Revised Management Plan
Pre-Demolition Survey and
Decontamination Plan of
CS Gas Chamber
Camp Bonneville, Washington

Prepared for
U.S. Army Corps of Engineers
Seattle District

Contract DACA67-93-D-1004
Delivery Order No. 52

J-3933-52
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REVISED MANAGEMENT PLAN
PRE-DEMOLITION SURVEY AND
DECONTAMINATION PLAN OF CS GAS CHAMBER
CAMP BONNEVILLE, WASHINGTON

1.0 INTRODUCTION

The Seattle District of the U.S. Army Corps of Engineers (Corps) has been charged with overseeing contracts relating to the remediation of Camp Bonneville, Washington, as part of the Base Realignment and Closure (BRAC) process. Existing land and structures at Camp Bonneville (BNVL), which is located approximately 20 miles east of Vancouver, Washington, will eventually be released by the U. S. Army to an as yet to be determined second party. However, some structures or areas at Camp Bonneville may not be suitable for any future use and may be hazardous to transfer to another party. These structures or areas must be investigated and remediated prior to property transfer.

Tasks to be completed by Hart Crowser as part of this contract include:

- Asbestos survey of the CS Gas Chamber Building;
- Lead-based paint (LBP) survey of the CS Gas Chamber building;
- CS survey and pilot treatment study to identify the best method for decontaminating the CS Gas Chamber Building; and
- Decontamination Plan for the CS Gas Chamber Building.

All work on this project is to be performed at Camp Bonneville, Washington, in Hart Crowser's Chemistry Laboratory in Seattle, or in other subcontracted chemistry laboratories, under Contract No. DACA67-93-D-1004, Delivery Order No. 52. The Contracting Officer's Representative (COR) for this project is Mr. David E. Roden of the Seattle, District, U.S. Army Corps of Engineers, (206) 764-3448. The Seattle District Project Manager (PM) point of contact (POC) for the project is Mr. William P. Graney, (206) 764-3494.

1.1 Organization of This Management Plan

This section presents the organization of the Management Plan, incorporates all currently available information regarding the CS Gas Chamber Building, relevant regulations, our general project approach, (i.e., details of the proposed approach to testing and decontaminating the structure prior to demolition), and project schedule.

Following the Introduction, Section **2.0 CS GAS CHAMBER SURVEY**

WORK PLAN details the specific types of measurements and bulk samples that will be collected, including wood, soil, and air samples, and the specific analytical methods necessary to determine material and waste characteristics.

Section **3.0 CS GAS CHAMBER PILOT TREATMENT AND DECONTAMINATION WORK PLAN** outlines the steps to be taken in the laboratory to determine the best method for decontaminating the structure and its underlying soils (if necessary). This study will include considering various costs of materials and ease of disposal of waste materials, including wastewater resulting from the decontamination activities. Section 3.0 also lists the most likely considerations necessary for scaling up the pilot treatment study results to effectively decontaminate the building prior to demolition It also includes a description of the draft and final Plan of Action Reports, as well as an outline of the Final Project Documentation Report anticipated to be provided for this project.

Section **4.0 SITE-SPECIFIC SAFETY AND HEALTH PLAN** details the procedures and precautions necessary for collecting project samples and decontaminating the structure prior to demolition.

1.2 CS Gas Chamber Building History and Description

The Camp Bonneville "CS Gas Chamber" Building was until recently used to train troops in chemical warfare agents. This 1-story wood frame, post-on-pier converted troop barracks, is approximately 20 feet by 40 feet in plan dimension. This building has painted sheet rock interior walls and ceiling, unpainted cedar shake exterior siding, and an unpainted wood floor decking. It has no internal partitions. The roof is covered with asphalt shingles.

We understand that chemical warfare training in this building was limited to the use of CS gas. Chemical warfare training was conducted inside while troops wore chemical warfare protective gear. The CS gas would be generated inside by heating a CS capsule with a candle in a metal container. Over years of such use, a visible residue has adhered to the interior building surfaces. This residue may pose a potential risk to demolition workers and, if untreated, might pose a potential dangerous waste disposal issue. The Army wants this building to be decontaminated and demolished prior to disposition of the Camp Bonneville property.

1.3 CS Chemical Warfare Agent

CS is the common name for 2-chlorobenzalmalononitrile (CAS: 2698-41-1; synonyms: o-chlorobenzalmalanonitrile, and o-chlorobenzylidene malononitrile). CS is used as a military or police riot-control and incapacitating agent. It is a solid particulate that is typically heated to the vapor phase, introduced into the area to be controlled, where it recondenses into a solid particulate (a true fume). The material reportedly hydrolyses in water into hydrocyanic acid and 2-chlorobenzaldehyde. Hydrolysis is greatly accelerated in the presence of an aqueous caustic solution or slurry (sodium hydroxide [caustic soda], trisodium phosphate [TSP], lime, or sodium carbonate [soda ash]). The 2-chlorobenzaldehyde is hydrolyzed to benzoate, and the hydrocyanic acid is hydrolyzed to a cyanate.

When mixed with an aqueous oxidizer, the first breakdown products of CS (o-chlorobenzylmalononitrile) are o-chlorobenzaldehyde and hydrocyanic acid. Further reaction with the aqueous oxidizer results in conversion of the cyanide (in hydrocyanic acid) to a much less toxic cyanate, plus o-chlorobenzoic acid. Depending on the degree of oxidation, the cyanate may be further oxidized to nitrous or nitro groups. Heating CS can result in formation of cyanide gas (HCN).

A technical report (AD-A033469) available from the National Technical Information Services (NTIS) recommends the chemical disposal method for CS to be hydrolysis in an aqueous alkaline solution. Refer to the SSSHP (Section 4.0) for the human health effects of CS gas.

1.4 Applicable Regulations

All applicable federal, Washington State, and ACE safety requirements will be followed. The site is not considered an uncontrolled hazardous waste site, and thus is not regulated under 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response. Safety and health regulations are cited in Section 4.0.

A breakdown product of CS, namely cyanide salts, may be considered an Extremely Hazardous Waste by the Washington State Department of Ecology (Ecology). However, we expect the degradation reaction described above to convert nearly all free cyanide to a cyanate.

Applicable regulations associated with asbestos sampling, removal, and disposal include:

- Air Emissions Control and Agency Notification: The National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 61;
- Regulations of the agency that regulates asbestos air emissions in Clark County, the Clark County Air Pollution Control Authority (CCAPCA);
- Asbestos Sampling and Worker Certification: The Asbestos Hazard Emergency Response Act (AHERA) Regulations, 40 CFR Part 763;
- Worker Health: OSHA Asbestos, 29 CFR Part 1926.1101; and
- Department of Army Technical Manual (TM) 5-612.

Application of NESHAP to BNVL

In Clark County, NESHAP regulations are enforced by CCAPCA. NESHAP addresses emissions of asbestos from renovation and demolition activities. In essence, NESHAP prohibits the emission of any visible asbestos-containing dust to the environment.

How Asbestos Might Be Released. The EPA NESHAP regulation distinguishes between "friable" and "non-friable" ACM. "Friable material" is defined as that material which when dry, may be crumbled, pulverized, or reduced to a powder by hand pressure. Intact and undisturbed non-friable asbestos pose little threat to the health of building occupants. On the other hand, both friable and non-friable asbestos may be easily turned into a dust by routine building demolition practices.

Therefore, before any demolition activity begins, it is important to determine whether the building materials contain asbestos above regulated limits. This is accomplished by sampling and analyzing suspect materials. Small pieces of the materials are collected and submitted to laboratory analysis, using polarized light microscopy (PLM) to determine asbestos content.

Asbestos Survey. Under the EPA NESHAP regulations, a survey to identify ACM is required before beginning demolition and renovation projects. CCAPCA requires that an asbestos survey use the procedures contained in AHERA regulations (40 CFR 763.86) or an alternate method that has received prior written approval from CCAPCA.

Definition of ACM. The EPA NESHAP only regulates asbestos when analyzed materials contain greater than 1 percent asbestos. The CCAPCA definition of ACM is similar to NESHAP.

Emission Controls. Under both EPA and CCAPCA regulations, all ACM must be kept adequately wet while being removed from the structure, building, or vessel, and no visible asbestos emissions are allowed.

Asbestos Sampling and Inspector Certification: AHERA Regulations

AHERA was originally passed to provide for detection of asbestos in schools and to provide for proper repair or removal from those structures. Inspectors properly trained and certified under AHERA were to conduct all surveys for asbestos in school buildings. AHERA was amended by the Asbestos School Hazard Abatement Reauthorization Act (ASHARA) on November 28, 1990. The amended law expanded requirements that asbestos-related activities in schools and public and commercial buildings be accomplished by accredited personnel trained according to AHERA specifications. AHERA-certified inspectors are trained to identify, sample, and analyze potential ACM according to 40 CFR 763.86 and 763.87.

Sampling Suspect Materials. AHERA regulations under 40 CFR 763.86 define "surfacing material" as materials which are sprayed on, troweled on, or otherwise applied to surfaces. Examples include acoustical plaster on ceilings, fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes. Random samples must be collected that statistically represent a homogeneous area of friable surfacing material, which is not assumed to be ACM. "Homogeneous area" is defined as an area of material that is uniform in color and texture. Suspect materials may be assumed to be asbestos, and not sampled for analysis, or they may be sampled to provide a determination of the asbestos content.

If a decision is made to sample a homogeneous friable surfacing material, at least three samples must be collected from homogeneous areas of 1,000 square feet or less, at least five samples must be collected from homogeneous areas greater than 1,000 square feet but less than 5,000 square feet, and at least seven samples must be collected from homogeneous areas greater than 5,000 square feet. The EPA considers wallboard, joint compound, and tape to be a single wall system. Therefore, random samples of this material should theoretically include all components of the system.

For thermal system insulation (TSI), at least three bulk samples from each homogenous area should be collected. However, if the homogenous material is a patched area less than 6 linear or square feet, only one bulk sample needs to be collected.

For friable miscellaneous materials and for all other non-friable suspect materials, the judgement of the inspector is used to determine the number of samples sufficient to determine whether the material is ACM.

Analysis of Bulk Samples. AHERA regulations under 40 CFR 763.87 state that bulk samples of suspect materials collected during the asbestos survey are to be analyzed by accredited laboratories using PLM techniques. Bulk samples taken from a homogenous area cannot be composited.

When laboratory analysis shows that all samples collected from a single homogeneous area contain less than 1 percent asbestos, the area is considered to be free of ACM. If even one sample, collected from a homogeneous area, contains 1 percent or more of asbestos, the entire homogeneous area is considered to contain ACM.

Worker Health

The purpose of the federal and state asbestos health regulations is to protect workers performing work in or around asbestos from inhaling the material. The health effects of asbestos include asbestosis (scarring of the lungs), lung cancer, and mesothelioma (cancer of the lining of the lung). There is a considerable body of evidence linking asbestos exposure to these health effects.

It is believed that by limiting asbestos exposure among workers to less than the Permissible Exposure Limit (PEL), the adverse health effects can be minimized. The asbestos PEL is currently set by OSHA regulations under 29 CFR 1926.1101 at no more than 0.1 fiber of asbestos per cubic centimeter of air (f/cc), averaged over an 8-hour period.

Collecting asbestos samples as part of a routine building survey are not specifically included in the scope of 29 CFR 1926.1101, but an argument could be made that such work involves "disturbance" of asbestos (e.g., "contact which releases fibers from ACM or PACM [presumed ACM]."). Therefore, an initial exposure assessment will be performed to determine if employees collecting bulk samples are exposed over the PEL. Once the assessment has been made, and results indicate no employee is potentially exposed above the PEL, further air sampling is necessary only when exposures are expected to exceed the PEL, such as when collecting samples in areas with visible asbestos debris.

The Contractor is separately performing a lead-based paint (LBP) and soil metals survey at Camp Bonneville as part of Contract No. DACA67-93-D-1004, Delivery Order No. 49. Because the CS Gas Chamber Building requires extra precautions for entry and sampling, it has been excluded from the SOW for Delivery Order No. 49, and instead included with this delivery order. Refer to appropriate sections of the Camp Bonneville Revised Management Plan for LBP and Soil-Metals Survey for issues not specifically addressed in this plan. In addition, the SSSHP in Section **4.0** is identical for the two projects, with overlapping potential hazards.

1.5 Schedule and Personnel

Scope of work specifies we will start field work within seven calendar days after approval of final work plan. The draft final report is to be submitted within 21 days following completion of field work; however, lab analysis of CS is an unknown variable at this time. We will begin field work as soon as possible after our final Management Plan is approved. We anticipate that field work will take no longer than two weeks. The CS Gas pilot treatment portion of this work is estimated to last an additional three weeks. We anticipate submittal of our draft final report approximately three weeks after the completion of the treatability study.

Chad Armour and David Chawes will share project management responsibilities. David Chawes will be the Certified Industrial Hygienist, and David Winter will be the Principal in charge.

2.0 CS GAS CHAMBER SURVEY WORK PLAN

The field survey of the CS Gas Chamber Building will consist of the following:

- Asbestos;
- Lead-Based Paints;
- CS in Building Materials; and
- CS in Soil.

2.1 Asbestos Survey

The asbestos survey will determine the location, quantity, and condition of friable and non-friable ACM in the CS Gas Chamber Building. An asbestos survey of the building is necessary to adequately identify the location of all ACM, develop appropriate ACM removal specifications, and develop an engineering cost estimate for ACM removal and disposal.

Hart Crowser will survey the CS Gas Chamber Building and prepare a comprehensive report describing the location, extent, and condition of ACM. Because of its high thermal resistance, tensile strength, stability, and non-combustible nature, asbestos was widely used for many years as insulating material on pipes, boilers, ventilation ducts, tanks, and as a fireproofing material on structural steel beams and roofing decks. Asbestos was also applied extensively to control acoustics inside buildings prior to the 1970s.

It is anticipated that the principal asbestos that will be discovered in the building will be roofing felts and shingles. There are no windows or floor coverings. Wallboard will also be sampled to (most likely) rule out asbestos as a concern for that material.

All personnel performing visual inspections and collecting bulk samples of suspect ACM must be accredited building inspectors in accordance with the AHERA (40 CFR Part 763). Certificates for each inspector are included in Appendix A of this Management Plan.

A thorough visual inspection of all accessible areas (including areas above the ceiling, crawl spaces, and the roof of each building) will be conducted.

Table 2-1 - ACM Sample Type Codes

Material	Description
BB	Black board
BI	Boiler Insulation
CA	Caulking
CM	Base Cove and Mastic
CT	Ceiling Tile
CW	Canvas Wrap
DE	Loose Insulation and Debris
DI	HVAC Insulation
EW	Electrical Wire Insulation
FM	Finishing Mud
FP	Felt Paper
FT	Floor Tile
LI	Loose Insulation
LM	Loose Material
LN	Linoleum
MA	Mastic
MI	Miscellaneous
MT	Mortar
NA	Material not available
PF	Pipe Fitting Insulation
PI	Pipe Insulation
PL	Plaster
RF	Roofing Felt
RM	Roofing Material
SM	Surface Material
TI	Tank Insulation
TP	Tar Paper-wall or floor
TR	Transite
UK	Unknown (not observable)
WB	Wallboard, Compound, and Tape
WP	Window Putty-glazing

Each material type will be assigned a two-character material type code, as shown in Table 2-1. During the inspection, a list of homogeneous materials will be developed, utilizing the Suspect Asbestos Sample Plan form (Figure 2-1). Because of the extremely limited nature of this asbestos survey, field data entry on laptop computers will not be performed. We will collect essentially the same type of data, however, and will enter it into the computer in the office.

The visual inspection will include destructive procedures, as necessary to identify all suspect ACM.

Sampling locations will be identified on the CADD drawings. Each sampling location will be identified by a unique sample number so that it is possible to identity the material from which the sample was collected. CADD drawings will be modified as necessary to reflect actual building characteristics noted in the field. Dimensions will not be provided on the CADD drawings.

A photograph of each sample location, including the sample number and the date of collection, will be taken and stored in the project files. Assumed ACM will also be photographed.

Sample Collection Procedures

All sampling will be conducted in accordance with 40 CFR 763 and the EPA publication "Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials." Hart Crowser will conduct a systematic inspection of all areas of the selected buildings to locate suspect ACM.

Prior to surveying a building, the asbestos field team leader, or his/her designee, will perform a walk-through of the facility to identify potentially hazardous conditions. At that time, the asbestos field team leader, will determine the appropriate level of personal protective equipment (PPE) to be used during the survey of that particular building. If at any time during the course of the survey/inspection, a situation which presents a high risk of exposure is observed, the field team leader will immediately take steps to upgrade the PPE category for the asbestos survey team to the appropriate level as described in Section 4.0.

The surface of the material to be sampled must be completely wet with amended water prior to and during sample collection to reduce the potential for fiber release. Amended water is water to which a surfactant has been added to decrease the surface tension.

Number of Samples per Homogeneous Material. At least three core samples of thermal system insulation (e.g., boiler, pipe, pipe-fitting, and tank insulation) or miscellaneous materials (e.g., ceiling tile, floor tile, wallboard, and roofing materials) from each homogeneous material will be collected. If the boiler, water tanks, condensate tank, etc. appear to be insulated with the same material (under any protective coverings), all the tank insulation will be considered a homogeneous material. If a tank has been repaired with a different material, one sample from each type of insulation material present will be collected, as long as the "patched" area is less than 6 linear or square feet in size.

For surfacing materials (e.g., wallboard), three bulk samples will be collected randomly from each homogeneous area that measures 1,000 square feet, five bulk samples from each homogeneous area that measures greater than 1,000 square feet but less than 5,000 square feet, and seven bulk samples from each homogeneous, area that measures greater than 5,000 square feet.

Assumed ACM. Inspectors will not sample materials assumed to be asbestos. However, inspectors will still assign a sample number (so that the information can be entered into the database), take a photograph, assess material condition, and quantify the material. Assumed asbestos materials will be recorded in the database using field sample numbers in the format "AS-9", where "AS" stands for "assumed asbestos."

For this project, all TSI which is not obviously fiberglass will be assumed to be asbestos. All transite and cement asbestos board will also be assumed as asbestos.

Dry Wall and Plaster. Dry wall (or wall board) and plaster will be sampled utilizing the AHERA Grid (Figure 2-2). The inspector will provide adequate information in his/her notes of field floor plans to quantify the material should it be reported as positive.

Roofing Material. Roofing material should be collected using a hammer and chisel (or screwdriver) to cut a wedge of the material from the roof. It is important to include all layers of the roofing materials down to the roof deck.

Insulation Material. When using a cutter sleeve (commonly used to sample certain types of pipe and pipe fitting insulation), the cutter sleeve should be pushed slowly with a twisting motion into the material. If a knife is used, the blade should be inserted all the way into the material and a small triangle core should be cut out of the material. A sample at least the size of a quarter is needed for analysis. The inspector should be sure

Figure 2-2 AHERA GRID

Sampling Area	Sampling Locations			Sampling Area	Sampling Locations			Sampling Area	Sampling Locations		
	9	8	1		5	8	1		8	5	2
1	2	7	6	7	4	3	6	13	3	6	9
	5	3	4		2	7	9		7	1	4
	8	7	1		5	7	1		4	1	6
2	3	9	5	8	6	3	4	14	3	9	7
	4	2	6		2	8	9		8	5	2
	4	1	7		3	6	4		3	5	6
3	2	9	3	9	9	2	7	15	9	2	8
	8	5	3		5	8	1		7	4	1
	6	1	8		5	7	3		4	8	3
4	5	9	3	10	8	1	6	16	2	5	9
	2	7	4		2	9	4		7	1	6
	6	4	3		5	1	6		8	2	7
5	1	5	8	11	3	4	9	17	4	5	3
	9	2	7		7	8	2		1	9	6
	7	4	3		7	1	9		2	5	9
6	6	1	5	12	2	4	5	18	6	1	8
	2	9	8		6	8	3		4	7	3

to penetrate any paint or protective coating and all the layers of the material.

Sample Labeling

All sample bags will be labeled at the time of sample collection with indelible ink. The following information will be recorded directly on the bag:

- Sample ID number;
- Date of collection; and
- Inspector's initials.

The labeled samples will then be placed in a larger Ziploc™-type bag and sealed for additional protection during handling and shipment.

Condition Assessment and Documentation

The inspector will also perform a condition assessment of the suspect ACM and will assign each homogeneous material to a condition category according to the specific guidelines provided in Table 2-2.

Table 2-2 - ACM Condition Assessment

Assessment	Description
0	Only use for materials not observed
1	Friable and non-friable material in good condition
2	Friable material showing signs of isolated areas of damage (less than 10%)
3	Friable materials showing signs of isolated areas of damage (greater than 10%)
4	Friable material with areas of moderate to significant damage and loss of integrity
5	Highly friable and severely damaged

Instructions for Suspect Asbestos Bulk Sample Data Collection

1. **Building Number:** The building number located on the exterior of the building.

2. **SubBuilding:** When the building contains clearly identifiable sub-elements, such as sheds or outstructures, they will be assigned a sequential letter designator.

3. **Sample Type:** Abbreviation of material being sampled, from Table 2-1.

4. **Quantity:** Quantity of the homogenous material in the building or subbuilding. Include units of measurement ("ft" for linear feet, "sq. ft" for square feet, "#" for each elbow, fitting, etc.)

5. **Description:** Additional description for the material. Do not repeat the sample type. For pipes, include diameter so that an appropriate cost-estimate for removal can be made. Ranges of diameters (i.e., <4", 4" to 6", etc.) will be used.

6. **Outer Color:** Surface color or colors of the material sampled.

7. **Inner Color:** Interior color or colors of the material sampled.

8. **Pattern/Shape:** Surface design/texture and size of material sampled for materials such as floor and ceiling tiles.

9. **Friable:** Y (yes) if the material is friable, or N (no) if it is non-friable.

10. **ACM Assessment:** Refer to ACM Condition Assessment Table (Table 2-2). This is an overall assessment of homogeneous material sampled throughout the building.

11. **Material Extent:** Locations within building where the material is located.

12. **Damage Localized?:** Y if damage is located in one specific area that would potentially have a different material assessment rating than that of the overall material assessment rating provided above.

13. **Location and Percent of Localized Damage:** Description of area, room location, and percent of material that is damaged.

14. **Emergency Notification Required:** This form is activated automatically when the ACM Assessment field contains a 5, indicating highly friable and severely damaged material. Emergency notification is required.

15. **Building System:** Note the building system including or impacted by the material.

16. **Area Utilization:** Include type of activity at sample location (e.g., maintenance, cooking, storage room, etc.).

17. **Air Erosion, Contact, and Vibration Potentials:** Include potential (high, medium, or low) for air erosion, contact, and vibration.

18. **Comment:** Brief descriptions of:

    a. Determination of concealed quantities (if any); and

    b. Specific activities causing or reasons for localized damage (if any).

For each sample, complete the following:

1. **Sample No.** Should be filled in automatically, using the building number and a sequential three-digit sample number. Example: 999-001.

2. **Photo No.** Should be filled in automatically, using the sample identification number.

3. **Date Sampled.** Will be filled in automatically.

4. **Room No.** Enter room name or number from the CADD drawing. If no number is provided, assign a unique room number or name. Add the new room number or name to the CADD drawing.

5. **Related Sample.** Sample number of material related or associated with the current sample.

6. **Location.** Where sample was actually collected (e.g., 4 feet from east wall).

7. **Comment.** Documentation of all room numbers/areas in the building containing homogeneous material sampled; specific activities causing or reasons for localized damage (if any).

Decontamination of Sampling Equipment

All sampling tools (except cutter sleeves which will not be reused) will be thoroughly sprayed with amended water prior to collecting another sample. When decontaminating equipment that has been used to sample materials such as floor tile mastic or roofing materials, it may be necessary to use a non-flammable solution that dissolves tar rather than amended water. Wipes or other towels used during decontamination should be placed in a Ziploc™-type bag for later disposal. If decontamination is not possible immediately after sample collection, contaminated sampling equipment will be placed in Ziploc™-type bags until decontamination can be performed.

Repair of Sampled Locations

Destructive sampling techniques will be employed during the course of this survey. Hart Crowser will make every attempt to minimize fiber release to the lowest possible level. To that end, Hart Crowser will spray each sampling point with an EPA-accepted bridging encapsulant or with the appropriate heat-rated silicon caulk to prevent subsequent fiber release. Because the building is scheduled to be demolished, our level of repair effort will be limited.

Chain of Custody

A sample chain of custody form will be completed with each batch of samples (Figure 2-3). A custody seal will be wrapped around each sampling container for shipment (Figure 2-4). Chain of custody records will include complete information for each sample. The inspector is responsible for providing a legible signature.

If the samples are shipped via commercial express carrier or other public transportation, the custody record will be signed to relinquish custody of the samples. The inspector, handling sample shipment, will relinquish custody only when directly transmitting the sample container to a receiving party or when handing the container to a shipper for subsequent transmittal to the analytical laboratory. A copy of the custody record should be retained by the inspector handling shipment and placed in the project file with other field notes. The inspector will place the original and remaining copies of the custody record into the shipping container.

The inspector will obtain custody seal(s), and will sign and date them. The custody seal(s) will be used to seal the sample shipping container lid and will be covered with transparent packaging tape.

Upon receipt of the samples, the analytical laboratory will break the custody seal(s), open the shipping container, and sign "Received by" line on the sample chain of custody form. The laboratory will verify that the custody seal was intact at the time of opening. The analytical laboratory will then forward the original sample chain of custody form to Hart Crowser to indicate that sample transmittal is complete. A copy of the sample chain of custody form will to be kept on file by the laboratory.

These chain of custody procedures must be followed for each shipment of samples.

Analytical Procedures

All suspected ACM bulk samples collected will be analyzed by polarized light microscopy (PLM) using the Interim Method for Determination of Asbestos in Bulk Insulation Samples (EPA Method 600/M4-82-020). At least two laboratories will be used: one for the regular samples, and another independent lab for analysis of QC samples.

If all PLM sample results for a homogeneous material indicate that the material does not contain asbestos or if the maximum quantity of asbestos found was a trace amount, the samples may be reanalyzed (at the Project Manager's and laboratories' discretion) by the point count method (PCM) or Transmission Light Microscopy (TEM). In general, TEM analysis will be reserved for negative materials that contain asphalt, vinyl, or other binders that may have interfered with the PLM procedure.

Plaster materials containing less than or equal to 3 percent asbestos may be re analyzed using PCM. If reanalysis determines that 1 percent or less asbestos is present, then the material will be considered not to be ACM.

CADD Drawings

AutoCADD drawings of the CS Gas Chamber Building will be produced and will indicate the location of each sample collected; the analytical result (positive or negative for asbestos); and, when asbestos is positive, the extent of the material in the building using a color-coded and shaded legend. The CADD drawing will be produced on 11-inch by 17-inch paper.

Final Asbestos Survey Report

A comprehensive final Asbestos Survey Report will be prepared after all survey and analytical work is completed. This report will contain the following information:

- Summary of on-site survey activities;
- Tabular summary of findings for all building materials surveyed, indicating type and location. For confirmed or assumed asbestos, the estimated quantity, condition, and percent asbestos content;
- Characterization of all confirmed or assumed ACM, including type, specific location, relationship of ACM to building systems, quantity estimates, hazard assessment, and abatement control alternatives;
- Signatures of accredited inspectors, with certification numbers; and
- The brick red folders containing all project documentation, including the CADD drawings.

Quality Control

The asbestos inspector will collect at least one quality control (QC) sample for each 20 regular samples with a minimum of at least one QC sample per building. QC samples are collected by splitting a regular sample. Care will be taken to help ensure that all layers of the samples are evenly divided. The QC sample will be analyzed by the Corps of Engineers North Pacific laboratory to confirm the results of the primary laboratory. The QC sample will be assigned the same sample number as the original sample, except the QC sample number will end with a "Q." QC samples will have their own chain of custody form.

Results from analyses of QC samples and related regular samples will be compared by Hart Crowser staff. Samples which are not in agreement (e.g., positive or negative for asbestos) will both be reanalyzed by the appropriate method by the respective labs. Continued disagreement between the labs after re-analysis will result in declaring the sample as positive for asbestos.

2.2 Lead-Based Paint Survey

Demolition of the existing CS gas chamber building at BNVL will require completing a survey to determine the location and approximate quantity of lead-based paint (LBP). This information will assist BNVL in selecting the appropriate contractor to abate and/or demolish the building, the appropriate level of PPE for abatement and/or demolition personnel, the extent of air monitoring required during abatement and/or demolition, and to pre-screen the debris to determine the appropriate waste disposal method. The results of this survey will assist the Army to determine the appropriate method for handling building materials that contain regulated quantities of lead.

The specific procedures Hart Crowser will follow in conducting the LBP survey of the CS Gas Chamber Building are fully contained in the Hart Crowser document entitled "Revised Management Plan for Lead-Based Paint and Soil-Metals Survey, Camp Bonneville, Washington."

In addition, a TCLP sample representative of the CS Building materials will be collected and analyzed for TCLP lead, if lead content exceeds 4 mg/cm^2 in a majority of the painted surfaces as determined by the XRF used for the LBP survey. Because the exterior surfaces are not painted, we assume there is no need to collect soil samples from the building drip line to determine the potential for lead in soil resulting from weathering of LBP.

2.3 Sample Collection for CS Analysis

CS residue concentrations present in the subject building will be determined to plan for the appropriate decontamination method, and to serve as a baseline for comparison of the various decontamination methods to be used in the Pilot Treatment Study. CS may also be present in the soils surrounding the building, or directly under it. One surficial soil sample will be collected from underneath the building, and one soil sample in the predominant downwind direction will also be collected.

Samples of representative surfaces of the building's interior and adjacent soils will be collected and returned to the Hart Crowser Chemistry Laboratory for extraction using a suitable organic solvent.

<u>Analytical Procedures for CS</u>

We intend to use NIOSH Analytical Method PC&AM No. 304. This method is not performed by the Hart Crowser Chemistry Laboratory, so once the analyte is extracted, it will be sent to a subcontract laboratory.

In the laboratory under controlled conditions, the surface of each sampled building material of known area will be rinsed with approximately 20 percent methylene chloride in hexane and/or wiped down with filter paper soaked in the same solvent mixture. The solvent mixture is the same as the HPLC mobile phase in the analytical procedure [NIOSH P&CAM 304], and will consist of solvents certified for organic residue analysis. The extraction method chosen will depend on the nature of the building material. For the rinse method, the total volume of sample used will be recorded, and the total weight of analyte calculated from lab data will be related to the original sample area; for example ug/cm^2 or mg/ft^2. For the wipe method, the final volume of wipe extract will be used in the same calculations.

Field personnel will collect soil samples in certified pre-cleaned 8 oz. glass jars, and place them in coolers with "blue ice" or equivalent for transport. Soil extraction will consist of a shakeout with the above solvent mixture.

Quality assurance/quality control measures will include extracting a duplicate from the building material and a soil sample; however, due to the hazardous nature of the analyte, a soil matrix spike is not planned (the nature of the building material precludes any matrix spike). After extraction, a solvent blank, a blind blank spike, and a blind extract split will be sent to the analytical laboratory. A standard cooler receipt form will be included with the chain of custody to both the pilot laboratory (Hart Crowser) and the analytical laboratory (American Interplex Corporation (AIC)). AIC will perform a multi-point HPLC calibration curve. The client has provided an independent source of standard reference material.

3.0 CS GAS CHAMBER PILOT TREATMENT AND DECONTAMINATION

3.1 Pilot Treatment Study

Based on the results of the CS and lead surveys, a pilot treatment system for CS removal will be tested in the laboratory. This will involve collecting several approximately 3-square-foot sections of the building interior surfaces, careful packaging these in coolers for transport to the Hart Crowser Chemistry Laboratory, and testing selected surface treatment methods with appropriate dilutions of various decontamination solutions, such as soda ash and lime slurry.

It is anticipated that the following materials will be sampled:

- Sheetrock wall;
- Sheetrock ceiling;
- Wood wall behind sheetrock; and
- Wood floor.

Analysis of cores of the bulk samples for total CS content will be performed after application of each treatment methodology. It is intended that the treatment will entail surface washing using only hand application of the decontaminant (i.e., sponges or cloths). Pressure washing is not initially considered a feasible option, as it would result in too much wastewater being generated.

If simple hand surface treatment does not remove the CS to below detectable limits, a more aggressive treatment method (such as spray washing, pressure washing, or digestion) may be proposed.

Samples of the solvent used during the pilot laboratory study will be collected and sent to AIC for analysis. If no analyte residues are detected, the remaining solvent will be included in the Hart Crowser Chemistry Laboratory's normal waste streams, and taken to an approved TSD facility for disposal. If analyte residues are detected, then the solvent will be agitated with a household bleach solution to destroy the CS. We will separate and properly dispose of the aqueous and non-aqueous phases.

The analytical laboratory will also collect its solvents and will follow a similar procedure, except that it may elect to recycle some or all of the solvent.

The most cost-effective and safest method of decontamination will be scaled up and selected for implementation in the field. Scale-up considerations will include control of runoff, additional worker protection measures (possibly resulting in modification of the SSSHP), and verification analysis of the cleaned materials and the waste materials (applicators and water solutions).

3.2 Pilot Treatment Study Report and Plan of Action

Following completion of the Pilot Treatment Study, an interim draft report will be issued for Corps review incorporating the results of the field surveys and pilot treatment study. Scale-up procedures and plans will be included for full building decontamination. This report will be submitted as a draft for review, and resubmitted after review incorporating comments of the reviewers. The report will include a revised SSSHP to reflect actual decontamination methods proposed for use. The final report will be approved prior to implementation of field decontamination. A CADD floor plan of the building will be included with the Plan of Action to note sample locations collected in the field.

3.3 Building Decontamination

The Building will be decontaminated by the Contractor using the procedures approved by the Army. After decontamination, verification samples will be collected and analyzed by the appropriate methods for certification of decontamination. When building decontamination is confirmed, demolition by the Army will be separately performed. Disposal of debris will be as a non-hazardous construction debris.

4.0 SITE-SPECIFIC SAFETY AND HEALTH PLAN (SSSHP)

**ASBESTOS, LEAD-BASED PAINT AND SOIL-METALS SURVEYS AND
CS GAS CHAMBER BUILDING SURVEY
CAMP BONNEVILLE, WASHINGTON
DATE REVISED: May 22, 1996**

4.1 Introduction

SSSHP Review

Hart Crowser Review:

______________________________	____________________
David E. Chawes, CIH Certified Industrial Hygienist Project Health and Safety Officer	Date
______________________________	____________________
Chad Armour Project Manager	Date

U. S. Army Corps of Engineers Review:

______________________________	____________________
Signature	Date
______________________________	
Name (print)	

Personnel Acknowledgement

The following personnel have reviewed a copy of this SSSHP. By signing below, these personnel indicate that they have read the plan, including all referenced information, and that they understand the requirements which are detailed for this project.

PRINTED NAME	SIGNATURE	PROJECT DUTIES	DATE

Table 4-1 - Emergency Contingency Information

SITE LOCATION	Camp Bonneville Camp Bonneville, Washington
EMERGENCY INFORMATION	Police.....911 Fire.....911 Ambulance.....911 Hospital (Southwest Washington Medical Center).....256-2064
EMERGENCY CONTACTS	David Chawes, Hart Crowser ..... (206) 324-9530 Jerry Cummings ..... (360) 892-6179 Tim Grube, Corps Health & Safety Office ..... (206) 764-3503 Bill Graney, Corps of Engineers ..... (206) 764-3494
IN EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: _ **Where you are** (cross streets or landmarks) ☎ **Phone number** you are calling from ☹ **What happened** - type of injury, accident # **How many persons** need help _ **What is being done** for the victim(s) ! **You hang up last** - let whomever you called hang up first

Plan Distribution

This SSSHP is for use by all Hart Crowser personnel working on the asbestos, lead-based paint, and soil-metals surveys, and the pre-demolition survey for the CS Gas Chamber Building at Camp Bonneville, Washington. A revised SSSHPA will be necessary and developed in the future for the CS building decontamination activities. A copy of this plan shall be readily available at all times that Hart Crowser employees are present. All employees assigned to site work shall read, sign, and abide by this SSSHP. Table 4-1 lists emergency contacts for the site. This SSSHP was prepared on June 19, 1996, by David E. Chawes, CIH, for Hart Crowser activities relating to the referenced site.

Brief Description of the Site

Camp Bonneville is located approximately 20 miles east of Vancouver, Washington. It is used by the Army as a training facility. In addition to CS gas training, soldiers also use the site to fire small arms and larger weapons such as tanks and artillery. As such, unused ammunition and unexploded ordinance are likely present over most of the Camp Bonneville Military Reservation.

Brief Description of Planned Field Activities

This SSSHP pertains to the following field activities:

- Collect representative samples of asbestos.
- Collect representative samples of suspect LBP and soil;
- Use portable XRF device to measure lead content of painted surfaces;
- Use portable XRF device to measure metal content of the soil; and
- Collect representative samples of CS gas-impregnated building materials.

Contamination Characterization

Potentially hazardous materials, other than asbestos, LBP, metals in the soil, and CS gas residue expected to be on the BNVL site, include:

- Unexploded ordinance; and
- Fuel.

It is not anticipated that asbestos, lead, metal in soil, and CS gas survey activities will typically involve substantial disturbance of these materials. None of the other hazardous materials will be sampled or handled, and thus pose no health concern to the survey workers.

Regulatory Compliance

Hart Crowser ensures that all personnel comply with the basic provisions of the following as applicable to the specific project tasks:

- Washington State General Safety and Health Standards Chapter 296-24 WAC, and General Occupational Health Standards Chapter 296-62 WAC;

- Occupational Safety and Health Administration (OSHA) Regulations (29 CFR 1910); and

- US Army Corps of Engineers Health and Safety Requirements Manual, EM 385-1-1 Oct. 1992.

4.2 Hazard Assessment and Risk Analysis

Chemical Hazards

Descriptions of the principal health hazards of the potential contaminants affecting this survey include:

Asbestos. Asbestos fibers are usually mixed with various binder materials or resinous matrices. Collecting bulk samples of building materials may release extremely low concentrations of asbestos fibers. Asbestos occurs as bundles of fibers that, when disturbed, are easily separated into smaller and smaller sizes. Micron-size fibers tend to remain airborne and, because of their small size, can be inhaled down to the alveolar surface (smallest ends of air passageways) of the lungs.

Exposure to elevated levels of airborne asbestos fibers is known to cause a number of asbestos-related diseases, including asbestosis (fibrosis of the lung), mesothelioma (cancer of the lining of the lung), and other cancers of the lung, esophagus, stomach, and colon. Although the risk of developing asbestos-related diseases is greatest for individuals who are regularly exposed to relatively high airborne asbestos fiber concentrations (e.g., industrial asbestos workers), it is apparent that some degree of elevated risk exists for individuals chronically exposed to low airborne asbestos fiber concentrations, which may be present in a building that contains friable ACM. The actual degree of risk associated with prolonged exposure to asbestos levels in this range is still unknown at this time; however, it is prudent to take steps to limit asbestos exposure to the lowest extent possible.

OSHA has established standards for limiting the exposure of personnel working with asbestos. As described in the OSHA Standard (29 CFR 1910.1001), the current permissible exposure limit (PEL) for asbestos, as an 8-hour time weighted average (TWA), is 0.1 fiber per cubic centimeter of air (f/cc). The OSHA 8-hour TWA action limit is 0.05 f/cc. There is no OSHA standard regarding asbestos exposure for the general public.

Inorganic Lead. Inorganic lead exposure can occur via inhalation or ingestion of lead-containing dusts. Skin and eye contact are not considered routes of entry of lead dust into the body. The principal target organs of lead toxicity include the nervous system, kidneys, blood, gastrointestinal, and reproductive systems. Generalized symptoms of lead exposure include decreased physical fitness, fatigue, sleep disturbances, headaches, bone and muscle pain, constipation, abdominal pain, and decreased appetite. More severe exposure can result in anemia, severe gastrointestinal disturbance, a "lead-line" on the gums, neurological symptoms, convulsions, and death.

Neurological effects are among the most severe of inorganic lead's toxic effects and vary depending on the age of individual exposed. Effects observed in adults occur primarily in the peripheral nervous system, resulting in nerve destruction and degeneration. Wrist-drop and foot-drop are two characteristic manifestations of this toxicity.

The EPA also currently lists inorganic lead as a Group B2 probable human carcinogen via the oral route. This conclusion is based on feeding studies conducted in laboratory animals. The current PEL-TWA for inorganic lead is 0.05 mg/m^3. Occupational exposure to lead is also specifically regulated under WAC 296-62-07521, with an action level established at 0.03 mg/m^3 that triggers monitoring and other requirements. It is not anticipated that any sampling activities involving potential exposure to lead will trigger monitoring requirements for lead, because of the extremely low concentrations released to the air during paint sampling activities.

CS Gas. CS "gas" (actually fume) causes lacrimation and irritant effects at concentrations between 12 to 20 mg/m^3. The Permissible Exposure Limit (PEL) for occupational settings is 0.4 mg/m^3. the American Conference of Governmental Industrial Hygienists (ACGIH) recommends in the 1995-1996 Threshold Limit Values (TLV) that the maximum exposure to CS be 0.05 mg/m^3 as a ceiling value, with a Skin notation, indicates potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, either by contact with the vapors or direct skin contact. Only residue from expended CS is expected on the site. No actual airborne CS "gas" will be encountered.

Radiation Hazards

Ionizing radiation is emitted by the portable XRF device. This will only be an issue when the analyzer is physically used in the survey of LBP.

Radiation hazards are dependent on the activity (in mCi) of the source, as well as the types and energy of the ionizing radiation emitted. The risk of exposure to radiation is related to three factors: time, distance, and shielding. The longer one is exposed to radioactivity, the more radioactive energy strikes the body and the greater the risk to health.

The allowable exposure limit for occupational exposure is 5,000 mrem/year while the allowable exposure limit for the public is 100 mrem/year. Exposure to the XRF device will not result in any appreciable radiation dose, and total exposure over the duration of the project is estimated to be well below 100 mrem/year.

The farther you stand from a radioactive source, the fewer x-rays will hit you. The damage caused by radiation drops off by the square of the distance. Thus, standing 10 feet from a source of radiation is 100 times less hazardous than standing 1 foot away.

Cadmium^{109} (Cd^{109}), the radiation source in the Niton XL and LISA XRF devices, is effectively and easily shielded, since it is at the low end of the energy spectrum, 4 keV to 25 keV, and less than 3 percent of 88 keV.

It is not anticipated that any sampling activities involving potential exposure to x-rays will trigger monitoring requirements because of the anticipated extremely low x-ray emissions.

Potential Exposure Routes

Inhalation. Exposure via this route could occur if large amounts of asbestos or lead dusts, or fugitive CS gas fumes are encountered during sampling activities.

Skin Contact. Skin contact with asbestos and lead are not considered significant routes of entry of those materials.

The Niton XL analyzer uses a Cd^{109} source to fluoresce LBP. Cd^{109} is the safest radioactive source used for x-ray fluorescence of lead paint. With its Cd^{109} source, the Niton XL analyzer has virtually no radiation leakage when its shutter is closed. With the shutter open (while taking a test) it gives off only a minute amount of extraneous radiation. Properly used, the radiation exposure to the skin and body from the Niton XL analyzer should be minimal.

Ingestion. Exposure via this route could occur if individuals eat, drink or perform other hand-to-mouth contact while conducting sampling. This should not occur, as inspectors will be instructed not to do these practices.

Physical and Other Hazards

Physical hazards associated with transportation to and from the site, and site activities include those listed in the Activity Hazard Analysis, Table 4-2. No other physical, radiological, biological, or safety hazards are indicated for the work at this site.

4.3 Accident Prevention

The Activity Hazard Analysis is presented in Table 4-2.

Table 4-2 - Activity Hazard Analysis Sheet 1 of 2

ACTIVITY	HAZARD	CONTROL(S)
Driving to, on, and from the site	Striking pedestrians, runaway vehicles, striking structures, overturning vehicles	Wear seat belts at all times while vehicles are in motion. Use licensed drivers. Define vehicle routes of travel. Obey Washington State driving regulations. Do not drive over holes or down sides of improperly sloped depressions.
General site activities	Stinging insects (bees, wasps, spiders)	Use care when sampling near dense vegetation. Be sure individuals allergic to insect bites (if any) have obtained prescription for insect-bite kit.
	Unexploded Ordinance	Stay on roads, paths, and maintained areas. Do not walk or drive in non-maintained portions of the site.
	Inhalation of asbestos or lead from debris piles and from damaged insulation.	Wear protective clothing, and air-purifying respirators as appropriate. Do not walk on or disturb debris, if possible.
	Inhalation of CS from impregnated building materials.	Wear protective clothing, and air-purifying respirators if irritation occurs, as necessary.
	Slipping on wet or oily surfaces	Wear appropriate slip-resistant boots

Table 4-2 - Activity Hazard Analysis (Continued) Sheet 2 of 2

ACTIVITY	HAZARD	CONTROL(S)
Use of portable XRF device	Radiation exposure	Do not point XRF device at anyone while device is ON. Keep in carrying case when not in use. Never leave device unattended or in unlocked vehicle.
Collecting bulk material samples for CS analysis	Skin contact with or inhalation of CS	Use care while cutting bulk materials not to dislodge residue, and wear appropriate personal protection, including Tyvek suit, gloves, and full-face respirators, as necessary to avoid eye, respiratory, or skin irritation.
Collecting bulk suspect asbestos samples	Inhalation of asbestos in dusts	Use wet methods to collect samples. Spray areas damaged by sampling with adhesive or encapsulant to hold down fibers.
Collecting bulk suspect LBP samples	Inhalation of lead in dusts	Use wet methods or adhesive tape as necessary to avoid generating any dusts. Repair areas damaged during sampling immediately.
Using sharp tools	Cuts and punctures	Use extreme care when cutting or chipping samples with sharp instruments. Retract blades into containers, or hold blades and sharp tools away from body when walking.
Working at heights on ladders	Falls from heights, ladders slipping, dropping items	All ladders will be placed at a proper angle equal to 1 length of run for every 4 lengths of rise. Ladders will be tied off before work at heights will be attempted. Only Class I ladders with 300 lb. weight limits will be used. Weight limits on ladders will not be exceeded. Ladder footings will be level and on non-slippery surfaces before climbing. Individuals working under ladders will wear hard hats to protect against dropped objects. Requirements for working at heights listed by WISHA and in Corps of Engineers Safety Manual will be followed.

4.4 Staff Organization, Qualifications, and Responsibilities

<u>Project Managers - Chad Armour/David Chawes</u>

The Project Managers have overall responsibility for the fulfillment of the contract requirements. Duties include management of the technical and administrative project activities. The Project Manager works under the direction of the Health and Safety Officer (HSO) for continued safety and health surveillance. The Project Manager has authority to act on all health and safety measures and to establish new controls as needed.

Health and Safety Officer - David Chawes, Certified Industrial Hygienist (CIH)

Mr. Chawes will be responsible for Health and Safety issues associated with the projects. He is a CIH and has over 10 years of working experience on environmental projects. As the Hart Crowser HSO, Mr. Chawes developed the SSSHP, ensures training of employees, and provides overall management of the health and safety requirements covered in the SSSHP. The HSO is Hart Crowser's representative, with overall responsibility for the preparation, implementation, and enforcement of the SSSHP. The HSO has a broad working knowledge of state and federal occupational safety and health regulations and formal training in occupational safety and health. In addition, the HSO has demonstrable expertise in air monitoring techniques and in the development of respiratory protection programs. The HSO will also serve as the Radiation Safety Officer's representative for this project.

Periodic Inspections by HSO. The HSO shall conduct periodic inspections as necessary to determine the overall effectiveness of the SSSHP. Any deficiencies shall be submitted to the Contracting Officer (CO) in writing and the SSSHP shall be modified accordingly. Should deficiencies at any time be of a nature that presents an immediate danger, the HSO or Site Safety Coordinator (SSC) shall stop all work in the area and initiate changes as required immediately.

Site Safety Coordinator - Brian Christianson

The SSC will be assigned to the site on a full-time basis for the duration of the field work with functional responsibility for implementation and enforcement of the SSSHP. This individual will be responsible for implementing this SSSHP in the field.

4.5 Training

Asbestos and LBP inspectors are required to be in an annual medical surveillance program and to have completed and asbestos and a lead building inspection course. Recertification for asbestos is annual; however, there is no recertification process for lead inspectors.

At least one individual on the site will be first aid/CPR trained. Army representatives present at the same time as the survey team may be included as "on-site" workers.

4.6 Personal Protective Equipment

Sampling personnel will be required to wear the appropriate personal protective equipment. The selection of equipment will be based on the structure walk-through prior to beginning the survey, observing personnel working in the building, and identifying and adhering to all safety signs posted for each area of a building inspected.

Persons collecting bulk samples of materials suspected of containing CS gas, or asbestos, at BNVL may be protected, at the direction of the SSC, by wearing a half-face, air-purifying respirator. All respirators will be equipped with combination organic vapor/HEPA filter cartridges. A higher level of respiratory protection (e.g., full-face respirator) may be chosen at the inspector's discretion. Additional protective equipment, such as a hard hat, Tyvek coveralls, gloves, etc. will be required when sampling in or under the CS Gas Chamber Building.

Employees expected to wear air-purifying respiratory protection must be fit tested for the brand and model respirator they will be wearing during sampling. Fit tests are required to be performed in accordance with the OSHA standard every 6 months.

Levels of Protection

Levels of protection specified by 29 CFR 1910.120, Appendix B, Parts A and B, are not applicable to work on this project. Protective equipment to be worn is described in the following section.

Protective Equipment

Respiratory Protection. It is not anticipated that respiratory protection will be necessary during routine sampling activities, except when CS residue causes irritation, or if damaged asbestos or LBP paint are present. A half-mask respirator with HEPA cartridges will be worn by the inspectors whenever undue risk of exposure to lead or asbestos exists. Such situations could arise if sampling in areas with a large amount of suspect asbestos or lead dust or debris. A full-face respirator with organic vapor/HEPA combination cartridges will be used if irritation is noted while sampling CS-affected materials.

Respirators, if used, shall be NIOSH/MSHA-approved. Cartridges shall be changed whenever breathing resistance increases noticeably. Cartridge changes shall be made only in areas outside the area in which respiratory protection is being used.

All respiratory protection will follow OSHA Safety and Health Standards 29 CFR 1910.134 and the Hart Crowser Respiratory Protection Program, found in the Hart Crowser Health and Safety Manual.

Chemical-Resistant Clothing. In general, protective clothing will not be necessary while conducting routine sampling. However, when sampling CS-affected materials, or sampling for lead or asbestos in areas with large amounts of dust or debris, then regular Tyvek, or equivalent, garments will be used.

Gloves. Work gloves (Scorpio or equivalent) will be worn as necessary to avoid skin contact with sharp objects or rough edges on equipment.

Other Protective Equipment. Safety glasses will be used while sampling LBP, soils, and in the CS Gas Chamber Building. For individuals who require prescription glasses for their work tasks, prescription safety glasses will be made available at no extra cost to the individual.

4.7 Medical Surveillance

Persons working on this project must be current in an annual medical surveillance program.

This program includes a pulmonary function test performed by trained personnel to record Forced Vital Capacity (FCC) and Forced Expiratory Volume in One Second (FEV_1). As directed by the physician, an audiogram and visual acuity measurement, including color perception, and a resting EKG with 12 lead ECG and PA and lateral chest X-ray, is also provided. Furthermore, the physician must certify in writing if a person can or cannot wear a respirator. Hart Crowser personnel routinely get exit medical exams upon completion of employment.

A written medical opinion signed by a physician for each employee on site will be available upon request.

Hart Crowser routinely provides results of the employee's medical exam to that employee. Any employee who develops a work-related time loss illness or injury during the period of the Contract shall be evaluated by the Hart Crowser physician prior to allowing the employee to re-enter the work site.

4.8 Exposure Monitoring/Air Sampling

Individuals using the XRF will wear film badges measuring whole body radiation. They will be analyzed once per quarter by Troxler, Inc., with results reported to David Chawes, CIH, for review.

4.9 Heat/Cold Stress Monitoring

Use of impermeable clothing reduces the cooling ability of the body because of evaporation reduction. This may lead to heat stress. Cold stress, or hypothermia, can result from abnormal cooling of the core body temperature.

Heat Stress

Signs of Heat Stress. "Heat stress" is a term that is used to describe progressively more serious symptoms, as follows:

- An initial rise in skin temperature from increased blood flow to the skin (skin redness);
- Increase in heart rate, to more than 30 beats/minute above the resting level;
- Collapse, or heat exhaustion, due to inadequate blood flow to the brain;
- Dehydration, from excessive sweating;
- Hyperventilation, resulting in a reduction of the normal blood carbon dioxide concentrations;
- Tingling around the lips, dizziness, cramping of muscles of hands and feet, and blackout; and
- "Heat stroke," characterized by unconsciousness, hot dry skin, and absence of sweating.

Control of Heat Stress. On hot, sunny days (high radiant heat load), if using impermeable work clothing, maintain appropriate work-rest cycles (progressively longer rest breaks in a cool location or the shade as temperature and work tasks increase) and drink water or electrolyte-rich fluids (Gatorade or equivalent) to minimize heat stress effects. Impermeable clothing will only be worn when absolutely necessary for control of hazardous chemicals.

Also, when ambient temperatures exceed 70° F, employees will conduct monitoring of their heart (pulse) rates, as follows:

- Each employee will check his or her own pulse rate at the beginning of each break period;
- Take the pulse at the wrist for 6 seconds, and multiply by 10; and
- If the pulse rate exceeds 110 beats per minute, then reduce the length of the next work period by one-third.

Example: After a one-hour work period at 80 degrees, a worker has a pulse rate of 120 beats per minute. The worker must therefore shorten the next work period by one-third, resulting in a work period of 40 minutes until the next break.

Treatment of Heat Stress. Individuals affected by mild forms of heat stress (heat exhaustion, dehydration, or cramping) should take a break in a cool or shaded location, drink liquids, and sit or lay down until feeling better. Shorter work periods should be used until temperature cools off.

Individuals affected by heat stroke are in critical condition. Summon emergency aid immediately, remove clothing, and bathe individual in cool water continually to bring down body temperature.

Hypothermia

Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment, and wind-chill as well as wetness or water immersion can play a significant role. The following discusses signs and symptoms as well as treatment for hypothermia.

Signs of Hypothermia. Typical warning signs of hypothermia include fatigue, weakness, incoordination, apathy, and drowsiness. A confused state is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink. Body temperatures below 90° F require immediate treatment to restore temperature to normal.

Treatment of Hypothermia. Current medical practice recommends slow rewarming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping with blankets in a warm room. In emergency situations where body temperature falls below 90° F and heated shelter is not available, use a sleeping bag, blankets and/or body heat from another individual to help restore normal body temperature.

4.10 Standard Operating Safety Procedures

Equipment

Portable XRF Device. All employees who may operate portable XRF equipment will be trained by a trainer approved by the manufacturer prior to its use.

The Niton XL and LISA were designed to be safe. The Cd^{109} source inside the Niton emits low energy gamma radiation. The location of the source and the direction of its beam are both clearly marked on the case of the machine.

There is no measurable radiation from an XRF when its shutter is closed. The maximum dosage to which you are exposed when properly operating the XRF is 0.1 mR/hr on the fingers of the hand holding the XRF with the shutter open. The dosage you would receive on the fingers **while holding the shutter open** for 8 hours a day, 200 days a year is 160 mrem.

The operator's hand and any other body part should be kept as far away as practicable from the beam.

Never point the XRF at someone or yourself.

XRF equipment will be blocked and braced in vehicle so that it cannot move around inside vehicle. Carry permit for use of radioactive source in Niton case at all times.

Motor Vehicle Operation (General). All employees who may operate motor vehicle equipment at or during transportation to the job site must hold a valid driver's license. Seat belts must be worn at all times when the vehicle is in motion. Vehicles must be operated in compliance with applicable state and federal laws as well as the provisions of WAC 296-155-600 through 296-155-630. Vehicles shall also be inspected in a regularly scheduled maintenance program.

Hand and Power Tools. Hand tools would include chisels, knives, and other devices used to collect building material samples. Care will be taken to avoid injury from routine use of tools.

Electrical Hazards

Electrical Circuits. No samples of electrical cords will be taken. Care will be maintained to avoid damage to existing building electrical circuits during all sampling activities.

Lockout/Tagout Procedures. It is not anticipated that work procedures requiring lockout/tagout will be performed during this project by Hart Crowser personnel, as no confined spaces with energized parts or equipment will be entered.

Working around Power Lines. If sampling on roofs, care will be taken to avoid power lines to buildings.

Working at Heights/Fall Protection

Sampling on ceilings or roofs will generally be from ladders. Care will be taken to use ladders properly, using the following guidelines:

Ladders will be set up so that a ratio of 1:4 (distance from base of building to height of ladder against building) is maintained at all times. An individual will remain on the ground to steady the ladder while another individual is climbing or descending. Items will not be passed up or down from ladders. No items will be intentionally dropped from ladders.

Individuals sampling on roofs will wear slip-resistant shoes or boots, and will not take any risks in collecting samples.

Trenching and Excavation

No excavation or trenching will be conducted for this project.

Fuels, Cleaning Solutions, and Chemical Handling

On-site fuels or chemicals have been reported to be stored in an appropriate manner. Work around areas that may have been affected by historical fuel and/or chemical spills is not anticipated for this project. Cleaning solutions will be limited to amended water for cleaning asbestos-sampling tools, or deionized water for cleaning LBP sampling tools.

Hot Work

No hot work on site is anticipated for this project, as no welding, cutting, or burning is planned.

Slip and Fall Prevention

Suitable slip-resistant boots will be worn whenever conditions dictate. Site conditions are such that tripping over debris presents a real risk.

Compressed Gases

No compressed gases are anticipated for this project.

Confined Space Entry

No confined space entry is anticipated for this project. If any confined spaces are found that do require entry, this SSSHP would require modification.

Housekeeping and Maintenance

Housekeeping

- Responsibility for good housekeeping rests with each employee and shall be enforced by the SSC.
- Keep all work areas clear (including all inside and outside areas).
- Clean up all liquid spills immediately to prevent slipping, or other hazards.
- Clean up the area after each job. Remove tools and surplus material, to their proper places. No job is complete until this has been done.

Maintenance. No maintenance of equipment will be performed for this project.

Drum Handling. No drums will be moved, handled, or sampled in this project.

Guarding of Machinery and Equipment. No machinery will be used for this project.

Illumination. All exterior work will be conducted during daylight hours only. Interior spaces will not have electrical power and illumination. If necessary, flashlights will be used to illuminate dark areas for better visibility.

Sanitation. On-site sanitary facilities will be used.

Engineering Controls. Spraying a fine mist of deionized water on dry surfaces will be used to control dust release.

Hazard Communication. It is not anticipated that any chemicals requiring special hazard communication training will be brought on site during this project.

Process Safety Management. There are no industrial processes to be sampled during this project, so this item is not relevant to this project.

Signs and Labels. Labeling of all samples is discussed in the work plan sections of this document. Warning signs will not be necessary for this project, as it consists of short-term sampling as discrete locations for very brief periods.

4.11 Site Control Measures

No hazardous waste operations are anticipated to require sampling for this project, so site control requirements are not needed.

4.12 Personnel Hygiene and Decontamination

Respirators

All respirators, if used, shall be provided and maintained by the individual employer (Hart Crowser and subcontractors) for their own employees and shall be cleaned per WISHA requirements and inspected daily (if used) by the individual user.

Disposable Materials

All disposable clothing, gloves, expendable protective wear, used respirator cartridges, and other disposable material generated during site activities shall be placed in suitable plastic bags and disposed of at the appropriate on-site waste disposal receptacle. If protective equipment is significantly contaminated with asbestos, it will be bagged into special yellow Asbestos Waste bags.

Personal Hygiene

All site workers will thoroughly wash hands and face before eating, drinking, or performing other actions with a hand-to-mouth component.

Minimization of Contamination

Do not kneel on contaminated ground, stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers where appropriate. Eating, drinking, chewing gum, smoking or using smokeless tobacco are forbidden while collecting samples. Coordination with other site workers will be accomplished, as necessary, to avoid cross-contamination.

4.13 Equipment Decontamination

Decontamination of equipment used in sampling is discussed in the ***Decontamination of Sampling Equipment*** sections above.

4.14 Emergency Equipment and First Aid Requirements

This section covers the emergency equipment to be utilized in the performance of the work.

Emergency Equipment

The following emergency equipment must be available on site at all times:

- First aid kit complying with 29 CFR 1926.50(d)(1);
- A 10:ABC fire extinguisher;
- Spill Control materials; and
- A portable emergency eyewash bottle.

First Aid and CPR

An individual who is first aid/CPR trained shall be on site at all times when active work for this project is being conducted.

4.15 Emergency Response Plan

The Hart Crowser Emergency Response Plan (ERP) outlines the steps necessary for appropriate response to emergency situations. This ERP addresses the following:

- Pre-Emergency Planning;
- Personnel Roles;
- Emergency Contacts;
- Emergency Recognition and Prevention;
- Site Characteristics;
- Site Evacuation;
- Medical Emergencies;
- Route to Hospital;
- Community Alert; and
- Critique of Emergency Response.

Pre-Emergency Planning

Although emergencies are unanticipated for the nature of work to be conducted for this project, field personnel shall always exercise caution and look for signs of potentially hazardous situations that could impact them or the project, including:

- Visible or odorous chemical contaminants;
- Live electrical wires or equipment;
- Underground pipelines or cables; and
- Poisonous plants or dangerous animals.

The ERP shall be reviewed, as necessary, during project-specific training.

Personnel Roles

The SSC shall act as the lead individual in the event of an emergency situation and evaluate the situation. He/she will determine the need to implement the emergency procedures, in concert with other resource personnel including client representatives, the Project Manager, and the HSO. Other on-site field personnel will assist the SSC, as required, during the emergency.

In the event that the ERP is implemented, the SSC or designee is responsible for alerting all personnel at the affected area by use of visual or verbal instructions, as appropriate. Cease all work immediately. Offer whatever assistance is required, but do not enter work areas without proper protective equipment. Workers not needed for immediate assistance will leave the work area, pending approval by the SSC for re-start of work.

Emergency Contacts

Site personnel must notify Jerry Cummings in the event of ERP implementation. Table 4-1 will be readily available in each project vehicle's glove compartment. Refer to Table 4-1 for the following information:

- Emergency Contacts and Telephone Numbers; and
- Nearest Hospital.

Emergency Recognition and Prevention

Fires. Hart Crowser personnel will attempt to control only very small fires. If an explosion appears likely, evacuate the area immediately. If a fire occurs which cannot be controlled with the 10-pound ABC fire extinguisher located in the field equipment, then immediate intervention by the Camp Bonneville Fire Department is necessary. Use these steps:

- Evacuate the area to a previously agreed upon, upwind location;
- Contact Jerry Cummings; and
- Inform Project Manager of the situation, as soon as practicable.

Uncontrolled Contaminant Release. In the unlikely event of a tank rupture or other material spill, attempt to stop and contain the flow of material using absorbents, booms, dirt, or other appropriate material. Prevent migration of liquids into streams or other bodies of water by building trenches, dikes, etc. Drum recovered material for proper disposal, or contact a spill removal firm for material cleanup and disposal, as required. Observe all fire and explosion precautions while dealing with spills.

Potentially High Chemical Exposure Situations. In some emergency situations, workers may encounter localized work areas where exposure to previously unidentified chemicals could occur. A similar hazard includes the situation where chemicals are unexpectedly present above permissible exposure levels and/or above the levels suitable for the personnel protective equipment at hand on site. If these situations occur, immediately stop work and evacuate the work area. Do not reenter the area until appropriate help is available and/or appropriate personnel protective equipment is obtained and donned. Do not attempt to rescue a downed worker from such areas without employing appropriate rescue procedures. Professional emergency response assistance (fire department, HAZMAT team, etc.) may be necessary to deal with this type of situation.

Site Characteristics

Prevailing weather conditions are rainy and cool during the fall and winter, mild during the spring, and warm during the summer.

Site Evacuation

In the unlikely event of an unforeseen release of a hazardous chemical, evacuate the sampling area to an upwind location. Be sure to remove the Niton XRF device during evacuation. Since all individuals sampling will be within shouting distance, no special alarm system is anticipated as necessary. Contact appropriate emergency authorities. No other situation calling for site evacuation is reasonably anticipated.

Medical Emergencies

Contact the emergency responders if a life-threatening medical emergency occurs. If any worker leaves the site to seek medical attention, another worker must accompany the patient to the hospital. When in doubt about the severity of an accident or exposure, always seek medical attention as a conservative approach. Notify the Project Manager of the outcome of the medical evaluation as soon as possible. For minor cuts and bruises, an on-site first aid kit will be available.

- If a worker is seriously injured or becomes ill or unconscious, immediately request assistance from the local emergency response agency (911). Do not attempt to assist an unconscious worker in an untested or known dangerous area without following appropriate rescue procedures.

- In the event that a seriously injured person is also heavily contaminated, use clean plastic sheeting to prevent contamination of the inside of the emergency vehicle. Less severely injured individuals may also have their protective clothing carefully removed or cut off before transport to the hospital.

If appropriate equipment or resources are not available on site, emergency removal will require professional assistance (fire department, rescue squad, etc.).

Route to Hospital

The nearest hospital is depicted on Figure 4-1 on page 4-3.

Community Alert Procedures

It is not anticipated that any Hart Crowser site emergency would require the need to notify the local community, beyond that of calling the police or fire department. All accidents and unusual events shall be dealt with in a manner which minimizes continued health risk to site workers and the general public.

Critique of Emergency Response

The SSC will notify the Project Manager as soon as possible after the emergency situation has been stabilized. The Project Manager will notify the HSO, appropriate client contacts, and regulatory agencies, if applicable. If any individual is injured in conjunction with this project, the SSC will file a detailed Accident Report with the HSO within 24 hours. The Contracting Officer's Representative (COR) will receive a copy of the Report from the HSO.

The Project Manager, SSC, and the HSO will critique the emergency response action following the event. The results of the critique will be used in follow-up training exercises to improve the ERP.

4.16 Logs, Reports, and Recordkeeping

Site-specific health and safety records to be retained for this project include:

- Training records;
- Medical surveillance records;
- Daily safety inspection records;
- Results of film badge dosimetry;
- Accidents, incidents, or unexpected events; and
- Other records as appropriate (see ER 385-1-92 Appendix B, Section 17b.)

These site safety records will be retained for 30 years.

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APPENDIX A
PROJECT PERSONNEL CERTIFICATES