Attachment M

Final Status Survey Report #13 Documentation

(UNDER SEPARATE COVER)

FINAL

COLUMBUS CLOSURE PROJECT CHARACTERIZATION AND FINAL STATUS SURVEY REPORT FOR ACTIVE NORTH FILTER BED – SOUTH SUBSURFACE SAND FILTER

Revision 0
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Prepared by

ECC & E2 Closure Services
1425 State Route 142 East
West Jefferson, OH 43162

Contract Number: DE-AC24-04OH20171

Final Characterization and Final Status Report for the Active North Filter Bed South Subsurface Sand Filter

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Table of Contents

1.0 Introduction 1
1.1 Background 1
2.0 Site Description 3
2.1 Facility Description 3
3.0 Decommissioning Activities 4
3.1 Decommissioning Objective 4
4.0 Final Status Survey Procedures 5
4.1 Sampling Parameters 5
4.2 Background/Baseline Levels Identified 5
4.3 Major Contaminants Identified 6
4.3.1 Guidelines Established 6
5.0 Equipment and Procedures 8
5.1 Equipment 8
5.2 Minimum Detectable Activities 8
5.3 Procedures 9
6.0 Survey Findings 10
6.1 Exposure Rate Surveys 10
6.2 Scanning and Fixed Measurements 10
7.0 Conclusions 12
8.0 References 13

Figures

Figure 1 Site Map
Figure 2 Active North Filter Bed – South Subsurface Sand Filter
Figure 3 Grid Map – South Subsurface Sand Filter

Tables

Table 1 Surface Contamination Guidelines for BCLDP
Table 2 ANFB-SSSF – Scan Surveys
Table 3 ANFB-SSSF – FSS Surveys
Table 4 Chauvenet's Criterion
Pop DLV Alpha-Concrete
Table 5 Chauvenet's Criterion
Pop DLV Beta-Concrete
Table 6 Chauvenet's Criterion
Scan DLV Beta-Concrete

Attachments

Attachment A Minimum Detectable Activity Calculations for a Ludlum Model 43-20 Detector and Eberline ESP-2 Meter

1.0 Introduction

This report contains the final status surveys (FSS) of the Active North Filter Bed (ANFB) South Subsurface Sand Filter (SSSF) located at the Columbus Closure Project (CCP), 1425 State Route 142 East, West Jefferson, OH 43162. Final status surveys were conducted according to the guidance presented the *Manual for Conducting Surveys in Support of License Termination*, NUREG/CR-5849 (ORAU, 1992) and the *Radiological Characterization and Final Status Plan for Battelle Columbus Laboratories Decommissioning Project, West Jefferson Site*, DD-97-02 (Final Status Plan) (Battelle, 2000). The final status surveys were conducted in September of 2004.

The intent of this final status survey report is to provide a complete and unambiguous record of the radiological status of ANFB-SSSF. Sufficient information and data is provided to enable an independent re-creation and evaluation at some future date of both the survey activities and the reported results for ANFB-SSSF. Information in this report is also available in referenced technical basis documents, final status survey plans and procedures, and the *Battelle Memorial Institute Columbus Operations, Decommissioning Plan,* DD-93-19 (BMI Decommissioning Plan), and reporting and quality assurance procedures (ORAU, 1992).

To the extent practicable, this final status survey report is presented with minimal information incorporated by reference. The report has been generated following the comprehensive, annotated outline presented in Chapter 9 of NUREG-5849.

1.1 Background

On April 16, 1943, BMI, acting through what is now its Battelle Columbus Operations (BCO), entered into Contract No. W-7405-ENG-92 with the Manhattan Engineering District to perform atomic energy research and development (R&D) activities. BCO performed nuclear materials research and development at privately-owned facilities for the Manhattan Engineering District and its successor agencies – the Atomic Energy Commission (AEC), the Energy Research and Development Agency (ERDA), and the Department of Energy (DOE). Research and development continued until 1988 (Battelle, 2003).

The BCO facilities at the King Avenue Site, Columbus, Ohio, and the West Jefferson North (WJN) and South (WJS) Sites, West Jefferson, Ohio, became partially radiologically contaminated as a result of the R&D activities. Decontamination of the King Avenue Sites has been completed and activities continue at the WJN site. The DOE, as the successor to the AEC and the Government's earlier work, is the agreed party with predominant liability and responsibility for decontamination and decommissioning (D&D) of the BCO facilities (Battelle, 2003). The Assistant Secretary for Nuclear Energy of the DOE accepted the decontamination and decommissioning (D&D) of the WJN into the DOE's Surplus Facilities Management Program as a major project (DOE,

1986). The DOE is the agency funding and managing the cleanup of the WJN (Battelle, 2003). However, the site is not a DOE-owned facility.

BMI holds U.S. Nuclear Regulatory Commission (NRC) license number SNM-7. BMI has continually operated and conducted D&D activities in full compliance with this NRC license. The BMI Decommissioning Plan for the WJN site does not serve as a declaration to terminate SNM-7, but establish the criteria for performing D&D activities. The end goal of the BMI Decommissioning Plan is to reach unrestricted use conditions for the site (Battelle, 2003).

The DOE has contracted ECC&E2 Closure Services, LLC (Closure Services) to safely remove DOE radioactive materials and contamination from WJN site. Removal of radioactive material will be to levels allowing future use of the site without radiological restrictions as described in the BMI Decommissioning Plan. Closure Services has conducted characterization and final status surveys of the ANFB-SSSF to demonstrate that the structure is available for unrestricted release.

2.0 Site Description

Created in 1984, the Battelle Columbus Decommissioning Project (BCLDP) is a remediation project that includes nine buildings at the King Avenue site and five at the WJN site. The CCP is the successor of the BCLDP. The WJN site has one permanent structure (Well House). Three former research facilities, JN-1, JN-2 and JN-3 have been demolished as well as JN-6, the guard house. Several outfalls, filter beds, and wells are also located at the site. The ANFB-SSSF is one of the filter beds located at the CCP. Figure 1 presents the CCP.

2.1 Facility Description

Constructed in 1979, the ANFB-SSSF was constructed to replace the previous filter bed serving the West Jefferson North Site. The previous filter bed was constructed in the flood plain and periodically flooded out. The ANFB-SSSF was constructed out of the flood plain. The ANFB-SSSF serves the West Jefferson North Site, including buildings JN-1, JN-2, JN-3 and JN-4. The ANFB-SSSF is used to treat the sanitary waste generated from these buildings. The ANFB-SSSF is presented in Figure 2.

The ANFB is constructed of two subsurface sand filters each measuring 30 feet by 36 feet and are approximately 4 feet deep. The ANFB is constructed of reinforced concrete walls and bottom.

Two classifications of areas are used in NUREG-5849 and are termed **affected** or **unaffected.** These classifications are defined as (NRC, 1992):

> **Affected Areas:** Areas that have potential radioactive contamination (based on plant operating history) or known radioactive contamination (based on past or preliminary radiological surveillance). This would normally include areas where radioactive materials were used and stored, where records indicate spills or other unusual occurrences that could have resulted in spread of contamination, and where radioactive materials were buried. Areas immediately surrounding or adjacent to locations where radioactive materials were used, stored, or buried are included in this classification because of the potential for inadvertent spread of contamination.
>
> **Unaffected Areas:** All areas not classified as affected. These areas are not expected to contain residual radioactivity, based on knowledge of site history and previous information.

ANFB-SSSF is considered an affected area due to the documented inlet and outlet pipe surveys. The in-situ survey performed by Science & Engineering Associates, Incorporated in August of 2000 indicated internal contamination of the pipe exceeding those levels presented in DD-93-02, Rev 0, *Surface Release Criteria Technical Basis Document for Battelle Columbus Laboratories Decommissioning Project.*

3.0 Decommissioning Activities

3.1 Decommissioning Objective

ANFB-SSSF is considered to be an affected, baseline area. The objective of the final status survey preformed in ANFB-SSSF was to statistically demonstrate that the structure was available for unrestricted release. **Table 1** presents the surface release criteria as detailed in DD-93-02, Rev. 0, "Surface Release Criteria Technical Basis Document," (Battelle, 1993).

4.0 Final Status Survey Procedures

The CS Characterization Team conducted the final status survey of the ANFB-SSSF according to the Final Status Plan (Battelle, 2000). CS Characterization Teams performed final status surveys under Work Instruction 2806 (Closure Services, 2004).

The planning and implementation of the final status survey of the facility surface for effected areas adhered to the requirements the Final Status Plan (Battelle, 2000).

4.1 Sampling Parameters

The Final Status Plan requires that grid systems be established for structural effected areas (Battelle, 2000). The ANFB-SSSF characterization and final status survey grid system comprised of one square meter (1m x 1m) grids in the structure. **Figure 3** presents the ANFB-SSSF grids and the alpha numeric identifier for each.

Direct and indirect surveys were performed within each grid as required by the Final Status Plan, §5.1.3 (Battelle, 2000). The Characterization Team scanned 100 percent of the floor and walls. Scanning surveys included alpha and beta measurements of all accessible surfaces. Static one-minute readings were performed in a grid if scan survey readings indicated a net activity above the Decision Level Value (DLV). Section 4.2 of this report discusses the DLV in further detail.

A large population statistical survey was conducted for the floors and the wall surfaces within the ANFB-SSSF as required by §5.3.3 and §5.4.5 of the Final Status Plan (Battelle, 2000). Population surveys are those grouped surface activity measurements that are performed at randomly and systematically selected locations. Surface activity measurements are performed for a 1-minute, static count, using a large area (180 cm^2) gas proportional detector. This method provides detection efficiencies well below the guideline level.

The ANFB-SSSF was grouped into "blocks" or "units". The ANFB-SSSF was divided into two units, the walls being one unit, and the floor the other. From each block, 30 grids were selected for the population statistical survey. Population statistical surveys consisted of static alpha + beta integrated measurement, of the thirty grids from the floor and the walls of the structure. This information is provided in the table detailing the final status survey results.

4.2 Background/Baseline Levels Identified

The Characterization Team performed a background survey in support of the characterization and final status survey for the ANFB-SSSF. The background survey was conducted within Building JN-6 for alpha + beta and alpha integrated measurements for each building material type. Additionally, the final status survey performed for Building

JN-6 supported the unrestricted release of the facility (Closure Services, 2004). Building material types selected for the background survey included:

- Concrete block wall,
- Concrete forms & Concrete floor,
- LONAM (steel, window frames, building components), and
- Brick

Background surveys were performed in the same manner and with the same instrumentation used during the characterization and final status survey of the ANFB-SSSF. **Tables 4 through Table 6** list the results of the background survey.

A decision level value (DLV) was calculated to permit the field identification of surfaces requiring additional radiological measurements. Decision level values were calculated using the following equation (Battelle, 2000).

$$DLV = \bar{x}_{bkg} + MDA$$

where:

$\bar{x}_{bkg}$ = mean background value (cpm)
MDA = minimum detectable activity (cpm).

MDA values were calculated using the following equation:

$$MDA = 3 + 4.65(\sigma_{bkg})$$

where:

σ_{bkg} = standard deviation of background value.

4.3 Major Contaminants Identified

Existing monitoring data and historical information available for the ANFB-SSSF indicates that contamination consists of fission and activation products. The potential radioactive substances which have been identified for the ANFB-SSSF include cesium-137 (Cs-137), cobalt-60 (Co-60), strontium-90 (Sr-90), and a few other individual nuclides. Cs-137, Co-60, and Sr-90 are the prominent isotopes present. The more restrictive surface contamination limits associated with Sr-90 were applied to the characterization and final status survey for ANFB-SSSF scans.

4.3.1 Guidelines Established

Table 1 presents the surface contamination guidelines applied for ANFB-SSSF. These criteria are provided by DOE Order 5400.5 "Radiation Protection of the Public and Environment," which reference Regulatory Guide 1.86. DOE Order 5400.5 does not

define the release levels for nuclides such as transuranics, Ra-226 and Th-230, therefore the CCP adopted the guidance of Regulatory Guide 1.86.

As previously stated, the more restrictive surface contamination limits associates with strontium-90 were applied to the characterization and final status survey for total fixed plus removable and removal contamination for alpha + beta measurements.

Exposure rates were compared to the 5 μR/hr above mean background limit listed in DD-97-02, Rev. 0. The calculated mean background exposure rate and the 95 percent confidence intervals used for the CCP grounds are 8 ± 2 μR/hr.

5.0 Equipment and Procedures

5.1 Equipment

Direct reading gas proportional survey instruments sensitive to alpha and beta radiation are used to monitor facility surfaces for residual radioactive materials. Ludlum Model 43-20 gas proportional detectors (180 square centimeters (cm^2) detection areas) with Eberline ESP-2 meters were used to scan all structure surfaces. The 180 cm^2 detector was used for all static measurements for the determination of residual radioactivity levels. P-10 gas was supplied via a continuous feed to the detectors. Thin, flat plate thorium-230 and technicium-99 (Tc-99) sources traceable to the National Institute of Standards and Technology (NIST) per requirements of ANSI-N323a, "Radiation Protection Instrumentation Test and Calibration" were used to calibrate the gas proportional instruments for alpha and beta detection, respectively (ANSI, 1997). Tc-99 was used as the calibration source in accordance with Section 4.2.2 of ANSI-N323A which states "the detector shall be calibrated with an energy that is less than or similar to beta energies in the field." (ANSI, 1997) The average beta energy of Tc-99 is 85 KeV, with the average energies of Co-60, Cs-137, and Sr-90 being 95, 156, and 196 KeV, respectively.

Other instrumentation used in the support of the final status survey includes:

- A Ludlum Model 19 Exposure Rate Meter to perform gamma radiation measurements
- A Tennelec Model LB5100 Simultaneous Alpha and Beta Gas Proportional Counter to count smear samples

5.2 Minimum Detectable Activities

Minimum detectable activities (MDAs) for structure surface scanning are determined utilizing the data collected for each surface material. The following equation is used to calculate the MDA:

$$MDA = \frac{3 + (4.65 * \sigma_{bkg})}{Eff * T * G}$$

where:

σ_{bkg}	=	standard deviation of background value = $\sqrt{counts_{bkg}}$
Eff	=	efficiency of detector
T	=	time in minutes
G	=	geometry = $\frac{\text{active probe area in cm}^2}{100}$

The MDA for large, wide area sources was calculated assuming the radioactive source remained under the detector approximately one minute, allowing the MDA for wide-area

source scan surveys to approach the MDA reported for a static survey. The MDA for a wide-area source was calculated at 260 disintegrations per minute per 100 square centimeters (dpm/100 cm^2). The MDA for scans involving point sources were calculated by evaluating the time a point source remained under the detection area, given a worst-case brick background. An MDA of 1,600 dpm/100 cm^2 was calculated for a point source configuration during a scan survey. Attachment A details the method for calculating the MDA.

5.3 Procedures

The Characterization Team was formally trained and qualified to applicable procedures prior to the initiation of the characterization and final status surveys. Documentation of training is maintained by CCP Project Records.

The following plans and procedures were utilized for the surveys:

DD-93-19, Rev. 5	Decommissioning Plan, Battelle Memorial Institute Columbus Operations
DD-97-02, Rev. 0	Radiological Characterization and Final Status Plan for BCLDP West Jefferson Site
SC-OP-004, Rev. 0	Radioactive Contamination Monitoring Requirements for Facility Surface Characterization
SC-OP-007, Rev. 0	Baseline Reference Values for Facility Radiological Characterization Surveys
SC-OP-010, Rev. 0	Establishing a Surface Reference Grid for Walls, Floors, and Ceilings for a Detailed Characterization Survey
WI-2806, Rev. 2	Excavation and Trench Sampling and Surveys

6.0 Survey Findings

6.1 Exposure Rate Surveys

The calculated mean background exposure rate and the 95 percent confidence intervals used for the CCP grounds are 8 ± 2 μR/hr. The exposure rate readings for each appropriate area are presented in **Table 2**. The exposure rate readings were individually compared to the mean background value of 8 ± 2 μR/hr in order to show compliance with the 5 μR /hr above background release criterion (exposure rate surveys must be less than 13 μR/hr to be compliant). The average one meter measurement was 10.6 μR/hr, the minimum measurement was 9 μR/hr and the maximum measurement was 12 μR/hr.

6.2 Scanning and Fixed Measurements

Final status surveys for total (fixed and removable) radiological contamination were less than the release criteria defined in **Table 1.**

Table 2 presents scanning survey results and **Table 3** presents the static survey results from the ANFB-SSSF surveys. Numerical values in the tables represent residual activities and were computed as follows:

$$\frac{dpm}{100cm^2} = \frac{C_g - C_b}{(T)(Eff)(\frac{180}{100})}$$

Where:

C_g = Gross counts (counts/180 cm^2)
C_b = Mean value of background counts (counts/180 cm^2)
T = count time (min) [one minute count time is standard]
Eff = average instrument efficiency

Count rates for both wide area (greater than the probe area of 180 cm^2) and point (less than the probe area of 180 cm^2) sources were normalized to 100 cm^2 through this equation. Utilizing the equation confirms that all wide-area sources met the 1,000 dpm/100 cm^2 release criteria. Point sources, if identified, were also subject to the normalizing equation. Therefore, activities for point sources was limited to 1800 dpm/100 cm^2, which is well below the 3,000 dpm/100 cm^2 release criteria for "hot spots."

Areas where measurements exceed the decision level value (DLV), precise identification of the area and additional data collection is required. Further data collection includes: (a) a static alpha-plus-beta measurement, (b) a static alpha-only measurement, and (c) a smear sample. In these areas, it is Closure Services current policy to decontaminate the area to below 1000 dpm/100 cm^2, or the appropriate radiological cleanup criteria. If decontamination is not feasible in the area, additional information such as the exact area of contamination and contamination levels using a 100 cm^2 probe are obtained.

The following summarizes the alpha + beta scanning and integrated measurement surveys obtained for ANFB-SSSF. A total of 178 Survey grids were scanned, static measurements and smears were collected in 60 survey grids. The results of these surveys are summarized below.

Location	Total Alpha + Beta Activity in dpm/100cm^2		
	Average	Minimum	Maximum
Scanning Survey	-3.91	-268.52	163.40
FSS Static - Walls	-90.12	-161.11	62.96
FSS Static – Floor	51.79	-14.81	122.22

7.0 Conclusions

The characterization and final status survey results demonstrate that the radiological endpoint criteria objectives of the NRC-approved Decommissioning Plan have been met for the areas addressed by this effort. (Battelle, 2003) The scanning and the integrated measurements for alpha + beta and the smear survey results obtained from the ANFB-SSSF are reported as concentrations less than those listed in **Table 1.**

The final status survey performed on the ANFB-SSSF area statistically demonstrates that the remediation of the area was successful and that the area is free from residual radioactive contamination making it suitable for unrestricted release.

8.0 References

American National Standards Institute (ANSI), 1997. ANSI-N323a, "Radiation Protection Instrumentation Test and Calibration."

Battelle, 2003a. "Decommissioning Plan for the Battelle Memorial Institute Columbus Operations," DD-93-19.

Battelle, 2000. "Radiological Characterization and Final Status Survey Plan for Battelle Columbus Laboratory Decommissioning Project West Jefferson Site", DD-97-02.

Battelle, 1993A. "Surface Release Criteria Technical Basis Document", DD-93-02.

ECC&E2 Closure Services, LLC (Closure Services, 2004A). Work Instruction 2500, Rev. 0, CS CCP Filter Bed Remediation Project.

ECC&E2 Closure Services, LLC (Closure Services, 2004B). Characterization and Final Status Report for JN-6, Revision 1, July 2004.

U.S. Department of Energy (DOE), 1986. May 29, 1986 memorandum, Voight to Vaughan, approved by Vaughan, June 10, 1986.

Oak Ridge Associated Universities (ORAU), 1992. "Manual for Conducting Radiological Surveys in Support of License Termination, Draft Report for Comment" NUREG/CR-5849, ORAU-92/C57, prepared for the Nuclear Regulatory Commission by the Environmental Survey and Assessment Program, Energy/Environmental Systems Division, ORAU, 1992.

FIGURES

FIGURE 1, SITE MAP

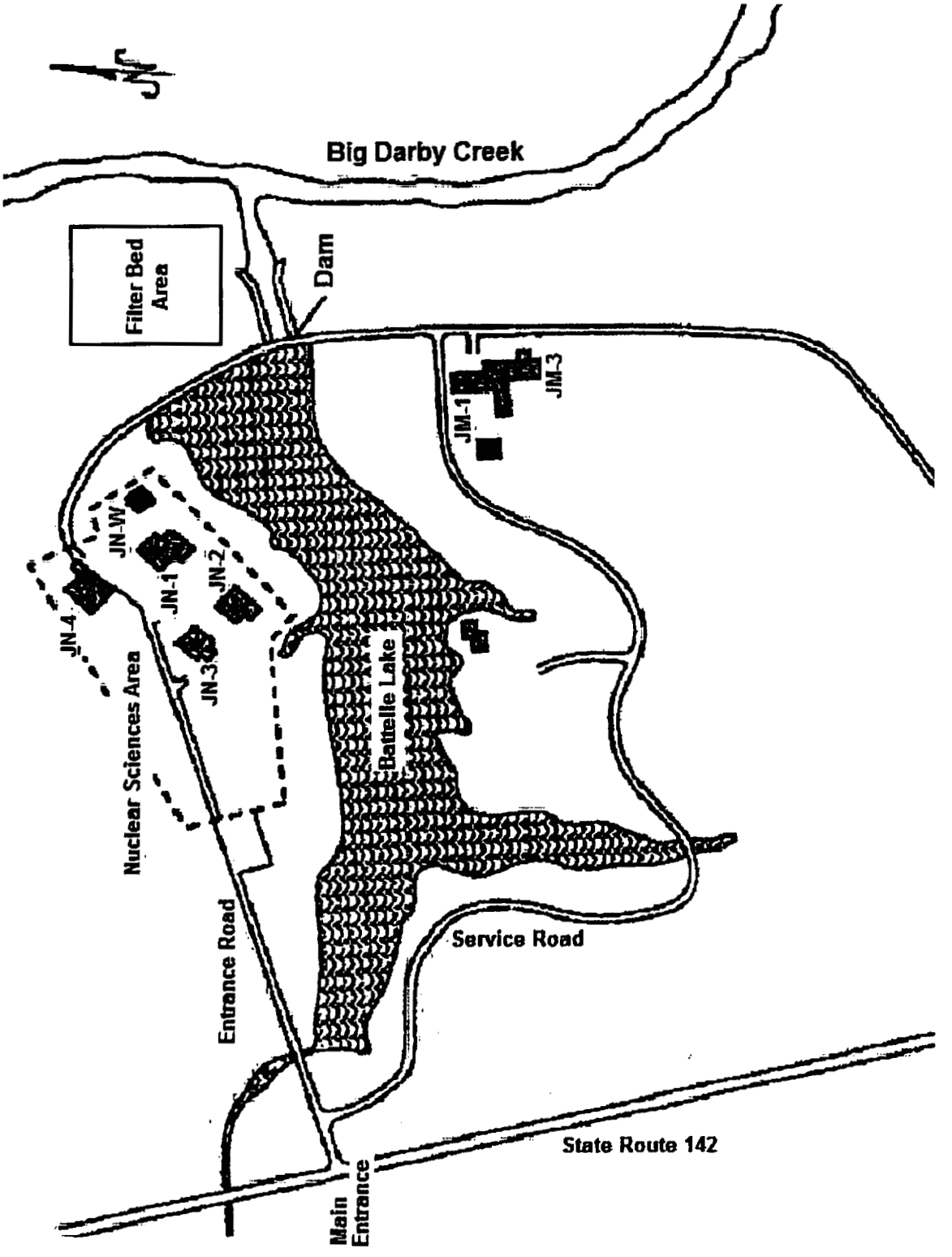


FIGURE 2, ACTIVE NORTH FILTER BED – SOUTH SUBSURFACE SAND FILTER

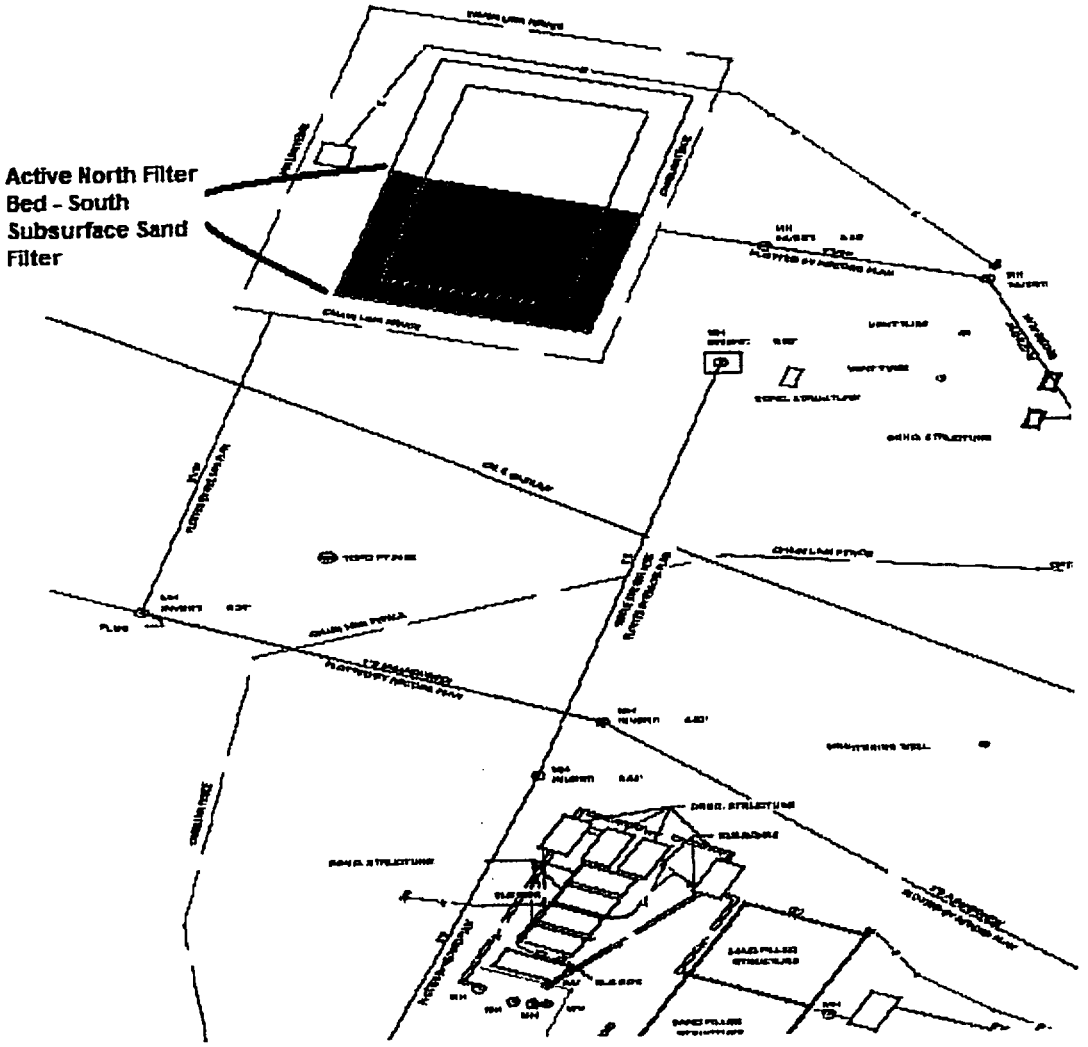
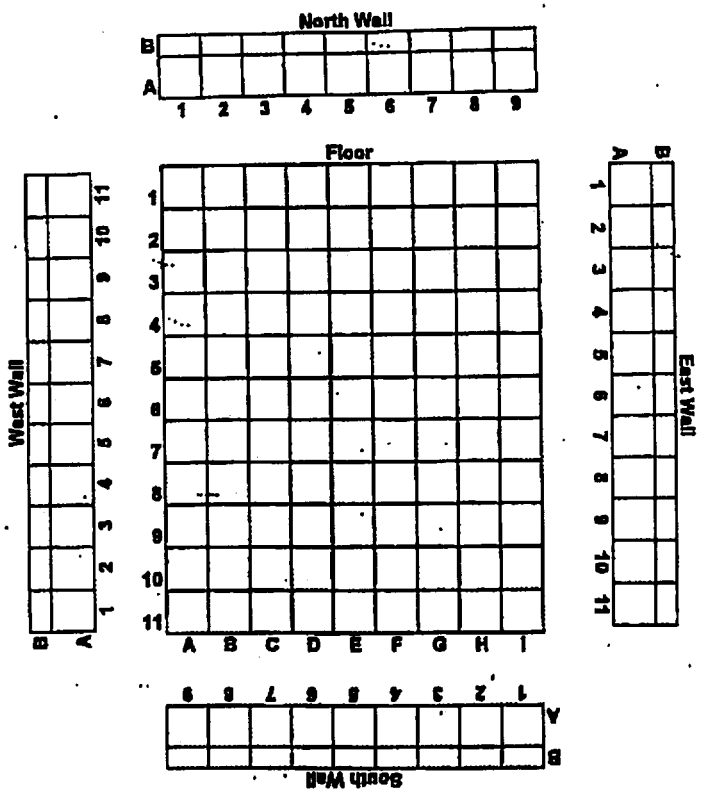


FIGURE 3
ANFB – NSSF GRID MAP



TABLES

Table 1
Surface Contamination Guidelines for BCLDP

Radionuclides [2]	Allowable Total Residual Surface Contamination (dpm/100 cm^2)[1]		
	Average [3,4]	Maximum [4,3]	Removable [4,6]
Transuranics, 1-125. 1-129. Ra-226, Ac-227. Ra-228. Th-228. Th-230, Pa-231	Reserved (100)*	Reserved (300)*	Reserved (20)*
Th-Natural, Sr-90. 1-126. 1-131. 1-133, . Ra-223. Ra-224, U-232. Th-232	1,000	3,000	200
U-Natural, U-235. U-238. and associated decay product. alpha emitters	5,000	15,000	1.000
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others notes above. [7]	5.000	15,000	1,000

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

(2) Where surface contamination by both alpha-and beta-gamma-emitting radionuclides exists. the limits established for alpha-and beta-gamma-emitting radionuclides should apply independently.

(3) Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

(4) The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr and 1.0 mrad/hr., respectively, at 1 cm.

(5) The maximum contamination level applies to an area of not more than 100 cm^2.

(6) The amount of removable material per 100 cm^2 of surface area should be determined by wiping and area of that size with dry filter or soft absorbent paper. applying moderate pressure. and measuring the amount of radioactive material on the wiping an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

(7) This category of radionuclides includes mixed fission products. including the Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

* Regulatory Guide 1.86

Table 2
CHARACTERIZATION SURVEY DATA SHEET
SCAN SURVEY RESULTS

Area/Building: Filter Bed
Room: Active North
Date: 09/29/2004

			Results in CPM					Instrument		Results in DPM/100cm²	Results in CPM					Instrument		Results in DPM/100cm²	Smear Results in DPM/100cm²		Results in µR/hr Gamma	
	Surface	Material	Alpha + Beta BKG			Scan Measurements					Alpha BKG			Scan Measurements								
Grid	Medium	Type	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	Alpha	Beta	Contact	1 Meter
A1	Floor	C	545	300	457	479	22	0.3	1.8	40.74	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	3.7	10	10
A2	Floor	C	545	300	457	484	27	0.3	1.8	50.00	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
A3	Floor	C	545	300	457	493	36	0.3	1.8	66.67	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
A4	Floor	C	545	300	457	464	7	0.3	1.8	12.96	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	2.61	N/A	N/A
A5	Floor	C	545	300	457	526	69	0.3	1.8	127.78	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	2.61	N/A	N/A
A6	Floor	C	545	300	457	525	68	0.3	1.8	125.93	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-0.65	N/A	N/A
A7	Floor	C	545	300	457	503	46	0.3	1.8	85.19	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-2.83	N/A	N/A
A8	Floor	C	545	300	457	402	-55	0.3	1.8	-101.85	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	1.52	N/A	N/A
A9	Floor	C	545	300	457	407	-50	0.3	1.8	-92.59	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
A10	Floor	C	545	300	457	406	-51	0.3	1.8	-94.44	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
A11	Floor	C	545	300	457	476	19	0.3	1.8	35.19	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	11	9
B1	Floor	C	545	300	457	384	-73	0.3	1.8	-135.19	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
B2	Floor	C	545	300	457	385	-72	0.3	1.8	-133.33	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-0.65	N/A	N/A
B3	Floor	C	545	300	457	425	-32	0.3	1.8	-59.26	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	0.43	N/A	N/A
B4	Floor	C	545	300	457	400	-57	0.3	1.8	-105.56	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
B5	Floor	C	545	300	457	445	-12	0.3	1.8	-22.22	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	N/A	N/A
B6	Floor	C	545	300	457	415	-42	0.3	1.8	-77.78	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	2.61	N/A	N/A
B7	Floor	C	545	300	457	394	-63	0.3	1.8	-116.67	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
B8	Floor	C	545	300	457	540	83	0.3	1.8	153.70	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	N/A	N/A
B9	Floor	C	545	300	457	467	10	0.3	1.8	18.52	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
B10	Floor	C	545	300	457	402	-55	0.3	1.8	-101.85	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-0.65	N/A	N/A
B11	Floor	C	545	300	457	504	47	0.3	1.8	87.04	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	6.96	N/A	N/A
C1	Floor	C	545	300	457	540	83	0.3	1.8	153.70	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
C2	Floor	C	545	300	457	519	62	0.3	1.8	114.81	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
C3	Floor	C	545	300	457	475	18	0.3	1.8	33.33	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
C4	Floor	C	545	300	457	488	31	0.3	1.8	57.41	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-0.65	N/A	N/A
C5	Floor	C	545	300	457	511	54	0.3	1.8	100.00	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-0.65	N/A	N/A
C6	Floor	C	545	300	457	519	62	0.3	1.8	114.81	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	3.7	N/A	N/A
C7	Floor	C	545	300	457	535	79	0.3	1.8	146.30	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	2.61	N/A	N/A
C8	Floor	C	545	300	457	520	63	0.3	1.8	116.67	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
C9	Floor	C	545	300	457	479	22	0.3	1.8	40.74	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	3.7	N/A	N/A
C10	Floor	C	545	300	457	476	19	0.3	1.8	35.19	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
C11	Floor	C	545	300	457	471	14	0.3	1.8	25.93	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
D1	Floor	C	545	300	457	497	40	0.3	1.8	74.07	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
D2	Floor	C	545	300	457	509	52	0.3	1.8	96.30	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	1.52	N/A	N/A
D3	Floor	C	545	300	457	476	19	0.3	1.8	35.19	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	N/A	N/A
D4	Floor	C	545	300	457	480	23	0.3	1.8	42.59	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	4.8	N/A	N/A
D5	Floor	C	545	300	457	500	43	0.3	1.8	79.63	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	N/A	N/A
D6	Floor	C	545	300	457	508	51	0.3	1.8	94.44	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
D7	Floor	C	545	300	457	457	0	0.3	1.8	0.00	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
D8	Floor	C	545	300	457	498	41	0.3	1.8	75.93	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-2.83	N/A	N/A
D9	Floor	C	545	300	457	426	-31	0.3	1.8	-57.41	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	2.61	N/A	N/A
D10	Floor	C	545	300	457	478	21	0.3	1.8	38.89	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	0.43	N/A	N/A
D11	Floor	C	545	300	457	519	62	0.3	1.8	114.81	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	2.61	N/A	N/A
E1	Floor	C	545	300	457	485	28	0.3	1.8	51.85	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	4.8	N/A	N/A
E2	Floor	C	545	300	457	435	-22	0.3	1.8	-40.74	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	N/A	N/A

N/A = Not Analyzed

Table 2
CHARACTERIZATION SURVEY DATA SHEET
SCAN SURVEY RESULTS

Area/Building: Filter Bed
Room: Active North
Date: 09/29/2004

			Results in CPM							Results in	Results in CPM								Results in	Smear Results in		Results in µR/hr	
	Surface	Material	Alpha + Beta BKG			Scan Measurements		Instrument		DPM/100cm²	Alpha BKG			Scan Measurements		Instrument			DPM/100cm²	DPM/100cm²		Gamma	
Grid	Medium	Type	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity		Alpha	Beta	Contact	1 Meter
E3	Floor	C	545	300	457	360	-97	0.3	1.8	-179.63	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	3.7	N/A	N/A
E4	Floor	C	545	300	457	463	6	0.3	1.8	11.11	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	2.61	N/A	N/A
E5	Floor	C	545	300	457	457	0	0.3	1.8	0.00	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
E6	Floor	C	545	300	457	483	26	0.3	1.8	48.15	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	12	12
E7	Floor	C	545	300	457	467	10	0.3	1.8	18.52	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-0.65	N/A	N/A
E8	Floor	C	545	300	457	441	-16	0.3	1.8	-29.63	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-0.65	N/A	N/A
E9	Floor	C	545	300	457	453	-4	0.3	1.8	-7.41	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
E10	Floor	C	545	300	457	441	-16	0.3	1.8	-29.63	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
E11	Floor	C	545	300	457	445	-12	0.3	1.8	-22.22	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	3.7	N/A	N/A
F1	Floor	C	545	300	457	484	27	0.3	1.8	50.00	35	0	16	N/A	N/A	0.245	1.8	N/A		1.31	-0.65	N/A	N/A
F2	Floor	C	545	300	457	450	-7	0.3	1.8	-12.96	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
F3	Floor	C	545	300	457	411	-46	0.3	1.8	-85.19	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	2.61	N/A	N/A
F4	Floor	C	545	300	457	429	-28	0.3	1.8	-51.85	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-0.65	N/A	N/A
F5	Floor	C	545	300	457	382	-75	0.3	1.8	-138.89	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
F6	Floor	C	545	300	457	514	57	0.3	1.8	105.56	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	1.52	N/A	N/A
F7	Floor	C	545	300	457	414	-43	0.3	1.8	-79.63	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	2.61	N/A	N/A
F8	Floor	C	545	300	457	504	47	0.3	1.8	87.04	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	3.7	N/A	N/A
F9	Floor	C	545	300	457	455	-2	0.3	1.8	-3.70	35	0	16	N/A	N/A	0.245	1.8	N/A		1.31	-0.65	N/A	N/A
F10	Floor	C	545	300	457	436	-21	0.3	1.8	-38.89	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	1.52	N/A	N/A
F11	Floor	C	545	300	457	461	4	0.3	1.8	7.41	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	1.52	N/A	N/A
G1	Floor	C	545	300	457	468	11	0.3	1.8	20.37	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-1.74	N/A	N/A
G2	Floor	C	545	300	457	448	-9	0.3	1.8	-16.67	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
G3	Floor	C	545	300	457	439	-18	0.3	1.8	-33.33	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
G4	Floor	C	545	300	457	451	-6	0.3	1.8	-11.11	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-0.65	N/A	N/A
G5	Floor	C	545	300	457	443	-14	0.3	1.8	-25.93	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-1.74	N/A	N/A
G6	Floor	C	545	300	457	441	-16	0.3	1.8	-29.63	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	2.61	N/A	N/A
G7	Floor	C	545	300	457	459	2	0.3	1.8	3.70	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
G8	Floor	C	545	300	457	462	5	0.3	1.8	9.26	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-0.65	N/A	N/A
G9	Floor	C	545	300	457	393	-64	0.3	1.8	-118.52	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
G10	Floor	C	545	300	457	396	-61	0.3	1.8	-112.96	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	2.61	N/A	N/A
G11	Floor	C	545	300	457	409	-48	0.3	1.8	-88.89	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-1.74	N/A	N/A
H1	Floor	C	545	300	457	424	-33	0.3	1.8	-61.11	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	1.52	N/A	N/A
H2	Floor	C	545	300	457	429	-28	0.3	1.8	-51.85	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	3.7	N/A	N/A
H3	Floor	C	545	300	457	462	5	0.3	1.8	9.26	35	0	16	N/A	N/A	0.245	1.8	N/A		1.31	-1.74	N/A	N/A
H4	Floor	C	545	300	457	452	-5	0.3	1.8	-9.26	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
H5	Floor	C	545	300	457	397	-60	0.3	1.8	-111.11	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-0.65	N/A	N/A
H6	Floor	C	545	300	457	399	-58	0.3	1.8	-107.41	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-1.74	N/A	N/A
H7	Floor	C	545	300	457	438	-19	0.3	1.8	-35.19	35	0	16	N/A	N/A	0.245	1.8	N/A		1.31	1.52	N/A	N/A
H8	Floor	C	545	300	457	432	-25	0.3	1.8	-46.30	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	1.52	N/A	N/A
H9	Floor	C	545	300	457	420	-37	0.3	1.8	-68.52	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
H10	Floor	C	545	300	457	386	-71	0.3	1.8	-131.48	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	1.52	N/A	N/A
H11	Floor	C	545	300	457	387	-70	0.3	1.8	-129.63	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
I1	Floor	C	545	300	457	394	-63	0.3	1.8	-116.67	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	1.52	10	11
I2	Floor	C	545	300	457	312	-145	0.3	1.8	-268.52	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	0.43	N/A	N/A
I3	Floor	C	545	300	457	510	53	0.3	1.8	98.15	35	0	16	N/A	N/A	0.245	1.8	N/A		-0.51	-0.65	N/A	N/A
I4	Floor	C	545	300	457	409	-48	0.3	1.8	-88.89	35	0	16	N/A	N/A	0.245	1.8	N/A		1.31	-1.74	N/A	N/A

N/A = Not Analyzed

Table 2
CHARACTERIZATION SURVEY DATA SHEET
SCAN SURVEY RESULTS

Area/Building: Filter Bed
Room: Active North
Date: 09/29/2004

			Results in CPM							Results in	Results in CPM								Results in	Smear Results in		Results in µR/hr	
	Surface	Material	Alpha + Beta BKG			Scan Measurements		Instrument		DPM/100cm²	Alpha BKG			Scan Measurements		Instrument			DPM/100cm²	DPM/100cm²		Gamma	
Grid	Medium	Type	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	Alpha	Beta	Contact	1 Meter
I5	Floor	C	545	300	457	462	5	0.3	1.8	9.26	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	1.52	N/A	N/A
I6	Floor	C	545	300	457	456	-1	0.3	1.8	-1.85	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-0.65	N/A	N/A
I7	Floor	C	545	300	457	433	-24	0.3	1.8	-44.44	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	N/A	N/A
I8	Floor	C	545	300	457	412	-45	0.3	1.8	-83.33	35	0	16	N/A	N/A	0.245	1.8	N/A	1.31	-2.83	N/A	N/A
I9	Floor	C	545	300	457	444	-13	0.3	1.8	-24.07	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	N/A	N/A
I10	Floor	C	545	300	457	464	7	0.3	1.8	12.96	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	-1.74	N/A	N/A
I11	Floor	C	545	300	457	534	77	0.3	1.8	142.59	35	0	16	N/A	N/A	0.245	1.8	N/A	-0.51	0.43	10	11
A1	N.Wall	C	545	326	457	456	-1	0.289	1.8	-1.92	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	3.7	N/A	N/A
A2	N.Wall	C	545	326	457	402	-55	0.289	1.8	-105.73	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	3.7	N/A	N/A
A3	N.Wall	C	545	326	457	496	39	0.289	1.8	74.97	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
A4	N.Wall	C	545	326	457	460	3	0.289	1.8	5.77	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	2.61	N/A	N/A
A5	N.Wall	C	545	326	457	402	-55	0.289	1.8	-105.73	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
A6	N.Wall	C	545	326	457	395	-62	0.289	1.8	-119.18	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
A7	N.Wall	C	545	326	457	481	24	0.289	1.8	46.14	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	4.8	N/A	N/A
A8	N.Wall	C	545	326	457	420	-37	0.289	1.8	-71.13	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A9	N.Wall	C	545	326	457	465	8	0.289	1.8	15.38	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-1.74	N/A	N/A
B1	N.Wall	C	545	326	457	454	-3	0.289	1.8	-5.77	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	3.7	N/A	N/A
B2	N.Wall	C	545	326	457	404	-53	0.289	1.8	-101.88	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
B3	N.Wall	C	545	326	457	472	15	0.289	1.8	28.84	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	0.43	N/A	N/A
B4	N.Wall	C	545	326	457	472	15	0.289	1.8	28.84	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	3.7	N/A	N/A
B5	N.Wall	C	545	326	457	528	71	0.289	1.8	136.49	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
B6	N.Wall	C	545	326	457	510	53	0.289	1.8	101.88	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
B7	N.Wall	C	545	326	457	426	-31	0.289	1.8	-59.59	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	0.43	N/A	N/A
B8	N.Wall	C	545	326	457	462	5	0.289	1.8	9.61	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
B9	N.Wall	C	545	326	457	493	36	0.289	1.8	69.20	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	1.52	N/A	N/A
A1	E.Wall	C	545	326	457	542	85	0.289	1.8	163.40	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A2	E.Wall	C	545	326	457	409	-48	0.289	1.8	-92.27	35	0	16	N/A	N/A	0.24	1.8	N/A	3.14	-0.65	N/A	N/A
A3	E.Wall	C	545	326	457	495	38	0.289	1.8	73.05	35	0	16	N/A	N/A	0.24	1.8	N/A	3.14	-1.74	N/A	N/A
A4	E.Wall	C	545	326	457	502	45	0.289	1.8	86.51	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-1.74	N/A	N/A
A5	E.Wall	C	545	326	457	446	-11	0.289	1.8	-21.15	35	0	16	N/A	N/A	0.24	1.8	N/A	4.96	1.52	N/A	N/A
A6	E.Wall	C	545	326	457	410	-47	0.289	1.8	-90.35	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-1.74	N/A	N/A
A7	E.Wall	C	545	326	457	466	9	0.289	1.8	17.30	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
A8	E.Wall	C	545	326	457	503	46	0.289	1.8	88.43	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	3.7	N/A	N/A
A9	E.Wall	C	545	326	457	489	32	0.289	1.8	61.51	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
A10	E.Wall	C	545	326	457	451	-6	0.289	1.8	-11.53	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	0.43	N/A	N/A
A11	E.Wall	C	545	326	457	462	5	0.289	1.8	9.61	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	-2.83	N/A	N/A
B1	E.Wall	C	545	326	457	532	75	0.289	1.8	144.18	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
B2	E.Wall	C	545	326	457	431	-26	0.289	1.8	-49.98	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	4.8	N/A	N/A
B3	E.Wall	C	545	326	457	429	-28	0.289	1.8	-53.83	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	-2.83	N/A	N/A
B4	E.Wall	C	545	326	457	481	24	0.289	1.8	46.14	35	0	16	N/A	N/A	0.24	1.8	N/A	4.96	1.52	N/A	N/A
B5	E.Wall	C	545	326	457	426	-31	0.289	1.8	-59.59	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	1.52	N/A	N/A
B6	E.Wall	C	545	326	457	411	-46	0.289	1.8	-88.43	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	1.52	N/A	N/A
B7	E.Wall	C	545	326	457	441	-16	0.289	1.8	-30.76	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
B8	E.Wall	C	545	326	457	495	38	0.289	1.8	73.05	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	1.52	N/A	N/A
B9	E.Wall	C	545	326	457	442	-15	0.289	1.8	-28.84	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	2.61	N/A	N/A
B10	E.Wall	C	545	326	457	468	11	0.289	1.8	21.15	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A

N/A = Not Analyzed

Table 2
CHARACTERIZATION SURVEY DATA SHEET
SCAN SURVEY RESULTS

Area/Building: Filter Bed
Room: Active North
Date: 09/29/2004

			Results in CPM					Instrument		Results in DPM/100cm²	Results in CPM					Instrument		Results in DPM/100cm²	Smear Results in DPM/100cm²		Results in µR/hr Gamma	
	Surface	Material	Alpha + Beta BKG			Scan Measurements					Alpha BKG			Scan Measurements								
Grid	Medium	Type	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	Alpha	Beta	Contact	1 Meter
B11	E.Wall	C	545	326	457	359	-98	0.289	1.8	-188.39	35	0	16	N/A	N/A	0.24	1.8	N/A	3.14	2.61	N/A	N/A
A1	S.Wall	C	545	326	457	475	18	0.289	1.8	34.60	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	0.43	N/A	N/A
A2	S.Wall	C	545	326	457	467	10	0.289	1.8	19.22	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	4.8	N/A	N/A
A3	S.Wall	C	545	326	457	403	-54	0.289	1.8	-103.81	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A4	S.Wall	C	545	326	457	421	-36	0.289	1.8	-69.20	35	0	16	N/A	N/A	0.24	1.8	N/A	3.14	-1.74	N/A	N/A
A5	S.Wall	C	545	326	457	437	-20	0.289	1.8	-38.45	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
A6	S.Wall	C	545	326	457	463	6	0.289	1.8	11.53	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
A7	S.Wall	C	545	326	457	413	-44	0.289	1.8	-84.58	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A8	S.Wall	C	545	326	457	396	-61	0.289	1.8	-117.26	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A9	S.Wall	C	545	326	457	466	9	0.289	1.8	17.30	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	3.7	N/A	N/A
B1	S.Wall	C	545	326	457	385	-72	0.289	1.8	-138.41	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
B2	S.Wall	C	545	326	457	401	-56	0.289	1.8	-107.65	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-2.83	N/A	N/A
B3	S.Wall	C	545	326	457	365	-92	0.289	1.8	-176.86	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-1.74	N/A	N/A
B4	S.Wall	C	545	326	457	457	0	0.289	1.8	0.00	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	3.7	N/A	N/A
B5	S.Wall	C	545	326	457	373	-84	0.289	1.8	-161.48	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	-0.65	N/A	N/A
B6	S.Wall	C	545	326	457	391	-66	0.289	1.8	-126.87	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-2.83	N/A	N/A
B7	S.Wall	C	545	326	457	477	20	0.289	1.8	38.45	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	2.61	N/A	N/A
B8	S.Wall	C	545	326	457	495	38	0.289	1.8	73.05	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
B9	S.Wall	C	545	326	457	414	-43	0.289	1.8	-82.66	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-1.74	N/A	N/A
A1	W.Wall	C	545	326	457	493	36	0.289	1.8	69.20	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A2	W.Wall	C	545	326	457	489	32	0.289	1.8	61.51	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
A3	W.Wall	C	545	326	457	452	-5	0.289	1.8	-9.61	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
A4	W.Wall	C	545	326	457	506	49	0.289	1.8	94.19	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	-1.74	N/A	N/A
A5	W.Wall	C	545	326	457	482	25	0.289	1.8	48.08	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-1.74	N/A	N/A
A6	W.Wall	C	545	326	457	474	17	0.289	1.8	32.68	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
A7	W.Wall	C	545	326	457	414	-43	0.289	1.8	-82.66	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A8	W.Wall	C	545	326	457	425	-32	0.289	1.8	-61.51	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
A9	W.Wall	C	545	326	457	457	0	0.289	1.8	0.00	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	3.7	N/A	N/A
A10	W.Wall	C	545	326	457	474	17	0.289	1.8	32.68	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
A11	W.Wall	C	545	326	457	459	2	0.289	1.8	3.84	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
B1	W.Wall	C	545	326	457	511	54	0.289	1.8	103.81	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
B2	W.Wall	C	545	326	457	531	74	0.289	1.8	142.25	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-1.74	N/A	N/A
B3	W.Wall	C	545	326	457	489	32	0.289	1.8	61.51	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A
B4	W.Wall	C	545	326	457	447	-10	0.289	1.8	-19.22	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
B5	W.Wall	C	545	326	457	512	55	0.289	1.8	105.73	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	-0.65	N/A	N/A
B6	W.Wall	C	545	326	457	446	-11	0.289	1.8	-21.15	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
B7	W.Wall	C	545	326	457	516	59	0.289	1.8	113.42	35	0	16	N/A	N/A	0.24	1.8	N/A	1.31	-0.65	N/A	N/A
B8	W.Wall	C	545	326	457	437	-20	0.289	1.8	-38.45	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
B9	W.Wall	C	545	326	457	498	41	0.289	1.8	78.82	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	0.43	N/A	N/A
B10	W.Wall	C	545	326	457	467	10	0.289	1.8	19.22	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	2.61	N/A	N/A
B11	W.Wall	C	545	326	457	519	62	0.289	1.8	119.18	35	0	16	N/A	N/A	0.24	1.8	N/A	-0.51	1.52	N/A	N/A

N/A = Not Analyzed

Table 3

CHARACTERIZATION SURVEY DATA SHEET

STATIC SURVEY RESULTS (FSS) - CONCRETE FLOOR AND WALLS

Area/Building: Filter Bed
Room: Active North
Date:09/30/2004

			Results in CPM					Instrument		Results in DPM/100cm²	Results in CPM					Instrument		Results in DPM/100cm²	Smear Results in DPM/100cm²		Results in µR/hr Gamma	
	Surface	Material	Alpha + Beta BKG			Static Measurements					Alpha BKG			Static Measurements								
Grid	Medium	Type	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	Alpha	Beta	Contact	1 Meter
A1	Floor	C	473	316	393	421	28	0.3	1.8	51.85	11	2	3	2	-1	0.245	1.8	-2.27	-0.51	3.7	N/A	N/A
A5	Floor	C	473	316	393	385	-8	0.3	1.8	-14.81	11	2	3	2	-1	0.245	1.8	-2.27	-0.51	2.61	N/A	N/A
A8	Floor	C	473	316	393	385	-8	0.3	1.8	-14.81	11	2	3	4	1	0.245	1.8	2.27	1.31	1.52	N/A	N/A
B2	Floor	C	473	316	393	426	33	0.3	1.8	61.11	11	2	3	7	4	0.245	1.8	9.07	-0.51	-0.65	N/A	N/A
B6	Floor	C	473	316	393	422	29	0.3	1.8	53.70	11	2	3	5	2	0.245	1.8	4.54	-0.51	2.61	N/A	N/A
B9	Floor	C	473	316	393	448	55	0.3	1.8	101.85	11	2	3	5	2	0.245	1.8	4.54	-0.51	-1.74	N/A	N/A
C3	Floor	C	473	316	393	440	47	0.3	1.8	87.04	11	2	3	6	3	0.245	1.8	6.80	-0.51	-1.74	N/A	N/A
C7	Floor	C	473	316	393	428	35	0.3	1.8	64.81	11	2	3	11	8	0.245	1.8	18.14	-0.51	2.61	N/A	N/A
C9	Floor	C	473	316	393	409	16	0.3	1.8	29.63	11	2	3	6	3	0.245	1.8	6.80	-0.51	3.7	N/A	N/A
D1	Floor	C	473	316	393	403	10	0.3	1.8	18.52	11	2	3	5	2	0.245	1.8	4.54	-0.51	-1.74	N/A	N/A
D5	Floor	C	473	316	393	409	16	0.3	1.8	29.63	11	2	3	12	9	0.245	1.8	20.41	-0.51	0.43	N/A	N/A
D8	Floor	C	473	316	393	399	6	0.3	1.8	11.11	11	2	3	9	6	0.245	1.8	13.61	-0.51	-2.83	N/A	N/A
E1	Floor	C	473	316	393	439	46	0.3	1.8	85.19	11	2	3	4	1	0.245	1.8	2.27	1.31	4.8	N/A	N/A
E5	Floor	C	473	316	393	429	36	0.3	1.8	66.67	11	2	3	5	2	0.245	1.8	4.54	-0.51	0.43	N/A	N/A
E8	Floor	C	473	316	393	427	34	0.3	1.8	62.96	11	2	3	7	4	0.245	1.8	9.07	-0.51	-0.65	N/A	N/A
F2	Floor	C	473	316	393	432	39	0.3	1.8	72.22	11	2	3	2	-1	0.245	1.8	-2.27	-0.51	0.43	N/A	N/A
F6	Floor	C	473	316	393	405	12	0.3	1.8	22.22	11	2	3	8	5	0.245	1.8	11.34	-0.51	1.52	N/A	N/A
F9	Floor	C	473	316	393	412	19	0.3	1.8	35.19	11	2	3	8	5	0.245	1.8	11.34	1.31	-0.65	N/A	N/A
G3	Floor	C	473	316	393	436	43	0.3	1.8	79.63	11	2	3	1	-2	0.245	1.8	-4.54	-0.51	0.43	N/A	N/A
G5	Floor	C	473	316	393	420	27	0.3	1.8	50.00	11	2	3	2	-1	0.245	1.8	-2.27	-0.51	-1.74	N/A	N/A
G7	Floor	C	473	316	393	434	41	0.3	1.8	75.93	11	2	3	2	-1	0.245	1.8	-2.27	-0.51	0.43	N/A	N/A
H1	Floor	C	473	316	393	397	4	0.3	1.8	7.41	11	2	3	7	4	0.245	1.8	9.07	-0.51	1.52	N/A	N/A
H3	Floor	C	473	316	393	440	47	0.3	1.8	87.04	11	2	3	8	5	0.245	1.8	11.34	1.31	-1.74	N/A	N/A
H6	Floor	C	473	316	393	459	66	0.3	1.8	122.22	11	2	3	6	3	0.245	1.8	6.80	-0.51	-1.74	N/A	N/A
H8	Floor	C	473	316	393	425	32	0.3	1.8	59.26	11	2	3	8	5	0.245	1.8	11.34	-0.51	1.52	N/A	N/A
H9	Floor	C	473	316	393	408	15	0.3	1.8	27.78	11	2	3	9	6	0.245	1.8	13.61	-0.51	0.43	N/A	N/A
I1	Floor	C	473	316	393	443	50	0.3	1.8	92.59	11	2	3	4	1	0.245	1.8	2.27	-0.51	1.52	N/A	N/A
I3	Floor	C	473	316	393	418	25	0.3	1.8	46.30	11	2	3	7	4	0.245	1.8	9.07	-0.51	-0.65	N/A	N/A
I5	Floor	C	473	316	393	398	5	0.3	1.8	9.26	11	2	3	4	1	0.245	1.8	2.27	-0.51	1.52	N/A	N/A
I8	Floor	C	473	316	393	432	39	0.3	1.8	72.22	11	2	3	11	8	0.245	1.8	18.14	1.31	-2.83	N/A	N/A
A1	N.Wall	C	473	316	393	308	-85	0.3	1.8	-157.41	11	2	3	10	7	0.245	1.8	15.87	-0.51	3.7	N/A	N/A
A4	N.Wall	C	473	316	393	365	-28	0.3	1.8	-51.85	11	2	3	8	5	0.245	1.8	11.34	-0.51	2.61	N/A	N/A
A7	N.Wall	C	473	316	393	341	-52	0.3	1.8	-96.30	11	2	3	5	2	0.245	1.8	4.54	-0.51	4.8	N/A	N/A
A9	N.Wall	C	473	316	393	334	-59	0.3	1.8	-109.26	11	2	3	3	0	0.245	1.8	0.00	-0.51	-1.74	N/A	N/A
B2	N.Wall	C	473	316	393	330	-63	0.3	1.8	-116.67	11	2	3	6	3	0.245	1.8	6.80	-0.51	1.52	N/A	N/A
B6	N.Wall	C	473	316	393	311	-82	0.3	1.8	-151.85	11	2	3	4	1	0.245	1.8	2.27	-0.51	1.52	N/A	N/A
B8	N.Wall	C	473	316	393	351	-42	0.3	1.8	-77.78	11	2	3	10	7	0.245	1.8	15.87	-0.51	1.52	N/A	N/A
A1	E.Wall	C	473	316	393	339	-54	0.3	1.8	-100.00	11	2	3	11	8	0.245	1.8	18.14	-0.51	1.52	N/A	N/A
A4	E.Wall	C	473	316	393	387	-6	0.3	1.8	-11.11	11	2	3	6	3	0.245	1.8	6.80	-0.51	-1.74	N/A	N/A
A7	E.Wall	C	473	316	393	365	-28	0.3	1.8	-51.85	11	2	3	7	4	0.245	1.8	9.07	-0.51	0.43	N/A	N/A
A9	E.Wall	C	473	316	393	350	-43	0.3	1.8	-79.63	11	2	3	0	-3	0.245	1.8	-6.80	-0.51	0.43	N/A	N/A
A11	E.Wall	C	473	316	393	320	-73	0.3	1.8	-135.19	11	2	3	9	6	0.245	1.8	13.61	1.31	-2.83	N/A	N/A
B3	E.Wall	C	473	316	393	334	-59	0.3	1.8	-109.26	11	2	3	9	6	0.245	1.8	13.61	1.31	-2.83	N/A	N/A
B5	E.Wall	C	473	316	393	355	-38	0.3	1.8	-70.37	11	2	3	8	5	0.245	1.8	11.34	1.31	1.52	N/A	N/A
B8	E.Wall	C	473	316	393	353	-40	0.3	1.8	-74.07	11	2	3	11	8	0.245	1.8	18.14	1.31	1.52	N/A	N/A
B10	E.Wall	C	473	316	393	359	-34	0.3	1.8	-62.96	11	2	3	4	1	0.245	1.8	2.27	-0.51	0.43	N/A	N/A

Table 3

CHARACTERIZATION SURVEY DATA SHEET

STATIC SURVEY RESULTS (FSS) - CONCRETE FLOOR AND WALLS

Area/Building: Filter Bed
Room: Active North
Date:09/30/2004

			Results in CPM							Results in	Results in CPM							Results in	Smear Results in		Results in µR/hr	
	Surface	Material	Alpha + Beta BKG			Static Measurements		Instrument		DPM/100cm²	Alpha BKG			Static Measurements		Instrument		DPM/100cm²	DPM/100cm²		Gamma	
Grid	Medium	Type	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	DLV	Ambient	Mean	Gross Counts	Net Counts	EFF	CF	Activity	Alpha	Beta	Contact	1 Meter
A2	S.Wall	C	473	316	393	331	-62	0.3	1.8	-114.81	11	2	3	3	0	0.245	1.8	0.00	-0.51	4.8	N/A	N/A
A4	S.Wall	C	473	316	393	314	-79	0.3	1.8	-146.30	11	2	3	2	-1	0.245	1.8	-2.27	3.14	-1.74	N/A	N/A
A7	S.Wall	C	473	316	393	324	-69	0.3	1.8	-127.78	11	2	3	2	-1	0.245	1.8	-2.27	-0.51	1.52	N/A	N/A
A9	S.Wall	C	473	316	393	311	-82	0.3	1.8	-151.85	11	2	3	4	1	0.245	1.8	2.27	-0.51	3.7	N/A	N/A
B1	S.Wall	C	473	316	393	401	8	0.3	1.8	14.81	11	2	3	5	2	0.245	1.8	4.54	-0.51	0.43	N/A	N/A
B5	S.Wall	C	473	316	393	427	34	0.3	1.8	62.96	11	2	3	5	2	0.245	1.8	4.54	1.31	-0.55	N/A	N/A
B8	S.Wall	C	473	316	393	399	6	0.3	1.8	11.11	11	2	3	7	4	0.245	1.8	9.07	-0.51	-0.65	N/A	N/A
A2	W.Wall	C	473	316	393	306	-87	0.3	1.8	-161.11	11	2	3	3	0	0.245	1.8	0.00	-0.51	0.43	N/A	N/A
A4	W.Wall	C	473	316	393	314	-79	0.3	1.8	-146.30	11	2	3	4	1	0.245	1.8	2.27	1.31	-1.74	N/A	N/A
A6	W.Wall	C	473	316	393	341	-52	0.3	1.8	-96.30	11	2	3	5	2	0.245	1.8	4.54	-0.51	0.43	N/A	N/A
A8	W.Wall	C	473	316	393	338	-55	0.3	1.8	-101.85	11	2	3	2	-1	0.245	1.8	-2.27	-0.51	1.52	N/A	N/A
A10	W.Wall	C	473	316	393	359	-34	0.3	1.8	-62.96	11	2	3	4	1	0.245	1.8	2.27	-0.51	-0.65	N/A	N/A
B3	W.Wall	C	473	316	393	326	-67	0.3	1.8	-124.07	11	2	3	1	-2	0.245	1.8	-4.54	-0.51	1.52	N/A	N/A
B7	W.Wall	C	473	316	393	337	-56	0.3	1.8	-103.70	11	2	3	8	5	0.245	1.8	11.34	1.31	-0.65	N/A	N/A

Table 4

Building	JN-6	Room:	Various	Surface Material	Concrete Floor
Meter ID:	92374	Probe ID:	149047	Probe Area	180
Survey Date:	7/7/2004	Chauvenet's Criterion	2.488	Survey Type:	POP DLV Alpha

Grid ID	Other ID	cpm	Comparison CC
A1	Stairwell	2	0.649
A1	Utility	3	0.016
A2	Utility	3	0.016
A4	Utility	1	1.281
A5	Utility	1	1.281
B1	Utility	2	0.649
B2	Utility	6	1.881
B3	Utility	2	0.649
B4	Utility	2	0.649
B5	Utility	5	1.249
A1	Stairwell	1	1.281
A1	Utility	6	1.881
A2	Utility	4	0.616
A3	Utility	3	0.016
A4	Utility	2	0.649
A5	Utility	5	1.249
B1	Utility	5	1.249
B2	Utility	2	0.649
B3	Utility	4	0.616
B4	Utility	0	1.914
B5	Utility	1	1.281
A1	Stairwell	2	0.649
A2	Utility	3	0.016
A3	Utility	3	0.016
A4	Utility	2	0.649
A5	Utility	5	1.249
B1	Utility	2	0.649
B2	Utility	3	0.016
B3	Utility	6	1.881
B4	Utility	3	0.016
B5	Utility	3	0.016
A1	Stairwell	4	0.616
A1	Utility	6	1.881
A2	Utility	4	0.616
A3	Utility	2	0.649
A4	Utility	4	0.616
A5	Utility	2	0.649
B1	Utility	2	0.649
B2	Utility	2	0.649

Mean	3
Std Dev	2
Data Points	39

MDA	8
DLV	11

Mean + 2 Sigma	6
Mean + 3 Sigma	8

Survey BKG 1 cpm

Table 5

Building	JN-6	Room:	Utility	Surface Material	Concrete
Meter ID:	92374	Probe ID:	149047	Probe Area	180
Survey Date:	7/8/2004	Chauvenet's Criterion	2.496	Survey Type:	POP DLV Beta

Grid ID	Other ID	cpm	Comparison CC
A1	Floor	361	0.595
A2	Floor	426	0.616
A3	Floor	498	1.958
A4	Floor	374	0.353
A5	Floor	426	0.616
B1	Floor	302	1.695
B2	Floor	396	0.057
B3	Floor	375	0.335
B4	Floor	411	0.336
B5	Floor	400	0.131
A1	Floor	496	1.920
A2	Floor	483	1.678
A3	Floor	385	0.148
A4	Floor	409	0.299
A5	Floor	422	0.541
B1	Floor	325	1.266
B2	Floor	388	0.092
B3	Floor	343	0.931
B4	Floor	368	0.465
B5	Floor	372	0.390
A1	Floor	462	1.287
A2	Floor	488	1.771
A3	Floor	379	0.260
A4	Floor	486	1.734
A5	Floor	417	0.448
B1	Floor	342	0.950
B2	Floor	302	1.695
B3	Floor	379	0.260
B4	Floor	334	1.099
B5	Floor	408	0.280
A1	Floor	472	1.473
A2	Floor	398	0.094
A3	Floor	344	0.912
A4	Floor	362	0.577
A5	Floor	429	0.672
B1	Floor	383	0.185
B2	Floor	317	1.415
B3	Floor	335	1.060
B4	Floor	374	0.353
B5	Floor	347	0.856

Mean	393
Std Dev	54
Data Points	40

MDA	80
DLV	473

Mean + 2 Sigma	500
Mean + 3 Sigma	554

Survey BKG 277 cpm

Table 6

Building	JN-6	Room:	Various	Surface Material	Concrete Floor
Meter ID:	92374	Probe ID:	149047	Probe Area	180
Survey Date:	7/7/2004	Chauvenet's Criterion	2.488	Survey Type:	Scan DLV Beta

Grid ID	Other ID	cpm	Comparison CC
A1	Stairwell	413	0.419
A1	Utility	345	1.073
A2	Utility	557	0.964
A3	Utility	587	1.253
A4	Utility	371	0.823
A5	Utility	548	0.878
B1	Utility	522	0.628
B2	Utility	439	0.170
B3	Utility	514	0.551
B4	Utility	510	0.513
B5	Utility	512	0.532
A1	Stairwell	587	1.253
A1	Utility	605	1.426
A2	Utility	584	1.224
A3	Utility	565	1.041
A4	Utility	543	0.830
A5	Utility	401	0.535
B1	Utility	674	2.089
B2	Utility	584	1.224
B3	Utility	551	0.907
B4	Utility	550	0.897
B5	Utility	521	0.618
A1	Stairwell	562	1.012
A2	Utility	444	0.121
A3	Utility	409	0.458
A4	Utility	404	0.506
A5	Utility	382	0.717
B1	Utility	354	0.986
B2	Utility	366	0.871
A2	Utility	328	1.236
A3	Utility	312	1.390
A4	Utility	347	1.054
A5	Utility	334	1.178
B2	Utility	356	0.967
B3	Utility	346	1.063
B5	Utility	358	0.948
A2	Utility	359	0.938
A3	Utility	345	1.073
A4	Utility	320	1.313

Mean	457
Std Dev	104
Data Points	39

MDA	88
DLV	545

Mean + 2 Sigma	665
Mean + 3 Sigma	769

Survey BKG 332 cpm

Attachment A

Minimum Detectable Activity Calculations for a Ludlum Model 43-20 Detector and Eberline ESP-2 Meter

The minimum detectable activity (MDA) for scanning an alpha/beta point source with instrument progression rate of 5 centimeters per second (cm/sec) is calculated using the following method:

Given:

Width of detector = 10 cm
Area of detector = 180 cm^2

Time probe is above point (T) = $\frac{10cm}{5cm/\sec} * \frac{1\min}{60\sec} = 0.033\min$

Alpha/beta background (worst case brick) = 729 counts per minute (cpm)

C_b = scanning background = 729 cpm x 0.033 min = 24.1 counts (c)
S_b = standard deviation of $C_b = \sqrt{C_b} = 4.91$
Eff = efficiency of detector = 0.28 counts per disintegration (c/d)

$$MDA = \frac{3+(4.65*S_b)}{Eff*T*\frac{A}{100}} = \frac{3+(4.65*4.91)}{(0.28*0.033*\frac{180}{100})} = 1600 \text{ dpm/100 cm}^2$$

For a wide area alpha/beta source, the MDA would approach the static 1 minute count MDA:

T = 1 minute
S_b = $\sqrt{background} = \sqrt{729} = 27$ cpm

$$MDA + \frac{3+(4.65*27)}{(0.28*1\bullet\frac{180}{100})} = 260 \text{ dpm/100 cm}^2$$

The MDA for an alpha source is calculated using the same methodology. The following presents the calculation.

Given:

Width of detector = 10 cm

Area of detector = 180 cm^2

Time probe is above point (T) = $\frac{10cm}{5cm/\sec} * \frac{1\min}{60\sec} = 0.033\min$

Alpha background = 1 counts per minute (cpm)

C_b = scanning background = 1 cpm x 0.033 min = 0.033 counts (c)

S_b = standard deviation of $C_b = \sqrt{C_b} = 0.18$

Eff = efficiency of detector = 0.23 counts per disintegration (c/d)

$$MDA = \frac{3+(4.65*S_b)}{Eff*T*\frac{A}{100}} = \frac{3+(4.65*0.18)}{(0.23*0.033*\frac{180}{100})} = 281 \text{ disintegrations per minute}$$

For a wide area alpha source, the MDA would approach the static 1 minute count MDA:

T = 1 minute

S_b = $\sqrt{background} = \sqrt{1} = 1$ cpm

$$MDA + \frac{3+(4.65*1)}{(0.23*1*\frac{A}{100})} = 18.5 \text{ dpm/100 cm}^2$$