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ENGINEERING DATA TRANSMITTAL

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5. Proj./Prog./Dept./Div.: 88210	6. Cog. Engr.: Andrea L. Prignano	7. Purchase Order No.: NA
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16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
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17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

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1	1	Cog. Eng. Andrea L. Prignano		8/4/94	H6-23						
1	1	Cog. Mgr. Fred A Ruck, III		8/4/94	H6-23						
		QA									
		Safety									
		Env.									

18.	19.	20.	21. DOE APPROVAL (if required)
Andrea L. Prignano 8/4/94 Signature of EDT Originator Date	Andrea L. Prignano 8/4/94 Authorized Representative for Receiving Organization Date	Fred A. Ruck, III 8/4/94 Cognizant/Project Engineer's Manager Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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7. Abstract

This report summarizes the sampling activities undertaken and the analytical results obtained in a soil and sediment sampling study performed at the 300 Area Solvent Evaporator (300 ASE) closure site. The 300 ASE is identified as a Resource Conservation and Recovery Act (RCRA) treatment, storage, or disposal (TSD) unit that will be closed in accordance with the applicable laws and regulations. The 300 ASE is considered an interim-status tank treatment unit which was located in the 300 Area of the Hanford Site from 1975 to 1986.

No constituents of concern were found in concentrations indicating contamination of the soil by 300 ASE operations.

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Revision 0

Soil Characterization at the 300 Area Solvent Evaporator Closure Site

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

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
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METRIC CONVERSION CHART

The following conversion chart is provided to aid in conversion.

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

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SOIL CHARACTERIZATION AT THE 300 AREA SOLVENT EVAPORATOR CLOSURE SITE

1.0 INTRODUCTION

This report summarizes the sampling activities undertaken and the analytical results obtained in a soil and sediment sampling study performed at the 300 Area Solvent Evaporator (300 ASE) closure site. The results of this sampling effort will be used to assess contamination of surface and near-surface soils due to the 300 ASE and attendant barrel storage operations. The 300 ASE treated radioactively contaminated dangerous waste and thus was a mixed waste treatment facility. Results from this soil sampling effort have been compared to the Hanford Site Background thresholds for soils (DOE-RL 1993) and the *Washington Administrative Code* (WAC 173-340) "Model Toxics Control Act Cleanup Regulations" (MTCA) residential limits.

No constituents of concern were found in concentrations indicating contamination of the soil by 300 ASE operations. The organic analytes detected were dismissed because of their low concentrations and status as common laboratory contaminants. Inorganic analytes found in levels detectable by the laboratory instrumentation were compared to Hanford Site Background (DOE-RL 1993) and health-based standards. Of the analyses that showed levels above detection limits, none indicate contamination.

A second sampling event has recently been completed that focuses on sampling and analysis of the concrete pad associated with the 300 ASE. This concrete sampling effort will be reported separately.

1.1 REGULATORY BACKGROUND

The U.S. Environmental Protection Agency and the Washington State, Department of Ecology (Ecology) jointly administer the *Resource Conservation and Recovery Act of 1976* (RCRA) in Washington State. The U.S. Environmental Protection Agency retains oversight authority while delegating to Ecology enforcement of a state program that is consistent with, or more stringent than, the corresponding federal program. The implementing regulations can be found in WAC 173-303 "Dangerous Waste Regulations" and Title 40 *Code of Federal Regulations* Parts 260 to 270. Ecology's authorization includes administering treatment, storage, and/or disposal (TSD) closures.

The U.S. Department of Energy, Richland Operations Office, the U.S. Environmental Protection Agency, and Ecology have entered into the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1992), commonly referred to as the Tri-Party Agreement. This agreement affects environmental regulation at the Hanford Site. One purpose of this agreement is to ensure that environmental impacts associated with past activities are investigated and appropriate response actions taken as necessary to protect human health and the environment. The agreement seeks to promote this goal, in part, by identifying TSD units, identifying which units will undergo closure, and promoting compliance with relevant RCRA permitting requirements.

The 300 ASE is identified as a RCRA TSD unit that will be closed in accordance with the applicable laws and regulations. The 300 ASE is considered an interim-status tank treatment facility, which was located in the 300 Area of the Hanford Site from 1975 to 1986 and managed for the U.S. Department of Energy, Richland Operations Office by UNC Nuclear Industries, Incorporated.

1.2 FACILITY INFORMATION

The 300 ASE was a modified 'Brooks' load lugger (i.e., dumpster) constructed of carbon steel with a hinged aluminum sheet metal canopy over the top. The canopy (added in 1978) prevented entry of precipitation while allowing airflow across the top of the solvent. The canopy was hinged so that one end could be lifted for pouring the contents of solvent barrels into the cutout side of the evaporator. Dimensionally, the 300 ASE was about 96 inches long, 55 inches high, 68 inches wide across the canopy, and 53 inches long at the bottom. The evaporator had been placed in four known locations adjacent to the southwest portion of the original 333 East Concrete Pad.

The 300 ASE closure area consists of two sub-areas: (1) a gravel area on the south side of the 333 East Concrete Pad (approximately 10 feet wide by 50 feet long), and; (2) an area about 50 feet long on the south portion of the original 333 East Concrete Pad that extends about 32 feet to the north and then tapers towards the original 4-inch diameter pad drain.

1.2.1 Operation as a Treatment, Storage, and/or Disposal Unit

The 300 ASE was installed in the spring of 1976 and was a treatment tank (evaporator) that received barrel-transferred solvent waste from degreasing operations associated with the N Reactor Fuel manufacturing facility. Degreaser solvent barrels were routinely stored (up to 1 year) within about 20 feet of the evaporator until poured into the 300 ASE with the barrel tilter. Small quantities of solvent (from the paint shop and uranium-ethyl acetate-bromine solutions) were poured by hand directly into the evaporator. Typical 300 ASE waste was composed of perchloroethylene, trichloroethylene, 1,1,1,-trichloromethane, ethyl acetate/bromine solution, paint shop solvents, and possibly used oil. Small amounts of uranium and alloys of copper, zirconium, and possibly zirconium/beryllium were also present in the degreaser solvents as particulates. In 1985, the 300 ASE was phased out and the Brooks load lugger was demolished during the period from 1985 to 1986.

1.2.2 Facility Location

The location of the 300 ASE closure area and proximity to other 300 Area facilities is shown in Figures 1 and 2.

The 300 ASE unit and associated storage barrels were located in the 300 Area of the Hanford Site from 1975 to 1985. They were situated in the northeast corner of the 300 Area near the 333, 334, and 303-M Buildings, as

shown in Figures 1 and 2. The site for the 300 ASE was chosen for its proximity to the operations of the N Reactor Fuel Manufacturing facility in the 333 Building.

2.0 SAMPLING

Sampling was performed on August 10, 1993, as described in the *300 Area Solvent Evaporator Closure Plan* (DOE-RL 1988). Soil analyses were largely confined to known and suspected waste constituents associated with the 300 ASE. These waste constituents can be grouped into the following four categories: (1) solvents and organic compounds known to be treated: (2) organic degradation products of the primary organic compounds; (3) inorganic constituents from the degreasing of fuel element materials, and; (4) inorganic constituents that may have been treated in the evaporator via paint in conjunction with paint solvents. As is described in the closure plan, some constituents were omitted from the list because of their low concentrations in the raw-waste solvent or their concentration in native rocks and soils.

One change was made to the original sampling and analyses plan described in the closure plan. It was decided to use the Hanford Site Background threshold values (DOE-RL 1993) in place of a local background. Therefore, no local background samples were taken. This change is recorded in the July 13, 1993 Unit Managers' Meeting Minutes for the 300 Area Solvent Evaporator.

A total of seven soil samples were collected (six samples and one duplicate).

2.1 SAMPLE LOCATIONS AND DEPTH

The soil sample locations are shown in Figure 3. Sampling was done within the soil closure area next to the concrete pad. This is a 10 x 50-foot soil/gravel area where the solvent evaporator sat during its operational phase. The soil closure area was delineated by the locations of the evaporator during its operation. The soil closure area was gridded into five blocks (referred to as Areas A, B, C, D, and E) and each block subdivided into nine equal parts. Five sample locations were then randomly chosen; one from each block. Additionally, an authoritative sample was selected from near where a small amount of solvent overflowed from the evaporator because of a steam coil leak. The duplicate sample was taken at this authoritative sample site.

2.2 SAMPLE COLLECTION

The six soil samples were collected using hand tools (spoon and bowl) from a depth of -6 to -12 inches. The 12-inch maximum sampling depth was chosen to avoid the 618-1 Burial Ground, which is below this site. Samples were collected for off-site laboratory analyses per Sample Analysis Form 93-222 (Figure 4).

In addition to these samples, at each location a sample was collected for volatile organics analysis using field analysis methods. At soil sample sites B090C3, B090C4, and B090C8, soil was also collected for immunoassay polyaromatic hydrocarbon (PAH) field analysis. These three sites were selected for this analysis because they are close to the last known location of the 300 ASE and to where a small amount of solvent overflowed from the evaporator because of a steam coil leak. Field analyses collection and methods are described in Section 4.1.

2.3 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Sampling for laboratory analyses was performed as described in the closure plan. Field analyses, for volatile organic compounds and PAH's, were performed in addition to the analyses listed in the closure plan. The results of field analyses are for information only and will not be used for decision-making purposes.

Field quality assurance/quality control (QA/QC) samples are used to monitor the performance of the sampling and analysis system. Field QA/QC samples allow analysis of the quality of the measurement system. Additional information regarding laboratory cleanliness and sample handling protocol can be inferred by the results of analyses of blank samples. Field duplicates and blanks were prepared to address issues related to field QA/QC.

Duplicate samples are independent samples that are collected as close as possible to the same point in space and time. They are collected and treated separately. Field duplicates are useful in documenting the precision of the sampling process.

Matrix trip blanks are used when volatile organics are sampled. Trip blanks consist of clean sand that is placed in the sample bottle in an uncontaminated area. Trip blanks are subjected to the same handling as other samples and serve to identify contamination from sample containers or transportation and storage procedures. Trip blanks are then submitted to the analytical laboratory with the other field samples.

Field blanks are identical to matrix trip blanks except that the sample bottles are opened in the field for the typical sampling time, closed, and transported and submitted to the analytical laboratory with the other field samples.

Equipment blanks consist of clean sand poured over or through the sampling device after decontamination, collected in the sample bottle, and transported to the laboratory for analysis. Equipment blanks test for residual contamination.

A duplicate sample (B090C9) was taken at the location of the authoritative sample (B909C8). One equipment blank (B090D2), one matrix trip blank (B090D0), and one field blank (B090D1) were prepared. The field blank was opened next to sample B090C3. Table 1 summarizes sample identification, location, and QA/QC designation.

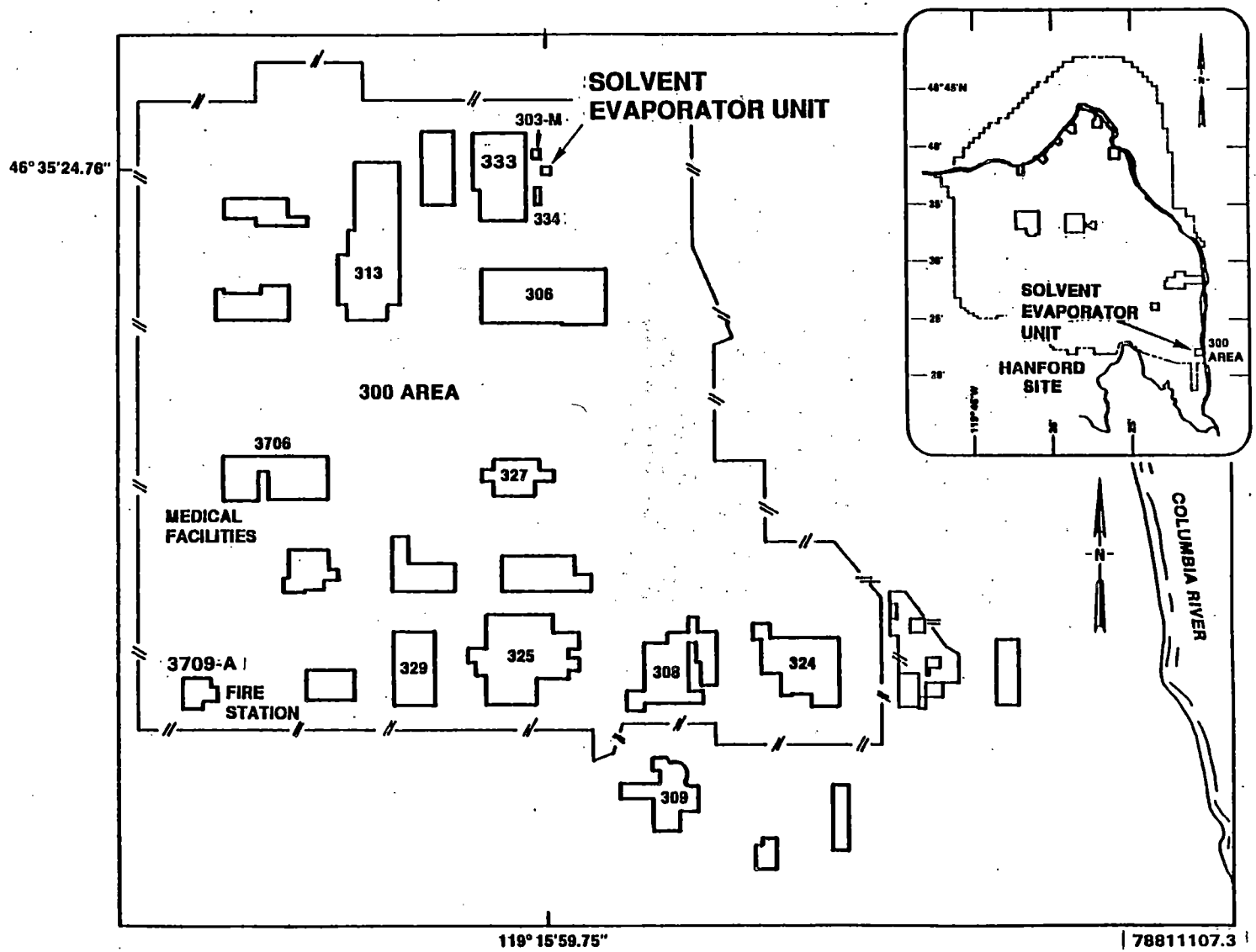
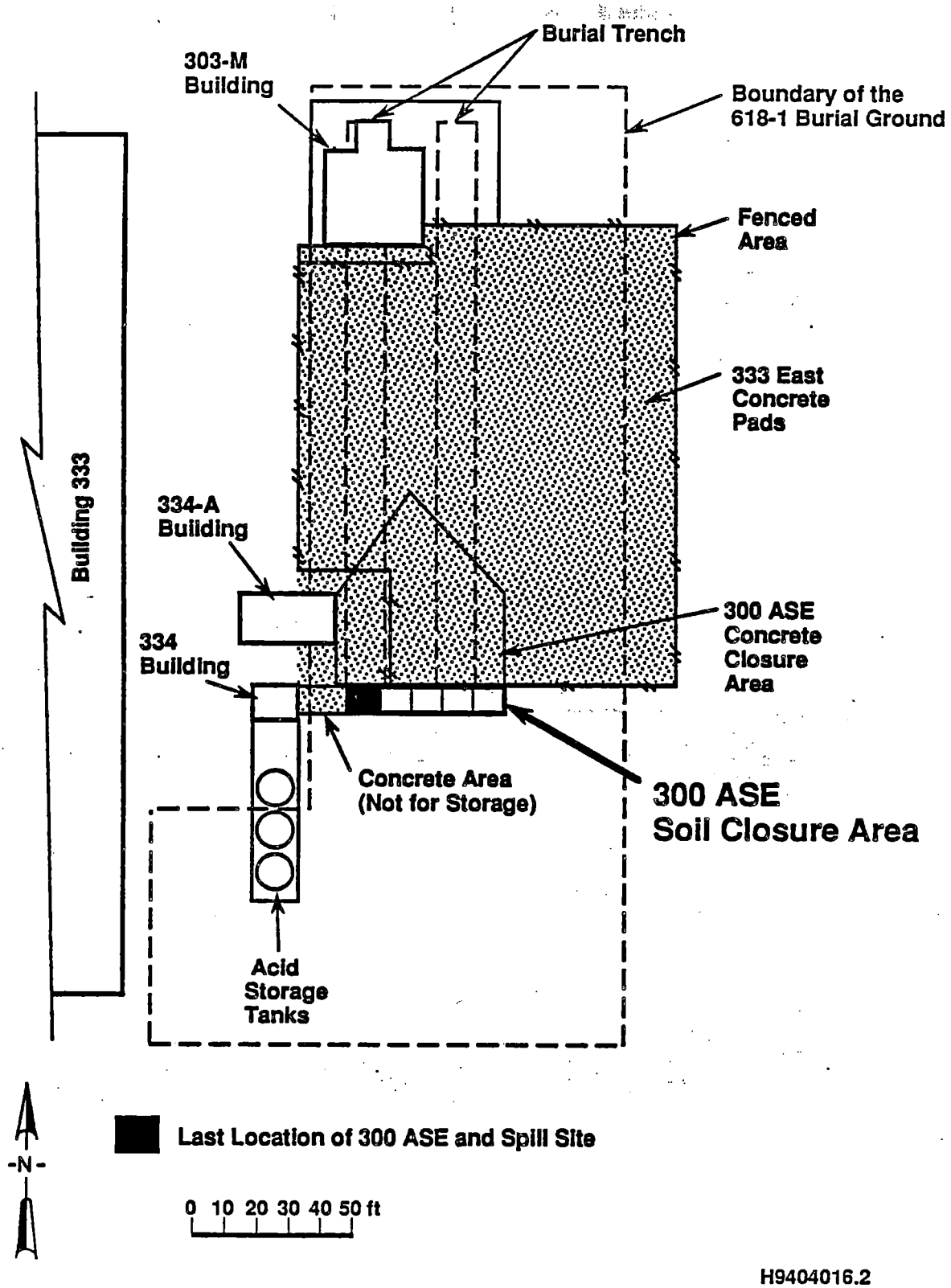


Figure 1. 300 Area Solvent Evaporator Unit.

1 Figure 2. Layout of 300 Area Solvent Evaporator Closure Area.



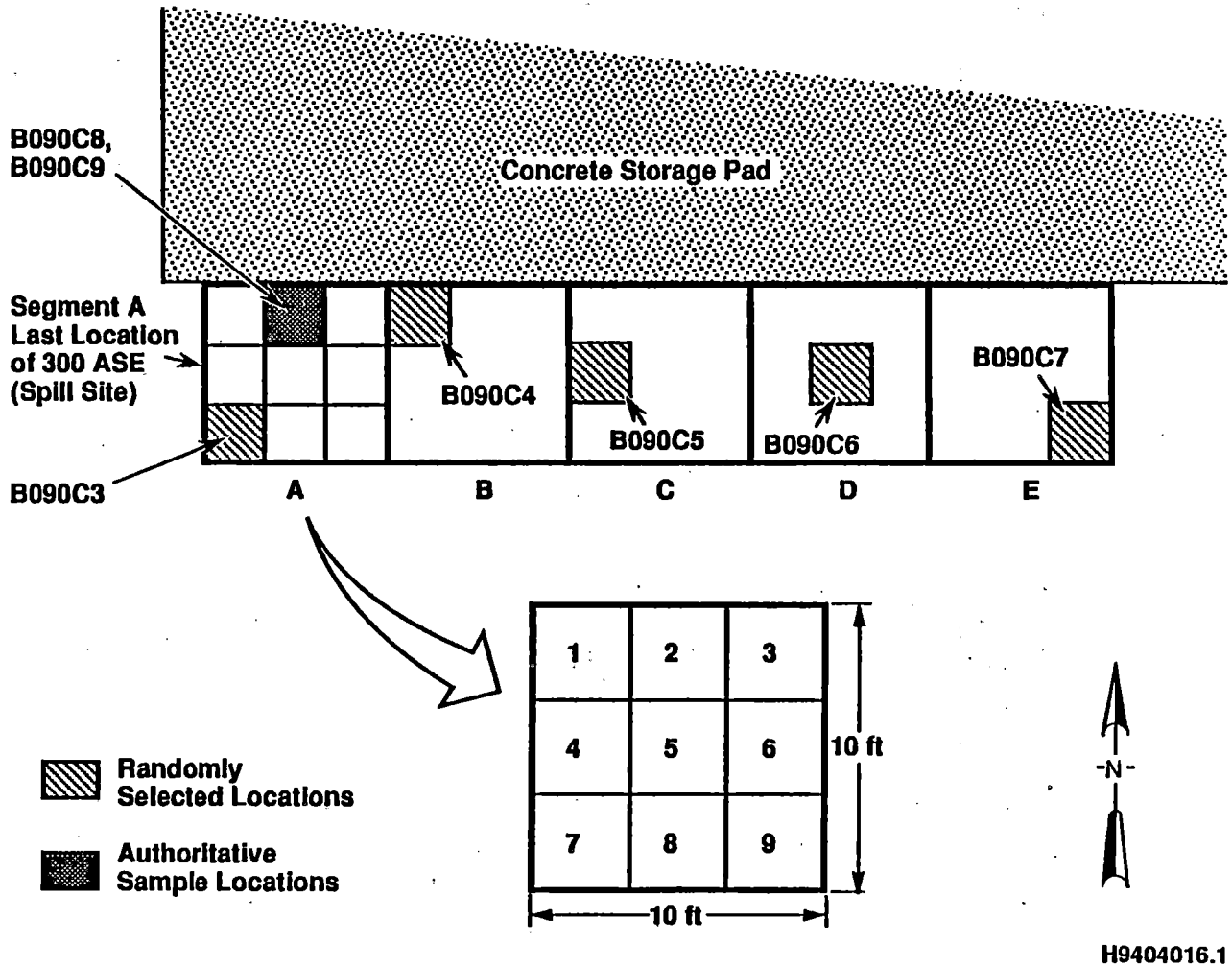


Figure 3. 300 Area Solvent Evaporator Soil Closure Area and Sampling Sites.

1 Figure 4. Sample Analyses Form 93-222.

Office of Sample Management Field Sampling Requirements Requirements are for TMA REV 0 07/16/93				93-222 SAF Number
Parameter/analysis	**Analytical methods**	**Container[1]/ volume**	**Preservation**	**Holding time**
1. VOA	8240	Gs* 250 mℓ	None	14 days
2. Non-halogenated VOA	8015 (petroleum naptha)	Gs* 250 mℓ	None	14 days
3. ICP metals - Barium - Beryllium - Cadmium - Copper - Silver - Zirconium	6010	P 250 mℓ	None	6 months
Lead	7421			
4. Anions - IC ▸ Bromide	EPA 300.0	G[3] 125 mℓ	None	28 days
5. Total Uranium	EA-D1C	G/P 10 g - 60 mℓ	None	6 months
6. Total activity	LA-528-111 LA-548-121	G or P small vial (at least 1g)	None	ASAP

[1]Container types:
P = Plastic (polyethylene).
G = Glass.
Gs = Glass w/septum cap.
Gw = Glass/wide mouth jar.
Gs* = Glass w/septum cap -- no head space in container.
PW = Plastic (polyethylene)/wide mouth jar.
PP = Polypropylene.
aG = Amber glass.
T = Fluorocarbon resins.

[2]14 days for extraction, 40 days for analysis.
[3]Glass container unless sample is highly acidic.

Table 1. Soil Sample Locations and Description.

Sample Number	Location*	Description
B090C3	Area A	Brown fine sand/cobble, 6 - 10"
B090C4	Area B	Moist sand/cobble, a 1" grayish layer at a 6.5" depth
B090C5	Area C	Dry gray sand/cobble, 6 - 12"
B090C6	Area D	Moist brown sand, 6 - 9"
B090C7	Area E	Brown sand, sampling depth 6 - 12"
B090C8	Area A	Authoritative Sample, fine sand/cobble, 6 - 12"; note: a grayish layer was found at 7.5 - 8", a red/purple layer at 8 to 8 1/8", and fine brown sand below to 12"
B090C9	Area A	Duplicate of B090C8
B090D0	NA	Matrix trip blank, clean silica sand
B090D1	NA	Field blank, clean silica sand, bottle opened next to B090C3, Area A
B090D2	NA	Matrix equipment blank, clean silica sand

* Sample locations are described in Figure 3.

3.0 PERFORMANCE STANDARDS

Analytical results were compared to background levels and health-based limits. For background, the Hanford Site Background threshold values were used. Hanford Site Background threshold values are taken from the *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes, Revision 1* (DOE-RL 1993) and are listed in Appendix A. For health-based levels, WAC 173-340 (MTCA Cleanup Regulations) was used. Calculations for these health-based levels are described in Appendix B.

3.1 BACKGROUND

Hanford Site Background is a sitewide approach to determining background levels and was developed as an alternative to local unit-based background determinations at the Hanford Site. Using local backgrounds for each unit can lead to different definitions of contamination and different assessments of remediation goals and risk for different units. The Hanford Site Background approach is based on the premise that all the waste management units are part of a common sequence of vadose zone sediments, and that the basic characteristics that control the chemical composition of these sediments are similar throughout the Hanford Site. The range of natural soil compositions is then used to establish a single set of soil background data. Use of the Hanford Site Background for environmental restoration at the Hanford Site is technically preferable to the use of unit-based background because it more accurately represents the range of natural variability in soil composition, and also provides a more consistent, credible, and efficient basis for evaluating contamination in soil.

The Hanford Site Background threshold values are summarized in Appendix A of this report. The background threshold is the concentration level defining the upper limit of what is considered part of the background population. Background thresholds are based on a tolerance interval approach. The calculated threshold levels depend on the confidence interval and percentile used in the calculation. The WAC 173-340-708(11)(d) specifies a tolerance coefficient of 95 percent and a coverage of 95 percent. The Hanford Site Background threshold values are based on this 95/95 confidence interval. Statistical calculations are described in the source document (DOE-RL 1993).

3.2 HEALTH-BASED LEVELS

The calculated health-based cleanup levels in this report are taken from the equations, risk levels, and exposure assumptions found in the MTCA Method B [WAC 173-340-740 (3)(a)(iii)]. For noncarcinogens, the principal variable is the oral reference dose. The reference dose is defined as the level of daily human exposure at or below which no adverse effect is expected to occur during a lifetime. For carcinogens, the cancer slope factor is the basis for determining human health effects; it is a measurement of the risk per unit dose. The oral reference dose and the cancer slope factor are chemical-specific and are obtained from the Integrated Risk Information System database (EPA 1988), if available. Secondary sources for these toxicity values also are taken from the U.S. Environmental Protection Agency or Ecology. Health-based thresholds, references and calculations are reported in Appendix B.

In those instances in which one toxicity value (i.e., slope factor or reference dose) is not available, the health-based threshold is based upon the available value. This does not assume that the toxicity via the uncharacterized mechanism is negligible, only that information supporting this type of toxicity is lacking.

It is proposed that an alternative way of generating health-based standards is to use published concentrations in similar media that are not known to produce adverse health effects (e.g., typical world or U.S. native soil composition).

4.0 ANALYSES

All samples were analyzed for volatile organic compounds, naphtha, bromide, barium, beryllium, cadmium, copper, silver, zirconium, lead, and total uranium. In addition, field analysis for volatile organic compounds (VOC) and PAH were performed to compare field results for volatile organics with offsite volatile organic analysis results and to provide immediate information on VOC or PAH contamination at the closure site.

4.1 FIELD ANALYSES

Field analyses were performed for information only. No closure decision will be based on the results of this portion of the sampling effort. These results can be compared with the offsite sample analysis results and provided immediate information concerning contamination at the site. Table 2 summarizes the field screening analyses. No findings of significance were found in any of the field analyses.

Field volatile organic analysis (VOA) was performed using a portable gas chromatograph. Analyses were performed consistent with the manufacturer's recommendations. Samples were collected using a plastic 10-milliliter syringe that had been modified by cutting off the end. The modified syringe was pushed into the soil sample to withdraw a plug of soil about 3 to 5 grams in mass. The soil plug was immediately injected into a 40-milliliter VOA vial containing 30 milliliters of deionized water. The VOA vial was quickly capped and shaken for about 1 minute to distribute the soil sample in solution. The VOA vial was then weighed to determine the net mass of the soil sample.

Headspace vapor samples from each of the VOA vials were analyzed using a Photovac 10S Plus Gas Chromatograph*. The 10S Plus was equipped with a 10-meter, wide-bore, non-polar capillary column and a photoionization detector with a 10.6 electronvolt lamp. The photoionization detector is a broad-spectrum detector that is particularly sensitive to aromatic compounds. Headspace samples of 250 μL volume were collected from each VOA vial using a 500-μL gas-tight syringe and were immediately injected onto the 10S Plus

*10S Plus Gas Chromatograph is a trademark of Photovac International.

Table 2. Results from Field Analyses.

Sample number	VOA Field analyses results*	Immunoassay results*	Comments
B090C3	nothing of significance	less than 1 ppm	none
B090C4	nothing of significance	less than 1 ppm	VOA field analysis was performed on the gray layer and surrounding soil analyzed pH of gray layer is 7.5.
B090C5	nothing of significance	NA	none
B090C6	nothing of significance	NA	none
B090C7	nothing of significance	NA	none
B090C8	nothing of significance	less than 1 ppm	none
B090C9	nothing of significance	NA	Duplicate of B090C8
B090D1	NA	NA	Field blank collected next to B090C3
B090C2	NA	NA	Equipment blank
B090D0	NA	NA	Trip blank

* Volatile organic analysis (VOA) field analyses were performed using aqueous head space extraction with a Photovac 10S Plus Gas Chromatograph. Detection level is considered to be approximately 20 parts per billion (µg/kg). Immunoassay tests for polynuclear aromatic hydrocarbons (PAH) were performed using the PAH RISc.

NA = not analyzed.

Notes:

1 Organic Vapor Monitor Readings were performed on all routine analyses samples; all results were less than detection.

2 Radiological Readings were performed on all routine analyses samples; all results were less than detection. Detection level was background at 80 counts per minute.

chromatographic column for separation and detection of the vapor constituents. The 10S Plus was operated isothermally at 40 degrees Celsius using ultra-high-purity air carrier gas at a flow rate of 8 milliliters per minute. Each chromatogram was run for a period of 10 minutes.

The 10S Plus was equipped with a library for identification of a variety of volatile organic compounds based on retention time. Quantification is based on peak area, with appropriate response factors for each compound of interest. Three-point calibration curves were developed for each compound of interest using pure chemical standards in solution. Detected compounds are quantified in parts per million (µg/g) concentration. The detection levels for this method are considered to be approximately 20 parts per billion (µg/kg).

The immunoassay tests were performed using the PAH RISc. The test is useful for assessing the level and location of soil contamination with PAHs. The analyses were performed according to the kit manufacturer's (Ensys Inc.) procedure. Detection levels are listed by the manufacture as 1 to 10 parts per million (µg/g). A detection limit of 1 part per million (µg/g) is listed for phenanthrene, anthracene, fluorene, benzo[a]anthracene, chrysene, and fluoranthrene. All of the immunoassay results were less than 1 part per million (µg/g).

4.2 OFFSITE ANALYSES

The analytical results from the offsite laboratories are summarized in Tables 3 and 4. Samples B090C3, B090C4, B090C5, B090C6, B090C7, B090C8, B090C9, B090D0, B090D1, and B090D2 were collected on August 10, 1993 by Westinghouse Hanford Company and transferred to TMA/Norcal Laboratory in Richmond, California for analysis. Volatile organic analyses were performed on all samples. In addition, samples B090C3 through B090C9 were analyzed for naphtha (total petroleum hydrocarbon as naphtha) by gas chromatography; barium, beryllium, cadmium, copper, silver, and zirconium by inductively coupled plasma; lead by furnace atomic absorption; bromide by ion chromatography; and total uranium. Total uranium was determined by TMA/Norcal Laboratory using laser-induced kinetic phosphorescence analysis.

The results from the total uranium analyses are meant to be used for information only. No closure decisions will be based on the results reported for uranium. Uranium concentrations are not being considered because of the presence of the 618-1 Burial Ground, located approximately 4 feet below the 300 ASE closure area. The 618-1 Burial Ground operated from 1944 to 1951 as a low-level radioactive solid waste burial ground that received uranium as well as other metallic and nonmetallic materials. Remedial action for the 618-1 Burial Ground will be evaluated as part of the 300-FF-2 Operable Unit.

4.3 DATA VALIDATION

Data validation was performed by the Los Alamos Technical Associates Inc., for Westinghouse Hanford. Data validation activities were performed in accordance with Level C as defined in Data Validation Procedures for Chemical Analysis (WHC 1993b) and Data Validation Procedures for Radiochemical Analysis

(WHC 1993a). Level C validation includes evaluation and qualification of results based on analytical holding times, method blank results, matrix spikes and duplicates, surrogate recoveries, and analytical method blanks.

The data validation procedure establishes the following qualifiers and definitions to describe the associated data:

U Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content.

UJ Indicates the compound or analyte was analyzed for and not detected in the sample. Because of a quality control deficiency identified during data validation, the associated quantitation limit is an estimate.

J Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision-making purposes.

R Indicates the compound or analyte was analyzed for, detected, and because of an identified quality control deficiency, the data are unusable.

The results of the data validation process can be found in Tables 3 and 4.

5.0 DATA EVALUATION

Detectable analyte concentrations were not observed for most samples. The organic analytes detected were dismissed because of their low concentrations and status as common laboratory contaminants. Inorganic analytes found in levels detectable by the laboratory instrumentation were compared to the Hanford Site Background (DOE-RL 1993) and to health-based standards. Of the analyses that showed levels above detection limits, none indicate contamination.

5.1 ORGANICS

All of the organic compounds found in the soil samples (Table 3) are considered common laboratory contaminants. Methylene chloride was detected in the trip blanks in the µg/kilogram levels. All the other organic compounds found: methylene chloride; perchloroethylene (tetrachloroethane); toluene; chloroform; and acetone were also found in the low µg/kilogram levels (less than 5 parts per billion). Of these compounds, only methylene chloride and perchloroethylene were considered analytes of concern at the 300 ASE in the closure plan (DOE-RL 1988). However, at these extremely low concentrations, these compounds are being dismissed as common laboratory contaminants. The other analytes noted are not considered to have been associated with 300 ASE activities, and at these concentrations, they are also being dismissed as

Table 3. 300 Area Solvent Evaporator Soil Results of Organic Analyses.

Sample number	VOCs found[a] (ug/kg)	Naphtha[b] (ug/kg)	Comments
B090C3	Methylene Chloride, 4 J Perchloroethylene, 2 J	400 UJ	
B090C4	Methylene Chloride, 4 J Perchloroethylene, 2 J Toluene, 2 J	400 UJ	
B090C5	Chloroform, 1 J Toluene, 2 J	400 UR	
B090C6	Methylene Chloride, 4 J Toluene, 1 J	400 UJ	
B090C7	Methylene Chloride, 3 J Toluene, 1 J	400 UJ	
B090C8	Methylene Chloride, 4 J Perchloroethylene, 4 J Toluene, 3 J	400 UJ	Duplicate of B090C9
B090C9	Methylene Chloride, 5 J Acetone, 4 J Perchloroethylene, 4 J Toluene, 3 J	400 UJ	Duplicate of B090C8
B090D0	Methylene Chloride, 3 J Unknown Hydrocarbon, 8.3 J	NA	Matrix Trip Blank
B090D1	Methylene Chloride, 3 J Unknown Hydrocarbon, 13 J	NA	Field Blank
B090D2	Methylene Chloride, 3 J Unknown Hydrocarbon, 5 J Unknown Hydrocarbon, 14 J	NA	Matrix Equipment Blank

NA = not analyzed.
Note: VOC results qualified as U, analyzed for and not detected, are not reported.

[a] All target volatile organic compounds (VOC) listed were detected at levels below the quantitation limit and thus are reported as estimated. Tentatively identified compounds (TIC), unknowns by definition, cannot be quantitated and thus are estimated.

[b] All values reported for naphtha (except B090C5) were at the practical quantitation level (PQL) of 400 µg/kilogram and qualified as UJ, which indicates that the analyte was not detected. However, the quantitation limit is estimated. B090C5 is qualified as UR.

Table 4. 300 Area Solvent Evaporator Soil Results of Inorganic Analyses.

Sample Number	Bromide mg/Kg	Barium mg/Kg	Beryllium mg/Kg	Cadmium mg/Kg	Copper mg/Kg	Lead mg/Kg	Silver mg/Kg	Zirconium mg/Kg	Total uranium µg/g
B090C3	< 2.0	152	0.37	0.15 U	86.6	45.6 J	0.38	16.8	59
B090C4	< 2.0	98.6	0.22	1.0	109	101 J	0.48	50.3	60
B090C5	< 2.0	160	0.19	0.15 U	121	41.1 J	0.35	45.2	41
B090C6	< 2.0	128	0.27	0.15 U	26.8	10.4 J	0.35 U	11	36
B090C7	< 2.0	172	0.26	0.14 U	66.2	9.4 J	0.32 U	17.5	33
B090C8	< 2.0	90	0.25	0.16 U	109	56.2 J	0.6	26.3	71
B090C9	< 2.0	105	0.21	0.28	84.3	60.9 J	0.34 U	30.2	70
Hanford site background[a]		175	1.8	LOQ[b] = 0.79	30	14.9	2.1	53	
MTCA[c]		5600	0.23	40	3000	250	400	NA	
Common ranges in soils[d]		100 - 3000	0.1 - 40	0.1 - 7	2 - 100	2 - 200	0.01 - 5	60 - 2000	0.9 - 9, extreme 250

[a] DOE-RL 1993 (see Appendix A).

[b] LOQ = limit of quantitation.

[c] WAC 173-340 (see Appendix B). All values listed are from MTCA Method B soil, except for lead, which is from MTCA Method A soil table.

[d] Adapted from Dragun (1988).

activities, and at these concentrations, they are also being dismissed as common laboratory contaminants. In addition, all target VOA compounds detected were at less than quantitation limits and thus were reported as estimated.

Ethyl acetate is listed as an analyte of concern for the 300 ASE in the closure plan, but was not analyzed for during this sampling and analyses effort. There is no standard method that includes ethyl acetate as a target compound. If the compound was present in the sample, it would be expected to be reported as a tentatively identified compound in the analysis report of the VOCs. Because all tentatively identified compounds reported were at extremely low concentrations, in the (µg/kg) range, it is concluded that ethyl acetate is not present at a concentration of concern.

All results for naphtha analyses were listed at the practical quantitation level. Therefore, it can be concluded that there are no VOCs or naphtha at concentrations of concern.

5.2 INORGANICS

Metals were analyzed using inductively coupled plasma and, for lead, furnace atomic absorption. Results are summarized in Table 4. Metal analyses reported above the laboratory instrument detection limits were first compared to Hanford Site Background values [(DOE-RL 1993) (Appendix B)]. Barium, beryllium, silver, and zirconium were all found to be below the Hanford Site Background 95/95 confidence level threshold. Some of the beryllium concentrations found were slightly above the MTCA Method B levels, however, these values are all well below the Hanford Site Background. Based on this regional background, there is insubstantial evidence to conclude that any beryllium contamination exists at the 300 ASE site. Therefore, it is concluded that none of these analytes are present in levels indicating contamination.

A cadmium threshold was not computed for Hanford Site Background; however, a limit of quantitation (LOQ) was determined. The LOQ is the level above which quantitative analyses can be obtained with a specific degree of confidence (generally the mean background signal plus 10 standard deviations). The LOQ for cadmium is 0.79 milligram/kilogram. All but one of the cadmium results are below the LOQ determined during the Hanford Site Background study (DOE-RL 1993). The one result above the LOQ was at 1.0 milligram/kilogram and found in sample B090C4. This result is well below the MTCA Method B level of 40 milligrams/kilogram and is, therefore, considered to be below a level of concern.

In addition to the one cadmium result, only copper and lead were found in concentrations exceeding Hanford Site Background thresholds. Copper was compared to the MTCA Method B cleanup level of 3,000 milligrams/kilogram. The

results for copper in this soil study ranged from 26.8 to 109 milligrams/kilogram. All of these values are well below the MTCA Method B cleanup level. Lead was compared to the more stringent Method A cleanup level. The MTCA Method A cleanup level was used for comparison to lead because data for the Method B cleanup level calculation were not available. The MTCA Method A cleanup level for lead is 250 milligrams/kilogram. The results found ranged from 9.4 to 101 milligrams/kilogram. All of the results are well below the MTCA Method A cleanup level.

All bromide results were less than the detection level of 2.0 milligrams/kilogram and are, therefore, considered to be below levels of concerns. The total uranium results ranged from 33 to 71 µg/gram. There are no Hanford Site Background threshold values for total uranium. According to Dragun (1988), the typical range of uranium concentrations in native soil is 0.9 to 9.0 µg/gram. Dragun (1988) also notes an extreme limit for uranium as less than 250 µg/gram. The levels found at the 300 ASE are well below this extreme limit. In addition, uranium concentrations are not being used for closure decisions because of the presence of the 618-1 Burial Ground, located approximately 4 feet below the 300 ASE closure area. The 618-1 Burial Ground received uranium as well as other metallic and nonmetallic materials during its operation and will be remediated as part of the 300-FF-2 Operable Unit. It is concluded that no inorganic constituents analyzed are present in concentrations of concern.

5.3 COMPARISON OF FIELD ANALYSES WITH OFFSITE LABORATORY ANALYSES

All of the field analyses were for organic compounds and all were found to be at less than detection. Detection levels for the field analyses are considered to be approximately 20 parts per billion (µg/kg). Detection levels for the immunoassay test for PAH are considered to be 10 parts per million (µg/g) or less. Results returned from offsite laboratories confirm these findings because all results were in the low part per billion (µg/kg) range. In addition, these analytes may be the result of laboratory contamination.

6.0 CONCLUSIONS

The organic analytes detected were dismissed because of their low concentrations and status as common laboratory contaminants. Inorganic analytes detected by the laboratory were compared to the Hanford Site Background thresholds. Those found to be above Hanford Site Background were compared with MTCA Method B residential levels or, in the case of lead, to the more stringent MTCA Method A levels. Of the analytes that showed levels above detection limits, none indicate contamination.

7.0 REFERENCES

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40 CFR 262, "Standards Applicable to Generators of Hazardous Waste, *Code of Federal Regulations*, as amended.

40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*, as amended.

40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

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40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program," *Code of Federal Regulations*, as amended.

APPENDIX A

MAXIMA AND 95/95 REFERENCE THRESHOLD VALUES FOR HANFORD SITE SOIL BACKGROUND

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APPENDIX A

MAXIMA AND 95/95 REFERENCE THRESHOLDS FOR HANFORD SITE SOIL BACKGROUND[1]

Analyte	Limit of detection	Limit of quantitation	95/95 threshold[2] (mg/kg)	Maximum concentration (mg/kg)	Sample with maximum concentration
Barium	0.87	2.7	175	480	VOLCANIC ASH*
Beryllium	NA	NA	1.8	10	VOLCANIC ASH*
Cadmium	0.24	0.79	NC	11	VOLCANIC ASH*
Copper	2.1	6.2	30	61	VOLCANIC ASH*
Lead	NA	NA	14.9	74.1	TOPSOIL, JUNIPER
Silver	2.1	4.5	2.1	14.6	RANDOM SAMPLES, #6
Zirconium	NA	NA	53	84.8	RANDOM SAMPLES, #10

[1]DOE-RL 1993.
NA = Not available.
NC = Not calculated.
* = Offsite

[2]The 95/95 thresholds values represent the upper 95% confidence interval of the 95th percentile of the distribution. Information on the statistics is provided in the source document (DOE-RL 1993).

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APPENDIX B

WASHINGTON ADMINISTRATIVE CODE
MODEL TOXICS CONTROL ACT
CLEANUP STANDARDS

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APPENDIX B

MODEL TOXICS CONTROL ACT* CLEANUP STANDARDS FOR SPECIFIC ANALYTES

Compound	RfD[a]	Cleanup level[b] (mg/kg)	CPF[a]	Cleanup level[b] (mg/kg)	Carcinogenic classification[a]
Acetone	0.1	8000	NA	NA	D
Chloroform	0.01	800	0.0061	160	B2
Methylene Chloride	0.06	4800	0.0075	130	B2
Perchloroethylene	0.01	800	0.052[c]	19	NA
Toluene	0.2	16000	NA	NA	D
Trichloroethylene	0.006[c]	480	0.011[c]	91	B2[f]
Barium	0.07	5600	NA	NA	NA
Beryllium	0.005	400	4.3	0.23	B2
Cadmium	0.001	40	NA	NA	B1
Copper	0.04[d]	3000	NA	NA	D
Lead	NA	250[e]	NA	NA	B2[f]
Silver	0.005	400	NA	NA	D
Zirconium	NA	NA	NA	NA	NA

NA = not available.

[a] WAC 173-340.
Except where noted, information is taken from the Integrated Risk Information System (IRIS) database, part of the Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland.
RfD = Reference Dose.
CPF = Carcinogenic Potency Factor (Cancer Slope Factor).
A = Human carcinogen.
B = Probable human carcinogen:
B1 indicates limited human evidence;
B2 indicates sufficient evidence in animals and inadequate or no evidence in humans.
D = Not classifiable as to human carcinogenicity.

[b] MTCA Method B Soil Cleanup Levels Calculations:
for noncarcinogens:

$$\textit{Soil Cleanup Level, mg/Kg,} = \frac{RFD \times ABW \times UCF \times HQ}{SIR \times AB1 \times FOC}$$

for carcinogens:

$$\textit{Soil Cleanup Level, mg/Kg,} = \frac{RISK \times ABW \times LIFE \times UCF}{CPF \times SIR \times AB1 \times DUR \times FOC}$$

where:
RfD = Reference Dose (mg/kg/day)
CPF = Carcinogenic Potency Factor (Cancer Slope Factor) (kg-day/mg)
ABW = Average Body Weight (16 kg)
UCF = Unit Conversion Factor ($1.0 \times 10^{+6}$ mg/kg)
SIR = Soil Ingestion Rate (200 mg/day)
AB1 = Gastrointestinal Adsorption Rate (1.0)
FOC = Frequency of Contact (1.0)
HQ = Hazard Quotient (1)
RISK = Acceptable Cancer Risk (1.0×10^{-6})
LIFE = Lifetime (75 years)
DUR = Duration of Exposure (6 years).

[c] Values from the Superfund Technical Support Center, Environmental Protection Agency, Environmental Criteria Assessment Office, Washington, D.C.

[d] Washington State Department of Ecology, Toxics Cleanup Program, Cleanup Levels and Risk Calculation database (CLARC II), July 9, 1993.

[e] Cleanup Level is from MTCA Method A table. No data is available for calculation of MTCA Method B Level.

[f] Federal Register, Volume 55, Number 145, Friday, July 1990, Proposed Rules.

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