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Radioactive Air Emissions Notice of Construction Use of a Portable Exhauster on Single-Shell Tanks During Salt Well Pumping and Other Activities

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TERMS

ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BARCT	best available radionuclide control technology
CFR	Code of Federal Regulations
DCRT	double-contained receiver tank
DF	decontamination factor
DST	double-shell tank
EPA	U.S. Environmental Protection Agency
Ecology	Washington State Department of Ecology
HEPA	high-efficiency particulate air
ISVS	in-situ vapor sampling
LFL	lower flammability limit
LANL	Los Alamos National Laboratory
MEI	maximally exposed individual
ND	not detected
NEPA	*National Environmental Policy Act of 1969*
NOC	notice of construction
RCRA	*Resource Conservation and Recovery Act of 1976*
SAD	safety analysis document
SEPA	*State Environmental Policy Act of 1971*
SST	single-shell tank
TEDE	total effective dose equivalent
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
VSS	vapor sampling system
WAC	*Washington Administrative Code*
WDOH	Washington State Department of Health
Bq	becquerels
Ci	curie

METRIC CONVERSION CHART

Into metric units

If you know	Multiply by	To get
Length		
inches	25.40	millimeters
inches	2.54	centimeters
feet	0.3048	meters
yards	0.914	meters
miles	1.609	kilometers
Area		
square inches	6.4516	square centimeters
square feet	0.092	square meters
square yards	0.836	square meters
square miles	2.59	square kilometers
acres	0.404	hectares
Mass (weight)		
ounces	28.35	grams
pounds	0.453	kilograms
short ton	0.907	metric ton
Volume		
fluid ounces	29.57	milliliters
quarts	0.95	liters
gallons	3.79	liters
cubic feet	0.03	cubic meters
cubic yards	0.76456	cubic meters
Temperature		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius
Force		
pounds per square inch	6.895	kilopascals

Out of metric units

If you know	Multiply by	To get
Length		
millimeters	0.0393	inches
centimeters	0.393	inches
meters	3.2808	feet
meters	1.09	yards
kilometers	0.62	miles
Area		
square centimeters	0.155	square inches
square meters	10.7639	square feet
square meters	1.20	square yards
square kilometers	0.39	square miles
hectares	2.471	acres
Mass (weight)		
grams	0.0352	ounces
kilograms	2.2046	pounds
metric ton	1.10	short ton
Volume		
milliliters	0.03	fluid ounces
liters	1.057	quarts
liters	0.26	gallons
cubic meters	35.3147	cubic feet
cubic meters	1.308	cubic yards
Temperature		
Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Force		
kilopascals	1.4504×10^{-4}	pounds per square inch

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

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION USE OF A PORTABLE EXHAUSTER ON SINGLE-SHELL TANKS DURING SALT WELL PUMPING AND OTHER ACTIVITIES

1.0 INTRODUCTION

This document serves as a notice of construction (NOC), pursuant to the requirements of Washington Administrative Code (WAC) 246-247-060, and as a request for approval to construct, pursuant to 40 Code of Federal Regulations (CFR) 61.96, portable exhausters for use on single-shell tanks (SSTs) during salt well pumping and other activities. The reference to 'other activities' throughout this NOC means those activities described in Appendix A. The use of portable exhausters represents a cost savings feature because one portable exhauster can be moved back and forth between SSTs as schedules for salt well pumping or other activities dictate. A portable exhauster also could be used to simultaneously exhaust more than one SST during salt well pumping or during performance of other activities.

The primary objective of providing active ventilation to these SSTs is to reduce the risk of postulated accidents to remain within risk guidelines. It is anticipated that salt well pumping will release gases entrapped within the waste as the liquid level is lowered, because of less hydrostatic force keeping the gases in place. Other activities also have the potential to release trapped gases by interrupting gas pockets within the waste. Hanford Site waste tanks must comply with the Tank Farms Safety Basis (DESH 1997) which requires that the flammable gas concentration be less than 25 percent of the lower flammability limit (LFL). The Los Alamos National Laboratory (LANL) safety analysis (WHC 1996i) indicates that the LFL might be exceeded in some tanks during certain postulated accident scenarios. Also, the potential for electrical (pump motor, heat tracing) and mechanical (equipment installation) spark sources exist. Therefore, because of the presence of ignition sources and the potential for released flammable gases, active ventilation might be required in some SSTs to reduce the 'time at risk' while salt well pumping or performing other activities.

Thirty tanks remain to be salt well pumped. Determination of which of the 30 tanks have the potential to exceed the 25 percent LFL is continuing as this NOC is submitted. Table 1-1 lists 17 SSTs covered by this NOC. These 17 tanks have been identified as having the following:

- The potential for exceeding the 25 percent LFL, or are still undergoing this evaluation
- A vapor space radionuclide aerosol source term low enough such that the potential unabated offsite dose predicted to occur during salt well pumping or other activities is less than 0.1 millirem per year total effective dose equivalent (TEDE) to the maximally exposed individual (MEI) due to ventilation of each tank.

Table 1-1. Single-Shell Tanks Covered by this Notice of Construction.

Tank number
241-BY-105
241-BY-106
241-S-101
241-S-102
241-S-106
241-S-109
241-S-111
241-SX-102
241-SX-103
241-SX-105
241-SX-106
241-U-103
241-U-105
241-U-107
241-U-108
241-U-109
241-U-111

In the event that analyses now in progress conclude that flammable gas levels cannot exceed the 25 percent LFL threshold, no active ventilation will be required during salt well pumping or the performance of other activities.

2.0 FACILITY IDENTIFICATION AND LOCATION (Requirement 1)

The SSTs covered in this NOC are located at:

U.S. Department of Energy, Richland Operations Office
Hanford Site
200 East and 200 West Area
Richland, Washington 99352

Table 2-1 lists the area location and geodetic coordinates for tanks covered by this NOC.

Figure 2-1 shows the location of the 200 West and 200 East Areas within the Hanford Site. Figures 2-2 and 2-3 shows the location of each tank farm within its respective area.

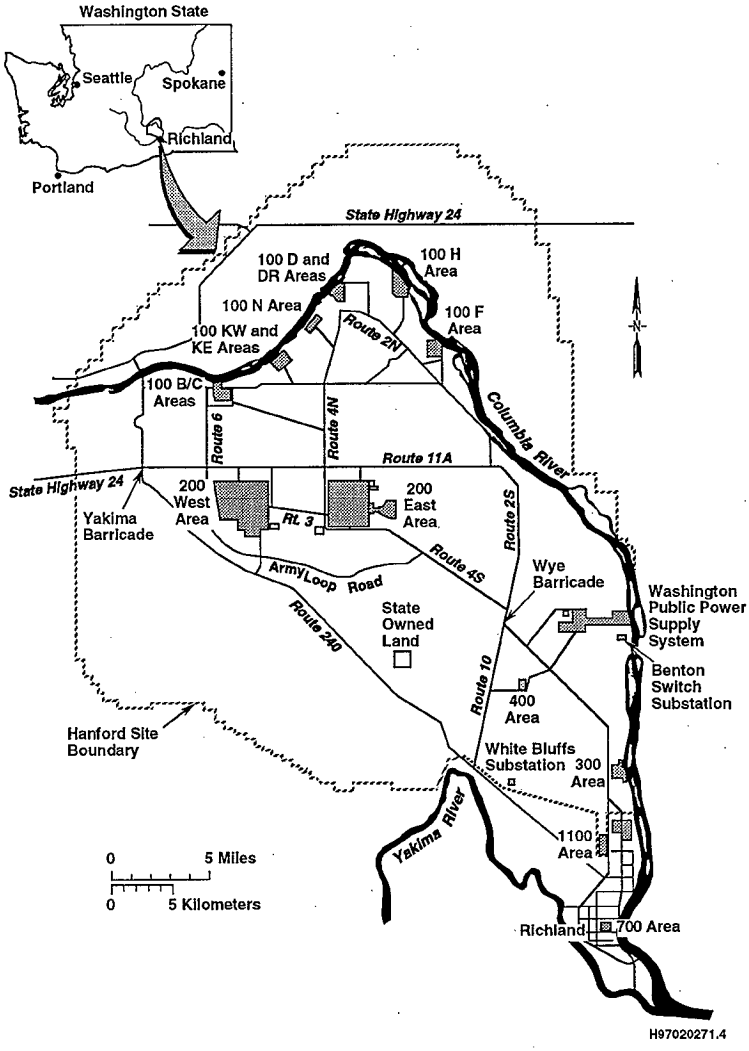

Figure 2-1. Hanford Site.

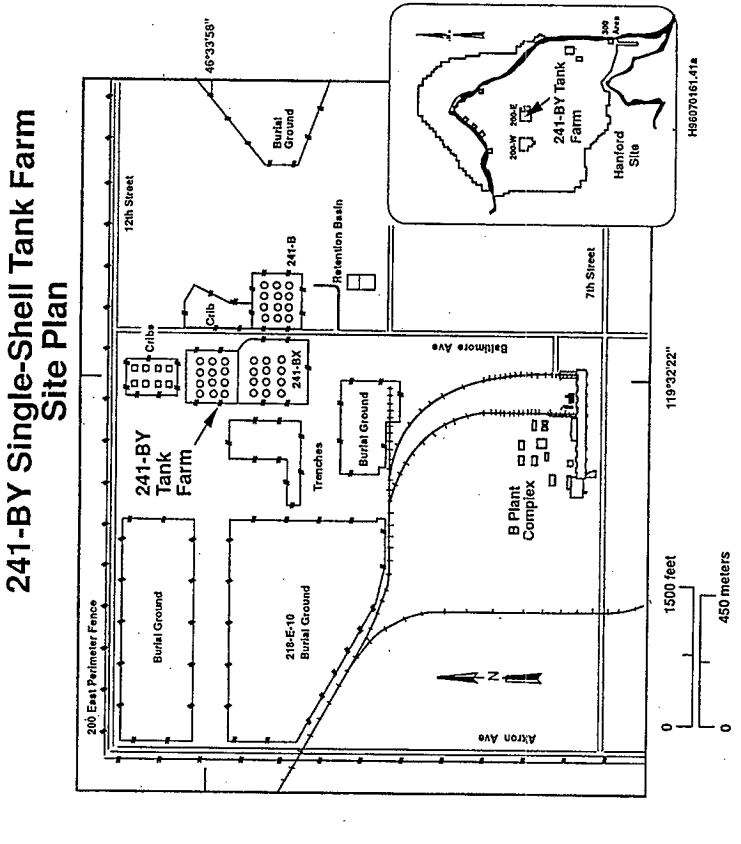

Figure 2-2. Location of the 241-BY Tank Farm Within the 200 East Area.

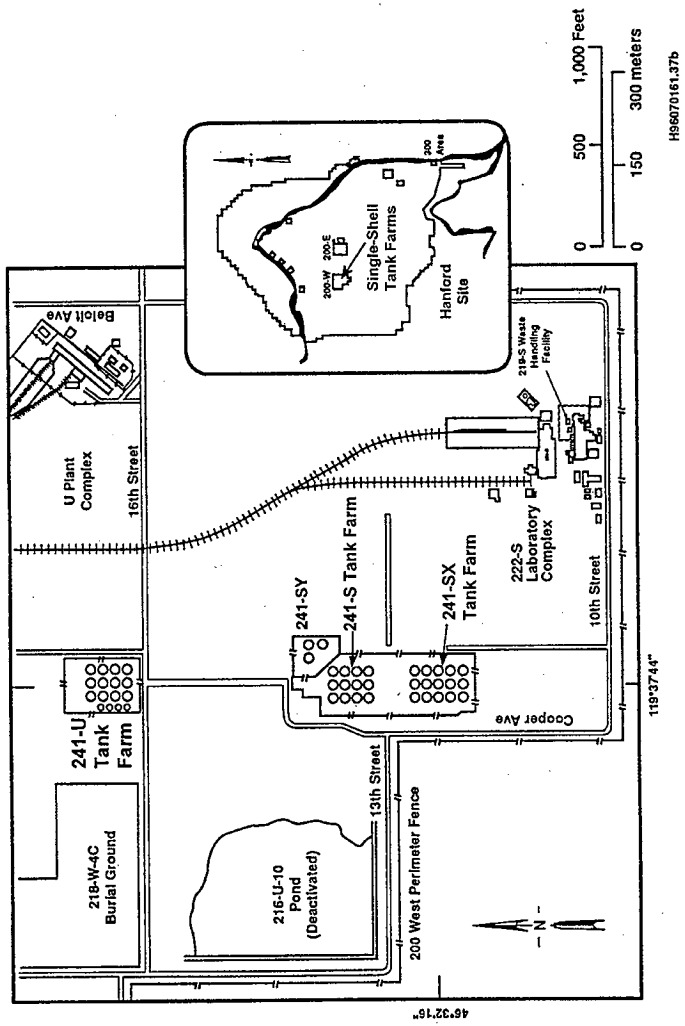

Figure 2-3. Location of Tank Farms Within the 200 West Area.

Table 2-1. Single-Shell Tank Locations.

Tank number	200 Area location	Geodetic coordinates	
		North latitude	West longitude
241-BY-105	East	46°33'58"	119°32'22"
241-BY-106	East	46°33'60"	119°32'22"
241-S-101	West	46°32'24"	119°37'43"
241-S-102	West	46°32'24"	119°37'44"
241-S-106	West	46°32'23"	119°37'46"
241-S-109	West	46°32'22"	119°37'46"
241-S-111	West	46°32'21"	119°37'44"
241-SX-102	West	46°32'33"[a]	119°37'43"[a]
241-SX-103	West		
241-SX-105	West		
241-SX-106	West		
241-U-103	West	46°32'44"	119°37'45"
241-U-105	West	46°32'43"	119°37'44"
241-U-107	West	46°32'42"	119°37'42"
241-U-108	West	46°32'42"	119°37'44"
241-U-109	West	46°32'42"	119°37'45"
241-U-111	West	46°32'41"	119°37'44"

[a] Represents current location of stack that serves 241-SX Tank Farm.

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3.0 RESPONSIBLE MANAGER (Requirement 2)

The responsible manager's name and address are as follows:

Mr. J. E. Kinzer, Director
Tank Waste Remediation Division
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 376-7591.

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4.0 TYPE OF PROPOSED ACTION (Requirement 3)

The proposed action represents a modification to an existing emission unit for SSTs listed in Table 1-1. The proposed modification is to install and operate a portable exhauster on SSTs that have the potential to exceed 25 percent LFL while salt well pumping and/or performing other activities. Presently, each of these tanks is passively ventilated and once salt well pumping has been completed, the need for continued operation of the exhauster might arise for other activities performed at the tank.

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5.0 STATE ENVIRONMENTAL POLICY ACT (Requirement 4)

This activity is categorically exempt from the State Environmental Policy Act process.

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6.0 PROCESS DESCRIPTION (Requirements 5 and 7)

Salt well pumping is a method used to interim stabilize SSTs. Interim stabilization is commenced once all the liquid above the solids has been removed. Salt well pumping removes the gravity drainable liquid and the interstitial liquid between the solids and uses pre-estabilished routes to transfer the liquid either directly to a double shell tank (DST) or to a staging double-contained receiver tank (DCRT) and subsequently to a DST.

Before transferring waste, tank farm operations performs several activities which include:

1) Verifying the waste chemistry to ensure that the waste to be transferred is compatible with the receiving tank waste.
2) Performing criticality safety analyses to ensure that stored waste will remain in a subcritical state.
3) Verifying equipment operability.
4) Developing a baseline material balance for both sending and receiving tanks. (The material balance is also reviewed periodically during the transfer to provide early leak detection and avoid filling tanks above safe levels.)

Salt well pumping involves four main phases:

1) Preparation for salt well pumping activities for a specific tank
2) Installation of a saltwell screen and jet pump assembly
3) Salt well pumping activities
4) Removal of the salt well jet pump assembly and salt well screen upon completion of pumping.

After the transfer, all associated equipment is deenergized; transfer lines are flushed with water; and a final material balance is recorded for both tanks.

Various components are used in the saltwell jet pump process as summarized below:

A salt well screen is a mechanical devise which normally extends from the top of the waste to within 2" of the tank bottom. The 400 mesh size holes in the screen allows liquid waste to pass through the screen (enter the pump cavity) while preventing solid waste from migrating to the jet pump. The jet pump is located at the bottom of the saltwell screen and is suspended by supply and return lines connected to a centrifugal pump unit located in the pump pit. The motive power for the pumping process is provided by the centrifugal pump unit. The motor and contrifugal pump assembly is hermetically sealed and thus ideal for pumping hazardous material. Pump pits are equipped with leak detectors to help detect any possible waste leakage. Salt well pumping is accomplished at very slow rates, 15.16 liters per minute or less. Slow collection of liquid in the well often requires pumping at less than 3.79 liters per minute.

A unique pipe and valving arrangement is used to convey pumped waste from the tank. The overall piping arrangement is described in detail in HNF-SD-WM-BIO-001, "Tank Waste Remediation System Basis For Interim Operation".

Salt well assembly control instruments are mounted on the jet pump assembly in the pit and in the salt well pump control cabinet. All instruments in the pump pit are rated for or otherwise qualify for service in NFPA Class-I, Div.-2, Group B environments.

Normally, salt well pumping is performed without the need of an exhauster. However, as discussed in Section 1.0, the LANL safety analysis concluded exhausting the tanks at a low rate would enhance safe pumping of certain waste tanks that have a potential for releasing trapped flammable gases if the waste is pumped or intruded upon. Therefore, active ventilation will be a part of the salt well pumping process for any SST that exhibits the potential for releasing trapped flammable gas concentrations that could exceed 25% LFL in the tank atmosphere. Table 6.1 shows several waste tank characteristics for the SSTs covered by this NOC.

Four of the SSTs covered by this NOC are actively ventilated by the SX sludge cooler (currently stack number 296-S-15). These four tanks are SX-102, SX-103, SX-105 and SX-106. Current plans include isolating these tanks from the sludge cooler and using a portable exhauster to perform salt well pumping operations, as described in this NOC. This will allow for use of the more up-to-date monitoring and ventilating equipment available with the portable exhausters. Emission estimates provided in this NOC assume use of the portable exhauster. If requested by RL or WDOH, details of the pumping process will be fowarded to each as procedures are finalized.

During salt well pumping or other activities that require active ventilation, the exhauster will be operated continuously or intermittently as required by flammable gas levels. A pumping campaign might take up to 3 years to complete and it is likely other activities will be performed in this timeframe. On completion of salt well pumping, the exhauster will be shut down. However, intermitten exhauster operation might be required in the event certain other activities requiring active ventilation must be performed after salt well pumping is complete.

Table 6-1. Waste Tank Characteristics.

Tank number	Date in service	Date inactivated	Total waste[a] (thousands of liters)	Pumpable waste[a] (thousands of liters)	Maximum waste temperature (°C)	Tank integrity[a]	Watch list tank[a]
241-BY-105	1951	1974	1,906	819	44	Assumed leaker	No
241-BY-106	1953	1977	2,433	618	49	Assumed leaker	No
241-S-101	1953	1980	1,618	481	48	Sound	No
241-S-102	1953	1980	2,081	906	42	Sound	Flammable gas and organic salt
241-S-106	1953	1976	1,815	637	27	Sound	No
241-S-109	1952	1982	2,221	451	30	Sound	No
241-S-111	1952	1978	2,259	508	33	Sound	Flammable gas and organic salt
241-SX-102	1955	1980	2,056	819	65	Sound	Flammable gas
241-SX-103	1954	1980	2,471	1,031	76	Sound	Flammable gas and organic salt
241-SX-105	1955	1980	2,475	1,133	79	Sound	Flammable gas
241-SX-106	1954	1980	2,039	1,001	43	Sound	Flammable gas and organic salt
241-U-103	1947	1978	1,774	777	30	Sound	Flammable gas and organic salt
241-U-105	1947	1979	1,584	728	32	Sound	Flammable gas and organic salt
241-U-107	1948	1980	1,539	694	27	Sound	Flammable gas and organic salt
241-U-108	1949	1979	1,774	792	31	Sound	Flammable gas
241-U-109	1949	1980	1,565	777	28	Sound	Flammable gas
241-U-111	1947	1980	1,316	489	27	Sound	Organic salt

[a] Reference: WHC 1996a.

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7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM

(Requirements 8, 10, 11, and 12)

Table 6-1 summarized the major characteristics for waste tanks covered by this NOC. Additional waste tank characterization is summarized in the following sections and includes an estimate of radionuclide inventories based on core samples and laboratory analysis or on process histories and transfer data.

7.1 241-BY-105 TANK

A cement layer on the surface of this tank required rotary mode sampling to be performed in October 1995 to obtain a core sample. The radionuclide waste inventory is reported to be as follows (WHC 1994a):

Plutonium	2.66×10^2 curies
Uranium	4.47×10^6 curies
Cesium	3.39×10^5 curies
Strontium	2.00×10^5 curies.

7.2 241-BY-106 TANK

The tank was last sampled in December 1995. A hard layer of waste near the bottom prevented successful sampling of the lower 57 inches of the waste. No additional sampling is scheduled. The radionuclide waste inventory is reported to be as follows (WHC 1994a):

Total alpha	189.5 curies
Strontium-90	4.84×10^5 curies
Cesium-137	6.88×10^5 curies.

7.3 241-S-101 TANK

The tank was core sampled in April 1996. The radionuclide waste inventory is reported to be as follows (WHC 1996b):

Total alpha	949 curies
Strontium-90	6.53×10^5 curies
Cesium-137	3.40×10^5 curies.

7.4 241-S-102 TANK

The tank was core sampled in March 1996. However, the bottom 10 inches of the waste was not included in the sample. No additional sampling is scheduled. The radionuclide waste inventory is reported to be as follows (WHC 1996c):

Total alpha	443 curies
Total beta	5.31×10^5 curies.

7.5 241-S-106 TANK

This tank was last core sampled in August 1974. Push mode core sampling is now scheduled for May 1997. In-tank photography shows a dry surface. Process histories and waste transfer data estimate the tank radionuclide waste inventory to be 5.24×10^5 curies. The primary contributors are as follows (WHC 1994b):

Total alpha	244 curies
Cesium-137	3.64×10^5 curies
Strontium-90	1.59×10^5 curies.

7.6 241-S-109 TANK

A hard layer of waste located near mid-depth prevented a successful attempt in June 1996 to core sample the waste. The tank has not been rescheduled for rotary core mode sampling. The radionuclide inventory reported is based on historical data and is presented as follows (WHC 1996d):

Total alpha	26.1 curies
Cesium-137	4.82×10^5 curies
Strontium-90	2.14×10^5 curies.

7.7 241-S-111 TANK

This tank was core sampled in June 1996. As of this writing, laboratory analytical results are not complete. The estimated tank radionuclide waste inventory of 1.04×10^6 curies is estimated from the process histories and waste transfer data (WHC 1994b). The major contributing radionuclides are as follows:

Total alpha	651 curies
Strontium-90	4.71×10^5 curies
Cesium-137	5.74×10^5 curies.

7.8 241-SX-102 TANK

This tank was last sampled in March 1976. In-tank photography suggests a mostly solid surface interlaced with some sections of liquid. Rotary core mode sampling is scheduled for September 1997. Process histories and waste transfer data estimate the tank radionuclide waste inventory to be 1.12×10^6 curies. The primary contributors are as follows (WHC 1994b):

Total alpha	857 curies
Strontium-90	5.01×10^5 curies
Cesium-137	6.20×10^5 curies.

7.9 241-SX-103 TANK

No core samples have been taken since June 1976. In-tank photographs suggests a hard surface. Rotary core mode sampling is scheduled for April 1997. Process histories and waste transfer data estimate the tank radionuclide inventory to be 1.20×10^6 curies. The primary contributors are as follows (WHC 1994b):

Total alpha	816 curies
Cesium-137	7.73×10^5 curies
Strontium-90	4.25×10^5 curies.

7.10 241-SX-105 TANK

No core samples have been taken since February 1977. In-tank photographs suggest a hard surface. The tank is scheduled for rotary core mode sampling in May 1998. Process histories and waste transfer data estimate a tank radionuclide inventory of 1.64×10^6 curies. The primary contributors are as follows (WHC 1994b):

Total alpha	1.04×10^3 curies
Cesium-137	7.73×10^5 curies
Strontium-90	8.67×10^5 curies.

7.11 241-SX-106 TANK

This tank has not been core sampled. Push mode core sampling is scheduled for August 1997 because in-tank photographs suggest a soft surface. Process histories and waste transfer data estimate the tank radionuclide inventory to be 7.89×10^5 curies. The primary contributors are as follows (WHC 1994b):

Total alpha	560 curies
Cesium-137	5.45×10^5 curies
Strontium-90	2.44×10^5 curies.

7.12 241-U-103 TANK

A hard layer of waste located just under the surface prevented a successful attempt in October 1996 to core sample the waste. The partial sample obtained is now being analyzed. Process histories and waste transfer data estimate the tank radionuclide inventory to be 6.63 x 10^5 curies. The primary contributors are as follows (WHC 1994b):

Total alpha	528 curies
Cesium-137	4.55 x 10^5 curies
Strontium-90	2.07 x 10^5 curies.

7.13 241-U-105 TANK

This tank was core sampled in March 1996 to within 10 inches of the bottom in three risers. The radionuclide waste inventory is reported to be as follows (WHC 1996e):

Total alpha	1,800 curies
Europium-154	1,590 curies
Strontium-90	1.46 x 10^5 curies
Cesium-137	3.84 x 10^5 curies.

7.14 241-U-107 TANK

This tank was partially core sampled in March 1996. Hard layers were encountered near the top and bottom of the tank. Additional sampling via rotary core mode is scheduled for June 1999. The radionuclide waste inventory is reported to be as follows (WHC 1996f):

Total alpha	221 curies
Cesium-137	2.06 x 10^5 curies.

7.15 241-U-108 TANK

This tank was core sampled to within 5 inches of the bottom on three risers in May 1996. The radionuclide waste inventory estimate based on composite sample data analysis is as follows (WHC 1996g):

Total alpha	126 curies
Total beta	4.79 x 10^5 curies.

7.16 241-U-109 TANK

This tank was core sampled in January 1996. The radionuclide waste inventory is reported to be as follows (WHC 1996h):

Total alpha	109 curies
Total beta	3.69×10^5 curies.

7.17 241-U-111 TANK

This tank has not been core sampled. In-tank photographs show a surface that appears to be dried out but soft enough to allow push mode core sampling that is scheduled for February 1998. Process histories and waste transfer data estimate the tank radionuclide inventory to be 3.66×10^5 curies. The primary contributors are as follows (WHC 1994b):

Total alpha	264 curies
Cesium-137	2.22×10^5 curies
Strontium-90	1.44×10^5 curies.

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8.0 CONTROL SYSTEM (Requirement 6)

Two types of portable exhausters are being manufactured: One rated for 14.2 cubic meters per minute and one rated for 28.3 cubic meters per minute. In both designs, the exhaust fan is a centrifugal fan and meets requirements for Air Movement Contractors Association type A classification for spark resistant construction. Present plans are to construct six portable exhausters. Stack identification will be assigned before startup and will be reported in the notification of startup.

When an exhauster is required, the exhauster will be mechanically connected, using a flanged arrangement, to a suitable riser on one or more waste tanks and will draw fresh air through a breather equipped with an inlet high-efficiency particulate air (HEPA) filter. Air drawn into the vapor space by the negative pressure produced by the exhaust fan will dilute and disburse any flammable gases present. Exhaust air will be drawn up through the riser and into the portable exhauster. Before the vapor space gas can be discharged to the atmosphere, the gas must be filtered through two stages of glass fiber HEPA filters. The 14.2 cubic meter per minute exhauster's filter size is 60.96 x 60.96 x 14.92 centimeters and the 28.3 cubic meter per minute exhauster's filter size is 60.96 x 60.96 x 29.21 centimeters. The HEPA filters must be protected from entrained moisture and/or high humidity and from loading by atmospheric dust. Therefore, the gas entering the system will be heated to lower the relative humidity and prefiltered before entering the first stage of HEPA filtration. Each filter is designed and will be tested routinely to ensure a minimum efficiency of 99.95 percent for removal of particulates with a median diameter of 0.3 microns. Both stages of HEPA filters will be capable of being tested-in-place (ASME N509/510) to ensure that the desired efficiency is maintained. Appendix B provides a discussion of best available radionuclide control technology.

These HEPA filters and their housings, together with a suitable exhaust fan and stack, form the major components of the exhauster. The stack is circular, 15.2 centimeters in diameter and ranges from 3.7 to 4.6 meters high from ground level. Exhaust temperatures will be between 57 and 60°C. Figures 8-1 and 8-2 show plan and elevation views of the ventilation control system.

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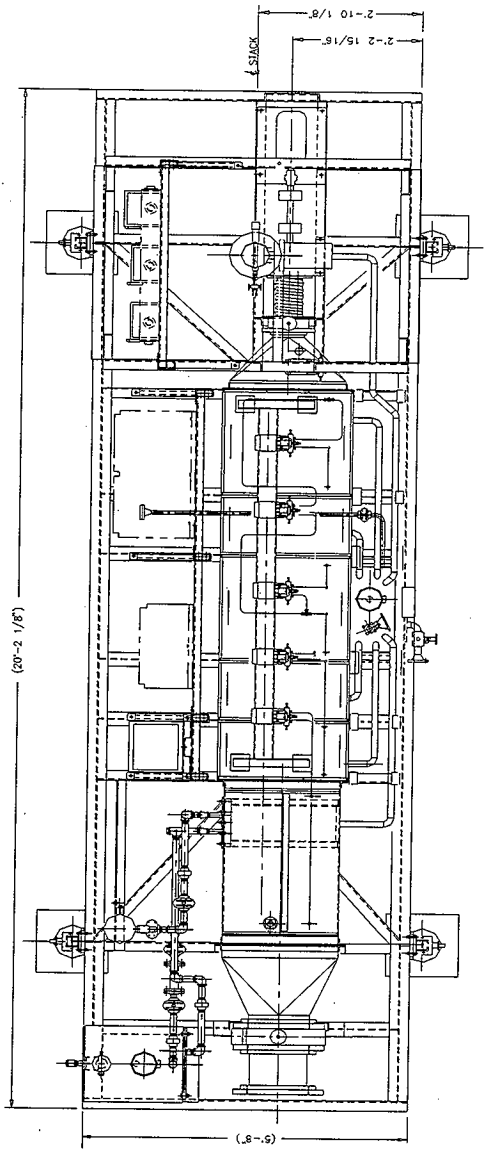

Figure 8-1. Ventilation Control System Diagram--Plan View.

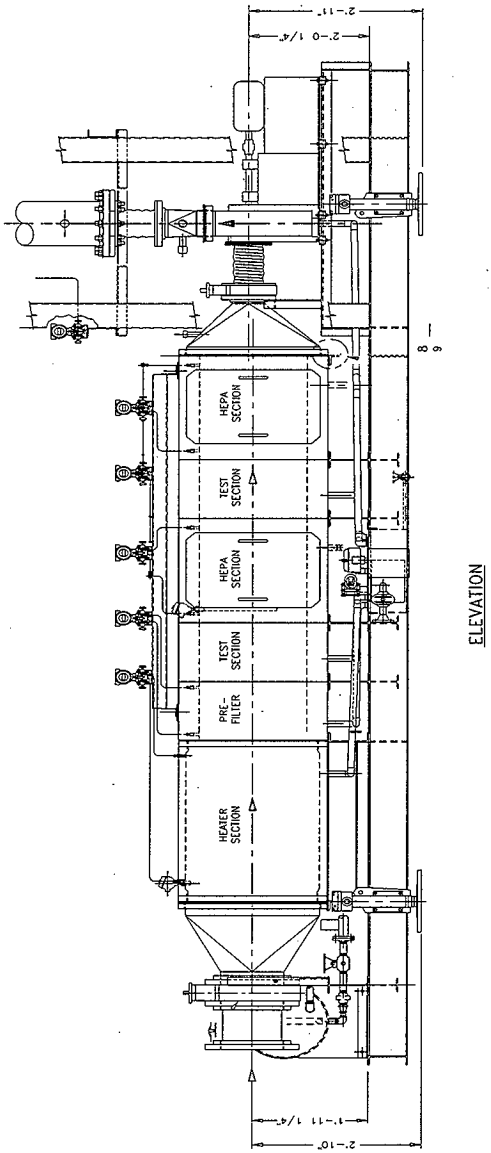

Figure 8-2. Ventilation Control System Diagram--Elevation View.

9.0 MONITORING SYSTEM (Requirement 9)

The potential unabated offsite dose for use of an exhauster on each of the 17 tanks covered by this NOC is calculated to be less than 0.1 millirem per year TEDE to the MEI under conservative assumptions for vapor space radionuclide concentration and maximum exhauster operation at 28.3 cubic meters per minute. Details of the analysis for these tanks is presented in Section 11.0.

Therefore, in accordance with 40 CFR 61, Subpart H, periodic confirmatory measurements will be made at least annually for each tank location to verify low emissions. Several methods have been proposed to WDOH for use to confirm low emissions. These methods include: nondestructive assay, record sampling, smears, upstream measurements (continuous air monitoring or air samples), grab samples, HEPA filter analysis or Appendix D calculations on measured inventory (WHC 1996k). A National Emission Standards for Hazardous Air Pollutants (NESHAPs)-compliant monitoring system is not required for use of an exhauster on these tanks.

At this time the prefered method to implement the periodic confirmatory measurements requirement is record sampling. Although the equipment design and operating procedure requirements have not been finalized, the principle of operation will consist of drawing an effluent air sample from the stack through a small HEPA filter for a specific time at a specific rate. The HEPA filter will then be analyzed for the presence of radionuclides. If requested by WDOH, the design and procedural details will be fowarded to WDOH prior to salt well pumping the first tank covered by this NOC.

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10.0 RELEASE RATES (Requirement 13)

Emissions resulting from the use of an exhauster on any of the 17 tanks covered by this NOC during salt well pumping and other activities are expected to be low. A primary question in determining the unabated emissions from intrusive activities involves the mechanism for formation of aerosols in the tank vapor space. Two mechanisms have been postulated to occur during intrusive activities: the release of trapped gas and associated aerosols and resuspension of dry particulate material due to air currents created by the exhausters. Information available to date shows that salt well pumping and other activities covered in this NOC minimally disturb the tank waste and vapor space.

This position is supported by modeling designed to predict gas release during intrusive activities, analysis of release scenarios conducted for the Tank Farm Final Safety Analysis Report, and operational experience gained from SY-101 tank. The following is a discussion of results from these activities.

Numeric modeling designed to predict gas release during salt well pumping is documented (PNNL 1996a and PNNL 1996b). Results suggest that, as the retreating liquid exposes the trapped gas bubbles, the trapped gas is released by diffusing through the connected gas channels to the surface of the salt cake or sludge. Thus, during salt well pumping, gas release is characterized as a continuous, slow release process. The generation of additional aerosol radionuclides under these conditions is unlikely.

Intrusion into the waste by activities such as saltwell screen insertion or thermocouple tree insertion offers the possibility of a more rapid gas release resulting in a potential increase in aerosol radionuclides. A conservative gas release analysis based on release scenarios including saltwell pumping, intrusion into the waste, and rollover was performed (WHC 1996i). Although this study addressed flammable gas concentration changes in the vapor space as a function of release rates, the study did conclude that a rollover will release the largest amount of gas in a short time. The study also concluded that although a rollover is possible, a rollover is unlikely because changes in waste levels in SSTs have been small, which implies gas generation rates are balanced by gas release rates. The study also concludes that intrusion into the waste will release relatively small volumes of gas as compared to a rollover. The lowest gas release rates are characteristic of saltwell pumping. Considering the operational experience gained during May 1990 to December 1994 for SY-101 tank, it is considered unlikely that salt well pumping or activities that intrude into the waste will cause gas releases that significantly will increase the radiological aerosol in the tank vapor space.

Operational experience with SY-101 tank suggests that even more aggressive waste intrusive activities involving intermittent mixer pump operation and rollover, due to the release of trapped gas to the surface, would not significantly contribute to an increase in radionuclide aerosol concentration in the vapor space. This is demonstrated by passive assay analysis of HEPA filters in service on the SY-101 tank from May 1990 to

December 1994. The analysis indicates the potential offsite cumulative dose of 1.5 E-03 millirem for the 4.5-year period (WHC 1996j). The type of gas releases experienced in SY-101 are not expected to occur during salt well pumping or the performance of other activities. However, assuming a very conservative position that a rollover does occur, the SY-101 experience suggests a maximum increase in annual dose of only 3.3 E-04 millirem per year which has an insignificant affect on the analysis presented in Section 11 of this NOC.

Another potential source of an increase in the radiological aerosol concentration in the tank vapor space might be attributed to the dry waste surface believed to be present in several tanks. This scenario for potential increased emissions assumes a radiological source, in the form of dry particulates, has been deposited or has formed on top of the dry waste surface. These particulates could become airborne when the exhauster is turned on. In-tank photography is not considered sensitive enough to verify the presence or absence of dry particulates. However, no mechanism is known for the generation or formation of such a condition. It is believed the dry surface in these tanks was formed by evaporation of liquid waste, which is expected to result in a hard surface on the resulting saltcake. It also is considered unlikely that air flow into the tank, because of exhauster operation, could generate sufficient turbulence to disturb particulates even if the particulates were present.

Additional mechanisms for a potential increase in aerosol concentration in the tank vapor space include accident conditions associated with a flammable gas burn in the vaporspace, waste collapse, and equipment drop scenarios. These mechanisms are not addressed in this NOC because the likelihood of occurrence is less than or equal to 1 E-06 per year (WHC 1996i).

The following estimate of emissions is based on analyses of filter papers in sampling equipment used for vapor space sampling in support of worker health and safety issues. The vapor sample analysis did not include radionuclide analytes; therefore, analyses of the filter papers were used for this estimate. The emission estimates presented in this NOC are conservative and representative of the samples taken at that time. Results of future periodic confirmatory measurements required by this NOC may vary slightly due to sample heterogeniety and changes in labratory procedural protocols. However, there is no information to suggest that emission rates based on future periodic confirmatory samples will exceed regulatory limits.

Two types of vapor sampling systems were used: a truck mounted vapor sampling system (VSS) and/or a cart mounted in-situ vapor sampling system (ISVS). In both systems, filter papers were used to provide protection against radioactive contamination from reaching the sampling apparatus in the cart or truck. The filter papers have a minimum aerosol retention of 99.98 percent for particles of 0.3 microns. In the case of the VSS, the filters are mounted outside the tank while for the ISVS the filters are mounted in the tank. In both cases, the filter papers are upstream from the sampling apparatus. Additional details of the sampling effort are documented (PNNL 1997).

10.1 UNABATED EMISSIONS

The unabated emissions for all tanks were estimated using the measured total alpha, total beta, and cesium-137 concentrations collected on filter papers used during vapor sampling of undisturbed vapor space in each tank (PNNL 1997). Most of the filter papers were analyzed from 1 to 4 days after the sampling occurred. Subsequent tests and analysis of the activity on the filter papers showed a half-life of approximately 10 days. Therefore, the activities measured on the filter papers are believed to be attributed to radon progeny (PNNL 1997 and WHC 1982).

Curie concentrations and the unabated emissions for each tank are presented in Table 10-1.

Table 10-1. Curie Concentrations from Filter Papers and Potential Annual Unabated Emissions.

Tank number	Radionuclide concentration (picocuries per liter)			Unabated emissions at 28.3 cubic meters per minute (curies per year)		
	Total alpha	Total beta	Cesium-137	Total alpha	Total beta	Cesium-137
241-BY-105	0.003*	0.01	0.01*	4.46 E-05	1.49 E-04	1.49 E-03
241-BY-106	0.01	.03	0.01*	1.49 E-04	4.46 E-04	1.49 E-03
241-S-101	0.258*	1.99*	26.9*	3.84 E-03	2.96 E-02	4.00 E-01
241-S-102	0.37*	1.07*	0.5*	5.50 E-03	1.59 E-02	7.44 E-03
241-S-106	0.609*	2.06*	28*	9.06 E-03	3.06 E-02	4.16 E-01
241-S-109	0.058*	0.32	0.25*	8.63 E-04	4.76 E-03	3.72 E-03
241-S-111	0.5	0.8	0.1*	7.44 E-03	1.19 E-02	1.49 E-03
241-SX-102	0.003*	0.1	0.1*	4.46 E-05	1.49 E-03	1.49 E-03
241-SX-103	0.63	0.78	0.1*	9.37 E-03	1.16 E-02	1.49 E-03
241-SX-105	0.28	0.51	0.1*	4.16 E-03	7.59 E-03	1.49 E-03
241-SX-106	0.27	0.77	0.1*	4.02 E-03	1.15 E-02	1.49 E-03
241-U-103	0.21	0.01	0.1*	3.12 E-03	1.49 E-04	1.49 E-03
241-U-105	0.02	0.08	0.1*	2.97 E-04	1.19 E-03	1.49 E-03
241-U-107	0.005*	0.05	0.1*	7.44 E-05	7.44 E-04	1.49 E-03
241-U-108	0.03	0.16	0.1*	4.46 E-04	2.38 E-03	1.49 E-03
241-U-109	0.22	0.31	0.1*	3.27 E-03	4.61 E-03	1.49 E-03
241-U-111	0.05	0.2	0.1*	7.44 E-04	2.97 E-03	1.49 E-03

* Minimum level detectable by labratory analysis

The exhauster was assumed to run at 28.3 cubic meters per minute, 24 hours per day, 365 days per year. The following is a sample calculation using 241-S-109 alpha concentration data from the filter papers.

Unabated alpha emission =

$$\left[0.058\ \frac{pCi}{L}\right] \times \left[10^{-12}\ \frac{Ci}{pCi}\right] \times \left[\frac{1{,}000\ \frac{ft^3}{min}}{35.3\ \frac{ft^3}{M^3}}\right] \times \left[10^{3}\ \frac{L}{M^3}\right] \times \left[60\ \frac{min}{hr}\right] \times \left[24\ \frac{hr}{day}\right] \times \left[365\ \frac{days}{year}\right] = 8.63 \times 10^{-4}\ \frac{Ci}{year}.$$

10.2 ABATED EMISSIONS

The abated emissions for each tank were calculated from the unabated emissions and the decontamination factor (DF) for the HEPA filters. The DF for each HEPA filter is equal to

$$\frac{1}{1 - \text{efficiency}} = \frac{1}{1-.9995} = 2\ E{+}03.$$

The overall DF is determined by multiplying the DFs for each HEPA filter together, i.e., (2 E+03) X (2 E+03) = 4 E+06 for the ventilation system. The abated emissions equals the unabated emissions divided by the overall DF. The potential annual abated emissions for each tank is shown in Table 10-2.

Table 10-2. Potential Annual Abated Emissions.

Tank number	Annual unabated emissions (curies per year)			Decontamination factor	Annual abated emissions (curies per year)		
	Total alpha	Total beta	Cesium-137		Total alpha	Total beta	Cesium-137
241-BY-105	4.46 E-05	1.49 E-04	1.49 E-03	4.00 E+06	1.12 E-11	3.72 E-11	3.72 E-10
241-BY-106	1.49 E-04	4.46 E-04	1.49 E-03	4.00 E+06	3.72 E-11	1.12 E-10	3.72 E-10
241-S-101	3.84 E-03	2.96 E-02	4.00 E-01	4.00 E+06	9.59 E-10	7.40 E-09	1.00 E-07
241-S-102	5.50 E-03	1.59 E-02	7.44 E-03	4.00 E+06	1.38 E-09	3.98 E-09	1.86 E-09
241-S-106	9.06 E-03	3.06 E-02	4.16 E-01	4.00 E+06	2.26 E-09	7.66 E-09	1.04 E-07
241-S-109	8.63 E-04	4.76 E-03	3.72 E-03	4.00 E+06	2.16 E-10	1.19 E-09	9.30 E-10
241-S-111	7.44 E-03	1.19 E-02	1.49 E-03	4.00 E+06	1.86 E-09	2.97 E-09	3.72 E-10
241-SX-102	4.46 E-05	1.49 E-03	1.49 E-03	4.00 E+06	1.12 E-11	3.72 E-10	3.72 E-10
241-SX-103	9.37 E-03	1.16 E-02	1.49 E-03	4.00 E+06	2.34 E-09	2.90 E-09	3.72 E-10
241-SX-105	4.16 E-03	7.59 E-03	1.49 E-03	4.00 E+06	1.04 E-09	1.90 E-09	3.72 E-10
241-SX-106	4.02 E-03	1.15 E-02	1.49 E-03	4.00 E+06	1.00 E-09	2.86 E-09	3.72 E-10
241-U-103	3.12 E-03	1.49 E-04	1.49 E-03	4.00 E+06	7.81 E-11	3.72 E-11	3.72 E-10
241-U-105	2.97 E-04	1.19 E-03	1.49 E-03	4.00 E+06	2.97 E-10	2.97 E-10	3.72 E-10
241-U-107	7.44 E-05	7.44 E-04	1.49 E-03	4.00 E+06	1.86 E-10	1.86 E-10	3.72 E-10
241-U-108	4.46 E-04	2.38 E-03	1.49 E-03	4.00 E+06	3.72 E-10	5.95 E-10	3.72 E-10
241-U-109	3.27 E-03	4.61 E-03	1.49 E-03	4.00 E+06	1.15 E-09	1.15 E-09	3.72 E-10
241-U-111	7.44 E-04	2.97 E-03	1.49 E-03	4.00 E+06	7.44 E-10	7.44 E-10	3.72 E-10

11.0 OFFSITE IMPACT

This section presents information regarding the TEDE to the MEI offsite resulting from unabated and abated emissions from use of an exhauster on the tanks covered in this NOC. For SSTs BY-105, and BY-106, the MEI is located at the Hanford Site boundary, 16 kilometers east of the 200 East Area. All other tanks covered by this NOC are located in the 200 West Area where the MEI is at the Hanford Site boundary, 24 kilometers east. The unit dose factors used to calculate offsite dose were submitted previously to the Washington State Department of Health (WDOH). The information required to develop the unit dose factors from the Clean Air Assessment Package 1988 computer code is included in *Unit Dose Calculation Methods Summary of Facility Effluent Monitoring Plan Determinations* (WHC 1991).

11.1 POTENTIAL OFFSITE DOSE FROM UNABATED EMISSIONS

The potential unabated offsite doses resulting from actively ventilating the SSTs covered by this NOC are calculated as the product of the unabated emissions and the applicable unit dose factor. A conservative approach is used which assumes the total alpha to be from americium-241, instead of radon 226 as indicated in Section 10.1, because americium provides the highest dose consequence of all alpha emitters, 7.79 mrem vs. 3.23 E-01 mrem. The total beta activity is assumed to be strontium-90.

Iodine is found in the tank waste because iodine is a decay product from the fission process. The offsite dose potential due to iodine is evaluated separately because although the total beta activity is inclusive of all beta emitters, it is treated as though it is all from Sr-90. The evaluation shows that any gaseous iodine that passes through the HEPA filters is inconsequential. The evaluation uses process history information because the percentage of iodine in the measured total beta activity is not known. Process information indicates that tank S-112 contains the highest inventory of iodine at 1.5 E+11 becquerels (Bq) (4.05 curies) which equates to an offsite dose of 4.62×10^{-4}.

$$\left[\frac{1.5\ \text{E+11 Bq}}{3.7\ \text{E+10}\ \frac{\text{Bq}}{\text{Ci}}}\right] \times \left[1.14 \times 10^{-1}\ \frac{\frac{\text{mrem}}{\text{Ci}}}{\text{yr}}\right] \times (10^{-3}\ \text{Appendix D release factor})$$

$$= 4.62 \times 10^{-4}\ \frac{\text{mrem}}{\text{yr}}.$$

Some iodine might escape into the environment as a result of chemical reactions involving hydrolysis, oxidation-reduction, dismutation, neutralization, and reversible-equilibrium reactions. On formation, iodine reacts with the waste and becomes present in the waste as iodate and iodine ions. These two ions have no measurable vapor pressure and do not become airborne from the tank as free chemicals. However, these ions might become airborne as dissolved ions on wetted particulates. When this occurs, the ions might become entrapped on the HEPA filters with the particulates. Here the iodine ions become neutralized by the air flow (carbon dioxide) that allows the iodine ions to change to free molecular iodine. This form of iodine has a measurable vapor pressure and readily vaporizes from the particulate into the environment.

Results of the analysis for potential offsite dose from unabated emissions are summarized in Table 11-1. Appendix C shows details of this analysis.

Table 11-1. Potential Unabated Offsite Dose for Tanks Less Than 0.1 Millirem Per year.

Tank number	Potential unabated Offsite dose (millirems per year)
241-BY-105	6.27 E-04
241-BY-106	2.00 E-03
241-S-101	3.63 E-02
241-S-102	4.34 E-02
241-S-106	7.73 E-02
241-S-109	6.90 E-03
241-S-111	5.83 E-02
241-SX-102	4.07 E-04
241-SX-103	7.33 E-02
241-SX-105	3.27 E-02
241-SX-106	3.16 E-02
241-U-103	2.44 E-02
241-U-105	2.37 E-03
241-U-107	6.20 E-04
241-U-108	3.56 E-03
241-U-109	2.56 E-02
241-U-111	5.89 E-03

Preliminary planning includes simultaneous pumping of tanks BY-105 and BY-106 using a single portable exhauster. Also tanks SX-102 and SX-103 are tentatively planned for simultaneous salt well pumping using a single portable exhauster. To determine the need for NESHAPs-compliant monitoring for a particular combination of tanks, add the unabated dose specified for each tank

in Table 11-1 together and compare the sum to 0.1 millirem per year. Any exhauster used on any combination of tanks that exceeds the regulatory dose criterion of 0.1 millirem per year will require approval from the Washington State Department of Health in the form of a NESHAP measurement assessment letter or a new NOC for that combination of tanks.

11.2 POTENTIAL OFFSITE DOSE FROM ABATED EMISSIONS (Requirements 14 and 15)

The potential abated offsite dose resulting from actively ventilating the tanks covered by this NOC is calculated as the product of the abated emissions and the applicable unit dose factor. Results for each tank are shown in Appendix C. The maximum abated dose is estimated at 1.06 E-07 millirem per year. This value is very conservative because it assumes an exhauster is operating at maximum flow rate (28.3 cubic meters per minute) on all 17 tanks at the same time. However, in actual practice, application of an exhauster to the 17 tanks covered by this NOC is scheduled to occur over a period from 1997 into the year 2000. Although the exact schedule is not certain, it is extremely unlikely that all 17 tanks will be ventilated at the same time.

The dose resulting from all Hanford Site operations in 1995 was determined to be 2.9×10^{-3} millirems per year (DOE/RL-96-37) for a MEI located at Sagemore Road farm. The analysis performed to arrive at the 1.06 E-07 millirems per year also is presented in Appendix C. The emissions originating from the tanks covered in this NOC, in conjunction with other current operations on the Hanford Site, will not violate the National Emission Standard limit of 10 millirems per year.

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12.0 FACILITY LIFETIME (Requirement 17)

The minimum design life of the exhauster equipment is 10 years. The exhauster will be operated continuously or intermittently, as required by flammable gas levels, for the duration of the pumping campaign, including installation of the pump. Pumping operations could be in a continuous mode for up to 3 or more years and it is likely other activities will be performed in that timeframe. Operations will be conducted up to 24 hours a day, 7 days a week.

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13.0 TECHNOLOGY STANDARDS (Requirement 18)

The emissions control equipment employed on exhausters to be used on the tanks included in this NOC adhere to the compliance standards as noted in Tables 13-1. This table summarizes the compliance of emissions control equipment with the listed technology standards for tanks with a potential to emit less than 0.1 millirem per year TEDE to the MEI as discussed in Sections 9.0 and 11.0.

Table 13-1. Emissions Control Equipment Standards Compliance, Less Than 0.1 Millirem Per Year.

Standard	Does design comply	If not, what standard was used
ASME/ANSI AG-1	Yes	
ASME/ANSI N509	Yes	
ASME/ANSI N510	Yes	
ANSI/ASME NQA-1	Yes	
ANSI N13.1	No	Not required for periodic confirmatory measurement
40 CFR 60, Appendix A Test Methods: 1, 1A	No	Not required for periodic confirmatory measurement
2, 2A, 2C, 2D	No	Not required for periodic confirmatory measurement
4	No	
5, 17	No	

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APPENDIX A

LIST OF ACTIVITIES

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APPENDIX A

LIST OF ACTIVITIES

This appendix describes the activities and controls to be met for current passively and actively ventilated SSTs that might require portable ventilation to reduce the concentration of flammable gases, as described in Section 1.0.

A. ACTIVITIES THAT DO NOT CREATE A POTENTIAL NEW PATHWAY FOR AIR EMISSIONS.

1. Activities that do not create a potential new air pathway.

   a. EXAMPLES

      (1) Opening a riser, where the ventilation system can be depended on to maintain adequate in-flow to the tank.
      (2) Disturbing the tank waste, where the potential for significant aerosol generation is not present.
      (3) Equipment installation, repair, replacement, or removal.
      (4) Photography.
      (5) Obtaining vapor space samples where the sample is returned to the tank after collection, or there is not release of the vapor sample.
      (6) Receipt of waste into DSTs from SSTs, the 242-A Evaporator, the 204-AR Waste Unloading Station, or other waste generators (e.g., laboratories).
      (7) Receipt of SST waste in DCRTs.

   b. CONTROLS

      (1) Radiological control technician (RCT) coverage as required by procedure (with retrievable records*).
      (2) As low as reasonably achievable (ALARA).

2. Activities that involve routine replacement, repair, or replacement-in-kind of ventilation system components.

   a. EXAMPLES

      (1) Replacing sample probes.
      (2) Replacing HEPA filters.
      (3) Repair of exhaust damper valves.
      (4) Sampling or replacing ion-exchange filter media.

   b. CONTROLS

      (1) RCT coverage as required by procedure (with retrievable records*).
      (2) Greenhouses/glovebags as practical.
      (3) ALARA.

3. Activities that involve routine replacement, repair, or replacement-in-kind of equipment.

   a. EXAMPLES

      (1) Repair/replacement of pressure switches.

   b. CONTROLS

      (1) RCT coverage as required by procedure (with retrievable records*).
      (2) Greenhouses/glovebags as practical.
      (3) ALARA.

4. Activities that do not involve a potential new pathway of air emissions, nor an increase in emissions to a breather filter.

   a. EXAMPLES

      (1) Operating core sampling equipment, using push-mode, in soft tank waste. Also includes auger sampling.
      (2) Pumping liquid from tanks.
      (3) Transportation of packaged waste and used equipment.

   b. CONTROLS

      (1) RCT coverage as required by procedure (with retrievable records*).
      (2) Greenhouses/glovebags as practical.
      (3) ALARA.

B. ACTIVITIES PROVIDING A NEW PATHWAY FOR POTENTIAL EMISSIONS TO THE AIR

1. Activities that disturb only the vapor space and involve a potential new pathway to the air (i.e., open riser).

   a. EXAMPLES

      (1) Equipment installation, repair, replacement, or removal
      (2) Obtaining samples of vapor space materials.
      (3) In-tank photography.
      (4) Replacement/testing of breather filters.
      (5) Obtaining psychrometric data.
      (6) Installation of core sampling equipment.

   b. CONTROLS

      (1) RCT coverage for entire time potential new pathway is open (with retrievable records*).
      (2) Greenhouses/glovebags as practical.
      (3) ALARA.

2. Activities that temporarily disturb the vapor space and a small amount of the tank waste.

   a. ACTIVITIES SPECIFICALLY COVERED

      (1) Installation and removal of thermocouples or thermocouple trees.
      (2) Removal of core sampling equipment and samples.
      (3) Pump installation, where the pump will be used solely for the transfer of liquid waste (i.e., no mixer pumps, no sluicing pumps). Also includes pump removal.
      (4) Installation of saltwell screens (including the use of a water lance if required to soften the sludge).
      (5) Obtaining liquid waste samples.

   b. CONTROLS

      (1) RCT coverage for entire time potential new pathway is open (with retrievable records*).
      (2) Greenhouses/glovebags as practical.
      (3) ALARA.
      (4) Flex-sleeving for retrieval, contained water wash.

3. Activities that involve only a small quantity of radioactive material (i.e., surface contamination) and a potential new pathway to the air (example, valve pits, diversion boxes).

   a. EXAMPLES

      (1) Nonroutine equipment installation, repair, replacement or removal.
      (2) Asbestos removal.
      (3) Flushing transfer lines.
      (4) Leak or pressure testing of transfer lines that have previously been flushed.
      (5) Isolation of abandoned exhaust systems.
      (6) Removal of contaminated soil within or immediately adjacent to the tank farms.
      (7) Waste packaging associated with routine operations, including operations described in this list.

   b. CONTROLS

      (1) RCT coverage for entire time of potential radionuclide emissions, or to verify that there is not potential for air emissions (with retrievable records*).
      (2) Greenhouses/glovebags as practical.
      (3) ALARA.

4. Activities that disturb the vapor space and a potential new pathway for emissions is temporarily open.

   a. EXAMPLES

      (1) Obtaining vapor samples, where the sample is not routed back to the actively ventilated vapor space after collection.
      (2) Opening large risers, where the ventilation system cannot be depended upon to maintain a negative pressure, relative to atmosphere, in the tank.

   b. CONTROLS

      (1) RCT coverage for entire time potential new pathway is open (with retrievable records*).
      (2) Greenhouses/glovebags as practical.
      (3) ALARA.

C. USE OF CONTAINMENT TENTS IN THE TANK FARMS

1. Actively ventilate, using portable exhausters, up to 10 containment tents in the tank farms, for use in conjunction with approved routine activities.

   a. SYSTEM PARAMETERS AND CONFIGURATION

      (1) Each portable exhauster will exhaust less than 1,000 cubic feet per minute.
      (2) Each portable exhauster will operate less than 4,176 hours per year.
      (3) A portion of the exhaust air can be recirculated back into the containment tent for cooling purposes.
      (4) All air can be exhausted, drawing fresh outside air into the containment tent.
      (5) Each portable exhauster will be equipped with a HEPA filter.

   b. CONTROLS

      (1) An air sample will be taken each day the containment tent is occupied and the exhauster is operating. The sample will be taken while work is ongoing. The sample will be of sufficient volume to detect 3.6 E-09 μCi/ml total ß and 9.3 E-12 μCi/ml total α.
      (2) A survey of the inlet to the HEPA filter will be taken and documented each day the containment is occupied.
      (3) Records supporting these conditions will be available in the field offices.

D. PIT DECONTAMINATION WITHIN TANK FARMS AND ANCILLARY FACILITIES

1. Application of various methods to reduce dose and contamination levels.

a. EXAMPLES

(1) Use of sprays/washes (up to 3,000 pounds per square inch) and fixatives. Initial wash down is with low-pressure sprays. Pit might be open at this time. Higher pressure sprays are done with the pit covered (i.e., cover blocks or work space barriers). Ventilation of the pit during decontamination is not required but air in-flow to the pit is preferred during these activities. Currently this only can be done in tank farms that have active, registered emission sources
(2) Use of HEPA vacuums within the contained areas.
(3) Removal and packaging of failed or reusable equipment.

b. CONTROLS

(1) RCT coverage during work evolution, with retrievable records*.
(2) Use of containment methods: closed, open-topped greenhouses.
(3) Use of sleeving and/or glovebags as appropriate for close decontamination and waste packaging.
(4) Use of work space barriers such as temporary, clear pit covers during washes as appropriate or possible.
(5) Use of active ventilation of workspace as appropriate, per the containment tent agreement in Section C.
(6) ALARA.

E. SIZE REDUCTION OF WASTE EQUIPMENT FOR DISPOSAL

1. Size-reducing, cutting, or disassembling contaminated equipment as appropriate for more economical waste packaging. The process is employed in full containment using only very rigorous bag-in/bag-out methods. The process could include sawing, snipping, sheering, etc. Containment is never lost during normal operations. The process involves only surface contamination.

a. EXAMPLES

(1) Waste jumpers from pits.
(2) Waste tank-level instrumentation.
(3) Waste sampling equipment such as drill strings or augers.
(4) Waste thermocouple trees, specific gravity probes, observation ports, or other equipment extracted from a tank.

b. CONTROLS

(1) RCT coverage during all work evolution, with retrievable records*.
(2) Use of containment methods: closed, open-topped greenhouses.
(3) Use of sleeving and/or glovebags (hard or soft) as appropriate.
(4) Use of work space barriers as appropriate or possible.
(5) Use of active ventilation of workspace as appropriate, per the containment tent agreement in Section C.
(6) ALARA.

F. REMOVAL OF CONTAMINATED EQUIPMENT FROM TANK FARM TANKS AND ANCILLARY FACILITIES

1. Removing contaminated equipment from SSTs, DSTs, or associated ancillary facilities. Equipment dimensions vary from 3.6 to 17 meters long and from 10.2 to 107 centimeters in diameter. Including but not limited to transfer pumps, instrument trees, steam coils, thermocouple trees, saltwell pumps and screens, and sampling or monitoring equipment. (Reference Sections A.1.a.3, B.1.a.1, B.2.a.3 and B.3.a.1.).

a. EXAMPLES (METHODS)

(1) Use of the manually operated flexible receiver

Equipment to be retrieved is equipped with a flexible sleeve of sufficient length as to provide complete, sealed containment during lifting from the tank. The equipment is rinsed, as appropriate, as it is retrieved, to minimize the contamination adhering to the surface. Radiation measurements are performed as the equipment is raised. If elevated levels of contamination are detected the equipment is re-rinsed. Once the equipment is fully retrieved, the process is stopped to allow time to drain any free liquids remaining from the flush. Once the sleeving bag is fully deployed, it is cinched tight, maintaining the containment seal, and separated from the tank riser. The riser is closed and the equipment is ready for waste packaging or repair.

(2) Use of the remotely operated, mobile flexible receiver

The operation involves connecting to/disconnecting from a tank riser, lifting the equipment, washing down the equipment, and bagging the equipment. The flex receiver is an improvement over existing methods of removal and packaging but does not preclude deployment of the manual method previously discussed.

The washing process uses preheated water pressurized up to 3,000 pounds per square inch and is done concurrent with the lifting process. Washing takes place outside the vapor space of the tank with waste and run-off being returned to the tank through the riser.

Once washed and dripped dry, the equipment is pulled through a radiation monitor spool assembly to monitor the amount of radioactivity remaining on the equipment. At this point, the flexible receiver bag, which expands as the equipment is being hoisted, is attached to the top of the lifting bail.

Once the equipment is pulled fully into the flexible receiver bag, a remotely operated mechanical sealing device crimps the bottom of the bag in two places. A scissoring device severs the bag between the two crimps, leaving a sealed top section (containing the equipment) and sealed bottom section that seals the riser opening. The bag is hoisted into position for secondary bagging of the first seal.

The bottom section is removed from the riser and disposed of under routine maintenance procedures and the riser is resealed.

b. CONTROLS

(1) RCT coverage as required by procedure, with retrievable records*. Applicable to removals at actively ventilated tanks.
(2) RCT coverage during the entire removal, with retrievable records*. Applicable to removals at passively ventilated tanks.
(3) Use of work area barriers as appropriate (i.e., wind control).
(4) ALARA.

G. CHARACTERIZATION ACTIVITIES

1. Activities done to determine physical, chemical, radiological, or psychrometric properties of a tank vapor space or waste. These activities only can temporarily disturb the vapor space, a small amount of waste or a small amount of radioactive material (i.e., surface contamination). Including deployment of remotely or manually operated equipment for data or sample gathering. (Reference Sections: A.4.a.1., B.1.a.2., B.2.a.2.).

a. EXAMPLES

(1) Push mode core sampling in soft tank waste.
(2) Auger sampling in soft tank waste.
(3) Use of the surface moisture measurement system.

(4) Use of the cone penetrometer.
(5) Use of the void fraction meter.
(6) Use of the waste viscometer.
(7) Vapor sampling (grab or continuous) of the vapor space or ventilation effluent stream.
(8) Taking psychrometric measurements of the vapor space or ventilation effluent stream.

b. CONTROLS

(1) RCT coverage for the entire activity, with retrievable records*. Applicable to activities at passively ventilated tanks.
(2) RCT coverage as required by procedure, with retrievable records*. Applicable to activities at actively ventilated tanks.
(3) Greenhouses/glovebags as appropriate.
(4) ALARA.

* Retrievable records are defined here as records available for WDOH inspection while the activity is ongoing, and all positive indications of airborne releases reported through the offnormal reporting system, or included in the annual dose estimation for Hanford Site activities.

APPENDIX B

DISCUSSION OF BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

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DISCUSSION OF BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

(Requirement 16)

Requirement 16 of WAC 246-247-060 is not applicable because best available radionuclide control technology (BARCT) emission equipment will be used in this NOC. The BARCT is defined by WAC 246-247-030 as follows:

> "Technology that will result in a radionuclide emission limitation based on the maximum degree of reduction for radionuclides from any proposed newly constructed or significantly modified emission units that the licensing authority determines is achievable on a case-by-case basis. A BARCT compliance demonstration must consider energy, environmental, and economic impacts, and other costs through examination of production processes, and available methods, systems and techniques for control of radionuclide emissions. A BARCT compliance demonstration is the conclusion of an evaluative process that results in the selection of the most effective control technology from all known feasible alternatives. In no event shall application of BARCT result in emissions of radionuclides that could exceed the applicable standards of WAC 246-247-040. Control technology that meets BARCT requirements also meets ALARCT requirements."

As stated in WAC 246-247-120, only those radionuclides comprising more than 10 percent of the unabated dose need to be evaluated. All of the dose is due to particulate radionuclides. The WDOH has provided guidance that HEPA filters generally are considered BARCT for particulate emissions (WDOH 1992).

It is proposed, pursuant to the citation above, that the ventilation control system (Section 8.0) be approved as BARCT for the proposed portable exhausters.

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APPENDIX C

EMISSION AND DOSE CALCULATIONS

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VERIFICATION OF SALT WELL RADIOLOGICAL CALCULATIONS

VENTILATION FLOW RATE	28.3	METER^3/MIN																
# HEPA FILTERS IN SER	2																	
HEPA FILTER EFFICIENC	99.95%																	
DOSE CONVERSION MREM/CURIE																		
	200-EAST	200-WEST																
TOTAL ALPHA (Am-241)	13.1	7.79																
TOTAL BETA (Sr-90)	4.38E-02	2.60E-02																
Cs-137	2.39E-02	1.42E-02																
							UNABATED			ABATED			UNABATED DOSE				ABATED DOSE		
TANK	LOCATION	TOTAL ALPHA pCi/LITER	TOTAL BETA pCi/LITER	Cs-137 pCi/LITER	ALPHA PER YEAR, Ci	BETA PER YEAR, Ci	Cs-137 PER YEAR, Ci	ALPHA PER YEAR, Ci	BETA PER YEAR, Ci	Cs-137 PER YEAR, Ci	ALPHA PER YEAR, mrem	BETA PER YEAR, mrem	Cs-137 PER YEAR, mrem	TOTAL UNABATED PER YEAR, mrem	ALPHA PER YEAR, mrem	BETA PER YEAR, mrem	Cs-137 PER YEAR, mrem	TOTAL ABATED PER YEAR, mrem
241-BY-105	200-EAST	0.003	0.01	0.1	4.46E-05	1.49E-04	1.49E-03	1.12E-11	3.72E-11	3.72E-10	5.85E-04	6.52E-06	3.56E-05	6.27E-04	1.46E-10	1.63E-12	8.89E-12	1.57E-10
241-BY-106	200-EAST	0.01	0.03	0.1	1.49E-04	4.46E-04	1.49E-03	3.72E-11	1.12E-10	3.72E-10	1.95E-03	1.95E-05	3.56E-05	2.00E-03	4.87E-10	4.89E-12	8.89E-12	5.01E-10
241-S-101	200-WEST	0.258	1.99	26.9	3.84E-03	2.96E-02	4.00E-01	9.59E-10	7.40E-09	1.00E-07	2.99E-02	7.70E-04	5.68E-03	3.63E-02	7.47E-09	1.92E-10	1.42E-09	9.09E-09
241-S-106	200-WEST	0.609	2.06	28	5.50E-03	1.59E-02	7.44E-03	1.38E-09	3.98E-09	1.86E-09	4.29E-02	4.14E-04	1.06E-04	4.34E-02	1.07E-08	1.03E-10	2.64E-11	1.08E-08
241-S-109	200-WEST	0.058	0.32	0.25	9.06E-03	3.06E-02	4.16E-01	2.26E-09	7.66E-09	1.04E-07	7.06E-02	7.97E-04	5.91E-03	7.73E-02	1.76E-08	1.99E-10	1.48E-09	1.93E-08
241-S-111	200-WEST	0.5	0.8	0.1	7.44E-03	1.19E-02	1.49E-03	1.86E-09	2.97E-09	9.30E-10	5.72E-03	1.24E-04	5.28E-05	6.90E-03	1.68E-09	3.09E-11	1.32E-11	1.72E-09
241-SX-102	200-WEST	0.003	0.1	0.1	4.46E-05	1.49E-03	1.49E-03	1.12E-11	3.72E-10	3.72E-10	5.79E-02	3.09E-04	2.11E-05	5.83E-02	1.45E-08	7.73E-11	5.28E-12	1.46E-08
241-SX-103	200-WEST	0.63	0.78	0.1	9.37E-03	1.16E-02	1.49E-03	2.34E-09	2.90E-09	3.72E-10	7.30E-02	3.02E-04	2.11E-05	7.33E-02	1.82E-08	7.54E-11	5.28E-12	1.83E-08
241-SX-106	200-WEST	0.27	0.77	0.1	4.16E-03	7.59E-03	1.49E-03	1.04E-09	1.90E-09	3.72E-10	3.24E-02	1.97E-04	2.11E-05	3.27E-02	8.11E-09	4.93E-11	5.28E-12	8.17E-09
241-U-103	200-WEST	0.21	0.01	0.1	4.02E-03	1.15E-02	1.49E-03	1.00E-09	2.86E-09	3.72E-10	3.13E-02	2.98E-04	2.11E-05	3.16E-02	7.82E-09	7.44E-11	5.28E-12	7.90E-09
241-U-105	200-WEST	0.02	0.08	0.1	3.12E-03	1.49E-04	1.49E-03	7.81E-10	3.72E-11	3.72E-10	2.43E-02	3.87E-06	2.11E-05	2.44E-02	6.08E-09	9.67E-13	5.28E-12	6.09E-09
241-U-107	200-WEST	0.005	0.05	0.1	2.97E-04	1.19E-03	1.49E-03	7.44E-11	2.97E-10	3.72E-10	2.32E-03	3.09E-05	2.11E-05	2.37E-03	5.79E-10	7.73E-12	5.28E-12	5.92E-10
241-U-108	200-WEST	0.03	0.16	0.1	7.44E-05	7.44E-04	1.49E-03	1.86E-11	1.86E-10	3.72E-10	5.79E-04	1.93E-05	2.11E-05	6.20E-04	1.45E-10	4.83E-12	5.28E-12	1.55E-10
241-U-109	200-WEST	0.22	0.31	0.1	4.46E-04	2.38E-03	1.49E-03	1.12E-10	5.95E-10	3.72E-10	3.48E-03	6.19E-05	2.11E-05	3.56E-03	8.69E-10	1.55E-11	5.28E-12	8.90E-10
241-U-111	200-WEST	0.05	0.2	0.1	3.27E-03	4.61E-03	1.49E-03	8.18E-10	1.15E-09	3.72E-10	2.55E-02	1.20E-04	2.11E-05	2.56E-02	6.37E-09	3.00E-11	5.28E-12	6.41E-09
TOTALS					7.44E-04	2.97E-03	1.49E-03	1.86E-10	7.44E-10	3.72E-10	5.79E-03	7.73E-05	2.11E-05	5.89E-03	1.45E-09	1.93E-11	5.28E-12	1.47E-09
					5.24E-02	1.38E-01	8.47E-01	1.31E-08	3.44E-08	2.12E-07	4.10E-01	3.59E-03	1.21E-02		1.02E-07	8.97E-10	3.01E-09	1.06E-07

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