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Facility Effluent Monitoring Plan for the 2724-W Protective Equipment Decontamination Facility

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G. H. Lavey

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Part 1

FACILITY EFFLUENT MONITORING PLAN FOR THE 2724-W PROTECTIVE EQUIPMENT DECONTAMINATION FACILITY

J. M. Nickels

ABSTRACT

A facility effluent monitoring plan is required by the U.S. Department of Energy in DOE Order 5400.1 for any operations that involve hazardous materials and radioactive substances that could impact employee or public safety or the environment. A facility effluent monitoring plan determination was performed during Calendar Year 1991 and the evaluation requires the need for a facility effluent monitoring plan. This document is prepared using the specific guidelines identified in A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, WHC-EP-0438**. This facility effluent monitoring plan assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal, state, and local requirements.*

This facility effluent monitoring plan shall ensure long-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated, as a minimum, every three years.

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*General Environmental Protection Program, *DOE Order 5400.1, U.S. Department of Energy, Washington, D.C., 1988.*

**A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, *WHC-EP-0438, Westinghouse Hanford Company, Richland, Washington, 1991.*

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This facility effluent monitoring plan has been revised to include Department of Energy/Westinghouse Hanford Regulatory Analysis comments, and procedure changes (revisions).

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LIST OF TERMS

ALARA	as low as reasonably achievable
BAT	best available technology
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
DCG	Derived Concentration Guides
DLF	Decontamination Laundry Facility
DOE	U.S. Department of Energy
DOP	dioctyl phthalate
ECL	environmental control limit
Ecology	Washington Department of Ecology
EDE	effective dose equivalent
EMP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
FEMP	Facility Effluent Monitoring Plan
HEPA	high-efficiency particulate air (filter)
LES	liquid effluent study
NESHAP	*National Emission Standards for Hazardous Air Pollutants*
PEDF	Protective Equipment Decontamination Facility
PNL	Pacific Northwest Laboratory
QA	Quality Assurance
QAPjP	Quality Assurance Project Plan
RCRA	*Resource Conservation and Recovery Act of 1976*
RL	U.S. Department of Energy, Richland Field Office
RWP	Radiation Work Procedure
SAP	sampling and analysis plan
SARA	*Superfund Amendments and Reauthorization Act of 1986*
TLD	Thermoluminescent Dosimetry
TPA	*Hanford Federal Facility Agreement and Consent Order*
VOC	volatile organic chemicals
WAC	Washington Administrative Code
WDOH	Washington Department of Health
Westinghouse Hanford	Westinghouse Hanford Company

FACILITY EFFLUENT MONITORING PLAN FOR THE 2724-W PROTECTIVE EQUIPMENT DECONTAMINATION FACILITY

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) 5400 Series of Orders requires effluent monitoring plans (EMP) for each site, facility, or process that uses, generates, releases, or manages significant pollutants of radioactive and hazardous material. A facility effluent monitoring plan (FEMP) determination was prepared in 1991. Results of the evaluation indicated that a FEMP is required to address the significant radioactive releases in the facility wastewater liquid effluent stream.

This FEMP for the 2724-W Protective Equipment Decontamination Facility (PEDF), also known as the laundry facility provides the program plan for monitoring and characterizing the radioactive and nonradioactive hazardous wastewater effluent, as required by the FEMP determination (WHC 1991a).

This plan was prepared by 200 Area Environmental Protection and laundry plant engineers according to the Westinghouse Hanford Company (Westinghouse Hanford) guide for preparing Hanford Site FEMPs, WHC-EP-0438 (WHC 1991b) and is intended as a standalone document with limited effluent data and information, incorporated by reference.

1.1 POLICY

It is the policy of the DOE and Westinghouse Hanford to conduct effluent monitoring that is adequate to determine whether the public and the environment are adequately protected during DOE operations and whether operations are in compliance with DOE orders, applicable federal, state, and local regulations to ensure that an acceptable level of risk to the public and environment posed by the laundry facility is not exceeded. It is also DOE and Westinghouse Hanford policy that effluent monitoring programs meet high standards of quality and credibility.

1.2 PURPOSE

This plan fulfills the DOE requirement (DOE 1988) and Westinghouse Hanford Environmental Compliance Manual (ECM) WHC-CM-7-5 (WHC 1991c) for a FEMP for each facility that contains radioactive or hazardous pollutants that could impact the health and safety of the employees, public, and environment.

1.3 SCOPE

This document includes program plans for monitoring and characterizing radioactive and nonradioactive hazardous materials discharged in the laundry wastewater liquid effluent. This plan includes complete documentation for liquid effluent monitoring for both radioactive and nonradioactive hazardous pollutants that could be discharged under routine and/or upset conditions.

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1.4 DISCUSSION

The laundry facility provides a service to its customers by receiving only cleanable items, not waste material. Unique to the laundry facility, its effluent constituents are generated at the customers location and cannot be tracked in a material balance from a source to the point of discharge. Radiation work procedure (RWP) and ethical work practices (DOE 1990a) are required at the customers facility to maintain acceptable levels of radioactivity. Based on operating record data, a hazard analysis has determined this facility to be a low hazard nuclear facility. Because there is radionuclide inventory within the facility with sampling data indicating measurable radionuclide constituents, it is necessary to verify that the monitoring program addresses all pertinent constituents at the point of discharge.

As for the nonradioactive constituents, the wastewater characterization report (WHC 1990a) documents that this wastewater stream is not a dangerous waste, based on Washington Administrative Code (WAC) 173-303 (Ecology 1989a). The facility preventative capabilities of engineered and administrative control barriers will be discussed but are not required according to state requirements because this is not a dangerous waste stream.

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2.0 FACILITY DESCRIPTION

2.1 PHYSICAL DESCRIPTION

The PEDF is located in the 200 West Area of the Hanford Site, which is located in the south central region of Washington State. The original building was a wood and concrete structure constructed in 1952. It has subsequently been expanded using prefabricated metal buildings and mobile offices.

The current complex is one level and covers approximately 2,250 m^2 (25,000 ft^2) of connected buildings (2724-W, 2724-WA, 2724-WB, and MO-406). There are separate process areas for radioactive and for nonradioactive washing and drying in Building 2724-W. The remaining buildings are for laundry finishing tasks, storage, changerooms, offices, and a lunchroom. Mask cleaning and repair operations are performed in mobile office complex (MO-412), which is adjacent to the Laundry Facility and referred to as the mask station. A location diagram of the PEDF can be seen in Figure 2-1.

All respirators used on the Hanford Site are sanitized using a commercial dishwasher and repaired by certified operators at the mask station, a 6-wide portable trailer located directly east of Building 2724-W. The trailers were installed in 1984 to provide approximately 486 m^2 (5,400 ft^2) of process area. The major areas of this facility are a decontamination station, respiratory protection area, incoming storage area, outgoing storage area, clean mask room, lavatories, and covered dock.

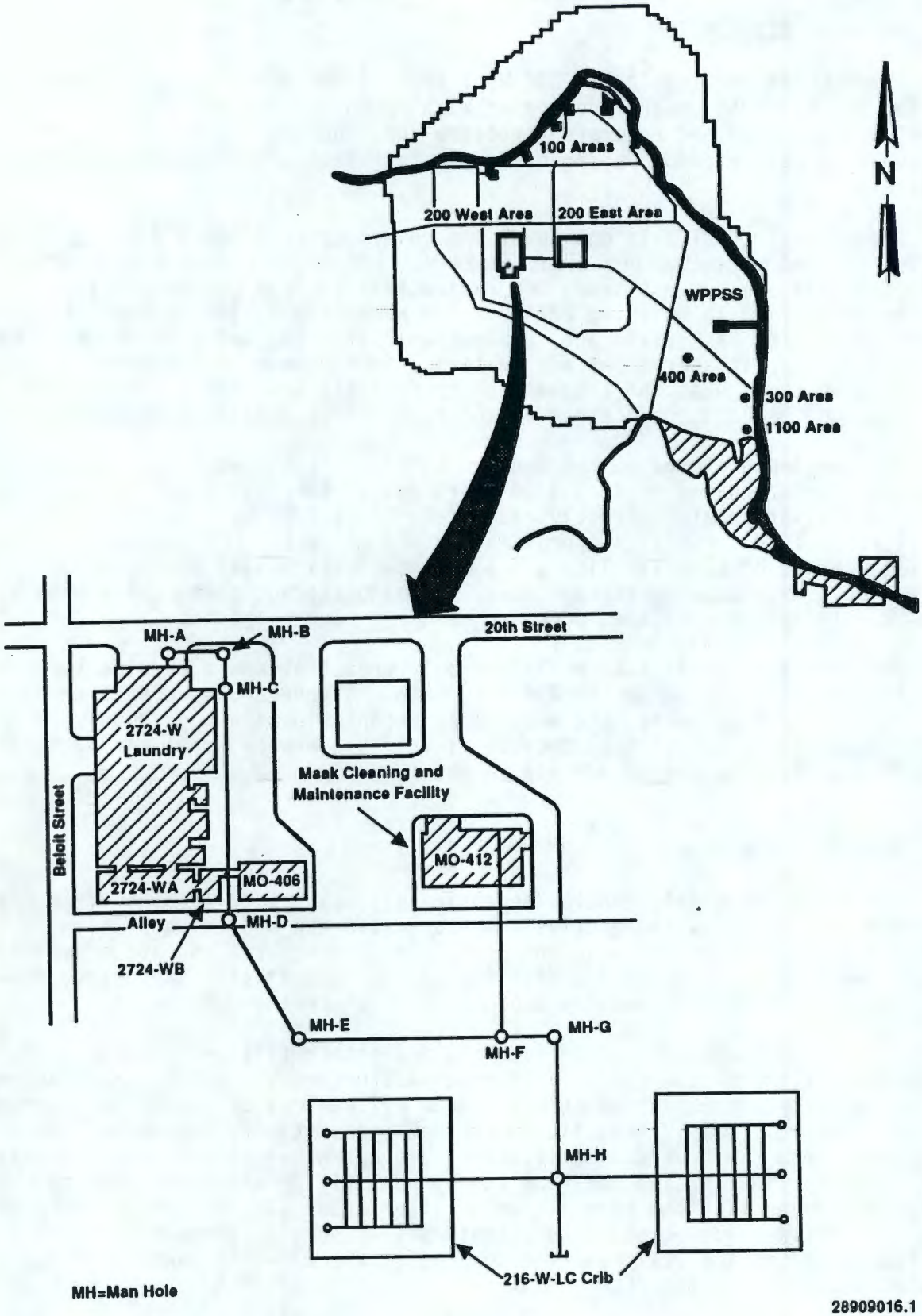
The decontamination station is the only area that has a physically isolated connected drain to the 216-W-LC crib. Although the decontamination station was expected to replace older mask decontamination operations, it never became fully operational because it failed a 6-week trial period in 1986; it is not expected to operate in the future.

2.2 PROCESS DESCRIPTION

The laundry facility handles approximately 1,350 tons (3 Mlb) of laundry per year consisting of radioactively contaminated and nonradioactively contaminated clothing. Because commercial laundry washers and steam heated dryers are used in both the decontamination and sanitization processes, the facility uses commercial laundry products and maintenance chemicals.

The air discharges from the facility are either filtered through a cloth media lint filter or the hydrostatic precipitator and 296-W-1 stack. Because of the facility's age and design all liquid effluent is collected in a common 2,195 L (580-gal) sump. This liquid effluent consists of wash water; steam condensate from the dryers, room heaters, and hot water tank coils; and water from sink and floor drains and from the hydrostatic precipitator used to filter the dryer lint and room exhaust. After these liquids collect in the sump, the effluent is pumped to a vibratory lint screen for particulate filtration, beginning its gravity discharge to the 216-W-LC laundry crib, located southeast of the PEDF.

Figure 2-1. Aerial View.



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Radiological monitoring requirements are based on DOE 5400.1, 5400.5 and EH-0173T DOE Guide. Currently, there is no sampling equipment available. Manual effluent samples are taken daily from the sump by Waste Tank/Tank Farms Program personnel for environmental protection as described in DOE Order 5400.5 (DOE 1990b). The samples are composited monthly and analyzed by the 222-S Laboratory with the data presented annually to U.S. Department of Energy Field Office, Richland (RL) by Westinghouse Hanford Environmental Protection (Brown 1990). Though the wastewater volumes are estimated by using the incoming sanitary watermeter and steam record charts, a new (ISCO, Incorporated, Model 2700) liquid sampler has been installed and flowmeter installation is expected next year. Procedures are being prepared to address the new installations.

This new sample equipment is part of Project B-697, Laundry Effluent Treatment, which will provide increased solids filtration to protect the laundry crib pipes from plugging. Although a liquid time or flow proportional sampler was installed in Manhole C northeast of the PEDF in 1981 for flow proportional sampling, it failed to provide accurate flow readings. It was set in the time proportional operation mode until the start of Project B-697 construction in 1989 at which time manual sampling began.

2.2.1 Radioactive Laundry Wash Process

Before the potentially contaminated radioactive laundry is received from the customer, radiation levels are verified to be within approved limits according to a site-wide RWP. Radioactivity limits are defined for both the overall bag and individual garment (to reduce risk).

In addition, the overall exterior of the bag is resurveyed before it is washed to establish the wash program. This reduces cross-contamination and allows additional washing of the heavier soiled garments, while providing for complete segregation throughout the facility. Because washer data sheets show that less than 10 percent of the incoming laundry bags are contaminated above detectable levels, the segregation allows operational flexibility in wash scheduling.

To reduce the potential of room airborne radiation, the soiled laundry bags are not opened or pre-sorted before washing. After their drawstrings are loosened, the bags are placed inside the washer and submerged in water before the clothing is machine tumbled out of the bags. This is facilitated with a prewash, flush cycle to wet down the material.

Following the wash cycle, the wet items are placed on a turntable and sorted for drying. The material is then taken into the finishing rooms for folding, bagging, and final radiological surveys.

The dryers and room air exhausts to the hydrostatic precipitator where the effluent is filtered for particulate using a water bath, sampled, and discharged without high-efficiency particulate air (HEPA) filtration because of the low levels of radioactivity (Table 2-1). The exhaust sampler is a near isokinetic probe that provides a weekly composite.

Table 2-1. Facility Inventory at Risk.

Radionuclide	Physical/ chemical form	Quantity released (Ci)	Projected dose
1. Gross alpha	Air particulate	1.67 E-06	<0.1 mrem/yr
2. Gross beta	Air particulate	1.46 E-05	<0.1 mrem/yr
3. ^{90}SR	Aqueous	9.6 E-04	>4 mrem/yr (4% above DCG)
Totals	Air particulate Aqueous	1.63 E-05	<0.1 mrem/yr >4 mrem/yr

Regulated material	Stored quantity Kg (lb)	Annual quantity released (lb)	Reportable quantity Kg (lb)	Percent of Reportable quantity/yr
1. Ammonium bicarbonate	567 (1,247)	None	2272 (5,000)	
2. Sodium metasilicate	485 (1,067)	None	45 (100)	
3. Sodium phosphate	290 (638)	None	2272 (5,000)	
4. Dioctyl phthalate	8 (17)	42(lb)	2272 (5,000)	0.84%

2.2.2 Nonradioactive Laundry Wash Process

Nonradioactive laundry consists of typical industrial coveralls and lab coats. This process is similar to the above activity with the exception of a presort capability. The overall relative process volume is one third the total laundry process. Liquid discharges are collected in the facility sump, sampled and handled, along with the radiological effluents. Air exhaust from this process is filtered using cloth media lint filters on each dryer.

2.2.3 Mask Station Process

The mask station operation handles only nonradioactive respiratory equipment. The mask decontamination room with HEPA exhaust is not presently in use and is not expected to be operational in the future because of ineffective cleaning. The radioactively contaminated masks are decontaminated at Building 2706-T in the 200 West Area to background levels before they are received at the mask station.

After masks are sanitized and inspected, the mask canisters and face pieces are tested on a (Air Techniques, Incorporated, Model Q-127) smoke generator before field reuse. The mask washer uses dish soap and sanitizer that are not regulated. The liquid effluent is discharged to the sanitary

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sewer. The Q-127 smoke generator heats dioctyl phthalate (DOP) to generate smoke that is filtered through a portable HEPA filter vacuum and discharged back into the room.

2.3 IDENTIFICATION AND CHARACTERIZATION OF POTENTIAL SOURCE TERMS

The radioactive laundry process has a potential to discharge radioactive airborne and liquid effluents during wash and dry operations. The quantities of each discharge source appear in Table 2-1 and are from the annual effluent discharge report (Brown 1990) and FEMP determination (WHC 1991a).

The mask station and nonradioactive laundry processes have no potential to generate radioactive airborne and liquid effluents; however, all hazardous material inventories are presented in Table 2-1. This information is documented in the *Superfund Amendments and Reauthorization Act of 1986* (SARA) database used at the Hanford Site.

Potential sources of hazardous material inventories are the laundry soap products and maintenance chemicals used within the facility. Chemical soiled clothing is not considered a potential source using criteria of WAC 173-303 (Ecology 1989a). That is, laundering is not considered waste treatment. The specific locations of the materials in the facility are discussed in Section 4.0 of this document.

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3.0 APPLICABLE REGULATIONS

Regulations pertaining to effluent releases at the Hanford Site have been developed by several regulatory agencies: the Environmental Protection Agency (EPA), DOE, Washington Department of Ecology (Ecology), and the Benton-Franklin-Walla Walla Counties Air Pollution Control Authority (APCA 1980). Westinghouse Hanford has established administrative requirements for compliance based on as low as reasonably achievable (ALARA); however, this plan has been prepared against the federal, state, and local regulations, and DOE orders to maintain consistency. Table 3-1 gives a brief summary of the regulations and standards applicable to this FEMP.

3.1 FACILITY EFFLUENT MONITORING PLAN REQUIREMENTS

Requirements for FEMPs are provided in DOE Order 5400.1, "General Environmental Protection Program" (DOE 1988). The order provides specific information in Chapter IV on the requirements for effluent monitoring. A written environmental monitoring plan shall be prepared for each site, facility, or process that uses, generates, releases, or manages significant pollutants or hazardous materials.

To ensure the health and safety of the public, radioactive effluents and nonradioactive pollutants released at the Hanford Site shall be monitored in accordance with the DOE 5400 Series of Orders (DOE 1988); Title 40, Code of Federal Regulations (CFR), Part 61 and 302-306 (EPA 1989a); and WAC 173-303 (Ecology 1989a). Information on the monitoring requirements for liquid effluent release pathways is presented according to whether the effluent is radioactive or nonradioactive hazardous material. Regulations pertaining to the monitoring and environmental surveillance requirements of effluents are typically based on the effluent release limits for that material associated with the risk to the public.

Monitoring programs should be conducted in a manner that provides accurate measurements of the quantity and/or concentration of liquid pollutants in effluents as a basis for (1) determining compliance with applicable discharge and effluent control limits, effluent standards or guides, and with environmental standards; (2) evaluating the adequacy and effectiveness of containment, waste treatment, control, efforts toward achieving levels of radioactivity that are ALARA considering technical and economical constraints; and, (3) compiling an annual inventory of the radioactive material released in effluents and onsite discharges.

Effluents are sampled after particulate filtration and the last point of control before entering the disposal system. This is required to determine the effluent concentrations at the point of discharge from the facility according to environmental regulations (DOE 1990b). The PEDF has been in operation since the early 1950's and does not have a discharge or operating

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Table 3-1. Applicable Regulations and Standards.

Agency/Originator	Regulation No.	HA	HL	RA	RL	Summary/Application
U.S. Department of Energy, (DOE) Washington, D.C.	DOE Order 5400.1, 1988 General Environmental Protection Program	X	X	X	X	Outlines effluent monitoring requirements
	DOE Order 5400.5, 1990 Radiation Protection of the Public and Environment			X	X	Protects public/environment from radiation associated with DOE operations
	DOE Order 5480.4, 1989 Environmental Protection, Safety, and Health Protection (ES&H) Standards	X	X	X	X	Sets requirements for the application of the mandatory ES&H standards; lists reference ES&H standards
	DOE Order 5484.1, 1981 Environmental Protection, Safety, and Health Protection Information Reporting Requirements	X	X	X	X	Sets requirements for reporting information having ES&H protection significance
	DOE Order 5820.2A, 1988 Radioactive Waste Management	X	X	X	X	Sets radioactive waste management requirements
	DOE/EH-0173T, January 1991 Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance			X	X	Provides guidance for effluent sampling and monitoring.
U.S. Environmental Protection Agency, (EPA) Washington, D.C.	40 CFR 52.21 Prevention of Significant Deterioration (PSD) Requirements	X				Governs releases of criteria pollutants including NO_x, SO_2, and particulates
	40 CFR 61, 1989 National Emission Standards for Hazardous Air Pollutants (NESHAP)	X		X		NESHAPs
	40 CFR 61, 1989 Subpart A General Provisions	X				Regulates hazardous pollutants
	40 CFR 122, 1983 The EPA Administered Permit Programs: The National Pollutant Discharge Elimination System		X			Governs release of nonradioactive liquids
	40 CFR 141.16, 1989 Safe Drinking Water Act (National Interim Primary Drinking Water Regulations)		X		X	Sets maximum contaminant levels in public water systems
	40 CFR 261, 1989 Identification and Listing of Hazardous Waste		X			Identifies and lists hazardous wastes
	40 CFR 302.4, 1980 Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA): Designation, Reportable Quantities and Notification	X	X	X	X	Designates hazardous materials, reportable quantities, notification process

Table 3-1. Applicable Regulations and Standards.

Agency/Originator	Regulation No.	HA	HL	RA	RL	Summary/Application
EPA (Cont'd)	40 CFR 355, 1987 Superfund Amendments and Reauthorization Act of 1986 (SARA): Emergency Planning and Notification	X	X			Identifies threshold planning quantities for extremely hazardous substances
	40 CFR 403-471, 1990 Effluent Guidelines and Standards		X			Sets pretreatment standards for wastewater discharged to Public-Owned Treatment Works (POTW)
Washington State Department of Ecology, (Ecology) Olympia, Washington	WAC 173-216, 1989 State Waste Discharge Permit Program		X			Governs discharges to ground and surface waters
	WAC 173-220, 1988 National Pollutant Discharge Elimination System (NPDES) Permit		X		X	Governs wastewater discharges to navigable waterways; controls NPDES permit process
	WAC 173-240, 1990 Submission of Plans and Reports for Construction of Wastewater Facilities		X			Controls release of nonradioactive liquids
	WAC 173-303, 1989 Dangerous Waste Regulations		X			Regulates dangerous wastes; prohibits direct release to soil columns
	WAC 173-400, 1991 General Regulations for Air Pollution Sources	X		X		Sets emissions standards for hazardous air pollutants
	WAC 173-400-105 Records, Monitoring and Reporting	X				Governs recordkeeping and reporting
	WAC 173-480 Utilities and Transportation Commission	X		X		Endorses the 10 mrem/yr EDE EPA standard (40 CFR 61, Subpart H)
Washington State Department of Health, Olympia, Washington	WAC 246-247 Radiation Protection-Air Emission	X		X		Set standards for registration, permitting, notification, new source view, monitoring and reporting.
Benton-Franklin Walla-Walla Counties Air Pollution Control Authority, Richland, Washington	General Regulation 80-7, 1980	X				Regulates air quality

HA = hazardous airborne.
HL = hazardous liquid.
RA = radioactive airborne.
RL = radioactive liquid.
*Refers to standards that are referenced in the DOE and EPA regulations.

permit. As an existing facility, subsequent surveys and continued monitoring are required based on the operation and inventory at risk.

3.2 HAZARDOUS MATERIAL

The EPA regulations pertaining to the release of hazardous substances from DOE facilities are presented in 40 CFR 302, "Designation, Reportable Quantities, and Notification" (EPA 1989b). This regulation, in accordance with Sections 101 (14) and 102 (a) of the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA), defines hazardous substances, identifies reportable quantities of those substances, and set forth notification requirements for releases of those substances. This regulation also describes reportable quantities for hazardous substances designated under Section 311 (b) (2) (A) of the *Clean Water Act of 1977*. Any credible or potential upset condition identified in the FEMP determination shall be evaluated as to its risk to the environment using the CERCLA values (reportable quantities) as a basis for determining monitoring and/or sampling. Releases from any TSD facility containing any quantity of toxic chemicals listed in 40 CFR 372, Subpart D, shall be tracked and reported annually to the U.S. EPA and Washington State Department of Ecology in accordance with RCRA. Release of nonradioactive liquid effluents containing dangerous wastes are regulated by WAC-173-303. Actions necessary to be in compliance with the above requirements shall be stated in this FEMP.

3.2.1 Hazardous Mixed Waste

Currently no regulations pertain to mixed waste in effluents. Radioactive/dangerous/hazardous contaminants in effluent streams are handled as individual components in effluent regulations and in effluent monitoring; (i.e., regulations pertaining to both radioactive and hazardous contaminants apply to discharges of mixed waste). The policies on mixed waste are presented in ECM WHC-CM-7-5, Section J. The *Resource Conservation and Recovery Act of 1976* (RCRA) protocol samples on the liquid effluent wastewater are performed according to the requirements stated in the SAP and the LES Quality Assurance Project Plan (QAPjP).

3.3 AIRBORNE EFFLUENTS

Airborne emissions of radioactive materials from DOE-controlled facilities at the Hanford Site are subject to 40 CFR Part 61, *National Emissions Standards for Hazardous Air Pollutants* (NESHAP) (EPA 1989a) as stated in DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE 1990a), and DOE 5400.1, Chapter IV, "Environmental Monitoring Requirements" (DOE 1988). The list of hazardous air pollutants regulated under the NESHAPs is provided in Subpart A, "General Provisions." The specific emissions standards and monitoring requirements for radionuclides are contained in Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities." Subpart H covers all DOE operations that emit radionuclides other than radon to the air.

Subpart H presents detailed requirements for emissions monitoring and test procedures (61.93), compliance and reporting (61.94), recordkeeping requirements (61.95), and exemptions from the reporting and testing requirements of 40 CFR Part 61 (61.97). Radionuclide emission rates from stacks and vents must be measured at all release points that have the potential to discharge radionuclides into the air in quantities that could cause an effective dose equivalent in excess of 1 percent from the NESHAPS 10 mrem/year standard.

The projected dose equivalent for offsite determined by Westinghouse Hanford Environmental Protection from the laundry is less than 0.1 mrem/yr. Because the PEDF does not have HEPA filtration, the potential to discharge radionuclides is based on the discharge from the effluent stream without any pollution control equipment as normal operation. All radionuclides which could contribute greater than 10 percent of the potential effective dose equivalent for each release point must be measured. For release points that have a potential to release radionuclides into the air, but have effluents below the continuous monitoring standard, periodic confirmatory measurements must be made to verify low emissions. With EPA approval alternative methods to the one described, including process knowledge, can be substituted for measurement to determine the emission levels of individual radionuclides.

In Washington State, airborne effluents are regulated by the *Washington Clean Air Act of 1967*. General regulations for air pollution sources are presented in WAC 173-400 (Ecology 1976) and includes emission standards for sources emitting hazardous air pollutants in WAC 173-400-075. Westinghouse Hanford has received verbal concurrence from Ecology that laundry nonradioactive clothes dryers should not be included under WAC 173-400.

The WAC 246-247 (Ecology 1990), Radiation Protection Air Emissions specifies new source review, notification, registration, and permitting requirements associated with any source of radioactive air emissions in Washington State, including those on the Hanford Site. One requirement is the semiannual reporting of emissions from each registered stack or vent onsite. By agreement with Washington Department of Health (WDOH), only annual reporting is required.

The laundry stack, 296-W-1 is registered with the state and releases are reported on an annual basis.

Currently, there are no treatment, storage, and disposal facilities at the laundry facility which would contain airborne emissions subject to the federal register airborne requirements.

3.4 LIQUID EFFLUENTS

Chapter II of DOE Order 5400.5 presents the required limits for exposure of the public to radioactive materials from DOE-controlled facilities through the drinking water pathway (DOE 1990b). The DOE requires that any person consuming drinking water cannot receive an effective dose equivalent greater than 4 mrem in a year, excluding naturally occurring radionuclides. It is DOE policy to comply with the radiological criteria of the public community drinking water standards of 40 CFR 141, "National Interim Primary Drinking

Water Regulations" (*Safe Drinking Water Act*); the maximum contaminant levels in public water systems are found in Subsections 15 and 16 (EPA 1989c).

Liquid effluents from DOE-controlled facilities that have the potential for radioactive contamination must be monitored in accordance with the requirements of DOE Orders 5400.1 and 5400.5 (DOE 1988, 1990b). Facility operators must provide monitoring of liquid waste streams adequate to (1) demonstrate compliance with the applicable requirements of DOE 5400.5, Chapter II, (2) quantify radionuclides released from each discharge point, and (3) alert affected process supervisors of upsets in processes and emissions controls.

Washington State controls discharges to ground and surface waters within the state according to WAC 173-216 (Ecology 1989b). In addition to EPA requirements, the state and local sewerage agencies may impose additional limitations, monitoring, and reporting requirements. Because the Hanford Site has 33 separate liquid discharges, the *Hanford Federal Facility Agreement and Consent Order*, also known as the Tri-Party Agreement (TPA), has established milestones, as part of the LES program, for compliance plans of liquid discharges to land that could infiltrate to groundwater (Ecology, et al. 1991). Sampling and analysis plans are required for each Hanford Site liquid effluent stream. A SAP (WHC-SD-LL-PLN-001 [WHC 1991]) for the laundry wastewater was prepared as part of the TPA milestones.

Because the current laundry facility will end operation and stop all discharges by the 1995 TPA milestone, it will not require a discharge permit. A FEMP determination will be required for the new offsite laundry facility.

4.0 IDENTIFICATION AND CHARACTERIZATION OF EFFLUENT STREAMS

Laundry wastewater is the combination of effluents from many concurrent activities. During laundry operation, the machines are at different points in their respective cycles. Consequently, point source sampling at the various machines, while providing information about discharges from a particular machine, does not adequately characterize the composition of routine laundry wastewater.

4.1 IDENTIFICATION AND CHARACTERIZATION OF SOURCE TERMS CONTRIBUTING TO EACH EFFLUENT STREAM

Although the laundry facility is the only routine wastewater source to the 216-W-LC crib, there are 34 from a crib total of 78 frequent contributors or points of entry into the crib from the laundry. The remaining contributors are infrequent sources and include crib vent risers, manholes, and floor drains.

As shown in Figure 4-1, routine wastewater sources include: five washing machines; five dryer steam condensate lines; one heating, ventilation, and air conditioning system; the hydrostatic precipitator lint filter; boiler tank heating coils; and one handwashing sink.

To obtain a representative sample for the entire laundry wastewater, the discharge point for the validated sample data in stream-specific report (WHC 1990) was selected as Manhole H to obtain discharge concentrations at the end of pipe. Radiological data has been obtained from both Manhole C and the sump to document radionuclide inventory discharge information.

The following are the specific locations of the materials in the facility.

- The radionuclides generally are spread throughout the laundry garments with the majority of contamination in the soiled laundry storage room adjacent to the washers and dryers.

- The laundry detergents and bleach are purchased as a powder with the exception of the liquid degreaser, which does not have any reportable quantities of hazardous chemicals listed in Title 40 CFR 302 (EPA 1989b). These products are interim stored in bins outside the facility on their arrival from the company warehouse. When a product is needed, individual containers are moved into the process area allowing manual feeding of the products into the washers.

- The DOP is used for smoke testing the respiratory equipment. It is stored in a 2-gallon container, 7.7 kg (17 lb) maximum, within a controlled flammable storage cabinet in Mobile Office MO-412. Typically, small amounts of DOP have to be added to the Q-127 throughout the year to replenish the system.

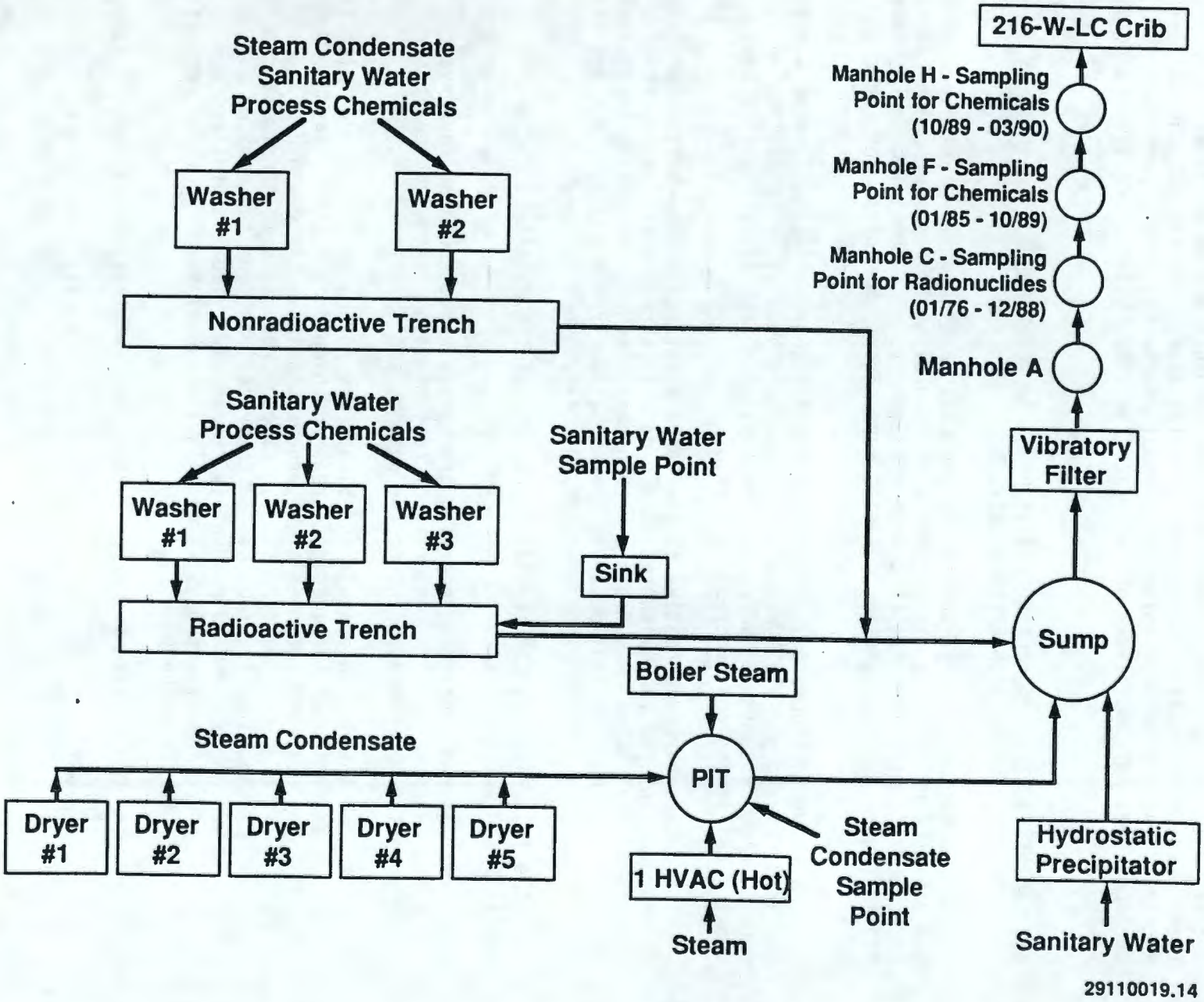

Figure 4-1. Wastewater Flow Schematic.

4.1.1 Routine Operating Conditions

Radiological material contamination (concentration) is relatively higher in the material receiving and storage areas than other areas. However, detail accounting is not possible because of a lack of available technology to monitor the constant laundry throughput. Based on the level of contamination and the limited amount of clothing per load, constituents are diluted with 2,280 L (600 gal) of water per washer, which is further diluted in the drain system.

The hazardous material inventories are distributed throughout the process areas with locations addressed in Section 4.1 of this document.

4.1.2 Upset Operating Conditions

The laundry facility is considered a low hazard, nuclear facility because it has a radioactive inventory (Table 2-1). All airborne radioactive material within the facility could be released without exceeding the onsite or offsite dose limits to the population. For the wastewater, the potential exists to exceed the administrative control value (2.0E-05 μCi/ml) as well as the drinking water standard of 4 mrem/yr (4% of DCG) for ^{90}Sr during normal operations. No upset operating conditions have been determined.

Based on the quantities of powdered soap needed to exceed the reportable limits, a process upset or spill is not capable of discharging significant amounts of hazardous materials. It would require several hundred pounds of soap to be flushed down the floor drains rather than swept up for reuse. Accordingly, no upset operating condition is credible.

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5.0 EFFLUENT POINT OF DISCHARGE DESCRIPTION

Although there are 34 routine wastestream sources within the facility, the laundry recognizes only one liquid effluent discharge point (i.e., sump) because of converging streams. The sewer line is a 20.3-cm (8-in.) vitrified clay pipe which connects the sump to the 216-W-LC laundry crib.

During operation, the estimated average flow rate is 380 L (100 gal)/min based on watermeter readings having a maximum flow of 570 L (150 gal)/min based on pump capacity. Process shutdowns occur as a result of maintenance outages on equipment. During the downtimes, the flow rate is significantly reduced to only steam condensate.

The facility storm drains collect the runoff in separate caissons around the exterior of the building. Process water cannot enter these drains. Because the soap products are stored outside in metal bins, spill kits have been provided at each storage location (DOE 1988).

Table 5-1. Radionuclide (Ci) Deposits from Laundry Wastewater to the 216-W-LC Crib.

	Average concentration 1989 (μCi/mL)	Average concentration 1990 (μCi/mL)
α	<4.62 E-08	9.7 E-02
β	<3.63 E-06	9.2 E-01
^{90}Sr	<3.49 E-08	6.9 E-04
^{129}I	<5.73 E-08	1.3 E-03
^{137}Cs	6.84 E-08	none detected
^{239}Pu	<1.62 E-08	1.8 E-04
^{241}Am	<1.53 E-08	4.1 E-04

The laundry facility has one registered stack, 296-W-1, with the WDOH under WAC 246-247. Airborne emissions from this stack are reported annually to the state, the DOE and EPA. The galvanized cylindrical stack is approximately 3 ft in diameter. The stack runs along the roof of the facility horizontally approximately 15 ft long. Flow is approximately 500 ft^3/min.

Table 5-2. (Ci) Releases from the Stack.

	1989	1990
$^{239,240}Pu$	<3.91 E-07	3.9 E-07
^{241}Am	<6.61 E-07	none detected

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6.0 EFFLUENT MONITORING/SAMPLING SYSTEM DESIGN CRITERIA

6.1 OLD FACILITIES

The general design criteria for liquid effluent sampling and monitoring systems are presented in Section 2.0, DOE/EH-0173T (1991) Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance.

1. Sampling systems shall be provided for all liquid effluents that have a potential for exceeding concentrations equivalent to the Drinking Water Standards contained in 40 CFR 141 (EPA 1976).

2. Sampling systems shall be designed to take a representative sample of the effluent stream. The sample location shall be as close to the environmental discharge point as practical and downstream of the effluent control systems. The sampler should sample only what is discharged to the environment. Samples of a stream diverted from environmental discharge should not be combined with the samples of the discharged effluent.

3. Automatic samplers should operate on a flow-proportional basis as controlled by a flow measurement system. The flow-metering device should be equipped with a flow totalizer for recording total effluent volume released from a given source.

4. Sampling probes should be suspended in the water so as not to pick up particulate matter from the bottom or top of the stream, pond, or basin.

5. The sampler should have a sufficiently high transport velocity to ensure accurate collection and transport of suspended solids to the sample collector. Lengths of sample tubing should be minimized.

6. The sampling system should ensure that no unsampled releases occur as a result of power failure (the sampler shall have backup power).

7. The sampler should be equipped to minimize cross contamination by sample line flushing or other methods.

8. For a batch discharge system, mechanical mixing or other design should ensure reasonable homogeneity of a batch before sampling. The system should have the means for accurate determination of batch volumes to permit volume-weighted compositing of grab (taken at random as opposed to continuous) samples.

For monitoring and diversion systems, the following criteria apply.

1. Monitoring systems shall be provided for all discharged liquid effluents that have the potential of exceeding four times the applicable administrative control limits in WHC-CM-7-5, *Westinghouse Hanford Company Environmental Compliance Manual* (WHC 1988a).

2. Monitoring shall be provided for each radionuclide which has the potential for exceeding the values in (1) above unless an increase in one radionuclide concentration is accompanied by proportional increases in another type.

3. Monitoring systems should be placed upstream from diversion systems and downstream from effluent treatment systems.

4. Monitors should have distinguishable, audible, and visible high-radiation alarms capable of alarming in an area subject to frequent or continuous occupancy.

5. Monitors should have distinguishable, audible, and visible detector-failure alarms capable of alarming in an area subject to frequent or continuous occupancy. The monitoring system electronics should include a low-count alarm. This module monitors the count rate provided by the electronics and alarms if the count rate drops below a selected level. This acts as a failure alarm for the system components.

6. Monitors should have distinguishable, audible, and visible loss-of-sample alarms capable of alarming in an area subject to frequent or continuous occupancy.

7. Monitors should have distinguishable capability to transmit a real-time measurement to a remote location.

8. Accessibility and maintainability should be considered with respect to the system configuration to accommodate periodic in-place calibration and maintenance.

9. A diversion and retention system shall be coupled with the monitoring system if the potential exists for exceeding the limits contained in WHC-CM-7-5, *Westinghouse Hanford Company Environmental Compliance Manual* (WHC 1988a).

10. Retention capacity shall be sufficient to retain the volume of liquid which exceeds the applicable limits based on a safety analysis postulated upset. The retention basin should be covered.

11. It should be possible to flush or decontaminate the monitor if a buildup of contamination raises the background radiation levels.

Delivery of a representative portion of the effluent stream to the sampler or monitor is dependent on the design of the transport line. The following are guidelines for the design of sampler or monitor system transport lines.

- The sampler and monitor should be located as far upstream as practical.

- Traps should be avoided and uphill runs kept as short as practical upstream of the sampler or monitor.

- Grab sample valves, throttling valves, and flow alarms should be downstream of the sampler and monitor.

- To reduce the number of fittings needed, tubing should be used instead of piping. Sample tubing should be as short as practical, have as few valves and bends as possible, and contain no traps.

- Transport velocity in systems with horizontal or uphill runs should be 61 cm/s (2 ft/s) or greater to ensure transport of suspended solids.

- If a heat exchanger is used, it should be sized to maintain the desired transport velocity and, if practical, the sample should flow downhill.

- The sampler should be upstream of the monitor if both units are on the same transport line.

- The sampler should be separate or separable from the monitor. The two capabilities may be on the same system if either can be isolated by maintenance by-pass loops.

The PEDF does not have any monitoring or alarm equipment because the effluent concentration levels are orders of magnitude below detection limits of in-line monitors. For environmental protection in accordance with DOE Order 5400.5 (DOE 1990b) the effluent constituents are documented for release from samples that have been composited monthly. Past reported releases have shown that the airborne and liquid effluent discharges are at or below minimum detectable levels measured at the 222-S Laboratory. A portable ISCO sampler is installed on the liquid effluent. Plans for 1993 include installation of a flowmeter and controller on the ISCO sampler to improve monitoring and sampling of the liquid effluent.

This facility has been in operation since 1952 and cannot be economically upgraded to meet current environmental regulations. A new facility will use the best available technology (BAT) approach for wastewater treatment and discharge. Until then, the PEDF will provide laundry services with continued discharges to the environment using the laundry crib.

In Section 8.0 of this document, effluent discharge information is compared to established criteria to meet DOE Order 5400.1 (DOE 1988) for effluent monitoring plan compliance.

6.2 296-W-1 STACK

This stack exhausts air from the wash process and clothes dryer, which has lint filters. The sampling and monitoring system consists of a record sampler only. The filter is exchanged weekly and composited monthly for analysis by the 222-S Laboratory. Because this offsite dose is less than the NESHAPs criteria, the EPA monitoring requirements are not enforced.

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7.0 CHARACTERIZATION OF CURRENT EFFLUENT MONITORING SYSTEM

The current liquid effluent monitoring system or program is performed as a service to the laundry facility by the Waste Tank Program. Until new sample equipment in Project B-697 is available, and to comply with environmental regulations (DOE 1990b), the monitoring program consists of manual grab samples taken by Tank Farm personnel on a daily basis according to Tank Farm surveillance operating procedure. Each week, the B Plant sample truck is contacted to pick-up and transfer the composites to the Westinghouse Hanford 222-S Analytical Laboratory for monthly analysis.

Routine sample information is compiled in annual radiological discharge reports generated by Environmental Protection. The laundry liquid effluent is analyzed routinely for total alpha, total beta, ^{90}Sr, ^{129}I, ^{137}Cs, ^{241}Am, and $^{239/240}Pu$. The most limiting isotope for total alpha is ^{239}Pu and the most limiting isotope for total beta is ^{90}Sr.

New sample information was generated and analyzed in the wastewater stream-specific report (WHC 1990a) to complete a dangerous waste designation on the laundry waste stream. Four random samples were taken during a 6-month period and are included for a more complete list of potential radionuclide constituents.

Using Table 7-1, a comparison of the sample information with the derived concentration guide (DCG) was performed. As shown, several radionuclides and the gross beta activity are above the DCG's. The potential exists to exceed the ACV for ^{90}Sr in the liquid effluent under routine and upset conditions.

Although the term gross activity indicates approximate activities, they have been compared to more accurate individual activities to reduce the potential of overlooking a significant individual emitter. This review identified that the gross activity is greater than the sum of activity for known emitters.

To verify and resolve this difference, the general routine monthly report needs to include less significant radionuclide constituents for this specific stream. The 222-S Laboratory reports significant emitters, to be at least 90 percent of the total gross activity. Otherwise, they are not reported because of insignificant levels. However, this stream has numerous minor emitters that influence the gross activity when combined.

Routine analysis will include the radionuclides identified in the wastewater stream-specific report (WHC 1990a) that are above 4 percent of the DCG limits shown in Table 8-1. These specific isotopes are ^{60}Co, ^{210}Pb, ^{228}Ra, ^{238}Pu, ^{244}Cm, ^{234}U, ^{235}U and ^{238}U. Also, total Uranium and ^{99}Tc activity for Beta emitters were identified through discussions with the PEDF customers with potential contamination on their clothing. This modification to the 222-S Laboratory report will determine the validity of this difference and resolve this issue.

Table 7-1. Liquid Effluent Data Summary.

Radionuclide	1990 (Ci)	Annual Average* µCi/ml	Derived Concentration Guide
Gross Alpha	4.51 E-07	3.3 E-06	3.00 E-08
Gross Beta	3.42 E-06	3.1 E-05	1.00 E-06
^{90}Sr	3.22 E-06	2.3 E-08	1.00 E-06
$^{239,240}Pu$	3.95 E-07	1.4 E-08	3.00 E-08
^{241}Am	1.16 E-07	6.2 E-09	3.00 E-08
^{137}Cs	3.57 E-07	<6.2 E-08	3.00 E-06
^{129}I	N/A	4.3 E-08	5.00 E-07
^{244}Cm	2.10 E-09	N/A	6.00 E-08
^{60}Co	5.45 E-07	N/A	5.00 E-06
^{3}H	3.64 E-06	N/A	2.00 E-03
^{54}Mn	7.45 E-08	N/A	5.00 E-05
^{22}Na**	8.88 E-08	N/A	1.00 E-05
^{210}Pb	2.03 E-09	N/A	3.00 E-08
^{238}Pu	3.39 E-08	N/A	4.00 E-08
^{228}Ra**	2.50 E-07	N/A	1.00 E-07
^{106}Ru	5.98 E-08	N/A	6.00 E-06
^{234}U	1.42 E-07	N/A	5.00 E-07
^{235}U	1.53 E-08	N/A	6.00 E-07
^{238}U	1.63 E-07	N/A	6.00 E-07

*Brown (1990)
**Indicates only one sample result.
<Indicates that monthly less than results contributed at least 10% of the annual total.

8.0 HISTORICAL MONITORING/SAMPLING DATA FOR EFFLUENT STREAMS

The routine daily grab samples are for an interim period during Project B-697 construction and less than desirable as verified by random samples of the wastewater stream-specific report (WHC 1990a) showing consistently higher values. As a resolution, the new sampler will provide a accurate representation of the radionuclide concentrations through more frequent sampling.

Specifically, the wastewater samples should be taken at a rate of 100 mL (3 oz) per sample at a flow rate of one sample per 3,785 L (1,000 gal). A sample of 400 mL (12 oz) per day is to be combined to accumulate a weekly 2.0 L (60 oz) sample, which is required for 222-S Laboratory minimum sample volumes.

8.1 NORMAL CONDITIONS

The daily volume of laundry processed from nearly 100 individual customers is 7.2 t (8 tons) of clothing which generates approximately 152,000 L (40,000 gal) of effluent. Because the laundry facility does not generate radionuclide material, laundry operations include verification of the contamination levels on the clothing received before being processed. This is accomplished by checking the radiation tags on each laundry bag against the laundry facility radiation surveys.

A review of the historic effluent information (Brown 1990) demonstrates that the radionuclide concentrations are consistently less than values. This supports the statement that operational controls maintain routine operations within DCG limits as evident from the sample data. Effluent data on the laundry wastewater for 1990-1991 is also included in Table 8-1.

8.2 UPSET CONDITIONS

In April 1990, processed laundry was being surveyed for radiological release to the field when abnormally high radioactivity was discovered on an article of clothing. Follow-up laboratory analysis of the article determined the radionuclide isotopes were specific to one customer facility. Because the average monthly concentrations are consistently less than detectable values, this one-time event did not exceed the release guidelines. However, it was considered a significant change from normal conditions.

Table 8.1. 200 West Laundry Wastewater to 216-W-LC Crib for 1990-1991.

Radionuclide	Release (Ci)	1990	1991	Average Concentrated
^{90}Sr	6.9 E-04	4.1 E-07	2.3 E-08	1.0 E-08
^{129}I	1.3 E-03	ND	4.3 E-08	<6.1 E-08
^{137}Cs	ND	3.0 E-06	6.2 E-08	7.6 E-08
Gross U	1.0 E-04	1.5 E-07	3.4 E-09	3.8 E-09
$^{239/240}Pu$	1.8 E-04	ND	6.2 E-09	<8.8 E-09
^{141}Am	4.1 E-04	ND	1.4 E-08	<1.2 E-08
Gross α	9.7 E-02	1.9 E-07	3.3 E-06	4.9 E-09
Gross β	9.2 E-01	2.2 E-06	3.1 E-05	5.7 E-08
Volume	3.0 E+07 L		3.9 E+04 L	

ND = None detected

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9.0 SAMPLE ANALYSIS

9.1 ANALYTICAL LABORATORY AND PROCEDURES

The 222-S Laboratory performs all analytical laboratory work following Westinghouse Hanford approved procedures. This provides proper handling of the samples, current equipment calibration, accurate analytical work methods, and certified data reporting for ensurance of accurate sample analysis results.

9.2 U.S. DEPARTMENT OF ENERGY ANALYTICAL AND LABORATORY GUIDELINES

Because the laundry facility obtains environmental sampling support, the samples are taken and controlled by other organizations. Sampling is performed by Waste Tank Program personnel with transport to the 222-S Laboratory using of Defense Waste Remediation procedures.

The analytical and laboratory procedures for the FEMP activities are identified in the *Quality Assurance Project Plan for the Facility Effluent Monitoring Plan Activities* (WHC 1991d). General requirements for laboratory procedures, data analyses, and statistical treatment are addressed in the QAPjP. Additional procedural references also are included in the 222-S Laboratory FEMP.

The 222-S Laboratory on the Hanford Site has one program plan and two project plans to address applicable quality requirements related to sample analysis. These plans are as follows:

- WHC-SD-CP-QAPP-003, *Quality Assurance Program Plan for the Chemical Analysis of Environmental Samples* (WHC 1990e)
- WHC-SD-CP-QAPP-001, *Analytical Chemistry Services Laboratories Quality Assurance Plan* (WHC 1989a)
- WHC-SD-CP-QAPP-002, *Quality Assurance Project Plan for the Chemical Analysis of Highly Radioactive Mixed Waste Samples in Support of Environmental Activities on the Hanford Site* (WHC 1989b).

The following elements are identified in *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE 1991). These elements also are addressed in the 222-S Laboratory FEMP (Tables 9-1 and 9-2).

The RCRA protocol liquid effluent sampling, associated with the LES, is not part of the FEMPs. The QA requirements for the sampling analysis plans associated with the LES are identified in the latest version of the WHC-SD-WM-QAPP-011, *Liquid Effluent Sampling Quality Assurance Project Plan* (WHC 1991d).

Table 9-1. Laboratory Procedures.

Element	Documentation
Sample identification system	To be provided when complete
Procedures preventing crosscontamination	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Documentation of methods	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Gamma emitting radionuclides	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Calibration	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table B-1)
Handling of samples	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table B-1)
Analysis method and capabilities	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Gross alpha, beta, and gamma measurements	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table B-1)
Direct gamma-ray spectrometry	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Beta counters	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Alpha-energy analysis	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Radiochemical separation procedures	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table 8-1)
Reporting of results	To be provided

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Table 9-1. Laboratory Procedures.

Element	Documentation
Counter calibration	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table B-1)
Intercalibration of equipment and procedures	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP WHC-EP-0446 Table B-1)
Counter background	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)

QAPjP = Quality Assurance Project Plan.

Table 9-2. Data Analyses and Statistical Treatment.

Element	Documentation
Summary of data and statistical treatment requirements	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)
Variability of effluent and environmental data	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)
Summarization of data and testing for outliers	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)
Treatment of significant figures	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)
Parent-decay product relationships	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)
Comparisons to regulatory or administrative control standards and control data	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)
Quality assurance	Contained in 222-S Laboratory Analytical Procedures (identified in QAPjP, WHC-EP-0446 Table 8-1)

Sampling will be performed according to the SAP. The SAPs have been prepared pursuant to the Tri-Party Agreement (Ecology et al. 1991) and are available for review.

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10.0 NOTIFICATIONS AND REPORTING REQUIREMENTS

Notifications and reporting of specific events related to environmental releases and/or events involving effluents and/or hazardous materials shall made in accordance with DOE Orders 5400.1 (DOE 1988) and 5000.3A (DOE 1990a). Implementation of the orders is accomplished using *Management Requirements and Procedures*, WHC-CM-1-3, MRP 5.14 (WHC 1990b).

10.1 DEFINITIONS

Primary Environmental Monitors--Monitoring equipment legally required to monitor ongoing discharges. In general, this term applies to monitors closest to the point of discharge that are used to determine if discharges are within specified limits.

Secondary Environmental Monitors--Environmental monitoring equipment or activities which, if degraded, will produce more than minor disruption of a monitoring program. An example of a minor disruption would be the failure of a unit whose place in the program is effectively overlapped by one or more components.

Environmental Control Limit (ECL)--Environmental requirements based on permit limits, DOE, EPA, or Ecology requirements, and Westinghouse Hanford policy.

Hazardous Substance or Material--Solid, liquid, or gaseous material as defined by the following regulations:

- Any CERCLA hazardous substance identified in 40 CFR 302.4 (EPA 1989b)
- Any SARA extremely hazardous substance identified in Appendix A of 40 CFR 355 (EPA 1988)
- Any dangerous waste regulated pursuant to the WAC 173-303, "Dangerous Waste Regulations" (Ecology 1989a).

Nonconformance--A nonconformance exists when the following has occurred, and appropriate recovery actions are implemented:

- Exceeding an ECL
- Failure to meet an environmental surveillance requirement
- Failure to implement an environmental administrative control
- Failure of primary environmental monitoring equipment to pass a surveillance check.

Oil--Any kind or form of oil, including, but not limited to, petroleum, fuel oil, sludge, oil refuse and oil mixed with wastes other than dredged spoil.

Occurrence Report--A written evaluation of an event or condition that is prepared in sufficient detail to enable the reader to assess its significance, consequences, or implications and evaluate the actions being proposed or employed to correct the condition or avoid recurrence.

Releases--Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of substances into the environment. This includes abandoning or discarding any type of receptacle containing substances or the stockpiling of a reportable quantity of a hazardous substance in an unenclosed containment structure.

Statistically Significant Increase--The largest 5 percent of all continuous releases when used in reference to a continuous release of a hazardous substance listed in 40 CFR 302.4 (EPA 1989b). Determination of statistical significance shall be based on any of the following:

a. Nonparametric statistical test
b. Control chart or student t test
c. Other tests that have equivalent sensitivity to (a) or (b).

10.2 REQUIREMENTS

10.2.1 Occurrence Identification and Immediate Response

1. Each employee shall identify events and conditions, and promptly notify management of such occurrences.

   - Call 811 if immediate help (e.g., fire, ambulance, or patrol) is required.

   - Call 3-3800 (the Patrol Operations Center) if assistance other than fire, ambulance, or patrol is required.

   - After requesting necessary outside assistance, the employee shall notify their supervisor, who shall notify the facility manager, the building emergency director, and the Occurrence Notification Center (6-2900).

2. Operations personnel shall take appropriate immediate action to stabilize or return the facility/operation to a safe condition.

3. The oversight organizations shall notify their RL counterparts of the event after receiving notifications from and discussing the event with the facility manager.

10.2.2 Occurrence Categorization

Occurrences (environmental) shall be categorized as soon as practical using specific criteria for radioactive and hazardous materials release. These categorizations should be made within 2 hours of identification. Occurrences shall be categorized by their seriousness; if categorization is not clear, the occurrence shall be initially categorized at the highest level being considered. The occurrence categorization shall then be evaluated, maintained, or lowered as information becomes available.

10.3 OCCURRENCE CATEGORIZATION

10.3.1 Radioactive Releases

Radioactive releases are divided into the following categories.

1. EMERGENCY

   - Release of radioactive material to controlled or uncontrolled areas in concentrations that, if averaged over a 24-hour period would exceed 5,000 times the DCG.

   - Release of radioactive material offsite that is not a normal monitored release and could result in an annual dose or dose commitment to any member of the general population greater than 500 mrem.

2. UNUSUAL OCCURRENCE

   - Release of radionuclide material that violates environmental requirements in permits, regulations, or DOE standards as determined by Westinghouse Hanford Environmental Protection.

   - Release below emergency levels that require immediate reporting to regulatory agencies or trigger outside agency specific action levels as determined by Westinghouse Hanford Environmental Protection.

3. OFF-NORMAL

   - Release of radionuclides not normally monitored.

   - Discovery of radionuclides where they are not expected (e.g., storm and sanitary sewers) and for which no immediate explanation is available.

   - Statistically significant increase in normally monitored releases of radionuclides to an uncontrolled area.

- Release of radionuclides that will be reported to an outside agency (excluding normal reporting) but not classified as an unusual occurrence.

- Controlled and monitored (instantaneous) gaseous radionuclide release exceeding 5,000 times the DCG over any 4-hour period.

- Controlled and monitored (instantaneous) liquid radionuclide release exceeding 5,000 times DCG.

10.3.2 Hazardous Substances Releases

Hazardous substances releases are divided into the following categories.

1. EMERGENCY

   Actual or potential release of material to the environment that results in or could result in significant offsite consequences (i.e., the need to relocate people and secure downstream water supply intakes, major wildlife kills, woodland degradation, and aquifer contamination).

2. UNUSUAL OCCURRENCE

   Release of a hazardous substance, regulated pollutant, or oil that exceeds a reportable quantity, federal permits, DOE standards, or levels requiring immediate reporting to outside agencies as determined by Westinghouse Hanford Environmental Protection.

3. OFF-NORMAL

   - Unmonitored release of hazardous substance or regulated pollutant as determined by Westinghouse Hanford Environmental Protection.

   - Statistically significant increase of hazardous substance in normally monitored released.

   - Discovery of a toxic or hazardous substance where it is not expected.

   - Release of a hazardous substance or oil which is not classified as unusual occurrence but will be reported to outside agencies (excluding normal reporting) as determined by Westinghouse Hanford Environmental Protection.

10.3.3 Agreement/Compliance Activities

Agreement/Compliance activities are divided into the following categories.

1. UNUSUAL OCCURRENCE

   - Agreement, compliance, remediation, or permit-mandated activity for which notification has been received from the relevant regulatory agency that a site plan is not satisfactory, or that a site is considered to be in noncompliance with schedules or requirements.

   - Occurrence under any agreement or compliance area that requires notification of an outside agency within 4 hours or less, triggers an outside regulatory agency action level, or indicates specific interest/concern from such agencies.

2. OFF-NORMAL

   - Occurrence under any agreement or compliance area that will be reported to outside agencies in a format other than routine monthly or quarterly reports.

   - Changes to existing agreements or permit-mandated activities.

   - Development of news agreements or permit-mandated activities.

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11.0 INTERFACE WITH THE OPERATIONAL ENVIRONMENTAL SURVEILLANCE PROGRAM

11.1 DESCRIPTION

The sitewide Environmental Monitoring Plan, as described in the FEMP Management Plan (WHC 1991b), consists of two distinct but related components: environmental surveillance conducted by Pacific Northwest Laboratory (PNL) and effluent monitoring conducted by Westinghouse Hanford. The responsibilities for these two portions of the EMP are delineated in a Memorandum of Understanding (PNL/WHC 1989). Environmental surveillance, conducted by PNL, consists of surveillance of all environmental parameters to demonstrate compliance with regulations. Effluent monitoring includes both in-line and facility effluent monitoring as well as near-facility operational environmental monitoring. Projected effective dose equivalent (EDE), reported in this FEMP, are the products of in-line effluent monitoring. Near-facility operational environmental monitoring is required by Part O, "Environmental Monitoring," *Environmental Compliance Manual* (WHC 1991c), and procedures are described in *Operational Environmental Monitoring* (WHC 1988).

11.2 PURPOSE

Operational environmental monitoring determines the effectiveness of environmental controls in preventing unplanned spread of contamination from facilities and sites operated by Westinghouse Hanford for DOE. Effluent monitoring and reporting, monitoring of surplus and waste management units, and monitoring near-facility environmental media are, therefore, conducted by Westinghouse Hanford for controlling operations, determining the effectiveness of facility effluent controls, measuring the adequacy of containment at waste transportation and disposal units, detecting and monitoring upset conditions, and evaluating and upgrading effluent monitoring capabilities.

11.3 BASIS

Near-facility environmental surveillance is conducted to (1) monitor employee protection; (2) monitor environmental protection; and (3) ensure compliance with local, state, and federal regulations. Compliance with parts of DOE Orders 5400.1, *General Environmental Protection Program* (DOE 1988); 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1990b); 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements* (DOE 1981); 5820.2A, *Radioactive Waste Management*; (DOE 1990c) and DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE 1991), are addressed through this activity.

11.4 MEDIA SAMPLED AND ANALYSES PERFORMED

Procedure protocols for sampling, analysis, data handling, and reporting are specified in WHC-CM-7-4 (WHC 1988). Media include ambient air, surface water, groundwater, external radiation dose, soil, sediment, vegetation, and

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animals at or near active and inactive facilities and/or waste sites. Parameters monitored include the following, as needed: pH, water temperature, radionuclides, radiation exposure, and hazardous constituents. Animals that are not contaminated, as determined by a field instrument survey, are released at the capture location.

11.5 LOCATIONS

Samples are collected from known or suspected effluent pathways (e.g., downwind of potential releases, liquid streams, or proximal to release points). To avoid duplication, Westinghouse Hanford relies on existing sample locations where PNL has previously established sample sites (e.g., air samplers in the 300 Area). There are 38 air samplers (4 in the 100 Area and 34 in the 200/600 Areas), 35 surface water sample sites (22 in the 100 Area and 13 in the 200/600 Areas), 110 groundwater monitoring wells (20 in the 100 Area, 89 in the 200/600 Areas, and 1 in the 300/400 Areas), 299 external radiation monitor points (182 survey points and 41 thermoluminescent dosimetry (TLD) sites in the 100 Area, 61 TLD sites in the 200/600 Areas, and 15 TLD sites in the 300/400 Areas), 157 soil sample sites (32 in the 100 Area, 110 in the 200/600 Areas, and 15 in the 300/400 Areas), and 95 vegetation sample sites (40 in the 100 Area, 40 in the 200/600 Areas, and 15 in the 300/400 Areas). Animal samples are collected at or near facilities and/or waste sites. Specific locations of sample sites are found in WHC-CM-7-4 (WHC 1988).

Additionally, surveys to detect surface radiological contamination, scheduled in WHC-CM-7-4, are conducted near and on liquid waste disposal sites (e.g., cribs, trenches, drains, retention basin perimeters, pond perimeters, and ditch banks), solid waste disposal sites (e.g., burial grounds and trenches), unplanned release sites, tank farm perimeters, stabilized waste disposal sites, roads, and firebreaks in the Operations Areas. There are 391 sites in the Operations Areas (100 in the 100 Area, 273 in the 200/600 Areas, and 18 in the 300/400 Areas) where radiological surveys are conducted.

11.6 PROGRAM REVIEW

The operational environmental monitoring program will be reviewed at least annually to determine that the appropriate effluents are being monitored and that the monitor locations are in position to best determine potential releases.

11.7 SAMPLER DESIGN

Sampler design (e.g., air monitors) will be reviewed at least biannually to determine equipment efficiency and compliance with current EPA and industry [e.g., American National Standards Institute and American Society for Testing and Materials] standards.

11.8 COMMUNICATION

The operations and engineering contractor and the research and development contractor will compare and communicate results of their respective monitoring programs at least quarterly and as soon as possible under upset conditions.

11.9 REPORTS

Results of the near-facility operational environmental monitoring program are published in the document series WHC-EP-0145, *Westinghouse Hanford Company Environmental Surveillance Annual Report* (WHC 1991f). The radionuclide values in these reports are expressed in curies, or portions thereof, for each radionuclide per unit weight of sample (e.g., picocuries per gram) or in field instrument values (e.g., counts per minute) rather than EDE, which is calculated as the summation of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighting factor.

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12.0 QUALITY ASSURANCE

12.1 PURPOSE

The Quality Assurance (QA) plan implements the overall QA Program requirements defined in WHC-CM-4-2, *Quality Assurance Manual* (WHC 1991g). This QA plan shall be consistent with the requirements in DOE 5700.6C, "Quality Assurance" (DOE 1991). In addition, the QA requirements in 40 CFR 60, *Appendix A*, "Test Methods and Procedures" (EPA 1990) shall be considered when performing monitoring calculations and establishing monitoring systems.

12.2 OBJECTIVE

This plan provides a documented QA plan describing QA requirements for the FEMP.

12.3 REQUIREMENTS

A Quality Assurance Project Plan (QAPjP) describes the QA requirements of the overall QA program. The QAPjP applies specifically to the activities associated with implementing the FEMP (WHC 1991b). Engineering, Health and Safety, Quality Assurance, and Environmental Protection organizations shall evaluate engineered systems that provide radiological and hazardous material safety to the public, employees, and environment and/or operational success. Their evaluations shall identify areas of significant concern requiring the development of QA verification plans. The general QA requirements are identified in the FEMP QAPjP (WHC 1991d). A facility-specific QA project plan will be provided when available and incorporated into the next revision.

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13.0 INTERNAL AND EXTERNAL PLAN REVIEW

The DOE Order 5400.1, "General Environmental Protection Program," Chapter IV (DOE 1988) requires the FEMP be reviewed annually and updated every 3 years. The FEMP should be reviewed and updated as necessary after each major change or modification in the facility processes, structure, ventilation and liquid collection systems, monitoring equipment, waste treatment, or significant change to the safety analysis reports. In addition, EPA regulations require that records on the results of radioactive airborne emissions monitoring be maintained on site for 5 years. Operations management shall maintain records of reports on measurements of stack particulate or other nonradioactive hazardous pollutant emissions for 3 years.

Facility operators must certify on a semiannual basis that no changes in operations which require new testing have occurred. Although the report is based on the calendar year, the emission limits apply to any period of 12 consecutive months. The Westinghouse Hanford Environmental Protection prepares an annual effluent discharges report for each area on the Hanford Site to cover both airborne and liquid release pathways. In addition, a report on the air emissions and compliance to the NESHAPs is prepared by Environmental Protection and submitted to EPA as well as DOE.

Facility management obtains the environmental protection function's approval for all changes to the FEMPs, including those generated in the annual review and update. In addition, the FEMPs shall be reviewed by QA and Regulatory Analysis.

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14.0 COMPLIANCE ASSESSMENT

This section discusses the conclusion reached from evaluating the existing monitoring against regulatory requirements derived from DOE, federal and state regulations. The only effluent type for which a FEMP is required for the laundry facility is the liquid (wastewater).

14.1 LIQUID EFFLUENTS GUIDANCE DERIVED FROM U.S. DEPARTMENT OF ENERGY, FEDERAL, AND STATE REGULATIONS

14.1.1 General

As stated in DOE Order 5400.1, Preamble 8e (DOE 1988), "Effluent monitoring is the collection and analysis of samples or direct measurement of liquid and gaseous effluents for the purpose of characterizing and quantifying contaminants, assessing radiation exposures of members of the public, providing a means to control effluents at or near the point of discharge and demonstrating compliance with applicable standards and permit requirements."

Further, it is stated that "DOE is committed to good environmental management of all its programs and at all its facilities to correct existing environmental problems, to minimize risks to the environment or public health and to anticipate and address potential environmental problems before they pose a threat to the quality of the environment or the public welfare." (DOE Order 5400.1, Preamble 5a)

The DOE has committed by means of DOE Orders 5484.1 (DOE 1981), 5000.3A (DOE 1990b), and the 5500 series dealing with emergency management to "...notify Headquarters [Emergency Operations Center] EOC of significant nonroutine releases of any pollutant or hazardous substance, e.g., releases of hazardous substances . . . as required by the CERCLA." The actual amount of hazardous or radioactive substance that requires notification under CERCLA is found in 40 CFR 302 (EPA 1989b).

14.1.2 Nonradioactive Liquids

For liquid effluents discharged to cribs, the basic criterion is that facilities may not discharge any effluent that is a hazardous waste according to WAC 173-303. Washington Administrative Code 173-303 (Ecology 1991b) is the State's implementation of RCRA and incorporates, by reference, 40 CFR 261 (EPA 1987a) and 40 CFR 264 (EPA 1989d). The monitoring required is to demonstrate (1) a continuing knowledge of the waste composition and (2) compliance with the prohibition on discharging hazardous waste to the ground, as called for in DOE Order 5400.1, Sections 5 and 8 of Chapter IV (DOE 1988).

A second area that impacts liquid releases to ponds, cribs, and ditches is the Land Ban Regulations embodied in 40 CFR 268 (EPA 1987b) and

WAC 173-303-140 (Ecology 1991a). The 40 CFR 268 is incorporated by reference into WAC 173-303. Again, monitoring will be necessary to confirm the identity of the waste and demonstrate compliance.

While these regulations generally apply only to wastes designated as dangerous or those expected to be dangerous, the applicable DOE regulations (DOE Order 5400.1, 5.a 1-4) require monitoring to demonstrate verification of compliance, to evaluate effectiveness of effluent treatment, and to control and determine if a waste is hazardous. In addition, DOE has committed to maintaining the ability to address environmental discharges before they pose a threat to the quality of the environment or the public welfare.

Monitoring will provide facility data to demonstrate compliance with applicable regulations. If groundwater contamination is found, these data can possibly provide objective evidence that the contamination did not originate from a particular facility. The continued monitoring of liquid releases will serve to alert Westinghouse Hanford to potential problems in the effluents before significant groundwater contamination. In addition, a waste-analysis plan for interim facilities complies with WAC 173-303-300, WAC 173-303-400 and 40 CFR 265.13 (EPA 1987c) to ensure that dangerous wastes will be adequately characterized before they are treated, stored, or disposed of within the Hanford Site boundaries.

One additional regulation that should be considered is WAC 173-216, *State Waste Discharge Permit Program* (Ecology 1990b). This regulation implements a State permit program for discharges of waste materials from industrial, commercial, and municipal operations into the ground and surface waters of the State.

This program is much like the NPDES program as required by the *Clean Water Act of 1977* and is implemented by WAC 173-220 (Ecology 1990a). The regulations under WAC 173-216 (Ecology 1990) establish a number of conditions that will be addressed in an issued permit. These include:

- Use of all known, available, and reasonable methods of prevention, control, and treatment (AKART)
- Pretreatment requirements
- Requirements pursuant to other laws, including as they apply to RCRA
- Conditions necessary to meet applicable water quality standards for surface waters or to preserve beneficial uses for groundwater
- Conditions necessary to prevent and control pollutant discharges from plant site runoff, spillage or leaks, sludge or waste disposal, or raw material storage
- Appropriate monitoring, reporting, and recordkeeping requirements
- Schedules of compliance.

14.1.3 Radioactive Liquids

The DOE has maintained that the release of radioactive materials is governed by the *Atomic Energy Act of 1954* and that the release limits set by DOE correspond to federally permitted releases and are thus exempt from other Federal and State regulations. At the same time, DOE has committed to complying with all "applicable" limits of EPA and State regulations.

The DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1990b), provides guidance on the acceptable levels of radioactivity allowed in liquid waste and effluents. The purpose of the DOE standards is to ensure that the dose to the public remains below 100 mrem EDE per year (Chapter I.3) and to protect the natural resources.

Demonstration of compliance with DOE Order 5400.5 will generally be based on data from monitoring and surveillance programs (Chapter I, 8.a; Chapter II, 6). It is stated in the DOE Order (Chapter II, 4.d) that liquid effluents from DOE activities will not cause private or public drinking water systems downstream of the facility discharge to exceed the drinking water limits in 40 CFR, Part 141, which are, in general, numerically equivalent to 4 percent of DOE DCG values. The drinking water limits also are addressed in Part F of the *Environmental Compliance Manual*, WHC-CM-7-5 (WHC 1991c).

Guidance on discharges of liquid waste to aquifers and the phase out of soil columns is found in DOE Order 5400.5, Chapter II, 3.b. The guidance is limited to a reaffirmation of DOE commitment to phase out soil-column use (i.e., trenches, cribs, ponds, and drain fields) at the earliest practicable time. For those liquid discharges not first treated by BAT, DOE will develop (within 6 months of the issuance date of order) a plan and a schedule for implementing alternative, acceptable disposal at the earliest practicable time. In addition, new or increased discharges of radionuclides in liquid waste to soil columns are prohibited [Chapter II, 3.b(2)] unless the DOE activity cannot comply or the release is tritium [Chapter II, 3.e(1)].

Compliance with the dose limits of DOE Order 5400.5 (DOE 1990b) will be demonstrated by documentation of a combination of measurements and calculation (Chapter II, 6.a). The ALARA concept called for in DOE Order 5400.1 (DOE 1988) has the objective of attaining dose levels as low as possible. Compliance with these two objectives would seem to require monitoring any stream that has the potential for containing measurable radioactivity. The DCGs are concentrations of radionuclides in water that, under continuous exposure (ingestion of water), would result in an EDE of 100 mrem/year to the public. One method relating directly to the EDE of 100 mrem/year would be to monitor to limits connected to some multiple or fraction of a DCG. That is the approach currently taken in Westinghouse Hanford's Environmental Compliance Manual (WHC 1991c).

14.2 COMPARISON OF CURRENT AND PLANNED LIQUID EFFLUENT MONITORING AGAINST REGULATORY COMPLIANCE

The major regulatory criteria for the liquid effluent from wastewater to the 216-W-LC Crib are (1) that a representative sample be obtained and (2) that the effluent batch can be demonstrated to be nonhazardous and below DOE-

approved radiological dose limits. The major regulation that has to be satisfied is WAC 173-303, to ensure that no dangerous or hazardous waste is disposed of to the ground (Ecology 1991b). Satisfying WAC 173-303 will largely ensure that (1) EPA RQs 40 CFR 302 (EPA 1989b) are not exceeded and (2) the Land Ban Regulations of 40 CFR 268 (EPA 1987c) and WAC 173-303 are satisfied.

This liquid stream comprises wastewaters from the laundering of contaminated clothing and equipment. Bag filters are used to filter the larger particulates before discharge to the crib. Weekly samples are taken from an unincremental, time-proportioned sampler.

The use of a time-proportional sampler can provide a representative sample only as long as the flow to the crib is relatively constant. To the extent that the flowrate varies, an error is introduced in the sample taken on a time-proportional basis. The flowrate to wastewater should be evaluated, and if there is significant variation, sampling should be performed on a flow-proportional or batch-sampling mode.

One of the proportional sampling systems considered for future use incorporates a vacuum sampling line. However, the use of a vacuum pump to remove the sample from the sample stream is not appropriate for sampling volatile organic chemicals (VOC). Any sampling system that uses a pump to extract a liquid sample to analyze for VOCs should use a positive-displacement design to minimize potential for aerating or stripping volatile organics from the sample during removal from the basin influent.

A more suitable grab-sampling device would be the weighted bottle type as described in SW 846, Vol. II, Chapter 9.0. This would allow a vertical stratified sampling plan to be used, ensuring more closely that the basin sample is representative.

The frequency of analysis (each batch before discharge to the crib) is appropriate.

In the event of an unplanned release, it might be necessary to confirm the identity of the specific spilled waste in order to adequately report the spill and help identify remedial actions. To provide compliance with DOE orders, the monitoring indicated for this stream would be to detect an unplanned release. Subsequent sampling and analysis actions would be determined if and when a release occurred.

15.0 SUMMARY

For discharge of hazardous material, the 2724-W facility wastewater stream has been evaluated (WHC 1990a) and determined not to be a dangerous waste in accordance with the procedure defined in WAC 173-303 (Ecology 1989a). However, this wastewater stream does have measurable quantities of radionuclides that require a monitoring program.

This FEMP proposes that the wastewater samples be taken at a rate of 100 mL (3 oz) per sample at a flow rate of one sample per 3,785 L (1,000 gal). A sample of 400 mL (12 oz) per day is to be combined to accumulate a weekly 2.0 L (60 oz) sample required for Westinghouse Hanford 222-S Analytical Laboratory minimum sample volumes. This sampling method will assure that an accurate radionuclide concentration is obtained that will be representative of what is actually present in the effluent.

Based on the radionuclide history, the wastewater stream will be analyzed for the following:

- ^{60}Co
- ^{90}Sr
- ^{99}Tc
- ^{129}I
- ^{137}Cs
- ^{210}Pb
- ^{228}Ra
- ^{234}U
- ^{235}U
- ^{238}U
- ^{238}Pu
- $^{239/240}Pu$
- ^{241}Am
- ^{244}Cm
- Gross Alpha
- Gross Beta
- Gross Uranium.

The water sample analysis is conducted by the 222-S Laboratory according to the requirements specified in the statement of work (WHC 1992). Because this FEMP is a living document, data will be reviewed annually against regulatory criteria for compliance verification. If required, any future modifications will be approved by Environmental Protection and QA.

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16.0 ATTACHMENTS

16.1 REFERENCES

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