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FINAL STATUS SURVEY REPORT
INDOOR SURVEY UNITS

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

APRIL 2004

Docket No.040-08006
License No. SUB-986

Kerr-McGee Corporation
Oklahoma City, Oklahoma

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April 15, 2004

VIA OVERNIGHT MAIL

Ms. Rachel Browder
Fuel Cycle Decommissioning Branch
United States Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Re: Docket No. 040-08006; License No. SUB-986
Kerr-McGee Chemical L.L.C. (KMCLLC) Technical Center
Indoor Final Status Survey Report

Dear Ms. Browder:

Attached are two copies of the above referenced report. This report documents work done to demonstrate that interior rooms historically used for licensed activities at the Technical Center meet release criteria described in the approved decommissioning plan. Work was conducted in accordance with our approved decommissioning plan.

You will note that there are three Technical Memos located at the back of the report. These relate to the embedded piping issue raised in your review of the outdoor final status survey report. They are designed as stand alone documents that can be removed and sent to NRC headquarters for review

If you have any questions regarding this report, please feel free to contact me at (405) 270-2665.

Sincerely yours,

Russell H. Jones
Project Manager

Attachment

cc: (w/ attachment)
Mike Broderick, ODEQ

cc: (w/o attachment)
D. Blair Spitzberg, PH.D.

Kerr-McGee
Technical Center Decommissioning Project

FINAL STATUS SURVEY REPORT
Indoor Survey Units
Revision 0

Prepared by

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Approved by: _____ Date: 4/15/04
KMTC, Project Manager

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Approved by: _____ Date: 4/13/2004
NEXTEP Environmental, Inc., Technical Director

Kerr-McGee
Technical Center
Decommissioning Project

FINAL STATUS SURVEY REPORT
Indoor Survey Units

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Kerr-McGee

Technical Center Decommissioning Project

FINAL STATUS SURVEY REPORT

Indoor Survey Units

1 INTRODUCTION

1.1 PURPOSE

1.1.1 This Final Status Survey Report (FSSR) is being submitted by Kerr-McGee Chemical, LLC (KMCLLC) to the Nuclear Regulatory Commission (NRC) for the areas on the Kerr-McGee Technical Center site (KMTC) designated as Indoor Survey Units (ISU). This report discusses the initial characterization surveys which were performed to define the extent and magnitude of residual contamination present within the survey units. The characterization data generated during the initial surveys were utilized in designing the Final Status Survey (FSS) for these survey units. This FSS was performed in accordance with the Final Status Survey Plan (FSSP) and the KMTC Decommissioning Plan[1] (D Plan) to demonstrate that the established guidelines for unrestricted release have been met. The results of the indoor FSS are presented in this FSSR as justification for release of these survey units from License SUB-986 for unrestricted use.

1.2 HISTORICAL BACKGROUND

1.2.1 The KMTC facility was established in 1963 to provide a dedicated research and development facility for conducting chemical and radiological analyses, doing small quantity bench and batch scale research and development studies on manufacturing processes and investigating new chemicals. The site was licensed under a source materials license, SUB-986, and a byproduct materials license, 35-12636-06. License SUB-986 authorized the receipt of small quantities of source material for research and development in designated laboratories within the KMTC facility and in immediately surrounding designated sample storage or sample preparation areas. Source materials could be in any form but were typically ores containing uranium and thorium from NRC or Agreement State licensed facilities, or process stream materials

[1] Decommissioning Plan for the Kerr-McGee Chemical LLC Technical Center License No. SUB-986.

from a NRC licensed natural uranium conversion facility. KMCLLC ceased radiological activities at KMTC in 1998 at which time decommissioning activities were initiated.

1.2.2 Decommissioning efforts concerning byproduct nuclear materials were completed in 1998 and KMCLLC applied to the NRC to terminate License 35-12636-06. After confirmation that the sealed byproduct material sources had been removed from KMTC and returned to their manufacturers, with no leakage or contamination present, NRC terminated License 35-12636-06 by letter dated March 2, 1998.

1.2.3 Decommissioning efforts at KMTC were initiated in 1998. Characterization, remediation, and final status survey of the outdoor survey units were completed in 2003. The goal of the decommissioning effort is to release the entire 160-acre site and facilities for unrestricted use.

1.2.4 The KMTC D Plan was submitted to NRC on April 5, 2001. The NRC approved the KMTC D Plan via license amendment No. 9 on June 5, 2003. The FSSP for the indoor survey units was in accordance with the KMTC D Plan.

2 SCOPE OF FINAL STATUS SURVEY

2.1 DESCRIPTION AND CLASSIFICATION OF SURVEY UNIT

2.1.1 The survey units are listed in Appendix 1 and are shown on Figures 2-1 and 2-2 included in Appendix 2. With the exceptions of ISU's 108 and 109, all the survey units are located on the first floor of Technical Center main building. ISU-108 is in the solvent storage building located behind the Technical Center main building. ISU-109 is the former sample prep lab within the TSSL building at KMTC. Appendix 1 includes descriptive information for the rooms included in each ISU as well as the affected surfaces and fixed equipment. All affected removable equipment was previously released per license requirements and is not covered in this report. The classification and area included in each ISU are listed in Table 2.1. Detail drawings of each survey unit showing the location of fixed equipment items are presented in Appendix 2, Figures 2.3 through 2.13.

2.1.2 In addition to the eleven indoor survey units described in Table 2.1, two additional survey units (SU EP-1 and SU EP-2) were defined to cover all affected portions of the KMTC laboratory chemical drain system. Both are classified as Class 2. The Chemical Drain System addendum is discussed in NEXTEP Tech Memo 0401[2], which is enclosed as Appendix 5.

2.1.3 SU EP-1 consists of the portion of the former chemical drain system which originated in the TSSL Building. The TSSL building had a single sink that drained to a sump filled with limestone rocks and an outlet pipe extending from the sump 85

[2] NEXTEP Tech Memo 0401, *Chemical Drain System Addendum for the KMTC FSSR Indoor Survey Units*, R. Newman.

meters to the West where it exits the surface in Soil Survey Unit 5.[3] The sink and drain piping, the limestone-filled sump, and the exit pipe from the pit were removed in the late 1980's. Impacted soil at the site of the pit was identified and remediated as reported in the FSSR for Outdoor Survey Units. Only the end of the drain pipe is accessible at the outfall point to the west of the TSSL building. A diagram of the western drain system is provided in Appendix 5, Attachment A, Figure 1.

2.1.4 SU EP-2 consists of a more complex network of sinks and drains extending from the laboratories to a 4 inch drain pipe which runs through the building in the plumbing chase between the labs and out the eastern end of the building. The main drain pipe runs in the bottom of a four foot deep trench below floor level in the chase and is located with a group of pipes mounted on racks within one foot of the bottom. The chemical drain pipe is mounted in the bottom rack. Once outside the building the drain pipe runs underground to a stainless steel sediment collection tank which is approximately 5 feet in diameter and 5 to 6 feet deep. Both entrance and exit of the drain from this tank are approximately one foot from the top. From the exit of the sediment tank, the drain enters a rectangular pit about 6 feet x 30 feet x 7 feet deep which is lined with steel and filled with limestone rock. A bypass pipe is incorporated into the system to isolate the limestone pit for cleaning and rock replacement since the drains are constantly flowing with water at all times. The pipe which exits the pit is routed to the south and into a manhole which is approximately 3 ft. in diameter and 5 ft. deep. The walls are brick and the bottom is concrete. The pipe enters and exits at the bottom of the manhole. The exit proceeds west and joins the sanitary sewer.

2.1.5 The limestone pit was emptied and new rock was installed in 2002. At the same time the sediment tank was flushed and cleaned out. A diagram of the eastern chemical drain system and the limestone pit is provided in Appendix 5, Attachment A, Figures 2 and 3.

[3] *Final Status Survey Report, Outdoor Survey Units*, Kerr-McGee Technical Center Decommissioning Project

Table 2.1
Survey Unit Classifications

Survey Unit	Class	Building	A (ft^2) (ISU Area)
100	2	Main	8,030
101	2	Main	6,994
102	2	Main	5,665
103	2	Main	7,008
104	2	Main	7,497
105	2	Main	5,967
106	2	Main	8,146
107	1	Main	1,230
108	2	Storage	3,952
109	2	TSSL	2,298
110	1	Main	2,148
EP-1	2	West of Main	N/A
EP-2	2	East of Main	N/A

2.2 IDENTIFICATION OF THE RADIOLOGICAL CONTAMINANTS

2.2.1 The radionuclides of concern are the uranium and thorium series. The radionuclides may not be in equilibrium.

2.3 REFERENCE BACKGROUND LEVELS

2.3.1 Background beta measurements have been collected for several matrix materials which are present in the survey unit. All background levels were determined by taking direct readings on the specified matrix on unaffected surfaces using the same methods and instruments as were used for the FSS. Natural background levels for the contaminants of interest in the survey units are presented in Table 2.2. Matrix materials for which no beta background data are available are assumed to have a background value of zero.

Table 2.2
Summary of Background Data for Indoor Survey Units

Matrix Code	Matrix Material	Number of Data Points	Average Background (dpm/100cm^2)	Sigma (dpm/100cm^2)
B	Brick	15	2225	214
C	Concrete	15	543	179
CB	Concrete Block	15	1471	163
CT	Ceramic Tile	0	0	NA
CTP	Countertop	15	481	348
CTX	Celotex Tile	25	1112	239
F	Foam Insulation	0	0	NA
FT	Formica Tops	15	243	128
G	Glass	0	0	NA
GB	Gypsum Board	15	95	190
M	Metal	0	0	NA
P	Plastic	0	0	NA
PL	Plaster	15	420	320
R	Rubber	0	0	NA
RF	Removable Flooring	0	0	NA
SS	Stainless Steel	0	0	NA
VT	Vinyl Tile	15	279	164
W	Wood	0	0	NA

2.4 RELEASE CRITERIA

2.4.1 Building Surfaces and Fixed Equipment

2.4.1.1 Table 2.3 displays the Derived Concentration Guideline ($DCGL_w$) for measurements on building surfaces and fixed equipment. This value is the primary release criterion from the D Plan and is applied net of background to building surfaces such as roofs. Fixed equipment, such as laboratory casework, piping and tanks that will remain in use and are unlikely to be removed are considered part of the building structure surface and are subject to final status survey at the classification of the survey unit in which they are installed. Some examples of building surfaces and fixed equipment are floors, walls, ceilings, doors, windows, sinks, hoods, lighting fixtures, built-in laboratory benches, built-in furniture, and ventilation ducts.

Table 2.3
Building Surfaces Release Criteria

Nuclide	$DCGL_W$ (dpm/100cm^2)	$DCGL_{EMC}$ (dpm/100cm^2)
Thorium-232 and progeny	12,500	31,000
Uranium series through U-234	177,300	443,000
Ra-226 and progeny	16,300	40,000

2.4.1.2 The most conservative release criterion (thorium) was used exclusively for the FSS unless it became necessary to compute a composite limit based upon the relative proportions of uranium, throrium and radium to more accurately describe the surface radioactivity.

2.4.1.3 Localized regions of elevated radioactivity above the $DCGL_w$ were evaluated against the DCGL for Elevated Material Concentrations ($DCGL_{EMC}$).

2.4.1.4 The EMC criteria in Table 2.3 take into consideration ALARA principles and allow no greater than 2.5 times the $DCGL_w$ as a threshold for investigation.[4]

2.4.2 Embedded Piping and Equipment

2.4.2.1 Release criteria for embedded piping and equipment have been developed for the chemical drain systems. A surface activity DCGLw for the inside of embedded piping and equipment was developed in NEXTEP Tech Memo 0403,[5] which is enclosed as Appendix 7. The embedded piping and equipment DCGLw is **487,000 dpm/100 cm^2.**[6]

2.4.2.2 This DCGLw limit is the basis for action thresholds used for the embedded portions of SU EP-1 and EP-2. For purposes of this survey the portions of SU EP-2 located within the laboratories (traps, drains, etc.) are not considered to be embedded and are subject to the release criteria of Table 2.3. The portions of the system within the plumbing chase and underground will be treated as embedded piping and will be subject to the embedded DCGLw criteria.

2.5 SURVEY INSTRUMENTS

2.5.1 The instrumentation utilized to generate FSS data was maintained, calibrated, and tested according to the requirements of the D Plan. All procedures, responsibilities, and schedules for calibrating and testing equipment have been documented.

2.5.2 Maintenance information and use limitations provided in the vendor documentation of the instruments used during this FSS were adhered to. Measuring and analyzing equipment were tested and calibrated before initial use and were recalibrated periodically and whenever previous calibrations were invalidated. Field and laboratory equipment specifically used for obtaining final radiological survey data were calibrated based on standards traceable to NIST. Minimum frequencies for calibrating equipment have been established and documented.

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[4] NEXTEP Tech Memo 0203, *Derivation of Indoor Surface DCGLs for KMTC,* H. Newman, CHP.
[5] NEXTEP Tech Memo 0403, *Derivation of Embedded Piping DCGL for KMTC,* A. H. Thatcher, CHP.
[6] 487,000 dpm/100cm^2 is the most conservative DCGLw and is specific to Th-232.

2.5.3 Measuring equipment were tested at least once on each day the equipment was used for FSS. Test results were recorded in tabular or graphic form and compared to predetermined, acceptable performance ranges. Equipment not conforming to the performance criteria was promptly removed from service and any data gathered in the interim evaluated for quality until the deficiencies were resolved.

2.5.4 All calibration and source check records were completed, reviewed, signed-off and retained in accordance with the Kerr-McGee Quality Assurance Program. Copies of the calibration records for each instrument used in the FSS are available in the QA records for the project.

2.5.5 L43-89 – The primary instrument used for the detection of surface radioactivity was the Ludlum 43-89 scintillation detector configured for beta detection. The Ludlum 43-89 scintillation detector is a dual phosphor alpha/beta scintillator that may be paired with several different rate meters and scalers. The L43-89 detector houses a ZnS(Ag) scintillator and was paired with the Ludlum 2224 scaler/rate meter or the Ludlum 2360 Alpha/Beta Data Logger for fixed and scan surveys.

2.5.6 L2221/3"x½" NaI - When beta measurements could not be taken, due to coatings or inaccessible locations, the 3"x½" Sodium Iodide (NaI) gamma detector was used. This factory-calibrated instrument was used with no modifications or normalizations.

2.5.7 Tennelec LB-5100 - The LB-5100 is a computer-based, low background alpha/beta counting system used for laboratory counting of air, water (dried), and smear samples. Smear samples were used to measure removable contamination on the exhaust systems of the affected rooms.

2.6 Lower Limit of Detection

2.6.1 The Minimum Detectable Concentration (MDC) of an instrument refers to the intrinsic detection capability of the entire measurement process. The MDC is the lowest level of radioactivity that will yield a net count, above system blank, that will be detected with at least 95% probability with no greater than a 5% probability of falsely concluding that a blank observation represents a real signal. It is desirable to express the MDC in units comparable to a regulatory limit with which a measurement may be compared.

2.6.2 The MDC requirements for the FSS have been developed in accordance with MARSSIM[7] Chapter 4 guidelines. The requirements are listed in Table 2.4.

[7] NUREG 1575, *Multi Agency Radiation Survey and Site Investigation Manual.*

Table 2.4
Minimum Detectable Concentrations

	MDC for DIRECT dpm/cm^2	Count time (min.)	MDC for SCAN dpm/cm^2
Required MDC	***6,250***		***12,500***
L2224/43-89 or equiv.	670	1	7,130

2.6.3 The MDCs for the instruments used in the FSS were calculated according to Appendix F of the D Plan. A comparison of the MDCs calculated for the L43-89 with the requirements for this FSS is also provided in Table 2.4.

2.7 ACTIVITY/DENSITY CALCULATION

2.7.1 Beta direct measurements taken in the field were converted to dpm/100 cm^2 using the following equation:

Equation 1

$$AD = \frac{C_s - C_a}{\varepsilon_i t (Ae/100)(C_{th})}$$

Where:

- AD = Areal Activity Density in dpm/100 cm2
- C_s = Counts measured on the survey location
- C_a = Ambient count[8]
- ϵ_i = Beta efficiencies of the instrument
- Ae = Effective detector area[9] (cm^2)
- t = Integration time in minutes
- C_{th} = Ratio of beta emissions to disintegrations of the parent nuclide, Th-232 (3.8βpm/dpm)

2.7.2 The ambient count rate provides a rough approximation of the gamma flux through the detector. Measurements taken on the survey location include both the gamma flux and beta emissions from the surface. The difference between these two numbers calculates the counts at the survey location due to beta emissions only and include both the natural beta background of the test matrix and any residual contamination if present.

2.8 BETA SCAN THRESHOLD

2.8.1 An action threshold based upon the release criteria was calculated for the L43-89 in the scan mode of operation and is presented in Table 2.5.

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[8] Ambient count measurements were counts performed with the detector suspended in mid-air at least 24 inches from any building surface or equipment items.

[9] The effective detector area (A_e) divided by 100 is provided by the manufacturer and stored in the database for each type of instrument.

Table 2.5
Beta Scan Threshold

Instrument	dpm/100 cm^2	cpm
Ludlum 43-89	12,500	5,510

2.8.2 The scan threshold was calculated using typical instrument parameters and the following equation:

Equation 2

$$T_{sc} = \varepsilon_i \frac{A_e}{100} \sqrt{p}\,(C_{th}) DCGL_w = (0.15)(1.1)\sqrt{0.5}(3.8)(12{,}500) = 5{,}510 cpm$$

Where:

- Tsc = Scan Threshold in cpm
- ϵ_i = Instrument beta efficiency
- A_e = Effective Detector Area (cm^2)
- p = Surveyor efficiency
- C_{th} = Ratio of beta emissions to disintegrations of the parent nuclide, Th-232 (3.8βpm/dpm)

2.8.3 When NaI gamma detectors were used in areas where beta measurements were impracticable, the scan threshold was set to twice background.

2.9 GAMMA THRESHOLDS

2.9.1 NaI gamma detectors were used to scan areas where beta measurements were either impossible due to material covering the affected surface or due to inaccessible location. Normal gamma scans in such areas used twice background as the action threshold.

2.9.2 In addition, thresholds were developed for direct gamma measurements made on the outside of drains and pipes that are part of the chemical drain system. Detailed calculations for these thresholds are provided in NEXTEP Tech Memo 0402[10], enclosed as Appendix 6. A summary of the thresholds used for 2" pipes inside the laboratories (under the sinks) and for the 4" drain pipes inside the plumbing chase and outside the building is presented in Table 2.6. The thresholds chosen from the Tech Memo assumed a mixture of Ra-226, Th-232, and U-238 in glass and plastic pipe.

[10] NEXTEP Tech Memo 0402, *Use of the 3" x ½" NaI Detector for Measurement of Contamination Inside Pipes for KMTC,* N. Zhang.

Table 2.6
Chemical Drain System Gamma Thresholds[a]

Type	Diameter (inches)	Threshold (cpm)
Glass	2.0	4,856
	4.0	290,512
Plastic	2.0	5,073
	4.0	309,446

[a] Net of Background

3 SURVEY METHODS

3.1 SURVEY PROCEDURES

3.1.1 The FSS conformed to the procedures and plans listed in Table 3.1. The primary guidance for the FSS is contained in the D Plan and the FSS Plan.

Table 3.1

Survey Procedures and Documents
KMTC Decommissioning Plan
KMTC Decommissioning Project, Final Status Survey Plan, Indoor Survey Units
KM-CI-RP-31: Personnel Monitoring and Decontamination
KM-CI-RP-33: Decontamination of Tools, Equipment, Materials and Surfaces
KM-CI-RP-39: Performance of Radiation and Contamination Surveys
KM-CI-RP-40: Survey Documentation and Review
KM-CI-RP-49: NaI 3" Detector
KM-CI-RP-52: Ludlum 2224 Alpha-Beta Detector

3.1.2 All FSS data recorded in the field was submitted to the Quality Assurance Manager (or designee) for processing and review. The data collection forms and annotated drawings were signed by the technician taking the data and reviewed by the QA Coordinator (or designee) overseeing the survey. After data entry and review, QA approved the data sheets and filed them with the permanent KMTC records.

3.1.3 All the data generated by the surveys were entered into the KMTC Radiation Database (RDB) and analyzed as outlined in Section 6.4 of the D Plan.

3.2 SPECIFIC SURVEY CONSIDERATIONS

3.2.1 ISU 106 & 107

ISU 106 consists of the lower portion of the Pilot Plant area (P-1), the upper portion of the Sample Prep Room (P-2U), and the changing room (G-1). The P-1 pit area has been filled with concrete since radiological operations were terminated. Although the ceiling height is 45 feet, only the walls up to 6 feet are considered impacted.

The Sample Prep Room was resized in a prior renovation and the south and west walls and the suspended ceiling have been replaced. Only the ceiling and the north and east walls were included in the survey for P-2.

3.3 SURVEY MEASUREMENTS

3.3.1 Characterization Data

3.3.1.1 Direct beta characterization measurements were taken in the 11 Indoor Survey Units in 2000 and 2001. Those data are included in the data set unless they were remediated or otherwise disqualified. All measurements included from characterization that were not counted as grid measurements were treated as bias measurements.

3.3.2 Beta Measurements:

3.3.2.1 *Direct* – A systematic grid of direct beta measurements was obtained on the wall and floor surfaces as described in the FSSP. Bias measurements were taken on building surfaces and on fixed apparatus at locations determined by the surveyor in an effort to more fully characterize the surfaces or fixed equipment.

3.3.2.2 *Scans* - Beta scans were performed using the same instruments used for the direct beta measurements. Scans were performed at a scan rate of less than one detector width per second with a probe height less than one inch from the surface being scanned. Beta scan measurements were taken on 100% of all surfaces and fixed equipment except for the ceiling of the Storage Building and the TSSL sample prep lab where gamma scans were performed due to a covering of foam insulation over the affected surfaces.

3.3.2.3 When the thresholds specified in Section 2.8 were exceeded, action was taken in accordance with the FSSP for Indoor Survey Units[11].

3.3.3 Gamma Measurements:

3.3.3.1 *Scans* - Gamma Scans were performed in straight lines within 6 inches of the ceiling in Rooms S-1 (ISU-108) and T-1 (ISU-109) with each scan line separated from the next by 1 meter. Additionally, gamma scans were performed in the areas around the laboratory exhaust system vent stacks on the roof of the building with the scan lines separated by less than one meter and the instrument within 6 inches of the roof surface, and contact readings collected on the vent stacks. The scan rate did not exceed 1 ft/s.

3.3.4 Removable Contamination Measurements:

[11] Section 4.5, Measurements Exceeding Limits.

3.3.4.1 *Swipes* - Removable contamination samples were collected on the exhaust systems connected to each hood in the affected rooms and on the roof vent stack for each exhaust outlet. The swipes were counted in the laboratory and recorded in the database.

3.4 MEASUREMENT LOCATIONS

3.4.1 Statistical Grid Data Points

3.4.1.1 The *Visual Sample Plan*© (VSP)[12] software was used to develop a systematic sample grid for each survey unit. The minimum number of points required and their spacing were calculated in accordance with the statistical guidance given in MARSSIM Sections 5.5.2.2 and 5.5.2.5.

3.4.1.2 VSP uses the Data Quality Objective (DQO) input values to calculate the minimum number of measurement points, N, required to satisfy MARSSIM statistical guidance. A summary of all the input parameters used with VSP for this Report is presented in Table 3.2.

Table 3.2
VSP Input

	All Survey Units
Type I Error Rate	5
Type II Error Rate	5
Width of Gray Region	VAR[13]
Action Level (dpm/100cm^2)	12,500
Estimated Standard Deviation (dpm/100cm^2)	VAR

3.4.1.3 The minimum required number of grid measurements for all survey units was 24. Up to 20% excess points were included for survey planning to account for inaccessible or unusable locations. The actual number of grid points collected in a survey unit varied due to the assignment of surfaces and geometric effects. When a specified grid location was inaccessible, an offset of up to 15% of the grid spacing was permitted to obtain the grid measurement.

3.4.1.4 A rectangular grid pattern was used for all survey units. The number of grid points actually recorded for each survey unit is presented in Table 3.3.

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[12] NEXTEP Tech Memo 0008, *Verification and Validation of Applicable Portions of VSP Software, A.* H. Thatcher, CHP.

[13] The width of the gray region was always set equal to the estimated standard deviation in each survey unit to produce a relative shift of 1.0.

Table 3.3
Grid Points Recorded by Survey Unit

Survey Unit	Class	N (actual)
100	2	34
101	2	37
102	2	32
103	2	29
104	2	28
105	2	30
106	2	43
107	1	29
108	2	30
109	2	26
110	1	28

3.4.2 Bias Measurement Locations

3.4.2.1 Bias direct measurements were taken at the discretion of the HP technician performing the survey.

3.4.2.2 Bias surveys were also taken at hot spot locations identified by scans as directed in the documents referenced in Table 3.1 (KM-CI-RP-39).

3.5 REFERENCE COORDINATE SYSTEM

3.5.1 A unified reference system was prescribed for the location of all data points taken on all building surfaces and on the surface of fixed equipment. A description of the reference coordinate system is provided below.

3.5.2 A data point's unique location is specified by a combination of the following data elements: building, room, surface ID, X, and Y. The surface ID refers to the four walls, floor, and ceiling as shown in Table 3.4. X and Y are distances from the origin measured as shown in the table. The origin for the floor and ceiling is the southwest corner of the room.

3.5.3 Fixed equipment is identified by a surface ID beginning with Q (Q1, Q2, etc.). Each item of fixed equipment is identified in the database and listed along with the building surfaces of each room in Appendix 1. Since X and Y coordinates are impractical on equipment, the X coordinate is used to reference the measurement location on a drawing of the room or equipment which is filed along with the data sheet.

Table 3.4
Coordinate System Locators

Location	Identifier	X	Y
North Wall	N	Feet right from leftmost edge of the wall surface	Feet up from floor or the lowest point in the room
South Wall	S		
East Wall	E		
West Wall	W		
Floor	F	Feet east of western-most edge of the surface	Feet north of southern-most edge of the surface
Ceiling	C		

3.5.4 The surface ID for a roof applies only in the case when measurements are being made on the exterior surface of a building. In this unique case the "room" assigned has the special number "999".

3.5.5 Systematic grid data points which fell on external surfaces of installed apparatus were located with the primary coordinate system. The ID code of the apparatus was recorded in the remarks. For example: Let Q2 be identified as a sink unit located on the floor. Any systematic grid measurement points for the floor surface which landed on the sink would have been identified using the X and Y coordinates from the southwest corner of the floor. "Q2 – sink unit" would be noted in the remarks. The surface ID would be "F".

3.5.6 All bias data points taken on installed apparatus were numbered and located on the drawings provided. This number was recorded as the X coordinate on the data sheet and amplifying information was entered in the remarks section.

3.6 DATA EVALUATION

3.6.1 All of the direct and scan data were entered into the KMTC Radiation Database (RDB) for easy access and analysis. The direct beta measurements are the primary means for documenting the survey unit and justifying its release. Therefore, a special report was programmed to perform all the tests specified in Section 6.6.3 of the D Plan and to provide a clear report of the results for evaluation. These reports, the Threshold Comparison Test Reports (TCTRs), for each ISU are included in Appendix 4.

3.6.2 The calculations and comparisons made in the TCTR have been tested and verified as reported in NEXTEP Tech Memo 0301.[14]

3.6.3 The purpose of the screening software is to compare each direct beta reading taken in the survey unit with specified threshold levels, to apply the statistical tests called for in MARSSIM when appropriate, and to present the results in a clear and useful

[14] NEXTEP Tech Memo 0301, *Verification of the KMTC Database Analysis Software for Building Survey Data*, B.P. Anderson.

manner so that an analyst can accurately assess the action to be taken or declare that the survey unit meets the requirements for release.

3.6.4 Some of the screening tests apply to each record in the survey unit and failure of one data point results in failure of the survey unit. Other tests do not apply to each survey record but generate a single PASS/FAIL verdict for the entire data set. The tests are described in the following paragraphs. An abbreviated summary of these tests is presented in Table 3.5.

3.6.5 *Background Screen.*

3.6.5.1 For each MATRIX code in the database, calculate the mean background reading, its standard deviation, and its minimum value. Calculate and store the Background Threshold, T_{bk}, with its matrix code according to the following equation:

Equation 3

$$T_{bk}(m) = \overline{BK}(m) + 2 * \sigma_{bk}(m)$$ [15]

3.6.5.2 T_{bk} is equal to the mean of the background readings $(\overline{BK})$ for a given matrix plus two times its standard deviation (2σ).

3.6.5.3 Compare each data point in the filtered survey unit with T_{bk}. If the survey reading > T_{bk} the data point fails the test. One data point failure implies failure of the background screen test for the survey unit.

3.6.6 *Min/Max Test.*

3.6.6.1 Find the maximum direct survey result, in dpm/100cm^2, for the survey data set.

3.6.6.2 Find the minimum background reading among all the background data points having MATRIX codes that match those in the data set.

3.6.6.3 If the difference between these two values is greater than $DCGL_w$ the MIN/MAX test fails for the survey unit.

3.6.7 *$DCGL_w$ Screen.*

3.6.7.1 For each matrix code calculate and store a $DCGL_w$ Threshold (T_d). T_d is calculated by adding the value of $DCGL_w$ to T_{bk}.

Equation 4

$$T_d(m) = T_{bk}(m) + DCGLw$$

[15] T_{BK} (m) denotes the background threshold for each matrix. Similar notation is used throughout this report.

3.6.7.2 Compare each data point in the survey unit with T_d. If the survey reading > T_d the data point fails the test. One data point failure implies failure of the $DCGL_w$ screen test for the survey unit.

3.6.8 *EMC Screen.*

3.6.8.1 For each matrix code calculate and store an EMC Threshold (T_e). T_e is calculated by adding the value of EMC to T_{bk} as shown in Equation 5. The EMC value selected is normally dependent upon the area involved. However, if no specific area was known, the EMC was normally set to the maximum permissible EMC value of 31,000 dpm/100cm^2 (2.5 times $DCGL_W$) for all survey units.[16]

Equation 5

$$T_e(m) = T_{bk}(m) + EMC$$

3.6.8.2 Compare each data point in the filtered survey unit with T_e. If the survey reading > T_e the data point fails the test. One data point failure implies failure of the EMC test for the survey unit.

3.6.9 *DCGL Average Test.*

3.6.9.1 For each matrix material in the survey unit, calculate the mean activity density, (in dpm/100cm^2), in the survey data set. Subtract from this value, the mean value of background activity for the same matrix. If the remainder is greater than $DCGL_w$ for any matrix in the survey unit, the test fails.

Equation 6

$$\overline{AD}(m) - \overline{BK}(m) > DCGLw$$

3.6.10 *Statistical Tests.*

3.6.10.1 The statistical tests prescribed by MARSSIM operate only on the data points of MEASUREMENT TYPE = RG (Regular Grid). The program narrows the filter to include only these points before proceeding.

3.6.10.2 The Wilcoxon Rank Sum Test[17] is applicable for survey units with measurements on a single matrix type or on matrices with similar background characteristics. Since more than one matrix was present in virtually all indoor survey units, the Sign Test for Paired Data was used.[18]

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[16] NEXTEP Tech Memo 0201, *Derivation of Surface Soil DCGLs for KMTC*, A.H. Thatcher.
[17] Described in Appendix I of MARSSIM.
[18] NUREG 1505, *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys.*

3.6.11 The output of the Threshold Comparison Test Report (TCTR) was used for analysis of the data for the interior surfaces and fixed equipment of KMTC and the results are presented in Appendix 4. The TCTR is divided into eight sections which are briefly described in the following paragraphs to assist the unfamiliar reader.

3.6.11.1 General: date, survey unit number, and class.

3.6.11.2 Survey Unit Table: building surface included, affected fixed apparatus, and total surface area of the survey unit.

3.6.11.3 Initialization Data: On startup of the analysis report program, the analyst must tell the program which parameters to use while running the tests described in this section. The *Initialization Data* section of the report output displays the options that were chosen for the run. The measurement types listed (regular grid, bias, characterization, post remediation, post remediation grid, and quality assurance) are those chosen by the analyst to be included in the report. The date range chosen is also listed. The default value is "All Dates". If remediated data points are included in the run, it will be noted in this section. Normally they will be excluded.

3.6.11.4 Values for $DCGL_w$ and $DCGL_{EMC}$ are also specified at the start of the run and are listed in this section. The values for $DCGL_w$ and $DCGL_{EMC}$ were initialized to 12,500 and 31,000 dpm/100cm^2 respectively[19].

3.6.11.5 Survey Unit Test Status: Lists Pass/Fail status of all tests and gives a high level summary of key activity levels in the survey unit.

3.6.11.6 Points that failed tests: Lists all points that failed each specified threshold test in descending order of severity (EMC, DCGL, and Background).

3.6.11.7 Points that passed all the tests: This includes the remainder of all the points in the data set. These data points have passed all the tests.

3.6.11.8 Summary of background data used in the calculations. This table includes the matrix materials included in the survey and the thresholds calculated for each of the tests discussed in this section.

3.6.11.9 Statistical Test Results: This page lists the results of the Sign Test for Paired Data or the Wilcoxon Rank Sum test, whichever is selected. If the Test Status line reads Pass then the survey unit passes the Sign Test for Paired Data. The Data Summary section lists the number of background points and the number of survey points used from the data set. If the

[19] 31,000 dpm/100 cm^2 is 2.5 times the DCGLw, the maximum value for EMC permitted by the D Plan. Since no data recorded exceeded the DCGLw there was no need to adjust EMC according to the area of elevated concentration.

operator selects the option to show all data, a table of all data points used in the test is printed out.

Table 3.5
Threshold Screening Tests

Test	Test Criteria for PASS
Min/Max	Difference between minimum background measurement and maximum survey value less than $DCGL_w$
Background	All samples must be less than the background threshold[a]
$DCGL_w$	All samples must be no more than $DCGL_w$ + the background threshold
$DCGL_{avg}$	The average of all net survey values must be less than $DCGL_w$
EMC	All samples must be less than $DCGL_{EMC}$ + the background threshold
Sign Test for Paired Data	The Sign Test for Paired Data is described in detail in NUREG 1505[20]
Wilcoxon Rank Sum Test	This statistical test is described in detail in MARSSIM, Appendix I.

[a] The background threshold is equal to the mean background value plus twice σ_{BK}.

3.6.12 Provided all additional considerations such as scan data, swipes, sampling of removable contamination or sludge from traps, etc. indicate that the survey unit meets the release criteria, the release of the survey unit can be determined from the test report according to Table 3.6.

Table 3.6
Requirements for ISU Release[21]

Test	Class 1	Class 2	Class 3
Min/Max	Not required[a]	Not required[a]	PASS
Background	Not required	Not required	PASS
$DCGL_w$	Not required	PASS	PASS
$DCGL_{avg}$	PASS	PASS	PASS
EMC	PASS	PASS	PASS
Sign Test for Paired Data	PASS	PASS	PASS

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

[20] NUREG 1505, *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys.*

[21] See MARSSIM, Chapter 8, Table 8.2.

4 FSS RESULTS AND DISCUSSION

4.1 INDOOR SURVEY UNIT 100

4.1.1 Direct Beta Measurements on Building Surfaces

4.1.1.1 ISU-100 was surveyed from November 2000 through February 2004. 99 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 34 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figures 4.1a and 4.1b.

4.1.1.2 A summary of the direct measurement results is presented in Table 4.100.1 and shows that the maximum activity measured, net of background, was 112 dpm/100cm2. The average value for the survey unit was -127 dpm/100cm2. All values were less than 1% of the DCGLw.

Table 4.100.1
ISU-100 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity ($dpm/100cm^2$)	Max Net Activity ($dpm/100cm^2$)
Concrete	C	2	-357	-294
Glass	G	1	-63	-63
Gypsum Board	GB	62	-75	112
Metal	M	5	-15	73
Vinyl Tile	VT	29	-245	34

4.1.2 Direct Beta Measurements on Fixed Equipment

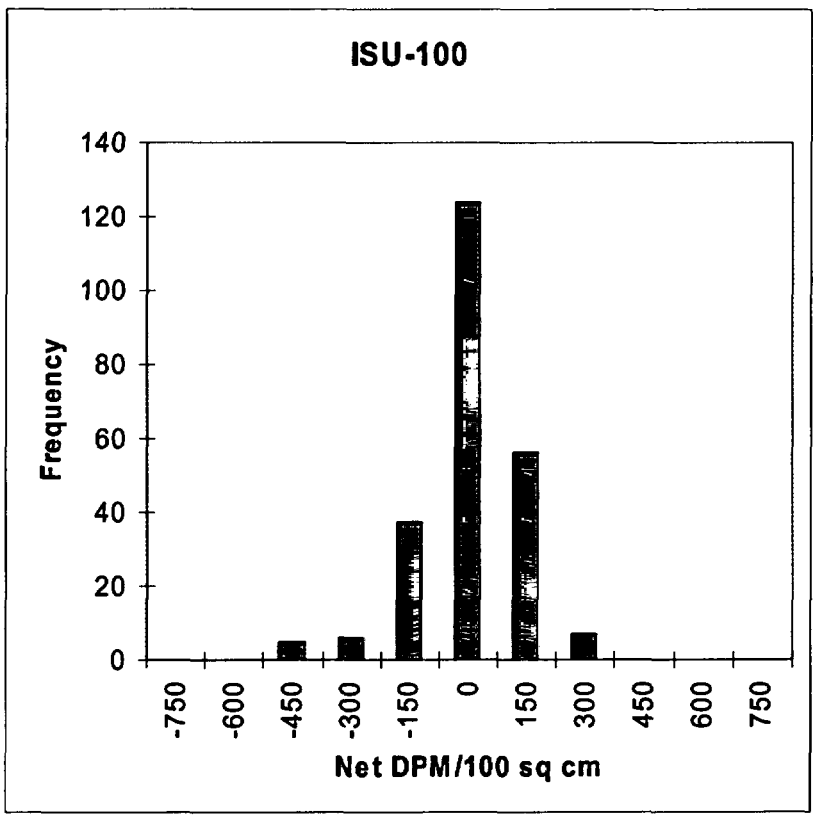
4.1.2.1 All items of fixed equipment assigned to ISU-100 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.100.2 sorted by matrix. The net values observed ranged from -544 to 296 $dpm/100cm^2$. All values were less than 3% of the $DCGL_w$.

Table 4.100.2
ISU-100 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Counter Top	CTP	18	-355	-223
Metal	M	111	28	296
Plastic	P	5	48	102
Wood	W	2	-3	10

4.1.3 Direct Beta Measurement Distribution and Threshold Tests

4.1.3.1 A histogram of all the beta direct net activity values found in ISU-100 is provided in Figure 4.100.1. The distribution appears to have a single mode with the majority of the data centered at 0 dpm/100cm^2. This is consistent with a normal distribution of background radioactivity possibly mixed with some residual radioactivity. All measurements were well below the $DCGL_W$.



Histogram of Net Direct Beta Measurements
Figure 4.100.1

4.1.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-100. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-100 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.100.3.

Table 4.100.3
Requirements for ISU Release[a]

Test	Class 2	ISU-100
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.1.4 Beta Scan Measurements

4.1.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-100 exceeded the scan threshold in Table 2.5.

4.1.5 Exhaust System Measurements

4.1.5.1 Additional measurements were collected from the exhaust system outlets on the roof of the building. Direct beta measurements on the exhaust systems were included in the fixed equipment analysis.

4.1.5.2 Gamma scan measurements were collected on the vent stacks and surrounding roof areas, including nearby roof drains, for ISU-100. There was only one vent stack for the two hoods in Room C-13. No gamma scan measurements exceeded the scan threshold listed in Section 2.9.

4.1.5.3 Swipes were collected for measurements of removable contamination on the blowers, ducts and vent stacks of the exhaust systems in ISU-100. No swipe measurements exceeded 0.2 % of the DCGLw. The data demonstrate that virtually no removable contamination is present within ISU-100.

4.2 INDOOR SURVEY UNIT 101

4.2.1 Direct Beta Measurements on Building Surfaces

4.2.1.1 ISU-101 was surveyed from October 2000 through February 2004. 80 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 37 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figure 4.2.

4.2.1.2 A summary of the direct measurement results is presented in Table 4.101.1 and shows that the maximum activity measured, net of background, was 1 dpm/100cm2. The average value for the survey unit was -218 dpm/100cm2. All values were less than 1% of the DCGLw.

Table 4.101.1
ISU-101 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity ($dpm/100cm^2$)	Max Net Activity ($dpm/100cm^2$)
Concrete	C	6	-512	-447
Counter Top	CT	2	-543	-435
Gypsum Board	GB	31	-109	1
Metal	M	9	-65	-30
Plaster	PL	4	-387	-341
Vinyl Tile	VT	28	-278	-187

4.2.2 Direct Beta Measurements on Fixed Equipment

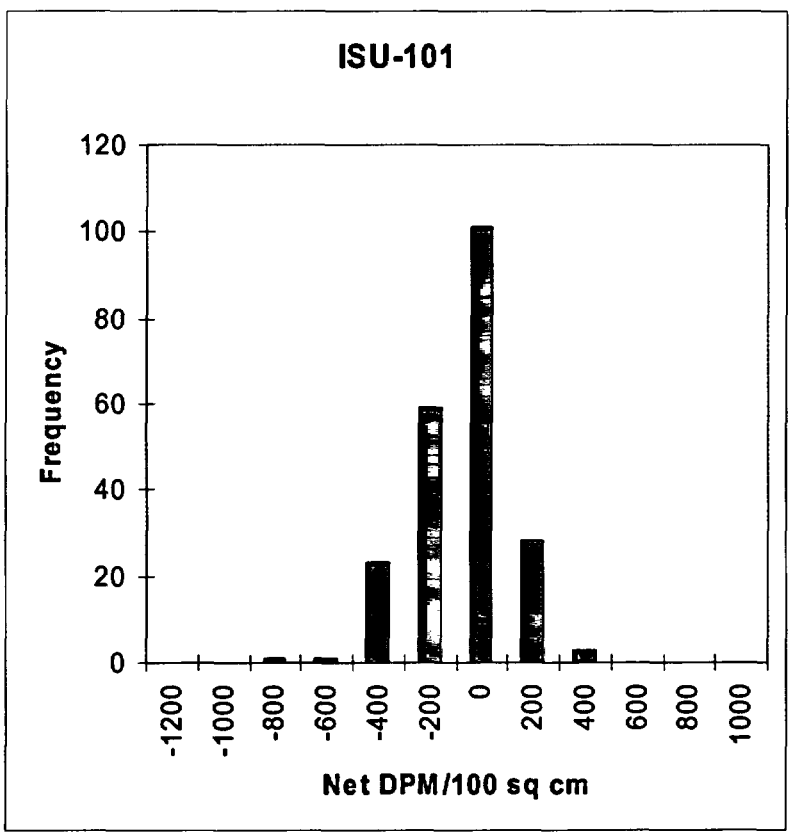
4.2.2.1 All items of fixed equipment assigned to ISU-101 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.101.2 sorted by matrix. The net values observed ranged from -994 to 236 $dpm/100cm^2$. All values were less than 2% of the $DCGL_W$.

Table 4.101.2
ISU-101 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Ceramic Tile	CT	4	-443	-258
Counter Top	CTP	38	-364	-272
Celotex	CTX	1	-994	-994
Metal	M	93	11	236

4.2.3 Direct Beta Measurement Distribution and Threshold Tests

4.2.3.1 A histogram of all the beta direct net activity values found in ISU-101 is provided in Figure 4.101.1 The distribution appears to have a single mode with the majority of the data centered at approximately 0 dpm/100cm^2. This is consistent with a normal distribution of background radioactivity possibly mixed with some residual radioactivity. All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.101.1

4.2.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-101. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-101 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.101.3.

Table 4.101.3
Requirements for ISU Release[a]

Test	Class 2	ISU-101
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.2.4 Beta Scan Measurements

4.2.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-101 exceeded the scan threshold in Table 2.5.

4.2.5 Exhaust System Measurements

4.2.5.1 Additional measurements were collected from the exhaust system outlets on the roof of the building. Direct beta measurements on the exhaust systems were included in the fixed equipment analysis.

4.2.5.2 Gamma scan measurements were collected on the vent stacks and surrounding roof areas, including nearby roof drains, for ISU-101. All hoods in ISU-101, ISU-102 and ISU-104 are vented through one bag house filter and one vent stack. No gamma scan measurements exceeded the scan threshold listed in Section 2.9.

4.2.5.3 Swipes were collected for measurements of removable contamination on the blowers, ducts and vent stacks of the exhaust systems in ISU-101. No swipe measurements exceeded 0.2 % of the DCGLw. The data demonstrate that virtually no removable contamination is present within ISU-101.

4.3 INDOOR SURVEY UNIT 102

4.3.1 Direct Beta Measurements on Building Surfaces

4.3.1.1 ISU-102 was surveyed from October 2000 through February 2004. 72 direct beta measurements were taken on the floor and wall surfaces. 32 of these were included in the systematic grid. Diagrams of the room layouts (walls and floor) with the beta measurements taken on them are presented in Appendix 2, Figure 4.3.

4.3.1.2 A summary of the direct measurement results is presented in Table 4.102.1 and shows that the maximum activity measured, net of background, was 31 dpm/100cm^2. The average value for the survey unit was -253 dpm/100cm^2. No direct beta measurements were observed on building surfaces in ISU-102 above 1% of the DCGLw.

Table 4.102.1
ISU-102 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Concrete	C	2	-464	-417
Counter Top	CTP	6	-461	-336
Celotex	CTX	5	-907	-813
Glass	G	2	-77	-70
Gypsum Board	GB	23	-95	-18
Metal	M	9	-56	31
Plaster	PL	5	-388	-322
Vinyl Tile	VT	20	-261	-158

4.3.2 Direct Beta Measurements on Fixed Equipment

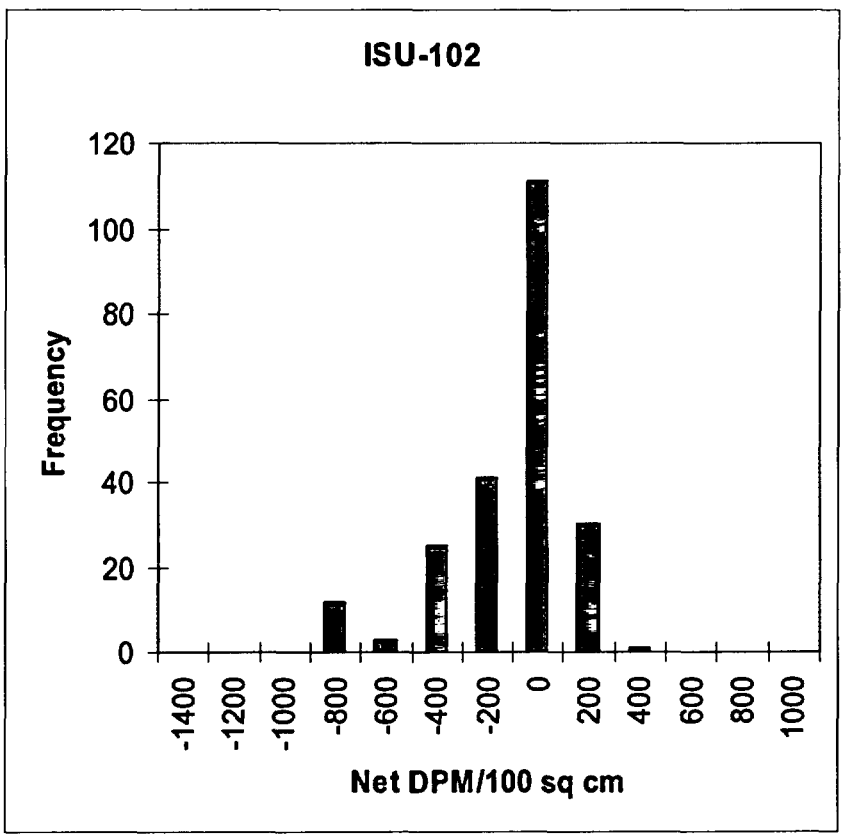
4.3.2.1 All items of fixed equipment assigned to ISU-102 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.102.2 sorted by matrix. All net values observed ranged from -986 to 236 dpm/100cm^2. All these values were less than 2% of the $DCGL_w$.

Table 4.102.2
ISU-102 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm²)	Max Net Activity (dpm/100cm²)
Counter Top	CTP	38	-409	-201
Celotex	CTX	7	-925	-837
Metal	M	101	4	236
Plastic	P	5	-32	5

4.3.3 Direct Beta Measurement Distribution and Threshold Tests

4.3.3.1 A histogram of all the beta direct net activity values found in ISU-102 is provided in Figure 4.102.1. The distribution appears to have a single background distribution grouped about 0 dpm/100cm^2. This is consistent with a normal distribution of background radioactivity possibly mixed with some residual radioactivity. All measurements were well below the $DCGL_W$.



Histogram of Net Direct Beta Measurements
Figure 4.102.1

4.3.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-102. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-102 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.102.3.

Table 4.102.3
Requirements for ISU Release[a]

Test	Class 2	ISU-101
Min/Max	Not Required[a]	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.3.4 Beta Scan Measurements

4.3.4.1 Beta scans were performed on 100% of the room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-102 exceeded the scan threshold in Table 2.5.

4.3.5 Exhaust System Measurements

4.3.5.1 Additional measurements were collected from the exhaust system outlets on the roof of the building. Direct beta measurements on the exhaust systems were included in the fixed equipment analysis.

4.3.5.2 Gamma scan measurements were collected on the vent stacks and surrounding roof areas, including nearby roof drains, for ISU-102. All hoods in ISU-101, ISU-102 and ISU-104 are vented through one bag house filter and one vent stack. No gamma scan measurements exceeded the scan threshold listed in Section 2.9.

4.3.5.3 Swipes were collected for measurements of removable contamination on the blowers, ducts and vent stacks of the exhaust systems in ISU-102. No swipe measurements exceeded 0.2 % of the DCGLw. The data

demonstrate that virtually no removable contamination is present within ISU-102.

4.4 INDOOR SURVEY UNIT 103

4.4.1 Direct Beta Measurements on Building Surfaces

4.4.1.1 ISU-103 was surveyed from October 2000 through February 2004. 97 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 29 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figures 4.4a and 4.4b.

4.4.1.2 A summary of the direct measurement results is presented in Table 4.103.1 and shows that the maximum activity measured, net of background, was 214 dpm/100cm2. The average value for the survey unit was -115 dpm/100cm2. All values were less than 2% of the DCGLw.

Table 4.103.1
ISU-103 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity ($dpm/100cm^2$)	Max Net Activity ($dpm/100cm^2$)
Concrete	C	1	-389	-389
Counter Top	CTP	1	-291	-291
Glass	G	1	-5	-5
Gypsum Board	GB	53	-22	214
Metal	M	3	-21	22
Plaster	PL	8	-350	-183
Vinyl Tile	VT	29	-228	-139
Wood	W	1	136	136

4.4.2 Direct Beta Measurements on Fixed Equipment

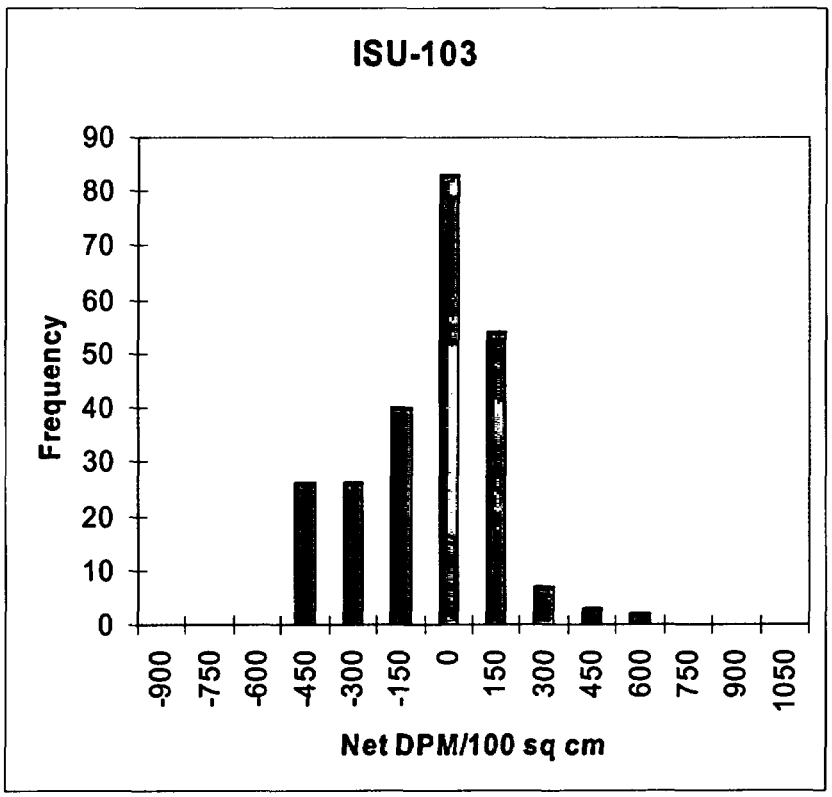
4.4.2.1 All items of fixed equipment assigned to ISU-103 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.103.2 sorted by matrix. The net values observed ranged from -594 to 596 $dpm/100cm^2$. All values were less than 5% of the $DCGL_W$.

Table 4.103.2
ISU-103 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm²)	Max Net Activity (dpm/100cm²)
Counter Top	CTP	53	-416	-175
Glass	G	2	553	596
Metal	M	82	29	385
Plastic	P	6	63	91
Rubber	R	1	161	161

4.4.3 Direct Beta Measurement Distribution and Threshold Tests

4.4.3.1 A histogram of all the beta direct net activity values found in ISU-103 is provided in Figure 4.103.1 The distribution appears to have a single mode with the majority of the data centered around 0 dpm/100cm^2. This is consistent with a normal distribution of background radioactivity possibly mixed with some residual radioactivity. All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.103.1

4.4.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 4 for ISU-103. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-103 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.103.3.

Table 4.103.3
Requirements for ISU Release[a]

Test	Class 2	ISU-103
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.4.4 Beta Scan Measurements

4.4.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-103 exceeded the scan threshold in Table 2.5.

4.4.5 Exhaust System Measurements

4.4.5.1 Additional measurements were collected from the exhaust system outlets on the roof of the building. Direct beta measurements on the exhaust systems were included in the fixed equipment analysis.

4.4.5.2 Gamma scan measurements were collected on the vent stacks and surrounding roof areas, including nearby roof drains, for ISU-103. No gamma scan measurements exceeded the scan threshold listed in Section 2.9.

4.4.5.3 Swipes were collected for measurements of removable contamination on the blowers, ducts and vent stacks of the exhaust systems in ISU-103. No swipe measurements exceeded 0.1 % of the DCGLw. The data demonstrate that virtually no removable contamination is present within ISU-103.

4.5 INDOOR SURVEY UNIT 104

4.5.1 Direct Beta Measurements on Building Surfaces

4.5.1.1 ISU-104 was surveyed from December 2000 through February 2004. 87 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 28 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figures 4.5a and 4.5b.

4.5.1.2 A summary of the direct measurement results is presented in Table 4.104.1 and shows that the maximum activity measured, net of background, was 202 dpm/100cm^2. The average value for the survey unit was -160 dpm/100cm^2. All values were less than 2% of the DCGLw.

Table 4.104.1
ISU-104 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Ceramic Tile	CT	5	-528	-491
Counter Top	CTP	2	-288	-286
Celotex	CTX	1	-867	-867
Glass	G	3	-56	6
Gypsum Board	GB	46	-85	49
Metal	M	4	-96	-43
Plaster	PL	4	-368	-309
Removable Flooring	RF	5	117	202
Vinyl Tile	VT	17	-262	-203

4.5.2 Direct Beta Measurements on Fixed Equipment

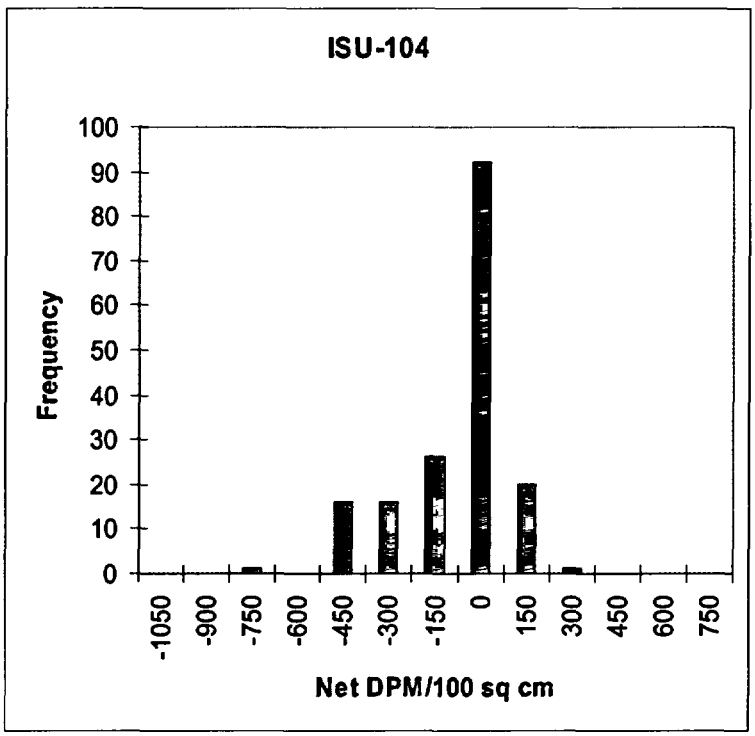
4.5.2.1 All items of fixed equipment assigned to ISU-104 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.104.2 sorted by matrix. The net values observed ranged from -581 to 82 dpm/100cm^2. All values were less than 1% of the $DCGL_W$.

Table 4.104.2
ISU-104 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Counter Top	CTP	24	-421	-232
Metal	M	61	-39	82

4.5.3 Direct Beta Measurement Distribution and Threshold Tests

4.5.3.1 A histogram of all the beta direct net activity values found in ISU-104 is provided in Figure 4.104.1. The distribution appears to have a single mode consistent with a normal distribution of background possibly mixed with some residual radioactivity. All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.104.1

4.5.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-104. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-104 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.104.3.

Table 4.104.3
Requirements for ISU Release[a]

Test	Class 2	ISU-104
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.5.4 Beta Scan Measurements

4.5.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-104 exceeded the scan threshold in Table 2.5.

4.5.5 Exhaust System Measurements

4.5.5.1 Additional measurements were collected from the exhaust system outlets on the roof of the building. Direct beta measurements on the exhaust systems were included in the fixed equipment analysis.

4.5.5.2 Gamma scan measurements were collected on the vent stacks and surrounding roof areas, including nearby roof drains, for ISU-104. All hoods in ISU-101, ISU-102 and ISU-104 are vented through one bag house filter and one vent stack. No gamma scan measurements exceeded the scan threshold listed in Section 2.9.

4.5.5.3 Swipes were collected for measurements of removable contamination on the blowers, ducts and vent stacks of the exhaust systems in ISU-104. No swipe measurements exceeded 0.2 % of the DCGLw. The data demonstrate that virtually no removable contamination is present within ISU-104.

4.6 INDOOR SURVEY UNIT 105

4.6.1 Direct Beta Measurements on Building Surfaces

4.6.1.1 ISU-105 was surveyed from November 2000 through January 2003. 66 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 30 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figure 4.6.

4.6.1.2 A summary of the direct measurement results is presented in Table 4.105.1 and shows that the maximum activity measured, net of background, was 68 dpm/100cm^2. The average value for the survey unit was -243 dpm/100cm^2. All values were less than 1% of the DCGLw.

Table 4.105.1
ISU-105 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Concrete	C	13	-480	-410
Gypsum Board	GB	15	-43	57
Metal	M	7	8	68
Plaster	PL	11	-400	-313
Vinyl Tile	VT	20	-239	-115

4.6.2 Direct Beta Measurements on Fixed Equipment

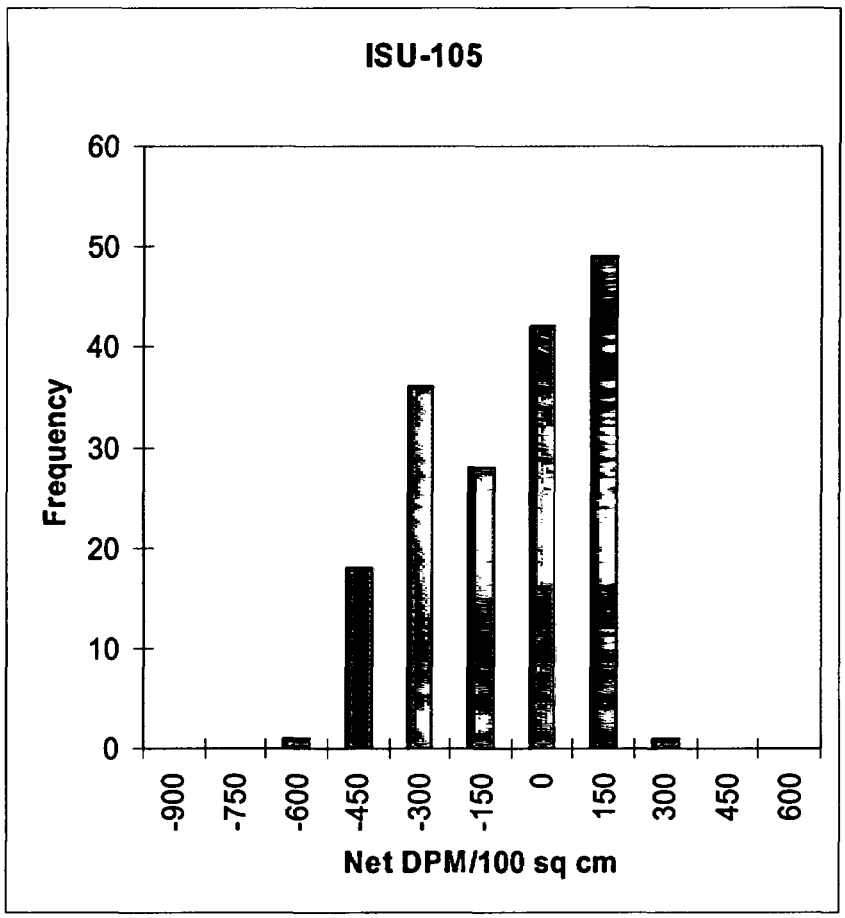
4.6.2.1 All items of fixed equipment assigned to ISU-105 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.105.2 sorted by matrix. The net values observed ranged from -580 to 159 dpm/100cm^2. All values were less than 2% of the $DCGL_w$.

Table 4.105.2
ISU-105 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Counter Top	CTP	42	-386	-194
Metal	M	61	34	159
Plastic	P	6	62	128

4.6.3 Direct Beta Measurement Distribution and Threshold Tests

4.6.3.1 A histogram of all the beta direct net activity values found in ISU-105 is provided in Figure 4.105.1. The distribution appears to have multiple modes with the majority of the data centered at approximately -150 dpm/100cm^2. This is consistent with a normal distribution of background radioactivity possibly mixed with some residual radioactivity. All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.105.1

4.6.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-105. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-105 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.105.3.

Table 4.105.3
Requirements for ISU Release[a]

Test	Class 2	ISU-105
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.6.4 Beta Scan Measurements

4.6.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-105 exceeded the scan threshold in Table 2.5.

4.6.5 Exhaust System Measurements

4.6.5.1 Additional measurements were collected from the exhaust system outlets on the roof of the building. Direct beta measurements on the exhaust systems were included in the fixed equipment analysis.

4.6.5.2 Gamma scan measurements were collected on the vent stacks and surrounding roof areas, including nearby roof drains, for ISU-105. No gamma scan measurements exceeded the scan threshold listed in Section 2.9.

4.6.5.3 Swipes were collected for measurements of removable contamination on the blowers, ducts and vent stacks of the exhaust systems in ISU-105. No swipe measurements exceeded 0.1 % of the DCGLw. The data demonstrate that virtually no removable contamination is present within ISU-105.

4.7 INDOOR SURVEY UNIT 106

4.7.1 Direct Beta Measurements on Building Surfaces

4.7.1.1 ISU-106 was surveyed from December 2000 through February 2004. 92 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 43 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figure 4.7.

4.7.1.2 A summary of the direct measurement results is presented in Table 4.106.1 and shows that the maximum activity measured, net of background, was 5 dpm/100cm^2. The average value for the survey unit was -527 dpm/100cm^2. All values were less than 1% of the DCGLw.

Table 4.106.1
ISU-106 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Concrete	C	42	-417	-142
Concrete Block	CB	22	-1,156	-1,022
Ceramic Tile	CT	12	-262	-89
Metal	M	10	-58	-3
Plaster	PL	5	-346	5
Wood	W	1	-53	-53

4.7.2 Direct Beta Measurements on Fixed Equipment

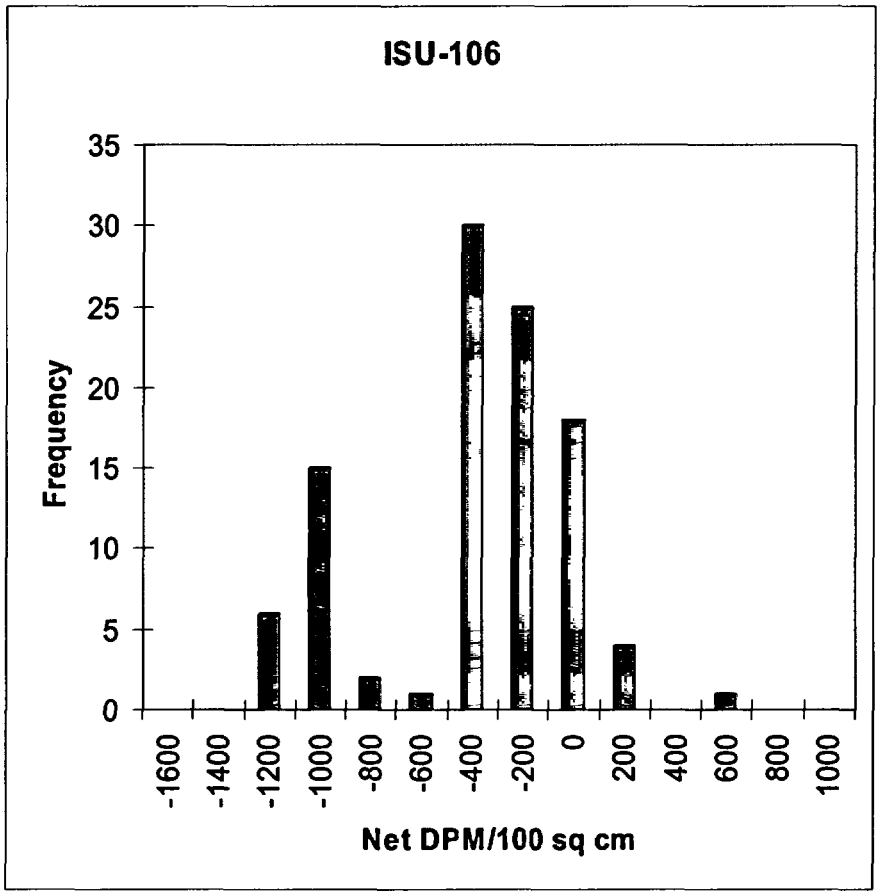
4.7.2.1 All items of fixed equipment assigned to ISU-106 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.106.2 sorted by matrix. The net values observed ranged from -587 to 425 dpm/100cm^2. All values were less than 4% of the $DCGL_w$.

Table 4.106.2
ISU-106 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Concrete	C	6	-588	-545
Metal	M	5	109	425

4.7.3 Direct Beta Measurement Distribution and Threshold Tests

4.7.3.1 A histogram of all the beta direct net activity values found in ISU-106 is provided in Figure 4.106.1. The distribution appears to have two modes with the majority of the data centered at approximately -200 dpm/100cm^2. All of the data taken on concrete and concrete block appear in the left hand mode exclusively. Since the reference background for concrete and concrete block may be significantly greater than the corresponding matrix materials in the survey unit, that would account for the split in the data. In that event the histogram would be typical of a single background distribution. All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.106.1

4.7.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-106. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-106 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.106.3.

Table 4.106.3
Requirements for ISU Release[a]

Test	Class 2	ISU-106
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

4.7.4 Beta Scan Measurements

4.7.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-106 exceeded the scan threshold in Table 2.5.

4.8 INDOOR SURVEY UNIT 107

4.8.1 Direct Beta Measurements on Building Surfaces

4.8.1.1 ISU-107, one of two Class 1 survey units, was surveyed from October 2000 and through October 2002. 64 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 29 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figure 4.8.

4.8.1.2 A summary of the direct measurement results is presented in Table 4.107.1 and shows that the maximum activity measured, net of background, was 448 dpm/100cm^2. The average value for the survey unit was -536 dpm/100cm^2. All values were less than 4% of the DCGLw.

Table 4.107.1
ISU-107 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Concrete	C	35	-324	448
Concrete Block	CB	18	-1,203	-1,049
Counter Top	CTP	2	-405	-385
Glass	G	3	-126	-118
Metal	M	5	-27	97
Wood	W	1	3	3

4.8.2 Direct Beta Measurements on Fixed Equipment

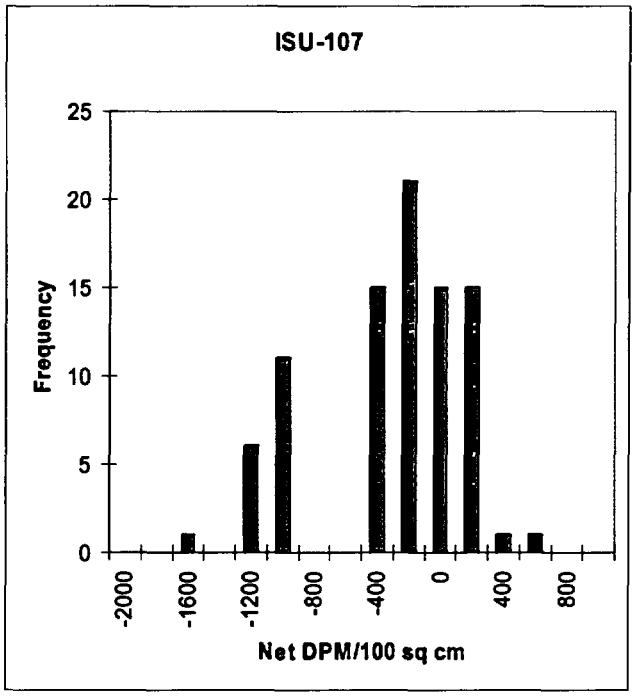
4.8.2.1 All items of fixed equipment assigned to ISU-107 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.107.2 sorted by matrix. The net values observed ranged from -459 to 318 dpm/100cm^2. All values were less than 3% of the $DCGL_w$.

Table 4.107.2
ISU-107 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Counter Top	CTP	3	-452	-447
Metal	M	19	36	318

4.8.3 Direct Beta Measurement Distribution and Threshold Tests

4.8.3.1 A histogram of all the beta direct net activity values found in ISU-107 is provided in Figure 4.107.1. The distribution appears to have two modes with the majority of the data centered at approximately -200 dpm/100cm^2. All of the data taken on concrete, concrete block and countertop appear in the left hand mode exclusively. Since the reference background for these matrix materials may be greater than the corresponding matrix materials in the survey unit, that would account for the split in the data. In that event the histogram would be typical of a single background distribution. All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.107.1

4.8.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-107. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-107 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 1 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.107.3.

Table 4.107.3
Requirements for ISU Release[a]

Test	Class 1	ISU-107
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	Not Required	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.8.4 Beta Scan Measurements

4.8.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-107 exceeded the scan threshold in Table 2.5.

4.9 INDOOR SURVEY UNIT 108

4.9.1 Direct Beta Measurements on Building Surfaces

4.9.1.1 ISU-108 was surveyed in October 2000 and June 2001. 43 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 30 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figure 4.9.

4.9.1.2 A summary of the direct measurement results is presented in Table 4.108.1 and shows that the maximum activity measured, net of background, was 58 dpm/100cm^2. The average value for the survey unit was -765 dpm/100cm^2. All values were less than 1% of the DCGLw.

Table 4.108.1
ISU-108 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Concrete	C	9	-358	-258
Concrete Block	CB	28	-1,066	-856
Foam Insulation Board	F	6	27	58

4.9.2 Direct Beta Measurements on Fixed Equipment

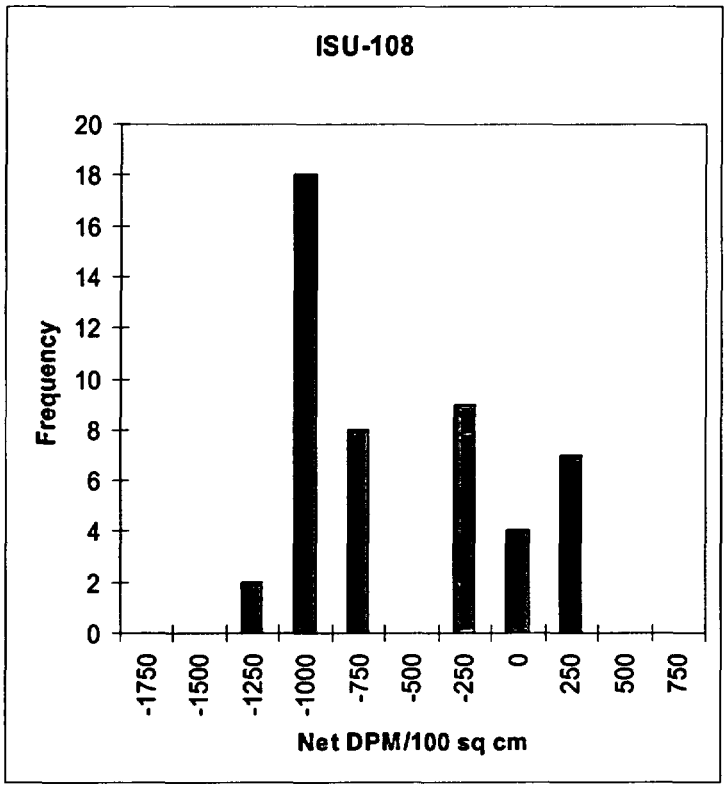
4.9.2.1 All items of fixed equipment assigned to ISU-108 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.108.2 sorted by matrix. The net values observed ranged from -73 to 91 dpm/100cm^2. All values were less than 1% of the $DCGL_W$.

Table 4.108.2
ISU-108 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Metal	M	5	-1	91

4.9.3 Direct Beta Measurement Distribution and Threshold Tests

4.9.3.1 A histogram of all the beta direct net activity values found in ISU-108 is provided in Figure 4.108.1. The distribution appears to have two distinct modes. All of the data taken on concrete, concrete block and countertop appear in the left hand mode exclusively. Since the reference background for these matrix materials may be greater than the corresponding matrix materials in the survey unit, that would account for the split in the data. In that event the histogram would be typical of a single background distribution. All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.108.1

4.9.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-108. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-108 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.108.3.

Table 4.108.3
Requirements for ISU Release[a]

Test	Class 2	ISU-108
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.9.4 Beta Scan Measurements

4.9.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-108 exceeded the scan threshold in Table 2.5.

4.9.5 Gamma Scan Measurements

4.9.5.1 Because the ceiling surface of Room S-1 had been covered with foam insulation since 1987, the ceiling was also scanned with a 3"x1/2" NaI gamma detector. The scan results are presented in Appendix 4. No gamma scan readings were observed above the gamma scan threshold in Section 2.9.

4.10 INDOOR SURVEY UNIT 109

4.10.1 Direct Beta Measurements on Building Surfaces

4.10.1.1 ISU-109, the former vegetation sample prep lab in the TSSL building, was surveyed in October 2000 and June 2001. 65 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 26 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figure 4.10.

4.10.1.2 A summary of the direct measurement results is presented in Table 4.109.1 and shows that the maximum activity measured, net of background, was 39 dpm/100cm2. The average value for the survey unit was -136 dpm/100cm2. All values were less than 1% of the DCGLw.

Table 4.109.1
ISU-109 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Foam Insulation	F	6	-12	39
Gypsum Board	GB	33	-119	-62
Metal	M	7	-48	-15
Vinyl Tile	VT	18	-249	-18
Wood	W	1	-135	-135

4.10.2 Direct Beta Measurements on Fixed Equipment

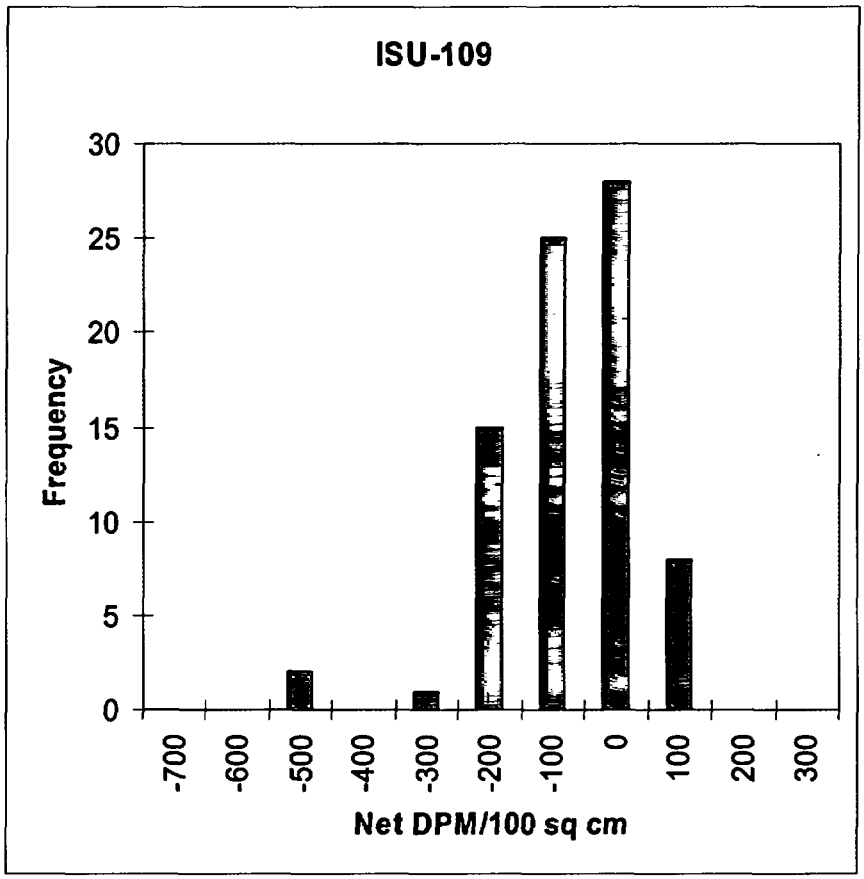
4.10.2.1 All items of fixed equipment assigned to ISU-109 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.109.2 sorted by matrix. The net values observed ranged from -565 to 19 dpm/100cm^2. All values were less than 1% of the $DCGL_W$.

Table 4.109.2
ISU-109 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Ceramic Tile	CT	1	-565	-565
Counter Top	CTP	1	-513	-513
Metal	M	12	-13	19

4.10.3 Direct Beta Measurement Distribution and Threshold Tests

4.10.3.1 A histogram of all the beta direct net activity values found in ISU-109 is provided in Figure 4.109.1. The distribution appears to have a single mode with the majority of the data centered at approximately -100 dpm/100cm^2 and is consistent with a normal distribution of background radioactivity mixed with some residual radioactivity above background. Two data points on high background materials (CT and CTP) are isolated well to the left of the distribution and are most likely separated by background as described in ISU-107 and 108. All measurements were well below the $DCGL_W$.



Histogram of Net Direct Beta Measurements
Figure 4.109.1

4.10.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-109. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-109 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.109.3.

Table 4.109.3
Requirements for ISU Release[a]

Test	Class 2	ISU-109
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	PASS	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.10.4 Beta Scan Measurements

4.10.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-109 exceeded the scan threshold in Table 2.5.

4.10.5 Gamma Scan Measurements

4.10.5.1 Because the ceiling of the TSSL Prep Lab had been covered with foam insulation since 1987, the ceiling was also scanned with a 3"x1/2" NaI gamma detector. The scan results are presented in Appendix 4. No gamma scan readings were observed above the gamma scan threshold in Section 2.9.

4.11 INDOOR SURVEY UNIT 110

4.11.1 Direct Beta Measurements on Building Surfaces

4.11.1.1 ISU-110, one of two Class 1 survey units, was surveyed in December 2000 and June 2001. 42 direct beta measurements were taken on the floor, ceiling, and wall surfaces. 28 of these were included in the systematic grid. Diagrams of the room layouts of the walls and floor with the beta measurements taken on them are presented in Appendix 2, Figure 4.11.

4.11.1.2 A summary of the direct measurement results is presented in Table 4.110.1 and shows that the maximum activity measured, net of background, was -6 dpm/100cm^2. The average value for the survey unit was -137 dpm/100cm^2. All values were less than 1% of the DCGLw.

Table 4.110.1
ISU-110 Direct Measurements Summary
(Building Surfaces)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Glass	G	1	-60	-60
Gypsum Board	GB	16	-99	-6
Metal	M	11	-47	-7
Vinyl Tile	VT	14	-256	-190

4.11.2 Direct Beta Measurements on Fixed Equipment

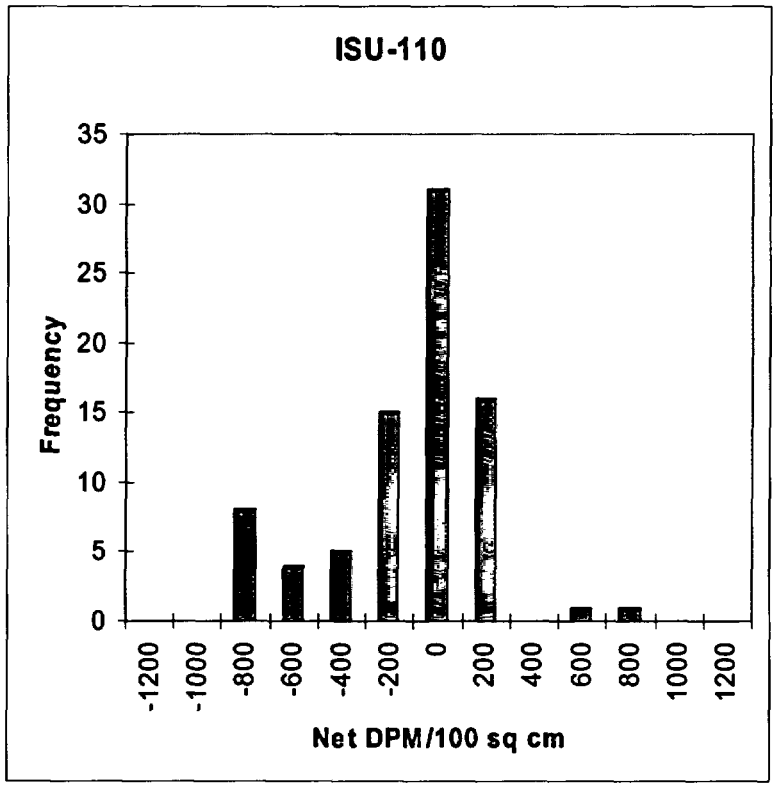
4.11.2.1 All items of fixed equipment assigned to ISU-110 (listed in Appendix 1) were surveyed by direct beta measurements. A summary of the measurements taken is provided in Table 4.110.2 sorted by matrix. The net values observed ranged from -907 to 669 dpm/100cm^2. All values were less than 21% of the $DCGL_w$.

Table 4.110.2
ISU-110 Direct Measurements Summary
(Fixed Equipment)

Matrix		Points	Avg Net Activity (dpm/100cm^2)	Max Net Activity (dpm/100cm^2)
Counter Top	CTP	7	-439	-275
Celotex	CTX	12	-837	-741
Metal	M	15	131	669
Plastic	P	5	58	104

4.11.3 Direct Beta Measurement Distribution and Threshold Tests

4.11.3.1 A histogram of all the beta direct net activity values found in ISU-110 is provided in Figure 4.110.1. The distribution appears to have a single mode with the majority of the data centered at approximately 0 dpm/100cm^2. This is consistent with a normal distribution of background radioactivity mixed with some residual radioactivity above background. Measurements to the extreme left of the histogram were low survey readings taken on a very high background matrix material (CTX). All measurements were well below the $DCGL_w$.



Histogram of Net Direct Beta Measurements
Figure 4.110.1

4.11.3.2 All the direct measurements in the survey unit were analyzed using the Threshold Comparison Test Report (TCTR) and the results are presented in Appendix 3 for ISU-110. The TCTR report contains a complete listing of all the beta direct measurements taken in the Final Status Survey within ISU-110 sorted by room, surface, and activity. The summary pages indicate that all tests described in the D Plan passed except for the background test. All tests required for release of a Class 2 survey unit were passed. A comparison of test results and requirements for release of the survey unit is presented in Table 4.110.3.

Table 4.110.3
Requirements for ISU Release[a]

Test	Class 1	ISU-110
Min/Max	Not Required	P
Background	Not Required	F
$DCGL_w$	Not Required	P
$DCGL_{avg}$	PASS	P
EMC	PASS	P
Sign Test for Paired Data	PASS	P

[a] Class 1 or 2 survey units which pass Min/Max may be released without further consideration.

4.11.4 Beta Scan Measurements

4.11.4.1 Beta scans were performed on 100% of all room surfaces and fixed equipment. The beta scan results are presented in Appendix 4. No beta scan measurements in ISU-110 exceeded the scan threshold in Table 2.5.

4.12 CHEMICAL DRAIN SYSTEMS

4.12.1 Two chemical drain systems at KMTC extend from in the main building to the east and west. They include both outdoor and indoor components and are designated SU EP-1 and SU EP-2. the results and discussion of the Final Status Surveys of these drain systems are covered in NEXTEP Tech Memo 0401[22]. Which is included as Appendix 5.

5 CONCLUSIONS

5.1 No direct beta survey values measured in any of the survey units exceeded 26% of the DCGLw.

5.2 All tests required by the D Plan passed in all survey units except the background test. All tests required for Class 2 survey units passed for both Class 1 and Class 2 survey units.

5.3 All beta scan data values were less than the net scan threshold of 1450 dpm/100cm ^{2}.

5.4 Gamma scan surveys on foam insulation in SU-108 and 109 were less than twice background.

5.5 Gamma scan surveys on the exhaust systems in ISU-100, 101, 102, 103, 104, and 105 were less than twice background.

5.6 No swipe measurements which were collected on the laboratory exhaust systems exceeded 0.2% of the DCGLw.

5.7 No FSS measurements for the chemical drain systems designated, SU EP-1 and SU EP-2, exceeded the release limits for the survey unit.

5.8 SU EP-1 and SU EP-2 meet all criteria for nonrestricted release of a Class 2 survey unit.

6 RECOMMENDATIONS

6.1 All eleven indoor survey units should be released from the license.

6.2 The chemical drain systems, SU EP-1 and SU EP-2, should be released from the license.

[22] NEXTEP Tech Memo 0401, Ibid.

APPENDIX 1
Indoor Survey Unit Listing

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 100

Room C-13

F	15.5	22.0	318	
C	15.5	22.0	318	
N	15.5	10.8	167	
S	15.5	10.8	167	
E	22.0	10.8	238	
W	22.0	10.8	238	
Q1	0.0	0.0	0	Walk in Hood N side
Q2	0.0	0.0	0	Hood NE corner
Q3	0.0	0.0	0	Casework W side
Q4	0.0	0.0	0	Casework Center
Q5	0.0	0.0	0	Casework w/sink E side
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room C-13 (12 detail records) *1,447* **Sq. Feet**

Room C-13a

F	2.7	7.0	19	
C	2.7	7.0	19	
N	2.7	10.8	29	
S	2.7	10.8	29	
E	7.0	10.8	76	
W	7.0	10.8	76	

Summary for Room C-13a (6 detail records) *247* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*
Room C-17				
F	15.3	22.0	337	
C	15.3	22.0	337	
N	15.3	10.8	165	
S	15.3	10.8	165	
E	22.0	10.8	238	
W	22.0	10.8	238	
Q1	0.0	0.0	0	Hood N side
Q2	0.0	0.0	0	Casework w/sink N and E side
Q3	0.0	0.0	0	Casework w/sink W side
Q4	0.0	0.0	0	Casework w/sink center
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room C-17 (11 detail records) *1,479* **Sq. Feet**

Room C-19				
F	15.9	37.9	603	
C	15.9	37.9	603	
N	15.9	10.8	172	
S	15.9	10.8	172	
E	37.9	10.8	409	
W	37.9	10.8	409	
Q1	0.0	0.0	0	Casework W side
Q2	0.0	0.0	0	Casework w/sink Center S
Q3	0.0	0.0	0	Casework E side
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room C-19 (10 detail records) *2,367* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*
Room E-12				
F	15.7	22.0	345	
C	15.7	22.0	345	
N	15.7	10.8	170	
S	15.7	10.8	170	
E	22.0	10.8	238	
W	22.0	10.8	238	
Q1	0.0	0.0	0	Casework W side
Q2	0.0	0.0	0	Stainless Steel casework Center
Q3	0.0	0.0	0	Casework w/sink E side
Q4	0.0	0.0	0	Hood W side S
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling
Summary for Room E-12 (12 detail records)			*1,505* **Sq. Feet**	
Room E-14				
F	15.8	12.1	191	
C	15.8	12.1	191	
N	15.8	10.8	171	
S	15.8	10.8	171	
E	12.1	10.8	131	
W	12.1	10.8	131	
Q1	0.0	0.0	0	Micronizer Center
Q2	0.0	0.0	0	Boiler NE corner
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling
Summary for Room E-14 (9 detail records)			*985* **Sq. Feet**	
TOTAL for Survey Unit 100			*8,030* Sq.	

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 101

Room C-29a

F	24.5	27.2	666	
C	24.5	27.2	666	
N	24.5	13.1	321	
S	24.5	13.1	321	
E	27.2	13.1	356	
W	27.2	13.1	356	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Hood NW Corner
Q3	0.0	0.0	0	Casework on N side
Q4	0.0	0.0	0	Casework with 2 sinks on W side N
Q5	0.0	0.0	0	Casework with 2 sinks on W side S
Q6	0.0	0.0	0	Casework E side

Summary for Room C-29a (12 detail *2,687* **Sq. Feet**

Room C-29b

F	24.5	27.3	669	
C	24.5	27.3	669	
N	24.5	13.1	321	
S	24.5	13.1	321	
E	27.3	13.1	358	
W	27.3	13.1	358	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Casework E side
Q2	0.0	0.0	0	Casework 2 sinks W side - N
Q3	0.0	0.0	0	Casework 2 sinks W side - S
Q4	0.0	0.0	0	Hood SW corner
Q5	0.0	0.0	0	Casework S side

Summary for Room C-29b (12 detail *2,695* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*
Room C-33				
F	24.5	12.9	316	
C	24.5	12.9	316	
N	24.5	13.1	321	
S	24.5	13.1	321	
E	12.9	13.1	169	
W	12.9	13.1	169	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Casework on N side
Q2	0.0	0.0	0	Hood on E side - N
Q3	0.0	0.0	0	Hood on E Side - S (incl bench)
Q4	0.0	0.0	0	Casework w/ sink on S side

Summary for Room C-33 (11 detail records) *1,612* **Sq. Feet**

TOTAL for Survey Unit 101 *6,994* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 102

Room C-39

F	11.5	24.0	276	
C	11.5	24.0	276	
N	11.5	8.5	98	
S	11.5	8.5	98	
E	24.0	8.5	204	
W	24.0	8.5	204	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Hood E side S
Q2	0.0	0.0	0	Casework with Sink N and E side
Q3	0.0	0.0	0	Casework W side

Summary for Room C-39 (10 detail records) *1,156* **Sq. Feet**

Room E-22

F	24.5	24.1	590	
C	24.5	24.1	590	
N	24.5	8.5	208	
S	24.5	8.5	208	
E	24.1	8.5	205	
W	24.1	8.5	205	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Casework & Sink on N & W walls
Q2	0.0	0.0	0	Casework in SE Corner

Summary for Room E-22 (9 detail records) *2,007* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*
Room E-30				
F	24.5	31.6	774	
C	24.5	31.6	774	
N	24.5	8.5	208	
S	24.5	8.5	208	
E	31.6	8.5	269	
W	31.6	8.5	269	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Casework N side
Q2	0.0	0.0	0	Hood N side - W
Q3	0.0	0.0	0	Hood N side - E
Q4	0.0	0.0	0	Casework 2 sinks E side - N
Q5	0.0	0.0	0	Casework 3 sinks E side - S
Q6	0.0	0.0	0	Casework S side
Q7	0.0	0.0	0	Hood S side - W
Q8	0.0	0.0	0	Hood S side - E

Summary for Room E-30 (15 detail records) *2,502* **Sq. Feet**

TOTAL for Survey Unit 102 *5,665* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 103

Room C-1

F	23.2	9.7	225	
C	23.2	9.7	225	
N	23.2	10.8	251	
S	23.2	10.8	251	
E	9.7	10.8	105	
W	9.7	10.8	105	
Q1	0.0	0.0	0	Casework w/ sink - N Side
Q2	0.0	0.0	0	Casework S Side
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room C-1 (9 detail records) *1,161* **Sq. Feet**

Room C-1a

F	10.0	12.0	120	
C	10.0	12.0	120	
N	10.0	10.8	108	
S	10.0	10.8	108	
E	12.0	10.8	130	
W	12.0	10.8	130	
Q1	0.0	0.0	0	Casework on N and E sides
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room C-1a (8 detail records) *715* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	Xmax	Ymax	Area (sq.ft.)	Description
Room E-10				
F	15.7	22.0	345	
C	15.7	22.0	345	
N	15.7	10.8	170	
S	15.7	10.8	170	
E	22.0	10.8	238	
W	22.0	10.8	238	
Q1	0.0	0.0	0	Walk in Hood E side S
Q2	0.0	0.0	0	Casework w/sink E side
Q3	0.0	0.0	0	Casework W side
Q4	0.0	0.0	0	Sink S side
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room E-10 (11 detail records) *1,505* **Sq. Feet**

Room E-2				
F	19.2	22.0	422	
C	19.2	22.0	422	
N	19.2	10.8	207	
S	19.2	10.8	207	
E	22.0	10.8	238	
W	22.0	10.8	238	
Q1	0.0	0.0	0	Casework w sink W side
Q2	0.0	0.0	0	Center Casework
Q3	0.0	0.0	0	Hood on S wall
Q4	0.0	0.0	0	Casework on S wall W
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room E-2 (11 detail records) *1,735* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*
Room E-8				
F	21.6	22.0	475	
C	21.6	22.0	475	
N	21.6	10.8	233	
S	21.6	10.8	233	
E	22.0	10.8	238	
W	22.0	10.8	238	
Q1	0.0	0.0	0	Casework w/sink W side
Q2	0.0	0.0	0	Casework w/hood S side
Q3	0.0	0.0	0	Casework E side
Q4	0.0	0.0	0	Casework w/sink Center N
Q5	0.0	0.0	0	Casework Center S
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room E-8 (12 detail records) *1,892* **Sq. Feet**

TOTAL for Survey Unit 103 *7,008* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 104

Room C-21

F	19.2	21.9	420	
C	19.2	21.9	420	
N	19.2	13.1	252	
S	19.2	13.1	252	
E	21.9	13.1	287	
W	21.9	13.1	287	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	AC Unit W side
Q2	0.0	0.0	0	Kristalloflex 805 - NE corner

Summary for Room C-21 (9 detail records) *1,918* **Sq. Feet**

Room C-23

F	19.2	22.0	422	
C	19.2	22.0	422	
N	19.2	13.1	252	
S	19.2	13.1	252	
E	22.0	13.1	288	
W	22.0	13.1	288	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	A C unit NE corner
Q2	0.0	0.0	0	Perkin Elmer Plasma II - Center N

Summary for Room C-23 (9 detail records) *1,924* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*
Room C-25				
F	9.0	22.0	198	
C	9.0	22.0	198	
N	9.0	13.1	118	
S	9.0	13.1	118	
E	22.0	13.1	288	
W	22.0	13.1	288	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Sink NE Corner
Q2	0.0	0.0	0	AC unit SE corner
Q3	0.0	0.0	0	Casework East Wall S
Summary for Room C-25 (10 detail records)				*1,208* **Sq. Feet**
Room C-27				
F	24.5	24.0	588	
C	24.5	24.0	588	
N	24.5	13.1	321	
S	24.5	13.1	321	
E	24.0	13.1	314	
W	24.0	13.1	314	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Hood SW corner
Q2	0.0	0.0	0	Casework w/sink W side
Q3	0.0	0.0	0	Casework N side
Q4	0.0	0.0	0	Casework SE Corner
Summary for Room C-27 (11 detail records)				*2,447* **Sq. Feet**
TOTAL for Survey Unit 104				*7,497* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 105

Room F-12

F	24.7	21.7	536	
C	24.7	21.7	536	
N	24.7	10.8	267	
S	24.7	10.8	267	
E	21.7	10.8	234	
W	21.7	10.8	234	
Q1	0.0	0.0	0	Casework w sink W side
Q2	0.0	0.0	0	Hood SW corner
Q3	0.0	0.0	0	Center Hood S wall
Q4	0.0	0.0	0	Double Hood S wall - E
Q5	0.0	0.0	0	Casework w/sink E side
Q6	0.0	0.0	0	Casework Center
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room F-12 (13 detail records) *2,074* **Sq. Feet**

Indoor Survey Unit Listing

SurfaceCode	Xmax	Ymax	Area (sq.ft.)	Description
Room F-2&4				
F	43.3	22.0	851	
C	43.3	22.0	851	
N	43.3	13.2	521	non rectangle
S	43.3	13.2	521	non-rectangle
E	22.0	10.7	235	
W	22.0	13.2	290	
Q0	0.0	0.0	0	Suspended ceiling (over F2) and associated lights, vents & ducts
Q1	0.0	0.0	0	Casework West Wall S
Q2	0.0	0.0	0	Casework & Sink South Wall
Q3	0.0	0.0	0	Casework East Wall
Q4	0.0	0.0	0	Casework North Wall
Q5	0.0	0.0	0	Center Casework off Q4 - West
Q6	0.0	0.0	0	Center Casework off Q4 - East
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling in F4
Q8	0.0	0.0	0	Center Casework off Q4 - Center
Summary for Room F-2&4 (15 detail				*3,269* **Sq. Feet**
Room F-4a				
F	12.0	8.0	96	
C	12.0	8.0	96	
N	12.0	10.8	130	
S	12.0	10.8	130	
E	8.0	10.8	86	
W	8.0	10.8	86	
Summary for Room F-4a (6 detail records)				*624* **Sq. Feet**
TOTAL for Survey Unit 105				*5,967* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 106

Room G-1

F	8.0	26.5	206	
C	8.0	26.5	206	
N	8.0	9.0	72	
S	8.0	9.0	72	
E	26.5	9.0	239	
W	26.5	9.0	239	
Q1	0.0	0.0	0	Toilet and Stall
Q2	0.0	0.0	0	Urinal and partition
Q3	0.0	0.0	0	Sink
Q4	0.0	0.0	0	Bench
Q5	0.0	0.0	0	West Lockers
Q6	0.0	0.0	0	Shower
Q7	0.0	0.0	0	East Lockers
Q8	0.0	0.0	0	Heater on East Wall
Q9	0.0	0.0	0	minor fixed eqpt attached to the ceiling

Summary for Room G-1 (15 detail records) *1,033* **Sq. Feet**

Room P-1

F	73.2	61.1	4,369	
N	73.2	6.0	439	
S	73.2	6.0	439	
E	61.1	6.0	367	
W	61.1	6.0	367	
Q1	0.0	0.0	0	Steel Stair in SW Corner

Summary for Room P-1 (6 detail records) *5,981* **Sq. Feet**

Room P-2U

C	27.2	30.2	771	
N	27.2	6.3	171	
E	30.2	6.3	190	

Summary for Room P-2U (3 detail records) *1,132* **Sq. Feet**

TOTAL for Survey Unit 106 *8,146* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 107

Room P-2L

F	27.2	30.2	771	
N	27.2	8.0	218	
E	30.2	8.0	242	
Q1	0.0	0.0	0	Lab bench in center
Q2	0.0	0.0	0	Transformer E side
Q3	0.0	0.0	0	Roll Mill - S side
Q4	0.0	0.0	0	Chipmunk Crusher - SW corner
Q5	0.0	0.0	0	Pulverizer - W side
Q6	0.0	0.0	0	Rotap Shaker Enclosure - W side
Q8	0.0	0.0	0	Casework - North Wall

Summary for Room P-2L (10 detail records) *1,230* **Sq. Feet**

TOTAL for Survey Unit 107 *1,230* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 108

Room S-1

F	38.5	28.0	1,078	
C	38.5	28.0	1,078	
N	38.5	13.5	520	
S	38.5	13.5	520	
E	28.0	13.5	378	
W	28.0	13.5	378	
Q0	0.0	0.0	0	Suspended ceiling and associated lights, etc.

Summary for Room S-1 (7 detail records) *3,952* **Sq. Feet**

TOTAL for Survey Unit 108 *3,952* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 109

Room T-1

F	19.4	27.7	537	
C	19.4	27.7	537	
N	19.4	13.0	252	
S	19.4	13.0	252	
E	27.7	13.0	360	
W	27.7	13.0	360	
Q1	0.0	0.0	0	Casework w/sink N wall
Q7	0.0	0.0	0	Small fixed eqpt items attached to ceiling

Summary for Room T-1 (8 detail records) *2,298* **Sq. Feet**

TOTAL for Survey Unit 109 *2,298* Sq.

Indoor Survey Unit Listing

SurfaceCode	*Xmax*	*Ymax*	*Area (sq.ft.)*	*Description*

SurveyUnitID: 110

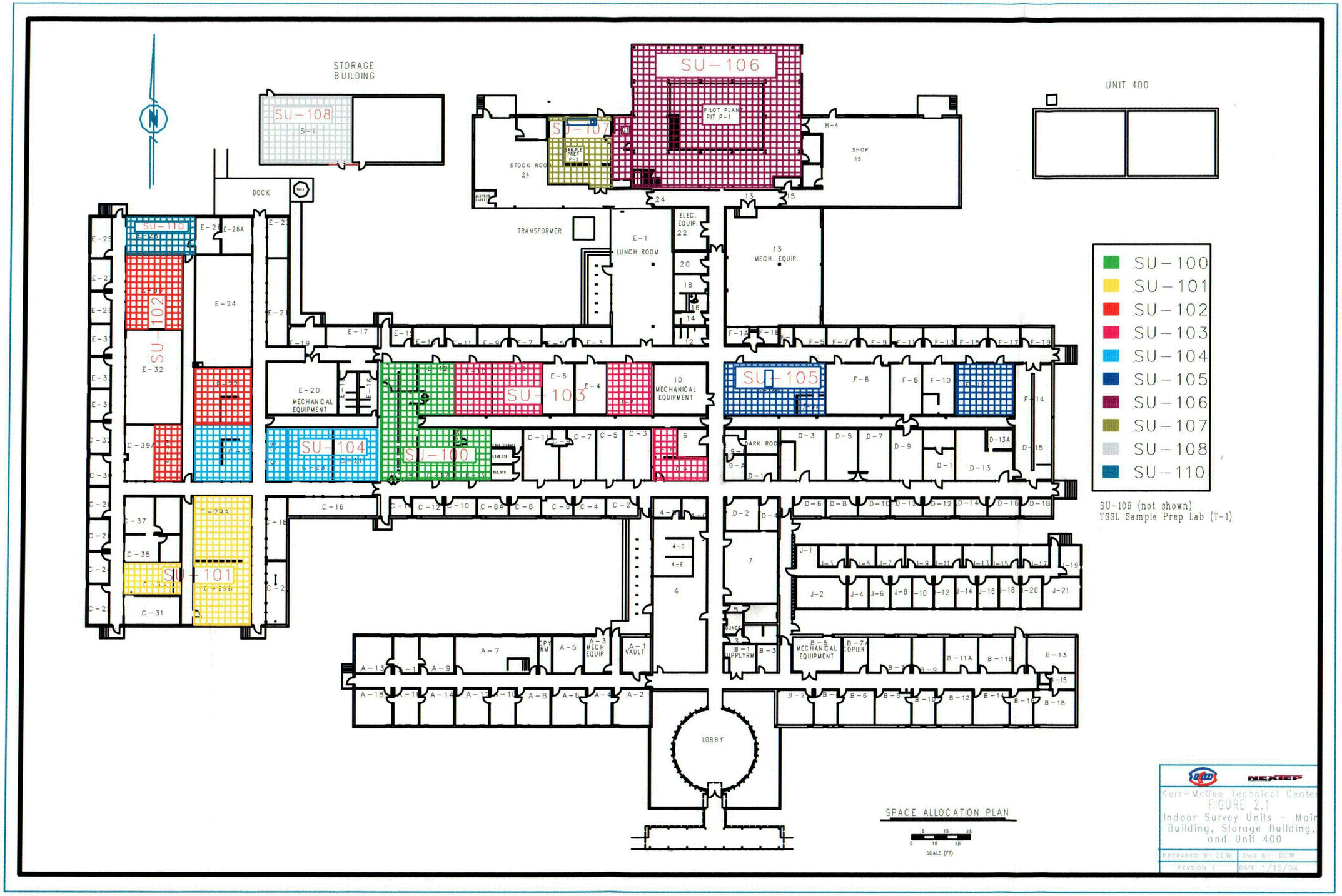
Room E-28

F	30.0	15.8	474	
C	30.0	15.8	474	
N	30.0	13.1	393	
S	30.0	13.1	393	
E	15.8	13.1	207	
W	15.8	13.1	207	
Q0	0.0	0.0	0	Suspended Ceiling and Assoc. Lights, Vents, Ducts
Q1	0.0	0.0	0	Sink S side
Q2	0.0	0.0	0	Bench Center

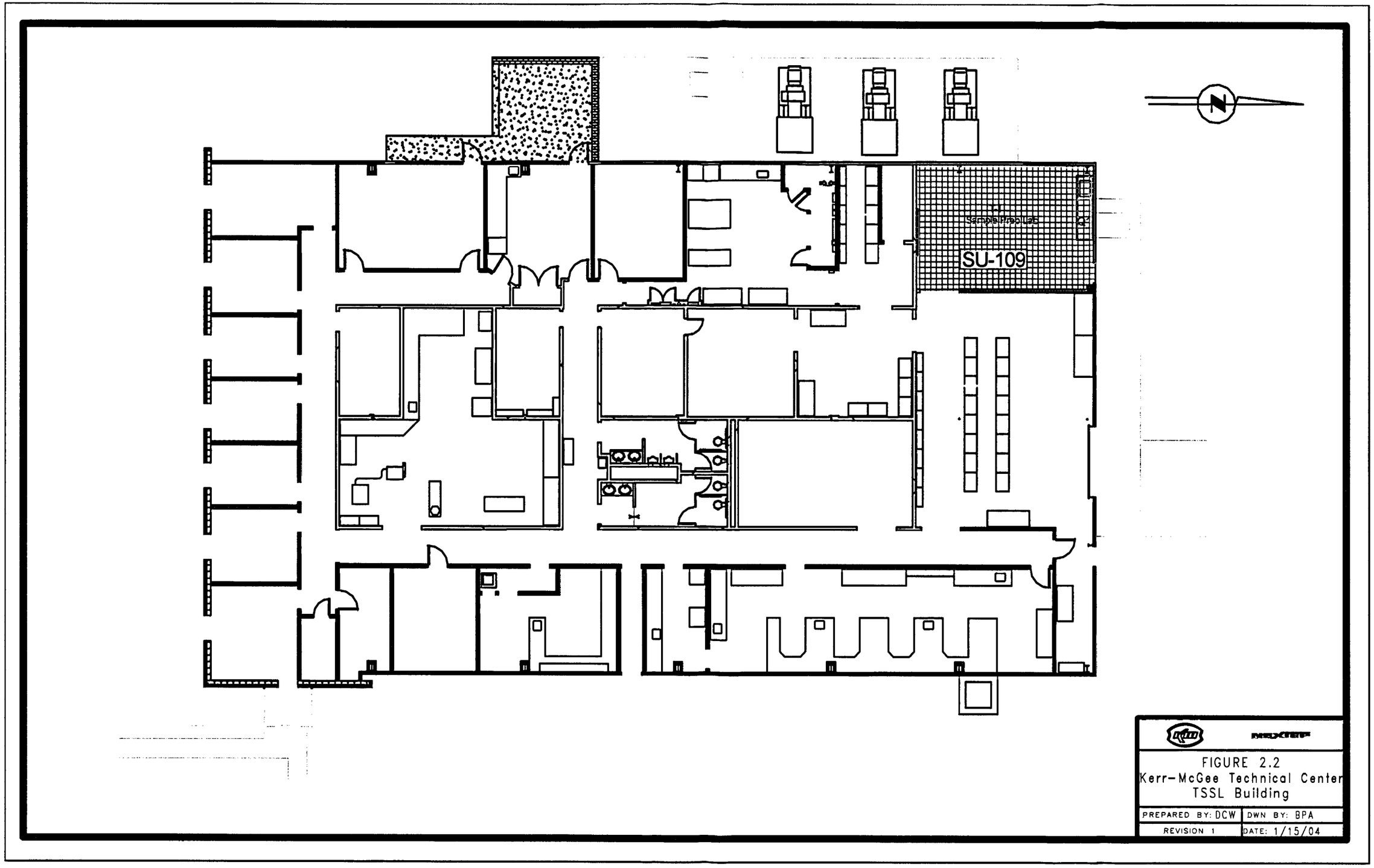
Summary for Room E-28 (9 detail records) *2,148* **Sq. Feet**

TOTAL for Survey Unit 110 *2,148* Sq.

APPENDIX 2
Figures


STORAGE BUILDING
SU-108
UNIT 400
SU-106
PILOT PLANT PIT P-1
SU-107
SAMPLE PREP P-1
STOCK ROOM 24
SHOP 15
DOCK
TRANSFORMER
E-1 LUNCH ROOM
ELEC. EQUIP. 22
13 MECH. EQUIP.
SU-110
SU-102
SU-103
SU-104
SU-100
SU-105
SU-101
E-20 MECHANICAL EQUIPMENT
10 MECHANICAL EQUIPMENT
PARK ROOM
LOBBY
A-1 VAULT
B-5 MECHANICAL EQUIPMENT
B-7 COPIER
SU-100
SU-101
SU-102
SU-103
SU-104
SU-105
SU-106
SU-107
SU-108
SU-110
SU-109 (not shown)
TSSL Sample Prep Lab (T-1)
SPACE ALLOCATION PLAN
SCALE (FT)
NEXTEP
Kerr-McGee Technical Center
FIGURE 2.1
Indoor Survey Units - Main Building, Storage Building, and Unit 400
PREPARED BY: DCW
DWN BY: DCW
REVISION: 1
DATE: 1/15/04

C01


SU-109
Sample Prep Lab
FIGURE 2.2
Kerr-McGee Technical Center
TSSL Building
PREPARED BY: DCW
DWN BY: BPA
REVISION 1
DATE: 1/15/04

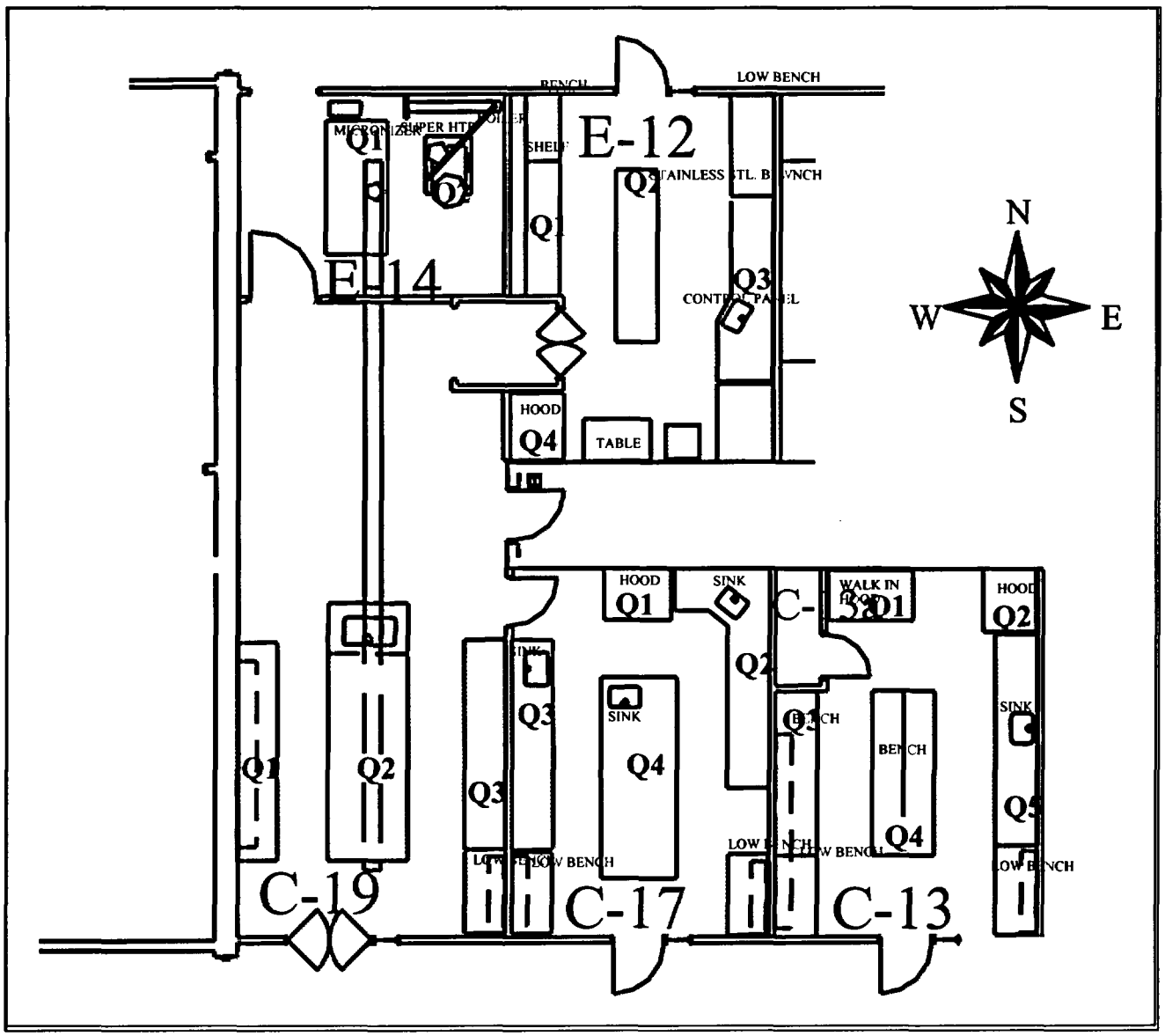


Figure 2.3
ISU-100

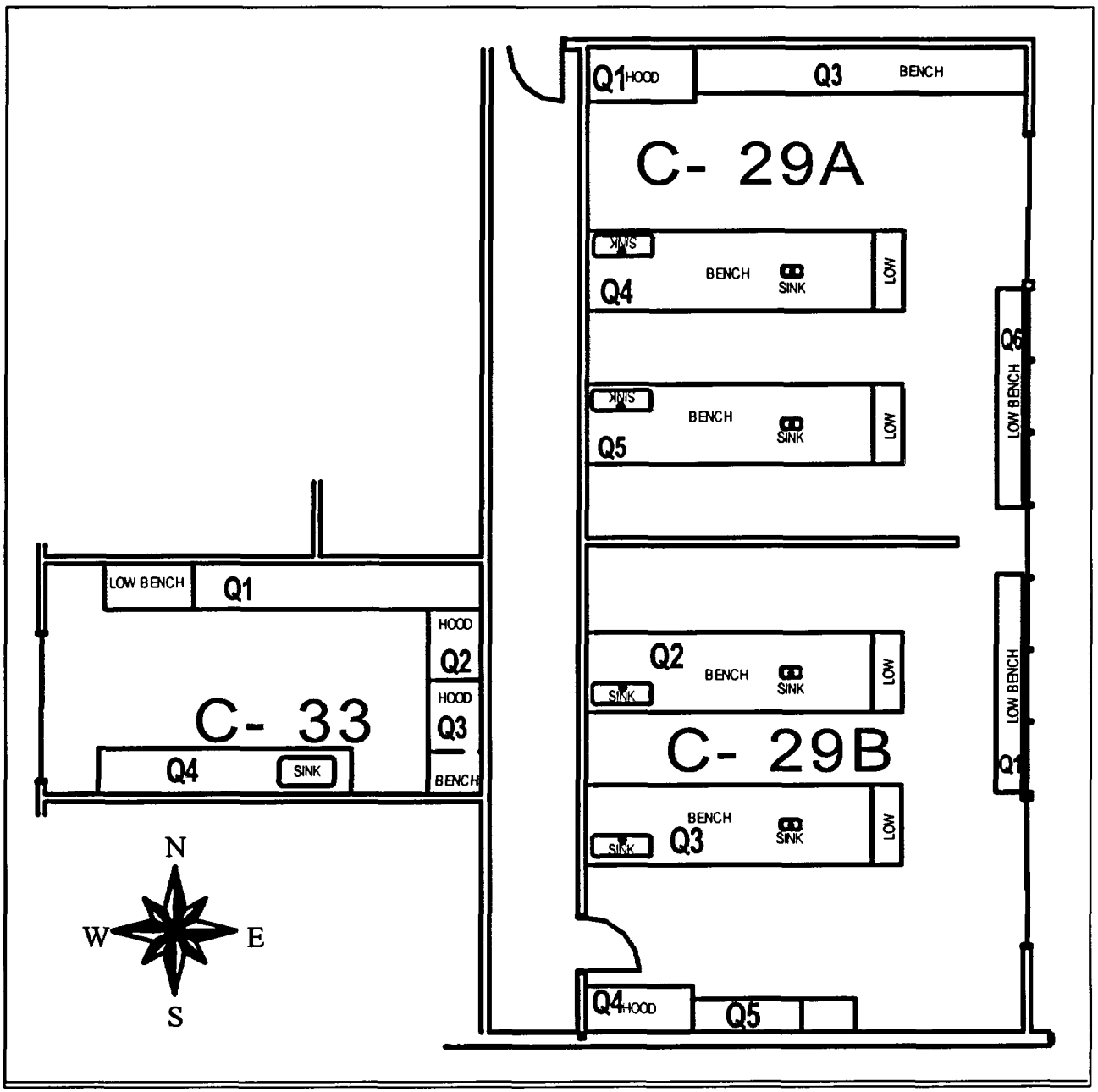


Figure 2.4
ISU-101

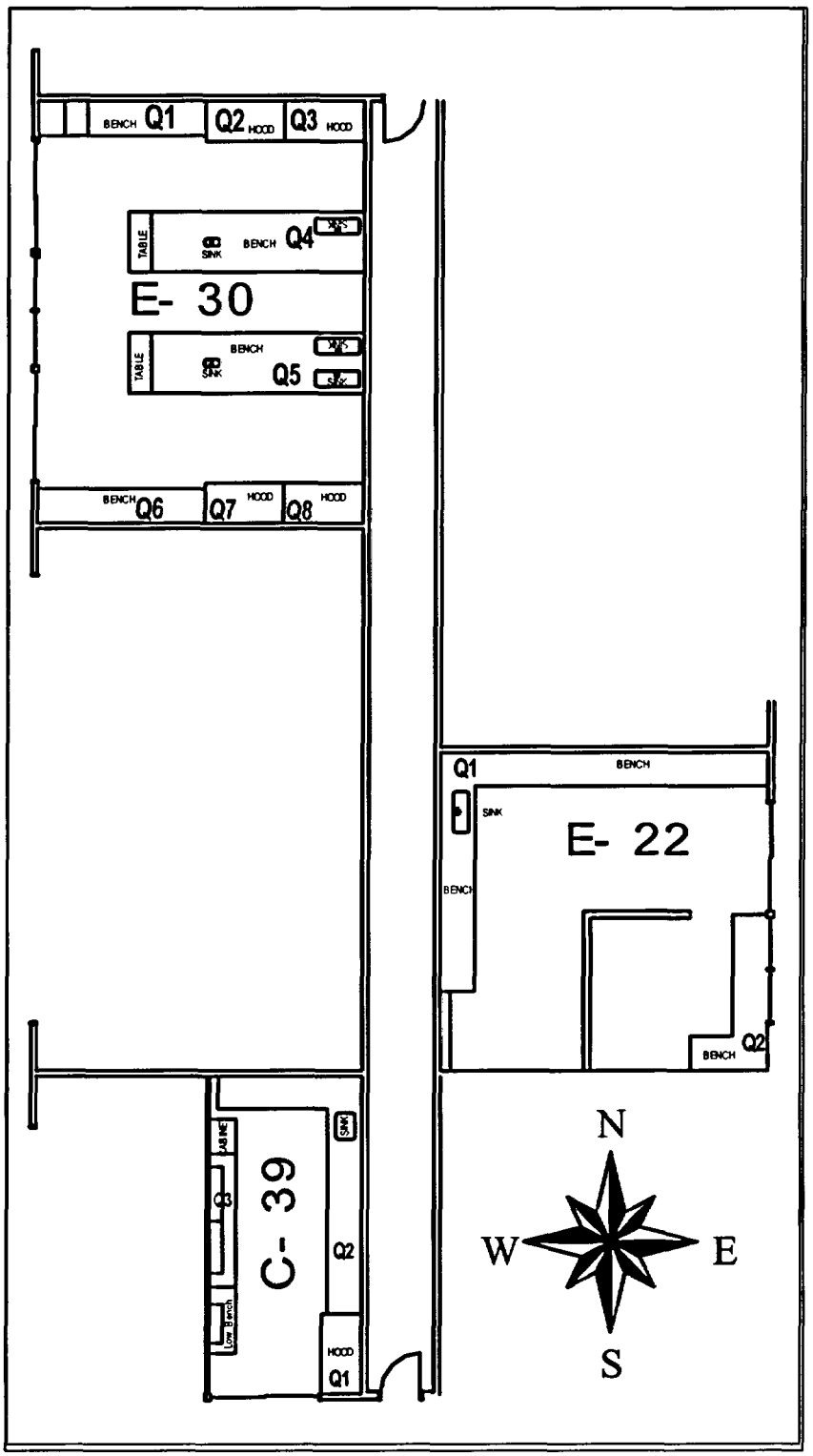


Figure 2.5
ISU-102

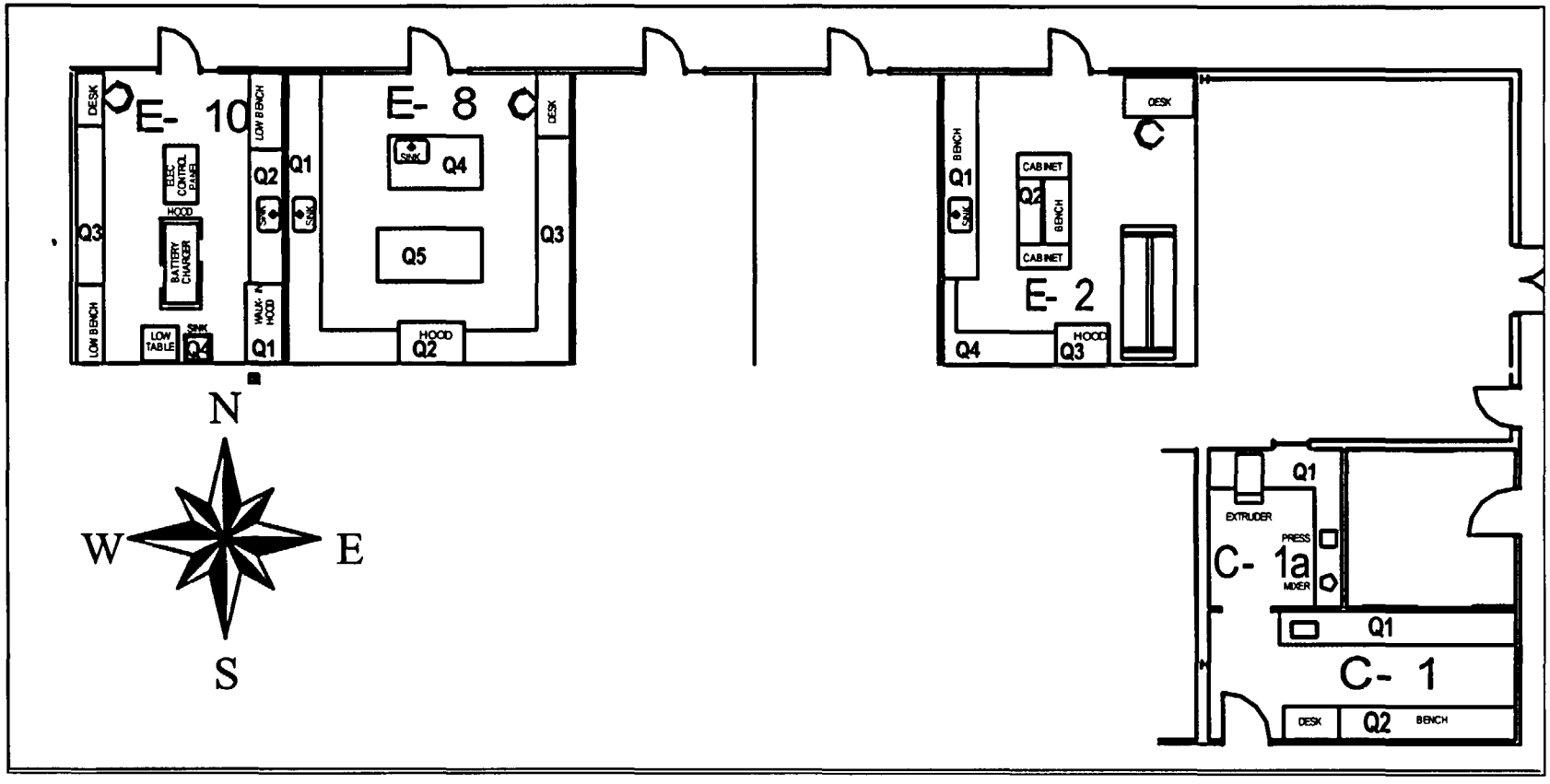


Figure 2.6
ISU-103

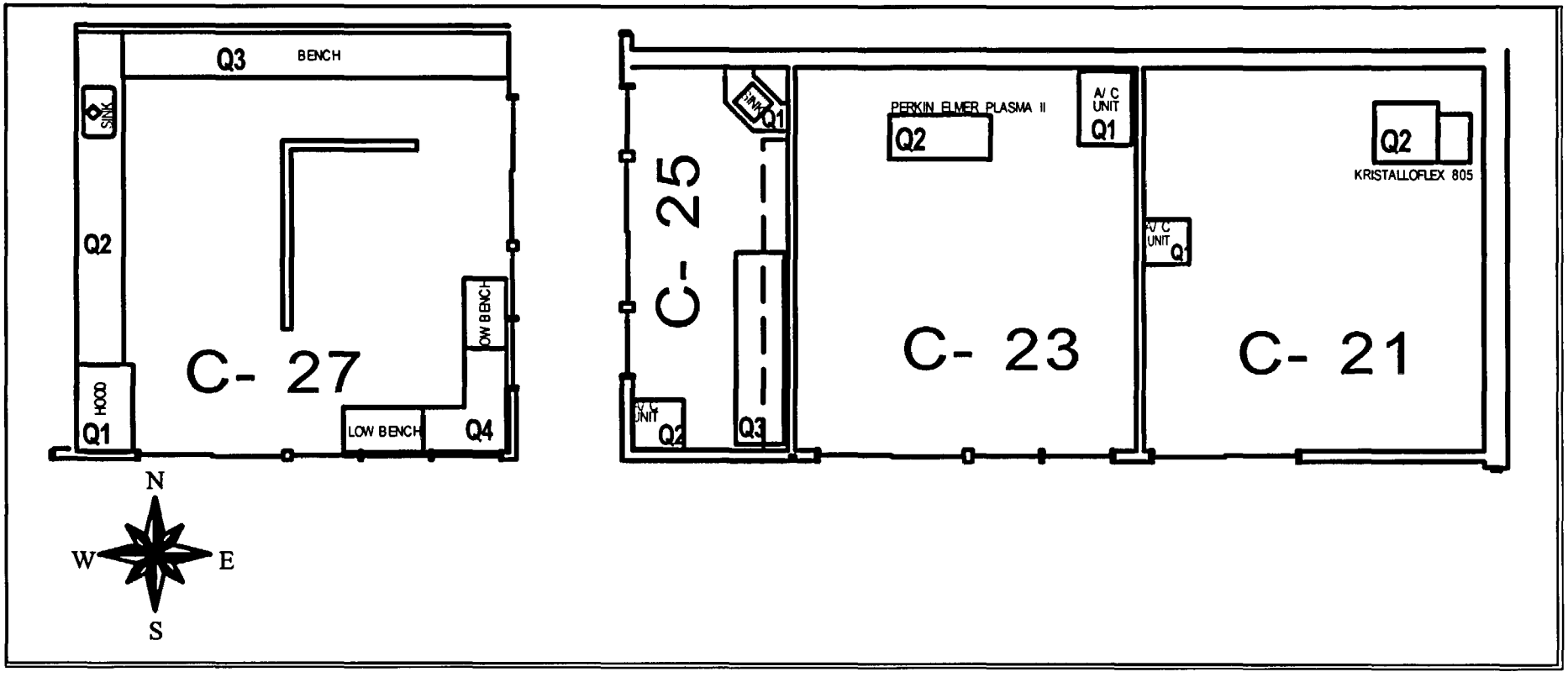


Figure 2.7
ISU-104

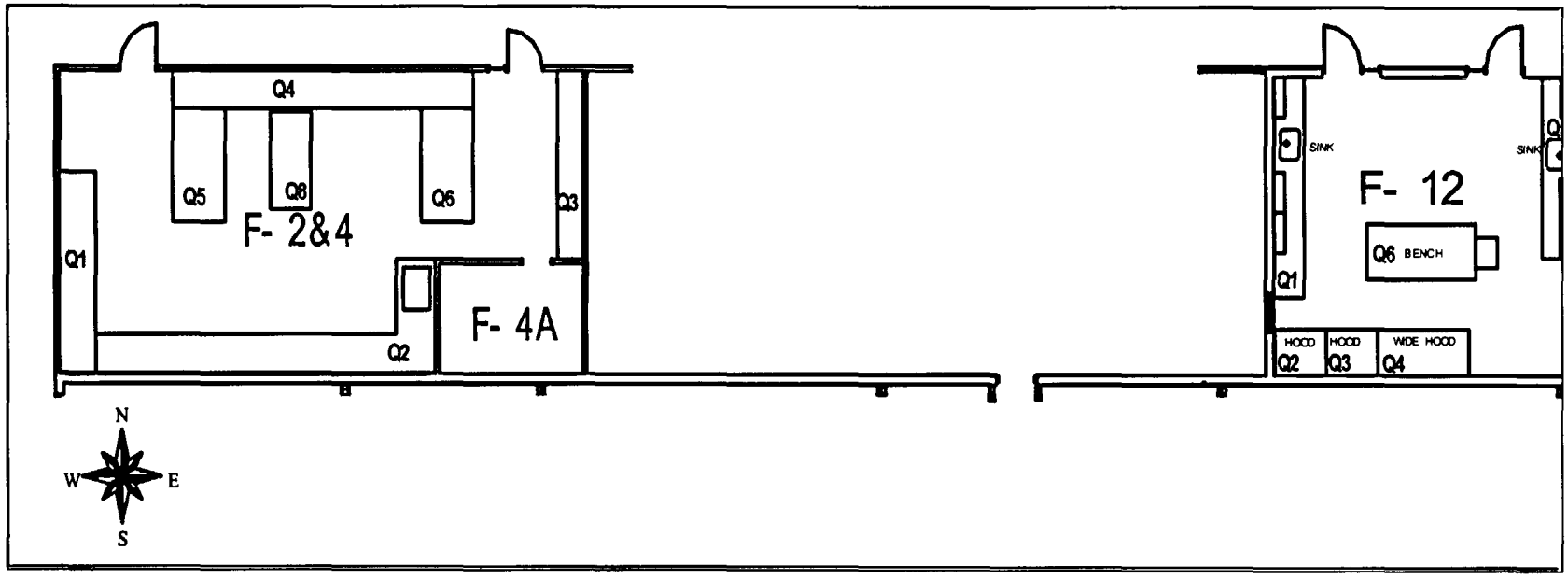


Figure 2.8
ISU-105

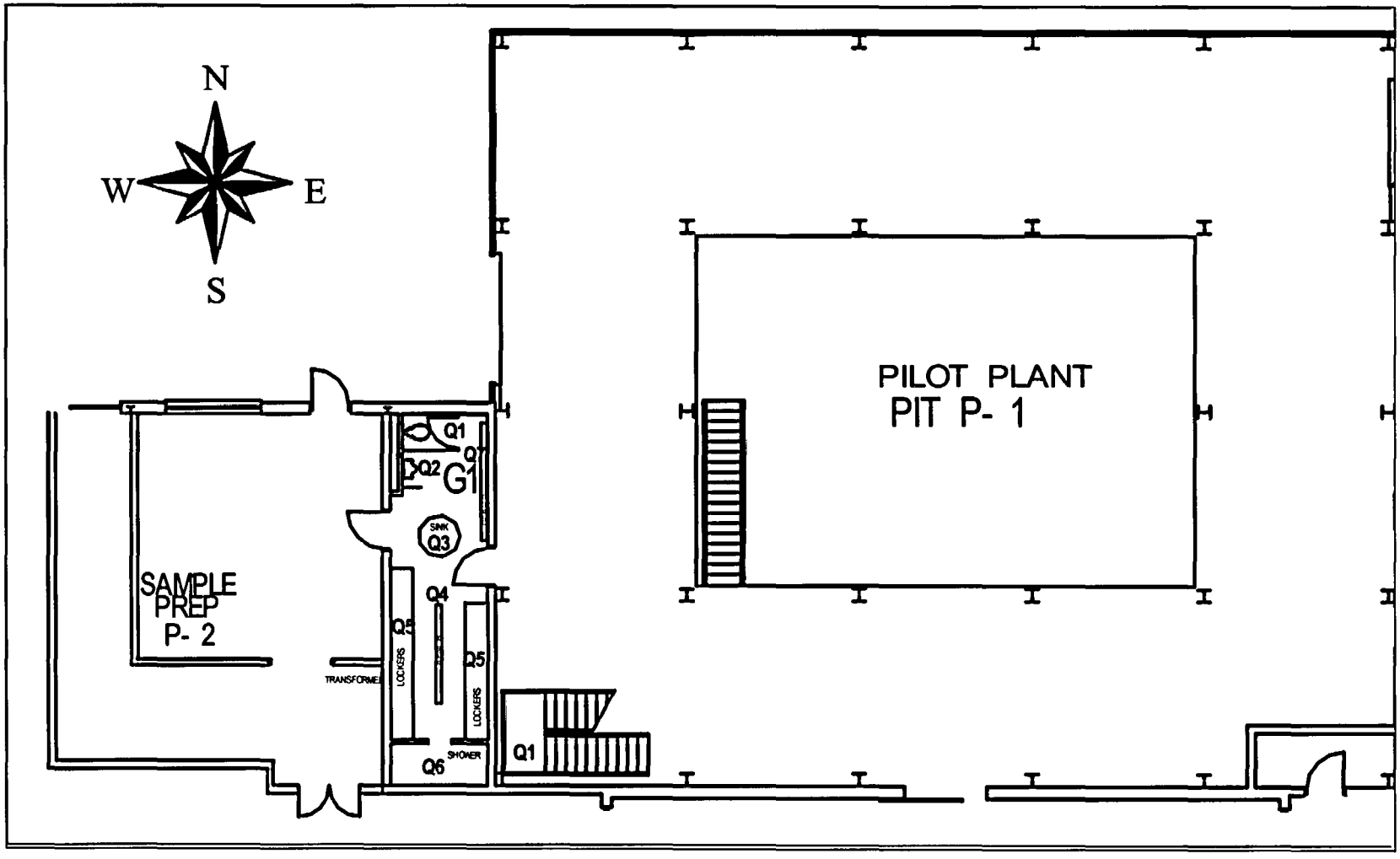


Figure 2.9
ISU-106

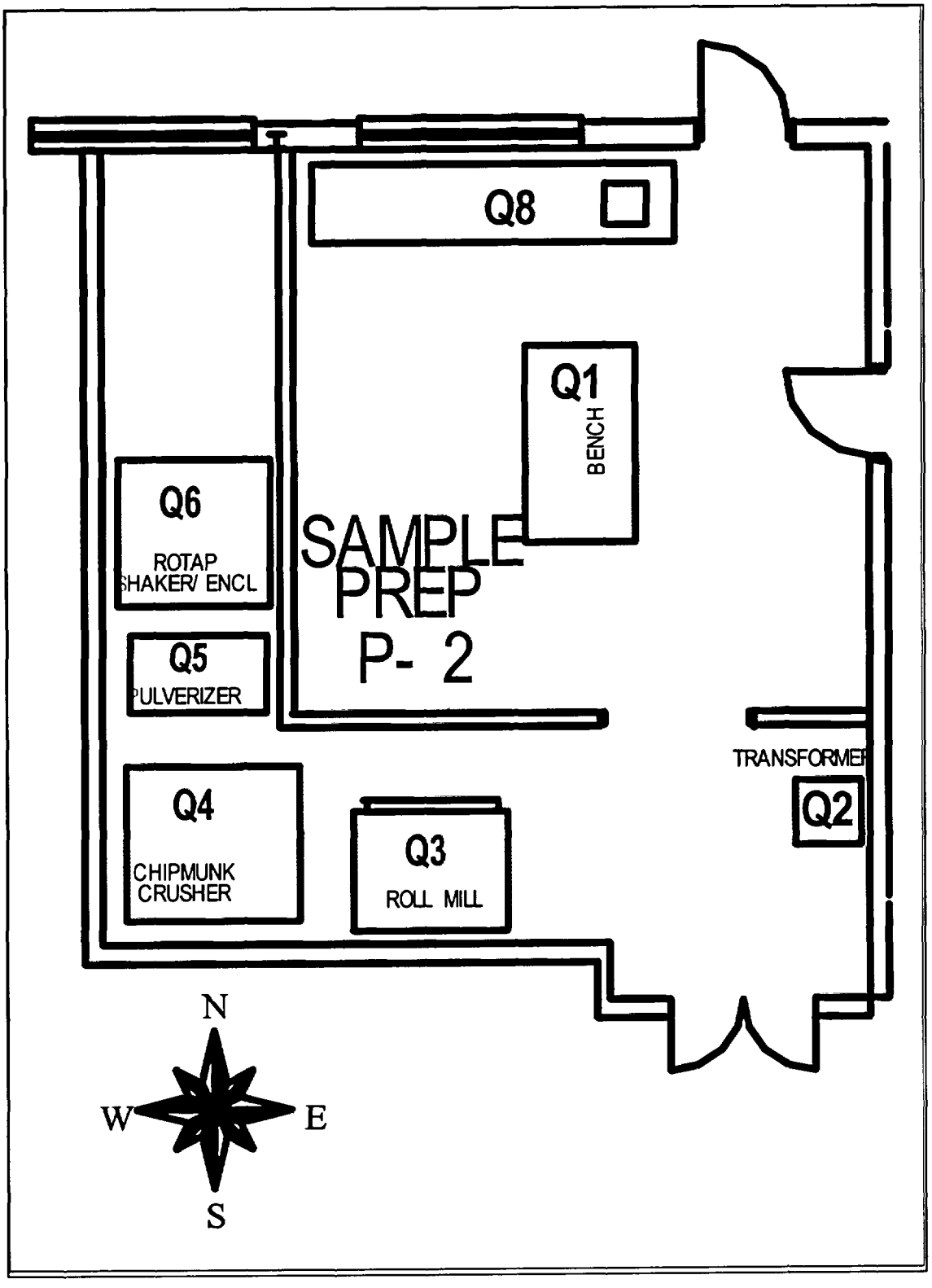


Figure 2.10
ISU-107

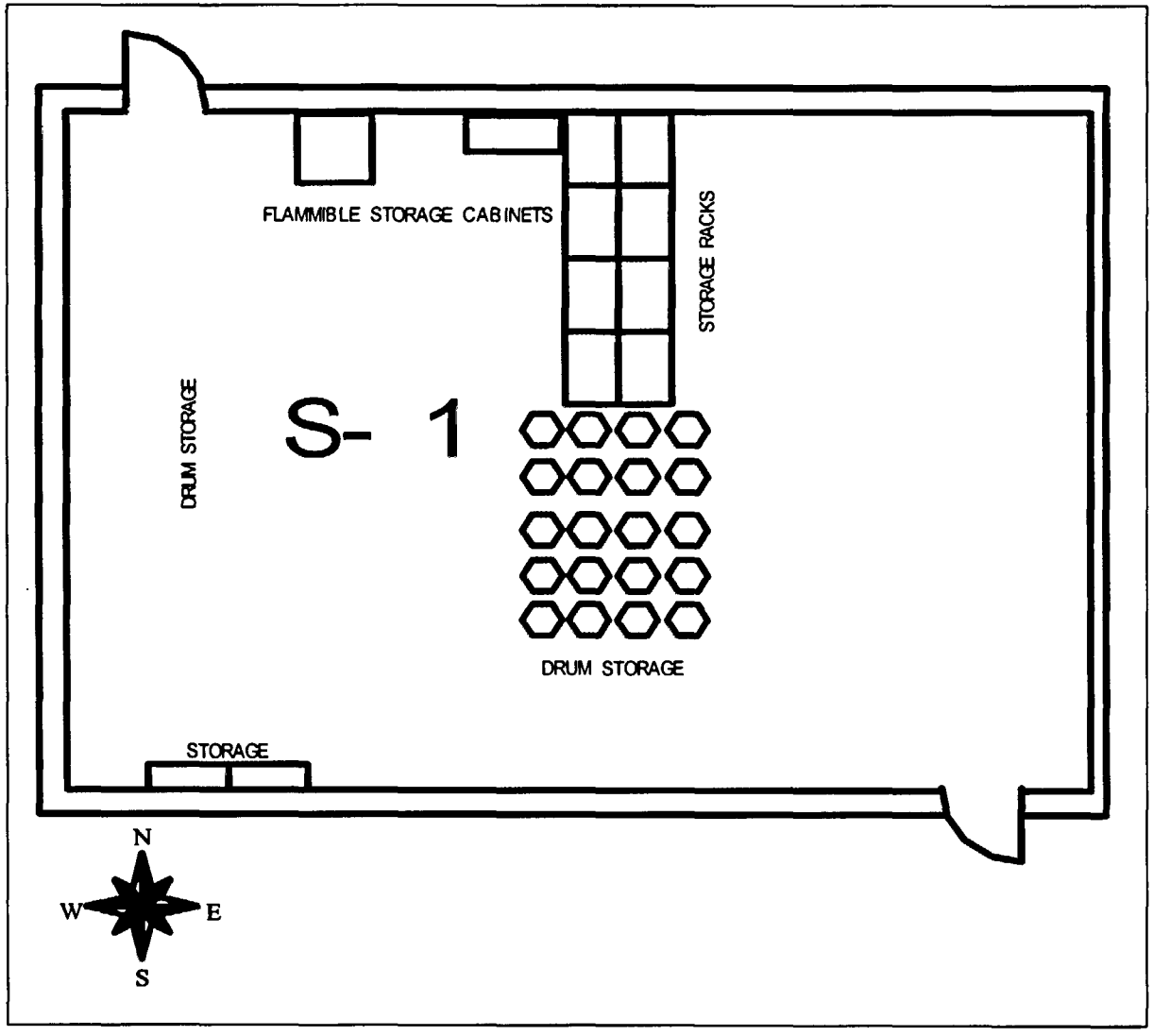


Figure 2.11
ISU-108

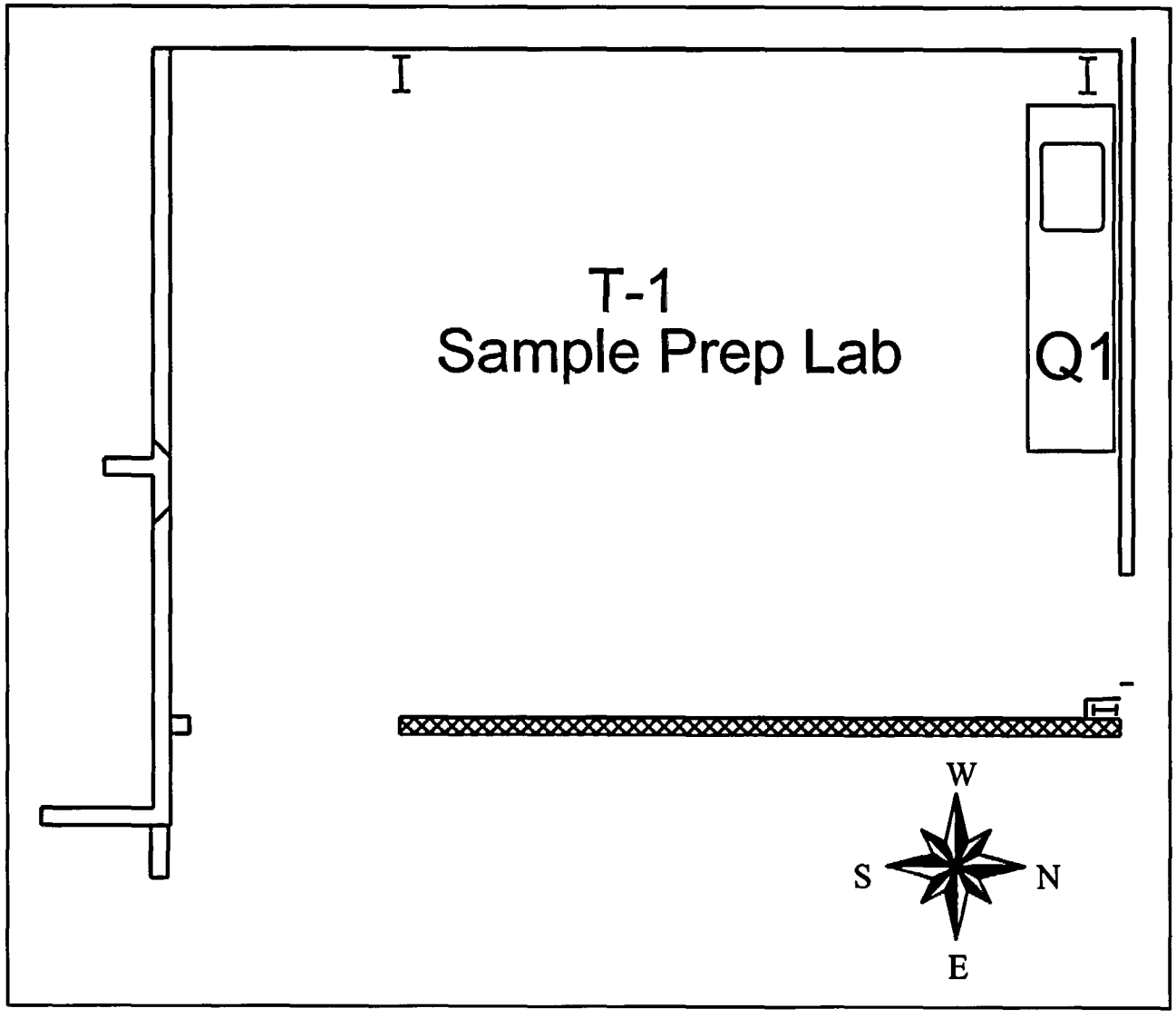


Figure 2.12
ISU-109

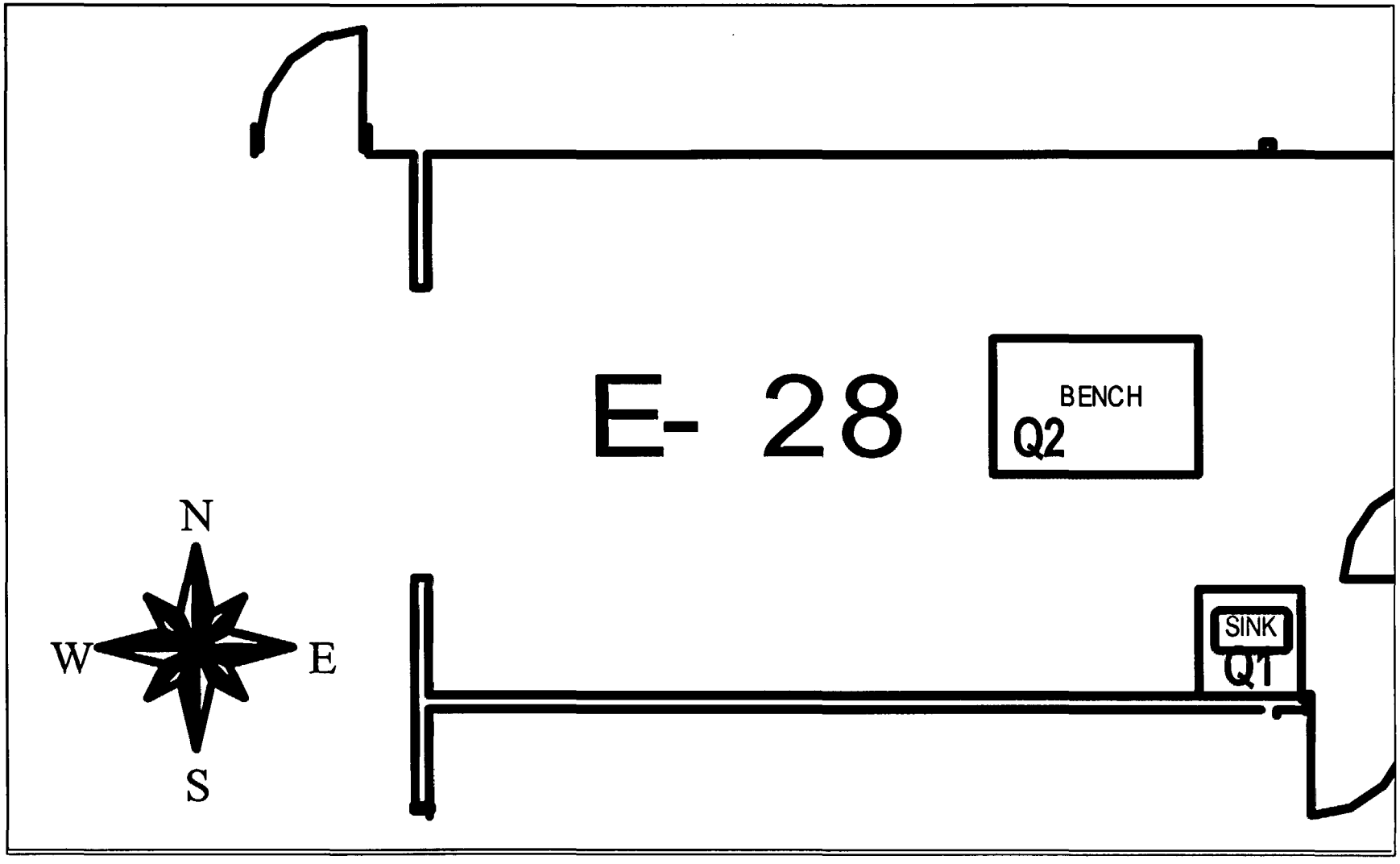
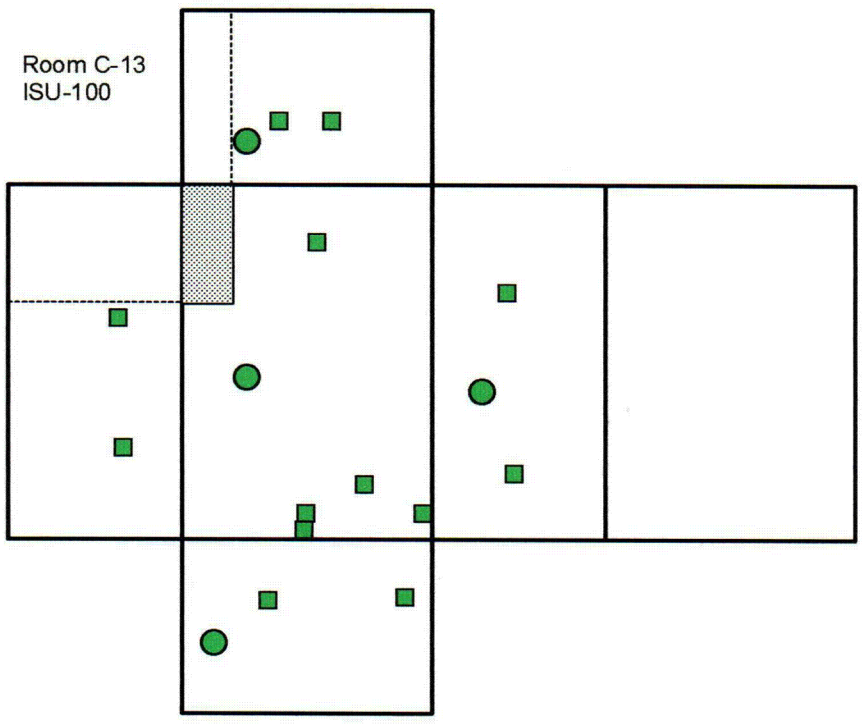
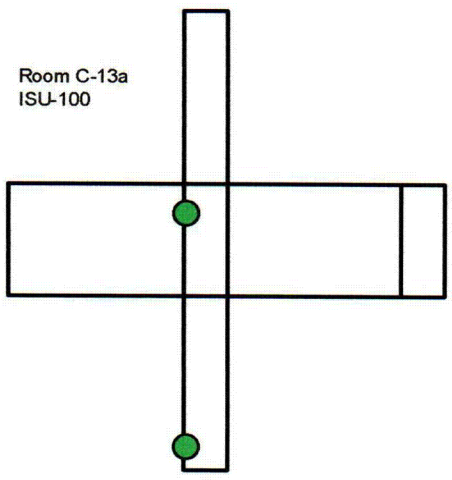
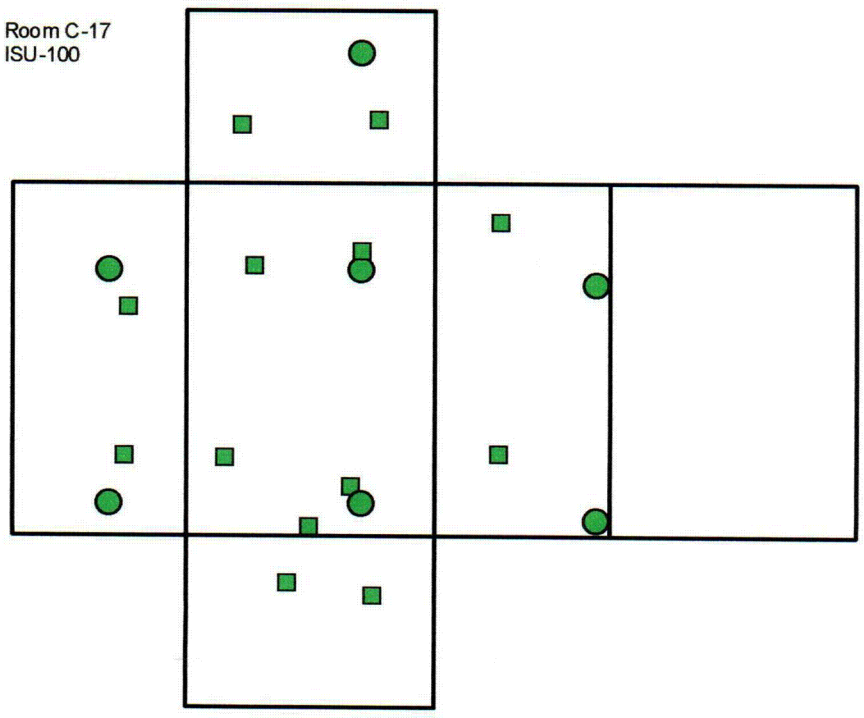
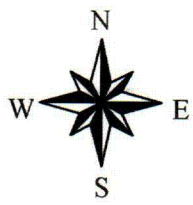


Figure 2.13
ISU-110









20 0 20 Feet

Direct Measurements (dpm/100 cm^2)

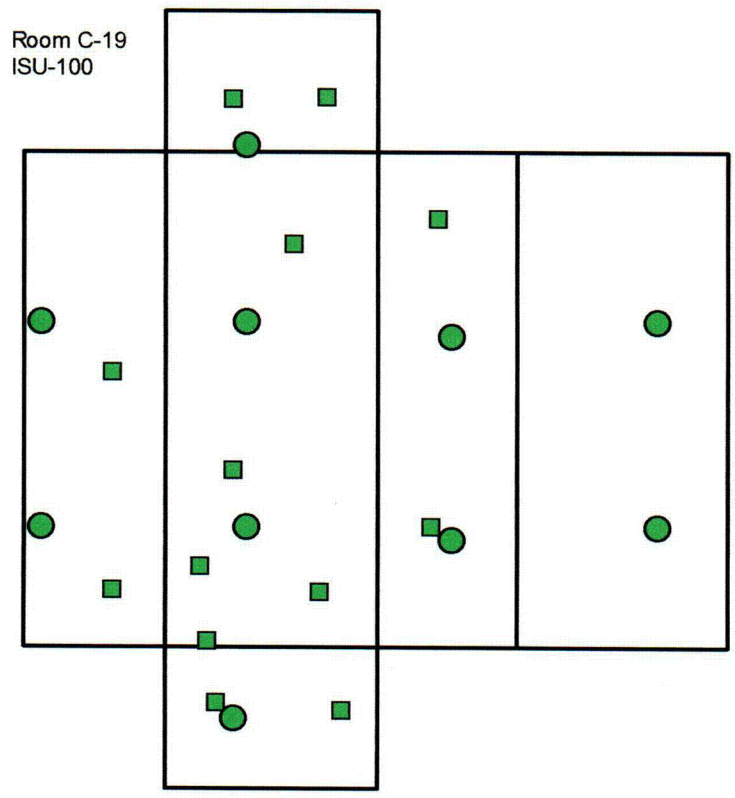
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

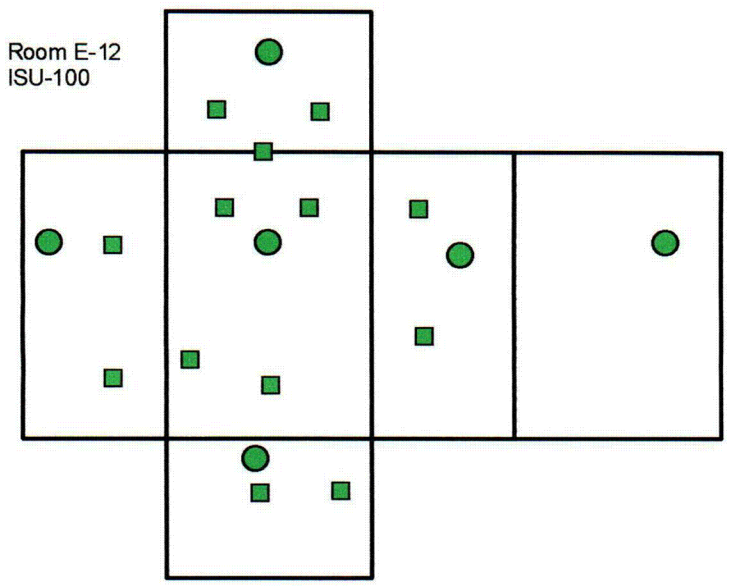
Kerr-McGee Technical Center
Final Status Survey Report

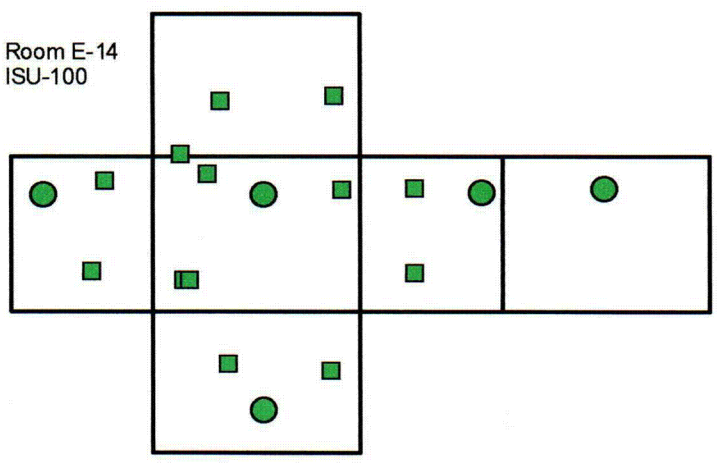
Figure 4.1a
ISU-100 Direct Beta Measurements

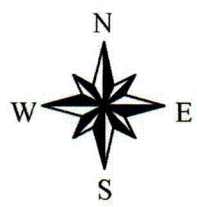
Drawn by: RDN	Date: 2/10/04
Building: MAIN	Revision: 0

C02









25 0 25 Feet

Direct Measurements (dpm/100 cm^2)

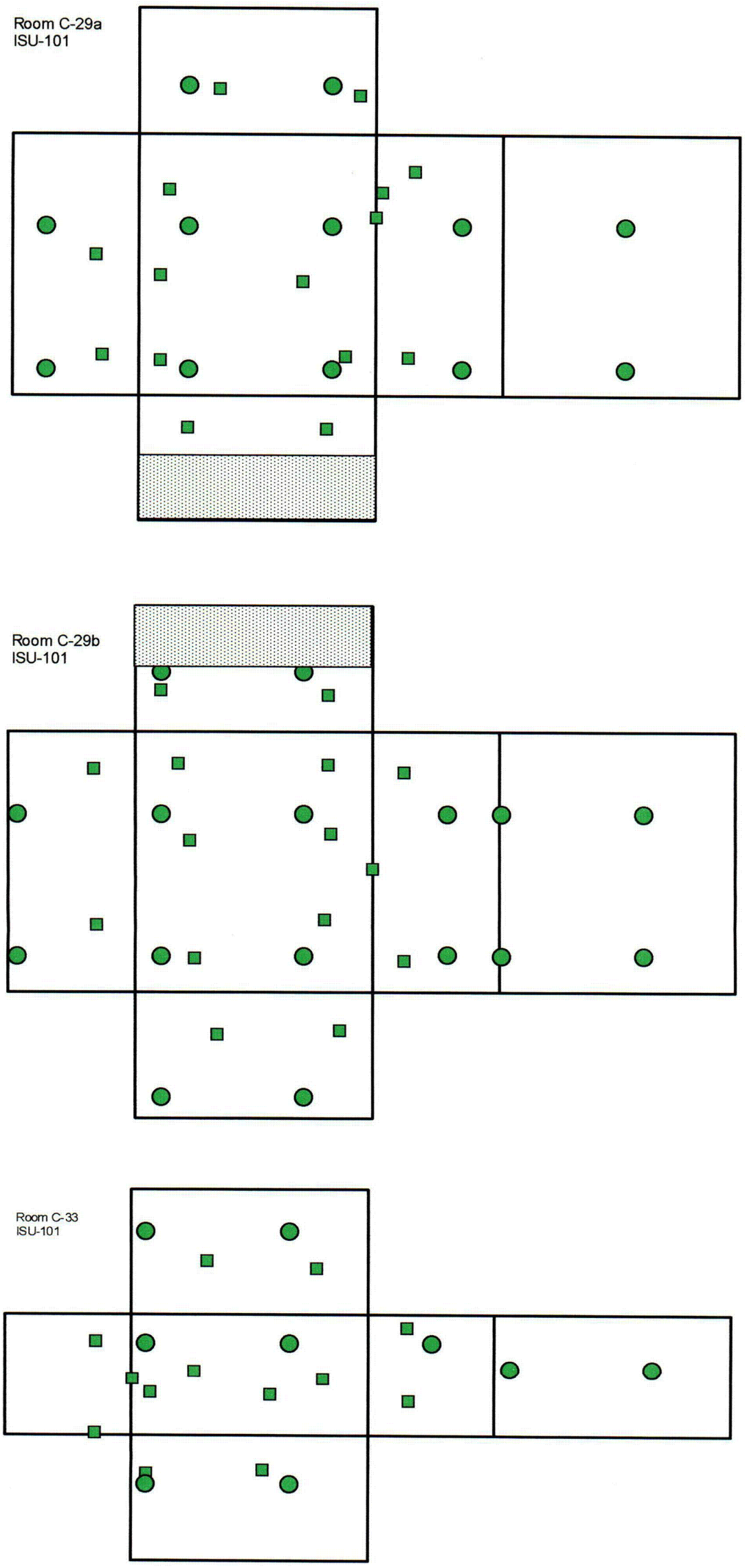
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.1b
ISU-100 Direct Beta Measurements

Drawn by: RDN	Date: 2/10/04
Building: MAIN	Revision: 0

C03



N
W E
S

20 0 20 Feet

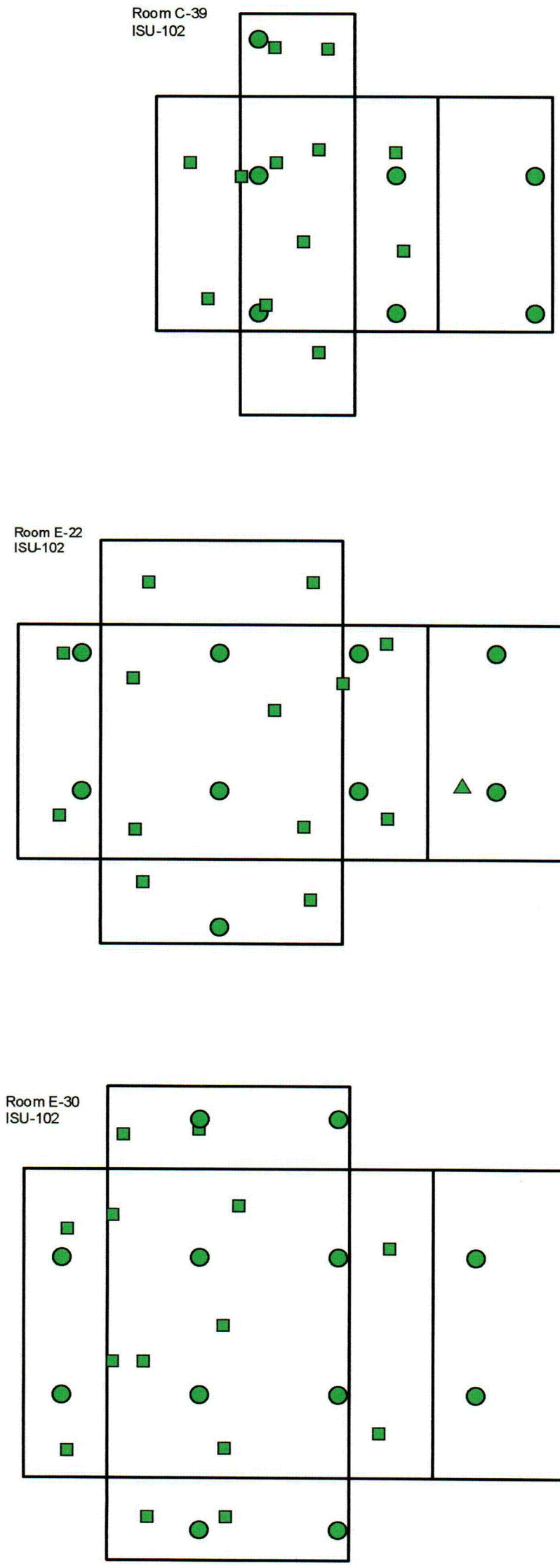
Direct Measurements (dpm/100 cm^2)

Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

Kerr-McGee Technical Center
Final Status Survey Report
Figure 4.2
ISU-101 Direct Beta Measurements

Drawn by: RDN	Date: 2/10/04
Building: MAIN	Revision: 0

C04



N
W E
S

20 0 20 Feet

Direct Measurements (dpm/100 cm^2)

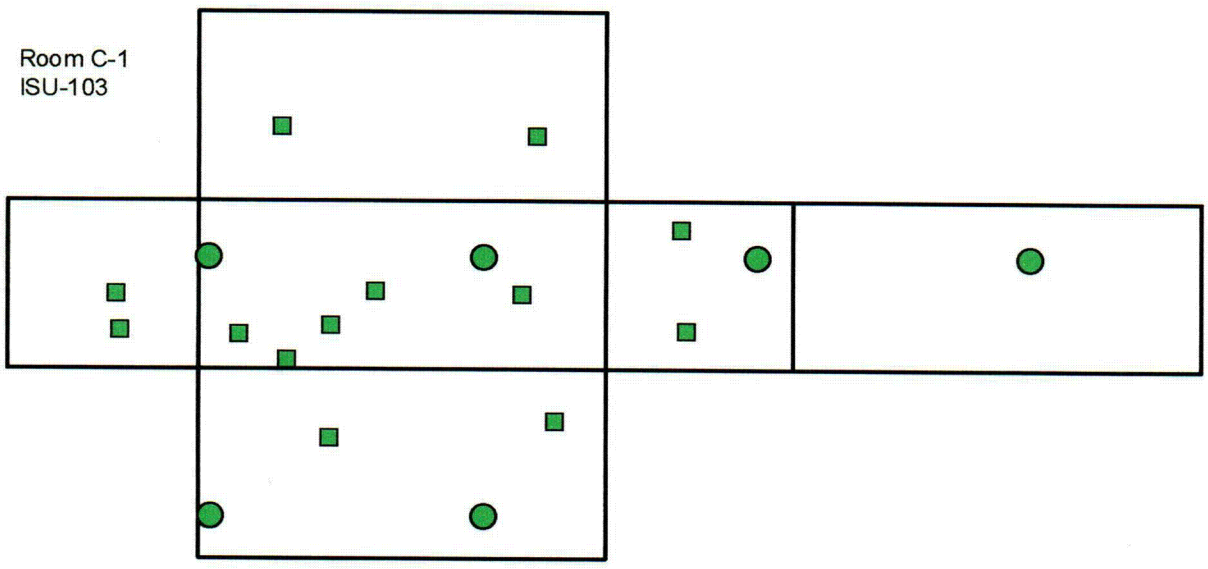
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

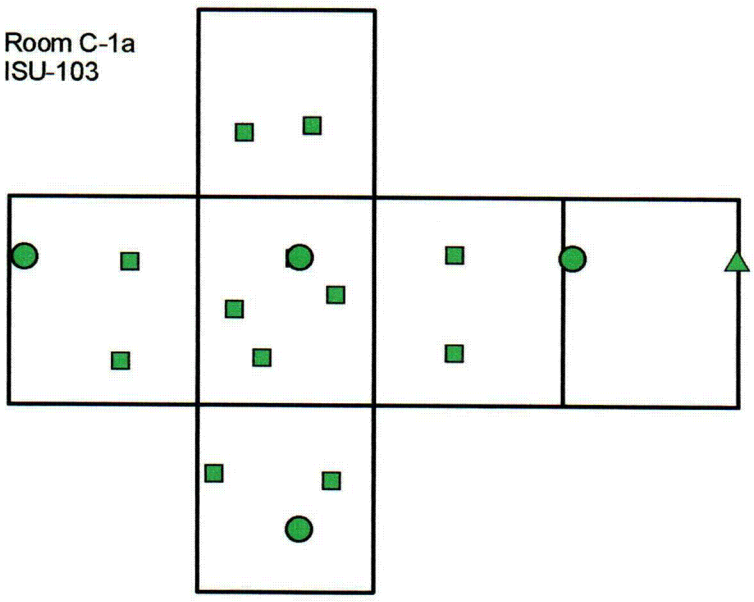
Kerr-McGee Technical Center
Final Status Survey Report

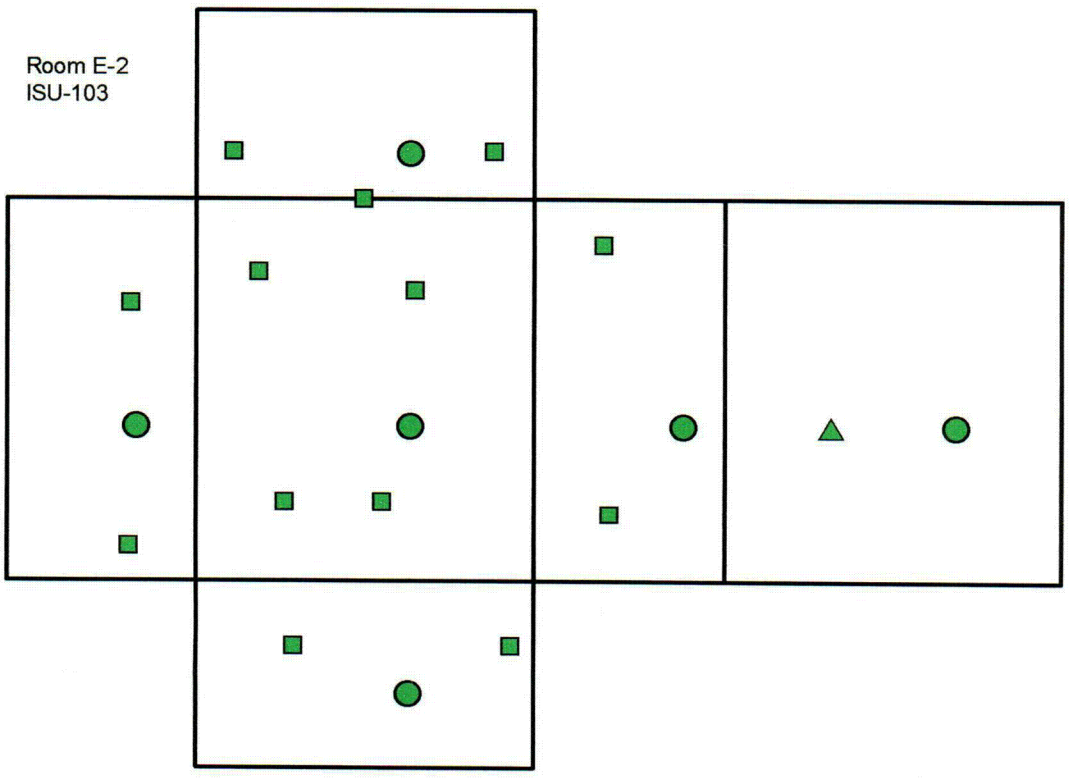
Figure 4.3
ISU-102 Direct Beta Measurements

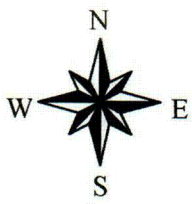
Drawn by: RDN	Date: 2/11/04
Building: MAIN	Revision: 0

C05









20 0 20 Feet

Direct Measurements (dpm/100 cm^2)

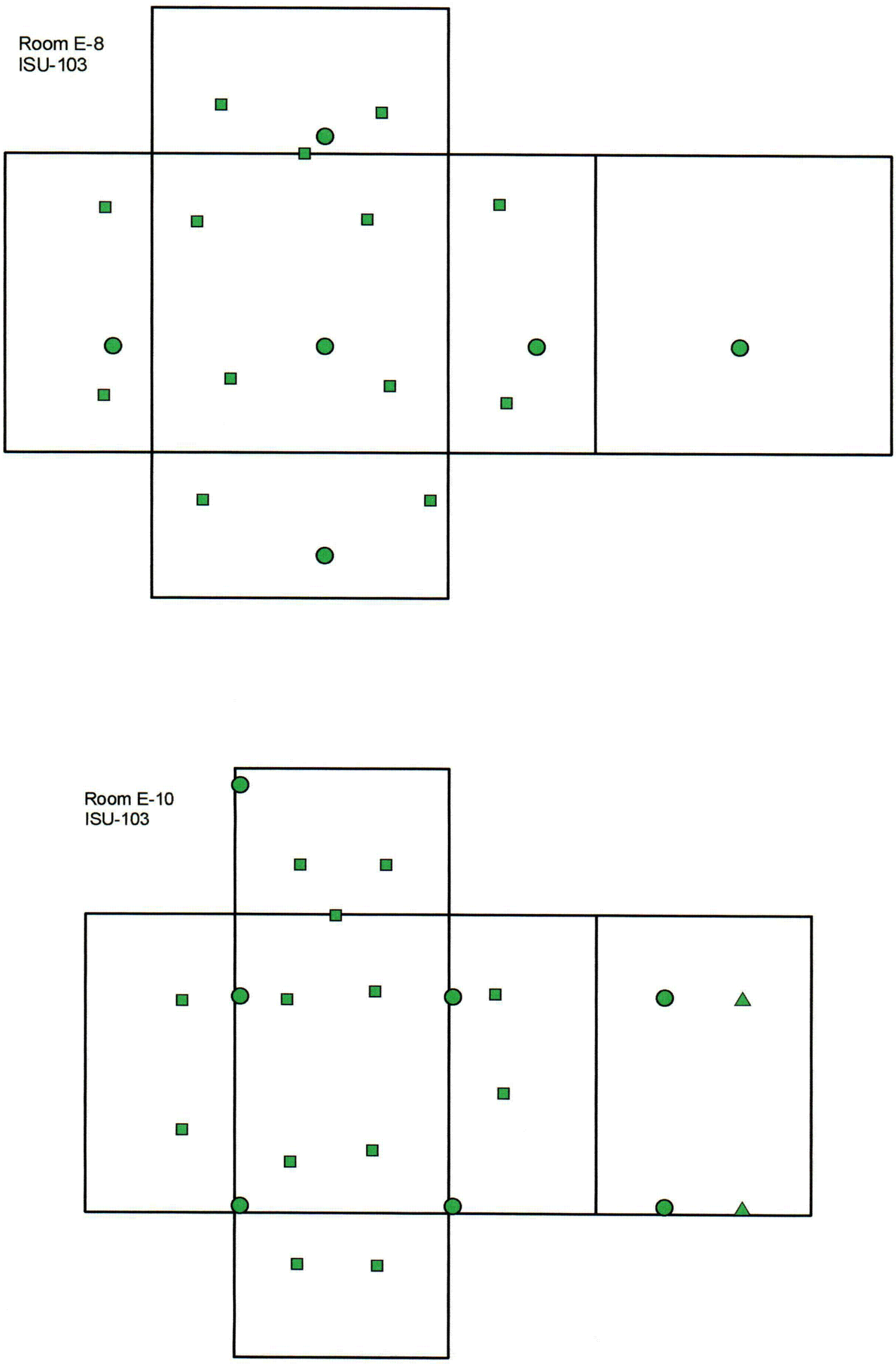
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

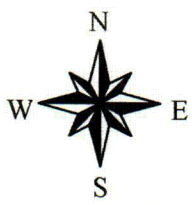
Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.4a
ISU-103 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/04
Building: MAIN	Revision: 0

C06





10 0 10 20 Feet

Direct Measurements (dpm/100 cm^2)

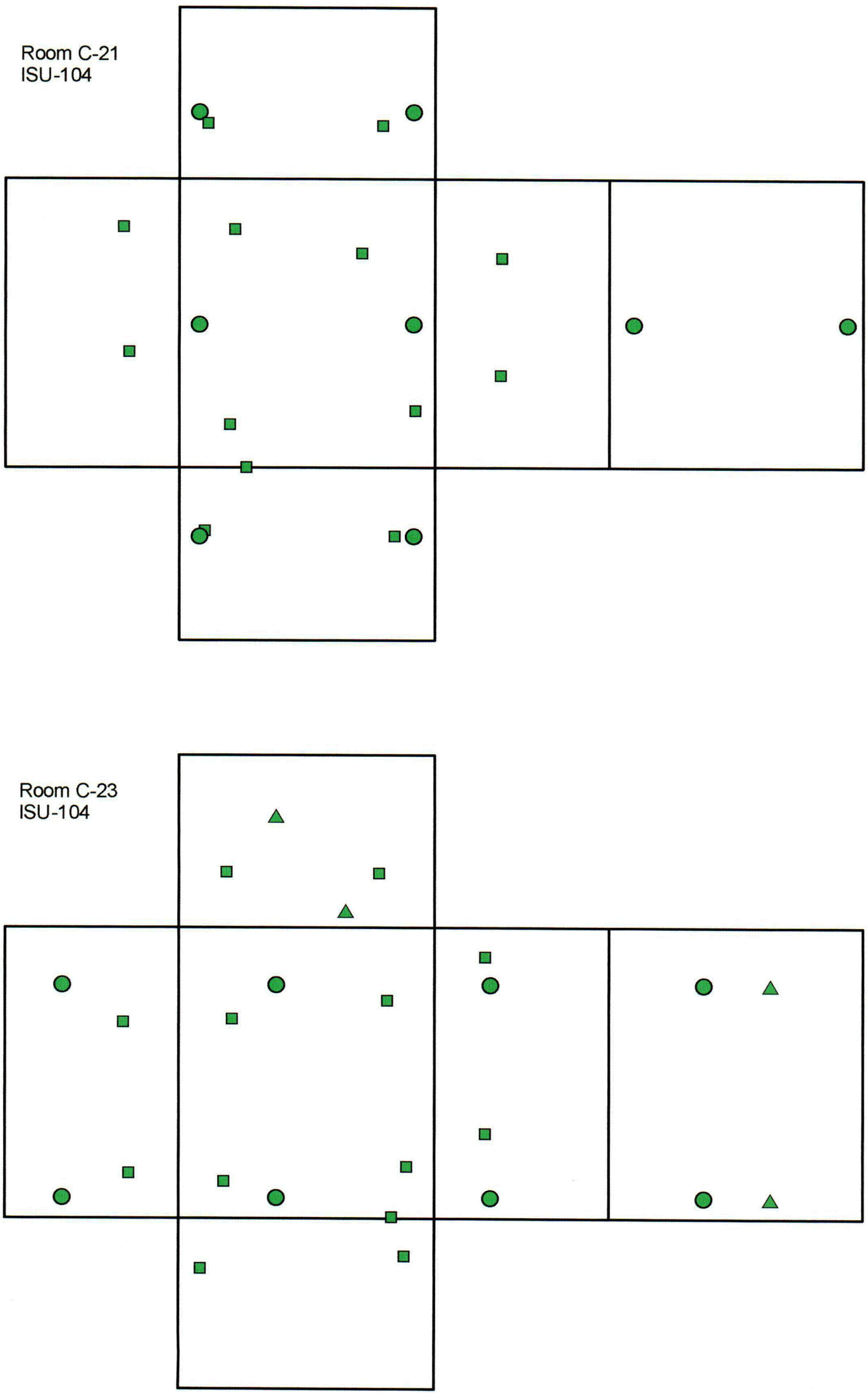
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.4b
ISU-103 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/04
Building: MAIN	Revision: 0

C07



N
W E
S

10 0 10 20 Feet

Direct Measurements (dpm/100 cm^2)

Grid Bias Char

< 12,500

12,500 - 31,000

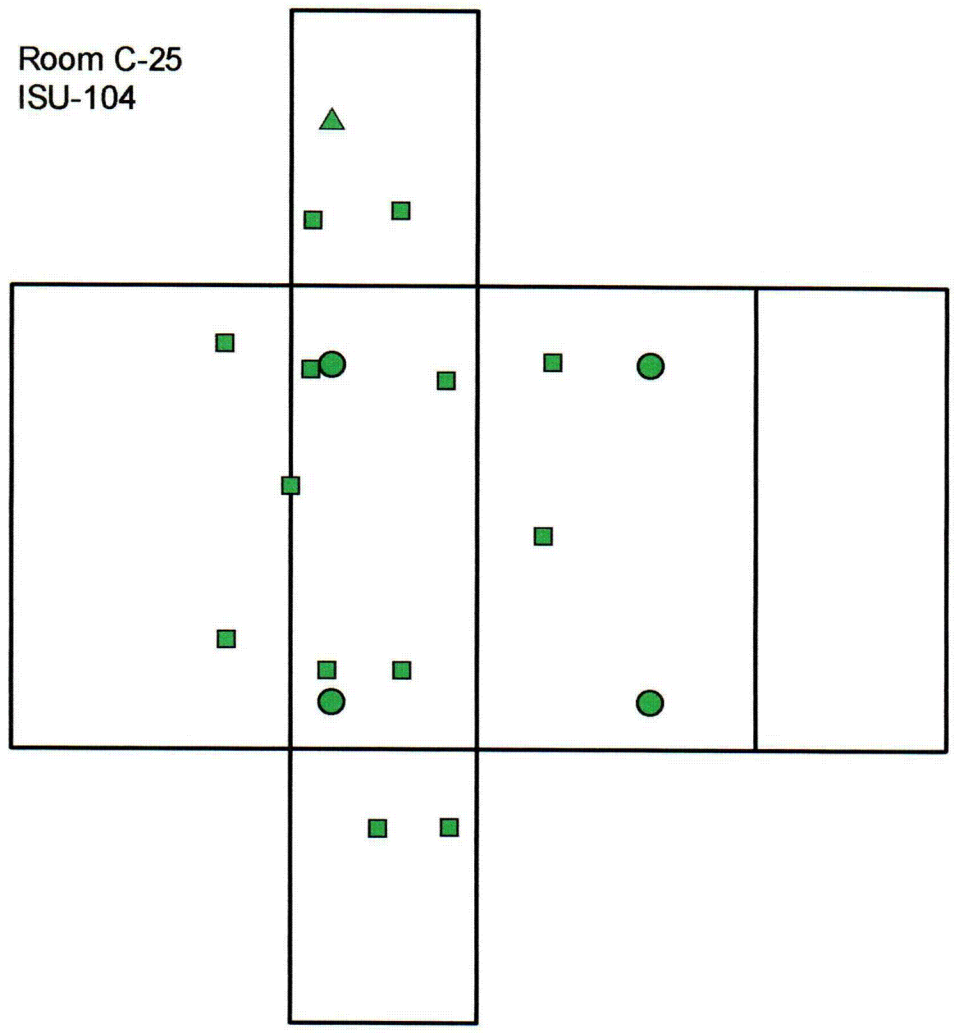
> 31,000

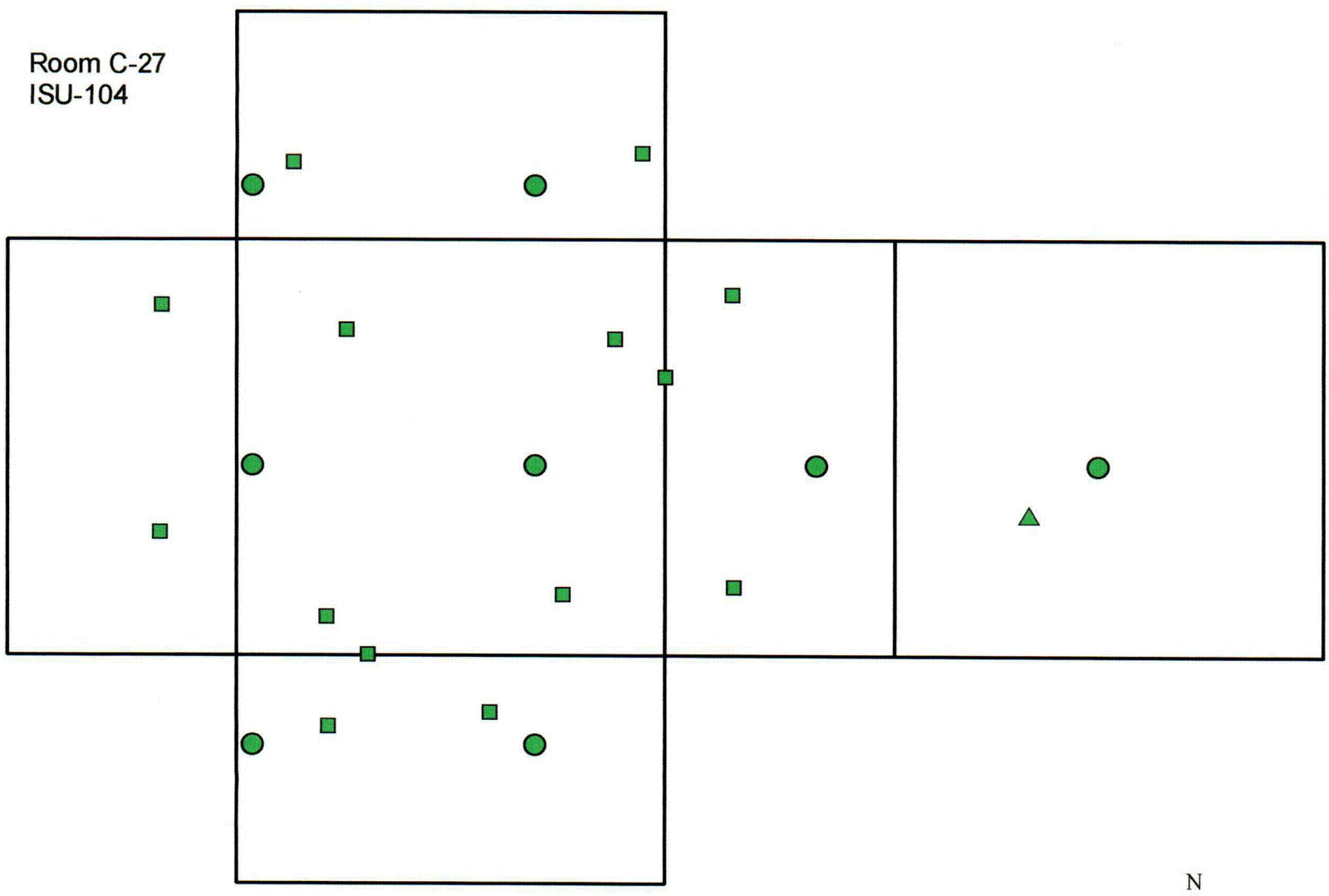
Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.5a
ISU-104 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/04
Building: MAIN	Revision: 0

C08





N
W E
S

10 0 10 20 Feet

Direct Measurements (dpm/100 cm^2)

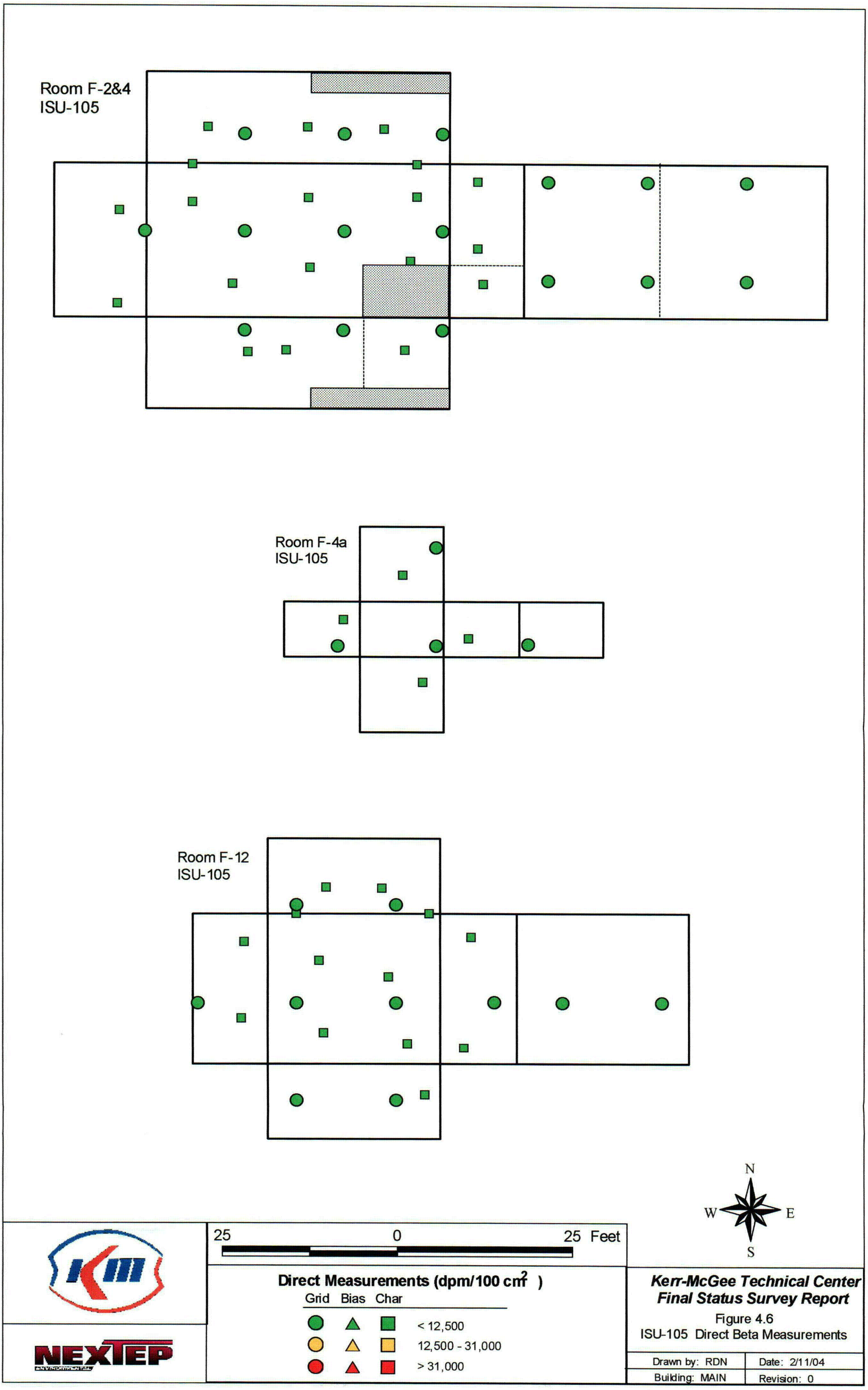
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

Kerr-McGee Technical Center
Final Status Survey Report

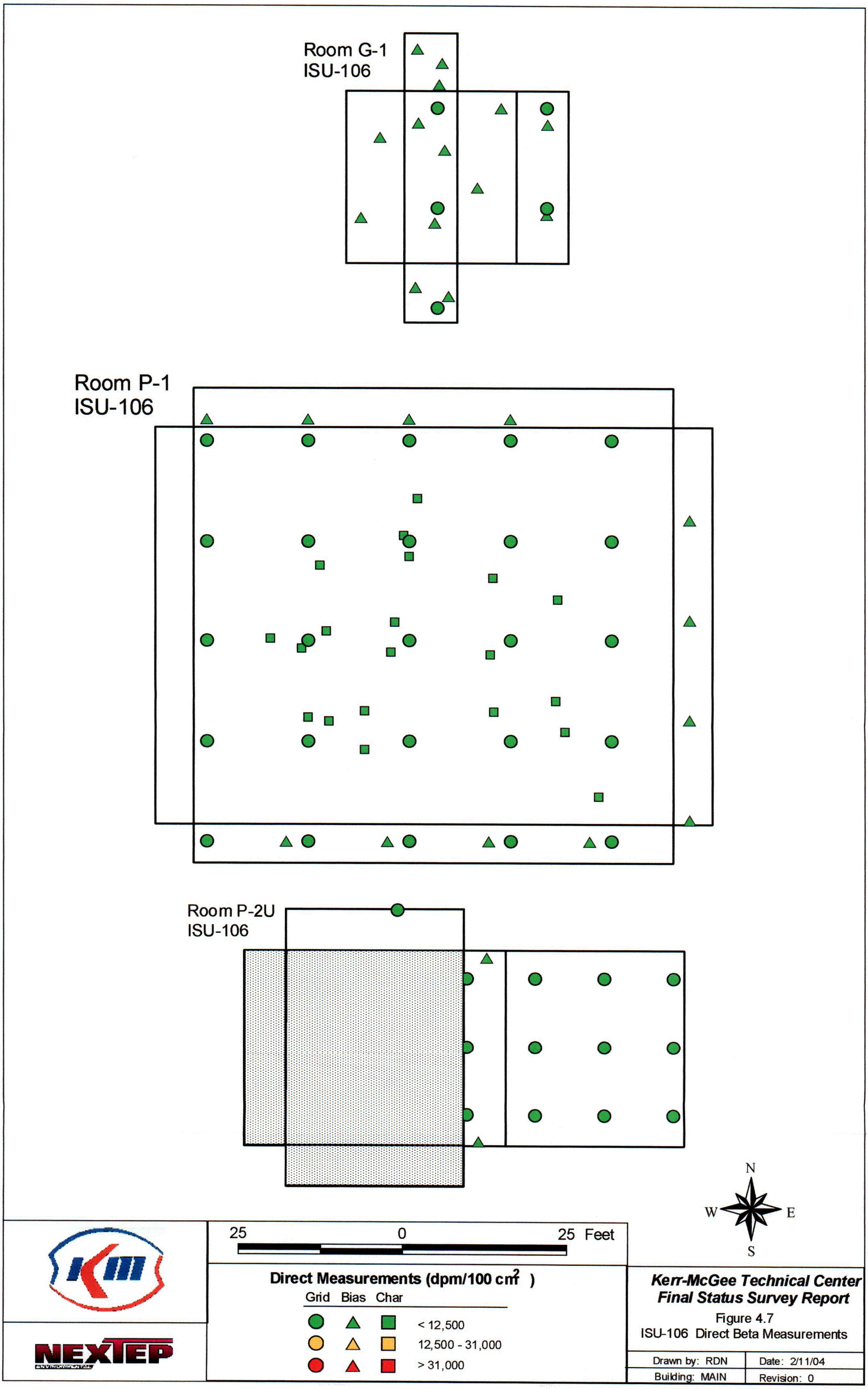
Figure 4.5b
ISU-104 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/04
Building: MAIN	Revision: 0

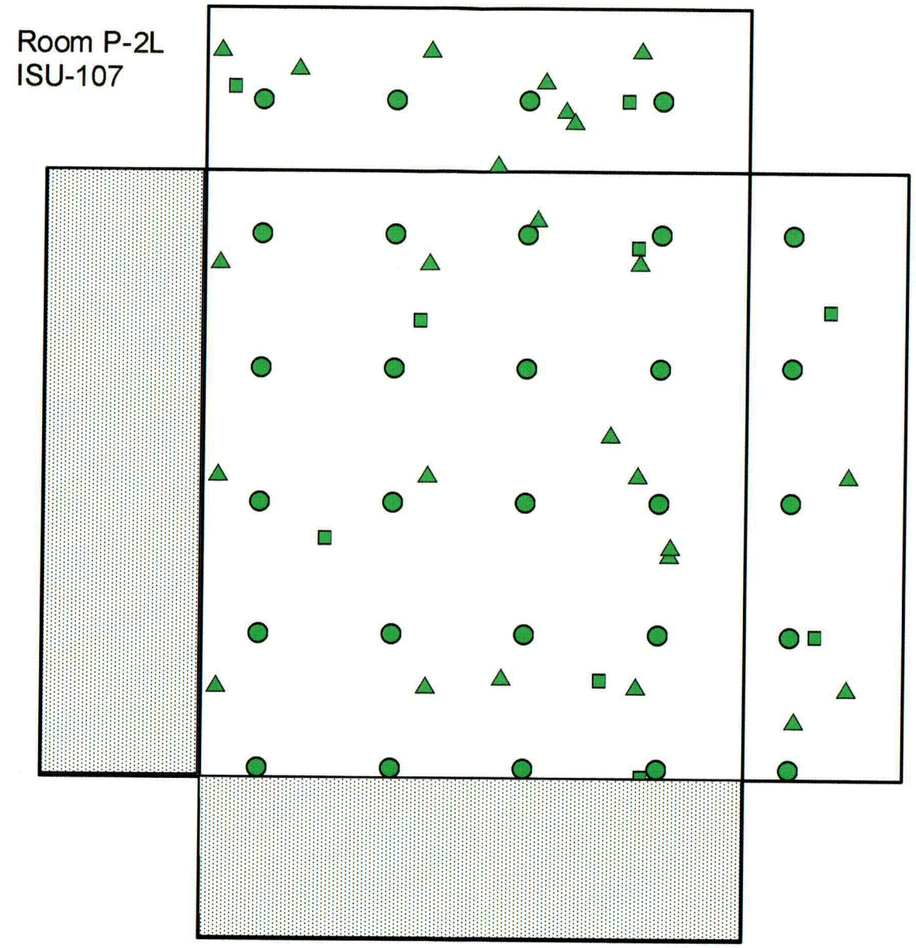
C09


Room F-2&4
ISU-105
Room F-4a
ISU-105
Room F-12
ISU-105
N
W
E
S
25
0
25 Feet
Direct Measurements (dpm/100 cm2)
Grid Bias Char
< 12,500
12,500 - 31,000
> 31,000
Kerr-McGee Technical Center
Final Status Survey Report
Figure 4.6
ISU-105 Direct Beta Measurements
Drawn by: RDN
Date: 2/11/04
Building: MAIN
Revision: 0

C10


Room G-1
ISU-106
Room P-1
ISU-106
Room P-2U
ISU-106
N
W
E
S
25
0
25 Feet
Direct Measurements (dpm/100 cm2)
Grid Bias Char
< 12,500
12,500 - 31,000
> 31,000
Kerr-McGee Technical Center
Final Status Survey Report
Figure 4.7
ISU-106 Direct Beta Measurements
Drawn by: RDN
Date: 2/11/04
Building: MAIN
Revision: 0

C11



15 0 15 Feet

Direct Measurements (dpm/100 cm^2)

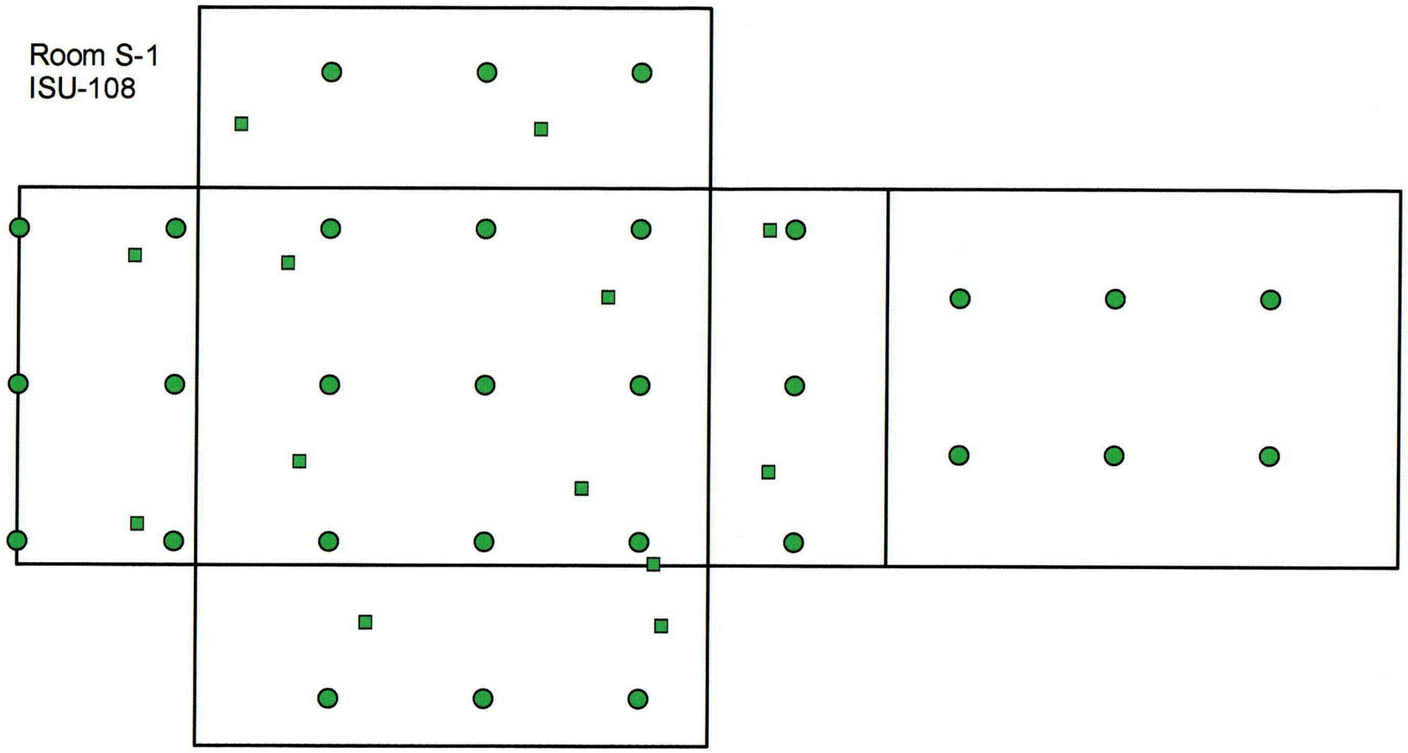
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

N
W E
S

Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.8
ISU-107 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/2004
Building: MAIN	Revision: 0



10 0 10 20 Feet

Direct Measurements (dpm/100 cm^2)

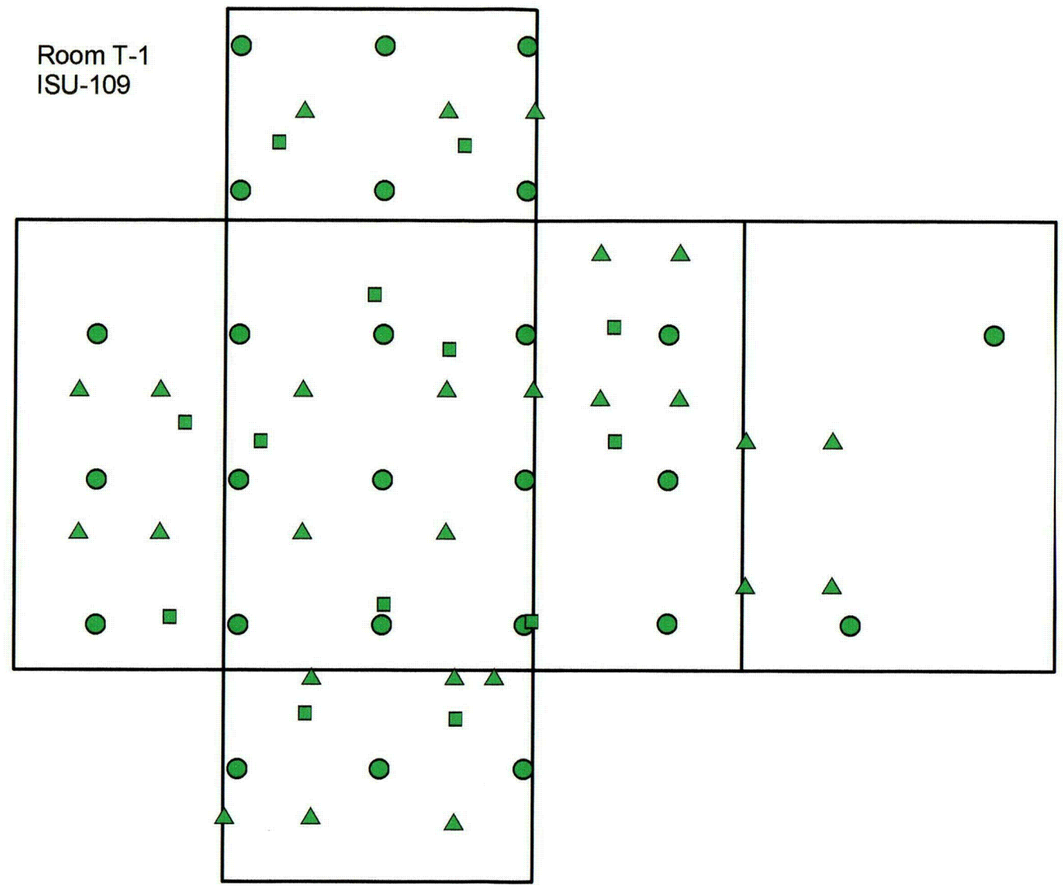
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

N
W E
S

Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.9
ISU-108 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/2004
Building: STORAGE	Revision: 0



10 0 10 20 Feet

Direct Measurements (dpm/100 cm^2)

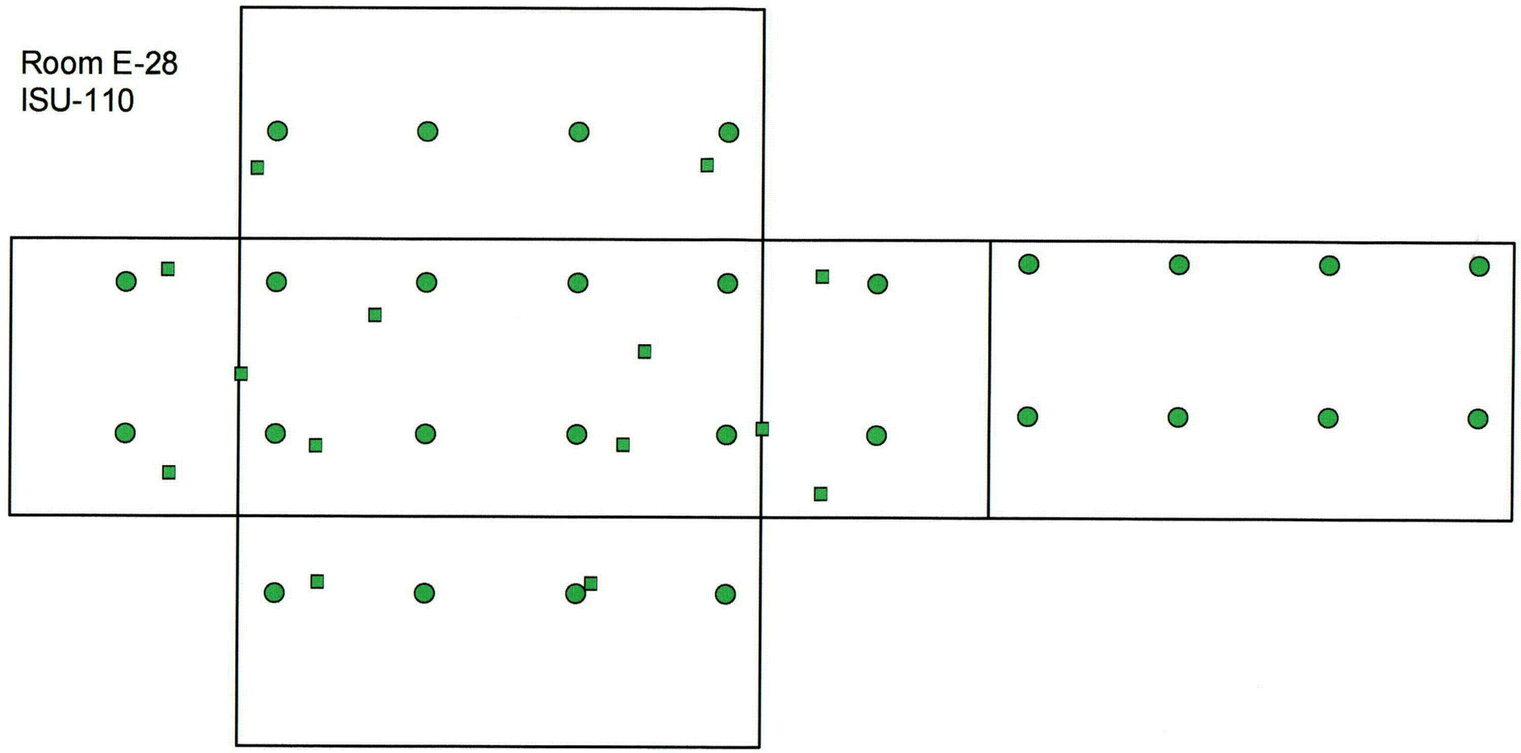
Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

N
W E
S

Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.10
ISU-109 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/2004
Building: TSSL	Revision: 0



10 0 10 20 Feet

Direct Measurements (dpm/100 cm^2)

Grid	Bias	Char	
●	▲	■	< 12,500
●	▲	■	12,500 - 31,000
●	▲	■	> 31,000

N
W E
S

Kerr-McGee Technical Center
Final Status Survey Report

Figure 4.11
ISU-110 Direct Beta Measurements

Drawn by: RDN	Date: 2/11/2004
Building: MAIN	Revision: 0

APPENDIX 3

Threshold Comparison Test Reports (TCTR)

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 100 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	C-13	FCNSEW	Q1Q2Q3Q4Q5Q7	1447	Non-rectangle
Main	C-13a	FCNSEW		247	Closet in rm C-13
Main	C-17	FCNSEW	Q1Q2Q3Q4Q7	1479	
Main	C-19	FCNSEW	Q1Q2Q3Q7	2367	Includes 1/2 of the entry vestibule w E-12
Main	E-12	FCNSEW	Q1Q2Q3Q4Q7	1505	Includes 1/2 of entry vestibule w C-19
Main	E-14	FCNSEW	Q1Q2Q7	985	
			Total Area	8030	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	VT	306.0
Background	Fail	Minimum Background	GB	-139.0
DCGLw	Pass	Difference		445.0
DCGLavg	Pass	Average Activity	33.6	
EMC	Pass	Average Below DCGL	33.6	
Wilcoxon Rank Sum Test	N/A	Average Background	348.0	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 100 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-13	Q1	1.0	0.0	M	CH	0.5	395	284.0	hood	C	
C-13	Q2	3.0	0.0	M	BI	1	2160	59.0	Top of Blower	C	
C-13	Q2	1.0	0.0	P	BI	1	2158	48.0	Top of Duct Work	C	
C-13	Q2	2.0	0.0	P	BI	1	2159	13.0	Bottom of Duct	C	
C-13	Q4	7.0	0.0	M	BI	1	1709	80.0	Center Drawer, Top,	C	
C-13	Q4	6.0	0.0	M	BI	1	1708	58.0	1st Shelf	C	
C-13	Q4	4.0	0.0	M	BI	1	1707	15.0	Drawer, 2nd, N	C	
C-13	Q4	8.0	0.0	M	BI	1	1710	5.0	Front of Cabinet, S	C	
C-13	Q7	1.0	0.0	M	BI	1	1837	41.0	West Light	C	
C-13	Q7	2.0	0.0	M	BI	1	1838	34.0	Center, South Light	C	
C-17	Q1	3.0	0.0	M	BI	1	2163	113.0	Top of Blower	C	
C-17	Q1	1.0	0.0	P	BI	1	2161	102.0	Top of Duct Work	C	
C-17	Q1	2.0	0.0	P	BI	1	2162	67.0	Bottom of Duct	C	
C-17	Q2	4.0	0.0	M	BI	1	1723	3.0	N.W. Top Drawer	C	
C-17	Q3	4.0	0.0	M	BI	1	1733	55.0	S. End, Lower Shelf	C	
C-17	Q3	2.0	0.0	M	BI	1	1731	17.0	Bottom Shelf, North	C	
C-17	Q3	1.0	0.0	M	BI	1	1730	14.0	Top	C	
C-17	Q4	2.0	0.0	M	BI	1	1725	15.0	Top, Center	C	
C-17	Q7	3.0	0.0	M	BI	1	1842	44.0	Center, North Light	C	
C-17	Q7	2.0	0.0	M	BI	1	1841	15.0	West, South Light	C	
C-19	E	14.2	5.7	M	RG	1	1745	73.0	On Door	C	
C-19	Q1	6.0	0.0	M	BI	1	1764	294.0	Casework, S. Bottom	C	
C-19	Q1	5.0	0.0	M	BI	1	1763	156.0	North, Bottom Shelf	C	
C-19	Q1	4.0	0.0	M	BI	1	1762	128.0	North End, Center,	C	
C-19	Q1	7.0	0.0	M	BI	1	1765	108.0	N., 2nd Shelf,	C	

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Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-19	Q1	3.0	0.0	M	BI	1	1761	97.0	Top, Center, W	C	
C-19	Q1	2.0	0.0	M	BI	1	1760	92.0	Bottom Shelf, S.W.	C	
C-19	Q1	1.0	0.0	M	BI	1	1759	80.0	Top, S.E. Corner	C	
C-19	Q2	5.0	0.0	M	BI	1	1756	296.0	Top, N.W. Corner	C	
C-19	Q2	2.0	0.0	M	BI	1	1753	171.0	Center, Top	C	
C-19	Q2	4.0	0.0	M	BI	1	1755	135.0	Top, N.E. Corner	C	
C-19	Q2	3.0	0.0	M	BI	1	1754	108.0	Bottom Shelf, E.	C	
C-19	Q2	6.0	0.0	M	BI	1	1758	101.0	Bottom Shelf, S.W.	C	
C-19	Q2	4.0	0.0	M	CH	0.5	440	85.0	sink	C	
C-19	Q2	1.0	0.0	M	BI	1	1752	44.0	S.E. Corner, Top	C	
C-19	Q3	2.0	0.0	M	BI	1	1739	46.0	3rd Drawer, North	C	
C-19	Q3	4.0	0.0	M	BI	1	1749	44.0	2nd Large Drawer,	C	
C-19	Q3	5.0	0.0	M	BI	1	1750	34.0	Top, Front Edge	C	
C-19	Q3	1.0	0.0	M	BI	1	1738	32.0	Top, Center	C	
C-19	Q7	2.0	0.0	M	BI	1	1844	268.0	Top of S.W. Light,	C	
C-19	Q7	1.0	0.0	M	BI	1	1843	185.0	Top of Light, N.W.	C	
C-19	Q7	4.0	0.0	P	BI	1	1846	9.0	PVC Duct Work	C	
E-12	E	8.1	6.6	M	RG	1	1816	41.0		C	
E-12	Q1	1.0	0.0	M	BI	1	1821	65.0		C	
E-12	Q1	3.0	0.0	M	BI	1	1822	53.0	Bottom Shelf, 2nd	C	
E-12	Q1	4.0	0.0	M	BI	1	1823	9.0	2nd Shelf, 3rd Bin	C	
E-12	Q2	1.0	0.0	M	BI	1	1826	15.0	Top	C	
E-12	Q2	4.0	0.0	W	BI	1	1835	10.0	Front of Cabinet	C	
E-12	Q3	4.0	0.0	M	BI	1	1830	48.0	Top	C	
E-12	Q3	3.0	0.0	M	BI	1	1829	34.0	2nd Wide Drawer	C	
E-12	Q4	1.0	0.0	M	BI	1	2164	122.0	Top of Blower	C	
E-12	Q4	2.0	0.0	M	BI	1	2165	70.0	Bottom of Blower	C	
E-12	Q4	3.0	0.0	M	BI	1	2166	46.0	Blower Fan	C	
E-12	Q7	2.0	0.0	M	BI	1	1832	99.0	Ceiling A/C Vent	C	
E-12	Q7	3.0	0.0	M	BI	1	1833	89.0	N.E. Light, South	C	
E-12	Q7	1.0	0.0	M	BI	1	1831	79.0	S.W. Light	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 100 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-13	E	17.9	4.9	GB	CH	0.5	387	0.0			
C-13	E	6.8	4.5	GB	CH	0.5	388	0.0			
C-13	E	13.0	2.8	M	RG	1	1690	-29.0	Cabinet Front, Q5		
C-13	F	3.8	9.9	VT	RG	1	1691	58.0			
C-13	F	8.2	18.4	VT	CH	0.5	404	0.0			
C-13	F	11.1	3.3	VT	CH	0.5	405	0.0			
C-13	F	7.4	0.5	VT	CH	0.5	406	0.0	in doorway		
C-13	F	7.5	1.6	VT	CH	0.5	402	0.0			
C-13	F	14.8	1.5	VT	CH	0.5	403	0.0			
C-13	N	5.8	3.9	GB	CH	0.5	399	79.0			
C-13	N	9.1	3.9	GB	CH	0.5	400	76.0			

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Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-13	N	3.8	2.6	GB	RG	1	1692	58.0			
C-13	Q1	2.0	0.0	M	CH	0.5	396	0.0	hood		
C-13	Q1	4.0	0.0	M	CH	0.5	398	0.0	hood		
C-13	Q1	3.0	0.0	M	CH	0.5	397	0.0	hood		
C-13	Q2	2.0	0.0	M	CH	0.5	380	0.0	hood		
C-13	Q2	3.0	0.0	M	CH	0.5	381	0.0	hood		
C-13	Q2	4.0	0.0	M	CH	0.5	382	0.0	hood		
C-13	Q2	1.0	0.0	M	CH	0.5	379	0.0	hood		
C-13	Q3	4.0	0.0	CT	BI	1	1702	258.0			
C-13	Q3	1.0	0.0	CT	BI	1	1699	181.0			
C-13	Q3	3.0	0.0	CT	BI	1	1701	149.0			
C-13	Q3	2.0	0.0	CT	BI	1	1700	-63.0			
C-13	Q4	2.0	0.0	CT	BI	1	1704	236.0	Top		
C-13	Q4	5.0	0.0	CT	BI	1	1706	214.0	Top		
C-13	Q4	3.0	0.0	CT	BI	1	1705	183.0	Top		
C-13	Q4	1.0	0.0	CT	BI	1	1703	167.0	Top		
C-13	Q5	1.0	0.0	CT	BI	1	1694	243.0	Top of Counter Top		
C-13	Q5	4.0	0.0	CT	BI	1	1697	202.0	Top of Counter Top		
C-13	Q5	3.0	0.0	CT	BI	1	1696	200.0	Top of Counter Top		
C-13	Q5	2.0	0.0	CT	BI	1	1695	193.0	Top of Counter Top		
C-13	Q5	5.0	0.0	CT	BI	1	1698	53.0	Desk Top		
C-13	Q5	4.0	0.0	M	CH	0.5	386	0.0	sink		
C-13	Q5	3.0	0.0	M	CH	0.5	385	0.0	sink		
C-13	Q5	2.0	0.0	M	CH	0.5	384	0.0	sink		
C-13	Q5	1.0	0.0	M	CH	0.5	383	0.0	sink		
C-13	Q7	3.0	0.0	M	BI	1	1839	-9.0	A/C Supply Vent,		
C-13	S	10.3	3.8	GB	CH	0.5	390	0.0			
C-13	S	1.8	3.7	GB	CH	0.5	389	0.0			
C-13	S	13.8	6.6	GB	RG	1	1693	-29.0	Bulletin Board		
C-13	W	13.7	4.1	GB	CH	0.5	392	0.0			
C-13	W	5.7	3.8	GB	CH	0.5	391	0.0			
C-13a	F	0.1	5.2	VT	RG	1	1711	79.0			
C-13a	S	2.6	9.4	GB	RG	1	1712	41.0			
C-17	E	21.1	9.9	GB	RG	1	1714	22.0			
C-17	E	6.4	9.9	GB	RG	1	1713	3.0			
C-17	E	2.5	4.0	GB	CH	0.5	423	0.0			
C-17	E	16.9	3.8	GB	CH	0.5	424	0.0			
C-17	F	10.6	16.5	VT	RG	1	1718	39.0			
C-17	F	10.6	1.9	VT	RG	1	1717	17.0			
C-17	F	10.0	3.0	VT	CH	0.5	435	0.0			
C-17	F	2.3	4.8	VT	CH	0.5	432	0.0			
C-17	F	4.0	16.8	VT	CH	0.5	433	0.0			
C-17	F	7.4	0.5	VT	CH	0.5	436	0.0	In Doorway		
C-17	F	10.8	17.7	VT	CH	0.5	434	0.0			
C-17	N	10.6	8.1	GB	RG	1	1715	207.0			
C-17	N	3.3	3.6	GB	CH	0.5	429	13.0			
C-17	N	11.8	4.0	GB	CH	0.5	430	0.0			
C-17	Q1	4.0	0.0	M	CH	0.5	410	0.0	hood		
C-17	Q1	1.0	0.0	M	CH	0.5	407	0.0	hood		
C-17	Q1	3.0	0.0	M	CH	0.5	409	0.0	hood		
C-17	Q1	2.0	0.0	M	CH	0.5	408	0.0	hood		
C-17	Q2	4.0	0.0	M	CH	0.5	422	0.0	sink		
C-17	Q2	2.0	0.0	M	CH	0.5	420	0.0	sink		
C-17	Q2	3.0	0.0	M	CH	0.5	421	0.0		sink	

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C-17	Q2	1.0	0.0	M	CH	0.5	419	0.0	sink		
C-17	Q2	5.0	0.0	CT	BI	1	1737	-21.0	Top		
C-17	Q2	1.0	0.0	M	BI	1	1720	-26.0	Top, South End		
C-17	Q2	6.0	0.0	M	BI	1	1735	-26.0	Bottom Shelf,		
C-17	Q2	3.0	0.0	M	BI	1	1722	-27.0	Top of Counter		
C-17	Q2	2.0	0.0	M	BI	1	1721	-34.0	Front, S. End		
C-17	Q3	5.0	0.0	CT	BI	1	1736	17.0	Top		
C-17	Q3	1.0	0.0	M	CH	0.5	415	0.0	sink		
C-17	Q3	3.0	0.0	M	CH	0.5	417	0.0	sink		
C-17	Q3	4.0	0.0	M	CH	0.5	418	0.0	sink		
C-17	Q3	2.0	0.0	M	CH	0.5	416	0.0	sink		
C-17	Q3	6.0	0.0	M	BI	1	1734	-14.0	Bottom Shelf,		
C-17	Q3	3.0	0.0	M	BI	1	1732	-17.0	Top		
C-17	Q4	3.0	0.0	M	CH	0.5	413	0.0	sink		
C-17	Q4	1.0	0.0	M	CH	0.5	411	0.0	sink		
C-17	Q4	5.0	0.0	M	BI	1	1728	0.0	Top		
C-17	Q4	2.0	0.0	M	CH	0.5	412	0.0	sink		
C-17	Q4	4.0	0.0	M	CH	0.5	414	0.0	sink		
C-17	Q4	4.0	0.0	M	BI	1	1727	-3.0	Bottom Shelf, N. End		
C-17	Q4	1.0	0.0	M	BI	1	1724	-19.0	Top, S.E. Counter		
C-17	Q4	3.0	0.0	M	BI	1	1726	-53.0	Middle, Bottom Shelf		
C-17	Q4	6.0	0.0	M	BI	1	1729	-55.0	South End		
C-17	Q7	1.0	0.0	M	BI	1	1840	-48.0	East, South Light		
C-17	S	9.3	2.9	GB	CH	0.5	426	0.0			
C-17	S	3.9	3.8	GB	CH	0.5	425	0.0			
C-17	W	16.5	5.0	GB	RG	1	1716	51.0			
C-17	W	4.9	4.0	GB	CH	0.5	427	0.0			
C-17	W	14.2	3.8	GB	CH	0.5	428	0.0			
C-17	W	1.9	5.0	G	RG	1	1719	-63.0	Fell on CaseWork, Q1		
C-19	C	5.5	24.8	GB	RG	1	2268	179.0			
C-19	C	5.5	9.1	GB	RG	1	2267	135.0			
C-19	E	5.3	4.6	GB	CH	0.5	441	28.0			
C-19	E	28.8	4.1	GB	CH	0.5	442	0.0			
C-19	E	29.8	5.7	GB	RG	1	1741	-29.0			
C-19	F	6.0	9.1	C	RG	1	1747	249.0			
C-19	F	6.0	24.8	C	RG	1	1748	123.0			
C-19	F	9.6	30.8	VT	CH	0.5	451	44.0			
C-19	F	2.4	6.2	VT	CH	0.5	454	16.0			
C-19	F	5.0	13.5	VT	CH	0.5	455	13.0			
C-19	F	11.5	4.3	VT	CH	0.5	452	0.0			
C-19	F	3.0	0.5	VT	CH	0.5	453	0.0	In Doorway		
C-19	N	5.0	4.0	GB	CH	0.5	447	0.0			
C-19	N	12.0	4.1	GB	CH	0.5	448	0.0			
C-19	N	6.0	0.4	GB	RG	1	1742	-27.0			
C-19	Q2	3.0	0.0	M	CH	0.5	439	0.0	sink		
C-19	Q2	1.0	0.0	M	CH	0.5	437	0.0	sink		
C-19	Q2	2.0	0.0	M	CH	0.5	438	0.0	sink		
C-19	Q3	6.0	0.0	CT	BI	1	1757	24.0	Desk		
C-19	Q3	3.0	0.0	M	BI	1	1740	-43.0	Top, East		
C-19	Q3	7.0	0.0	M	BI	1	1751	-50.0	Casework, Mid-Back,		
C-19	Q7	3.0	0.0	M	BI	1	1845	-34.0	Electrical Chaseway,		

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Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-19	S	12.2	4.3	GB	CH	0.5	444	0.0			
C-19	S	2.8	4.8	GB	CH	0.5	443	0.0			
C-19	S	10.9	5.5	M	RG	1	1746	-27.0	On Door		
C-19	W	9.1	9.6	GB	RG	1	1743	113.0			
C-19	W	24.8	9.6	GB	RG	1	1744	46.0			
C-19	W	4.4	4.2	GB	CH	0.5	445	32.0			
C-19	W	21.1	4.2	GB	CH	0.5	446	6.0			
E-12	C	4.3	14.9	GB	RG	1	2276	60.0			
E-12	E	14.2	3.9	GB	CH	0.5	465	0.0			
E-12	E	4.5	3.5	GB	CH	0.5	464	0.0			
E-12	F	7.7	14.9	GB	RG	1	1817	27.0	Fell on Q2		
E-12	F	7.9	4.0	VT	CH	0.5	473	0.0			
E-12	F	10.9	17.7	VT	CH	0.5	472	0.0			
E-12	F	4.5	17.7	VT	CH	0.5	475	0.0			
E-12	F	1.8	6.0	VT	CH	0.5	474	0.0			
E-12	F	7.4	22.0	VT	CH	0.5	476	0.0	In Doorway		
E-12	N	7.8	7.5	GB	RG	1	1818	55.0			
E-12	N	3.9	3.2	GB	CH	0.5	470	0.0			
E-12	N	11.7	3.0	GB	CH	0.5	471	0.0			
E-12	Q1	5.0	0.0	M	BI	1	1824	-10.0	Front of Shelves,		
E-12	Q1	2.0	0.0	CT	BI	1	1825	-19.0			
E-12	Q2	3.0	0.0	W	BI	1	1834	-15.0	West Coverings		
E-12	Q2	2.0	0.0	M	BI	1	1827	-29.0	Top		
E-12	Q3	1.0	0.0	CT	BI	1	1836	63.0	Top of Desk Area		
E-12	Q3	3.0	0.0	M	CH	0.5	462	0.0	sink		
E-12	Q3	1.0	0.0	M	CH	0.5	460	0.0	sink		
E-12	Q3	2.0	0.0	M	CH	0.5	461	0.0	sink		
E-12	Q3	4.0	0.0	M	CH	0.5	463	0.0	sink		
E-12	Q3	2.0	0.0	M	BI	1	1828	-39.0	Top		
E-12	Q4	4.0	0.0	M	CH	0.5	459	0.0	hood		
E-12	Q4	2.0	0.0	M	CH	0.5	457	0.0	hood		
E-12	Q4	1.0	0.0	M	CH	0.5	456	0.0	hood		
E-12	Q4	3.0	0.0	M	CH	0.5	458	0.0	hood		
E-12	S	9.0	1.7	GB	RG	1	1819	142.0			
E-12	S	8.6	4.2	GB	CH	0.5	467	0.0			
E-12	S	2.5	4.0	GB	CH	0.5	466	0.0			
E-12	W	14.9	8.9	GB	RG	1	1820	3.0			
E-12	W	14.8	4.0	GB	CH	0.5	469	0.0			
E-12	W	4.7	4.0	GB	CH	0.5	468	0.0			
E-14	C	8.3	9.4	GB	RG	1	1848	-55.0			
E-14	E	9.2	4.0	GB	CH	0.5	363	0.0			
E-14	E	2.6	4.0	GB	CH	0.5	362	0.0			
E-14	E	3.1	9.0	GB	RG	1	1850	-89.0			
E-14	F	2.3	2.4	VT	CH	0.5	374	306.0			
E-14	F	2.7	2.4	VT	CH	0.5	375	199.0			
E-14	F	4.1	10.6	VT	CH	0.5	372	9.0			
E-14	F	14.3	9.3	VT	CH	0.5	373	0.0			
E-14	F	2.0	12.1	VT	CH	0.5	376	0.0	In Doorway		
E-14	F	8.3	9.0	M	RG	1	1847	-132.0	Falls on Q1		
E-14	N	5.0	4.1	GB	CH	0.5	370	0.0			
E-14	N	13.6	4.5	GB	CH	0.5	371	0.0			
E-14	Q1	1.0	0.0	M	BI	1	1852	-38.0	S. End, Center		
E-14	Q1	2.0	0.0	M	BI	1	1853	-118.0	N. End, Center		

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Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-14	Q2	2.0	0.0	M	BI	1	1855	-67.0	Top		
E-14	Q2	1.0	0.0	M	BI	1	1854	-106.0	Top		
E-14	Q7	1.0	0.0	M	BI	1	1856	-55.0	N. Return Air		
E-14	Q7	2.0	0.0	M	BI	1	1857	-55.0	W. Light, N. End		
E-14	S	2.4	4.5	GB	CH	0.5	364	0.0			
E-14	S	10.3	4.0	GB	CH	0.5	365	0.0			
E-14	S	7.6	7.6	GB	RG	1	1849	-19.0			
E-14	W	9.0	8.4	GB	RG	1	1851	106.0			
E-14	W	3.2	4.7	GB	CH	0.5	368	13.0			
E-14	W	10.1	3.8	GB	CH	0.5	369	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CTP	15	481.3	347.7	1,176.8	13,677	32,177
G	0	0.0	0.0	0.0	12,500	31,000
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
P	0	0.0	0.0	0.0	12,500	31,000
VT	15	272.3	159.9	592.2	13,092	31,592
W	0	0.0	0.0	0.0	12,500	31,000

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:13:17 PM

Survey Unit Numbers: 100 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

34 Survey points processed and 5 matrices processed

S+ = 34 Wc = 22

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER

Threshold Comparison Test Report -

Run Date: Saturday, April 10, 2004

Survey Unit Number: 101 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	C-29a	FCNSEW	Q0Q1Q3Q4Q5Q6	2687	Drop Ceiling
Main	C-29b	FCNSEW	Q0Q1Q2Q3Q4Q5	2695	Drop Ceiling
Main	C-33	FCNSEW	Q0Q1Q2Q3Q4	1612	Drop Ceiling
			Total Area	6994	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	CT	280.0
Background	Fail	Minimum Background	GB	-139.0
DCGLw	Pass	Difference		419.0
DCGLavg	Pass	Average Activity	23.0	
EMC	Pass	Average Below DCGL	23.0	
Wilcoxon Rank Sum Test	N/A	Average Background	548.1	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit: 101 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-29a	Q1	5.0	0.0	M	BI	1	2170	215.0	Top of Exhaust	C	
C-29a	Q1	3.0	0.0	M	BI	1	2169	163.0	Top of Exhaust	C	
C-29a	Q1	4.0	0.0	M	BI	1	2240	159.0	Top of Exhaust	C	
C-29a	Q1	2.0	0.0	M	BI	1	2168	120.0	Top of Exhaust	C	
C-29a	Q1	1.0	0.0	M	BI	1	2167	96.0	Top of Exhaust	C	
C-29a	Q1	2.0	0.0	M	BI	1	1177	16.0	Back	C	
C-29a	Q4	9.0	0.0	M	CH	0.5	212	101.0	sm waste sink	C	
C-29a	Q4	4.0	0.0	M	CH	0.5	204	22.0	sink	C	
C-29a	Q5	4.0	0.0	M	CH	0.5	137	98.0	sink	C	
C-29a	Q5	8.0	0.0	M	CH	0.5	141	76.0	sink	C	
C-29a	Q5	5.0	0.0	M	CH	0.5	138	41.0	sink	C	
C-29a	Q5	3.0	0.0	M	CH	0.5	136	13.0	sink	C	
C-29a	Q5	1.0	0.0	M	CH	0.5	132	6.0	sink	C	
C-29b	Q1	4.0	0.0	M	BI	1	1215	100.0		C	
C-29b	Q2	1.0	0.0	M	CH	0.5	254	6.0	sink	C	
C-29b	Q2	6.0	0.0	M	CH	0.5	259	3.0	sink	C	
C-29b	Q3	9.0	0.0	M	CH	0.5	263	13.0	Small Waste Sink	C	
C-29b	Q4	1.0	0.0	M	CH	0.5	250	28.0		C	
C-29b	Q4	1.0	0.0	M	BI	1	1497	14.0	Bottom of Cabinet,	C	
C-29b	Q5	2.0	0.0	M	BI	1	1499	24.0	Bottom of Cabinet,	C	
C-33	Q1	4.0	0.0	M	BI	1	1576	236.0	Top Drawer, W. End	C	
C-33	Q1	5.0	0.0	M	BI	1	1577	92.0	Top Drawer, Center	C	
C-33	Q1	6.0	0.0	M	BI	1	1578	73.0	Bottom Drawer, E.	C	
C-33	Q2	4.0	0.0	M	CH	0.5	586	221.0	hood	C	
C-33	Q2	1.0	0.0	M	BI	1	1263	57.0	Front Top Inside	C	
C-33	Q3	1.0	0.0	M	BI	1	1264	49.0	Back Right Inside	C	
C-33	Q4	6.0	0.0	M	BI	1	1575	179.0	Under S.E. Sink	C	
C-33	Q4	4.0	0.0	M	BI	1	1573	80.0	Metal Drawer, #2 E.	C	
C-33	Q4	1.0	0.0	M	CH	0.5	591	77.0	sink	C	
C-33	Q4	5.0	0.0	M	BI	1	1574	75.0	Metal Drawer, #4 W.	C	

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 101 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-29a	C	11.9	2.5	M	RG	1	1175	-77.0			
C-29a	C	11.9	17.3	M	RG	1	1176	-139.0			
C-29a	E	3.9	4.0	GB	CH	0.5	149	0.0			
C-29a	E	23.4	3.3	GB	CH	0.5	150	0.0			
C-29a	E	9.8	8.8	GB	RG	1	1186	-96.0	No Wall Above 8'9"		
C-29a	E	24.7	8.8	GB	RG	1	1187	-136.0	No Wall Above 8'9"		
C-29a	F	5.0	17.3	CT	RG	1	1183	46.0	Middle of Q4		
C-29a	F	25.0	21.1	VT	CH	0.5	159	32.0			
C-29a	F	24.4	18.4	VT	CH	0.5	219	16.0	In Doorway		
C-29a	F	3.1	21.3	VT	CH	0.5	158	0.0			
C-29a	F	16.8	11.8	VT	CH	0.5	161	0.0			
C-29a	F	21.3	4.0	VT	CH	0.5	160	0.0			
C-29a	F	2.2	12.5	VT	CH	0.5	162	0.0			
C-29a	F	2.2	3.6	VT	CH	0.5	157	0.0			
C-29a	F	5.0	2.5	VT	RG	1	1178	-26.0			
C-29a	F	19.8	2.5	VT	RG	1	1179	-70.0			
C-29a	F	19.8	17.3	VT	RG	1	1180	-78.0			
C-29a	N	22.8	4.0	GB	CH	0.5	144	19.0			
C-29a	N	8.3	4.7	GB	CH	0.5	143	0.0			
C-29a	N	19.8	4.9	GB	RG	1	1185	-115.0			
C-29a	N	5.0	4.9	CT	RG	1	1184	-169.0	Inside Q1 - Hood		
C-29a	Q1	1.0	0.0	M	CH	0.5	215	0.0			
C-29a	Q1	4.0	0.0	M	CH	0.5	218	0.0			
C-29a	Q1	2.0	0.0	M	CH	0.5	216	0.0			
C-29a	Q1	3.0	0.0	M	CH	0.5	217	0.0			
C-29a	Q1	1.0	0.0	M	BI	1	1472	-103.0	Bottom of Hood		
C-29a	Q3	4.0	0.0	CT	BI	1	1188	209.0	CTP - Highest		
C-29a	Q3	1.0	0.0	CT	BI	1	1458	157.0	N.E. End Counter Top		
C-29a	Q3	2.0	0.0	CT	BI	1	1459	73.0	N. End Counter Top		
C-29a	Q3	3.0	0.0	M	BI	1	1471	-103.0	E. Metal Cabinet, Top		
C-29a	Q4	9.0	0.0	CT	BI	1	1189	191.0	CTP - Highest		
C-29a	Q4	1.0	0.0	CT	BI	1	1460	147.0	Top E. of Sink		
C-29a	Q4	3.0	0.0	CT	BI	1	1461	140.0	Top, N.E. Corner		
C-29a	Q4	7.0	0.0	CT	BI	1	1463	103.0	Top, S.W. End		
C-29a	Q4	5.0	0.0	CT	BI	1	1462	97.0	Top, S.E. End		
C-29a	Q4	3.0	0.0	M	CH	0.5	203	0.0	Sink		
C-29a	Q4	1.0	0.0	M	CH	0.5	201	0.0	Sink		
C-29a	Q4	2.0	0.0	M	CH	0.5	202	0.0	sink		
C-29a	Q4	6.0	0.0	M	CH	0.5	208	0.0	sink		
C-29a	Q4	8.0	0.0	M	CH	0.5	211	0.0	sink		
C-29a	Q4	7.0	0.0	M	CH	0.5	210	0.0	sink		
C-29a	Q4	5.0	0.0	M	CH	0.5	207	0.0	sink		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-29a	Q4	4.0	0.0	M	BI	1	1474	-79.0	Bottom Drawer, N.E.		
C-29a	Q4	6.0	0.0	M	BI	1	1475	-109.0	Drawer #4, S.E. End		
C-29a	Q4	8.0	0.0	M	BI	1	1476	-118.0	Top Drawer, S.W. End		
C-29a	Q4	2.0	0.0	M	BI	1	1473	-121.0	2nd Drawer, E. of Sink		
C-29a	Q5	3.0	0.0	CT	BI	1	1466	193.0	Just E. of Sink		
C-29a	Q5	1.0	0.0	CT	BI	1	1464	190.0	N.E. End of Counter		
C-29a	Q5	7.0	0.0	CT	BI	1	1468	181.0	S.W. End of Counter		
C-29a	Q5	10.0	0.0	CT	BI	1	1190	175.0	CTP - Highest		
C-29a	Q5	2.0	0.0	CT	BI	1	1465	147.0	N. Center of Counter		
C-29a	Q5	6.0	0.0	CT	BI	1	1467	85.0	S.E. Counter Top,		
C-29a	Q5	2.0	0.0	M	CH	0.5	133	0.0	sink		
C-29a	Q5	7.0	0.0	M	CH	0.5	140	0.0	sink		
C-29a	Q5	6.0	0.0	M	CH	0.5	139	0.0	sink		
C-29a	Q5	9.0	0.0	M	CH	0.5	213	0.0	sm waste sink		
C-29a	Q5	5.0	0.0	M	BI	1	1478	-48.0	3rd Drawer, N.E.		
C-29a	Q5	4.0	0.0	M	BI	1	1477	-70.0	Just E. of Sink,		
C-29a	Q5	9.0	0.0	M	BI	1	1480	-72.0	4th Drawer, S.E. End		
C-29a	Q5	8.0	0.0	M	BI	1	1479	-80.0	Top Drawer, S. W. End		
C-29a	Q6	3.0	0.0	CT	BI	1	1470	178.0	S. End, Top		
C-29a	Q6	4.0	0.0	CT	BI	1	1191	159.0	CTP - Highest		
C-29a	Q6	1.0	0.0	CT	BI	1	1469	149.0	N. end, Top		
C-29a	Q6	2.0	0.0	M	BI	1	2123	-96.0			
C-29a	S	5.2	3.6	GB	CH	0.5	147	0.0			
C-29a	S	19.5	3.5	GB	CH	0.5	148	0.0			
C-29a	W	4.1	3.8	PL	CH	0.5	145	79.0			
C-29a	W	14.5	4.6	PL	CH	0.5	146	16.0			
C-29a	W	2.5	9.8	C	RG	1	1181	-8.0			
C-29a	W	17.3	9.8	C	RG	1	1182	-49.0			
C-29b	C	9.5	3.8	M	RG	1	1206	-46.0			
C-29b	C	9.5	18.6	M	RG	1	1207	-53.0			
C-29b	C	24.3	18.6	M	RG	1	1209	-53.0			
C-29b	C	24.3	3.8	M	RG	1	1208	-69.0			
C-29b	E	24.0	3.3	GB	CH	0.5	273	0.0			
C-29b	E	4.3	3.3	GB	CH	0.5	272	0.0			
C-29b	E	23.5	7.7	GB	RG	1	1205	-91.0			
C-29b	E	8.8	7.7	GB	RG	1	1204	-97.0			
C-29b	F	19.6	7.6	VT	CH	0.5	285	25.0			
C-29b	F	6.2	3.6	VT	CH	0.58	286	22.0			
C-29b	F	19.9	23.8	VT	CH	0.5	280	22.0			
C-29b	F	20.2	16.6	VT	CH	0.5	283	13.0			
C-29b	F	4.4	23.9	VT	CH	0.5	281	0.0			
C-29b	F	24.5	13.0	VT	CH	0.5	288	0.0	In sliding doorway		
C-29b	F	5.6	16.0	VT	CH	0.5	284	0.0			
C-29b	F	17.4	18.6	VT	RG	1	1203	-32.0			
C-29b	F	2.6	18.6	VT	RG	1	1201	-53.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-29b	F	17.4	3.8	VT	RG	1	1202	-94.0			
C-29b	F	2.6	3.8	VT	RG	1	1200	-97.0			
C-29b	N	17.4	6.1	GB	RG	1	2270	13.0			
C-29b	N	2.6	6.1	GB	RG	1	2269	9.0			
C-29b	N	19.9	3.8	GB	CH	0.5	279	0.0			
C-29b	N	2.7	4.3	GB	CH	0.5	278	0.0			
C-29b	Q0	1.0	0.0	CT	BI	1	1214	118.0			
C-29b	Q1	2.0	0.0	CT	BI	1	1482	121.0	Top, S. End		
C-29b	Q1	1.0	0.0	CT	BI	1	1481	108.0	Top, N. End		
C-29b	Q1	3.0	0.0	M	BI	1	1490	-70.0	S. End, Bottom Shelf		
C-29b	Q2	1.0	0.0	CT	BI	1	1483	164.0	N. of Small Sink, Top		
C-29b	Q2	2.0	0.0	CT	BI	1	1484	128.0	E. of Lg. Sink, N. Top		
C-29b	Q2	5.0	0.0	CT	BI	1	1216	30.0			
C-29b	Q2	4.0	0.0	M	CH	0.5	257	0.0	sink		
C-29b	Q2	8.0	0.0	M	CH	0.5	261	0.0	sink		
C-29b	Q2	5.0	0.0	M	CH	0.5	258	0.0	sink		
C-29b	Q2	3.0	0.0	M	CH	0.5	256	0.0	sink		
C-29b	Q2	2.0	0.0	M	CH	0.5	255	0.0	sink		
C-29b	Q2	7.0	0.0	M	CH	0.5	260	0.0	sink		
C-29b	Q2	9.0	0.0	M	CH	0.5	262	0.0	Small Waste Sink		
C-29b	Q2	4.0	0.0	M	BI	1	1492	-56.0	Top Drawer, Middle		
C-29b	Q2	3.0	0.0	M	BI	1	1491	-72.0	Top Shelf, N.W.		
C-29b	Q3	3.0	0.0	CT	BI	1	1487	169.0	N. of Lg. Sink, Top		
C-29b	Q3	7.0	0.0	CT	BI	1	1489	166.0	S. Side, E. of Lg. Sink		
C-29b	Q3	1.0	0.0	CT	BI	1	1485	147.0	Top, Desk, N.E. End		
C-29b	Q3	2.0	0.0	CT	BI	1	1486	138.0	Top, N. of Small Sink		
C-29b	Q3	6.0	0.0	CT	BI	1	1488	123.0	S. Side, Top, E. End		
C-29b	Q3	10.0	0.0	CT	BI	1	1217	100.0			
C-29b	Q3	2.0	0.0	M	CH	0.5	269	0.0	Sink		
C-29b	Q3	6.0	0.0	M	CH	0.5	265	0.0	Sink		
C-29b	Q3	1.0	0.0	M	CH	0.5	268	0.0	Sink		
C-29b	Q3	8.0	0.0	M	CH	0.5	267	0.0	Sink		
C-29b	Q3	3.0	0.0	M	CH	0.5	270	0.0	Sink		
C-29b	Q3	4.0	0.0	M	CH	0.5	271	0.0	Sink		
C-29b	Q3	7.0	0.0	M	CH	0.5	266	0.0	Sink		
C-29b	Q3	5.0	0.0	M	CH	0.5	264	0.0	Sink		
C-29b	Q3	8.0	0.0	M	BI	1	1495	-29.0	S. Bottom Cabinet, E.		
C-29b	Q3	5.0	0.0	M	BI	1	1494	-53.0	Bottom Drawer, N.E.		
C-29b	Q3	9.0	0.0	M	BI	1	1496	-79.0	Top Drawer, S.E. End		
C-29b	Q3	4.0	0.0	M	BI	1	1493	-103.0	Top Drawer, N.W. End		
C-29b	Q4	2.0	0.0	CT	BI	1	1218	85.0			
C-29b	Q4	4.0	0.0	M	CH	0.5	253	0.0			
C-29b	Q4	2.0	0.0	M	CH	0.5	251	0.0			
C-29b	Q4	3.0	0.0	M	CH	0.5	252	0.0			
C-29b	Q5	3.0	0.0	CT	BI	1	1219	77.0			
C-29b	Q5	1.0	0.0	M	BI	1	1498	-2.0	Top, S.E. End		
C-29b	S	21.9	11.0	C	RG	1	1213	96.0			
C-29b	S	7.1	11.0	C	RG	1	1212	93.0			
C-29b	S	3.4	3.9	GB	CH	0.5	274	0.0			
C-29b	S	16.0	4.4	GB	CH	0.5	275	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-29b	W	18.6	12.3	C	RG	1	1211	45.0			
C-29b	W	7.1	4.0	PL	CH	0.5	276	38.0			
C-29b	W	3.8	12.3	C	RG	1	1210	14.0			
C-29b	W	23.4	4.3	PL	CH	0.5	277	0.0			
C-33	C	8.3	7.0	M	RG	1	1256	-30.0			
C-33	C	23.1	7.0	M	RG	1	1255	-53.0			
C-33	E	9.2	4.2	GB	CH	0.5	576	96.0			
C-33	E	1.5	4.0	GB	CH	0.5	575	0.0			
C-33	E	3.3	6.5	M	RG	1	1254	-64.0	Front of Hood		
C-33	F	1.9	4.6	VT	CH	0.5	600	85.0			
C-33	F	0.1	6.0	VT	CH	0.5	601	37.0	In Doorway		
C-33	F	16.2	9.7	VT	RG	1	1253	21.0			
C-33	F	1.4	9.7	VT	RG	1	1252	8.0			
C-33	F	14.3	4.3	VT	CH	0.5	598	7.0			
C-33	F	19.8	6.0	VT	CH	0.5	597	0.0			
C-33	F	6.5	6.8	VT	CH	0.5	599	0.0			
C-33	N	19.1	4.8	GB	CH	0.5	582	66.0			
C-33	N	7.8	5.6	GB	CH	0.5	581	0.0			
C-33	N	16.2	8.5	GB	RG	1	1260	-5.0	No Wall Above 8'6"		
C-33	N	1.4	8.5	GB	RG	1	1259	-38.0	No Wall Above 8'6"		
C-33	Q1	2.0	0.0	CT	BI	1	1571	72.0	W. End, Top of		
C-33	Q1	3.0	0.0	CT	BI	1	1572	58.0	W. End, Top of		
C-33	Q1	1.0	0.0	CT	BI	1	1570	34.0	E. End, Top of		
C-33	Q1	1.0	0.0	CT	BI	1	1261	-6.0	Top Center		
C-33	Q2	5.0	0.0	CT	PR	1	1268	280.0	North End - Top Inside		
C-33	Q2	4.0	0.0	CT	PR	1	1267	39.0	North End - Top Inside		
C-33	Q2	3.0	0.0	CT	PR	1	1266	31.0	North End - Top Inside		
C-33	Q2	2.0	0.0	CT	PR	1	1265	29.0	North End - Top Inside		
C-33	Q2	3.0	0.0	M	CH	0.5	585	0.0	hood		
C-33	Q2	2.0	0.0	M	CH	0.5	584	0.0	hood		
C-33	Q2	1.0	0.0	M	CH	0.5	583	0.0	hood		
C-33	Q3	2.0	0.0	M	CH	0.5	588	0.0	hood		
C-33	Q3	3.0	0.0	M	CH	0.5	589	0.0	hood		
C-33	Q3	1.0	0.0	M	CH	0.5	587	0.0	hood		
C-33	Q3	4.0	0.0	M	CH	0.5	590	0.0	hood		
C-33	Q4	3.0	0.0	CT	BI	1	1569	75.0			
C-33	Q4	2.0	0.0	CT	BI	1	1568	46.0			
C-33	Q4	1.0	0.0	CT	BI	1	1567	38.0			
C-33	Q4	1.0	0.0	CT	BI	1	1262	30.0	Front of Sink - Top		
C-33	Q4	4.0	0.0	M	CH	0.5	594	0.0	sink		
C-33	Q4	3.0	0.0	M	CH	0.5	593	0.0	sink		
C-33	Q4	2.0	0.0	M	CH	0.5	592	0.0	sink		
C-33	Q4	5.0	0.0	M	CH	0.5	595	0.0	sink		
C-33	S	23.0	4.0	GB	CH	0.5	578	0.0			
C-33	S	11.0	3.6	GB	CH	0.5	577	0.0			
C-33	S	8.3	5.2	GB	RG	1	1258	-32.0			
C-33	S	23.1	5.2	GB	RG	1	1257	-38.0			
C-33	W	0.3	3.8	GB	CH	0.5	579	0.0			
C-33	W	10.0	3.7	GB	CH	0.5	580	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-33	Q3	1.0	0.0	M	CH	0.5	587	0.0	hood		
C-33	Q3	4.0	0.0	M	CH	0.5	590	0.0	hood		
C-33	Q4	3.0	0.0	CT	BI	1	1569	75.0			
C-33	Q4	2.0	0.0	CT	BI	1	1568	46.0			
C-33	Q4	1.0	0.0	CT	BI	1	1567	38.0			
C-33	Q4	1.0	0.0	CT	BI	1	1262	30.0	Front of Sink - Top		
C-33	Q4	4.0	0.0	M	CH	0.5	594	0.0	sink		
C-33	Q4	3.0	0.0	M	CH	0.5	593	0.0	sink		
C-33	Q4	2.0	0.0	M	CH	0.5	592	0.0	sink		
C-33	Q4	5.0	0.0	M	CH	0.5	595	0.0	sink		
C-33	S	23.0	4.0	GB	CH	0.5	578	0.0			
C-33	S	11.0	3.6	GB	CH	0.5	577	0.0			
C-33	S	8.3	5.2	GB	RG	1	1258	-32.0			
C-33	S	23.1	5.2	GB	RG	1	1257	-38.0			
C-33	W	0.3	3.8	GB	CH	0.5	579	0.0			
C-33	W	10.0	3.7	GB	CH	0.5	580	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CT	15	537.5	62.0	661.6	13,162	31,662
CTP	15	481.3	347.7	1,176.8	13,677	32,177
CTX	25	1,111.6	239.3	1,590.1	14,090	32,590
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
PL	15	420.0	320.3	1,060.6	13,561	32,061
VT	15	272.3	159.9	592.2	13,092	31,592

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:18:58 PM

Survey Unit Number: 101 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

37 Survey points processed and 5 matrices processed

S+ = 37 Wc = 24

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number 102 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	C-39	FCNSEW	Q0Q1Q2Q3	1156	Drop Ceiling
Main	E-22	FCNSEW	Q0Q1Q2	2007	Drop Ceiling
Main	E-30	FCNSEW	Q0Q1Q2Q3Q4Q5Q6	2502	Drop Ceiling
			Total Area	5665	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	CTX	299.0
Background	Fail	Minimum Background	GB	-139.0
DCGLw	Pass	Difference		438.0
DCGLavg	Pass	Average Activity	23.8	
EMC	Pass	Average Below DCGL	23.8	
Wilcoxon Rank Sum Test	N/A	Average Background	549.7	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 102 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-39	C	1.8	1.8	M	RG	1	1769	31.0		C	
C-39	Q0	3.0	0.0	M	BI	1	1774	236.0	Light Fixture, Top,	C	
C-39	Q0	5.0	0.0	M	BI	1	1775	89.0	Return Air Vent, N.E.	C	
C-39	Q0	4.0	0.0	P	BI	1	1776	5.0	Light Fixture,	C	
C-39	Q2	8.0	0.0	M	BI	1	1782	43.0	Bottom Drawer,	C	
C-39	Q2	6.0	0.0	M	BI	1	1780	10.0	2nd Drawer, North	C	
C-39	Q3	2.0	0.0	M	BI	1	1783	51.0	Top Shelf, Wall	C	
E-22	Q0	6.0	0.0	M	BI	1	1454	89.0	Return Vent	C	
E-22	Q1	2.0	0.0	M	CH	0.5	316	76.0	Sink	C	
E-22	Q1	8.0	0.0	M	CH	0.5	313	66.0	Sink	C	
E-22	Q1	4.0	0.0	M	CH	0.5	318	60.0	Sink	C	
E-22	Q1	6.0	0.0	M	BI	1	1447	46.0	Top Drawer - South	C	
E-22	Q1	7.0	0.0	M	CH	0.5	312	44.0	Sink	C	
E-22	Q1	2.0	0.0	M	BI	1	1445	41.0	4th Drawer - East	C	
E-22	Q1	4.0	0.0	M	BI	1	1446	38.0	Top Drawer - 3rd	C	
E-22	Q1	8.0	0.0	M	BI	1	1448	17.0	Bottom Large South	C	
E-22	Q1	5.0	0.0	M	CH	0.5	310	16.0	Sink	C	
E-22	Q1	1.0	0.0	M	CH	0.5	315	13.0	Sink	C	
E-22	Q1	3.0	0.0	M	CH	0.5	317	9.0	Sink	C	
E-22	Q2	6.0	0.0	M	BI	1	1451	72.0	Bottom of Drawer -	C	
E-22	Q2	4.0	0.0	M	BI	1	1449	68.0	Top Drawer - East	C	
E-22	Q2	5.0	0.0	M	BI	1	1450	43.0	Bottom of Cabinet -	C	
E-30	Q0	4.0	0.0	M	BI	1	1974	84.0	A/C Duct, S.W.	C	
E-30	Q1	3.0	0.0	M	BI	1	1956	29.0	2nd Drawer, East	C	
E-30	Q5	4.0	0.0	M	CH	0.5	1143	77.0	Sink	C	

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-30	Q5	8.0	0.0	M	CH	0.5	1147	41.0	Sink	C	
E-30	Q5	16.0	0.0	M	CH	0.5	1155	37.0	Sink	C	
E-30	Q5	3.0	0.0	M	BI	1	1963	34.0	2nd Drawer, Center	C	
E-30	Q5	12.0	0.0	M	CH	0.5	1151	22.0	Sink	C	
E-30	Q5	6.0	0.0	M	CH	0.5	1145	18.0	Sink	C	
E-30	Q8	3.0	0.0	M	BI	1	1968	12.0	Bottom of Cabinet	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 102 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-39	C	1.8	15.8	CT	RG	1	2281	299.0			
C-39	E	8.3	4.3	C	RG	1	1771	126.0			
C-39	E	22.3	4.3	CT	RG	1	1768	12.0	Back of East Hood		
C-39	E	5.8	4.2	PL	CH	0.5	176	0.0			
C-39	E	15.8	5.0	PL	CH	0.5	177	0.0			
C-39	F	1.8	15.8	CT	RG	1	1767	103.0	On Top of Q2 Counter		
C-39	F	1.8	1.8	VT	RG	1	1766	63.0			
C-39	F	7.8	18.5	VT	CH	0.5	185	0.0			
C-39	F	3.6	17.3	VT	CH	0.5	184	0.0			
C-39	F	2.5	2.7	VT	CH	0.5	183	0.0			
C-39	F	0.1	15.8	M	CH	0.5	200	0.0	In Doorway		
C-39	F	6.3	9.2	VT	CH	0.5	186	0.0			
C-39	N	1.8	5.8	GB	RG	1	1770	26.0			
C-39	N	3.5	4.9	GB	CH	0.5	181	0.0			
C-39	N	8.8	4.8	GB	CH	0.5	182	0.0			
C-39	Q0	1.0	0.0	CT	BI	1	1772	275.0	Ceiling Tile, Top, S.W.		
C-39	Q0	2.0	0.0	CT	BI	1	1773	236.0	Ceiling Tile, Bottom		
C-39	Q1	1.0	0.0	M	CH	0.5	188	0.0			
C-39	Q1	3.0	0.0	M	CH	0.5	190	0.0			
C-39	Q1	4.0	0.0	M	CH	0.5	191	0.0			
C-39	Q1	2.0	0.0	M	CH	0.5	189	0.0			
C-39	Q1	4.0	0.0	M	BI	1	1778	-7.0	Bottom of Cabinet		
C-39	Q1	1.0	0.0	M	BI	1	1777	-60.0	Front Edge		
C-39	Q1	3.0	0.0	CT	BI	1	1788	-62.0	South Side		
C-39	Q1	2.0	0.0	CT	BI	1	1787	-73.0	Bottom		
C-39	Q2	2.0	0.0	CT	BI	1	1790	210.0	Top of Counter		
C-39	Q2	1.0	0.0	CT	BI	1	1789	149.0	Top of Counter		
C-39	Q2	4.0	0.0	CT	BI	1	1792	147.0	Top of Counter		
C-39	Q2	3.0	0.0	CT	BI	1	1791	29.0	Sink, Bottom, North		
C-39	Q2	4.0	0.0	M	CH	0.5	195	0.0			
C-39	Q2	8.0	0.0	M	CH	0.5	199	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-39	Q2	7.0	0.0	M	CH	0.5	198	0.0			
C-39	Q2	6.0	0.0	M	CH	0.5	197	0.0			
C-39	Q2	5.0	0.0	M	CH	0.5	196	0.0			
C-39	Q2	1.0	0.0	M	CH	0.5	192	0.0			
C-39	Q2	2.0	0.0	M	CH	0.5	193	0.0			
C-39	Q2	3.0	0.0	M	CH	0.5	194	0.0			
C-39	Q2	5.0	0.0	M	BI	1	1779	-31.0	3rd Drawer, East		
C-39	Q2	7.0	0.0	M	BI	1	1781	-46.0	2nd Drawer, South,		
C-39	Q3	4.0	0.0	CT	BI	1	1794	3.0	Top		
C-39	Q3	5.0	0.0	M	BI	1	1785	-14.0	Bottom Drawer		
C-39	Q3	1.0	0.0	CT	BI	1	1793	-21.0	Top		
C-39	Q3	3.0	0.0	M	BI	1	1784	-27.0	Bottom Shelf, Wall		
C-39	Q3	6.0	0.0	M	BI	1	1786	-31.0	Bottom, Cabinet Shelf		
C-39	S	3.7	2.2	PL	CH	0.5	178	0.0			
C-39	W	3.3	3.3	GB	CH	0.5	179	0.0			
C-39	W	17.2	5.1	GB	CH	0.5	180	0.0			
E-22	C	3.5	21.0	CT	RG	1	2278	223.0			
E-22	C	3.5	7.0	CT	RG	1	2277	185.0			
E-22	C	17.5	7.0	CT	RG	1	2279	176.0			
E-22	C	17.5	21.0	CT	RG	1	2280	138.0			
E-22	C	21.0	7.7	M	BI	1	1429	-63.0			
E-22	E	19.9	4.5	GB	CH	0.5	320	0.0			
E-22	E	2.1	4.4	GB	CH	0.5	319	0.0			
E-22	E	17.1	1.5	M	RG	1	1430	-80.0	Back of E. Counter Q2		
E-22	E	3.1	1.5	GB	RG	1	1433	-89.0			
E-22	F	24.4	18.0	VT	CH	0.5	331	114.0	in doorway		
E-22	F	20.5	3.3	VT	CH	0.5	330	47.0			
E-22	F	3.4	3.1	VT	CH	0.5	327	35.0			
E-22	F	3.3	18.6	VT	CH	0.5	328	6.0			
E-22	F	17.6	15.3	VT	CH	0.5	329	0.0			
E-22	F	12.0	21.0	VT	RG	1	1428	-26.0			
E-22	F	12.0	7.0	VT	RG	1	1427	-75.0			
E-22	N	4.8	4.2	GB	CH	0.5	325	0.0			
E-22	N	21.5	4.2	GB	CH	0.5	326	0.0			
E-22	Q0	4.0	0.0	CT	BI	1	1456	183.0	Ceiling Tile Bottom		
E-22	Q0	3.0	0.0	CT	BI	1	1455	161.0	Ceiling Tile Top		
E-22	Q0	2.0	0.0	M	BI	1	1453	-10.0	Top of Light Fixture		
E-22	Q0	5.0	0.0	P	BI	1	1457	-17.0	Light Fixture Bottom		
E-22	Q0	1.0	0.0	M	BI	1	1452	-58.0	Air Con Duct		
E-22	Q1	1.0	0.0	CT	BI	1	1436	280.0	Top		
E-22	Q1	7.0	0.0	CT	BI	1	1439	275.0	Top		
E-22	Q1	10.0	0.0	CT	BI	1	1441	267.0	Top		
E-22	Q1	9.0	0.0	CT	BI	1	1440	232.0	Top @ Sink		
E-22	Q1	3.0	0.0	CT	BI	1	1437	220.0	Top		
E-22	Q1	5.0	0.0	CT	BI	1	1438	53.0	Sink - Bottom - North		
E-22	Q1	6.0	0.0	M	CH	0.5	311	0.0	Sink		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-22	Q2	2.0	0.0	CT	BI	1	1443	217.0	Top		
E-22	Q2	3.0	0.0	CT	BI	1	1444	179.0	Top		
E-22	Q2	1.0	0.0	CT	BI	1	1442	10.0	Top		
E-22	S	20.3	2.3	GB	CH	0.5	322	38.0			
E-22	S	3.3	4.1	GB	CH	0.5	321	0.0			
E-22	S	12.5	7.0	GB	RG	1	1432	-51.0			
E-22	W	4.5	4.3	PL	CH	0.5	323	98.0			
E-22	W	21.1	3.8	PL	CH	0.5	324	60.0			
E-22	W	7.0	2.0	C	RG	1	1434	32.0	Back ofQ1, S. End		
E-22	W	21.0	2.0	M	RG	1	1431	-91.0	Back of Q1 Under N.		
E-30	C	6.3	22.5	M	RG	1	1928	-48.0			
E-30	C	6.3	8.5	M	RG	1	1927	-67.0			
E-30	C	20.3	8.5	M	RG	1	1929	-79.0			
E-30	C	20.3	22.5	M	RG	1	1930	-104.0			
E-30	E	8.0	4.0	GB	CH	0.5	921	77.0			
E-30	E	27.0	3.0	GB	CH	0.5	922	22.0			
E-30	F	9.3	22.5	CT	RG	1	1923	145.0	Fell on Top of N.		
E-30	F	23.3	22.5	CT	RG	1	1924	121.0	Fel on Top of N.		
E-30	F	0.5	12.0	VT	CH	0.5	934	81.0	In Doorway		
E-30	F	11.7	15.6	VT	CH	0.5	931	55.0			
E-30	F	13.3	27.8	VT	CH	0.5	932	22.0			
E-30	F	0.5	27.0	VT	CH	0.5	933	18.0	In Doorway		
E-30	F	11.8	3.0	VT	CH	0.5	929	0.0			
E-30	F	3.7	12.0	VT	CH	0.5	930	0.0			
E-30	F	9.3	8.5	VT	RG	1	1921	-55.0			
E-30	F	23.3	8.5	VT	RG	1	1922	-65.0			
E-30	N	1.5	3.5	GB	CH	0.5	927	0.0			
E-30	N	9.3	4.0	GB	CH	0.5	928	0.0			
E-30	N	9.3	4.9	GB	RG	1	1931	-29.0			
E-30	N	23.3	4.9	CT	RG	1	1926	-121.0	In Back of N.E. Hood		
E-30	Q0	6.0	0.0	CT	BI	1	1971	166.0	Bottom of Ceiling Tile,		
E-30	Q0	1.0	0.0	CT	BI	1	1969	159.0	Top of Ceiling Tile		
E-30	Q0	5.0	0.0	CT	BI	1	1970	126.0	Top of Ceiling Tile,		
E-30	Q0	7.0	0.0	P	BI	1	1978	-27.0	Light Fixture, Bottom		
E-30	Q0	12.0	0.0	P	BI	1	1980	-39.0	Light Fixture, Bottom,		
E-30	Q0	10.0	0.0	M	BI	1	1976	-53.0	A/C Supply Duct, N.E.		
E-30	Q0	11.0	0.0	M	BI	1	1977	-67.0	Light Fixture, Top,		
E-30	Q0	8.0	0.0	P	BI	1	1979	-82.0	PVC A/C Duct, S.E.		
E-30	Q0	9.0	0.0	M	BI	1	1975	-84.0	A/C Duct, N.W.		
E-30	Q0	3.0	0.0	M	BI	1	1973	-96.0	S.W. Air Supply Vent,		
E-30	Q0	2.0	0.0	M	BI	1	1972	-121.0	Top of S.W. Light		
E-30	Q1	1.0	0.0	CT	BI	1	1935	149.0	Top		
E-30	Q1	2.0	0.0	CT	BI	1	1936	142.0	Top		
E-30	Q2	2.0	0.0	M	CH	0.5	904	0.0	hood		
E-30	Q2	3.0	0.0	M	CH	0.5	905	0.0	hood		
E-30	Q2	1.0	0.0	M	CH	0.5	903	0.0	hood		
E-30	Q2	4.0	0.0	M	CH	0.5	906	0.0	hood		
E-30	Q2	1.0	0.0	M	BI	1	1957	-44.0	Front Edge		
E-30	Q2	2.0	0.0	CT	BI	1	1937	-91.0	Bottom Inside		
E-30	Q2	3.0	0.0	CT	BI	1	1938	-103.0	East Side		
E-30	Q3	1.0	0.0	M	CH	0.5	907	0.0	hood		
E-30	Q3	4.0	0.0	M	CH	0.5	910	0.0	hood		
E-30	Q3	2.0	0.0	M	CH	0.5	908	0.0	hood		
E-30	Q3	3.0	0.0	M	CH	0.5	909	0.0	hood		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-30	Q3	1.0	0.0	M	BI	1	1958	-53.0	Front Edge		
E-30	Q3	3.0	0.0	CT	BI	1	1940	-73.0	Beck Center		
E-30	Q3	2.0	0.0	CT	BI	1	1939	-91.0	Bottom		
E-30	Q4	6.0	0.0	CT	BI	1	1945	181.0	Top of Table		
E-30	Q4	4.0	0.0	CT	BI	1	1943	171.0	Center, Top		
E-30	Q4	1.0	0.0	CT	BI	1	1941	12.0	East Sink Bottom		
E-30	Q4	6.0	0.0	M	CH	0.5	916	0.0	sink		
E-30	Q4	4.0	0.0	M	CH	0.5	914	0.0	sink		
E-30	Q4	1.0	0.0	M	CH	0.5	911	0.0	sink		
E-30	Q4	5.0	0.0	M	CH	0.5	915	0.0	sink		
E-30	Q4	7.0	0.0	M	CH	0.5	917	0.0	sink		
E-30	Q4	2.0	0.0	M	CH	0.5	912	0.0	sink		
E-30	Q4	8.0	0.0	M	CH	0.5	918	0.0	sink		
E-30	Q4	3.0	0.0	M	CH	0.5	913	0.0	sink		
E-30	Q4	3.0	0.0	M	BI	1	1959	-3.0	Top Drawer		
E-30	Q4	7.0	0.0	M	BI	1	1960	-12.0	3rd Drawer, West		
E-30	Q4	8.0	0.0	M	BI	1	1961	-17.0	Top Shelf, West Side		
E-30	Q4	2.0	0.0	CT	BI	1	1942	-32.0	West Sink Bottom		
E-30	Q4	5.0	0.0	CT	BI	1	1944	-41.0	Small Sink, South		
E-30	Q5	5.0	0.0	CT	BI	1	1948	183.0	Top of Counter		
E-30	Q5	7.0	0.0	CT	BI	1	1949	167.0	Top of Counter		
E-30	Q5	3.0	0.0	M	CH	0.5	1142	0.0	Sink		
E-30	Q5	5.0	0.0	M	CH	0.5	1144	0.0	Sink		
E-30	Q5	7.0	0.0	M	CH	0.5	1146	0.0	Sink		
E-30	Q5	2.0	0.0	M	CH	0.5	1141	0.0	Sink		
E-30	Q5	1.0	0.0	M	CH	0.5	1140	0.0	Sink		
E-30	Q5	11.0	0.0	M	CH	0.5	1150	0.0	Sink		
E-30	Q5	15.0	0.0	M	CH	0.5	1154	0.0	Sink		
E-30	Q5	14.0	0.0	M	CH	0.5	1153	0.0	Sink		
E-30	Q5	10.0	0.0	M	CH	0.5	1149	0.0	Sink		
E-30	Q5	9.0	0.0	M	CH	0.5	1148	0.0	Sink		
E-30	Q5	13.0	0.0	M	CH	0.5	1152	0.0	Sink		
E-30	Q5	8.0	0.0	CT	BI	1	1950	-17.0	Sink Bottom, West		
E-30	Q5	1.0	0.0	CT	BI	1	1946	-21.0	West Side Sink		
E-30	Q5	2.0	0.0	M	BI	1	1962	-34.0	2nd Drawer		
E-30	Q5	4.0	0.0	CT	BI	1	1947	-39.0	Small Sink, North		
E-30	Q5	6.0	0.0	M	BI	1	1964	-44.0	Top Drawer, 3rd Row		
E-30	Q6	3.0	0.0	CT	BI	1	1952	178.0	Top of Counter		
E-30	Q6	2.0	0.0	CT	BI	1	1951	176.0	Top of Counter		
E-30	Q6	1.0	0.0	M	BI	1	1965	-24.0	Cabinet, Top Shelf		
E-30	Q7	4.0	0.0	M	CH	0.5	898	0.0	hood		
E-30	Q7	1.0	0.0	M	CH	0.5	895	0.0	hood		
E-30	Q7	3.0	0.0	M	CH	0.5	897	0.0	hood		
E-30	Q7	2.0	0.0	M	CH	0.5	896	0.0	hood		
E-30	Q7	1.0	0.0	M	BI	1	1966	-67.0	Front Edge		
E-30	Q7	2.0	0.0	CT	BI	1	1953	-75.0	Bottom Center		
E-30	Q7	3.0	0.0	CT	BI	1	1954	-121.0	Side, East		
E-30	Q8	3.0	0.0	M	CH	0.5	901	0.0	hood		
E-30	Q8	2.0	0.0	M	CH	0.5	900	0.0	hood		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-30	Q8	1.0	0.0	M	CH	0.5	899	0.0	hood		
E-30	Q8	4.0	0.0	M	CH	0.5	902	0.0	hood		
E-30	Q8	2.0	0.0	CT	BI	1	1955	-31.0	Bottom Center		
E-30	Q8	1.0	0.0	M	BI	1	1967	-67.0	Front Edge		
E-30	S	12.5	4.0	GB	CH	0.5	923	0.0			
E-30	S	20.5	4.0	GB	CH	0.5	924	0.0			
E-30	S	15.3	5.5	GB	RG	1	1932	-5.0			
E-30	S	1.3	5.5	CT	RG	1	1925	-137.0	In Back of S.E. Hood		
E-30	W	2.7	4.0	GB	CH	0.5	925	4.0			
E-30	W	25.5	4.0	GB	CH	0.5	926	0.0			
E-30	W	22.5	4.8	G	RG	1	1934	-70.0	On N. Sliding Door		
E-30	W	8.5	4.8	G	RG	1	1933	-84.0	On S. Sliding Door		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CTP	15	481.3	347.7	1,176.8	13,677	32,177
CTX	25	1,111.6	239.3	1,590.1	14,090	32,590
G	0	0.0	0.0	0.0	12,500	31,000
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
P	0	0.0	0.0	0.0	12,500	31,000
PL	15	420.0	320.3	1,060.6	13,561	32,061
VT	15	272.3	159.9	592.2	13,092	31,592

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:20:09 PM

Survey Unit Number: 102 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

32 Survey points processed and 7 matrices processed

S+ = 32 Wc = 21

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 103 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	C-1	FCNSEW	Q1Q2Q7	1161	
Main	C-1a	FCNSEW	Q1Q7	715	
Main	E-10	FCNSEW	Q1Q2Q3Q4Q7	1505	
Main	E-2	FCNSEW	Q1Q2Q3Q4Q7	1735	
Main	E-8	FCNSEW	Q1Q2Q3Q4Q5Q7	1892	
			Total Area	7008	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	G	596.0
Background	Fail	Minimum Background	GB	-139.0
DCGLw	Pass	Difference		735.0
DCGLavg	Pass	Average Activity	56.6	
EMC	Pass	Average Below DCGL	56.6	
Wilcoxon Rank Sum Test	N/A	Average Background	362.4	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 103 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-1	Q1	2.0	0.0	M	CH	0.5	1114	81.0	SINK	C	
C-1	Q1	1.0	0.0	M	CH	0.5	1113	70.0	Sink	C	
C-1	Q1	3.0	0.0	M	CH	0.5	1115	66.0	Sink	C	
C-1	Q1	4.0	0.0	M	CH	0.5	1116	63.0	Sink	C	
C-1	Q7	1.0	0.0	M	BI	1	1802	2.0	Lights	C	
C-1a	Q7	3.0	0.0	M	BI	1	1806	260.0	Return Vent	C	
C-1a	Q7	2.0	0.0	M	BI	1	1805	104.0	Vent	C	
C-1a	Q7	1.0	0.0	M	BI	1	1804	99.0	Lights - West	C	
E-10	E	21.6	0.3	M	RG	1	1363	22.0	In Q1	C	
E-10	F	0.4	0.4	W	RG	1	1365	136.0	In Q3	C	
E-10	Q1	3.0	0.0	M	BI	1	2222	165.0	Top of Blower	C	
E-10	Q1	2.0	0.0	P	BI	1	2221	74.0	Bottom of Duct	C	
E-10	Q1	1.0	0.0	P	BI	1	2220	59.0	Top of Duct Work	C	
E-10	Q4	1.0	0.0	G	BI	1	1367	596.0	Sink Bottom	C	
E-10	Q4	2.0	0.0	G	BI	1	1368	509.0	Crockery	C	
E-10	Q4	3.0	0.0	M	CH	0.5	518	385.0	sink	C	
E-10	Q4	1.0	0.0	M	CH	0.5	516	379.0	sink	C	
E-10	Q4	2.0	0.0	M	CH	0.5	517	354.0	sink	C	
E-10	Q4	4.0	0.0	M	CH	0.5	519	234.0	sink	C	
E-10	Q7	1.0	0.0	M	BI	1	1812	24.0	Lights	C	
E-10	Q7	2.0	0.0	M	BI	1	1813	8.0	Duct Work	C	
E-2	Q1	4.0	0.0	M	CH	0.5	296	79.0	Sink	C	
E-2	Q1	4.0	0.0	M	BI	1	1583	27.0	N. End, 2nd Drawer	C	
E-2	Q1	3.0	0.0	M	BI	1	1582	7.0	S. End, 4th Drawer	C	
E-2	Q2	7.0	0.0	R	BI	1	1592	161.0	2nd Shelf Top, N.	C	

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-2	Q2	8.0	0.0	M	BI	1	1587	26.0	N. Cabinet, Top,	C	
E-2	Q2	9.0	0.0	M	BI	1	1588	12.0	S. Cabinet, Top,	C	
E-2	Q3	3.0	0.0	M	BI	1	1340	190.0	Top	C	
E-2	Q3	4.0	0.0	M	CH	0.5	292	107.0		C	
E-2	Q3	3.0	0.0	M	CH	0.5	291	104.0		C	
E-2	Q3	1.0	0.0	P	BI	1	2214	91.0	Top of Duct Work	C	
E-2	Q3	2.0	0.0	M	BI	1	2216	39.0	Top of Blower	C	
E-2	Q3	2.0	0.0	M	CH	0.5	290	35.0		C	
E-2	Q3	2.0	0.0	M	BI	1	1338	12.0	Bottom Right	C	
E-2	Q3	3.0	0.0	P	BI	1	2215	11.0	Bottom of Duct	C	
E-2	Q4	3.0	0.0	M	BI	1	1591	41.0	2nd Drawer, E Side	C	
E-2	Q7	1.0	0.0	M	BI	1	1810	14.0	Lights	C	
E-8	Q2	2.0	0.0	M	BI	1	2219	130.0	Top of Blower	C	
E-8	Q2	2.0	0.0	M	BI	1	1620	121.0	Bottom Center, Hood	C	
E-8	Q2	4.0	0.0	M	BI	1	1354	93.0	Bottom	C	
E-8	Q2	3.0	0.0	M	BI	1	1353	86.0	Top	C	
E-8	Q2	1.0	0.0	P	BI	1	2217	78.0	Top of Duct Work	C	
E-8	Q2	3.0	0.0	P	BI	1	2218	65.0	Bottom of Duct	C	
E-8	Q4	7.0	0.0	M	BI	1	1355	22.0	Top Drawer	C	
E-8	Q5	7.0	0.0	M	BI	1	1351	57.0	Top Drawer	C	
E-8	Q5	6.0	0.0	M	BI	1	1628	22.0	2nd Drawer, S.E.	C	
E-8	Q7	1.0	0.0	M	BI	1	1811	11.0	Lights	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 103 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-1	C	10.0	6.3	GB	RG	1	2272	123.0			
C-1	E	7.5	4.5	GB	CH	0.5	535	77.0			
C-1	E	1.7	4.3	GB	CH	0.5	534	22.0			
C-1	E	3.3	8.5	GB	RG	1	1316	-68.0			
C-1	F	5.0	0.5	VT	CH	0.5	546	133.0	in doorway		
C-1	F	7.5	2.5	VT	CH	0.5	543	122.0			
C-1	F	10.0	4.5	VT	CH	0.5	544	114.0			
C-1	F	18.3	4.3	VT	CH	0.5	545	103.0			
C-1	F	2.3	2.0	VT	CH	0.5	542	96.0			
C-1	F	16.2	6.3	VT	RG	1	1318	79.0			
C-1	F	0.6	6.3	VT	RG	1	1317	26.0			
C-1	N	4.7	4.2	GB	CH	0.5	540	85.0			
C-1	N	19.2	3.7	GB	CH	0.5	541	48.0			
C-1	Q1	3.0	0.0	CT	BI	1	1502	207.0	Top, E. End		
C-1	Q1	1.0	0.0	CT	BI	1	1500	171.0	E. of Sink, Top		
C-1	Q1	2.0	0.0	CT	BI	1	1501	162.0	Top, Center		
C-1	Q1	6.0	0.0	CT	BI	1	1323	-19.0	Sink Bottom		
C-1	Q2	3.0	0.0	CT	BI	1	1505	191.0	Top, E. End		
C-1	Q2	2.0	0.0	CT	BI	1	1504	-44.0	Desk, W. End		
C-1	Q2	1.0	0.0	CT	BI	1	1503	-63.0	Center, Desk		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-1	Q2	4.0	0.0	CT	BI	1	1324	-113.0			
C-1	Q7	2.0	0.0	M	BI	1	1803	-31.0	Vents		
C-1	S	3.0	3.0	GB	CH	0.5	536	66.0			
C-1	S	15.8	4.0	GB	CH	0.5	537	48.0			
C-1	S	22.6	8.5	GB	RG	1	1320	10.0	No Ceiling Above 8ft		
C-1	S	7.1	8.5	GB	RG	1	1319	-56.0	No Ceiling Above 8ft 6		
C-1	W	2.2	4.5	GB	CH	0.5	538	206.0			
C-1	W	4.3	4.7	GB	CH	0.5	539	181.0			
C-1a	C	0.3	8.4	GB	BI	1	1325	182.0			
C-1a	C	9.7	8.4	GB	RG	1	2271	153.0			
C-1a	E	3.3	4.5	GB	CH	0.5	548	192.0			
C-1a	E	9.0	4.5	GB	CH	0.5	549	107.0			
C-1a	F	7.8	6.3	VT	CH	0.5	558	122.0			
C-1a	F	5.6	8.4	VT	RG	1	1327	104.0			
C-1a	F	3.5	2.7	VT	CH	0.5	556	99.0			
C-1a	F	5.4	8.4	VT	CH	0.5	557	0.0			
C-1a	F	2.0	5.5	VT	CH	0.5	559	0.0			
C-1a	N	2.5	3.7	GB	CH	0.5	554	262.0			
C-1a	N	6.3	4.0	GB	CH	0.5	555	85.0			
C-1a	Q1	2.0	0.0	CT	BI	1	1328	10.0			
C-1a	Q1	1.0	0.0	CT	BI	1	1508	2.0	Top, N.E.		
C-1a	Q1	2.0	0.0	CT	BI	1	1509	-7.0	Top, N. End		
C-1a	Q1	4.0	0.0	CT	BI	1	1510	-50.0	Top, S.		
C-1a	S	9.2	4.0	GB	CH	0.5	551	309.0			
C-1a	S	4.4	7.2	GB	RG	1	1374	62.0			
C-1a	S	2.5	4.4	GB	CH	0.5	550	37.0			
C-1a	W	8.3	4.0	GB	CH	0.5	553	206.0			
C-1a	W	8.4	10.0	GB	RG	1	1326	182.0			
C-1a	W	2.5	4.5	GB	CH	0.5	552	158.0			
E-10	C	10.8	0.4	GB	RG	1	2262	197.0			
E-10	C	5.0	0.4	GB	BI	1	1360	105.0			
E-10	C	10.8	15.9	GB	RG	1	2266	91.0			
E-10	C	5.0	15.9	GB	BI	1	1361	65.0			
E-10	E	13.2	4.0	GB	CH	0.5	521	0.0			
E-10	E	5.8	3.4	GB	CH	0.5	520	0.0			
E-10	E	6.1	0.3	GB	RG	1	1362	-27.0			
E-10	F	0.4	15.9	CT	RG	1	1366	190.0			
E-10	F	10.3	16.3	VT	CH	0.5	528	0.0			
E-10	F	7.4	22.0	VT	CH	0.5	533	0.0	In doorway		
E-10	F	3.9	15.8	VT	CH	0.5	531	0.0			
E-10	F	10.2	4.6	VT	CH	0.5	529	0.0			
E-10	F	4.2	3.8	VT	CH	0.5	530	0.0			
E-10	N	4.8	3.7	GB	CH	0.5	526	0.0			
E-10	N	11.1	3.7	GB	CH	0.5	527	0.0			
E-10	N	0.4	9.5	M	RG	1	1364	-69.0	Door		
E-10	Q1	2.0	0.0	M	CH	0.5	509	0.0	hood		
E-10	Q1	4.0	0.0	M	CH	0.5	511	0.0	hood		
E-10	Q1	1.0	0.0	M	CH	0.5	508	0.0	hood		
E-10	Q1	3.0	0.0	M	CH	0.5	510	0.0	hood		
E-10	Q1	2.0	0.0	M	BI	1	1371	-8.0			
E-10	Q2	1.0	0.0	CT	BI	1	1629	208.0	N.E. Corner		
E-10	Q2	3.0	0.0	CT	BI	1	1630	195.0	S. End, Top		
E-10	Q2	5.0	0.0	CT	BI	1	1370	118.0			
E-10	Q2	1.0	0.0	M	CH	0.5	512	0.0	sink		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-10	Q2	3.0	0.0	M	CH	0.5	514	0.0	sink		
E-10	Q2	4.0	0.0	M	CH	0.5	515	0.0	sink		
E-10	Q2	2.0	0.0	M	CH	0.5	513	0.0	sink		
E-10	Q2	2.0	0.0	M	BI	1	1636	-3.0	N. Bottom Drawer		
E-10	Q2	4.0	0.0	M	BI	1	1637	-48.0	S. End, Front		
E-10	Q3	2.0	0.0	CT	BI	1	1632	205.0	N., Top		
E-10	Q3	4.0	0.0	CT	BI	1	1634	149.0	S. End, Back		
E-10	Q3	3.0	0.0	CT	BI	1	1633	130.0	Center		
E-10	Q3	5.0	0.0	CT	BI	1	1635	29.0	S. Narrow Bench		
E-10	Q3	6.0	0.0	CT	BI	1	1369	-27.0			
E-10	Q3	1.0	0.0	CT	BI	1	1631	-44.0	Center, Desk		
E-10	S	11.0	3.9	GB	CH	0.5	523	0.0			
E-10	S	5.3	4.0	GB	CH	0.5	522	0.0			
E-10	W	6.1	3.8	GB	CH	0.5	524	0.0			
E-10	W	15.6	3.8	GB	CH	0.5	525	0.0			
E-2	C	6.0	8.9	GB	RG	1	2263	148.0			
E-2	C	13.2	8.9	GB	BI	1	1332	124.0			
E-2	E	13.1	8.4	GB	RG	1	1333	139.0			
E-2	E	2.6	3.9	PL	CH	0.5	297	0.0			
E-2	E	18.1	4.3	PL	CH	0.5	298	0.0			
E-2	F	12.4	16.8	VT	CH	0.5	308	126.0			
E-2	F	12.1	8.9	VT	RG	1	1337	54.0			
E-2	F	9.5	22.0	VT	CH	0.5	309	51.0	In doorway		
E-2	F	10.5	4.6	VT	CH	0.5	307	32.0			
E-2	F	5.0	4.7	VT	CH	0.5	306	0.0			
E-2	F	3.5	17.9	VT	CH	0.5	305	0.0			
E-2	N	16.8	2.8	PL	CH	0.5	304	196.0			
E-2	N	2.1	2.8	PL	CH	0.5	303	76.0			
E-2	N	12.1	2.5	G	RG	1	1336	-5.0			
E-2	Q1	2.0	0.0	CT	BI	1	1580	34.0	S. End, Top		
E-2	Q1	1.0	0.0	CT	BI	1	1579	17.0	N.W. Top		
E-2	Q1	5.0	0.0	CT	BI	1	1342	10.0	Sink Area		
E-2	Q1	3.0	0.0	M	CH	0.5	295	0.0	Sink		
E-2	Q1	2.0	0.0	M	CH	0.5	294	0.0	Sink		
E-2	Q1	1.0	0.0	M	CH	0.5	293	0.0	Sink		
E-2	Q2	1.0	0.0	CT	BI	1	1581	17.0	N.W. End, Top		
E-2	Q2	12.0	0.0	M	BI	1	1339	-5.0	Drawer - Top - NW		
E-2	Q2	11.0	0.0	M	BI	1	1590	-7.0	S. Cabinet, Bottom		
E-2	Q2	13.0	0.0	CT	BI	1	1344	-10.0			
E-2	Q2	4.0	0.0	M	BI	1	1585	-19.0	3rd Drawer, N. End		
E-2	Q2	6.0	0.0	M	BI	1	1586	-22.0	Cabinet, N., 2nd From		
E-2	Q2	5.0	0.0	CT	BI	1	1594	-26.0	S. End, Middle		
E-2	Q2	2.0	0.0	M	BI	1	1584	-26.0	N. End, 2nd Drawer		
E-2	Q2	10.0	0.0	M	BI	1	1589	-26.0	S. Cabinet, E. Side,		
E-2	Q2	3.0	0.0	CT	BI	1	1593	-46.0	N. End, Center		
E-2	Q3	1.0	0.0	M	CH	0.5	289	0.0			
E-2	Q4	4.0	0.0	CT	BI	1	1343	80.0			
E-2	Q4	1.0	0.0	CT	BI	1	1595	15.0	Center Top, W. Side		
E-2	Q4	2.0	0.0	CT	BI	1	1596	-3.0	Top, E. Side, Front		
E-2	S	13.7	3.8	PL	CH	0.5	300	237.0			
E-2	S	7.2	6.6	GB	RG	1	1334	164.0			
E-2	S	1.3	3.7	PL	CH	0.5	299	19.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-2	W	16.1	3.8	PL	CH	0.5	302	35.0			
E-2	W	2.0	3.8	PL	CH	0.5	301	0.0			
E-2	W	8.9	3.5	GB	RG	1	1335	-24.0			
E-8	C	11.2	7.7	GB	RG	1	1345	68.0			
E-8	E	14.3	6.4	GB	RG	1	1346	29.0			
E-8	E	3.8	3.7	GB	CH	0.5	495	0.0			
E-8	E	18.4	4.2	GB	CH	0.5	496	0.0			
E-8	F	12.5	7.7	VT	RG	1	1348	19.0			
E-8	F	15.7	17.2	VT	CH	0.5	503	0.0			
E-8	F	17.3	4.8	VT	CH	0.5	504	0.0			
E-8	F	5.7	5.3	VT	CH	0.5	505	0.0			
E-8	F	3.3	17.0	VT	CH	0.5	506	0.0			
E-8	F	11.0	22.0	VT	CH	0.5	507	0.0	In Doorway		
E-8	N	16.7	3.1	GB	CH	0.5	502	0.0			
E-8	N	4.9	3.6	GB	CH	0.5	501	0.0			
E-8	N	12.5	1.3	M	RG	1	1349	-17.0	Door		
E-8	Q1	11.0	0.0	CT	BI	1	1356	306.0	Old Sink Area		
E-8	Q1	12.0	0.0	CT	BI	1	1357	279.0	Old Sink Area		
E-8	Q1	10.0	0.0	CT	BI	1	1602	181.0	Top, S.E., Center		
E-8	Q1	6.0	0.0	CT	BI	1	1599	169.0	Top, S. of Sink		
E-8	Q1	8.0	0.0	CT	BI	1	1600	147.0	Front of S. Sink, Top		
E-8	Q1	4.0	0.0	CT	BI	1	1598	111.0	Top, N. of Sink		
E-8	Q1	1.0	0.0	CT	BI	1	1597	41.0	Top, N. End, Front		
E-8	Q1	4.0	0.0	M	CH	0.5	488	0.0	sink		
E-8	Q1	2.0	0.0	M	CH	0.5	486	0.0	sink		
E-8	Q1	3.0	0.0	M	CH	0.5	487	0.0	sink		
E-8	Q1	1.0	0.0	M	CH	0.5	485	0.0	sink		
E-8	Q1	9.0	0.0	CT	BI	1	1601	-70.0	Top, S.W. Rollout		
E-8	Q1	7.0	0.0	M	BI	1	1618	-77.0	4th Rollout, 2nd		
E-8	Q1	5.0	0.0	M	BI	1	1617	-80.0	3rd Rollout from N.		
E-8	Q1	3.0	0.0	M	BI	1	1616	-120.0	2nd Rollout, N. End,		
E-8	Q1	2.0	0.0	M	BI	1	1615	-142.0	N. Rollout, Front		
E-8	Q2	1.0	0.0	M	CH	0.5	481	0.0	hood		
E-8	Q2	2.0	0.0	M	CH	0.5	482	0.0	hood		
E-8	Q2	3.0	0.0	M	CH	0.5	483	0.0	hood		
E-8	Q2	4.0	0.0	M	CH	0.5	484	0.0	hood		
E-8	Q2	1.0	0.0	M	BI	1	1619	-114.0	Front of Rollout,		
E-8	Q3	3.0	0.0	CT	BI	1	1604	171.0	S.E. Top, Center		
E-8	Q3	7.0	0.0	CT	BI	1	1606	164.0	Top, North End		
E-8	Q3	1.0	0.0	CT	BI	1	1603	150.0	S.E. Top		
E-8	Q3	5.0	0.0	CT	BI	1	1605	82.0	Top, Center, Front		
E-8	Q3	2.0	0.0	M	BI	1	1621	-24.0	S.E. Rollout, Bottom		
E-8	Q3	8.0	0.0	M	BI	1	1624	-65.0	N. Rollout, Bottom		
E-8	Q3	4.0	0.0	M	BI	1	1622	-72.0	3rd Rollout, E. Side, S.		
E-8	Q3	6.0	0.0	M	BI	1	1623	-84.0	Center Rollout, Top		
E-8	Q4	8.0	0.0	CT	BI	1	1358	188.0	Top		
E-8	Q4	3.0	0.0	CT	BI	1	1608	121.0	Top, S.W. Corner		
E-8	Q4	1.0	0.0	CT	BI	1	1607	101.0	Top, S.E. Corner		
E-8	Q4	2.0	0.0	M	CH	0.5	490	0.0	sink		
E-8	Q4	4.0	0.0	M	CH	0.5	492	0.0	sink		
E-8	Q4	3.0	0.0	M	CH	0.5	491	0.0	sink		
E-8	Q4	1.0	0.0	M	CH	0.5	489	0.0	sink		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-8	Q4	4.0	0.0	CT	BI	1	1609	-38.0	Top, N.E. Corner		
E-8	Q4	2.0	0.0	M	BI	1	1625	-43.0	3rd Drawer, Center, S.		
E-8	Q4	5.0	0.0	M	BI	1	1626	-44.0	N.E. Top Drawer		
E-8	Q4	6.0	0.0	CT	BI	1	1610	-60.0	Front of Sink, N. Side,		
E-8	Q5	8.0	0.0	CT	BI	1	1359	54.0	Top		
E-8	Q5	4.0	0.0	CT	BI	1	1613	-19.0	S.E. Corner, Top		
E-8	Q5	2.0	0.0	CT	BI	1	1611	-24.0	N.W. Corner, Top		
E-8	Q5	5.0	0.0	CT	BI	1	1614	-48.0	S.W. Corner, Top		
E-8	Q5	3.0	0.0	CT	BI	1	1612	-51.0	N.E. Corner, Top		
E-8	Q5	1.0	0.0	M	BI	1	1627	-62.0	1/2 Shelf, N. Side		
E-8	S	9.1	7.8	C	RG	1	1350	154.0			
E-8	S	17.9	3.6	GB	CH	0.5	498	19.0			
E-8	S	1.3	3.6	GB	CH	0.5	497	0.0			
E-8	W	7.7	3.0	GB	RG	1	1347	111.0	Transite Mix		
E-8	W	18.0	3.5	GB	CH	0.5	500	0.0			
E-8	W	4.1	3.6	GB	CH	0.5	499	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CTP	15	481.3	347.7	1,176.8	13,677	32,177
G	0	0.0	0.0	0.0	12,500	31,000
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
P	0	0.0	0.0	0.0	12,500	31,000
PL	15	420.0	320.3	1,060.6	13,561	32,061
R	0	0.0	0.0	0.0	12,500	31,000
VT	15	272.3	159.9	592.2	13,092	31,592
W	0	0.0	0.0	0.0	12,500	31,000

KERR-MCGEE TECHNICAL CENTER
DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:21:26 PM

Survey Unit Number: 103 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

29 Survey points processed and 7 matrices processed

S+ = 29 Wc = 19

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 104 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	C-21	FCNSEW	Q0Q1Q2	1918	Drop Ceiling
Main	C-23	FCNSEW	Q0Q1Q2	1924	Drop Ceiling
Main	C-25	FCNSEW	Q0Q1Q2Q3	1208	Drop Ceiling
Main	C-27	FCNSEW	Q0Q1Q2Q3Q4	2447	Drop Ceiling
			Total Area	7497	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	CTP	249.0
Background	Fail	Minimum Background	RF	-171.0
DCGLw	Pass	Difference		420.0
DCGLavg	Pass	Average Activity	2.0	
EMC	Pass	Average Below DCGL	2.0	
Wilcoxon Rank Sum Test	N/A	Average Background	469.2	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 104 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-21	F	5.0	0.1	RF	CH	0.5	1124	141.0	In Doorway	C	
C-21	F	4.2	18.1	RF	CH	0.5	1121	71.0		C	
C-21	Q1	5.0	0.0	M	BI	1	1229	5.0	Top	C	
C-21	Q2	9.0	0.0	M	BI	1	1230	3.0	Front - Left	C	
C-21	S	1.7	5.3	G	RG	1	1226	6.0		C	
C-23	Q0	1.0	0.0	M	BI	1	1808	82.0		C	
C-23	Q1	1.0	0.0	M	BI	1	1528	5.0	Top, W. Side, Center	C	
C-25	Q2	1.0	0.0	M	BI	1	1533	26.0	Top, N.E. Corner	C	
C-25	Q3	1.0	0.0	M	BI	1	1536	24.0	S. End, 3rd Drawer	C	
C-27	Q1	4.0	0.0	M	BI	1	1277	45.0	Hood	C	
C-27	Q2	2.0	0.0	M	CH	0.5	222	35.0	sink	C	
C-27	Q2	8.0	0.0	M	CH	0.5	228	32.0	sink	C	
C-27	Q2	3.0	0.0	M	CH	0.5	1138	16.0	sink	C	
C-27	Q2	5.0	0.0	M	CH	0.5	225	3.0	sink	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 104 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-21	C	17.4	10.8	GB	RG	1	1221	99.0			
C-21	C	1.3	10.8	GB	RG	1	1220	26.0			
C-21	E	14.9	4.9	GB	CH	0.5	1132	144.0			
C-21	E	5.9	5.0	GB	CH	0.5	1131	142.0			
C-21	F	17.7	4.3	RF	CH	0.5	1123	54.0			
C-21	F	17.5	10.8	VT	RG	1	1225	54.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-21	F	3.8	3.3	RF	CH	0.5	1120	14.0			
C-21	F	13.7	16.3	RF	CH	0.5	1122	0.0			
C-21	F	1.4	10.8	VT	RG	1	1224	-48.0			
C-21	N	15.3	4.0	GB	CH	0.5	1126	57.0			
C-21	N	17.5	5.0	GB	RG	1	1223	18.0			
C-21	N	2.2	4.3	GB	CH	0.5	1125	0.0			
C-21	N	1.4	5.0	GB	RG	1	1222	-80.0			
C-21	Q0	1.0	0.0	M	BI	1	1807	-85.0			
C-21	Q1	2.0	0.0	M	BI	1	1513	-101.0	Top, Center		
C-21	Q1	4.0	0.0	M	BI	1	1515	-120.0	N. Side, Center		
C-21	Q1	3.0	0.0	M	BI	1	1514	-123.0	E. Side, Bottom		
C-21	Q1	1.0	0.0	M	BI	1	1512	-145.0	S. Side, Center		
C-21	Q2	3.0	0.0	CT	BI	1	1523	-27.0	E. Side, Top Center		
C-21	Q2	7.0	0.0	M	BI	1	1521	-50.0	N. Side, Center		
C-21	Q2	1.0	0.0	M	BI	1	1516	-67.0	W. Side, Mid-Top		
C-21	Q2	8.0	0.0	M	BI	1	1522	-72.0	E. Side, Top Center		
C-21	Q2	4.0	0.0	M	BI	1	1518	-75.0	S. Side, Top E. Corner		
C-21	Q2	6.0	0.0	M	BI	1	1520	-106.0	N. Side, Top W.		
C-21	Q2	5.0	0.0	M	BI	1	1519	-130.0	S. Side, Bottom, W.		
C-21	Q2	2.0	0.0	M	BI	1	1517	-164.0	W. Side, N. Bottom		
C-21	S	3.1	5.2	GB	CH	0.5	1129	96.0			
C-21	S	17.3	4.8	GB	CH	0.5	1130	2.0			
C-21	S	17.8	5.3	G	RG	1	1227	-16.0			
C-21	W	18.3	4.2	GB	CH	0.5	1128	0.0			
C-21	W	8.8	3.8	GB	CH	0.5	1127	0.0			
C-23	C	12.1	17.6	GB	RG	1	2273	73.0			
C-23	C	12.1	1.5	GB	RG	1	2274	73.0			
C-23	C	7.1	17.6	GB	BI	1	1232	19.0			
C-23	C	7.1	1.5	GB	BI	1	1231	5.0			
C-23	E	20.5	4.2	GB	RG	1	2291	15.0			
C-23	E	2.3	3.8	GB	CH	0.5	1137	0.0			
C-23	E	15.6	3.8	GB	CH	0.5	1136	0.0			
C-23	E	4.4	4.2	M	RG	1	1236	-93.0	Fell on Q1 - A/C unit		
C-23	F	16.0	0.1	VT	CH	0.5	75	69.0	In doorway		
C-23	F	4.0	15.1	VT	CH	0.5	72	19.0			
C-23	F	3.3	2.8	VT	CH	0.5	71	6.0			
C-23	F	15.6	16.5	VT	CH	0.5	73	0.0			
C-23	F	17.1	3.9	VT	CH	0.5	74	0.0			
C-23	F	7.3	17.6	VT	RG	1	1238	-10.0			
C-23	F	7.3	1.5	VT	RG	1	1237	-14.0			
C-23	N	15.0	4.2	GB	CH	0.5	70	0.0			
C-23	N	3.5	4.3	GB	CH	0.5	69	0.0			
C-23	N	12.5	1.3	GB	BI	1	1233	-29.0			
C-23	N	7.3	8.5	GB	BI	1	1239	-32.0			
C-23	Q1	5.0	0.0	M	BI	1	1241	-7.0	Front Vent Filter Area		
C-23	Q1	2.0	0.0	M	BI	1	1529	-55.0	S. Side, Center		
C-23	Q1	4.0	0.0	M	BI	1	1531	-97.0	N. Side, Center		
C-23	Q1	3.0	0.0	M	BI	1	1530	-108.0	Lower E. Side, Center		
C-23	Q2	2.0	0.0	M	BI	1	1526	-9.0	Top, Center		
C-23	Q2	5.0	0.0	M	BI	1	1242	-15.0	Front Button Area		
C-23	Q2	1.0	0.0	CT	BI	1	1524	-19.0	S. W. End, Table		
C-23	Q2	3.0	0.0	CT	BI	1	1525	-36.0	Bottom, Table		
C-23	Q2	4.0	0.0	M	BI	1	1527	-89.0	Back, Center		
C-23	S	2.3	2.9	GB	CH	0.5	1134	0.0			
C-23	S	17.6	3.8	GB	CH	0.5	1135	0.0			
C-23	W	14.8	4.2	GB	CH	0.5	68	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-23	W	3.3	3.8	GB	CH	0.5	67	0.0			
C-23	W	17.6	8.8	GB	RG	1	1235	-41.0			
C-23	W	1.5	8.8	GB	RG	1	1234	-51.0			
C-25	E	11.8	3.1	GB	CH	0.5	82	0.0			
C-25	E	3.6	3.5	GB	CH	0.5	81	0.0			
C-25	E	3.8	8.1	GB	RG	1	1245	-54.0	No Wall Above 8'6"		
C-25	E	19.8	8.1	GB	RG	1	1246	-56.0	No Wall Above 8'6"		
C-25	F	0.1	12.5	CT	CH	0.5	96	47.0	In Doorway		
C-25	F	7.4	17.6	CT	CH	0.5	91	0.0			
C-25	F	1.0	18.1	CT	CH	0.5	90	0.0			
C-25	F	1.8	3.8	CT	CH	0.5	89	0.0			
C-25	F	5.3	3.8	CT	CH	0.5	93	0.0			
C-25	F	2.0	2.2	M	RG	1	1243	-43.0	Fell on Q2		
C-25	F	2.0	18.3	VT	RG	1	1244	-69.0			
C-25	N	1.1	3.2	GB	CH	0.5	87	0.0			
C-25	N	5.3	3.7	GB	CH	0.5	88	0.0			
C-25	N	2.0	8.0	GB	BI	1	1247	-57.0	No Wall Above 8'6"		
C-25	Q0	1.0	0.0	M	BI	1	1809	-30.0			
C-25	Q1	2.0	0.0	CT	BI	1	1538	9.0	Top, Center		
C-25	Q1	1.0	0.0	M	CH	0.5	77	0.0			
C-25	Q1	2.0	0.0	M	CH	0.5	78	0.0			
C-25	Q1	4.0	0.0	M	CH	0.5	80	0.0			
C-25	Q1	3.0	0.0	M	CH	0.5	79	0.0			
C-25	Q1	1.0	0.0	M	BI	1	1532	-68.0	Inside, Bottom		
C-25	Q1	3.0	0.0	CT	BI	1	1251	-100.0	Front Top Sink		
C-25	Q2	2.0	0.0	M	BI	1	1534	-26.0	Bottom, N.E. Corner		
C-25	Q2	4.0	0.0	M	BI	1	1249	-30.0	Top Center		
C-25	Q2	3.0	0.0	M	BI	1	1535	-73.0	E. Side, Center		
C-25	Q3	4.0	0.0	CT	BI	1	1540	3.0	S.W. Corner, Top		
C-25	Q3	2.0	0.0	M	BI	1	1537	-14.0	N. End, Bottom		
C-25	Q3	3.0	0.0	CT	BI	1	1539	-22.0	N.W. Corner, Top		
C-25	Q3	5.0	0.0	M	BI	1	1250	-58.0	Front		
C-25	S	4.8	3.8	GB	CH	0.5	84	0.0			
C-25	S	1.4	3.8	GB	CH	0.5	83	0.0			
C-25	W	19.3	3.1	PL	CH	0.5	86	0.0			
C-25	W	5.2	3.0	PL	CH	0.5	85	0.0			
C-27	C	13.0	10.9	CT	RG	1	2275	245.0			
C-27	C	16.9	8.2	M	BI	1	1274	-94.0			
C-27	E	13.1	8.5	GB	RG	1	1269	48.0			
C-27	E	3.3	3.8	GB	CH	0.5	113	0.0			
C-27	E	20.1	3.8	GB	CH	0.5	115	0.0			
C-27	F	0.8	10.9	CT	RG	1	1271	195.0	Fell on Counter Top		
C-27	F	5.1	2.3	VT	CH	0.5	121	54.0			
C-27	F	16.9	10.9	VT	RG	1	1273	38.0			
C-27	F	7.5	0.1	VT	CH	0.5	125	35.0	In Doorway		
C-27	F	21.6	18.2	VT	CH	0.5	123	19.0			
C-27	F	18.6	3.5	VT	CH	0.5	124	16.0			
C-27	F	6.3	18.8	VT	CH	0.5	122	6.0			
C-27	F	24.4	16.0	VT	CH	0.5	126	0.0	In Doorway E		
C-27	N	0.8	3.0	CT	RG	1	1272	191.0	Fell on CTP Splash		
C-27	N	16.9	3.0	GB	RG	1	1270	44.0			
C-27	N	3.3	4.3	GB	CH	0.5	119	0.0			
C-27	N	23.1	4.9	GB	CH	0.5	120	0.0			
C-27	Q1	2.0	0.0	M	CH	0.5	102	0.0			
C-27	Q1	3.0	0.0	M	CH	0.5	103	0.0			
C-27	Q1	4.0	0.0	M	CH	0.5	104	0.0			
C-27	Q1	1.0	0.0	M	CH	0.5	98	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
C-27	Q1	3.0	0.0	M	BI	1	1563	-29.0	Under Hood, N. End		
C-27	Q1	2.0	0.0	M	BI	1	1562	-56.0	Bottom, Center		
C-27	Q1	1.0	0.0	M	BI	1	1561	-121.0	N.E. Bottom		
C-27	Q2	1.0	0.0	CT	BI	1	1545	249.0	N. of Sink		
C-27	Q2	2.0	0.0	CT	BI	1	1546	208.0	Front Sink, Top		
C-27	Q2	6.0	0.0	CT	BI	1	1549	145.0	Top, Front Center		
C-27	Q2	8.0	0.0	CT	BI	1	1550	104.0	Top Rear, S. End		
C-27	Q2	10.0	0.0	CT	BI	1	1278	41.0	CTP - West		
C-27	Q2	1.0	0.0	M	CH	0.5	221	0.0	sink		
C-27	Q2	7.0	0.0	M	CH	0.5	227	0.0	sink		
C-27	Q2	6.0	0.0	M	CH	0.5	226	0.0	sink		
C-27	Q2	4.0	0.0	M	CH	0.5	224	0.0	sink		
C-27	Q2	4.0	0.0	CT	BI	1	1547	-32.0	N. Sink, Drain		
C-27	Q2	3.0	0.0	M	BI	1	1558	-44.0	Under Sink, Center		
C-27	Q2	5.0	0.0	CT	BI	1	1548	-53.0	S. Sink		
C-27	Q2	7.0	0.0	M	BI	1	1559	-53.0	Top Drawer, 2nd from		
C-27	Q2	9.0	0.0	M	BI	1	1560	-70.0	4th Drawer, 5th from		
C-27	Q3	6.0	0.0	CT	BI	1	1544	191.0	Top, W. End		
C-27	Q3	1.0	0.0	CT	BI	1	1541	159.0	Top, Above 1st Set of		
C-27	Q3	3.0	0.0	CT	BI	1	1542	147.0	Top, Front Center		
C-27	Q3	5.0	0.0	CT	BI	1	1543	121.0	Top, W. Center		
C-27	Q3	8.0	0.0	CT	BI	1	1279	69.0	CTP - North		
C-27	Q3	7.0	0.0	M	BI	1	1557	-12.0	W. End, 3rd Drawer		
C-27	Q3	4.0	0.0	M	BI	1	1556	-62.0	Shelf, Bottom		
C-27	Q3	2.0	0.0	M	BI	1	1555	-85.0	1st Drawer, Front		
C-27	Q4	5.0	0.0	CT	BI	1	1553	125.0	Top, Center		
C-27	Q4	7.0	0.0	CT	BI	1	1554	114.0	Top, N. Desk		
C-27	Q4	3.0	0.0	CT	BI	1	1552	82.0	S.W. Corner, Top		
C-27	Q4	8.0	0.0	CT	BI	1	1280	15.0	CTP - S.E.		
C-27	Q4	1.0	0.0	CT	BI	1	1551	-50.0	Top, Bench		
C-27	Q4	6.0	0.0	M	BI	1	1566	-55.0	Drawer, S. Top		
C-27	Q4	4.0	0.0	M	BI	1	1565	-56.0	Top Shelf		
C-27	Q4	2.0	0.0	M	BI	1	1564	-67.0	Bottom Drawer, W.		
C-27	S	19.3	4.0	GB	CH	0.5	1139	0.0			
C-27	S	10.1	3.3	GB	CH	0.5	116	0.0			
C-27	S	23.7	5.2	M	RG	1	1275	-152.0	Fell in Hood		
C-27	S	7.6	5.2	G	RG	1	1276	-159.0			
C-27	W	20.1	4.3	PL	CH	0.5	118	111.0			
C-27	W	7.1	4.3	PL	CH	0.5	117	98.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
CT	15	537.5	62.0	661.6	13,162	31,662
CTP	15	481.3	347.7	1,176.8	13,677	32,177
CTX	25	1,111.6	239.3	1,590.1	14,090	32,590
G	0	0.0	0.0	0.0	12,500	31,000
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
PL	15	420.0	320.3	1,060.6	13,561	32,061
RF	15	-61.2	59.4	57.5	12,558	31,058
VT	15	272.3	159.9	592.2	13,092	31,592

KERR-MCGEE TECHNICAL CENTER

Threshold Comparison Test Report -

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:24:02 PM

Survey Unit Number: 104 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

28 Survey points processed and 6 matrices processed

S+ = 28 Wc = 18

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 105 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	F-12	FCNSEW	Q1Q2Q3Q4Q5Q6Q7	2074	
Main	F-2&4	FCNSEW	Q0Q1Q2Q3Q4Q5Q6	3268	Non-rectangle, partial susp. Ceiling
Main	F-4a	FCNSEW		624	
			Total Area	5966	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	CTP	287.0
Background	Fail	Minimum Background	GB	-139.0
DCGLw	Pass	Difference		426.0
DCGLavg	Pass	Average Activity	51.2	
EMC	Pass	Average Below DCGL	51.2	
Wilcoxon Rank Sum Test	N/A	Average Background	362.4	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 105 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
F-12	E	12.9	7.6	M	RG	1	1408	39.0	Inside of Cabinet	C	
F-12	N	18.2	1.3	M	RG	1	1409	3.0	on NE door	C	
F-12	Q2	2.0	0.0	M	BI	1	2234	63.0	Top of Blower	C	
F-12	Q2	1.0	0.0	P	BI	1	2228	57.0	Top of Duct Work	C	
F-12	Q2	3.0	0.0	P	BI	1	2229	24.0	Top of Elbow, Duct	C	
F-12	Q2	4.0	0.0	M	BI	1	2235	7.0	Bottom of Blower	C	
F-12	Q3	2.0	0.0	M	CH	0.5	1040	79.0		C	
F-12	Q3	5.0	0.0	P	BI	1	2230	67.0	Bottom of Duct	C	
F-12	Q4	7.0	0.0	P	BI	1	2232	128.0	Top of Duct Work	C	
F-12	Q4	10.0	0.0	P	BI	1	2233	94.0	Bottom of Duct	C	
F-12	Q4	8.0	0.0	M	BI	1	2236	80.0	Top of Blower	C	
F-12	Q4	9.0	0.0	M	BI	1	2237	78.0	Bottom of Blower	C	
F-12	Q4	1.0	0.0	M	BI	1	1421	67.0	Bottom	C	
F-12	Q4	3.0	0.0	M	CH	0.5	937	22.0	hood	C	
F-12	Q5	4.0	0.0	M	CH	0.5	951	41.0	sink	C	
F-12	Q6	7.0	0.0	M	BI	1	1422	43.0	Inside Drawer	C	
F-12	Q7	3.0	0.0	M	BI	1	1815	159.0	Light Fixtures	C	
F-12	Q7	1.0	0.0	M	BI	1	1800	145.0	W. Row Lights, S.	C	
F-12	S	20.7	5.4	M	RG	1	1411	68.0	Inside	C	
F-12	S	6.5	5.4	M	RG	1	1410	63.0	Inside SE cabinet	C	
F-2&4	Q1	2.0	0.0	M	BI	1	1658	63.0	N. End, Top Shelf	C	
F-2&4	Q1	4.0	0.0	M	BI	1	1659	46.0	Middle, Top Shelf	C	
F-2&4	Q1	6.0	0.0	M	BI	1	1660	27.0	S. End, Bottom Shelf	C	
F-2&4	Q1	8.0	0.0	M	BI	1	1394	19.0	Inside Cabinet	C	
F-2&4	Q2	6.0	0.0	M	BI	1	1663	150.0	3rd Drawer, Center	C	

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
F-2&4	Q2	8.0	0.0	M	BI	1	1664	113.0	E. End, Bottom Shelf	C	
F-2&4	Q2	4.0	0.0	M	BI	1	1662	87.0	Top Drawer, Middle	C	
F-2&4	Q2	2.0	0.0	M	BI	1	1661	63.0	W. End, 3rd Drawer	C	
F-2&4	Q2	13.0	0.0	M	BI	1	1396	41.0	Inside Drawer	C	
F-2&4	Q2	10.0	0.0	M	BI	1	1665	24.0	Bottom Shelf, N.E.	C	
F-2&4	Q3	4.0	0.0	M	BI	1	1667	65.0	3rd Drawer, Center	C	
F-2&4	Q3	2.0	0.0	M	BI	1	1666	41.0	Top Drawer, S. End	C	
F-2&4	Q3	6.0	0.0	M	BI	1	1668	26.0	2rd Drawer, N. End	C	
F-2&4	Q4	4.0	0.0	M	BI	1	1673	87.0	W. End, Bottom	C	
F-2&4	Q4	2.0	0.0	M	BI	1	1672	36.0	2nd Drawer, E. End	C	
F-2&4	Q5	4.0	0.0	M	BI	1	1675	114.0	2nd From Bottom in	C	
F-2&4	Q5	2.0	0.0	M	BI	1	1674	68.0	S.E. End, Top	C	
F-2&4	Q6	6.0	0.0	M	BI	1	1671	75.0	S.E. End, Top Shelf	C	
F-2&4	Q6	4.0	0.0	M	BI	1	1670	39.0	Center, E. Side, 2nd	C	
F-2&4	Q6	2.0	0.0	M	BI	1	1669	27.0	Bottom Shelf, N.E.	C	
F-2&4	Q7	2.0	0.0	M	BI	1	1796	118.0	Top of Vent Hood, S.	C	
F-2&4	Q7	4.0	0.0	M	BI	1	1798	92.0	S.E. Return Air Vent	C	
F-2&4	Q7	3.0	0.0	M	BI	1	1797	89.0	3rd Row Lights from	C	
F-2&4	Q7	1.0	0.0	M	BI	1	1795	63.0	W. Row of Dropped	C	
F-2&4	Q7	6.0	0.0	M	BI	1	1814	34.0	Light Fixtures	C	
F-2&4	Q7	5.0	0.0	M	BI	1	1799	26.0	E. Row Lights, N.	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 105 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
F-12	C	18.2	8.8	C	RG	1	1405	101.0			
F-12	C	4.0	8.8	C	RG	1	1404	101.0			
F-12	E	3.4	4.3	GB	CH	0.5	940	111.0			
F-12	E	19.3	3.3	GB	CH	0.5	941	35.0			
F-12	F	4.0	8.8	VT	RG	1	1412	157.0			
F-12	F	17.1	12.6	VT	CH	0.5	1031	54.0			
F-12	F	18.2	8.8	VT	RG	1	1413	15.0			
F-12	F	7.2	15.0	VT	CH	0.5	1028	13.0			
F-12	F	7.9	4.6	VT	CH	0.5	1029	0.0			
F-12	F	4.0	21.7	VT	CH	0.5	1036	0.0	In NW door		
F-12	F	23.0	21.7	VT	CH	0.5	1034	0.0	in NE door		
F-12	F	19.8	2.9	VT	CH	0.5	1033	0.0			
F-12	N	16.2	3.7	GB	CH	0.5	947	41.0			
F-12	N	8.3	3.8	GB	CH	0.5	946	25.0			
F-12	N	4.0	1.3	C	RG	1	1406	3.0			
F-12	Q1	4.0	0.0	CT	BI	1	1686	285.0	N. End, Top Front, by		
F-12	Q1	2.0	0.0	CT	BI	1	1684	210.0	Middle, Back		
F-12	Q1	3.0	0.0	CT	BI	1	1685	185.0	S. Side Sink, Front,		
F-12	Q1	1.0	0.0	CT	BI	1	1683	147.0	S. End, Top Front		
F-12	Q1	5.0	0.0	CT	BI	1	1414	80.0	Sink Bottom - W Wall		
F-12	Q1	3.0	0.0	M	CH	0.5	1044	0.0			
F-12	Q1	1.0	0.0	M	CH	0.5	1042	0.0			
F-12	Q1	2.0	0.0	M	CH	0.5	1043	0.0			

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Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
F-12	Q1	4.0	0.0	M	CH	0.5	1045	0.0			
F-12	Q1	6.0	0.0	M	BI	1	1420	-9.0	Inside Drawer		
F-12	Q2	1.0	0.0	CT	BI	1	1415	77.0	Bottom		
F-12	Q2	1.0	0.0	M	CH	0.5	1037	0.0			
F-12	Q2	2.0	0.0	M	CH	0.5	1038	0.0			
F-12	Q3	1.0	0.0	CT	BI	1	1416	14.0	Bottom		
F-12	Q3	3.0	0.0	M	CH	0.5	1041	0.0			
F-12	Q3	6.0	0.0	P	BI	1	2231	0.0	Top of Duct Work		
F-12	Q3	1.0	0.0	M	CH	0.5	1039	0.0			
F-12	Q4	1.0	0.0	M	CH	0.5	935	0.0	hood		
F-12	Q4	2.0	0.0	M	CH	0.5	936	0.0	hood		
F-12	Q4	4.0	0.0	M	CH	0.5	938	0.0	hood		
F-12	Q5	7.0	0.0	CT	BI	1	1419	287.0			
F-12	Q5	3.0	0.0	CT	BI	1	1678	261.0	Top, Center		
F-12	Q5	6.0	0.0	CT	BI	1	1418	261.0	Front Top of Sink		
F-12	Q5	1.0	0.0	CT	BI	1	1676	248.0	N. End, Front, Top		
F-12	Q5	5.0	0.0	CT	BI	1	1417	229.0	Front Top of Sink		
F-12	Q5	2.0	0.0	CT	BI	1	1677	203.0	S. of Sink, Front		
F-12	Q5	4.0	0.0	CT	BI	1	1679	193.0	S. End, Front		
F-12	Q5	2.0	0.0	M	CH	0.5	949	0.0	sink		
F-12	Q5	3.0	0.0	M	CH	0.5	950	0.0	sink		
F-12	Q5	1.0	0.0	M	CH	0.5	948	0.0	Sink		
F-12	Q6	1.0	0.0	CT	BI	1	1680	-36.0	Top, S.E. Corner		
F-12	Q6	6.0	0.0	M	BI	1	1689	-36.0	S.W. Corner, 2nd from		
F-12	Q6	5.0	0.0	CT	BI	1	1682	-60.0	S.W. Corner, Top		
F-12	Q6	2.0	0.0	M	BI	1	1687	-63.0	Top Shelf, S.E. Side		
F-12	Q6	3.0	0.0	CT	BI	1	1681	-99.0	Top, Center, S. Side		
F-12	Q6	4.0	0.0	M	BI	1	1688	-108.0	S. Side, Middle, 3rd		
F-12	Q7	2.0	0.0	M	BI	1	1801	-135.0	E. Row Lights, N. End		
F-12	S	2.3	4.4	GB	CH	0.5	942	152.0			
F-12	W	6.6	3.8	GB	CH	0.5	943	142.0			
F-12	W	8.8	10.2	C	RG	1	1407	132.0			
F-12	W	17.8	3.5	GB	CH	0.5	944	0.0			
F-2&4	C	14.0	19.4	C	RG	1	1376	113.0			
F-2&4	C	28.2	5.3	GB	RG	1	1384	96.0			
F-2&4	C	42.3	5.3	GB	RG	1	1386	73.0			
F-2&4	C	42.3	19.4	GB	RG	1	1387	62.0			
F-2&4	C	28.2	19.4	GB	RG	1	1385	48.0			
F-2&4	C	14.0	5.3	C	RG	1	1375	36.0			
F-2&4	E	2.4	4.0	GB	CH	0.5	342	0.0			
F-2&4	E	17.3	4.8	GB	CH	0.5	344	0.0			
F-2&4	E	12.2	4.1	GB	CH	0.5	343	0.0			
F-2&4	F	14.0	12.2	VT	RG	1	1388	145.0			
F-2&4	F	42.3	12.2	VT	RG	1	1390	72.0			
F-2&4	F	28.2	12.2	VT	RG	1	1389	56.0			
F-2&4	F	37.8	8.0	VT	CH	0.5	357	16.0			
F-2&4	F	12.3	4.8	VT	CH	0.5	354	9.0			
F-2&4	F	23.2	17.2	VT	CH	0.5	356	0.0			
F-2&4	F	23.4	7.2	VT	CH	0.5	355	0.0			
F-2&4	F	6.5	22.0	VT	CH	0.5	360	0.0	In Doorway		
F-2&4	F	38.7	22.0	VT	CH	0.5	361	0.0		In Doorway	
F-2&4	F	38.7	17.3	VT	CH	0.5	358	0.0			
F-2&4	F	6.5	16.5	VT	CH	0.5	353	0.0			
F-2&4	N	14.0	4.3	C	RG	1	1377	50.0			
F-2&4	N	42.3	4.3	C	RG	1	1379	19.0			
F-2&4	N	8.8	5.3	PL	CH	0.5	350	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
F-2&4	N	34.0	5.1	PL	CH	0.5	352	0.0			
F-2&4	N	23.0	5.4	PL	CH	0.5	351	0.0			
F-2&4	N	28.2	4.3	C	RG	1	1378	-58.0			
F-2&4	Q1	5.0	0.0	CT	BI	1	1642	120.0	Top, S. End, Back		
F-2&4	Q1	1.0	0.0	CT	BI	1	1640	51.0	N. End, Top		
F-2&4	Q1	3.0	0.0	CT	BI	1	1641	46.0	Top, Center Front		
F-2&4	Q1	7.0	0.0	CT	BI	1	1397	15.0			
F-2&4	Q2	5.0	0.0	CT	BI	1	1645	239.0	Top, Center		
F-2&4	Q2	1.0	0.0	CT	BI	1	1643	132.0	W. End, Top Front		
F-2&4	Q2	7.0	0.0	CT	BI	1	1646	116.0	E. End, Top		
F-2&4	Q2	9.0	0.0	CT	BI	1	1647	111.0	E. End, Center		
F-2&4	Q2	3.0	0.0	CT	BI	1	1644	85.0	Middle, Top		
F-2&4	Q2	12.0	0.0	CT	BI	1	1403	80.0			
F-2&4	Q2	2.0	0.0	M	CH	0.5	339	0.0	sink		
F-2&4	Q2	3.0	0.0	M	CH	0.5	340	0.0	sink		
F-2&4	Q2	1.0	0.0	M	CH	0.5	338	0.0	sink		
F-2&4	Q2	4.0	0.0	M	CH	0.5	341	0.0	sink		
F-2&4	Q2	11.0	0.0	CT	BI	1	1402	-43.0	Inside Sink - E. Side		
F-2&4	Q3	5.0	0.0	CT	BI	1	1650	51.0	Top, N. End		
F-2&4	Q3	3.0	0.0	CT	BI	1	1649	48.0	Center, Top		
F-2&4	Q3	1.0	0.0	CT	BI	1	1648	27.0	S. End, Front Top		
F-2&4	Q3	7.0	0.0	CT	BI	1	1400	21.0			
F-2&4	Q4	3.0	0.0	CT	BI	1	1655	65.0	W. End, Front Top		
F-2&4	Q4	1.0	0.0	CT	BI	1	1654	14.0	Top, E. End, Front		
F-2&4	Q4	5.0	0.0	CT	BI	1	1399	-36.0			
F-2&4	Q5	1.0	0.0	CT	BI	1	1656	58.0	N. E. Corner, Top		
F-2&4	Q5	3.0	0.0	CT	BI	1	1657	50.0	W. Side, Center Top		
F-2&4	Q5	5.0	0.0	CT	BI	1	1398	10.0			
F-2&4	Q6	5.0	0.0	CT	BI	1	1653	99.0	Top, S.E. End		
F-2&4	Q6	3.0	0.0	CT	BI	1	1652	82.0	Top, Center		
F-2&4	Q6	1.0	0.0	CT	BI	1	1651	43.0	N. E. Corner, Top		
F-2&4	Q6	7.0	0.0	CT	BI	1	1401	21.0			
F-2&4	Q6	8.0	0.0	M	BI	1	1395	-3.0	Inside Drawer		
F-2&4	S	23.3	4.8	PL	CH	0.5	346	107.0			
F-2&4	S	28.8	4.9	PL	CH	0.5	347	82.0			
F-2&4	S	1.0	2.0	C	RG	1	1380	53.0			
F-2&4	S	6.4	4.7	PL	CH	0.5	345	0.0			
F-2&4	S	15.2	2.0	M	RG	1	1391	-27.0	Front		
F-2&4	S	29.3	2.0	M	RG	1	1392	-55.0	Front of S. Cabinet		
F-2&4	W	2.0	4.1	PL	CH	0.5	348	25.0			
F-2&4	W	15.3	3.8	PL	CH	0.5	349	0.0			
F-2&4	W	12.2	0.2	M	RG	1	1393	-36.0	Front of W. Cabinet		
F-4a	C	10.8	1.8	C	RG	1	1423	114.0			
F-4a	E	5.3	3.6	GB	CH	0.5	334	0.0			
F-4a	F	10.8	1.6	VT	RG	1	1426	123.0			
F-4a	N	10.8	7.8	C	RG	1	1424	21.0			
F-4a	N	6.2	3.8	PL	CH	0.5	335	0.0			
F-4a	S	2.9	3.5	PL	CH	0.5	336	3.0			
F-4a	W	1.6	3.3	C	RG	1	1425	133.0			
F-4a	W	5.4	2.3	PL	CH	0.5	333	0.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CTP	15	481.3	347.7	1,176.8	13,677	32,177
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
P	0	0.0	0.0	0.0	12,500	31,000
PL	15	420.0	320.3	1,060.6	13,561	32,061
VT	15	272.3	159.9	592.2	13,092	31,592

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:25:03 PM

Survey Unit Number: 105 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

30 Survey points processed and 4 matrices processed

S+ = 30 Wc = 20

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 106 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	P-1	FNSEW	Q1	5981	Pilot Plan Pit Area. Pit was filled w concrete.
Main	P-2U	CNE		1132	Sample Prep Room above susp ceiling. Susp
Main	G-1	FCNSEW	Q1Q2Q3Q4Q5Q6Q7	1033	Men's changing room off P-1 and P-2
			Total Area	8146	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	CB	449.0
Background	Fail	Minimum Background	W	0.0
DCGLw	Pass	Difference		449.0
DCGLavg	Pass	Average Activity	151.3	
EMC	Pass	Average Below DCGL	151.3	
Wilcoxon Rank Sum Test	N/A	Average Background	743.0	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 106 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
G-1	Q1	7.0	0.0	M	BI	1	2146	425.0	D1 - floor drain	C	
P-1	Q1	3.0	0.0	M	BI	1	2011	150.0	Top, Left Handrail	C	
P-1	Q1	1.0	0.0	M	BI	1	2009	22.0	Bottom Step	C	
P-1	Q1	4.0	0.0	M	BI	1	2012	21.0	Top Step	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 106 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
G-1	C	3.4	7.3	PL	BI	1	2130	425.0			
G-1	C	3.3	21.3	PL	BI	1	2129	-17.0			
G-1	C	3.4	23.8	C	RG	1	2152	-371.0	Plaster		
G-1	C	3.4	8.3	C	RG	1	2153	-437.0	Plaster		
G-1	E	14.9	3.0	CT	BI	1	2132	330.0			
G-1	E	2.7	6.7	PL	BI	1	2127	-10.0			
G-1	F	2.0	21.6	CT	BI	1	2137	408.0			
G-1	F	4.5	6.1	CT	BI	1	2139	355.0			
G-1	F	5.3	27.4	CT	BI	1	2136	332.0			
G-1	F	6.0	17.3	CT	BI	1	2138	294.0			
G-1	F	5.0	23.8	CT	RG	1	2154	44.0	Tile		
G-1	F	5.0	8.3	CT	RG	1	2155	17.0	Tile		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
G-1	N	5.6	4.3	CT	BI	1	2131	330.0			
G-1	N	1.9	6.4	PL	BI	1	2126	-14.0			
G-1	Q1	4.0	0.0	C	BI	1	2143	-2.0	sk-4		
G-1	Q1	6.0	0.0	C	BI	1	2145	-5.0	drain		
G-1	Q1	5.0	0.0	C	BI	1	2144	-5.0	trap		
G-1	Q1	2.0	0.0	C	BI	1	2141	-14.0	sk-2		
G-1	Q1	1.0	0.0	C	BI	1	2140	-19.0	sk-1		
G-1	Q1	3.0	0.0	C	BI	1	2142	-44.0	sk-3		
G-1	S	1.4	5.1	CT	BI	1	2133	449.0			
G-1	S	6.3	3.7	CT	BI	1	2134	420.0			
G-1	S	3.0	7.0	CT	RG	1	2156	-73.0	Tile		
G-1	W	19.3	3.8	CT	BI	1	2135	405.0			
G-1	W	7.0	6.8	PL	BI	1	2128	-14.0			
P-1	E	45.1	2.4	CB	BI	1	1983	236.0			
P-1	E	14.3	2.4	CB	BI	1	1981	183.0			
P-1	E	60.5	2.4	M	BI	1	1988	-24.0	Metal Support Beam		
P-1	E	29.8	2.4	W	BI	1	1982	-53.0			
P-1	F	26.0	11.5	C	CH	0.5	996	401.0			
P-1	F	63.6	58.9	C	RG	1	2290	302.0			
P-1	F	56.6	14.2	C	CH	0.5	1003	300.0			
P-1	F	48.2	12.7	C	RG	1	2001	267.0			
P-1	F	1.9	28.1	C	RG	1	1990	255.0			
P-1	F	63.6	12.7	C	RG	1	2287	235.0			
P-1	F	63.6	28.1	C	RG	1	2288	226.0			
P-1	F	11.7	28.5	C	CH	0.5	994	221.0			
P-1	F	20.5	15.9	C	CH	0.5	998	205.0			
P-1	F	61.8	4.2	C	CH	0.5	995	196.0			
P-1	F	19.1	39.8	C	CH	0.5	986	189.0			
P-1	F	55.2	19.0	C	CH	0.5	992	164.0			
P-1	F	63.6	43.5	C	RG	1	2289	163.0			
P-1	F	17.3	16.5	C	CH	0.5	997	161.0			
P-1	F	45.5	37.9	C	CH	0.5	990	161.0			
P-1	F	1.9	12.7	C	RG	1	1989	161.0			
P-1	F	55.5	34.5	C	CH	0.5	991	148.0			
P-1	F	48.2	58.9	C	RG	1	2004	147.0			
P-1	F	17.3	12.7	C	RG	1	1993	147.0			
P-1	F	31.9	44.4	C	CH	0.5	1000	145.0			
P-1	F	34.0	50.2	C	CH	0.5	993	145.0			
P-1	F	26.0	17.5	C	CH	0.5	983	145.0			
P-1	F	45.7	17.3	C	CH	0.5	984	142.0			
P-1	F	16.3	27.0	C	CH	0.5	999	136.0			
P-1	F	45.2	26.0	C	CH	0.5	989	126.0			
P-1	F	1.9	43.5	C	RG	1	1991	125.0			
P-1	F	32.8	58.9	C	RG	1	2000	121.0			
P-1	F	1.9	58.9	C	RG	1	1992	118.0			
P-1	F	32.8	41.2	C	CH	0.5	1001	111.0			
P-1	F	20.1	29.7	C	CH	0.5	985	107.0			
P-1	F	17.3	58.9	C	RG	1	1996	106.0			
P-1	F	32.8	12.7	C	RG	1	1997	97.0			
P-1	F	17.3	28.1	C	RG	1	1994	97.0			
P-1	F	17.3	43.5	C	RG	1	1995	92.0			
P-1	F	48.2	43.5	C	RG	1	2003	82.0			
P-1	F	30.6	31.1	C	CH	0.5	987	82.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
P-1	F	30.0	26.4	C	CH	0.5	988	63.0			
P-1	F	32.8	43.5	C	RG	1	1999	29.0			
P-1	F	32.8	28.1	C	RG	1	1998	19.0			
P-1	F	48.2	28.1	C	RG	1	2002	-26.0			
P-1	N	17.3	1.1	CB	BI	1	1985	241.0			
P-1	N	48.2	1.1	CB	BI	1	1987	197.0			
P-1	N	1.9	1.1	CB	BI	1	1984	191.0			
P-1	N	32.8	1.1	CB	BI	1	1986	176.0			
P-1	Q1	2.0	0.0	M	BI	1	2010	-73.0	Bottom Right Handrail		
P-1	S	25.0	2.8	CB	RG	1	2283	449.0			
P-1	S	55.8	2.8	CB	RG	1	2285	426.0			
P-1	S	59.2	2.8	CB	BI	1	2008	410.0			
P-1	S	71.3	2.8	CB	RG	1	2286	402.0			
P-1	S	40.4	2.8	CB	RG	1	2284	375.0			
P-1	S	9.6	2.8	CB	RG	1	2282	339.0			
P-1	S	43.8	2.8	CB	BI	1	2007	332.0			
P-1	S	12.9	2.8	CB	BI	1	2005	323.0			
P-1	S	28.3	2.8	CB	BI	1	2006	275.0			
P-2U	C	1.7	25.7	M	RG	1	1193	-3.0			
P-2U	C	22.8	25.7	M	RG	1	1199	-30.0			
P-2U	C	12.2	25.7	M	RG	1	1196	-49.0			
P-2U	C	1.7	4.6	M	RG	1	2124	-62.0			
P-2U	C	1.7	15.1	M	RG	1	1192	-72.0			
P-2U	C	12.2	4.6	M	RG	1	1194	-77.0			
P-2U	C	22.8	15.1	M	RG	1	1198	-85.0			
P-2U	C	12.2	15.1	M	RG	1	1195	-88.0			
P-2U	C	22.8	4.6	M	RG	1	1197	-93.0			
P-2U	E	15.1	0.3	CB	RG	1	2261	420.0			
P-2U	E	1.3	3.4	CB	BI	1	1638	371.0			
P-2U	E	4.5	0.3	CB	RG	1	2264	330.0			
P-2U	E	29.8	2.2	CB	BI	1	1639	323.0			
P-2U	E	25.6	0.3	CB	RG	1	2260	307.0			
P-2U	N	17.0	6.0	CB	RG	1	2257	320.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CB	15	1,471.3	162.9	1,797.1	14,297	32,797
CT	15	537.5	62.0	661.6	13,162	31,662
M	0	0.0	0.0	0.0	12,500	31,000
PL	15	420.0	320.3	1,060.6	13,561	32,061
W	0	0.0	0.0	0.0	12,500	31,000

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:26:10 PM

Survey Unit Number: 106 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

43 Survey points processed and 4 matrices processed

S+ = 43 Wc = 27

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 107 Class: 1 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	P-2L	FNE	Q1Q2Q3Q4Q5Q6Q8	1230	Sample Prep Room up to susp. Ceiling.. Has
			Total Area	1230	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	C	991.0
Background	Fail	Minimum Background	W	0.0
DCGLw	Pass	Difference		991.0
DCGLavg	Pass	Average Activity	150.3	
EMC	Pass	Average Below DCGL	150.3	
Wilcoxon Rank Sum Test	N/A	Average Background	832.0	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 107 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
P-2L	E	3.3	2.2	M	RG	1	2076	27.0	Power Panel	C	
P-2L	F	23.4	11.6	C	PR	1	2148	991.0	Micro R @ bkg - 9	C	
P-2L	F	15.0	5.0	M	BI	1	1174	97.0	Floor Drain	C	
P-2L	F	2.8	13.7	W	RG	1	2102	3.0	Top of Rotap Shaker	C	
P-2L	Q1	2.0	0.0	M	BI	1	2107	118.0	Bottom Drawer,	C	
P-2L	Q1	5.0	0.0	M	BI	1	2109	62.0	Cabinet, Top Shelf,	C	
P-2L	Q1	3.0	0.0	M	BI	1	2108	51.0	Cabinet, Bottom	C	
P-2L	Q2	1.0	0.0	M	BI	1	2110	104.0	South Side	C	
P-2L	Q2	2.0	0.0	M	BI	1	2111	58.0	North Side	C	
P-2L	Q2	1.0	0.0	M	BI	1	1108	10.0	Top, Center	C	
P-2L	Q3	2.0	0.0	M	BI	1	2113	43.0	West, Outside Wall	C	
P-2L	Q4	3.0	0.0	M	BI	1	2116	318.0	Motor, Top	C	
P-2L	Q5	1.0	0.0	M	BI	1	2117	94.0	Casing Below Motor	C	
P-2L	Q6	2.0	0.0	M	BI	1	2120	68.0	Motor Housing	C	
P-2L	Q6	1.0	0.0	M	BI	1	2119	22.0	Rotap Face - East	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 107 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
P-2L	E	29.8	2.2	CB	RG	1	2081	326.0			
P-2L	E	16.5	2.2	CB	RG	1	2079	316.0			
P-2L	E	23.2	2.2	CB	RG	1	2080	306.0			
P-2L	E	23.1	3.5	CB	CH	0.5	1020	306.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
P-2L	E	7.0	4.1	CB	CH	0.5	1019	306.0			
P-2L	E	15.1	5.1	CB	BI	1	1161	212.0	Painted		
P-2L	E	9.8	2.2	CB	RG	1	2078	205.0	Exhaust Filter (Paper)		
P-2L	E	27.3	2.4	CB	BI	1	1112	188.0	Painted		
P-2L	E	25.7	5.1	M	BI	1	1162	-82.0	Metal Elec. Box,		
P-2L	F	23.3	11.2	C	BI	1	1110	711.0	Not Painted		
P-2L	F	20.3	17.1	C	BI	1	1111	588.0	Painted		
P-2L	F	10.8	22.8	C	CH	0.5	1025	413.0			
P-2L	F	16.1	20.3	C	RG	1	2096	332.0			
P-2L	F	2.8	27.0	C	RG	1	2088	296.0			
P-2L	F	16.1	7.1	C	RG	1	2094	273.0			
P-2L	F	22.8	20.3	C	RG	1	2100	260.0			
P-2L	F	21.7	26.3	C	CH	0.5	1026	232.0			
P-2L	F	9.4	20.3	C	RG	1	2092	215.0			
P-2L	F	22.8	13.7	C	RG	1	2099	202.0			
P-2L	F	16.1	0.4	C	RG	1	2093	200.0			
P-2L	F	22.8	27.0	C	RG	1	2101	200.0			
P-2L	F	9.4	13.7	C	RG	1	2091	200.0			
P-2L	F	19.9	4.9	C	CH	0.5	1023	192.0			
P-2L	F	9.4	7.1	C	RG	1	2090	188.0			
P-2L	F	22.8	7.1	C	RG	1	2098	186.0			
P-2L	F	16.1	13.7	C	RG	1	2095	186.0			
P-2L	F	2.8	20.3	C	RG	1	2087	176.0			
P-2L	F	22.8	0.4	C	RG	1	2097	174.0			
P-2L	F	22.0	0.1	C	CH	0.5	1027	173.0	In Doorway		
P-2L	F	21.8	15.1	C	BI	1	1105	164.0	Painted		
P-2L	F	2.8	7.1	C	RG	1	2086	161.0			
P-2L	F	9.4	0.4	C	RG	1	2089	144.0			
P-2L	F	2.8	0.4	C	RG	1	2085	137.0			
P-2L	F	11.2	25.7	C	BI	1	1168	113.0	Painted		
P-2L	F	6.1	11.9	C	CH	0.5	1024	111.0			
P-2L	F	21.8	4.6	C	BI	1	1104	108.0	Painted		
P-2L	F	11.2	15.1	C	BI	1	1167	99.0	Painted		
P-2L	F	16.1	27.0	CT	RG	1	2104	96.0	Top of N. Counter		
P-2L	F	0.7	25.7	C	BI	1	1165	92.0	Painted		
P-2L	F	21.8	25.7	C	BI	1	1106	92.0	Painted		
P-2L	F	0.7	15.1	C	BI	1	1164	82.0	Painted		
P-2L	F	9.4	27.0	CT	RG	1	2103	56.0	Top of N. Counter		
P-2L	F	0.7	4.6	C	BI	1	1163	14.0	Painted		
P-2L	F	11.2	4.6	C	BI	1	1166	-5.0	Painted		
P-2L	F	16.6	27.8	C	BI	1	2150	-12.0	Below Cabinets		
P-2L	N	18.4	2.5	CB	PR	1	2149	422.0	North Wall		
P-2L	N	21.1	3.4	CB	CH	0.5	1022	394.0			
P-2L	N	18.0	3.0	CB	BI	1	1107	345.0	Not Painted		
P-2L	N	1.4	4.2	CB	CH	0.5	1021	313.0			
P-2L	N	16.1	3.4	CB	RG	1	2084	311.0			
P-2L	N	4.6	5.1	CB	BI	1	1160	280.0	Painted		
P-2L	N	16.9	4.5	CB	BI	1	1109	265.0	Not Painted		
P-2L	N	2.8	3.4	CB	RG	1	2082	263.0			
P-2L	N	9.4	3.4	CB	RG	1	2083	229.0			
P-2L	N	22.8	3.4	M	RG	1	2077	-46.0	Steel Door, North		
P-2L	N	0.7	6.0	G	BI	1	1156	-118.0	Window, Above Bench		
P-2L	N	0.7	6.0	G	BI	1	1157	-120.0	Window, Above Bench		
P-2L	N	21.8	6.0	M	BI	1	1159	-132.0	Door, Metal, 1		
P-2L	N	11.2	6.0	G	BI	1	1158	-140.0	Window, Above Bench		
P-2L	N	14.6	0.3	CB	BI	1	2151	-158.0	Below Cabinets		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
P-2L	Q1	4.0	0.0	CT	BI	1	2106	34.0	Top		
P-2L	Q1	1.0	0.0	CT	BI	1	2105	31.0	Top		
P-2L	Q1	1.0	0.0	M	BI	1	1172	-58.0	ROTAP		
P-2L	Q3	1.0	0.0	M	BI	1	2112	-7.0	East, Inside Wall		
P-2L	Q3	1.0	0.0	M	BI	1	1169	-85.0	Painted Bottom Gear		
P-2L	Q4	1.0	0.0	M	BI	1	2114	-2.0	Chain Guard, South		
P-2L	Q4	2.0	0.0	M	BI	1	2115	-5.0	Inside Wall, South		
P-2L	Q4	1.0	0.0	M	BI	1	1170	-22.0	Painted, S. Front		
P-2L	Q5	2.0	0.0	M	BI	1	2118	-2.0	Face - East		
P-2L	Q5	1.0	0.0	M	BI	1	1171	-82.0	Painted, NW Corner of		
P-2L	Q6	1.0	0.0	CT	BI	1	1173	22.0	Center Bench on		

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK *DCGL:* 12,500 *EMC:* 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CB	15	1,471.3	162.9	1,797.1	14,297	32,797
CTP	15	481.3	347.7	1,176.8	13,677	32,177
G	0	0.0	0.0	0.0	12,500	31,000
M	0	0.0	0.0	0.0	12,500	31,000
W	0	0.0	0.0	0.0	12,500	31,000

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:27:06 PM

Survey Unit Number: 107 Class 1

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

29 Survey points processed and 5 matrices processed

S+ = 29 Wc = 19

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 108 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Storage	S-1	FCNSEW	Q0	3952	
			Total Area	3952	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	CB	615.0
Background	Fail	Minimum Background	M	0.0
DCGLw	Pass	Difference		615.0
DCGLavg	Pass	Average Activity	274.4	
EMC	Pass	Average Below DCGL	274.4	
Wilcoxon Rank Sum Test	N/A	Average Background	1,007.3	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 108 Building: Storage

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
S-1	C	33.3	19.8	F	RG	1	1286	58.0		C	
S-1	C	33.3	8.2	F	RG	1	1285	55.0		C	
S-1	C	9.9	19.8	F	RG	1	1282	29.0		C	
S-1	C	21.6	8.2	F	RG	1	1283	15.0		C	
S-1	C	9.9	8.2	F	RG	1	1281	10.0		C	
S-1	Q0	4.0	0.0	M	BI	1	1315	91.0	Light	C	
S-1	Q0	1.0	0.0	M	BI	1	1311	19.0	Vent Duct - West	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 108 Building: Storage

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
S-1	C	21.6	19.8	F	RG	1	1284	-7.0			
S-1	E	3.0	4.5	CB	CH	0.5	1004	578.0			
S-1	E	21.0	4.5	CB	CH	0.5	1005	505.0			
S-1	E	26.3	6.4	CB	RG	1	1289	371.0			
S-1	E	14.7	6.4	CB	RG	1	1288	349.0			
S-1	E	3.0	6.4	CB	RG	1	1287	347.0			
S-1	F	30.8	20.0	CB	CH	0.5	1017	376.0			
S-1	F	6.8	22.5	CB	CH	0.5	1013	346.0			
S-1	F	7.7	7.7	CB	CH	0.5	1012	335.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
S-1	F	33.3	25.0	C	RG	1	1298	285.0			
S-1	F	21.6	1.7	C	RG	1	1293	200.0			
S-1	F	33.3	1.7	C	RG	1	1296	197.0			
S-1	F	9.9	1.7	C	RG	1	1290	191.0			
S-1	F	33.3	13.3	C	RG	1	1297	181.0			
S-1	F	21.6	25.0	C	RG	1	1295	174.0			
S-1	F	21.6	13.3	C	RG	1	1294	164.0			
S-1	F	34.3	0.1	CB	CH	0.5	1018	140.0	In Doorway		
S-1	F	9.9	25.0	C	RG	1	1292	140.0			
S-1	F	9.9	13.3	C	RG	1	1291	135.0			
S-1	F	29.0	5.8	CB	CH	0.5	1016	99.0			
S-1	N	25.8	4.5	CB	CH	0.5	1011	615.0			
S-1	N	3.1	4.8	CB	CH	0.5	1010	531.0			
S-1	N	33.3	8.7	CB	RG	1	1301	390.0			
S-1	N	21.6	8.7	CB	RG	1	1300	374.0			
S-1	N	9.9	8.7	CB	RG	1	1299	320.0			
S-1	Q0	2.0	0.0	M	BI	1	1312	-9.0	Vent Duct - Center		
S-1	Q0	6.0	0.0	M	BI	1	1314	-31.0	South Man-Door		
S-1	Q0	5.0	0.0	M	BI	1	1313	-73.0	Air Blower - Vent		
S-1	S	5.3	10.0	CB	RG	1	1302	487.0			
S-1	S	25.8	4.3	CB	CH	0.5	1007	486.0			
S-1	S	3.5	4.5	CB	CH	0.5	1006	457.0			
S-1	S	16.9	10.0	CB	RG	1	1303	396.0			
S-1	S	28.6	10.0	CB	RG	1	1304	357.0			
S-1	W	3.0	4.5	CB	CH	0.5	1008	597.0			
S-1	W	23.0	4.8	CB	CH	0.5	1009	556.0			
S-1	W	1.7	1.8	CB	RG	1	1305	460.0			
S-1	W	1.7	13.5	CB	RG	1	1306	410.0			
S-1	W	13.3	1.8	CB	RG	1	1307	400.0			
S-1	W	25.0	1.8	CB	RG	1	1309	384.0			
S-1	W	13.3	13.5	CB	RG	1	1308	350.0			
S-1	W	25.0	13.5	CB	RG	1	1310	332.0			

KERR-MCGEE TECHNICAL CENTER

Threshold Comparison Test Report -

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
C	15	543.3	179.4	902.1	13,402	31,902
CB	15	1,471.3	162.9	1,797.1	14,297	32,797
F	0	0.0	0.0	0.0	12,500	31,000
M	0	0.0	0.0	0.0	12,500	31,000

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:27:56 PM

Survey Unit Number: 108 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

30 Survey points processed and 3 matrices processed

S+ = 30 Wc = 20

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 109 Class: 2 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
TSSL	T-1	FCNSEW	Q1Q7	2298	Exposure Lab
			Total Area	2298	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	VT	254.0
Background	Fail	Minimum Background	GB	-139.0
DCGLw	Pass	Difference		393.0
DCGLavg	Pass	Average Activity	-12.6	
EMC	Pass	Average Below DCGL	-12.6	
Wilcoxon Rank Sum Test	N/A	Average Background	346.5	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 109 Building: TSSL

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
T-1	C	13.8	14.2	F	BI	1	2044	39.0		C	
T-1	C	19.3	5.3	F	BI	1	2045	29.0		C	
T-1	C	19.3	14.2	F	BI	1	2046	27.0		C	
T-1	C	13.8	5.3	F	BI	1	2043	12.0		C	
T-1	C	3.8	20.6	F	RG	1	2023	3.0		C	
T-1	Q1	4.0	0.0	M	CH	0.5	956	18.0	sink	C	
T-1	Q1	3.0	0.0	M	CH	0.5	955	7.0	sink	C	
T-1	Q7	2.0	0.0	M	BI	1	2074	19.0	Top of Light	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 109 Building: TSSL

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
T-1	C	12.8	2.8	F	RG	1	2022	-39.0			
T-1	E	13.6	5.0	GB	CH	0.5	959	0.0			
T-1	E	6.6	4.9	GB	CH	0.5	958	0.0			
T-1	E	10.9	9.0	GB	BI	1	2050	-15.0			
T-1	E	2.0	9.0	GB	BI	1	2048	-36.0			
T-1	E	2.0	4.0	GB	BI	1	2047	-38.0			
T-1	E	7.1	8.3	GB	RG	1	2033	-39.0			
T-1	E	16.0	8.3	GB	RG	1	2034	-46.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
T-1	E	10.9	4.0	GB	BI	1	2049	-60.0			
T-1	E	24.9	8.3	GB	RG	1	2035	-67.0			
T-1	F	19.3	3.0	VT	CH	0.5	982	254.0	In Doorway		
T-1	F	9.3	23.1	VT	CH	0.5	980	85.0			
T-1	F	4.9	8.5	VT	BI	1	2064	38.0			
T-1	F	10.1	4.0	VT	CH	0.5	978	33.0			
T-1	F	19.3	17.3	VT	BI	1	2068	29.0			
T-1	F	18.8	20.6	VT	RG	1	2021	26.0			
T-1	F	18.8	11.7	VT	RG	1	2018	17.0			
T-1	F	0.9	2.8	VT	RG	1	2013	10.0			
T-1	F	9.8	20.6	VT	RG	1	2020	5.0			
T-1	F	13.8	17.3	VT	BI	1	2066	5.0			
T-1	F	13.8	8.5	VT	BI	1	2065	0.0			
T-1	F	14.0	19.8	VT	CH	0.5	981	0.0			
T-1	F	2.3	14.1	VT	CH	0.5	979	0.0			
T-1	F	9.8	11.7	VT	RG	1	2017	-2.0			
T-1	F	18.8	2.8	VT	RG	1	2015	-5.0			
T-1	F	0.9	20.6	VT	RG	1	2019	-15.0			
T-1	F	4.9	17.3	M	BI	1	2069	-15.0			
T-1	F	9.8	2.8	VT	RG	1	2014	-21.0			
T-1	F	0.9	11.7	VT	RG	1	2016	-31.0			
T-1	N	3.3	4.8	GB	CH	0.5	964	33.0			
T-1	N	14.9	4.6	GB	CH	0.5	965	0.0			
T-1	N	13.8	6.8	GB	BI	1	2052	-29.0			
T-1	N	4.9	6.8	GB	BI	1	2051	-29.0			
T-1	N	19.3	6.8	GB	BI	1	2053	-32.0			
T-1	N	0.9	1.8	M	RG	1	2024	-32.0	Fell on Q1, South		
T-1	N	0.9	10.7	M	RG	1	2027	-43.0	Support Beam		
T-1	N	9.8	1.8	M	RG	1	2025	-48.0	Fell on Q1, South		
T-1	N	18.8	10.7	M	RG	1	2029	-51.0	Support Beam		
T-1	N	18.8	1.8	M	RG	1	2026	-58.0	Door		
T-1	N	9.8	10.7	M	RG	1	2028	-89.0	Support Beam		
T-1	Q1	2.0	0.0	M	CH	0.5	954	0.0	sink		
T-1	Q1	1.0	0.0	M	CH	0.5	953	0.0	sink		
T-1	Q1	7.0	0.0	M	BI	1	2042	-5.0	Sink Bottom		
T-1	Q1	3.0	0.0	M	BI	1	2072	-7.0	Top Drawer, East End		
T-1	Q1	2.0	0.0	CTP	BI	1	2071	-27.0	Center of Counter Top		
T-1	Q1	6.0	0.0	M	BI	1	2041	-27.0	Middle Cabinet,		
T-1	Q1	5.0	0.0	M	BI	1	2040	-29.0	Top Drawer, East		
T-1	Q1	4.0	0.0	CT	BI	1	2039	-32.0	East End, Top		
T-1	Q1	1.0	0.0	M	BI	1	2070	-67.0	Sink		
T-1	Q7	1.0	0.0	M	BI	1	2073	-26.0	Building Support Beam		
T-1	Q7	3.0	0.0	M	BI	1	2075	-36.0	Top of Air Duct		
T-1	S	14.2	2.7	GB	CH	0.5	961	0.0			
T-1	S	4.8	3.0	GB	CH	0.5	960	0.0			
T-1	S	4.9	9.3	GB	BI	1	2055	-5.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
T-1	S	19.3	9.0	GB	BI	1	2059	-15.0			
T-1	S	13.8	9.0	GB	BI	1	2057	-17.0			
T-1	S	9.6	6.2	GB	RG	1	2031	-36.0			
T-1	S	4.9	0.4	GB	BI	1	2054	-41.0			
T-1	S	13.8	0.4	GB	BI	1	2056	-50.0			
T-1	S	2.5	0.4	GB	BI	1	2058	-53.0			
T-1	S	18.4	6.2	GB	RG	1	2032	-62.0			
T-1	S	0.7	6.2	W	RG	1	2030	-135.0	Door		
T-1	W	15.3	2.3	GB	CH	0.5	963	15.0			
T-1	W	3.3	3.3	GB	CH	0.5	962	0.0			
T-1	W	8.5	3.9	GB	BI	1	2060	-5.0			
T-1	W	17.3	9.0	GB	BI	1	2063	-10.0			
T-1	W	17.3	3.9	GB	BI	1	2062	-14.0			
T-1	W	8.5	9.0	GB	BI	1	2061	-32.0			
T-1	W	11.7	7.9	GB	RG	1	2037	-34.0			
T-1	W	2.8	7.9	GB	RG	1	2036	-41.0			
T-1	W	20.6	7.9	GB	RG	1	2038	-51.0			

KERR-MCGEE TECHNICAL CENTER

Threshold Comparison Test Report -

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
CT	15	537.5	62.0	661.6	13,162	31,662
CTP	15	481.3	347.7	1,176.8	13,677	32,177
F	0	0.0	0.0	0.0	12,500	31,000
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
VT	15	272.3	159.9	592.2	13,092	31,592
W	0	0.0	0.0	0.0	12,500	31,000

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:28:49 PM

Survey Unit Number: 109 Class 2

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

26 Survey points processed and 5 matrices processed

S+ = 26 Wc = 17

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Run Date: Saturday, April 10, 2004

Survey Unit Number: 110 Class: 1 Data Points: Beta Grid Type: R

SURVEY UNIT TABLE

Bld	*Rm*	*Surface*	*Fixed Equipment*	*Surface Area Included (sq. ft)*	*Remarks*
Main	E-28	FCNSEW	Q0Q1Q2	2148	Drop Ceiling
			Total Area	2148	

INITIALIZATION DATA

Measurement Types Selected: RG, PR, PG, BI, CH

Date Range: All

Thresholds:

EMC: 31,000 DCGLw: 12,500

SURVEY UNIT TEST STATUS

Test Performed	Status		Mtx	Dpm/100cm^2
Min/Max	Pass	Maximum Survey	M	669.0
Background	Fail	Minimum Background	GB	-139.0
DCGLw	Pass	Difference		808.0
DCGLavg	Pass	Average Activity	67.1	
EMC	Pass	Average Below DCGL	67.1	
Wilcoxon Rank Sum Test	N/A	Average Background	578.8	
Sign Test for Paired Data	Pass			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

THE FOLLOWING DATA POINTS FAILED THE EMC TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE DCGLw TEST:

NONE

THE FOLLOWING DATA POINTS FAILED THE BACKGROUND TEST:

Survey Unit 110 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-28	Q0	6.0	0.0	M	BI	1	1900	181.0	W. Exhaust Vent,	C	
E-28	Q0	13.0	0.0	M	BI	1	1902	137.0	N. Central Light, Top	C	
E-28	Q0	17.0	0.0	M	BI	1	1903	113.0	N.E. Light, Top	C	
E-28	Q0	18.0	0.0	P	BI	1	1908	104.0	N.E. Light, Bottom	C	
E-28	Q0	22.0	0.0	P	BI	1	1909	89.0	S.E. Light, Bottom	C	
E-28	Q0	21.0	0.0	M	BI	1	1904	84.0	S.E. Light, Top	C	
E-28	Q0	14.0	0.0	P	BI	1	1907	82.0	N. Central Light,	C	
E-28	Q0	3.0	0.0	M	BI	1	1898	50.0	Light Fixture, Top	C	
E-28	Q0	4.0	0.0	P	BI	1	1905	50.0	Light Fixture, Bottom	C	
E-28	Q0	9.0	0.0	M	BI	1	1901	21.0	S. Central Light, Top	C	
E-28	Q1	4.0	0.0	M	CH	0.5	232	669.0	At the drain	C	
E-28	Q1	1.0	0.0	M	CH	0.5	229	486.0		C	
E-28	Q1	3.0	0.0	M	CH	0.5	231	98.0		C	
E-28	Q1	2.0	0.0	M	CH	0.5	230	25.0		C	
E-28	Q1	6.0	0.0	M	BI	1	1915	24.0	Inside, Cabinet,	C	
E-28	Q2	2.0	0.0	M	BI	1	1917	77.0	S. Middle Drawer	C	
E-28	Q2	1.0	0.0	M	BI	1	1916	54.0	S.E. Drawer	C	
E-28	Q2	3.0	0.0	M	BI	1	1918	10.0	S.W. Drawer	C	

THE FOLLOWING DATA POINTS PASSED BACKGROUND, DCGLw, AND EMC SCREENING TESTS:

Survey Unit 110 Building: Main

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-28	C	2.1	5.7	M	RG	1	1866	-7.0			
E-28	C	27.9	14.3	M	RG	1	1873	-10.0			
E-28	C	19.3	14.3	M	RG	1	1871	-15.0			
E-28	C	10.7	14.3	M	RG	1	1869	-27.0			
E-28	C	19.3	5.7	M	RG	1	1870	-29.0			
E-28	C	2.1	14.3	M	RG	1	1867	-31.0			
E-28	C	10.7	5.7	M	RG	1	1868	-36.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Room	SFC	X (ft)	Y (ft)	Mtx	Meas. Type	Min	SID	Gross Activity (dpm/100cm²)	Remarks	Exc	Res.
E-28	C	27.9	5.7	M	RG	1	1872	-96.0			
E-28	E	2.2	3.4	GB	CH	0.5	233	0.0			
E-28	E	14.5	3.4	GB	CH	0.5	234	0.0			
E-28	E	2.6	6.5	GB	RG	1	1884	-41.0			
E-28	E	11.2	6.5	M	RG	1	1876	-62.0	On E. Door Frame		
E-28	F	4.4	4.0	VT	CH	0.5	244	82.0			
E-28	F	19.3	13.2	VT	RG	1	1863	72.0			
E-28	F	30.0	5.0	VT	CH	0.5	249	51.0	In E Doorway		
E-28	F	23.3	9.3	VT	CH	0.5	241	44.0			
E-28	F	27.9	13.2	VT	RG	1	1865	19.0			
E-28	F	7.8	11.4	VT	CH	0.5	242	19.0			
E-28	F	10.7	13.2	VT	RG	1	1861	15.0			
E-28	F	2.1	13.2	VT	RG	1	1859	14.0			
E-28	F	19.3	4.6	VT	RG	1	1862	5.0			
E-28	F	22.1	4.1	VT	CH	0.5	245	0.0			
E-28	F	0.1	8.0	VT	CH	0.5	248	0.0	In W Doorway		
E-28	F	27.9	4.6	VT	RG	1	1864	-15.0			
E-28	F	10.7	4.6	VT	RG	1	1860	-29.0			
E-28	F	2.1	4.6	VT	RG	1	1858	-48.0			
E-28	N	2.1	6.0	GB	RG	1	1878	89.0			
E-28	N	19.3	6.0	GB	RG	1	1880	46.0			
E-28	N	10.7	6.0	GB	RG	1	1879	34.0			
E-28	N	1.0	3.9	GB	CH	0.5	239	28.0	Brick outside wall		
E-28	N	26.8	4.2	GB	CH	0.5	240	0.0	Brick outside wall		
E-28	N	27.9	6.0	GB	RG	1	1881	-12.0			
E-28	Q0	19.0	0.0	CT	BI	1	1894	371.0	N.E., Top		
E-28	Q0	16.0	0.0	CT	BI	1	1893	354.0	N. Central, Bottom		
E-28	Q0	2.0	0.0	CT	BI	1	1887	326.0	N.W. Corner, Bottom		
E-28	Q0	20.0	0.0	CT	BI	1	1895	313.0	N.E.. Bottom		
E-28	Q0	15.0	0.0	CT	BI	1	1892	296.0	N. Central, Top		
E-28	Q0	23.0	0.0	CT	BI	1	1896	289.0	S.E., Top		
E-28	Q0	7.0	0.0	CT	BI	1	1888	243.0	S.W., Top		
E-28	Q0	24.0	0.0	CT	BI	1	1897	234.0	S.E., Bottom		
E-28	Q0	11.0	0.0	CT	BI	1	1890	229.0	S. Central, Top		
E-28	Q0	1.0	0.0	CT	BI	1	1886	227.0	N.W. Corner, Top		
E-28	Q0	8.0	0.0	CT	BI	1	1889	207.0	S.W., Bottom		
E-28	Q0	12.0	0.0	CT	BI	1	1891	205.0	S. Central, Bottom		
E-28	Q0	10.0	0.0	P	BI	1	1906	-36.0	S. Central Light,		
E-28	Q0	5.0	0.0	M	BI	1	1899	-68.0	W. Exhaust Vent, Top		
E-28	Q1	5.0	0.0	CT	BI	1	1914	-16.0	Drain Area		
E-28	Q1	4.0	0.0	CT	PR	1	1913	-16.0	Sink, Bottom		
E-28	Q1	3.0	0.0	CT	PR	1	1912	-16.0	Sink, Back		
E-28	Q1	2.0	0.0	CT	PR	1	1911	-32.0	Sink, West Inside		
E-28	Q1	1.0	0.0	CT	PR	1	1910	-32.0	Sink, East Inside		
E-28	Q2	5.0	0.0	CT	BI	1	1920	206.0	Top, N. Center		
E-28	Q2	4.0	0.0	CT	BI	1	1919	204.0	Top, S.E. Corner		
E-28	S	9.8	3.8	GB	CH	0.5	235	0.0			
E-28	S	25.4	3.8	GB	CH	0.5	236	0.0			
E-28	S	10.7	4.5	GB	RG	1	1882	-89.0			
E-28	S	27.9	4.5	M	RG	1	1875	-96.0	On Back of South		
E-28	S	19.3	4.5	GB	RG	1	1883	-97.0			
E-28	S	2.1	4.5	M	RG	1	1874	-104.0	On South Door		
E-28	W	14.0	4.1	GB	CH	0.5	238	0.0			
E-28	W	2.4	3.9	GB	CH	0.5	237	0.0			
E-28	W	13.2	6.5	GB	RG	1	1885	-21.0			
E-28	W	4.6	6.5	G	RG	1	1877	-60.0			

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

Summary of Background Data and Thresholds Used in this Analysis

Measurement Type: BK ***DCGL:*** 12,500 ***EMC:*** 31,000

Matrix	*Number of Data Points*	*Average Background*	*Sigma*	*Background Threshold (Tbk)*	*DCGLw Threshold (Td)*	*EMC Threshold (Te)*
		(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
CTP	15	481.3	347.7	1,176.8	13,677	32,177
CTX	25	1,111.6	239.3	1,590.1	14,090	32,590
G	0	0.0	0.0	0.0	12,500	31,000
GB	15	94.9	190.1	475.0	12,975	31,475
M	0	0.0	0.0	0.0	12,500	31,000
P	0	0.0	0.0	0.0	12,500	31,000
VT	15	272.3	159.9	592.2	13,092	31,592

KERR-MCGEE TECHNICAL CENTER DECOMMISSIONING PROJECT

Threshold Comparison Test Report - Buildings

STATISTICAL TEST RESULTS

Run Date: 4/10/2004 7:29:45 PM

Survey Unit Number: 110 Class 1

Selected Test: SIGN TEST FOR PAIRED

Test Results: Pass

Thresholds:

EMC 31,000 DCGL 12,500

DATA SUMMARY TABLE

28 Survey points processed and 4 matrices processed

S+ = 28 Wc = 18

****** The survey unit has passed the SIGN TEST FOR PAIRED DATA ******

APPENDIX 4
Scan Data Summary

Appendix 4
Scan Data Summary – KMTC FSSR Indoor

ISU	Room #	Net β High Max (cpm)	Net β Av (cpm)	β Low Amb. Bkgr (cpm)	Net Gamma High Max (cpm)	Net Gamma High Av (cpm)	Gamma Low Bkgr (cpm)
100	C-13	95	45	205			
	C-13a	85	-15	215			
	C-17	133	103	187			
	C-19	386	66	214			
	E-12	174	114	166			
	E-14	311	61	189			
101	C-29a	189	83	252			
	C-29b	217	82	228			
	C-33	56	31	294			
102	C-39	138	78	222			
	E-22	180	120	180			
	E-30	137	87	238			
103	C-1	206	56	194			
	C-1a	177	77	223			
	E-2	199	79	181			
	E-8	215	95	185			
	E-10	395	320	180			
104	C-21	103	3	222			
	C-23	83	3	177			
	C-25	180	100	150			
	C-27	286	156	194			
105	F-2&4	227	107	173			
	F-4a	127	47	173			
	F-12	187	87	213			
106	G-1	263	112	368			
	P-1	260	200	200			
	P-2U	217	112	178			
107	P-2L	723	125	178	Gamma scans for ceiling only in rooms S-1 and T-1		
108	S-1	273	173	252	-569	-969	5869
109	T-1	158	108	192	184	-16	3316
110	E-28	170	70	180			

APPENDIX 5
NEXTEP Technical Memorandum 04-01

NEXTEP Environmental

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TECHNICAL MEMORANDUM 04-01

March 26, 2004

Originator: Robert Newman, Analyst
Subject: Chemical Drain System Addendum for the KMTC FSSR Indoor Survey Units
Revision: 0

ENDORSEMENT: This document contains the results of research and technical analysis which have been reviewed and approved for publication by the Technical Director, NEXTEP Environmental, Inc.

Signed originals on file at NEXTEP Louisville office and with KMTC QA.

Harry J. Newman, CHP, Technical Director Date

1 INTRODUCTION

1.1 The Kerr-McGee Technical Center (KMTC) used nuclear material under the Nuclear Regulatory Commission (NRC) Source Material License SUB-986. License SUB-986 authorized the receipt of small quantities of source material for use in research and development. The source materials could be in any form, but were typically ores containing uranium and thorium from NRC or Agreement State licensed facilities. Source materials were usually received in small quantities from Kerr-McGee's formerly licensed fuel cycle facilities or its Minerals Exploration Unit to ensure that KMTC would never maintain large quantities on site. As work with the various source materials was completed, the materials were returned to the facility of origination. The use of the authorized source materials was restricted to designated laboratories, storage and preparation areas within KMTC, and all areas were posted. Radiological activities at KMTC ceased in 1998, at which time decommissioning activities were initiated.

1.2 In July 1999, a gamma scan was conducted in each designated room to identify all the material at KMTC that was associated with license SUB-986. All containers of licensed material were identified and moved to the storage vault. On August 16, 1999 all the containers of licensed material were removed from the storage vault and disposed of. The KMTC chemical drain system has been isolated from license SUB-986 material since that date.

1.3 The chemical drain system at the Technical Center consisted of two separate systems. One system, designated Survey Unit EP-1 (SU EP-1), formerly drained from the TSSL Building to the north and then west. The other system, designated SU EP-2, drains from the Main Building to the east.

2 SCOPE OF FINAL STATUS SURVEY

2.1 DESCRIPTION AND CLASSIFICATION OF SURVEY UNITS

2.1.1 SURVEY UNIT EP-1 consists of a portion of the chemical drain system originating in the TSSL building. The TSSL building had a single sink that drained to a sump (pit) filled with limestone rocks and an outlet pipe extending from the sump 85 meters to the west where it exits at the surface in Soil Survey Unit 5.[23] The sink and drain piping, the limestone-filled pit, and the exit pipe from the pit were removed in the late 1980's. Only an unspecified length of the drainpipe still exists extending back from the outfall. Impacted soil at the site of the pit was identified and remediated as reported in the FSSR for Outdoor Survey Units. Only the end of the drain pipe is accessible at the outfall point to the west of the TSSL building. The Final Status Survey (FSS) revealed no measurements above the release limits and no remediation was required. A diagram of the former TSSL system is provided as Figure 1 of Attachment A. The classification of SU EP-1 is Class 2.

2.1.2 SURVEY UNIT EP-2 consists of a more complex network of sinks and drains extending from the laboratories to a 4 inch drain pipe which runs through the building in the plumbing chase between the labs. A map showing the location of the indoor elements of the system is presented in Attachment A, Figure 2. The 4-inch drain pipe runs near the bottom of a four foot deep trench below floor level and is located below all other pipes in the chase and exits out the eastern end of the building.

2.1.3 Once outside the building the drainpipe runs underground to a stainless steel sediment collection tank which is approximately 5 feet in diameter and 5 to 6 feet deep. Water is continuously running through the drain pipe and sediment tank. From the exit of the sediment tank, the drain enters a rectangular pit about 6 feet x 30 feet x 7 feet deep which is lined with steel and filled with limestone rock. A bypass pipe is incorporated into the system to isolate the limestone pit for cleaning and rock replacement. The outlet pipe is routed south from the pit and through a manhole which is approximately 3 ft. in diameter and 5 ft. deep. The drain pipe then proceeds west from the manhole and joins the sanitary sewer. A map showing the location of the key outdoor elements of the system is presented in Attachment A, Figure 3. A schematic rendering of the system is provided in Attachment A, Figure 4.

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[23] *Final Status Survey Report, Outdoor Survey Units,* Kerr-McGee Technical Center Decommissioning Project.

2.1.4 The limestone pit was emptied and new rock was installed as part of regular maintenance in 2002. At the same time the sediment tank was flushed and cleaned out and the contents were disposed.

2.2 IDENTIFICATION OF THE RADIOLOGICAL CONTAMINANTS

2.2.1 The radionuclides of concern are the uranium and thorium series. The radionuclides may not be in equilibrium.

2.3 REFERENCE BACKGROUND LEVELS

2.3.1 Background beta measurements have been collected for several matrix materials which are present in the survey unit. All background levels were determined by taking direct readings on the specified matrix on unaffected surfaces using the same methods and instruments as were used for the FSS. Natural background levels for the contaminants of interest in the survey units are presented in Table 2.1. Matrix materials for which no beta background data are available are assumed to have a background value of zero.

Table 2.1
Summary of Beta Background Data

Matrix Code	Matrix Material	Number of Data Points	Average Background (dpmβ/100cm^2)	Sigma (dpmβ/100cm^2)
B	Brick	15	2,225	214
C	Concrete	15	543	179
M	Metal	0	0	NA

2.3.2 Background gamma measurements were taken with the 3" shielded NaI detector at each indoor location where pipes under the sinks were surveyed. The detector was positioned in the same direction as the survey itself was taken and at least nine inches away from the drain pipe being surveyed. Special background gamma measurements were collected at the bottom of the plumbing chase at the extreme southern end of the building where the 4" drain pipe did not extend. For outdoor NaI gamma measurements the average background value obtained for concrete and reported in the FSSR, Outdoor Survey Units was used. The three values for background are listed in Table 2.2.

Table 2.2
Summary of Gamma Background Data

Location	Number of Data Points	Average Background (cpm)
Outside	10	2,110
In Laboratories	49	2,410
In Plumbing Chase	13	3,160

2.4 RELEASE CRITERIA FOR LABORATORY DRAIN SYSTEMS

2.4.1 Release criteria for embedded piping have been developed for the chemical drain systems. A surface activity limit for the inside of embedded piping was developed in NEXTEP Tech Memo 0403[24]. The most conservative embedded piping DCGLw is **487,000 dpm/100 cm²**. The limit cited here is for Th-232 alone and is the lowest limit calculated in NEXTEPTM 0403.[25] It is the basis for calculating action thresholds used for the embedded portion of SU EP-1 and SU EP-2.

2.4.2 For purposes of this survey the exposed portions of SU EP-2 located within the laboratories (traps, drains, etc.) are not considered to be embedded and are subject to the release criteria of Table 2.3. The portions of the system within the plumbing chase and underground will be treated as embedded piping and will be subject to the embedded piping DCGLw as described in paragraph 2.4.1.

Table 2.3
Building Surfaces Release Criteria[26]

Nuclide	DCGLw (dpm/100cm²)	DCGLEMC (dpm/100cm²)
Thorium-232 and progeny	12,500	31,000
Uranium series through U-234	177,300	443,000
Ra-226 and progeny	16,300	40,000

2.5 ACTION THRESHOLDS

2.5.1 Thresholds were developed for direct gamma measurements made on the outside of drains and pipes that are part of the chemical drain system. Detailed calculations for these thresholds are provided in NEXTEP Tech Memo 0402[27]. A summary of the non-embedded thresholds used for 2" pipes inside the laboratories (under the sinks) and for the embedded thresholds for 4" drainpipes inside the plumbing chase and outside the building are presented in Table 2.4. The thresholds chosen from the Tech Memo assumed a mixture of Ra-226, Th-232, and U-238 radionuclides in glass and plastic pipe.

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[24] NEXTEP Tech Memo 0403, *Derivation of Embedded Piping DCGL for KMTC,* A. H. Thatcher, CHP.
[25] NEXTEP Tech Memo 0403, ibid.
[26] D Plan Section 3.2.4.
[27] NEXTEP Tech Memo 0402, *Use of the 3" x ½" NaI Detector for Measurement of Contamination Inside Pipes for KMTC,* N. Zhang.

Table 2.4

Chemical Drain System Direct Gamma Thresholds[a]

Type	Diameter (inches)	Threshold (cpm)
Glass	2.0	4,856
	4.0	290,512
Plastic	2.0	5,073
	4.0	309,446

[a] Net of Background; 1 minute integration time.

3 SURVEY METHODS

3.1.1 The survey methods described in the KMTC Final Status Survey Report for Indoor Survey Units, Section 3 were applied to portions of the drain systems where appropriate. Special gamma direct measurements were also taken on embedded piping within the Main Building. These direct gamma measurements were collected on the embedded piping in the utility chase located between the labs, and on the sink drains and piping that ran from the laboratory sinks into the utility chase. NaI gamma detectors were placed on the pipe parallel to the floor or nearest wall and the instrument integration count time was one minute. Details in positioning of the detector for these measurements are provided in NEXTEP Tech Memo 0402.[28]

3.1.2 The drain traps on most of the laboratory sink drains connected to the system were of the mason jar type. All traps containing residual material in the mason jars were removed and replaced with new jars. When possible, any sediment within the traps was dried and counted on the Cushing HP Laboratory soil counters.

3.1.3 Removable (swipe) samples were also collected from the inside of the pipes at the drains. Outside, swipe data were collected in the limestone pit and on the sides of the manhole as close to the drain water as possible. The swipe samples were counted in the Cimarron laboratory.

4 FSS RESULTS AND DISCUSSION

4.1 SURVEY UNIT EP-1

4.1.1 SU EP-1 originated at the north end of the TSSL Building. The sink and drain piping, the limestone-filled pit, and the exit pipe from the pit were removed in the late 1980s. Impacted soil at the site of the pit was identified and remediated as reported in the FSSR for Outdoor Survey Units. The only portion surveyed was the remaining drainpipe at the outfall west of the TSSL building.

[28] NEXTEP Tech Memo 0402, ibid.

4.1.2 Soil Samples - The outfall area at the end of the buried drainpipe is located in Soil Survey Unit 5, approximately 85 meters west of the TSSL building. Most of the drainpipe has been excavated and disposed of and the remaining pipe is below grade and filled with soil. The gradient of the surface drainage slopes gently westward from the outfall area. Five bias (BI) soil samples were collected at the location of the outfall, with the surface sample collected from inside the drain pipe. Additionally, one BI soil sample was collected 4 meters west of the outfall, 5 BI soil samples were collected 7 meters west of the outfall and 3 BI soil samples were collected 11 meters west of the outfall. All of the soil samples were below 1.0 FMPC. The soil data are presented in Table 4.1, and the location of the outfall is shown in Attachment A, Figure 1. The soil sample data from SU EP-1 show only background levels of radioactivity in the pipe and along the drainage path to the west.

Table 4.1

Pipe Outfall Soil Results – SU EP-1

TCN	Location	Depth (cm)	Soil FMPC[a]
914	Outfall	0 – 15	-0.19
915	Outfall	15 – 50	-0.18
916	Outfall	50 – 100	-0.17
917	Outfall	100 – 150	-0.18
918	Outfall	150 – 200	-0.19
891	4 meters West	0 – 15	-0.2
909	7 meters West	0 – 15	-0.2
910	7 meters West	15 – 50	-0.2
911	7 meters West	50 – 100	-0.3
912	7 meters West	100 – 150	-0.2
913	7 meters West	150 – 200	-0.2
888	11 meters West	0 – 15	-0.2
889	11 meters West	15 – 50	-0.2
890	11 meters West	50 – 100	-0.3

[a] net of background

4.1.3 Gamma Scans – Gamma scan measurements were collected at the outfall of the drainpipe and surrounding area. No gamma scan measurements exceeded the scan threshold of twice background.

4.2 SURVEY UNIT EP-2

4.2.1 SU EP-2 Non-Embedded Piping/Equipment Measurements

4.2.1.1 The non-embedded components of SU EP-2 included the indoor sink drains, traps, floor drains, and piping contained within the affected rooms of the FSS.

4.2.1.2 Gamma Direct Measurements: Twenty affected rooms in the Main Building contain components of the chemical drain system. 49 gamma direct measurements were collected on the sink drains, floor drains, and piping in the affected rooms, where accessible. A complete listing of the direct gamma data for the indoor portion of the chemical drain system is presented in Table 1 of Attachment B. The maximum net gamma direct measurement was 1521 cpm and the average gamma direct measurement was -5 cpm net. No gamma direct measurements on the indoor portions of SU EP-2 exceeded any of the thresholds presented in Table 2.3.

4.2.1.3 Removable Contamination Measurements: Fifty swipes were collected for measurements of removable contamination on the sink drains, traps, floor drains, and piping in the affected rooms, within the building. A complete listing of the removable beta measurements in presented in Table 1 of Attachment B. The maximum swipe measurement was 14.6 dpm and the average swipe measurement was 0.77dpm. No swipe measurements exceeded 0.2% of the DCGLw for fixed equipment. The data demonstrate that virtually no removable contamination is present within the indoor portion of SU EP-2.

4.2.1.4 Chemical Drain Sludge Samples: The sink drain systems that have drain traps were disassembled and sludge samples were collected if sludge was available. All the drain trap collection jars that contained sludge were replaced with new collection jars. Sixteen sludge samples were dried and analyzed, and the results are presented in Table 4.2.

Table 4.2

Chemical Drain Sludge Sample Results (pCi/g)

Sample ID	# of Samples	Location	Average Total U	Average Th(nat)	Average Ra-226
TCN-2551	1	C-27 South	2.3	2.2	0.4
TCN-2552	1	C-27 North	2	5	1.8
TCN-2553	1	C-29a South	0.2	0.4	0.2
TCN-2554	2	C-29b South West Trap	0.4	28.5	4.1
TCN-2555	1	C-29b South East Trap	4.8	0.4	0
TCN-2556	2	C-33	6.9	2.7	3.1
TCN-2557	1	C-39 South Trap	5.5	8	0.8
TCN-2558	2	C-39 North Trap	7.3	11.1	2.3
TCN-2559	3	E-22 South Trap	62.9	0.5	0.4
TCN-2560	1	E-22 North Trap	3.2	0.4	0
TCN-2561	1	E-28	0.7	0.4	0
TCN-2562	1	E-30 Middle Sink West Trap	0	1.6	0
TCN-2563	1	E-30 South East Sink	0.2	0.2	0
TCN-2564	1	E-30 Middle Sink East Trap	5.8	1.2	2.6
TCN-2565	1	E-30 North East Sink	0	4.4	0.7
TCN-2566	1	E-30 South West Sink	1.9	0.4	0.1

4.2.1.5 Additionally, samples were collected of materials (raw titanium dioxide, synthetic rutile, manganese dioxide, and ilmenite) that are commonly used at the Technical Center to identify other possible sources of present in the chemical drain system. The analysis results of the common laboratory materials are summarized in Table 4.3.

Table 4.3

Common Lab Materials Sample Results (pCi/g)

Sample ID	Location	Total U	Th(nat)	Ra-226
TCN-1980	Raw TiO2	2.1	0	0.3
TCN-1981	Synthetic Rutile	3.4	5.3	0.7
TCN-1982	Synthetic Rutile	2.8	1.4	0.4
TCN-1983	MnO2	0.4	0	0
TCN-1985	Ilmenite	13	3.9	3.3

4.2.1.6 Chemical drain sludge samples TCN-2554, TCN-2557, TCN-2558, and TCN-2559 had analysis results that were higher than the common laboratory materials[29]. No documentation was available to demonstrate that the sink traps were cleaned out since the termination of licensed activities. The sludge material for these four samples, which appears to include residual licensed material, was removed from the traps and will be properly disposed of as part of the approved waste stream for this facility.

4.2.1.7 Since all the traps containing residual material were replaced with new mason jars, no licensed material exists in the drain traps of the chemical drain system inside the main building.

4.2.2 SU EP-2 Embedded Piping/Equipment Measurements

4.2.2.1 The embedded components of SU EP-2 included the piping in the plumbing chase within the building, the sedimentation tank, the limestone-filled neutralization pit and the subsurface embedded piping that connects the system to the sanitary sewer.

4.2.2.2 Beta Direct Measurements: Twelve direct beta measurements were collected in the limestone pit and the manhole. Eight direct beta measurements were collected on the walls and floor of the limestone pit below the level of the outlet pipe. Four measurements were collected in the manhole: two on the concrete floor at the edge of the water channel, and two on the walls approximately 20 inches above the floor. A complete listing of the direct beta measurements taken on the embedded component of the chemical drain system is presented in Table 2 of Attachment B. The average of the net values was -20 dpm/100cm^2, and the net values observed ranged from -293 to 431 dpm/100cm^2. All values were less than 0.1% of the most conservative DCGLw for embedded piping.

4.2.2.3 Gamma Direct Measurements: Thirteen gamma direct measurements were collected on the embedded piping in the utility chase component of SU EP-2. These measurements are presented in Table 3 of Attachment B. The maximum net gamma direct measurement was 1,975 cpm and the average net gamma direct measurement was 48 cpm. No gamma direct measurements exceeded the thresholds listed in Table 2.4.

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[29] A minute quantity of apparently enriched material was identified in one of the sludge samples. The material was less than one milligram of uranium enriched at <5%. This material may have originated from prior licensed activities or test samples from other sites.

4.2.2.4 Gamma Scan Measurements: Gamma scans were performed on the walls and floor of the limestone pit and on the limestone fill that was removed from the pit. The average gamma scan measurement was 1,559 cpm and the maximum gamma scan measurement was 2,100 cpm. The gamma scan measurements taken on the limestone pit liner and its contents were all at background levels.

4.2.2.5 Removable Contamination Measurements: Twenty-seven swipes were collected for measurements of removable contamination on the limestone pit, the sedimentation tank, the manhole, and the limestone fill that was removed from the pit. The average swipe measurement was 2 dpm and the maximum swipe measurement was 7 dpm. The data demonstrate that virtually no removable contamination is present within SU EP-2.

4.2.2.6 Sediment Sample Measurements: Sediment samples were collected from the sedimentation tank and the limestone pit. A listing of these sediment samples is presented in Table 4 of Attachment B. The data show that no levels of contaminants exceeded typical values normally contained in the laboratory waste stream described in Table 4.3 except for an elevated level of radium found in one sediment tank sample. Since no evidence exists to indicate that the sedimentation tank has ever been cleaned out since 1998 it is possible that the radium is residual material from licensed operations. All sediment was subsequently removed from the sedimentation tank and the limestone pit and disposed of at a licensed disposal facility.

4.2.2.7 A summary of survey measurements for the embedded piping/equipment components of SU EP-2 is shown in Table 4.4.

Table 4.4

SU EP-2 Embedded Piping/Equipment Components Measurements Summary

	Number of Measurements	Average	Maximum
Gamma Direct (cpm)	14	1,559	2,100
Beta Direct (dpm/100 cm^2)	12	-20	431
Removable (dpmβ/100 cm^2)	27	2	7
Sediment (FMPC)	7	0.5	2.6

5 CONCLUSIONS

5.1 SU EP-1

5.1.1 The soil sample data from SU EP-1 show only background levels of radioactivity in the pipe and along the drainage path to the west. (par. 4.1.2)

5.1.2 No gamma scans taken over the drain pipe outfall and surrounding area in SU EP-1 exceeded a gamma scan threshold of twice background. (par. 4.1.3)

5.1.3 SU EP-1 meets all criteria for unrestricted release of a Class 2 Survey Unit.

5.2 SU EP-2

5.2.1 No gamma direct measurements on the indoor portions of SU EP-2 exceeded the prescribed thresholds. (par. 4.2.1.2)

5.2.2 No removable contamination is present within the indoor portion of SU EP-2. (par. 4.2.1.3)

5.2.3 Since all the sink traps containing residual material were replaced with new mason jars, no licensed material exists in the drain traps in SU EP-2. (par. 4.2.1.7)

5.2.4 All sediment was removed from the sedimentation tank and the limestone pit and disposed of at a licensed disposal facility. (par. 4.2.2.6)

5.2.5 All direct beta measurements on outdoor portions of SU EP-2 were less than 0.1% of the most conservative DCGLw for embedded piping. (par. 4.2.2.2)

5.2.6 All direct gamma measurements on embedded piping in the utility chase component of SU EP-2 were less than the prescribed thresholds for embedded piping. (par. 4.2.2.3)

5.2.7 All gamma scans of the limestone pit liner and contents were at background levels. (par. 4.2.2.4)

5.2.8 No removable contamination was measured in embedded piping/equipment portions of SU EP-2. (par. 4.2.2.5)

5.2.9 Sediment sample data taken from the limestone pit showed levels of radioactivity typical of non-licensed materials in the laboratory waste stream. (par. 4.2.2.6)

5.2.10 SU EP-2 meets all criteria for unrestricted release of a Class 2 survey unit.

6 RECOMMENDATIONS

6.1 SU EP-1 and EP-2, which comprise the chemical drain system at the technical center, should be released from the license.

APPENDIX 5

ATTACHMENT A

FIGURES

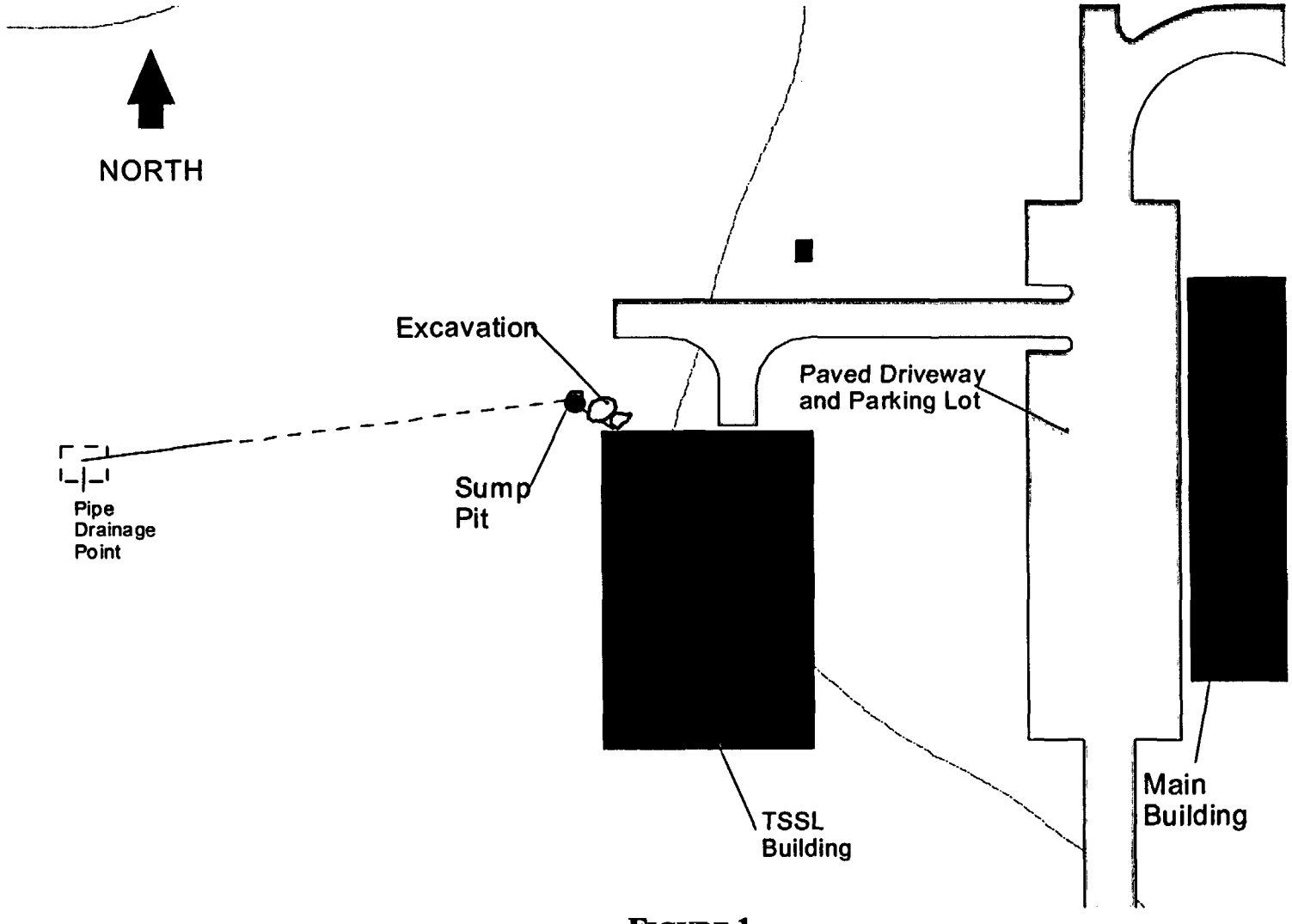
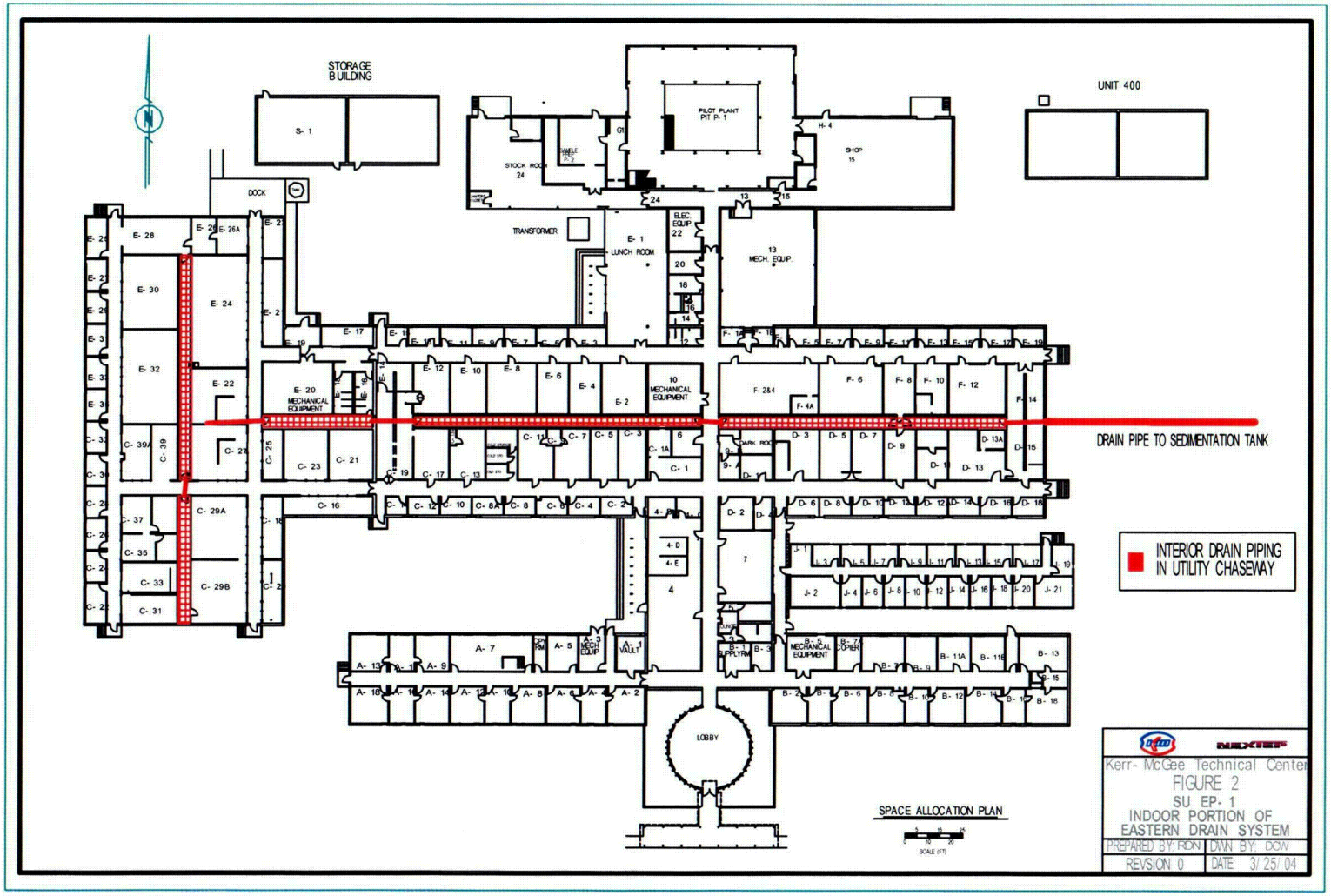


FIGURE 1
SU EP-1
TSSL DRAIN SYSTEM


STORAGE BUILDING
UNIT 400
DRAIN PIPE TO SEDIMENTATION TANK
INTERIOR DRAIN PIPING IN UTILITY CHASEWAY
SPACE ALLOCATION PLAN
LOBBY
TRANSFORMER
Kerr- McGee Technical Center
FIGURE 2
SU EP- 1
INDOOR PORTION OF
EASTERN DRAIN SYSTEM
REVISION 0
DATE 3/25/04

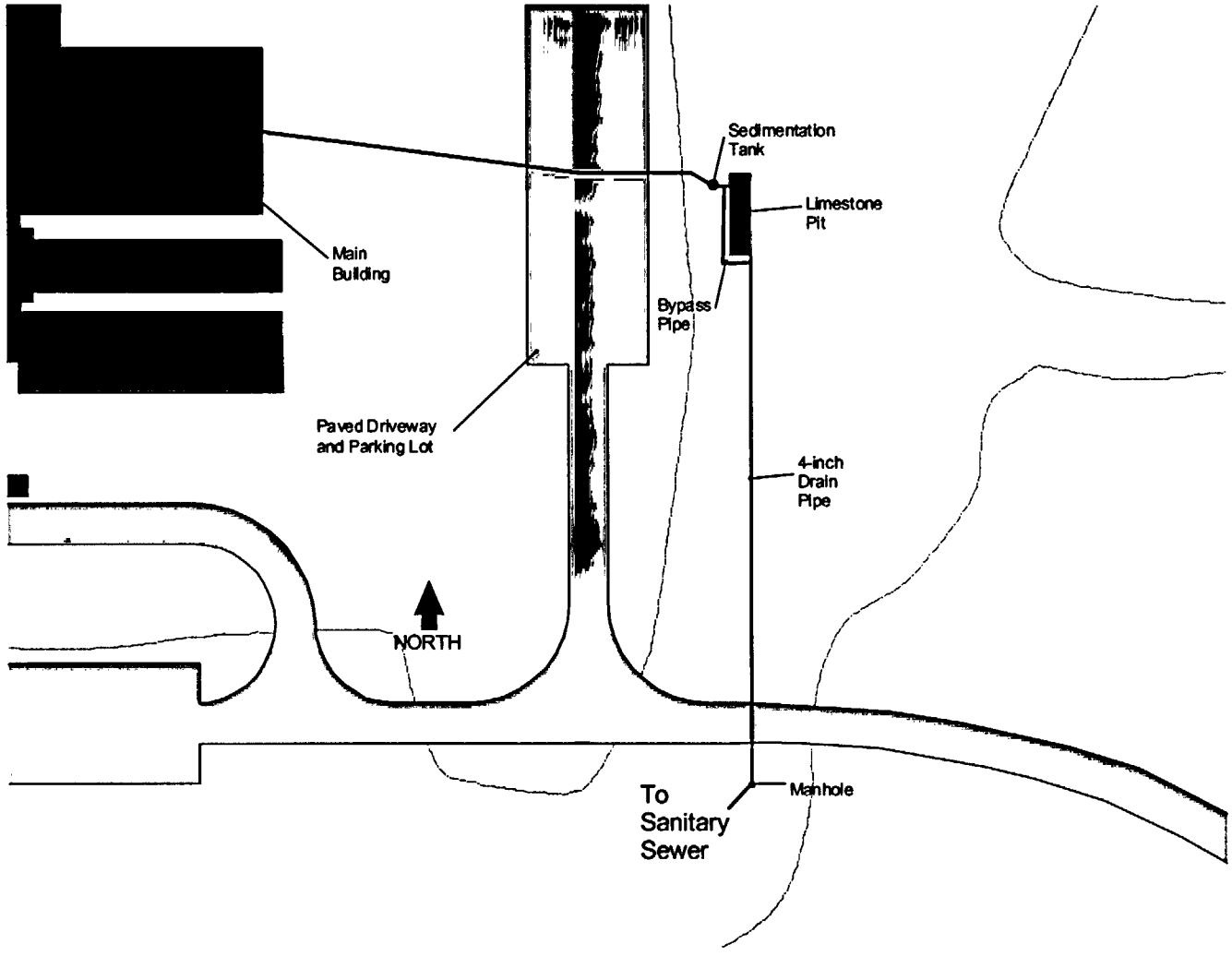


FIGURE 3
SU EP-2
EASTERN DRAIN SYSTEM

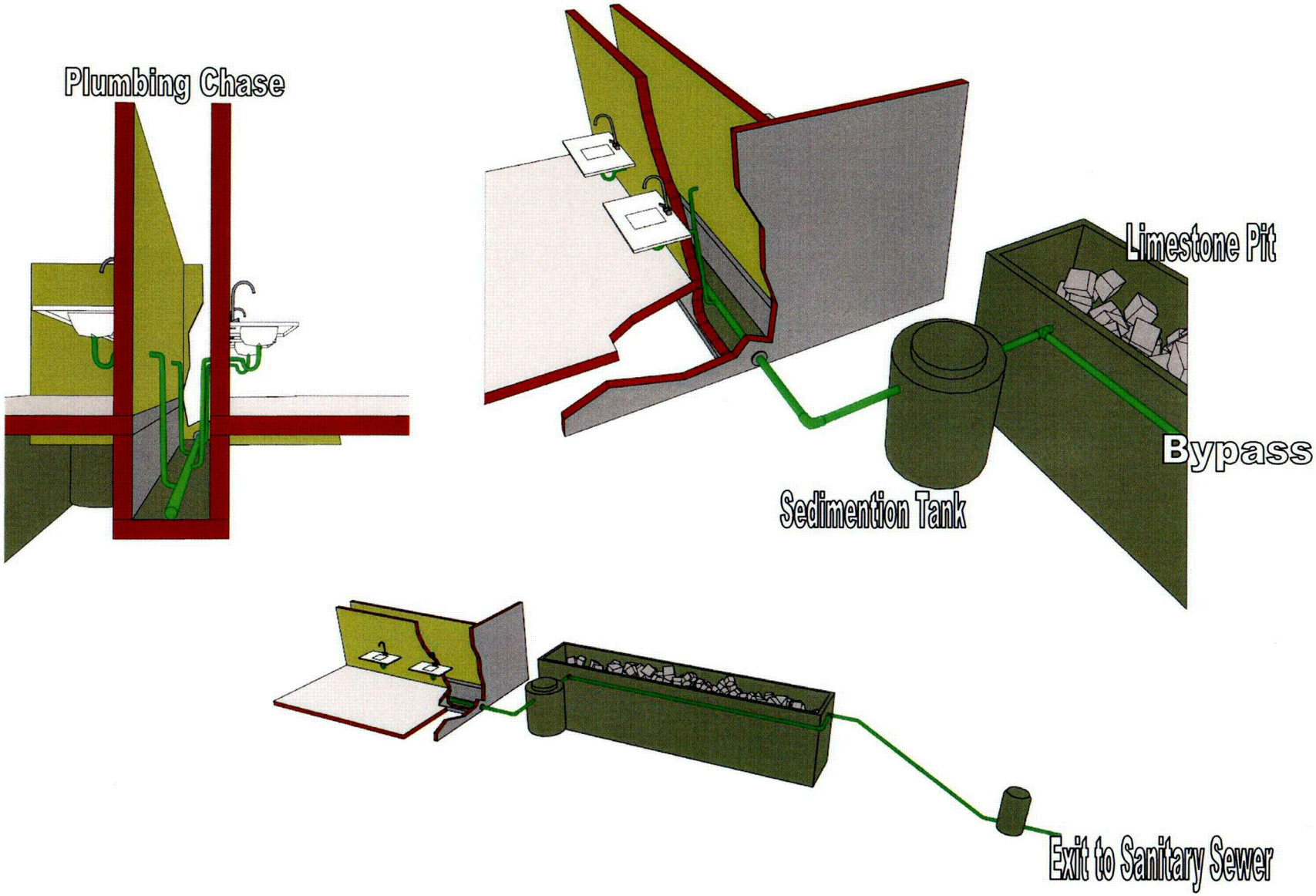


FIGURE 4
SU EP-2 SCHEMATIC DIAGRAMS

C16A

APPENDIX 5

ATTACHMENT B

DATA TABLES

Table 1
SU EP-2 Indoor Piping (Non-Embedded)
Removable Beta Measurements and Direct Gamma Measurements

Room	Net Beta Swipe (dpm/100cm^2)	Direct Gamma Gross (cpm)	Direct Gamma Net (cpm)
F-2&4	6.65	2293	-117
F-12	0.80	3642	1232
F-12	1.62	3486	1076
F-12	-0.84	2779	369
P-2L	1.62	3931	1521
P-2L	2.45	3298	888
G-1	-1.67	2479	69
G-1	4.92	2593	183
C-19	1.62	2401	-9
C-19	0.80	NA	NA
C-17	-0.84	2282	-128
C-17	-0.02	2160	-250
C-17	-1.67	2130	-280
C-17	4.09	2265	-145
E-30	-0.29	2139	-271
E-30	-1.11	2229	-181
E-30	-0.29	2097	-313
E-30	14.56	2130	-280
E-30	-1.11	2305	-105
E-30	2.19	2093	-317
E-30	-1.11	2030	-380
E-30	-1.11	2053	-357
E-2	-0.29	3148	738
E-8	3.84	2569	159
E-8	0.54	2577	167
E-8	-0.29	2349	-61
E-10	-2.76	2401	-9
E-12	2.19	3162	752
C-1	-2.76	3172	762
C-25	4.66	1681	-729
C-33	2.83	1792	-618
C-29a	-0.48	2085	-325
C-29a	-0.48	2196	-214
C-29a	-2.13	2037	-373
C-29a	5.32	2187	-223
C-29a	-0.48	2007	-403
C-29a	-0.48	2003	-407
C-29b	-2.13	2186	-224
C-29b	0.35	2335	-75
C-29b	-3.79	2629	219
C-29b	0.35	2051	-359
C-29b	1.18	2309	-101
C-29b	2.01	2434	24
E-22	-2.96	2169	-241
E-22	0.35	2254	-156
E-28	2.01	2208	-202
C-39	1.18	2278	-132
C-39	-0.48	2213	-197
C-27	-0.48	2260	-150
C-27	0.35	2340	-70

Table 2
SU EP-2 Outdoor Piping (Embedded)
Direct Beta Measurements

Sample Number	Location	Direct Beta Net (dpm/100cm^2)
1	Limestone Pit – NW Wall	64
2	Limestone Pit – NE Wall	-175
3	Limestone Pit – N Wall	-175
4	Limestone Pit – N Bottom	431
5	Limestone Pit – SW Wall	64
6	Limestone Pit – SE Wall	64
7	Limestone Pit – S Bottom	431
8	Limestone Pit – S Wall	-175
9	Manhole – W Bottom	12
10	Manhole – E Bottom	-223
11	Manhole – W Wall	-263
12	Manhole – E Wall	-293

Table 3
SU EP-2 Indoor and Embedded Piping
Removable Beta Measurements and Direct Gamma Measurements

Location	Direct Gamma Gross (cpm)	Direct Gamma Net (cpm)
C-17	4314	1155
E-12W,E-10W,C-13W	2929	-230
C-13E	2680	-479
E-10E,E-8W	2890	-269
E-8 MID	2967	-192
E-8E	2972	-187
E-2W	3026	-133
F-12	2823	-336
CHASEWAY	2539	-620
CHASEWAY	2611	-548
CHASEWAY	3154	-5
CHASEWAY	5134	1975
CHASEWAY	3646	487

Table 4
SU EP-2 Outdoor Piping
Sediment Sample Measurements (pCi/g)

Sample ID	Location	Net Total U (pCi/g)	Net Th(nat) (pCi/g)	Net Ra-226 (pCi/g)
TCN-1977	Sedimentation Tank	-1.8	0.5	3.9
TCN-1977B	Sedimentation Tank	-1.8	1.9	8.5
TCN-1978	Limestone Pit	-1.7	-1.8	-0.4
TCN-1978B	Limestone Pit	-1.8	-1.7	-0.3
TCN-1984A	Limestone Pit	-0.6	-1.8	-0.3
TCN-1984B	Limestone Pit	-0.5	-1.7	-0.3
TCN-1984C	Limestone Pit	-0.5	-0.9	0.2

APPENDIX 6

NEXTEP Technical Memorandum 04-02

NEXTEP Environmental

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TECHNICAL MEMORANDUM 04-02

March 18, 2004

Originator: Ning Zhang, HP Analyst

Subject: ***Use of the 3" x ½" NaI Detector for Measurement of Contamination Inside Pipes for KMTC***

Revision: 0

ENDORSEMENT: This document contains the results of research and technical analysis which have been reviewed and approved for publication by the Technical Director, NEXTEP Environmental, Inc.

Signed original on file at NEXTEP Louisville office and with KMTC QA.

Harry J. Newman, CHP, Technical Director Date

Introduction

Laboratory drains and pipes within the Kerr-McGee Technical Center (KMTC) were potentially contaminated with uranium and thorium. The general materials and geometries for these pipes are listed in Attachment A. In this Technical Memorandum (TM), the MCNP[30] code was used to simulate the radiological characteristics and geometry of the pipes and to determine the detection capabilities of the instrumentation that is proposed for site characterization and final status survey.

The object of this study, therefore, is to model the pipes, and obtain information required to relate the NaI count rate data to activity, and to determine the minimum detectable concentration (MDC) from the simulated background counts expected for each configuration. The results will be used to direct on-site surveys.

[30] MCNP is the acronym for "Monte Carlo N Particle" software, Los Alamos National Laboratory, Version 4c

Model Specifications

Geometry

Figure 1 illustrates the basic geometry of the MCNP model for the pipes and associated NaI detector.

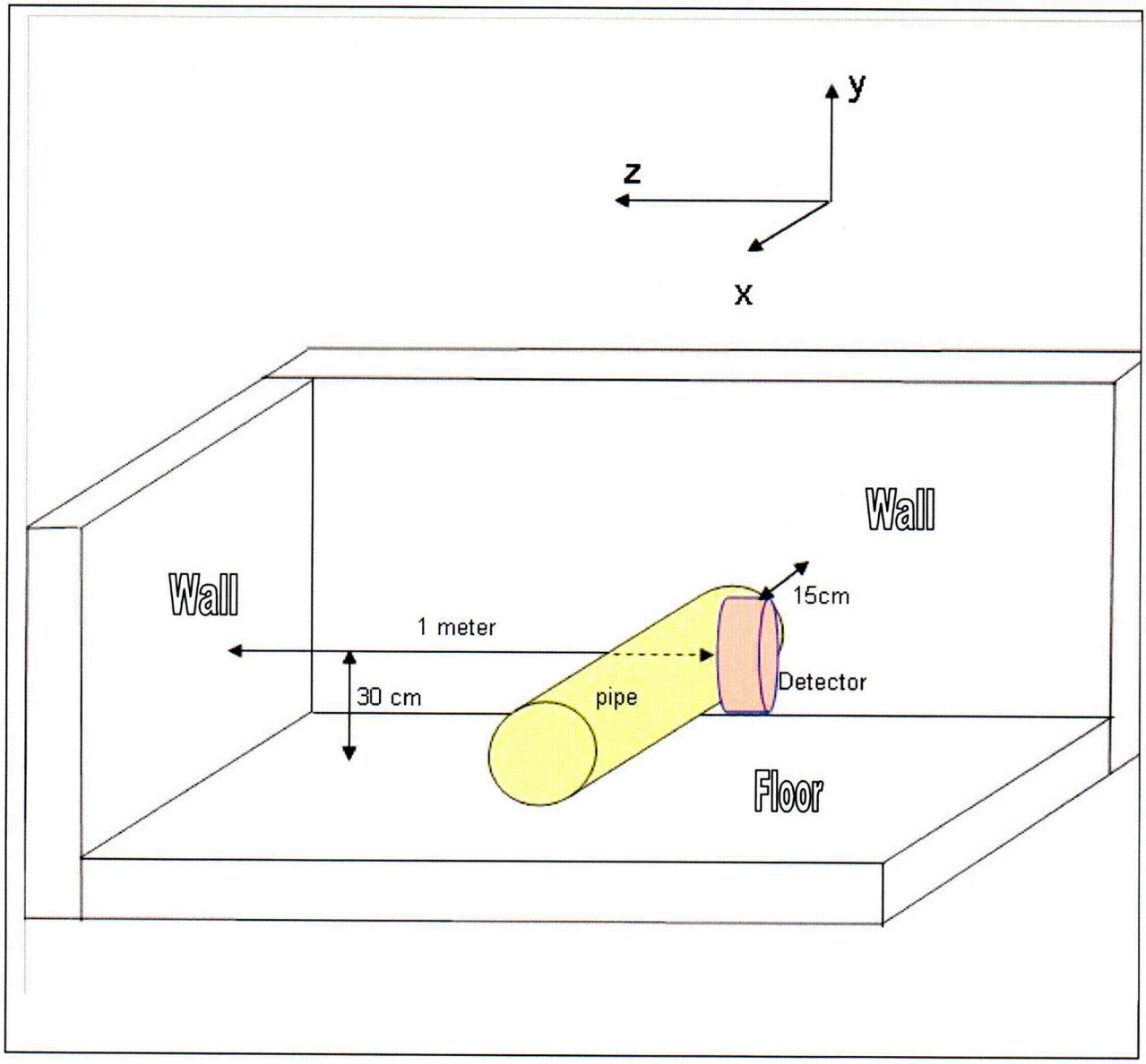

Figure 1

MCNP Model

The MCNP model consisted of three parts:

1. Pipe: the pipe was constructed according to one of the geometries listed in Attachment A.

2. Detector: the detector was a 3"x1/2" NaI detector with 1/4" thick lead shield. Figure 2 illustrates the detector structures in the MNCP model and it's geometrical relationship to the pipe in the model.

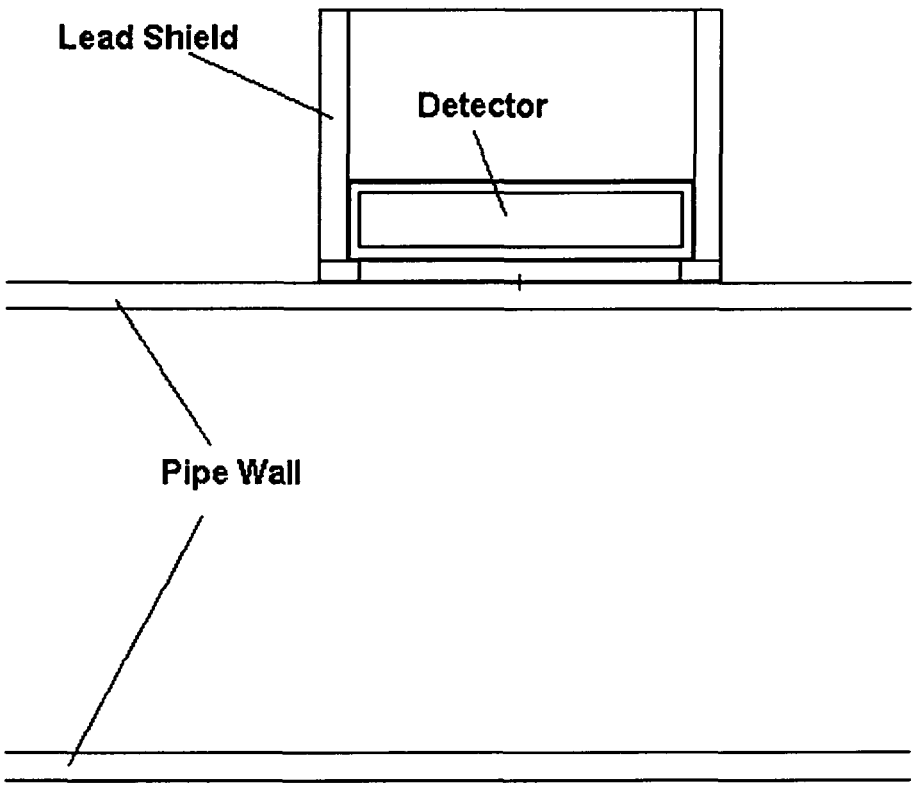

Figure 2
Detector Structure in MCNP Model

3. Concrete Wall and Floor: three concrete blocks were constructed in the MCNP model to represent the two walls and one floor involved. The purpose of constructing the walls and floor was to simulate background.

In the MCNP model, it was assumed that the pipe was 30 cm above the concrete floor. The detector was placed parallel to the floor and 1 meter away from the opposite wall and 15 cm away from the side wall as shown in Figure 1.

Background Activities

Table 1 lists the activity densities for simulating the background radioactivity in the model. This activity was uniformly distributed within the three concrete blocks.

Table 1

Activity Densities Assigned to Background Materials[31]

Nuclide	Activity Density of Concrete pCi/g
U-238	0.675
Th-232	0.216
Ra-226	0.6
K-40	1.89

Contaminant Activity for Accessible (Exposed) Piping

Table 2 lists the indoor surface DCGLs as well as an assumed "mixture" DCGL for KMTC. These limits were assigned to the inner surfaces of the accessible (exposed) pipes. The counting rate of the detector was simulated using these activity assignments.

Table 2

Contamination Activity Assigned to Exposed Pipe Inner Surfaces

Nuclide	$DCGL_w$[32] ($dpm/100cm^2$)*
Radium-226	16,300
Th-232	12,500
U-238	177,300
Mixture**	20,615

*The DCGLw are in units of $dpm/100cm^2$ for the parent nuclide.

** The mixture limit was calculated according to the Unity Rule using the assumed activity of 1/3 DCGLw for each of the 3 parent nuclides per Equation 1.

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31 Based on NCRP Report No.94, Exposure of the Population in the United States and Canada from Natural Background Radiation. page 61, using carbonate rocks. The Ra-226 value was assigned using professional judgement.

32 NEXTEP Tech Memo 0203, *Derivation of Indoor Surface DCGLs for KMTC*, H. Newman, CHP.

Equation 1

$$\frac{1}{\frac{0.33}{177,300}+\frac{0.33}{12,500}+\frac{0.33}{16,300}} = 20,615 dpm/100cm2$$

Contaminant Activity for Embedded Piping[33]

Pipes and drains located within the plumbing chase between laboratories and underground components of the chemical drain system are considered as "embedded piping" and are subject to the higher limits derived in NEXTEP TM 0403[34]. The limits provided by TM 0403 are listed in Table 3.

Table 3

Contamination Activity Assigned to Embedded Pipe Inner Surfaces[35]

Nuclide	$DCGL_w$[36] (dpm/100cm^2)
Th-232	487,000
U-238	4,350,000
Ra-226	1,150,000
Mixture*	961,000

* According to TM0403, the activities contributed from each nuclide were equal.

These results will be applied to the simulation for the 4" pipes within the chase ways between the laboratories.

Background Calculations

The background activity from Table 1 was applied to the background models for different pipe configurations. The background count rates from these simulations is listed in Table 4.

Table 4

Background Count Rates (cpm)

	Glass	Plastic
1"	1,063	1,081
2"	1,043	1,070
4"	1,035	1,081

[33] NEXTEP Tech Memo 0403, *Derivation of Embedded Piping DCGLs for KMTC*, A.H. Thatcher, CHP.
[34] NEXTEP Tech Memo 0403, ibid.
[35] NEXTEP Tech Memo 0403, ibid.
[36] NEXTEP Tech Memo 0203, ibid.

It can be seen from Table 4 that the background count rates for different configurations did not have significant differences. So a single background count rate can be reported for all of those configurations. To be conservative, the largest background count rate value of 1,081 cpm plus an extra 1,000 cpm count rate from other sources will be used as the background count rate for purposes of MDC calculation. This simulated background count rate (2,081 cpm) was within the range of the actual background count rate, which ranged from 1,800 cpm to 2,300 cpm based upon actual measurements taken onsite.

Minimum Detectable Concentration (MDC)

According to MARSSIM[37], the MDC can be calculated using Equation 2. Substituting a background of 2,081 cpm into Equation 2 yields a MDC of 215 cpm.

Equation 2

$$MDC = 3 + 4.65\sqrt{B} = 3 + 4.65\sqrt{2081} = 215cpm$$

Where:

B = Background Count Rate, in cpm.

Results and Discussion

The activities listed in Table 2 were applied to the inner surfaces of each configuration of the pipes, the model was run and MCNP returned the detector efficiency for each configuration MCNP data have not been included as the printouts are voluminous. The count rate at the detector as listed in Tables 5 and 6 was then determined by multiplying the MCNP output (efficiency) by the total contaminant activity as calculated by Microshield (see Attachment C). A summary of Microshield results is provided in Attachment C, Table C-1. Listings of all Microshield files are provided in Attachment C, Table C-2 and in the archive CD. Printouts of all Microshield results are also provided in Attachments C-1 through C-17. Integration time for the survey measurement being simulated was 1 minute.

From the simulation results in Tables 5 and Table 6, all resulting theoretical count rates are much higher than the Minimum Detectable Limit and therefore a 1-minute direct count time can be used for final survey in such a situation.

[37] MARSSIM Chapter 6

Table 5
Count Rates at DCGLw for Glass Pipe (cpm, net of background)

	Accessible Piping Limits			Embedded Limits 4" dia.
	1" dia.	2" dia.	4" dia.	
Ra-226 Only	3,973	5,222	6,594	464,784
Th-232 Only	3,482	4,604	6,008	234,553
U-238 Only	2,579	3,385	4,270	104,824
Mixture	3,672	4,856	6,202	290,512

Table 6
Count Rates at DCGLw for Plastic Pipe (cpm, net of background)

	Accessible Piping Limits			Embedded Limits 4" dia.
	1" dia.	2" dia.	4" dia.	
Ra-226 Only	4,291	5,672	7,354	518,329
Th-232 Only	3,520	4,660	6,146	239,933
U-238 Only	2,696	3,547	4,584	112,527
Mixture	3,830	5,073	6,608	309,446

The detailed results from the MCNP model simulation runs are contained in the text files provided in the data CD in the folder TCPipeMCNP. The names of the files are listed in Attachment B. The data CD will be maintained in NEXTEP's TM archives for future referral as required.

Conclusions and Recommendations

The theoretical background count rate for measurement of affected drain piping is **2,081 cpm**.

The predicted count rate for accessible piping contaminated on the inside at the DCGLw for indoor surfaces was greater than the MDC for the detector.

Predicted count rates for embedded piping contaminated on the inside surface at the DCGLw was greater than the MDC for the detector.

One-minute integration times should be used for FSS gamma surveys of affected piping.

Thresholds equal to the theoretical detector count rates produced by the model (Tables 5 and 6) should be used for FSS surveys of the chemical drain system at KMTC.

Appendix 6
Attachment A
Pipe Geometries*

	Glass			Plastic		
	1"	2"	4"	1"	2"	4"
Outer Diameter(Inches)	$1\frac{5}{8}$	$2\frac{3}{8}$	$4\frac{5}{8}$	2	$2\frac{3}{8}$	$4\frac{1}{2}$
Inner Diameter(Inches)	$1\frac{1}{4}$	2	$4\frac{1}{8}$	$1\frac{9}{16}$	2	4

*In the original configuration spreadsheet, there is an additional 2"-pipe made of a polyurethane-based material for "Acid Waste." Because this material is similar to plastic, no individual model was constructed. The results for plastic pipe can be applied to the Acid Waste pipes.

Appendix 6
Attachment B
MCNP Model INP File List

Table B-1

MCNP INP File for Glass

	Background	Ra-226	Th-232	U-238	Mixture
1"	**TCPPBK11**	**TCPP1G01**	**TCPP1G02**	**TCPP1G03**	**TCPP1G04**
2"	**TCPPBK12**	**TCPP2G01**	**TCPP2G02**	**TCPP2G03**	**TCPP2G04**
4"	**TCPPBK13**	**TCPP4G01**	**TCPP4G02**	**TCPP4G03**	**TCPP4G04**

Table B-2

MCNP INP File for Plastic

	Background	Ra-226	Th-232	U-238	Mixture
1"	**TCPPBK21**	**TCPP1P01**	**TCPP1P02**	**TCPP1P03**	**TCPP1P04**
2"	**TCPPBK22**	**TCPP2P01**	**TCPP2P02**	**TCPP2P03**	**TCPP2P04**
4"	**TCPPBK23**	**TCPP4P01**	**TCPP4P02**	**TCPP4P03**	**TCPP4P04**

Appendix 6

Attachment C

Microshield5 Output

Table C-1

Summary Of MS5 Running Results (photons/second)

Background	*68,680 (c-17)** For 1meter x 1meter x 1foot(3.48cm) Concrete Block (density=2.6g/cm^3)			
	1"	2"	4"	TM0403
Ra-226	*4,055(C-1)*	*6,488(C-5)*	*13,380(C-9)*	*943,000(C-13)*
Th-232	*4,219(C-2)*	*6,751(C-6)*	*13,920(C-10)*	*543,400(C-14)*
U-238	*2,259(C-3)*	*3,615(C-7)*	*7,456(C-11)*	*182,900(C-15)*
Mixture	*4,099(C-4)*	*6,559(C-8)*	*13,530(C-12)*	*633,700(C-16)*

*(C-number) in each cell stand for order number of MicroShield output in Attachment C

Table C-2

MS5 Input File list

Background	*TCPPC17.ms5*			
	1"	2"	4"	TM0403
Ra-226	*TCPPC01.ms5*	*TCPPC05.ms5*	*TCPPC09.ms5*	*TCPPC13.ms5*
Th-232	*TCPPC02.ms5*	*TCPPC06.ms5*	*TCPPC10.ms5*	*TCPPC14.ms5*
U-238	*TCPPC03.ms5*	*TCPPC07.ms5*	*TCPPC11.ms5*	*TCPPC15.ms5*
Mixture	*TCPPC04.ms5*	*TCPPC08.ms5*	*TCPPC12.ms5*	*TCPPC16.ms5*

Attachment C-1

Ra-226 for 1" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC01.MS5
Run Date : March 24, 2004
Run Time : 3:57:55 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 1", Ra-226
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	1.588 cm	0.6 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	1.588 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Bi-210	2.8687e-008	1.0614e+003	4.4247e-005	1.6371e+000
Bi-214	4.7038e-008	1.7404e+003	7.2550e-005	2.6844e+000
Pb-210	2.8699e-008	1.0618e+003	4.4264e-005	1.6378e+000
Pb-214	4.7038e-008	1.7404e+003	7.2550e-005	2.6844e+000
Po-210	2.8370e-008	1.0497e+003	4.3757e-005	1.6190e+000
Po-214	4.7028e-008	1.7400e+003	7.2535e-005	2.6838e+000
Po-218	4.7047e-008	1.7407e+003	7.2565e-005	2.6849e+000
Ra-226	4.7047e-008	1.7407e+003	7.2564e-005	2.6849e+000
Rn-222	4.7047e-008	1.7407e+003	7.2565e-005	2.6849e+000

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.05	6.224e+01	4.438e-03	4.446e-03	1.182e-05	1.184e-05
0.08	4.012e+02	4.579e-02	4.585e-02	7.246e-05	7.256e-05
0.1	2.363e+00	3.370e-04	3.374e-04	5.156e-07	5.162e-07
0.2	1.875e+02	5.349e-02	5.353e-02	9.441e-05	9.448e-05
0.3	3.592e+02	1.537e-01	1.538e-01	2.916e-04	2.918e-04
0.4	6.660e+02	3.801e-01	3.803e-01	7.406e-04	7.410e-04
0.5	3.109e+01	2.218e-02	2.219e-02	4.354e-05	4.356e-05
0.6	8.391e+02	7.184e-01	7.187e-01	1.402e-03	1.403e-03
0.8	1.645e+02	1.878e-01	1.878e-01	3.571e-04	3.572e-04

Page : 2
DOS File : TCPPC01.MS5
Run Date : March 24, 2004
Run Time: 3:57:55 PM
Duration : 00:00:01

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
1.0	5.449e+02	7.776e-01	7.778e-01	1.433e-03	1.434e-03
1.5	3.313e+02	7.093e-01	7.094e-01	1.193e-03	1.194e-03
2.0	4.658e+02	1.329e+00	1.330e+00	2.056e-03	2.056e-03
TOTALS:	4.055e+03	4.383e+00	4.384e+00	7.697e-03	7.699e-03

Attachment C-2

Th-232 for 1" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC02.MS5
Run Date : March 24, 2004
Run Time : 4:09:38 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 1", TH-232
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	1.588 cm	0.6 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	1.588 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ac-228	3.5468e-008	1.3123e+003	5.4705e-005	2.0241e+000
Bi-212	3.4977e-008	1.2941e+003	5.3948e-005	1.9961e+000
Pb-212	3.4977e-008	1.2941e+003	5.3948e-005	1.9961e+000
Po-212	2.2410e-008	8.2915e+002	3.4564e-005	1.2789e+000
Po-216	3.4977e-008	1.2942e+003	5.3948e-005	1.9961e+000
Ra-224	3.4977e-008	1.2942e+003	5.3948e-005	1.9961e+000
Ra-228	3.5468e-008	1.3123e+003	5.4705e-005	2.0241e+000
Rn-220	3.4977e-008	1.2942e+003	5.3948e-005	1.9961e+000
Th-228	3.4980e-008	1.2942e+003	5.3952e-005	1.9962e+000
Th-232	3.6448e-008	1.3486e+003	5.6216e-005	2.0800e+000
Tl-208	1.2567e-008	4.6498e+002	1.9383e-005	7.1718e-001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	1.323e+01	7.547e-04	7.561e-04	3.338e-06	3.344e-06
0.06	9.142e+00	7.823e-04	7.836e-04	1.554e-06	1.556e-06
0.08	5.589e+02	6.377e-02	6.387e-02	1.009e-04	1.011e-04
0.1	9.299e+01	1.327e-02	1.328e-02	2.029e-05	2.032e-05
0.15	5.513e+01	1.180e-02	1.181e-02	1.943e-05	1.945e-05
0.2	7.039e+02	2.009e-01	2.010e-01	3.545e-04	3.548e-04
0.3	3.409e+02	1.459e-01	1.460e-01	2.768e-04	2.770e-04

Page : 2
DOS File : TCPPC02.MS5
Run Date: March 24, 2004
Run Time: 4:09:38 PM
Duration : 00:00:01

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
0.4	3.103e+01	1.771e-02	1.772e-02	3.451e-05	3.453e-05
0.5	1.805e+02	1.288e-01	1.289e-01	2.528e-04	2.529e-04
0.6	4.118e+02	3.525e-01	3.527e-01	6.881e-04	6.884e-04
0.8	4.146e+02	4.733e-01	4.734e-01	9.002e-04	9.004e-04
1.0	7.639e+02	1.090e+00	1.090e+00	2.009e-03	2.010e-03
1.5	1.754e+02	3.755e-01	3.755e-01	6.317e-04	6.319e-04
2.0	3.947e+00	1.127e-02	1.127e-02	1.742e-05	1.742e-05
3.0	4.641e+02	1.987e+00	1.987e+00	2.696e-03	2.696e-03
TOTALS:	4.219e+03	4.873e+00	4.875e+00	8.007e-03	8.009e-03

Attachment C-3

U-238 for 1" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC03.MS5
Run Date : March 24, 2004
Run Time : 4:05:42 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 1", U238
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	1.588 cm	0.6 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	1.588 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Bi-210	4.9478e-018	1.8307e-007	7.6314e-015	2.8236e-010
Bi-214	2.5389e-017	9.3939e-007	3.9160e-014	1.4489e-009
Pa-234	8.2848e-010	3.0654e+001	1.2778e-006	4.7280e-002
Pa-234m	5.1780e-007	1.9159e+004	7.9865e-004	2.9550e+001
Pb-210	4.9604e-018	1.8353e-007	7.6508e-015	2.8308e-010
Pb-214	2.5389e-017	9.3940e-007	3.9160e-014	1.4489e-009
Po-210	4.6180e-018	1.7087e-007	7.1228e-015	2.6354e-010
Po-214	2.5384e-017	9.3920e-007	3.9151e-014	1.4486e-009
Po-218	2.5394e-017	9.3959e-007	3.9168e-014	1.4492e-009
Ra-226	2.5433e-017	9.4101e-007	3.9227e-014	1.4514e-009
Rn-222	2.5394e-017	9.3959e-007	3.9168e-014	1.4492e-009
Th-230	5.9081e-015	2.1860e-004	9.1126e-012	3.3717e-007
Th-234	5.1780e-007	1.9159e+004	7.9865e-004	2.9550e+001
U-234	4.3897e-011	1.6242e+000	6.7706e-008	2.5051e-003
U-238	5.1780e-007	1.9159e+004	7.9865e-004	2.9550e+001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	3.752e-02	2.140e-06	2.144e-06	9.465e-09	9.482e-09
0.05	1.917e-03	1.367e-07	1.369e-07	3.641e-10	3.647e-10
0.06	7.499e+02	6.417e-02	6.428e-02	1.275e-04	1.277e-04

Page : 2
DOS File : TCPPC03.MS5
Run Date : March 24, 2004
Run Time : 4:05:42 PM
Duration : 00:00:01

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
0.08	2.724e+01	3.108e-03	3.112e-03	4.918e-06	4.925e-06
0.1	1.176e+03	1.678e-01	1.680e-01	2.566e-04	2.570e-04
0.15	9.665e+00	2.068e-03	2.070e-03	3.406e-06	3.409e-06
0.2	6.466e+00	1.845e-03	1.846e-03	3.256e-06	3.259e-06
0.3	2.226e+00	9.529e-04	9.534e-04	1.808e-06	1.809e-06
0.4	1.882e+00	1.074e-03	1.075e-03	2.093e-06	2.094e-06
0.5	2.795e+00	1.994e-03	1.995e-03	3.915e-06	3.916e-06
0.6	1.142e+01	9.779e-03	9.783e-03	1.909e-05	1.909e-05
0.8	6.360e+01	7.261e-02	7.263e-02	1.381e-04	1.382e-04
1.0	2.034e+02	2.902e-01	2.903e-01	5.349e-04	5.351e-04
1.5	4.290e+00	9.183e-03	9.185e-03	1.545e-05	1.545e-05
2.0	5.534e-01	1.580e-03	1.580e-03	2.443e-06	2.443e-06
TOTALS:	2.259e+03	6.263e-01	6.268e-01	1.114e-03	1.114e-03

Attachment C-4

Mixture for 1" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC04.MS5
Run Date: March 24, 2004
Run Time: 4:14:26 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 1", mix
Description: Case 1
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	1.588 cm	0.6 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	1.588 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ac-228	1.9439e-008	7.1925e+002	2.9983e-005	1.1094e+000
Bi-210	1.2023e-008	4.4486e+002	1.8545e-005	6.8615e-001
Bi-212	1.9170e-008	7.0929e+002	2.9567e-005	1.0940e+000
Bi-214	1.9714e-008	7.2943e+002	3.0407e-005	1.1251e+000
Pa-234	3.1962e-011	1.1826e+000	4.9297e-008	1.8240e-003
Pa-234m	1.9976e-008	7.3911e+002	3.0811e-005	1.1400e+000
Pb-210	1.2028e-008	4.4504e+002	1.8552e-005	6.8642e-001
Pb-212	1.9170e-008	7.0929e+002	2.9567e-005	1.0940e+000
Pb-214	1.9714e-008	7.2943e+002	3.0407e-005	1.1251e+000
Po-210	1.1890e-008	4.3994e+002	1.8339e-005	6.7855e-001
Po-212	1.2282e-008	4.5444e+002	1.8944e-005	7.0092e-001
Po-214	1.9710e-008	7.2928e+002	3.0401e-005	1.1248e+000
Po-216	1.9170e-008	7.0929e+002	2.9568e-005	1.0940e+000
Po-218	1.9718e-008	7.2958e+002	3.0413e-005	1.1253e+000
Ra-224	1.9170e-008	7.0929e+002	2.9568e-005	1.0940e+000
Ra-226	1.9718e-008	7.2957e+002	3.0413e-005	1.1253e+000
Ra-228	1.9439e-008	7.1925e+002	2.9983e-005	1.1094e+000
Rn-220	1.9170e-008	7.0929e+002	2.9568e-005	1.0940e+000
Rn-222	1.9718e-008	7.2958e+002	3.0413e-005	1.1253e+000
Th-228	1.9171e-008	7.0935e+002	2.9570e-005	1.0941e+000
Th-230	2.2793e-016	8.4333e-006	3.5155e-013	1.3007e-008
Th-232	1.9976e-008	7.3911e+002	3.0811e-005	1.1400e+000
Th-234	1.9976e-008	7.3911e+002	3.0811e-005	1.1400e+000
Tl-208	6.8878e-009	2.5485e+002	1.0624e-005	3.9307e-001
U-234	1.6935e-012	6.2659e-002	2.6120e-009	9.6644e-005
U-238	1.9976e-008	7.3911e+002	3.0811e-005	1.1400e+000

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

Page : 2
DOS File : TCPPC04.MS5
Run Date : March 24, 2004
Run Time: 4:14:26 PM
Duration : 00:00:01

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Results Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.04	7.254e+00	4.137e-04	4.145e-04	1.830e-06	1.833e-06
0.05	2.609e+01	1.860e-03	1.863e-03	4.955e-06	4.964e-06
0.06	3.394e+01	2.905e-03	2.909e-03	5.769e-06	5.779e-06
0.08	4.755e+02	5.426e-02	5.434e-02	8.587e-05	8.600e-05
0.1	9.733e+01	1.388e-02	1.390e-02	2.124e-05	2.127e-05
0.15	3.059e+01	6.546e-03	6.552e-03	1.078e-05	1.079e-05
0.2	4.646e+02	1.326e-01	1.327e-01	2.340e-04	2.342e-04
0.3	3.375e+02	1.445e-01	1.445e-01	2.740e-04	2.742e-04
0.4	2.962e+02	1.691e-01	1.691e-01	3.294e-04	3.296e-04
0.5	1.121e+02	7.997e-02	8.000e-02	1.570e-04	1.570e-04
0.6	5.778e+02	4.947e-01	4.949e-01	9.656e-04	9.660e-04
0.8	2.986e+02	3.409e-01	3.410e-01	6.484e-04	6.486e-04
1.0	6.549e+02	9.346e-01	9.348e-01	1.723e-03	1.723e-03
1.5	2.352e+02	5.034e-01	5.035e-01	8.470e-04	8.472e-04
2.0	1.974e+02	5.634e-01	5.635e-01	8.713e-04	8.714e-04
3.0	2.543e+02	1.089e+00	1.089e+00	1.477e-03	1.478e-03
TOTALS:	4.099e+03	4.532e+00	4.533e+00	7.657e-03	7.659e-03

Attachment C-5

Ra-226 for 2" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC05.MS5
Run Date : March 24, 2004
Run Time : 3:59:39 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 2", Ra-226
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	2.54 cm	1.0 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	2.54 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Bi-210	4.5900e-008	1.6983e+003	4.4247e-005	1.6371e+000
Bi-214	7.5260e-008	2.7846e+003	7.2550e-005	2.6844e+000
Pb-210	4.5918e-008	1.6990e+003	4.4264e-005	1.6378e+000
Pb-214	7.5260e-008	2.7846e+003	7.2550e-005	2.6844e+000
Po-210	4.5391e-008	1.6795e+003	4.3757e-005	1.6190e+000
Po-214	7.5244e-008	2.7840e+003	7.2535e-005	2.6838e+000
Po-218	7.5275e-008	2.7852e+003	7.2565e-005	2.6849e+000
Ra-226	7.5275e-008	2.7852e+003	7.2564e-005	2.6849e+000
Rn-222	7.5275e-008	2.7852e+003	7.2565e-005	2.6849e+000

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.05	9.959e+01	4.136e-03	4.147e-03	1.102e-05	1.105e-05
0.08	6.420e+02	4.267e-02	4.277e-02	6.753e-05	6.768e-05
0.1	3.780e+00	3.141e-04	3.147e-04	4.805e-07	4.814e-07
0.2	3.000e+02	4.986e-02	4.992e-02	8.800e-05	8.810e-05
0.3	5.746e+02	1.433e-01	1.434e-01	2.718e-04	2.721e-04
0.4	1.066e+03	3.543e-01	3.546e-01	6.904e-04	6.908e-04
0.5	4.974e+01	2.068e-02	2.069e-02	4.059e-05	4.061e-05
0.6	1.343e+03	6.697e-01	6.701e-01	1.307e-03	1.308e-03
0.8	2.632e+02	1.750e-01	1.751e-01	3.329e-04	3.331e-04

Page : 2
DOS File : TCPPC05.MS5
Run Date: March 24, 2004
Run Time: 3:59:39 PM
Duration : 00:00:01

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
1.0	8.719e+02	7.249e-01	7.252e-01	1.336e-03	1.337e-03
1.5	5.301e+02	6.612e-01	6.614e-01	1.113e-03	1.113e-03
2.0	7.452e+02	1.239e+00	1.240e+00	1.917e-03	1.917e-03
TOTALS:	6.488e+03	4.086e+00	4.087e+00	7.175e-03	7.178e-03

Attachment C-6

Th-232 for 2" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC06.MS5
Run Date : March 24, 2004
Run Time: 4:10:20 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 2", TH-232
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	2.54 cm	1.0 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	2.54 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ac-228	5.6748e-008	2.0997e+003	5.4705e-005	2.0241e+000
Bi-212	5.5963e-008	2.0706e+003	5.3948e-005	1.9961e+000
Pb-212	5.5963e-008	2.0706e+003	5.3948e-005	1.9961e+000
Po-212	3.5855e-008	1.3266e+003	3.4564e-005	1.2789e+000
Po-216	5.5963e-008	2.0706e+003	5.3948e-005	1.9961e+000
Ra-224	5.5963e-008	2.0706e+003	5.3948e-005	1.9961e+000
Ra-228	5.6749e-008	2.0997e+003	5.4705e-005	2.0241e+000
Rn-220	5.5963e-008	2.0706e+003	5.3948e-005	1.9961e+000
Th-228	5.5967e-008	2.0708e+003	5.3952e-005	1.9962e+000
Th-232	5.8316e-008	2.1577e+003	5.6216e-005	2.0800e+000
Tl-208	2.0107e-008	7.4397e+002	1.9383e-005	7.1718e-001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	2.117e+01	7.033e-04	7.052e-04	3.110e-06	3.119e-06
0.06	1.463e+01	7.291e-04	7.309e-04	1.448e-06	1.452e-06
0.08	8.942e+02	5.944e-02	5.957e-02	9.406e-05	9.427e-05
0.1	1.488e+02	1.236e-02	1.239e-02	1.891e-05	1.895e-05
0.15	8.821e+01	1.100e-02	1.101e-02	1.811e-05	1.813e-05
0.2	1.126e+03	1.872e-01	1.874e-01	3.304e-04	3.308e-04
0.3	5.455e+02	1.360e-01	1.361e-01	2.580e-04	2.583e-04

Page : 2
DOS File : TCPPC06.MS5
Run Date : March 24, 2004
Run Time: 4:10:20 PM
Duration : 00:00:01

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
0.4	4.965e+01	1.651e-02	1.652e-02	3.217e-05	3.219e-05
0.5	2.889e+02	1.201e-01	1.201e-01	2.357e-04	2.358e-04
0.6	6.588e+02	3.286e-01	3.288e-01	6.414e-04	6.418e-04
0.8	6.633e+02	4.412e-01	4.414e-01	8.392e-04	8.395e-04
1.0	1.222e+03	1.016e+00	1.017e+00	1.873e-03	1.874e-03
1.5	2.806e+02	3.500e-01	3.501e-01	5.889e-04	5.891e-04
2.0	6.315e+00	1.050e-02	1.050e-02	1.624e-05	1.624e-05
3.0	7.425e+02	1.852e+00	1.853e+00	2.513e-03	2.514e-03
TOTALS:	6.751e+03	4.543e+00	4.545e+00	7.464e-03	7.467e-03

Attachment C-7

U-238 for 2" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC07.MS5
Run Date : March 24, 2004
Run Time: 4:06:28 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 2", U238
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	2.54 cm	1.0 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	2.54 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	uCi/cm³	Bq/cm³
Bi-210	7.9164e-018	2.9291e-007	7.6314e-015	2.8236e-010
Bi-214	4.0622e-017	1.5030e-006	3.9160e-014	1.4489e-009
Pa-234	1.3256e-009	4.9046e+001	1.2778e-006	4.7280e-002
Pa-234m	8.2848e-007	3.0654e+004	7.9865e-004	2.9550e+001
Pb-210	7.9366e-018	2.9365e-007	7.6508e-015	2.8308e-010
Pb-214	4.0623e-017	1.5030e-006	3.9160e-014	1.4489e-009
Po-210	7.3888e-018	2.7339e-007	7.1228e-015	2.6354e-010
Po-214	4.0614e-017	1.5027e-006	3.9151e-014	1.4486e-009
Po-218	4.0631e-017	1.5033e-006	3.9168e-014	1.4492e-009
Ra-226	4.0693e-017	1.5056e-006	3.9227e-014	1.4514e-009
Rn-222	4.0631e-017	1.5033e-006	3.9168e-014	1.4492e-009
Th-230	9.4530e-015	3.4976e-004	9.1126e-012	3.3717e-007
Th-234	8.2848e-007	3.0654e+004	7.9865e-004	2.9550e+001
U-234	7.0235e-011	2.5987e+000	6.7706e-008	2.5051e-003
U-238	8.2848e-007	3.0654e+004	7.9865e-004	2.9550e+001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	6.003e-02	1.994e-06	2.000e-06	8.819e-09	8.843e-09
0.05	3.066e-03	1.274e-07	1.277e-07	3.393e-10	3.402e-10
0.06	1.200e+03	5.981e-02	5.996e-02	1.188e-04	1.191e-04

Page : 2
DOS File : TCPPC07.MS5
Run Date : March 24, 2004
Run Time: 4:06:28 PM
Duration : 00:00:01

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
0.08	4.358e+01	2.897e-03	2.903e-03	4.584e-06	4.594e-06
0.1	1.882e+03	1.563e-01	1.566e-01	2.392e-04	2.397e-04
0.15	1.546e+01	1.928e-03	1.931e-03	3.174e-06	3.179e-06
0.2	1.035e+01	1.720e-03	1.722e-03	3.035e-06	3.039e-06
0.3	3.562e+00	8.882e-04	8.890e-04	1.685e-06	1.686e-06
0.4	3.012e+00	1.001e-03	1.002e-03	1.951e-06	1.953e-06
0.5	4.472e+00	1.859e-03	1.860e-03	3.649e-06	3.651e-06
0.6	1.827e+01	9.116e-03	9.121e-03	1.779e-05	1.780e-05
0.8	1.018e+02	6.769e-02	6.772e-02	1.287e-04	1.288e-04
1.0	3.254e+02	2.705e-01	2.706e-01	4.987e-04	4.988e-04
1.5	6.864e+00	8.561e-03	8.563e-03	1.440e-05	1.441e-05
2.0	8.855e-01	1.473e-03	1.473e-03	2.277e-06	2.278e-06
TOTALS:	3.615e+03	5.838e-01	5.844e-01	1.038e-03	1.039e-03

Attachment C-8

Mixture for 2" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC08.MS5
Run Date : March 24, 2004
Run Time: 4:16:21 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 2", mix
Description: Case 1
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	2.54 cm	1.0 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	2.54 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ac-228	3.1103e-008	1.1508e+003	2.9983e-005	1.1094e+000
Bi-210	1.9237e-008	7.1178e+002	1.8545e-005	6.8615e-001
Bi-212	3.0672e-008	1.1349e+003	2.9567e-005	1.0940e+000
Bi-214	3.1543e-008	1.1671e+003	3.0407e-005	1.1251e+000
Pa-234	5.1139e-011	1.8921e+000	4.9297e-008	1.8240e-003
Pa-234m	3.1962e-008	1.1826e+003	3.0811e-005	1.1400e+000
Pb-210	1.9245e-008	7.1206e+002	1.8552e-005	6.8642e-001
Pb-212	3.0672e-008	1.1349e+003	2.9567e-005	1.0940e+000
Pb-214	3.1543e-008	1.1671e+003	3.0407e-005	1.1251e+000
Po-210	1.9024e-008	7.0390e+002	1.8339e-005	6.7855e-001
Po-212	1.9651e-008	7.2710e+002	1.8944e-005	7.0092e-001
Po-214	3.1536e-008	1.1668e+003	3.0401e-005	1.1248e+000
Po-216	3.0672e-008	1.1349e+003	2.9568e-005	1.0940e+000
Po-218	3.1549e-008	1.1673e+003	3.0413e-005	1.1253e+000
Ra-224	3.0672e-008	1.1349e+003	2.9568e-005	1.0940e+000
Ra-226	3.1549e-008	1.1673e+003	3.0413e-005	1.1253e+000
Ra-228	3.1103e-008	1.1508e+003	2.9983e-005	1.1094e+000
Rn-220	3.0672e-008	1.1349e+003	2.9568e-005	1.0940e+000
Rn-222	3.1549e-008	1.1673e+003	3.0413e-005	1.1253e+000
Th-228	3.0674e-008	1.1350e+003	2.9570e-005	1.0941e+000
Th-230	3.6468e-016	1.3493e-005	3.5155e-013	1.3007e-008
Th-232	3.1962e-008	1.1826e+003	3.0811e-005	1.1400e+000
Th-234	3.1962e-008	1.1826e+003	3.0811e-005	1.1400e+000
Tl-208	1.1020e-008	4.0775e+002	1.0624e-005	3.9307e-001
U-234	2.7096e-012	1.0025e-001	2.6120e-009	9.6644e-005
U-238	3.1962e-008	1.1826e+003	3.0811e-005	1.1400e+000

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

Page : 2
DOS File : TCPPC08.MS5
Run Date : March 24, 2004
Run Time : 4:16:21 PM
Duration : 00:00:01

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Results Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.04	1.161e+01	3.855e-04	3.866e-04	1.705e-06	1.710e-06
0.05	4.174e+01	1.734e-03	1.738e-03	4.618e-06	4.630e-06
0.06	5.431e+01	2.707e-03	2.714e-03	5.377e-06	5.390e-06
0.08	7.608e+02	5.057e-02	5.068e-02	8.003e-05	8.021e-05
0.1	1.557e+02	1.294e-02	1.296e-02	1.980e-05	1.983e-05
0.15	4.894e+01	6.101e-03	6.110e-03	1.005e-05	1.006e-05
0.2	7.434e+02	1.236e-01	1.237e-01	2.181e-04	2.183e-04
0.3	5.400e+02	1.346e-01	1.348e-01	2.554e-04	2.556e-04
0.4	4.739e+02	1.576e-01	1.577e-01	3.070e-04	3.073e-04
0.5	1.793e+02	7.454e-02	7.459e-02	1.463e-04	1.464e-04
0.6	9.245e+02	4.612e-01	4.614e-01	9.001e-04	9.006e-04
0.8	4.778e+02	3.178e-01	3.179e-01	6.044e-04	6.047e-04
1.0	1.048e+03	8.712e-01	8.716e-01	1.606e-03	1.607e-03
1.5	3.763e+02	4.693e-01	4.694e-01	7.896e-04	7.898e-04
2.0	3.158e+02	5.253e-01	5.254e-01	8.123e-04	8.125e-04
3.0	4.069e+02	1.015e+00	1.015e+00	1.377e-03	1.378e-03
TOTALS:	6.559e+03	4.225e+00	4.226e+00	7.138e-03	7.141e-03

Attachment C-9

Ra-226 for 4" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC09.MS5
Run Date : March 24, 2004
Run Time : 4:01:14 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4", Ra-226
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Bi-210	9.4668e-008	3.5027e+003	4.4247e-005	1.6371e+000
Bi-214	1.5522e-007	5.7433e+003	7.2550e-005	2.6844e+000
Pb-210	9.4705e-008	3.5041e+003	4.4264e-005	1.6378e+000
Pb-214	1.5522e-007	5.7433e+003	7.2550e-005	2.6844e+000
Po-210	9.3619e-008	3.4639e+003	4.3757e-005	1.6190e+000
Po-214	1.5519e-007	5.7421e+003	7.2535e-005	2.6838e+000
Po-218	1.5526e-007	5.7444e+003	7.2565e-005	2.6849e+000
Ra-226	1.5525e-007	5.7444e+003	7.2564e-005	2.6849e+000
Rn-222	1.5526e-007	5.7444e+003	7.2565e-005	2.6849e+000

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.05	2.054e+02	3.794e-03	3.812e-03	1.011e-05	1.015e-05
0.08	1.324e+03	3.915e-02	3.931e-02	6.195e-05	6.220e-05
0.1	7.796e+00	2.882e-04	2.892e-04	4.409e-07	4.424e-07
0.2	6.187e+02	4.575e-02	4.585e-02	8.075e-05	8.092e-05
0.3	1.185e+03	1.315e-01	1.317e-01	2.495e-04	2.499e-04
0.4	2.198e+03	3.252e-01	3.256e-01	6.336e-04	6.344e-04
0.5	1.026e+02	1.898e-02	1.900e-02	3.725e-05	3.729e-05
0.6	2.769e+03	6.147e-01	6.153e-01	1.200e-03	1.201e-03
0.8	5.428e+02	1.607e-01	1.608e-01	3.056e-04	3.058e-04

Page : 2
DOS File : TCPPC09.MS5
Run Date : March 24, 2004
Run Time: 4:01:14 PM
Duration : 00:00:01

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
1.0	1.798e+03	6.655e-01	6.659e-01	1.227e-03	1.227e-03
1.5	1.093e+03	6.071e-01	6.074e-01	1.021e-03	1.022e-03
2.0	1.537e+03	1.138e+00	1.138e+00	1.760e-03	1.760e-03
TOTALS:	1.338e+04	3.750e+00	3.753e+00	6.587e-03	6.592e-03

Attachment C-10

Th-232 for 4" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC10.MS5
Run Date : March 24, 2004
Run Time : 4:11:00 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4", TH-232
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ac-228	1.1704e-007	4.3306e+003	5.4705e-005	2.0241e+000
Bi-212	1.1542e-007	4.2707e+003	5.3948e-005	1.9961e+000
Pb-212	1.1542e-007	4.2707e+003	5.3948e-005	1.9961e+000
Po-212	7.3952e-008	2.7362e+003	3.4564e-005	1.2789e+000
Po-216	1.1542e-007	4.2707e+003	5.3948e-005	1.9961e+000
Ra-224	1.1542e-007	4.2707e+003	5.3948e-005	1.9961e+000
Ra-228	1.1704e-007	4.3306e+003	5.4705e-005	2.0241e+000
Rn-220	1.1542e-007	4.2707e+003	5.3948e-005	1.9961e+000
Th-228	1.1543e-007	4.2710e+003	5.3952e-005	1.9962e+000
Th-232	1.2028e-007	4.4502e+003	5.6216e-005	2.0800e+000
Tl-208	4.1472e-008	1.5344e+003	1.9383e-005	7.1718e-001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	4.367e+01	6.450e-04	6.481e-04	2.852e-06	2.866e-06
0.06	3.017e+01	6.688e-04	6.719e-04	1.328e-06	1.334e-06
0.08	1.844e+03	5.453e-02	5.475e-02	8.629e-05	8.664e-05
0.1	3.069e+02	1.134e-02	1.138e-02	1.735e-05	1.741e-05
0.15	1.819e+02	1.009e-02	1.012e-02	1.661e-05	1.666e-05
0.2	2.323e+03	1.718e-01	1.722e-01	3.032e-04	3.038e-04
0.3	1.125e+03	1.248e-01	1.250e-01	2.368e-04	2.372e-04

Page : 2
DOS File : TCPPC10.MS5
Run Date : March 24, 2004
Run Time : 4:11:00 PM
Duration : 00:00:01

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
0.4	1.024e+02	1.515e-02	1.517e-02	2.952e-05	2.956e-05
0.5	5.958e+02	1.102e-01	1.103e-01	2.163e-04	2.166e-04
0.6	1.359e+03	3.016e-01	3.019e-01	5.888e-04	5.893e-04
0.8	1.368e+03	4.050e-01	4.053e-01	7.703e-04	7.709e-04
1.0	2.521e+03	9.329e-01	9.335e-01	1.720e-03	1.721e-03
1.5	5.788e+02	3.214e-01	3.215e-01	5.407e-04	5.409e-04
2.0	1.302e+01	9.642e-03	9.646e-03	1.491e-05	1.492e-05
3.0	1.531e+03	1.701e+00	1.701e+00	2.307e-03	2.308e-03
TOTALS:	1.392e+04	4.171e+00	4.173e+00	6.852e-03	6.857e-03

Attachment C-11

U-238 for 4" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC11.MS5
Run Date : March 24, 2004
Run Time: 4:07:06 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4", U238
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm 0.0 in	0.5 cm 0.2 in	0 cm 0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Bi-210	1.6328e-017	6.0412e-007	7.6314e-015	2.8236e-010
Bi-214	8.3784e-017	3.1000e-006	3.9160e-014	1.4489e-009
Pa-234	2.7340e-009	1.0116e+002	1.2778e-006	4.7280e-002
Pa-234m	1.7087e-006	6.3223e+004	7.9865e-004	2.9550e+001
Pb-210	1.6369e-017	6.0566e-007	7.6508e-015	2.8308e-010
Pb-214	8.3784e-017	3.1000e-006	3.9160e-014	1.4489e-009
Po-210	1.5239e-017	5.6386e-007	7.1228e-015	2.6354e-010
Po-214	8.3766e-017	3.0993e-006	3.9151e-014	1.4486e-009
Po-218	8.3801e-017	3.1007e-006	3.9168e-014	1.4492e-009
Ra-226	8.3928e-017	3.1053e-006	3.9227e-014	1.4514e-009
Rn-222	8.3802e-017	3.1007e-006	3.9168e-014	1.4492e-009
Th-230	1.9497e-014	7.2138e-004	9.1126e-012	3.3717e-007
Th-234	1.7087e-006	6.3223e+004	7.9865e-004	2.9550e+001
U-234	1.4486e-010	5.3598e+000	6.7706e-008	2.5051e-003
U-238	1.7087e-006	6.3223e+004	7.9865e-004	2.9550e+001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	1.238e-01	1.829e-06	1.838e-06	8.088e-09	8.127e-09
0.05	6.325e-03	1.168e-07	1.174e-07	3.112e-10	3.127e-10
0.06	2.475e+03	5.486e-02	5.511e-02	1.090e-04	1.095e-04

Page : 2
DOS File : TCPPC11.MS5
Run Date : March 24, 2004
Run Time : 4:07:06 PM
Duration : 00:00:01

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
0.08	8.988e+01	2.657e-03	2.668e-03	4.205e-06	4.222e-06
0.1	3.881e+03	1.435e-01	1.439e-01	2.195e-04	2.202e-04
0.15	3.189e+01	1.769e-03	1.774e-03	2.913e-06	2.921e-06
0.2	2.134e+01	1.578e-03	1.581e-03	2.785e-06	2.791e-06
0.3	7.346e+00	8.152e-04	8.164e-04	1.546e-06	1.549e-06
0.4	6.211e+00	9.191e-04	9.203e-04	1.791e-06	1.793e-06
0.5	9.224e+00	1.706e-03	1.708e-03	3.349e-06	3.353e-06
0.6	3.769e+01	8.367e-03	8.375e-03	1.633e-05	1.635e-05
0.8	2.099e+02	6.214e-02	6.218e-02	1.182e-04	1.183e-04
1.0	6.711e+02	2.483e-01	2.485e-01	4.578e-04	4.581e-04
1.5	1.416e+01	7.860e-03	7.863e-03	1.322e-05	1.323e-05
2.0	1.826e+00	1.352e-03	1.353e-03	2.091e-06	2.092e-06
TOTALS:	7.456e+03	5.358e-01	5.368e-01	9.526e-04	9.543e-04

Attachment C-12

Mixture for 4" Tube

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC12.MS5
Run Date : March 24, 2004
Run Time : 4:16:55 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4", mix
Description: Case 1
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm 0.0 in	0.5 cm 0.2 in	0 cm 0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ac-228	6.4149e-008	2.3735e+003	2.9983e-005	1.1094e+000
Bi-210	3.9677e-008	1.4681e+003	1.8545e-005	6.8615e-001
Bi-212	6.3261e-008	2.3406e+003	2.9567e-005	1.0940e+000
Bi-214	6.5057e-008	2.4071e+003	3.0407e-005	1.1251e+000
Pa-234	1.0547e-010	3.9025e+000	4.9297e-008	1.8240e-003
Pa-234m	6.5921e-008	2.4391e+003	3.0811e-005	1.1400e+000
Pb-210	3.9693e-008	1.4686e+003	1.8552e-005	6.8642e-001
Pb-212	6.3261e-008	2.3406e+003	2.9567e-005	1.0940e+000
Pb-214	6.5057e-008	2.4071e+003	3.0407e-005	1.1251e+000
Po-210	3.9238e-008	1.4518e+003	1.8339e-005	6.7855e-001
Po-212	4.0531e-008	1.4997e+003	1.8944e-005	7.0092e-001
Po-214	6.5044e-008	2.4066e+003	3.0401e-005	1.1248e+000
Po-216	6.3261e-008	2.3407e+003	2.9568e-005	1.0940e+000
Po-218	6.5070e-008	2.4076e+003	3.0413e-005	1.1253e+000
Ra-224	6.3261e-008	2.3407e+003	2.9568e-005	1.0940e+000
Ra-226	6.5070e-008	2.4076e+003	3.0413e-005	1.1253e+000
Ra-228	6.4149e-008	2.3735e+003	2.9983e-005	1.1094e+000
Rn-220	6.3261e-008	2.3407e+003	2.9568e-005	1.0940e+000
Rn-222	6.5070e-008	2.4076e+003	3.0413e-005	1.1253e+000
Th-228	6.3266e-008	2.3408e+003	2.9570e-005	1.0941e+000
Th-230	7.5216e-016	2.7830e-005	3.5155e-013	1.3007e-008
Th-232	6.5921e-008	2.4391e+003	3.0811e-005	1.1400e+000
Th-234	6.5921e-008	2.4391e+003	3.0811e-005	1.1400e+000
Tl-208	2.2730e-008	8.4099e+002	1.0624e-005	3.9307e-001
U-234	5.5885e-012	2.0677e-001	2.6120e-009	9.6644e-005
U-238	6.5921e-008	2.4391e+003	3.0811e-005	1.1400e+000

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

Page : 2
DOS File : TCPPC12.MS5
Run Date : March 24, 2004
Run Time: 4:16:55 PM
Duration : 00:00:01

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Results Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.04	2.394e+01	3.536e-04	3.553e-04	1.564e-06	1.571e-06
0.05	8.609e+01	1.590e-03	1.598e-03	4.236e-06	4.256e-06
0.06	1.120e+02	2.483e-03	2.494e-03	4.932e-06	4.955e-06
0.08	1.569e+03	4.640e-02	4.658e-02	7.342e-05	7.372e-05
0.1	3.212e+02	1.187e-02	1.191e-02	1.816e-05	1.823e-05
0.15	1.009e+02	5.598e-03	5.614e-03	9.219e-06	9.244e-06
0.2	1.533e+03	1.134e-01	1.136e-01	2.001e-04	2.006e-04
0.3	1.114e+03	1.236e-01	1.238e-01	2.344e-04	2.348e-04
0.4	9.775e+02	1.446e-01	1.448e-01	2.818e-04	2.822e-04
0.5	3.699e+02	6.842e-02	6.849e-02	1.343e-04	1.344e-04
0.6	1.907e+03	4.233e-01	4.237e-01	8.262e-04	8.270e-04
0.8	9.854e+02	2.917e-01	2.919e-01	5.548e-04	5.553e-04
1.0	2.161e+03	7.998e-01	8.003e-01	1.474e-03	1.475e-03
1.5	7.761e+02	4.309e-01	4.311e-01	7.249e-04	7.253e-04
2.0	6.514e+02	4.822e-01	4.824e-01	7.457e-04	7.460e-04
3.0	8.393e+02	9.322e-01	9.324e-01	1.265e-03	1.265e-03
TOTALS:	1.353e+04	3.878e+00	3.881e+00	6.553e-03	6.558e-03

Attachment C-13

Ra-226 for TM0403 Limit

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC13.MS5
Run Date: March 24, 2004
Run Time: 4:03:22 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4",TM0403, RA
Description: Case 1
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Bi-210	6.6710e-006	2.4683e+005	3.1179e-003	1.1536e+002
Bi-214	1.0938e-005	4.0471e+005	5.1124e-003	1.8916e+002
Pb-210	6.6736e-006	2.4692e+005	3.1192e-003	1.1541e+002
Pb-214	1.0938e-005	4.0471e+005	5.1124e-003	1.8916e+002
Po-210	6.5971e-006	2.4409e+005	3.0834e-003	1.1409e+002
Po-214	1.0936e-005	4.0463e+005	5.1113e-003	1.8912e+002
Po-218	1.0940e-005	4.0479e+005	5.1134e-003	1.8920e+002
Ra-226	1.0940e-005	4.0479e+005	5.1134e-003	1.8920e+002
Rn-222	1.0940e-005	4.0479e+005	5.1134e-003	1.8920e+002

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.05	1.447e+04	2.674e-01	2.686e-01	7.122e-04	7.156e-04
0.08	9.331e+04	2.759e+00	2.770e+00	4.366e-03	4.383e-03
0.1	5.494e+02	2.031e-02	2.038e-02	3.107e-05	3.118e-05
0.2	4.360e+04	3.224e+00	3.231e+00	5.690e-03	5.702e-03
0.3	8.352e+04	9.267e+00	9.282e+00	1.758e-02	1.761e-02
0.4	1.549e+05	2.292e+01	2.294e+01	4.465e-02	4.471e-02
0.5	7.230e+03	1.337e+00	1.339e+00	2.625e-03	2.628e-03
0.6	1.951e+05	4.332e+01	4.336e+01	8.455e-02	8.463e-02
0.8	3.825e+04	1.132e+01	1.133e+01	2.153e-02	2.155e-02

Page : 2
DOS File : TCPPC13.MS5
Run Date : March 24, 2004
Run Time: 4:03:22 PM
Duration : 00:00:01

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
1.0	1.267e+05	4.689e+01	4.692e+01	8.644e-02	8.650e-02
1.5	7.705e+04	4.278e+01	4.280e+01	7.197e-02	7.201e-02
2.0	1.083e+05	8.018e+01	8.021e+01	1.240e-01	1.240e-01
TOTALS:	9.430e+05	2.643e+02	2.645e+02	4.641e-01	4.645e-01

Attachment C-14

Th-232 for TM0403 Limit

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC14.MS5
Run Date : March 24, 2004
Run Time: 4:12:01 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4", TM0403, Th
Description: Case 1
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm	0.5 cm	0 cm
	0.0 in	0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ac-228	4.5675e-006	1.6900e+005	2.1348e-003	7.8988e+001
Bi-212	4.5043e-006	1.6666e+005	2.1053e-003	7.7894e+001
Pb-212	4.5043e-006	1.6666e+005	2.1053e-003	7.7894e+001
Po-212	2.8859e-006	1.0678e+005	1.3488e-003	4.9907e+001
Po-216	4.5043e-006	1.6666e+005	2.1053e-003	7.7895e+001
Ra-224	4.5043e-006	1.6666e+005	2.1053e-003	7.7895e+001
Ra-228	4.5675e-006	1.6900e+005	2.1348e-003	7.8988e+001
Rn-220	4.5043e-006	1.6666e+005	2.1053e-003	7.7895e+001
Th-228	4.5046e-006	1.6667e+005	2.1054e-003	7.7901e+001
Th-232	4.6937e-006	1.7367e+005	2.1938e-003	8.1170e+001
Tl-208	1.6184e-006	5.9880e+004	7.5642e-004	2.7987e+001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	1.704e+03	2.517e-02	2.529e-02	1.113e-04	1.119e-04
0.06	1.177e+03	2.610e-02	2.622e-02	5.184e-05	5.208e-05
0.08	7.197e+04	2.128e+00	2.136e+00	3.368e-03	3.381e-03
0.1	1.198e+04	4.427e-01	4.442e-01	6.772e-04	6.796e-04
0.15	7.100e+03	3.937e-01	3.948e-01	6.484e-04	6.502e-04
0.2	9.065e+04	6.704e+00	6.718e+00	1.183e-02	1.186e-02
0.3	4.391e+04	4.872e+00	4.880e+00	9.241e-03	9.256e-03

Page : 2
DOS File : TCPPC14.MS5
Run Date: March 24, 2004
Run Time: 4:12:01 PM
Duration : 00:00:01

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
0.4	3.996e+03	5.913e-01	5.921e-01	1.152e-03	1.154e-03
0.5	2.325e+04	4.301e+00	4.305e+00	8.442e-03	8.451e-03
0.6	5.303e+04	1.177e+01	1.178e+01	2.298e-02	2.300e-02
0.8	5.339e+04	1.580e+01	1.582e+01	3.006e-02	3.008e-02
1.0	9.837e+04	3.641e+01	3.643e+01	6.711e-02	6.715e-02
1.5	2.259e+04	1.254e+01	1.255e+01	2.110e-02	2.111e-02
2.0	5.082e+02	3.763e-01	3.764e-01	5.819e-04	5.821e-04
3.0	5.976e+04	6.637e+01	6.639e+01	9.005e-02	9.007e-02
TOTALS:	5.434e+05	1.628e+02	1.629e+02	2.674e-01	2.676e-01

Attachment C-15

U-238 for TM0403 Limit

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC15.MS5
Run Date : March 24, 2004
Run Time: 4:08:09 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4", TM0403, U238
Description: Case 1
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm 0.0 in	0.5 cm 0.2 in	0 cm 0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Bi-210	4.0059e-016	1.4822e-005	1.8723e-013	6.9276e-009
Bi-214	2.0556e-015	7.6057e-005	9.6077e-013	3.5548e-008
Pa-234	6.7078e-008	2.4819e+003	3.1351e-005	1.1600e+000
Pa-234m	4.1923e-005	1.5512e+006	1.9595e-002	7.2500e+002
Pb-210	4.0161e-016	1.4860e-005	1.8771e-013	6.9453e-009
Pb-214	2.0556e-015	7.6058e-005	9.6078e-013	3.5549e-008
Po-210	3.7390e-016	1.3834e-005	1.7475e-013	6.4659e-009
Po-214	2.0552e-015	7.6041e-005	9.6057e-013	3.5541e-008
Po-218	2.0560e-015	7.6073e-005	9.6097e-013	3.5556e-008
Ra-226	2.0592e-015	7.6189e-005	9.6243e-013	3.5610e-008
Rn-222	2.0560e-015	7.6074e-005	9.6097e-013	3.5556e-008
Th-230	4.7835e-013	1.7699e-002	2.2357e-010	8.2723e-006
Th-234	4.1923e-005	1.5512e+006	1.9595e-002	7.2500e+002
U-234	3.5541e-009	1.3150e+002	1.6611e-006	6.1462e-002
U-238	4.1923e-005	1.5512e+006	1.9595e-002	7.2500e+002

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

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
0.04	3.038e+00	4.487e-05	4.509e-05	1.984e-07	1.994e-07
0.05	1.552e-01	2.866e-06	2.880e-06	7.635e-09	7.672e-09
0.06	6.072e+04	1.346e+00	1.352e+00	2.674e-03	2.686e-03

Page : 2
DOS File : TCPPC15.MS5
Run Date: March 24, 2004
Run Time: 4:08:09 PM
Duration : 00:00:01

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
0.08	2.205e+03	6.520e-02	6.546e-02	1.032e-04	1.036e-04
0.1	9.521e+04	3.520e+00	3.532e+00	5.385e-03	5.403e-03
0.15	7.825e+02	4.340e-02	4.352e-02	7.146e-05	7.166e-05
0.2	5.235e+02	3.872e-02	3.880e-02	6.833e-05	6.848e-05
0.3	1.802e+02	2.000e-02	2.003e-02	3.794e-05	3.800e-05
0.4	1.524e+02	2.255e-02	2.258e-02	4.394e-05	4.399e-05
0.5	2.263e+02	4.186e-02	4.191e-02	8.217e-05	8.226e-05
0.6	9.248e+02	2.053e-01	2.055e-01	4.007e-04	4.011e-04
0.8	5.150e+03	1.524e+00	1.526e+00	2.900e-03	2.902e-03
1.0	1.646e+04	6.093e+00	6.097e+00	1.123e-02	1.124e-02
1.5	3.473e+02	1.928e-01	1.929e-01	3.244e-04	3.246e-04
2.0	4.481e+01	3.317e-02	3.319e-02	5.130e-05	5.132e-05
TOTALS:	1.829e+05	1.315e+01	1.317e+01	2.337e-02	2.341e-02

Attachment C-16

Mixture for TM0403 Limit

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC16.MS5
Run Date : March 24, 2004
Run Time: 4:19:37 PM
Duration : 00:00:01

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: 4", TM0403, Mix
Description: Case 6
Geometry: 9 - Cylinder Surface - Internal Dose Point

Source Dimensions

Height	65.0 cm	2 ft 1.6 in
Radius	5.239 cm	2.1 in

Dose Points

	X	Y	Z
# 1	0 cm 0.0 in	0.5 cm 0.2 in	0 cm 0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Core	5.239 cm	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Ac-228	3.0049e-006	1.1118e+005	1.4044e-003	5.1965e+001
Bi-210	1.8586e-006	6.8767e+004	8.6867e-004	3.2141e+001
Bi-212	2.9633e-006	1.0964e+005	1.3850e-003	5.1245e+001
Bi-214	3.0474e-006	1.1275e+005	1.4243e-003	5.2700e+001
Pa-234	4.9406e-009	1.8280e+002	2.3092e-006	8.5440e-002
Pa-234m	3.0879e-006	1.1425e+005	1.4432e-003	5.3400e+001
Pb-210	1.8593e-006	6.8794e+004	8.6901e-004	3.2154e+001
Pb-212	2.9633e-006	1.0964e+005	1.3850e-003	5.1245e+001
Pb-214	3.0474e-006	1.1275e+005	1.4243e-003	5.2700e+001
Po-210	1.8380e-006	6.8005e+004	8.5905e-004	3.1785e+001
Po-212	1.8986e-006	7.0247e+004	8.8737e-004	3.2833e+001
Po-214	3.0468e-006	1.1273e+005	1.4240e-003	5.2689e+001
Po-216	2.9633e-006	1.0964e+005	1.3850e-003	5.1245e+001
Po-218	3.0480e-006	1.1278e+005	1.4246e-003	5.2711e+001
Ra-224	2.9633e-006	1.0964e+005	1.3850e-003	5.1245e+001
Ra-226	3.0480e-006	1.1278e+005	1.4246e-003	5.2710e+001
Ra-228	3.0049e-006	1.1118e+005	1.4045e-003	5.1965e+001
Rn-220	2.9633e-006	1.0964e+005	1.3850e-003	5.1245e+001
Rn-222	3.0480e-006	1.1278e+005	1.4246e-003	5.2711e+001
Th-228	2.9635e-006	1.0965e+005	1.3851e-003	5.1249e+001
Th-230	3.5233e-014	1.3036e-003	1.6467e-011	6.0930e-007
Th-232	3.0879e-006	1.1425e+005	1.4432e-003	5.3400e+001
Th-234	3.0879e-006	1.1425e+005	1.4432e-003	5.3400e+001
Tl-208	1.0647e-006	3.9394e+004	4.9763e-004	1.8412e+001
U-234	2.6178e-010	9.6857e+000	1.2235e-007	4.5270e-003
U-238	3.0879e-006	1.1425e+005	1.4432e-003	5.3400e+001

Buildup
The material reference is : Cyl. Core

Integration Parameters

Y Direction (axial)	20
Circumferential	20

Page : 2
DOS File : TCPPC16.MS5
Run Date : March 24, 2004
Run Time : 4:19:37 PM
Duration : 00:00:01

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Results Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.04	1.121e+03	1.656e-02	1.664e-02	7.325e-05	7.360e-05
0.05	4.033e+03	7.448e-02	7.484e-02	1.984e-04	1.994e-04
0.06	5.247e+03	1.163e-01	1.168e-01	2.310e-04	2.321e-04
0.08	7.351e+04	2.173e+00	2.182e+00	3.439e-03	3.453e-03
0.1	1.504e+04	5.561e-01	5.580e-01	8.508e-04	8.537e-04
0.15	4.728e+03	2.622e-01	2.630e-01	4.318e-04	4.330e-04
0.2	7.182e+04	5.312e+00	5.323e+00	9.375e-03	9.394e-03
0.3	5.217e+04	5.788e+00	5.798e+00	1.098e-02	1.100e-02
0.4	4.579e+04	6.775e+00	6.784e+00	1.320e-02	1.322e-02
0.5	1.733e+04	3.205e+00	3.208e+00	6.291e-03	6.298e-03
0.6	8.932e+04	1.983e+01	1.985e+01	3.870e-02	3.874e-02
0.8	4.616e+04	1.366e+01	1.367e+01	2.599e-02	2.601e-02
1.0	1.012e+05	3.746e+01	3.749e+01	6.906e-02	6.910e-02
1.5	3.635e+04	2.018e+01	2.019e+01	3.396e-02	3.397e-02
2.0	3.051e+04	2.259e+01	2.260e+01	3.493e-02	3.495e-02
3.0	3.932e+04	4.366e+01	4.368e+01	5.924e-02	5.926e-02
TOTALS:	6.337e+05	1.817e+02	1.818e+02	3.069e-01	3.072e-01

Attachment C-17

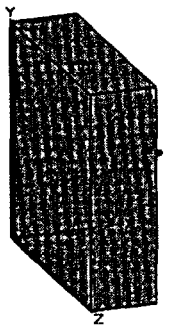
Background

MicroShield v5.03 (5.03-00027)
NEXTEP ENVIRONMENTAL INC.

Page : 1
DOS File : TCPPC17.MS5
Run Date: March 24, 2004
Run Time: 4:43:29 PM
Duration : 00:00:07

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Back, Con,1mx1mx1f
Description: Case 6
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	30.48 cm	1 ft
Width	100.0 cm	3 ft 3.4 in
Height	100.0 cm	3 ft 3.4 in

Dose Points

	X	Y	Z
# 1	50 cm	50 cm	50 cm
	1 ft 7.7 in	1 ft 7.7 in	1 ft 7.7 in

Shields

Shield Name	Dimension	Material	Density
Source	3.05e+05 cm³	Concrete	2.6
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ac-227	8.7667e-013	3.2437e-002	2.8762e-012	1.0642e-007
Ac-228	1.6657e-007	6.1632e+003	5.4650e-007	2.0221e-002
Bi-210	2.8619e-007	1.0589e+004	9.3895e-007	3.4741e-002
Bi-211	8.7071e-013	3.2216e-002	2.8567e-012	1.0570e-007
Bi-212	1.6427e-007	6.0779e+003	5.3894e-007	1.9941e-002
Bi-214	4.6926e-007	1.7363e+004	1.5396e-006	5.6964e-002
Fr-223	1.2098e-014	4.4763e-004	3.9692e-014	1.4686e-009
K-40	1.4978e-006	5.5418e+004	4.9140e-006	1.8182e-001
Pa-231	2.4637e-012	9.1157e-002	8.0830e-012	2.9907e-007
Pa-234	8.5588e-010	3.1668e+001	2.8080e-009	1.0390e-004
Pa-234m	5.3492e-007	1.9792e+004	1.7550e-006	6.4935e-002
Pb-210	2.8630e-007	1.0593e+004	9.3932e-007	3.4755e-002
Pb-211	8.7071e-013	3.2216e-002	2.8567e-012	1.0570e-007
Pb-212	1.6427e-007	6.0779e+003	5.3894e-007	1.9941e-002
Pb-214	4.6926e-007	1.7363e+004	1.5396e-006	5.6964e-002
Po-210	2.8302e-007	1.0472e+004	9.2854e-007	3.4356e-002
Po-211	2.3770e-015	8.7950e-005	7.7987e-015	2.8855e-010
Po-212	1.0525e-007	3.8941e+003	3.4530e-007	1.2776e-002
Po-214	4.6916e-007	1.7359e+004	1.5392e-006	5.6952e-002
Po-215	8.7072e-013	3.2217e-002	2.8567e-012	1.0570e-007
Po-216	1.6427e-007	6.0780e+003	5.3894e-007	1.9941e-002
Po-218	4.6935e-007	1.7366e+004	1.5399e-006	5.6975e-002
Ra-223	8.7072e-013	3.2217e-002	2.8567e-012	1.0570e-007
Ra-224	1.6427e-007	6.0780e+003	5.3894e-007	1.9941e-002
Ra-226	4.6935e-007	1.7366e+004	1.5399e-006	5.6975e-002
Ra-228	1.6657e-007	6.1633e+003	5.4650e-007	2.0221e-002
Rn-219	8.7072e-013	3.2217e-002	2.8567e-012	1.0570e-007
Rn-220	1.6427e-007	6.0780e+003	5.3894e-007	1.9941e-002
Rn-222	4.6935e-007	1.7366e+004	1.5399e-006	5.6975e-002
Th-227	8.6090e-013	3.1853e-002	2.8245e-012	1.0451e-007
Th-228	1.6428e-007	6.0784e+003	5.3898e-007	1.9942e-002

Page : 2
DOS File : TCPPC17.MS5
Run Date: March 24, 2004
Run Time: 4:43:29 PM
Duration : 00:00:07

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Th-230	6.1035e-015	2.2583e-004	2.0025e-014	7.4091e-010
Th-231	3.8832e-009	1.4368e+002	1.2740e-008	4.7138e-004
Th-232	1.7118e-007	6.3335e+003	5.6160e-007	2.0779e-002
Th-234	5.3492e-007	1.9792e+004	1.7550e-006	6.4935e-002
Tl-207	8.6833e-013	3.2128e-002	2.8489e-012	1.0541e-007
Tl-208	5.9021e-008	2.1838e+003	1.9364e-007	7.1647e-003
U-234	4.5348e-011	1.6779e+000	1.4878e-010	5.5049e-006
U-235	3.8832e-009	1.4368e+002	1.2740e-008	4.7138e-004
U-238	5.3492e-007	1.9792e+004	1.7550e-006	6.4935e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

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
0.015	2.703e-01	1.659e-13	1.784e-13	1.423e-14	1.530e-14
0.02	3.862e-04	7.488e-14	8.496e-14	2.594e-15	2.943e-15
0.03	2.106e+01	1.632e-07	2.092e-07	1.618e-09	2.073e-09
0.04	6.219e+01	1.739e-06	2.576e-06	7.693e-09	1.139e-08
0.05	6.210e+02	3.508e-05	5.940e-05	9.344e-08	1.582e-07
0.06	8.183e+02	7.398e-05	1.507e-04	1.469e-07	2.993e-07
0.08	6.673e+03	1.101e-03	2.744e-03	1.743e-06	4.343e-06
0.1	1.690e+03	4.091e-04	1.138e-03	6.259e-07	1.742e-06
0.15	2.913e+02	1.284e-04	3.842e-04	2.114e-07	6.326e-07
0.2	5.272e+03	3.457e-03	1.020e-02	6.101e-06	1.801e-05
0.3	5.187e+03	5.921e-03	1.627e-02	1.123e-05	3.087e-05
0.4	6.792e+03	1.153e-02	2.958e-02	2.248e-05	5.764e-05
0.5	1.161e+03	2.694e-03	6.523e-03	5.287e-06	1.280e-05
0.6	1.032e+04	3.096e-02	7.122e-02	6.044e-05	1.390e-04
0.8	3.653e+03	1.654e-02	3.519e-02	3.147e-05	6.693e-05
1.0	9.234e+03	5.777e-02	1.159e-01	1.065e-04	2.137e-04
1.5	1.005e+04	1.138e-01	2.058e-01	1.915e-04	3.463e-04
2.0	4.666e+03	8.042e-02	1.364e-01	1.244e-04	2.110e-04
3.0	2.179e+03	6.703e-02	1.042e-01	9.094e-05	1.414e-04
TOTALS:	6.868e+04	3.919e-01	7.359e-01	6.531e-04	1.245e-03

APPENDIX 7

NEXTEP Technical Memorandum 04-03

NEXTEP Environmental

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Louisville, KY 40222

Phone: (502) 339-9767
Fax: (502) 339-9275

TECHNICAL MEMORANDUM 04-03

March 1, 2004

Originator: Andrew H. Thatcher, CHP, Senior Scientist
Subject: Derivation of Embedded Piping DCGLs for KMTC
Revision: 0

ENDORSEMENT: This document contains the results of research and technical analysis which have been reviewed and approved for publication by the Technical Director, NEXTEP Environmental, Inc.

Signed original on file at NEXTEP Louisville office and with KMTC QA.

Harry J. Newman, CHP, Technical Director Date

INTRODUCTION:

Laboratory drains at the Kerr-McGee Technical Center (KMTC) discharge into common drains. This technical memorandum derives the allowable release limits (DCGLs) for:

- Pipe internals for embedded and buried piping outside of the building
- Piping contained within the chase ways between the laboratories
- Buried fixed equipment such as the sediment tank and the limestone pit

A brief discussion of the flow path of the piping is included below:

The laboratory drains are 1 ½ inch glass or PVC pipe from the laboratory sinks to the chase way. They then enter a 4" PVC pipe to the settling tank and then to the limestone pit. From the limestone pit to the manhole to the south is a 6" clay pipe. This portion of the drain system is always active and has a constant water flow with little sediment (or scale) buildup with the exception of a few traps in the building, the sediment tank, the limestone pit, and a manhole. The laboratory drainage system has been repaired and upgraded over the years and the type of pipe and wall thickness varies. Pipe access inside the building is limited.

BUILDING RENOVATION SCENARIO

Following the scenario guidance provided in NUREG 5512, a building renovation scenario was developed to determine the potential dose to individuals from the embedded piping and equipment. The scenario is summarized as follows:

1. A number of drainage runs exist at the Tech Center in addition to a sediment tank and limestone pit.
2. A reasonable worst case scenario would involve the demolition and removal of the buried piping and related fixed equipment.
3. The material is removed during site demolition with all formerly buried material stockpiled for ultimate disposal.
4. Exposure pathways include external gamma and inhalation of resuspended material.
5. It is likely that the potential for inhalation exposure would only exist during the time that each individual portion of the excavation or section of piping is removed. Even in these instances, resuspension would be limited due to both the limited area of the exposed piping and the likelihood that the potentially contaminated pipe scale would represent a airborne hazard.
6. In addition to exposed walls and floors from the sediment tank and limestone pit, it is assumed that many of the piping runs are crushed during stockpiling in order to reduce volume and allow for greater resuspension potential.

The following assumptions were used in the calculations:

- A unit uniform contamination on all buried surfaces is initially assumed to be 1 dpm/100 cm^2 for:

  The Uranium-238 series to Uranium-234

  Radium-226 and progeny (includes contribution from Th-230)

  Thorium-232 and progeny
- 30 years of ingrowth are assumed.
- The thickness of the contamination is assumed to be 1/32" (0.0008 m).
- Regardless of the composition of the pipe material, no shielding is taken into consideration in the calculations.
- There is no external contamination on the pipes.
- No shielding is assumed to exist between the pipe and the assumed dose point.
- External exposure to the contaminated material is assumed to be 50 hours.

EXTERNAL EXPOSURE CALCULATIONS

The Microshield® computer code[38] was used to model the external exposure from the contamination within the pipe as well as the surface of the limestone pit and the sediment tank. As previously mentioned, the material is assumed to be stockpiled. However, even in this condition a number of different methods for calculating exposures exist. The following three exposure scenarios were analyzed:

1. A pipe source. An individual is exposed to a contaminated pipe 20 meters in length. The calculated exposure point is 1 meter away from the midpoint of the pipe[39].
2. A volumetric source. The exhumed piping and excavation/tank material is assumed to be uniformly crushed such that the previously assumed surface contamination is now a volumetric source[40]. The tank/pit walls and floors are assumed to be 6" of concrete. The exposure point is assumed to be 1 m away from the crushed volume.
3. A slab source. The total surface area of the stockpiled material is 100 m^2 with all contamination on the surface layer. The exposure point is the center of the disk.

Scenario three, the slab source, is the most conservative assumption from an external dose standpoint and is included for all three radionuclide groupings in Attachment 1. In all instances, the appropriate exposure metric is assumed to be a rotational geometry. The conversion of the Microshield calculated dose rate to an estimated dose to an individual is performed as shown in Equation 1 for the case of the slab source and Uranium-238 to Uranium-234:

Equation 1

$$Exposure_{external} = \frac{4.57E-11\ \frac{mSv}{hr}}{dpm/cm^2} * 100\frac{Rem}{Sv} * 50hr = 2.29\ E-07\ \frac{mrem}{\frac{dpm}{100cm^2}}$$

Where:

$\frac{4.57E-11\ \frac{mSv}{hr}}{dpm/cm^2}$ = Effective dose equivalent rate calculated by Microshield (Attachment 1)

100 mrem/Sv = conversion factor

50 hr = exposure time

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38 Grove Engineering, Microshield, version 5.03, Rockville, MD. 1998.

39 Essentially standing on the pipe with the torso of the body as the dose point of interest.

40 A 100 m^2 surface area is based upon the dimensions of the sediment tank and the limestone pit and a conservative estimate of total piping area. The surface area assumes that a fraction of the total surface of the tank and pit are contaminated. The volumetric source is conservatively estimated as 10 m^3.

Inhalation Exposure Calculations

Using a unit surface concentration (1 dpm/100 cm²) with the following assumptions:

- Surface contamination[41] = 100 m².
- A worker breathing rate of 1.2 m³/hr.
- 3.2 E-05 of the material is available for release based upon a resuspension factor for mechanical disturbances[42] of 4 E-02/m. The fraction of material airborne is calculated as:

Equation 2

$$\text{Fraction released} = \frac{1.67\frac{Bq}{m^2} * \frac{4E-02}{m}}{1.67\frac{Bq}{m^2} * \frac{1}{0.0008m}} = 3.2E-05$$

Where:

1.67 Bq/m²	=	1 dpm/100 cm²
4 E-02	=	resuspension rate for mechanical disturbances
0.0008 m	=	thickness of scale contamination on surfaces

- Total time spent breathing the resuspended material[43] is assumed to be 3 seconds. Further assuming that there are 20 such mechanical disturbances that result in a total of 60 seconds of exposure.
- The elevated material is contained within a volume[44] of 200 m³.
- The wind speed is 2 m/s.
- DCFs for each isotope are as provided in Attachment 2, from ICRP (1995).

The calculated exposure per unit concentration for uranium is calculated as follows[45]:

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[41] The contaminant concentration is independent of the surface contamination as the volume increases linearly with the surface area.

[42] NUREG 5512, Table 6.4. This value represents the upper bound value for mechanical disturbances.

[43] The 100 m² area has a radius of 5.6 m. 6 m divided by 2 m/s = 3 seconds.

[44] The breathing height of 2 meters x the surface area of contamination.

[45] The calculated value shown represents the sum of the individual calculations in Attachment 2 from the parent and the progeny.

Equation 3

$$\frac{\left(Concentration\left(\frac{Bq}{m^2}\right) * Area_{contaminated}\left(m^2\right)\right)}{AirVolume\left(m^3\right)} * Fraction_{released} * Breathing_{rate}\left(\frac{m^3}{hr}\right) *$$

$$Time_{exposure}\left(\frac{hr}{yr}\right) * DCF\left(\frac{Sv}{Bq}\right) * 10^5\left(\frac{mrem}{Sv}\right) = 5.51\ E-06\left(\frac{\frac{mrem}{yr}}{\frac{1dpm}{100cm^2}}\right)$$

The calculations for each major isotope are included as Attachment 2.

Individual Radionuclide Limits

The internal and external dose contributions for uranium 238 to uranium 234 may be combined and applied to the 25 mrem/y release limit in the following manner:

Equation 4

$$\frac{25mrem/y}{2.29\ E\text{-}07\frac{mrem/y}{dpm/100cm^2} + 5.51\ E-06\frac{mrem/y}{dpm/100cm^2}} = 4.36E+06dpm/100cm^2$$

The release limit for all three radionuclide groups are shown in Table 1.

Table 1
Calculated Embedded Piping DCGLs

Nuclide	$DCGL_w$ (dpm/100cm^2)*
Radium-226 and progeny (including Th-230)	1,150,000
Th-232 and progeny	487,000
U-238 to U-234	4,350,000

*The units of the calculated DCGLw are dpm/100cm^2 for the parent nuclide.

Combining of Individual Release Limits

An overall release limit for the embedded piping may be determined by combining the individual release limits in the following manner:

Equation 5

$$DCGL_{comp} = \frac{\sum_i F_i}{\sum \frac{F_i}{Lm_i}}$$

Where:

$DCGL_{comp}$	=	Composite DCGL of Uranium, Radium and Thorium parents combined, (dpm/100 cm²)
Lm_i	=	maximum concentration of U series or Th series in radioactive equilibrium, (see Table 1)
F_i	=	fraction of radioactivity represented by Uranium, Radium, and Thorium

As an example, if all three radionuclide grouping were present in equal proportions, Equation 5 may be applied as follows:

$$DCGL_{comp} = \frac{1}{\frac{0.33}{4,350,000} + \frac{0.33}{1,150,000} + \frac{0.33}{487,000}} = 961,000 \frac{dpm}{100cm^2}$$

CONCLUSION

Combining the individual external gamma and inhalation exposures and converting this to an allowable release limit based upon a 25 mrem/y standard results in the calculated release limits provided in Table 1. Embedded piping release may be performed by assuming a conservative mix of contaminants and determining the external on contact counts from a NaI detector for that radionuclide mix.

Appendix 7
Attachment 1
MicroShield Output

MicroShield v5.03

Conversion of calculated exposure in air to dose

FILE: C:\MS5\DATA\TECHCE~1\TCRADSK1.MS5

Case Title: slab disk source for Ra-226 and progeny at 1 dpm/100cm²

This case was run on Monday, March 29, 2004 at 9:21:37 p.m.

Dose Point # 1 - (100,0,0)			
Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	3.30E-04	3.42E-04
Photon Energy Fluence Rate	MeV/cm²/sec	2.52E-04	2.56E-04
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	4.42E-07	4.50E-07
Absorbed Dose Rate in Air	mGy/hr	3.86E-09	3.93E-09
",mrad/hr"		3.86E-07	3.93E-07
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.54E-09	4.63E-09
o Opposed		3.745 E -09	3.82E-09
o Rotational		3.744E-09	3.82E-09
o Isotropic		3.347E-09	3.41E-09
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.77E-09	4.86E-09
o Opposed		4.551E-09	4.64E-09
o Rotational		4.551E-09	4.64E-09
o Isotropic		3.538E-09	3.61E-09
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	4.04E-09	4.12E-09
o Posterior/Anterior		3.640E-09	3.71E-09
o Lateral		2.821E-09	2.87E-09
o Rotational		3.267E-09	3.33E-09
o Isotropic		2.852E-09	2.91E-09

MicroShield v5.03

Conversion of calculated exposure in air to dose

FILE: C:\MS5\DATA\TECHCE~1\TCTHDSK1.MS5

Case Title: slab disk source for Th-232 and progeny at 1 dpm/100cm²

This case was run on Monday, March 29, 2004 at 9:21:37 p.m.

Dose Point # 1 - (100,0,0)			
Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	4.42E-04	4.59E-04
Photon Energy Fluence Rate	MeV/cm²/sec	3.62E-04	3.68E-04
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	5.94E-07	6.05E-07
Absorbed Dose Rate in Air	mGy/hr	5.19E-09	5.28E-09
",mrad/hr"		5.19E-07	5.28E-07
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	6.08E-09	6.20E-09
o Opposed		5.072E-09	5.16E-09
o Rotational		5.071E-09	5.16E-09
o Isotropic		4.573E-09	4.65E-09
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	6.38E-09	6.50E-09
o Opposed		6.078E-09	6.19E-09
o Rotational		6.078E-09	6.19E-09
o Isotropic		4.816E-09	4.90E-09
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	5.46E-09	5.56E-09
o Posterior/Anterior		4.958E-09	5.05E-09
o Lateral		3.920E-09	3.99E-09
o Rotational		4.465E-09	4.55E-09
o Isotropic		3.937E-09	4.01E-09

MicroShield v5.03

Conversion of calculated exposure in air to dose

FILE: C:\MS5\DATA\TECHCE~1\TCUDISKB.MS5

Case Title: slab disk source for U-238 to U-234 and progeny at 1 dpm/100cm²

This case was run on Monday, March 29, 2004 at 9:21:37 p.m.

Dose Point # 1 - (100,0,0)			
Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	1.66E-05	1.81E-05
Photon Energy Fluence Rate	MeV/cm²/sec	3.25E-06	3.40E-06
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	5.78E-09	6.04E-09
Absorbed Dose Rate in Air	mGy/hr	5.04E-11	5.27E-11
",mrad/hr"		5.04E-09	5.27E-09
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	6.78E-11	7.14E-11
o Opposed		4.776E-11	4.99E-11
o Rotational		4.749E-11	4.96E-11
o Isotropic		4.346E-11	4.55E-11
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	7.02E-11	7.38E-11
o Opposed		6.089E-11	6.37E-11
o Rotational		6.089E-11	6.37E-11
o Isotropic		.620E-11	4.83E-11
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	5.88E-11	6.19E-11
o Posterior/Anterior		4.967E-11	5.21E-11
o Lateral		3.523E-11	3.68E-11
o Rotational		4.364E-11	4.57E-11
o Isotropic		3.685E-11	3.85E-11

Appendix 7
Attachment 2
Resuspension Pathway Calculations

Resuspension Pathway Calculations for Uranium

Isotope	Concentration (Bq/m²)	Dose conversion factor (Sv/Bq)	Area (m²)	Air Volume (m^3)	Time (hours/y)	Breathing rate (m^3/hr)	fraction of ground contamination resuspended	Dose Estimate (CED) (Sv/y)	Dose Estimate (CED) (mrem/y)/ 1dpm/100 cm²
U-235	0.08	1.97E-06	100	200	0.0167	1.2	3.20E-05	4.83E-14	4.83E-09
U-238	1.67	1.90E-06	100	200	0.0167	1.2	3.20E-05	1.01E-12	1.01E-07
U-234	1.67	2.13E-06	100	200	0.0167	1.2	3.20E-05	1.14E-12	1.14E-07
Pa-231	0.08	3.47E-04	100	200	0.0167	1.2	3.20E-05	8.51E-12	8.51E-07
Ac-227	0.08	1.81E-03	100	200	0.0167	1.2	3.20E-05	4.44E-11	4.44E-06
Th-230	0.00	8.80E-05	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Ra-226	0.00	2.32E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Pb-210	0.00	3.67E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Th-232	0.00	4.43E-04	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Ra-228	0.00	1.29E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Th-228	0.00	6.75E-05	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Reference		[ICRP, 1995]			[Kennedy, W.E.Jr., and Strenge, D.L., 1992]	[USNRC, 1994]	[Kennedy, W.E.Jr., and Strenge, D.L., 1992]		5.51E-06

Resuspension Pathway Calculations for Thorium

Isotope	Concentration (Bq/m²)	Dose conversion factor (Sv/Bq)	Area (m²)	Air Volume (m^3)	Time (hours/y)	Breathing rate (m^3/hr)	fraction of ground contamination resuspended	Dose Estimate (CED) (Sv/y)	Dose Estimate (CED) (mrem/y)/ 1dpm/100 cm²
U-235	0.00	1.97E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
U-238	0.00	1.90E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
U-234	0.00	2.13E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Pa-231	0.00	3.47E-04	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Ac-227	0.00	1.81E-03	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Th-230	0.00	8.80E-05	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Ra-226	0.00	2.32E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Pb-210	0.00	3.67E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Th-232	1.67	4.43E-04	100	200	0.0167	1.2	3.20E-05	2.36E-10	2.36E-05
Ra-228	1.67	1.29E-06	100	200	0.0167	1.2	3.20E-05	6.88E-13	6.88E-08
Th-228	1.67	6.75E-05	100	200	0.0167	1.2	3.20E-05	3.60E-11	3.60E-06
Reference		[ICRP, 1995]			[Kennedy, W.E.Jr., and Strenge, D.L., 1992]	[USNRC, 1994]	[Kennedy, W.E.Jr., and Strenge, D.L., 1992]		2.73E-05

Resuspension Pathway Calculations for Radium

Isotope	Concentration (Bq/m²)	Dose conversion factor (Sv/Bq)	Area (m²)	Air Volume (m^3)	Time (hours/y)	Breathing rate (m^3/hr)	fraction of ground contamination resuspended	Dose Estimate (CED) (Sv/y)	Dose Estimate (CED) (mrem/y)/ 1dpm/100 cm²
U-235	0.00	1.97E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
U-238	0.00	1.90E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
U-234	0.00	2.13E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Pa-231	0.00	3.47E-04	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Ac-227	0.00	1.81E-03	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Th-230	1.67	8.80E-05	100	200	0.0167	1.2	3.20E-05	4.70E-11	4.70E-06
Ra-226	1.67	2.32E-06	100	200	0.0167	1.2	3.20E-05	1.24E-12	1.24E-07
Pb-210	1.67	3.67E-06	100	200	0.0167	1.2	3.20E-05	1.96E-12	1.96E-07
Th-232	0.00	4.43E-04	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Ra-228	0.00	1.29E-06	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Th-228	0.00	6.75E-05	100	200	0.0167	1.2	3.20E-05	0.00E+00	0.00E+00
Reference		[ICRP, 1995]			[Kennedy, W.E.Jr., and Strenge, D.L., 1992]	[USNRC, 1994]	[Kennedy, W.E.Jr., and Strenge, D.L., 1992]		5.02E-06