Appendix A

Chamber 3 area
Survey Design

FirstEnergy

SNEC CALCULATION COVER SHEET

CALCULATION DESCRIPTION

Calculation Number	Revision Number	Effective Date	Page Number
E900-03-032	0	8/2/04	1 of 10

Subject

Top of Seal Chamber 3 - Survey Design

Question 1 - Is this calculation defined as "In QA Scope"? Refer to definition 3.5. Yes ☒ No ☐

Question 2 - Is this calculation defined as a "Design Calculation"? Refer to definitions 3.2 and 3.3. Yes ☒ No ☐

Question 3 - Does the calculation have the potential to affect an SSC as described in the USAR? Yes ☐ No ☒

NOTES: If a "Yes" answer is obtained for Question 1, the calculation must meet the requirements of the SNEC Facility Decommissioning Quality Assurance Plan. If a "Yes" answer is obtained for Question 2, the Calculation Originator's immediate supervisor should not review the calculation as the Technical Reviewer. If a "YES" answer is obtained for Question 3, SNEC Management approval is required to implement the calculation. Calculations that do not have the potential to affect SSC's may be implemented by the TR.

DESCRIPTION OF REVISION

APPROVAL SIGNATURES

Calculation Originator	B. Brosey/ B. Brosey	Date	8/2/04
Technical Reviewer	R. Holmes/ Robert A. Holmes	Date	8/2/04
Additional Review	A. Paynter/ [signature]	Date	2Aug04
Additional Review		Date	
SNEC Management Approval		Date	

1.0 PURPOSE

1.1 The purpose of this calculation is to develop a survey design for the top of Seal Chamber 3 (SC3) (roof and walls). Seal Chamber 3 survey units are shown in **Attachment 1-1** & **1-2**.

Table 1, Survey Unit Information

Survey Units	Location	Material Types	Area Classification	Area (m^2)
SS17-1	Walls Above Seal Chamber 3 Roof	Concrete/Steel	3	35.4
SS18-1	Roof of Seal Chamber 3	Concrete/Steel	2	20.4

NOTE: There is << 2 m^2 of steel surface area included within these survey units. The majority of this steel surface is severely corroded with portions that are difficult to access.

2.0 SUMMARY OF RESULTS

The following information should be used to develop a survey request for this survey design:

2.1 GFPC Scanning Criteria

2.1.1 A gas flow proportional counter (GFPC) shall be used in the beta detection mode for the initial scan survey work (Ludlum 2350-1 with a 43-68B probe).

2.1.2 All GFPC instruments used shall demonstrate an efficiency (ε_t) at or above ***23.9%*** (value used for planning). Detector efficiency factors are presented in the following Table.

Table 2, GFPC Detection Efficiency Results Used for Planning

Material Type	ε_i	ε_s	ε_t (as %)*	ECF	% Cs-137	Resulting counts/disintegration
Concrete	0.478	0.5	23.9%	0.881	0.851	0.179

*Typical SNEC GFPC detector efficiency factors (as of 7/1/04) are provided in **Attachment 2-1**.

NOTE 1: *Total efficiency should not be less than ε_t value for any instrument used during this survey effort.*

2.1.3 An efficiency correction factor (ECF) is applied to compensate for efficiency loss over rough surface areas based on **Reference 3.1** criteria and **Attachment 3-1**.

2.1.4 The amount of detectable beta emitter is dependant on the amount of Cs-137 present in the radionuclide mix. From **Reference 3.2** the mix is determined to be 85.12% Cs-137. No other nuclides are credited with providing any additional detectable beta emissions for this mix.

Table 3, Summary Of GFPC Scanning Parameters

Instrument Type Used	Area or Structure	Material Type	Scan Speed	Surface to Detector Face	Coverage	MDCscan
GFPC (beta)	SS17-1 & SS18-1	Concrete	0.9" per sec (2.2 cm/sec)	Contact	50%	738 dpm/100 cm^2
GFPC (beta)	SS17-1 & SS18-1	Steel	0.9" per sec (2.2 cm/sec)	Contact	All available in designated area*	738 dpm/100 cm^2

The scan locations are assigned IAW Table 5-5 of **Reference 3.3**. See **Attachment 1-1** for areas identified for scanning.

*Only lightly corroded and accessible steel surfaces should be scanned using a GFPC beta detection system. A lightly corroded steel surface is typically discolored and may be not entirely smooth, but it must not have significant scale present (surface erosion). When in doubt about surface quality, contact the cognizant GRCS.

2.1.5 The action level during first phase scanning is ***900 cpm*** above background. If this level is reached, the surveyor should stop and perform a count of at least ***1/2 minute*** duration to identify the actual second phase count rate from the elevated area. If the second phase count rate is equal to or greater than ***1,300 cpm***, the area must be identified, bounded and documented to include an area estimate.

2.1.6 Any area or hardware that cannot be adequately surveyed with a GFPC as described in Table 3 above, should be identified for NaI scanning IAW Section 2.2.

2.2 NaI Scanning Criteria

2.2.1 A 2" by 2" diameter NaI detector with a Cs-137 window setting shall be used for gamma scanning these survey units IAW Table 4 parameters.

2.2.2 The conversion factor for NaI survey instruments used shall not be less than ***208,302 cpm/mR/h*** (see **Attachment 2-1** for current NaI instrument conversion factors as of 7-1-04).

Table 4, Summary Of Scanning Parameters

Instrument Type Used	Area or Structure	Material Type	Scan Speed	Surface to Detector Face	Coverage	MDCscan*
NaI (2" by 2" Cs-137 Window)	SS17-1 & SS18-1	Concrete	1" per sec (2.54 cm/sec)	2" (5.08 cm)	50%	2.7 pCi/g
NaI (2" by 2" Cs-137 Window)	SS18-1	Steel	2" per sec (5.08 cm/sec)	2" (5.08 cm)	100%	4,208 dpm/100 cm^2

The scan locations are assigned IAW Table 5-5 of Reference 3.3. See **Attachment 1-1** for areas identified for scanning.

*See **Attachment 4-1 to 4-4** for calculation results based on a 100 cpm background value.

2.2.3 The action level during first phase scanning using a NaI instrument is ***200 gross cpm***. If this level is reached, the surveyor should stop and perform a count of at least 15 seconds duration to identify the actual count rate of the elevated area.

2.2.4 Based on NaI scanning work, sample areas IAW the following:

2.2.4.1 When an area is confirmed to be above the action level the location should be marked for sampling (see Section 2.5) These areas shall be bounded and documented, and

2.2.4.2 At the highest location encountered during the NaI scanning process.

2.3 DCGLw Values

The following Table shows the DCGLw values that were used to plan surveys in these areas. Note that the SNEC facility has no specific volumetric DCGLw value for concrete. Instead, the soil volumetric DCGLw is used as a planning tool.

With regard to NaI scanning, a NaI detector is used to scan the areas shown on **Attachment 1-1.** Areas above the action level are then sampled to determine their real concentration and show what fraction of Table 5 values exist in the sampled media.

Table 5, Summary Of DCGLw Values

FSS Calculation No.	Surface DCGLw (dpm/100 cm²)	Volumetric DCGLw (pCi/g)
E900-04-008	GA = 7,650 (5,737 A.L.)	3.19 (2.39 A.L.) for Cs-137

DCGLw values from Reference 3.2.

2.4 *Fixed Point GFPC Static Measurements*

2.4.1 The minimum required number of static survey points for each area is provided in Table 6 (see **Attachment 5-1** to **5-4** for calculation of minimum No. of random start systematic grid survey points – Compass output). See **Attachment 6-1** to **6-2** for calculation of GFPC MDCscan value.

Table 6, Minimum No. Random Start Systematic Grid Survey Points (GFPC)

Survey Units	Location	Static Points
SS17-1	Walls Above Seal Chamber 3	8
SS18-1	Roof of Seal Chamber 3	8

See Attachment 7-1 for locations of fixed point measurements.

2.4.2 VSP (**Reference 3.4**) is used to plot all measurement points on **Attachment 7-1.** The actual number of random start systematically spaced measurement points is greater than that required by the Compass computer code because of any of the following:

- placement of the initial random starting point (edge effects),
- odd shaped diagrams, and/or
- coverage concerns

2.5 *Sampling of Concrete and Steel Surfaces*

Sample concrete or steel materials at locations above action levels when scanning with a NaI detector. (see Section 2.2).

2.5.1 A 4" long core bore sample is preferred so that the depth of penetration can be identified. However, when a core bore cannot be taken because of the quality of the concrete, or because of limited access in an area, sampling should remove the first 1" of concrete and yield a volume of at least ***200 cc*** to ensure an adequate counting MDA for Cs-137 (a 4" diameter area by 1" deep = ~200 cc).

2.5.2 For steel surfaces above the action level, scrape the surface to collect a sample for gamma scanning by removing as much material as possible in the suspect area. Document the approximate size of the area where the materials were removed. Whenever possible, obtain a volume of no less then 25 cc's (200 cc's is preferred).

2.5.3 In general, samples should be collected at all locations where measurements indicate elevated count rates exist above action levels, or where measurement capability is deemed inadequate due to poor geometry.

3.0 REFERENCES

3.1 SNEC Calculation No. 6900-02-028, GFPC Instrument Efficiency Loss Study.

3.2 SNEC Calculation No. E900-04-008, "Assessment of E900-03-030, Rev 0 – Seal Chambers – Survey Plan".

3.3 Plan SNEC Facility License Termination Plan.

3.4 Visual Sample Plan, Version 2.0 (or greater), Copyright 2002, Battelle Memorial Institute.

3.5 ISO 7503-1, Evaluation of Surface Contamination, Part 1: Beta-emitters (maximum beta energy greater than 0.15 MeV) and alpha-emitters, 1988.

3.6 SNEC Procedure E900-IMP-4520.06, "Survey Unit Inspection in Support of FSS Design".

3.7 GPU Nuclear, SNEC Facility, SSGS Footprint, Drawing, SNECRM-039, 040 & 041.

3.8 SNEC Procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA".

3.9 MicroShield, Computer Radiation Shielding Code, Version 5.05-00121, Grove Engineering.

3.10 NUREG-1507, "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions," June 1998.

3.11 SNEC Procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination".

3.12 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual", August, 2000.

3.13 Compass Computer Program, Version 1.0.0, Oak Ridge Institute for Science and Education.

3.14 Microsoft Excel 97, Microsoft Corporation Inc., SR-2, 1985-1997.

4.0 ASSUMPTIONS AND BASIC DATA

4.1 Remediation History

The roof of Seal Chamber 3 is located in the footprint of the SSGS area. This area was cleaned-up (general housekeeping) to remove loose material and prepare the area for FSS. A post remediation type survey was then performed in the area. However, no remediation was necessary with exception of removal of all downcomer steel cover plates to allow access to Seal Chamber 3. Since access to and from the interior of Seal Chamber 3 was via this route, the same radionuclide mix is assumed for this area as was used inside Seal Chamber 3.

4.2 Cs-137's detection efficiency has been checked by SNEC personnel using ISO standard 7503-1 methodology (**Reference 3.5**). The SNEC facility uses a conservatively low GFPC efficiency as input to the survey design process.

4.3 Survey unit variability (GFPC only) used to plan the number of fixed point measurement locations, is shown in **Attachment 8-1**.

4.4 An GFPC detector stand-off distance of 0.33" is assumed for all areas to compensate for rough surfaces in each survey unit. This factor corrects the overall efficiency by a factor of 0.88 (see **Reference 3.1**), as shown on **Attachment 3-1**.

4.5 The detectors physical probe area is 126 cm^2, and the instrument is calibrated to the same source area for Cs-137. The gross activity DCGLw is taken to be 5,737 dpm/100 cm^2 x (126 cm^2 physical probe area/100 cm^2) = 7,229 (0.8512 disintegration of Cs-137/ disintegration in mix) x ε_i (0.478) x ε_s (0.5) x 0.881 (distance factor) which yields ~1,296 net cpm above background (Compass calculates 1,301 ncpm as the gross beta DCGLw). The 0.1792 count per disintegration counting efficiency considers only the Cs-137 contaminant present in the sample material matrix, and is calculated by: ε_i (0.478) x ε_s (0.5) x 0.8512 disintegration of Cs-137/disintegration in mix x 0.881 (efficiency loss factor due to distance from surface) = ***0.179 cts/disintegration***.

4.6 Survey units described in this survey design were inspected IAW **Reference 3.6.** A copy of portions of the SNEC facility post-remediation inspection report are included (see **Attachment 9-1** to **9-4**). Surface defects (gouges, cracks, etc.), are present within these survey units, yielding a mean rough surface factor of 0.881. Thus the average concentration of the source term will be overestimated by using this factor for all surfaces (GFPC only).

4.7 Inaccessible areas or corroded steel surfaces, or any area where a 43-68 beta probe can not be used, shall be scanned using a 2" x 2" NaI detector.

4.8 MicroShield models containing Cs-137 were developed for this survey design. One slab and one surface model were used to work out NaI scan MDC values (see **Attachment 10-1** to **10-3**):

1) a 1" thick slab of concrete 12" in diameter with a density of 2.35 g/cc. This model assumes that the majority of the activity resides in no more than the first inch of concrete and that elevated areas are small in diameter. These models are based on previous remediation information from other areas within the SSGS facility.

2) a surface deposition of 12" in diameter to simulate a surface area of concrete or steel. A 1/8" layer of Fe_xO_x is assumed to compensate for a heavily corroded steel surfaces.

4.9 The modeled concentration used was 1 pCi/g or 1 pCi/cm^2 Cs-137, and a full density concrete is assumed. Then the concentration of Cs-137 in the first model is 2.35g/cc x 1 pCi/g or 2.35E-06 uCi/cc of Cs-137 for slab model, and 1.00E-06 uCi/cm^2 for the surface model. The calculated MDCscan for these two models is shown in the following table for a typical 2" by 2" NaI detector.

Table 7, NaI Scanning Parameters

Material/Model	Estimated BKGND (cts/min)	MDC_{SCAN}
1" Concrete Slab (2.35 g/cc)	100	Attachment 4-1 & 4-2 = 2.7 pCi/g
Surface Deposition	100	Attachment 4-3 & 4-4 = 4,208 dpm/100 cm^2

See attachment 4-1 to 4-4.

4.10 The results of the MicroShield modeling indicate that an exposure rate of approximately 7.888E-05 mR/h is obtained at a distance of 3" (2" inches from the face of the detector), from the surface of the slab model, and 1.563E-05 mR/h is seen 3 inches from the surface model. Exposure rate is measured to the center of the detector and therefore the air gap between the surface of both models is taken to be 2".

4.11 The majority of the structural surface area is concrete. GFPC measurements of structural concrete are compared to concrete background values (see Williamsburg concrete background values – **Attachment 11-1**).

4.12 The scan MDC calculation is determined based on a 1.38 index of sensitivity at a 95% correct detection probability and 60% false positive rate. In all cases, the scan MDC is less than the gross activity DCGLw for these survey units. A surveyor efficiency factor of 0.5 is assumed.

4.13 No special area characteristics including any additional residual radioactivity (not previously noted during characterization) have been identified in these survey units.

4.14 No special measurements are included for this survey design.

4.15 The applicable SNEC site radionuclides and their associated DCGLw values are listed on Exhibit 1 of this calculation.

4.16 The survey design checklist is listed in Exhibit 2.

4.17 Diagrams shown in this survey design have been developed from **Reference 3.7.**

4.18 There are no Class 1 survey units covered by this survey design. Thus area factors do not apply to these survey units.

4.19 The decision error for this survey design are listed on **Attachment 5-1** to **5-4** and are justified IAW Reference 3.3 criteria.

4.20 Analysis results (MDA requirements, etc.) will be IAW **Reference 3.11** criteria.

5.0 CALCULATIONS

5.1 All complex calculations are performed internal to applicable computer codes or within an Excel spreadsheet previously identified.

6.0 APPENDICES

6.1 **Attachment 1-1** to **1-2**, diagram/photo of Seal Chamber 3 area.

6.2 **Attachment 2-1**, is typical calibration information for NaI and GFPC detection systems used at the SNEC facility as of 7-1-04.

6.3 **Attachment 3-1**, is a calculation result for determining efficiency loss for a GFPC detector as a function of distance from a source.

6.4 **Attachment 4-1** to **4-4**, is calculation sheets to determine the scan MDC for a NaI detection system using a typical background count rate and a 12" diameter, 1" thick MicroShield slab model, and a 12" diameter surface deposition model.

6.5 **Attachment 5-1** to **5-4,** are Compass output results for the top of Seal Chamber 3.

6.6 **Attachment 6-1** to **6-2**, are calculation sheets used to determine the scan MDC for a GFPC detection system.

6.7 **Attachment 7-1**, is the random start, systematic grid diagram of GFPC fixed point survey locations.

6.8 **Attachment 8-1**, is the GFPC variability measurements from the roof of Seal Chamber three (3).

6.9 **Attachment 9-1** to **9-4**, are sections of survey unit inspection reports for the top of the Seal Chamber 3 area.

6.10 **Attachment 10-1** to **10-3**, is MicroShield output for two (2) models used for planning NaI measurements. Model one is a 1" thick slab. Model two is for a surface deposition.

6.11 **Attachment 11-1**, are background measurements of concrete using a GFPC instrument in an non-impacted area (Williamsburg).

Exhibit 1

SNEC Facility Individual DCGL Values [a]

Radionuclide	25 mrem/y Limit Surface Area (dpm/100cm^2)	25 mrem/y Limit (All Pathways) Open Land Areas (Surface & Subsurface) (pCi/g)	4 mrem/y Goal (Drinking Water) Open Land Areas [b] (Surface & Subsurface) (pCi/g)
Am-241	2.7E+01	9.9	2.3
C-14	3.7E+06	2	5.4
Co-60	7.1E+03	3.5	67
Cs-137	2.8E+04	6.6	397
Eu-152	1.3E+04	10.1	1440
H-3	1.2E+08	132	31.1
Ni-63	1.8E+06	747	1.9E+04
Pu-238	3.0E+01	1.8	0.41
Pu-239	2.8E+01	1.6	0.37
Pu-241	8.8E+02	86	19.8
Sr-90	8.7E+03	1.2	0.61

NOTES:

(a) While drinking water DCGLs will be used by SNEC to meet the drinking water 4 mrem/y goal, only the DCGL values that constitute the 25 mrem/y regulatory limit will be controlled under this LTP and the NRC's approving license amendment.

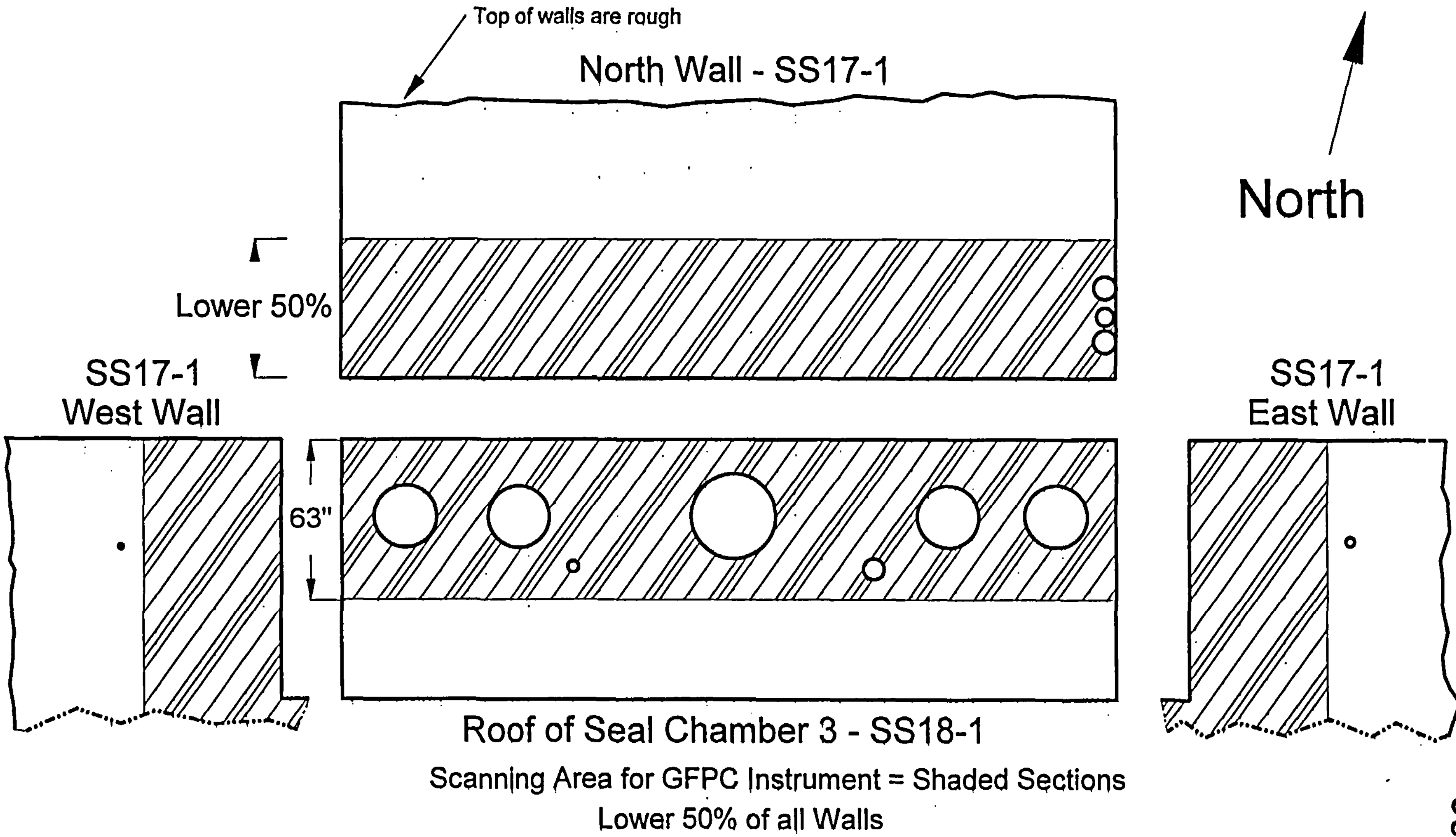
(b) Listed values are from the subsurface model. These values are the most conservative values between the two models (i.e., surface & subsurface).

Exhibit 2

Survey Design Checklist (From Reference 3.8)

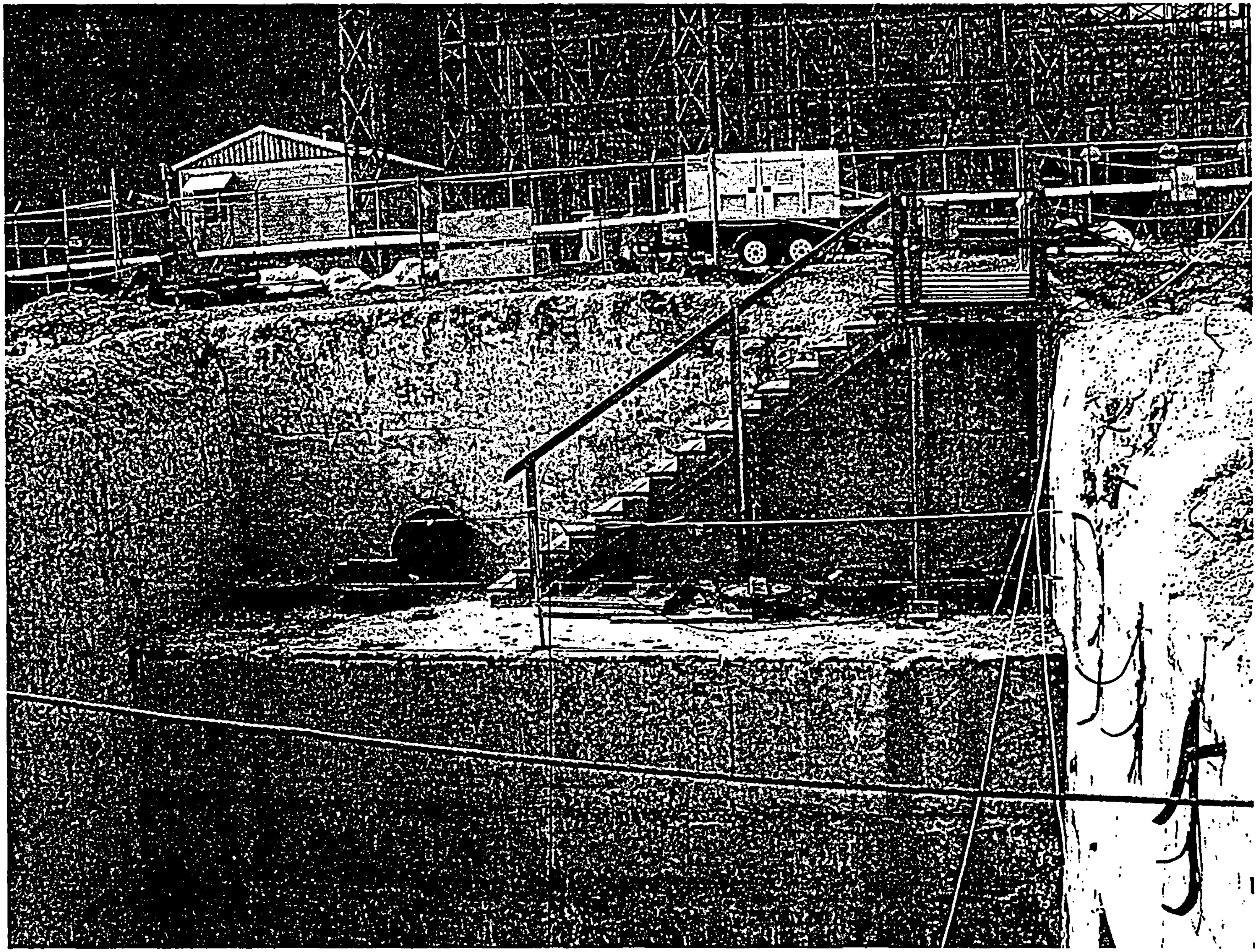
Calculation No. E900-03-032	SS17-1 & SS18-1		
ITEM	**REVIEW FOCUS**	**Status (Circle One)**	**Reviewer Initials & Date**
1	Has a survey design calculation number been assigned and is a survey design summary description provided?	(Yes) N/A	[initials] 8/2/04
2	Are drawings/diagrams adequate for the subject area (drawings should have compass headings)?	(Yes) N/A	[initials] 8/2/04
3	Are boundaries properly identified and is the survey area classification clearly indicated?	(Yes) N/A	[initials] 8/2/04
4	Has the survey area(s) been properly divided into survey units IAW EXHIBIT 10	(Yes) N/A	[initials] 8/2/04
5	Are physical characteristics of the area/location or system documented?	(Yes) N/A	[initials] 8/2/04
6	Is a remediation effectiveness discussion included?	Yes, (N/A)	[initials] 8/2/04
7	Have characterization survey and/or sampling results been converted to units that are comparable to applicable DCGL values?	(Yes) N/A	[initials] 8/2/04
8	Is survey and/or sampling data that was used for determining survey unit variance included?	(Yes) N/A	[initials] 8/2/04
9	Is a description of the background reference areas (or materials) and their survey and/or sampling results included along with a justification for their selection?	(Yes) N/A	[initials] 8/2/04
10	Are applicable survey and/or sampling data that was used to determine variability included?	(Yes) N/A	[initials] 8/2/04
11	Will the condition of the survey area have an impact on the survey design, and has the probable impact been considered in the design?	(Yes) N/A	[initials] 8/2/04
12	Has any special area characteristic including any additional residual radioactivity (not previously noted during characterization) been identified along with its impact on survey design?	Yes, (N/A)	[initials] 8/2/04
13	Are all necessary supporting calculations and/or site procedures referenced or included?	(Yes) N/A	[initials] 8/2/04
14	Has an effective DCGLw been identified for the survey unit(s)?	(Yes) N/A	[initials] 8/2/04
15	Was the appropriate $DCGL_{EMC}$ included in the survey design calculation?	Yes, (N/A)	[initials] 8/2/04
16	Has the statistical tests that will be used to evaluate the data been identified?	(Yes) N/A	[initials] 8/2/04
17	Has an elevated measurement comparison been performed (Class 1 Area)?	Yes, (N/A)	[initials] 8/2/04
18	Has the decision error levels been identified and are the necessary justifications provided?	(Yes) N/A	[initials] 8/2/04
19	Has scan instrumentation been identified along with the assigned scanning methodology?	(Yes) N/A	[initials] 8/2/04
20	Has the scan rate been identified, and is the MDCscan adequate for the survey design?	(Yes) N/A	[initials] 8/2/04
21	Are special measurements e.g., in-situ gamma-ray spectroscopy required under this design, and is the survey methodology, and evaluation methods described?	Yes, (N/A)	[initials] 8/2/04
22	Is survey instrumentation calibration data included and are detection sensitivities adequate?	(Yes) N/A	[initials] 8/2/04
23	Have the assigned sample and/or measurement locations been clearly identified on a diagram or CAD drawing of the survey area(s) along with their coordinates?	(Yes) N/A	[initials] 8/2/04
24	Are investigation levels and administrative limits adequate, and are any associated actions clearly indicated?	(Yes) N/A	[initials] 8/2/04
25	For sample analysis, have the required MDA values been determined.?	(Yes) N/A	[initials] 8/2/04
26	Has any special sampling methodology been identified other than provided in Reference 6.3?	Yes, (N/A)	[initials] 8/2/04

NOTE: a copy of this completed form or equivalent, shall be included within the survey design calculation.



ATTACHMENT 1 . 1

JUL 30 2004



ATTACHMENT 1 . 2

JUL 30 2004

JUL 3 0 2004

2350 INSTRUMENT AND PROBE EFFICIENCY CHART
7/01/04 (Typical 2" by 2" NaI (Cs-137 W) Conversion Factors)

Inst.#	Cal Due	AP #		Probe #	Cal Due	cpm/mR/h
98625	5/18/05	R & Y		211680 Pk	5/18/05	214.882
98647	5/18/05	G &Y		211667 Pk	5/18/05	218.807
129423	5/18/05	P &Y		211687 Pk	5/18/05	213.539
117573	5/18/05	O &Y		211674 Pk	5/18/05	212.173
117566	4/9/05	G&R		185852 Pk	4/13/05	209.862
126183	11/19/04	B&R		206280 Pk	12/12/04	190,907
129429	11/3/04	Y&W		206283 Pk	10/31/04	177185
126198	11/03/04	R&W		196021Pk	5/25/05	209.194
126172	6/07/05	G&W		196022	6/07/05	208.302
129440	4/09/05	O&W		210938 Pk	4/14/05	205.603
120588	6/08/05	B&W		185844 Pk	6/09/05	216.654
95361	6/25/05	P&W		025686	6/28/05	211.799

2350 INSTRUMENT AND PROBE EFFICIENCY CHART
7/01/04 (Typical 43-68 Beta Efficiency Factors)

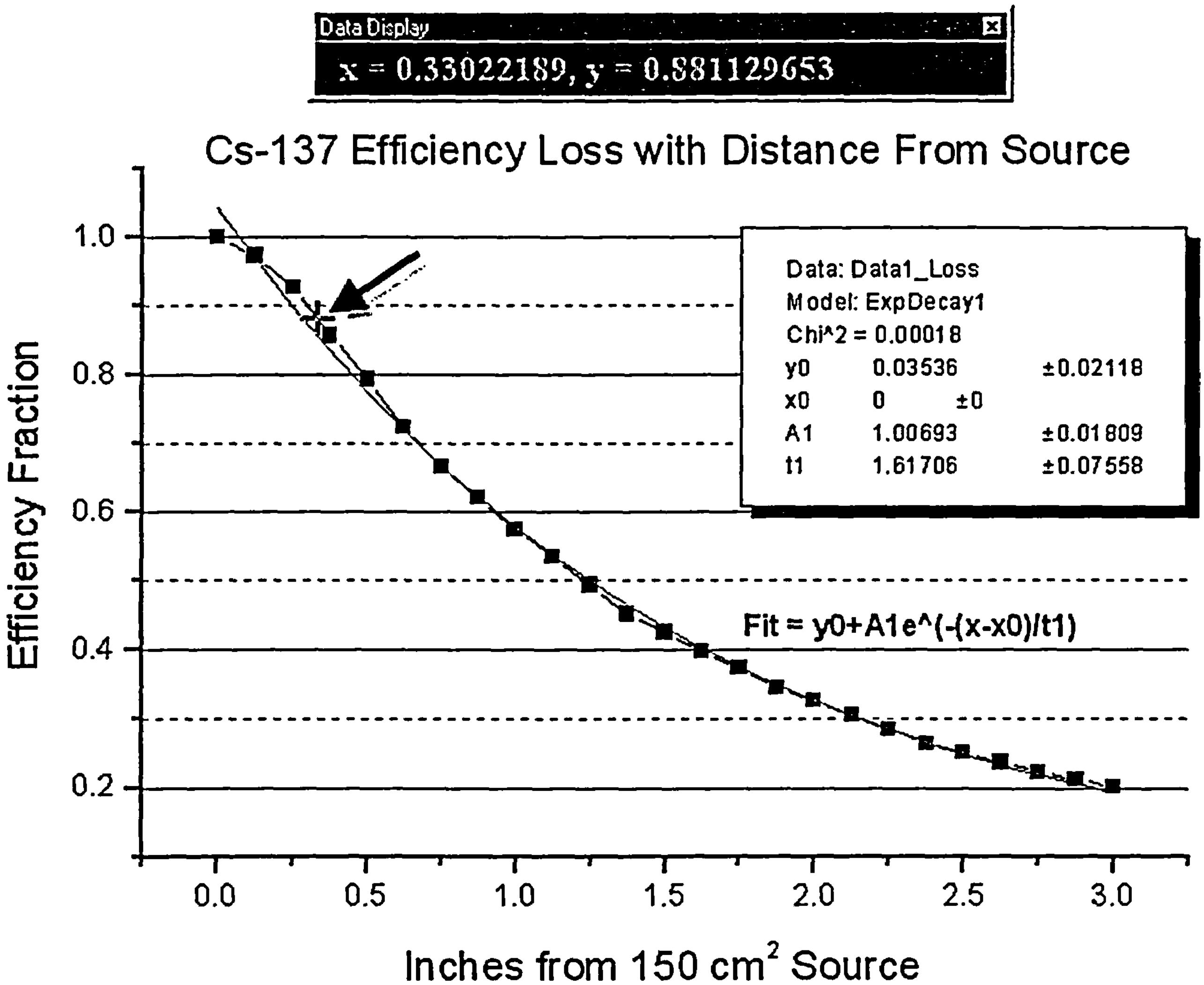
Different Instrument/Probe Cal. Due	Cesium only instruments (10mV to 100)

INST #	INST C/D	43-68 PROBE #	PROBE C/D	44-10 PROBE #	PROBE C/D	BETA EFF	ALPHA EFF
79037	04/05/05	122014	04/23/05			25.2%	N/A
126188	1/27/05	099186	1/27/05			28.2%	N/A
126218	01/08/05	095080	01/09/05			27.9%	N/A

ATTACHMENT 2.1

JUL 3 0 2004

1



ATTACHMENT 3.1

NaI Scan MDC Calculation - Concrete Volume

JUL 3 0 2004

$b := 100$ $p := 0.5$ $HS_d := 30.48$ $SR := 2.54$ $d := 1.38$

$Conv := 208.302$ $MS_{output} := 7.888 \cdot 10^{-5}$

$\frac{HS_d}{SR} = 12$ *Observation Interval (seconds)*

$O_i := \frac{HS_d}{SR}$ *Observation Interval (seconds)*

$$b_i := \frac{(b \cdot O_i)}{60}$$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 30.858$ *net counts per minute*

$$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$$

$MDCR_{surveyor} = 43.639$ *net counts per minute*

$$MDER := \frac{MDCR_{surveyor}}{Conv}$$

$MDER = 0.21$ μR/h

$$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$$

$MDC_{scan} = 2.656$ pCi/g

JUL 3 0 2004

where:

b = background in counts per minute

b_i *= background counts in observation interval*

Conv = NaI manufacturers reported response to energy of contaminant (cpm/uR/h)

d = index of sensitivity (Table 6.5 MARSSIM), 1.38 = 95% of correct detection's, 60% false positives

HS_d *= hot spot diameter (in centimeters)*

MDC_{scan} *= Minimum Detectable Concentration for scanning (pCi/g)*

$MDCR_i$ *= Minimum Detectable Count Rate (ncpm)*

$MDCR_{surveyor}$ *=* $MDCR_i$ *corrected by human performance factor (ncpm)*

MDER = Minimum Detectable Exposure Rate (uR/h)

MS_{output} *= MicroShield output exposure rate for 1 pCi/g of contaminant (mR/h)*

O_i *= obervation Interval (seconds)*

p = human performance factor

SR = scan rate in centimeters per second

JUL 3 0 2004

NaI Scan MDC Calculation - Surface Deposition

$b := 100$ $p := 0.5$ $HS_d := 30.48$ $SR := 5.08$ $d := 1.38$

$Conv := 208.302$ $MS_{output} := 1.563 \cdot 10^{-5}$ $O_i := \frac{HS_d}{SR}$

$O_i = 6$ *Observation Interval (seconds)*

$$b_i := \frac{(b \cdot O_i)}{60}$$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 43.639$ *net counts per minute*

$$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$$

$MDCR_{surveyor} = 61.715$ *net counts per minute*

$$MDER := \frac{MDCR_{surveyor}}{Conv}$$

$MDER = 0.296$ µR/h

$$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$$

$MDC_{scan} = 18.956$ pCi/cm²

$MDC_{scan} \cdot 222 = 4208.183$ *dpm/100 cm²*

JUL 3 0 2004

where:

b = background in counts per minute

b_i = background counts in observation interval

Conv = NaI manufacturers or calibration information reported response to energy of contaminant (cpm/uR/h)

d = index of sensitivity (Table 6.5 MARSSIM), 1.38 = 95% of correct detection's, 60% false positives

HS_d = hot spot diameter (in centimeters)

MDC_{scan} = Minimum Detectable Concentration for scanning (pCi/cm^2)

$MDCR_i$ = Minimum Detectable Count Rate (ncpm)

$MDCR_{surveyor}$ = $MDCR_i$ corrected by human performance factor (ncpm)

MDER = Minimum Detectable Exposure Rate (uR/h)

MS_{output} = MicroShield output exposure rate for 1 pCi/cm^2 of contaminant (mR/h)

O_i = obervation Interval (seconds)

p = human performance factor

SR = scan rate in centimeters per second

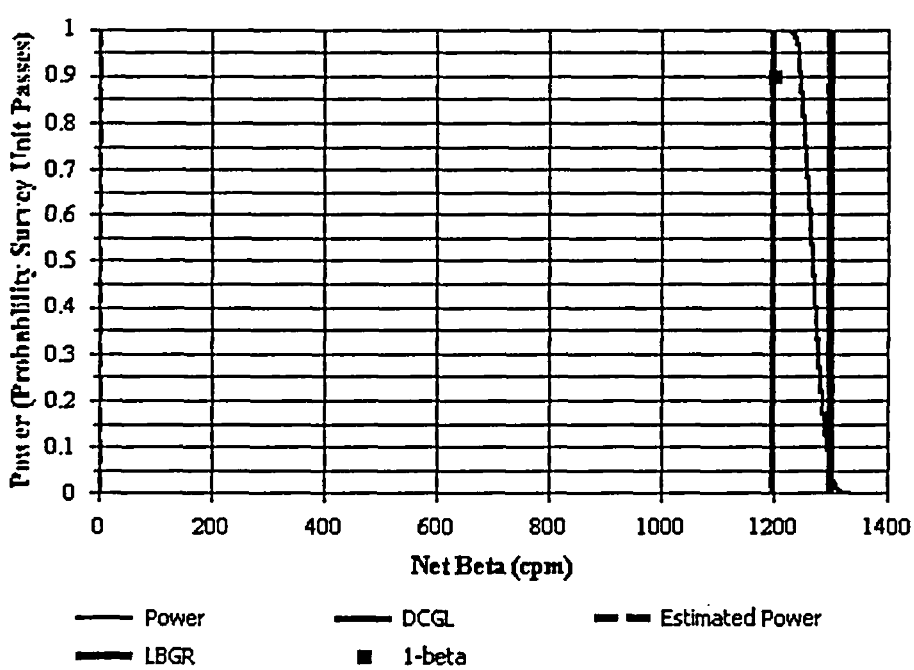
JUL 3 0 2004

Building Surface Survey Plan

Survey Plan Summary

Site:	TOP OF SEAL CHAMBER 3		
Planner(s):	BHB		
Survey Unit Name:	TOP OF SEAL CHAMBER 3a - WALLS		
Comments:			
Area (m²):	35	Classification:	3
Selected Test:	WRS	Estimated Sigma (cpm):	34.5
DCGL (cpm):	1,301	Sample Size (N/2):	8
LBGR (cpm):	1,200	Estimated Conc. (cpm):	0
Alpha:	0.050	Estimated Power:	1.00
Beta:	0.100		

Prospective Power Curve



Attachment 5-1

JUL 3 0 2004

Building Surface Survey Plan

Contaminant Summary

Contaminant	DCGLw (dpm/100 cm²)
Gross Activity	5,737

Beta Instrumentation Summary

Gross Beta DCGLw (dpm/100 cm²): 5,737
Total Efficiency: 0.18
Gross Beta DCGLw (cpm): 1,301

ID	Type	Mode	Area (cm²)
24	GFPC	Beta	126

Contaminant	Energy[1]	Fraction[2]	Inst. Eff.	Surf. Eff.	Total Eff.
Gross Activity	187.87	1.0000	0.48	0.37	0.1792

[1] Average beta energy (keV) [N/A indicates alpha emission]
[2] Activity fraction

Gross Survey Unit Mean (cpm): 306 ± 35 (1-sigma)
Count Time (min): 1

Material	Number of BKG Counts	Average (cpm)	Standard Deviation (cpm)	MDC (dpm/100 cm²)
Concrete	31	306	34.5	372

Attachment 5-2

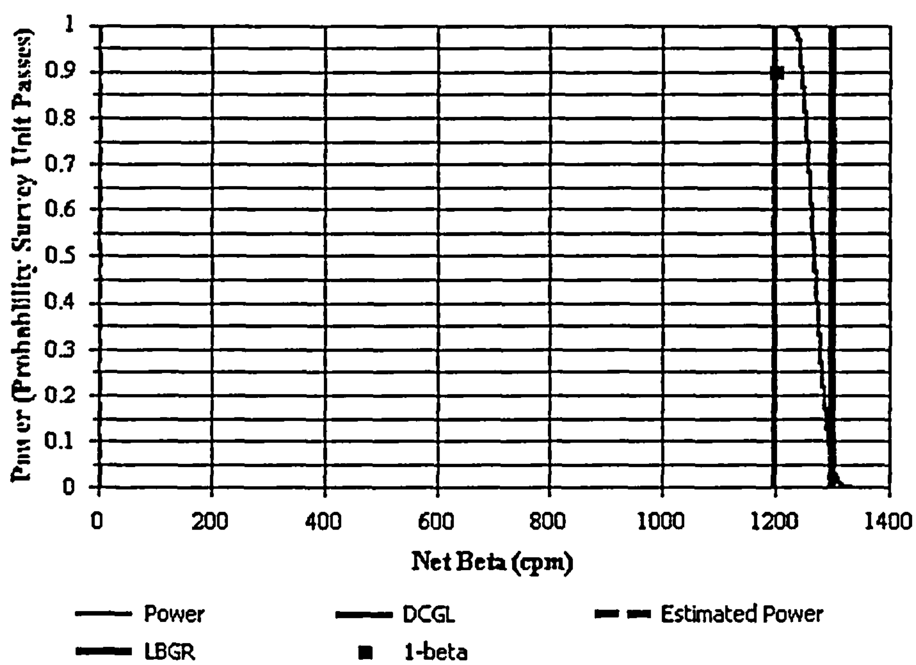
JUL 3 0 2004

Building Surface Survey Plan

Survey Plan Summary

Site:	TOP OF SEAL CHAMBER 3		
Planner(s):	BHB		
Survey Unit Name:	TOP OF SEAL CHAMBER 3b - ROOF		
Comments:			
Area (m²):	20	Classification:	2
Selected Test:	WRS	Estimated Sigma (cpm):	34.5
DCGL (cpm):	1,301	Sample Size (N/2):	8
LBGR (cpm):	1,200	Estimated Conc. (cpm):	0
Alpha:	0.050	Estimated Power:	1.00
Beta:	0.100		

Prospective Power Curve



Attachment 5-3

JUL 30 2004

Building Surface Survey Plan

Contaminant Summary

Contaminant	DCGLw (dpm/100 cm²)
Gross Activity	5,737

Beta Instrumentation Summary

Gross Beta DCGLw (dpm/100 cm²): 5,737
Total Efficiency: 0.18
Gross Beta DCGLw (cpm): 1,301

ID	Type	Mode	Area (cm²)
24	GFPC	Beta	126

Contaminant	Energy[1]	Fraction[2]	Inst. Eff.	Surf. Eff.	Total Eff.
Gross Activity	187.87	1.0000	0.48	0.37	0.1792

[1] Average beta energy (keV) [N/A indicates alpha emission]
[2] Activity fraction

Gross Survey Unit Mean (cpm): 306 ± 35 (1-sigma)
Count Time (min): 1

Material	Number of BKG Counts	Average (cpm)	Standard Deviation (cpm)	MDC (dpm/100 cm²)
Concrete	31	306	34.5	372

ATTACHMENT 5-4

Beta Scan Measurement MDC Calculation

Top of Seal Chamber 3

$\varepsilon_i := .478$ $\varepsilon_s := .5 \cdot .85119 \cdot .881$ $b := 306$ $p := 0.5$ $W_d := 8.8$ $S_r := 2.2$ $d := 1.38$ $A := 100$

$\frac{W_d}{S_r} = 4$ *Observation Interval (seconds)* $O_i := \frac{W_d}{S_r}$ *Observation Interval (seconds)*

$\varepsilon_t := \varepsilon_i \cdot \varepsilon_s$

$\varepsilon_t = 0.1792$

$$b_i := \frac{(b \cdot O_i)}{60}$$

$b_i = 20.4$ *Counts in observation Interval*

$$C := \frac{1}{\left(\varepsilon_i \cdot \varepsilon_s \cdot \frac{A}{100}\right)\sqrt{p}}$$

$C = 7.891$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 93.5$ *net counts per minute*

$MDCR_i + b = 399.494$ *gross counts per minute*

$\frac{MDCR_i}{O_i} = 23.4$ *net counts per minute in observation interval*

$$MDC_{scan} := C \cdot MDCR_i$$

$MDC_{scan} = 737.735$ **dpm per 100 cm^2**

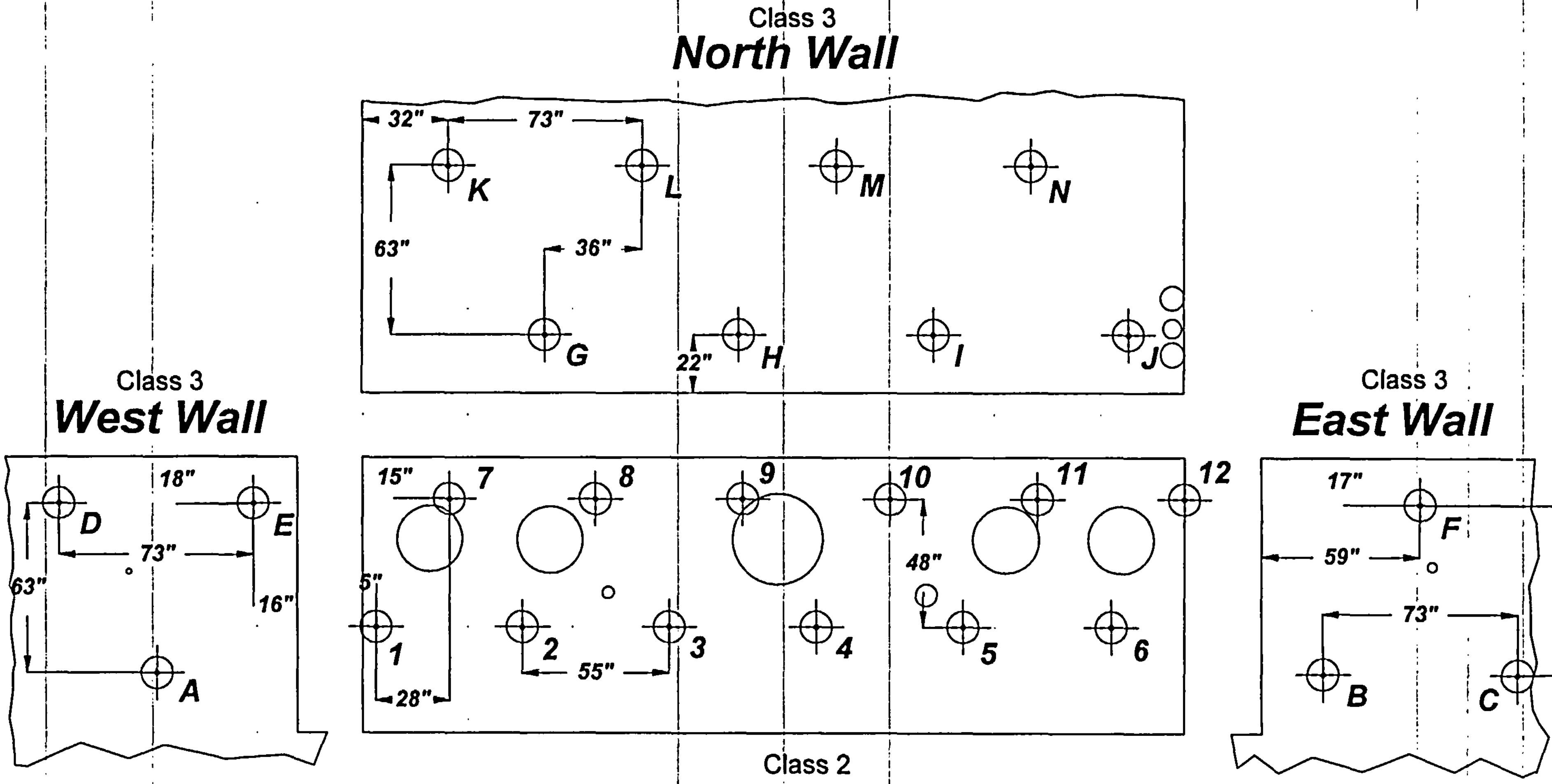
ATTACHMENT 6-1

JUL 3 0 2004

where:

b = *background counts per minute*
b_i = *background counts in observation interval*
p = *human performance factor*
W_d = *detector width in centimeters*
S_r = *scan rate in centimeters per second*
d = *index of sensitivity (Table 6.5 MARSSIM), 1.38 = 95% of correct detection's, 60% false positives*
MDC_{scan} = *Minimum Detectable Concentration for scanning (dpm/100 square centimeters)*
C = *constant used to convert MDCR to MDC*
ε_i = *instrument efficiency (counts/emission)*
ε_s = *source efficiency (emissions/disintegration)*
A = *instrument physical probe area (in square centimeters)*

ATTACHMENT 6-2



Class 2

TOP OF SEAL CHAMBER 3

GFPC Fixed Point Measurement Locations

ATTACHMENT 7-1

JUL 30 2004

SEAL CHAMBER 3 ROOF Variability Measurements SR-049

	126179	JG1135	Time	Detector	Counts	Count Time (sec)	Mode	Designator		FSS-463	BHB	
										Steel CF(cpm) ⇒	*0*	
										Shielded	**Unshielded**	**NET cpm**
2	SC3-FP1S	12/3/2003	12:51	1	1.89E+02	60	SCL	Shielded	β	1.89E+02		
3	SC3-FP1U	12/3/2003	12:52	1	2.84E+02	60	SCL	Unshielded	β		2.84E+02	9.50E+01
4	SC3-FP2S	12/3/2003	12:54	1	2.30E+02	60	SCL	Shielded	β	2.30E+02		
5	SC3-FP2U	12/3/2003	12:55	1	2.76E+02	60	SCL	Unshielded	β		2.76E+02	4.60E+01
6	SC3-FP3S	12/3/2003	12:56	1	2.06E+02	60	SCL	Shielded	β	2.06E+02		
7	SC3-FP3U	12/3/2003	12:57	1	2.54E+02	60	SCL	Unshielded	β		2.54E+02	4.80E+01
8	SC3-FP4S	12/3/2003	12:59	1	2.09E+02	60	SCL	Shielded	β	2.09E+02		
9	SC3-FP4U	12/3/2003	13:00	1	2.70E+02	60	SCL	Unshielded	β		2.70E+02	6.10E+01
10	SC3-FP5S	12/3/2003	13:02	1	2.28E+02	60	SCL	Shielded	β	2.28E+02		
11	SC3-FP5U	12/3/2003	13:03	1	2.92E+02	60	SCL	Unshielded	β		2.92E+02	6.40E+01
12	SC3-FP6S	12/3/2003	13:05	1	1.40E+02	60	SCL	Shielded	β	1.40E+02		
13	SC3-FP6U	12/3/2003	13:06	1	1.77E+02	60	SCL	Unshielded	β		1.77E+02	3.70E+01
14	SC3-FP7S	12/3/2003	13:07	1	1.27E+02	60	SCL	Shielded	β	1.27E+02		
15	SC3-FP7U	12/3/2003	13:08	1	1.94E+02	60	SCL	Unshielded	β		1.94E+02	6.70E+01
16	SC3-FP8S	12/3/2003	13:10	1	1.48E+02	60	SCL	Shielded	β	1.48E+02		
17	SC3-FP8U	12/3/2003	13:11	1	1.86E+02	60	SCL	Unshielded	β		1.86E+02	3.80E+01
18	SC3-FP9S	12/3/2003	13:12	1	1.38E+02	60	SCL	Shielded	β	1.38E+02		
19	SC3-FP9U	12/3/2003	13:13	1	1.90E+02	60	SCL	Unshielded	β		1.90E+02	5.20E+01
20	SC3-FP10S	12/3/2003	13:15	1	1.30E+02	60	SCL	Shielded	β	1.30E+02		
21	SC3-FP10U	12/3/2003	13:16	1	1.84E+02	60	SCL	Unshielded	β		1.84E+02	5.40E+01
22	SC3-QC9S	12/3/2003	13:17	1	1.38E+02	60	SCL	Shielded	β	1.38E+02		
23	SC3-QC9U	12/3/2003	13:18	1	2.00E+02	60	SCL	Unshielded	β		2.00E+02	6.20E+01
									Minimum ⇒	**1.27E+02**	**1.77E+02**	**3.70E+01**
									Maximum ⇒	**2.30E+02**	**2.92E+02**	**9.50E+01**
									Mean ⇒	**1.71E+02**	**2.28E+02**	**5.67E+01**
									Sigma ⇒	**4.12E+01**	**4.65E+01**	**1.62E+01**

ATTACHMENT 8-1

JUL 3 0 2004

INFORMATION ONLY

ORIGINAL

Exhibit 1
Survey Unit Inspection Check Sheet

SECTION 1 - SURVEY UNIT INSPECTION DESCRIPTION					
Survey Unit #	SS17-1, SS18-1	Survey Unit Location	SSGS – Top of Seal Chamber #3 – Floor and Walls		
Date	7/27/04	Time	0900	Inspection Team Members	D. Sarge

SECTION 2 - SURVEY UNIT INSPECTION SCOPE			
Inspection Requirements (Check the appropriate Yes/No answer.)	Yes	No	N/A
1. Have sufficient surveys (i.e., post remediation, characterization, etc.) been obtained for the survey unit?	X		
2. Do the surveys (from Question 1) demonstrate that the survey unit will most likely pass the FSS?	X		
3. Is the physical work (i e , remediation & housekeeping) in or around the survey unit complete?	X		
4. Have all tools, non-permanent equipment, and material not needed to perform the FSS been removed?	X		
5. Are the survey surfaces relatively free of loose debris (i.e., dirt, concrete dust, metal filings, etc.)?	X		
6 Are the survey surfaces relatively free of liquids (i.e., water, moisture, oil, etc.)?		X	
7. Are the survey surfaces free of all paint, which has the potential to shield radiation?	X		
8. Have the Surface Measurement Test Areas (SMTA) been established? (Refer to Exhibit 2 for instructions.)	X		
9. Have the Surface Measurement Test Areas (SMTA) data been collected? (Refer to Exhibit 2 for instructions.)	X		
10. Are the survey surfaces easily accessible? (No scaffolding, high reach, etc. is needed to perform the FSS)	X		
11. Is lighting adequate to perform the FSS?	X		
12. Is the area industrially safe to perform the FSS? (Evaluate potential fall & trip hazards, confined spaces, etc.)	X		
13. Have photographs been taken showing the overall condition of the area?	X		
14. Have all unsatisfactory conditions been resolved?	X		

NOTE: If a "No" answer is obtained above, the inspector should immediately correct the problem or initiate corrective actions through the responsible site department, as applicable. Document actions taken and/or justifications in the "Comments" section below. Attach additional sheets as necessary.

Comments:

Response to Question 6: Free standing water is present throughout floor surface in low-lying areas.

Survey Unit Inspector (print/sign)	D. Sarge / [signature]	Date	7/28/04
Survey Designer (print/sign)	B. Brosey / B. BROSEY	Date	7/28/04

ATTACHMENT 9-1

07/28/2004 11:53 8146352317 SNEC FACILITY RADCON PAGE 01

JUL 3 0 2004

ORIGINAL

INFORMATION ONLY

EXHIBIT 3
Surface Measurement Test Area (SMTA) Data Sheet

SECTION 1 - DESCRIPTION			
SMTA Number	SMTA-SS18-1-2	Survey Unit Number	SS18-1
SMTA Location	Top of Seal Chamber #3 Floor (East)		

Survey Unit Inspector	Date	Time
D. Sarge	7/28/04	0815

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED			
Caliper Manufacturer	N/A	Caliper Model Number	N/A
Caliper Serial Number	N/A	Calibration Due Date (as applicable)	N/A
Rad Con Technician	D. Sarge / [signature]	Date	07/28/04
		Time	0815
Survey Unit Inspector Approval	D. Sarge / [signature]	Date	7/28/04

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm
(Insert Results in White Blocks Below)

1 5.2	7 2.2	13 8.5	19 14.5	25 11.0	31 9.8
2 14	8 11.6	14 11.5	20 4.0	26 16.4	32 10.2
3 14	9 2.0	15 15.3	21 9.0	27 15.1	33 6.1
4 7.3	10 1.6	16 8.3	22 1.2	28 11.6	34 3.5
5 4.0	11 2.8	17 9.0	23 7.6	29 0.3	35 1.0
6 10.8	12 7.7	18 11	24 5.8	30 11.1	36 5.9

Average Measurement –8.3 mm

Comments

- Surface has cracks and chipping occurring in areas.

Additional Measurements Required

Floor surface around downcomers has surficial cracking/chipping at depths up to 1.5 inches.

Internal surfaces of downcomers indicated some pitting/scaling.

Seven 5 inch holes are present on floor (south edge) Depth is approx. 3.5 inches.

ATTACHMENT 9-2

JUL 3 0 2004

INFORMATION ONLY

ORIGINAL

EXHIBIT 3
Surface Measurement Test Area (SMTA) Data Sheet

SECTION 1 - DESCRIPTION			
SMTA Number	SMTA-SS18-1-1	Survey Unit Number	SS18-1
SMTA Location	Top of Seal Chamber #3 Floor (West)		

Survey Unit Inspector	D. Sarge	Date	7/28/04	Time	0800

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED					
Caliper Manufacturer	N/A	Caliper Model Number	N/A		
Caliper Serial Number	N/A	Calibration Due Date (as applicable)	N/A		
Rad Con Technician	D. Sarge / *[signature]*	Date	07/28/04	Time	0800
Survey Unit Inspector Approval	D. Sarge / *[signature]*	Date	7/28/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm
(Insert Results in White Blocks Below)

1 1.4	7 3.6	13 8.4	19 4.1	25 3.4	31 4.0
2 43	8 48	14 1.8	20 1.6	26 3.7	32 4.0
3 2.5	9 03	15 1.6	21 3.0	27 2.1	33 1.1
4 3.6	10 2.0	16 38	22 3.7	28 23	34 50
5 53	11 41	17 1.4	23 6.4	29 4.3	35 3.3
6 5.0	12 2.6	18 2.4	24 7.5	30 35	36 88

Average Measurement ~3.6 mm

Comments

- Surface has cracks in areas.

Additional Measurements Required

Floor surface around downcomers has surficial cracking/chipping at depths up to 1.5 inches.
Internal surfaces of downcomers indicated some pitting/scaling.

ATTACHMENT 9-3

JUL 3 0 2004

ORIGINAL

INFORMATION ONLY

EXHIBIT 3

Surface Measurement Test Area (SMTA) Data Sheet

SECTION 1 - DESCRIPTION			
SMTA Number	SMTA-SS17-1-1	Survey Unit Number	SS17-1
SMTA Location	Top of Seal Chamber #3 Wall (East)		

Survey Unit Inspector	D. Sarge	Date	7/28/04	Time	0900

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED			
Caliper Manufacturer	N/A	Caliper Model Number	N/A
Caliper Serial Number	N/A	Calibration Due Date (as applicable)	N/A

Rad Con Technician	D. Sarge / *[signature]*	Date	07/28/04	Time	0900
Survey Unit Inspector Approval	D. Sarge / *[signature]*	Date	7/28/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm (Insert Results in White Blocks Below)

1: 1.4	7: 2.0	13: 2.0	19: 1.5	25: 0.2	31: 2.7
2: 1.2	8: 0.9	14: 0.5	20: 0.4	26: 1.2	32: 2.5
3: 1.5	9: 0.1	15: 0.1	21: 1.4	27: 0.4	33: 3.0
4: 0.2	10: 0.4	16: 0.5	22: 1.5	28: 0.8	34: 0.5
5: 0.8	11: 0.4	17: 0.1	23: 0.8	29: 0.6	35: 1.0
6: 0.78	12: 0.4	18: 0.6	24: 7.3	30: 1.0	36: 1.8

Average Measurement – 1.2 mm

Comments

- Grid #22 has 2" conduit protruding wall approx. 2".
- Grid #24 has 1" stud protruding wall approx. 1".
- East wall surface is similar to north and west walls.

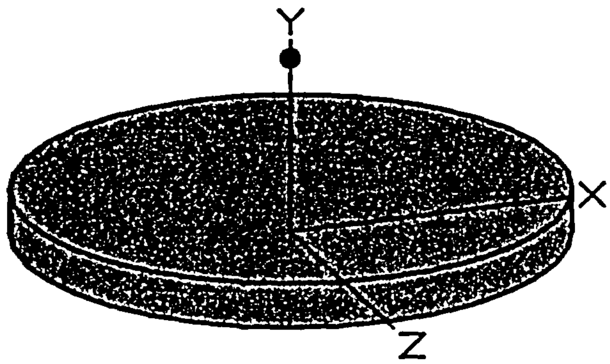
Additional Measurements Required

ATTACHMENT 9-4

Page : 1
DOS File : SLAB3.MS5
Run Date: July 29, 2004
Run Time: 9:46:14 AM
Duration : 00:00:01

File Ref: ________
Date: JUL 3 0 2004
By: ________
Checked: ________

Case Title: 12" Diameter
Description: Cs-137 @ 1 pCi/g in 1" Thick Slab
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	2.54 cm	1.0 in
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	0 cm	10.16 cm	0 cm
	0.0 in	4.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	113.097 in³	Concrete	2.35
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	4.1201e-009	1.5245e+002	2.2231e-006	8.2255e-002
Cs-137	4.3553e-009	1.6115e+002	2.3500e-006	8.6950e-002

Buildup
The material reference is : Source

Integration Parameters

Radial	40
Circumferential	40
Y Direction (axial)	40

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.156e+00	6.355e-06	7.682e-06	5.293e-08	6.399e-08
0.0322	5.823e+00	1.222e-05	1.486e-05	9.832e-08	1.196e-07
0.0364	2.119e+00	6.726e-06	8.749e-06	3.821e-08	4.971e-08
0.6616	1.372e+02	3.202e-02	4.057e-02	6.207e-05	7.865e-05

ATTACHMENT 10-1

File : SLAB3.MS5
Run Date: July 29, 2004
Run Time: 9:46:14 AM
Duration : 00:00:01

JUL 3 0 2004

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
TOTALS:	1.483e+02	3.204e-02	4.060e-02	6.226e-05	7.888e-05

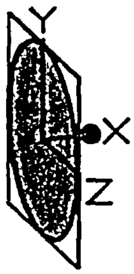
ATTACHMENT 10-2

JUL 3 0 2004

Page : 1
DOS File : SURFC.MS5
Run Date: July 29, 2004
Run Time: 9:40:56 AM
Duration : 00:00:00

File Ref: ________
Date: ________
By: ________
Checked: ________

Case Title: Surface Source
Description: 12" Diameter Model
Geometry: 3 - Disk



Source Dimensions

Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	7.62 cm	0 cm	0 cm
	3.0 in	0.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Shield 1	.125 in	Iron Oxide	5.1
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	6.9026e-010	2.5540e+001	9.4600e-007	3.5002e-002
Cs-137	7.2966e-010	2.6997e+001	1.0000e-006	3.7000e-002

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	40
Circumferential	40

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	5.287e-01	5.791e-10	6.709e-10	4.824e-12	5.589e-12
0.0322	9.755e-01	1.438e-09	1.670e-09	1.157e-11	1.344e-11
0.0364	3.550e-01	7.257e-09	8.723e-09	4.123e-11	4.956e-11
0.6616	2.298e+01	6.973e-03	8.064e-03	1.352e-05	1.563e-05
TOTALS:	2.484e+01	6.973e-03	8.064e-03	1.352e-05	1.563e-05

ATTACHMENT 10-3

JUL 3 0 2004

Williamsburg Concrete Background Measurements

37122N21	Instrument 95348	RLM6220	Time	Detector	Counts	Count Time (sec)	Mode	Designator		FSS-001	BHB
0	BKGND	1/4/2002	8:52	1	7.26E+03	1800	SCL	Inital Background	β		
1	Source Check	1/4/2002	9:07	1	1.79E+05	60	SCL	Source	β		
2	BKGND	1/4/2002	10:05	2	4.40E+01	1800	SCL	Inital Background	α	*Concrete CF(cpm) ⇒*	0
14	Source Check	1/4/2002	10:39	2	1.51E+05	60	SCL	Source	α	Shielded	Unshielded
15	CON A1S	1/4/2002	13:00	1	2.78E+02	60	SCL	Shielded	β	2.78E+02	
16	CON A1U	1/4/2002	13:02	1	3.88E+02	60	SCL	Unshielded	β		3.88E+02
17	CON A2S	1/4/2002	13:20	1	2.39E+02	60	SCL	Shielded	β	2.39E+02	
18	CON A2U	1/4/2002	13:21	1	2.22E+02	60	SCL	Unshielded	β		2.22E+02
19	CON A3S	1/4/2002	13:28	1	2.39E+02	60	SCL	Shielded	β	2.39E+02	
20	CON A3U	1/4/2002	13:30	1	2.62E+02	60	SCL	Unshielded	β		2.62E+02
21	CON A4S	1/4/2002	13:36	1	2.45E+02	60	SCL	Shielded	β	2.45E+02	
22	CON A4U	1/4/2002	13:38	1	2.71E+02	60	SCL	Unshielded	β		2.71E+02
23	CON A5S	1/4/2002	13:58	1	2.00E+02	60	SCL	Shielded	β	2.00E+02	
24	CON A5U	1/4/2002	14:00	1	2.82E+02	60	SCL	Unshielded	β		2.82E+02
25	CON A6S	1/4/2002	14:03	1	1.84E+02	60	SCL	Shielded	β	1.84E+02	
26	CON A6U	1/4/2002	14:05	1	3.10E+02	60	SCL	Unshielded	β		3.10E+02
27	CON A7S	1/4/2002	14:09	1	1.98E+02	60	SCL	Shielded	β	1.98E+02	
28	CON A7U	1/4/2002	14:10	1	3.15E+02	60	SCL	Unshielded	β		3.15E+02
29	CON A8S	1/4/2002	14:19	1	2.34E+02	60	SCL	Shielded	β	2.34E+02	
30	CON A8S	1/4/2002	14:22	1	2.31E+02	60	SCL	Shielded	β	2.31E+02	
31	CON A8U	1/4/2002	14:24	1	2.88E+02	60	SCL	Unshielded	β		2.88E+02
32	CON A9S	1/4/2002	14:31	1	2.65E+02	60	SCL	Shielded	β	2.65E+02	
33	CON A9U	1/4/2002	14:33	1	2.89E+02	60	SCL	Unshielded	β		2.89E+02
34	CON A10S	1/4/2002	14:42	1	2.46E+02	60	SCL	Shielded	β	2.46E+02	
35	CON A10U	1/4/2002	14:43	1	3.16E+02	60	SCL	Unshielded	β		3.16E+02
36	CON A11S	1/4/2002	15:10	1	1.95E+02	60	SCL	Shielded	β	1.95E+02	
37	CON A11U	1/4/2002	15:12	1	2.94E+02	60	SCL	Unshielded	β		2.94E+02
38	CON A12S	1/4/2002	15:13	1	2.21E+02	60	SCL	Shielded	β	2.21E+02	
39	CON A12U	1/4/2002	15:14	1	2.84E+02	60	SCL	Unshielded	β		2.84E+02
40	CON A13S	1/4/2002	15:23	1	1.74E+02	60	SCL	Shielded	β	1.74E+02	
41	CON A13U	1/4/2002	15:24	1	2.94E+02	60	SCL	Unshielded	β		2.94E+02
42	CON A14S	1/4/2002	15:25	1	1.96E+02	60	SCL	Shielded	β	1.96E+02	
43	CON A14U	1/4/2002	15:26	1	3.33E+02	60	SCL	Unshielded	β		3.33E+02
44	CON A15S	1/4/2002	15:28	1	2.16E+02	60	SCL	Shielded	β	2.16E+02	
45	CON A15U	1/4/2002	15:29	1	3.45E+02	60	SCL	Unshielded	β		3.45E+02
46	CON A16S	1/4/2002	15:30	1	1.83E+02	60	SCL	Shielded	β	1.83E+02	
47	CON A16U	1/4/2002	15:31	1	3.13E+02	60	SCL	Unshielded	β		3.13E+02
48	CON A17S	1/4/2002	15:33	1	1.82E+02	60	SCL	Shielded	β	1.82E+02	
49	CON A17U	1/4/2002	15:34	1	3.22E+02	60	SCL	Unshielded	β		3.22E+02
50	CON A18S	1/4/2002	15:35	1	1.84E+02	60	SCL	Shielded	β	1.84E+02	
51	CON A18U	1/4/2002	15:36	1	3.24E+02	60	SCL	Unshielded	β		3.24E+02
52	CON A19S	1/4/2002	15:37	1	1.91E+02	60	SCL	Shielded	β	1.91E+02	
53	CON A19U	1/4/2002	15:39	1	3.07E+02	60	SCL	Unshielded	β		3.07E+02
54	CON A20S	1/4/2002	15:40	1	1.94E+02	60	SCL	Shielded	β	1.94E+02	
55	CON A20U	1/4/2002	15:41	1	3.33E+02	60	SCL	Unshielded	β		3.33E+02
56	CON A21S	1/4/2002	15:57	1	2.23E+02	60	SCL	Shielded	β	2.23E+02	
57	CON A21U	1/4/2002	15:58	1	2.92E+02	60	SCL	Unshielded	β		2.92E+02
58	CON A22S	1/4/2002	15:59	1	1.72E+02	60	SCL	Shielded	β	1.72E+02	
59	CON A22U	1/4/2002	16:00	1	2.80E+02	60	SCL	Unshielded	β		2.80E+02
60	CON A23S	1/4/2002	16:01	1	1.94E+02	60	SCL	Shielded	β	1.94E+02	
61	CON A23U	1/4/2002	16:02	1	3.29E+02	60	SCL	Unshielded	β		3.29E+02
62	CON A24S	1/4/2002	16:04	1	1.87E+02	60	SCL	Shielded	β	1.87E+02	
63	CON A24U	1/4/2002	16:05	1	3.48E+02	60	SCL	Unshielded	β		3.48E+02
64	CON A25S	1/4/2002	16:06	1	2.07E+02	60	SCL	Shielded	β	2.07E+02	
65	CON A25U	1/4/2002	16:07	1	3.72E+02	60	SCL	Unshielded	β		3.72E+02
66	CON A26S	1/4/2002	16:09	1	2.09E+02	60	SCL	Shielded	β	2.09E+02	
67	CON A26U	1/4/2002	16:10	1	3.26E+02	60	SCL	Unshielded	β		3.26E+02
68	CON A27S	1/4/2002	16:11	1	2.07E+02	60	SCL	Shielded	β	2.07E+02	
69	CON A27U	1/4/2002	16:12	1	3.30E+02	60	SCL	Unshielded	β		3.30E+02
70	CON A28S	1/4/2002	16:14	1	2.30E+02	60	SCL	Shielded	β	2.30E+02	
71	CON A28U	1/4/2002	16:15	1	3.06E+02	60	SCL	Unshielded	β		3.06E+02
72	CON A29S	1/4/2002	16:20	1	2.13E+02	60	SCL	Shielded	β	2.13E+02	
73	CON A29U	1/4/2002	16:21	1	2.58E+02	60	SCL	Unshielded	β		2.58E+02
74	CON A30S	1/4/2002	16:24	1	2.33E+02	60	SCL	Shielded	β	2.33E+02	
75	CON A30U	1/4/2002	16:25	1	2.89E+02	60	SCL	Unshielded	β		2.89E+02
76	CON A31S	1/4/2002	16:28	1	1.84E+02	60	SCL	Shielded	β	1.84E+02	
77	CON A31U	1/4/2002	16:29	1	2.63E+02	60	SCL	Unshielded	β		2.63E+02
—	Source Check	1/4/2002	17:27	1	1.70E+05	60	SCL	—	β		
									Minimum ⇒	1.72E+02	2.22E+02
									Maximum ⇒	2.78E+02	3.88E+02
									Mean ⇒	2.11E+02	3.06E+02
									Sigma ⇒	2.69E+01	3.45E+01

ATTACHMENT 11-1