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Site Hazard Assessment Plan for Buildings 788 & 207A Clarifier

RF/RMRS-98-249

RMRS Rocky Mountain Remediation Services, L.L.C.
...protecting the environment

Reviewed for Classification/UCNI /OUO
By: Janet Nesheim, Derivative Classifier
DOE, EMCBC
Date: 10-14-08
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Environmental Restoration
Rocky Flats Environmental Technology Site

October 1998
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ADMINISTRATIVE INFORMATION

Site:Rocky Flats Environmental Technology Site (RFETS), Golden, Colorado

Project Name:Decommissioning of Buildings 788 & 207A Clarifier

Date Prepared:21-October-1998

Approvals

This Plan is approved with respect to the hazards, regulatory requirements, and overall (radioactive and chemical) characterization objectives of the project.

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ACRONYMS

AHA	Activity Hazard Analysis
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
AS	Absorption Spectroscopy
Be	Beryllium
CDPHE	Colorado Department of Public Health and Environment
D&D	Decontamination and Decommissioning
DCGL	Derived Concentration Guideline Level
DOE	U.S. Department of Energy
DOT	Department of Transportation
dpm	Disintegrations per minute
DQO	Data Quality Objective
EPA	U. S. Department of Environmental Protection Agency
LBGR	Lower Bound of Gray Region
LLW	Low Level Waste
MARSSIM	Multi-Agency Radiation Site Survey and Site Investigation Manual
MDA	Minimum Detectable Activity
NVLAP	National Voluntary Laboratory Accreditation Program
PCB	Polychlorinated biphenyl
PLM	Polarized Light Microscopy
QA/QC	Quality Assurance/Quality Control
RCT	Radiological Control Technician
RFETS	Rocky Flats Environmental Technology Site
TCLP	Toxicity Characteristic Leaching Procedure

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1.0 INTRODUCTION

The Rocky Flats Environmental Technology Site (RFETS) is currently undergoing environmental cleanup and closure. Building 788, the 207A Clarifier, and its associated facilities in the Solar Ponds have no practical purpose in the RFETS mission after Fiscal Year 1998. Therefore, the facilities are to be decommissioned to further reduce site risks, hazards, and operating costs. The physical layout of these is shown in Figure 1-1.

Characterization of the facilities with respect to radionuclides and hazardous substances is necessary for the appropriate management and disposition of materials and waste during and following decommissioning and demolition. Characterization, as described in this document, complements formal RCRA Closure of the facility (RMRS, 1998a; RMRS 1998b). Based on process knowledge of the facility, which is summarized is the referenced documents (ibid.) as well as in §2.0, the facility in question is a Type 2 (K-H, 1998b) — equivalent to a Class 2 as defined in the MARSSIM (NRC et al., 1997).

PURPOSE

This document, the Site Hazard Assessment Plan, when implemented, will provide the final data necessary to decommission and demolish the facility and the surrounding site relative to characterization of both radionuclides and hazardous substances. This document, therefore, implements chemical and radiological characterization. Radiological characterization is divided into 1) those surveys designed to characterize LLW for recycling or disposal and 2) final status survey requirements as described in the MARSSIM (NRC et al., 1997) for prospective free release of concrete foundations. The Site Hazard Assessment Plan also implements technical requirements of the RFETS D&D Characterization Protocol (K-H, 1998).

SCOPE

The scope of this plan covers chemical and radiological characterization of the building and surrounding site structures. Environmental media beneath and surrounding the facilities are not within scope, nor are those materials designated as low-level waste (LLW) based on previous surveys and process knowledge of the facilities.

DATA LIFE CYCLE

The MARSSIM (§ "Roadmap") recognizes four components of the data life cycle that apply to the characterization process: planning, implementing, assessing, and deciding. To produce a defensible decisions that support demolition of the facilities, each of the four must be applied in sequence and iteratively as necessary.

The first phase of the data life cycle for characterization, planning, uses the Data Quality Objective (DQO) process (EPA G-4, 1993 and NRC et al., 1997) to determine data needs and quality for adequate final survey design. Site walkdowns and historical data have been included in these planning tools.

The second phase of the cycle is implementation. Implementation includes sampling and surveying described later in this document; additional data will be acquired if initial sampling designs must be optimized as described in the third phase of the cycle, assessment, which corresponds with Step 7 of the DQO process, "Optimization of Design".

The third phase of the cycle is data assessment. The data are assessed for precision, accuracy, representativeness, completeness, and comparability (PARCC) against the DQO criteria through verification and validation (V&V).

The fourth and final phase of the cycle concludes with decisions on survey units, which are documented in the final report. The report will document all results, conclusions, and clear rationale that support the conclusions.

2.0 BUILDING /CLUSTER DESCRIPTION

2.1 Location

The Solar Ponds (207A, 207B, and 207C) and B788 are located in the northeast area of the Protected Area (PA) at the Rocky Flats Environmental Technology Site (RFETS). B788 and the Clarifier are located between Solar Ponds 207A and 207C. Principal structures of the B788 Complex consist of the Clarifier, B788, Trailer 788A, and a pug mill.

Building 788

Building 788 is a permitted RCRA container storage facility (Unit 21) which consists of a single-story steel-frame structure sitting on a concrete slab. It is 220 feet long, 20-25 feet wide and approximately 15 feet high. Two layers of metal siding that appear to have fiberglass insulation sandwiched between them, form the building's walls. A contamination control room (47feet long by 10 feet wide) is located on the northwest side of the northern half of the building.

Clarifier (207A)

The Clarifier Tank is located between B788 and the 207A Solar Pond and is part of RCRA Interim Unit 48 (RCRA Unit 48 also includes the pug mill and associated equipment). The tank is an open-top, right-circular cylinder with a cone-shaped bottom. The inside diameter is 25 feet and the overall height is 10 feet. The bottom of the tank sits approximately 6 feet above the slab floor. The circular portion of the tank is constructed of 1/4 -inch steel plate and the cone portion is constructed of 5/16 - inch steel plate.

The tank is supported by 6 steel I-beams mounted on the concrete slab and equally spaced around the tank's perimeter. The I-beams are 10-feet high, 10-inches wide and 1/2 - thick. A steel-strengthening ring (2 inches thick by 9 inches wide) encircles the tank's outside perimeter at the bottom of the cylinder.

A "woodshed" encloses the bottom of the tank and the equipment used for processing the tank water and sludge. The woodshed walls are 27 feet long by 8 feet high and are constructed of plywood. The shed rests on a concrete slab. The walls are secured to the tank support structure via angle iron braces. Equipment inside the shed includes an air compressor, a pump assembly and miscellaneous piping. Miscellaneous piping includes two sludge pipes that travel from the tank to Building 788, and to the cement mixer on the west side of B788. The pipes are disconnected from the cement mixer and are covered with insulation, which is labeled as being free of asbestos.

Trailer T788A

Trailer 788A sits on the east side of B788, approximately 47 feet south of the north side of B788. The trailer is 40-feet long, 10-feet wide and 15-feet high. A skirt covers the undercarriage. A wooden porch is attached to the east wall of the trailer. An air conditioning unit and a 50-KVA, 450-volt transformer are attached to the north side of the trailer. Trailer T788A will not undergo D&D, but will be transferred to another on-site location for reuse.

Pug Mill

A pug mill is located on the south side of the clarifier between B788 and Pond 207A. It is classified as a deactivated treatment unit. The area around the pug mill includes a temporary structure built to transfer sludge from the clarifier tank to a vacuum truck. The system was installed, but not used to empty the contents of the clarifier. In addition, a concrete ramp, utility poles, and a steel structure are located adjacent to the pug mill.

2.2 Operations History

The Solar (207) Ponds were constructed in the 1950s. The ponds recieved wastewater and other wastes from all areas of RFETS. The Solar Ponds were emptied in the late 1980s and mid 1990s. The current status of the ponds is (RCRA) empty.

The Clarifier was used to prepare pondcrete from the Solar Pond sludge. The pug mill was used to mix pond sludge from the clarifier into pondcrete. Construction started around 1984 and the system was operated from 1986 through 1989. It was shut down in 1989 (with sludge still in the tank) due to a lack of funding. It has been idle since that time. The top of the tank is open and readily fills with water from rain and snow. The pug mill, Clarifier, and related equipment are all part of a deactivated interim status treatment unit.

Building 788 is a storage facility for low level radioactive, low level mixed and hazardous wastes. It contains a contamination control room, which is used to decontaminate lightly contaminated materials and equipment. The B788 Complex is located on the Solar Pond Individual Hazardous Substance Site (IHSS) 101 which was part of Operable Unit (OU) 4.

3.0 DATA QUALITY OBJECTIVES

Materials resulting from the D&D of Building 788 and selected portions of the surrounding infrastructure must be dispositioned relative to the type of facility (Type 2, Class 2) under investigationand managed accordingly. Sampling for chemical constituents (Table 3-1), reconnaissance-level radiological surveys (RSP-09.05), and final status surveys (Tables 3-2 through 3-8) must be implemented to adequately characterize facilities and meet regulatory requirements. Sampling results will provide the data necessary to support the project decisions with adequate confidence for successful decommissioning of the facility. Sampling for purposes of industrial hygiene is addressed in the associated HASP (RMRS, 1998e).

Media	Location	Analysis	Analytical Methods	K-H Line item codes	Bottle/ Preservation requirements	Number of samples	Strategy	tool
Railroad ties	ramp near SE corner of 788	TCLP Semivolatiles DOT rad screen	SW846-1311/8270 L6194, L6278	SS08B011 OS01A003	500 ml g, 4°C 60 ml g	2	Any dark stained portion of ties	spade bit
telephone pole - highly stained at base potentially cresote preserved	pole C, just east of ramp at SE corner of 788	TCLP Semivolatiles DOT rad screen	SW846-1311/8270 L6194, L6278	SS08B011 OS01A003	500 ml g, 4°C 60 ml g	1	Visual outlier Collect biased sample at base of pole from highly stained (original preservative) area	spade bit
Telephone poles - old and weathered, unknown preservation	poles between 207A and 207B north middle and south ponds	TCLP Semivolatiles TCLP metals (no Hg) DOT rad screen	SW846-1311/8270 SW846-1311/6010 L6194, L6278	SS08B011 SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	random composite from at least 3 poles	spade bit
Telephone poles - green indicates preservation using Wolmanizing process	poles between 207A and 207B north middle and south ponds	TCLP metals (no Hg) DOT rad screen	SW846-1311/6010 L6194, L6278	SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	random composite from at least 3 poles	spade bit
yellow fixative and white paint on plywood	clarifier shack	TCLP metals (no Hg) DOT rad screen	SW846-1311/6010 L6194, L6278	SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	near entry door outside of radiological contamination area	hole saw or spade bit Caulk hole when done
white paint/wallboard	office in SE corner of 788	TCLP metals (no Hg) DOT rad screen	SW846-1311/6010 L6194, L6278	SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	random	hole saw or spade bit
beige paint/wallboard	E outside wall of permacon in 788	TCLP metals (no Hg) DOT rad screen	SW846-1311/6010 L6194, L6278	SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	random	hole saw or spade bit
Tan paint/plywood	Porch structure, E side of T788A	TCLP metals (no Hg) DOT rad screen	SW846-1311/6010 L6194, L6278	SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	random	spade bit
Grey paint/2x4 wood steps	Porch structure, E side of T788A	TCLP metals (no Hg) DOT rad screen	SW846-1311/6010 L6194, L6278	SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	random	spade bit
yellow paint/4x4 wood rail	Porch structure, E side of T788A	TCLP metals (no Hg) DOT rad screen	SW846-1311/6010 L6194, L6278	SS08B007 OS01A003	500 ml g, 4°C 60 ml g	1	random	spade bit

Table 3-1. Sampling Requirements.

The Problem

Radionuclides

The quantity and types of radioactivity and radioactive contamination present in and on the selected media — *targeted for unrestricted release* -- are not known with adequate confidence. The types and quantities must be established with enough confidence to disposition waste streams and determine whether contamination is above or below acceptable levels. Materials resulting from the building that are categorized as LLW and targeted for recycling require no further sampling; categorization as LLW is based on process knowledge (RMRS, 1998c). Metallic LLW is currently planned for recycling. Reconnaissance level surveys for radiological characterization will be performed as directed by Radiological Engineering and as described in PRO-267-RSP-09.05.

RCRA Constituents

The quantity of RCRA contaminants in or on the selected media listed in Table 3-1 are not known with adequate confidence. The types and quantities must be established with enough confidence to disposition waste streams and determine whether contamination is above or below acceptable levels. RCRA constituents of interest are limited to TCLP metals in paints and TCLP metals and semivolatiles in utility poles. The RCRA media of interest for this plan are under investigation for the chemicals originally used in manufacture of the materials themselves (i.e., ties and poles) and not RCRA constituents of the facility; the materials of interest were not a part of the facility's process flow. All other contaminants of concern produced by the RCRA process were successfully sampled and addressed via the RCRA Closure process (RMRS, 1998b and 1998c), including Beryllium. Beryllium monitoring relative to industrial hygiene concerns is addressed in the associated H&S Plan (RMRS, 1998e).

Asbestos

The quantity of these contaminants in or on the facility are not known with adequate confidence. The types and quantities must be established with enough confidence to disposition waste streams and determine whether contamination is above or below acceptable levels.

PCBs

The quantity of PCBs has been concluded as insignificant based on documented process knowledge (Appendix B). Additional DQOs for PCBs are not necessary unless the sampling design must be modified based on further knowledge gained in the D&D process. Sampling for PCBs in dried paint on debris (PCB bulk product waste) is not required per Federal Register Vol. 63, No. 124, §761.62 (June 29, 1998) and may be disposed of in a solid waste landfill.

Identification of Decisions

Radionuclides

What types and quantities of materials are contaminated and, conversely, not contaminated, with respect to concrete slab surfaces and all related materials assumed to be LLW?

How many samples and/or surveys are required for adequate confidence in final status surveys?

Based on the HSA and the scoping output, the estimated quantities of waste are given in the respective Project Execution Plan (PEP; RMRS 1998d, in publication).

RCRA Constituents

Have all RCRA constituents been removed from the facility?

- ➢ wooden utility poles
- ➢ wooden ramp
- ➢ power substations — metal frames and attached hardware
- ➢ metal process lines/pipes/electrical conduit

NOTE: because chemical samples will be analyzed relative to pass/fail of TCLP criteria, statistical adequacy of sample set is part of the decision, but rather the nominal outcome of "pass/fail" based on one representative sample.

Asbestos

Is asbestos contamination present within the facility?

How many samples are required?

Inputs to the Decisions

A detailed explanation of the inputs and their rationale, based on the MARSSIM, is provided in Appendix C. Precision, accuracy, representativeness, completeness, and comparability (i.e., the PARCC parameters) are addressed in §6.0, Quality Assurance.

Radionuclides

Inputs to the decision rule include the following:

- ☞ gross α,β (for DOT shipping limits and compliance)
- ☞ $DCGL_s$ = unrestricted release criteria (1-P73-HSP-18.10, Appendix 1)
- ☞ standard deviation of historical data sets (σ); assumed
- ☞ shift $\{\Delta = DCGL_s - LBGR$ = (free release levels) - (avg survey values)$\}$; assumed
- ☞ relative shift (Δ/σ)
- ☞ mean value of the scanning data (α,β; dpm/100cm^2); assumed
- ☞ mean value of swipe data (α,β dpm/100cm^2); assumed
- ☞ t statistics for 90% and 95% confidence levels
- ☞ Survey Units, Table 3-2 (100m^2 - 1000m^2; MARSSIM Roadmap, Table 1)
  - ➢ Bldg 788 concrete floor surface-north (~262m^2)
  - ➢ Bldg 788 concrete floor surface-south (~210m^2)
  - ➢ Bldg 788 "permacon" floor (~41m^2)
  - ➢ other (exterior) concrete pads (~57m^2; incl. pumphouse & power substations; $\leq$250m^2)
- ☞ grid spacings for radiological surveys

NOTE: many of the inputs are necessary for estimating the minimum number of samples required for adequate sampling; any Survey Units <100m^2 represents conservatism relative to decisions (i.e., higher confidence w/ additional sampling).

Instrumentation planned for the project is given in Table 3-3 and is significant because the type of instrumentation directly dictates minimum detectable activities, which in turn drives the number of samples required per MARSSIM. Figure 3-1 illustrates the importance of having an MDA or MDC below the DCGL (i.e., the action level), as the number of required surveys increases as the LBGR approaches the DCGL. The type curves presented in Figure 3-1 were derived from the data given in Tables 3-4 through 3-7 and allow the user to determine the number of surveys needed relative to the radiological instrument specifications (esp. MDA) and the standard deviation from baseline surveys (standard deviation is shown in the tables as a percentage of the sample mean). Note that the "relative shift" values in blue ink are values outside of the ideal MARSSIM tolerances, while the ideal tolerances are in green; however, MARSSIM values are provided for relative shifts of less than one, and are, therefore, considered. As a result, values of less than one were used for type curves, and for comparison with EPA G-4 values (also provided at the bottom of said tables). **The optimum values recommended for this project, depending on the ultimate standard deviation of reconnaissance data, are bolded in green.** *As can be seen with the type curves, the number of samples is reduced by increasing sensitivity of the detection equipment and having relatively lower standard deviations in the historical sample sets of interest.* Critical MARSSIM parameters are given in red text. Other noteworthy information in Tables 3-4 through 3-7 are as follow:

- ☞ the sample quantities include the 20% increase on the numbers of samples required in MARSSIM Tables 5.3 and 5.5;
- ☞ values in the cells under the "Total" (radiation) category are incomplete, because removable surveys drive the minimum sample quantities; this is evidenced by the relatively *lower* "Relative shift" values between the "Total" and "Removable" categories. Therefore, the superfluous values were not generated.

Grid spacing for radiological surveys are a function of the Survey Unit area and the number of samples required (MARSSIM § 5.5.2.5) per each Survey Unit. Grid spacing calculations are given in Table 3-8 and are shown graphically in Figure 3-2. A grid spacing is provided for each Survey Unit defined for the project. Note that the grid spacing decreases as the number of samples increases.

RCRA Constituents

- ☞ RCRA Closure Action Levels (RMRS, 1998a, Table 1)
- ☞ Rinsate data from 207 Clarifier (mg/L or pCi/L)
- ☞ maximum concentrations of contaminants for the Toxicity Characteristics (Table 6-1, K-H, 1998) — SVOCs, Metals action levels
- ☞ results from chemical analyses, Tables 3-1.

MARSSIM SURVEY UNITS[A]	N-S length (ft)	E-W length (ft)	Area (ft^2)	**Area (m^3)**	heights (ft)	COMMENTS
Bldg 788 Concrete Floor - N	113	25	2821	**262**		
Bldg 788 Concrete Floor - S	113	20	2257	**210**		
"permacon" floor	47	9.5	447	**41**		
other exterior concrete pads			620	**57**		Cumulative Area of all pads is the Survey Unit

[A]N=North; S=South

Instrument	Minimum Count Time	Allowable Background (cpm; to achieve MDA)	Survey Type	Controlling Protocols	MDA (dpm/100 cm^2) {1 min count}
Bicron Frisktech w/ A100 Probe	60 sec.	2	Direct Scan (total alpha)	3-PRO-165-RSP-07.02 3-PRO-112-RSP-02.01	55
Bicron Frisktech w/ B50 Probe	60 sec.	250	Direct Scan (total beta)	3-PRO-165-RSP-07.02 3-PRO-112-RSP-02.01	662
NE Electra W/ DP6B Probe	60 sec.	8 54[1]	Direct Scan (α_{total}) Direct Scan (β_{total})	3-PRO-165-RSP-07.02 3-PRO-112-RSP-02.01	93 318
Eberline SAC-4	60 sec.	1	Smear/Swipe (removable alpha)	3-PRO-165-RSP-07.02 3-PRO-112-RSP-02.01	20
Eberline BC-4	60 sec.	95	Smear/Swipe (removable beta)	3-PRO-165-RSP-07.02 3-PRO-112-RSP-02.01	200
Tennelec Gas Proportional α,β	120 sec.	0.5 4	Smear ($\alpha_{removable}$) Smear ($\beta_{removal}$)	3-PRO-165-RSP-07.02 3-PRO-112-RSP-02.01 3-PRO-214-RSP-03.01	17 35

[1]Estimated, based on ratio of 1699 MDA to 513 cpm background.

Table 3-3. Radiological Survey Equipment.

Table 3-4. Minimum Final Status Survey Data per MARSSIM (Sign Test), w/ Sigma @ 20% of the Mean

(minimum number of data points/survey un NE Electra (@ 20% eff)[A] Eberline SAC-4 Eberline BC-4
(as a function of changing LBGR)
NOTE: std dev = 20% of mean

	TOTAL alpha (dpm/100cm^2)	TOTAL beta (dpm/100cm^2)	REMOVABLE alpha (dpm/100cm^2)	REMOVABLE beta (dpm/100cm^2)
Supporting Data				
std deviation (s)	18.6	63.6	4	40
variance = (std dev)^2	346.0	4045.0	16.0	1600.0
n (assumed) =	3	3	3	3
t stat (85% CL)	1.386	1.386	1.386	1.386
t stat (90% CL)	1.886	1.886	1.886	1.886
t stat (95% CL)	2.92	2.92	2.92	2.92
arithmetic mean	93	318	20	200
$LBGR_1$	93	318	20	200
$LBGR_{1.5}$	63	149	18	118
$LBGR_2$	53	128	15	101
$LBGR_3$	43	103	11	82
$LBGR_4$	36	89	9	71
$LBGR_5$	32	79	8	63
UNRESTRICTED RELEASE CRITERIA ($DCGL_w$)	100	1000	20	200
shift $(delta)_1$	7	682	0	0
shift $(delta)_{1.5}$	37	851	2	82
shift $(delta)_2$	47	872	5	99
shift $(delta)_3$	57	897	9	118
shift $(delta)_4$	64	911	11	129
shift $(delta)_5$	68	921	12	137
relative shift $((delta)/(s))_1$	0.38	10.72	0.00	0.00
relative shift $((delta)/(s))_{1.5}$	2.00	13.39	0.62	2.06
relative shift $((delta)/(s))_2$	2.51	13.72	1.37	2.47
relative shift $((delta)/(s))_3$	3.09	14.10	2.20	2.95
relative shift $((delta)/(s))_4$	3.43	14.33	2.65	3.23
relative shift $((delta)/(s))_5$	3.65	14.48	2.95	3.42

note: subscripts correspond to count times, in minutes

Number of Samples Required [NUREG 1575, 12/97, Sec 5.5.2.3] for Unrestricted Release

	TOTAL alpha	TOTAL beta	REMOVABLE alpha	REMOVABLE beta
1-Minute Count Time 90% CL	94			
95% CL	156		200	(placeholder)
1.5-Minute Count Time 90% CL	10		46	10
95% CL	15		74	18
2-Minute Count Time 90% CL	9		13	9
95% CL	15		35	18
3-Minute Count Time 90% CL			12	9
95% CL			18	17
4-Minute Count Time 90% CL			11	
95% CL			18	
5-Minute Count Time 90% CL			11	
95% CL			17	

Number of Samples Required [EPA G-4 Model (EPA, 1994)][B]

	TOTAL alpha	TOTAL beta	REMOVABLE alpha	REMOVABLE beta
1-Minute Count Time 90% CL	102	2	#DIV/0!	#DIV/0!
95% CL	245	5	#DIV/0!	#DIV/0!
1.5-Minute Count Time 90% CL	5	2	39	5
95% CL	13	4	93	12
2-Minute Count Time 90% CL	4	2	9	4
95% CL	10	4	22	10
3-Minute Count Time 90% CL	3	2	5	3
95% CL	8	4	11	8
4-Minute Count Time 90% CL	3	2	4	3
95% CL	7	4	9	8
5-Minute Count Time 90% CL	3	2	3	3
95% CL	7	4	8	7

[A]10% to 100% areal coverage is MARSSIM requirement;
estimated quantity of required scans is for comparisons only
[B]assuming a normal distribution of radionuclide population

Table 3-5. Minimum Final Status Survey Data per MARSSIM (Sign Test), w/ Sigma @ 33% of the Mean

(minimum number of data points/survey unit) (as a function of changing LBGR) NOTE: std dev = 33% of mean	NE Electra (@ 20% eff)[A]		Eberline SAC-4	Eberline BC-4
	TOTAL		REMOVABLE	
	alpha	beta	alpha	beta
	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)	(dpm/100cm^2)
Supporting Data				
std deviation (s)	30.69	104.9	6.6	66
variance = (std dev)^2	941.9	11012.4	43.6	4356.0
n (assumed) =	3	3	3	3
t stat (85% CL)	1.386	1.386	1.386	1.386
t stat (90% CL)	1.886	1.886	1.886	1.886
t stat (95% CL)	2.92	2.92	2.92	2.92
arithmetic mean	93	318	20	200
$LBGR_1$	93	318	20	200
$LBGR_{1.5}$	63	149	18	118
$LBGR_2$	53	128	15	101
$LBGR_3$	43	103	11	82
$LBGR_4$	36	89	9	71
$LBGR_5$	32	79	8	63
UNRESTRICTED RELEASE CRITERIA ($DCGL_w$)	100	1000	20	200
shift $(delta)_1$	7	682	0	0
shift $(delta)_{1.5}$	37	851	2	82
shift $(delta)_2$	47	872	5	99
shift $(delta)_3$	57	897	9	118
shift $(delta)_4$	64	911	11	129
shift $(delta)_5$	68	921	12	137
relative shift $((delta)/(s))_1$	0.23	6.50	0.00	0.00
relative shift $((delta)/(s))_{1.5}$	1.21	8.11	0.38	1.25
relative shift $((delta)/(s))_2$	1.52	8.31	0.83	1.50
relative shift $((delta)/(s))_3$	1.87	8.55	1.33	1.79
relative shift $((delta)/(s))_4$	2.08	8.68	1.61	1.96
relative shift $((delta)/(s))_5$	2.21	8.77	1.79	2.07

note: subscripts correspond to count times, in minutes

Number of Samples Required [NUREG 1575, 12/97, Sec 5.5.2.3] for Unrestricted Release

	TOTAL alpha	TOTAL beta	REMOVABLE alpha	REMOVABLE beta
1-Minute Count Time 90% CL				
95% CL			240	(placeholder)
1.5-Minute Count Time 90% CL				
95% CL			160	
2-Minute Count Time 90% CL				
95% CL			52	18
3-Minute Count Time 90% CL				
95% CL			25	
4-Minute Count Time 90% CL				
95% CL			20	
5-Minute Count Time 90% CL				
95% CL			19	

Number of Samples Required [EPA G-4 Model (EPA, 1994)][B]

	TOTAL alpha	TOTAL beta	REMOVABLE alpha	REMOVABLE beta
1-Minute Count Time 90% CL	275	2	#DIV/0!	#DIV/0!
95% CL	660	5	#DIV/0!	#DIV/0!
1.5-Minute Count Time 90% CL	11	2	102	11
95% CL	27	5	245	26
2-Minute Count Time 90% CL	8	2	22	8
95% CL	19	5	54	20
3-Minute Count Time 90% CL	6	2	10	6
95% CL	14	5	24	15
4-Minute Count Time 90% CL	5	2	7	5
95% CL	12	5	17	13
5-Minute Count Time 90% CL	5	2	6	5
95% CL	11	5	15	12

[A] 10% to 100% areal coverage is MARSSIM requirement; estimated quantity of required scans is for comparisons only

[B] assuming a normal distribution of radionuclide population

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B788est2.xls

Table 3-6. Minimum Final Status Survey Data per MARSSIM (Sign Test), w/ Sigma @ 40% of the Mean

(minimum number of data points/survey unit **NE Electra (@ 20% eff)**[A] — **Eberline SAC-4** — **Eberline BC-4**
(as a function of changing LBGR)
NOTE: std dev = 40% of mean

	TOTAL alpha (dpm/100cm^2)	TOTAL beta (dpm/100cm^2)	REMOVABLE alpha (dpm/100cm^2)	REMOVABLE beta (dpm/100cm^2)
Supporting Data				
std deviation (s)	37.2	127.2	8	80
variance = (std dev)^2	1383.8	16179.8	64.0	6400.0
n (assumed) =	3	3	3	3
t stat (85% CL)	1.386	1.386	1.386	1.386
t stat (90% CL)	1.886	1.886	1.886	1.886
t stat (95% CL)	2.92	2.92	2.92	2.92
arithmetic mean	93	318	20	200
$LBGR_1$	93	318	20	200
$LBGR_{1.5}$	63	149	18	118
$LBGR_2$	53	128	15	101
$LBGR_3$	43	103	11	82
$LBGR_4$	36	89	9	71
$LBGR_5$	32	79	8	63
UNRESTRICTED RELEASE CRITERIA ($DCGL_w$)	100	1000	20	200
shift $(delta)_1$	7	682	0	0
shift $(delta)_{1.5}$	37	851	2	82
shift $(delta)_2$	47	872	5	99
shift $(delta)_3$	57	897	9	118
shift $(delta)_4$	64	911	11	129
shift $(delta)_5$	68	921	12	137
relative shift $((delta)/(s))_1$	0.19	5.36	0.00	0.00
relative shift $((delta)/(s))_{1.5}$	1.00	6.69	0.31	1.03
relative shift $((delta)/(s))_2$	1.26	6.86	0.69	1.23
relative shift $((delta)/(s))_3$	1.55	7.05	1.10	1.47
relative shift $((delta)/(s))_4$	1.71	7.16	1.33	1.62
relative shift $((delta)/(s))_5$	1.82	7.24	1.48	1.71

note: subscripts correspond to count times, in minutes

Number of Samples Required [NUREG 1575, 12/97, Sec 5.5.2.3] for Unrestricted Release

		Total alpha	Total beta	Removable alpha	Removable beta
1-Minute Count Time	90% CL				
	95% CL			480	(placeholder)
1.5-Minute Count Time	90% CL				
	95% CL			242	
2-Minute Count Time	90% CL				
	95% CL			62	
3-Minute Count Time	90% CL				
	95% CL			31	
4-Minute Count Time	90% CL				
	95% CL			25	
5-Minute Count Time	90% CL				
	95% CL			23	

Number of Samples Required [EPA G-4 Model (EPA, 1994)][B]

		Total alpha	Total beta	Removable alpha	Removable beta
1-Minute Count Time	90% CL	404	2	#DIV/0!	#DIV/0!
	95% CL	967	5	#DIV/0!	#DIV/0!
1.5-Minute Count Time	90% CL	16	2	150	15
	95% CL	38	5	358	36
2-Minute Count Time	90% CL	11	2	32	11
	95% CL	26	5	77	27
3-Minute Count Time	90% CL	8	2	14	8
	95% CL	19	5	33	20
4-Minute Count Time	90% CL	7	2	10	7
	95% CL	16	5	24	17
5-Minute Count Time	90% CL	6	2	8	7
	95% CL	15	5	20	16

[A] 10% to 100% areal coverage is MARSSIM requirement; estimated quantity of required scans is for comparisons only
[B] assuming a normal distribution of radionuclide population

Table 3-7. Minimum Final Status Survey Data per MARSSIM (Sign Test), w/ Sigma @ 50% of the Mean

(minimum number of data points/survey unit NE Electra (@ 20% eff)[A] Eberline SAC-4 Eberline BC-4

{as a function of changing LBGR}

NOTE: std dev = 50% of mean

	TOTAL alpha (dpm/100cm²)	TOTAL beta (dpm/100cm²)	REMOVABLE alpha (dpm/100cm²)	REMOVABLE beta (dpm/100cm²)
Supporting Data				
std deviation (s)	46.5	159	10	100
variance = (std dev)^2	2162.3	25281.0	100.0	10000.0
n (assumed) =	3	3	3	3
t stat (85% CL)	1.386	1.386	1.386	1.386
t stat (90% CL)	1.886	1.886	1.886	1.886
t stat (95% CL)	2.92	2.92	2.92	2.92
arithmetic mean	93	318	20	200
$LBGR_1$	93	318	20	200
$LBGR_{1.5}$	63	149	18	118
$LBGR_2$	53	128	15	101
$LBGR_3$	43	103	11	82
$LBGR_4$	36	89	9	71
$LBGR_5$	32	79	8	63
UNRESTRICTED RELEASE CRITERIA ($DCGL_w$)	100	1000	20	200
shift $(delta)_1$	7	682	0	0
shift $(delta)_{1.5}$	37	851	2	82
shift $(delta)_2$	47	872	5	99
shift $(delta)_3$	57	897	9	118
shift $(delta)_4$	64	911	11	129
shift $(delta)_5$	68	921	12	137
relative shift $((delta)/(s))_1$	0.15	4.29	0.00	0.00
relative shift $((delta)/(s))_{1.5}$	0.80	5.35	0.25	0.82
relative shift $((delta)/(s))_2$	1.00	5.49	0.55	0.99
relative shift $((delta)/(s))_3$	1.24	5.64	0.88	1.18
relative shift $((delta)/(s))_4$	1.37	5.73	1.06	1.29
relative shift $((delta)/(s))_5$	1.46	5.79	1.18	1.37

note: subscripts correspond to count times, in minutes

Number of Samples Required [NUREG 1575, 12/97, Sec 5.5.2.3] for Unrestricted Release

	TOTAL alpha	TOTAL beta	REMOVABLE alpha	REMOVABLE beta
1-Minute Count Time 90% CL				
95% CL			480	(placeholder)
1.5-Minute Count Time 90% CL				
95% CL			404	
2-Minute Count Time 90% CL	18	32		
95% CL	29	52	79	
3-Minute Count Time 90% CL				
95% CL			42	
4-Minute Count Time 90% CL				
95% CL			34	
5-Minute Count Time 90% CL				
95% CL			29	

Number of Samples Required [EPA G-4 Model (EPA, 1994)][B]

	TOTAL alpha	TOTAL beta	REMOVABLE alpha	REMOVABLE beta
1-Minute Count Time 90% CL	630	3	#DIV/0!	#DIV/0!
95% CL	1509	6	#DIV/0!	#DIV/0!
1.5-Minute Count Time 90% CL	24	2	233	23
95% CL	57	5	558	55
2-Minute Count Time 90% CL	16	2	49	16
95% CL	38	5	118	39
3-Minute Count Time 90% CL	11	2	20	12
95% CL	27	5	48	29
4-Minute Count Time 90% CL	9	2	14	10
95% CL	22	5	35	25
5-Minute Count Time 90% CL	8	2	12	9
95% CL	20	5	29	22

[A] 10% to 100% areal coverage is MARSSIM requirement; estimated quantity of required scans is for comparisons only

[B] assuming a normal distribution of radionuclide population

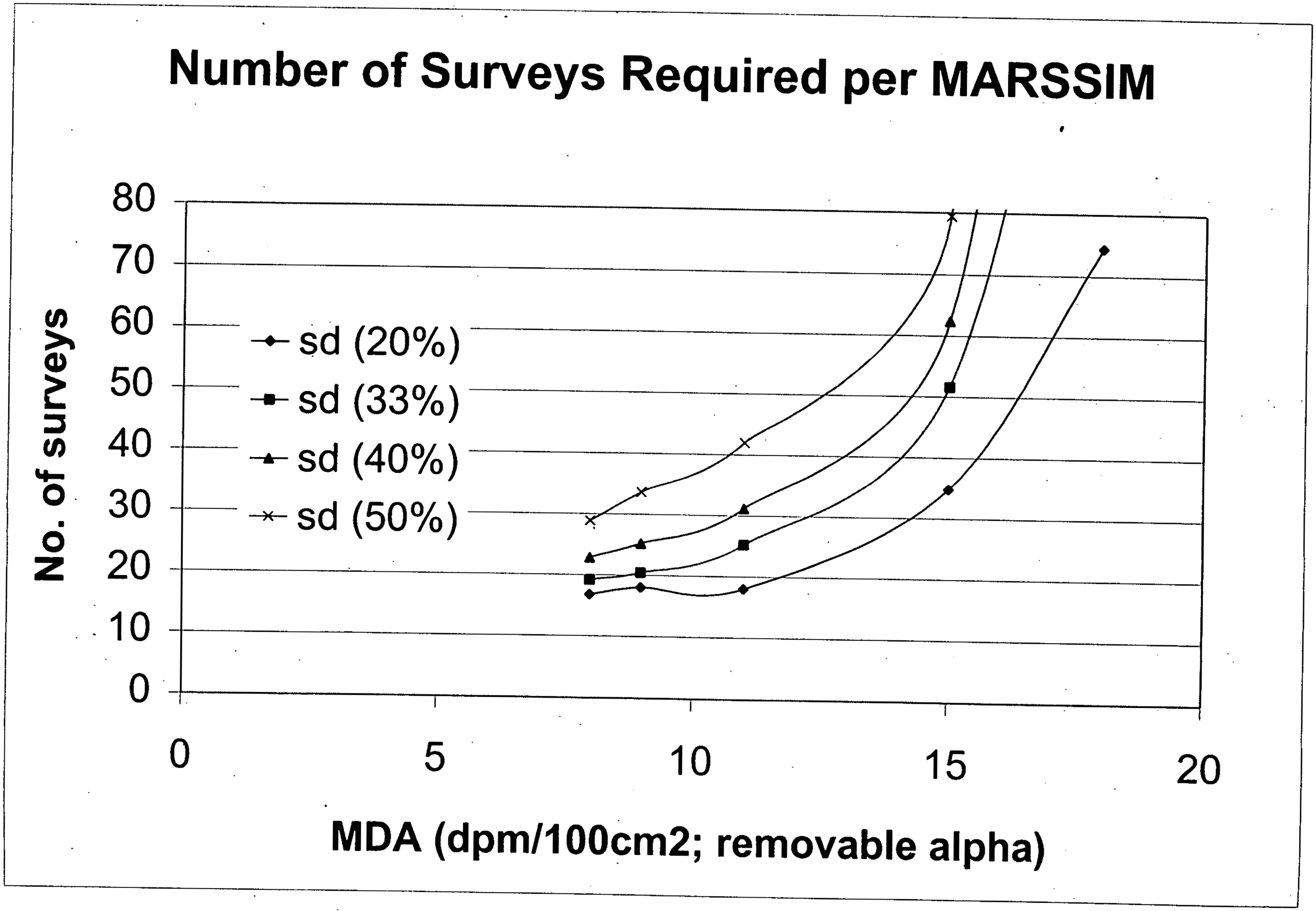


Figure 3-1. Number of Minimum Survey Data per MARSSIM, as a Function of MDA and Standard Deviation.

MARSSIM SQUARE GRID SPECIFICATION (based on Survey Units)[A]

	number of required samples						COMMENTS
	15	20	25	30	35	40	
	distance (m)						distance between survey or sample points
Bldg 788 Concrete Floor - N	4.49	3.89	3.48	3.18	2.94	2.75	
Bldg 788 Concrete Floor - S	4.02	3.48	3.11	2.84	2.63	2.46	
"permacon" floor	1.79	1.55	1.38	1.26	1.17	1.09	
other exterior concrete pads	2.09	1.81	1.62	1.48	1.37	1.28	

[A]these data are presented as type-curves in Figure 3-2.

Table 3-8. MARSSIM Survey Grid Spacing as a Function of Minimum Survey Data.

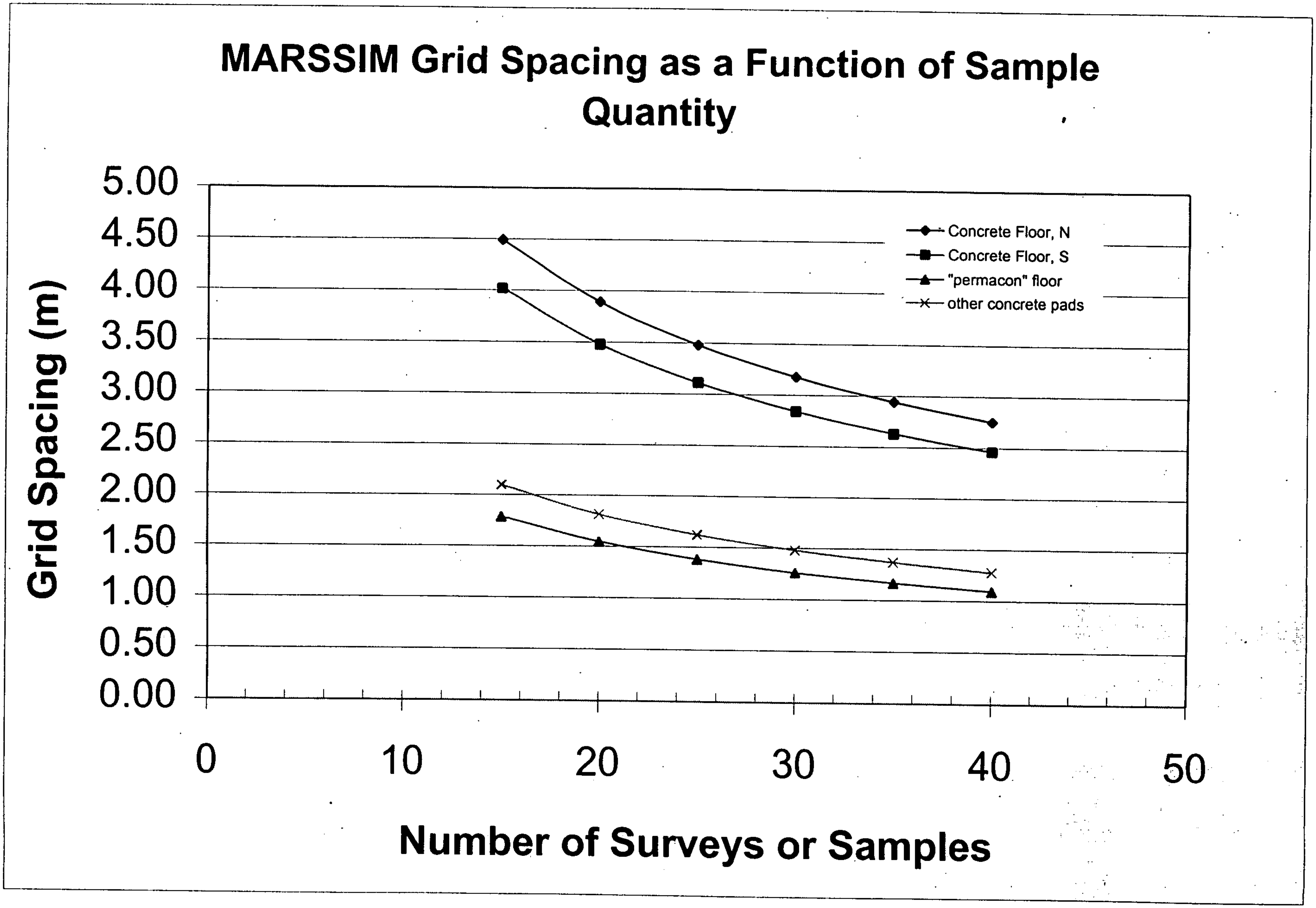


Figure 3-2. MARSSIM Survey Grid Spacing as a Function of Minimum Survey Data.

Definition of the Boundaries

Radionuclides

Areal boundaries for defining the levels and extent of radioactive contamination are given in Figure 1-1. Note that boundaries include the primary structures of the 788 building and the 207 clarifier unit, as well as selected areas peripheral to the solar ponds (especially 207A). Three-dimensionally, characterization is limited to building interiors as exteriors of Building 788 and the 207 clarifier are both assumed to be LLW. In addition, the depth of investigation into concrete pads will be limited to the pad surfaces (~1 cm in depth); intrusive characterization of the concrete pads, as well as soils below the pads, are deferred to the scope of Environmental Restoration projects.

There are no temporal boundaries relative to technical data quality; time constraints only result from the project schedule.

RCRA Constituents

Boundaries for RCRA constituents are the same as those described for radionuclides.

PCBs

Boundaries for PCBs are the same as those described for radionuclides.

Asbestos

Boundaries for asbestos are limited to those media that potentially contain asbestos — i.e., insulation materials between the building's inner and outer walls and nonlabelled pipe insulation.

Decision Rules

Radionuclides

For **nonstructural materials** and equipment (e.g., mobile equipment, removable electrical components from power substations, control panels, heater units, piping segments, sheet metal, etc.), if all individual results are less than the free release limits in Appendix 1, 1-P73-HSP-18.10 (based on RSP 09.05 and DOE Order 5400.5), then the associated material or equipment is eligible for unrestricted release (and any associated recycling alternative); otherwise, each area of the medium with elevated measurements must be decontaminated and resurveyed, or the medium (in total) managed as LLW.

For **structures** constituting a unique survey unit (e.g., individual concrete pads, ramps/bridges):

➢Scanning Results (Total)

If each individual scanning result is less than the associated unrestricted release limits in HSP-18.10, then the associated material or equipment is eligible for unrestricted release (and any associated recycling alternative); otherwise, each area of the medium with elevated measurements must be decontaminated and resurveyed, or the medium (in total) managed as LLW.

NOTE: a minimum of 10% areal survey coverage is required (MARSSIM Table 5.9).

➢Swipe Results (Removable)

If the arithemetic mean for the sample set is not greater than or equal to the free release criteria in DOE Order 5400.5 based on the Sign Test (MARSSIM §8.3)

null hypothesis H o: $\mu \geq$DCGL s and

alternate hypothesis H a : $\mu <$DCGL s

then the unit shall undergo unrestricted release (and any associated recycling alternative); otherwise, the medium must be decontaminated and resurveyed, or managed as LLW.

RCRA Constituents

For wooden media (e.g., power poles and ramps), if the physically averaged sample (i.e., a composite taken from several different posts or beams) result exceeds the RCRA toxicity characteristic threshold for either SVOCs or metals listed given in the RFETS D&D Characterization Protocol (K-H, 1998), then the associated material is considered hazardous; otherwise, the material is considered solid waste.

PCBs

If the physically averaged sample (i.e., a composite taken from several different locations on the post) result equals or exceeds 50ppm, then the associated medium is considered TSCA waste; otherwise, the medium is considered sanitary waste.

Asbestos

For initial investigation, If any one sample of a sample set representing a homogeneous medium results in a positive detection (i.e., >1% by volume), the material is considered asbestos containing material (ACM); otherwise the material is considered sanitary waste.

For verification of successful asbestos remediation, if there are <70 structures/mm^2 (based on 5 air samples @ >1200L/sample) as determined by Transmission Electron Microscopy (TEM) and as described in 40 CFR 763, Subpart F or Colorado Regulation #8, Subsection III.C.6-8 and a state-certified Air Monitoring Specialist, or equivalent, and a state-certified Building Inspector approves the demolition notification based on visual inspection, the friable and potentially friable asbestos have been successfully removed; otherwise, the facility may contain friable asbestos.

Limits on Decision Errors

Radionuclides

For **nonstructural materials** and equipment where radiation surveys (consisting of scans for total contamination and swipes for removable) are performed, individual measurements are compared to action levels in Appendix 1, 1-P73-HSP-18.10 (based on DOE Order 5400.5), and decisions made on a point-by-point basis; therefore errors on statistical decisions do not apply.

For **structures** constituting a unique survey unit (e.g., concrete pads, ramps/bridges), an error of ≤5% for alpha and beta error, respectively, is adequate.

RCRA Constituents

Because samples are physically averaged, the physical average is represented in one sample result and is compared with DCGL (action levels) for a one-to-one comparison; therefore errors on statistical decisions do not apply.

- *Asbestos*

Statistical (decision) error is not applicable in asbestos sampling, as decisions are made on a sample-by-sample (individual) basis, and not on a statistic.

Optimization of the Sampling Designs

Radionuclides

As no baseline or historic contamination surveys are available, the minimum number of samples estimated in this plan are based on assumptions that must be reevaluated after the first battery of measurements are acquired. Variability and magnitude of the sample sets will then be reevaluated against DCGLs (free-release levels, HSP-18.10; DOE Order 5400.5) to determine if an adequate number of samples were taken per MARSSIM and per EPA G-4. More sample measurements will be taken if necessary.

After all sample measurements are acquired, the power of the Sign test will be determined (MARSSIM §I.9), with a DQO of 80%. If inadequate power of the statistical test is indicated, additional samples will be collected.

RCRA Constituents

Additional samples will be acquired if additional RCRA constituents are suspected following the phase of sampling described in this plan. Statistical variations in the data are not applicable as the samples are physically averaged through compositing (vs. grab sampling).

Asbestos

If additional potential ACM is identified by personnel or the certified asbestos inspector at any time following acquisition of the original asbestos sample set, then additional samples shall be taken from the medium of interest.

4.0 SURVEYS, SAMPLES, AND ANALYSIS

Radionuclides

Consistent with the DQOs established in §3.0, ≥10% of the surface area of each individual Class 2 survey unit will be surveyed (specifically, scanned) per MARSSIM (Table 5.9).

The purpose of scanning surveys in a Type 2 facility (K-H, 1998b;or Class 2 facility per MARSSIM) is to identify locations within the survey unit that exceed the investigation level not detected by the systematic pattern (MARSSIM §5.5.3). Therefore, scanning locations shall be at selected locations on the facility with higher probability of contamination based on professional judgement and process knowledge, e.g., drains, fractures in the concrete pad, and around joints between concrete pours/pads. Several of the these locations are preselected, while others will be determined in the field. The total quantity of scans relative to surface will exceed 10%.

Any piping process lines, or conduit with uncertainty associated with the process knowledge shall be handled and managed as LLW as described in the PRE.

- *RCRA Constituents*

Samples of wood shall be acquired as follows:
Samples of 788 area materials for waste disposition will be collected in accordance with the procedures specified in the Commodore Advanced Sciences, Inc., procedure CAS SOP-003 Sampling for Waste Characterization for General Sampling activities at the Rocky Flats Environmental Technology Site.

Sampling of wooden material specified by this plan will be accomplished using the drill bits specified under the tool column in Table 3-1. The bits shall be free of paints or coatings. It is anticipated that a battery powered cordless portable drill will be used, however, this is not required. Whenever practical and when composite samples are required a spade bit will be used to collect sample material from painted or preserved wood materials. In accordance with RMRS Operations Directive-006, Safety Requirements for Work Involving Penetration of Walls, Floors, Ceilings, and Concrete, Asphalt or Masonry Pads, all penetrating (i.e. drilling) work in these areas shall be limited to 2" to minimize potential of accidental contact with energized circuits.

A spade bit shall be used for sampling. The spade bit is preferable for many situations because it allows for:

✓ Easy removal of sample material without complete penetration of the object being sampled,

✓ Sample material comes out in relatively uniform shavings which will assist the laboratory in performing the TCLP test,

✓ Supports compositing of sample material from numerous locations.

Sampling with a spade bit is performed as follows:

1) Tape a sealable ziplock type plastic bag approximately 3" below the area to be cored. To avoid possible sources of cross contamination be sure that tape bonding material does not come in contact with the inside of the plastic bag.

2) Place a mark on the spade bit no more than 2" above the tip

3) Attach decontaminated spade bit to drill

4) Begin coring sample. Limit penetration to the 2" mark described above, as

appropriate

5) As coring proceeds, be sure that the wood chips fall into the plastic bag.

If the sample is a single grab, collect appropriate sample volume from a single core or closely offset cores; avoid, as practical, moving the ziplock type bag. Fill sample bottle from the bag. If sample is collected as a composite, remove and zip close bag between subsample locations. Collect a subsample from each of the required subsample locations in accordance with steps 4 and 5 above. After collection of the final subsample seal the plastic bag. Homogenize the wood chips by turning over the bag several times and using hand movement to agitate the material, as practical. The homogenization activity should take between one and two minutes to ensure thoroughly homogenized wood chips. Fill the appropriate sample jar(s), as necessary.

Sampling may also be performed with a hole-saw bit, which allows collection of a sample through an entire object such as a sheet of plywood. In this configuration, the hole saw bit will contain applied coating or paints on both sides of the material being sampled. Generally, a hole saw bit is not used when sample material needs to be composited in the field.

Sampling with a hole-saw bit is performed as follows:

1) If the hole saw bit is capable of penetrating more than 2", place a mark on the bit no more than 2" above the center guide tip

2) Attach decontaminated hole saw bit to drill

3) Begin coring sample. Limit penetration to the 2" mark described above, as appropriate

4) After the desired depth is reached, or the object being sampled is penetrated, back out the drill bit.

If the object sampled was penetrated the cored sample material will likely be in the bit. The material may be extracted by turning the cored material opposite of the directional turn of the center guide bit. If the object being cored was not penetrated, a thin metal leverage bar such as a screwdriver may be used to break loose and pry the sample core out of the core hole. Fill the appropriate sample jar as necessary. If the required sample volume is not collected from a single core hole, collect additional cores closely offset of the original core hole. A fine mist will be used to control fines during drilling per the RMRS HASP (RMRS, 1998e.)

Asbestos

Asbestos samples shall be acquired in compliance with Colorado Regulation 8, and specifically as stated in Appendix E, Asbestos Characterization Protocol.

5.0 FACILITY ENTRY REQUIREMENTS

In order to access the facility, minimum requirements for entry must be met for the two basic categories of cleared and uncleared personnel.

Cleared Personnel
- GERT or RadWorker I or II
- Alarms, sounds, and responses
- Building Indoctrination

Uncleared Personnel
- Escorted
- GERT or RFETS Short-Term Visitor Orientation

Entry into Building 788 requires appropriate PPE, which consists of hard-toed safety shoes, clear safety glasses, and personal dosimeter.

6.0 QUALITY ASSURANCE

The project will comply with quality requirements as defined in the RMRS QAPD (RMRS, 1997), which in turn implements requirements set forth by K-H (K-H QAP, 1997). Data inputs to decisions, as defined in the DQO process, shall be verified and validated as described in the RFETS D&D Characterization Protocol (K-H, 1998). In particular, all Quality records shall be peer reviewed and the checklist given in the Characterization Protocol (ibid.) shall accompany all data packages submitted to the Records Center (these records directly support the Administrative Record). The said peer review constitutes data verification. Data validation will be performed according to the Rocky Flats Analytical Services Division (ASD), Analytical Services Performance Assurance Group procedures. Analytical laboratories supporting the B788/207 Clarifier will have undergone and passed laboratory audits by the Rocky Flats ASD. Overall data usability will be evaluated using the guidance developed by the RMRS Procedure RF/RMRS-98-200, Rev. 0, *Evaluation of Data for Usability in Final Reports*, which establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Quantitative values for PARCC parameters (DQOs) are provided below.

<u>Precision</u>

If 2 or more samples are acquired to represent a unique category of material, the repeatability (precision) must achieve the following specifications:

Radionuclides

The Duplicate Error Ratio (DER) must be less than 1.96 as defined in *Evaluation of Radiochemical Data Usability* (p. 30, Lockheed Martin, 1997).

Nonradionuclides

The relative percent difference shall not exceed 40% (RMRS, RF/RMRS-98-200).

If Quality Control results exceed the tolerances listed above, the data must be qualified and/or additional samples may be required.

Accuracy

Accuracy tolerances are ±20%, as defined by measured values compared with traceable standards; this tolerance is applicable to both radionuclide and nonradionuclide measurements.

Representativeness

Surveys and samples acquired in compliance with this characterization plan shall constitute adequate representativeness, based on consensus approval by all required reviewers. Compliance with standardized protocols for sampling, 3-dimensional locations of samples, and acceptable precision and accuracy all contribute to corroboration of representative sampling.

If representativeness of any sample set is ambiguous, the data shall be qualified and/or additional samples may be required.

Completeness

Completeness is a quantitative measure of data quality expressed as the percentage of valid or acceptable data obtained from the project relative to each medium and analytical suite of interest. If completeness of any sample set is not achieved, additional data shall be acquired. All characterization data collected for this project shall be verified as directed by K-H requirements (K-H, 1998a), as all data are critical for decision-making.

Comparability

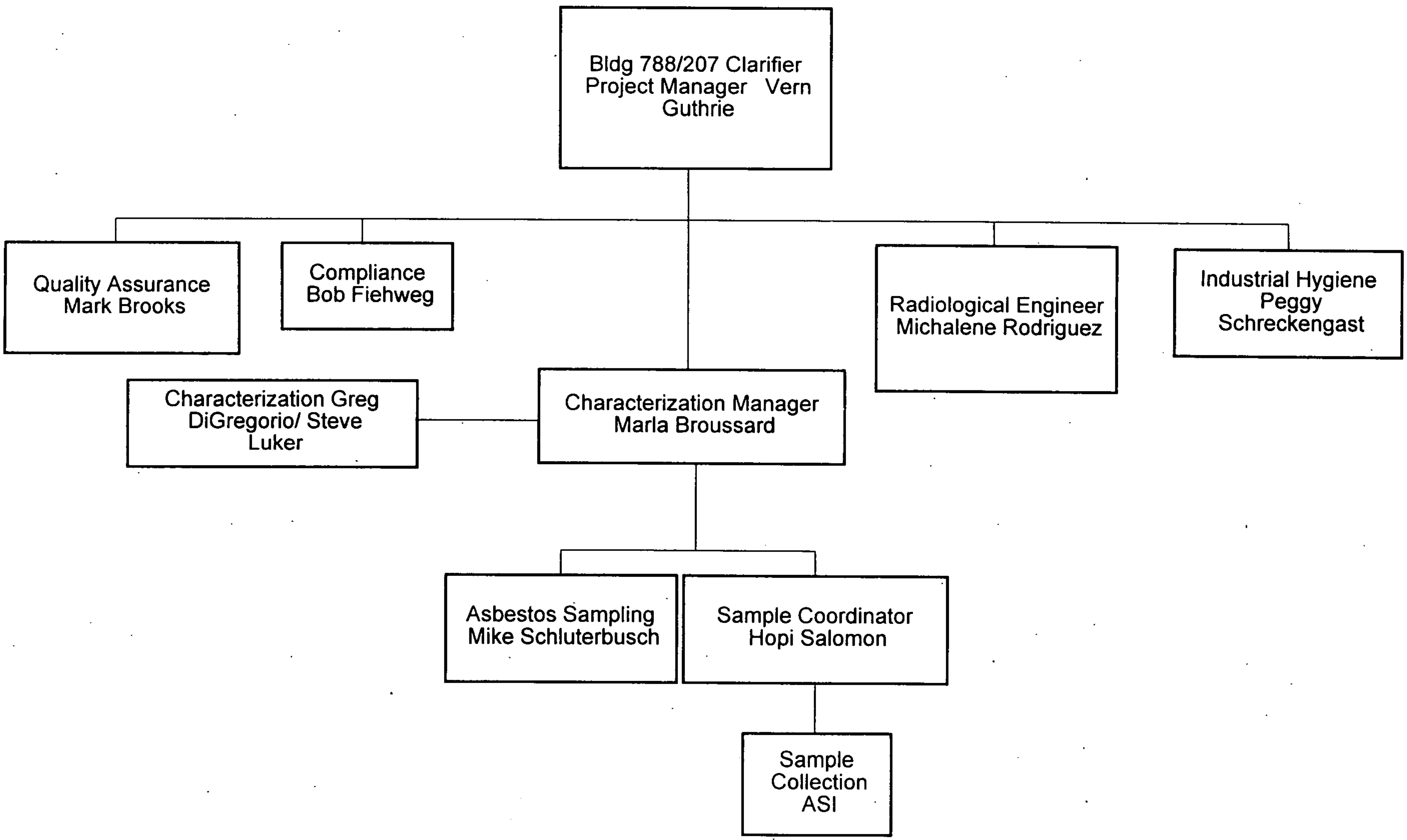
Sample collection methods and analyses per the protocols specified in this characterization plan provide comparability with other similar media types and contaminants of concern across the DOE complex and the commercial sector.

7.0 PROJECT ORGANIZATION

Figure 7-1 illustrates the project organizational structure for the B788/207 Clarifier Site Hazard Assessment. The project manager will be the primary point of responsibility for maintaining data collection and management methods that are consistent with site operations. This will involve data collection, verification, transmittal, and archiving of sample information. The project manager, or appropriate design, will coordinate the necessary Soil Water Database criteria, sample number methodology, and location codes for all samples collected during the hazard assessment.

The sampling crew personnel will be responsible for field data collection, documentation, and transfer of samples for analysis. Field data collections will include sampling and obtaining screening results. Documentation will require detailed field logs and completing appropriate forms for data management and chain-of-custody shipment. The sampling crew will coordinate

Figure 7-1. Project Organization Chart



sample transportation for on-site and off-site for analysis through K-H Analytical Services Division personnel. The sampling coordinator is responsible for verifying that chain-of-custody documents are complete and accurate before the samples are transported to the analytical laboratories.

8.0 REFERENCES

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RMRS, 1998b. *Closure Description Document, RCRA Units 21 & 48.*

RMRS, 1998c. *Radiological Historical Assessment for the 207 Clarifier*, M. Rodriquez (author)

RMRS, 1998d. *Project Execution Plan for Building 788 and the 207A Clarifier*

RMRS, 1998e. *RMRS Health & Safety Program for Characterization Sampling*, RF/RMRS-98-284, October

APPENDIX A

HSA INFORMATION for RADIOLOGICAL DATA

31

RMRS Rocky Mountain Remediation Services, L.L.C

. . . protecting the environment

Radiological Historical Assessment for the 207 Cluster

9/22/98

Prepared by: Michalene Rodriguez, Radiological Engineer — Date

9/22/98

Reviewed by: Jesus O. Cisneros, Radiological Engineer — Date

9/22/98

Approved by: Jeffrey B. Barroso, Radiological Engineering Manager — Date

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The Solar Evaporation Ponds, also known as the "high nitrate ponds," were used primarily for the disposal of low-level radioactive wastes contaminated with high concentrations of nitrate and for difficult to treat wastes.

Solar Pond 207A was constructed in 1956, and the date of last recorded use was August, 1991. Solar Pond 207B consists of three cells, North, Center, and South and has been used since its construction in 1960. Solar Pond 207C was constructed in 1970 primarily to allow the transfer of water from other solar ponds so that they could be repaired.

The most common characteristic of the wastes released to the solar ponds was high concentrations of nitrate. The ponds typically had untreated process waste placed in them, but on occasion treated process waste was also placed in the ponds. The monthly history reports from the Rocky Flats Plant Waste Group detailed the originating pond construction, quantity of water transferred, which pond the water was released to, and activity present in the water upon release. Based on these reports, a complete characterization of Pond 207A's water reveals detectable concentrations of plutonium, uranium, and various metals. The monthly history report also mentions radioactive contaminated aluminum scrap was disposed in the solar ponds.

Solar pond clean-up activities began in the mid-1980's and was a response action to the presence of waste materials in the solar ponds and the presence of contamination in nearby soils, groundwater, and surface water.

Rocky Flats Environmental Technology Site began using the 207A clarifier tank for the pondcrete sludge stabilization program in 1986. In 1989, the last of the process waste sludge was removed from Pond 207A and pumped into the open top tank. Clarifier operations were halted shortly thereafter leaving approximately 16,500 gallons of waste sludge and water in the 30,000 gallon capacity clarifier tank.

In 1985 Building 788 and Trailer 788A were constructed in support of the solar pond stabilization program. Building 788, to include a Contamination Control Room, was used for pondcrete processing, repackaging, and reprocessing. T788A was used for administrative purposes.

To ascertain the anticipated radionuclides and activities in the waste sludge, two laboratory analyses were conducted. The first study, gross alpha/beta analysis, was reported in June, 1992, from Brown and Root, Inc. (See Table 1). The second study was conducted by Halliburton NUS in January, 1995, reporting various radionuclides with corresponding activities (See Table 1). This sampling information was used to prepare a calculation for hazard categorization for the Clarifier to RCRA Closure Project.

Based on the "Radiological" hazard classification determination, radiological controls were required for the clarifier sludge removal activities.

Table 1. Radioactivity results from laboratory analyses conducted in 1992 and 1995.

Brown & Root, Inc.		*Halliburton NUS Corporation*	
Gross Alpha	3400-6600 pCi/g	Americium-241	13,000 pCi/g
Gross Beta	540 – 860 pCi/g	Plutonium-238	89 pCi/g
		Plutonium-239/240	3,900 pCi/g
		Uranium-233/234	28 pCi/g
		Uranium-235	1 pCi/g
		Uranium-238	32 pCi/g
		Strontium-90	1 pCi/g

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Removal of the waste sludge from the clarifier tank began in June,1998. A month prior, baseline characterization surveys were performed on the exterior, underside, catwalk, ladder and adjacent areas surrounding the clarifier tank. The survey results indicated no removable alpha/beta/gamma for the areas surveyed. During sludge removal, the interior portion of the tank was surveyed (exposed surface area). Removable alpha contamination ranging from 20 – 600 dpm/100 cm^2 was detected in several locations.

No known characterization surveys have been performed on Building 788 and T788A. However, since the Clarifier to RCRA Closure Project began, removable alpha/beta/gamma surveys have been recorded for the interior portions of Building 788 and T788A. No removable contamination was detected. No known surveys have been performed on the exterior portions of these buildings or in the Contamination Control Room located inside Building 788. The potential for exterior contamination on B788 and T788A exists due to their proximity to Solar Ponds A and C.

The Clarifier tank waste sludge removal was completed in August, 1998. High pressure spraying of the interior walls (up to the original waste/water line) of the clarifier tank is currently on-going. Closure will be attempted by a final rinse and sampling analysis. Radiological contamination surveys will be performed after the final rinse to determine the levels, if any, of removable alpha/beta contamination. A fixative may be sprayed on the interior portion of the tank depending on the results from these surveys.

Scoping surveys for Building 788 and Trailer 788A will need to be conducted in order to determine the associated hazards. A Radiological Engineering Report regarding the radiological controls for the Decontamination and Decommissioning for the 207 Cluster will be addressed once scoping/characterizations surveys are complete.

REFERENCES

Historical Release Report For The Rocky Flats Plant, Volume I, June , 1992.

Safety Analysis For Clarifier To RCRA Stable Project, Nuclear Safety Technical Report, Revision 0, NSTR-017-97, Rocky Mountain Remediation Services, LLC, December, 1997.

Integrated Safety Management Plan For The Clarifier To RCRA Closure Project, Revision 0, RF/RMRS-98-213UN, Rocky Mountain Remediation Services, LLC, May, 1998.

APPENDIX B

HSA INFORMATION ON TRANSFORMERS and PCBs

FAX TRANSMITTAL
COVER SHEET

TO THE ATTENTION OF: Hopi Salomon

DEPARTMENT NAME: RMRS

PHONE NUMBER: 6627	FAX NUMBER: 4046

NUMBER OF PAGES, INCLUDING COVER SHEET 4

FROM:

James Kihlthau
Rocky Flats Environmental and Technology Site
Plant Power
Building 662
PHONE: (303) 966-4266
FAX: (303) 966-3265

MESSAGE:

The following are Plant Power's transformer records, shich you requested from Mark Neeley, on 778-1. The nameplate data states "1 PPM PCB at time of manufacture". If you have any other questions, please call Mark at extension 2947, or myself at extension 4266.

THANK YOU

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PLANT POWER EQUIPMENT RECORD

PMO #: 370-100	LOCATION: 788-1
KVA RATING: 75	GRID/POLE: B-6 503
MANUFACTURER: WESTINGHOUSE	MANUFACTURE DATE: 1985
ASSET #: 0008589800	RESP CODE: 159
SERIAL #: 85A020643	MODEL #: NLL
DIAGRAM #: NONE	ORDER #: NLL
SPEC #: NLL	NAMEPLATE #: NLL
STYLE #: A5952675PR	INSTRUCTION MANUAL: UNKNOWN
VOLTAGE: 13800/23900-277/480	CONNECTED: DELTA-WYE (BANK)
HV TAPS: 1)14490-5)13110	HV NOMINAL TAP: 3-13800
CURRENT HV TAP: 5-13110	HV FUSE TYPE/LOCATION: CUTOUTS
LIVE/DEAD FRONT: LIVE	LIGHTNING ARRESTERS: 15KV
NUMBER HV BUSHINGS: 2	NUMBER LV BUSHINGS: 2
POLARITY: SUBTRACTIVE	IMPEDANCE: 1.9% @ 85 C
WEIGHT: 1000	GALLONS: 53
OIL TYPE: NLL	SECONDARY CONTAINMENT: NONE
CONT. TEMP. RISE RATING: 65 C	FULLWAVE IMPULSE/BIL: 125/30
CLASS/TYPE: OA	PAD/POLE: POLE
OIL LEVEL GAUGE: NO	OIL SAMPLE VALVE: NO
TEMPERATURE GAUGE: NO	PRESSURE GAUGE: NO
PCB TEST DATE: NON-PCB PPM:	RETROFILLED: N/A
SECONDARY ROTATION:	DATE TAKEN: / /
FEEDS FROM:	FEEDS TO:
COMMENTS/SPECIAL INSTRUCTIONS: DISTRIBUTION TRANSFORMER; 1 PPM PCB AT TIME OF MANUFACTURE;	

NLL-NOT LISTED ON LABEL. NA-NOT APPLICABLE.

PLANT POWER EQUIPMENT RECORD

PMO #: 370-101	LOCATION: 788-1 (S)
KVA RATING: 75	GRID/POLE: B-2 503
MANUFACTURER: WESTINGHOUSE	MANUFACTURE DATE: 1985
ASSET #: 0008589900	RESP CODE: 159
SERIAL #: 852A0120564732	MODEL #: NLL
DIAGRAM #: NONE	ORDER #: N/A
SPEC #: NLL	NAMEPLATE #: NLL
STYLE #: A5952G75PR	INSTRUCTION MANUAL: UNKNOWN
VOLTAGE: 13800/23900-277/480Y	CONNECTED: DELTA-WYE (BANK)
HV TAPS: 1)14475-5)13110	HV NOMINAL TAP: 13800/23900Y
CURRENT HV TAP: 5-13110	HV FUSE TYPE/LOCATION: CUTOUT
LIVE/DEAD FRONT: LIVE	LIGHTNING ARRESTERS: 15KV
NUMBER HV BUSHINGS: 2	NUMBER LV BUSHINGS: 2
POLARITY: SUBTRACTIVE	IMPEDANCE: 1.9% @ 85 C
WEIGHT: 1000	GALLONS: 53
OIL TYPE: NLL	SECONDARY CONTAINMENT: NONE
CONT. TEMP. RISE RATING: 65 C	FULLWAVE IMPULSE/BIL: 125/30
CLASS/TYPE: OA	PAD/POLE: POLE
OIL LEVEL GAUGE: N/A	OIL SAMPLE VALVE: NO
TEMPERATURE GAUGE: NONE	PRESSURE GAUGE: N/A
PCB TEST DATE: NON-PCB PPM:	RETROFILLED: N/A
SECONDARY ROTATION:	DATE TAKEN: / /
FEEDS FROM:	FEEDS TO:
COMMENTS/SPECIAL INSTRUCTIONS: DISTRIBUTION TRANSFORMER; 1PPM AT TIME OF MANUFACTURE;	

NLL-NOT LISTED ON LABEL. NA-NOT APPLICABLE.

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PLANT POWER EQUIPMENT RECORD

PMO #: 370-102	LOCATION: 788-1 (S)
KVA RATING: 75	GRID/POLE: B-6 503
MANUFACTURER: WESTINGHOUSE	MANUFACTURE DATE: 1985
ASSET #: 000859000	RESP CODE: 159
SERIAL #: 853A010573	MODEL #: NLL
DIAGRAM #: NONE	ORDER #: NLL
SPEC #: NLL	NAMEPLATE #: NLL
STYLE #: A5952G75PR	INSTRUCTION MANUAL: UNKNOWN
VOLTAGE: 13800/23900-277/480Y	CONNECTED: DELTA-WYE (BANK)
HV TAPS: 1)14475-5)13110	HV NOMINAL TAP: 13800/23900Y
CURRENT HV TAP: 5-13110	HV FUSE TYPE/LOCATION: CUTOUT
LIVE/DEAD FRONT: LIVE	LIGHTNING ARRESTERS: 15KV
NUMBER HV BUSHINGS: 2	NUMBER LV BUSHINGS: 2
POLARITY: SUBTRACTIVE	IMPEDANCE: 1.9% @ 85 C
WEIGHT: 1000	GALLONS: 53
OIL TYPE: NLL	SECONDARY CONTAINMENT: NONE
CONT. TEMP. RISE RATING: 65 C	FULLWAVE IMPULSE/BIL: 125/30
CLASS/TYPE: OA	PAD/POLE: POLE
OIL LEVEL GAUGE: N/A	OIL SAMPLE VALVE: NO
TEMPERATURE GAUGE: NONE	PRESSURE GAUGE: N/A
PCB TEST DATE: NON-PCB PPM:	RETROFILLED: N/A
SECONDARY ROTATION:	DATE TAKEN: / /
FEEDS FROM:	FEEDS TO:
COMMENTS/SPECIAL INSTRUCTIONS: DISTRIBUTION TRANSFORMER; 1PPM PCB AT TIME OF MANUFACTURE;	

NLL-NOT LISTED ON LABEL. NA-NOT APPLICABLE.

APPENDIX C

EXPLANATION OF MARSSIM METHODOLOGY

The logic sequence used for implementing MARSSIM guidelines was as follows:

- ✓ Contaminants were identified (per process knowledge):
  - ➢ radionuclides
  - ➢ RCRA constituents
  - ➢ asbestos
  - ➢ PCBs
- ✓ DCGLs were established: DOE unrestricted release criteria
- ✓ Survey areas were classified based on potential contamination: Class 2 (= Type 2)
- ✓ Areas were categorized (separated) into specific survey units (Table 3-3).
- ✓ Hypothesis test was defined: against DOE unrestricted release criteria (not bkgrd)
  - ➢ null hypothesis H o: $\mu \geq$DCGL s and
  - ➢ alternate hypothesis H a : $\mu<$DCGL s
- ✓ The number of data points were determined (based on Sign Test)
  - ➢ established σ (or variability in contamination levels)
  - ➢ calculated Δ/σ (relative shift)
  - ➢ adjusted relative shift as needed ($1 \leq \Delta/\sigma \leq 3$)
- ✓ The grid design was developed (MARSSIM §5.5.2.5), Table 3-8.
- ✓ Optimize overall design (DQO Step 7), esp. the number of data points based on latest survey data — pending latest data

APPENDIX D

GTS DURATEK WASTE ACCEPTANCE CRITERIA

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This is a
CONTROLLED DOCUMENT
ROCKY FLATS PLANT
This is a RED stamp
COPY HOLDER NO. 144

RMRS Rocky Mountain Remediation Services, L.L.C.
. . . protecting the environment

RF/RMRS-98-280

Asbestos Sampling and Analysis Plan

for

Building 788/207 Clarifier

ROCKY MOUNTAIN REMEDIATION SERVICES, L.L.C.

REVISION 0

OCTOBER 1998

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ASBESTOS SAMPLING AND ANALYSIS PLAN
FOR BUILDING 788/207 CLARIFIER
REVISION 0
OCTOBER 1998

This Sampling and Analysis Plan has been reviewed and approved by:

Vern Guthrie, Project Manager — 10/8/98 Date

M.D. Schreckengast, Health & Safety — 10-8-98 Date

Mark Brooks, Quality Assurance — 10-08-98 Date

This Sampling and Analysis Plan was prepared by:

Michael N. Schluterbusch, Certified Building Inspector — 10-08/98 Date

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ACRONYMS

AHA	Activity Hazards Analysis
AIHA	American Industrial Hygiene Association
ASD	Analytical Services Division
CCR	Colorado Code of Regulations
CFR	Code of Federal Regulations
DQO	Data Quality Objectives
Ft^2	Square Feet
HUD	Housing and Urban Development
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PLM	Polarized light microscopy
PPE	Personal Protective Equipment
RCT	Radiation Control Technician
RFETS	Rocky Flats Environmental Technology Site
TRM	Transuranic Mixed
TRU	Transuranic

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ASBESTOS,SAMPLING AND ANALYSIS PLAN

FOR BUILDING 788/207 CLARIFIER

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this project is to prepare the existing Building 788/207 Clarifier facility for decommissioning and demolition at the Rocky Flats Environmental Technology Site (RFETS). The pre-work characterization is to be implemented and completed within the FY99 budget cycle.

1.2 SCOPE

The scope of this plan includes the sampling of all areas under the scope of work for the demolition of Building 788/207 Clarifier at the RFETS. The scope includes characterization of building materials which could be impacted by decommissioning and demolition of the buildings. A walkdown of the project was performed on 10/6/1998. Details of the review and tour are included in Table 2-1.

1.3 PROTOCOL

Contained herein is a preliminary sampling and analysis protocol for asbestos in building materials for Building 788/207 Clarifier. This approach will ensure that the process will be in compliance with applicable Federal and State regulations.

The survey practices outlined are specifically designed to provide occupational hazard assessment information in support of activities to facilitate the demolition of Building 788/207 Clarifier. However, the information may be used to provide support for a comprehensive operations and maintenance program during normal building activities covered under the site Integrated Work Control Program such as routine or scheduled maintenance, repair or remodelling until such time as the buildings are evacuated and demolished.

2.0 METHODOLOGY

The first step in sampling for asbestos in building materials in a building is to research the building records such as blueprints and specifications for documentation of the use of these materials in construction or remodelling efforts. Dates of construction are considered in this process. This research also takes into account the materials sampling events that may have taken place in the past. For example, many buildings at RFETS have had cursory inspections for suspect asbestos containing building materials. These data will be included in the report if the inspector feels these data are relevant and meets the minimum requirements of this plan and any related regulatory drivers. Should acceptable data be available, some of the sampling requirements listed in Table 2-1 may be met in this manner.

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The second step in this process is to physically tour the building, entering every accessible area and room, looking for suspect (or affected) materials that may indicate through historical data or based on the inspector's experience, the presence of asbestos in building materials. A suspect list is generated, along with estimated quantities.

During the tour, several suspect materials that would be affected by the demolition effort were identified. Table 2-1 summarizes these suspect materials and the subsequent sampling requirements.

2.1 INSPECTION RATIONALE

Settled dust sampling for asbestos in building materials is used as an optional aid for assessment of industrial hygiene issues. Although material samples are to be collected from inconspicuous areas, proper safety precautions must be taken to prevent the spread of suspect materials.

2.1.1 Inspecting For Asbestos

When inspecting for asbestos, non-suspect (or unaffected) materials are those traditionally made of wood, glass or metal. However, the inspector will suspect the adhesives applied to secure non-suspect materials to the substrate. Suspect, or affected materials are separated into three general categories: thermal systems insulation (TSI), surfacing materials, and miscellaneous materials.

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Table 2-1 Asbestos Survey Results/Sampling Requirements

Locations	ACM Category	Sample Location	Sample Quantit
788 S.E. office	TSI (Thermal Systems Insulation)	Domestic water pipes, SW corner; mudded fittings	2
	Surfacing	Drywall, tape and joint compound, south wall	2
	Miscellaneous	floor tile and mastic	1
	Miscellaneous	Baseboard heater, E wall; wiring insulation	1
788 S.W. office	Surfacing	Drywall, tape and joint compound, south wall	1
	Miscellaneous	floor tile and mastic, SW corner	1
	Miscellaneous	3" black cove base, south wall	1
South end B788	Miscellaneous	Black mastic on floor, 25' north of offices.	1
788 Permacon	Surfacing	Drywall, tape and joint compound, interior and exterior north, south, and east walls	5
788, N center	TSI	Domestic water pipe, safety shower, approx. 25' S of N wall, 8' W of E wall, vapor barrier mastic.	3
788, N center	TSI	Domestic water pipe, safety shower, approx. 25' S of N wall, 8' W of E wall; mudded fitting	1
788 Underground	TSI	Manhole, approx. 30' N of S offices, 3' E of W wall; pipe insulation.	3
788 Exterior	Miscellaneous	Main electrical service panel, S side; arc chutes.	1
207 Clarifier	TSI	Piping to tank, center; insulation.	3
	TSI	Piping to tank, center; vapor barrier mastic.	3
	Miscellaneous	Tank base; fixative.	1
	Miscellaneous	Roofing; tar, paper and shingles	1
	Miscellaneous	Wall/pipe penetrations; caulking.	1
207B heater	TSI	Pipes, N end; pipe insulation.	3
QA/QC		5% of total; side by side; inspector determines locations.	2
TOTAL			37

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2.2 DATA COMPILATION

Data compilation will separate the materials into homogeneous areas within these general categories, which will lead to the number of samples necessary for regulatory compliance and statistical reliability of the outcome. Any homogeneous area may be assumed to contain asbestos, negating the need for samples.

3.0 SURVEY PROCEDURES

3.1 SAMPLE QUANTITY

Determination of sample quantity is based on the regulatory drivers attendant with each sample type. In the absence of a regulatory driver, process knowledge, historical data and the inspector's experience are the relevant deciding factors.

3.3.1 Sampling For Asbestos in Building Materials

The number of samples for asbestos for each homogeneous area is outlined in EPA 40 CFR 763.86. Sample quantity is decided first by a material's physical condition of friability, then by its general category. Friable materials are those that are capable of being crumbled or reduced to powder by hand pressure. Thermal systems insulation, such as that found on pipes or ducts, friable or non-friable, requires a minimum of three samples per homogeneous area, one sample from patches less than six linear or square feet. and one from cementitious or "mudded" fittings. Each mechanical system, such as hot and cold domestic water, may have several homogeneous areas. Each will be sampled accordingly. Only friable surfacing materials, such as fire-proofing or ceiling texture, will have a nine section grid applied to a blueprint of the area and samples will be acquired from the center of randomly selected grids. If the homogeneous area of friable surfacing material is less than 1,000 ft^2 (square feet), three samples are needed; if between 1,000 and 5,000 ft^2, five samples are needed; if the area is over 5,000 ft^2, seven samples are needed. Miscellaneous materials, such as floor and ceiling tiles are sampled according to the inspector's discretion, as outlined in EPA 40 CFR 763.86(C & D). For the purpose of this survey and based on the inspector's experience and discretion, a minimum of one sample of each suspected material in this category will be acquired.

3.2 SAMPLE LOCATION

Sample locations are selected randomly according to how each represents a homogeneous material. Since homogeneous areas are located throughout the building, the representation and number of samples is the driving factor rather than exact location of the sample in each room. Exact locations will be directly affected by the radiological concerns. In the absence of radiological surveys, a radiological control technician (RCT) will accompany the inspector. If a selected location is determined to exceed acceptable parameters, a second location will be selected. Should no radiologically acceptable location be found, a contaminated sample will be acquired and treated as a radiologically contaminated sample and cleared through Radiological Operations and Engineering.

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4.0 SAMPLING

Although several types of samples are to be acquired, the methodology for acquiring those samples have many identical steps. The section on settled dust sampling is included in the event that issues arise during the demolition effort that would require this type of sampling.

4.1 SETTLED DUST

Settled dust on horizontal surfaces will be sampled using a micro-vac technique that requires the use of a template that sequesters a 10 square inch pattern. The sampling tool is a low volume battery powered air sampling pump calibrated at 2 liters per minute with a 25 mm mce cassette attached. A two inch section of tygon tubing is attached to the upstream side of the cassette and facilitates pickup of all loose dust in the grid area. Each sample is documented as to location, the cassette is labeled with an identifying number, and sealed. The sample number is documented on the chain of custody form. The sample location may be photographed with a sample photo identification card in the focus area documenting the sample number and date, and orienting the viewer to the sample location with an arrow.

Each sample will be acquired with the intent of assuring the quality, representation, and safety of the process. The following steps will be performed for each sample acquired. Note that a RCT may be present as necessary to survey the area and location of the sample prior to proceeding.

4.2 ASBESTOS IN BUILDING MATERIALS

Sampling for asbestos is performed using destructive techniques that require acquiring a representative sample of the material down to the substrate. Each sample must contain a minimum of one cubic centimeter of material to facilitate analysis and archival processes.

All sampling will be in accordance with the Activity Hazards Analysis (AHA). The AHA, reviewed and approved by Industrial Hygiene, outlines potential hazards involved for sampling activities, PPE and outlines safety precautions to be utilized during the specified sampling activity.

Bulk sampling procedures as outlined:

- The location of the sample is visually verified against written descriptions.
- A polyethylene drop cloth or plastic bag is placed below the elevated sample areas.
- The immediate sample area is dampened with a mist of water and surfactant.
- A sampling tool, such as a hammer and chisel, razor knife, paint scraper, "Wondermaker" or hole saw is selected and the sample is acquired, making sure to take a complete sample to the substrate. During this process, the immediate surface is misted as necessary.
- The acquired sample is placed in a sealable container, such as a plastic bag or vial.
- The container is sealed and a pre-numbered label is placed on the container. The sample number label is placed on chain of custody papers and the container is verified to be sealed.
- The sampling tool is thoroughly cleaned using a mister and wipes.
- The sample area is patched as needed.

- The description and location is documented on a form, a sample label is placed on the form, and the location is documented on a blueprint.
- The sample container, drop cloth and immediate sample area is wet wiped and the drop cloth is carefully folded in to the center and placed in a sealable bag and the bag is sealed.
- In the case of routine maintenance areas, a pre-numbered label is placed at the sample location. With permission of the building manager, labels will be placed on all sample locations.
- The sample location may be photographed with a sample photo identification card in the focus area documenting the sample number and date, and orienting the viewer to the location with an arrow.
- All used wipes, drop cloths, and PPE will be added to the appropriate waste stream.

5.0 LAB SUBMISSION ANALYSIS AND INSTRUMENTATION

All asbestos samples shall be submitted to a laboratory recognized by the EPA National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos. Appropriate sample submittal forms shall be used.

The field sample number shall appear on the field sampling form, the laboratory submittal form, and the container label. The name of the laboratory, the date the samples were sent to the lab, and all personnel handling the sample from the time of collection to the time of arrival at the laboratory shall be recorded on a chain of custody form.

5.1 ANALYTICAL METHODOLOGY: ASBESTOS

The analytical methodology for bulk asbestos samples is polarized light microscopy (PLM) capable of 400x magnification augmented with dispersion staining. This method is outlined in the EPA 600/R-93/116 methods for the determination of asbestos in building materials.

Bulk samples of suspect materials are examined for homogeneity, layers and preliminary fiber identification using a stereoscope at 40x magnification. Layers are separated and mounted on slides. Refractive index oils are applied to the slide according to a morphology match. A light microscope equipped with two polarizing filters is used to observe seven specific optical characteristics of a sample at 400x magnification. The presence or absence of the characteristics determines the type of asbestos, or if not asbestos, the type of fiber present in the sample. The microscopist then visually estimates the percentage of asbestos or non-asbestos fibers in that layer. Each layer is reported separately. A layer or sample is determined to be an asbestos containing material if it contains more than one percent asbestos by this estimate. The limit of detection for PLM is less than five microns.

CCR 8 (Section iii.B.6.ii) mandates that results from PLM analysis of samples with asbestos percentages from trace (less than 1%) to 1% be re-assessed using point counting analysis. If point counting is chosen, these results take precedence over the PLM results. Point counting is a methodology that uses identical instrumentation, with the addition of a grid system on the stage. The analyst is required to look at a minimum of 100 locations on eight different mounts, estimate the percentage of asbestos, and add these percentages for a statistical representation of the content.

6.0 DATA ANALYSIS

Two types of data are generated during an asbestos in building materials inspection; the field data and the laboratory data. The field data consists of research on the building history, observation and identification of installed building materials, and measurements to determine quantities. The laboratory data consists of empirical observation through instrumentation, identification and quantification of sample information.

6.1 HISTORICAL RESEARCH

Historical research allows the inspector to compile information that is used to discover and verify the existence of asbestos in building materials. Maintenance and asbestos abatement records, blueprints, as-builts, specifications and emergency response documents are examples of the data used. Once the inspector arrives at the site, the visual inspection begins, usually at the basement level and proceeding throughout the building and ending up on the roof. The inspector is looking for suspect materials and damage to same. This information will be used later to provide a physical assessment of the materials found.

6.2 LABORATORY

The laboratory data is reported, usually in tabular format, to the inspector. In the asbestos report table, the inspector finds information on the fibrous and non-fibrous constituents in the sample, reported as percentages of the total material. If asbestos is discovered, the table will describe the geologic type (such as chrysotile) and which layer it was discovered in. Other common fibrous constituents are fiber glass, rock wool and nylon.

7.0 SUMMARY

The inspector compiles the field and lab data, cross-matches information, eliminates non-asbestos containing materials from the suspect list, and generates a report on the findings. The report consists of an executive summary, location and description of both asbestos and non-asbestos containing building materials either sampled or assumed, estimated quantities of same, physical assessment of the friable asbestos containing materials, location of samples acquired, optional photographs of sample locations and damaged materials, and blueprints indicating sample locations and homogeneous areas that contain asbestos.

8.0 QUALITY ASSURANCE

Although the U. S. Environmental Protection Agency's Asbestos Hazard Emergency Response Act on asbestos regulations are not applicable outside public and private primary and secondary schools, the procedure outlined in 40 CFR 763.85, *Inspections*, 763.86, *Sampling*, 763.87, *Analysis* and 763.88, *Assessment*, has become industry accepted and is outlined in Colorado Regulation 8 in Section IV (*School Requirements,* IV.C, D, E & F). In addition, OSHA 29 CFR 1926.1101 (Section k.2.i and k.5.ii) requires the building owner or manager to inspect for asbestos according to EPA 40 CFR 763 guidelines.

Both the field and laboratory data are verified for accuracy and consistency. Each sample location is verified for representative quality and the sampler verifies that the sample size or volume meets the analytical requirements, and that the sample includes depth to substrate. Sample numbers are continually cross-checked to avoid redundancy or omissions. Administrative and engineering controls are used in this process. Administrative controls include the mandate that all inspectors and lab analysts meet all applicable regulatory training certification and licensing requirements.

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8.1 FIELD DATA

In the field, the inspector acquires quality control (or duplicate) samples at the rate of five percent. Sample locations are chosen randomly and a second sample is acquired at the same location. This sample is sent to the same lab for analysis. Should discrepancies occur, the issue is resolved by retracing the steps back to the sample acquisition point and following the process back to the lab. If the issue is still unresolved, the inspector will acquire an additional sample to be sent to a different lab. In addition, the Analytical Services Division (ASD) is required to validate laboratory data at the rate of 25%.

8.2 LAB DATA

In the lab, the analyst uses the same five percent criteria in performing quality control procedures for asbestos as outlined in the NVLAP and other programs. Samples are randomly chosen and another analyst re-assesses the sample. Results are compared, and discrepancies are resolved. All mathematical calculations are verified through peer review.

8.3 COMPARISON/MATCHING

A last step in quality assurance involves the comparison of field and lab data. The sample numbers and descriptions are checked against each other to verify that the lab saw the same material as the inspector. Problems may occur due to transposition of number sequences, and this is resolved by checking the field data sheets against the chain of custody and the lab report. Minor differences in the physical descriptions are allowed due to the fact that lighting in the building may be different than that in the lab. Major differences in descriptions are often traced back to the number transposition issue. In order to avoid this issue, inspectors will use pre-printed labels on the field data sheet, sample container, and chain of custody document.

8.4 DATA EVALUATION

Asbestos sample data are evaluated according to asbestos content and the field sampler's determination of friability. If a single sample from a homogeneous area contains more than 1% asbestos, the entire area is considered to be asbestos containing. If all samples from a homogeneous area contain less than one percent asbestos, the material may be considered as non-asbestos containing. Decisions regarding health, safety, industrial hygiene and waste are determined through this evaluation.

Asbestos sampling protocols require that quality control samples be acquired at the rate of five percent. These sample data are checked against the data on the samples acquired at the same location. A 10% variation is allowed. Should that data not meet this standard, lab and field data are cross-checked for anomalies. If no discrepancies are discovered, or if there is no resolution, additional samples will be acquired accordingly.

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8.5 PEER REVIEW

Finally, the report itself is passed through peer review. This process assures the final product will be free of technical, grammatical, and mechanical errors prior to being passed on to the client or being used as a basis for future operations in the building such as abatement, maintenance, renovation, or demolition.

8.6 RECORDS MANAGEMENT

Throughout the process of characterization, data generated within the project scope will be retained in Project History files related to historical, field and laboratory data. These data are retained for the life of the project and are accessible to all project team members and any oversight personnel. Historical information including blueprints, interviews, previous sampling and analysis data, interviews with building staff, along with field generated (see Appendix A) forms, logbooks and laboratory generated data will be processed according to 1-77000-RM-001, Records Management Guidance for Records Service, and 1S78-ER-ARP-001, CERCLA Administrative Records Program.

9.0 REFERENCES

1-77000-RM-001 *Records Management Guidance for Records Sources*

Emission Standards for Asbestos, Excerpted from Colorado Regulation No. 8, *The Control of Hazardous Air Pollutants*, Part B, Emission Standards for Asbestos, November 30, 1996.

EPA 40 CFR 763, *Asbestos-Containing Materials in Schools*; Final Rule and Notice, October 30, 1986.

OSHA 29 CFR 1926.1101, *Asbestos Construction Standard*, August 10, 1994.

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APPENDIX A:

PROJECT FORMS

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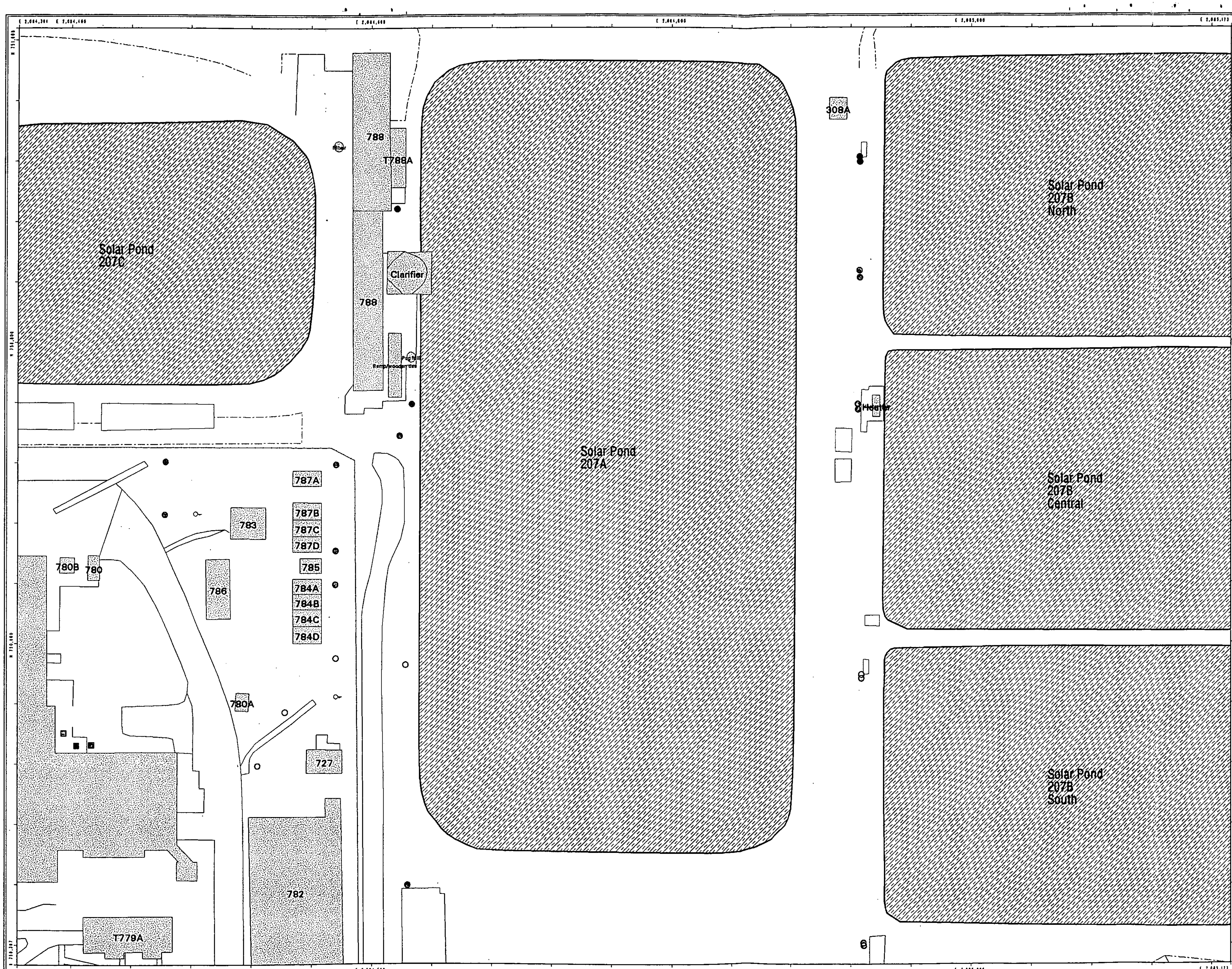

Figure 1-1

Building 788 Location Map

EXPLANATION

LEGEND - Utility Pole Type

- Electrical pole
- Light pole
- Electrical box (small)
- Miscellaneous pole
- Guywire
- Transmission tower (1 leg)
- Electrical box (large)
- Substation
- Transmission tower (4 leg)

Standard Map Features

- Buildings and other structures
- Solar evaporation ponds
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95
Electrical Utilities from 1994 aerial fly-over data captured by EG&G Remote Sensing Lab, Las Vegas, NV. Digitized from the othophotographs by the Othoshop, Tuson, AZ. 1/95

Scale = 1 : 770
1 inch represents approximately 64 feet

20 0 40 80 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
RMRS Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
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MAP ID: 99-0001

October 21, 1998

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