0050763

United States Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101

U.S. Department of Energy
Environmental Restoration Disposal Facility
Hanford Site - 200 Area
Benton County, Washington

Amended Record of Decision
Decision Summary and Responsiveness Summary

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DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

U.S. Department of Energy
Environmental Restoration Disposal Facility
Hanford Site - 200 Area
Benton County, Washington

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) Amendment has been developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. Section 9601 et.seq, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300. This ROD Amendment is based on the Administrative Record for the Environmental Restoration Disposal Facility.

The State of Washington concurs with the ROD Amendment.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the operable units on the Hanford Site, if not addressed by implementing the response action selected in the ROD, as amended, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

BACKGROUND AND DESCRIPTION OF THE AMENDMENT TO THE REMEDY

An Explanation of Significant Difference (ESD) (EPA et al. 1996) to the ERDF ROD was issued on July 26, 1996, which authorized the conditional use of the leachate for dust suppression and waste compaction through an Applicable or Relevant and Appropriate Requirement (ARAR) waiver until the leachate is delisted. The ERDF ESD identified the intention to delist the leachate from regulation as a hazardous waste. The waiver was proposed as an alternative until sufficient data became available to support a determination that the liquid is, in fact, a nonhazardous waste. The leachate is considered a listed hazardous waste because a small volume of soil presumed to have contacted carbon tetrachloride (F001 listed (40 CFR § 261.31)) at very low concentrations was disposed to ERDF. Other listed hazardous constituents could be disposed to ERDF in the future, causing the leachate to be listed as F039 (40 CFR § 261.31). The leachate also is designated as a state-only dangerous waste, F003, for the presence of methanol. The purpose of this amendment is to delist both the federal listed and state-only listed waste codes that would otherwise apply to the leachate as Resource Conservation and Recovery Act (RCRA) and Dangerous Waste ARARs under the ROD.

Leachate from the ERDF currently is transported to the Liquid Waste Processing Facility (LWPF) in the 200 East Area of the Hanford Site for treatment and disposal. The Effluent Treatment Facility (ETF), a permitted waste treatment and disposal facility, along with the Liquid Effluent Retention Facility (LERF) are the primary facilities that comprise the LWPF. Wastewaters are held in basins at the LERF prior to transfer for treatment at the ETF. Treatment at ETF significantly reduces or eliminates hazardous and radioactive constituents. Treated wastewaters from the ETF are disposed to the ground. Effluent from the ETF has been the subject of a previous delisting petition approved by the EPA in 1995 (60 FR 6054).

Under 40 CFR §§ 260.20 and 260.22, facilities may petition the EPA to remove their wastes from hazardous waste control by excluding them from the lists of hazardous wastes contained in §§ 261.31 and 261.32. Petitioners must provide sufficient information to the EPA to allow the Agency to determine that the waste to be excluded does not meet any of the criteria under which the waste was listed as a hazardous waste. In addition, the EPA must determine, where there is a reasonable basis to believe that factors (including additional constituents) other than those for which the waste was listed could cause the waste to be a hazardous waste, that such factors do not warrant retaining the waste as a hazardous waste.

In October 1998, the Department of Energy (DOE) submitted the *Environmental Restoration Disposal Facility Leachate Delisting Petition* (the Petition). The Petition describes the history of leachate management at ERDF, the rational for selection of contaminants of concern, and a proposed sampling and analysis plan for the delisting. The Petition also includes an analysis of current and potential contaminants of concern anticipated for waste disposal at the facility. Previous leachate characterization data indicated that constituent concentrations were below delisting levels, which account for some minimal dilution and attenuation (See Table 1), although a few were above actual docket values (*Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions, Submitted under 40 CFR 260.20 and 260.22*, May 1996) which do not account for any dilution or attenuation. These data were not subject to full validation and did not evaluate all of the constituents of concern, and therefore serve only as a preliminary indication of the concentrations of hazardous constituents in the leachate. The first round of sampling, consistent with the delisting sampling and analysis plan attached to this Amendment, was completed in January of 1999 and the validated data package was submitted to EPA. The Agency evaluated the information and the analytical data provided by DOE and determined that the levels of the constituents were well below the delisting levels in Table 1 and that management of the leachate as a non hazardous waste would not adversely affect human health or the environment. The data package may be found in the Administrative Record for ERDF.

The delisting is considered an up-front and conditional delisting for leachate, including leachate that will be generated in the future operations of the facility. The delisting is conditional because the contaminant concentration requirements specified in this amendment and in the sampling and analysis plan attached to this amendment must continue to be satisfied and management of the leachate must comply with the sampling and analysis plan and the leachate management plan, as approved by the EPA.

Exclusion from management as a hazardous waste is conditioned on the leachate meeting the limits

established in this amendment, as demonstrated through a verification sampling program. At a minimum, the leachate shall be sampled for all contaminants of concern (COCs), quarterly, for the first year. The results of these analyses will be compared to the delisting levels provided in Table 1 after each round of sampling. If the leachate achieves compliance with delisting levels, it will be managed as nonhazardous. Those COCs whose analytical results from the first year of baseline sampling indicate that their concentrations are less than 10% of the delisting level will be moved into a less frequent confirmatory sampling regimen. COCs detected at concentrations greater than 10% of the delisting level will be monitored on a routine basis. DOE shall include additional constituents in the routine sampling list after an evaluation of the data, as required by EPA. Additionally, an evaluation of the waste streams going to the ERDF shall be done biannually in accordance with the sampling and analysis plan to assure that the list of COCs adequately addresses contaminants being disposed. Confirmatory sampling for all COCs will take place every two years. Routine sampling will take place every six months.

DECLARATION

Although this ROD Amendment changes components of the remedy selected in the original ROD, the remedy, as modified, continues to be protective of human health and the environment. The remedy, as amended, complies with Federal and state requirements that are legally applicable or relevant and appropriate and is cost effective. The remedy, as amended, utilizes permanent solutions to the maximum extent practicable for this site. Treatment of ERDF leachate at the ETF satisfies the statutory preference for remedies that employ treatment as a principal element for this waste stream.

Treatment of remediation waste will continue to be addressed as part of the individual operable unit decisions. As a consequence, the statutory preference for treatment as a principal element will be addressed in those current and future documents rather than in this ROD. Because hazardous substances will remain on site above health-based levels in the ERDF disposal cells, a review will be conducted at least every five years after the commencement of remedial actions to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature sheet for the Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

James C. Hall
Acting Manager, Richland Operations
United States Department of Energy

3-22-99
Date

Signature sheet for the Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

for Chuck Clarke
Regional Administrator, Region 10
United States Environmental Protection Agency

3-25-99
Date

Signature sheet for the Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Laura A Cusack for Michael Wilson 3/23/99

Michael Wilson Date
Program Manager, Nuclear Waste Program
Washington State Department of Ecology

DECISION SUMMARY

USDOE Environmental Restoration Disposal Facility
Record of Decision Amendment

I. INTRODUCTION

This document presents an Amendment to the Record of Decision (ROD) for the Environmental Restoration Disposal Facility at the Hanford Site.

Site Name and Location

USDOE Hanford Environmental Restoration Disposal Facility
Hanford Site - 200 Area
Benton County, Washington

Lead and Support Agencies

The lead regulatory agency for this action is the U.S. Environmental Protection Agency (EPA). The U.S. Department of Energy (DOE) and the Washington Department of Ecology (Ecology) both concur with the upfront and conditional delisting of the ERDF leachate. The three agencies participated jointly in the decision and preparation of this document.

Statutory Citation for a ROD Amendment

The Environmental Restoration Disposal Facility (ERDF) ROD was signed by the EPA, Ecology, and the DOE in January 1995. In 40 CFR § 300.435(c)(2), the National Contingency Plan provisions are specified for addressing and documenting changes to the selected remedy after issuance of a ROD. An Explanation of Significant Differences (ESD) was issued in August of 1996. This ROD Amendment documents fundamental changes to the remedy set forth in the 1995 ERDF ROD. Public participation and documentation procedures have been followed as specified at 40 CFR § 300.435(c)(2)(ii).

Need for the ROD Amendment

This amendment is necessary because delisting hazardous waste leachate may be a fundamental change to the ERDF ROD regarding the implementation of RCRA. Once delisted, the leachate generated and managed under this ROD will no longer be regarded as a hazardous or dangerous waste under the RCRA and the Washington Administrative Code, WAC 173-303, which are ARARs for this remedy.

Public Involvement

A newspaper notice was placed in the Tri-City Herald on November 1, 1998 announcing the

availability of the proposed amendment and the start of the public comment period. Approximately fourteen hundred copies of a fact sheet describing the amendment proposal were mailed out. A public comment period was held from November 2 through December 1, 1998. No requests were received for a public meeting, therefore, no public meeting was held. The proposed amendment was discussed with the Hanford Advisory Board and the Hanford Advisory Board - Environmental Restoration Committee at meetings in October 1998. The decision to amend the ROD is based on the Administrative Record for the ERDF. Locations where the Administrative Record may be found are listed below.

Administrative Record

Supporting documentation for this amendment is described in the Environmental Restoration Disposal Facility Leachate Delisting Petition, (DOE/RL-98-47). This document can be found in the Administrative Record for the ERDF. This ROD Amendment is based on and will become part of the Administrative Record for the ERDF, as required by 40 CFR § 300.825(a)(2), and will be available to the public at the following locations:

ADMINISTRATIVE RECORD (Contains all project documents)

U.S. Department of Energy - Richland Operations Office
Administrative Record Center
2440 Stevens Center
Richland, Washington 99352

INFORMATION REPOSITORIES (Contain limited documentation)

University of Washington
Suzzallo Library
Government Publications Room
Seattle, Washington 98195

Gonzaga University, Foley Center
E. 502 Boone
Spokane, Washington 99258

Portland State University
Branford Price Millar Library
SW Harrison and Park
Portland, Oregon 97207

DOE Richland Public Reading Room
Washington State University, Tri-Cities
100 Sprout Road, Room 101L
Richland, Washington 99352

II. SITE HISTORY

In 1988, the Hanford Site was scored using the EPA's Hazard Ranking System. As a result of the scoring, the Hanford Site was added to the NPL in July 1989 as four sites (the 1100 Area, the 200 Area, the 300 Area, and the 100 Area). Each of these areas was further divided into operable units (a grouping of individual waste units based primarily on geographic area and common waste sources). These operable units contain contamination in the form of hazardous waste, radioactive/hazardous mixed waste, and other CERCLA hazardous substances.

In anticipation of the NPL listing, DOE, EPA, and Ecology entered into the Hanford Federal Facility Agreement and Consent Order in May 1989. This agreement established a procedural framework and schedule for developing, implementing, and monitoring remedial response actions at Hanford. The agreement also addresses RCRA compliance and permitting.

III. REMEDY SELECTED IN THE ROD

The major components of the selected remedy implemented as a result of the 1995 ERDF ROD include the following:

- Initial construction and operation of the first two disposal cells. These cells are expected to provide an approximate waste disposal capacity of one million yd^3. The cells are designed and constructed to RCRA minimum technological requirements (MTRs) (40 CFR Part 264, Subpart N). The decisions to expand the landfill in the future will be documented by amending the ERDF ROD or as part of the RODs for the Hanford operable units.

- The ERDF site will cover a maximum of 4.1 km^2 (1.6 mi^2) on the Central Plateau, southeast of the 200 West Area and southwest of the 200 East Area. The initial construction of the facility required 165 acres of this area.

- The ERDF facility will provide sufficient leachate storage capacity to ensure uninterrupted operations, and will comply with 40 CFR Part 264, Subpart N. Leachate collected at the landfill will be managed at the 200 Area Effluent Treatment Facility, located in the 200 East Area, or other approved facility.

- Surface water run-on/run-off will be controlled at the landfill and other areas of the facility that are potentially contaminated.

- Air monitoring will be accomplished by placement at ERDF of real-time air monitors for radioactive contaminants and air samplers for hazardous and radioactive constituents to detect any offsite migration of contaminants.

- Groundwater monitoring will be performed in accordance with 40 CFR Part 264, Subpart F.

- Appropriate measures to protect facility workers and the public will continue to be employed during ERDF operations, including contamination control and dust mitigation, and protection of personnel from industrial hazards presented by ERDF operations. Protective measures shall comply with applicable requirements found in the Occupational Safety and Health Act (OSHA), Washington Industrial Safety and Health Act (WISHA), and other safety regulations or ERDF-specific safety requirements. Energy shall also comply with 40 CFR § 300.150.

- Waste acceptance criteria have been developed by DOE and approved by the EPA in accordance with applicable or relevant and appropriate requirements (ARARs),

risk/performance assessments, ERDF-specific safety documentation, and worker protection requirements. Operable unit-specific waste disposal and treatment decisions will continue to be made as part of the remedy selection and cleanup decision process for each operable unit.

- The ERDF landfill will be closed by placing a modified RCRA-compliant closure cover over the waste. The cover will prevent direct exposure to the waste and will include a vegetated surface layer of fine-grained soils to retain moisture and encourage evapo-transpiration, thereby minimizing infiltration and vadose zone transport of contaminants to groundwater. The upper 50 cm (20 in.) of the soil cover system will be composed of an admixture of silt and gravels. This layer is intended to both reduce infiltration through the cover and enhance the resistance of the cover to burrowing animals and long-term wind erosion. The RCRA-compliant cover will be modified by providing a total of approximately 15 feet of cover material to deter intrusion. It is anticipated that additional research into closure covers may result in site-specific enhancements to RCRA-compliant designs. Prior to cover construction, closure cover designs will be evaluated and the most appropriate closure cover design will be selected for construction. Construction of the cover will occur on an incremental basis, as the trench is expanded. The design will, at a minimum, comply with applicable RCRA requirements found at 40 CFR Part 264, Subpart N. Basalt from Hanford Site borrow pits will not be required for construction of the ERDF closure cover.

- Institutional controls shall be imposed to restrict public access to the landfill

- Equipment will be available to transport wastes and operate the ERDF safely.

- Hanford Site infrastructure will be expanded as necessary to support the ERDF. Infrastructure improvements or extensions may include water, sewer, electric power, roads, operations facilities, and a chemical and fuel storage area.

- A decontamination facility will be constructed consisting of, at a minimum, an impervious pad with a sump, wash water storage, and secondary containment. Washwater used to decontaminate site equipment shall be managed in compliance with appropriate requirements.

- The detailed design will be submitted to EPA for approval (with consultation with Ecology) prior to construction of the ERDF facility. At a minimum, it will be submitted in two packages to allow for construction in phases.

- An operations plan will be submitted to the EPA for approval (with consultation with Ecology) prior to operation of the ERDF facility.

- Mitigation measures to reduce ecological impacts have been incorporated to satisfy the Remedial Action Objectives identified in Section 7(4)(i) through 7(4)(v). In addition, DOE commits to the development and implementation of a Mitigation Action Plan in coordination with the Natural Resource Trustees for additional mitigation measures.

The Explanation of Significant Differences to the ERDF ROD, issued in July of 1996, authorized the following changes:

- Any Hanford environmental cleanup waste generated as a result of CERCLA or RCRA cleanup actions (IDW, decontamination and decommissioning wastes, RCRA past-practice wastes) is eligible for disposal provided it meets the ERDF Waste Acceptance Criteria and provided that the appropriate CERCLA decision documents are in place. Additionally, non-process waste (e.g., contaminated soil, debris) generated from closure of inactive RCRA TSD units may be placed in ERDF provided that the units (1) are within the boundaries of a CERCLA or RCRA past-practice operable unit, (2) the closure wastes are sufficiently similar to CERCLA or RCRA past-practice wastes placed in ERDF, (3) the ERDF waste acceptance criteria are satisfied, and (4) the appropriate CERCLA decision documents are in place. Revision of the RCRA Permit and closure plans may be required.

- The ERDF leachate may be collected and stored at the ERDF for use within the trench, as appropriate. Appropriate uses are limited to dust suppression and waste compaction. The leachate must be sampled prior to use to ensure compliance with Land Disposal Restrictions (LDRs), ERDF waste acceptance criteria, and other health-based limits (whichever is more restrictive). Leachate in excess of ERDF recycling capacity or acceptable contaminant levels will be sent to the Effluent Treatment Facility or another approved facility for management.

Changes to the original ROD were addressed in a ROD Amendment issued in September 1997. These changes are explained below.

- **ERDF Expansion.** The ERDF ROD specifies that expansion of the facility would be authorized as-needed through the ROD amendment process. Based on estimated remediation waste volumes presented in the ERDF ROD, additional disposal cells were anticipated. Two additional ERDF cells are being constructed for disposal of Hanford Site remediation waste. Remediation volume estimates in final and planned cleanup decision documents, prepared since the ERDF ROD was issued, supported the need for additional capacity. The Phase II construction is located entirely within the 4.1 km^2 (1.6 mi^2) area selected for ERDF, as defined in the ERDF ROD. The same RCRA design selected for the existing ERDF disposal cells is being used for the Phase II cells.

- **Treatment at ERDF.** The selected remedial alternative in existing 100 and 300 Area waste site remediation RODs is removal, treatment if required, and disposal at ERDF. Treatment is required if the concentration of contaminants in the waste is above land disposal restriction standards found in the Federal and State hazardous waste regulations or above the ERDF waste acceptance criteria. The Amendment provides the option of conducting remediation waste treatment at ERDF instead of the operable unit, prior to disposal. This option does not preclude treatment at the operable units. Treatment at ERDF is limited to stabilization and encapsulation in containers. In addition, all substantive federal and state requirements governing hazardous waste treatment in containers, such as secondary containment, must be met as part of treatment at ERDF. The decision whether to perform remediation waste

treatment, and the specific treatment needed, must be documented as part of the remedy selection and remedial design process for the operable unit or waste site of origination.

IV. DESCRIPTION OF THE MODIFIED REMEDY

Leachate from the ERDF currently is transported to the LWPF in the 200 East Area of the Hanford Site for treatment and disposal. Wastewaters are collected in basins at the LERF prior to treatment in the ETF to eliminate hazardous and radioactive constituents. Treated wastewaters from the ETF are disposed to the ground. Effluent from the ETF has been the subject of a previous delisting petition approved by the EPA in 1995 (60 FR 6054).

Under 40 CFR §§ 260.20 and 260.22, facilities may petition the EPA to remove their wastes from hazardous waste control by excluding them from the lists of hazardous wastes contained in §§ 261.31 and 261.32. Petitioners must provide sufficient information to EPA to allow the Agency to determine that the waste to be excluded does not meet any of the criteria under which the waste was listed as a hazardous waste. In addition, EPA must determine, where there is a reasonable basis to believe that factors (including additional constituents) other than those for which the waste was listed could cause the waste to be a hazardous waste, that such factors do not warrant retaining the waste as a hazardous waste.

In October 1998, the DOE submitted the *Environmental Restoration Disposal Facility Leachate Delisting Petition* (the Petition). The Petition describes the history of leachate management at ERDF, rational for selection of contaminants of concern, and a proposed sampling and analysis plan for the delisting. The Petition also includes an analysis of current and potential contaminants of concern anticipated for waste disposal at the facility. Previous leachate characterization data indicated that constituent concentrations were below delisting levels (See Table 1), which account for some minimal dilution and attenuation, although a few were above actual docket values (See *Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions, Submitted under 40 CFR 260.20 and 260.22*, May 1996), which do not account for any dilution or attenuation. These data were not subject to full validation and did not evaluate all of the constituents of concern, and therefore serve only as a preliminary indication of the concentrations of hazardous constituents in the leachate. The first round of sampling, consistent with the delisting sampling and analysis plan attached to this Amendment, was completed in January of 1999 and the validated data package was submitted to EPA. The EPA evaluated the information and the analytical data provided by DOE and determined that the levels of the constituents were well below the delisting levels in Table 1 and that management of the leachate as a non hazardous waste would not adversely affect human health or the environment. The data package may be found in the Administrative Record for ERDF.

The delisting is an up-front and conditional delisting for leachate, including leachate that will be generated in the future operations of the facility. The delisting is conditional because contaminant concentration requirements specified in this amendment and in the sampling and analysis plan attached to this amendment must continue to be satisfied and management of the leachate must comply with the sampling and analysis plan and the leachate management plan, as approved by the EPA. Ongoing exclusion from management as a hazardous waste is conditioned on compliance with

specified management requirements and on the leachate meeting the limits established in this Amendment, as demonstrated through a verification sampling program.

In order to delist the leachate, it must be demonstrated that the concentrations of hazardous contaminants found in the leachate satisfy the requirement for an exclusion under 40 CFR § 260.22 and do not exceed the criteria for characteristic wastes as defined under 40 CFR Part 261 Subpart C and WAC 173-303-090. In order to confirm that the concentration of hazardous constituents in the leachate continue to be below delisting levels, a sampling and analysis plan supporting the delisting is attached to this ROD Amendment. The plan provides detail regarding sampling frequency and methodology and specified analytical methods. The sampling and analyses shall include comparison of leachate sample results with delisting levels. Delisting levels, in general, are based on the original docket values and health-based limits presented in Table 1. The table lists all of the identified constituents of concern (COCs) for the leachate. The initial list of COCs included the Toxicity Characteristic Analytes from 40 CFR § 261.24, the Appendix VII list of chemicals and compounds from 40 CFR Part 261. These lists of constituents provide the basis for which F001 and F039 are listed. Also included in the initial list were additional analytes from the EPA document entitled *Petitions to Delist Hazardous Wastes, A Guidance Manual,* and the list of analytes presented in the EPA docket list. The list was then compared in a thorough evaluation to regulated compounds that have been previously used and disposed of at Hanford, and revised to include only those potential contaminants. The complete evaluation is included within the Petition. Under the sampling and analysis plan, at a minimum, the leachate shall be sampled for all COCs, quarterly, for the first year. The results of subsequent analyses will be compared to the delisting levels provided in Table 1. If the leachate continues to achieve compliance with delisting levels, it will be managed as nonhazardous. Those COCs whose analytical results from baseline sampling indicate that their concentrations are less than 10% of the delisting level will be moved into a confirmatory sampling regimen. COCs detected at concentrations greater than 10% of the delisting level will be monitored on a routine basis. DOE shall include additional constituents in the routine sampling list after an evaluation of the data, as required by the EPA. Additionally, an evaluation of the waste streams going to the ERDF shall be done biannually, in accordance with the sampling and analysis plan, to assure that the list of COCs adequately addresses contaminants being disposed. Confirmatory sampling for all COCs will take place every two years. Routine sampling will take place every six months.

Over time, it is anticipated that waste compounds will be placed in ERDF that have not been evaluated through previous analysis of leachate. Waste profiles will be evaluated for the presence of compounds that are not on record as contained in ERDF waste biannually, in accordance with the sampling and analysis plan. These compounds will be evaluated against the initial list of COCs to determine if they should be included in future sampling and if they are identified on existing EPA docket lists.

Prior to January 1999, leachate analysis had been conducted primarily to characterize water quality for shipment to ETF. Not all COCs were sampled for this effort. Table 1 lists the maximum detected results for those COCs that were analyzed for in the leachate; if more than one sample showed the presence of a constituent, the highest value is reported.

Table 2 list constituents that are considered COCs in that they were retained through the evaluation of compounds used and disposed of at Hanford. These constituents, however, are not listed in the EPA docket nor are there established ground water quality criteria. The constituents will be sampled quarterly, for the first year, and then will be moved to the confirmatory sampling regimen. At such time that EPA waste docket values are established for these constituents, they will include these in the delisting criteria for this delisting and will be subject to the confirmatory sampling requirements.

Table 1. Environmental Restoration Disposal Facility Leachate Delisting Levels.

CAS#	Constituent	Docket Value [a]	Delisting Level [a]	Maximum Concentration Detected in Leachate [a]
100-41-4	Ethyl benzene	70000	1680000	ND
100-42-5	Styrene	100	2400	ND
100-51-6	Benzyl alcohol	10000	240000	NA
1024-57-3	Heptachlor epoxide	0.2	4.8	NA
105-67-9	2,4-Dimethylphenol	700	16800	ND
106-46-7	1,4-Dichlorobenzene	4	96	ND
106-50-3	p-Phenylenediamine	7000	168000	NA
106-93-4	Ethylene dibromide	0.05	1.2	NA
107-02-8	Acrolein	700	16800	NA
107-05-1	3-Chloropropene	4	96	NA
107-06-2	1,2-Dichloroethane	5	120	ND
107-13-1	Acrylonitrile	0.2	4.8	NA
108-05-4	Acetic acid vinyl ester	40000	960000	NA
108-10-1	4-Methyl-2-pentanone	2000	48000	ND
108-60-1	Bis(2-Chloroisopropyl) ether	1	24	ND
108-88-3	Toluene	1000	24000	2 J
108-90-7	Chlorobenzene	100	2400	ND
108-95-2	Phenol	20000	480000	ND
110-86-1	Pyridine	40	960	NA
111-44-4	Bis(2-chloroethyl) ether	0.08	1.92	ND
117-81-7	Bis(2-ethylhexyl) phthalate	6	144	14
117-84-0	Di-n-octylphthalate	700	16800	ND
120-12-7	Anthracene	10000	240000	ND
120-82-1	1,2,4-Trichlorobenzene	70	1680	ND
120-83-2	2,4-Dichlorophenol	100	2400	ND
122-39-4	N,N-Diphenylamine	900	21600	NA
122-66-7	1,2-Diphenylhydrazine	0.1	2.4	NA
123-91-1	1,4-Dioxane	8	192	NA
124-48-1	Dibromochloromethane	1	24	ND

CAS#	Constituent	Docket Value [a]	Delisting Level [a]	Maximum Concentration Detected in Leachate [a]
126-98-7	2-Methyl-2-propenenitrile	4	96	NA
127-18-4	1,1,2,2-Tetrachloroethene	5	120	ND
129-00-0	Pyrene	1000	24000	TIC
131-11-3	Dimethyl phthalate	400000	9600000	ND
1319-77-3	Cresols, total	2000	48000	ND
1330-20-7	Xylene	10000	240000	ND
1336-36-3	Polychlorinated biphenyls (PCBs)	0.5	12	NA
141-78-6	Acetic acid ethyl ester	30000	720000	NA
14797-55-8	Nitrate	10000	240000	19300
156-59-2	1,2-cis-Dichloroethene	400	9600	NA
156-60-5	1,2-trans-Dichloroethene	700	16800	NA
16984-48-8	Fluoride	4000	96000	1180
193-39-5	Indeno(1,2,3-cd)pyrene	0.21	5.04	ND
205-99-2	Benzo(b)fluoranthene	0.071	1.704	ND
206-44-0	Fluoranthene	1000	24000	TIC
207-08-9	Benzo(k)fluoranthene	25.2	604.8	ND
218-01-9	Chrysene	2.7	64.8	ND
309-00-2	Aldrin	0.005	0.12	ND
319-84-6	alpha-BHC	0.01	0.24	NA
319-85-7	beta-BHC	0.05	1.2	NA
50-00-0	Formaldehyde	7000	168000	NA
50-29-3	4,4-DDT	0.3	7.2	ND
50-32-8	Benzo(a)pyrene	0.2	4.8	ND
51-28-5	2,4-Dinitrophenol	70	1680	ND
53-70-3	Dibenz[a,h]anthracene	0.011	0.264	ND
541-73-1	1,3-Dichlorobenzene	1,890	45360	ND
542-75-6	1,3-Dichloropropene	0.5	12	NA
56-23-5	Carbon tetrachloride	5	120	ND
56-55-3	Benzo(a)anthracene	0.077	1.848	ND
57-12-5	Cyanide	200	4800	NA
58-89-9	gamma-BHC (lindane)	0.2	4.8	ND
59-50-7	4-Chloro-3-methylphenol	1260	30240	ND
60-29-7	Ethyl ether	7000	168000	NA
60-57-1	Dieldrin	0.005	0.12	ND
62-50-0	Ethyl methanesulfonate	0.0003	0.0072	NA
62-53-3	Aniline	10	240	NA
62-75-9	N-Nitroso-N,N-dimethylamine	0.002	0.048	NA
621-64-7	N-Nitroso-di-n-propylamine	0.01	0.24	ND
67-56-1	Methyl alcohol	20000	480000	NA
67-64-1	2-Propanone (acetone)	4000	96000	17 J
67-66-3	Chloroform	100	2400	ND

CAS#	Constituent	Docket Value [a]	Delisting Level [a]	Maximum Concentration Detected in Leachate [a]
67-72-1	Hexachloroethane	6	144	ND
70-30-4	Hexachlorophene	10	240	NA
71-36-3	n-Butyl alcohol	4000	96000	NA
71-43-2	Benzene	5	120	ND
71-55-6	1,1,1-Trichloroethane	200	4800	ND
72-20-8	Endrin	2	48	ND
72-54-8	4,4-DDD	0.4	9.6	ND
72-55-9	4,4-DDE	0.3	7.2	ND
74-83-9	Bromomethane	50	1200	ND
74-87-3	Chloromethane	33.7	808.8	ND
7439-92-1	Lead	15	360	ND
7439-96-5	Manganese	100	2400	17.7
7439-97-6	Mercury	2	48	0.16 J
7440-02-0	Nickel	100	2400	10.2 J
7440-22-4	Silver	200	4800	ND
7440-28-0	Thallium	2	48	ND
7440-31-5	Tin, metal	21000	504000	NA
7440-36-0	Antimony	6	144	ND
7440-38-2	Arsenic	50	1200	32.6
7440-39-3	Barium	2000	48000	63.3 J
7440-41-7	Beryllium	4	96	0.77 J
7440-43-9	Cadmium	5	120	ND
7440-47-3	Chromium	100	2400	13.9
7440-48-4	Cobalt	2100	50400	ND
7440-50-8	Copper	1300	31200	6.4 J
7440-62-2	Vanadium	300	7200	52.9
7440-66-6	Zinc	10000	240000	49.7
75-01-4	1-Chloroethene (vinyl chloride)	2	48	ND
75-05-8	Acetonitrile	200	4800	NA
75-09-2	Dichloromethane (methylene chloride)	5	120	ND
75-15-0	Carbon disulfide	4000	96000	ND
75-25-2	Tribromomethane	100	2400	ND
75-27-4	Bromodichloromethane	1.4	33.6	ND
75-34-3	1,1-Dichloroethane	0.9	21.6	ND
75-35-4	1,1-Dichloroethene	7	168	ND
75-69-4	Trichlorofluoromethane	10000	240000	NA
75-71-8	Dichlorodifluoromethane	7000	168000	NA
76-13-1	1,2,2-Trichlorotrifluoroethane (Freon 113)	1000000	24000000	NA
76-44-8	Heptachlor	0.1	2.4	ND
7782-49-2	Selenium	50	1200	3.1 J
78-59-1	Isophorone	90	2160	ND

CAS#	Constituent	Docket Value [a]	Delisting Level [a]	Maximum Concentration Detected in Leachate [a]
78-83-1	2-Methylpropyl alcohol	10000	240000	NA
78-87-5	1,2-Dichloropropane	5	120	ND
78-93-3	2-Butanone (MEK)	20000	480000	ND
79-00-5	1,1,2-Trichloroethane	5	120	ND
79-01-6	1,1,2-Trichloroethylene	8	192	ND
79-34-5	1,1,2,2-Tetrachloroethane	0.4	9.6	ND
8001-35-2	Toxaphene	3	72	ND
83-32-9	Acenaphthene	2000	48000	ND
84-66-2	Diethyl phthalate	30000	720000	ND
84-74-2	Di-n-butylphthalate	4000	96000	TIC
85-68-7	Butylbenzylphthalate	7000	168000	9 J
86-30-6	N-Nitrosodiphenylamine	20	480	ND
86-73-7	Fluorene	1000	24000	ND
87-68-3	Hexachlorobutadiene	1	24	ND
87-86-5	Pentachlorophenol	0.7	16.8	ND
88-06-2	2,4,6-Trichlorophenol	8	192	ND
91-20-3	Naphthalene	1000	24000	TIC
91-58-7	2-Chloronaphthalene	3000	72000	ND
91-59-8	2-Naphthylamine	0.1	2.4	NA
94-75-7	2,4-D	70	1680	ND
95-50-1	1,2-Dichlorobenzene	600	14400	ND
95-57-8	2-Chlorophenol	200	4800	ND
95-70-5	2,5-Diaminotoluene	96000	2304000	NA
95-95-4	2,4,5-Trichlorophenol	4000	96000	ND
98-82-8	(1-Methylethyl)benzene	1000	24000	NA
98-86-2	Acetophenone	4000	96000	NA
98-95-3	Nitrobenzene	20	480	ND
99-65-0	1,3-Dinitrobenzene	4	96	NA

[a]ALL RESULTS IN µG/L EXCEPT WHERE NOTED.

CAS# = chemical abstract services number
J = estimated value
NA = not analyzed
ND = not detected
TIC = tentatively identified compound

Table 2. Environmental Restoration Disposal Facility Other Constituents of Concern.

CAS#	Constituent	Maximum Concentration Detected in Leachate [A]
100-02-7	4-Nitrophenol	ND
101-55-3	4-Bromophenylphenyl ether	ND
106-99-0	1,3-Butadiene	NA
109-99-9	Tetrahydrofuran (THF - furan indicator)	NA
110-75-8	2-Chloroethyl vinyl ether	NA
111-91-1	Bis(2-Chloroethoxy)methane	ND
126-68-1	O,O,O-Triethyl phosphorothioate	NA
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	NA
134-32-7	alpha-Naphthylamine	NA
14265-44-2	Phosphate	840
14797-65-0	Nitrite	ND
14808-79-8	Sulfate	534000
1634-02-2	Tetrabutylthiuram disulfide	NA
16887-00-6	Chloride	443000
22781-23-3	Bendiocarb	ND
24959-67-9	Bromide	NA
26545-73-3	Dichloropropanol	NA
57-97-6	7,12-Dimethylbenz[a]anthracene	NA
59-89-2	N-Nitrosomorpholine	NA
591-08-2	1-Acetyl-2-thiourea	NA
7429-90-5	Aluminum	213
7439-95-4	Magnesium	65300
7440-21-3	Silicon	NA
75-00-3	Chloroethane	ND
75-70-7	Trichloromethanethiol	NA
7664-41-7	Ammonia	285

[A]ALL RESULTS IN µG/L EXCEPT WHERE NOTED.

CAS# = chemical abstract services number

NA = not analyzed

ND = not detected

In general, the delisting level for a particular constituent contained in the ERDF leachate is set at the lower of (1) the characteristic dangerous waste levels found in the *Washington Administrative Code* (WAC) Section 173-303, for determining the characteristic aspects of the waste, or (2) constituent concentrations provided in the EPA docket multiplied by 24. The docket values were provided to DOE by EPA Region 10 staff and represent health-based values for these specific constituents. The "24 times" factor represents a dilution/attenuation factor (DAF) developed according to the procedures set forth in the Composite Model for Landfills (EPACML), found in

56 FR 33000, July 18, 1991. This DAF is based on waste volume of 3,500,000 gallons per year managed in an unlined surface impoundment, the worst-case management scenario for the leachate. The delisting levels establish values for constituents below which the leachate would satisfy the requirement for an exclusion under 40 CFR § 260.22 and do not exceed the criteria for characteristic wastes as defined under 40 CFR Part 261 Subpart C and WAC 173-303-090. All leachate from the ERDF will continue to be sent to the ETF for treatment.

To date, ERDF has collected approximately 7,571,000 L (2 million gal) of leachate from two disposal cells. Approximately 6,814,000 L (1.8 million gal) of this water has been trucked to the 200 Area LWPF for processing, and 757,100 L (0.2 million gal) were retained in the leachate and washwater storage units, used for dust suppression or waste compaction, or lost to evaporation. After delisting, the DOE intends to utilize a single-walled pipeline for transport of the leachate from ERDF to the LWPF. A flowmeter has been installed at the beginning of the pipeline to measure the volumes of leachate pumped from the ERDF modu-tanks to the LWPF. Another flowmeter has been installed at the LERF end of the pipeline. If DOE chooses to use the single-walled pipeline, then the two meters shall be monitored, in accordance with the leachate management plan, to ensure that a mass balance is maintained, thereby assuring that the potential for major leaks along the pipeline are minimized.

A limited volume of the leachate may be recycled, as appropriate, in the disposal cells. Appropriate uses are limited to dust suppression and waste compaction. The approved operations plan for the ERDF specifies that compaction of the waste must achieve 90% of optimum density. Compaction of the waste is necessary to minimize the potential for subsidence and to support a final surface cover. It may be necessary to add nonhazardous liquid to the waste in order to achieve the required compaction. Use of a nonhazardous liquid for dust suppression is necessary for compliance with the Washington Administrative Code, WAC 246-247, Air Emission standards. The use of delisted leachate solely for dust suppression and waste compaction is not subject to the prohibition on the placement of non hazardous liquids in landfills found at Section 3004(c)(3) of RCRA (See the April 1986 OSWER Directive #9487.01-1A(85) *Restriction on the Placement of Nonhazardous Liquids in Hazardous Waste Landfills*). The ARAR waiver of RCRA 3004(c)(1) regarding use of hazardous waste liquids in a landfill, which was established in the ERDF ESD, is no longer necessary and is revoked. The selected ERDF remedy must comply with the ARAR. The volume of leachate used to suppress dust and compact waste within the landfill must be equal to or less than the minimum volume of water that otherwise would be necessary for these purposes. The ERDF will utilize ETF or some other authorized treatment facility for wastewater exceeding annual operation needs.

If detected concentrations exceed the delisting value for a particular constituent, the results shall be immediately reported to the EPA for a determination concerning the appropriate response action. If a constituent in the leachate exceeds the delisting levels established in this amendment, and the EPA has not adjusted the limit for that constituent, use of the single-walled pipeline shall cease immediately and the DOE/Environmental Restoration Contractor (ERC) will handle the leachate under established, RCRA compliant, management procedures for the leachate, after consultation with the EPA.

A leachate management plan has been submitted to and approved by the EPA as part of the operations plan for the ERDF. This plan ensures that the leachate is managed at the ERDF and transported to the ETF in a manner that is protective of human health and the environment. This plan shall be modified to include the requirements, as specified in this amendment, for operation of the single-walled pipeline system and for actions to be taken should the leachate sampling indicate that delisting levels have been exceeded and submitted to the EPA for approval.

V. EVALUATION OF ALTERNATIVES

The NCP establishes nine criteria for evaluating remedial action alternatives. These criteria are divided into three categories of weighted importance which include: threshold, balancing, and modifying criteria. All remedies must meet the threshold criteria to be considered. The seven balancing and modifying criteria help describe relative differences between the alternatives. A discussion of the original remedy and the modified remedy relative to the nine criteria evaluation is required by CERCLA.

Summary of Alternatives

The key elements of each alternative are described and briefly discussed below.

Alternative 1 – No Action. The no action alternative consists of not delisting the ERDF leachate. Leachate would continue to be managed as a hazardous waste. The waiver which allows use of leachate in the trench for dust suppression would continue.

Alternative 2 – CERCLA Delisting of ERDF Leachate. Delist ERDF leachate under CERCLA to allow more cost-effective and appropriate leachate handling techniques to be implemented.

Evaluation of Alternatives

1. **Overall protection of human health and the environment:** Both alternatives would satisfy the overall protection of human health and the environment criterion.

2. **Compliance with ARARs:** The key ARAR for the facility is the Resource Conservation and Recovery Act - Title 42 USC 6901 et seq., Subtitle C and Washington Administrative Code, WAC 173-303. RCRA and WAC 173-303 regulate the generation, transportation, storage, treatment, and disposal of hazardous waste. Alternative 1 would require an ARAR waiver. Alternative 2 would comply with ARARs.

3. **Long-term effectiveness and permanence:** Both alternatives would satisfy this criterion. However, delisting would enable long-term, effective handling of the leachate as a nonhazardous waste stream.

4. **Reduction of toxicity, mobility, or volume through treatment:** For both alternatives, ERDF leachate would continue to be treated at the ETF to reduce toxicity, mobility, or volume as necessary.

5. **Short-term effectiveness:** Delisting would enable more effective handling of ERDF leachate in the short term. Transportation of leachate to ETF by pipeline is more effective than transport by individual truck.

6. **Implementability:** Management of the leachate as a delisted waste is readily implementable.

7. **Cost:** An overall cost savings is likely to be recognized by delisting the leachate waste stream because it is anticipated that it would not have to be handled and stored as hazardous waste.

8. **State acceptance:** The State of Washington Department of Ecology concurs with the delisting of ERDF leachate.

9. **Community acceptance:** Newspaper notices, a fact sheet, and a proposed plan were issued to support starting public comment on November 2, 1998. Several comments were received during the 30-day public comment period. The comments supported the delisting and are included in the Responsiveness Summary attached to this Amendment.

VI. SELECTED AMENDED REMEDY FOR THE ERDF

The selected remedy modification for the ERDF is to delist the leachate. Delisting the ERDF leachate under CERCLA to allow more cost-effective and appropriate leachate handling techniques to be implemented is considered the best option. A detailed description of the selected amended remedy is found is Section IV (Description of the Modified Remedy) of this Amended Record of Decision for the ERDF. The ARARs for this amended remedy are unchanged from those specified in the 1995 ERDF ROD except that ERDF leachate that is otherwise identified as a hazardous or dangerous waste is delisted for purposes of the ROD pursuant to RCRA and WAC 173-303-910.

VII. STATUTORY DETERMINATIONS

The delisting process is based on the regulations established by the EPA as set out in Title 40, *Code of Federal Regulations* (CFR), Section 260.22 and at WAC 173-303-910.

The EPA and Ecology believe that the amended ROD remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. This remedy utilizes permanent solutions to the maximum extent practicable for this site. Treatment of ERDF leachate at the ETF satisfies the statutory preference for remedies that employ treatment as a principal element for this waste stream.

Treatment of remediation wastes will continue to be addressed as part of the operable unit decisions. As a consequence, the statutory preference for treatment as a principal element will be addressed in those current and future documents rather than in this ROD.

VIII. DOCUMENTATION OF SIGNIFICANT CHANGES

DOE and EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the amended remedy, as originally identified in the Proposed Plan, were necessary.

IX. RESPONSIVENESS SUMMARY

U.S. Department of Energy
Environmental Restoration Disposal Facility
Hanford Site
Benton County, Washington
Amended Record of Decision

Introduction

This responsiveness summary meets the requirements of Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended. The purpose of this responsiveness summary is to summarize and respond to public comments on the proposed amendment for the January 1995 Record of Decision (ROD) for the Hanford Environmental Restoration Disposal Facility. The proposed plan for the Amendment issued on November 2, 1998, was presented for public comment (on the proposed changes to components of the remedy set forth in the January 1995 ROD).

The Tri-Parties announced the issuance of the proposed plan in the community newspaper. A thirty-day comment period was provided for the public to read the proposed plan, review documents in the administrative record, and submit written comments. No request was made for a public meeting, therefore, no meeting was held. The proposed plan discusses the delisting of the ERDF leachate.

Community Involvement

A newspaper notice was placed in the Tri-City Herald on November 1, 1998 announcing the availability of the proposed amendment and the start of the public comment period. Approximately fourteen hundred copies of a fact sheet describing the amendment proposal were mailed out. A public comment period was held from November 2 through December 1, 1998. No requests were received for a public meeting, therefore, no public meeting was held. The proposed amendment was presented to the Hanford Advisory Board (HAB) and the HAB Environmental Restoration Committee in October 1998.

Comments and Responses

The EPA received two written comments and one verbal comment during the public comment period. All comments received supported the delisting of the ERDF leachate as proposed. No specific comments, requiring a detailed response, were submitted.

Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan

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1.0 SAMPLING AND ANALYSIS PLAN

This document provides the sampling and analysis plan (SAP) and sampling objectives for the Environmental Restoration Disposal Facility (ERDF) leachate. Approved handling methods and conditional delisting of the leachate will be based on the requirements of this SAP.

1.1 SAMPLING OBJECTIVES

There are two alternatives for handling the ERDF leachate: store the leachate and reuse it at the ERDF, or convey the leachate to the Liquid Waste Processing Facility (LWPF) for treatment. Authorized alternatives for reuse of the leachate include dust suppression and waste compaction within the trench. These two alternatives will continue as methods to manage the leachate. Whether the leachate is reused or conveyed to the LWPF, sampling is required to determine initial and ongoing compliance with the delisting criteria. Characterization data also will be required for treatment at the Effluent Treatment Facility (ETF). Therefore, the objectives of leachate sampling are as follows:

1. Collect baseline information to determine whether the leachate can be delisted on a compound-by-compound basis.

2. Evaluate the ongoing compliance of the leachate with delisting criteria.

3. Determine the profile for liquid that will be transferred to the LWPF.

The sampling logic for completing these objectives is provided in the *Environmental Restoration Disposal Facility Leachate Delisting Petition* (DOE-RL 1998). The eligibility of the leachate for delisting will be determined through analysis of characterization samples. Routine sampling will provide data to support objectives 2 and 3. The basic premise of the sampling logic is that all contaminants of concern (COC) are placed into one of two groups: those that will be monitored on a confirmatory basis, and those that will be monitored on a routine basis.

1.2 ANALYTICAL DESIGN

The organic and inorganic COC list for characterization includes the following:

- Regulated compounds previously detected in the leachate
- Compounds not found in the leachate but determined to require additional monitoring
- The list of compounds and test parameters derived in the delisting petition (DOE-RL 1998).

Characterization sampling has taken place to establish the baseline constituent values for the leachate. The list of initial COCs that will be evaluated for delisting and the analytical results are presented in Table 1.

Table 1. Initial Baseline Organic and Inorganic Contaminants of Concern. (6 sheets)

CAS#	Constituent	SW-846 Method	Alternate Analytical Method
100-02-7	4-Nitrophenol	8270C	
100-41-4	Ethyl benzene	8260B	
100-42-5	Styrene	8260B	
100-51-6	Benzyl alcohol	8270C	
101-55-3	4-Bromophenylphenyl ether	8270C	
1024-57-3	Heptachlor epoxide	8081A	
105-67-9	2,4-Dimethylphenol	8270C	
106-46-7	1,4-Dichlorobenzene	8270C	
106-50-3	p-Phenylenediamine	8270C	
106-93-4	Ethylene dibromide	8260B	
106-99-0	1,3-Butadiene		8260B
107-02-8	Acrolein	8260B	
107-05-1	3-Chloropropene (allyl chloride)	8260B	
107-06-2	1,2-Dichloroethane	8260B	
107-13-1	Acrylonitrile	8260B	
108-05-4	Acetic acid vinyl ester (vinyl acetate)	8260B	
108-10-1	4-Methyl-2-pentanone (MIBK)	8260B	
108-60-1	Bis(2-Chloroisopropyl) ether	8270C	
108-88-3	Toluene	8260B	
108-90-7	Chlorobenzene	8260B	
108-95-2	Phenol	8270C	
109-99-9	Tetrahydrofuran (THF – furan indicator)		8270C
110-75-8	2-Chloroethyl vinyl ether	8260B	
110-86-1	Pyridine	8270C	
111-44-4	Bis(2-chloroethyl) ether	8270C	
111-91-1	Bis(2-Chloroethoxy)methane	8270C	
117-81-7	Bis(2-ethylhexyl) phthalate	8270C	
117-84-0	Di-n-octylphthalate	8270C	
120-12-7	Anthracene	8270C or 8310	
120-82-1	1,2,4-Trichlorobenzene	8270C	
120-83-2	2,4-Dichlorophenol	8270C	
122-39-4	N,N-Diphenylamine	8270C	

Table 1. Initial Baseline Organic and Inorganic Contaminants of Concern. (6 sheets)

CAS#	Constituent	SW-846 Method	Alternate Analytical Method
122-66-7	1,2-Diphenylhydrazine	8270C	
123-91-1	1,4-Dioxane	8270C	
124-48-1	Dibromochloromethane	8260B	
126-68-1	O,O,O-Triethyl phosphorothioate	8270C	
126-98-7	2-Methyl-2-propenenitrile (methacrylonitrile)	8260B or 8310	
127-18-4	1,1,2,2-Tetrachloroethene	8260B	
129-00-0	Pyrene	8270C or 8310	
131-11-3	Dimethyl phthalate	8270C	
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	8270C	
1319-77-3	Cresols, total	8270C	
1330-20-7	Xylene	8260B	
1336-36-3	Polychlorinated biphenyls (PCBs)	8082	
134-32-7	alpha-Naphthylamine	8270C	
141-78-6	Acetic acid ethyl ester (ethyl acetate)	8260B	
14265-44-2	Phosphate	9056 or 300.0 or 365.2	
14797-55-8	Nitrate	9056 or 300.0	
14797-65-0	Nitrite	9056 or 300.0	
14808-79-8	Sulfate	9056 or 300.0	
156-59-2	1,2-cis-Dichloroethene		8260B
156-60-5	1,2-trans-Dichloroethene	8260B	
1634-02-2	Tetrabutylthiuram disulfide		9030B or 376.1
16887-00-6	Chloride	9056	
16984-48-8	Fluoride	9056 or 300.0	
193-39-5	Indeno(1,2,3-cd)pyrene	8270Cor 8310	
205-99-2	Benzo(b)fluoranthene	8270C	8310
206-44-0	Fluoranthene	8270C or 8310	
207-08-9	Benzo(k)fluoranthene	8270C or 8310	
218-01-9	Chrysene	8270C or 8310	
22781-23-3	Bendiocarb	8318	
24959-67-9	Bromide[a]	9056 or 300.0	

Table 1. Initial Baseline Organic and Inorganic Contaminants of Concern. (6 sheets)

CAS#	Constituent	SW-846 Method	Alternate Analytical Method
26545-73-3	Dichloropropanol		8260B
309-00-2	Aldrin	8081A	
319-84-6	Alpha-BHC	8081A	
319-85-7	Beta-BHC	8081A	
50-00-0	Formaldehyde	8315A	6252B
50-29-3	4,4-DDT	8081A	
50-32-8	Benzo(a)pyrene	8270C or 8310	8310
51-28-5	2,4-Dinitrophenol	8270C	
53-70-3	Dibenz[a,h]anthracene	8270C	8310
541-73-1	1,3-Dichlorobenzene	8270C	
542-75-6	1,3-Dichloropropene	8260B	
56-23-5	Carbon tetrachloride	8260B	
56-55-3	Benzo(a)anthracene	8270C	8310
57-12-5	Cyanide	9010B	
57-97-6	7,12-Dimethylbenz[a]anthracene	8270C	
58-89-9	Gamma-BHC (lindane)	8081A	
59-50-7	4-Chloro-3-methylphenol	8270C	
59-89-2	N-Nitrosomorpholine	8270C	
591-08-2	1-Acetyl-2-thiourea	8270C	
60-29-7	Ethyl ether	8260B	
60-57-1	Dieldrin	8081A	
62-50-0	Ethyl methanesulfonate	8270C	
62-53-3	Aniline	8270C	
62-75-9	N-Nitroso-N,N-dimethylamine	8270C	8070A
621-64-7	N-Nitroso-di-n-propylamine	8270C	8070A
67-56-1	Methyl alcohol	8015	
67-64-1	2-Propanone (acetone)	8260B	
67-66-3	Chloroform	8260B	
67-72-1	Hexachloroethane	8270C	
70-30-4	Hexachlorophene	8270C	
71-36-3	n-Butyl alcohol	8260B	
71-43-2	Benzene	8260B	

Table 1. Initial Baseline Organic and Inorganic Contaminants of Concern. (6 sheets)

CAS#	Constituent	SW-846 Method	Alternate Analytical Method
71-55-6	1,1,1-Trichloroethane	8260B	
72-20-8	Endrin	8081A	
72-54-8	4,4-DDD	8081A	
72-55-9	4,4-DDE	8081A	
74-83-9	Bromomethane	8260B	
74-87-3	Chloromethane	8260B	
7429-90-5	Aluminum	6010B	
7439-92-1	Lead	6010B	
7439-95-4	Magnesium[a]	6010B	
7439-96-5	Manganese	6010B	
7439-97-6	Mercury	7470A	
7440-02-0	Nickel	6010B	
7440-21-3	Silicon[a]	6010B	
7440-22-4	Silver	6010B	
7440-28-0	Thallium	6010B	
7440-31-5	Tin	6010B	
7440-36-0	Antimony	6010B	
7440-38-2	Arsenic	6010B	
7440-39-3	Barium	6010B	
7440-41-7	Beryllium	6010B	
7440-43-9	Cadmium	6010B	
7440-47-3	Chromium	6010B	
7440-48-4	Cobalt	6010B	
7440-50-8	Copper	6010B	
7440-62-2	Vanadium	6010B	
7440-66-6	Zinc	6010B	
75-00-3	Chloroethane	8260B	
75-01-4	1-Chloroethene (vinyl chloride)	8260B	
75-05-8	Acetonitrile	8260B	
75-09-2	Dichloromethane (methylene chloride)	8260B	
75-15-0	Carbon disulfide	8260B	
75-25-2	Tribromomethane (bromoform)	8260B	

Table 1. Initial Baseline Organic and Inorganic Contaminants of Concern. (6 sheets)

CAS#	Constituent	SW-846 Method	Alternate Analytical Method
75-27-4	Bromodichloromethane	8260B	
75-34-3	1,1-Dichloroethane	8260B	
75-35-4	1,1-Dichloroethene	8260B	
75-69-4	Trichlorofluoromethane	8260B	
75-70-7	Trichloromethanethiol		8260B [b]
75-71-8	Dichlorodifluoromethane	8260B	
76-13-1	1,2,2-Trichlorotrifluoroethane (Freon 113)	8260B	
76-44-8	Heptachlor	8081A	
7664-41-7	Ammonia		350.1/350.3
7782-49-2	Selenium	6010B	
78-59-1	Isophorone	8270C	
78-83-1	2-Methylpropyl alcohol (isobutyl alcohol)	8260B	
78-87-5	1,2-Dichloropropane	8260B	
78-93-3	2-Butanone (MEK)	8260B	
79-00-5	1,1,2-Trichloroethane	8260B	
79-01-6	1,1,2-Trichloroethylene	8260B	
79-34-5	1,1,2,2-Tetrachloroethane	8260B	
8001-35-2	Toxaphene	8081A	
83-32-9	Acenaphthene	8270C or 8310	
84-66-2	Diethyl phthalate	8270C	
84-74-2	Di-n-butylphthalate	8270C	
85-68-7	Butylbenzylphthalate	8270C	
86-30-6	N-Nitrosodiphenylamine	8270C	
86-73-7	Fluorene	8270C or 8310	
87-68-3	Hexachlorobutadiene	8270C	
87-86-5	Pentachlorophenol	8270C	
88-06-2	2,4,6-Trichlorophenol	8270C	
91-20-3	Naphthalene	8270C or 8310	
91-58-7	2-Chloronaphthalene	8270C	
91-59-8	2-Naphthylamine	8270C	
94-75-7	2,4-D	8151A	
95-50-1	1,2-Dichlorobenzene	8270C	

Table 1. Initial Baseline Organic and Inorganic Contaminants of Concern. (6 sheets)

CAS#	Constituent	SW-846 Method	Alternate Analytical Method
95-57-8	2-Chlorophenol	8270C	
95-70-5	2,5-Diaminotoluene		8270C
95-95-4	2,4,5-Trichlorophenol	8270C	
98-82-8	(1-Methylethyl)benzene	8260B	
98-86-2	Acetophenone	8270C	
98-95-3	Nitrobenzene	8270C	
99-65-0	1,3-Dinitrobenzene	8270C	

[a]Analyte evaluated for Liquid Waste Processing Facility (LWPF) waste acceptance purposes (FDNW 1998) and not as part of delisting assessment.

[b]Analyte will be reported as a tentatively identified compound (TIC).

CAS# = chemical abstract service number

Because the previous sampling did not provide a full characterization profile of the leachate, the baseline characterization sampling program will provide a thorough quarterly analysis of the leachate over a 1-year period. The first round of sampling to fully profile the leachate for delisting has taken place. The results of this analysis were compared to the delisting levels provided in Table 2 and it was determined that delisting could proceed.

Those COCs whose analytical results from baseline sampling indicate that their concentrations are below 10% of the delisting level will be moved into a confirmatory sampling regimen. COCs detected at concentrations greater than 10% of the delisting level may be monitored on a routine basis at the discretion of the U.S. Environmental Protection Agency (EPA). COCs that are not detected above 10% of the delisting level are considered to be below regulatory concern. Confirmatory sampling will take place every 2 years, and routine sampling will take place every 6 months after the first year.

A determination as to delisting has been made by the EPA based on the results of the initial characterization sampling. Since the results of the initial analyses indicate that the COCs do not exceed the delisting levels, the U.S. Department of Energy (DOE) will manage the leachate as a nonhazardous waste. Characterization sampling will continue for 1 year to establish baseline analyte concentrations for the leachate. This sampling will consist of quarterly sampling for all of the analytes listed in Table 1. In addition, samples may be collected in the midpoint of every quarter for the routine sample analytes reported at greater than 10% of the delisting level in the initial sample results at the EPA's discretion.

Table 2. ERDF Delisting Levels and Comparison to Baseline Analytical Results. (5 sheets)

CAS #	Constituent	Delisting Level[a]	Primary Sample[b]	Duplicate Sample[b]
100-25-4	1,4-Dinitrobenzene	240	10 U	10 U
100-41-4	Ethyl benzene	1680000	5 U	5 U
100-42-5	Styrene	2400	5 U	5 U
100-51-6	Benzyl alcohol	240000	10 U	10 U
1024-57-3	Heptachlor Epoxide	4.8	.05 U	.05 U
105-67-9	2,4-Dimethylphenol	16800	10 U	10 U
106-46-7	1,4-Dichlorobenzene	96	10 UJ	10 UJ
106-50-3	p-Phenylenediamine	168000	10 U	10 U
106-93-4	Ethylene dibromide	1.2	10 U	10 U
107-02-8	Acrolein	16800	20 U	20 U
107-05-1	3-Chloropropene (Allyl chloride)	96	10 U	10 U
107-06-2	1,2-Dichloroethane	120	5 U	5 U
107-13-1	Acrylonitrile	4.8	5 U	5 U
108-05-4	Acetic acid vinyl ester (Vinyl acetate)	960000	10 U	10 U
108-10-1	4-Methyl-2-pentanone (MIBK)	48000	10 U	10 U
108-60-1	Bis(2-Chloroisopropyl) ether	24	10 U	10 U
108-88-3	Toluene	24000	5 U	5 U
108-90-7	Chlorobenzene	2400	5 U	5 U
108-95-2	Phenol	480000	10 U	10 U
110-86-1	Pyridine	960	10 U	10 U
111-44-4	Bis(2-chloroethyl) ether	1.92	10 U	10 U
117-81-7	Bis(2-ethylhexyl) phthalate	144	10 U	10 U
117-84-0	Di-n-octylphthalate	16800	10 U	10 U
120-12-7	Anthracene	240000	10 U	10 U
120-82-1	1,2,4-Trichlorobenzene	1680	10 UJ	10 UJ
120-83-2	2,4-Dichlorophenol	2400	10 U	10 U
122-39-4	N,N-Diphenylamine	21600	10 U	10 U
122-66-7	1,2-Diphenylhydrazine	2.4	10 U	10 U
123-91-1	1,4-Dioxane	192	10 U	10 U
124-48-1	Dibromochloromethane	24	5 U	5 U
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	96	10 U	10 U

Table 2. ERDF Delisting Levels and Comparison to Baseline Analytical Results. (5 sheets)

CAS #	Constituent	Delisting Level[a]	Primary Sample[b]	Duplicate Sample[b]
127-18-4	1,1,2,2-Tetrachloroethene	120	5 U	5 U
129-00-0	Pyrene	24000	10 U	10 U
131-11-3	Dimethyl phthalate	9600000	10 U	10 U
1319-77-3	Cresols, total	48000	10U	10U
1330-20-7	Xylene	240000	5 U	5 U
1336-36-3	Polychlorinated biphenyls (PCBs)	12	2U	2U
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	720000	10 U	10 U
14797-55-8	Nitrate	240000	130000 J	120000 J
156-59-2	1,2-cis-Dichloroethene	9600	5 U	5 U
156-60-5	1,2-trans-Dichloroethene	16800	5 U	5 U
16984-48-8	Fluoride	96000	1400	1500
193-39-5	Indeno(1,2,3-cd)pyrene	5.04	.44 U	.44 U
205-99-2	Benzo(b)fluoranthene	1.704	.18 U	.18 U
206-44-0	Fluoranthene	24000	10 U	10 U
207-08-9	Benzo(k)fluoranthene	604.8	.17 U	.17 U
218-01-9	Chrysene	64.8	1.5 U	1.5 U
309-00-2	Aldrin	0.12	.05 U	.05 U
319-84-6	alpha-BHC	0.24	.05 U	.05 U
319-85-7	beta-BHC	1.2	.05 U	.05 U
50-00-0	Formaldehyde	168000	12 UJ	12 UJ
50-29-3	4,4-DDT	7.2	.1 U	.1 U
50-32-8	Benzo(a)pyrene	4.8	.23 U	.23 U
51-28-5	2,4-Dinitrophenol	1680	25 U	25 U
53-70-3	Dibenz[a,h]anthracene	0.264	.31 U	.31 U
541-73-1	1,3-Dichlorobenzene	45360	10 UJ	10 UJ
542-75-6	1,3-Dichloropropene	12	5U	5U
56-23-5	Carbon tetrachloride	120	5 U	5 U
56-55-3	Benzo(a)anthracene	1.848	.13 U	.13 U
57-12-5	Cyanide	4800	5 U	10 U
58-89-9	Gamma-BHC (lindane)	4.8	.05 U	.05 U
59-50-7	4-Chloro-3-methylphenol	30240	10 U	10 U

Table 2. ERDF Delisting Levels and Comparison to Baseline Analytical Results. (5 sheets)

CAS #	Constituent	Delisting Level[a]	Primary Sample[b]	Duplicate Sample[b]
60-29-7	Ethyl ether	168000	10 U	10 U
60-57-1	Dieldrin	0.12	.1 U	.1 U
621-64-7	N-Nitroso-di-n-propylamine	0.24	10 U	10 U
62-50-0	Ethyl methanesulfonate	0.0072	10 U	10 U
62-53-3	Aniline	240	10 U	10 U
62-75-9	N-Nitroso-N,N-dimethylamine	0.048	10 U	10 U
67-56-1	Methyl alcohol	480000	6500 UJ	6500 UJ
67-64-1	2-Propanone (Acetone)	96000	10 U	10 U
67-66-3	Chloroform	2400	5 U	5 U
67-72-1	Hexachloroethane	144	10 UJ	10 UJ
70-30-4	Hexachlorophene	240	100 U	100 U
71-36-3	n-Butyl alcohol	96000	250 U	250 U
71-43-2	Benzene	120	5 U	5 U
71-55-6	1,1,1-Trichloroethane	4800	5 U	5 U
72-20-8	Endrin	48	.1 U	.1 U
72-54-8	4,4-DDD	9.6	.1 U	.1 U
72-54-8	4,4-DDE	7.2	.1 U	.1 U
7439-92-1	Lead	360	1.8 U	1.8 U
7439-96-5	Manganese	2400	.2 U	.2 U
7439-97-6	Mercury	48	.1 U	.1 U
7440-02-0	Nickel	2400	6.3 B	6.1 B
7440-22-4	Silver	4800	.9 U	.9 U
7440-28-0	Thallium	48	4 B	3.7 U
7440-31-5	Tin	504000	2.7 U	2.7 U
7440-36-0	Antimony	144	2.3 U	2.3 U
7440-38-2	Arsenic	1200	14.9	14.4
7440-39-3	Barium	48000	64.6 B	64.2 B
7440-41-7	Beryllium	96	.12 U	.16 U
7440-43-9	Cadmium	120	.4 U	.4 U
7440-47-3	Chromium	2400	14.1	15.7
7440-48-4	Cobalt	50400	.6 U	.6 U

Table 2. ERDF Delisting Levels and Comparison to Baseline Analytical Results. (5 sheets)

CAS #	Constituent	Delisting Level[a]	Primary Sample[b]	Duplicate Sample[b]
7440-50-8	Copper	31200	6.4 U	6.7 U
7440-62-2	Vanadium	7200	25.9 B	26.3 B
7440-66-6	Zinc	240000	1 U	.8 U
74-83-9	Bromomethane	1200	10 U	10 U
74-87-3	Chloromethane	808.8	10 U	10 U
75-01-4	1-Chloroethene (Vinyl Chloride)	48	10 U	10 U
75-05-8	Acetonitrile	4800	20 U	20 U
75-09-2	Dichloromethane (Methylene Chloride)	120	3 BJ	2 BJ
75-15-0	Carbon disulfide	96000	5 U	5 U
75-25-2	Tribromomethane (Bromoform)	2400	5 U	5 U
75-27-4	Bromodichloromethane	33.6	5 U	5 U
75-34-3	1,1-Dichloroethane	21.6	5 U	5 U
75-35-4	1,1-Dichloroethene	168	5 U	5 U
75-69-4	Trichlorofluoromethane	240000	5 U	5 U
75-71-8	Dichlorodifluoromethane	168000	10 U	10 U
76-13-1	1,2,2-Trichlorotrifluoroethane (Freon 113)	24000000	10 U	10 U
76-44-8	Heptachlor	2.4	.05 U	.05 U
7782-49-2	Selenium	1200	3.6 U	3.6 U
78-59-1	Isophorone	2160	10 U	10 U
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	240000	100 U	100 U
78-87-5	1,2-Dichloropropane	120	5 U	5 U
78-93-3	2-Butanone (MEK)	480000	10 U	10 U
79-00-5	1,1,2-Trichloroethane	120	5 U	5 U
79-01-6	1,1,2-Trichloroethylene	192	5 U	5 U
79-34-5	1,1,2,2-Tetrachloroethane	9.6	5 U	5 U
8001-35-2	Toxaphene	72	5 U	5 U
83-32-9	Acenaphthene	48000	10 U	10 U
84-66-2	Diethyl phthalate	720000	10 U	10 U
84-74-2	Di-n-butylphthalate	96000	.5 J	.5 J
85-68-7	Butylbenzylphthalate	168000	10 U	10 U
86-30-6	N-Nitrosodiphenylamine	480	10 U	10 U

Table 2. ERDF Delisting Levels and Comparison to Baseline Analytical Results. (5 sheets)

CAS #	Constituent	Delisting Level[a]	Primary Sample[b]	Duplicate Sample[b]
86-73-7	Fluorene	24000	10 U	10 U
87-68-3	Hexachlorobutadiene	24	10 UJ	10 UJ
87-86-5	Pentachlorophenol	16.8	25 U	25 U
88-06-2	2,4,6-Trichlorophenol	192	10 U	10 U
91-20-3	Naphthalene	24000	10 U	10 U
91-58-7	2-Chloronaphthalene	72000	10 UJ	10 UJ
91-59-8	2-Naphthylamine	2.4	10 U	10 U
94-75-7	2,4-D	1680	1 U	1 U
95-50-1	1,2-Dichlorobenzene	14400	10 UJ	10 UJ
95-57-8	2-Chlorophenol	4800	10 U	10 U
95-70-5	2,5-Diamintoluene	230400	ND	ND
95-95-4	2,4,5-Trichlorophenol	96000	25 U	25 U
98-82-9	(1-Methylethyl)benzene	24000	ND	ND
98-86-2	Acetophenone	96000	10 U	10 U
98-95-3	Nitrobenzene	480	10 U	10 U
99-65-0	1,3-Dinitrobenzene	96	10 U	10 U

[a]Delisting level = 24 times the docket value.
[b]Sampling event of January 12, 1999. All values reported in µg/L.
B = qualifier denotes the analyte was detected in the associated quality control (QC) blank and in the sample
CAS# = chemical abstract number
J = qualifier denotes estimated value
ND = not detected
U = qualifier denotes not detected

After the first year, sample collection and analysis will move into the routine sampling program. Routine sampling will take place every 6 months. At the direction of the EPA, analyses will be conducted for all COCs identified in the characterization samples at levels greater than 10% of the delisting level. Analyses will also be performed for physical parameters and other constituents required by the ETF. Every 2 years, samples will be analyzed for the full suite of COCs identified in Table 1 unless otherwise agreed to by the DOE and EPA.

Several constituents identified as potentially being used on the Hanford Site have neither a docket value nor applicable health-based exposure limit. These constituents are listed in Table 3. If any of the chemicals listed in the table are detected in the leachate, further assessment will be done by the DOE and EPA to determine if further action needs to be taken.

Table 3. Potential Contaminants With No Delisting Levels.

CAS#	Constituent	Concentration Detected in Leachate [a]
100-02-7	4-Nitrophenol	25 U
101-55-3	4-Bromophenylphenyl ether	10 U
106-99-0	1,3-Butadiene	ND
109-99-9	Tetrahydrofuran (THF – furan indicator)	ND
110-75-8	2-Chloroethyl vinyl ether	10 U
111-91-1	Bis(2-Chloroethoxy)methane	10 U
126-68-1	O,O,O-Triethyl phosphorothioate	NA
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	ND
134-32-7	alpha-Naphthylamine	10 U
14265-44-2	Phosphate	0.12
14797-65-0	Nitrite	5000 UR
14808-79-8	Sulfate	338000
1634-02-2	Tetrabutylthiuram disulfide	--
16887-00-6	Chloride	443000
22781-23-3	Bendiocarb	NA
24959-67-9	Bromide	2800
26545-73-3	Dichloropropanol	ND
57-97-6	7,12-Dimethylbenz[a]anthracene	10 U
59-89-2	N-Nitrosomorpholine	10 U
591-08-2	1-Acetyl-2-thiourea	ND
7429-90-5	Aluminum	21.5 U
7439-95-4	Magnesium	47800
7440-21-3	Silicon	17000 J
75-00-3	Chloroethane	10 U
75-70-7	Trichloromethanethiol	ND
7664-41-7	Ammonia	100 U

[a]All results in µg/L except where noted.

CAS# = chemical abstract services number
J = qualifier denotes estimated value
NA = not analyzed
ND = not detected
R = result unusable
U = qualifier denotes not detected

1.2.1 Non-Delisting-Related Test Parameters

Physical parameters, radionuclides, and some inorganic constituents will be tested that do not relate to delisting of the leachate. The LWPF requires certain physical testing of incoming effluent per the facility's acceptance criteria (FDNW 1998). The following analyses are added to the test list for the general water quality information to support characterization requirements for the ETF:

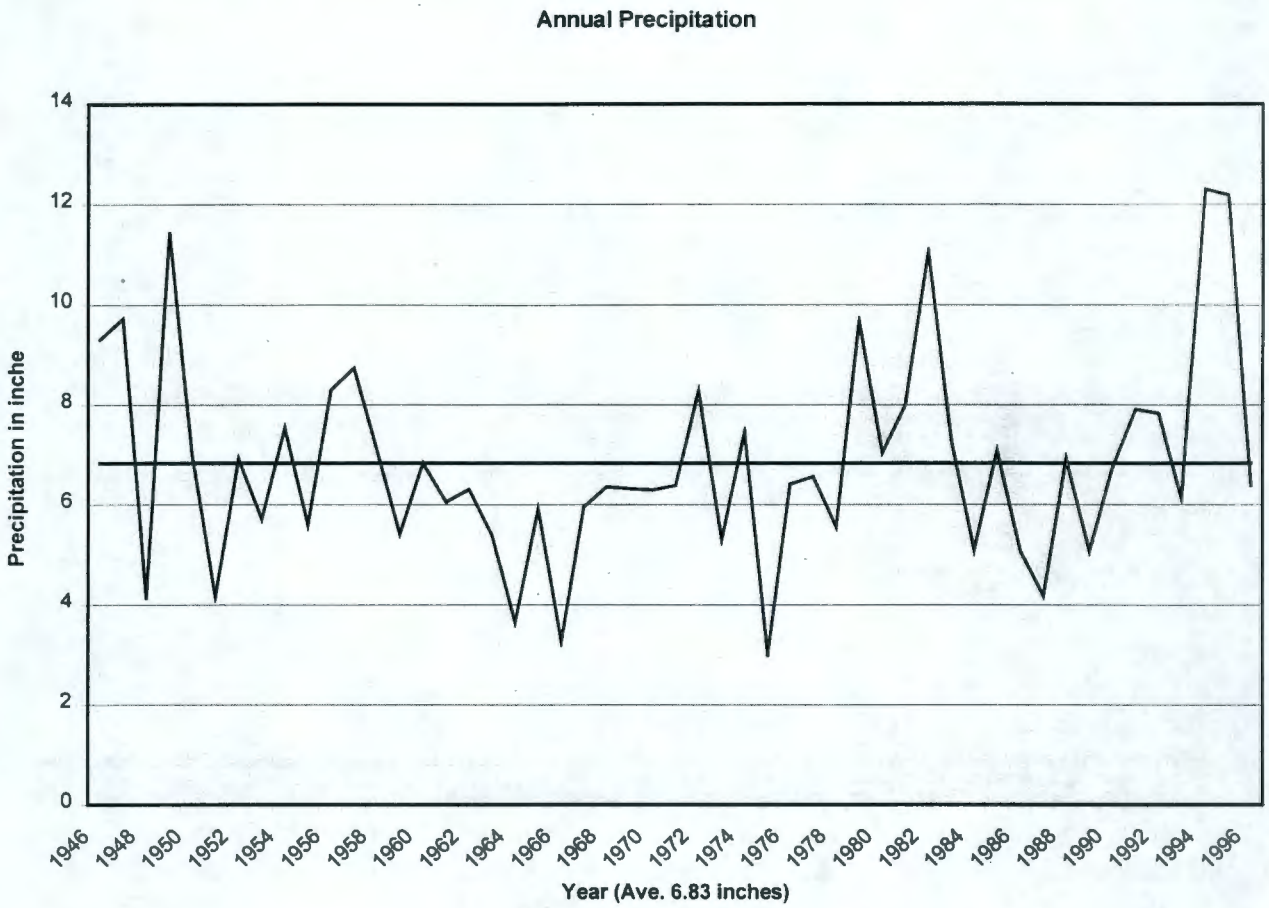
- pH
- Specific conductance
- Total dissolved solids
- Total organic carbon
- Total suspended solids
- Oil and grease
- Gross alpha
- Gross beta
- Gamma scan
- Potassium
- Calcium
- Sodium.

1.2.2 Rationale

Several factors may contribute to the variability of leachate analytical results and should be considered when determining the frequency of sample collection. Factors that may affect chemical, physical, and biological processes occurring within the facility include seasonal variations, waste stream, configuration of ERDF, and operational changes that may occur over time. Seasonal variations in temperature and precipitation may affect the composition of the leachate.

Seasonal and annual climate changes can significantly affect the volume of leachate generated at the ERDF. Beginning in July 1996, ERDF generated approximately 6,435,180 L (1.7 million gal) of leachate from disposal cell 1. During the second year of operation beginning in July 1997, ERDF generated approximately 1,514,160 L (0.4 million gal) of leachate from the combined operation of cells 1 and 2. The large difference in leachate generation between the two years is primarily a result of differences in precipitation and the amount of waste in the cells. The yearly total precipitation for the 1996-1997 operation was 28.9 cm (11.4 in.); for 1997-1998 the total was approximately 16.3 cm (6.4 in.). For comparison, the average annual precipitation from 1947 through 1997 has been 17.34 cm (6.83 in.). Figure 1 illustrates the average precipitation values at the Hanford Site for the past 50 years. Based on average precipitation, ERDF would be expected to collect from 757,080 to 1,135,620 L (0.2 to 0.3 million gal) of leachate per operating disposal cell per year, with a maximum annual leachate generation rate approaching 13,248,900 L (3.5 million gal). ERDF is expected to have up to three disposal cells operating at one time after an expansion, which could generate 2,271,240 to 3,406,860 L (0.6 to 0.9 million gal) annually during years of average precipitation. However, the leachate generated could be substantially more during years of high precipitation, as experienced in 1995 and 1996 (31.3 and 30.9 cm [12.31 and 12.19 in.], respectively). Leachate generation is enhanced when there is little waste in the cell, because the waste serves to retard the infiltration. Smaller volumes of waste in a cell results in faster conversion of precipitation to leachate, due to shorter travel time through the soil column. Smaller volumes also result in less surface contact of pore water with wastes and, therefore, less potential for contamination in leachate. Should leachate volume approach the maximum on an annual basis, the appropriate action will evaluated in coordination with EPA.

Figure 1. Hanford Site Annual Precipitation Values, 1946-1997.



The "wet" season at the Hanford Site typically occurs between November and February, which also generally corresponds to the coldest months of the year. June through September are typically the driest months, which correspond to the warmest weather months. The proposed sampling program is expected to be capable of characterizing any seasonal variations. If experience shows that only limited volumes of leachate are generated or shipped in dry months, the sampling program will be evaluated to consider grab samples for this time period.

The ERDF Record of Decision (ROD) (EPA 1995b) authorizes the construction of two disposal cells; a ROD amendment (DOE-RL 1997) authorizes the construction of two additional cells. As new cells are constructed and full cells are capped, the volume and composition of the leachate may be affected by variations in the waste matrices exposed to precipitation (i.e., waste within a capped cell may not generate as much leachate, and a cell that is open but not receiving waste will generate "cleaner" leachate than a cell actively receiving waste). It is difficult to determine the effects on the leachate of a different configuration of the facility; however, the proposed sampling is expected to be frequent enough to identify any changes that may be attributed to variations in open cells. In addition, mixing within the leachate storage units provide a buffer that reduces the variability associated with leachate from different cells. Therefore, additional sampling is not proposed when the configuration of the facility changes.

The final factor considered for its effects on the leachate is operational changes at the ERDF. Such changes may include the amount of liquid used for dust suppression and compaction, and opening a new cell for waste placement. Removal of the floating covers from the storage units or redesign of the leachate storage facility could result in higher evaporation rates, concentrating some COCs in the leachate. The proposed sampling plan will accommodate this variability.

ERDF may accept waste from different areas within the Hanford Site, but generally only receives waste from a subset of areas over a period of months. The waste matrix, as well as the COCs associated with the waste, may influence leachate concentrations. Therefore, at least semi-annually, the waste matrix will be evaluated by the project engineer for variability. If waste matrices not previously received enter the facility, the monitoring program will be evaluated to consider the regulated contaminants of potential concern that are defined in the waste profile, but are not currently being monitored. This evaluation will include risk drivers, as identified in the docket list, that are placed in the ERDF in significantly greater volumes than previously disposed at ERDF. It is anticipated that the proposed sampling approach will be sufficient to monitor any changes in leachate concentration that may be affected by the waste matrix.

1.2.3 Sampling Strategy

The leachate that is stored in the disposal cell sumps and holding tank(s) is considered to be representative of liquids that have been generated from the ERDF for a period of time. The purpose of the sampling and analysis is to ensure proper delisting status of the leachate. Delisting will allow the leachate to be stored and conveyed to the LWPF without having to be managed as a hazardous waste. Sampling must accomplish the dual goal of characterizing the leachate to ensure that it continues to meet delisting criteria and provide data to support treatment at the LWPF. Because the leachate is being stored for transfer to LWPF, characterizing the leachate so as to provide a representative sample is the primary analytical objective. There are three primary sampling designs that will meet the objective: 1) composite samples from the leachate storage units, 2) composite samples from the leachate sump crest pads, and 3) composite sample from an automatic flow-proportional device in the leachate pump station.

Normally a composite sample will be taken from the storage units or the crest pads. However, during times of high leachate generation, a flow-proportional device will be used to collect representative leachate samples for all monitored compounds except volatile organics and oil and grease. At a minimum, a grab sample will be collected for volatiles and oil and grease analysis when a composite sample from the flow-proportional device is retrieved for analysis. Flow-proportional samples will present a volume-averaged profile of the leachate during high-flow periods. A flow-proportional sampling device has been installed in-line between the storage tanks and the discharge point to the pipeline for transfer to LWPF or to tanker trucks.

Over time, compounds may be placed in the ERDF that have not been evaluated through previous analysis of the leachate. Profiles of waste streams that had not previously been placed in the ERDF will be evaluated for the presence of compounds that are not on record as being contained in ERDF wastes. These compounds will be evaluated against the initial list of COCs (Table 1) to determine whether constituents are regulated, are in sufficient quantity to warrant investigation, can be analyzed for, and are identified as a risk driver on the EPA docket list.

Compounds that remain after this screen (a similar process that was used to develop the initial COC list) will be evaluated for testing in the routine sampling program. If, after 1 year, the compound is not detected above the 10% delisting level, the compound will be eliminated from the routine monitoring list.

1.3 PROJECT ORGANIZATION AND RESPONSIBILITY

This section provides the organizational and project roles and responsibilities for sample collection, laboratory analysis, data management, and data assessment for ERDF leachate characterization and monitoring activities.

1.3.1 Project Responsibility

Site Technical Representative: The Environmental Restoration Contractor (ERC)/ERDF Site Technical Representative (STR) will coordinate efforts of support organizations as needed to complete the required tasks. The STR also determines the timing and volume of leachate transfers.

ERC/ERDF Project Engineer: The ERC/ERDF project engineer will direct and approve all technical aspects of the leachate characterization. Responsibilities include leachate flow volume calculations for programming of the automatic sampler to ensure that collected samples are representative of the leachate, and assessment of incoming waste profiles to evaluate any need for additional analysis.

ERC/ERDF Project Environmental Lead: The ERC/ERDF environmental lead will interface with the regulators to ensure that the characterization objectives for the leachate are consistent with regulatory requirements.

ERDF Project Technician: An ERDF technician will inspect the automatic sampler, document the inspections in the field logbook, and interface with ERDF operations and sampling support groups to ensure that the sampler functions as required.

1.3.2 Support Responsibilities

The following organizations will be responsible for performing all services to the ERDF project in accordance with the requirements in this SAP.

Sample Management: Sample Management will coordinate the sampling, laboratory services, data reporting, and data validation for leachate characterization. Additional responsibilities include handling and storage of deliverables generated through the process.

Project Chemist/Sample Coordinator: The chemist will ensure that validation is performed by qualified validators that may be ERC or qualified subcontractors. The chemist will assess the analytical data after validation and compare it to the warning levels (10% of the delisting level) and delisting levels. The chemist will coordinate with the project engineer to ensure that analytes are added to and removed from the sampling program.

Analytical Field Services: Analytical Field Services will provide qualified samplers to program the flow-proportional sampler, based on projected flow rates provided by the project engineer, as required. Field Services will collect, package, and ship leachate samples to the laboratory.

Data Management: Data Management will provide access to information stored in the Hanford Environmental Information System (HEIS) database.

Data Assessment: A statistician and the project chemist will assess the data for trends and perform statistical analysis after the first year of data collection, and on an ongoing basis, to evaluate trends in leachate quality.

ERC Quality Programs: ERC Quality Management will provide quality assurance (QA) assessments and surveillances.

1.4 SAMPLE COLLECTION

This section provides the requirements for collecting, packaging, and shipping leachate samples. Sample collection will be performed in accordance with this SAP and approved ERC procedures.

1.4.1 Sample Collection Techniques

Representative samples may be collected and composited from leachate storage units or the crest pads at leachate sump locations. Samples will be collected from leachate access ports or by use of portable or dedicated pumps. Care will be taken to ensure no contaminants are introduced by the sampling equipment being used.

An automatic sampler will be used to collect representative flow-proportional composite samples of the leachate during periods of high-volume flow. The flow-proportioned samples will be based on equal increments of flow as measured by an associated flowmeter. The flowmeter is installed to measure the volumes of leachate pumped from the modu-tanks to the LWPF. The automatic sampler will be installed downstream of this flowmeter. The composite sample will be analyzed for all monitored compounds except volatile organic analytes (VOA) and oil and grease. A grab sample will be collected for VOA analysis and the oil and grease analysis when the composite sampler is used. A grab sample may be collected for all analytes as appropriate.

1.4.2 Sample Volume, Preservation, and Holding Times

The volume of sample collected depends upon the type and number of analyses needed, as reflected in the parameters to be measured and the requirements of the analytical laboratory being used. Sample volume must be sufficient for all analyses, including laboratory QA/QC. Several analytes may be analyzed by one of two methods requiring different volumes; therefore, the total volume depends on the methods selected. The total composite volume required for analyses is approximately 13.2 L (3.5 gal). Final sample volumes will be specified in the SAF; SAF procedures are found in BHI-EE-01, *Environmental Investigations Procedures*, EIP 2.0, "Sample Event Coordination." Table 4 lists the analytical methods, preferred volumes, and a prioritized list of methods for analysis in the event of insufficient sample collection for analysis of the complete list of COCs. Sample analyses were prioritized based on multi-analyte methods and higher health-risk associated analytes.

Table 4. Sampling and Holding Time Requirements for the Contaminants of Concern Analytical Methods. (2 Sheets)

Analytical Method	Title	Preferred Sample Volume	Total Sample Volume, QC included	Container	Preservation	Hold Time		Priority
						Sampling to Prep	Prep to Analysis	
Composite Sample								
6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry	100 mL	300 mL	Glass or plastic	HNO3 to pH<2	6 months		3
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)	100 mL	300 mL	Glass or plastic	HNO3 to pH<2	28 days		5
8070A[a]	Nitrosamines by GC	1 L	3 L	Amber glass with Teflon-lined lid	Cool, 4°C	7 days	40 days	2
8081A/ 8082	Organochlorine Pesticides by GC/PCBs by GC	1 L	3 L	Glass, Teflon-lined cap	Cool, 4°C	7 days	40 days	4
8151A	Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzylation Derivatization: Capillary Column Techniques	1 L	3 L	Amber glass with Teflon-lined lid	Cool, 4°C	7 days	40 days	Lower priority
8270C[b]	Semivolatile Organic Compounds by GC/MS	1 L	3 L	Amber glass with Teflon-lined lid	Cool, 4°C	7 days	40 days	1
8315A[c]	Determination of Carbonyl Compounds by HPLC	100 mL	300 mL	Glass, Teflon-lined cap	Cool, 4°C	3 days	3 days	Lower priority
8310[b]	Solvent Extractable PAHs HPLC with UV and/or fluorescence	1 L	3 L	Glass, Teflon-lined cap	Cool, 4°C	7 days	40 days	Lower priority
8318	N-Methylcarbamates by HPLC	100 mL	300 mL	Amber glass with Teflon-lined lid	Cool, 4°C; adjust pH 4-5 with 0.1N chloroacidic acid	7 days	40 days	Lower priority
9010B	Total and Amenable Cyanide (Distillation/Automated Colorimetric)	500 mL	1,500 mL	Glass or plastic	Cool, 4°C; if oxidizing agents present add 5 mL 0.1N NaAsO2 per L or 0.06 g of ascorbic acid per L; adjust pH>12 with 10% NaOH	14 days		6
9056	Determination of Inorganic Anions by Ion Chromatography	100 mL	100 mL	Glass or plastic	Cool, 4°C	48 hr		7
9060	Total Organic Carbon	100 mL	100 mL	Glass	Cool, 4°C; adjust pH<2 with HCl or H2SO4	28 days		Lower priority
9050A	Specific Conductance	100 mL	100 mL	Glass or plastic	Cool, 4°C	28 days		Lower priority

Teflon is a trade name of E. I. duPont de Nemours and Company, Wilmington, Delaware.

Table 4. Sampling and Holding Time Requirements for the Contaminants of Concern Analytical Methods. (2 Sheets)

Analytical Method	Title	Preferred Sample Volume	Total Sample Volume, QC included	Container	Preservation	Hold Time		Priority
						Sampling to Prep	Prep to Analysis	
9040	pH Electrometric Measurement	100 mL	100 mL	Glass or plastic	Cool, 4°C	Analyze immediately		8
160.1	Total Dissolved Solids	100 mL	300 mL	Glass or plastic	Cool, 4°C	7 days		Lower priority
160.2	Total Suspended Solids	100 mL	300 mL	Glass or plastic	Cool, 4°C	7 days		Lower priority
350.2 (distill) followed by 350.1 or 350.3	Ammonia	400 mL	1,200 mL	Glass or plastic	Cool, 4°C; adjust pH<2 with H2SO4	28 days		Lower priority
	Total Volume for Composite Sample[d]	**5.4 – 6.5 L**	**13.9-17.2 L**					
			Grab Sample					
6252A[c]	PFBHA liquid-liquid extraction by GC method	2 x 40 mL	6 x 40 mL	40-mL glass vial with Teflon-lined septum caps	Cool, 4°C	48 hours		Lower priority
8015	Alcohols by GC	2 x 40 mL	6 x 40 mL	40-mL glass vial with Teflon-lined septum caps	Cool, 4°C	14 days		3
8260B	Volatile Organic Compounds by GC/MS	2 x 40 mL	6 x 40 mL	40-mL glass vial with Teflon-lined septum caps	Cool, 4°C, adjust pH<2 with HsSO4, HCl, or solid NaHSO4	14 days		2
9030B/ 9034 or 9215	Sulfide by distillation followed by Colorimetric or ISE	250 mL	500 mL	Glass or plastic	Cool, 4°C; add zinc acetate per 100 mL, adjust pH> with NaOH	7 days		6
9070	Total Recoverable Oil and Grease (Gravimetric, Separatory Funnel Extraction)	1 L	3 L	Glass	Cool, 4°C; adjust pH<2 with HCl	28 days		Lower priority
	Total Volume for Grab Sample[d]	**1.41-1.49 L**	**3.98-4.22 L**					

[a]Nitrosamines may be analyzed by 8070A or 8270C depending on which method will achieve detection limits in Table 5.

[b]PAHs may be analyzed by either 8270C or 8310 provided that practical quantitation limits in Table 5 are met.

[c]Either method may be used for formaldehyde.

[d]Volume depends on methods selected.

GC = gas chromatography
HPLC = high performance liquid chromatography
ISE = ion-selective electrode
MS = mass spectrometry
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
UV = ultraviolet

Sample preservation ensures the sample remains representative of the leachate from the time of collection until the time of analysis. Sample preservation techniques consist of refrigeration and pH adjustment. Because sample deterioration can take place during the flow-proportional sample compositing process, it will be necessary to refrigerate these samples during compositing, in addition to preserving any aliquot samples before shipment to the laboratory. Samples will be refrigerated to 4° ± 2°C when composited to decrease the potential for chemical degradation. After samples are aliquoted into bottles for specific analyses, samples will be preserved per Table 4. Refrigeration continues using wet ice (or equivalent) during sample shipment and until the sample is received in the laboratory for analysis. Final sample preservation requirements will be specified in the SAF and are shown in Table 4.

In addition to preservation techniques, holding times between sample collection and analysis must be met for the sample data to be considered valid. The leachate composite becomes a sample upon collection or the removal of the sample from the flow-proportional container. At that point, holding time limitations begin. Final sample holding times will be specified in the SAF and are shown in Table 4.

1.4.3 Sample Documentation

All information pertinent to field sampling and analysis will be recorded in bound logbooks in accordance with BHI-EE-01, EIP 1.5, "Field Logbooks." Entries made in the logbook will be dated and signed by the individual who makes the entry.

1.4.4 Sample Identification and Labeling

The Hanford Sample Data Tracking database will be used to track the sample and laboratory results. Sample numbers will be issued to the sampling organization in accordance with BHI-EE-01, EIP 2.0. Each sample will be identified and labeled with a unique sample number. The sample location, date, and time of collection along with the corresponding number will be recorded on the chain-of-custody form and in the field sampling logbook.

Each sample container will be labeled with the following information using a waterproof marker on firmly affixed, water-resistant labels:

- Sample number
- Sample collection date/time
- Name/initials of sampler
- Analysis required
- Preservation method, if applicable.

1.4.5 Chain-of-Custody Procedures

All samples will be controlled from the point of origin to the analytical laboratory in accordance with BHI-EE-01, EIP 3.0, "Chain of Custody." A chain-of-custody record will be initiated in the field at the time of collection and will accompany each set of samples. Chain-of-custody procedures will be followed throughout the sample collection, transfer, analysis, and disposal to ensure that the integrity of the sample is maintained.

A custody seal (evidence tape) will be affixed to the lid of each sample container. The custody seal will be initialed and dated by the sampler at the time the container is sealed.

1.4.6 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with BHI-EE-01, EIP 3.1, "Sample Packaging and Shipment." After the samples are properly labeled, they will be placed in a transportation package along with the chain-of-custody and sample analysis request form. Samples will be placed in sufficient ice to maintain the temperature at 4° ± 2°C throughout the shipment.

Most samples will not require any special transportation precautions except careful packaging to prevent breakage and/or spillage. The sample shipment must comply with applicable U.S. Department of Transportation Hazardous Materials Regulations (49 CFR 171-177) and International Air Transport Association air shipment requirements.

1.5 SAMPLING QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance requirements for sampling are established in BHI-QA-03, *Quality Assurance Program Plans*, Procedure 5.1, "Field Sampling Quality Assurance Program Plan." All sampling personnel will be sufficiently trained to ensure the acquisition of complete and high-quality data.

1.5.1 Equipment Operation and Calibration

All sampling and field measurement equipment used to support this project will be calibrated to operate within the specifications provided by the manufacturer and in accordance with applicable ERC procedures. Calibrations will be performed as stipulated by the manufacturer's calibration procedure, the project-specific calibration requirements, or as specified within the requirements defined by the analytical method.

1.5.2 Preventive Maintenance

All measurement and testing equipment used in the field that directly affects the quality of the analytical data is subject to preventive maintenance measures that ensure minimization of measurement system downtime.

Analytical Field Services will be responsible for maintenance of the sampling equipment (including the flow-proportional sampler) in accordance with manufacturers' recommendations. An ERDF project technician will perform routine inspections of the equipment and notify Analytical Field Services if problems occur with the equipment. Maintenance requirements, such as parts lists and instructions, will be included in the operating procedure for the automatic sampler. Field repair of the sampler may be limited to replacement of expendable items or certain mechanical parts. Electronic parts must be repaired by a qualified technician who has access to the proper test equipment, which may therefore require repair by the manufacturer.

1.5.3 Field Quality Control Requirements

QC samples are introduced into the collection system to monitor the adequacy of the sampling system and the integrity of the samples during their transfer from the field collection point through the laboratory analysis. QC requirements for the field sample collection process are defined as follows:

- When the composite flow-proportional sampler is used, one container rinsate blank will be collected from the carboy for each new sampling event. The equipment rinsate blank will assess the cleanliness of the sample container and the effectiveness of the container decontamination process. The rinsate blank will be collected using American Society for Testing and Materials (ASTM) Type II water passed through the decontaminated sampling container prior to starting the next sampling event. The rinsate blank will be analyzed for the same chemical constituents used to decontaminate the container (e.g., acetone). All sample results will be evaluated to determine the possible effects of any contamination that may be introduced by the sample collection container, as detected in the rinsate blank.

  The container rinsate blanks will be collected and submitted to the laboratory at the time of collecting the current composite sample; however, the analytical results will correlate to the subsequent composite sampling event.

- One field duplicate sample of the leachate will be collected for each sampling event. Field duplicates are composed of two samples produced from the same matrix and collected at the same location. The field duplicates provide information concerning the homogeneity of the matrix, as well as an evaluation of the precision of the sampling and analysis process.

  When the sampling event cycle is completed, and aliquots are prepared for the individual sample analyses, equal aliquots will be assigned to field duplicate samples.

- One VOA trip blank will be collected for every VOA sampling event. Trip blanks are samples prepared by adding clean, analyte-free water to sample containers for analysis of volatile organic compounds. Preservatives are added to the blank, and the containers are sealed before the sampling trip. Trip blanks are usually prepared in the laboratory and are transported with empty sample containers to the site of work and remain sealed until analyzed with the collected samples at the laboratory. Trip blanks permit evaluation of contamination generated from sample containers or occurring during the shipping and laboratory storage process.

1.6 LABORATORY ANALYSIS

1.6.1 Analytical Methods

Analytical methods will be as defined in *Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods* (EPA 1997), except for ammonia, total suspended solids (TSS), and total dissolved solids (TDS). Ammonia, TSS, and TDS analytical methods are defined in *Chemical Analysis of Water and Wastes* (EPA 1995a). Table 5 identifies analytes and the associated method references and target detection limits identification for all COCs. Analyses will be performed on unfiltered samples. Analyses are expected to be performed on and reported as undiluted samples except for quantification of constituents exceeding the upper calibration limit of the associated analytical method.

1.6.2 Detection Limits

Method detection limits (MDL), as defined in Chapter 1 of SW-846 (EPA 1997), will be used to assess method sensitivity. The MDL is the lowest amount of the analyte that can be detected in a sample, based on the analytical method. Laboratories report practical quantitation limits (PQL), which is another term that is equivalent to the estimated quantitation limits (EQL). PQL/EQL values typically are higher than the MDL and reflect levels that are routinely achieved in a variety of sample matrices. Table 5 lists the analytes, the method, the delisting level (24 times the docket value; see page 13 of accompanying ROD amendment), and the laboratory MDL.

The full spectrum analysis performed on the leachate includes a search for tentatively identified compounds (TIC). Detection of TICs may be due to the presence of secondary chemical breakdown products. Assessment of analytical results will include examination of any TIC reported as part of the routine broad-spectrum volatile and semi-volatile organic analyses (gas chromatograph – mass spectrum). The mass spectrum libraries, used to search for compound identification of "unknown" analysis peaks, typically exceed 60,000 individual compounds. Examination of reported TICs from periodic sampling will be the primary mechanism for inclusion of any unexpected constituents in future sampling lists, regardless of the source of the constituent. Potential sources could include residues from undocumented use or disposal of chemicals, or decomposition of known materials used/disposed of at the Hanford Site.

Additionally, the laboratories currently under contract must prove that the laboratory can satisfactorily perform any methods not typically performed under the existing contract (e.g., methods 8315A, 6252B, 8310, 8070A).

Table 5. Comparison of Delisting Levels and Method Detection Limits for the Contaminants of Concern. (6 Sheets)

CAS#	Constituent	Method ID	Delisting Level [a]	MDL[a]	Comments
7429-90-5	Aluminum	6010B	b	31	
7440-36-0	Antimony	6010B	144	2	
7440-38-2	Arsenic	6010B	1200	82	
7440-39-3	Barium	6010B	48000	0.4	
7440-41-7	Beryllium	6010B	96	0.4	
7440-43-9	Cadmium	6010B	120	3.3	
7440-47-3	Chromium	6010B	2400	2.7	
7440-48-4	Cobalt	6010B	50400	4.3	
7440-50-8	Copper	6010B	3120	4.1	
7439-92-1	Lead	6010B	360	30	
7439-95-4	Magnesium	6010B	b	5000	
7439-96-5	Manganese	6010B	2400	1	
7440-02-0	Nickel	6010B	2400	15	
7782-49-2	Selenium	6010B	1200	61	
7440-21-3	Silicon	6010B	b	5000	
7440-22-4	Silver	6010B	4800	6	
7440-28-0	Thallium	6010B	48	3	
7440-31-5	Tin	6010B	504000	35	
7440-62-2	Vanadium	6010B	7200	2.9	
7440-66-6	Zinc	6010B	240000	2.3	
7439-97-6	Mercury	7470A	48	0.03	
72-54-8	4,4-DDD	8081A	9.6	0.01	
72-55-9	4,4-DDE	8081A	7.2	0.01	
50-29-3	4,4-DDT	8081A	7.2	0.01	
309-00-2	Aldrin	8081A	0.12	0.01	
319-84-6	Alpha-BHC	8081A	0.24	0.01	
319-85-7	beta-BHC	8081A	1.2	0.019	
60-57-1	Dieldrin	8081A	0.12	0.02	
72-20-8	Endrin	8081A	48	0.02	
58-89-9	Gamma-BHC (lindane)	8081A	4.8	0.009	
76-44-8	Heptachlor	8081A	2.4	0.011	
1024-57-3	Heptachlor epoxide	8081A	4.8	0.01	
8001-35-2	Toxaphene	8081A	72	0.2	
1336-36-3	Polychlorinated biphenyls (PCBs)	8082	12	0.5 – 9.0	Depending on Arochlor
94-75-7	2,4-D	8151A	1680	4	
71-55-6	1,1,1-Trichloroethane	8260B	4800	0.89	
79-34-5	1,1,2,2-Tetrachloroethane	8260B	9.6	1.5	
127-18-4	1,1,2,2-Tetrachloroethene	8260B	120	0.92	

Table 5. Comparison of Delisting Levels and Method Detection Limits for the Contaminants of Concern. (6 Sheets)

CAS#	Constituent	Method ID	Delisting Level [a]	MDL[a]	Comments
79-00-5	1,1,2-Trichloroethane	8260B	120	0.5	
79-01-6	1,1,2-Trichloroethylene	8260B	192	2	
75-34-3	1,1-Dichloroethane	8260B	21.6	1	
75-35-4	1,1-Dichloroethene	8260B	168	0.97	
76-13-1	1,2,2-Trichlorotrifluoroethane (Freon 113)	8260B	24000000	10	
156-59-2	1,2-cis-Dichloroethene	8260B	9600	0.51	
107-06-2	1,2-Dichloroethane	8260B	120	0.72	
78-87-5	1,2-Dichloropropane	8260B	120	1	
156-60-5	1,2-trans-Dichloroethene	8260B	16800	5	
106-99-0	1,3-Butadiene	8260B	b	10[c]	
542-75-6	1,3-Dichloropropene	8260B	12	as isomers	
10061-01-5	cis-1,3-Dichloropropene	8260B	12	0.51	
10061-02-6	trans-1,3-Dichloropropene	8260B	12	0.29	
123-91-1	1,4-Dioxane	8270C	192	10[d]	
75-01-4	1-Chloroethene (vinyl chloride)	8260B	48	3.4	
98-82-8	(1-Methylethyl)benzene	8260B	24000	5	
78-93-3	2-Butanone (MEK)	8260B	480000	2.1	
110-75-8	2-Chloroethyl vinyl ether	8260B	b	3.1	
126-98-7	2-Methyl-2-propenenitrile (methacrylonitrile)	8260B	96	2.2	
78-83-1	2-Methylpropyl alcohol (isobutyl alcohol)	8260B	240000	380	
67-64-1	2-Propanone (acetone)	8260B	96000	9.7	
107-05-1	3-Chloropropene (allyl chloride)	8260B	96	1.2	
108-10-1	4-Methyl-2-pentanone (MIBK)	8260B	48000	1	
141-78-6	Acetic acid ethyl ester (ethyl acetate)	8260B	720000	10	
108-05-4	Acetic acid vinyl ester (vinyl acetate)	8260B	960000	3.6	
75-05-8	Acetonitrile	8260B	4800	23.5	
107-02-8	Acrolein	8260B	16800	21.4	
107-13-1	Acrylonitrile	8260B	4.8	1.7[d]	MDL with 25 mL ~1.7 µg/L
71-43-2	Benzene	8260B	120	0.84	
75-27-4	Bromodichloromethane	8260B	33.6	0.5	
74-83-9	Bromomethane	8260B	1200	1.4	
75-15-0	Carbon disulfide	8260B	96000	0.74	
56-23-5	Carbon tetrachloride	8260B	120	0.71	
108-90-7	Chlorobenzene	8260B	2400	0.75	
75-00-3	Chloroethane	8260B	b	1	

Table 5. Comparison of Delisting Levels and Method Detection Limits for the Contaminants of Concern. (6 Sheets)

CAS#	Constituent	Method ID	Delisting Level [a]	MDL[a]	Comments
67-66-3 *	Chloroform	8260B	2400	0.86	
74-87-3	Chloromethane	8260B	808.8	2.3	
124-48-1	Dibromochloromethane	8260B	24	0.33	
75-71-8	Dichlorodifluoromethane	8260B	168000	2.3	
75-09-2	Dichloromethane (methylene chloride)	8260B	120	3.8	
26545-73-3	Dichloropropanol	8260B	b	100[c]	
100-41-4	Ethyl benzene	8260B	1680000	1.3	
60-29-7	Ethyl ether	8260B	168000	10	
106-93-4	Ethylene dibromide	8260B	1.2	0.34	
67-56-1	Methyl alcohol	8015	480000	5000	
71-36-3	n-Butyl alcohol	8260B	96000	12.6	
100-42-5	Styrene	8260B	2400	0.64	
108-88-3	Toluene	8260B	24000	0.79	
75-25-2	Tribromomethane (bromoform)	8260B	2400	0.36	
75-69-4	Trichlorofluoromethane	8260B	240000	2	
75-70-7	Trichloromethanethiol	8260B	b	e	To be measured as TIC
1330-20-7	Xylene	8260B	240000	0.71	
120-82-1	1,2,4-Trichlorobenzene	8270C	1680	1.1	
122-66-7	*1,2-Diphenylhydrazine*	*8270C*	*2.4*	*10*	
106-46-7	1,4-Dichlorobenzene	8270C	96	5	
591-08-2	1-Acetyl-2-thiourea	8270C	b	1000	
95-95-4	2,4,5-Trichlorophenol	8270C	96000	0.76	
88-06-2	2,4,6-Trichlorophenol	8270C	192	1.2	
120-83-2	2,4-Dichlorophenol	8270C	2400	1.2	
105-67-9	2,4-Dimethylphenol	8270C	16800	0.79	
51-28-5	2,4-Dinitrophenol	8270C	1680	2.3	
95-70-5	2,5-Diaminotoluene	8270C	2304000	1000[c]	Degrades during extraction[f]
91-58-7	2-Chloronaphthalene	8270C	72000	1.4	
95-57-8	2-Chlorophenol	8270C	4800	1.2	
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	8270C	b	100	
91-59-8	*2-Naphthylamine*	*8270C*	*2.4*	*4.4*	
101-55-3	4-Bromophenylphenyl ether	8270C	b	1.9	
59-50-7	4-Chloro-3-methylphenol	8270C	30240	1.1	
100-02-7	4-Nitrophenol	8270C	b	2.1	
57-97-6	7,12-Dimethylbenz[a]anthracene	8270C	b	4.4	
83-32-9	Acenaphthene	8270C or 8310	48000	0.5	
98-86-2	Acetophenone	8270C	96000	3.4	

Table 5. Comparison of Delisting Levels and Method Detection Limits for the Contaminants of Concern. (6 Sheets)

CAS#	Constituent	Method ID	Delisting Level [a]	MDL[a]	Comments
134-32-7	Alpha-Naphthylamine	8270C	b	4.4	
62-53-3	Aniline	8270C	240	2.7	
120-12-7	Anthracene	8270C or 8310	240000	0.5	
56-55-3	Benzo(a)anthracene	8270C or 8310	1.848	0.1[g]	
50-32-8	Benzo(a)pyrene	8270C or 8310	4.8	0.05[g]	
205-99-2	Benzo(b)fluoranthene	8270C or 8310	1.704	0.06[g]	
207-08-9	Benzo(k)fluoranthene	8270C or 8310	604.8	0.2[g]	
100-51-6	Benzyl alcohol	8270C	240000	0.93	
111-91-1	Bis(2-Chloroethoxy)methane	8270C	b	1.6	
111-44-4	Bis(2-chloroethyl) ether	8270C	1.92	1.5	
108-60-1	Bis(2-Chloroisopropyl) ether	8270C	24	2	
117-81-7	Bis(2-ethylhexyl) phthalate	8270C	144	2.9	
85-68-7	Butylbenzylphthalate	8270C	168000	2.2	
218-01-9	Chrysene	8270C or 8310	64.8	0.1[g]	
1319-77-3	Cresols, total	8270C	48000	10	
95-48-7	o-Cresol	8270C	48000	0.97	
108-39-4	m-Cresol	8270C	48000	10	
106-44-5	p-Cresol	8270C	48000	0.69	
53-70-3	Dibenz[a,h]anthracene	8270C or 8310	0.264	0.05[g]	
25321-22-6	Dichlorobenzene	8270C		as isomers	
95-50-1	1,2-Dichlorobenzene	8270C	14400	1.2	
541-73-1	1,3-Dichlorobenzene	8270C	45360	1.3	
106-46-7	1,4-Dichlorobenzene	8270C	96	1.4	
84-66-2	Diethyl phthalate	8270C	720000	1.6	
131-11-3	Dimethyl phthalate	8270C	9600000	1.3	
84-74-2	Di-n-butylphthalate	8270C	96000	1.6	
99-65-0	1,3-Dinitrobenzene	8270C	96	3.8	
117-84-0	Di-n-octylphthalate	8270C	16800	1.8	
62-50-0	*Ethyl methanesulfonate*	*8270C*	*0.0072*	*3.3*	
206-44-0	Fluoranthene	8270C or 8310	24000	0.3[g]	
86-73-7	Fluorene	8270C or 8310	24000	0.3[g]	
87-68-3	Hexachlorobutadiene	8270C	24	0.89	

Table 5. Comparison of Delisting Levels and Method Detection Limits for the Contaminants of Concern. (6 Sheets)

CAS#	Constituent	Method ID	Delisting Level [a]	MDL[a]	Comments
67-72-1	Hexachloroethane	8270C	144	0.98	
70-30-4	Hexachlorophene	8270C	240	40	
193-39-5	Indeno(1,2,3-cd)pyrene	8270C or 8310	5.04	0.1[g]	
78-59-1	Isophorone	8270C	2160	1.4	
122-39-4	N,N-Diphenylamine	8270C	21600	5	
91-20-3	Naphthalene	8270C or 8310	24000	0.3[g]	
98-95-3	Nitrobenzene	8270C	480	1.2	
621-64-7	*N-Nitroso-di-n-propylamine*	*8270C or 8070A*	*0.24*	*1.8*	*MDL 8070A (0.46 ug/L)*
86-30-6	N-Nitrosodiphenylamine	8270C	480	1.5	
59-89-2	N-Nitrosomorpholine	8270C	b	10	
62-75-9	*N-Nitroso-N,N-dimethylamine*	*8270C or 8070A*	*0.048*	*1.3*	*MDL 8070A (0.15 ug/L)*
126-68-1	O,O,O-Triethyl phosphorothioate	8270C	b	5	
87-86-5	Pentachlorophenol	8270C	16.8	16	
108-95-2	Phenol	8270C	480000	0.42	
106-50-3	p-Phenylenediamine	8270C	168000	100	
129-00-0	Pyrene	8270C or 8310	24000	0.3[g]	
110-86-1	Pyridine	8270C	960	0.96	
109-99-9	Tetrahydrofuran (THF – furan indicator)	8270C	b	10	
50-00-0	Formaldehyde	8315A or 6252B	168000	5000[c]	
22781-23-3	Bendiocarb	8318	b	0.01	
57-12-5	Cyanide	9010B	4800	3.1	
1634-02-2	Tetrabutylthiuram disulfide	9030B or 376.1	b	500	This compound is likely to dissociate to sulfide. Sulfide analysis is specified.
	pH	9040	b	0.1 pH unit	
	Specific conductance	9050A or 120.1	b	0.15 umhos/ cm	
24959-67-9	Bromide	9056 or 300.0	b	250	
16887-00-6	Chloride	9056 or 300.0	b	100	
16984-48-8	Fluoride	9056 or 300.0	96000	50	
14797-55-8	Nitrate	9056 or 300.0	240000	50	
14797-65-0	Nitrite	9056 or 300.0	b	50	
14265-44-2	Phosphate	9056 or 300.0 or 365.2	b	250	

Table 5. Comparison of Delisting Levels and Method Detection Limits for the Contaminants of Concern. (6 Sheets)

CAS#	Constituent	Method ID	Delisting Level [a]	MDL[a]	Comments
14808-79-8	Sulfate	9056 or 300.0	b	250	
7664-41-7	Ammonia	350.1 or 350.3	b	30	Distill by method 350.2, followed by analysis by either 350.1 (colorimetric) or 350.3 (ISE)
	Total organic carbon	9060 or 415.1	b	530	
	Oil and grease	9070 or 413.1	b	500	
	Total dissolved solids	160.1	b	4700	
	Total suspended solids	160.2	b	1000	

NOTE: *italics* indicate analytes where MDL is above or equal to delisting levels.
[a]Unless otherwise noted, all values are in µg/L. Blank space in delisting level column indicates none established.
[b] No delisting level is specified for these analytes and/or they were added to meet ETF waste acceptance criteria and are not part of the delisting.
[c]MDLs are estimated based on compounds of similar functional groups. These compounds are not typically analyzed by the stated methods. Method validation will be done to determine if MDLs below the delisting level can be attained.
[d]A layer purge volume will be attempted (25 mL instead of 5 mL), which should decrease MDL by an order of magnitude. This is estimated and will be verified before sample analysis.
[e]MDL will be estimated based on compounds of similar volatility and structure. No other technical information could be found for this compound.
[f]Degradation and hydrolysis are discussed in method 8270C.
[g]MDL is based on method 8310.
ISE = ion-selective electrode

1.6.3 Volatile Organic Analysis

The following compounds have analytical detection limits above 1/10th of the delisting levels shown for SW-846 method 8260 in Table 5:

- Ethylene Dibromide
- Acrylonitrile.

Values reported as "non-detected" ("U" qualified) results will normally be standard analysis reporting limit values for these compounds, which are greater than the delisting level. If the compound is actually detected, the result will be reported to lower limits (it is possible to "identify" a compound at lower levels when present [resolved from background "noise"] than when not present), as low as the MDL. The MDL will be below the delisting value, but will be above 1/10th of the delisting value. Evaluation of alternative analytical techniques found no methods capable of routinely reaching detection limits of 1/10 or less of the delisting value. Analysis by method 8260 is the best available compromise at this time.

For a limited number of compounds measured by method 8260, routine "non-detect" reporting limit values may not meet 1/10th of the delisting level, but will be below delisting levels. Such compounds actually present in trace quantities (as explained above), will be detected below the delisting level, nominally, to values below 1/10th of the delisting value. These compounds include the following:

- 1,1,2,2-tetrachloroethane
- 1,1-Dichloroethane
- 1,3-Dichloropropene isomers
- Vinyl Chloride
- 2-Methyl-2-propenenitrile
- Allyl Chloride
- Bromodichloromethane
- Dibromochlorometnae.

1.6.4 Semi-Volatile Organic Analysis

The following compounds have delisting levels near or below the analytical detection limits shown for SW-846 method 8270 in Table 5:

- Bis(2-chloroethyl)ether
- 1,2-Diphenylhydrazine
- 2-Napthylamine
- Ethyl Methanesulfonate
- N-nitroso-di-n-proplyamine
- N-nitroso-n,n-dimethylamine
- Pentachlorophenol.

Values reported for "non-detected" ("U" qualified) results will normally be standard analysis reporting limit values for these compounds, which are near or greater than the delisting level. For all compounds except Pentachlorophenol and bis(2-chlororethyl)ether, method 8270 methodology is not capable of achieving detection limits at or below the delisting levels (method 8270 will likely detect Pentachlorophenol and bis(2-chloroethyl)ether at or just below delisting levels if present). Evaluation of alternative analytical techniques found no methods capable of reaching detection limits of 1/10th the delisting values for any of these compounds. All of the alternative analytical techniques identified may be considered to be non-routine, requiring special analysis equiprnent, extensive/specialized sample preparation, highly specialized training/expertise, or a combination of all of these. These techniques are normally limited to highly specialized laboratories unlikely to possess suitable licenses allowing the receipt of potentially radioactive samples. Implementation of any alternative technique at the existing contracted laboratories would be cost prohibitive as the project would essentially need to cover the entire cost (including equipment purchase, maintenance, and personnel [potentially PHD level dedicated to the analysis]). Analysis by method 8270 is the best available compromise at this time.

For a limited number of compounds measured by method 8270, routine non-detect reporting limit values may not meet 1/10th of the delisting level, but will be below the delisting level. Such compounds actually present in trace quantities will be detected below the delisting level, nominally, to values below 1/10th of the delisting value. These compounds include the following:

- Bis(2-chloroisopropyl)ether
- Hexachlorophene (this compound may not achieve MDL of 1/10th the delisting level).

1.6.5 Polynuclear Aromatic Organic Analysis by Method 8310

The compounds measured by method 8310 are also analyzed by method 8270. In most cases, the detection limits for method 8310 are lower than for method 8270. Final reporting of these compounds will be the lower of the two values for any non-detect and the higher of the two values for any detected results. All routine reported non-detect values will be lower than $1/10^{th}$ the delisting limits except for Dibenz[a,h]anthracene and Benzo(b)fluoranthene.

Routine reporting limits for Dibenz[a,h]anthracene will not meet the delisting level. If actually present in trace quantities, Dibenz[a,h]anthracene will be detected below the delisting level, nominally, to approximately $1/5^{th}$ of the delisting value. Evaluation of alternative analytical techniques found no methods capable of reaching detection limits of 1/10 the delisting value routinely.

Routine non-detect values for Benzo(b)fluoranthene may not meet $1/10^{th}$ of the delisting level, but will be below the delisting level. If actually present in trace quantities (as described in the above paragraph), Benzo(b)fluoranthene will be detected below the delisting level, nominally, to values below $1/10^{th}$ of the delisting value.

1.6.6 Pesticide Analysis by Method 8081A

Routine reporting limits for Dieldrin will not meet $1/10^{th}$ of the delisting level, but will be below the delisting level. If actually present in trace quantities, Dieldrin will be detected, nominally, to approximately $1/5^{th}$ of the delisting value. Evaluation of alternative analytical techniques found no methods capable of reaching detection limits of 1/10 the delisting value routinely.

For a limited number of compounds measured by method 8081, routine non-detect reporting limit values may not meet $1/10^{th}$ of the delisting level, but will be below the delisting level. Such compounds actually present in trace quantities will be detected below the delisting level, nominally, to values below $1/10^{th}$ of the delisting value. These compounds include the following:

- Aldrin
- Alpha-BHC.

1.6.7 Bendiocarb Analysis

All analytical techniques identified for Bendiocarb may be considered to be non-routine, requiring special analysis equipment, extensive/specialized sample preparation, highly specialized training/expertise, or a combination of all of these. These techniques are normally limited to highly specialized laboratories unlikely to possess suitable licenses allowing the receipt of potentially radioactive samples. Implementation of any technique at the existing contracted laboratories would be cost prohibitive as the project would essentially need to cover the entire cost (including equipment purchase, maintenance, and personnel [potentially PHD level dedicated to the analysis]).

Analytical capability will continue to be monitored for all of the items discussed above. If technical and economical methodology becomes available in the future, affected analysis will be upgraded or be added to the requests for future samples.

1.6.8 Laboratory Quality Assurance and Control

For samples analyzed according to SW-846 procedures (EPA 1997), all of the QC requirements outlined in EPA (1997) and in the applicable method will apply. At a minimum, the following QC shall be performed:

- One method blank for every 20 samples, analytical batch, or sample delivery group (whichever is most frequent) will be used to monitor contamination resulting from the sample preparation process for each analytical method.

- One laboratory control sample or blank spike will be performed for every 20 samples, analytical batch, or sample delivery group (whichever is most frequent) of samples for each analytical method criteria to monitor the effectiveness of the sample preparation process. The results from the analysis are used to assess laboratory performance.

- As appropriate to the method, a combination of either (1) a matrix spike and matrix spike duplicate, or (2) a matrix spike and duplicate sample will be prepared and analyzed for each 20 samples, analytical batch, or delivery group (whichever is most frequent). This QC step will be performed on an ERDF leachate sample. The matrix spike results are a measure of the accuracy of the analytes of interest that are measured in the sample matrix. Laboratory duplicates or matrix spike duplicates are used to assess precision and will be analyzed at the same frequency as the matrix spikes.

1.6.9 Laboratory Quality Control Acceptance Criteria

The definitions of matrix spikes, matrix spike duplicates, and sample duplicates found in Chapter 1 of SW-846 (EPA 1997) are used for this project. Matrix spikes will measure accuracy via percent recovery, as defined in Chapter 1 of SW-846. Relative percent difference and relative standard deviation, as defined in Chapter 1 of SW-846, will be used to assess precision. The accuracy and precision limits that are listed in the SW-846 methods will be applied to the results from the leachate for each sampling round. Analytes without accuracy and precision limits in SW-846 will be assessed based on statistical evaluation of laboratory control sample results using the same formulas presented for the compounds with limits. Because the leachate will be aqueous with low probability of interferences, this is a reasonable approach.

1.7 DATA MANAGEMENT

1.7.1 Data Reporting

The laboratory must prepare a report summarizing the results of analysis, including associated laboratory QC. Data summaries shall include, at a minimum, sample identity, sampling and analysis dates, reduced data results, analytical detection limits for nondetect results, and a

detailed case narrative for the following investigative and QC samples (as appropriate to the method):

- ERDF samples
- All associated laboratory method blanks
- Associated batch matrix spike/surrogate recoveries
- Associated batch duplicate/matrix spike duplicate relative percent differences
- Associated batch laboratory control sample recoveries.

1.7.2 Data Validation

Level C data validation has been selected for leachate data per ERC procedures (WHC 1993a, 1993b). This approach allows the review of all QC data, transcription error verification, and holding time review. This level is the middle validation level and does not require review of raw data and recalculation of data. The basic elements of this validation level include evaluation of the following parameters (as appropriate to the method):

- Required analysis hold times
- Associated batch method blank results
- Associated batch matrix spike/surrogate recoveries
- Associated batch duplicate/matrix spike duplicate relative percent differences
- Associated batch laboratory control sample recoveries
- Reported analytical detection limits for nondetect results.

Should problems arise from the level C review, the project will perform recalculation and review of raw data. Level C validation will be performed by qualified Sample Management personnel or by a qualified subcontractor. Subcontract validation requirements will be defined in procurement documentation or work orders, as appropriate.

1.7.3 Data Management

Data generated as a result of laboratory analysis will be managed and stored by the Sample Management organization, as outlined in BHI-EE-01, Section 2.0, "Sample Management."

All validated reports and supporting analytical data packages shall be subject to final technical review by qualified reviewers before their final submittal to regulatory agencies or inclusion in reports or technical memoranda, at the direction of the ERDF STR. Electronic data access, when appropriate, is through computerized databases (such as HEIS). Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1996).

1.8 AUDITING AND ASSESSMENT

The ERC Quality Programs department may conduct random surveillance and assessments to verify compliance with the requirements outlined in this SAP, the ERC Quality Management Plan (BHI-QA-01, *ERC Quality Program*, Section 2.0), and the ERC procedures and regulatory

requirements. Collectively, the surveillance and assessments will address quality-affecting activities that include, but are not limited to, measurement system accuracy, field activities, data collection, processing, validation, management, and QA programs.

Random surveillance and assessments will be structured to meet the following system and performance audit classification. System audits consist of the evaluation of the measurement system components to determine their proper selection and use. Performance audits ensure the accuracy of the total system and its individual parts.

1.9 DATA QUALITY ASSESSMENT

Once the monitoring data have been verified and validated by a chemist, the results will be evaluated by means of formal process and statistical tests that result in conclusions and recommendations for the sampling and analysis of leachate. This evaluation is commonly called a data quality assessment (DQA).

The DQA will be ongoing to coincide with the collection of monitoring data. In general, DQA activities include the following:

1. Review project objectives and sampling design
2. Conduct a preliminary data review
3. Perform statistical analysis of the data
4. Draw conclusions from the data and make recommendations.

Project objectives will be reviewed when sufficient data have been generated to allow a reevaluation of the project objectives to ensure they are still valid. The preliminary data review includes reviewing the QA and QC reports, tabulating the data in different forms, and graphically exploring the data. A preliminary data review can identify patterns, relationships, and potential anomalies that may need to be further explored. Statistical analysis may include the examination of time plots and performance of statistical tests to determine the significance of trends. Once graphical and quantitative analyses are performed, the results will be interpreted and conclusions and recommendations will be documented.

Moving average statistics may be used to determine compliance with delisting levels, in accordance with the sampling design specified in Section 1.2. Until enough data are collected to adequately identify cycles or trends, single concentrations will be used. Statistical estimates may be used once adequate data are collected. Either a single concentration or a statistical value will be compared with 10% of the delisting levels to determine whether an analyte should be monitored on a routine or confirmatory basis. Each time new data are collected, the same DQA procedure will take place to ensure ongoing compliance with delisting criteria.

Recommendations about the status of each analyte being monitored will be made on the same schedule that data are being collected to ensure that the monitoring status of each analyte remains up-to-date. Recommendations should be made in the context of the historical data and with respect to the waste management processes being performed at the site. The addition of

new or different waste streams and the management processes at the facility will be considered each time that data are assessed.

Over time, enough data may be collected to perform more involved statistical analyses, such as trend analysis, control chart analysis, time series modeling, and correlation analyses between analytes. These analyses may provide better estimates of uncertainty than a moving standard deviation, and their use should be considered for incorporation into the overall data assessment program.

2.0 REFERENCES

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EIP 1.5, "Field Logbooks"
EIP 2.0, "Sample Event Coordination"
EIP 3.0, "Chain of Custody"
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