Facility Effluent Monitoring Plan for the Tank Farm Facility

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Date Published
May 1998

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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P.O. Box 1000
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Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-98RL13200

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RELEASE AUTHORIZATION

Document Number: HNF-EP-0479-2

Document Title: Facility Effluent Monitoring Plan for the Tank Farm Facility

Release Date: 5/18/98

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz

May 18, 1998

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Printed in the United States of America

DISCLM-1.CHP (8-95)

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FACILITY EFFLUENT MONITORING PLAN FOR THE
TANK FARMS FACILITIES

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. 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 operational effluent monitoring systems and provide for plan 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.

*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-0438-1, Westinghouse Hanford Company, Richland, Washington, 1992.

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LIST OF TERMS

AEA	<u>Atomic Energy Act of 1954</u>
ABCASH	Automated Bar Coding of Air Samples at Hanford
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
APCA	Air Pollution Control Authority
ASF	Ammonia Scrubber Feed
ASP	Alarm Setpoints
ASTM	American Society for Testing and Materials
ATP	Acceptance Test Procedure
CAM	Continuous Air Monitoring
CERCLA	<u>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</u>
CFR	Code of Federal Regulations
DAC	Derived Air Concentration
DCRT	Double-Contained Receiver Tanks
DOE	U.S. Department of Energy
DST	Double-Shell Tank
EDE	Effective Dose Equivalent
EDP	Electronic Data Processing
EMP	Environmental Monitoring Plan
EMS	Effluent Monitoring System
EPA	U.S. Environmental Protection Agency
FEMP	Facility Effluent Monitoring Plan
FFCA	Federal Facility Compliance Agreement
HEPA	High Efficiency Particulate Air
HPT	Health Physics Technician
HWVP	Hanford Waste Vitrification Plant
ICRP	International Commission of Radiation Protection
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollution Discharge Elimination System
OEMP	Operational Environmental Monitoring Program
PFP	Plutonium Finishing Plant
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration Permit
PUREX	Plutonium/Uranium Extraction
RCRA	<u>Resource Conservation and Recovery Act of 1976</u>
RHO	Rockwell Hanford Operations
SAR	Safety Analysis Report

LIST OF TERMS (Continued)

SARA	<u>Superfund Amendments and Reauthorization Act of 1986</u>
SST	Single-Shell Tank
TSD	Treatment, Storage, or Disposal
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

A variety of liquid wastes are generated in treatment and disposal facilities throughout the Hanford Site. Tank Farm Facilities are a major part of Hanford Site waste management activities and involve temporary storage of wastes. These wastes include hazardous components regulated under the Resource Conservation and Recovery Act of 1976 (RCRA) and as by-product material regulated under the Atomic Energy Act of 1954. Tank Farms include a total of 177 single and double shell tanks (SSTs and DSTs) along with various transfer and receiving facilities which are all located at the 200 East and 200 West Areas of the Hanford Site. These facilities were constructed to various designs from 1943 to 1986. As part of the normal operation of some of these facilities, effluents are generated and, in some cases, released. Primary effluents from the Tank Farm Facilities are air emissions. These effluents are regulated via a variety of regulations which are discussed further in Section 3.

1.1 POLICY

It is the policy of the U.S. Department of Energy (DOE) to conduct effluent monitoring that is adequate to demonstrate that the public and environment are protected during Operations and that operations are in compliance with DOE and other applicable federal, state, and local radiation and hazardous material regulations. It is also DOE policy that effluent monitoring programs meet high standards of quality and credibility.

Facility Effluent Monitoring Plans (FEMP) are required to determine:

- (1) if the total projected effective dose equivalent (EDE) to any member of the public from radionuclide emissions from any single discharge point exceeds 0.1 mrem/yr,
- (2) if any one regulated material discharged over a 24-h period from a facility exceeds 100% of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) reportable quantity as listed in 40 Code of Federal Regulations (CFR) Part 302.4 (U.S. Environmental Protection Agency), or
- (3) if a liquid effluent is regulated by the National Pollutant Discharge Elimination System (NPDES) and contains radionuclides that will cause any person consuming that effluent to receive an EDE greater than

4.0 millirem per year.

1.2 PURPOSE

The purpose of this FEMP is to fulfill the requirements of DOE Order 5400.1, the General Environmental Protection Program (DOE 1990a), that requires an FEMP for each Hanford Site tank farm facility that contains hazardous materials, that could affect employee and public safety and/or the environment. This FEMP was prepared in accordance with A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans (WHC 1992c); and is intended to be the plan which details effluents, effluent discharge points, monitoring systems, data and information, sampling protocol, and engineering controls at the facility in order to meet regulatory requirements.

1.3 SCOPE

This document includes information on monitoring radioactive and nonradioactive hazardous materials discharged in the tank farm facility effluents. This plan includes gaseous effluent monitoring systems (EMS) for radioactive pollutants that could be discharged under routine and/or upset conditions. This FEMP describes airborne effluent pathways and associated sampling and monitoring systems for tank farm facilities. It also provides information on effluent characteristics and effluent monitoring systems for use in assessing compliance. Information is obtained to determine radioactive source terms for specific effluent streams. These, in turn, are related to discharge points and effluent monitoring system capability.

Tank Farm Facilities were originally evaluated for purposes of requiring an FEMP in Facility Effluent Monitoring Plan Determinations for the 200 Area Facilities (WHC 1991a). The primary results of these original evaluations focused primarily on radionuclide emission potentials rather than liquid effluents. Determinations of these potential emissions were originally accomplished using the method specified in 40 CFR 61, Appendix D. Since that time a number of other methods have been employed, resulting in differing potential emission determinations. The most current determinations refer to the most recent revision of HNF-SD-WM-EMP-031, "Tank Farm Stack NESHAP Designation Determinations." As of the published date of this FEMP, this document requires the facilities listed in Table 1-1 to be detailed within this FEMP. Exceptions and notes which apply to the Table 1-1 listed facilities are as follows:

1. The 296-A-12 stack system is not compliant. Determination of potential emissions from this stack resulting in an off-site dose consequence to the public of greater than 0.1 mrem/yr occurred after the National Emission Standards for Hazardous Air Pollutants (NESHAP) and Federal Facility Compliance Agreement (FFCA) was signed into agreement by U.S. EPA Region 10 and DOE-RL on February 7, 1994. As the stack system is not listed in the FFCA, it cannot be operated until upgrades are performed to bring it into compliance. Operation of an exhauster system is required, however, due to facility needs. Portable Exhauster, stack 296-P-32, has been designated to support these facility needs. A Notice of Construction to support use of this exhauster has been submitted and approved in accordance with WAC 246-247-060. Discussion of this exhauster will be accomplished herein.
2. The 296-A-17 and 296-P-26 stacks have been replaced with a new exhauster system under project W030. This new exhauster is designated as stack 296-A-42. This new system is discussed herein.
3. The 296-U-11 stack is not operational, as yet; and no date is available for when this facility will become operational. The operations' date is based on salt well pumping schedules which are not yet firmly established. Discussion of this facility within this FEMP revision will therefore only be in general terms.

The following is a compliance/operational status of the facilities discussed within this FEMP update:

Table 1-1: Tank Farm Stacks Discussed Within this FEMP				
Stack	Facility	Compliant yes/no	Operational yes/no	Notes
296-A-12	244-AR Vessel Vent	no	no	See 296-P-32
296-A-42	Aging Waste Replacement Exhauster Built Under Project W030	yes	yes	na
296-A-25	244-A Double Contained Receiver Tank Exhauster	no	yes	na

Table 1-1: Tank Farm Stacks Discussed Within this FEMP				
Stack	Facility	Compliant yes/no	Operational yes/no	Notes
296-B-28	244-BX Double Contained Receiver Tank Exhauster	no	yes	na
296-C-05	244-CR Vault Exhauster	no	yes	na
296-P-16	241-C-105/106 Tank Exhauster	no	yes	na
296-P-32	Core Sampling Exhauster Use at 244-AR	yes	yes	na
296-S-22	244-S Double Contained Receiver Tank Exhauster	no	yes	na
296-T-18	244-TX Double Contained Receiver Tank Exhauster	no	yes	na
296-U-11	244-U Double Contained Receiver Tank Exhauster	yes	Schedule not available.	

No new wastes have been added to the SSTs since 1981; and flow of dangerous waste into the SST system has been curtailed. Current planned activities support ultimate closure of the SST system and include interim stabilization (removal of liquids) and interim isolation of tanks. This work is done according to a compliance plan identified as part of the Hanford Federal Facility Agreement and Consent Order of 1990 (commonly called the Tri-Party Agreement) (Ecology et al. 1994). Liquids leaking from the SSTs are not considered effluents for this plan and are monitored as part of an environmental surveillance program.

2.0 FACILITY DESCRIPTION

2.1 FACILITY PHYSICAL DESCRIPTION

2.1.1 Tank Farms as Part of the 200 Area Facilities

Figure 2-1 shows the general locations for all of the tank farms in the 200 East and 200 West Areas. Both Double Shell Tanks (DSTs) and Single Shell Tanks (SSTs) are shown. Tank Farms in the 200 East Area include A, AX, B, BX, BY, C (SSTs), AN, AZ, AY, AP, and AW (DSTs). Those Tank Farms in the 200 West Area are S, SX, T, TX, TY, U (SSTs), and SY (DST).

Figure 2-2 is a schematic diagram showing the Hanford Site tank farm facilities including transfer routes, diversion boxes, storage vaults, double-contained receiver tanks, and evaporators within the overall system. Information on the type and/or status (i.e., single-shell, double-shell, assumed leaker, interim stabilized), tank number monitoring instrumentation, etc., is included in the diagram (Hanlon 1991).

2.1.2 Double-Shell Tanks

The DSTs, from which emission potentials are sufficient to require an in-depth FEMP write-up, are the two tanks in the 241-AY Tank Farm and the two tanks in the 241-AZ Tank Farm. These four tanks are designed to store 3.79-ML (1.0 Mgal) of high-activity mixed waste for up to 50 years.

For information, DSTs within Tank Farms are listed in Table 2-1 below. For efficiency, the million-gallon tanks were grouped into six tank farms with each tank farm having 2, 3, 6, 7, or 8 tanks. At the Hanford Site, all buildings, tanks, and other engineered structures are given an alpha-numeric designation (e.g. 241-SY-103). The 241 indicates that the structure is associated with a tank farm; the SY indicates that the tank is located in the SY Tank Farm; and the 103 is the individual tank number within the SY Tank Farm. The DSTs in each tank farm generally are numbered starting with 101. The 241-SY Tank Farm is located in the west-central portion of the 200 West Area and consists of three 3.79-ML (1-Mgal) tanks. The five other DST farms are located in the east-central part of the 200 East Area.

The DSTs were fabricated as two concentric tanks surrounded by a concrete shell. Waste is stored in the free standing primary tank which is 22.9 m (75 ft) in diameter and 14.2 m (46.8 ft) high at

the crown. The primary tank sits on a concrete pad. The secondary tank is 1.5 m (5 ft) larger in diameter than the primary tank which creates a surrounding space called the annulus. The secondary tank sits on a concrete pad. The completely enclosed annulus serves as a containment barrier in case the primary tank leaks. The annulus is ventilated and continually monitored for evidence of primary tank leakage. The concrete shell encloses the sides of both primary and secondary tanks for additional containment, radiation shielding, and structural support. Figure 2-3 shows a typical DST cross section.

Table 2-1: Double-Shell Tank List

Tank Number	Location	Operation Date
There are twenty-four 1.2 Mgal Non-Aging Double-Shell Tanks (DSTs).		
241-AN-101 241-AN-102 241-AN-103 241-AN-104 241-AN-105 241-AN-106 241-AN-107	200 East Area	09/81
241-AP-101 241-AP-102 241-AP-103 241-AP-104 241-AP-105 241-AP-106 241-AP-107 241-AP-108	200 East Area	10/86
241-AW-101 241-AW-102 241-AW-103 241-AW-104 241-AW-105 241-AW-106	200 East Area	08/80
241-SY-101 241-SY-102 241-SY-103	200 West Area	04/77
There are four 1.0 Mgal Aging Waste Double-Shell Tanks (DSTs).		
241-AY-101 241-AY-102	200 East Area	07/71 04/76*
241-AZ-101 241-AZ-102	200 East Area	11/76

*Estimated date the tank became operational.

2.1.3 Double Contained Receiver Tanks (DCRTs)

The Double Contained Receiver Tanks (DCRTs) discussed in this FEMP include 244-AR Vault, 244-A DCRT, 244-BX DCRT, 244-CR Vault, 244-S DCRT, and 244-TX DCRT. Table 2-2 list these facilities and provides pertinent information such as tank capacities, operation start dates, etc. These DCRTs are used primarily for transfer and storage of waste on its way to larger tanks or to other facilities. Structurally, DCRTs are comprised of a primary tank surrounded by a secondary containment vessel, called a tank vault with access ports on top for pumping, instrumentation, ventilation, and piping. The primary tank is located within the tank vault, separated by an annular space. The primary tank contains aqueous radioactive wastes. The bottom of the tank vault is sloped to a sump for leak collection and detection. The tank vault is designed to contain leakage from a failure of the primary tank.

244-AR - The 244-AR Vault is located near the 241-A Tank Farm in the 200 East area. There are a total of four tanks in the 244-AR Vault which are ventilated by the 296-A-12 Stack. Tanks 001 and 002 have a nominal volume of 190,000 liters. Tanks 003 and 004 have a nominal volume of 19,000 liters. The 244-AR Vault is considered to be a double-contained receiver tank based on its functional characteristics, although it is not listed as one of the five designated DCRTs in the 200 Area tank system. The 244-AR Vault was first used to transfer waste in 1966. Strontium sludge processing operations in the AR-Vault were completed in April 1978, with the goal of removing the bulk of A and AX Farm strontium accomplished. With the completion of this activity, the facility was cleaned out except for 600 gallons of sludge left in tank 004. This waste was subsequently transferred to tank 002 in preparation for use in a planned PNL vitrification study. The waste vitrification study was never conducted and the waste remains stored in tank 002. Since that time, this facility has remained inactive except for vault sump maintenance. The vessel vent was periodically turned to pump vault sump accumulations into the tanks.

The two tanks have been determined to currently contain the following:

Tank 001 contains 4,900 liters (1,300 gallons) of waste with an unknown source term.

Tank 002 contains 46,370 liters (12,250 gallons) of waste. Included, therein, is the high source term waste originally from tank 004.

Tank 003 currently holds 8,000 liters (2000 gallons) of storm-

water runoff pumped from the 244-AR canyon.

Tank 004 contains only about 950 liters (250 gallons), which most likely includes the remains of the original A & AX Farm wastes.

Each of the vessels is held in its own cell and isolated from the 244-AR Vault canyon via a cell cover. Each of the vessels is ventilated via a common pipe which passes through ports in the cell walls, then through a heater followed by parallel pre-filters/HEPA filters, and a single blower system before venting into the 296-A-12 Stack. The 296-A-12 stack system is not used due to the lack of a current mission for the facility and because of incomplete upgrades.

244-A - The 244-A DCRT is located west of AY and AZ farm. This DCRT is similar in design to 244-S. It consists of a vault surrounding a vertical cylindrical 75,000 liter, steel tank. The vault walls, floor, and sump are lined with carbon steel. The 296-A-25 stack system ventilates the 244-A DCRT tank and annulus. The 244-A DCRT is used to pump liquid waste from 200 East and 200 West to the 200 East double-shell tanks. The 244-A DCRT started operation in 1975. Potential waste streams which may pass through this DCRT include those from the 244-BX DCRT (BX, BY, B Tank Farms), from the 244-TX DCRT (PFP, T-Plant, TX, TY, and T Tank Farms), from the 244-S DCRT (222-S Lab, U-Plant, S and SX Tank Farms), from the 244-CR Vault (C Tank Farm); 241-AX and 241-A, and certain 242-A Evaporator feeds.

244-BX - The 244-BX DCRT is located just inside the BX/BY Tank Farm complex. This DCRT is similar in design to 244-TX and 244-U. The 244-BX DCRT consists of a horizontal, cylindrical, carbon steel 95,000 liter tank surrounded by a reinforced concrete vault. The vault floor and walls are painted with a protective paint. The 296-B-28 stack system ventilates the 244-BX Catch Station tank and annulus. The 244-BX DCRT is used to pump salt-well waste from single-shell tanks in the 241-B, 241-BX and 241-BY Tank Farms to double-shell tank farms in the 200 East area.

244-CR - The 244-CR Vault is located in the 241-C SST Farm in the 200 East area. The CR Vault is a reinforced concrete structure that houses two 150,000 liter tanks (CR-011 and CR-001) and two 55,000 liter tanks (CR-002 and CR-003). Tank CR-003 was designated for use as a salt well waste receiver tank for the C Farm salt wells. Each tank is housed in separate vaults, each with their own sumps. The 296-C-05 stack system ventilates the 244-CR Vault vessels, providing containment and moisture removal for the vessels' off-gas.

244-S - The 244-S DCRT is located just east of the 241-S Tank Farm. This DCRT is similar in design to 244-A. The 296-S-22 stack system ventilates the 244-S Catch Station tank and annulus. The 244-S Catch Station is used to transfer liquid waste from 241-S and 241-SX salt wells to the 241-SY Tank Farm. The 244-S Catch Station started operation in 1975.

244-TX - The 244-TX DCRT is located within TY Tank Farm. This DCRT is the same as 244-BX except that the vault is lined on the floor and walls to a height of 5 feet with carbon steel. Above that the walls are covered with a protective paint. The 296-T-18 stack system ventilates the 244-TX Double Shell Receiver Tank (DCRT) and annulus. The 244-TX DCRT is used to transfer liquid waste from the Plutonium Finishing Plant (PFP) and from single-shell tanks in the 241-T, 241-TX, and 241-TY Tank Farms to the 241-SY Tank Farm.

Table 2-2: DCRT List

Facility	Capacity (liters)	Location	Operation Date
244-AR-001	190,000	200 East Area	1966
244-AR-002	190,000		
244-AR-003	19,000		
244-AR-004	19,000		
244-CR-001	150,000	200 East Area	1946
244-CR-002	55,000		
244-CR-003	55,000		
244-CR-011	150,000		
244-A	75,000	200 East Area	1975
244-BX	95,000	200 East Area	1983
244-S	75,000	200 West Area	1975
244-TX	95,000	200 West Area	1981

2.1.4 Single Shell Tanks (SSTs)

The only SST facility covered within this FEMP includes the C Farm facility, which includes Tanks 241-C-104, 241-C-105, and 241-C-106. The 296-P-16 portable exhaustor and stack system directly ventilates tanks 241-C-105 and 241-C-106; and indirectly ventilates through a cascade effect 241-C-104 in the 241-C Tank Farm, providing negative pressure and removal of heat and vapor from these tanks. The 241-C Tank Farm is located north of the PUREX plant in the 200 East Area.

The 241-C Tank Farm contains single-shell tanks which first received waste in 1943. Tanks 104, 105, and 106 each have a fill volume of 0.5 M gallons. The ventilation system for the 104, 105, and 106 tanks consists of two exhaust heaters, a pre-filter, two HEPA filters and the 296-P-16 portable exhaustor, all in series.

2.2 PROCESS DESCRIPTION

The DST farms store waste from:

- PUREX Plant
- PFP
- B Plant
- T Plant
- 222-S Laboratory
- 100 Areas
- 300 Area
- 400 Area
- Single-shell tanks.

A maximum "operating volume" of 106 ML (28 Mgal) of waste can be stored in the 28 DSTs in the 6 tank farms. Thus, maximum "operating volume" is less than the maximum physical volume of all of the tanks of about 119 ML (31.5 Mgal). This operating volume allows for varied operating conditions (e.g., self-boiling in the aging tanks, frothing, mixing, agitation). No offsite waste is accepted for storage in these tanks. Tables 2-3 and 2-4 show the types of waste stored in non-aging and aging tanks.

Table 2-3: Tank Number and Type of Waste Stored in Million-Gallon Non-Aging Double-Shell Tanks

Tank number	Waste stream source	Type of waste stored in tank
241-AN-101	244-BX	Single-shell tank saltwell waste
241-AN-102	B-Plant	Complexed concentrate waste (waste encapsulation)
241-AN-103	242-A Evaporator	Double-shell slurry waste
241-AN-104	242-A Evaporator	Double-shell slurry feed waste
241-AN-105	PUREX	Neutralized cladding removal waste
241-AN-106	100 Area	Concentrate phosphate waste
241-AN-107	B Plant	Complexed concentrate waste (waste encapsulation)
241-AP-101	241-AP-103/G7	Ammonia scrubber feed (ASF) (PUREX)
241-AP-102	100 Area	Phosphate and sulfate waste
241-AP-103	PUREX	Ammonia scrubber feed
241-AP-104	100 Area	Phosphate and sulfate waste
241-AP-105	241-AW-106/241-AP-106	Double-shell slurry feed and noncomplexed (242-A Evaporator) waste
241-AP-106	241-AY-102/241-AW-106	Double-shell slurry feed and noncomplexed (242-A Evaporator) waste
241-AP-107	PUREX	Process distillate discharge
241-AP-108	PUREX	Process distillate discharge
241-AW-101	Single-shell tanks	Dilute noncomplexed waste Single-shell tank saltwell waste
241-AW-102	244-A/A-350 catch tank	Evaporator feed tank, double-shell slurry feed (242-A Evaporator)

Table 2-3: Tank Number and Type of Waste Stored in
Million-Gallon Non-Aging Double-Shell Tanks

Tank number	Waste stream source	Type of waste stored in tank
241-AW-103	PUREX	Neutralized cladding removal waste
241-AW-104	PUREX F-18, U-3, U-4, G-8, R-8	Dilute noncomplexed waste
241-AW-105	PUREX	Neutralized cladding removal waste
241-AW-106	242-A Evaporator	Double-shell slurry feed Single-shell tank saltwell
241-SY-101	Single-Shell tanks 242-S Evaporator	Double-shell slurry feed Single-shell tank saltwell, complexed waste
241-SY-102	244-TX-DCRT, 244-S-DCRT	Cross-site waste, single-shell tank saltwell, Plutonium Finishing Plant waste
241-SY-103	242-S Evaporator TK-C-100, 244-S	Uranium sludge waste, double-shell slurry, complexed waste

DCRT = Double-Contained Receiver Tanks.

PUREX = Plutonium/Uranium Extraction Plant.

Table 2-4: Tank Number and Type of Waste Stored in Million-Gallon Aging Waste Double-Shell Tanks

Tank number	Waste stream source	Type of waste stored in tank
241-AY-101	NDA	Strontium and cesium-bearing waste, depleted high-level waste, dilute noncomplexed waste, dilute complexed waste
241-AY-102	AX-152 catch tank, 204-AR waste unloading station	Neutralized high-level waste, A-417 catch tank, double-shell slurry feed, dilute B-Plant 25-1 NCPLX, noncomplexed waste
241-AZ-101	PUREX	Neutralized current acid waste
241-AZ-102	PUREX	Neutralized current acid waste

NDA = No data available.

Waste composition, concentration of radioactivity, and source location determine which tank is selected to store specific wastes. Some waste streams are combined in one DST, particularly when the waste stream volume and the potential for chemical interaction are small.

Waste from the 100, 300, and 400 Areas generally is transported to the 200 East Area in railroad tank cars. The waste enters the DST System at the 204-AR Waste Unloading Station, located north of the PUREX Plant. The 204-AR Building is also equipped to receive waste shipments by truck.

Characterization of wastes in DSTs generally is based on generator knowledge and records or other information from its point of origin. As stated in Double-Shell Tank System Dangerous Waste Permit Application, DOE/RL-90-39 (DOE/RL 1990), EPA protocols were not used in most of the limited analyses that have been performed. Hanford Site laboratories are currently modifying procedures to meet EPA protocols. However, all waste contained in DSTs has been analyzed to some extent for both hazardous and radioactive materials.

Waste stored in the DSTs is a mixed waste containing both radioactive and hazardous chemical components as defined by the

Atomic Energy Act of 1954 and RCRA. DST waste consists primarily of sodium hydroxide, sodium salts of nitrate, nitrite, carbonate, aluminate, phosphate, and hydrous oxides of iron and manganese. The radioactive part of the mixed waste includes various types and concentrations of radioactive constituents including high-level, transuranic, and low-level waste. These radioactive components consist primarily of fission products (e.g., ^{90}Sr , ^{137}Cs , and ^{129}I) and actinide elements (e.g., uranium, americium, plutonium, and neptunium).

RCRA regulated components of mixed waste have several potential waste classifications, including primarily RCRA characteristics. The dangerous waste classifications of toxic, persistent, and extremely hazardous waste, pursuant to Dangerous Waste Regulations, Washington Administrative Code (WAC) 173-303, also are potential designations for waste stored in the DSTs based on the presence of low concentrations of solvents and high concentrations of heavy metals.

Although DSTs contain mostly inorganic waste, small amounts of organics may be present. The presence of regulated organics in the waste may be a result of chemical breakdown or recombination of organic complexing agents, laboratory and research work, or solvents that may have been added during fuel reprocessing procedures.

The 28 DSTs are currently at about 75% of their 106 ML (28 Mgal) maximum "operating" storage capacity. Space for 7.6 ML (2 Mgal) is kept in reserve for contingencies (i.e., half of which is for aging waste, the other half is for non-aging waste). PUREX Plant was normally the largest contributor of waste transferred to the DSTs. PUREX has now been deactivated and no longer generates waste. The volumes of waste generated at individual sites and transferred to the DSTs varies greatly. For example, during early 1990, B Plant transferred approximately 212,000 L (56,000 gal) to the DSTs per month. T Plant transferred approximately 793,600 L (209,700 gal) during 1988. These numbers are provided for general information only.

In general, the majority of the waste stored in the DSTs was generated by the PUREX process. Facilities that currently (or previously) produce(d) and transfer(red) waste to the DSTs include the following:

- PUREX Plant
 - PUREX neutralized cladding removal waste
 - PUREX neutralized current acid waste from the

first extraction column (aging-waste)

- PUREX Tank F-18 miscellaneous waste
- PUREX Tanks U3 and U4 miscellaneous waste
- PUREX ammonia scrubber waste.
- Plutonium Finishing Plant
 - Transuranic sludge
 - Low-level processing waste supernatant
- 242-A Evaporator concentrated double-shell slurry and double-shell feed (the 242-A Evaporator is addressed in a separate FEMP).
- B Plant
 - Concentrated complexed waste and noncomplexed waste (currently not being generated)
 - Cell drainage and vessel cleanout waste.
- S Plant laboratory and decontamination waste
- T Plant decontamination solutions
- 300 Area laboratory and fuel fabrication waste
- 400 Area low level process waste
- 100 Area
 - Dilute phosphate reactor decontamination waste
 - 100 Area spent fuel storage basin sulfate waste (from ion exchange regeneration and sand filter backwashing).
- Single-shell tank saltwell waste.

Waste from historical chemical process operations is also transferred to the DSTs. Before 1980, this waste was stored in SSTs. Liquid supernatant from the SSTs has been and is being transferred to the DSTs.

3.0 APPLICABLE REGULATIONS

Conditions and requirements for monitoring existing or potential releases of radioactivity and other chemicals to the environment are contained in DOE Orders and federal, state and local laws, regulations, and permits. Table 3-1 gives a brief summary of the regulations and standards applicable to this FEMP. Since the regulations enforced by these agencies may differ, the PHMC may enforce more restrictive requirements as a matter of policy. These policies can be found in WHC-CM-7-5, Environmental Compliance.

3.1 U.S. DEPARTMENT OF ENERGY ORDERS

3.1.1 General Environmental Protection Program (DOE Order 5820.2A)

DOE Order 5400.1, General Environmental Protection Program, requires a written environmental monitoring plan for each site, facility, or process that uses, generates, releases, or manages significant pollutants or hazardous materials. The plan must include the rationale and design criteria for the monitoring program, as well as describe the extent and frequency of the monitoring analysis. The plan must also contain quality assurance (QA) requirements, program implementation procedures, directions for preparation and implementation of reports, and directions for identification and discussion of effluent monitoring and environmental surveillance.

The effluent monitoring portion of the plan must be able to determine compliance with applicable regulations and DOE Orders. It also should evaluate the effectiveness of treatment; identify potential environmental problems; evaluate the need for remedial action or mitigation measures; support permit revision and/or reissuance; and detect, characterize, and report unplanned releases.

DOE Order 5400.5 (10 CFR 834 is in draft and is planned to replace this Order) requires a monitoring plan that complies with the requirements of DOE Order 5400.1. Compliance with the requirements of DOE Order 5400.5 may be demonstrated based on calculations from monitoring and surveillance programs.

DOE Order 5820.2A, Radioactive Waste Management establishes policies, guidelines, and minimum requirements by which the DOE manages its radioactive and mixed waste and contaminated facilities.

3.2 FEDERAL REGULATIONS

3.2.1 National Emission Standards for Hazardous Air Pollutants (40 CFR 61)

Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," (40 CFR 61) establishes exposure limits and monitoring requirements. Exposure limits, for members of the public, from radionuclide emissions is an EDE not to exceed 10 mrem/year. Compliance with this standard is measured by calculating the highest EDE where a person resides or abides using an EPA approved method.

Emissions of radionuclides must be measured at all release points that have a potential to discharge radionuclides into the air in quantities that could cause an EDE in excess of 1% of the standard. If the EDE caused by all emissions is less than 1% of the standard, the facility is exempt from EPA's monitoring requirements. All radionuclides that could contribute greater than 10% of the potential EDE for a release point shall be measured individually. For other release points that have a potential to release radionuclides into the air, periodic confirmatory measurements shall be made to verify low emissions.

Table 3-1: Applicable Regulations, Standards, and Permits

Agency/Originator	Regulation, Standard, or Permit	RA	HL	RA	RL	Summary/Application
U.S. Department of Energy (DOE), Washington, D.C.	DOE Order 5400.1	X	X	X	X	Provides general environmental protection standards
	DOE Order 5400.5			X	X	Sets radioactive release standards for the public and environment (dose limits)
	DOE Order 5820.2A Radioactive Waste Management	X	X	X	X	Sets radioactive waste management requirements
	DOE/EH-0173T 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 60 Standards of Performance for New Stationary Sources			X		Establishes monitoring requirements for air pollutants.
	40 CFR 61 NESHAP	X		X		Sets national emission standards for hazardous air pollutants (NESHAP)
	40 CFR 6, Subpart A General Provisions	X				Regulates hazardous pollutants
	40 CFR 61, Subpart H NESHAP for Radionuclides other than Radon from Department of Energy Facilities			X		Sets emissions standards/monitoring requirements for radionuclides
	40 CFR 70 State Operating Permit Program	X		X		Requires state air operating permit programs (i.e., WAC 173-401)
	40 CFR 261 Identification and Listing of Hazardous Waste	X	X			Identifies and lists hazardous wastes
	40 CFR 302 Designation, Reportable Quantities, and Notification	X		X		Identifies the allowable release limits of hazardous and radioactive constituents.
American National Standards Institute, (ANSI) New York, NY	N 13.1* (ANSI 1969) Guidance to Sampling Airborne Radioactive Materials in Nuclear Facilities			X		Sets standards for effluent monitoring systems
	N 42.18* (ANSI 1974) Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactivity in Effluents			X	X	Recommendations for the selection of instrumentation for the monitoring of radioactive effluents

Table 3-1: Applicable Regulations, Standards, and Permits

Agency/Originator	Regulation, Standard, or Permit	HA	HL	RA	RL	Summary/Application
Washington State Department of Ecology, Olympia WA	WAC 173-216 State Waste Discharge Permit Program		X		X	Governs discharges to ground and surface waters
	WAC 173-220 National Pollutant Discharge Elimination system Permit		X		X	Governs wastewater discharges to navigable waterways; controls NPDES permit process
	WAC 173-303 Dangerous Waste Regulations		X			Regulates dangerous wastes; prohibits direct release to soil columns
	WAC 173-400 General Regulations for Air Pollution Sources	X				Sets emissions standards for hazardous air pollutants
	WAC 173-401 Air Operating Permit Program	X		X		Establishes an operating permit for hazardous (regulated) air pollutants, including radionuclides
	WAC 173-460 Control for New Sources of Toxic Air Pollutants	X				Sets standards or new sources of toxic air pollutants
	WAC 173-480 Washington State Ambient Air Quality Standard and Emission Limits for Radionuclides	X		X		Endorses the 10 mrem/year EDE-EPA standards (40 CFR 61, Subpart H)
Washington State Department of Health, Olympia, Washington	WAC 246-247 Radiation Protection - Air Emissions			X		Sets standards for registration, permitting, notification, new sources, review, monitoring, and reports.
	Notice of Construction (DOH 1993a, DOH 1993b)			X		
U.S. Environmental Protection Agency (EPA)	FF-01 Radioactive Airborne Emissions (DOH 1993c)			X		Collective emissions from registered sources shall meet the emissions requirements of WAC 173-480
Benton County Air Pollution Control Authority, (APCA) Richland, Washington	General Regulation 80-7/Proposed Regulation	X				Regulates air quality

Notes:

HA = hazardous airborne.
HL = hazardous liquid.
regulations.
RA = radioactive airborne.

RL = radioactive liquid.
*Refers to standards that are referenced in the DOE and EPA

To determine whether a release point is subject to emission monitoring requirements, it is necessary to evaluate the potential for radionuclide emissions for that release point. In evaluating the potential of a release point to discharge radionuclides into the air, the estimated radionuclide release rates shall be based on the discharge of the effluent stream that would result if all pollution control equipment did not exist, but the facility operations were otherwise normal.

Subpart H also states that effluent streams shall be directly monitored continuously with an in-line detector or representative samples of the effluent stream shall be withdrawn continuously from the sampling site following the guidance presented in American

National Standards Institute (ANSI) N13.1 (ANSI 1969). EPA has also approved an Alternate Method for sampling using single point sampling with a shrouded probe. Requirements for continuous sampling are applicable to batch processes when the unit is in operation. Periodic sampling (grab samples) may be used only with EPA's prior approval. Such approval may be granted in cases where continuous sampling is not practical and radionuclide emission rates are relatively constant. In such cases, grab samples shall be collected with sufficient frequency to provide a representative sample of the emissions.

3.2.2 State Operating Permit Program (40 CFR 70)

This regulation defines the minimum elements required by the Federal Water Pollution Control Act of 1972 (FWPCA) for state operating permit programs and corresponding standards and procedures by which the administrator will approve, oversee, and withdraw approval of state operating permit programs.

3.2.3 Identification and Listing of Hazardous Waste (40 CFR 261)

This part identified those solid wastes which are subject to regulation as hazardous waste.

3.2.4 Designation, Reportable Quantities, and Notification (40 CFR 302)

The regulations in "EPA Designation, Reportable Quantities, and Notification Requirements for Hazardous Substances Under CERCLA" (40 CFR 302) designate hazardous substances and identify reportable quantities and notification requirements for release of these hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Safe Drinking Water Act of 1974 (SDWA), as amended.

Any unpermitted release of these designated hazardous substances must be reported. Therefore, if the possibility exists for a facility to release any of the designated substances, waste streams must be monitored for their presence and monitoring practices must be provided in a FEMP.

3.3 INDUSTRY STANDARDS UNDER AMERICAN NATIONAL STANDARDS INSTITUTE

3.3.1 Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities (ANSI N13.1-1969)

Note: This standard is currently under revision. When issued, it will recommend performance based sampling that will allow the use of single point sampling (i.e., a shrouded probe).

The primary objective for sampling airborne radioactivity in effluents is to measure the release of radioactive materials to the environment. This is accomplished through sampling near the point of release. The objective of ANSI N13.1 (ANSI 1969) is to set forth the principles that apply in obtaining valid samples of airborne radioactive materials and to prescribe acceptable methods and materials for gaseous and particulate sampling.

ANSI N13.1 (ANSI 1969) is limited to the collection of samples and does not address measurement of the radioactive materials collected. The exclusion of radiochemical measurement from the scope must not be construed to mean that the measurement of samples is of lesser importance than sampling.

3.3.2 Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents (ANSI N42.18-1980)

The objective of continuously monitoring instrumentation is to measure the quantity, and/or the rate of release of radionuclides in the effluent stream and to provide useful documentation for scientific and logical purposes.

This standard applies to continuous monitors that measure normal releases, detect inadvertent releases, show general trends, and annunciate radiation levels that have exceeded predetermined values.

This standard specifies detection capabilities, physical operating limits, reliability, and calibration requirements and sets forth minimum performance requirements for effluent monitoring.

3.4 WASHINGTON STATE REGULATIONS

3.4.1 Air Operating Permit Program (WAC 173-401)

The provisions in this regulation establish the element of a comprehensive Washington State air operating permit program consistent with the requirements of the Federal Clean Air Act of 1977. All sources (hazardous and radionuclides pollutants) subject to this regulation shall have a permit that assures compliance by the service with all applicable requirements in order to operate.

3.4.2 Ambient Air Quality Standards and Emission Limits For Radionuclides (WAC 173-480)

Although the standard for Washington State establishes a 25-mrem/year EDE for public exposure to radionuclide emissions, facilities must comply with the most restrictive of federal, state, or local law. Therefore, the exposure limit that must be complied with is 10 mrem/year for the air pathway; however, compliance is calculated at the point of maximum annual air concentration in an unrestricted area where any member of the public may be located (fence boundary).

3.4.3 Radiation Protection - Air Emissions (WAC 246-247)

This regulation 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 listed in WAC 246-247 is the semi-annual reporting of emissions from each registered stack or vent onsite. By agreement with Washington State Department of Health, only annual reporting is required.

3.4.4 Water Quality Standards for Groundwater (WAC 173-200)

Water quality standards to protect groundwater to the level of drinking water standards are contained in "Water Quality Standards for Groundwater of the State of Washington (WAC 173-200)". These standards limit exposure to gross alpha, gross beta, tritium, ⁹⁰Sr, and ²²⁶, ²²⁸Ra. For radionuclides that are not specifically listed, exposures are limited by the federal standard to an EDE not to exceed 4 mrem/year.

3.4.5 State Waste Discharge Permit Program (WAC 173-216)

The purpose of this state regulation is to implement a state permit program, applicable to the discharge of waste materials from industrial operations into ground and surface waters of the state. However, this regulation excludes point source discharge of pollutants into navigable waters of the state, which is regulated by the "National Pollutant Discharge Elimination System Permit Program" (WAC 173-220). This regulation also excludes the injection of fluid through wells, which is regulated by "Underground Injection Control Program" (WAC 173-218).

3.4.6 Dangerous Waste Regulations (WAC 173-303)

Any release of a dangerous or hazardous substance (as designated by the Washington [State] Administration Code) to the environment, except permitted releases, must be reported. Waste streams that have the potential to contain dangerous waste constituents must be monitored accordingly.

3.5 LOCAL REGULATIONS

3.5.1 Benton County Air Pollution Control Authority (80-7)

The local air pollution control authority has jurisdiction over all air emissions except radionuclide emissions in Benton County areas, including the Hanford Site. Currently, there are no local standards more restrictive than the previously mentioned state and federal limits; therefore state and federal standards apply.

3.6 AIR EMISSIONS

DOE Order 5400.5 provides requirements for monitoring of radioactive and nonradioactive airborne effluents from DOE facilities at the Hanford Site. This order states that DOE controlled facilities must comply with NESHAPs (40 CFR 61).

Additional EPA requirements on hazardous substances are contained in the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). This regulation provides information on reportable quantities of nonradioactive hazardous substances. Unlisted hazardous substances designated by CERCLA are regulated in accordance with the EPA toxicity level of the contaminant.

In Washington State, airborne effluents are regulated by the Washington State Department of Ecology through regulations in the WAC, Title 173, Chapters 173-400 through 173-480, as amended, pursuant to the Washington Clean Air Act of 1967 (RCW 70.94, as amended). General regulations for air pollution sources are presented in WAC 173-400, including emission standards for sources emitting hazardous air pollutants found in WAC 173-400-075.

WAC 246-247, 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. By agreement with the Washington State Department of Health, only annual reporting is required.

WAC 173-480, Ambient Radionuclides, defines maximum allowable

levels for radionuclides in the ambient air and defines required levels for control of emissions.

While both WAC 246-247 and 173-480 list outdated maximum EDE standards, each contains a caveat stating that more stringent federal standards take precedence over the EDE standards specified by the WAC. Therefore, each effectively endorses the 10 mrem/year EDE standard of NESHAP (40 CFR 61), Subpart H.

Regulations, including DOE Orders, state that DOE facilities must comply with requirements set forth in NESHAP (40 CFR 61). Other regulations (e.g., 40 CFR 52, "Approval and Promulgation of Implementation Plans" and DOE Orders 5400.1, 5400.5, DOE/EH-0173T, and 5484.1 state that DOE facilities must comply with the applicable requirements set forth in the Washington Clean Air Act of 1967.

3.7 LIQUID EFFLUENTS

Depending on where a liquid effluent (wastewater) is discharged, certain regulations apply. These regulations are implemented through issuance of permits by federal, state, and/or local agencies. It is the responsibility of the facility, through the Richland Operations Office (RL), to apply for the permit appropriate to the effluent being discharged. Before applying for any permits, the applicant must know the source of wastewater discharges and where the wastewater is being discharged to.

Each type of discharge permit identified will typically contain discharge limitations and monitoring requirements. However, the limitations and monitoring requirements will vary depending on the source and type of wastewater being discharged. Washington State controls discharges to ground water and surface water of the state, under WAC-173-216, State Waste Discharge Permit Program; and issues permits for such discharges.

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4.0 IDENTIFICATION AND CHARACTERIZATION OF EFFLUENT STREAMS

This section identifies and characterizes source terms for the facilities discussed within this FEMP that need to be considered as potential contributors to offsite exposures to the maximum exposed individuals and are evaluated against instrumentation design criteria. Routine operational conditions and an upset condition are the two cases presented.

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

Radionuclide source terms and major contributors to the potential offsite dose are discussed and derived in HNF-SD-WM-EMP-031. Table 4-1 below tabulates major particulate emission contributors for each facility based on source term release factors. Common radionuclides are identified in Table 4-1 as Sr-90, Cs-137, Pu-239/240, and Am-241. There are various documents available from which to derive source term data from the Tanks. These documents show higher concentrations of radionuclides such as Sr-90, Pu-239/240, Am-241, etc. in the sludge which is at the bottom of the tanks, than in the liquid which is above. This is important to note, because if the sludge is stirred up, as is intended during mixer/retrieval activities, these radionuclide components will contribute significantly to contributors of off-site dose consequences.

Table 4-1: Significant Radionuclide Contributors to Potential EDE.

Facility	Stack Number	Radionuclide	% Of Potential EDE
244-AR	296-A-12 296-P-32	Sr-90	99%
241-AZ/AZ	296-A-17 296-P-26 296-A-42	137-Cs	97.60
244-A DCRT	296-A-25	137-Cs 239/240-Pu	Varies depending upon tanks being pumped
244-BX DCRT	296-B-28	137-Cs 241-Am 239/240-Pu	Varies depending upon tanks being pumped
244-CR	296-C-05	137-Cs 89/90-Sr 239/240-Pu 241-Am	Varies depending upon tanks being pumped
241-C	296-P-16	137-Cs 239/240-Pu	53.75 43.31
244-S	296-S-22	89/90-Sr 137-Cs 239/240-Pu 241-Am	Varies depending upon tanks being pumped
244-TX	296-T-18	89/90-Sr 137-Cs 239/240-Pu	Varies depending upon tanks being pumped
244-U	296-U-11	89/90-Sr 137-Cs 239/240-Pu	Varies depending upon tanks being pumped

4.1.1 BEST-BASIS INVENTORIES

Best-basis inventories for 26 chemicals and 46 radionuclides were completed August 29, 1997 in accordance with Defense Nuclear Facilities Safety Board milestone 5.6.3.1.f, "Provide Standard

Inventories for all Tanks." Best-basis inventories and the methodology used to generate estimates are contained in over 5,000 pages of text. Tank-specific and global inventories for each of the 149 single-shell and 28 double-shell tanks have been downloaded into the Tank Characterization Database (TCD) and are available for use. The TCD contains a best-basis summary table that presents the chemical mass and radionuclide concentration with the analytes along the left margin and the individual tanks across the top. A column listing global inventories is located at the end of the summary table. The global inventories were determined independently by analyzing essential material purchase invoices, chemical use records, and historical information. The global inventories are not merely a summation of tank-specific inventories. They are useful indicators of discrepancies between global and tank-specific inventories which will be reconciled during FY1998.

Several minor components (e.g., cerium, cadmium, silver, thorium, and tungsten) are included in the global inventories; but are not estimated on a tank-specific basis. This results in several blank rows in the summary table. Other blanks in the summary table represent nuances in the way the data was loaded into the TCD (e.g., phosphorus versus phosphate, sulfur versus sulfate, etc.).

Best-basis inventories will be updated annually to reflect new information collected through sampling, reconciliation efforts, and other planned activities. Changes to best-basis inventories will be administered through a formal Change Board and will be documented in Change Logs to ensure proper configuration control. The current version of best-basis inventories are accessible over the Internet through the Tank Waste Information Network System 2 (TWINS2) interface at the following internet address:

<http://twins.pnl.gov:8001/TCD/main.html>

The TWINS2 interface provides a quick and convenient mechanism for accessing Hanford Site databases containing tank waste information. The interface retrieves information from databases and presents it in a spreadsheet format. The TWINS2 interface is organized by "subject areas" and "table names." Detailed step-by-step instructions for accessing various data sources, including best-basis inventories, are provided in the "Introduction" page of the TWINS2 User's Guide.

4.2 UPSET EVENT

An upset event, in which the HEPA filters failed, occurred at the 244-A facility in early 1995. The HEPA filters on DCRTs cannot be

tested per the standards because doing so results in large dose exposures to workers. These filters are therefore tested in a manner which does not insure reliable results. This places more importance than ever on the particulate radionuclide monitoring/sampling system and its capability to ascertain whether or not an emission event has occurred. WHC-SD-WM-ES-291, Rev 1, "Tank Farm Stack Sampling System Configuration and Efficiency Study" was written, to assess and document the efficiency of these Tank Farm systems.

In early 1995 the HEPAs failed on 244-A. Facility staff were not aware of the failure as the aerosol tests had not indicated a failure. The first indication of this failure was the exhaust Continuous Air Monitor (CAM) alarm. The exhauster was shut down, new alarm set points were computed, and the CAM alarm was reset. After which the exhauster was turned back on. Prior to the confirmed HEPA failure, Operations personnel had suspected a HEPA filter failure and placed cheese cloth over the top of the stack in an attempt to catch any release. About 30 seconds after the exhauster was turned on, the CAM alarm annunciated again. The exhauster was shut down and the HEPAs were replaced.

After the alarm had gone off, radiation readings were taken of the CAM's collection filter, as well as the cheese cloth that had been placed on top of the stack. The CAM's filter read 7500 cpm and the cheese cloth read 15,000 cpm. WHC-SD-WM-ES-291 had predicted a worse case 10 micron particle efficiency of 49.3%. The efficiency noted from this event computes to 50%. The potential off-site public dose consequence of this 244-A release, if not caught and shut down, for an entire year would have been as follows:

15,000 cpm at a beta CAM counting efficiency of 10% amounts to 150,000 dpm, which is equal to $6.8\text{E-}08$ Ci per a 30 second interval.

$6.8\text{E-}08$ Ci/(30 seconds) * 2(30 second intervals)/min * 525,600 min/yr = 0.07 Ci/yr

Assuming this beta component (the CAM is a beta CAM) came from Cs-137, the off-site dose consequence would be approximately $1.7\text{E-}03$ mrem/yr. This is below the currently assessed 0.1 mrem/yr stack designation required for compliant continuous measurement. However, it was later determined that the waste held within the DCRT was dilute and not representative of normal waste transfer operations.

5.0 EFFLUENT POINT OF DISCHARGE DESCRIPTION

5.1 AIR EFFLUENTS

Airborne effluent discharge points associated with applicable stacks and associated information are listed below.

HEPA filter configurations are listed according to the following notation:

-H-H- Denotes 2 HEPA filters in series.

-iH-iH- Denotes i HEPA filters in the bank.

The flow rates data given below are from Vent and Balance Group measurements going back for several years. Data is updated on receipt of each new data set. Only if the process or fan design are changed are new flow rates measured and calculated.

5.1.1 Stack 296-A-42; 241-AY/AZ Tank Farm Exhaust

EMISSION CONTROL DEVICE: Filtration.

STACK SIZE: 25.4 cm (10 in.) diameter, 16.8 m (55 ft) high.

FAN DESIGN CAPACITY: 28.3 m³/min at 10°C (1000 ft³/min at 50°F). Fan numbers are AZ-K1-5-1A and AZ-K1-5-1B. Flow rates for the system are designed down to 400 cubic feet per minute dependent upon operating parameters.

Stack flow rates will be measured using stack flow indicator FI-AZ-K1-3. This instrument was certified accurate per the method called out in 40 CFR 52, Appendix E. This test was accomplished per work package number 2E-96-00287. The test results yielded a relative flow rate accuracy of 5.7%, with a 0% zero drift and 0.5% calibration drift. Pass/Fail criteria for use of this instrument in reporting regulatory values are less than 10% for flow rate and less than 3% for zero and calibration drift. Stack flow rates will also be periodically measured using Tank Farm Maintenance Air Flow Test Procedures. However, these measurements will only be used to check on the proper function of the stack flow instrument.

5.1.2 Stack 296-A-25; 244-A Lift Station Catch Tank Exhaust

This stack exhausts filtered air from the catch tank at the 244-A lift station.

STACK SIZE: 10 cm (4 in.) diameter, 2.9 m (9.5 ft) high.

FAN DESIGN CAPACITY: 4.25 m³/min at 99°C (150 ft³/min at 210°F). Fan No. is K1-5-1.

EMISSION CONTROL DEVICE: Filtration.

Stack flow rates are measured using Tank Farm Maintenance Air Flow Test Procedures. Flow rate statistical data results in the following values:

AVERAGE: 4.6 m³/min (163 ft³/min)

VARIABILITY: -21%/+28%

STANDARD DEVIATION: 0.76 m³/min (27 ft³/min)

2 SIGMA INTERVAL: 1.6 m³/min (58 ft³/min) (36%)

RANGE: 3.0 to 6.3 m³/min (105 to 221 ft³/min)

The location chosen for the measurement is specified in the procedure appendix.

5.1.3 Stack 296-B-28; 244-BX Salt Well Receiver Exhaust

This stack exhausts filtered air from the 244-BX tanks and annulus.

STACK SIZE: 15 cm (6 in.) diameter 3.4 m (11 ft) high

FAN DESIGN CAPACITY: 7.08 m³/min (250 ft³/min). Designed to vary from 3.54 to 7.08 m³/min (125 to 250 ft³/min). Fan No. is EF-1.

EMISSION CONTROL DEVICE: Filtration.

Stack flow rates are measured using Tank Farm Maintenance Air Flow Test Procedures. Flow rate statistical data results in the

following values:

AVERAGE: 5.8 m³/min (206 ft³/min)
VARIABILITY: -20%/+27%
STANDARD DEVIATION: 1.0 m³/min (34 ft³/min)
2 SIGMA INTERVAL: 2.1 m³/min (73 ft³/min) (+35%)
RANGE: 3.8 to 7.9 m³/min (134 to 279 ft³/min)

The location chosen for the measurement is specified in the procedure appendix.

5.1.4 Stack 295-C-5; CR Vault Cell and Vessel Ventilation Exhaust

This stack exhausts filtered air from the 244-CR Vault cell and process ventilation.

STACK SIZE: 46 cm (18 in.) diameter, 15.2 m (50 ft) high

STACK FANS: Two (2) in parallel. One primary, one stand-by.
Fan numbers 291-CR-923-1 and -2.

FAN DESIGN CAPACITY: 119 m³/min (4,200 ft³/min) each.

EMISSION CONTROL DEVICE: Filtration.

IN+4H-4H+OUT

Stack flow rates are measured using Tank Farm Maintenance Air Flow Test Procedures. Flow rate statistical data results in the following values:

AVERAGE: 89.0 m³/min (3,144 ft³/min)
VARIABILITY: -65%/+29%
STANDARD DEVIATION: 25.5 m³/min (899 ft³/min)
2 SIGMA INTERVAL: 53.5 m³/min (1,889 ft³/min) (60%)
RANGE: 35.5 to 142.5 m³/min (1,255 to 5,032 ft³/min)

The location chosen for the measurement is specified in the procedure appendix.

5.1.5 Stack 296-P-16; 241-C-105 and 241-C-106 Tank Exhaust

This stack exhausts filtered air directly from the 241-C-105 and -106 tanks, and indirectly from tank 241-C-104 through cascade line (underground pipe).

STACK SIZE: 41 cm (16 in.) diameter, 3.1 m (10 ft) high

FAN DESIGN CAPACITY: 198.2 m³/min at 21°C (7,000 ft³/min at 70 °F). No fan number.

EMISSION CONTROL DEVICE: Filtration

IN+9H-9H+OUT

Stack flow rates are measured using Tank Farm Maintenance Air Flow Test Procedures. Flow rate statistical data results in the following values:

AVERAGE: 93.0 m³/min (3,284 ft³/min)

VARIABILITY: -16%/+20%

STANDARD DEVIATION: 9.4 m³/min (333 ft³/min)

2 SIGMA INTERVAL: 19.3 m³/min (682 ft³/min) (±21%)

RANGE: 73.7 to 112.3 m³/min (2,602 to 3,966 ft³/min)

The location chosen for the measurement is specified in the procedure appendix.

5.1.6 Stack 296-P-32; 244-AR Vault use

This stack will be used to exhaust filtered air from the 244-AR tanks.

STACK SIZE: 10.1 cm (4 in.) diameter, 4.6 meters (183.5 inches) above the mounting platform

FAN DESIGN CAPACITY: 5.7 m³/min (200 ft³/min).

EMISSION CONTROL DEVICE: Filtration.

IN $\begin{bmatrix} \text{H-H} \\ \text{H-H} \end{bmatrix}$ OUT

Stack flow rates will be measured using a stack flow indicator. This instrument was certified accurate during a site test conducted by the manufacturer per the method called out in 40 CFR 52, Appendix E. The test results yielded a relative flow rate accuracy of 1.4%, with a 0% zero drift and less than 0% calibration drift. Pass fail criteria for use of this instrument in reporting regulatory values are less than 10% for flow rate and less than 3% for zero and calibration drift. Stack flow rates will also be periodically measured using Tank Farm Maintenance Air Flow Test Procedures. However, these measurements will only be used to check on the proper function of the stack flow instrument.

5.1.7 Stack 296-S-22; 244-S Salt Well Receiver Tank and Annulus Exhaust

This stack exhausts filtered air from the 244-S tank and annulus.

STACK SIZE: 15 cm (6 in.) diameter, 3.4 m (11 ft) high

FAN DESIGN CAPACITY: $4.67 \text{ m}^3/\text{min}$ at 116°C ($165 \text{ ft}^3/\text{min}$ at 240°F). Fan No. is K1-5-1.

EMISSION CONTROL DEVICE: Filtration.

Stack flow rates are measured using Tank Farm Maintenance Air Flow Test Procedures. Flow rate statistical data results in the following values:

AVERAGE: $4.1 \text{ m}^3/\text{min}$ ($144 \text{ ft}^3/\text{min}$)

VARIABILITY: $-15\%/+21\%$

STANDARD DEVIATION: $0.6 \text{ m}^3/\text{min}$ ($20 \text{ ft}^3/\text{min}$)

2 SIGMA INTERVAL: $1.3 \text{ m}^3/\text{min}$ ($46 \text{ ft}^3/\text{min}$) (32%)

RANGE: 2.8 to $5.4 \text{ m}^3/\text{min}$ (98 to $190 \text{ ft}^3/\text{min}$)

The location chosen for the measurement is specified in the procedure appendix. The sample transport line description is, in general, configured as follows:

horizontal length: 5 inches

vertical lengths: 28 inches

bends: one 90 degree, 24 inch radius

Specifically, this line has the following configuration:

- The line is 42 inches long from the stack to the top of the sampler instrument cabinet.
- This 42 inch length of line contains a single 37 inch, 90 degree bend; the radius of which is 24 inches (the vertical distance from the probe to the top of the cabinet is 24 inches).
- The horizontal line distance is, $42 - 37 = 5$ inches. The horizontal distance from the stack to the cabinet is 27 inches. The line enters the cabinet within an additional $(24 + 5) - 27 = 2$ horizontal inches.

- From the top of the cabinet to the record sample holder inside the cabinet, the line is 28 inches long.
- This gives a total line length of $42 + 28 = 70$ inches. In line loss computations, only the horizontal and vertical lengths, are included along with the number and angle of bends. Therefore, the "in general" values given above are stipulated correctly.

5.1.8 Stack 296-T-18; 244-TX Salt Well Receiver Tank and Annulus Exhaust

This stack exhausts filtered air from the 244-TX tank and annulus.

STACK SIZE: 15 cm (6 in.) diameter, 3.4 m (11 ft) high

FAN DESIGN CAPACITY: $7.09 \text{ m}^3/\text{min}$ ($250 \text{ ft}^3/\text{min}$). Stack is designed to vary from 3.54 to $7.09 \text{ m}^3/\text{min}$ (125 to $250 \text{ ft}^3/\text{min}$). Fan No. is EF-1.

EMISSION CONTROL DEVICE: Filtration.

$$\begin{array}{c} \text{H-H} \\ \text{IN} \left[\begin{array}{c} \text{H-H} \\ \text{H-H} \end{array} \right] \text{OUT} \end{array}$$

Stack flow rates are measured using Tank Farm Maintenance Air Flow Test Procedures. Flow rate statistical data results in the following values:

AVERAGE: $8.1 \text{ m}^3/\text{min}$ ($287 \text{ ft}^3/\text{min}$)

VARIABILITY: $-36\%/+16\%$

STANDARD DEVIATION: $1.1 \text{ m}^3/\text{min}$ ($40 \text{ ft}^3/\text{min}$)

2 SIGMA INTERVAL: $2.4 \text{ m}^3/\text{min}$ ($85 \text{ ft}^3/\text{min}$) ($\pm 30\%$)

RANGE: 5.7 to $10.6 \text{ m}^3/\text{min}$ (202 to $373 \text{ ft}^3/\text{min}$)

The location chosen for the measurement is specified in the procedure appendix.

5.1.9 Stack 296-U-11; 244-U Salt Well Receiver Tank and Annulus Exhaust

This stack exhausts filtered air from the 244-U tank and annulus.

STACK SIZE: 15 cm (6 in.) diameter, 4.3 m (14 ft) high

FAN DESIGN CAPACITY: $7.09 \text{ m}^3/\text{min}$ ($250 \text{ ft}^3/\text{min}$).

EMISSION CONTROL DEVICE: Filtration.

IN $\begin{bmatrix} \text{H-H} \\ \text{H-H} \\ \text{H-H} \end{bmatrix}$ OUT

Stack flow rates will be measured using stack flow indicator FI-244U-3. This instrument was certified accurate during a site test conducted by the manufacturer per the method called out in 40 CFR 52, Appendix E. The test results yielded a relative flow rate accuracy of 1.4%, with a 1.7% zero drift and less than 1% calibration drift. Pass fail criteria for use of this instrument in reporting regulatory values are less than 10% for flow rate and less than 3% for zero and calibration drift. Stack flow rates will also be periodically measured using Tank Farm Maintenance Air Flow Test Procedures. However, these measurements will only be used to check on the proper function of the stack flow instrument. The location chosen for the measurement is specified in the procedure appendix.

5.2 LIQUID EFFLUENTS

Liquid effluents include:

- 241-A Tank Farm Surface Condenser Cooling Water (CAR) to 216-B-3 Pond. Cooling water from the surface condensers for 241-AY and -AZ Tank Farms was collected in this waste stream. In August 1997, this waste stream discharge was changed to the Treated Effluent Disposal Facility. In March of 1998, the surface condenser cooling water waste stream was replaced by the W-030 cooling tower blowdown waste stream.

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6.0 EFFLUENT MONITORING/SAMPLING SYSTEM DESIGN CRITERIA

6.1 EFFLUENT MONITORING SYSTEM GENERAL DESIGN CRITERIA

Guidelines and performance based criteria for design and use of systems for the measurement of airborne radioactive materials from ducts or stacks are discussed in WHC-SD-EN-TI-288, Rev. 0, Functional Requirements Document for Measuring Emissions of Airborne Radioactive Materials (WHC 1994f). Design criteria for updated systems needed in Tank Farms are given in WHC-SD-WM-CR-058, Rev 0, Gaseous Effluent Monitoring System Design Criteria.

6.2 EFFLUENT MONITORING SYSTEM REQUIREMENTS/CONSIDERATIONS

NESHAP establishes requirements and procedures for measuring radionuclide emissions from point sources (e.g., stacks and vents). The requirements and procedures are contained in 40 CFR 61.93. Alternative procedures are allowed if EPA has granted prior approval. The following sections present methods that NESHAP mandates for an airborne radionuclide effluent monitoring system. Alternative methods are allowed but they must have received prior EPA approval.

In 40 CFR Part 61, NESHAP specifies parameters that must be sampled or measured and specific implementation methods. The methods are contained in 40 CFR 60, Appendix A and 40 CFR 61, Appendix B. The following seven elements are the essential requirements for design and operation of an airborne effluent release monitoring system mandated by NESHAP for DOE facilities.

1. Effluent flow rate must be measured using 40 CFR 60 Appendix A, Method 2. Method 2 is used for large stacks. Method 2A is used for small stacks or ducts of which the entire flows are routed thru a gas volume meter. It is difficult to route the entire stack flows through a gas meter unless the stack is extremely small. Since the sampling system can be routed through a gas volume meter, this method has been deemed appropriate for use in totalizing the sampling flows. Specifically, the accuracy requirement (within 2%) is used from this method as a design criteria for sampling system flow totalizers. Method 2C is more appropriate for use in measurement of flows from small stacks. In some cases Method 2D can also be used. Automated flow rate measurement instrumentation may be used, as well, if certified accurate per 40 CFR 52, Appendix E. This method was documented as a method for demonstrating compliance in a

letter from Jerry Leitch, EPA, to J. D. Bauer, RL dated March 11, 1993. In short, this method specifies instrumentation accuracies that must be met when compared against Method 2 type measurements taken over the 168 hour time frame during which the flows are adjusted over the full range of expected flow conditions.

2. Radionuclides shall be directly monitored or extracted, collected and measured.
3. Placement of the sampling/monitoring probe or sensor must be derived using 40 CFR, Appendix A, Method 1 or 1A. These methods are also used for location of measurement instrumentation of from where to take the measurements.
4. The sampling/monitoring probes must be designed per guidance presented in ANSI N13.1 1969. This Standard provides guidance, in Appendix B & C of the Standard, for determination of how representative the collected sample is. The latter two Appendices are often overlooked during designs of new systems as well as during compliance assessments accomplished to determine whether or not specific sampling systems meet the design requirements of this Standard. Therefore, in hopes of emphasizing this very important aspect of the Standard, efforts have focused on getting the Standard revised. The revision will focus heavily on the system's capability of obtaining representative samples and the proof thereof.
5. Radionuclides must be analyzed according to 40 CFR 61, Appendix B, Method 114.
6. A quality assurance program must be conducted that meets the performance requirements described in 40 CFR 61, Appendix B, Method 114.
7. Alternative designs must be addressed and approved by Regulators as discussed in 40 CFR 61.93(b)(3). Shrouded probe technology, for example has received such approval. It should be noted however, that use of such technology requires that certain conditions be met beforehand; such as proof that the system will do what it is designed to do.

6.3 ACCEPTANCE TEST PROCEDURE

A generic Acceptance Test Procedure (ATP-G-999-00010 [WHC 1981])

was used at the Hanford Site to verify initial stack sampling system operability. This procedure provides electrical, mechanical, and alarm function checks as identified in RHO-MA-241, "Installation Criteria for the Generic Airborne Radioactive Contamination Sampling and Monitoring System" (RHO 1980b). Applicable sections of this acceptance test procedure are applied to facility-specific airborne effluent monitoring/sampling systems.

The new systems which have recently been built, or are currently being built, have been tested by individually developed test procedures which were made part of the overall Operational Acceptance Test Procedure for the project/facility. These newer designs are installed on the following facilities:

The three Rotary Mode Core Sampling Exhausters, Stacks numbers 296-P-32, 33, & 34.

The new SY exhauster stack number 296-S-25.

The two new exhauster stacks built under the W030 project at the Aging Waste Facility (stack numbers 296-A-42 and 296-A-43). The former stack vents the tanks, the latter stack vents the building which houses the former.

The new 106-C Tank Exhauster stack, No. 296-C-06, which was built under the W320 project.

The 244-U DCRT stack system.

6.4 CONTINUOUS AIR MONITORS (CAM)

The following is a list of CAMs that have been tested for use as work place monitors by the Hanford Instrument Evaluation Committee. Testing was in accordance with ANSI N42.18 and IEEE 344. It is suggested that if other instruments are desired for use, that appropriate testing should be performed and documented first.

Beta CAMs

Eberline AMS 3
Eberline AMS-3A
Eberline AMS-3A-1
Eberline AMS 4

Alpha CAMs

Eberline Alpha 3
Eberline Alpha 4
Eberline Alpha 5
Eberline Alpha 5A
Eberline Alpha 5AS
Eberline Alpha 6A-1

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7.0 CHARACTERIZATION OF CURRENT EFFLUENT MONITORING SYSTEM

7.1 STACK SAMPLING/MONITORING INSTRUMENTATION

Most of the stack sampling/monitoring systems in the Tank Farms discussed in this FEMP are of a generic design. The 296-A-42, 296-P-32, 296-U-11 systems are newer and a bit different. The generic design is discussed first; and the newer design is discussed last. Section 7.3 lists specific instrumentation in each system.

7.1.1 The Generic Design

Generic stack sampling and monitoring systems consist of continuous air monitors (CAMs) and record samplers. The discussion presented here, however, centers mostly on the record samplers. CAM alarms are discussed in Section 7.2. The system consists of the following elements:

- The sampling probe withdraws the sample from the stack.
- The sample transport line transports the sample to a sample collection (record sampler) and/or other detection devices (CAMs).
- Heat trace on the sample transport line is to prevent condensation.
- The collection and/or detection devices collect the sample.
- The rotameter measures the flow through the system.
- The gasmeter or totalizer totals the sample flow.
- The pressure or vacuum gauge measures the vacuum in the system.
- The flow switch indicates when the sample flow falls below established limits.
- The flow regulator is used to adjust the flow to maintain established flow rates through the sampling system.
- The vacuum pump supplies the flow through the system.
- The timer indicates length of time the collection devices have been operating.

Sampling system elements and associated measurement errors are discussed in greater detail in WHC-SD-WM-ES-291-1 (WHC 1994e). A brief description is provided in the following sections.

7.1.1.1 Stack Sampling Probe

The sampling probe withdraws a sample from the stack or stream of interest. Most of the 200 Area Tank Farm radionuclide sampling systems are designed to sample isokinetically (i.e., sample probe intake velocity = stack velocity) by sizing the stack's sampling probes to a design sample flow rate and stack flow rate.

At some facilities, sampling systems are designed with a single sampling probe. In these cases, the sample from the probe is split and routed to the record sampler and the CAM(s). At other facilities multiple sampling probes are used, one for the record sampler and one for the CAM(s).

Most of the 200 Area Tank Farm record sampling systems were designed to operate at a $6\text{E-}2 \text{ m}^3/\text{min}$ ($2.2 \text{ ft}^3/\text{min}$) sample flow rate (reflected on the probe design paperwork for the various stacks). A lower flow rate of $6\text{E-}2 \text{ m}^3/\text{min}$ ($2.0 \text{ ft}^3/\text{min}$) is allowed for the CAMs; however, the design is still based on $6\text{E-}2 \text{ m}^3/\text{min}$ ($2.2 \text{ ft}^3/\text{min}$). The lower flow rate of $6\text{E-}2 \text{ m}^3/\text{min}$ ($2 \text{ ft}^3/\text{min}$) theoretically results in the CAMs oversampling (with respect to large particles) the airborne effluent stream. Because the ratio of the sample nozzle velocity to the stack velocity is the determining factor in the degree of oversampling, the exact amount of oversampling can only be determined upon close examination of each system. Because CAMs are monitoring devices which provide notification of increasing particulate radionuclide emissions, this oversampling improves the sampling system collection efficiency.

7.1.1.2 Record Sample Collection Filter Paper and Holder

The record sample collection filter paper and holder collects and samples particulate radionuclides from the stack or stream. This filter is sent to the laboratory on a periodic basis for analysis. The analytical results are used to quantify radionuclide emissions.

The record sample collection filter paper is held inside a holder. This holder requires inspection periodically for wear and for leaks. The filter paper needs to be removed for laboratory analysis and replaced with a new filter on a pre-determined schedule. The filter used in the filter holder is a Gelman Sciences Versapor 3000 - Supported Membrane type. The manufacturer specifies that this filter has a 91% collection efficiency for 0.3

micron particles (Butcher 1991). Typical initial pressure losses across a clean membrane filter, such as this one, are about 6.4 inches of mercury.

Most of the sampling systems consist of both record samplers and CAMs. The record sample portion of the sampling system is considered the regulatory portion of the system used to quantify and report what dose the public receives from operation of that particular emission point. CAMs are considered safety devices and are set to alarm if emission's concentrations increase above preset levels. They can also be used as backup regulatory devices. The difference between CAMs and the record samplers is a detector above or near the collection filter paper in the CAM. The record samplers only contain a filter paper. If the filter paper from the record sampler could not be used for analysis for some reason, the CAM's filter paper may be used as a backup.

7.1.1.3 Rotameter

The rotameter measures the flow rate through the sampling system. Knowing the flow rate is important to acquire a good sample. The rotameter consists of a ball floating in a column of fluid (air) in a tube. The model primarily used at Tank Farms is a DWYER/RMC-103PF. No calibration is required for this instrument. This model has neither flow adjustment nor calibration scale adjustment.

7.1.1.4 Gasmeter

The gasmeter or totalizer quantifies flow through the sampling system. This totalizer complies with specifications which state that a meter must remain within $\pm 2.0\%$ accuracy at $28,000 \text{ m}^3$ ($1,000,000 \text{ ft}^3$) total volume. Manufacturer supplied data shows that this meter is well within the required accuracy standard. Regulations specify accuracy to be within 2% . In fact, the data supplied showed this meter to be accurate to -0.4% at the maximum designed full rate and to $+0.2\%$ accuracy at 20% of the maximum designed full flow rate for an average volume of $28,000 \text{ m}^3$ ($1,000,000 \text{ ft}^3$).

7.1.1.5 Vacuum Gauge

The pressure (or vacuum) gauge measures the vacuum in the sampling system. Air coming from the stacks is first run through the record sample filter paper, then the flow meter and totalizer, and finally the air pump which pulls air through the system. The more

particulate matter collected by sample filter paper the higher the vacuum in the system. Filter papers are replaced either weekly or bi-weekly. Over this period, the vacuum within the sampling system should theoretically increase as particulate matter is collected. Pressure gauge readings are used in emission calculations to compute standard flows and volumes from the rotameter and gasmeter recorded values.

7.1.1.6 Flow Switch

The flow switch indicates when the sample flow falls below established limits. The purpose is three fold:

- a. to prevent damage to the sample collection filter paper. As the filter paper collects particulates, the vacuum increases and the sample flow rate drops. If the vacuum increases too much, the filter paper may be damaged.
- b. to prevent nonrepresentative sampling due to anisokinetic sampling conditions. As flow drops, isokinetic conditions necessary to acquire a representative sample are not maintained.
- c. to indicate vacuum pump problems (e.g. no flow or failed condition).

7.1.1.7 Flow Regulator

The flow regulator used in this generic design is an EBERLINE 10552-CO2 RAP-1. This regulator adjusts, and is adjustable, to maintain an established or desired flow within the system. The regulator bleeds in bypass air to relieve increases in external head losses (increased vacuum) that would be caused typically by sample filter loading or minor sample line plugging. Bypass air allows the pump to run cooler at its maximum capacity and thus increases the life of the pump. Calibration is not required. However, when changes from the original flow rates are realized, potential problems are indicated. Cleaning the regulator is the first step to correct this problem. Repair kits are available from the manufacturer, if necessary. Replacement of the entire regulator would be accomplished as a last step.

7.1.1.8 Vacuum Pump and Filters

The vacuum pump is a GAST MODEL NO. 0822-V103-G271X. This pump is an oil-less carbon vane rotary pump and is provided with air

filters, both intake and discharge, to prevent dirt and moisture from entering the regulator and pump chambers. Dirt and moisture can cause the pump's vanes to act sluggish, or even to break; and can cause faulty performance of the regulators. These filters should be in place and replaced periodically. The pump is a constant flow device. It is a 373 watts (1/2 HP), 115/230 VAC, 60 Hz, single phase motor. It does not need calibration. However, periodic maintenance may be required. The pump vanes are carbon based; and upon extended use, these vanes tend to disintegrate into fine powder causing decreased performance. Pump manufacturers recommend replacement of these hard carbon vanes after 6000 hours of service. That's about 8 months of continuous use. Also, periodic flushing of the pump improves its performance. The manufacturer recommends introducing cleaning solvent (GAST #AH255) into the pump intake while the pump is running.

7.1.1.9 Timer

The timer can be used in combination with the rotameter as a backup to the gasmeter. The timer indicates the length of time the filter paper has been collecting a sample. Most stack record sampling systems contain a switched and an unswitched power receptacle. Power is lost to the switched receptacle when the exhaust fan is turned off. The record sampling system, along with the timer are designed to be plugged into the switched receptacle. In this way, the timer will indicate the length of time the exhauster has been running as well. This is important because the sampling system should only be sampling when the exhauster is on.

This timer is a CRAMER 10083. The timer readout is an elapsed time resettable 5 digit meter which reads in hours. The first digit reads in tenths of an hour. It has a certified standard and must be accurate to $\pm 1\%$. This device, however, is a synchronous motor. Accuracy of the timer is a function of the accuracy of Hanford's power line frequency. Discussions with electrical experts indicate that power frequency varies from 58.5 to 61.5 hz. Based on this, accuracy of the timer is closer to $\pm 2.5\%$. The timer only indicates hours and tenths of hours; and if it is assumed that one could accurately read one-half the smallest graduation, then the timer is only capable of accurately indicating $\pm 5\%$. The manufacturer says there is no adjustment on this timer; therefore no calibration can be accomplished.

7.1.1.10 Instrument Enclosure

The standard design for tank ventilation systems consists of a record sampler and a beta-gamma CAM that are installed in a

weather-resistant cabinet. Figure 7-1 represents a composite generic monitor/sampler instrument enclosure and shows the equipment and instrumentation that can be located in one of the enclosures. Two thermostats control the cabinet environment. When the cabinet temperature drops below $18 \pm 3^\circ\text{C}$ ($65^\circ\text{F} \pm 5^\circ\text{F}$), the cabinet heater is activated and operates until the temperature reaches $24 \pm 3^\circ\text{C}$ ($75^\circ\text{F} \pm 5^\circ\text{F}$). The lower setting for the thermostat that controls the heater is above 10°C (50°F) which limits the potential for moisture condensation (RHO 1980a). A second thermostat actuates a fan to prevent the cabinet temperature from increasing to above 52°C (125°F), the upper limit for proper Beta/Gamma CAM operation.

Summer temperatures greater than $35 \pm 3^\circ\text{C}$ ($95^\circ\text{F} \pm 5^\circ\text{F}$) activate a ventilation fan, which draws in air from the outside to remove heat from the cabinet. An alarm light mounted on the cabinet alarm panel is activated if the temperature falls below 13°C (55°F) or exceeds 52°C (125°F).

The instrument enclosure has a rotating beacon in a plastic dome and a bell that is actuated by off-normal conditions. On all of the standard enclosures, the beacon alarm light is actuated by high or low temperatures in the enclosure, beta-gamma CAM (and/or Alpha CAM) failure, or low sample flow through the record sampler. If the beta-gamma CAM (or Alpha CAM) detects a level of radioactivity exceeding the alarm set point, the beacon and the bell on the side of the enclosure are activated.

7.1.2 The Newer Designs

Except for earlier Core Sampler Exhauster system designs, the record sample and the CAM probes are designed per the ANSI N13.1, Appendix A design with use of the correct multiple of 5 for bend and nozzle length. Nozzle length is 5 times the internal diameter of the nozzle. Just after the nozzle opening there is a 7 to 8 degree internal expansion designed to slow the particles down. This internal expansion design has been experimentally shown to lessen particle loss due to turbulent impaction. This is different than the published straight ANSI N13.1 design. To accommodate the ANSI design, the nozzle bend is 5 times the interior just where the bend begins.

Sample transport line sizes and lengths were chosen to optimize the system's collection efficiencies using computerized particle deposition programs. One such program is Deposition 2.0 (reference Anand, N. K., McFarland, A.R., Wong, F.S., Kocmound C.J., 1993b, DEPOSITION 2.0, NRC NuReg/GR-006, Serial # 2145, March 8, 1993, Aerosol Technology Laboratory, Department of Mechanical

Engineering, Texas A&M University College Station, TX 77843). In most cases the record sample holder and CAM detector and filter are short coupled to the stacks. The record sample filter holder is of the type which can also hold a silver zeolite or charcoal (for collection of radioiodine) cartridge. The CAM detector head is also located as near the sample extraction probe assembly as possible. The head sends a signal proportional to the particulate levels seen by a monitor located in the sample cabinet.

Sample and monitor flows are created via a vacuum pump system located in the instrument cabinet located nearer to the ground or on the ground. The vacuum pump system creates a manifold vacuum that will withdraw sample flows through the extraction probes (both the record sampler and CAM probes) and associated transport piping. Sample flow rates are independently determined by total and static pressure signals. Sample flow measurement instruments are stated by the manufacturer to be accurate to 1%. 40 CFR 60, Appendix A, Method 2A requires 2% accuracy.

Density compensation occurs for temperature and pressure changes; and sample flows are displayed on integral LEDs in units of Standard Cubic Feet per Minute (SCFM) in the sample cabinet. In addition, signals are sent to flow controllers (one for the record sampler and one for the Beta CAM) which control sample valves. The flow controllers compare sample flow signals to signals received from the stack flow transmitter. Sample valves are then controlled, to maintain the sample flow (for both the Record Sampler and the CAM) proportional to stack flow as conditions vary. An anisokinetic flow alarm light is installed in the system which activates when stack flow and sample or CAM flow velocities vary by more than 10%. In addition, both stack and sample flows are totalized either by the data logger in the 296-U-11 and 296-P-32 systems or by individual flow totalizers in 296-A-42 system.

Manifold system vacuum pressure is measured by a pressure transmitter. The signal is displayed on an integral LED in inches of water column and is also sent to a pressure controller which controls a control valve. The control valve is used to modulate manifold system vacuum.

Two independent vacuum pumps are used to provide the manifold vacuum by which the sample flows are extracted from the exhaust stack airflow. Two pumps are provided for redundancy. Which pump is operating is controlled by an auto pump control system. Pump start/stop initiation is interlocked with the stack exhaust fan on/off status. Pressure switches are provided to sense pump failure. Vacuum relief valves are also provided to protect the pumps from failure in case of airflow starvation. Two automatic isolation valves provide pump intake and exhaust swing-over. A

vacuum gauge is also installed to provide visual indication of manifold system vacuum pressure in inches of mercury.

Finally, for systems that are run out-of-doors, the instrument cabinets are provided with both heating and cooling capabilities.

7.1.3 The New Generic Design

As discussed above, a new generic design which uses the shrouded probe technology is being tested. Its first installation is on the Salt Well Pumping Exhausters. Details of this newest design will be provided in the next revision of this FEMP.

7.2 CAM ALARM SET POINTS

Regulatory emission limits are set to offsite public dose exposures (see 40 CFR 61.92). Regulations are also established to restrict, and require notification of increases in emissions. This is pointed out rather clearly in the recent wording being proposed for inclusion into the Hanford Site Air Operating Permit. The wording goes as follows:

"Conditions requiring DOH notification within 24 hours.
 . . . Notification is required if any of the above conditions occur and radioactive air emissions could cause the doses to the MEI to:

Exceed the 10 mrem/yr dose standard, or
 Exceed the upper bound of "normal" historical emission data scatter for a similar operating period . . ."

CAMS can be used as indicators of such increases. To do this, though, the situation demands that CAM alarm set points be set based on meaningful emission increases. This is not a simple matter, however. It is not simple because fluctuations in background and increased levels of short-lived radionuclides such as radon and radon daughters during inversion events can also be detected by the CAM. During these type events, if the alarm set point is set too low, it will annunciate. Under normal circumstances, this is not desired as these increases are not of real concern. To eliminate these type of annoyance/spurious alarms, the alarm set point must be set high enough so the alarm does not annunciate at these levels; yet not so high that it misses a real elevated emission event. Available guidance on the matter suggests the set point should be set as low as possible without causing more than one spurious alarm to occur per month. A suggested means of accomplishing this is to compile a data set from

which a statistically based alarm set point can be derived. This would allow tracking nominal radon increases and their associated magnitudes with the intent to base the set point on a value just high enough to avoid most of these type events. An attempt to accomplish this is discussed further below.

7.2.1 CAM Alarm Set Point Basis

Tank Waste Remediation System Basis for Interim Operations (BIO), HNF-SD-WM-BIO-001 requires the CAM alarm set point be set no greater than 10,000 count per minute (cpm). WHC-CM-7-5, Section 2.0 requires that monitoring systems be set to alarm at emission concentrations as low as possible without resulting in an excessive number of alarms due to normal fluctuations in background or normal fluctuations in emissions. The alarms are intended to provide timely warnings when the radionuclide concentration or content of emissions has increased significantly so that corrective actions are required to prevent their exceeding the discharge limits. The alarm settings for a specific facility may be selected by the cognizant engineer of the facility who has detailed knowledge of both its process design and its operating experience.

With that, WHC-SD-WM-EMP-034, "Basis for Tank Farm Airborne Effluent Continuous Air Monitor Alarm Set Points" provides several recommendations for establishing CAM alarm set points. One of these is to examine CAM alarm event readings and to establish alarm set points to a statistically significant value based on this analysis. These type readings are, unfortunately, not recorded. CAM nominal reading are, however, recorded. CAM readings were obtained, therefore, from the following sources:

702-A Beta CAM values were obtained from TF-OR-EF-AAX-D, "A & AX TANK FARMS DAILY ROUNDS" sheets dated from 6/24/96 till 6/23/97.

244-A Beta CAM values were recorded from TF-OR-A-01, from 6/24/96 until 12/15/96 and from TF-OR-EF-C-D, "C, CR TANK FARMS AND 244A DCRT LIFT STATION ROUNDS" sheets dated from 6/2/97 until 6/23/97.

244-BX Beta CAM values were obtained from TF-OR-WF-B-D, "BX, BY TANK FARMS AND 244-BX DCRT DAILY ROUNDS" sheets dated from 12/30/96 until 6/23/97.

244-CR Beta CAM values were obtained from TF-OR-EF-C-D, "C, CR TANK FARMS AND 244A DCRT LIFT STATION ROUNDS" sheets dated from 5/13/97 until 6/23/97.

241-C Farm Cam values were not examined because recorded values for the 296-C-16 stack CAM were not found.

244-S Beta CAM values were obtained from TF-OR-WST-01-D, "S, SY AND SX TANK FARMS DAILY ROUNDS" sheets date from 1/1/97 until 8/31/97.

244-TX Beta and Alpha values were obtained from TF-OR-WST-02-D, "242T, TX, TY AND U FARM TANK FARMS DAILY ROUNDS" sheets dated from 9/1/94 until 2/28/95. More recent dates were not used because these values are not being recorded on rounds any longer.

Data from the referenced sources was averaged, the standard deviations were found and the 3 sigma value computed. A 3 sigma value represents 99% of all the possible reading which might occur. Table 7-1 tabulates these values. From this set of values, a generic Tank Farm Beta CAM set point can be established as 3000 cpms. An alpha CAM alarm set point has not been determined as there was not enough data to evaluate.

Table 7-1: 3 Sigma Facility Specific CAM Reading		
	Statistically Based CAM Alarm Set Point Value	
Stack	Beta	Alpha
	cpm	
296-A-17	2833	na
296-A-25	1191	na
296-B-28	232	na
296-C-05	1669	na
296-P-16	nd	na
296-S-22	361	nd*
296-T-18	396	17
Set Point	3000	nd

* nd means not determined.

7.2.2 Quantity Based CAM Alarm Set Point Equation Derivation

This section provides the derivation of an equation which relates CAM alarm set points to stack emissions. The amount of material that is released from a stack effluent stream can be determined by multiplying the concentration of that material in the effluent stream by the total volume of the effluent stream that was released. This can be expressed mathematically as follows:

$$Tr = \rho_k * V_k$$

where:

Tr is the total amount released and is normally expressed in units of curies (Ci).

ρ_k is the concentration of the material in the effluent stream.

V_k is the released volume of the effluent stream.

The released volume, can be found from the flow rate of the effluent stream and the operating time of the system.

$$V_k = Q_k * t$$

where:

Q_k is the flow rate, and

t is the length of time that the system operated

Tr is therefore,

$$Tr = \rho_k * Q_k * t \quad [1]$$

Alarm set points are established based on concentrations. From equation [1] above, it is readily apparent that Tr is directly related to the concentration and the stack flow rate. Therefore, as long as the stack flow rate remains the same, increased emissions would be indicated by increased stack concentrations. The CAM can be used to indicate when this happens.

The CAM unit is designed to draw a portion of the stack effluent through a collection filter paper at certain sample flow rates. A radiation detector head is installed as part of the CAM unit and used to monitor the activity collected on this filter. The average concentration seen by the CAM is determined by dividing the activity seen by the CAM detector head by the sample flow volume,

which is the sample flow rate multiplied by the time the system was collecting the sample. This is expressed mathematically as follows:

$$\rho_o = \frac{A}{Q_o \times t}$$

where:

- ρ_o = the concentration of material seen in the CAM
- A = the activity seen on the CAM's collection filter by the CAM's detector
- Q_o = the flow rate through the CAM

The variable of interest is the concentration in the stack (recall that an increase in the concentration being released is what the alarm set point should be set to). Therefore the variable of interest, as given in equation [1] is ρ_k . In order to assume that ρ_o (the concentration collected in the sample) is equivalent to ρ_k (the concentration in the stack), losses and efficiencies must be known or estimated. Expression of these losses or efficiencies can be done as follows:

$$\epsilon * \rho_k = \rho_o$$

Where ϵ represents the efficiency of the sample collection and detection process, ϵ can be further broken down as follows:

- ϵ_c = the sample collection efficiency
- ϵ_f = the filter collection efficiency
- ϵ_d = the detector efficiency

where

$$\epsilon = \epsilon_c * \epsilon_f * \epsilon_d$$

Recall that the variable of interest here is ρ_k , the concentration in the stack. With this:

$$\rho_k = \frac{A}{Q_o \times t \times \epsilon_c \times \epsilon_f \times \epsilon_d} \quad [2]$$

The CAM reads out in counts per minute (cpm) which is an activity. As such, the alarm set point can be set to "A", the activity collected on the filter paper. Solving for "A" now gives:

$$A = \rho_k * Q_o * t * \epsilon_c * \epsilon_f * \epsilon_d \quad [3]$$

DISCUSSION OF THE VARIABLES: Now that an appropriate equation is derived, a brief discussion of the variables involved is in order:

From the discussion above, ρ_k is usually expressed in units of $\mu\text{Ci}/\text{ml}$.

ϵ_d is the detector efficiency, expressed as a ratio of cpm/dpm (dpm is the abbreviation for disintegrations per minute). Since ρ_k is expressed in units of $\mu\text{Ci}/\text{ml}$, a conversion factor is necessary to convert dpm to μCi . One μCi is equivalent to $2.22\text{E}+06$ dpm. ϵ_d is determined in the field. Available guidance suggest that ϵ_d efficiencies should be:

Alpha CAM efficiency performance should always be $>7\%$ and $<20\%$.

Beta CAM efficiency performance should always be $>10\%$ for Cs^{137} , and $>15\%$ for Sr-Y^{90} .

ϵ_f is the collection efficiency of the filter paper. The manufacturers efficiency given for the VERSAPOR 3000 filter paper is 91%. If another filter paper is used, the corresponding manufacturer's efficiency rating must be used.

ϵ_c is the collection efficiency of the sample probe and transport line. These values have been derived in WHC-SD-WM-ES-291, Rev. 1 (WHC 1994e); and are dependant upon particle size. Possible particle sizes affect these efficiencies. What different particle sizes might mean are explained further as follows:

- Small particles, such as radon daughters are estimated to be about 0.2 micrometers. As HEPAs are less efficient in trapping these size particles, this size may be present in the exhaust stream most often.
- WHC-SD-WM-ES-291, Rev. 1 justified use of a $3.5 \mu\text{m}$ sized particles for collection efficiencies during normal operation.
- If the HEPAs were to fail, large particles might exist in the exhaust stream. As such, the correct efficiency

factor to use would be for the 10 μm sized particles. WHC-SD-WM-ES-291, Rev. 1 provides these collection efficiencies as follows (Note: 296-A-42, 296-P-32, and 296-U-11 efficiencies are not included in this reference. Efficiencies are contained in the facility field files):

Table 7-2: Stack Sampling System Collection Efficiencies				
Stack	ϵ_c for 0.2 μm	ϵ_c for 1 μm	ϵ_c for 3.5 μm	ϵ_c for 10 μm
296-A-17	nc	0.972	0.775	0.014
296-P-26	nc	0.980	0.927	0.572
296-A-42	0.994*	0.994*	nc	0.36*
296-A-25	nc	0.979	0.894	0.493
296-B-28	nc	0.972	0.788	0.036
296-C-05	nc	0.986	0.916	0.525
296-P-16	nc	0.973	0.866	0.384
296-P-32	nc	nc	nc	1.011*
296-S-22	nc	0.976	0.787	0.092
296-T-18	nc	0.968	0.769	0.088
296-U-11	nc	nc	nc	0.824

nc stands for not computed

* these are collection efficiencies computed for the CAM. They are not to be confused with record sampler collection efficiencies. Record sampler collection efficiencies for these two system noted above are as follows:

Stack	ϵ_c for 10 μm
296-A-42	55% to 63%
296-P-32	77.3%
296-U-11	82.4% to 87.5%

The variable "t" is the time the sampler/monitor was running. This is the time since a fresh, clean filter was installed; and is usually expressed in units of hours. Q_0 is the variable for the sample flow rate. A rough estimate for this variable is $5.7\text{E-}2 \text{ m}^3$ (2 ft^3) per minute or 3.4 m^3 (120 ft^3)

per hour (abbreviated as CFH). Since, ρ_k is expressed in units of $\mu\text{Ci}/\text{ml}$, a conversion factor is necessary, to use the CFH unit in this equation. One ft^3 is equivalent to $2.83168\text{E}+04$ ml.

With the variables defined and the conversion factors determined, equation 3 can be rewritten as follows:

$$\begin{aligned} A &= \rho_k * Q_o * t * \epsilon_c * \epsilon_f * \epsilon_d * 2.832\text{E}+04 \text{ ml}/\text{ft}^3 * 2.22\text{E}+06 \text{ dpm}/\mu\text{Ci} \\ &= \rho_k * Q_o * t * \epsilon_c * \epsilon_f * \epsilon_d * 6.286\text{E}+10 (\text{ml}) (\text{dpm}) / (\text{ft}^3) (\mu\text{Ci}) \end{aligned}$$

Another way to express this is to put the conversion factor into the denominator as follows:

$$A = \frac{\rho_k \times Q_o \times t \times \epsilon_c \times \epsilon_f \times \epsilon_d (\text{dpm}) (\text{ml})}{1.591 \times 10^{-11} (\text{ft}^3) (\text{uCi})} \quad [4]$$

Note that in equation [4], one still has to put the units in for variables ρ_k , Q_o , t , and ϵ_d . These units should be:

- $\mu\text{Ci}/\text{ml}$ for ρ_k
- CFH for Q_o
- hrs for t
- ϵ_d cpm/dpm.

7.2.3 Interpretation of Alarm Set Points

Using equation [4] above, meaning can be placed on the 3000 cpm alarm set point from Section 7.2.1 above. The meaning will be in terms of stack emission concentrations. Table 7-3 tabulates what this set point means in terms of microcuries per milliliters of stack emissions, per unit time that the filter paper has been installed and in terms of the collection efficiencies of the system. See Table 7-2 above for collection efficiency values. The Table 7-3 values were computed using the following other assumed values:

- Q_o of 120
- ϵ_d cpm/dpm of 0.15
- ϵ_f of 0.91

For illustration purposes, a stack with a collection efficiency of 100% that alarms after the filter has been installed for the length of time given in the column header will have seen estimated stack emissions listed in the row with the ϵ_c value of 1. Note, stack concentration values are not computed for ϵ_c values less than 20% as systems with values this low are not considered reliable or capable of collection. It should also be noted that the advantage of the AMS-4 CAM is that alarm set points can be set to any length of time without regard for how long the filter has been in place. The next section discusses these type CAMs.

Table 7-3: 3000 cpm CAM Alarm Set Point Meaning in Terms of Stack Emission Concentration

ϵ_c	2 Week	Week	Hr	Min	Hr	Min
	$\mu\text{Ci/ml}$				dpm/ft^3	
1	8.7E-12	1.7E-11	2.9E-09	1.7E-07	183	10,996
0.9	9.6E-12	1.9E-11	3.2E-09	1.9E-07	204	12,218
0.8	1.1E-11	2.2E-11	3.6E-09	2.2E-07	229	13,745
0.7	1.2E-11	2.4E-11	4.2E-09	2.5E-07	262	15,708
0.6	1.4E-11	2.9E-11	4.9E-09	2.9E-07	305	18,327
0.5	1.7E-11	3.5E-11	5.8E-09	3.5E-07	367	21,992
0.4	2.2E-11	4.3E-11	7.3E-09	4.4E-07	458	27,490
0.3	2.9E-11	5.8E-11	9.7E-09	5.8E-07	611	36,653
0.2	4.3E-11	8.7E-11	1.5E-09	8.7E-07	916	54,980

7.2.4 Concentration Based CAM Alarm Set Points provided by the AMS-4 Beta CAMs

The AMS-4 CAMs have, in addition to the quantity based alarms discussed in the previous sections, concentration based alarms. There are two such alarms. The Vendor information on this CAM describes these alarms as follows:

"Slow Concentration Alarm Setpoint - The Slow Concentration Alarm Setpoint determines the concentration at which a slow concentration alarm will occur. The amount of history used to make this determination is defined by the Slow Alarm Interval. An alarm will be posted if the current interval of slow alarm concentration history exceeds the concentration of the

previous history interval by the value specified by the slow alarm set point..."

"Flow Concentration Alarm Setpoint - The Flow Concentration Alarm Setpoint determines the concentration at which a fast concentration alarm will occur. The amount of history used to make this determination is defined by the Fast Alarm Interval. An alarm will be posted if the current interval of slow alarm concentration history exceeds the concentration of the previous history interval by the value specified by the slow alarm set point..."

The slow alarm interval can be set from 1 to 120 minutes. The fast alarm interval can be set from 5 to 255 seconds.

What follows is a discussion and derivation of alarm set points for these concentration based alarms. Table 7-5 tabulates the data discussed below.

NOMINAL FACILITY EMISSIONS

The first step in establishing alarm set points based on emission concentration which are independent upon how long the CAM's collection filter has been installed is to establish nominal emissions. Current nominal facility emissions are reported in Section 8 of this document. Table 8-1 summarizes the data and provides the average of the maximum and the maximum Tank Farm alpha and beta values. Since the AMS-4 is a beta CAM only, Beta values are of interest here. These values are given as follows:

Average: $5.9\text{E-}11$ $\mu\text{Ci/ml}$ - 3.7 dpm/ft^3
Maximum: $2.4\text{E-}10$ $\mu\text{Ci/ml}$ - 15.1 dpm/ft^3

ELEVATED FACILITY EMISSIONS

The next step in establishing alarm set points is to establish a meaningful elevated emission value. The following reference provides radionuclide vapor space data from 18 single shell tanks sampled back in 1982:

Characterization of Breathing, Single-Shell Tanks Radionuclide Releases, Phase I, by Dr. Ellingson, dated March 1982.

In this study, the short-lived radionuclides were allowed to decay off before the samples were analyzed. The results, therefore provide concentrations which might exist prior to the HEPA filters under stagnant, undisturbed conditions. These values might be

useful as meaningful levels and not fluctuations in background or increased radon levels which will decay away after some short period of time. The average and maximum beta concentrations seen in these samples were given as follows:

Average: 3.7E-09 $\mu\text{Ci/ml}$ - 233 dpm/ft³
 Maximum: 3.7E-08 $\mu\text{Ci/ml}$ - 2,326 dpm/ft³

Vapor space radionuclide analysis data, which was analyzed before it decayed, also exist. This data came from a cc:mail message from John Evans to Eric Veith, "Assessment of Radiological Data Collected by VSS Sampling of SST Vapor Headspace", dated 1/6/97, Pacific Northwest National Laboratory, Richland, Washington. It was believed, these data might be useful in representing meaningful maximum fluctuations in background or increased radon levels. This data provided measured total alpha, beta, and cesium-137 concentrations collected on upstream filter papers used during various tank vapor sampling events. Maximum and averages beta values from this data were given as follows:

Average: 1.3E-08 $\mu\text{Ci/ml}$ - 817 dpm/ft³
 Maximum: 9.6E-08 $\mu\text{Ci/ml}$ - 6,035 dpm/ft³

CAM MINIMUM DETECTION CONCENTRATION

Minimum detection concentration (MDC) for the AMS 4 CAM is computed using the following equation:

$$MDC = \frac{4.65 \sqrt{\text{Background Counts per minute} \times \text{minutes}} + 3}{\epsilon_d \times Q_s \times \text{minutes}^2}$$

Where; Q_s is sample flow rate
 ϵ_d is the detector efficiency

Minimum detection concentrations are useful in determining what concentrations the CAM will be capable of detecting after specific periods of time or how long it'll take the CAM to see specific concentrations (e.g., CAM Alarm Set point concentrations). Table 7-4 has been provided to illustrate this point.

Table 7-4: AMS-4 CAM Response Time vs Detection Concentration

Time	Minimal Detection Concentration for a Sample Flow Rate of 1 CFM, a detector efficiency of 15%, and a background of 50 cpm.	
(minutes)	(dpm/ft ³)	μCi/ml
1	239	3.8E-09
2	82	1.3E-09
3	44	7.1E-10
4	29	4.6E-10
5	20	3.2E-10
10	7	1.1E-10
20	3	4.0E-11
30	1.4	2.2E-11
60	0.5	7.6E-12

SLOW ALARM SET POINT

A slow alarm setting of 300 dpm/ft³ with a slow alarm interval of 60 minutes has been established as appropriate for use in Tank Farms for the following reasons:

Spurious alarms could occur for various reasons, one of which may be from radon decay daughter products building up on the CAM filter paper. The radon-222 decay chain is made up of Po-218, which decays with a half life of 3 minutes; Pb-214 with a half life of 27 minutes; Bi-214 with a half life of 19.7 minutes; and Po-214 with a half life of 164 micro-seconds. The time required to get through this decay chain totals 49.7 minutes. This means that if radon-222 daughters build up on the CAM collection filter, the activity level should start to level off and potentially start to drop after about 50 minutes. Thus, a 60 minute slow alarm interval setting would be sufficient to avoid this event.

The slow alarm set point was set higher than the nominal Tank

Farm emission values determined above to range from 3.7 to 15.1 dpm/ft³. The alarm set point was set alarm at pre-HEPA filter concentration data determined to be represented in the 1982 study discussed above. These values were given to range from 233 to 2,326 dpm/ft³.

FAST ALARM SET POINT

A fast alarm setting of 7,000 dpm/ft³ with a fast alarm interval of 60 seconds has been established as appropriate for use in Tank Farms for the following reasons:

A 60 second fast alarm setting was chosen for no reason other than it was inbetween the allowed instrument settings of from 5 to 255 seconds.

This fast alarm provides for faster response than the slow alarm, thus making this alarm setting more sensitive to fluctuations that might occur during elevated radon events. Possible tank radon levels were given above to range from 817 to 6,035 dpm/ft³. It was assumed that if emissions exceeded these values, a real elevated emission event might be in progress.

TABLE 7-5: Summary of Emission Levels for AMS-4 CAM Alarm Set Point Determination				
R O W	Scenario	Stack Emissions (beta)		EDE/CFM*
		$\mu\text{Ci/ml}$	dpm/ft^3	mrem/yr
1	Nominal Emissions	5.9E-11	3.7	3.8E-08
		2.4E-10	15.1	1.6E-07
2	Potentially Undisturbed Pre-HEPA Levels	3.7E-09	233	2.4E-06
		3.7E-08	2,326	2.4E-05
3	Determined Slow Alarm Set Point	4.8E-09	300	3.1E-06
4	Estimated possible Fluctuation in Background/Radon Levels	1.3E-08	817	8.5E-06
		9.6E-08	6,035	6.3E-05
5	Determined Fast Alarm Set Point	1.1E-07	7000	7.3E-05

* Note: This column provides calculated off-site dose consequences (per unit cubic foot per minute) to the public due to emissions from the 200 East Area using the CAP-88 dispersion modeling code for Sr-90.

7.3 SPECIFIC STACK SAMPLING/MONITORING INSTRUMENTATION

The next few tables list current instrument numbers and the Component Based Recall System (CBRS) numbers for applicable stack sampling/monitoring systems discussed in this FEMP. The JCS is the current system used to track and schedule instrument maintenance. Contained within the JCS database are the maintenance procedures, last done and next due maintenance dates, and frequency.

Table 7-6: Stack 296-A-42 - 241-AY/AZ Tank
Farms Exhauster - Record Sampler Loop.

Instrument	PM ET#	COMP. ID (JCS)
Stack Flow	06290	FIT-AZK1-3
Stack Flow Totalizer		FIQ-AZK1-3
Sample Flow	06289	FIT-AZK1-2
Sample Flow Totalizer		FIQ-AZK1-2

Table 7-7: Stack 296-A-25 - 244-A
Double-Contained Receiver Tank Exhauster -
Record Sampler Loop.

Instrument	PM ET#	COMP. ID (JCS)
Rotameter	1207	FI-EXH-1
Gasmeter	2381	FIQ-EXH-1
Vacuum Gauge	5039	PI-EXH-1
Flow Switch	1115	FAS-EXH-1
Flow Regulator		VTP-PCV-806B
Vacuum Pump		VTP-P-816B
Timer		VTP-HM-806

Table 7-8: Stack 296-B-28 - 244-BX Double
Contained Receiver Tank Exhauster - Record
Sampler Loop.

Instrument	PM WT#	COMP. ID (JCS)
Rotameter	05368	FI-244BX-5
Gasmeter	05217	FI-244BX-9
Flow Switch	05203	PS-244BX-4
Flow Switch	05133	PS-244BX-3

Table 7-9: Stack 296-C-05 - 244-CR Vault
Exhauster - Record Sampler Loop.

Instrument	PM ET#	COMP. ID (JCS)
Rotameter	1208	FI-RS-1
Gasmeter	2383	FIQ-RS-1
Vacuum Gauge	4937	PI-RS-1
Flow Switch	1118	FAS-RS-1

Table 7-10: Stack 296-P-16 - 241-C-105/106
Tank Exhauster - Record Sampler Loop.

Instrument	PM ET#	COMP. ID (JCS)
Rotameter	1209	FI-RS-1
Gasmeter	2385	FIQ-RS-1
Vacuum Gauge	4983	PI-RS-1
Flow Switch	2527	FAS-RS-1

Table 7-11: Stack 296-P-32 - 244-AR Vault
Exhauster - Sampler/Monitor Loop

Instrument	PM ES#	COMP. ID (JCS)
Beta CAM Flow	00116	FT-4
Stack Flow	00110	FT-1
Sample Flow	00114	FT-3

Table 7-12: Stack 296-S-22 - 244-S
Double-Contained Receiver Tank Exhauster -
Record Sampler, Alpha, and Beta/Gamma Parallel
Loops.

Instrument	PM ET#	COMP. ID (JCS)
Rotameter	WT-02107	FI-1
Gasmeter	WT-01700	FI-2
Vacuum Gauge	WT-02894	PI-EXH-3
Vacuum Gauge	WT-03003	PI-EXH-2
Vacuum Gauge	WT-02911	PI-EXH-1
Pressure Switch	WT-02029	PS-EXH-3
Pressure Switch	WT-02030	PS-EXH-2
Pressure Switch	WT-02027	PS-EXH-1

Table 7-13: Stack 296-T-18 - 244-TX
Double-Contained Receiver Tank Exhauster -
Record Sampler, Alpha, and Beta/Gamma Parallel
Loops.

Instrument	PM ET#	COMP. ID (JCS)
Rotameter	WT-00482	FI-244-TX-5
Gasmeter	WT-01040	FI-244-TX-9
Pressure Switch	WT-01117	PS-244-TX-4
Pressure Switch	WT-01113	PS-244-TX-3
Pressure Switch	WT-01116	PS-244-TX-2

7.4 SYSTEM OPERATION AND MAINTENANCE

The systems are operated by the Health Physics (HP) group and maintained by the Maintenance group. The systems are maintained by the JCS system and the procedures called out within that system. The systems correct operation is assured by the HPs. Instructions for the operation of these systems are contained in Task Descriptions. Flow rate settings for older systems are also derived and issued to the HPs at least once a year per WHC-IP-0842, Volume VI, Section 5.1, "Stack Radionuclide Sampling and Monitoring System Flow Rate Adjustment."

8.0 EMISSION DATA

Emission data is compiled and reported each year. The following is a list of emission reports for the past several years.

- DOE/RL-97-43, Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1996.
- DOE/RL-96-37, Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1995.
- DOE/RL-95-49, Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1994.
- DOE/RL-94-51, Radionuclide Air Emission Report for the Hanford Site Calendar Year 1993 (DOE/RL 1994).
- DOE/RL-93-36, Radionuclide Air Emission Report for the Hanford Site Calendar Year 1992 (DOE/RL 1993).
- DOE/RL-92-30, Radionuclide Air Emission Report for the Hanford Site Calendar Year 1991 (DOE/RL 1992).
- DOE/RL-91-10, Calendar year 1990 Air Emissions Report for the Hanford Site (DOE/RL 1991).
- WHC-EP-0141-2, Westinghouse Hanford Company Effluent Discharges and Solid Waste Management Report for 1989: 200/600/1100 Areas (WHC 1990).
- WHC-EP-0141-1, Westinghouse Hanford Company Effluent Discharges and Solid Waste Management Report for 1988: 200/600/1100 Areas (WHC 1989a).
- WHC-EP-0141, Westinghouse Hanford Company Effluent Discharges and Solid Waste Management Report for 1987: 200/600/1100 Areas (WHC 1988).

In addition to these reports, tritium emissions from a few Tank Farm facilities have been reported in WHC-SD-WM-EMP-032, Tritium Emissions From the 200 East Area Double Shell Tanks; Dated November 28, 1994 (reference F).

Regulations require that records be kept for five years. For convenience, the last five years worth of data for Stacks of interest to this FEMP have been compiled in Tables 8-2 through 8-8. Data in these Tables was examined for nominal emissions and compared to the maximum values found in the Automated Bar Coding of

Air Samples at Hanford (ABCASH) Database. ABCASH is the application developed by Automation and Simulation Engineering to provide automated data acquisition/tracking of air sample information. Table 8-1 summarizes statistical values from the other tables. A maximum value, or emission concentration limit for Tank Farms has been derived from this examination.

Table 8-1: Emission Data Summary				
	Emission Maximums from ABCASH		Statistically Based Emission Maximums Derived from Emission Reports	
Stack	Alpha	Beta	Alpha	Beta
	$\mu\text{Ci/ml}$			
296-A-17	2.6E-13	9.6E-11	2.2E-16	2.8E-12
296-A-25	9.2E-13	5.7E-12	2.5E-14	2.4E-12
296-B-28	3.5E-13	2.4E-10	3.0E-15	1.2E-13
296-C-05	2.4E-14	2.7E-13	6.9E-16	4.3E-14
296-P-16	3.7E-14	3.7E-11	4.4E-16	7.2E-13
296-S-22	2.1E-12	2.2E-11	7.9E-16	4.2E-14
296-T-18	6.2E-13	1.5E-11	1.9E-15	5.8E-14
Average	6.2E-13	5.9E-11	4.6E-15	8.8E-13
Emission Limits	2.1E-12	2.4E-10		

Table 8-2: Stack 296-A-17/296-P-26 Measured Public Abated Dose Consequence					
Radionuclide	1996	1995	1994	1993	1992
	(mrem/yr)				Ci/yr (mrem/yr)
H-3	NM	NM	6.55E-05 (F)	NM	NM
Sr-90	1.1E-07	1.5E-07	2.9E-08	2.5E-07	4.6E-07 2.0E-08
Ru-106	ND	1.4E-08	NR	NR	NR
Sn-113	ND	1.5E-10	6.3E-10	NR	NR
Sb-125	ND	6.4E-09	NR	NR	NR
I-129	5.1E-05	5.6E-05	9.2E-05	9.1E-06	1.5E-04 4.4E-05
Cs-137	5.2E-06	3.8E-06	5.0E-07	3.4E-06	4.0E-06 9.6E-08
Pu-239/240	1.4E-08	2.6E-08	NM	NM	NR
Am-241	2.0E-08	3.3E-08	NM	NM	NR
Total Alpha	NR	NR	ND	1.1E-08	ND
Total Emissions (mrem/yr)	5.6E-05	6.0E-05	1.6E-04	1.3E-05	4.4E-05
Flow Rate (m ³)	5.0E+07	9.2E+07	7.5E+07	6.8E+07	4.9E+07

Table 8-2: Stack 296-A-17/296-P-26 Measured Public Abated Dose Consequence					
Maximum Emission Concentrations ($\mu\text{Ci}/\text{ml}$)					
Beta	1.9E-12	6.7E-13	9.9E-14	7.8E-13	8.2E-14
Alpha	1.6E-16	1.3E-16	ND	1.6E-16	ND
Statistical Analysis			Total	Beta	Alpha
			mrem/yr	($\mu\text{Ci}/\text{ml}$)	
Average			6.6E-05	7.1E-13	1.5E-16
Standard Deviation			5.5E-05	7.4E-13	1.7E-17
2 Sigma Interval			1.5E-04	2.1E-12	7.5E-17
Upper Bound of the Normal Historical Emission Data Scatter			2.2E-04	2.8E-12	2.2E-16
ABCASH MAX VALUES (date)				9.6E-11 (4/18/93)	2.6E-13 (1/4/96)

DNO stands for did not operate.

ND stands for not detected.

NM stands for not measured.

NR stands for not reported.

(F) means the value was obtained from reference F as identified above.

Table 8-3: Stack 296-A-25 Measured Public Abated Dose Consequence					
Radionuclide	1996	1995	1994	1993	1992
	(mrem/yr)			Ci/yr (mrem/yr)	
Total Beta	NR	NR	2.6E-08	DNO	ND
Sr-90	8.6E-11	8.8E-10	NM	DNO	NM
Cs-137	1.8E-08	8.5E-08	NM	DNO	NM
Pu-238	1.9E-11	9.8E-11	NM	DNO	NM
Pu-239/240	ND	3.1E-10	NM	DNO	NM
Am-241	3.2E-10	1.1E-09	NM	DNO	NM
Total Alpha	NR	NR	1.5E-08	DNO	ND
Total Emissions (mrem/yr)	1.8E-08	8.7E-08	4.1E-08	DNO	ND
Flow Rate (m ³)	2.2E+06	2.6E+06	7.9E+05	DNO	3.6E+05

Table 8-3: Stack 296-A-25 Measured Public Abated Dose Consequence					
Maximum Emission Concentrations ($\mu\text{Ci}/\text{ml}$)					
Beta	1.5E-13	5.3E-13	1.0E-12	DNO	ND
Alpha	5.9E-17	1.6E-16	8.9E-15	DNO	ND
Statistical Analysis			Total	Beta	Alpha
			mrem/yr	($\mu\text{Ci}/\text{ml}$)	
Average			4.9E-08	5.6E-13	3.0E-15
Standard Deviation			3.5E-08	4.3E-13	5.1E-15
2 Sigma Interval			1.5E-07	1.8E-12	2.2E-14
Upper Bound of the Normal Historical Emission Data Scatter			2.0E-07	2.4E-12	2.5E-14
ABCASH MAX VALUES (date)				5.7E-12 (12/28/94)	9.2E-13 (9/12/94)

DNO stands for did not operate.

ND stands for not detected.

NM stands for not measured.

NR stands for not reported.

(F) means the value was obtained from reference F.

Table 8-4: Stack 296-B-28 Measured Public Abated Dose Consequence					
Radionuclide	1996	1995	1994	1993	1992
	(mrem/yr)			Ci/yr (mrem/yr)	
Total Beta	NR	NR	6.1E-08	1.3E-08 5.7E-10	2.4E-08 1.1E-09
Sr-90	ND	3.4E-10	NM	NM	NM
Cs-137	4.5E-11	1.6E-10	NM	NM	NM
Pu-239/240	8.8E-11	1.3E-10	NM	NM	NM
Am-241	2.7E-10	3.6E-10	NM	NM	NM
Total Alpha	NR	NR	5.7E-09	5.2E-10 6.8E-09	6.0E-10 7.9E-09
Total Emissions (mrem/yr)	4.0E-10	9.9E-10	6.7E-08	7.4E-09	9.0E-09
Flow Rate (m ³)	3.0E+06	4.2E+06	3.7E+06	8.2E+05	2.9E+05

Table 8-4: Stack 296-B-28 Measured Public Abated Dose Consequence					
(μCi/ml)					
Beta	2.7E-16	2.9E-15	1.1E-14	1.6E-14	8.3E-14
Alpha	3.7E-17	3.1E-17	3.2E-16	6.3E-16	2.1E-15
Statistical Analysis			Total	Beta	Alpha
			mrem/yr	(μCi/ml)	
Average			1.7E-08	2.3E-14	6.2E-16
Standard Deviation			2.8E-08	3.4E-14	8.6E-16
2 Sigma Interval			7.8E-08	9.5E-14	2.4E-15
Upper Bound of the Normal Historical Emission Data Scatter			1.9E-07	1.2E-13	3.0E-15
ABCASH MAX VALUES (date)				2.4E-10 (1/15/92)	3.5E-13 (1/15/92)

DNO stands for did not operate.

ND stands for not detected.

NM stands for not measured.

NR stands for not reported.

(F) means the value was obtained from reference F.

Table 8-5: Stack 296-C-05 Measured Public Abated Dose Consequence					
Radionuclide	1996	1995	1994	1993	1992
	(mrem/yr)			Ci/yr (mrem/yr)	
Total Beta	NR	NR	6.1E-08	1.2E-06 5.3E-08	2.7E-07 1.2E-08
Sr-90	4.9E-09	7.4E-09	NM	NM	NM
Cs-137	1.4E-08	1.7E-08	NM	NM	NM
Pu-239/240	8.1E-10	6.8E-09	NM	NM	NM
Am-241	4.9E-09	6.1E-09	NM	NM	NM
Total Alpha	NR	NR	5.7E-08	2.0E-08 2.6E-07	2.9E-09 3.8E-08
Total Emissions (mrem/yr)	2.5E-08	3.7E-08	1.2E-07	3.1E-07	5.0E-08
Flow Rate (m ³)	4.6E+07	7.5E+07	7.2E+07	5.0E+07	2.4E+07

Table 8-5: Stack 296-C-05 Measured Public Abated Dose Consequence					
Maximum Emission Concentrations ($\mu\text{Ci}/\text{ml}$)					
Beta	5.4E-15	3.7E-15	2.6E-14	2.4E-14	1.1E-14
Alpha	4.3E-17	4.9E-17	3.8E-16	4.0E-16	1.2E-16
Statistical Analysis			Total	Beta	Alpha
			mrem/yr	($\mu\text{Ci}/\text{ml}$)	
Average			1.1E-07	1.4E-14	2.0E-16
Standard Deviation			1.2E-07	1.0E-14	1.8E-16
2 Sigma Interval			3.3E-07	2.9E-14	4.9E-16
Upper Bound of the Normal Historical Emission Data Scatter			4.4E-07	4.3E-14	6.9E-16
ABCASH MAX VALUES (date)				2.7E-13 (6/17/93)	2.4E-14 (8/25/94)

DNO stands for did not operate.

ND stands for not detected.

NM stands for not measured.

NR stands for not reported.

(F) means the value was obtained from reference F.

Table 8-6: Stack 296-P-16 Measured Public Abated Dose Consequence

Radionuclide	1996	1995	1994	1993	1992
	(mrem/yr)				Ci/yr (mrem/yr)
Total Beta	NR	NR	6.1E-08	4.3E-07	1.3E-05 5.7E-07
Sr-90	3.6E-09	1.2E-08	NM	NM	NM
Cs-137	3.7E-08	8.5E-08	NM	NM	NM
Pu-238	6.2E-10	1.9E-09	NM	NM	NM
Pu-239/240	5.7E-09	3.4E-10	NM	NM	NM
Am-241	6.8E-09	1.9E-08	NM	NM	NM
Total Alpha	NR	NR	5.9E-09	3.6E-08	4.1E-09 5.4E-08
Total Emissions (mrem/yr)	5.4E-08	1.1E-07	6.7E-08	4.7E-07	6.2E-07
Flow Rate (m ³)	4.9E+07	6.0E+07	5.9E+07	5.7E+07	2.7E+07

Table 8-6: Stack 296-P-16 Measured Public Abated Dose Consequence					
Maximum Emission Concentrations ($\mu\text{Ci}/\text{ml}$)					
Beta	1.4E-14	2.3E-14	3.2E-14	2.4E-13	4.8E-13
Alpha	5.7E-17	1.1E-16	4.7E-17	3.2E-16	1.5E-16
Statistical Analysis			Total	Beta	Alpha
			mrem/yr	($\mu\text{Ci}/\text{ml}$)	
Average			2.6E-07	1.6E-13	1.4E-16
Standard Deviation			2.6E-07	2.0E-13	1.1E-16
2 Sigma Interval			7.3E-07	5.6E-13	3.1E-16
Upper Bound of the Normal Historical Emission Data Scatter			9.9E-07	7.2E-13	4.4E-16
ABCASH MAX VALUES (date)				3.7E-11 (6/4/92)	3.7E-14 (6/6/92)

DNO stands for did not operate.

ND stands for not detected.

NM stands for not measured.

NR stands for not reported.

(F) means the value was obtained from reference F.

Table 8-7: Stack 296-S-22 Measured Public Abated Dose Consequence					
Radionuclide	1996	1995	1994	1993	1992
	(mrem/yr)				
Total Beta	NR	NR	DNO	DNO	ND
Sr-90	ND	4.7E-10	DNO	DNO	NM
Cs-137	1.1E-11	1.9E-11	DNO	DNO	NM
Pu-239/240	9.5E-11	2.0E-10	DNO	DNO	NM
Am-241	9.8E-11	8.7E-10	DNO	DNO	NM
Total Alpha	NR	NR	DNO	DNO	ND
Total Emissions (mrem/yr)	2.0E-10	1.6E-09	DNO	DNO	ND
Flow Rate (m ³)	2.2E+06	1.7E+06	0	0	4.4E+06

Table 8-7: Stack 296-S-22 Measured Public Abated Dose Consequence					
Maximum Emission Concentrations ($\mu\text{Ci}/\text{ml}$)					
Beta	1.2E-16	1.2E-14	DNO	DNO	ND
Alpha	2.3E-17	2.4E-16	DNO	DNO	ND
Statistical Analysis			Total	Beta	Alpha
			mrem/yr	($\mu\text{Ci}/\text{ml}$)	
Average			9E-10	6.1E-15	1.3E-16
Standard Deviation			9.9E-10	8.4E-15	1.5E-16
2 Sigma Interval			1.3E-08	3.6E-14	6.6E-16
Upper Bound of the Normal Historical Emission Data Scatter			1.3E-08	4.2E-14	7.9E-16
ABCASH MAX VALUES (date)				2.2E-11 (6/5/92)	2.1E-12 (6/5/92)

DNO stands for did not operate.

ND stands for not detected.

NM stands for not measured.

NR stands for not reported.

(F) means the value was obtained from reference F.

Table 8-8: Stack 296-T-18 Measured Public Abated Dose Consequence					
Radionuclide	1996	1995	1994	1993	1992
	(mrem/yr)			Ci/yr (mrem/yr)	
Total Beta	NR	NR	4.0E-09	5.4E-08 1.4E-09	3.0E-08 7.8E-10
Sr-90	ND	2.2E-12	NM	NM	NM
Cs-134	ND	4.0E-12	NM	NM	NM
Cs-137	2.9E-10	1.2E-11	NM	NM	NM
Pu-238	1.1E-11	2.7E-11	NM	NM	NM
Pu-239/240	2.7E-10	1.4E-09	NM	NM	NM
Am-241	4.3E-10	1.2E-09	NM	NM	NM
Total Alpha	NR	NR	3.0E-09	1.8E-09 1.4E-08	NR
Total Emissions (mrem/yr)	1.0E-09	2.6E-09	7.0E-09	1.5E-08	7.8E-10
Flow Rate (m ³)	4.3E+06	5.4E+06	5.7E+06	1.6E+06	3.1E+06

Table 8-8: Stack 296-T-18 Measured Public Abated Dose Consequence					
Maximum Emission Concentrations ($\mu\text{Ci}/\text{ml}$)					
Beta	1.6E-15	4.3E-17	2.8E-14	3.4E-14	9.7E-15
Alpha	5.3E-17	1.9E-16	3.3E-16	1.1E-15	NM
Statistical Analysis			Total	Beta	Alpha
			mrem/yr	($\mu\text{Ci}/\text{ml}$)	
Average			5.3E-09	1.5E-14	4.2E-16
Standard Deviation			6.0E-09	1.5E-14	4.7E-16
2 Sigma Interval			1.7E-08	4.3E-14	1.5E-15
Upper Bound of the Normal Historical Emission Data Scatter			2.2E-08	5.8E-14	1.9E-15
ABCASH MAX VALUES (date)				1.5E-11 (1/6/94)	6.2E-13 (1/10/94)

DNO stands for did not operate.

ND stands for not detected.

NM stands for not measured.

NR stands for not reported.

(F) means the value was obtained from reference F.

9.0 SAMPLE ANALYSIS

9.1 ANALYTICAL LABORATORY AND PROCEDURES

Analytical and laboratory procedures for the FEMP activities are identified in the quality assurance project plans (QAPjP), one quality assurance program plan (QAPP), and the annual statement of work as follows:

- WHC-EP-0446-2, Quality Assurance Project Plan for the Facility Effluent Monitoring Plan Activities.
- HNF-EP-0536-4, Quality Assurance Program Plan for Radionuclide Airborne Emissions Monitoring.
- HNF-EP-0528-3, Quality Assurance Project Plan for Radioactive Emissions Data.
- HNF-EP-0835-2, Statement of Work for Services Provided by the Waste Sampling and Characterization Facility for the Effluent and Environmental Program during Calendar Year 1997.

Record sampling requirements shall be conducted according to HNF-POL-450 policy, Air Quality Program.

9.1.1 Record Sample Exchange

Sample identification is initiated by the operations group taking the sample. Sampling personnel use the Automated Bar Coding of Air Samples at Hanford (ABCASH) system to provide sample identification and chain of custody, which is performed through ABCASH electronically. Sample custody is transferred when the properly marked sample is received by the analytical laboratory.

Record sampler filter paper and CAM sample filters will all be sent to an analytical laboratory. A Health Physics Technician performs the sample exchanges in air sampling and monitoring devices.

9.1.2 Laboratory Sample Analysis Instructions

The Effluent Monitoring group assigns Effluent Data Processing codes to each discharge point monitoring and sampling equipment units.

Table 9-1: Minimum Quantifiable Concentrations
for Specific Radionuclides as Measured in Bi-
Weekly Air Samples

Radionuclide	Minimum Quantifiable Concentration (uCi/mL)
Total a	2.0 E-15
Total b	1.9 E-14
GEA of Ag Zeolite (Ru-106)	3.4 E-13
^{239,240} Pu	2.0 x 10 ⁻¹⁵
²³⁸ Pu	2.0 x 10 ⁻¹⁵
²⁴¹ Am	1.9 x 10 ⁻¹⁵
⁹⁰ Sr	1.9 x 10 ⁻¹⁴
¹⁰⁶ Ru\Rh	3.4 x 10 ⁻¹³

Table 9-2: Tank Farm Radionuclide Emission EDP Codes

Stack	Facility	Sample Device	EDP Codes
296-A-12	244-AR VV Stack	Record Sampler	E058
		Beta/Gamma CAM	E509
296-P-32	244AR	Record Sampler	E401
296-A-13	244-AR C&C Stack	Record Sampler	E052
		Beta/Gamma CAM	E464
296-A-17	AY/AZ Primary Stack	Record Sampler	E059
		Silver Zeolite Cartridge	E026
		Silver Zeolite Cartridge	E027
		Beta/Gamma CAM	E992
		Tritium Sampler SPL1	E003
		Tritium Sampler SPL2	E004
		Tritium Sampler SPL3	E005
		C14 Sampler SPL4	E006
		C14 Sampler SPL5	E007
296-P-26	AY/AZ BACKUP Stack	Record Sampler	E039
		Silver Zeolite Cartridge	E040
		Silver Zeolite Cartridge	E041
		Beta/Gamma Cam	E990
296-A-42	W030 TANK VENT Stack	Record Sampler	E147
		Silver Zeolite	E152
		Beta CAM	E153
296-A-43	W030 BLDG VENT Stack	Record Sampler	E148
		Beta CAM	E154
296-A-18	101 AY Annulus Stack	Record Sampler	E060
		Annulus Leak Detector CAM	E145

Table 9-2: Tank Farm Radionuclide Emission EDP Codes			
Stack	Facility	Sample Device	EDP Codes
296-A-19	102 AY Annulus Stack	Record Sampler	E061
		Annulus Leak Detector CAM	E146
296-A-20	AZ Annulus Stack	Record Sampler	E197
		101 AZ Annulus Leak Detector CAM	E195
		102 AZ Annulus Leak Detector CAM	E196
296-A-25	244-A Stack	Record Sampler	E080
		Beta/Gamma CAM	E082
		Annulus Leak Detector CAM	E087
296-A-26	204-AR Stack	Record Sampler	E297
		Beta/Gamma CAM	E298
296-A-27	AW Primary Stack	Record Sampler	E270
		Silver Zeolite Sampler	E933
		Silver Zeolite Sampler	E934
		Beta/Gamma CAM	E271
296-A-28	AW Annulus Stack	Record Sampler	E272
		Beta/Gamma CAM	E273
		101 AW Annulus Leak Detector CAM	E276
		102 AW Annulus Leak Detector CAM	E274
		103 AW Annulus Leak Detector CAM	E275
		104 AW Annulus Leak Detector CAM	E278
		105 AW Annulus Leak Detector CAM	E279

Table 9-2: Tank Farm Radionuclide Emission EDP Codes

Stack	Facility	Sample Device	EDP Codes
		106 AW Annulus Leak Detector CAM	E280
296-A-29	AN Primary Stack	Record Sampler	E901
		Beta/Gamma CAM	E902
296-A-30	AN Annulus Stack	Record Sampler	E903
		Beta/Gamma CAM	E904
		101 AN Annulus Leak Detector CAM	E905
		102 AN Annulus Leak Detector CAM	E906
		103 AN Annulus Leak Detector CAM	E907
		104 AN Annulus Leak Detector CAM	E908
		105 AN Annulus Leak Detector CAM	E909
		106 AN Annulus Leak Detector CAM	E910
		107 AN Annulus Leak Detector CAM	E911
296-A-40	AP Primary Stack	Record Sampler	E013
		Silver Zeolite Cartridge	E028
		Silver Zeolite Cartridge	E029
		Beta/Gamma CAM	E014
296-A-41	AP Annulus Stack	Record Sampler	E015
		Beta/Gamma CAM	E016
		101 AP Annulus Leak Detector CAM	E017
		102 AP Annulus Leak Detector CAM	E018

Table 9-2: Tank Farm Radionuclide Emission EDP Codes

Stack	Facility	Sample Device	EDP Codes
		103 AP Annulus Leak Detector CAM	E019
		104 AP Annulus Leak Detector CAM	E020
		105 AP Annulus Leak Detector CAM	E021
		106 AP Annulus Leak Detector CAM	E022
		107 AP Annulus Leak Detector CAM	E023
		108 AP Annulus Leak Detector CAM	E024
296-B-28	244-BX Stack	Record Sampler	E886
		Beta/Gamma CAM	E887
		Annulus Leak Detector Beta/Gamma CAM	E888
296-C-05	244-CR Stack	Record Sampler	E069
		Beta/Gamma CAM	E993
296-C-06	C-106 W320 Stack	Record Sampler	E083
		Beta CAM	none
296-C-07	103-C Mixer Stack	Record Sampler	E044
296-P-16	105/106-C Stack	Record Sampler	E068
		Beta/Gamma CAM	E081
296-P-31	209E Stack	Record Sampler	E209
296-P-32, 296-P-33, 296-P-34	Core Sampler Exhauster Stacks	East Area Record Sampler	E311-E399
		West Area Record Sampler	W301-W399

Table 9-2: Tank Farm Radionuclide Emission EDP Codes

Stack	Facility	Sample Device	EDP Codes
296-P-35	Blue Max Exhausters	Record Sampler	E088
296-P-36		Record Sampler	E089
296-P-37		Record Sampler	E090
296-P-38		Record Sampler	E091
296-P-39		Record Sampler	E092
296-P-40		Record Sampler	E093
296-P-41	A101 Salt Well Stack	Record Sampler	E037
296-P-22	SY Annulus Stack	Record Sampler	W191
		Beta/Gamma CAM	W198
		101 SY Annulus Leak Detector CAM	W194
		102 SY Annulus Leak Detector CAM	W192
		103 SY Annulus Leak Detector CAM	W193
296-S-25	New SY Stack	Record Sampler	W145
		Beta CAM	
296-P-23	SY Primary Stack	Record Sampler	W190
		Beta/Gamma CAM	W199
296-P-28	SY BACKUP Stack	Record Sampler	W195
		Beta/Gamma CAM	W196
		Alpha CAM	W197
296-S-15	SX Stack	Record Sampler	W111
		Beta/Gamma CAM	W114

Table 9-2: Tank Farm Radionuclide Emission EDP Codes			
Stack	Facility	Sample Device	EDP Codes
296-S-18	242-S BV Stack	Record Sampler	W096
		Alpha CAM	W122
		Beta/Gamma CAM	W994
296-S-19	242-S VV Stack	Record Sampler	W085
		Alpha CAM	W121
		Beta/Gamma CAM	W915
296-S-22	244-S Stack	Record Sampler	W880
		Alpha CAM	W881
		Beta/Gamma CAM	W890
		Annulus Leak Detector CAM	W891
296-T-17	242-T Stack	Record Sampler	W117
		Alpha CAM	W118
		Beta/Gamma CAM	NONE
296-T-18	244-TX Stack	Record Sampler	W882
		Alpha CAM	W883
		Beta/Gamma CAM	W889
		Annulus Leak Detector CAM	W892
296-U-11	244-U Stack	Record Sampler	W884
		Beta CAM	none
		Annulus Leak Detector CAM	none
296-W-03	213W Stack	Record Sampler	W003
		Beta/Gamma CAM	none

9.1.3 Laboratory Analysis

When the sample reaches the laboratory, the Record sample is held in the lab for seven days to allow the short lived natural occurring isotopes to decay. The sample is then counted for alpha and beta readings. These readings are reported to Effluent Monitoring (EM) and lab Health and Safety groups. These samples are put in storage for further sampling. Quarterly, these samples are gathered and dissolved for radio-isotopic analysis. The results of these analyses are submitted to EM and reported annually.

The CAM samples are not treated as record samples unless it is specifically requested. CAM filters from the stacks are managed by the Radiological Control group.

9.1.4 Laboratory Procedures

Analytical lab procedures are identified in section 5.0 and 5-1 of WHC-EP-0528-2, Quality Assurance Project Plan for Radioactive Airborne Emissions Data Compilation and Reporting. Additional laboratory procedural requirements are presented in WHC-EP-0536-2, Quality Assurance Program Plan for Radionuclide Airborne Emissions Monitoring.

9.2 SAMPLE AND DATA AND TRACKING

Sample exchange procedures are specified in WHC-IP-0718, Section 3.3.2, "Gaseous Effluent Monitoring System Inspection and Sample Exchange." Tracking of samples and sample data is governed by Automated Bar Coding of Air Samples at Hanford.

Tracking of radioactive airborne emissions sample data is controlled by the Fluor Daniel Hanford's (FDH) Project Hanford Management Contractor team through assignment of unique electronic processing codes (EDP) for each sample location. These EDP codes are used by WSCF to report the results in accordance with the QAPjP for radioactive emissions data.

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

Analytical and laboratory procedures for FEMP activities are identified in Section 8.0 of the QAPP, Quality Assurance Project Plan for Facility Effluent Monitoring Plans. General requirements for laboratory procedures, data analyses, and statistical treatment are addressed in the QAPP. Detailed descriptions of these

requirements are given in each FEMP.

The following elements, identified in Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance, DOE/EH-0173T are addressed in Quality Assurance Program Plan for Laboratory Analysis and Process Testing, WHC-SD-CP-QAPP-003, and Quality Assurance Project Plan for Chemical Analysis of Highly Radioactive Mixed Waste Samples in Support of Environmental Activities on the Hanford Site, WHC-SD-CP-QAPP-002.

- Procedures preventing cross contamination
- Documentation of Methods
- Gamma emitting radionuclides
- Calibration
- Handling of Samples
- Analysis method and capabilities
- Gross alpha, beta, and gamma measurements
- Direct gamma-ray spectrometry
- Beta counters
- Alpha-energy analysis
- Radiochemical separation procedures
- Reporting of Results
- Counter Calibration
- Inter calibration of equipment and procedures
- Counter background
- Quality assurance

Table 9-3: Data Analyses and Statistical Treatment	
Element	Documentation
Summary of data and statistical treatment requirements	WHC-SD-CP-QAPP-003, Rev. 1
Variability of effluent and environmental data	HNF-EP-0527-6, <u>Environmental Releases for Calendar Year 1996</u> (HNF 1997)
Summarization of data and testing for outliers	Statistical identification of control standards are performed by the Laboratory Measurement Control System database program during the annual review of data for setting control limits. Outliers are evaluated.
Treatment of significant figures	WHC-SD-CP-QAPP-003, Rev. 1
Parent-decay product relationships	Parent-decay product relationships are not accounted for in laboratory operating procedures.
Comparisons to regulatory or administrative control standards and control data	The WSCF laboratory participates in the EPA Intra Comparison Program
Quality Assurance	WHC-SD-CP-QAPP-003, Rev. 1

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10.0 NOTIFICATION AND REPORTING REQUIREMENTS

Notification and reporting requirements are imposed by DOE Orders and federal and state regulations. Because DOE and EPA documents are periodically updated, current requirements should be obtained from the latest CFR and DOE Order. This section is to serve as a guideline for general notification and reporting requirements and as a reference to the sources where specific information may be found for federal, state, and DOE requirements.

10.1 OCCURRENCE CATEGORIZATION, NOTIFICATION, AND REPORTING

Notifications and reporting of specific events related to environmental releases and/or events involving effluents and/or hazardous materials shall be made in accordance with DOE Orders 5400.1 (DOE 1990a) and 5000.3B (DOE 1993b). Implementing the orders is accomplished via Management Requirements and Procedures Manual. Specific implementation, where required, is included in the appropriate facility's "Occurrence Categorization, Notification, and Reporting" procedure. Implementing environmental limits and requirements is found in the Environmental Compliance Manual, WHC-CM-7-5.

10.1.1 Occurrence Identification and Immediate Response

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

1. Call 911 if immediate help such as fire, ambulance, or patrol is required.
2. Call 373-3800 (the Patrol Operations Center) if assistance other than fire, ambulance, or patrol is required.
3. After requesting necessary outside assistance, the employee shall notify his or her supervisor, who shall notify the facility manager, the building emergency director, and the Occurrence Notification Center (376-2900).

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

Oversight organizations shall notify their DOE Field Office, counterparts of the event after receiving notifications from and discussing the event with the facility manager.

10.1.2 Occurrence Categorization

Environmental occurrences shall be categorized as soon as practical using the specific criteria listed in Section 10.2 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 categorized initially at the higher level being considered. The occurrence categorization shall then be further evaluated and either maintained or lowered as information becomes available.

10.2 OCCURRENCE CATEGORIZATION

The following criteria for categorization of occurrences are established in WHC-CM-1-3, Identifying and Resolving Unreviewed Safety Questions, which implements the requirements contained in DOE Order 5000.3B (DOE 1993b).

10.2.1 Radioactive Releases

10.2.1.1 Emergency.

- Any release of radionuclide material to controlled or uncontrolled areas in concentrations which, if averaged over a 24-hour period, would exceed 5 times the respective reportable quantities specified for such materials in 40 CFR 302.

Note: This event must also meet the criteria for classified emergency in accordance with WHC-CM-4-1, Emergency Plan, and/or facility specific emergency action levels.

10.2.1.2 Unusual Occurrence.

- Release of a radionuclide material that exceeds a federally permitted release by the amount of a CERCLA reportable quantity or where no federally permitted release exists, the release exceeds the reportable quantity.
- Release of radionuclide material that violates environmental requirements in federal permits, federal regulations, or DOE standards.

- Release below emergency levels which requires immediate reporting (less than 4 hours) to Federal regulatory authorities or triggers specific action levels for an outside agency.

10.2.1.3 Off-Normal.

- Any release of radionuclide material to controlled or uncontrolled areas that is not part of a normal monitored release and exceeds 50 percent of a CERCLA reportable quantity specified for such material in accordance with 40 CFR 302.
- Any controlled release of radionuclide material that occurs as a monitored part of normal operations which exceeds what historical data and/or analysis shows is expected as a result of normal operations.
- Any monitored facility or site boundary where exposure of concentrations exceed what historical data and/or analysis shows is expected as a result of normal operations.
- Any detection of a radionuclide in a sanitary or storm sewer, waste or process stream, or any holding points where such a material is not expected.
- Any controlled, uncontrolled, or accidental release which is not classified as an unusual occurrence but which will be reported in writing to state/local agencies in a format other than routine monthly or quarterly reports.

Note: This does not include routine offsite distribution of notification reports.

10.2.2 Release of Hazardous Substances/Regulated Pollutants/Oil

10.2.2.1 Emergency

- Any actual or potential effluent release to the environment that results in, or could result in, significant off-site consequences (e.g., need to relocate people, major wildlife kills, major wetland degradation, major aquifer contamination, need to secure downstream water supply intakes, etc.).

Note: This event must also meet the criteria for classified emergency in accordance with WHC-CM-4-1, and/or facility specific emergency action levels.

- Any release of hazardous substances or regulated pollutants in concentrations which exceed 5 times the respective reportable quantities specified for such materials in 40 CFR 302.

Note: This event must also meet the criteria for classified emergency in accordance with WHC-CM-4-1, and/or facility specific emergency action levels.

10.2.2.2 Unusual Occurrence

- Release of a hazardous substance or regulated pollutant that exceeds a CERCLA reportable quantity in accordance with 40 CFR 302 or exceeds a federally permitted release by a reportable quantity.
- Release of a hazardous substance, regulated pollutant, or oil that violates environmental requirements in federal permits, federal regulations, or DOE standards.
- Release below emergency levels that requires immediate reporting (less than 4 hours) to federal regulatory agencies or triggers specific levels for an outside federal agency.
- Any release of 100 gallons or more of oil.

10.2.2.3 Off-Normal

- Release of a hazardous substance or regulated pollutant to controlled or uncontrolled areas that is not part of a normal, monitored release and exceeds 50 percent of a CERCLA reportable quantity as specified for such material in accordance with 40 CFR 302.
- Any release of oil less than unusual occurrence levels but greater than 10 gallons.
- Any detection of a toxic or hazardous substance in a sanitary or storm sewer, waste or process stream, or any holding points where such a material is not expected.
- Any controlled, uncontrolled, or accidental release which

is not classified as an unusual occurrence but which will be reported in writing to state/local agencies in a format other than routine monthly or quarterly reports.

Note: This does not include routine offsite distribution of notification reports.

- Any controlled release of hazardous/regulated material that occurs as a monitored part of normal operations which exceeds what historical data and/or analysis shows is expected as a result of normal operations.
- Any general environmental monitoring where concentration increases to a level which exceeds what historical data and/or analysis shows is expected as a result of normal operations.

10.2.3 Discovery of Hazardous Material Contamination Due to DOE Operations

10.2.3.1 Emergency

- Discovery of contamination that results or could result in significant consequences (i.e. exceeding safe exposure limits to workers or the public).

Note: This event must also meet the criteria for classified emergency in accordance with WHC-CM-4-1 and/or facility specific emergency action levels.

- Discovery of onsite or offsite hazardous material contamination in concentrations that exceed 5 times the respective reportable quantities specified for such materials in 40 CFR 302.

Note: This event must also meet the criteria for classified emergency in accordance with WHC-CM-4-1 and/or facility specific emergency action levels.

10.2.3.2 Unusual Occurrence

- Discovery of on-site or off-site contamination which does not represent an immediate threat to the public and that exceeds a reportable quantity for such materials in accordance with 40 CFR 302 due to DOE operations.

- Any discovery of groundwater contamination that is not part of an existing plume previously identified either in an annual report or in any CERCLA/RCRA activity or report.

10.2.3.3 Off-Normal

- Discovery of on-site contamination that exceeds 50 percent of a reportable quantity for such material in accordance with 40 CFR 302 and is attributable to DOE operations.

10.2.4 Agreement/Compliance Activities

10.2.4.1 Unusual Occurrence

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

Note: Formal notification must be received by FDH in writing.

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

Note: This does not include notifications made for radionuclide/hazardous material releases that are less than 50 percent of the reportable quantity as specified in 40 CFR 302.

10.2.4.2 Off-Normal

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

Note: This does not include routine off-site distribution of notification reports.

10.2.5 Ecological Resources

10.2.5.1 Unusual Occurrence

- Any occurrence causing significant impact to any ecological resource for which DOE is a trustee (i.e. destruction of a critical habitat, damage to a historical/archeological site, or damage to wetlands, etc).

10.3 FEDERAL REQUIREMENTS

10.3.1 Resource Conservation and Recovery Act of 1976

RCRA requires biennial reports to be submitted to the regional administrator of EPA. 40 CFR 262, Subpart D, sets forth reporting requirements for generators of hazardous waste that ship waste off-site or that store, treat, or dispose of hazardous waste on-site.

Owners or operators of treatment, storage, or disposal (TSD) facilities must comply with reporting requirements contained in 40 CFR 264, Subpart E and 40 CFR 265, Subpart E.

10.3.2 Comprehensive Environmental Response, Compensation and Liability Act of 1980

40 CFR 302 contains reportable quantities and notification requirements for releases of hazardous substances as designated by CERCLA and the Safe Drinking Water Act of 1974.

10.3.3 National Emission Standards for Hazardous Air Pollutants

Compliance and reporting requirements for DOE facilities emitting radionuclides other than radon are contained in 40 CFR 61, Subpart H. NESHAP requires that an annual report be submitted to EPA headquarters and the appropriate regional office.

10.4 STATE REQUIREMENTS

10.4.1 Generator Reporting

Generator reporting requirements are found in WAC 173-303-220. The State requires that annual reports covering the preceding year be submitted to Ecology by March 1.

10.4.2 Facility Reporting

Owners or operators of TSD facilities are also required to prepare and submit annual reports. These must be submitted by March 1 and cover facility activities for the previous year. Specific content requirements are specified in WAC 173-303-390.

While in transition to shutdown, effluents produced by PUREX do not contain hazardous or dangerous wastes. Therefore, PUREX operations are not subject to RCRA or WAC 173 reporting requirements. FDH would only have to comply with the above federal and state reporting requirements in the event that facility operations were to change and discharges (either liquid or gaseous) from the PUREX facility contained a hazardous or dangerous components.

10.5 U.S. DEPARTMENT OF ENERGY REQUIREMENTS

10.5.1 U.S. Department of Energy Order 5400.1, Chapter II General Environmental Protection Program - Notification and Reports

Consistent with the notification requirements contained in DOE Orders 5484.1, 5000.3B and the DOE 5500 series, field organizations shall notify the Emergency Operations Center (EOC) of significant nonroutine releases of any pollutant and/or hazardous substance.

All DOE facilities that conduct significant environmental protection programs shall prepare an annual site environmental report. Annual summary reports on environmental occurrences shall be included in the annual site environmental report. Suggested content and format for the annual site environmental report are contained in DOE Order 5400.1 (DOE 1990a).

DOE Order 5400.1 also requires a radioactive effluent and on-site discharge data report, covering the previous calendar year, be submitted to the Waste Information Systems Branch, EG&G Idaho, in Idaho Falls, Idaho 83415 by April 1. Unplanned releases of radioactive material in effluents, whether on-site or off-site, shall also be reported. Content and forms to be used for these reports are contained in DOE Order 5400.1, Chapter II.

10.5.2 U.S. Department of Energy Order 5484.1 Environmental Protection, Safety and Health Protection Information Reporting Requirements

Annual radiation exposure reports for the preceding calendar year are required to be submitted to the System Safety Development

Center by March 31. Content and form requirements are in Chapter IV of this order.

DOE Order 5484.1 also requires radiation exposures of individuals that exceed specified limits in one calendar quarter be reported in the form of a memorandum to the Operational and Environmental Safety Division. Radiation exposure limits are listed in Chapter II of this order.

Events that occur in the facility and adversely affect operations, personnel safety, or DOE requirements should receive a thorough investigation and an investigation report should be prepared. DOE Order 5484.1 (DOE 1990b) sets forth occurrences requiring investigation as well as the investigation requirements as determined by the severity of the occurrence, investigation report format, and content outlines.

RL Order 5484.1 contains the following requirements for the implementation of DOE Order 5484.1 at the Hanford Site. Contractors shall, at a minimum, make oral notification to the appropriate RL program division or office, to the Public Affairs Office (PAO), and to Safety and Quality Assurance (SQA) or the SQA duty officer as soon as it is apparent that an incident may meet the criteria of a Type A or Type B occurrence. A listing of occurrences requiring a Type A or Type B investigation is contained in Chapter I of DOE Order 5484.1.

Contractors are required to verbally notify responsible SQA environmental protection officials within 24 hours of becoming aware of any of the following occurrences:

- Violation of applicable federal, state, or local pollution control standards and requirements
- Any noncompliance with the terms and/or conditions of an existing NPDES permit, Prevention of Significant Deterioration (PSD) permit, or any other environmental protection based permit or formal agreement with an applicable regulatory body
- Any gaseous or liquid radiological effluent releases which exceed DOE requirements and/or contractor specific radiological release concentration guides.

Following verbal notifications, written reports must be submitted according to procedures in DOE Order 5000.3B (DOE 1993b).

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11.0 INTERFACE WITH NEAR-FACILITY MONITORING

11.1 DESCRIPTION

The sitewide Environmental Monitoring Plan (EMP), DOE/RL-91-50, Rev 1, consists of two distinct but related components: environmental surveillance conducted by PNNL and effluent monitoring conducted by the FDH team. Environmental surveillance, 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 environmental monitoring. Projected EDEs, reported in this FEMP, are products of effluent monitoring. Near-field monitoring is required in accordance with procedures described in the operational environmental monitoring QAPjP (WHC 1994b).

11.2 PURPOSE

Near-Facility Environmental Monitoring (NFM) provides facility-specific environmental monitoring to protect the environment adjacent to facilities under the responsibility of the FDH team and to assure compliance with local, state, and federal environmental regulations.

The objectives of the NFM are to evaluate the following:

- Compliance with DOE, EPA, Ecology, WDOH, and internal FDH team environmental radiation protection requirements and guides.
- Performance of radioactive waste confinement systems.
- Trends of radioactive materials in the environment at and adjacent to nuclear facilities and waste disposal sites.

Specifically, the NFM is developed to:

- Monitor all inactive, existing, and new low-level waste disposal sites to assess both radiological and nonradiological hazards (DOE Order 5820.2A).
- Determine the effectiveness of effluent treatment and controls in reducing effluents and emissions (DOE/EH-0173T).
- Detect and quantify unplanned releases (DOE/EH-0173T) (40 CFR 302) (WAC 173-303-145) (DOE O 232.1) (DOE 5484.1).
- Monitor fugitive emissions and diffuse sources from contaminated areas for compliance with NESHAP (40 CFR 61),

(DOE/EH-0173T), Toxic Air Emissions Inventory (40 CFR 265, Subparts AA & B13), State Operating Permit Program (40 CFR 70), and Source Registration (WAC 246-247).

- Monitor all surplus facilities before decontaminating or decommissioning (DOE Order 5820.2A).
- Monitor new and existing sites, processes, and facilities for potential impacts and releases (DOE Order 5484.1 and DOE/EH-0173T).
- Monitor and assess radioactive contamination and potential exposure to employees and the public (DOE Orders 5400.1 & 5400.5).

The purpose and justification for the NFM is contained in WHC-CM-7-4, Operational Environmental Monitoring (WHC 1992). The primary justification for the NFM includes the following:

- The NFM provides a level of assurance to the FDH team that the effluent and contamination controls for the various facilities and waste sites are effective.
- A secondary aspect of the NFM is additional assurance, beyond that provided by the Occupational Health and Safety Program, that it is safe to work on-site and for visitors to safely tour the site.

11.3 BASIS

Near-facility environmental monitoring is conducted to: (1) monitor employee protection; (2) monitor environmental protection; and (3) ensure compliance with local, State, and Federal regulations.

11.4 MEDIA SAMPLED AND ANALYSES PERFORMED

Procedures for sampling, analysis, data handling, and reporting are specified in WHC-CM-7-4 (WHC 1992). Media include ambient air, surface water, groundwater, external radiation dose, soil, sediment, vegetation, and 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 to a nonhazardous environment.

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, the FDH team relies on existing sample locations where PNNL has previously established sample sites (e.g., air samplers in the 300 Area). There are approximately (numbers and locations may vary year to year) 47 air samplers (8 in the 100 Area, 37 in the 200/600 Areas, 1 at the 300 Area Treated Effluent Disposal Facility, and 1 collocated with samplers operated by WDOH and PNNL at the Wye Barricade); 24 surface water sample sites (22 in the 100 Area and 2 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 dosimeter (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-SP-0098-8.

Surveys to detect surface radiological contamination, scheduled in WHC-SP-0098-8, 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

Near-facility environmental monitoring will be reviewed at least annually to determine that appropriate effluents are being monitored and that 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., ANSI and American Society for Testing and Materials [ASTM]) standards.

11.8 COMMUNICATION

The FDH team and the research and development contractor (PNNL) 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 NFM are published in annual reports, such as Environmental Releases for Calendar Year 1995, WHC-EP-0527-5 (WHC 1992 through 1995); Environmental Surveillance Annual Report Calendar Year 1995, WHC-EP-0573-4 (WHC 1996); and Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1995, DOE/RL-96-37. 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). Values are reported in this manner, 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.

12.0 QUALITY ASSURANCE

12.1 PURPOSE

This Quality Assurance (QA) Plan describes quality assurance requirements associated with implementing FEMPs. The Hanford Site Quality Assurance Program is described in PROJECT HANFORD QUALITY ASSURANCE PROGRAM DESCRIPTION, HNF-MP-599 revision 1, October 31, 1997. The Project Hanford QAPD addresses requirements of DOE Order 5700.6C and 10 CFR 830.120. Waste Management Hanford's implementation of the sitewide QA program will be described in Waste Management Federal Services QA Program Plan, HNF-SD-WM-QAPP-036. This QAPP will include indicies that list applicable Quality Assurance requirements and implementing procedures. During the interim, WHC-CM-4-2 has been invoked by Management Directive (HNF-MD-039) to assure continuity of Quality Assurance program.

A QA plan is required for facilities meeting the criteria for FEMP preparation and implementation. 40 CFR 61.93 (b)(2)(iv) states that a quality assurance program that meets performance requirements described in Appendix B, Method 114 of 40 CFR 61 shall be conducted.

12.2 OBJECTIVE

The objective of this chapter is to provide a documented plan describing QA requirements specific to Tank Farms.

12.3 REQUIREMENTS

WHC-EP-0446-2, Quality Assurance Plan For Facility Effluent Monitoring Plan Activities, was written to specify all QA requirements that apply to field activities, laboratory analyses, and continuous monitoring performed for all FEMPs. The requirements of this referenced Quality Assurance Project Plan (QAPP) shall be considered in preparing each FEMP.

Organizations that support the tank farms must follow current approved procedures to comply with requirements of the plan. On-going review and modification of the functional procedures will assure full compliance with the requirements of the QA manual.

Engineering, Safety, Quality Assurance, and Environmental Protection organizations shall evaluate engineered systems which protect the public, employees, the environment, and/or operations from radiological and hazardous materials. Their evaluations shall

identify areas of significant concern requiring the development of QA verification plans.

Quality Assurance programs shall be developed and implemented to assess the performance of organizations responsible for the QA plan. Verification methods defined in the planning for FEMP activities, including those associated with equipment or component items, shall undergo inspection, surveillance, and audit in any combination that will confirm compliance with designated requirements.

12.4 FACILITY-SPECIFIC REQUIREMENTS

The analytes of interest applicable to the tank farms liquid effluent and air emission samples are identified annually by Effluent Monitoring (EM) group. Procedural controls specific to the tank farms are presented in Section 9.0.

13.0 INTERNAL AND EXTERNAL PLAN REVIEW

The General Environmental Protection Program, DOE Order 5400.1, Chapter IV.4 (DOE 1990a), 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 facility processes, facility structure, ventilation and liquid collection systems, monitoring equipment, waste treatment, or a 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 particulates or other nonradioactive hazardous pollutant emissions for three years. Facility operators will have to certify, on a semi-annual basis, that no changes in operations requiring additional measurements have occurred.

Effluent Monitoring (EM) prepares an annual effluent discharge report for each area on the Hanford Site to cover both airborne and liquid release pathways. Although the report is based on the calendar year, emission limits apply to any period of 12 consecutive months. In addition, a report on air emissions and compliance to the Clean Air Act is prepared by EM and submitted to EPA as well as DOE-HQ.

Facility management is to obtain the EM's approval for all changes to the FEMP, including those generated in the annual review and update. In addition, the FEMP shall be reviewed by QA.

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14.0 COMPLIANCE ASSESSMENT

WHC-EP-0784, Tank Exhaust Comparison With 40 CFR 61.93, Subpart H, and Other Referenced Guidelines for Tank Farm's National Emission Standards for Hazardous Air Pollutants (NESHAP) Designated Stacks was prepared to provide a comparison with the requirements of 40 CFR 61.93 to various Tank Farm designated stacks. The comparisons identified existing conditions which required correction in order to achieve compliance with 40 CFR 61.93. The comparisons were made on the following stacks:

<u>Stack</u>	<u>Facility</u>
296-A-25	244-A Double Contained Receiver Tank Exhauster
296-B-28	244-BX Double Contained Receiver Tank Exhauster
296-C-5	244-CR Vault Exhauster
296-P-16	241-C-105/106 Tank Exhauster
296-S-22	244-S Double Contained Receiver Tank Exhauster
296-T-18	244-TX Double Contained Receiver Tank Exhauster

The paragraphs that follow summarize and update identified deficiencies for the designated facilities listed in this FEMP.

The 296-A-12 Stack (244AR Facility): This stack was not included in NESHAP's Federal Facility Compliance Agreement (FFCA) because this facility was declared "major" after the FFCA was signed into effect. The 296-A-12 stack system is not compliant with regulations. Therefore, it cannot be operated without first upgrading and/or asking for equivalency per 40 CFR 61.93. The Core Sampling Exhauster system stack 296-P-32 has been installed on the vessel vent system. Operation of this new system has been addressed in DOE/RL-97-05, Revision 2, Radioactive Air Emissions Notice of Construction (NOC) Use of a Portable Exhauster at 244-AR Vault. This 296-P-32 system is fully compliant with the regulations.

The 296-A-42 Stack (AY/AZ Tank Farm Exhauster): This system was built to be compliant. It was accepted as compliant and approved for operation in letter AIR 98-207 from Allen, W. Conklin, Health, to James E. Rasmussen, RL, dated February 13, 1998.

The 296-A-25 Stack (244-A Double Contained Receiver Tank Exhauster): FLOW MEASUREMENT DEFICIENCIES:

- Measurements are taken along one traverse instead of two as required.
- Flow is variable (>10%) - measurements should be taken

frequently per requirements.

- Flow is measured upstream of sample probe location (instead of downstream as required).

INTERIM RESOLUTION: Correction to this deficiency was a commitment which was made to use maximum flow rate values determined statistically from flow rate vent and balance data. This commitment was made in ltr 9550296, from CJ Geier, WHC, to Sidpara, RL, dated January 25, 1995. The commitment was made in response to a Department of Health Audit finding

DEFICIENCY: Sample flows are not isokinetic.

INTERIM RESOLUTION: Sample flows are optimized per methodology detailed in WHC-IP-0842, Volume VI, Section 5.1, "Stack Radionuclide Sampling and Monitoring System Flow Rate Adjustment."

FINAL RESOLUTION: The sampling system is being replaced with a new compliant system built via project W420. The committed completion schedule for this project according to the FFCA is as follows:

Begin Construction by June 30, 1999

Finish Construction by December 31, 2005

Provide documentation to EPA by April 30, 2006

The 296-B-28 Stack (244-BX Double Contained Receiver Tank Exhauster): FLOW MEASUREMENT DEFICIENCIES:

- Flow is variable (>10%) - the requirement is to take measurements frequently. With this measurements should be taken with every known change - they aren't.
- Flow is measured upstream of sample probe location instead of downstream as required.

INTERIM RESOLUTION: Correction to this deficiency was a commitment which was made to use maximum flow rate values determined statistically from flow rate vent and balance data. This commitment was made in ltr 9550296, from CJ Geier, WHC, to Sidpara, RL, dated January 25, 1995. The commitment was made in response to a Department of Health Audit finding

DEFICIENCY: Sample flows are not isokinetic.

INTERIM RESOLUTION: Sample flows are optimized per methodology detailed in WHC-IP-0842, Volume VI, Section 5.1, "Stack Radionuclide Sampling and Monitoring System Flow Rate Adjustment."

DEFICIENCY: Sample collection efficiencies are poor. See Table 7-2.

INTERIM RESOLUTION: None proposed. See Final Resolution.

FINAL RESOLUTION: The sampling system is being replaced with a new compliant system built via project W420. The committed completion schedule for this project according to the FFCA is as follows:

Re-assess Stack Potential Emissions by February 28, 1999. If potential emissions to the public are still greater than 0.1 mrem/yr off-site, then:

Begin Construction by June 30, 1999

Finish Construction by December 31, 2005

Provide documentation to EPA by April 30, 2006

The 296-C-5 Stack (244-CR Vault Exhauster): FLOW MEASUREMENT DEFICIENCIES:

- Measurements are only taken along one traverse (instead of two as required).
- Flow is variable (>10%) - measurements should be taken frequently per requirements (they are not).

INTERIM RESOLUTION: Correction to this deficiency was a commitment which was made to use maximum flow rate values determined statistically from flow rate vent and balance data. This commitment was made in ltr 9550296, from CJ Geier, WHC, to Sidpara, RL, dated January 25, 1995. The commitment was made in response to a Department of Health Audit finding

DEFICIENCY: Sample Probe should have 3 nozzles. It has only one.

INTERIM RESOLUTION: None. See Final Resolution.

DEFICIENCY: Sample flows are not isokinetic.

INTERIM RESOLUTION: Sample flows are optimized per methodology detailed in WHC-IP-0842, Volume VI, Section 5.1, "Stack Radionuclide Sampling and Monitoring System Flow Rate Adjustment."

FINAL RESOLUTION: The sampling system is being replaced with a new compliant system built via project W420. The committed to completion schedule for this according to the FFCA is as follows:

Re-assess Stack Potential Emissions by December 31, 1999. If potential emissions to the public are still greater than 0.1 mrem/yr offsite, then:

Begin Construction by June 30, 1999
Finish Construction by December 31, 2005
Provide documentation to EPA by April 30, 2006

The 296-P-16 Stack (C-105/106 Tank Exhauster): FLOW MEASUREMENT DEFICIENCIES:

- Measurements are only taken along one traverse (instead of two as required).
- Flow is variable (>10%) - measurements should be taken frequently per requirements (they are not).

INTERIM RESOLUTION: Correction to this deficiency was a commitment which was made to use maximum flow rate values determined statistically from flow rate vent and balance data. This commitment was made in ltr 9550296, from CJ Geier, WHC, to Sidpara, RL, dated January 25, 1995. The commitment was made in response to a Department of Health Audit finding.

DEFICIENCY: Sample flows are not isokinetic.

INTERIM RESOLUTION: Sample flows are optimized per methodology detailed in WHC-IP-0842, Volume VI, Section 5.1, "Stack Radionuclide Sampling and Monitoring System Flow Rate Adjustment."

FINAL RESOLUTION: The sampling system is being replaced with a new compliant system built via project W420. The committed completion schedule for this project according to the FFCA is as follows:

Re-assess Stack Potential Emissions by February 28, 1999. If potential emissions to the public are still greater than 0.1 mrem/yr offsite, then:

Begin Construction by June 30, 1999
Finish Construction by December 31, 2005
Provide documentation to EPA by April 30, 2006

The 296-S-22 Stack (244-S Double Contained Receiver Tank Exhauster): FLOW MEASUREMENT DEFICIENCIES:

- Measurements are only taken along one traverse (instead of two as required).
- Less than 16 measurements, as required, are taken along each traverse.
- Flow is variable (>10%) - measurements should be taken frequently per requirements (they are not).

- Flow is measured upstream of sample probe location (instead of downstream as required) ..

INTERIM RESOLUTION: Correction to this deficiency was a commitment which was made to use maximum flow rate values determined statistically from flow rate vent and balance data. This commitment was made in ltr 9550296, from CJ Geier, WHC, to Sidpara, RL, dated January 25, 1995. The commitment was made in response to a Department of Health Audit finding.

DEFICIENCY: Sample Probe

- Bend radius does not meet ANSI N13.1 guidelines.
- Probe length does not meet ANSI N13.1 guidelines.

INTERIM RESOLUTION: None proposed. See Final Resolution.

DEFICIENCY: Sample flows are not isokinetic.

INTERIM RESOLUTION: Sample flows are optimized per methodology detailed in WHC-IP-0842, Volume VI, Section 5.1, "Stack Radionuclide Sampling and Monitoring System Flow Rate Adjustment."

DEFICIENCY: Sample collection efficiencies are poor. See Table 7-2.

INTERIM RESOLUTION: None proposed. See Final Resolution.

FINAL RESOLUTION: The sampling system is being replaced with a new compliant system built via project W420. The committed completion schedule for this project according to the FFCA is as follows:

Begin Construction by June 30, 1999
Finish Construction by December 31, 2005
Provide documentation to EPA by April 30, 2006

The 296-T-18 Stack (244-TX Double Contained Receiver Tank Exhauster): FLOW MEASUREMENT DEFICIENCIES:

- Flow is measured upstream of sample probe location (instead of downstream as required).
- Flow is variable (>10%) - measurements should be taken frequently per requirements (they are not).

INTERIM RESOLUTION: Correction to this deficiency was a commitment which was made to use maximum flow rate values determined statistically from flow rate vent and balance data. This commitment was made in ltr 9550296, from CJ Geier, WHC, to Sidpara, RL, dated January 25, 1995. The commitment was made in response to

a Department of Health Audit finding.

DEFICIENCY: Sample flows are not isokinetic.

INTERIM RESOLUTION: Sample flows are optimized per methodology detailed in WHC-IP-0842, Volume VI, Section 5.1, "Stack Radionuclide Sampling and Monitoring System Flow Rate Adjustment."

DEFICIENCY: Sample collection efficiencies are poor. See Table 7-2.

INTERIM RESOLUTION: None proposed. See Final Resolution.

FINAL RESOLUTION: The sampling system is being replaced with a new compliant system built via project W420. The committed completion schedule for this project according to the FFCA is as follows:

Begin Construction by June 30, 1999

Finish Construction by December 31, 2005

Provide documentation to EPA by April 30, 2006

The 296-U-11 Stack (244-U Double Contained Receiver Tank Exhauster)

A point-by-point compliance assessment was not prepared for the 296-U-11 stack because the stack was recently upgraded and is in compliance with 40 CFR 61.93.

15.0 SUMMARY

15.1 SUMMARY

This revision of the FEMP has provided compliance status for currently operated systems; and the path for resolution has been forged through upgrades, where necessary. In addition, new data has been evaluated, from which two very useful operations' parameters have been derived. These parameters are:

Particulate Beta Continuous Air Monitor Alarm Set Point Values as follows:

3000 counts per minute on all the Beta CAMs used for stack effluent monitoring (refer to section 7.2.1 for discussion and section 7.2.3 and Table 7-3 for emission implications of this setting).

On the newer AMS 4 CAMs, a Slow Alarm Set point of 300 dpm/ft³ and the Fast Alarm Set point set of 7000 is established (refer to section 7.3.4 for discussion on this subject).

Based on values tabulated in Section 8, from historical emission data files and reports, the following two emission limits have been derived as applicable for Tank Farms:

Alpha: 2.1E-12 μ Ci/ml
Beta: 2.4E-10 μ Ci/ml

15.3 FUTURE USE/UPGRADES/ISSUES

This section is provided for discussion of known or envisioned future use, compliance, and potential upgrade issues. To start out, is the following discussion of a recent Facility Evaluation Board (FEB) issue:

ISSUE: The exact wording of this issue is as follows: "There is no formal process to determine if stacks should be classified as "minor" or "designated" following waste transfers. TWRS submits Quarterly reports, as required by the Federal Facility Compliance Agreement, listing stack designation. Without periodic reevaluation, TWRS can not ensure stack designations remain the same following transfers."

ISSUE DEFICIENCY: Wording of the issue is not quite correct. The issue can be interpreted to assume that

TWRS stack designations are updated within the Federal Facility Compliance Agreement (FFCA) with each quarterly report submittal. This is not true. Quarterly reports only update status of the stacks originally listed as "major" within the FFCA. TWRS stacks that are assessed as "major" after the FFCA was originally developed will not normally be listed in the FFCA. For example, the 244-AR stack 296-A-12 was assessed as "major" after the FFCA was developed and is not currently listed in the FFCA. This means that the 296-A-12 stack cannot be run until and unless the regulator(s) having jurisdiction at the time gives approval and concurrence that the appropriate systems are compliant with regulations.

ISSUE CORRECTION: A correction to the wording of the issue is as follows: There is no formal process to re-assess potential stack emissions to determine if stacks should maintain their current designation as either "major" or "minor." Potential emissions follow from vapor concentrations resulting, for example, from waste concentrations, waste surface consistency, waste activity (e.g., slashing or mixing), and distance of waste surface from ventilation ducting. All these parameters are dependant upon current facility operations or missions. When any, or a variety of these, parameters change, potential emissions and their current designations could change. Without reevaluation, TWRS can not ensure stack designations remain the same following such activities changes (i.e., waste transfers).

RESOLUTION: DOCUMENTED resolution to this issue is as follows: FEB-97-2-C2.9.1.3: Modify TWRS Facility Effluent Monitoring Plan and exhauster operating procedures to require potential emissions be assessed each time ventilation exhaust filters are changed-out and assayed for disposal. Implement HEPA filter dose rate assessments and trend for abnormal increases after a baseline is established.

IMPLEMENTATION: Periodically, HEPA filter assay data will be sought from appropriate files for the purpose of re-assessing potential emissions from various Tank Farm Stacks. Potential emissions' determinations will be documented in HNF-SD-WM-EMP-031. If the data results in designating a formerly non-designated or "minor" stack, negotiations will be initiated with the appropriate authorities and appropriate upgrade schedules will be developed as necessary.

NESHAP COMPLIANCE PHILOSOPHICAL NOTE: There are two philosophical pathways that can be followed for compliance with NESHAP

regulations:

1. Install and operate only compliant systems on all current and future designated major emission points.
2. Install compliant systems only on currently designated "major" emission points and provide for periodic compliance assessments at all other applicable locations.

HISTORICAL PATH: NESHAP regulations were implemented on December 15, 1989. Because DOE did not know whether their site's systems complied with the design Standards and Methods specified in these new regulations, they requested and received a two year EPA waiver from the regulations. They utilized this time to determine their compliance status. During the compliance determination period, Tank Farms took the position that if any radioactive waste tank stack system was to be operated into the next century, it should be upgraded/updated to meet all regulatory requirements. The advantage to this was not having to worry about immediate changes to the facility's compliance status due to changing facility processes, changing site boundaries, changes to dispersion modeling used in compliance determinations, or even slight changes to the regulations. Along with this philosophy efforts focused on cost savings by development of generic systems which would minimize maintenance/operating procedures and training; and by employing state-of-the-art technology which would produce low-maintenance type systems. Because of this philosophy little effort was necessary for potential emission determinations. Potential emission determinations are the indicators of whether or not a system must comply with the design standards and methods specified in these new regulations. Since little effort was necessary, conservative methods were chosen. These methods yielded results which placed many of the Tank Farm systems on upgrade schedules, specifically the FFCA and project W420 as discussed in Section 14.

CURRENT PATH: In the last couple of years, philosophy has changed. The philosophy changed to place emphasis, not on the designs of these systems, but on potential emission determinations instead. These efforts focused on development of assessment methods which would yield lower, less conservative results. These new methods were applied to many facilities with conclusions that showed upgrades were not required. With this in mind, these systems were removed from formerly made compliance agreements (specifically the FFCA and project W420) and upgrade scheduled.

FUTURE COMPLIANCE UPGRADES/ISSUES: Future upgrades to stack systems in Tank Farms, as plans currently indicate, may be necessary as follows:

1. Project W211 may need to upgrade facility stack systems involved. Project W211 will be installing mixer pumps in several Double Shell Tanks in different Farms. The first such set of mixers has been installed in Tank AZ-101 under project W151. The project team is currently interested in testing particulate emissions generated from this facility during initial testing of these pumps. Test results will be useful in determining actual emissions generated. These results will indicate whether or not compliant sampling systems will need to accompany similar mixer pump installations in other Tank Farm facilities.
2. Vittrification will increase the source term of waste currently in AP Tank Farm. Two of the Tanks in AP Tank Farm will be designated as the Vittrification Waste Feed Tanks. Currently AP Farm contains dilute waste. One of the Vittrification Plants will be receiving high level waste. With the feed tank being located in AP Farm, waste concentration will obviously go up. It is possible this increased concentration will increase potential tank emissions enough to redesignate the AP stack as "major," thus requiring a compliant stack sampling system. This will require an upgrade to the currently installed system.
3. At some unknown time in the future, site boundaries will be shrunk closer to the Tank Farm fence line. At that time, dispersion modeling conversion codes will change because distances to the public will be decreased. These changes may be significant enough to redesignate formerly designated "minor" stacks to the "major" category; thus requiring compliant stack sampling systems. This will require upgrades to these system.
4. Currently, there are discussions occurring between the Washington State Department of Health and the Department of Energy (DOE) on the currently used dispersion model (CAP-88). There are two versions of this code: a main frame versions and a PC version. Both versions yield different conversion factors, with the PC version yielding the highest. Health indicates they are using the PC version. DOE is still using the mane frame version. If the PC version factors are ultimately adopted for use, formerly designated "minor" stacks may be redesignated to the "major" category; thus requiring compliant stack sampling systems. This will require upgrades to these system.

16.0 REFERENCES

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