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Data Quality Objectives to Support the Preparation of the Sampling and Analysis Plan for the 108-F Biological Laboratory

HANFORD

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Bechtel Hanford, Inc.
Richland, Washington

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TABLES

1.0 INTRODUCTION

This document is a summary intended to assist in the decision making associated with the Data Quality Objective (DQO) process pertaining to the sampling and analysis activities in the 108-F Biological Laboratory. The following are suggested participants for review and comment in the DQO process:

DECISION MAKERS

Jeff Bruggeman	DOE
Mike Mihalic	ERC
Philip Jackson	ERC

TECHNICAL SUPPORT

Bob Hobbs	ERC
Don Smith	WHC
Steve Hamblin	ERC
Rikki Harris	ERC
Dave Encke	ERC
Susan Winslow	ERC
Dave Byers	ERC
John Lawson	ERC

2.0 SCOPE

The 108-F Biological Laboratory is scheduled for characterization to support decontamination and demolition activities. Facility characterization is required, in order to identify the radiological contamination and presence of hazardous materials. The scope of this DQO is to ensure that the analytical data gathered is sufficient to support disposal of the demolition debris, as required by the Washington Administrative Code (WAC) 173-303, "Hanford Site Solid Acceptance Criteria," WHC-EP-0063-4, and the "Environmental Restoration Disposal Facility Waste Acceptance Criteria," BHI-00139.

3.0 HISTORY

The 108-F building was constructed in 1947 as part of the original Hanford site construction. Its intended use was to provide chemical treatment of the 105-F Reactor cooling water. In 1949, the 108-F building was completely remodeled for use in life-science studies for the effects of radiation and contamination on plant and animal life.

The original 108-F building was a four-story steel frame, concrete block structure with reinforced concrete foundation, and a total floor space of about 20,000 ft^2 (1,858 m^2). In 1949, and again in 1962, the 108-F building was remodeled, and the floor space increased by the addition of an 11,000 ft^2 (1,022 m^2) annex. This addition is a three-story concrete block structure adjoining the older building.

The interior of the building was laid out in a typical laboratory fashion with 47 rooms, equipped for laboratory use, a number of small offices, a large conference room, an administrative section, a library, lunch and locker rooms. Since radioactive materials were used in the work performed within the building, the laboratories and storage rooms were maintained in a controlled status until 1973 when the laboratory activities were phased out and transferred to other facilities.

A housekeeping program was conducted in the facility during 1977, which removed highly contaminated materials and gloveboxes. In 1983, the remaining laboratory equipment was removed and the facility structure was decontaminated and released from a contaminated status.

4.0 PRELIMINARY PLANNING AND HISTORICAL DATA

4.1 Records Review

The characterization team performed a records review of historical documents, process manuals and facility drawings (Table 4), to identify operations or processes that used or generated hazardous materials within the buildings and the location of any equipment that may have contained potentially hazardous materials from those operations.

4.2 Site Reconnaissance

A walk-through of the 108-F Biological Laboratory was conducted to identify stains, leaks, equipment, containers and locations which should be sampled for hazardous and radiological constituents.

4.3 Data Quality Objective Readiness Checklist

The planning team prepared a readiness checklist to identify applicable items needed prior to preparing the DQO summary and sampling and analysis plan (SAP). See Table 3 for information gathered and the source of that information.

5.0 RADIOLOGICAL STATUS

5.1 Radionuclides of Concern

Radioactive materials were used for the work performed within the building. The laboratories and storage rooms were maintained in a controlled status and contained contaminated laboratory equipment, drains, and exhaust ducts. The maximum contamination levels at some locations were 5,000 c/m Beta-Gamma and 100,000 d/m Alpha. The overall background exposure rate to personnel working in the building radiation zone was 1 mR/hr. Sampling and analysis performed in 1983 indicated that the radionuclides of concern in this facility were Pu-238, Sr-90, Co-60, and Cs-137 (Table 1).

5.2 Equipment Removal and Decontamination

The contaminated areas were decontaminated and released from a contaminated status in fiscal year (FY) 1983. The decontamination phase progressed from the fourth floor down and involved foaming, disassembly and wrapping of all laboratory equipment including sinks, cabinets, and hoods. The contaminated piping was removed, except for the central drain piping system which lies in a sub-floor trench located on the first-floor of the original structure. The contaminated exhaust duct was removed by fixing the contamination, dismantling/cutting and sealing the duct work each time it was opened. The duct work on the roof and east side of the building was painted, then cut into sections and removed. The contaminated ventilation system was dismantled, sealed and removed. Contamination was removed from the structures by removing wall partitions, surface spalling the concrete floors, and the use of strippable coating.

5.3 Radiological Survey Data

The building was decontaminated to unrestricted use levels. A final release survey and sampling of all interior surfaces was conducted to release the structure. Two-thousand two-hundred twenty-five (2,225) smear samples and approximately five-hundred (500) coupons, tile, and concrete samples were collected and counted. Final release data can be reviewed in the UNC Nuclear Industries Radiation Survey Report, Number 00322. This ninety-nine page report lists the release data on each of the survey grids.

5.4 Radiological Survey Requirements/Limits

The accepted release limits applicable to the 1983 decontamination and survey activities were specified in the "Radiation Control Manual," UNI-M-30, dated August 1, 1977, and the United States Atomic Energy Commission (AEC) Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," dated June, 1974. In 1983, the applicable release limits were as follows:

Table 1. 1983 Accepted Surface Release Limits

MEASUREMENT TYPE	*REMOVABLE SURFACE CONTAMINATION*	*FIXED CONTAMINATION*
ALPHA	500 dpm/100 cm2	500 dpm/100 cm2
BETA/GAMMA	2000 dpm/100 cm2	2000 dpm/100 cm2

The current applicable release limits used today are specified in the "Radiological Work Instructions," BHI-SH-04, dated December, 1995, and the "Radiation Protection of the Public and the Environment," Chapter IV, DOE 5400.5. The current applicable release limits are as follows:

Table 2. Current Accepted Surface Release Limits

MEASUREMENT TYPE	*FIXED+REMOVABLE CONTAMINATION*	*REMOVABLE SURFACE CONTAMINATION*
ALPHA	100 dpm/100 cm2	20 dpm/100 cm2
BETA/GAMMA	5000 dpm/100 cm2	1000 dpm/100 cm2

5.5 Beta/Gamma Measurements

It is evident that 1983 release limits were higher than the current release limits used today. However, the 1983 survey indicates that the beta/gamma fixed contamination measurements did not exceed the current beta/gamma fixed+removable contamination limits of 5,000 dpm / 100 cm2. Survey data also indicates that the 1983 beta/gamma removable contamination measurements do not exceed the current beta/gamma removable surface contamination limits of 1000 dpm/100cm2.

5.6 Alpha Measurements

The 1983 survey indicates that the alpha removable contamination measurements do not exceed the current alpha removable contamination limits of 20 dpm/100 cm2. However, the measurements for the alpha fixed contamination, which are listed as being <500 dpm/100 cm2, indicate that there is a potential for exceeding the current alpha removable contamination limits of 100 dpm/100 cm2. Further characterization surveys in these areas will need to be performed, in order to identify the actual dpm measurements.

5.7 Radiological Contaminated Areas

The only known, posted radiological area is the main pipe trench and sump system which is located in the sub-floor, first-level. The trench was sealed and designated a contaminated area. The planning team conducted a visual inspection of the trench on July 2, 1996, and the covers were removed. Portions of the pipe system, in the main pipe trench have been removed. There is no historical or physical evidence that the pipe trench ever contained liquids. Fixed contaminated was identified on the surfaces of the concrete trench, and the pipe system in the sump is contaminated, but a complete and accurate survey has not been conducted. Further characterization surveys will need to be performed and isotopic identification is needed.

6.0 HAZARDOUS MATERIALS STATUS

The planning team identified large amounts of friable asbestos insulation in various office areas and asbestos wrapped piping throughout the building. Damaged floor tiles are also suspected to contain asbestos. The exterior of the building contains friable asbestos containing pipe insulation and asbestos cement.

On the first-floor there are exposed sheets of lead, approximately 1/4 inch thick, beneath the wallboard. The lead was used for shielding around the rooms containing counting equipment. The lead sheets may be found beneath the wallboards throughout the entire facility. All the paint located throughout the facility is suspected of containing lead. The cast iron pipes, located throughout the facility, contain lead joints.

Oil in the elevator motor, compressor motors, water coolant system and hoist equipment may contain polychlorinated biphenyl (PCB) and Resource Conservation and Recovery Act of 1976 (RCRA) metals. The pipe trench and sump system, located on the first-floor, were subject to possible oil and mercury contamination through process spills. The debris in the first-floor trench and sump could possibly contain PCB and RCRA metal (including mercury) contamination. There is a french drain located on the east-side of the facility. This french drain is approximately four-feet deep, and three-feet in diameter. The bottom of the drain consists of soil and large gravel, which supports a five-gallon carboy container.

7.0 STATEMENT OF PROBLEM

The 108-F Biological Laboratory is scheduled for characterization to support decontamination and demolition activities. Facility characterization is required in order to identify the radiological contamination and presence of hazardous materials. The facility structure will be radiologically released using surface contamination limits from DOE Order 5400.5, because there is no potential for volumetric contamination. This information will be used to support disposal of the demolition debris, as required by WAC 173-303, "Westinghouse Acceptance Criteria," WHC-EP-0063-4 and the "Environmental Restoration Disposal Facility Waste Acceptance Criteria (ERDF)," BHI-00139, Rev. 3.

8.0 DECISIONS

8.1 Principal Study Questions

1. What are the radiological and hazardous constituents of concern?
2. Do the constituents of concern exceed the levels that require corrective action for disposal as hazardous or mixed waste?
3. What will determine the action levels?

8.2 Alternative Corrective Actions Resulting From the Principal Study Questions

- ☐ The demolition debris will be disposed of as hazardous waste.
- ☐ The demolition debris will be disposed of as low level radioactive waste.
- ☐ The demolition debris will be disposed of as mixed waste.
- ☐ The demolition debris will be disposed of as clean waste via surface contamination criteria for the building structures and equipment.

9.0 DECISION INPUTS

9.1 Existing Information

The planning team has identified the areas that will require sampling and laboratory analysis. The analysis data will be used to determine if the suspect areas are radiologically contaminated, or if the chemical concentrations exceed the dangerous waste criteria.

9.2 Information Needed

- ☐ Sampling of all the suspect areas to support decontamination and disposal.
- ☐ Laboratory analysis to confirm the presence or absence of radiological and hazardous constituents.

- Laboratory analysis to confirm the presence or absence of radiological and hazardous constituents.
- Analysis data will meet the waste threshold requirements and lower limits of detection as required by the Hanford Site Solid Waste Acceptance Criteria, WHC-EP0063, Appendix J, "Release of Non-Radioactive Dangerous Waste for Offsite Disposal." This data will be used to designate material as hazardous or mixed waste. If the material is non hazardous then the data will be evaluated for radiological release using RESRAD.

10.0 DECISION RULES

The oil sample locations, lubricant, and french drain have not been identified as being radiologically contaminated, nor are they located in radiologically contaminated areas. However, there was the potential for radiological contamination and disposal procedures require analysis for confirmation of the presence or absence of radiological constituents. All laboratory analysis data will meet the established criteria in order to determine if the radiological and hazardous constituents are above the action levels. If the material is non hazardous then the data will be evaluated for radiological release using RESRAD.

10.1 Suspect Areas That Require Sampling and Analysis

Pipe Trench: Concrete chip samples will be collected every five feet from within the trench and combined into one composite sample for laboratory analysis. The sample will be analyzed for gross alpha, gross beta, gamma energy analysis (GEA), Plutonium (Pu)-238, -239/240, Strontium (Sr) -90, total uranium, TCLP metals, and mercury.

Main Sump System: One scale sample will be collected from the pipe interior for laboratory analysis. The sample will be analyzed for gross alpha, gross beta, GEA, Pu-238, -239/240, Sr-90, total uranium, TCLP metals, mercury, inorganic anions (F, Cl, NO_3, NO_2, SO_4, PO_4) and PCB.

Paint: Bulk paint samples will be collected from all walls (interior and exterior), pipe systems, equipment and tank systems. The bulk samples will be sent to the laboratory to confirm the presence or absence of lead. The analysis will also quantify the amount of lead (if any) in the bulk samples.

Equipment Oil and Lubricant: Oil samples will be obtained from the elevator motor, compressor motors, water coolant system, fan motor, and hoist equipment. The samples will be analyzed for gross alpha, gross beta, GEA, TCLP metals, PCBs, total halogens and ignitability.

Liquid Aerosol Container: There is approximately 50 ml of unknown liquid stored in a sample bottle, currently in room 110. The sample bottle is labeled "aerosol." The liquid will be sent to the laboratory and analyzed for gross alpha, gross beta, GEA, pH, total organic, inorganic anions (F, Cl, NO_3, NO_2, SO_4, PO_4) and ammonia.

French Drain: One solid sample will be collected from the five-gallon carboy container. Five soil samples will be collected from the soil surrounding the carboy container and combined into one composite. The container sample and soil sample will be sent to the laboratory and analyzed for GEA, Pu -238, -239/240, Sr -90, total uranium, TCLP metals, mercury, inorganic anions (F, Cl, NO_3, NO_2, SO_4, PO_4), and PCB.

Asbestos Containing Material: A certified Asbestos Hazard Emergency Response Act (AHERA) Asbestos Building Inspector will perform a complete asbestos inspection of the facility. Asbestos samples will be collected to confirm the absence or presence of asbestos containing materials in suspect areas. Samples will be obtained using AHERA protocol. The asbestos bulk samples will be analyzed using Polarized Light Microscopy.

11.0 BOUNDARIES

The boundaries for this project include the 108-F Biological Laboratory structure, concrete foundation, below grade piping, and french drains (limited to five-feet from the building foundation).

12.0 DECISION STATEMENT

The planning team is interested in the concentration of hazardous materials and radiological contaminants in the 108-F Biological Laboratory. If the concentration of hazardous materials and radiological contamination is above the regulatory levels, then the demolition debris will be disposed of as mixed waste, or decontaminated and released. If the concentration of hazardous material and radiological contamination is below the regulatory levels, then the demolition debris will be disposed of as non-regulated waste. If the concentration is more than the action level for hazardous waste, then the demolition debris will be disposed of as hazardous waste or decontaminated and released. If the concentration is less than the action levels for hazardous waste, and above the regulatory levels for radiological contamination, then the demolition debris will be disposed of as low-level waste (LLW) or decontaminated and released.

13.0 SAMPLING DESIGN/ANALYSIS CRITERIA

An approved SAP will be prepared to instruct the sampling and analysis activities scheduled at the 108-F Biological Laboratory. The contents of the SAP will be based on the DQO decision and appropriate sampling and analysis criteria/procedures.

The sample collection, handling and preparation of samples shall comply with the protocol of "Test Methods for Evaluating Solid Waste Physical/Chemical Methods," SW-846. The chain of custody shall comply with BHI-EE-01, *Environmental Investigations Procedures*, Volume 2, Section 3.0, or equivalent procedure, approved by Bechtel Hanford, Incorporated (BHI). A chain of custody form will be filled out at the time of sampling and shall accompany each sample. Sampling equipment will be procured, precleaned, or cleaned in accordance with *Environmental Investigations Instructions*, WHC-CM-7-7, EII 5.5, "Sampling Equipment Decontamination," (WHC 1988), prior to use. Additional sampling procedures are identified in applicable *Environmental Restoration Contractor Environmental Investigation Procedures* (EIP) in BHI-EE-01 and include the following:

EIP 1.5	"Field Logbooks"
EIP 2.0	"Sample Event Coordination"
EIP 3.0	"Chain of Custody"
EIP 3.1	"Sample Packaging and Shipping"

Analytical methods and holding times are presented in Table 3. The SAF will also provide laboratory specific container types and volumes, preservatives, and analytical holding times.

Standard laboratory analytical procedures will be used as prescribed in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (EPA 1986) by a qualified laboratory. All samples, that are shipped off site will have a radiological screening performed by the Westinghouse Hanford Company (WHC) 222-S laboratory prior to shipment to the commercial laboratory. Analytical results will be provided to the waste management organization to support waste designation of the samples. All analytical samples will be returned to the 108-F Biological Laboratory upon notification of laboratory data acceptance.

Table 3. Requested Analysis

ANALYSIS	*CONTAINER/VOLUME*	*PRESERVATION*	*HOLDING TIMES*	*REFERENCE METHOD*
TCLP Metals	P/G 1000 ml	None	180/360 Days	1311/6010/7000
ICP Metals--TAL AA Metals -Arsenic -Barium -Cadmium -Chromium -Lead -Selenium -Silver	P/G 1000 ml	HNO3 to pH<2	6 Months	SW-846 1311/6010/7000
Mercury	G 1000 ml	HNO3 to pH<2	28 Days	7470
TOX	aGs*3X250^	H2SO4 to pH<2 Cool 4 degrees C	28 days	9020
PCB/Pest	aG 2X1000 ml	Cool 4 degrees C	7/40 days	8080
Ammonia	P/G 300 ml	H2SO4 to pH<2 Cool 4 degrees C	28 days	EPA 350.1
Flashpoint	G 500 ml	None	14 days	1010
TOC	P/G 400 ml	Hcl or H2SO4 to Ph<2 Cool 4 degrees C	28 days	EPA 415.1
Cyanide	P/G 2X1000 ml	ZnAC + NaOH to pH>9 Cool 4 degrees C	14 days	EPA 335.2
Sulfide	P 3X400 ml^	ZnAC + NaOH to pH>9 Cool 4 degrees C	7 days	9030
Anions --F, Cl, SO4 --PO4, NO2, NO3 --pH	P/G 300 ml	Cool 4 degrees C	28 days 48 hours	EPA 300.0 9040
Gross Alpha Gross Beta **Gamma Energy Analysis** Pu-238, 239/240 Pu-241 Sr-90 Total U	P/C 6X1000 ml	HNO3 to pH<2	6 months	ITAS-RD-3214 ITAS-RD-3214 ITAS-RD-3219 ITAS-RD-3209 ITAS-RD-3209 ITAS-RD-3204 ITAS-RD-3219
Activity Scan	P/G 20 ml	None	ASAP	Lab Specific

Table 4. DQO Readiness Checklist

INFORMATION TYPE	*YES*	*NO*	*SOURCE*
Identification of regulatory legal, agreement, and statute obligations and constraints	XXX		Jim Rugg, Ella Coenenburg, Jeff Bruggeman
Identification of regulatory quantitative limits	XXX		Jeff Bruggeman, Solid Waste Acceptance, ERDF WAC-173-303
Identification of cultural and biological constraints	XXX		Cultural Resources: Darby Stapp
Air quality constraints	XXX		Ella Coenenburg
Health Physics risks, hazards and ALARA needs	XXX		Robert Hobbs, Susan Winslow
Milestone requirements	XXX		Gregg Frank, Bob Henckel
Collection of historical information, process knowledge, waste inventories, analysis, available data	XXX		Rikki Harris, David Encke
Identification of potential data and data users	XXX		Solid Waste Management
List of contaminants of concern	XXX		Planning Team, Draft DQO Summary
List of potential investigation method alternatives	XXX		Planning Team, Draft DQO Summary
List of potential remedial design criteria and alternative data needs	XXX		Planning Team, Draft DQO Summary
Maps and diagrams	XXX		Rikki Harris, David Encke
Cost-estimating tools and documents	XXX		Greg Frank
List of analytical methods and detection limits	XXX		Draft DQO Summary, Rikki Harris, David Encke, Melanie Myers
Radiation detection methods and limitations	XXX		Susan Winslow

Table 5. 108-F Historical Information

INFORMATION TYPE	*SOURCE*	*AUTHOR*
Records Review, Historical Documents, Reports.	**UNI-1007**, *108-F Decommissioning Plan*	R. A. Paasch E. W. Powers
	UNI-2627, *108-F Biological Laboratory Hanford Site Interim Decommissioning Report..*	R. A. Paasch/E. W. Powers/ R. B. Loveland
	WHC-SD-EN-TI-169, *100-F Reactor Site Technical Baseline Report Including Operable Units 100-FR-1 and 100-FR-2.*	D. H. DeFord
	WHC-MR-0425, *Manhattan Project Buildings and Facilities at the Hanford Site: A Construction History.*	Michele S. Gerber

DRAWING NUMBER	*DESCRIPTION*	*COMPANY*
H-1-1342	*108-F Service Piping, First Floor Plan.*	General Electric Company, Hanford Works.
H-1-1346	*108-F, Basement Piping, H. W. Tank-Air Compressor and Quench Tank.*	
H-1-1347	*108-F Steam Supply P. R. V. Station and Piping.*	
H-1-1348	*108-F Building Ventilation.*	
H-1-1723	*108-F Fire and Service Water Supply.*	
H-1-1936	*108-F Laboratory Furniture Arrangement. First Floor plan.*	
H-1-2038	*108-F Biological Laboratory. Laboratory Hood System.*	
H-1-2042	*108-F Biological Laboratory. First Floor Plumbing Drains.*	
H-1-2064	*108-F Quench Tank*	
H-1-2069	*108-F Outside Lines*	
H-1-2077	*108-F Propane Storage*	
H-1-2083	*108-F Service Piping, Splashback Penetration*	
H-1-2089	*108-F Furnace Table Hoods*	
H-1-2090	*108-F Fifth Floor Equipment*	
H-1-2092	*108-F Room 110 Piping*	
H-1-2093	*108-F Pneumatic controls for ventilation*	
H-1-2349	*108-F Room 109A Cold Storage Piping*	
H-1-2380	*108-F Hot Water Supply System*	
H-1-2381	*108-F Hood Exhaust Duct Assembly*	
H-1-2382	*108-F Autopsy Room, Exhaust Duct*	
H-1-2383	*108-F Junior Cave Details*	
H-1-2386	*108-F Aquatic Biological Laboratory Trough Units*	
H-1-2419	*108-F Isotopic Preparation Ventilation*	
H-1-2429	*108-F Rooms 107A and 108A Architectural Foundation Plans*	
H-1-2450	*108-F Isotope Preparation Area Cave and Pit Exhaust Equipment*	

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