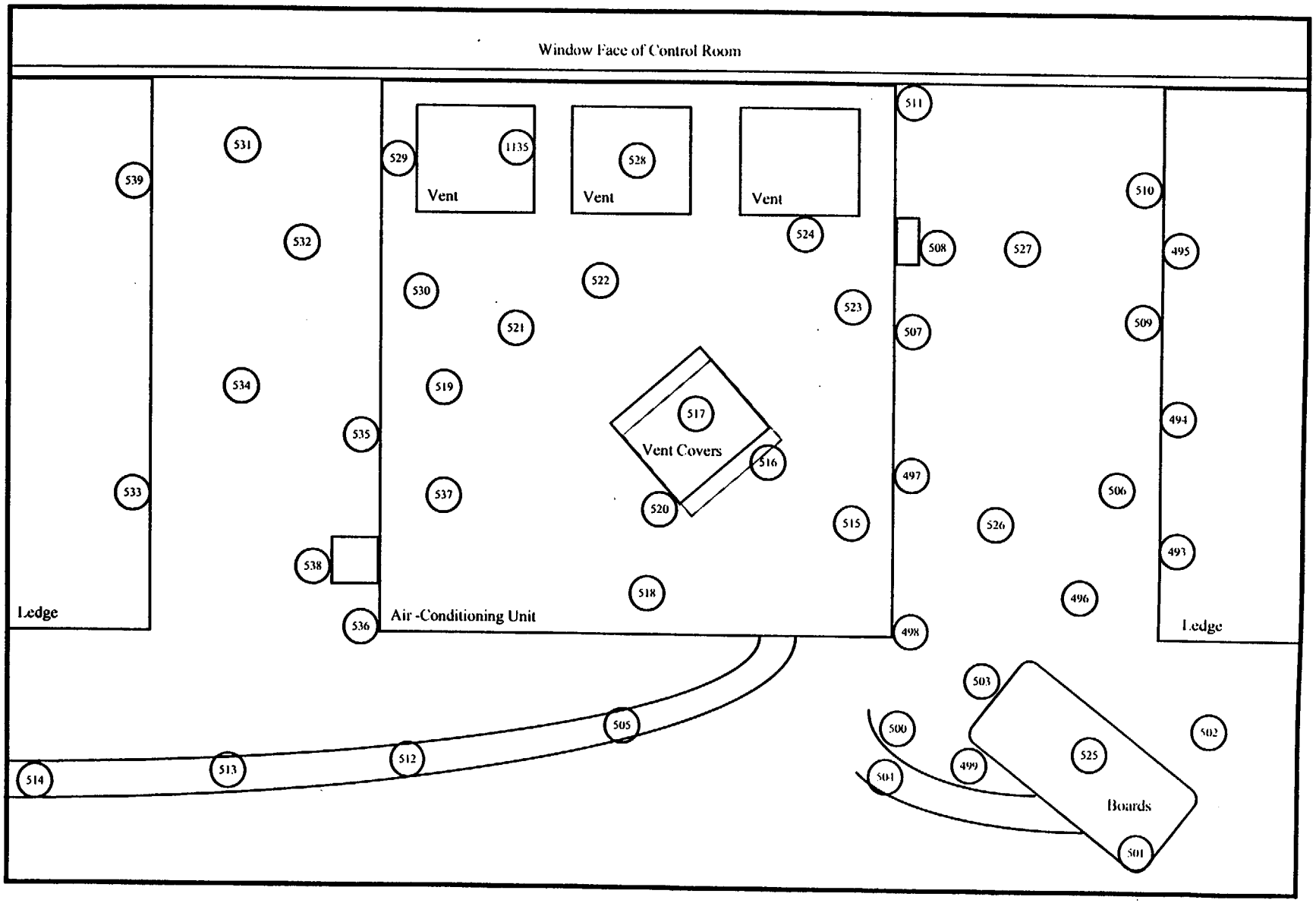
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
416	7	17
422	1	17
423	3	17
424	0	17
425	1	17
426	3	17
427	1	17
428	7	17
429	0	17
430	0	17
431	0	17
432	3	17
433	1	17
434	10	17
435	5	17
436	7	17
437	0	17
438	10	17
439	12	17
440	10	17
441	7	17
442	0	17
443	1	17
444	5	17
445	1	17
446	1	17
447	10	17
448	0	17
449	0	17
450	1	17
451	10	17
452	1	17
453	3	17
454	21	17
455	5	17
456	3	17
457	10	17
458	5	17
459	3	17
460	16	17
461	19	17
462	5	17
463	5	17
464	3	17
465	3	17
466	1	17
467	1	17
468	10	17
469	0	17
470	3	17
471	0	17
472	0	17
473	1	17
474	7	17
475	1	17
476	14	17
477	5	17
478	1	17
479	1	17
482	3	17
484	3	17

Individual Completing Form: Pat [signature] Date: 12/30/97
Reviewed By: [signature] Date: 1/12/98

Second Floor- Air-Conditioning Unit on Top of Control Room

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Air-Conditioning Unit on Top of Control Room

SURVEY TYPE:	1	(direct alpha)
METER:	L2221	
SERIAL #:	50062	
PROBE #:	AC-3	
SERIAL #:	408951	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	7:20
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	7:20
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/23/97

Reviewed By: Gerard M Tourney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: *
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Air-Conditioning Unit on Top of Control Room
Date: 10 9/97

Notes
1) Place total counts directly from meter Activity column will correct for background
2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA 289

NT= None Taken

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
493	3	3	-44	122	289
494	4	4	-22	129	289
495	7	7	44	149	289
496	3	3	-44	122	289
497	2	2	-66	114	289
498	0	0	-110	96	289
499	4	4	-22	129	289
500	2	2	-66	114	289
501	4	4	-22	129	289
502	4	4	-22	129	289
503	3	3	-44	122	289
504	2	2	-66	114	289
505	7	7	44	149	289
506	34	34	638	269	289
507	4	4	-22	129	289
508	0	0	-110	96	289
509	4	4	-22	129	289
510	22	22	374	224	289
511	10	10	110	167	289
512	5	5	0	136	289
513	9	9	88	161	289
514	3	3	-44	122	289
515	5	5	0	136	289
516	5	5	0	136	289
517	6	6	22	143	289
518	4	4	-22	129	289
519	5	5	0	136	289
520	3	3	-44	122	289
521	0	0	-110	96	289
522	0	0	-110	96	289
523	3	3	-44	122	289
524	11	11	132	173	289
525	5	5	0	136	289
526	4	4	-22	129	289
527	8	8	66	156	289
528	1	1	-88	106	289
529	7	7	44	149	289
530	9	9	88	161	289
531	6	6	22	143	289
532	5	5	0	136	289
533	3	3	-44	122	289
534	5	5	0	136	289
535	6	6	22	143	289
536	4	4	-22	129	289
537	6	6	22	143	289
538	3	3	-44	122	289
539	4	4	-22	129	289
1135	NT				

Individual Completing Form: Gate [illegible] Date: 12/23/97

Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	Second Floor- Air-Conditioning Unit on Top of Control Room	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	418
n_s =	47
x_{avg} =	9
Maximum value in population =	638 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	9
n_s =	47
$\Sigma(x_{avg} - x_i)^2$ =	689855
s_x =	122

Calculation Sheet

Survey Unit: Second Floor- Air-Conditioning Unit on Top of Control Room

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	9
$t_{1-\alpha,df}$ =	1.684
s_x =	122
n_s =	47
μ_α =	39

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/23/97

Reviewed by: [signature] Date: 1/15/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit Location: Second Floor- Air-Conditioning Unit on Top of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA screadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2663

NT= None Taken

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
493	217	217	-3475	1399	2663
494	168	168	-4969	1335	2663
495	144	144	-5700	1302	2663
496	135	135	-5975	1290	2663
497	126	126	-6249	1277	2663
498	143	143	-5731	1301	2663
499	127	127	-6219	1279	2663
500	206	206	-3810	1385	2663
501	156	156	-5335	1319	2663
502	152	152	-5456	1313	2663
503	168	168	-4969	1335	2663
504	138	138	-5883	1294	2663
505	158	158	-5274	1321	2663
506	140	140	-5822	1297	2663
507	167	167	-4999	1333	2663
508	108	108	-6798	1252	2663
509	117	117	-6523	1265	2663
510	231	231	-3048	1416	2663
511	229	229	-3109	1414	2663
512	152	152	-5456	1313	2663
513	132	132	-6066	1286	2663
514	117	117	-6523	1265	2663
515	212	212	-3627	1392	2663
516	190	190	-4298	1364	2663
517	155	155	-5365	1317	2663
518	217	217	-3475	1399	2663
519	169	169	-4938	1336	2663
520	135	135	-5975	1290	2663
521	206	206	-3810	1385	2663
522	182	182	-4542	1353	2663
523	192	192	-4237	1366	2663
524	289	289	-1280	1488	2663
525	138	138	-5883	1294	2663
526	162	162	-5152	1327	2663
527	193	193	-4207	1368	2663
528	161	161	-5182	1325	2663
529	175	175	-4755	1344	2663
530	126	126	-6249	1277	2663
531	188	188	-4359	1361	2663
532	208	208	-3749	1387	2663
533	263	263	-2073	1456	2663
534	116	116	-6554	1263	2663
535	284	284	-1433	1482	2663
536	154	154	-5396	1316	2663
537	167	167	-4999	1333	2663
538	201	201	-3963	1378	2663
539	117	117	-6523	1265	2663
1135	NT				

Individual Completing Form: Pat [illegible] Date: 12/23/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE: 2

Survey Unit	Second Floor- Air-Conditioning Unit on Top of Control Room
Date	10/9/97
Meter	L2220
Serial #	52823
Probe	44-9
Serial #	11150
MDA	2663
Survey Type	Direct Beta/Gamma
Guideline Value	5000 (dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-229413
n_s =	47
x_{avg} =	-4881
Maximum value in population =	-1280 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-4881
n_s =	47
$\Sigma(x_{avg} - x_i)^2$ =	80709214
s_x =	1325

Calculation Sheet

Survey Unit: Second Floor- Air-Conditioning Unit on Top of Control Room

Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-4881
$t_{1-\alpha,df}$ =	1.684
s_x =	1325
n_s =	47
μ_α =	-4556

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/23/97

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor, Air-Conditioning unit on Top of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
493	0	13
494	0	13
495	0	13
496	0	13
497	0	13
498	0	13
499	0	13
500	3	13
501	0	13
502	0	13
503	0	13
504	0	13
505	0	13
506	0	13
507	0	13
508	0	13
509	3	13
510	0	13
511	3	13
512	0	13
513	0	13
514	0	13
515	0	13
516	0	13
517	3	13
518	0	13
519	0	13
520	0	13
521	0	13
522	0	13
523	0	13
524	0	13
525	0	13
526	0	13
527	0	13
528	0	13
529	0	13
530	0	13
531	0	13
532	3	13
533	3	13
534	0	13
535	0	13
536	0	13
537	0	13
538	0	13
539	0	13
1135	0	13

Individual Completing Form: Peter [illegible] — Date: 12/23/97
Reviewed By: Gerard M. [illegible] — Date: 1/16/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Air-Conditioning Unit on Top of Control Room
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

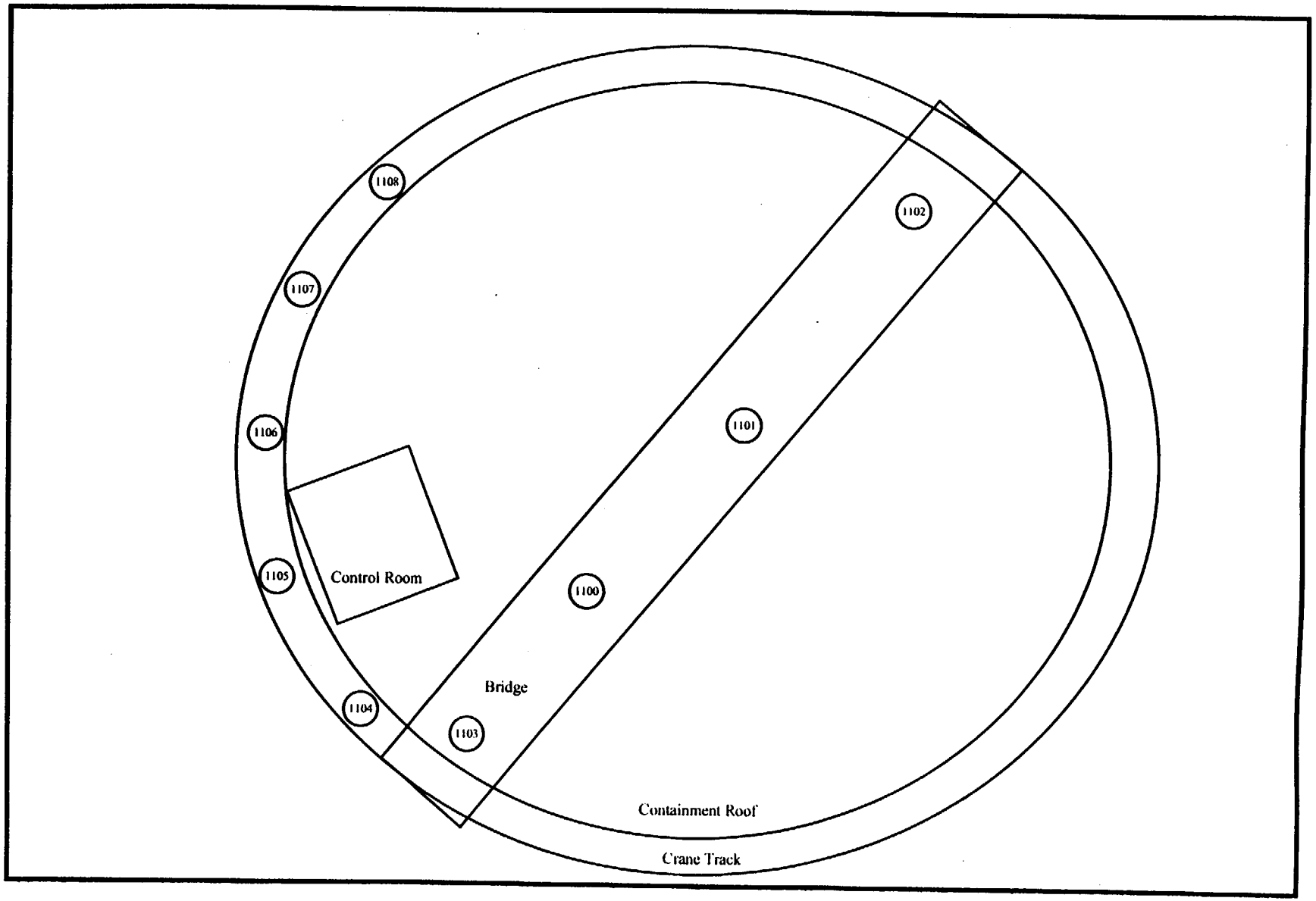
Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
493	3	17
494	1	17
495	0	17
496	1	17
497	10	17
498	5	17
499	0	17
500	0	17
501	7	17
502	0	17
503	10	17
504	0	17
505	5	17
506	7	17
507	0	17
508	1	17
509	0	17
510	1	17
511	5	17
512	1	17
513	5	17
514	5	17
515	0	17
516	3	17
517	0	17
518	3	17
519	0	17
520	3	17
521	1	17
522	1	17
523	0	17
524	0	17
525	3	17
526	0	17
527	5	17
528	0	17
529	1	17
530	5	17
531	7	17
532	0	17
533	3	17
534	3	17
535	1	17
536	1	17
537	1	17
538	5	17
539	1	17
1135	0	17

Individual Completing Form: Pete [illegible] Date: 12/23/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Top of Crane Bridge

Roof
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Top of Crane Bridge

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/15/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/15/97
Time background was taken =	8:00
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 12/31/97

Reviewed By: [signature] Date: 1/12/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Top of Crane Bridge
Date: 10/15/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W
Serial #: 13795
Efficiency: 28.35%
Probe: N/A
Serial #: N/A
MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1100	0	13
1101	0	13
1102	3	13
1103	3	13
1104	3	13
1105	0	13
1106	0	13
1107	0	13
1108	0	13

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: Gerald M Tourney Date: 1/15/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Top of Crane Bridge
Date: 10/15/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

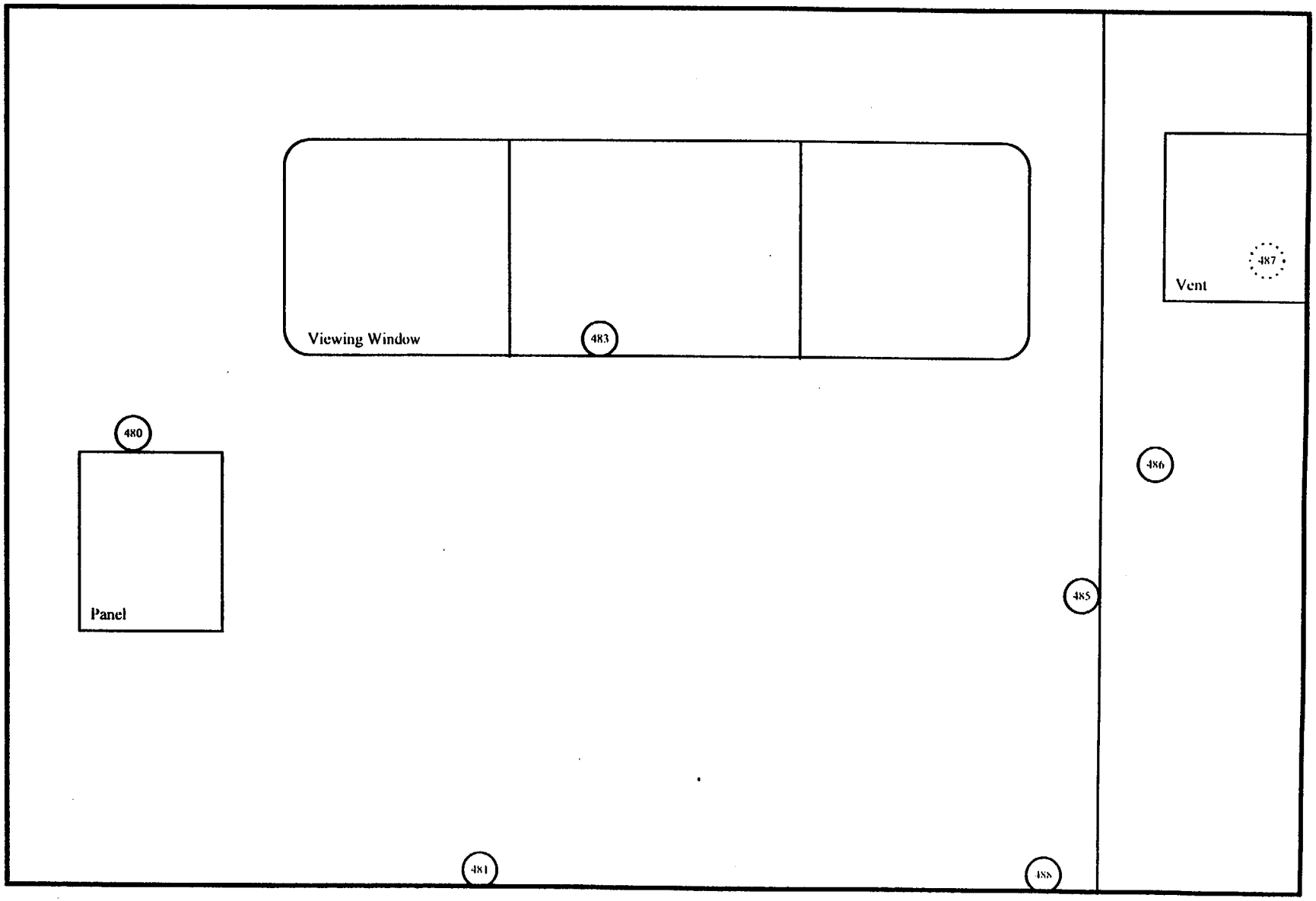
Instrument
Model: LB 5100 W
Serial #: 13795
Efficiency: 43.45%
Probe: N/A
Serial #: N/A
MDA: 17

Survey Point	Activity (dpm/100 cm²)	MDA (dpm/100 cm²)
1100	26	17
1101	16	17
1102	16	17
1103	19	17
1104	1	17
1105	7	17
1106	3	17
1107	7	17
1108	3	17

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: Gerard M Tourney Date: 1/15/98

Second Floor- Northeast Wall of Containment

Elevation View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Northeast Wall of Containment

SURVEY TYPE:	1 (direct alpha)
METER:	L2221
SERIAL #:	50062
PROBE #:	AC-3
SERIAL #:	408951
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	7.70%
a = Probe Area (cm) =	59
MDA (dpm/100 cm^2) =	289

SURVEY TYPE:	2 (direct beta/gamma)
METER:	L2220
SERIAL #:	52823
PROBE #:	44-9
SERIAL #:	11150
GUIDELINE VALUE:	5000 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	331
Date background was taken =	10/9/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	331
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm^2) =	2663

SURVEY TYPE:	3 (removable alpha)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	20 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/9/97
Time background was taken =	19:34
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13

SURVEY TYPE:	4 (removable beta/gamma)
METER:	LB 5100 W
SERIAL #:	13795
PROBE #:	N/A
SERIAL #:	N/A
GUIDELINE VALUE:	100 (dpm/100 cm^2)
Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/9/97
Time background was taken =	19:34
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 1/5/98

Reviewed By: Gerard M. Tourney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Northeast Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2221 Serial #: 50062 Efficiency: 7.70%
Probe: AC-3 Serial #: 408951 MDA: 289

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
480	3	3	-44	122	289
481	3	3	-44	122	289
483	3	3	-44	122	289
485	3	3	-44	122	289
486	2	2	-66	114	289
487	4	4	-22	129	289
488	2	2	-66	114	289

Individual Completing Form: Nate [illegible] Date: 1/5/98
Reviewed By: Gerard M Tourney Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	1	Input one of the following
Survey Unit	Second Floor- Northeast Wall of Containment	
Date	10/9/97	
Meter	L2221	
Serial #	50062	
Probe	AC-3	
Serial #	408951	
MDA	289	
Survey Type	Direct Alpha	
Guideline Value	100 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-330
n_s =	7
x_{avg} =	-47
Maximum value in population =	-22 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-47
n_s =	7
$\Sigma(x_{avg} - x_i)^2$ =	1383
s_x =	15

Calculation Sheet

Survey Unit: Second Floor- Northeast Wall of Containment

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-47
$t_{1-\alpha,df}$ =	1.943
s_x =	15
n_s =	7
μ_α =	-36

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 1/15/98

Reviewed by: Gerard M Tourney Date: 1/15/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Northeast Wall of Containment
Date: 10/9/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2663

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
480	127	127	-6219	1279	2663
481	189	189	-4329	1362	2663
483	141	141	-5792	1298	2663
485	241	241	-2743	1429	2663
486	177	177	-4694	1347	2663
487	155	155	-5365	1317	2663
488	148	148	-5578	1308	2663

Individual Completing Form: Nate [signature] Date: 1/5/98
Reviewed By: Gerard M Toomey Date: 1/15/98

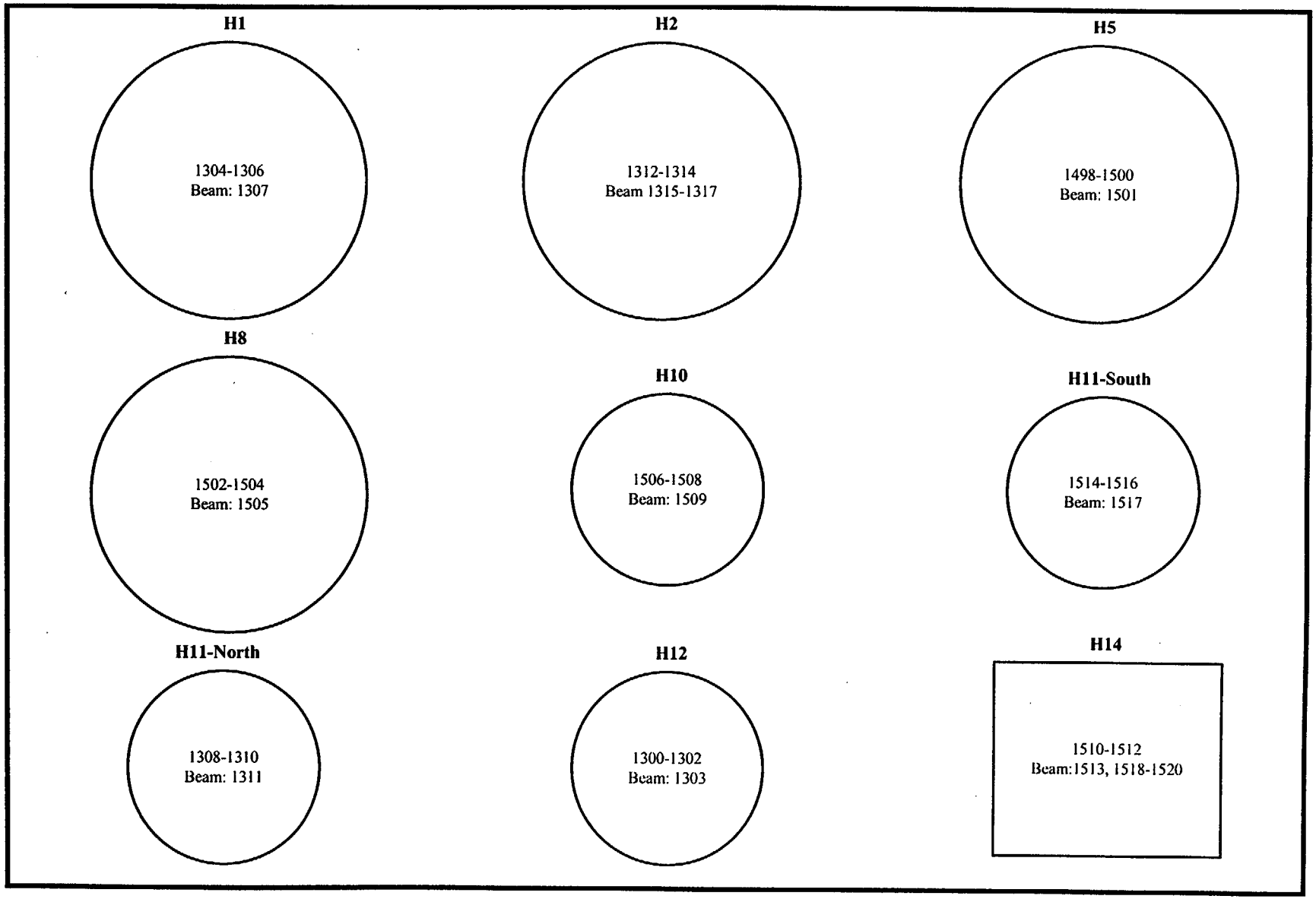
Reactor Block Survey Data Summary

Survey Location	No. of Survey Points	Range of Activity (dpm/100 cm^2) Direct Alpha	MDA	Beta-Gamma	MDA	Removable Alpha	MDA	Beta-Gamma	MDA
Horizontal Beam Ports	41	None Taken	-	None Taken	-	0 to 3429	13	1 to 10614	17
Miscellaneous Eqpmt-Reactor Top	30	-44 to 26	116	-8169 to 28410	2628	0 to 70	13	0 to 461	17
Storage Holes on Reactor Top	15	-47 to 28	123	-5417 to 116766	1805	0 to 46	13	0 to 456	17
Vertical Beam Ports	43	None Taken	-	None Taken	-	0 to 765	13	0 to 17675	17

Shading represent areas where activities are above acceptable limits in
U.S. Nuclear Regulatory Guide 1.86, "Termination for Operating License for Nuclear Reactors," June 1974.

First Floor- Horizontal Beam Ports

Elevation View
Not Drawn To Scale



Survey Locations are Shown Within the Beam

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): First Floor - Horizontal Beam Ports

SURVEY TYPE:	3	(removable alpha)	SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W		METER:	LB 5100 W	
SERIAL #:	13795		SERIAL #:	13795	
PROBE #:	N/A		PROBE #:	N/A	
SERIAL #:	N/A		SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)	GUIDELINE VALUE:	100	(dpm/100 cm^2)

Ts = Sample Time (min) =	1	Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10	Tb = Background Time (min) =	10
Background counts in Tb =	0.7	Background counts in Tb =	18.3
Date background was taken =	10/23/97	Date background was taken =	10/23/97
Time background was taken =	17:18	Time background was taken =	17:18
Rb = Background rate (cpm) =	0.07	Rb = Background rate (cpm) =	2
e = Probe Efficiency =	28.35%	e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100	a = Probe Area (cm) =	100
MDA (dpm/100 cm^2) =	13	MDA (dpm/100 cm^2) =	17

Individual Completing Form: [signature] Date: 1/16/98

Reviewed By: [signature] Date: 1/19/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor - Horizontal Beam Ports
Date: 10/23/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1300	84	13
1301	42	13
1302	359	13
1303	32	13
1304	24	13
1305	39	13
1306	0	13
1307	0	13
1308	32	13
1309	88	13
1310	21	13
1311	3	13
1312	7	13
1313	7	13
1314	42	13
1315	10	13
1316	0	13
1317	0	13
1498	3	13
1499	49	13
1500	32	13
1501	0	13
1502	17	13
1503	7	13
1504	109	13
1505	21	13
1506	0	13
1507	0	13
1508	7	13
1509	0	13
1510	0	13
1511	3	13
1512	0	13
1513	10	13
1514	46	13
1515	84	13
1516	3429	13
1517	592	13
1518	3	13
1519	3	13
1520	10	13

Individual Completing Form: [signature] Date: 1/9/98
Reviewed By: [signature] Date: 1/19/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): First Floor - Horizontal Beam Ports
Date: 10/23/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 43.45%
Probe: N/A Serial #: N/A MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1300	2631	17
1301	534	17
1302	9777	17
1303	428	17
1304	705	17
1305	1664	17
1306	1	17
1307	3	17
1308	599	17
1309	1927	17
1310	486	17
1311	53	17
1312	109	17
1313	106	17
1314	456	17
1315	304	17
1316	37	17
1317	5	17
1498	63	17
1499	435	17
1500	935	17
1501	19	17
1502	132	17
1503	74	17
1504	10614	17
1505	168	17
1506	10	17
1507	26	17
1508	205	17
1509	3	17
1510	26	17
1511	26	17
1512	115	17
1513	35	17
1514	1890	17
1515	2033	17
1516	3429	17
1517	592	17
1518	23	17
1519	35	17
1520	74	17

Individual Completing Form: [signature] Date: 1/19/98
Reviewed By: [signature] Date: 1/19/98

Exposure of Horizontal Beam Ports (taken at one-foot depth intervals)

H 1

	Smears
	1304
	1305
	1306
Beam Rear	1307

Distance(ft)	Exposure (mR/hr)		
Cover	0.2	5	666.2
1	7.0	6	1500.0
2	7.5	7	1300.0
3	17.1	8	4000.0
4	75.1	9	6200.0

Note: The gamma reading at the rear face of the port, before the shutter was moved, was 2.2 mR/hr.

H 2

	Smears
	1312
	1313
	1314
Beam Front	1315
Beam Middle	1316
Beam Rear	1317
	T-206
	T-207

Distance(ft)	Exposure (mR/hr)		
Cover		5	304.6
1	0.2		
2	0.3		
3	3.6		
4	38.2		

Note: A graphite block found past the shutter had an exposure rate of 368 mR/hr. After removal, the graphite cylinder had an exposure rate of 20 mR/hr. A second graphite block was also found. It had an exposure rate of 768 mR/hr. This second graphite block could not be removed.

H 5

	Smears
	1498
	1499
	1500
Beam	1501
	T-318

Distance(ft)	Exposure (mR/hr)		
On Beam	0.0	6	62.1
1	0.1		
2	0.1		
3	0.5		
4	27.3		
5	80.0		

Note: A graphite block was found past the shutter had an exposure rate of 354mR/hr.

H 8

	Smears
	1502
	1503
	1504
Beam	1505
	T-326

Distance(ft)	Exposure (mR/hr)		
On Beam	0.1	6	1400.0
1	0.9	7	1500.0
2	5.6	8	1500.0
3	6.0	9	1500.0
4	15.6	10	1400.0
5	848.7		

H 10

	Smears
	1506
	1507
	1508
Beam	1509
	T-327

Distance(ft)	Exposure (mR/hr)		
On Beam	0.1	5	11.2
1	0.1		
2	0.1		
3	0.4	Graphite block was found	
4	1.0	in shutter	

Note: The distance from outer edge of hole to shutter is 20 inches.

H 11
South End

	Smears
	1514
	1515
	1516
Beam	1517
	T-329

Distance(ft)	Exposure (mR/hr)		
On Beam	9.5	5	485.0
Cover	0.1	6	734.6
1	6.1	7	2100.0
2	8.9	8	3900.0
3	15.9	9	4500.0
4	41.0		

H 11
North End

	Smears
	1308
	1309
	1310
Beam	1311
	T-204
	T-205

Distance(ft)	Exposure (mR/hr)		
On Beam	0.1	5	610.9
1	5.5	6	2700.0
2	8.6	7	5400.0
3	21.0	8	5600.0
4	137.1	9	6100.0

H 12

	Smears
	1300
	1301
	1302
Beam	1303
	T-202
	T-203

Distance(ft)	Exposure (mR/hr)		
Beam	12.5	5	19.5
Cover	1.4	6	152.0
1	7.3	7	650.0
2	10.0	8	1600.0
3	12.7	9	6200.0
4	20.0	10	9500.0

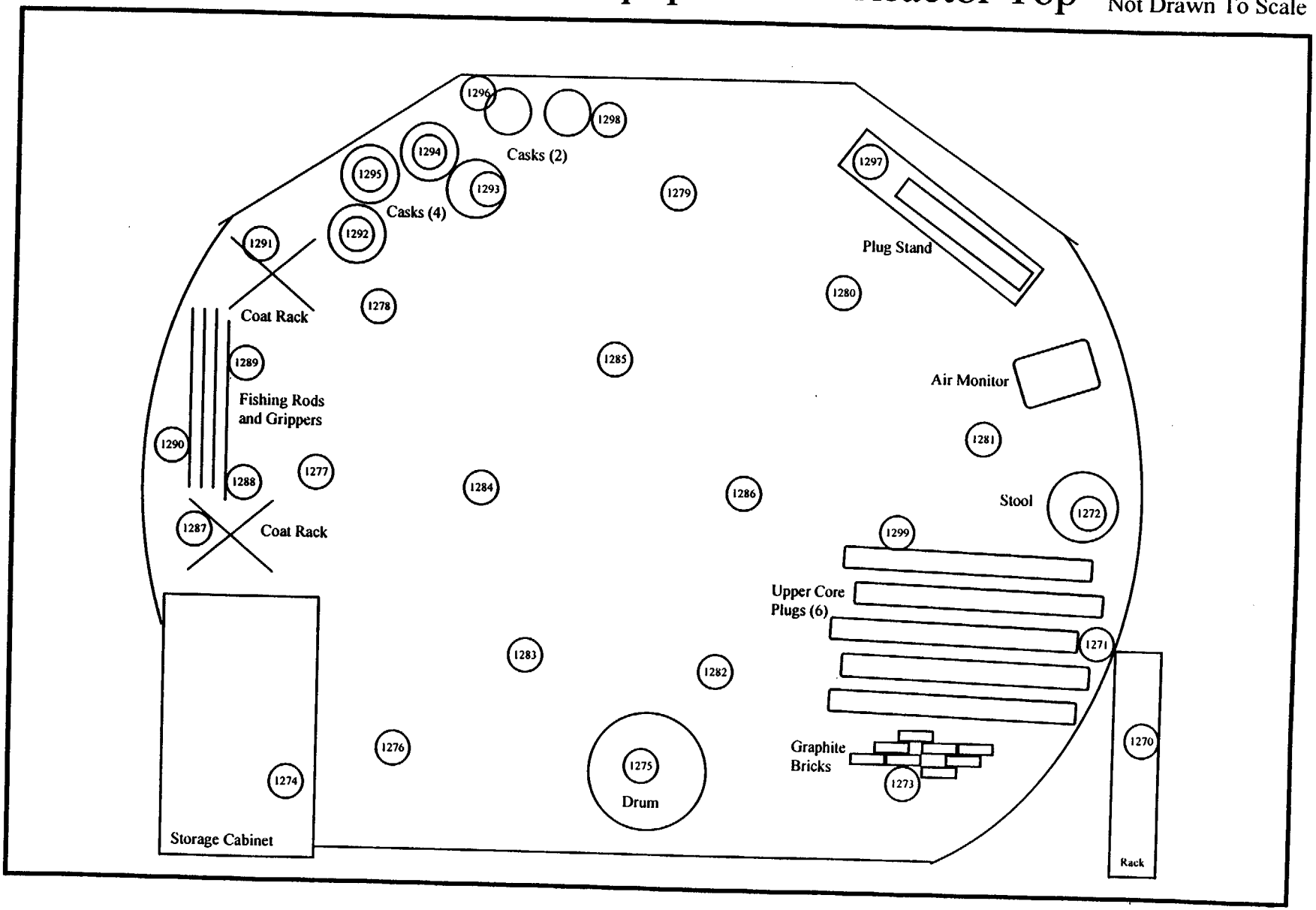
H 14

	Smears
	1510
	1511
	1512
	1521
Front of Beam	1513
Middle of Beam	1518
Crack on Beam	1519
Rear of Beam	1520

Distance(ft)	Exposure (mR/hr)		
On Beam	0.6	6	186.8
1	0.8		
2	4.3		
3	19.6		
4	20.6		
5	74.1		

Second Floor- Miscellaneous Equipment on Reactor Top

Top View
Not Drawn To Scale



Survey Location

Survey Locations
Behind Figure

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/Ts + 3.29(Rb/Tb + Rb/Ts)1/2}{e\ (a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Miscellaneous Equipment on Reactor Top

SURVEY TYPE:	1	(direct alpha)
METER:	L2220	
SERIAL #:	50061	
PROBE #:	43-65	
SERIAL #:	63291	
GUIDELINE VALUE:	100	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	5
Date background was taken =	10/22/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	5
e = Probe Efficiency =	18.00%
a = Probe Area (cm) =	63
MDA (dpm/100 cm2) =	116

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	52823	
PROBE #:	44-9	
SERIAL #:	11150	
GUIDELINE VALUE:	5000	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	1
Background counts in Tb =	322
Date background was taken =	10/22/97
Time background was taken =	7:30
Rb = Background rate (cpm) =	322
e = Probe Efficiency =	21.87%
a = Probe Area (cm) =	15
MDA (dpm/100 cm2) =	2628

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	0.7
Date background was taken =	10/22/97
Time background was taken =	15:20
Rb = Background rate (cpm) =	0.07
e = Probe Efficiency =	28.35%
a = Probe Area (cm) =	100
MDA (dpm/100 cm2) =	13

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm2)

Ts = Sample Time (min) =	1
Tb = Background Time (min) =	10
Background counts in Tb =	18.3
Date background was taken =	10/22/97
Time background was taken =	15:20
Rb = Background rate (cpm) =	2
e = Probe Efficiency =	43.45%
a = Probe Area (cm) =	100
MDA (dpm/100 cm2) =	17

Individual Completing Form: Patrick [illegible] Date: 1/5/98

Reviewed By: Gerard McInerney Date: 1/15/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Miscellaneous Equipment on Reactor Top
Date: 10/22/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 50061 Efficiency: 18.00%
Probe: 43-65 Serial #: 63291 MDA: 116

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm2)	Uncertainty (95% Confidence Level) (dpm/100 cm2)	MDA (dpm/100 cm2)
1270	0	0	-44	39	116
1271	2	2	-26	46	116
1272	5	5	0	55	116
1273	1	1	-35	42	116
1274	0	0	-44	39	116
1275	1	1	-35	42	116
1276	0	0	-44	39	116
1277	0	0	-44	39	116
1278	0	0	-44	39	116
1279	2	2	-26	46	116
1280	6	6	9	57	116
1281	4	4	-9	52	116
1282	8	8	26	62	116
1283	0	0	-44	39	116
1284	0	0	-44	39	116
1285	0	0	-44	39	116
1286	0	0	-44	39	116
1287	0	0	-44	39	116
1288	1	1	-35	42	116
1289	1	1	-35	42	116
1290	1	1	-35	42	116
1291	0	0	-44	39	116
1292	0	0	-44	39	116
1293	2	2	-26	46	116
1294	4	4	-9	52	116
1295	1	1	-35	42	116
1296	0	0	-44	39	116
1297	0	0	-44	39	116
1298	2	2	-26	46	116
1299	1	1	-35	42	116

Individual Completing Form: Date: 1/5/98

Reviewed By: Date: 1/12/98

Calculation Sheet

SURVEY TYPE: 1

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Survey Unit	Second Floor- Miscellaneous Equipment on Reactor Top
Date	10/20/97
Meter	L2220
Serial #	50061
Probe	43-65
Serial #	63291
MDA	116
Survey Type	Direct Alpha
Guideline Value	100 (dpm/100 cm2)

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

xavg 1/ns * E(xi)

Where

xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

E(xi) =	-948
ns =	30
xavg =	-32
Maximum value in population =	26 (dpm/100 cm2)

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$Sx = \frac{(E(xavg - xi)2)1/2}{(ns - 1)1/2}$$

Where

sx = standard deviation
xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

xavg =	-32
ns =	30
ΣY`Y*ε Z `xΔθ Ξ	9350
sx =	18

Calculation Sheet

Survey Unit: Second Floor- Miscellaneous Equipment on Reactor Top

Survey Type: 1

This sheet uses the following equation to determine the 95% Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df}\ [s_x/(n_s)^{1/2}]$$

Where

μα Ξ value compared to guideline value to determine 95% Confidence Level
xavg = calculated mean for a survey unit
t1-",df = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
sx = standard deviation of measurements in a survey unit
ns = number of measurements within a survey unit used to determine xavg and sx

xavg =	**-32**
t1-",df =	**1.699**
sx =	**18**
ns =	**30**
μα Ξ	**-26**

*Note: for values of t1-a ,df not on the table, the nearest greater value is used

Individual Completing Form: Nate Lopez Date: 1/5/98

Reviewed by: Date: 1/12/05

Direct Beta-Gamma Data Sheet

<<<NOTE SURVEY AND MDA DATES DO NOT MATCH!!>>>

Survey Type: 2
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Miscellaneous Equipment on Reactor Top
Date: 10/20/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 52823 Efficiency: 21.87%
Probe: 44-9 Serial #: 11150 MDA: 2628

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm2)	Uncertainty (95% Confidence Level) (dpm/100 cm2)	MDA (dpm/100 cm2)
1270	150	150	-5243	1298	2628
1271	678	678	10852	1889	2628
1272	200	200	-3719	1365	2628
1273	401	401	2408	1607	2628
1274	108	108	-6523	1239	2628
1275	755	755	13199	1961	2628
1276	450	450	3902	1660	2628
1277	440	440	3597	1649	2628
1278	1254	1254	28410	2372	2628
1279	598	598	8413	1812	2628
1280	200	200	-3719	1365	2628
1281	96	96	-6889	1222	2628
1282	78	78	-7438	1195	2628
1283	106	106	-6584	1236	2628
1284	78	78	-7438	1195	2628
1285	76	76	-7499	1192	2628
1286	74	74	-7560	1189	2628
1287	120	120	-6158	1256	2628
1288	540	540	6645	1754	2628
1289	721	721	12163	1930	2628
1290	754	754	13169	1960	2628
1291	118	118	-6219	1253	2628
1292	510	510	5731	1723	2628
1293	54	54	-8169	1159	2628
1294	524	524	6158	1738	2628
1295	620	620	9084	1834	2628
1296	687	687	11126	1898	2628
1297	410	410	2683	1616	2628
1298	320	320	-61	1514	2628
1299	297	297	-762	1486	2628

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/15/98

Calculation Sheet

SURVEY TYPE:	2	Input one of the following
Survey Unit	Second Floor- Miscellaneous Equipment on Reactor Top	
Date	10/20/97	
Meter	L2220	
Serial #	52823	
Probe	44-9	
Serial #	11150	
MDA	2628	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000 (dpm/100 cm2)	

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

xavg 1/ns * E(xi)

Where

xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

E(xi) =	**53559**	
ns =	**30**	
xavg =	**1785**	
Maximum value in population =	**28410**	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$Sx = \frac{(E(xavg - xi)2)1/2}{(ns - 1)1/2}$$

Where

sx = standard deviation
xavg = calculated mean for a survey unit
ns = number of measurements within a survey unit
xi = systematic and random measurements at point (i)
(i varies from 1 to ns)

xavg =	**1785**
ns =	**30**
ΣY`Y*ε Z `xΔθ Ξ	**2314475689**
sx =	**8934**

Calculation Sheet

Survey Unit: Second Floor- Miscellaneous Equipment on Reactor Top

Survey Type: 2

This sheet uses the following equation to determine the 95% Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

$\mu\alpha$ Ξ value compared to guideline value to determine 95% Confidence Level

xavg = calculated mean for a survey unit

t1-",df = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

sx = standard deviation of measurements in a survey unit

ns = number of measurements within a survey unit used to determine xavg and sx

xavg =	**1785**
t1-",df =	**1.699**
sx =	**8934**
ns =	**30**
$\mu\alpha$ Ξ	**4556**

*Note: for values of t1-a ,df not on the table, the nearest greater value is used

Individual Completing Form: Pat [illegible] Date: 1/5/98

Reviewed by: Gerard M Tourney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Miscellaneous Equipment on Reactor To
Date: 10/22/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm2)	MDA (dpm/100 cm2)
1270	17	13
1271	32	13
1272	24	13
1273	0	13
1274	0	13
1275	0	13
1276	0	13
1277	3	13
1278	0	13
1279	0	13
1280	0	13
1281	3	13
1282	3	13
1283	0	13
1284	0	13
1285	0	13
1286	3	13
1287	0	13
1288	3	13
1289	0	13
1290	0	13
1291	0	13
1292	0	13
1293	3	13
1294	3	13
1295	70	13
1296	0	13
1297	0	13
1298	3	13
1299	7	13

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/12/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Miscellaneous Equipment on Reactor To
Date: 10/22/97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm2)	MDA (dpm/100 cm2)
1270	143	17
1271	208	17
1272	228	17
1273	5	17
1274	14	17
1275	26	17
1276	7	17
1277	5	17
1278	5	17
1279	5	17
1280	1	17
1281	5	17
1282	5	17
1283	14	17
1284	7	17
1285	0	17
1286	23	17
1287	3	17
1288	1	17
1289	30	17
1290	14	17
1291	21	17
1292	40	17
1293	19	17
1294	14	17
1295	461	17
1296	3	17
1297	12	17
1298	12	17

Individual Completing Form: Patty [illegible] — Date: 12/23/97
Reviewed By: [illegible] — Date: 1/16/98

Exposure Measurement Data Sheet

Survey Type: 5
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Miscellaneous Equipment on Reactor Top
Date: 10/22/97

Notes:
(1) Place exposure directly into appropnate column from meter.
(2) Survey Type "5" is for 1 cm
(3) Survey Type "6" is for 1 m
(4) Enter date survey was performed

Instrument
Model: Bicron microRem
Background: 9.4 (in microR/hr)

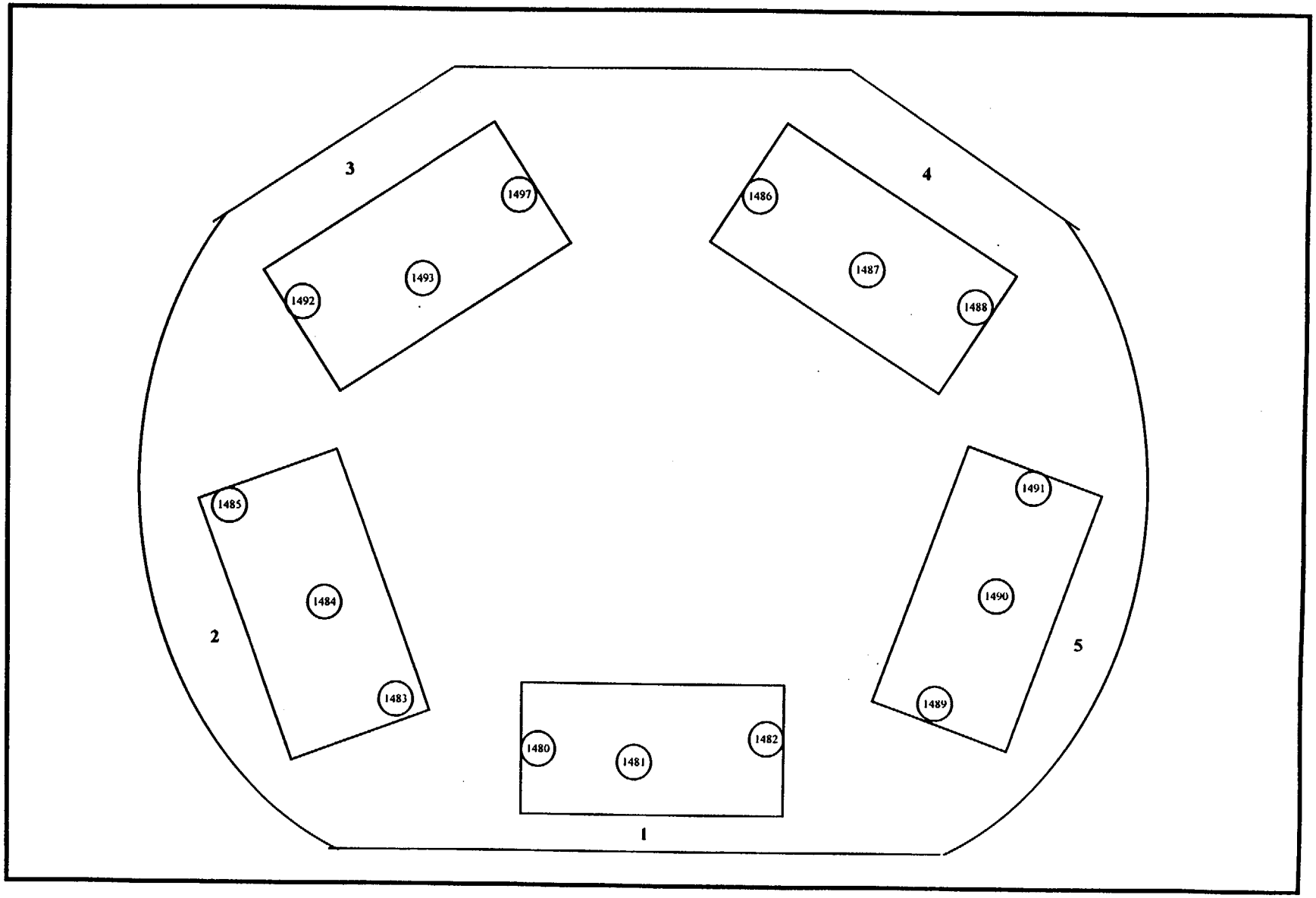
Serial #: B218L
Guideline value: 2BKG (in microR/hr)

Survey Point	Exposure Rate (microR/hour) 1 cm	1 m
1271	n/a	45
1274	n/a	40
1276	n/a	25
1277	n/a	15
1278	n/a	35
1279	n/a	100
1279	n/a	100
1280	n/a	35
1281	n/a	90
1282	n/a	30
1283	n/a	20
1284	n/a	50
1285	n/a	180
1286	n/a	50
1287	n/a	70
1299	n/a	110

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/16/98

Second Floor- Storage Holes on Reactor Top

Top View
Not Drawn To Scale



Survey Location

Survey Locations Behind Figure

Reactor Storage Area (5)

	Smears	Tritium Smears	
SA1	1480	T-313	
	1481		
	1482		
SA 2	1483	T-314	No Surrounding Walls
	1484		
	1485		
SA 3	1492	T-317	1.2 mR/hr in right corner
	1493		3.4 mR/hr in left corner
	1497		
SA 4	1486	T-315	
	1487		
	1488		
SA 5	1489	T-316	
	1490		
	1491		

Note: Dr. Ice reported a spill in Storage Area #3 in the past.

MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor- Storage Holes on Reactor Top

SURVEY TYPE:	1	(direct alpha)
METER:	L2220	
SERIAL #:	48409	
PROBE #:	43-65	
SERIAL #:	62385	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	5	
Date background was taken =	10/23/97	
Time background was taken =	7:30	
Rb = Background rate (cpm) =	5	
e = Probe Efficiency =	18.00%	
a = Probe Area (cm) =	59	
MDA (dpm/100 cm^2) =	123	

SURVEY TYPE:	2	(direct beta/gamma)
METER:	L2220	
SERIAL #:	68537	
PROBE #:	44-9	
SERIAL #:	66762	
GUIDELINE VALUE:	5000	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	1	
Background counts in Tb =	320	
Date background was taken =	10/23/97	
Time background was taken =	7:30	
Rb = Background rate (cpm) =	320	
e = Probe Efficiency =	31.75%	
a = Probe Area (cm) =	15	
MDA (dpm/100 cm^2) =	1805	

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	0.7	
Date background was taken =	10/23/97	
Time background was taken =	17:18	
Rb = Background rate (cpm) =	0.07	
e = Probe Efficiency =	28.35%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	13	

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	18.3	
Date background was taken =	10/23/97	
Time background was taken =	17:18	
Rb = Background rate (cpm) =	2	
e = Probe Efficiency =	43.45%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	17	

Individual Completing Form: [signature] Date: 12/31/97

Reviewed By: [signature] Date: 1/16/98

Direct Alpha Data Sheet

Survey Type: 1
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Storage Holes on Reactor Top
Date: 10/23/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA screadsheet

Instrument
Model: L2220 Serial #: 48409
Probe: 43-65 Serial #: 62385

Efficiency: 18.00%
MDA: 123

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1480	0	0	-47	41	123
1481	2	2	-28	49	123
1482	0	0	-47	41	123
1483	0	0	-47	41	123
1484	0	0	-47	41	123
1485	0	0	-47	41	123
1486	0	0	-47	41	123
1487	4	4	-9	55	123
1488	0	0	-47	41	123
1489	0	0	-47	41	123
1490	4	4	-9	55	123
1491	0	0	-47	41	123
1492	2	2	-28	49	123
1493	8	8	28	67	123
1497	2	2	-28	49	123

Individual Completing Form: Peter [illegible] Date: 12/23/97

Reviewed By: Gerard M Bourey Date: 1/16/98

Calculation Sheet

SURVEY TYPE:	1	
Survey Unit	Second Floor- Storage Holes on Reactor Top	
Date	10/23/97	
Meter	L2220	
Serial #	48409	
Probe	43-65	
Serial #	62385	
MDA	123	
Survey Type	Direct Alpha	
Guideline Value	100	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	-497	
n_s =	15	
x_{avg} =	-33	
Maximum value in population =	28	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	-33
n_s =	15
$\Sigma(x_{avg} - x_i)^2$ =	6712
s_x =	22

Calculation Sheet

Survey Unit: Second Floor- Storage Holes on Reactor Top

Survey Type: 1

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level

x_{avg} = calculated mean for a survey unit

$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)

s_x = standard deviation of measurements in a survey unit

n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	-33
$t_{1-\alpha,df}$ =	1.761
s_x =	22
n_s =	15
μ_α =	-23

*Note: for values of $t_{1-a,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: [signature] Date: 1/16/98

Direct Beta-Gamma Data Sheet

Survey Type: 2
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Storage Holes on Reactor Top
Date: 10-23-97

Notes
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: L2220 Serial #: 68537
Probe: 44-9 Serial #: 66762

Efficiency: 31.75%
MDA: 1805

NT= None Taken

Survey Point	Gross Total Counts	Gross Counts Per Minute	Activity (dpm/100 cm^2)	Uncertainty (95% Confidence Level) (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1480	146	146	-3654	888	1805
1481	NT				
1482	984	984	13942	1486	1805
1483	180	180	-2940	920	1805
1484	152	152	-3528	894	1805
1485	304	304	-336	1028	1805
1486	323	323	63	1044	1805
1487	378	378	1218	1087	1805
1488	74	74	-5165	817	1805
1489	122	122	-4157	865	1805
1490	66	66	-5333	809	1805
1491	62	62	-5417	804	1805
1492	3254	3254	61606	2460	1805
1493	3409	3409	64861	2513	1805
1497	5881	5881	116766	3241	1805

Individual Completing Form: Patrick [illegible] Date: 12/3/97
Reviewed By: [illegible] Date: 1/16/98

Calculation Sheet

SURVEY TYPE:	2	
Survey Unit	Second Floor- Storage Holes on Reactor Top	
Date	10/23/97	
Meter	L2220	
Serial #	68537	
Probe	44-9	
Serial #	66762	
MDA	1805	
Survey Type	Direct Beta/Gamma	
Guideline Value	5000	(dpm/100 cm2)

Input one of the following

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma
5 for exposure data at 1 cm
6 for exposure data at 1 meter

Average Measurement Level

This sheet uses the following equation to determine the Average Measurement Level for each instrument per survey unit. (NUREG/CR-5849)

$$x_{avg} = 1/n_s \cdot \Sigma(x_i)$$

Where

x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

$\Sigma(x_i)$ =	227926	
n_s =	14	
x_{avg} =	16280	
Maximum value in population =	116766	**(dpm/100 cm2)**

Standard Deviation

This sheet uses the following equation to determine the Standard Deviation. (NUREG/CR-5849)

$$S_x = \frac{(\Sigma(x_{avg} - x_i)^2)^{1/2}}{(n_s - 1)^{1/2}}$$

Where

s_x = standard deviation
x_{avg} = calculated mean for a survey unit
n_s = number of measurements within a survey unit
x_i = systematic and random measurements at point (i)
(i varies from 1 to n_s)

x_{avg} =	16280
n_s =	14
$\Sigma(x_{avg} - x_i)^2$ =	18523017258
s_x =	37747

Calculation Sheet

Survey Unit: Second Floor- Storage Holes on Reactor Top
Survey Type: 2

This sheet uses the following equation to determine the 9 Confidence Level. (NUREG/CR-5849)

$$\mu_\alpha = x_{avg} + t_{1-\alpha,df} \; [s_x/(n_s)^{1/2}]$$

Where

μ_α = value compared to guideline value to determine 95% Confidence Level
x_{avg} = calculated mean for a survey unit
$t_{1-\alpha,df}$ = 95% confidence level for n-1 degrees of freedom (see table B-1 of NUREG-5849)
s_x = standard deviation of measurements in a survey unit
n_s = number of measurements within a survey unit used to determine x_{avg} and s_x

x_{avg} =	16280
$t_{1-\alpha,df}$ =	1.771
s_x =	37747
n_s =	14
μ_α =	34146

*Note: for values of $t_{1-\alpha,df}$ not on the table, the nearest greater value is used

Individual Completing Form: [signature] Date: 12/31/97

Reviewed by: [signature] Date: 1/16/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor- Storage Holes on Reactor Top
Date: 10/23/97

Notes:
(1) Place total counts directly from meter Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W Serial #: 13795 Efficiency: 28.35%
Probe: N/A Serial #: N/A MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1480	0	13
1481	3	13
1482	0	13
1483	48	13
1484	0	13
1485	0	13
1486	0	13
1487	0	13
1488	3	13
1489	0	13
1490	0	13
1491	0	13
1492	3	13
1493	0	13
1497	0	13

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/12/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor- Storage Holes on Reactor Top
Date: 10/23/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

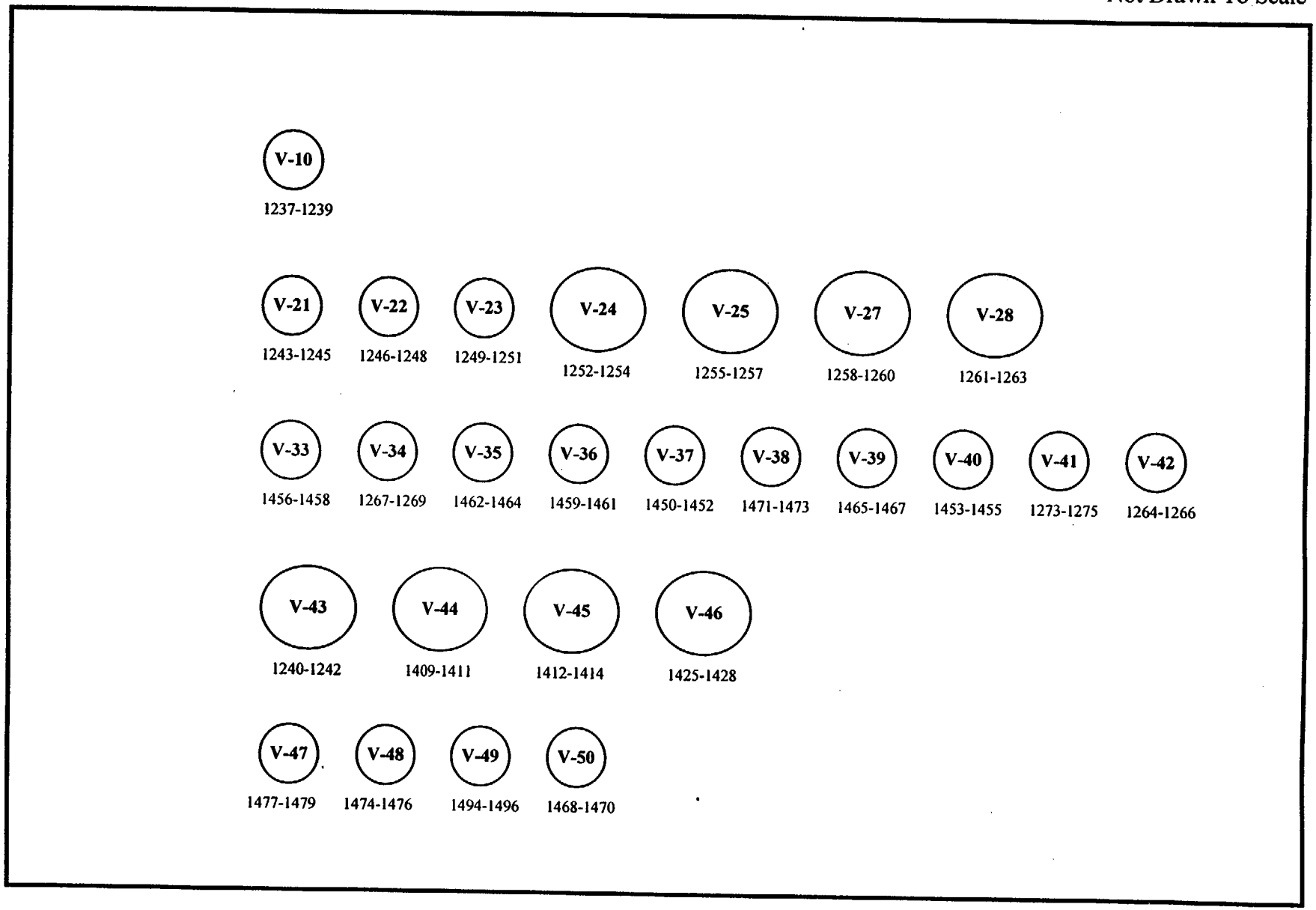
Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1480	33	17
1481	14	17
1482	28	17
1483	456	17
1484	1	17
1485	5	17
1486	1	17
1487	5	17
1488	14	17
1489	0	17
1490	5	17
1491	7	17
1492	72	17
1493	16	17
1497	3	17

Individual Completing Form: [signature] Date: 12/31/97
Reviewed By: [signature] Date: 1/12/95

Second Floor- Vertical Beam Ports

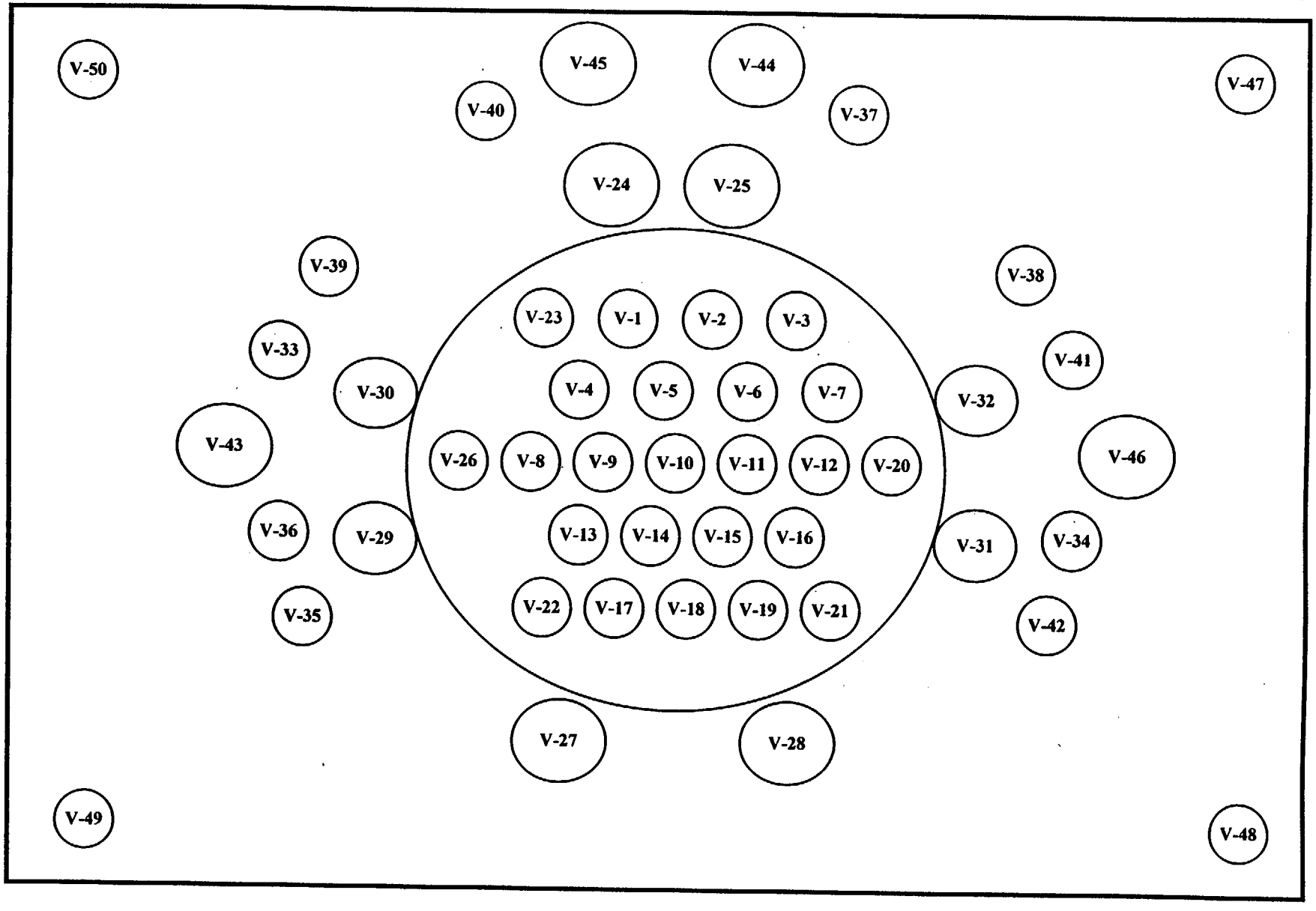
Elevation View
Not Drawn To Scale



Survey Locations are Shown Below the Beam Port

Second Floor- Vertical Beam Ports

Top View
Not Drawn To Scale



MINIMUM DETECTABLE ACTIVITY (MDA) CALCULATION SHEET

This sheet uses the following equation to determine the MDA for each instrument per survey unit (NUREG/CR-5849):

$$MDA = \frac{2.71/T_s + 3.29(R_b/T_b + R_b/T_s)^{1/2}}{e\,(a/100)}$$

Notes:

Enter all time in minutes
Enter all dates as m/d/y
Enter efficiency in decimal form (i.e., 28.3% = 0.283)
Enter probe area as 100 if not applicable (i.e., Ludlum 2929, etc.)

Survey type (by number) refers to direct or removable alpha or beta/gamma surveys. This is used to tie the various sheets together:

1 for direct alpha
2 for direct beta/gamma
3 for removable alpha
4 for removable beta/gamma

PROJECT TITLE: Georgia Tech Characterization Survey
SURVEY UNIT (Location): Second Floor - Vertical Beam Ports

SURVEY TYPE:	3	(removable alpha)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	20	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	0.7	
Date background was taken =	10/22/97	
Time background was taken =	15:16	
Rb = Background rate (cpm) =	0.07	
e = Probe Efficiency =	28.35%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	13	

SURVEY TYPE:	4	(removable beta/gamma)
METER:	LB 5100 W	
SERIAL #:	13795	
PROBE #:	N/A	
SERIAL #:	N/A	
GUIDELINE VALUE:	100	(dpm/100 cm^2)
Ts = Sample Time (min) =	1	
Tb = Background Time (min) =	10	
Background counts in Tb =	18.3	
Date background was taken =	10/22/97	
Time background was taken =	15:16	
Rb = Background rate (cpm) =	2	
e = Probe Efficiency =	43.45%	
a = Probe Area (cm) =	100	
MDA (dpm/100 cm^2) =	17	

Individual Completing Form: [signature] Date: 12/31/97

Reviewed By: Gerard M Torney Date: 1/15/98

Removable Alpha Data Sheet

Survey Type: 3
Project Title: Georgia Tech Charactenzation Survey
Survey Unit (Location): Second Floor - Vertical Beam Ports
Date: 10/22/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 28.35%
Probe: N/A — Serial #: N/A — MDA: 13

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1237	0	13
1238	0	13
1239	0	13
1240	17	13
1241	3	13
1242	10	13
1243	0	13
1244	49	13
1245	67	13
1246	3	13
1247	14	13
1248	53	13
1249	10	13
1250	0	13
1251	24	13
1252	17	13
1253	21	13
1254	0	13
1255	3	13
1256	7	13
1257	49	13
1258	7	13
1259	10	13
1260	24	13
1261	0	13
1262	349	13
1263	3	13
1264	0	13
1265	0	13
1266	10	13
1267	0	13
1268	17	13
1269	3	13
1273	0	13
1274	0	13
1275	0	13
1409	17	13
1410	3	13
1411	3	13
1412	17	13
1413	0	13
1414	7	13
1425	0	13
1426	0	13
1427	0	13
1428	0	13
1450	14	13
1451	0	13
1452	10	13
1453	24	13
1454	765	13
1455	409	13
1456	3	13
1457	7	13
1458	7	13
1459	0	13
1460	3	13
1461	7	13
1462	32	13
1463	7	13
1464	24	13
1465	0	13
1466	3	13
1467	0	13
1468	7	13
1469	7	13
1470	7	13
1471	0	13
1472	3	13
1473	14	13
1474	0	13
1475	7	13
1476	3	13
1477	0	13
1478	7	13
1479	7	13
1494	0	13
1495	0	13
1496	0	13

Individual Completing Form: [signature] — Date: 12/31/97
Reviewed By: [signature] — Date: 1/16/98

Removable Beta-Gamma Data Sheet

Survey Type: 4
Project Title: Georgia Tech Characterization Survey
Survey Unit (Location): Second Floor - Vertical Beam Ports
Date: 10/22/97

Notes:
(1) Place total counts directly from meter. Activity column will correct for background
(2) Information for instrument and background taken directly from the MDA spreadsheet

Instrument
Model: LB 5100 W — Serial #: 13795 — Efficiency: 43.45%
Probe: N/A — Serial #: N/A — MDA: 17

Survey Point	Activity (dpm/100 cm^2)	MDA (dpm/100 cm^2)
1237	3	17
1238	1	17
1239	0	17
1240	95	17
1241	56	17
1242	90	17
1243	109	17
1244	502	17
1245	873	17
1246	44	17
1247	369	17
1248	468	17
1249	99	17
1250	56	17
1251	256	17
1252	237	17
1253	115	17
1254	44	17
1255	99	17
1256	65	17
1257	555	17
1258	21	17
1259	191	17
1260	428	17
1261	19	17
1262	4631	17
1263	90	17
1264	14	17
1265	19	17
1266	46	17
1267	33	17
1268	382	17
1269	16	17
1273	5	17
1274	14	17
1275	26	17
1409	97	17
1410	497	17
1411	23	17
1412	447	17
1413	33	17
1414	166	17
1425	5	17
1426	10	17
1427	5	17
1428	5	17
1450	256	17
1451	69	17
1452	51	17
1453	244	17
1454	17675	17
1455	6058	17
1456	30	17
1457	166	17
1458	45	17
1459	35	17
1460	44	17
1461	51	17
1462	318	17
1463	72	17
1464	185	17
1465	30	17
1466	14	17
1467	49	17
1468	23	17
1469	95	17
1470	63	17
1471	23	17
1472	97	17
1473	26	17
1474	19	17
1475	86	17
1476	51	17
1477	14	17
1478	37	17
1479	111	17
1494	30	17
1495	7	17
1496	26	17

Individual Completing Form: [signature] Date: 1/5/98
Reviewed By: [signature] Date: 1/16/98

Exposure of Vertical Beam Ports (taken at one-foot depth intervals)

VP 10

Smears
1237
1238
1239

Distance(ft)	Exposure (mR/hr)		
Cover	0.3	6	23.5
1	1.4	7	51.1
2	2.5	8	461.5
3	3.7	Bottom of	
4	5.1	Lower Shield	1200.0
5	7.8		

VP21

Smears
1243
1244
1245

Distance(ft)	Exposure (mR/hr)		
Cover	<0.1	6	14.0
1	1.1	7	43.0
2	1.5	8	700.0
3	7.9	9	3400.0
4	15.4	Bottom of	
5	14.5	Lower Shield	114

VP 22

Smears
1246
1247
1248

Distance(ft)	Exposure (mR/hr)		
Cover	0.1	6	9.5
1	0.9	7	40.9
2	1.5	8	1100.0
3	2.2	9	3800.0
4	3.5	10	3300.0
5	4.8	Bottom of	
		Lower Shield	227.0

VP 23

Smears
1249
1250
1251

Distance(ft)	Exposure (mR/hr)		
Cover	<0.1	6	8.8
1	0.5	7	73.3
2	1.5	8	660.0
3	2.0	9	4700.0
4	4.1	10	3700.0
5	9.8	Bottom of	
		Lower Shield	343.0

VP 24

Smears
1252
1253
1254

T-240

Distance(ft)	Exposure (mR/hr)		
Cover	0.1	7	68.7
1	0.5	8	173.0
2	0.8	9	236.0
3	1.6	10	3300.0
4	3.1	11	2300.0
5	4.5	12	3000.0
6	13.1	Bottom of	
		Lower Shield	550.0

VP 25

Smears
1255
1256
1257
T-241

Distance(ft)	Exposure (mR/hr)		
Cover		6	6.0
1	0.6	7	128.0
2	1.1	8	2400.0
3	1.2	9	2200.0
4	1.6	10	3300.0
5	3.5	Bottom of Lower Shield	600.0

VP 27

Smears
1258
1259
1260
T-242

Distance(ft)	Exposure (mR/hr)		
Cover		6	40.0
1	1.2	7	211.0
2	1.5	8	2200.0
3	2.9	9	2900.0
4	5.1	Bottom of Lower Shield	800.0
5	13.8		

VP 28

Smears
1261
1262
1263
T-243

Distance(ft)	Exposure (mR/hr)		
Cover		6	15.9
1	0.8	7	42.7
2	1.5	8	296.3
3	1.9	9	4100.0
4	3.5	10	2600.0
5	7.5	Bottom of Lower Shield	235.0

VP 33

Smears
1456
1457
1458
T-253

Distance(ft)	Exposure (mR/hr)		
Cover		6	1.2
1	0.0	7	1.4
2	0.0	8	3.2
3	0.0		
4	0.1	Bottom of Lower Shield	40.0
5	0.6		

VP 34

Smears
1267
1268
1269
T-245

Distance(ft)	Exposure (mR/hr)		
Cover		6	0.8
1	0.0	7	4.1
2	0.0	8	119.2
3	0.0		
4	0.0	Bottom of Lower Shield	40.0
5	0.1		

VP 35

Smears
1462
1463
1464
T-255

Distance(ft)	Exposure (mR/hr)		
Cover		6	1.0
1	0.1	7	2.1
2	0.2	8	6.1
3	0.4		
4	0.4	Bottom of	
5	0.5	Lower Shield	205.0

VP 36

Smears
1459
1460
1461
T-254

Distance(ft)	Exposure (mR/hr)		
Cover		6	2.0
1	0.0	7	4.1
2	0.0	8	13.6
3	0.1		
4	0.0	Bottom of	
5	0.2	Lower Shield	57.0

VP 37

Smears
1450
1451
1452
T-249

Distance(ft)	Exposure (mR/hr)		
Cover		6	0.2
1	0.0	7	0.4
2	0.0	8	5.9
3	0.1	9	8.5
4	0.0	Bottom of	
5	0.1	Lower Shield	185.0

VP 38

Smears
1471
1472
1473
T-248

Distance(ft)	Exposure (mR/hr)		
Cover		6	3.0
1	0.0	7	85.6
2	0.0	8	161.0
3	0.1		
4	0.1	Bottom of	
5	0.1	Lower Shield	185.0

VP 39

Smears
1465
1466
1467
T-256

Distance(ft)	Exposure (mR/hr)		
Cover		6	0.2
1	0.0	7	12.8
2	0.0	8	14.3
3	0.1		
4	0.1	Bottom of	
5	0.2	Lower Shield	175.0

VP 40

Smears
1453
1454
1455
T-252

Distance(ft)	Exposure (mR/hr)		
Cover		6	2.1
1	0.6	7	11.3
2	0.2	8	294.4
3	0.2	9	130.0
4	0.4	Bottom of	
5	1.1	Lower Shield	205.0

VP 41

Smears
1273
1274
1275
T-247

Distance(ft)	Exposure (mR/hr)		
Cover		6	0.3
1	0.0	7	6.7
2	0.0	8	41.2
3	0.1	9	147.0
4	0.1	Bottom of	
5	0.1	Lower Shield	120.0

VP 42

Smears
1264
1265
1266
T-244

Distance(ft)	Exposure (mR/hr)		
Cover		6	0.2
1	0.0	7	0.8
2	0.0	8	9.6
3	0.0	9	7.5
4	0.0	10	107.5
5	0.0	Bottom of	
		Lower Shield	50.0

VP 43

Smears
1240
1241
1242

Distance(ft)	Exposure (mR/hr)		
Cover	2.5	7	15.1
1	2.3	8	70.2
2	3.1	9	227.6
3	5.5	10	333.1
4	6.0	Bottom of	
5	7.8	Lower Shield	534.0
6	8.9		

VP 44

Smears
1409
1410
1411
T-250

Distance(ft)	Exposure (mR/hr)		
Cover		6	10.9
1	0.0	7	24.3
2	0.0	8	89.1
3	0.1		
4	0.3	Bottom of	
5	0.2	Lower Shield	140.0

VP 45

Smears
1412
1413
1414
T-251

Distance(ft)	Exposure (mR/hr)		
Cover		6	7.5
1	0.1	7	6.0
2	0.1	8	95.4
3	0.0		
4	0.2	Bottom of	
5	0.5	Lower Shield	35.0

VP 46

Smears

1425
1426
1427
1428

T-246

Distance(ft)	Exposure (mR/hr)		
Cover		6	1.4
1	0.0	7	7.8
2	0.2	8	236.2
3	0.5	9	298.1
4	0.2	Bottom of	
5	0.9	Lower Shield	425.0

VP 47
Dry Storage Ports

Smears

1477
1478
1479

T-260

Distance(ft)	Exposure (mR/hr)		
Cover		6	0.0
1	0.0	7	0.0
2	0.0	8	0.0
3	0.0	9	0.0
4	0.0	Bottom of	
5	0.0	Lower Shield	0.0

VP 48
Dry Storage Ports

Smears

1474
1475
1476

T-259

Distance(ft)	Exposure (mR/hr)		
Cover		6	0.0
1	0.0	7	0.0
2	0.0	8	0.0
3	0.0	9	0.0
4	0.0	Bottom of	
5	0.0	Lower Shield	0.0

VP 49
Dry Storage Ports

Smears

1494
1495
1496

T-258

Exposure	(in mR/hr)		
Cover		6	0.0
1	0.0	7	0.0
2	0.0	8	0.0
3	0.0	9	0.0
4	0.0	Bottom of	
5	0.0	Lower Shield	0.0

VP 50
Dry Storage Ports

Smears

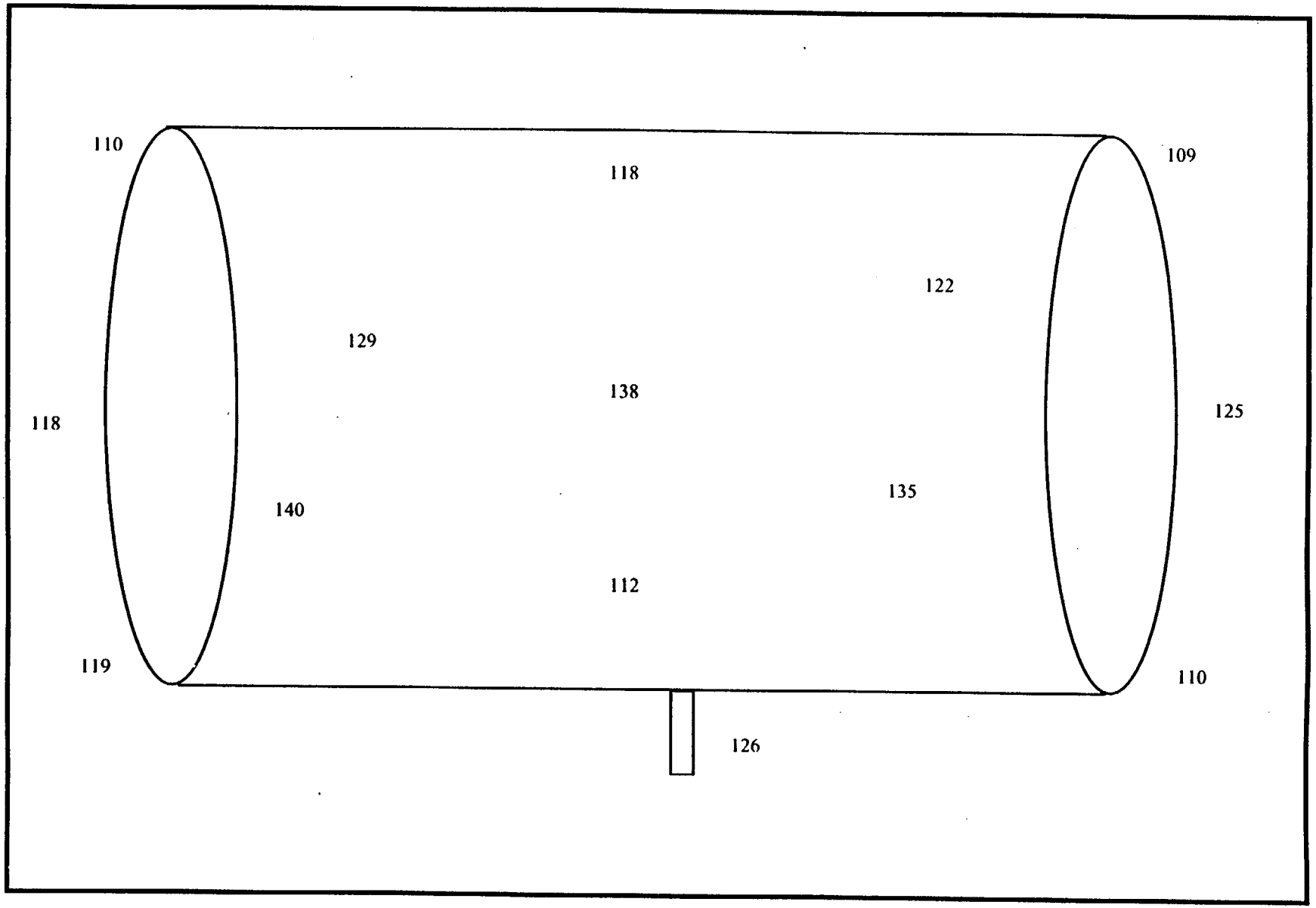
1468
1469
1470

T-257

Exposure	(in mR/hr)		
Cover		6	0.0
1	0.0	7	0.0
2	0.0	8	0.0
3	0.0	9	0.0
4	0.0	Bottom of	
5	0.0	Lower Shield	0.0

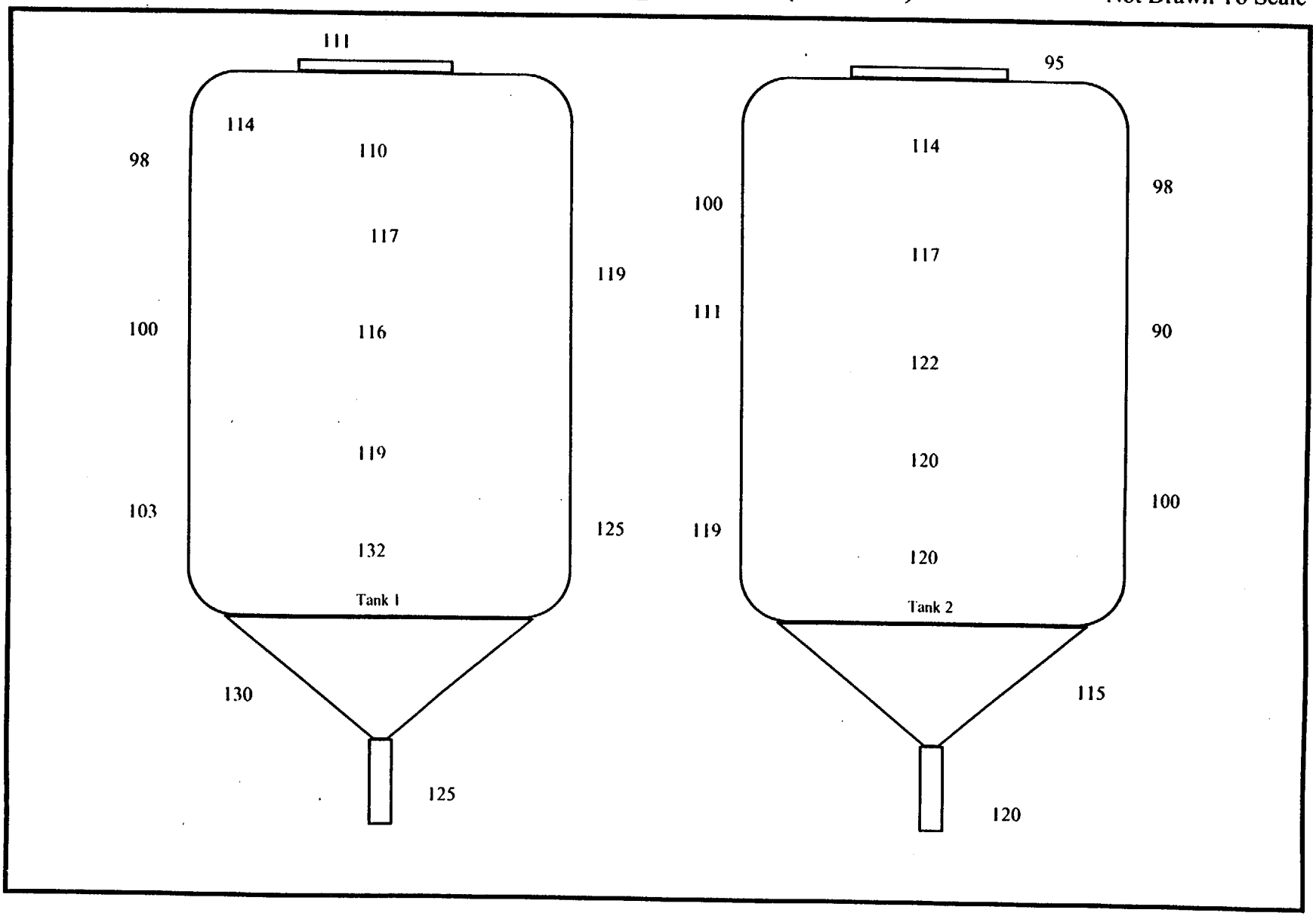
Suspect Waste Tank- Exposure (*u*R/hr)

Elevation View
Not Drawn To Scale



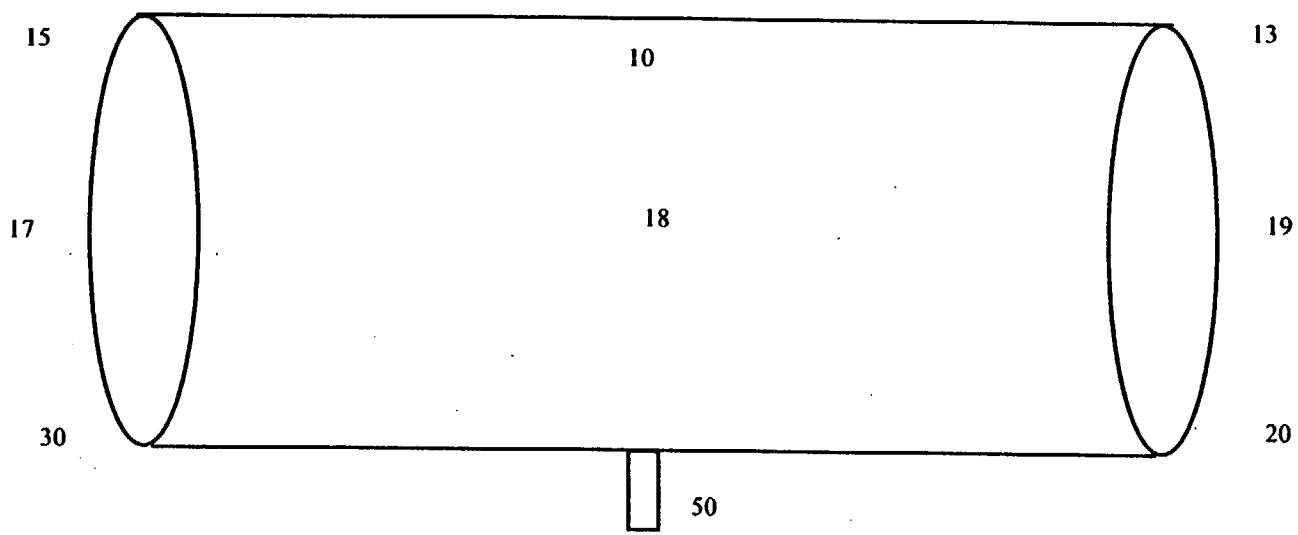
Low-Level Waste Tanks- Exposure (*u*R/hr)

Elevation View
Not Drawn To Scale



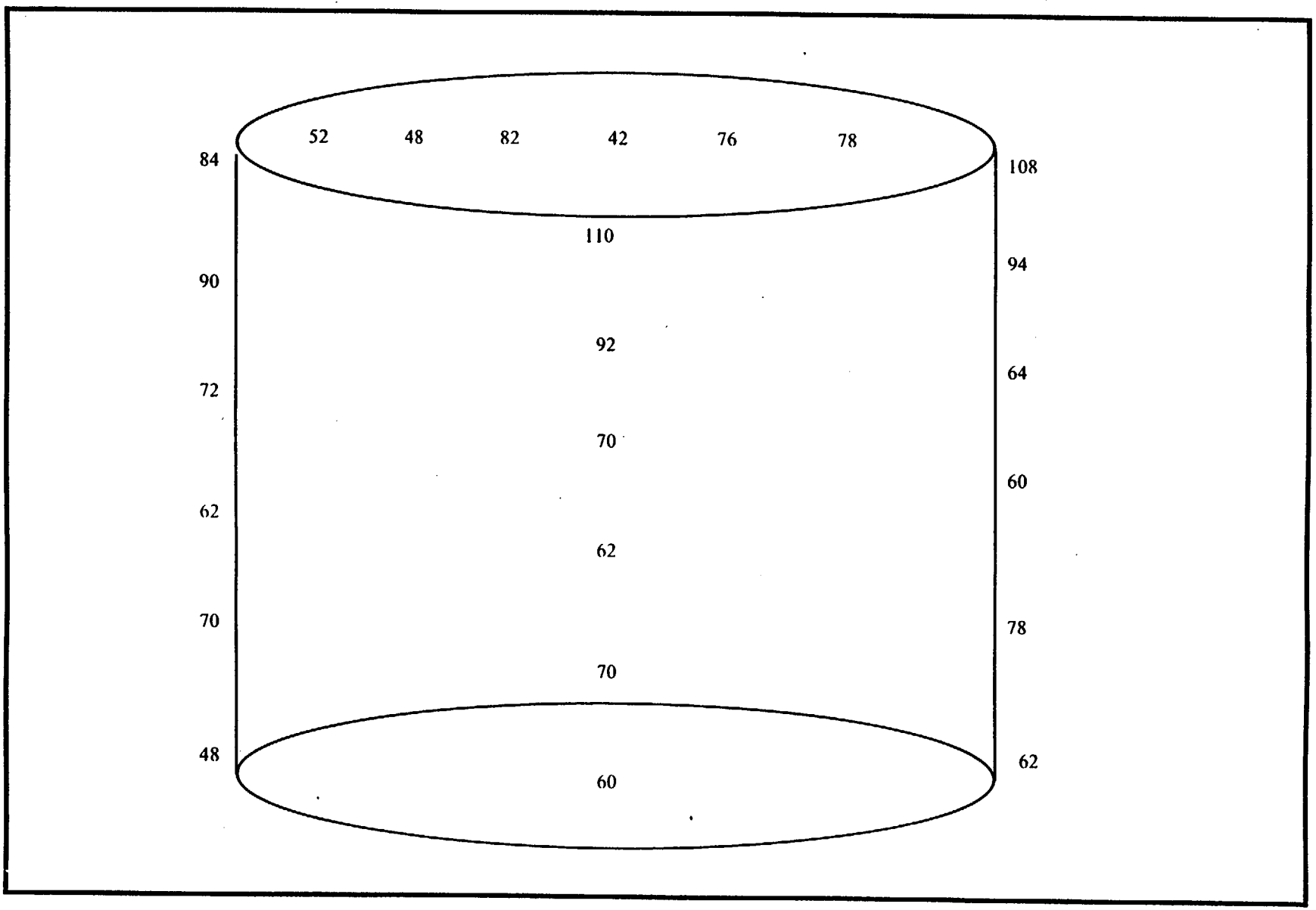
ECCS Tank- Exposure (*u*R/hr)

Elevation View
Not Drawn To Scale



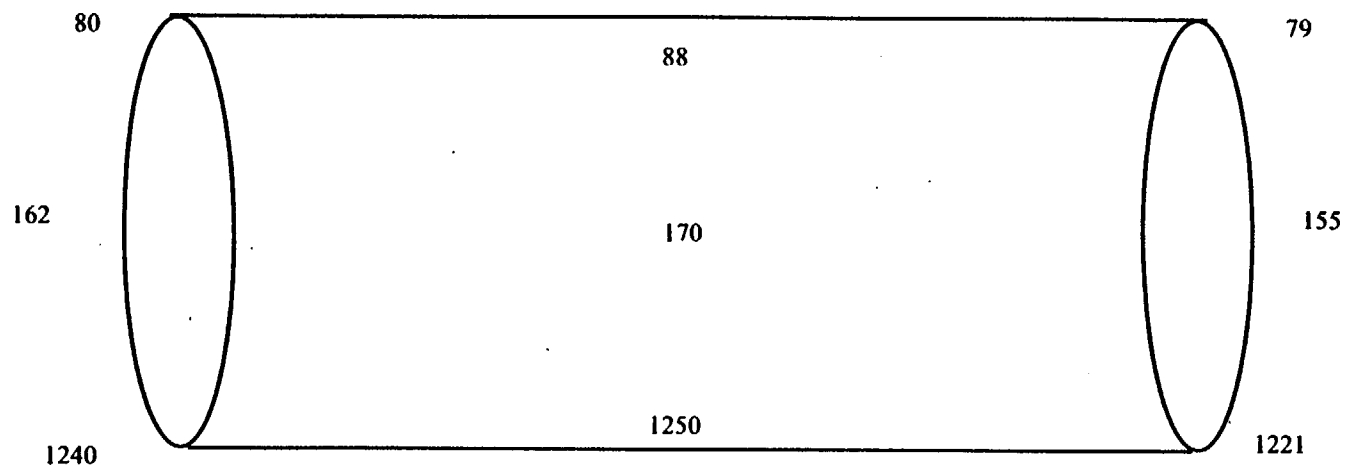
Tank He-1 in Process Equipment Room- Exposure (*u*R/hr)

Elevation View
Not Drawn To Scale



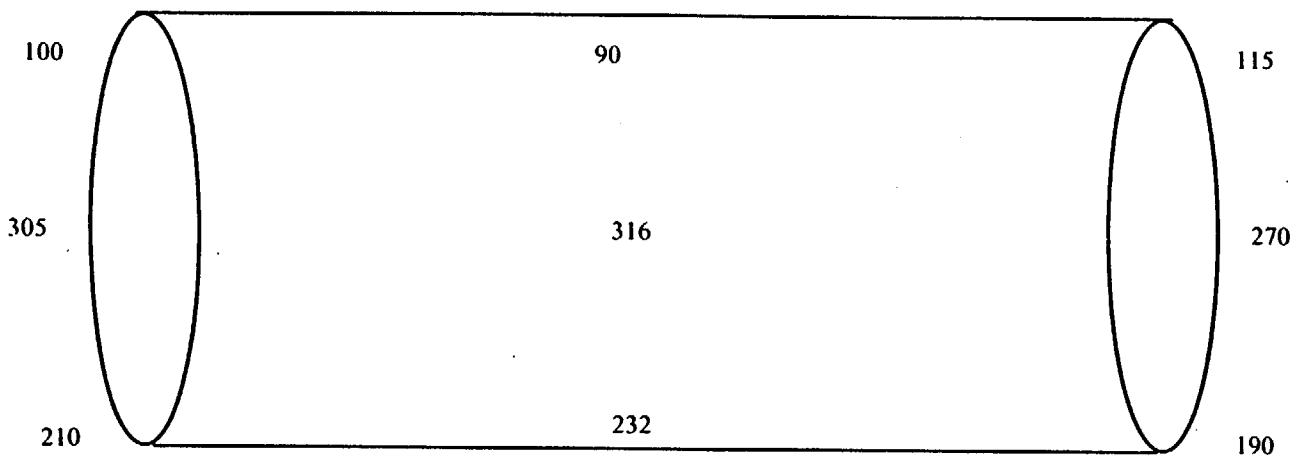
HXD1 Tank in Process Equipment Room- Exposure (*u*R/hr)

Elevation View
Not Drawn To Scale



HXD2 Tank in Process Equipment Room- Exposure (*u*R/hr)

Elevation View
Not Drawn To Scale

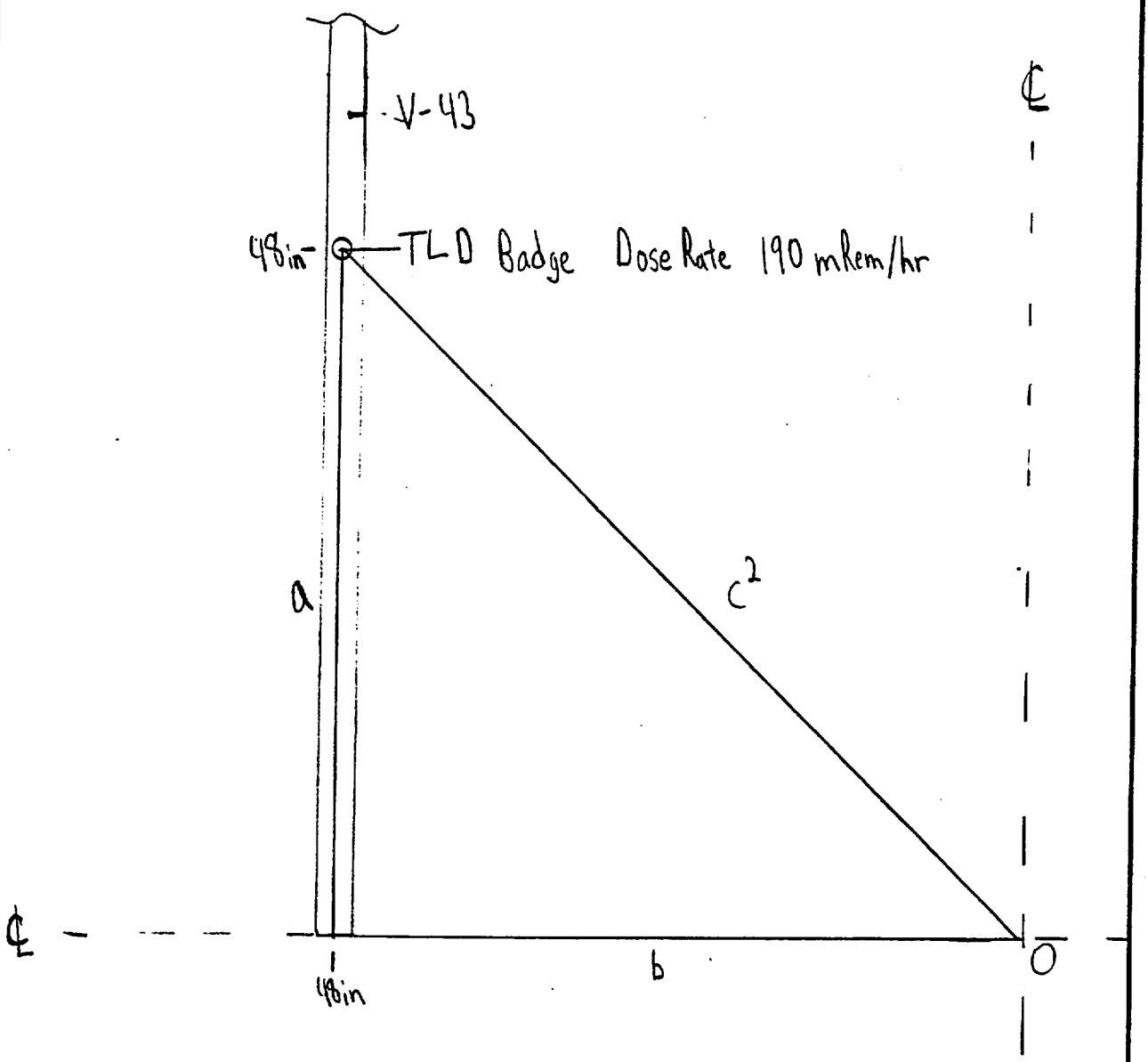


NES

BY D. Thomas DATE 1/12/98 PROJ. 3027 TASK 103
CHKD. P. Lopez DATE 1/12/98 PAGE 1 OF 7

Calculation for Radius of Concrete Activation

REF.



$c^2 = a^2 + b^2$

$c^2 = 48^2 + 48^2$

$c^2 = 4608\ in^2$

$c = 67.88(in)$ - Radius of Concrete Activation

NES 105 (5/93)

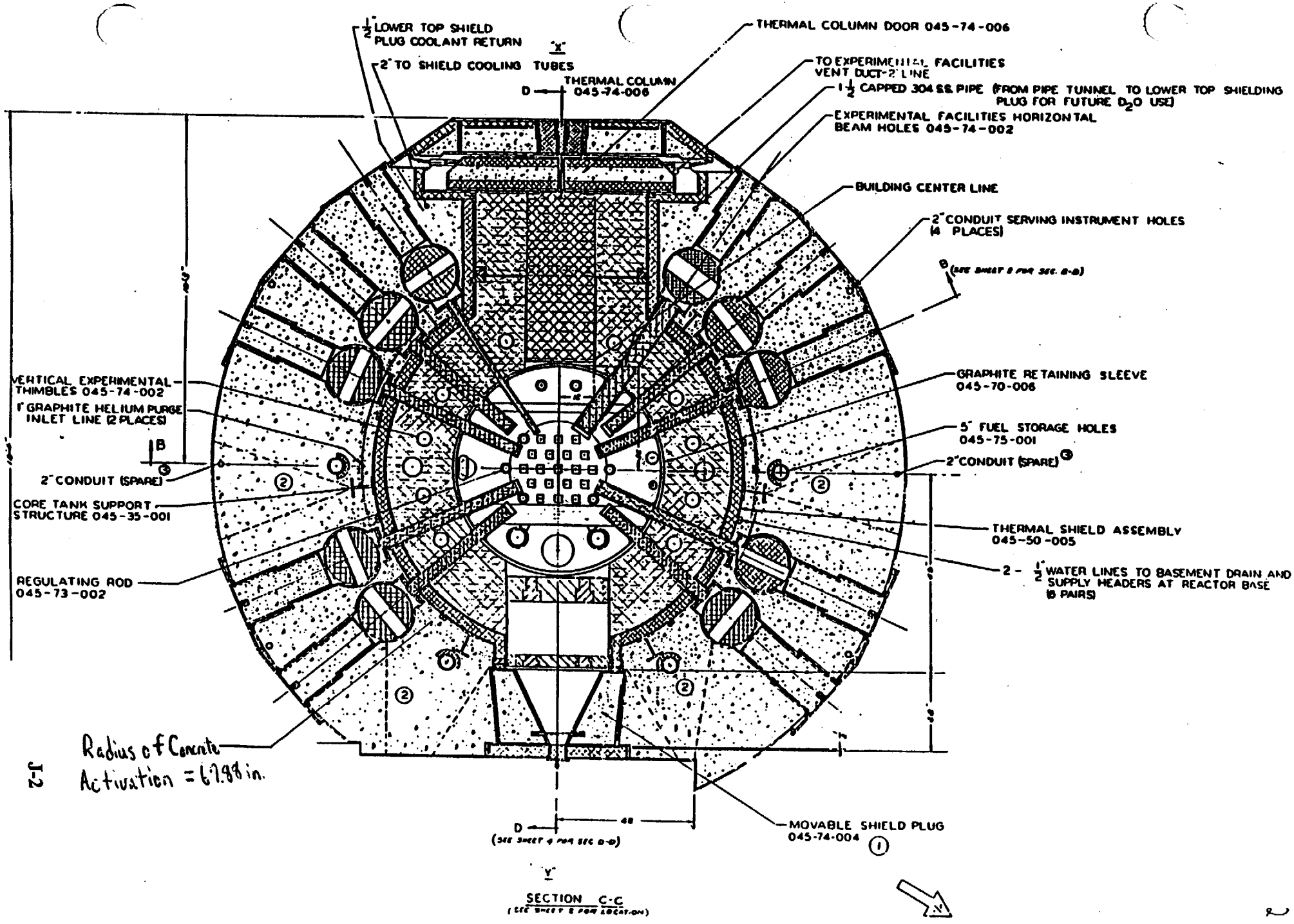


Figure 4.13 Horizontal Section C-C Through Reactor

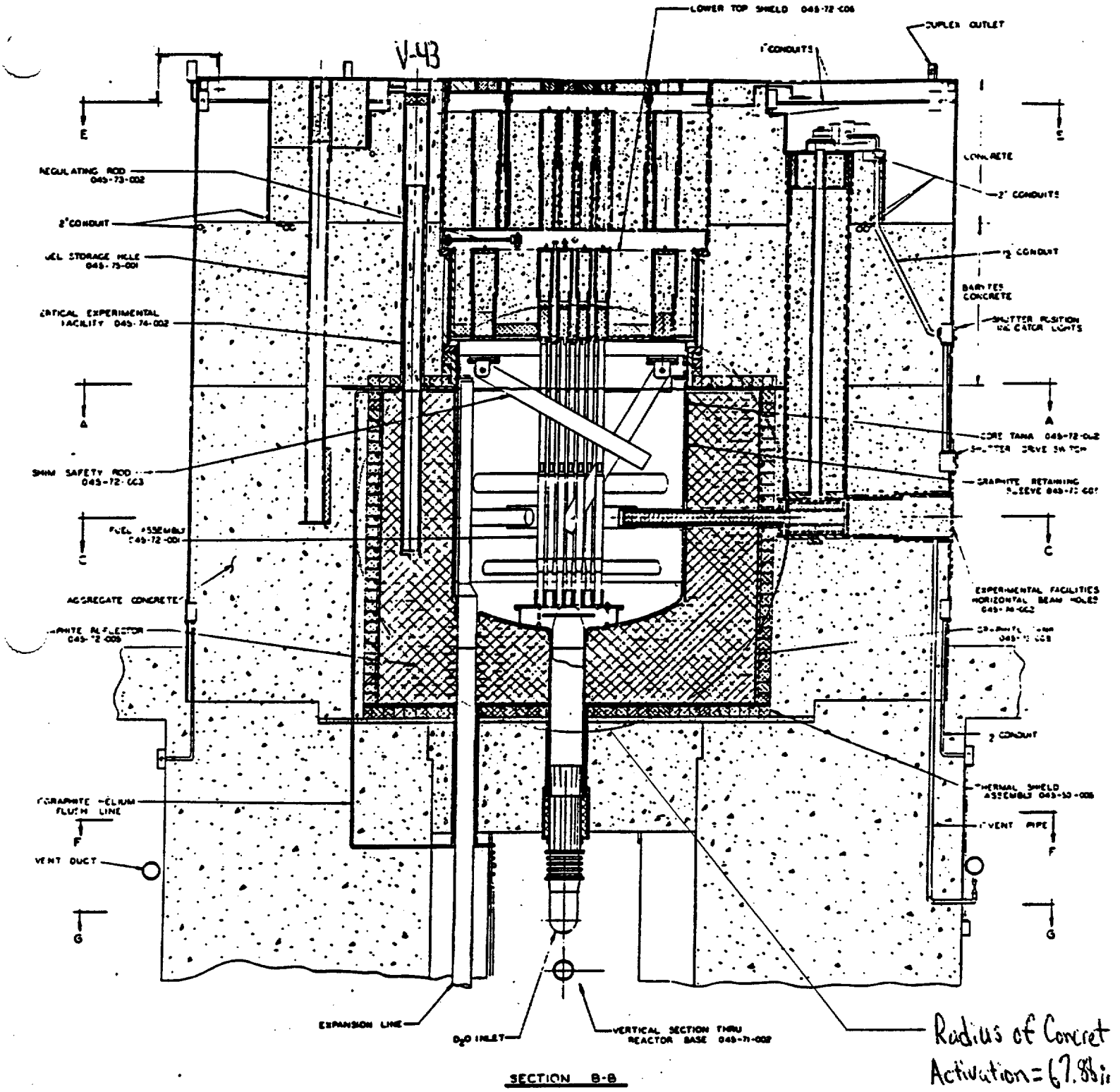
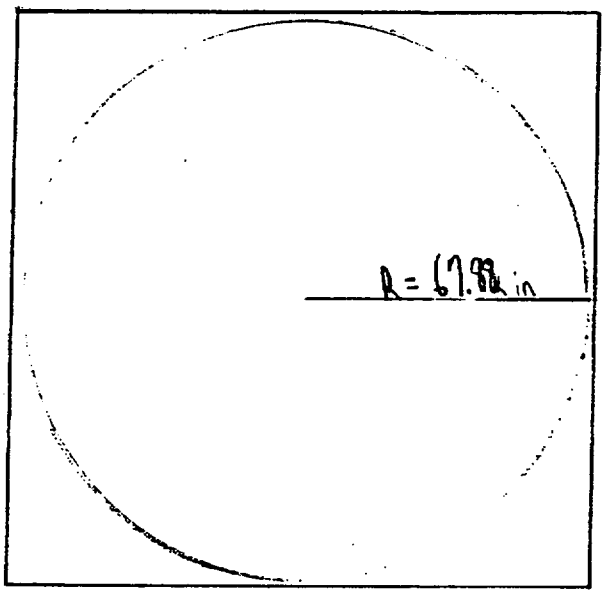


Figure 4.14 Vertical Section B-B Thru Reactor.

Total Volume of Activation (Assume Rx core is a sphere)

REF.



Total Volume: $\frac{4}{3}\pi R^3$

$= \frac{4}{3}\pi (67.88)^3$

$= 1{,}310{,}129 \text{ in}^3$

$\boxed{V_T = 758 \text{ ft}^3}$

Volume of Activated Concrete

REF.

$$V_C = V_T - V_{internal}$$

$$V_{internal} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\pi (60^3)$$

$$= 904{,}789 \text{ in}^3$$

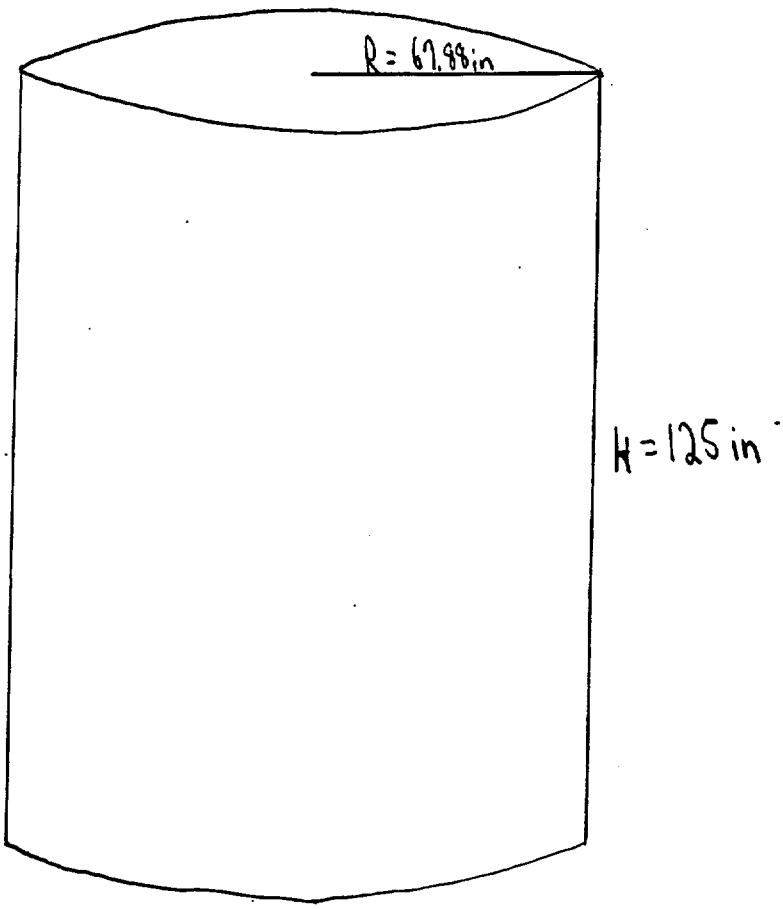
$$V_C = 1{,}310{,}129 - 904{,}789 \text{ in}^3$$

$$= 405{,}340 \text{ in}^3$$

$$\boxed{V_C = 235 \text{ ft}^3}$$

Volume of Activation (Assume Rx Core is a Cylinder)

REF.



$$V_T = \pi R^2 H$$

$$V_T = \pi (67.88^2)(125)$$

$$V_T = 1{,}809{,}437 \text{ in}^3$$

$$\boxed{V_T = 1047 \text{ ft}^3}$$

Volume of Activated Concrete (Cylinder)

REF.

$V_C = V_T - V_{internals}$

$V_{internals} = \pi R^2 H$

$V_{internals} = \pi (60^2)(125)$

$= 1{,}413{,}717 \text{ in}^3$

$V_{internals} = 818 \text{ ft}^3$

$V_C = V_T - V_{internals}$

$= 1047 - 818$

$\boxed{V_C = 229 \text{ ft}^3}$

NES INC
44 SHELTER ROCK ROAD
ATTN DEBBIE OCONNELL
DANBURY CT 06810

ACCOUNT NO.	SERIES CODE
138560	

PROCESS NO.	REPORT DATE	DOSIMETER RECEIVED	REPORT TIME IN WORK DAYS	PAGE NO.
EW548	10/31/97	10/20/97	9	1

QUALITY CONTROL RELEASE
RAH

LANDAUER®

Landauer, Inc. 2 Science Road Glenwood, Illinois 60425-1586
Telephone: (708)755-7000 Facsimile: (708)755-7016

Accredited by the National Institute of Standards and Technology through NVLAP*

RADIATION DOSIMETRY REPORT

NAME	PARTICIPANT NUMBER	TYPE OF RECORD	DOSIMETER TYPE OR SOURCE	NOTES	RADIATION QUALITY	DOSE EQUIVALENT (MREM) FOR PERIODS SHOWN BELOW DEEP DDE	EYE LDE	SHALLOW SDE	ACCUMULATED DOSE EQUIVALENT (MREM) DEEP DDE	EYE LDE	SHALLOW SDE	ACCUMULATED DOSE EQUIVALENT (MREM) DEEP DDE	EYE LDE	SHALLOW SDE	INCEPTION DATE MO/YR	LAST AMENDMENT	RECORDS FOR YEAR	ID NUMBER	SEX	BIRTH DATE MO/DA/YR
FOR MONITORING PERIOD:						10/01/97				QTR 4			1997							
		CONTROL	K			M	M	M									4			
	99016	OTH WH B	K		P	202510	202510	202510				NO TOTAL								
	99017	OTH WH B	K		P	125220	125220	125220				NO TOTAL					1			
	99018	OTH WH B	K		P	138160	138160	138160				NO TOTAL								
	99019	OTH WH B	K		P	90850	90850	90850				NO TOTAL					1			
	99020	OTH WH B	K		P	81330	81330	81330				NO TOTAL								
	99021	OTH WH B	K		P	79320	79320	79320				NO TOTAL					1			
	99022	OTH WH B	K		P	92040	92040	92040				NO TOTAL								
	99023	OTH WH B	K		P	87160	87160	91700				NO TOTAL					1			
	99024	OTH WH B	K		P	203020	203020	203020				NO TOTAL								
	99025	OTH WH B	K		P	174440	174440	174440				NO TOTAL					1			
	99026	OTH WH B	K		P	126380	123380	126380				NO TOTAL								
	99027	OTH WH B	K		P	90550	90550	90550				NO TOTAL					1			
	99028	OTH WH B	K		P	83970	83970	83970				NO TOTAL								
	99029	OTH WH B	K		P	72290	72290	72290				NO TOTAL					1			
	99030	OTH WH B	K		P	93900	93900	93900				NO TOTAL								
	99031	OTH WH B	K		P	141100	141100	141100				NO TOTAL					1			
	99032	OTH WH B	K		P	27150	27150	27150				NO TOTAL								
	99033	OTH WH B	K		P	13890	13890	13890				NO TOTAL					1			
	99034	OTH WH B	K		P	8750	8750	8750				NO TOTAL								
	99035	OTH WH B	K		P	5380	5380	5380				NO TOTAL					1			
	99036	OTH WH B	K		P	4550	4550	4550				NO TOTAL								
	99037	OTH WH B	K		P	450	450	450				NO TOTAL					1			
	99038	OTH WH B	K		P	210	210	210				NO TOTAL					1			

1 - PR 6316 - RPT101 - N1

J-8

TLD Results

NES INC
44 SHELTER ROCK ROAD
ATTN DEBBIE OCONNELL
DANBURY CT 06810

ACCOUNT NO.	SERIES CODE
136560	

PROCESS NO.	REPORT DATE	DOSIMETER RECEIVED	REPORT TIME IN WORK DAYS	PAGE NO.
EW548	10/31/97	10/20/97	9	2

QUALITY CONTROL RELEASE
RAH

** LAST PAGE **

LANDAUER®

RADIATION DOSIMETRY REPORT

Landauer, Inc. 2 Science Road Glenwood, Illinois 60425-1586
Telephone: (708)755-7000 Facsimile: (708)755-7016

Accredited by the National Institute of Standards and Technology through NVLAP*

NAME	PARTICIPANT NUMBER	TYPE OF RECORD	DOSIMETER TYPE OR SOURCE	NOTES	RADIATION QUALITY	DOSE EQUIVALENT (MREM) FOR PERIODS SHOWN BELOW			ACCUMULATED DOSE EQUIVALENT (MREM)			ACCUMULATED DOSE EQUIVALENT (MREM)			INCEPTION DATE MO/YR	LAST AMENDMENT	RECORDS FOR YEAR	ID NUMBER	SEX	BIRTH DATE MO/DA/YR
						DEEP DDE	EYE LDE	SHALLOW SDE	DEEP DDE	EYE LDE	SHALLOW SDE	DEEP DDE	EYE LDE	SHALLOW SDE						
FOR MONITORING PERIOD:						10/01/97				QTR 4			1997							
	99039	OTH WH B	K		P	100	100	100				NO TOTAL					1			

1 - PR 6318 - RPT101 - N1

J-9

TLD Results

Asbestos Analysis Locations

Sample No.	Location	Percentage of Asbestos
1	Containment Building- Ceiling	60%
4	Top of Hood in DECON Room	35%
7	Piping in Air-conditioning	50%
	Unit over Control Room	

Samples were analyzed by an independent laboratory for first positives.

EnviroMed Services, Inc.
25 Science Park, Box 9, New Haven, Connecticut 06511
Phone: (203)786-5580 Fax: (203) 786-5579

Laboratory Analysis Report

To: Mr. Peter Manion
IES (NES)
44 Shelter Rock Road
Danbury, Connecticut 06810-7009

Client Job #:	None Given.
Date Collected:	10/20/97
Date Received:	10/20/97
Date Analyzed:	10/28/97
Date Report Prepared:	10/29/97

Analysis: Asbestos Content
Analytical Method: Polarized Light Microscopy with Dispersion Staining
Location: Cont. Bldg. Ceiling #1 - #3; Lab Hood; Pipe Wrapping

Sample #	Sample Description	Asbestos Content Per Layer	Total Asbestos Per Sample
13276-1	Beige/Gray Fibrous	20% Chrysotile 40% Amosite	20% Chrysotile 40% Amosite
13276-2	*AHERA Analysis.		
13276-3	*AHERA Analysis.		
13276-4	Gray Fibrous	35% Chrysotile	35% Chrysotile
13276-5	*AHERA Analysis.		
13276-6	*AHERA Analysis.		

13276-7	Gray Fibrous with White Fibrous	50% Chrysotile	50% Chrysotile
13276-8	*AHERA Analysis.		

Connecticut 's Lab #PH0571 Massachusetts' Certification #AA000049

*Per the client's request, these samples were analyzed by the AHERA method: Analysis is stopped after the first positive result of each type of material and the similar material not analyzed is considered positive.

Analyst: Cynthia Pumphrey Date: 10/30/97

Technical Manager: J. Pasquariello Date: 10/30/97

There exists a degree of variability for the results due to the inherent uncertainty within the analytical method.

Per the State of Connecticut Regulations, Standards for Asbestos Abatement, Section 19a-332a-1 Definitions (n): "Asbestos-Containing Material" (ACM) means material composed of asbestos of any type and in an amount greater than one percent by weight, either alone or mixed with other fibrous or non-fibrous material.

Inc.
44 Shelter Rock Road

Danbury CT 06810-

XRF and Lab Results

Customer: Georgia Institute of Technology
Atlanta

Project Name: Containment Building- Lead Testing
Atlanta

Site Name: Georgia Tech Research Reactor
Atlanta, GA

Lab 0.500 % by Weight
Action Level 1.000

Total Assays Reported 48

#	Site	Room Tested	#	Wall	Component	Substrate	Paint Condition	K-Shell mg/cm2	L-Shell mg/cm2	Map #	Lab	Result
2253	0053	Calibration			*	*	*	0.000 X	0.000 X	0		
2254	0053	Calibration			*	*	*	1.104 K	0.957 L	412		Incl
2255	0053	Containment Bld	1stFl	1	Wall	Masonry	Satisfactory	0.528 K	-0.273 L	412		Neg
2256	0053	Containment Bld	1stFl	1	Wall	Masonry	Satisfactory	0.406 K	-0.368 L	412		Neg
2257	0053	Containment Bld	1stFl	1	Wall	Masonry	Satisfactory	0.083 K	-0.106 L	412		Neg
2258	0053	Containment Bld	1stFl	1	Wall	Masonry	Satisfactory	0.075 K	-0.413 L	412		Neg
2259	0053	Containment Bld	1stFl	4	Wall	Masonry	Poor	-0.106 K	-0.407 L	412		Neg
2260	0053	Containment Bld	1stFl	4	Wall	Masonry	Poor	0.044 K	-0.191 L	412		Neg
2261	0053	Containment Bld	1stFl	3	Wall	Masonry	Satisfactory	0.271 K	-0.126 L	412		Neg
2262	0053	Containment Bld	1stFl	3	Baseboard	Masonry	Satisfactory	0.275 K	-0.086 L	412		Neg
2263	0053	Containment Bld	1stFl	3	Wall	Masonry	Satisfactory	0.274 K	-0.255 L	412		Neg
2264	0053	Containment Bld	1stFl	2	Wall	Masonry	Satisfactory	0.162 K	-0.159 L	412		Neg
2265	0053	Containment Bld	1stFl	2	Wall	Masonry	Satisfactory	-0.062 K	-0.199 L	412		Neg
2266	0053	Containment Bld	1stFl	3	Baseboard	Masonry	Poor	0.209 K	-0.223 L	412		Neg
2267	0053	Containment Bld	1stFl	3	Floor	Masonry	Satisfactory	0.342 K	-0.172 L	412		Neg
2268	0053	Containment Bld	1stFl	3	Floor	Masonry	Satisfactory	0.439 K	-0.140 L	412		Neg
2269	0053	Containment Bld	1stFl	1	Floor	Masonry	Satisfactory	0.402 K	-0.104 L	412		Neg
2270	0053	Containment Bld	1stFl	4	Floor	Masonry	Satisfactory	0.274 K	-0.292 L	412		Neg
2271	0053	Containment Bld	1stFl	3	Floor	Masonry	Satisfactory	0.212 K	-0.283 L	412		Neg
2272	0053	Reactor Bld	1stFl	1	Wall	Masonry	Satisfactory	0.006 K	-0.056 L	412		Neg

Inc.
4· .ıelter Rock Road

Danbury CT 06810-

XRF and Lab Results

Customer: Georgia Institute of Technology
Atlanta

Project Name: Containment Building- Lead Testing
Atlanta

Site Name: Georgia Tech Research Reactor
Atlanta, GA

Lab 0.500 % by Weight
Action Level 1.000

Total Assays Reported 48

#	Site	Room Tested	#	Wall	Component	Substrate	Paint Condition	K-Shell mg/cm2	L-Shell mg/cm2	Map #	Lab	Result
2273	0053	Reactor Bld	1stFl	1	Wall	Other	Poor	3.011 S	0.000 X	412		Pos
2274	0053	Reactor Bld	1stFl	1	Wall	Other	Poor	3.016 S	0.000 X	412		Pos
2275	0053	Reactor Bld	1stFl	4	Wall	Other	Poor	5.265 S	0.000 X	412		Pos
2276	0053	Reactor Bld	1stFl	4	Wall	Other	Poor	2.255 S	0.000 X	412		Pos
2277	0053	Reactor Bld	1stFl	3	Wall	Other	Poor	1.987 S	0.000 X	412		Pos
2278	0053	Reactor Bld	1stFl	3	Wall	Other	Poor	2.414 S	0.000 X	412		Pos
2279	0053	Reactor Bld	1stFl	3	Wall	Masonry	Satisfactory	-0.232 K	0.928 L	412		Neg
2280	0053	Reactor Bld	1stFl	2	Wall	Masonry	Poor	0.226 K	-0.025 L	412		Neg
2281	0053	Bio-Med Room	1stFl	2	Wall	Masonry	Poor	57.186 K	4.348 L	412		Pos
2282	0053	Bio-Med Room	1stFl	2	Wall	Masonry	Poor	57.713 K	5.230 L	412		Pos
2283	0053	Bio-Med Room	1stFl	3	Wall	Masonry	Poor	-0.220 K	-0.088 L	412		Neg
2284	0053	Bio-Med Room	1stFl	1	Wall	Masonry	Poor	-0.523 K	0.521 L	412		Neg
2285	0053	Stairway	1stFl	1	Stair Tread	Other	Satisfactory	1.265 S	0.000 X	412		Incl
2286	0053	Stairway	1stFl	1	Stair Tread	Other	Satisfactory	1.355 S	0.000 X	412		Pos
2287	0053	Stairway	1stFl	1	Stair Stringer	Other	Satisfactory	2.439 S	0.000 X	412		Pos
2288	0053	Stairway	1stFl	1	Stair Riser	Other	Satisfactory	3.415 S	0.000 X	412		Pos
2289	0053	Containment Bld	Bsmn	1	Wall	Masonry	Satisfactory	0.365 K	-0.022 L	412		Neg
2290	0053	Containment Bld	Bsmn	1	Wall	Masonry	Satisfactory	0.274 K	-0.301 L	412		Neg
2291	0053	Containment Bld	Bsmn	3	Wall	Masonry	Poor	0.480 K	-0.185 L	412		Neg
2292	0053	Containment Bld	Bsmn	4	Wall	Masonry	Satisfactory	-0.146 K	0.007 L	412		Neg

Inc.
44 Shelter Rock Road

Danbury CT 06810-

XRF and Lab Results

Customer: Georgia Institute of Technology
Atlanta

Project Name: Containment Building- Lead Testing
Atlanta

Site Name: Georgia Tech Research Reactor
Atlanta, GA

Lab 0.500 % by Weight
Action Level 1.000

Total Assays Reported 48

#	Site	Room Tested	#	Wall	Component	Substrate	Paint Condition	K-Shell mg/cm2		L-Shell mg/cm2		Map #	Lab	Result
2293	0053	Stairway	Bsmn	1	Stair Stringer	Other	Satisfactory	0.951	S	0.000	X	412		Incl
2294	0053	Stairway	Bsmn	1	Stair Stringer	Other	Satisfactory	1.224	S	0.000	X	412		Pos
2295	0053	Containment Bld	2ndFl	1	Wall	Masonry	Satisfactory	0.479	K	-0.136	L	412		Neg
2296	0053	Containment Bld	2ndFl	4	Wall	Masonry	Satisfactory	0.060	K	-0.099	L	412		Neg
2297	0053	Containment Bld	2ndFl	2	Wall	Masonry	Satisfactory	0.270	K	-0.014	L	412		Neg
2298	0053	Stairway	2ndFl	2	Stair Handrail	Other	Satisfactory	0.176	S	0.000	X	412		Neg
2299	0053	Stairway	2ndFl	1	Door	Other	Satisfactory	2.546	S	0.000	X	412		Pos
2300	0053	Calibration		*		*	*	1.352	S	0.000	X	412		Pos

L-3

Inc.
4- ..helter Rock Road

Danbury CT 06810-

Summary Analysis

Customer: Georgia Institute of Technology
Atlanta

Project Name: Containment Building- Lead Testing
Atlanta

Site Name: Georgia Tech Research Reactor
Atlanta, GA

Lab 0.500 % by Weight
Action Level 1.000

Comp	Component Name	Number Tested	Num Pos	(%)	Num Neg	(%)	Num Incl	(%)	Lab Tested	Lab Pos	(%)
1	**Door**	1	1	(100 %)	0	(0 %)	0	(0 %)	0	0	(0 %)
4	**Wall**	30	8	(26 %)	22	(73 %)	0	(0 %)	0	0	(0 %)
5	**Baseboard**	2	0	(0 %)	2	(100 %)	0	(0 %)	0	0	(0 %)
13	**Stair Tread**	2	1	(50 %)	0	(0 %)	1	(50 %)	0	0	(0 %)
14	**Stair Riser**	1	1	(100 %)	0	(0 %)	0	(0 %)	0	0	(0 %)
15	**Stair Stringer**	3	2	(66 %)	0	(0 %)	1	(33 %)	0	0	(0 %)
16	**Stair Handrail**	1	0	(0 %)	1	(100 %)	0	(0 %)	0	0	(0 %)
18	**Floor**	5	0	(0 %)	5	(100 %)	0	(0 %)	0	0	(0 %)
	Total Reported	45	13		30		2		0	0	

L-4

Inc.
4-. .ielter Rock Road

Danbury CT 06810-

Confi..ned Positives

Customer: Georgia Institute of Technology
Atlanta

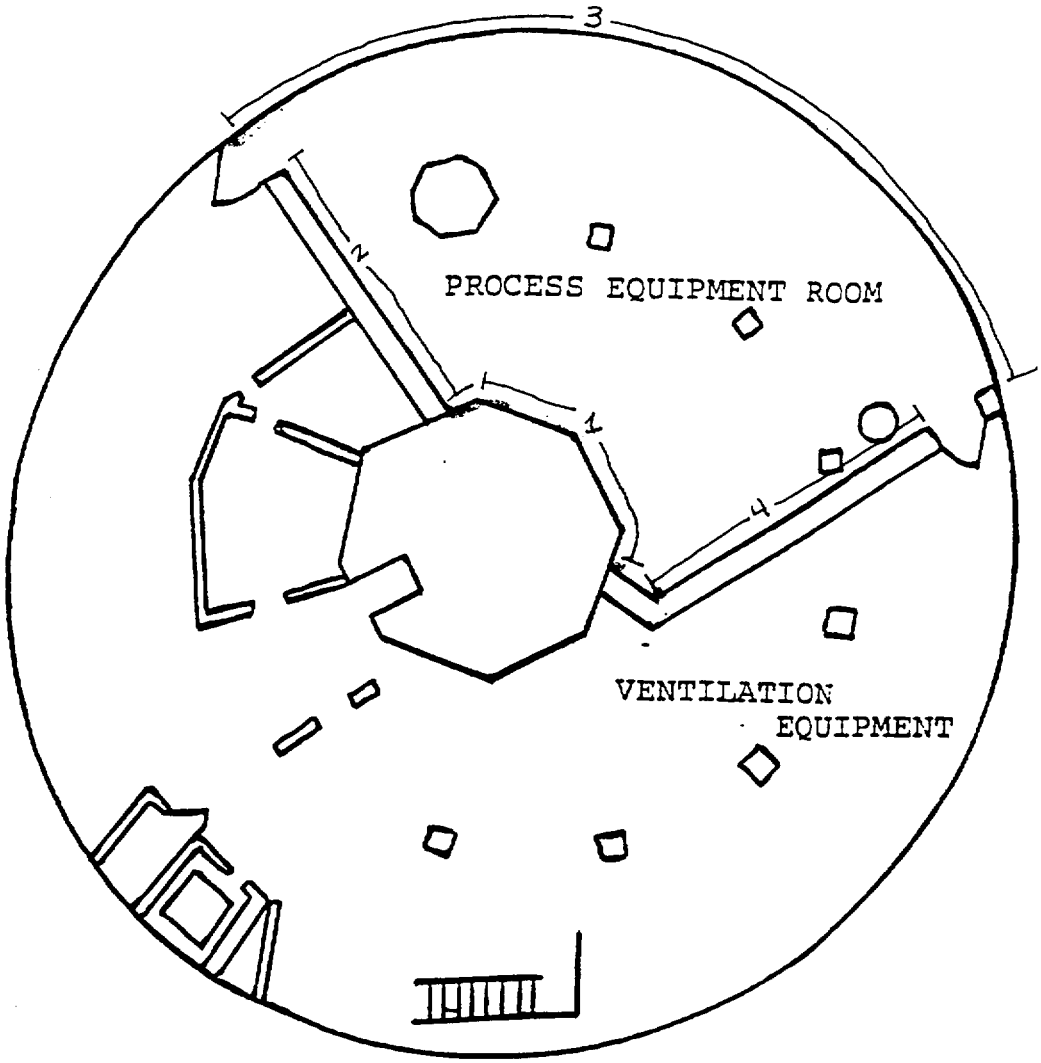
Project Name: Containment Building- Lead Testing
Atlanta

Site Name: Georgia Tech Research Reactor
Atlanta, GA

Lab 0.500 % by Weight
Action Level 1.000

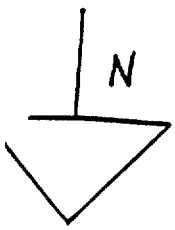
Total Assays Reported 13

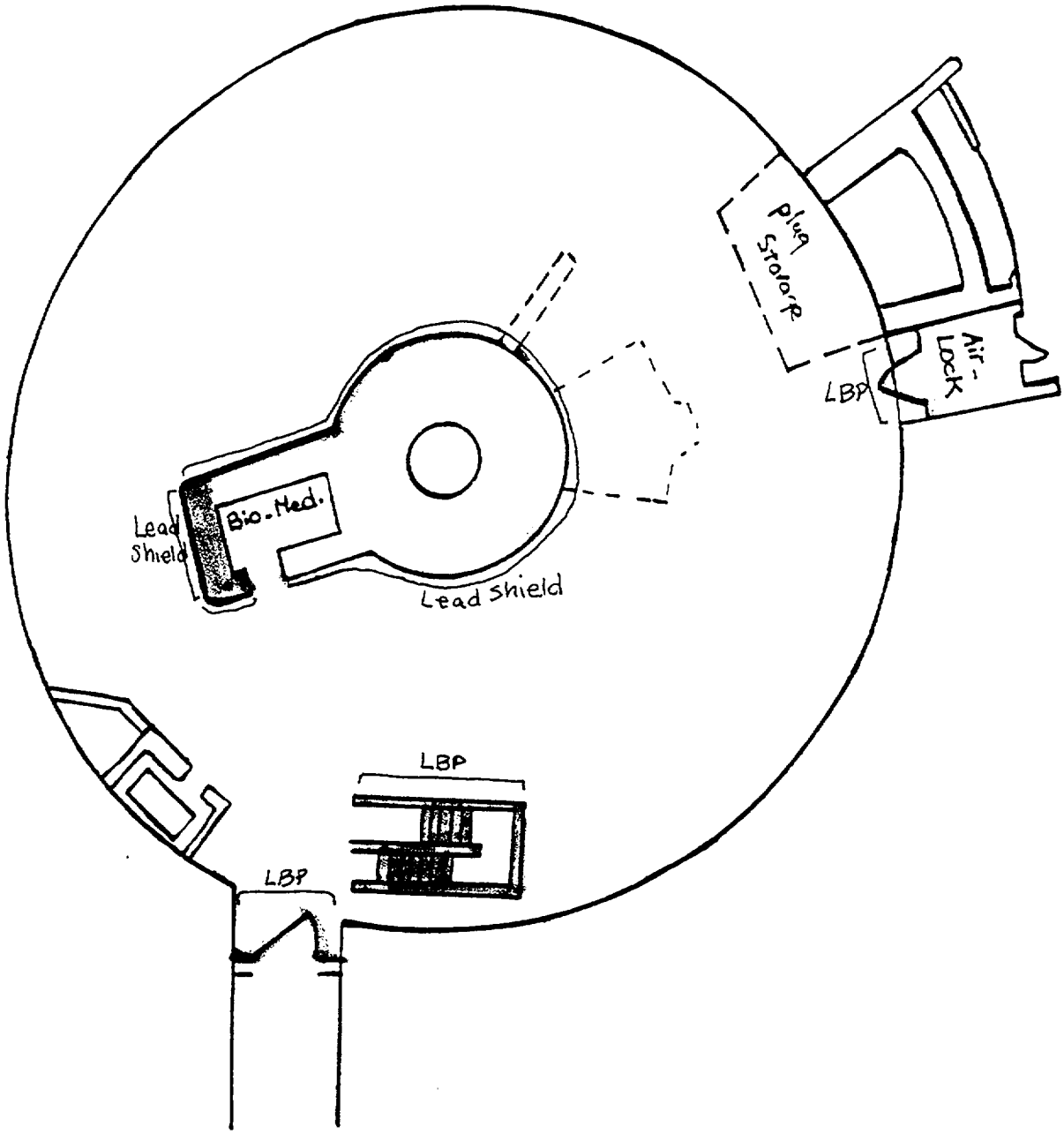
#	Site	Room Tested	#	Wall	Component	Substrate	Paint Condition	K-Shell mg/cm2	L-Shell mg/cm2	Map #	Lab	Result
2273	0053	Reactor Bld	1stFl	1	Wall	Other	Poor	3.011 S	0.000 X	412		Pos
2274	0053	Reactor Bld	1stFl	1	Wall	Other	Poor	3.016 S	0.000 X	412		Pos
2275	0053	Reactor Bld	1stFl	4	Wall	Other	Poor	5.265 S	0.000 X	412		Pos
2276	0053	Reactor Bld	1stFl	4	Wall	Other	Poor	2.255 S	0.000 X	412		Pos
2277	0053	Reactor Bld	1stFl	3	Wall	Other	Poor	1.987 S	0.000 X	412		Pos
2278	0053	Reactor Bld	1stFl	3	Wall	Other	Poor	2.414 S	0.000 X	412		Pos
2281	0053	Bio-Med Room	1stFl	2	Wall	Masonry	Poor	57.186 K	4.348 L	412		Pos
2282	0053	Bio-Med Room	1stFl	2	Wall	Masonry	Poor	57.713 K	5.230 L	412		Pos
2286	0053	Stairway	1stFl	1	Stair Tread	Other	Satisfactory	1.355 S	0.000 X	412		Pos
2287	0053	Stairway	1stFl	1	Stair Stringer	Other	Satisfactory	2.439 S	0.000 X	412		Pos
2288	0053	Stairway	1stFl	1	Stair Riser	Other	Satisfactory	3.415 S	0.000 X	412		Pos
2294	0053	Stairway	Bsmn	1	Stair Stringer	Other	Satisfactory	1.224 S	0.000 X	412		Pos
2299	0053	Stairway	2ndFl	1	Door	Other	Satisfactory	2.546 S	0.000 X	412		Pos



BASEMENT

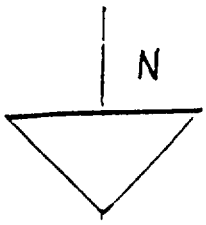
Containment

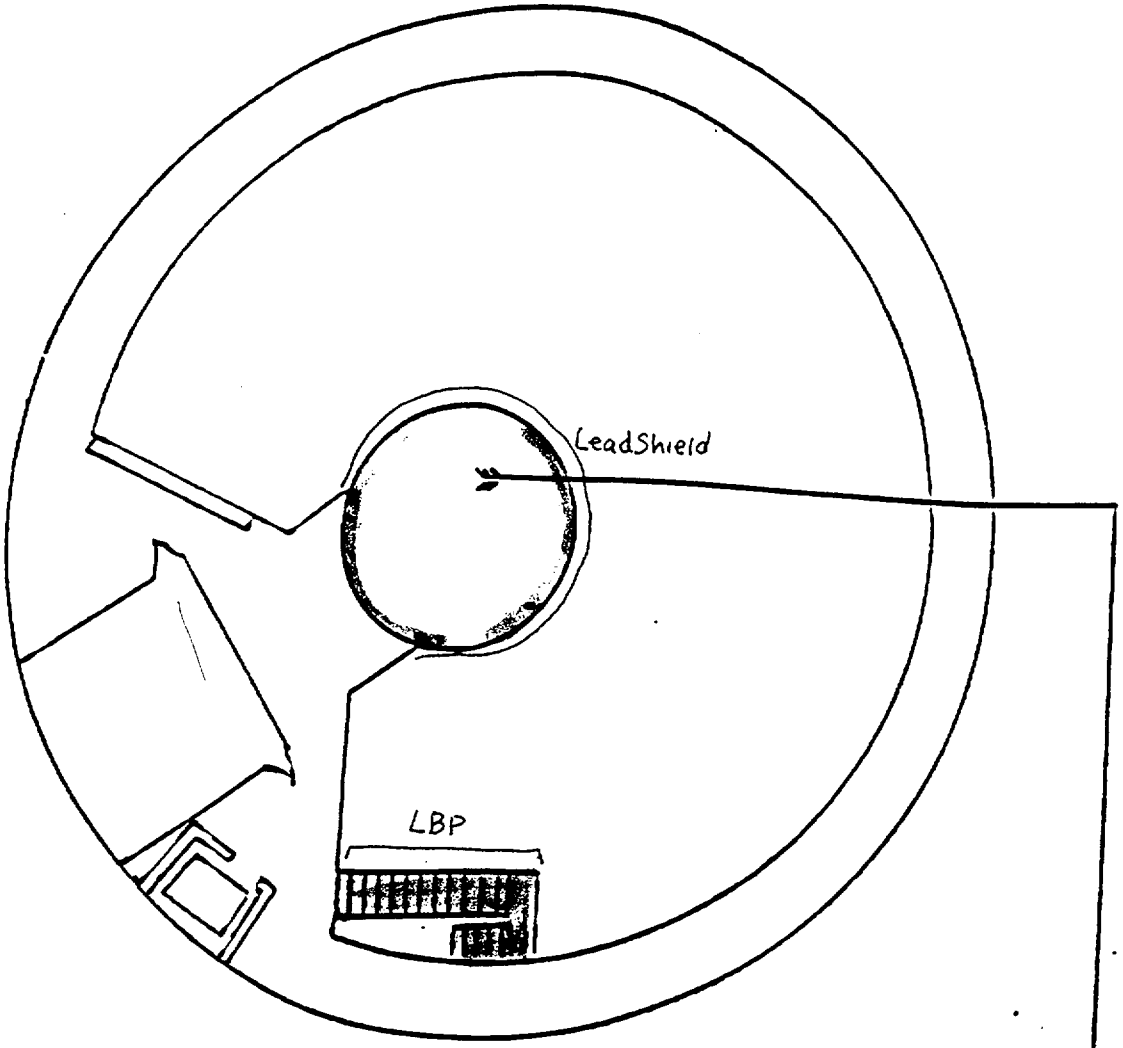




FIRST FLOOR

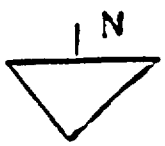
Containment

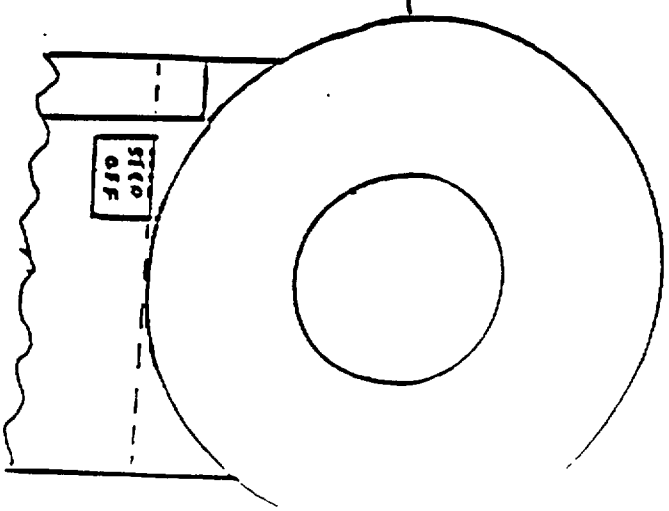




SECOND FLOOR

Containment





NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: KEN VEINOT (Print) — [signature] (Sign) — 10/7/97 (Date)

Reviewer: Patricia Lopez (Print) — [signature] (Sign) — 10/7/97 (Date)

Sample Location: NES OFFICE

Sample Number: AS-1

Collected By: KEN VEINOT

Sampler ID No.: 20440N

Type of A/S: Ground Prep (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/7/97 9:30

Flow Rate On (CFM or LPM): 18 cfm

Date/Time Off: 10/7/97 9:40

Flow Rate Off (CFM or LPM): 20 cfm

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W	LB5100W		LB5100W	LB5100W	
Serial Number	LB5100W	LB5100W		LB5100W	LB5100W	
Counting Date/Time	10/7/97 12:38	10/8/97 8:42		10/7/97 12:38	10/8/97 8:42	
Gross Counts	501	99		1568	346.06	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	25.05	4.95		78.403	17.303	
Background Counts	1.334	1.334		36.66	36.66	
Bkg Count Time (Min)	~~10~~ 20	20		20	20	
Bkg Counts (cpm)	MDC ~~1.83~~ 0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	24.983	4.883		76.57	15.47	
Counter Efficiency	28.35%	28.35%		43.45%	43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	5.38 E6	5.38 E6		5.37E6	5.38 E6	
Activity (μCi/ml)	1.10 E-11	2.16E-12		1.97E-11	2.98E-12	
MDCR (cpm)	0.985	0.985		1.544	1.544	
MDC (μCi/ml)	2.9×10^{-13}	2.9×10^{-13}		2.9×10^{-13}	2.9×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) Patricia Lopez (Sign) 10/7/97 (Date)

Reviewer D Thomas (Print) D Thomas (Sign) 10/7/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 $\beta\gamma$

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(5.38\times10^{6})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(5.38\times10^{6})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 2.9×10^{-13} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 2.9×10^{-13} µCi/ml $\beta\gamma$ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml $\beta\gamma$

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Darold Thomas (Print) — [signature] (Sign) — 10/7/97 (Date)

Reviewer: Patricia Lopez (Print) — [signature] (Sign) — 10/7/97 (Date)

Sample Location: Decon Room

Sample Number: AS-2

Collected By: Darold Thomas

Sampler ID No.: 20441 N

Type of A/S: GA (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/7/97 9:40

Flow Rate On (CFM or LPM): 22

Date/Time Off: 10/7/97 9:50

Flow Rate Off (CFM or LPM): 23

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W	LB5100W		LB5100W	LB5100W	
Serial Number	LB5100W	LB5100W		LB5100W	LB5100W	
Counting Date/Time	10/7/97 12:59	10/8/97 9:03		10/7/97 12:59	10/8/97 9:03	
Gross Counts	1179.93	264.99		4014.06	862.06	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	58.99	13.25		200.7	43.103	
Background Counts	1.334	1.334		36.66	36.66	
Bkg Count Time (Min)	20	20		20	20	
Bkg Counts (cpm)	0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	58.93	13.183		198.87	41.27	
Counter Efficiency	28.35%	28.35%		43.45%	43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	6.37E6	6.37E6		6.37E6	6.37E6	
Activity (μCi/ml)	6.25 E-10	4.93E-12		1.41E-11	6.71E-12	
MDCR (cpm)	0.985	0.985		1.544	1.544	
MDC (μCi/ml)	2.4×10^{-13}	2.4×10^{-13}		2.5×10^{-13}	2.5×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

NES, Inc. 82A8008 ATTACHMENT D

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/7/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/7/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(6.37\times10^{4})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(6.37\times10^{4})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 2.4×10^{-13} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 2.5×10^{-13} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) — [signature] (Sign) — 10/7/97 (Date)

Reviewer: Harold Thomas (Print) — [signature] (Sign) — 10/7/97 (Date)

Sample Location: Bioirradiation Rm

Sample Number: A5-3

Collected By: D. Reisenweber

Sampler ID No.: 20440

Type of A/S: General Area
BZ or WZ or GA / particulate or iodine

RWP No.: N/A

Date/Time On: 10/7/97 10:15

Flow Rate On (CFM or LPM): 28

Date/Time Off: 10/7/97 10:25

Flow Rate Off (CFM or LPM): 32

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100 W	LB5100W		LB5100W	LB5100W	
Serial Number	LB5100W	LB5100W		LB5100W	LB5100W	
Counting Date/Time	10/7/97 13:14	10/8/97 9:23		10/7/97 13:19	10/8/97 9:23	
Gross Counts	452.95	103.34		1342.06	253.06	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	22.65	5.167		67.103	12.65	
Background Counts	1.334	1.334		36.66	36.66	
Bkg Count Time (Min)	20	20		20	20	
Bkg Counts (cpm)	0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	22.58	3.833		65.27	10.82	
Counter Efficiency	28.35%	28.35%		43.45%	43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	8.5E6	8.5E6		8.5E6	8.5E6	
Activity (μCi/ml)	6.35E-10	1.08E-12		7.97E-10	1.32E-12	
MDCR (cpm)	0.985	0.985		1.554	1.554	
MDC (μCi/ml)	1.84×10^{-13}	1.84×10^{-13}		1.88×10^{-13}	1.88×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/7/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/7/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(8.5\times10^{6})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(8.5\times10^{6})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 1.84×10^{-13} µCi/ml α

MDC = 1.88×10^{-13} µCi/ml βγ

CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

.NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) — Sign — 10/7/97 (Date)

Reviewer: David Thomas (Print) — Sign — 10/7/97 (Date)

Sample Location: 1st Floor Containment, Right Side Entrance

Sample Number: A5-4

Collected By: Patricia Lopez

Sampler ID No.: 20441

Type of A/S: General Area (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/7/97 10:22

Flow Rate On (CFM or LPM): 23

Date/Time Off: 10/7/97 10:32

Flow Rate Off (CFM or LPM): 25

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W	LB5100W	LB5100W	LB5100W	LB5100W	LB510
Serial Number	LB5100W	LB5100W	LB5100W	LB5100W	LB5100W	LB5100
Counting Date/Time	10/7/97 13:40	10/8/97 9:44		10/7/97 13:40	10/8/97 9:44	
Gross Counts	393.93	57.994		1008	249.06	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	19.69	2.899		50.40	12.45	
Background Counts	1.334	1.334		36.66	36.66	
Bkg Count Time (Min)	20	20		20	20	
Bkg Counts (cpm)	0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	19.63	2.833		48.57	10.62	
Counter Efficiency	28.35%	28.35%		43.45%	43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	6.80E6	6.80E6		6.80E6	6.80E6	
Activity (μCi/ml)	1.28E-11	9.93E-13		7.42E-10	1.62E-12	
MDCR (cpm)	0.985	0.985		1.544	1.544	
MDC (μCi/ml)	2.3×10^{-13}	2.3×10^{-13}		2.4×10^{-13}	2.4×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/7/97 (Date)

Reviewer D Thomas (Print) [signature] (Sign) 10/7/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(6.8\times10^{6})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(6.8\times10^{6})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 2.3×10^{-13} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 2.4×10^{-13} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

Air Sample Analysis Data Sheet

Surveyor: Ken Veinot (Print) — Sign — Date: 10/7/97

Reviewer: Patricia Joper (Print) — Sign — Date: 10/7/97

Sample Location: Control Room

Sample Number: A5-5

Collected By: Ken Veinot

Sampler ID No.: 20440

Type of A/S: General Area (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/7/97 10:30

Flow Rate On (CFM or LPM): 27

Date/Time Off: 10/7/97 10:40

Flow Rate Off (CFM or LPM): 27

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W	LB5100W	LB5100W	LB5100W	LB5100W	
Serial Number	LB5100W	LB5100W				
Counting Date/Time	10/7/97 14:00	10/8/97 10:04		10/7/97 14:00	10/8/97 10:04	
Gross Counts	244.93	50.99		792.06	184.06	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	12.25	2.55		39.60	9.203	
Background Counts	1.334	1.334		36.66	36.66	
Bkg Count Time (Min)	20	20		20	20	
Bkg Counts (cpm)	0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	12.18	2.483		37.77	7.37	
Counter Efficiency	28.35%	28.35%		43.45%	43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	7.65E6	7.65E6		7.65E6	7.65E6	
Activity (μCi/ml)	3.79E-12	7.74E-13		5.12E-12	9.98E-13	
MDCR (cpm)	0.985	0.985		1.544	1.544	
MDC (μCi/ml)	2×10^{-13}	2×10^{-13}		2.1×10^{-13}	2.1×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/17/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/17/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(7.65\times10^{6})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(7.65\times10^{6})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 2.0×10^{-13} µCi/ml α — CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 2.1×10^{-13} µCi/ml βγ — CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

CE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) Pat Lopez (Sign) 10/7/97 (Date)

Reviewer: David Thomas (Print) David Thomas (Sign) 10/7/97 (Date)

Sample Location: 1st Floor Containment Left side

Sample Number: AS-6

Collected By: Patricia Lopez

Sampler ID No.: 20941

Type of A/S: General Area (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/7/97 10:35

Flow Rate On (CFM or LPM): 19

Date/Time Off: 10/7/97 10:45

Flow Rate Off (CFM or LPM): 20

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W	LB5100W		LB5100W	LB5100W	
Serial Number	LB5100W	LB5100W		LB5100W	LB5100W	
Counting Date/Time	10/7/97 14:21	10/8/97 10:25		10/7/97 14:21	10/8/97 10:25	
Gross Counts	216.93	43.99		693.00	194.00	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	10.85	2.199		34.65	9.703	
Background Counts	1.334	1.334		36.66	36.66	
Bkg Count Time (Min)	20	20		20	20	
Bkg Counts (cpm)	0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	10.78	2.133		32.82	7.87	
Counter Efficiency	28.35%	28.35%		43.45%	43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	5.52E6	5.52E6		5.52E6	5.52E6	
Activity (μCi/ml)	4.6E-12	9.21E-13		6.17E-12	1.48E-12	
MDCR (cpm)	0.985	0.985		1.554	1.554	
MDC (μCi/ml)	2.8×10^{-13}	2.8×10^{-13}		2.9×10^{-13}	2.9×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/7/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/7/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(5.52\times10^{6})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(5.52\times10^{6})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 2.8×10^{-13} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 2.9×10^{-13} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

E: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Ken Verhoot (Print) — [signature] (Sign) — 10/7/97 (Date)

Reviewer: _____ (Print) — [signature] (Sign) — 10/7/97 (Date)

Sample Location: Balcony Recess from Counter

Sample Number: A3-7

Collected By: Ken Verhoot

Sampler ID No.: 1

Type of A/S: General Area (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/7/97 10:50

Flow Rate On (CFM or LPM): 28

Date/Time Off: 10/7/97 11:00

Flow Rate Off (CFM or LPM): 28

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W	LB5100W		LB5100W	LB5100W	
Serial Number	LB5100W	LB5100W		LB5100W	LB5100W	
Counting Date/Time	10/7/97 14:41	10/8/97 10:46		10/7/97 14:41	10/8/97 10:46	
Gross Counts	180.93	55.79		641.06	179.06	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	9.04	2.79		32.053	8.953	
Background Counts	1.334	1.334		36.666	36.666	
Bkg Count Time (Min)	20	20		20	20	
Bkg Counts (cpm)	0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	8.98	2.723		30.22	7.12	
Counter Efficiency	28.35%	28.35%		43.45%	NDS ~~28~~. 43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	7.93E6	7.93E6		7.93E6	7.93E6	
Activity (µCi/ml)	2.68E-12	8.37E-13		3.91E-12	9.30E-13	
MDCR (cpm)	0.985	0.985		1.554	1.554	
MDC (µCi/ml)	1.97×10^{-13}	1.97×10^{-13}		2.0×10^{-13}	2.0×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (µCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/7/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/7/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(7.93\times10^{6})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(7.93\times10^{6})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 1.97×10^{-13} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 2×10^{-13} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) — Pat Lopez (Sign) — 10/7/97 (Date)

Reviewer: David Thomas (Print) — David Thomas (Sign) — 10/7/97 (Date)

Sample Location: Top of Remote

Sample Number: 15-8

Collected By: Patricia Lopez

Sampler ID No.: 20441

Type of A/S: General Area (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/7/97 1046

Flow Rate On (CFM or LPM): 23

Date/Time Off: 10/7/97 1056

Flow Rate Off (CFM or LPM): 27

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W	LB5100W		LB5100W	LB5100W	
Serial Number	LB5100W	LB5100W		LB5100W	LB5100W	
Counting Date/Time	10/7/97 15:02	10/8/97 11:06		10/7/97 15:02	10/8/97 11:06	
Gross Counts	196	61.994		556.06	214.06	
Sample Count Time (Min)	20	20		20	20	
Gross Counts (cpm)	9.80	3.099		27.803	10.703	
Background Counts	1.334	1.334		36.66	36.66	
Bkg Count Time (Min)	20	20		20	20	
Bkg Counts (cpm)	0.0667	0.0667		1.833	1.833	
Net Counts (cpm)	9.733	3.033		25.97	8.87	
Counter Efficiency	28.35%	28.35%		43.45%	43.45%	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	7.08E6	7.08E6		7.08E6	7.08E6	
Activity (µCi/ml)	3.27E-12	1.02E-12		3.8E-12	1.30E-12	
MDCR (cpm)	0.985	0.985		1.554	1.554	
MDC (µCi/ml)	2.2×10^{-13}	2.2×10^{-13}		2.3×10^{-13}	2.3×10^{-13}	

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (µCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) _____ (Sign) 10/7/97 (Date)

Reviewer D Thomas (Print) _____ (Sign) 10/7/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(7.08\times10^{6})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(7.08\times10^{6})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 2.2×10^{-13} µCi/ml α — CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 2.3×10^{-13} µCi/ml βγ — CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/7/97
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1A035.XLD
Batch Ended: 10/7/97 15:02
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLES 1-8

Carrier	Alpha Activity				Beta Activity				Count	Alpha	Beta	Completion
	DPM	σ	flags	MDA	DPM	σ	flags	MDA	time (min)	CPM	CPM	Date - Time
1	88.111	4.24	>AL	1.34	176.21	6.52	>AL	3.27	20.00	24.983	76.57	10/7/97 12:38
2	207.846	7.07	>AL	1.34	457.67	14.06	>AL	3.27	20.00	58.933	198.87	10/7/97 12:59
3	79.647	4.01	>AL	1.34	150.21	5.81	>AL	3.27	20.00	22.583	65.27	10/7/97 13:19
4	69.243	3.71	>AL	1.34	111.77	4.73	>AL	3.27	20.00	19.633	48.57	10/7/97 13:40
5	42.968	2.87	>AL	1.34	86.92	4.01	<AL	3.27	20.00	12.183	37.77	10/7/97 14:00
6	38.031	2.69	>AL	1.34	75.52	3.67	<AL	3.27	20.00	10.783	32.82	10/7/97 14:21
7	31.682	2.44	>AL	1.34	69.54	3.49	<AL	3.27	20.00	8.983	30.22	10/7/97 14:41
8	34.328	2.55	>AL	1.34	59.76	3.19	<AL	3.27	20.00	9.733	25.97	10/7/97 15:02

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/8/97
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1A036.XLD
Batch Ended: 10/8/97 11:06
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta Into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLES 1-8 (DAY 2)

Carrier	Alpha Activity				Beta Activity			
	DPM	σ	flags	MDA	DPM	σ	flags	MDA
1	17.223	1.79	At AL	1.34	35.60	2.41	<AL	3.27
2	46.495	2.99	>AL	1.34	94.97	4.24	At AL	3.27
3	13.519	1.58	<AL	1.34	24.89	2.03	<AL	3.27
4	9.993	1.36	<AL	1.34	24.43	2.01	<AL	3.27
5	8.758	1.28	<AL	1.34	16.95	1.72	<AL	3.27
6	7.524	1.19	<AL	1.34	18.10	1.77	<AL	3.27
7	9.816	1.35	<AL	1.34	16.38	1.70	<AL	3.27
8	10.698	1.41	<AL	1.34	20.41	1.86	<AL	3.27

Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
20.00	4.883	15.47	10/8/97 8:42
20.00	13.183	41.27	10/8/97 9:03
20.00	3.833	10.82	10/8/97 9:23
20.00	2.833	10.62	10/8/97 9:44
20.00	2.483	7.37	10/8/97 10:04
20.00	2.133	7.87	10/8/97 10:25
20.00	2.783	7.12	10/8/97 10:46
20.00	3.033	8.87	10/8/97 11:06

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor Patricia Lopez (Print) [signature] (Sign) 10/15/97 (Date)

Reviewer Darold Thomas (Print) [signature] (Sign) 10/15/97 (Date)

Sample Location: Plug Storage Area

Sample Number: Vault Area before Tube 1 Open

Collected By: Patricia Lopez

Sampler ID No.: #1

Type of A/S: GA WZ ~~BZ~~ (BZ or WZ or GA / particulate or iodine)

RWP No.: 97-32

Date/Time On: 10/15/97 09:20

Flow Rate On (CFM or LPM): 20

Date/Time Off: 10/15/97 09:43

Flow Rate Off (CFM or LPM): 22

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/15/97 10:38			10/15/97 10:38		
Gross Counts	131133			21659		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	655.66			1082.95		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	655.6			1081.12		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.37E7			1.37E7		
Activity (μCi/ml)	1.14E-10			8.17E-11		
MDCR (cpm)	0.985			1.554		
MDC (μCi/ml)	1.14×10^{-13}			1.17×10^{-13}		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) Patricia Lopez (Sign) 10/15/97 (Date)

Reviewer D Thomas (Print) [signature] (Sign) 10/15/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(1.37\times10^{-7})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(1.37\times10^{-7})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 1.14×10^{-13} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 1.17×10^{-13} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/15/97
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1C011.XLD
Batch Ended: 10/15/97 10:38
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLE - VAULT AREA BEFORE TUBE 1 OPENED

Carrier	Alpha Activity				Beta Activity			
	DPM	σ	flags	MDA	DPM	σ	flags	MDA
1	655.574	15.75	>AL	1.34	1081.12	30.48	>AL	3.27

Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
20.00	185.883	469.77	10/15/97 10:38

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) — Pat Lopez (Sign) — 10/15/97 (Date)

Reviewer: David Thomas (Print) — David Thomas (Sign) — 10/15/97 (Date)

Sample Location: Plug Storage Area

Sample Number: Small Tubes #1 Cont. while opening

Collected By: Darold Thomas

Sampler ID No.: #2

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine)

RWP No.: 97-32

Date/Time On: 10/15/97 09:34

Flow Rate On (CFM or LPM): 20 cfm

Date/Time Off: 10/15/97 12:16

Flow Rate Off (CFM or LPM): 22 cfm

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/15/97 13:56			10/15/97 13:56		
Gross Counts	24623			43913.66		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	1231.16			2195.68		
Background Counts	~~[illegible]~~ 1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	1231.1			2193.85		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.37E8			1.37E8		
Activity (μCi/ml)	2.14E-11			1.66E-11		
MDCR (cpm)	0.985			1.554		
MDC (μCi/ml)	1.14E-14			1.17E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/15/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/15/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(1.37X10^{8})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(1.37X10^{8})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = $1.14X10^{-14}$ µCi/ml α — CONCENTRATION LIMIT = $3X10^{-11}$ µCi/ml α

MDC = $1.17X10^{-14}$ µCi/ml βγ — CONCENTRATION LIMIT = $9X10^{-9}$ µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) — Patricia Lopez (Sign) — 10/15/97 (Date)

Reviewer: Darold Thomas (Print) — Darold Thomas (Sign) — 10/15/97 (Date)

Sample Location: Plug Storage Area

Sample Number: cont. while opening small tubes

Collected By: Darold Thomas

Sampler ID No.: #3

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine)

RWP No.: 97-32

Date/Time On: 10/15/97 9:40

Flow Rate On (CFM or LPM): 20

Date/Time Off: 10/15/97 12:10

Flow Rate Off (CFM or LPM): 22

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/15/97 13:56			10/15/97 13:56		
Gross Counts	20011.3			107648.6		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	1000.56			5382.43		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	1000.5			5380.6		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.25E8			1.25E8		
Activity (μCi/ml)	1.91E-11			4.46E-11		
MDCR (cpm)	0.985			1.554		
MDC (μCi/ml)	1.25E-14			1.28E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) Patricia Lopez (Sign) 10/15/91 (Date)

Reviewer D Thomas (Print) D Thomas (Sign) 10/15/91 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(1.25\times10^{8})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(1.25\times10^{8})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 1.25×10^{-14} µCi/ml α

MDC = 1.28×10^{-14} µCi/ml βγ

CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/15/97
Counting Unit Id: 1
Data file name: C:\LBXL\UNIT1\SME1C014.XLD
Batch Ended: 10/15/97 13:56
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLES -CONT WHILE OPENING SM TUBES

Carrier	Alpha Activity				Beta Activity				Count	Alpha	Beta	Completion
	DPM	σ	flags	MDA	DPM	σ	flags	MDA	time (min)	CPM	CPM	Date - Time
2	1231.149	26.15	>AL	1.34	2193.85	59.68	>AL	3.27	20.00	349.083	953.27	10/15/97 13:35
3	1000.496	22.02	>AL	1.34	5380.61	143.22	>AL	3.27	20.00	283.683	2337.97	10/15/97 13:56

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) — Pat Lopez (Sign) — 10/15/97 (Date)

Reviewer: Darold Thomas (Print) — Darold Thomas (Sign) — 10/15/97 (Date)

Sample Location: Inside Air Sample -

Sample Number: Vertical Beam Port Op

Collected By: Darold Thomas

Sampler ID No.: # 1

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine)

RWP No.: 97-36

Date/Time On: 10/15/97 14:24

Flow Rate On (CFM or LPM): 25

Date/Time Off: 10/15/97 17:23

Flow Rate Off (CFM or LPM): 27

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/16/97 11:52			10/16/97 11:52		
Gross Counts	1989			13926.66		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	99.46			696.33		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	99.4			694.5		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.32E8			1.32E8		
Activity (μCi/ml)	1.79E-12			5.45E-12		
MDCR (cpm)	0.985			1.554		
MDC (μCi/ml)	1.18E-14			1.2E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) Patricia Lopez (Sign) 10/15/97 (Date)

Reviewer D. Thomas (Print) David G. Thomas (Sign) 10/15/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 $\beta\gamma$

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(1.32\times10^{8})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(1.32\times10^{8})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 1.18×10^{-14} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 1.2×10^{-14} µCi/ml $\beta\gamma$ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml $\beta\gamma$

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Patricia Lopez (Print) — Pat Lopez (Sign) — 10/15/97 (Date)

Reviewer: Darold Thomas (Print) — Darold Thomas (Sign) — 10/15/97 (Date)

Sample Location: Outside Air Sample

Sample Number: Vertical Port Ope

Collected By: Darold Thomas

Sampler ID No.: # 2

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine)

RWP No.: 97-36

Date/Time On: 10/15/97 17:23

Flow Rate On (CFM or LPM): 18

Date/Time Off: 10/15/97 17:24

Flow Rate Off (CFM or LPM): 21

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/16 11:31			10/16 11:52		
Gross Counts	1971.33			4000.66		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	98.566			200.03		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	98.5			198.2		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	9.99E7			9.99E7		
Activity (μCi/ml)	2.35E-12			2.05E-12		
MDCR (cpm)	0.985			1.554		
MDC (μCi/ml)	1.57E-14			1.6E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/15/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/15/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(9.99\times10^{7})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(9.99\times10^{7})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 1.57×10^{-14} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 1.6×10^{-14} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/16/97
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1C017.XLD
Batch Ended: 10/16/97 11:52
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLES INSIDE AND OUTSIDE PLUG STORAGE AREA

	Alpha Activity				Beta Activity							
Carrier	DPM	σ	flags	MDA	DPM	σ	flags	MDA	Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
1	99.397	4.54	>AL	1.34	694.49	20.31	>AL	3.27	20.00	28.183	301.77	10/16/97 11:31
2	98.515	4.52	>AL	1.34	198.19	7.13	>AL	3.27	20.00	27.933	86.12	10/16/97 11:52

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Darold Thomas (Print) — Darold S Thomas (Sign) — 10/17/97 (Date)

Reviewer: Patricia Lopez (Print) — Patricia Lopez (Sign) — 10/17/97 (Date)

Sample Location: In Working Area

Sample Number: Horizontal Port 9

Collected By: Darold Thomas

Sampler ID No.: #1

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine)

RWP No.: ~~NTA~~ PS 97-35

Date/Time On: 10/17/97 16:05

Flow Rate On (CFM or LPM): 23

Date/Time Off: 10/17/97 17:25

Flow Rate Off (CFM or LPM): 27

COUNTING DATA	ALPHA			BETA		
Counting System	LB 5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/20/97 9:16			10/20/97 9:16		
Gross Counts	395.33			2773.86		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	19.76			138.69		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	19.7			136.86		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	5.66 E7			5.66E7		
Activity (μCi/ml)	8.3 E-13			2.50E-12		
MDCR (cpm)	0.985			0.985		
MDC (μCi/ml)	2.77E-14			2.8E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (C...

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/17/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/17/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(5.66\times10^{3})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(5.66\times10^{3})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 2.77×10^{-14} µCi/ml α

MDC = 2.8×10^{-14} µCi/ml βγ

CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

'E: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/20/97
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1A063.XLD
Batch Ended: 10/20/97 9:16
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230A.B
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90A.B
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AAIR SAMPLE IN WORKING AREA

Carrier	Alpha Activity				Beta Activity			
	DPM	σ	flags	MDA	DPM	σ	flags	MDA
1	19.691	1.91	At AL	1.34	136.86	5.44	>AL	3.27

Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
20.00	5.583	59.47	10/20/97 9:16

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/20/97
Counting Unit Id: 1
Data file name: C:\LBXL\UNIT1\SME1A068.XLD
Batch Ended: 10/20/97 18:31
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLES

Carrier	Alpha Activity				Beta Activity				Count	Alpha	Beta	Completion
	DPM	σ	flags	MDA	DPM	σ	flags	MDA	time (min)	CPM	CPM	Date - Time
1	831.738	18.97	>AL	1.34	9431.89	249.41	>AL	3.27	20.00	235.833	4098.32	10/20/97 18:10
2	909.328	20.37	>AL	1.34	1686.62	46.37	>AL	3.27	20.00	257.833	732.87	10/20/97 18:31

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/20/97
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1A067.XLD
Batch Ended: 10/20/97 17:19
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLES

Carrier	Alpha Activity				Beta Activity			
	DPM	σ	flags	MDA	DPM	σ	flags	MDA
1	123.203	5.15	>AL	1.34	3633.84	97.43	>AL	3.27
2	233.063	7.61	>AL	1.34	503.59	15.28	>AL	3.27

Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
20.00	34.933	1578.97	10/20/97 16:58
20.00	66.083	218.82	10/20/97 17:19

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor Patricia Lopez (Print) Pat Lopez (Sign) 10/17/97 (Date)

Reviewer Darold Thomas (Print) Darold Thomas (Sign) 10/17/97 (Date)

Sample Location: Inside

Sample Number: Horizontal Ports

Collected By: Darold Thomas

Sampler ID No.: #2

Type of A/S: GA 1wz (BZ or WZ or GA / particulate or iodine)

RWP No.: 97-35

Date/Time On: 10/17/97 11:30

Flow Rate On (CFM or LPM): 27

Date/Time Off: 10/17/97 12:15

Flow Rate Off (CFM or LPM): 27

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/17/97			10/17/97		
Gross Counts	14559			122678.6		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	727.96			6133.9		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	727.9			6132.1		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	3.44E7			3.44E7		
Activity (μCi/ml)	5.05E-11			1.85E-10		
MDCR (cpm)	0.985			1.554		
MDC (μCi/ml)	4.5E-14			4.65E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Efficiency) (Volume in ml)

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) [signature] (Sign) 10/17/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/17/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(3.44\times10^{7})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(3.44\times10^{7})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 4.5×10^{-14} µCi/ml α — CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 4.65×10^{-14} µCi/ml βγ — CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

NOTE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Darold Thomas (Print) — Darold Thomas (Sign) — 10/17/97 (Date)

Reviewer: Patricia Lopez (Print) — Patricia Lopez (Sign) — 10/17/97 (Date)

Sample Location: Outside

Sample Number: Horizontal Beam 3

Collected By: Darold Thomas

Sampler ID No.: 3

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine)

RWP No.: 97-35

Date/Time On: 10/17/97 11:30

Flow Rate On (CFM or LPM): 20

Date/Time Off: 10/17/97 12:15

Flow Rate Off (CFM or LPM): 22

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/17/97 14:37			10/17/97 14:37		
Gross Counts	10100.9			18918.06		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	505.04			945.9		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	504.98			944.07		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	2.68E7			2.68E7		
Activity (µCi/ml)	4.49E-11			3.65E-11		
MDCR (cpm)	0.985			0.985		
MDC (µCi/ml)	5.8E-14			5.97E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (µCi/ml) = (Net cpm) (Conversion Factor) / (C

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) Patricia Lopez (Sign) 10/17/97 (Date)

Reviewer D. Thomas (Print) [signature] (Sign) 10/17/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 $\beta\gamma$

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(2.68\times10^{1})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(2.68\times10^{1})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 5.8×10^{-14} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 5.97×10^{-14} µCi/ml $\beta\gamma$ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml $\beta\gamma$

NOTE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/17/97
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1A061.XLD
Batch Ended: 10/17/97 14:37
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.65%
Alpha Background (CPM): 0.066666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 0.66%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLES 10/17/97

Carrier	Alpha Activity				Beta Activity				Count	Alpha	Beta	Completion
	DPM	σ	flags	MDA	DPM	σ	flags	MDA	time (min)	CPM	CPM	Date - Time
1	727.874	17.08	>AL	1.34	6132.13	162.92	>AL	3.27	20.00	206.383	2664.52	10/17/97 14:16
2	504.980	12.95	>AL	1.34	944.07	26.88	>AL	3.27	20.00	143.183	410.22	10/17/97 14:37

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Darold Thomas (Print) — [signature] (Sign) — 10/20/97 (Date)

Reviewer: Patricia Lopez (Print) — [signature] (Sign) — 10/20/97 (Date)

Sample Location: Inside Area While Cutting V-12 Sample Number: Vertical Plug

Collected By: Darold Thomas Sampler ID No.: 2

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine) RWP No.: N/A

Date/Time On: 10/20/97 9:25 Flow Rate On (CFM or LPM): 21

Date/Time Off: 10/20/97 10:25 Flow Rate Off (CFM or LPM): 21

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/20/97			10/20/97		
Gross Counts	15211.3			116748.7		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	760.56			5837.4		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	760.5			5835.6		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	3.57E7			3.57E7		
Activity (µCi/ml)	5.08E-11			1.69 E-10		
MDCR (cpm)	0.985			1.554		
MDC (µCi/ml)	4.4E-14			4.5E-14		

Comments:

NOTE: (ft^3) (2.832 E4) = ml $\left(\frac{1}{10^{-3}ml}\right)$

Activity (µCi/ml) = (Net cpm) (Conversion Factor) / (C...

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) _____ (Sign) 10/20/97 (Date)

Reviewer D. Thomas (Print) _____ (Sign) 10/20/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(3.57\times10^{7})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(3.57\times10^{7})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 4.4×10^{-14} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 4.5×10^{-14} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

NES, Inc. 82A8008 ATTACHMENT B

Air Sample Analysis Data Sheet

Surveyor: Darold Thomas (Print) — Darold Thomas (Sign) — 10/20/97 (Date)

Reviewer: Patricia Lopez (Print) — Patricia Lopez (Sign) — 10/20/97 (Date)

Sample Location: Outside while cutting V-12

Sample Number: Vertical Plugs

Collected By: Darold Thomas

Sampler ID No.: 3

Type of A/S: WZ (BZ or WZ or GA / particulate or iodine)

RWP No.: N/A

Date/Time On: 10/20/97 8:43

Flow Rate On (CFM or LPM): 10

Date/Time Off: 10/20/97 10:07

Flow Rate Off (CFM or LPM): 10

COUNTING DATA	ALPHA			BETA		
Counting System	LB5100W			LB5100W		
Serial Number	LB5100W			LB5100W		
Counting Date/Time	10/20/97 11:08			10/20/97 11:08		
Gross Counts	54109			90933.66		
Sample Count Time (Min)	20			20		
Gross Counts (cpm)	2705.5			4546.68		
Background Counts	1.334			36.66		
Bkg Count Time (Min)	20			20		
Bkg Counts (cpm)	0.0667			1.833		
Net Counts (cpm)	2705.4			4544.85		
Counter Efficiency	28.35%			43.45%		
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	2.24E7			2.24E7		
Activity (μCi/ml)	6.45E-10			2.10E-10		
MDCR (cpm)	0.985			1.554		
MDC (μCi/ml)	7×10^{-14}			7.1×10^{-14}		

Comments:

NOTE: (ft^3) (2.832 E4) = ml

Activity (μCi/ml) = (Net cpm) (Conversion Factor) / (Counter Eff...

MDCR/MDC Calculation Sheet

By Patricia Lopez (Print) _____ (Sign) 10/20/97 (Date)

Reviewer D. Thomas (Print) _____ (Sign) 10/20/97 (Date)

MDCR CALCULATION:

$$MDCR = \frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}$$

where:
R_b = background counting rate
T_b = background counting time
T_s = sample count time

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(0.667)}{(20)} + \frac{(0.667)}{(20)}} \quad \alpha$$

$$MDCR = \frac{2.71}{(20)} + 3.29\sqrt{\frac{(1.833)}{(20)} + \frac{(1.833)}{(20)}} \quad \beta\gamma$$

MDCR = 0.985 α

MDCR = 1.544 βγ

MDC CALCULATION:

$$MDC = \frac{MDCR}{(Volume)\ (Eff.)\ (2.22E6)}$$

where:
Volume is in milliliters
(should be at least 1 E6 ml)
Efficience is in decimal form

$$MDC = \frac{(0.985)}{(2.24\times10^{3})\ (.2835)\ (2.22E6)} \quad \alpha$$

$$MDC = \frac{(1.544)}{(2.24\times10^{3})\ (.4345)\ (2.22E6)} \quad \beta\gamma$$

MDC = 7×10^{-14} µCi/ml α CONCENTRATION LIMIT = 3×10^{-11} µCi/ml α

MDC = 7.1×10^{-14} µCi/ml βγ CONCENTRATION LIMIT = 9×10^{-9} µCi/ml βγ

TE: The MDC should be less then 10% of the concentration limit. If it is not contact the SS. It may be necessary to increase sample volume or sample count time.

LB5100-W Low Background Counting System -- Smear Analysis

Date: 10/20/97
Counting Unit Id: 1
Data file name: C:\LBXL\UNIT1\SME1A064.XLD
Batch Ended: 10/20/97 11:08
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 20.00
Beta activity action level (DPM): 100.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1490

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: TH230AB
Alpha Efficiency: 28.35%
Alpha to Beta Crosstalk: 28.35%
Alpha Background (CPM): 0.036666667
Alpha Correction Factor: 1.000

Beta efficiency log file: SR90AB
Beta Efficiency: 43.45%
Beta into Alpha Crosstalk: 2.63%
Beta Background (CPM): 1.833333333
Beta Correction Factor: 1.000

Batch ID: AIR SAMPLE

Carrier	Alpha Activity DPM	Alpha Activity σ	Alpha Activity flags	Alpha Activity MDA	Beta Activity DPM	Beta Activity σ	Beta Activity flags	Beta Activity MDA	Count time (min)	Alpha CPM	Beta CPM	Completion Date - Time
2	760.497	17.67	>AL	1.34	5835.60	155.14	>AL	3.27	20.00	215.633	2535.67	10/20/97 10:48
3	2705.354	52.26	>AL	1.34	4544.85	121.31	>AL	3.27	20.00	767.083	1974.83	10/20/97 11:08