U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

0089032

JUL 0 2 2010

10-ESQ-210

Mr. John Martell, Manager
Radioactive Air Emissions Section
Washington State Department of Health
309 Bradley Blvd., Suite 201
Richland, Washington 99352
(Hanford Mailstop: B1-42)

Dear Mr. Martell:

U.S. DEPARTMENT OF ENERGY, OFFICE OF RIVER PROTECTION (ORP) REQUEST FOR APPROVAL OF THE RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION (NOC) APPLICATION FOR THE E-525 DOUBLE-SHELL TANK (DST) TRANSFER SYSTEM MODIFICATONS PROJECT REVISION 1

ORP is requesting approval from the Washington State Department of Health (WDOH) on the attached Radioactive Air Emissions NOC Application for the E-525 DST Transfer System Modifications Project Revision 1. This revised NOC is being submitted in compliance with Washington Administrative Code 246-247, Radiation Protection – Air Emissions, as amended. This project is funded under the American Recovery and Reinvestment Act Program.

ORP is requesting approval of the subject application to replace existing transfer lines in order to provide a Resource Conservation and Recovery Act compliant system. The replacement system will be an improvement to the existing system.

This revised application includes changes to the E-525 DST Transfer System Modifications Project. This NOC is cited in the Hanford Site Title V Air Operating Permit #00-05-006, Revision 1, Emission Unit Identification Number 486, NOC Identification Number 688, issued under Approval Order letter AIR 08-1104.

Through discussions with WDOH, to complete the work described under Project E-525 and to add the additional scope of the replacement of two transfer lines not identified in the NOC, a revision to the NOC was determined to be necessary.

5-2-3

If you have any questions, please contact me, or your staff may contact Dennis W. Bowser, Environmental Division, (509) 373-2566.

Sincerely,

James A. Winkler
for

Shirley J. Olinger, Manager
Office of River Protection

ESQ:DWB

Attachment

cc w/attach:
O. S. Wang, Ecology
R. H. Anderson, MSA
J. Schmidt, WDOH Richland Office
Administrative Record
Environmental Portal, LMSI
WRPS Correspondence

cc w/o attach:
J. A. Bates, CHPRC
J. Cox, CTUIR
S. Harris, CTUIR
S. L. Dahl, Ecology
D. Hendrickson, Ecology
G. Bohnee, NPT
K. Niles, Oregon Energy
M. F. Jarvis, RL
F. R. Miera, WRPS
L. L. Penn, WRPS
R. Jim, YN

Attachment
10-ESQ-210
(49 Pages)

Radioactive Air Emissions Notice of Construction Application for the E-525 Double-Shell Tank Transfer System Modifications Project, Revision 1

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION APPLICATION FOR THE E-525 DOUBLE-SHELL TANK TRANSFER SYSTEM MODIFICATIONS PROJECT REV 1.

An American Recovery and Reinvestment Act Project

Prepared by **Washington River Protection Solutions, LLC**
Richland, WA 99352

Date Published
June 2010

United States Department of Energy
Office of River Protection
P.O. Box 550
Richland, Washington

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FIGURES

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TERMS

ALARACT	as low as reasonably achievable control technology

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
COB	clean out boxes
DST	double-shell tank
Ecology	State of Washington, Department of Ecology
EPA	the U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air
MEI	maximally exposed individual
MPR	maximum public receptor
NOC	notice of construction
PTE	potential to emit
RCRA	*Resource Conservation and Recovery Act of 1976*
RPP	River Protection and Implementation Project
SEPA	State Environmental Policy Act
TEDE	total effective dose equivalent
WAC	*Washington Administrative Code*
WDOH	Washington State Department of Health
WFD	waste feed delivery
WTP	Waste Treatment Plant

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
Inches	25.40	Millimeters	millimeters	0.0393	Inches
Inches	2.54	Centimeters	centimeters	0.393	Inches
Feet	0.3048	Meters	meters	3.2808	Feet
Yards	0.914	Meters	meters	1.09	Yards
Miles	1.609	Kilometers	kilometers	0.62	Miles
Area			**Area**		
square inches	6.4516	Square centimeters	square centimeters	0.155	Square inches
square feet	0.092	Square meters	square meters	10.7639	Square feet
square yards	0.836	Square meters	square meters	1.20	Square yards
square miles	2.59	Square kilometers	square kilometers	0.39	Square miles
Acres	0.404	Hectares	hectares	2.471	Acres
Mass (weight)			**Mass (weight)**		
Ounces	28.35	Grams	grams	0.0352	ounces
Pounds	0.453	Kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	Milliliters	milliliters	0.03	fluid ounces
Quarts	0.95	Liters	liters	1.057	Quarts
Gallons	3.79	Liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76456	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Force/Pressure			**Force/Pressure**		
pounds per square inch	6.895	Kilopascals	kilopascals	1.4504×10^{-1}	pounds per square inch

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

INTRODUCTION

This modified Application includes changes to the E-525 Double-Shell Tank (DST) Transfer System Modifications Project. This NOC is cited in the Hanford Site Title V Air Operating Permit (AOP) #00-05-006, Revision 1, Emission Unit Identification Number 486, NOC Identification Number 688, issued under Approval Order letter AIR 08-1104, dated 11/10/08. The prior AIR 08-1104 approval order required a total abated and unabated emission limit for this Notice of Construction to be limited to 5.9E-03 mrem/year to the maximally exposed individual (MEI).

This NOC modification is being submitted as a result of:

1. A change in the estimated volume of soil excavation for removing 241-SY transfer lines in the 200 West Area and installation of the AZ-102 condensate drain lines in the 200 East Area.
2. Added transfer lines SN-278 and SN-279 to the SY Transfer Line Modifications – Package 3, Table 3. The revised estimated volume includes the addition of transfer lines SN-278 and SN-279.
3. A change in the estimated number of 3-inch pipe cuts associated with removal of 241-SY transfer lines SL-177, SN-277, SL-180, SN-280, SN-285, SN-286, SN-278 and SN-279 in the 200 West Area. The revised estimated 3-inch pipe cuts are 230 cuts.
4. A change in the estimated potential to emit from the additional 3-inch pipe cuts.
5. A change in the TEDE to the MEI
6. The calculations for the revised 230-3-inch pipe cut were updated inclusive of 2-inch pipe cuts based upon the latest CAP-88 dose factors included in DOE/RL-2006-29, Revision 0, dated May 2006.

This modified Notice of Construction (NOC) is submitted for approval in accordance with *Washington Administrative Code* (WAC) 246-247-060, *Applications, Registration and Licensing*, for the E-525 Double-Shell Tank (DST) Transfer System Modifications Project Rev 1. Additionally, pursuant to 40 CFR 61.09 (a)(1), *National Emission Standards for Hazardous Air Pollutant*, this application also is intended to provide anticipated initial start-up notification. It is requested that the Washington Department of Health (WDOH) approval of this application also will constitute EPA acceptance of the initial start-up notification.

The total effective dose equivalent (TEDE) to the offsite MEI for purposes of this NOC is estimated to be 3.7E-02 mrem/yr without controls as summarized in Table 7. The total radiological dose for 2008 to the MEI from all Hanford Site point radionuclide emissions, including radon, was 0.11 mrem.

1.0 FACILITY IDENTIFICATION AND LOCATION

Regulatory Citation: Name and address of the facility, and location (latitude and longitude) of the emission unit(s).

Work will be performed at the U.S. Department of Energy Hanford Site, 200 East and 200 West Areas, Richland, Washington, in the following tank farms: 241-AN, 241-AW, 241-AY, 241-AZ, and 241-SY. Work also will be performed in the 241-204 AR Waste Unloading Facility and within the boundaries of 241-AZ-702 and the 242-A Evaporator Facility.

1.1 COORDINATES

Table 1. Emission Points For Each Work Area.

Facility	North Latitude	West Longitude
241-AN Tank Farm	46° N 33' 22"	119° W 30' 59"
241-AW Tank Farm	46° N 33' 10"	119° W 31' 03"
241-AY Tank Farm	46° N 33' 17"	119° W 31' 02"
241-AZ Tank Farm	46° N 33' 19"	119° W 31' 03"
241-SY Tank Farm	46° N 32' 26"	119° W 37' 40"
204-AR Building	46° N 33' 06"	119° W 31' 09"
242-A Evaporator	46° N 33' 09"	119° W 31' 01"
241-AZ-702 Building	46° N 33' 19"	119° W 31' 03"

2.0 RESPONSIBLE MANAGER

Regulatory Citation: Name, title, address, and phone number of the responsible manager.

Ms. S. J. Olinger, Manager
Office of River Protection
U.S. Department of Energy
Post Office Box 450
Richland, Washington, 99352-0450
(509) 372-3062

3.0 PROPOSED ACTION

Regulatory Citation: Identify the type of proposed action for which this application is submitted: (a) Construction of new emission units(s); (b) Modification of existing emission units(s); identify whether this is a significant modification; (c) Modification of existing unit(s), unregistered.

The proposed action is a non-significant modification of an existing emission unit. Significant is defined in WAC 246-247-030 as "the potential-to-emit airborne radioactivity at a rate that could increase the TEDE to the maximally exposed individual (MEI) by at least 1.0 mrem/yr as a result of a proposed modification."

The objective of Project E-525 was to bring selected portions of the DST system into conformance with regulatory, safety, and contractual requirements. Project E-525, in performing these modifications, brought these portions of the DST transfer system into compliance with *Resource Conservation and Recovery Act of 1976* (RCRA) standards.

This work was responsive to a directive by the State of Washington, Department of Ecology (Ecology) to comply with DOE-RL-93-69, "Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)," Milestone M-43-00, *Upgrades Complete*. M-43-00 has been completed. The proposed project will bring into compliance transfer lines that were placed on a deferred list for future upgrade outside Milestone M-43-00.

The modification was accomplished by performing the following work package activities:

- 241-AZ-151 Catch Tank Bypass - Package 1 (pending)
- 241- AN and 241-AW Tank Farm Clean Out Box (COB) Transfer Line Modifications - Package 2 (completed)
- 241-SY Tank Farm Transfer Line Modifications - Package 3 (pending)
- 204-AR Waste Transfer Facility Transfer Line Modification - Package 4 (pending)

Work activities with potential-to-emit (PTE) for which approval is requested are pipe cutting, pit work, and soil excavation.

4.0 STATE ENVIRONMENTAL POLICY ACT OF 1971

Regulatory Citation: If this project is subject to the requirements of the State Environmental Policy Act (SEPA) contained in chapter 197-11 WAC, provide the name of the lead agency, lead agency contact person, and their phone number.

The proposed action is categorically exempt from the requirements of the *State Environmental Policy Act* under WAC 197-11, "SEPA Rules, Section WAC 197-11-845, Department of Social and Health Services."

5.0 CHEMICAL AND PHYSICAL PROCESS

Regulatory Citation: Describe the chemical and physical processes upstream of the emission unit(s).

5.1 241-AZ-151 CATCH TANK BYPASS – PACKAGE 1

The modification description for the 241-AZ-151 catch tank bypass modification includes the installation of a new RCRA-compliant condensate distribution system for condensate generated from the existing 241-AZ-702 ventilation system. This will involve tapping into existing ventilation headers. This work will be done according to ALARACT 16 requirements. This new system will consist of a 1200 gallon capacity catch tank (241-AZ-301), secondary containment, piping, pumps, and controls. The system is designed to collect condensate at rate of 0.29 gallons per minute (154,424 gallons per year). The tank

will be emptied every 2 to 3 days. At that time, the condensate will be pumped back to one of the 241-AY or 241-AZ tanks at a rate of 4 to 5 gallons per minute. Condensate accumulation is currently estimated at between 6000 to 8000 gallons per month- 72,000 to 96,000 gallons per year.

The new 241-AZ-301 tank and system will be located outside the northeast corner of building 241-AZ-702. Most of the secondary containment structure will be located below grade (except for the cover that will be located above grade) to provide operator access and remote valve operation. A HEPA filter will also be installed above grade. This filter will be connected to 241-AZ-301 tank and will be used as the vent for the 241-AZ-301 tank.

The lower level of the fabricated tank system will contain the receiver tank for the condensate coming from the AZ-PC-SP-1 seal pot via line AZ-503. Other components housed in the lower level will include the sump, sump suction line, tank suction piping, tank return piping, tank vent lines, instrument access risers, leak detection, and freeze protection, as required.

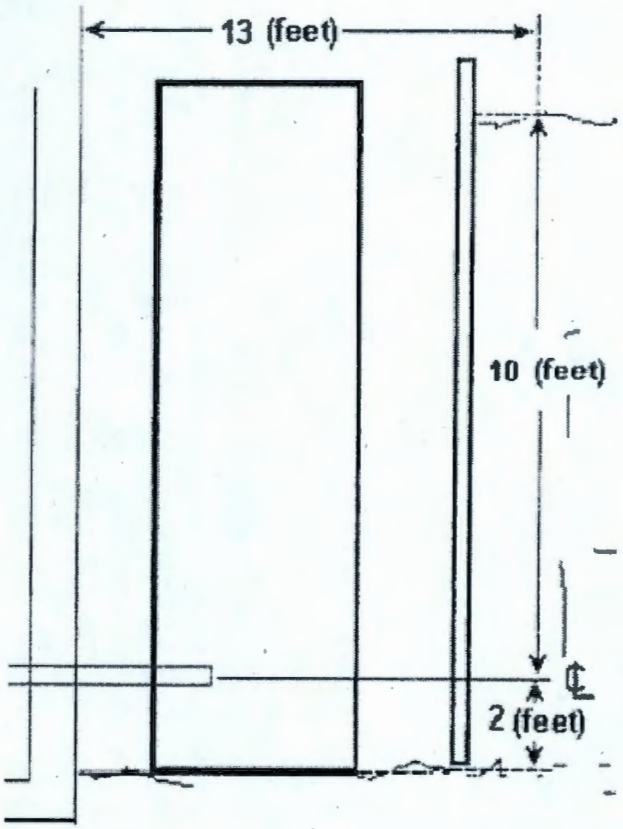
The upper level of the fabricated tank system will contain the distribution pumps, valves, instrumentation, and controls. Operator access will be provided as required (e.g., access ladder, door in system cover, mid-level grating to support operator). Distribution valves will be located to provide the ability to use remote valve actuators. Freeze protection for the piping, pumps, and valves will be used as required.

The AZ-PC-SP-1 seal pot is located in the 241-AZ-702 building and this seal pot serves as a collection point for condensate originating from the 241-AZ-702 ventilation system. The 241-AZ-702 ventilation system provides primary tank ventilation for the 241-AY and 241-AZ DSTs. The existing 241-AZ-151 catch tank would be isolated in a separate effort to support other commitments.

Currently there are two drain paths into the 241-AZ-151 catch tank that will remain active after June 30, 2005. Those two drain paths are the condensate from the 241-AZ-702 facility and the 241-AZ-801A floor drain. The 241-AZ-702 condensate drain line will be rerouted to the 241-AY tanks and also to the 241-AZ tanks. In addition, the 241-AZ-801A floor drain will be isolated. In addition to the installation of a drain line to AZ-102, a new jumper will be installed in the 241-AZ-02A pit. This work will be accomplished under ALARACT 4,6,14 and 15.

Figure 1. Depiction of 241-AZ-151 excavation work

241-AZ-702 excavation volume



Hole dimensions
13 x 13 x 12 (feet) = 2028 (cu ft)
2028 (cu ft) / 27 (cu ft/(cu yd) = 75 (cu yds)

There are 4 drain line runs. One to each of the AY and AZ Double Shell Tanks

Per AE estimate for drain line runs:
508 (cu yds) or 13722 (cu ft)

Total Excavation Volume 15750 (cu ft) or 583 (cu yds)

5.2 241-AN & 241-AW CLEAN OUT BOX TRANSFER LINE MODIFICATIONS – PACKAGE 2

Some of the transfer lines associated with 241-AN tank farm, 241-AW tank farm, and the 242-A-Evaporator facilities were constructed with clean out boxes (COBs). A COB provides access to transfer lines in case of line plugging. Sixteen COBs have been identified on transfer lines that will remain operational after June 30, 2005.

These COBs will have the upper portion of the structure cut off, caps welded on the primary pipes and encasements, and the upper structure of the COB will be isolated and disposed. That modification will entail approximately 100 one-inch pipe cuts, and approximately 230- three- inch pipe cuts for SY transfer lines bounding any possible two-inch pipe cuts. The primary transfer lines and encasement pipes will be capped on the branch section and welded to the COB structure. The COBs are not currently compliant for several reasons, including:

- The COBs do not have an operational drain and do not have adequate minimum volume to act as secondary containment for the primary pipe
- The COBs are not pressure tight and cannot meet the 60 psig pressure rating of the encasement piping system.

Therefore, because the transfer lines associated with COBs will remain operational, the COBs must either be modified to be regulatory compliant or deactivated/isolated and removed.

The AN and AW Farms COB design consists of a 24-inch diameter steel cylinder formed from 1/4-inch thick rolled steel plate and mounted on a 12-inch vertical encasement pipe. The vertical encasement extends about four feet below grade to the slurry transfer line. A concrete anchor block supports the COB, encasement, and transfer pipe.

The 16 COBs to be deactivated and/or isolated by the E-525 Project are:

AN FARM

- COB-AN-7, COB-AN-8, COB-AN-9

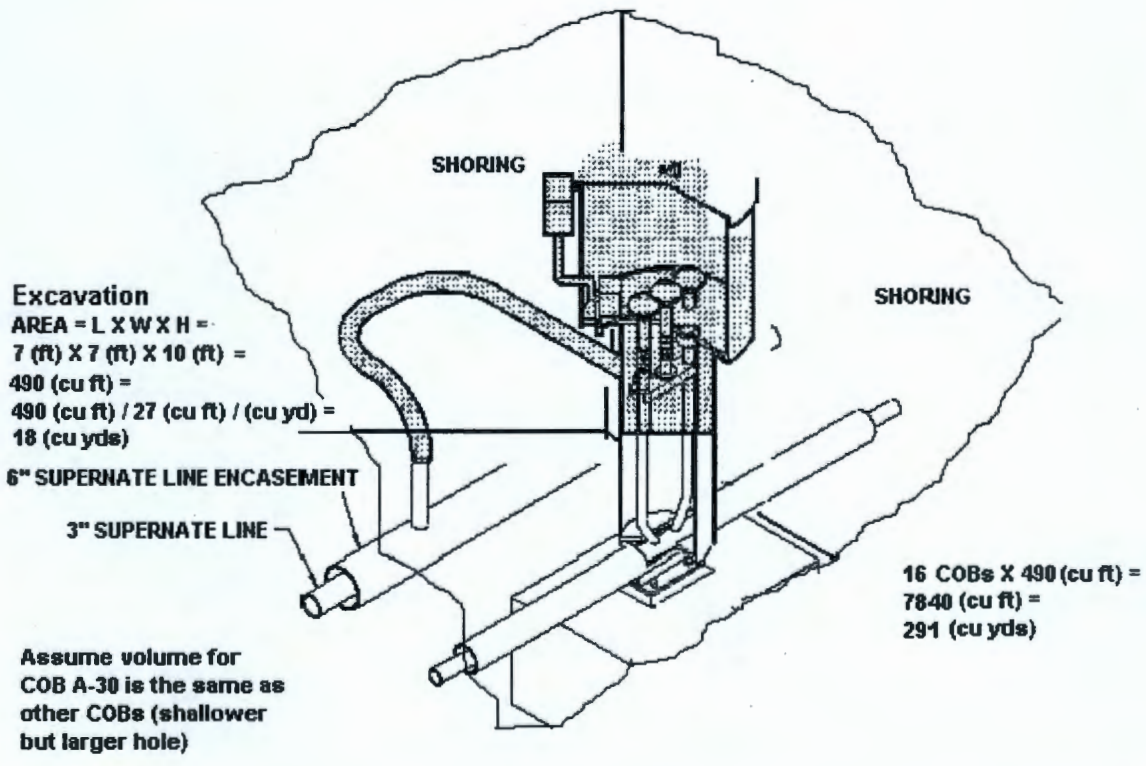
AW FARM

- COB-AW-1, COB-AW-2, COB-AW-3, COB-AW-4, COB-AW-5, COB-AW-6, COB-AW-7, COB-AW-8, COB-AW -9, COB-AW-10, COB-AW-11, COB-AW-12

242-A Evaporator

- COB-A-30

Figure 2. Clean Out Box Modification Work



In addition to the COB modifications and the 241-AN and 241-AW transfer line modifications, entry into tank farm pits will be necessary to complete this package. The pit work will involve removal of jumpers, post modification testing, and administrative isolation (e.g. lock and tag). Not all activities will be performed in each pit. The pits involved are those listed in the following table, Table 2.

Table 2. Clean Out Box Transfer Line Modification – Package 2

Pit	Number of Entries	Reason for Entries
241-AN-A	6	Post modification pressure tests and removal of jumpers.
241-AN-B	3	Post modification pressure testing, jumper removal, and lock and tag isolation.
241-AN-01A	3	Post modification pressure testing and jumper removal.
241-AN-04A	3	Post modification pressure testing and jumper removal.
241-AN-07A	3	Post modification pressure testing and jumper removal.
241-AW-02E	6	Post modification pressure testing and jumper removal.
241-AW-02D	1	Post modification pressure testing of encasements.
241-AW-05A	3	Post modification pressure testing and jumper removal.
241-AW-06A	3	Post modification pressure test and jumper removal.
241-AW-A	6	Post modification pressure testing and jumper removal.
241-AW-B	6	Post modification pressure testing and jumper removal.
242-A Evaporator	2	Post modification

5.3 SY TRANSFER LINE MODIFICATIONS – PACKAGE 3

Work under this package will involve excavating and removing the lines identified in Table 3. Each line to be removed, cut into sections, and disposed of in accordance with the tank farm solid waste disposal procedures. Pit walls will be core drilled as needed to accommodate the new pipe-in-pipe RCRA compliant configuration.

Excavation for the 241-SY tank farm line modification work will be between the pits listed in Table 3. Pipe trenches will be excavated to remove and install the new transfer lines. Approximately 230 – 2 and 3 inch pipe cuts will be involved when removing the old transfer lines. Excavation will be accomplished with the guzzler and hand digging.

Table 3. 241-SY Tank Farm Transfer Lines and Pit/Nozzle End Points.

Line Number	SIZE	End Point 1	End Point 2
SL-177	2"	102-SY-Pump Pit	SY-A-Valve Pit
SN-277	3"	102-SY Pump Pit	SY-A-Valve Pit
SN-285	3"	102-SY Pump Pit	SY-A-Valve Pit
SL-180	2"	SY-A-Valve Pit	SY-B-Valve Pit
SN-280	3"	SY-A-Valve Pit	SY-B-Valve Pit
SN-286	3"	102-SY-Pump Pit	SY-B-Valve Pit
SN-278	3"	101-SY-Pump Pit	SY-B-Valve Pit
SN-279	3"	103-SY-Pump Pit	SY-B-Valve Pit

In addition to the transfer line modification work within this package, entry into tank farm pump and valve pits will be necessary. The pit work will involve such activities as removal of jumpers. Not all activities will be performed in each pit. The pits involved are listed in Table 4 and 5.

Table 4. SY Transfer Line Modification - Package 3.

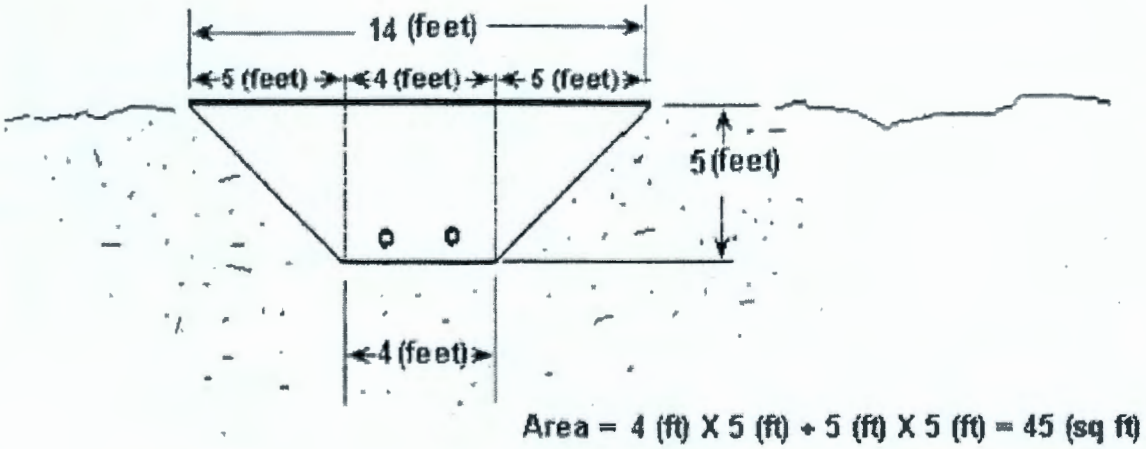
Pit	Number Of Entries	Reason for Entries
241-SY-02A	4	Core drilling, installation for new nozzles and post modification pressure testing.
241-SY-A	6	Core drilling for new nozzles and post modification pressure testing.
241-SY-B	5	Core drilling for new nozzles and post modification pressure testing.
241-SY-01A	2	Core drilling for new nozzles and post modification pressure testing.
241-SY-03A	2	Core drilling for new nozzles and post modification pressure testing.

Table 5: AZ Jumper Replacement

Pit	Number Of Entries	Reason for Entries
AZ-02A	2	Remove cover block to remove and install jumper.

Figure 3. 241-SY Transfer Line Modifications - Package 3

E-525 SY Tank Farm Soil Estimate



Lengths

SN-277/SL-177	113(ft)	45 (sq ft) x 113 (ft) = 5085 (cu ft)
SN-285/SN-286	215(ft)	45 (sq ft) x 215 (ft) = 9675 (cu ft)
SN-280/SL-180	30 (ft)	45 (sq ft) x 30 (ft) = 1350 (cu ft)
SN-278/SN-279	210(ft)	45 (sq ft) x 210 (ft) = 9450 (cu ft)
	Total	25560 (cu ft)

25560 (cu ft) / 27 (cu ft) / (cu yd) = 947 (cu yds)

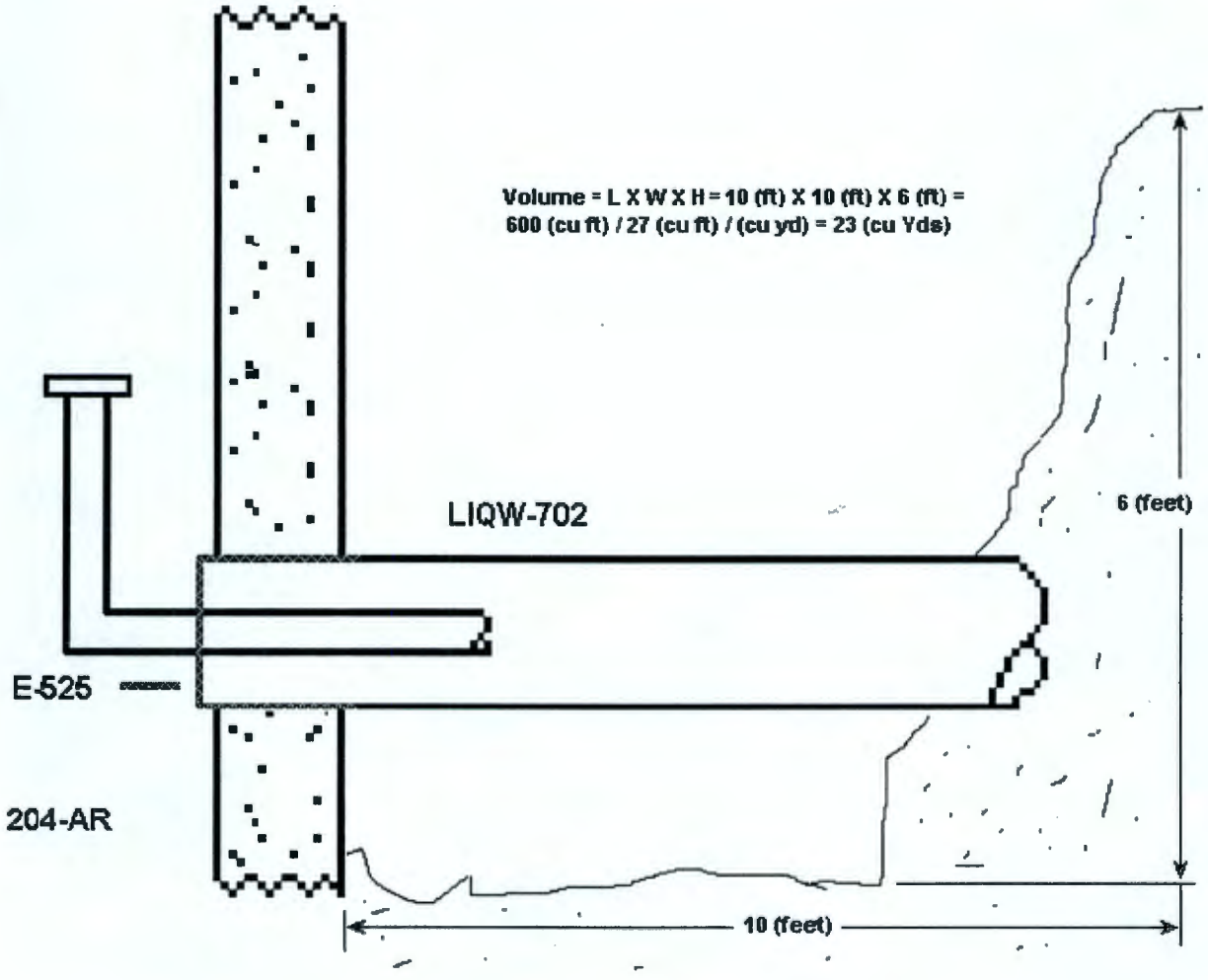
5.4 204-AR TRANSFER LINE MODIFICATION – PACKAGE 4

The 204-AR Waste Unloading Facility will continue to be in operation after

June 30, 2005. Waste transfer line LIQW-702 will be modified to extend the transfer line encasement through the pit wall. This pipe is buried approximately three and a half feet below grade, so the excavated area will be approximately 10' x 10' x 6'. A portion of the slab under an old laundry facility and a section of the asphalt surface adjacent to the doorstep of the facility will require demolition for access.

The new encasement section will be open-ended, upstream of the exterior wall seal plate. The obsolete air purge connection to the existing encasement pipe will be removed.

Figure 4. 204 AR Unloading Facility Waste Transfer Line Modification - Package 4.



6.0 ABATEMENT TECHNOLOGY

Regulatory Citation: Describe the existing and proposed (as applicable) abatement technology. Describe the bases for the use of the proposed system. Include expected efficiency of each control device, and the annual average volumetric flow rate(s) in meters^3/sec for the emission units(s).

6.1 PIT WORK ABATEMENT

Pit work will be performed in accordance with as low as reasonably achievable control technology (ALARACT) Demonstrations, (HNF-4327) ALARACT Demonstrations 6, 13, and 14, *TWRS ALARACT Demonstration for Pit Access, TWRS ALARACT Demonstration for Installation, Operation, and Removal of Tank Equipment,* and *TWRS ALARACT Demonstration for Pit Work,* respectively.

Packaging and Transportation of waste will be handled in accordance with ALARACT Demonstration 4, *TWRS ALARACT Demonstration For Packaging and Transportation of Waste* (HNF-4327).

6.2 SOIL EXCAVATION ABATEMENT TECHNOLOGES

Because of the possibility of encountering previously undetected subsurface contamination, work within a tank farm will be performed in accordance with appropriate radiological controls and the River Protection and Implementation Project (RPP) as low as reasonably achievable. These requirements are carried out through work packages and associated radiological work permits.

Manual soil excavation activities will be performed in accordance with ALARACT Demonstration 5, *TWRS ALARACT Demonstration for Soil Excavation (Using Hand Tools).* For guzzler excavation within the 200 Area Tank Farm Complex controls will be those in the latest WDOH approved NOC for a regulated Guzzler. The potential-to-emit calculations were based on hand excavation.

For guzzler excavation, monitoring will be performed as discussed in the latest WDOH approved NOC, "Operation of the Guzzler in the Tank Farm Facilities." o A Guzzler tracking log will be used to track emissions. Periodic confirmatory measurements will be performed in accordance with the WDOH approved NOC.

Clean soil piles may be moved from one place to another within the tank farm with heavy equipment (i.e., backhoe or front-end loader). Soil excavation outside the tank farm fence in non-contaminated areas also may be performed with heavy equipment. If contamination is discovered in areas to be excavated outside the tank farm fence, ALARACT 5 will be followed.

6.3 PIPE CUT ABATEMENT TECHNOLOGIES

Containment in accordance with the latest revision of RPP-7933, *"Radiological Containment Selection, Design and Specification Guide,"* will be used for cutting of waste transfer lines and contaminated piping. Surveys of the exterior and/or interior of the pipe will be used to determine containment selection. Continuous health physics technician coverage is used to ensure control if unexpected changes in radiological conditions occur.

6.4 PASSIVE VENTILATION FOR THE 241-AZ-301 CATCH TANK

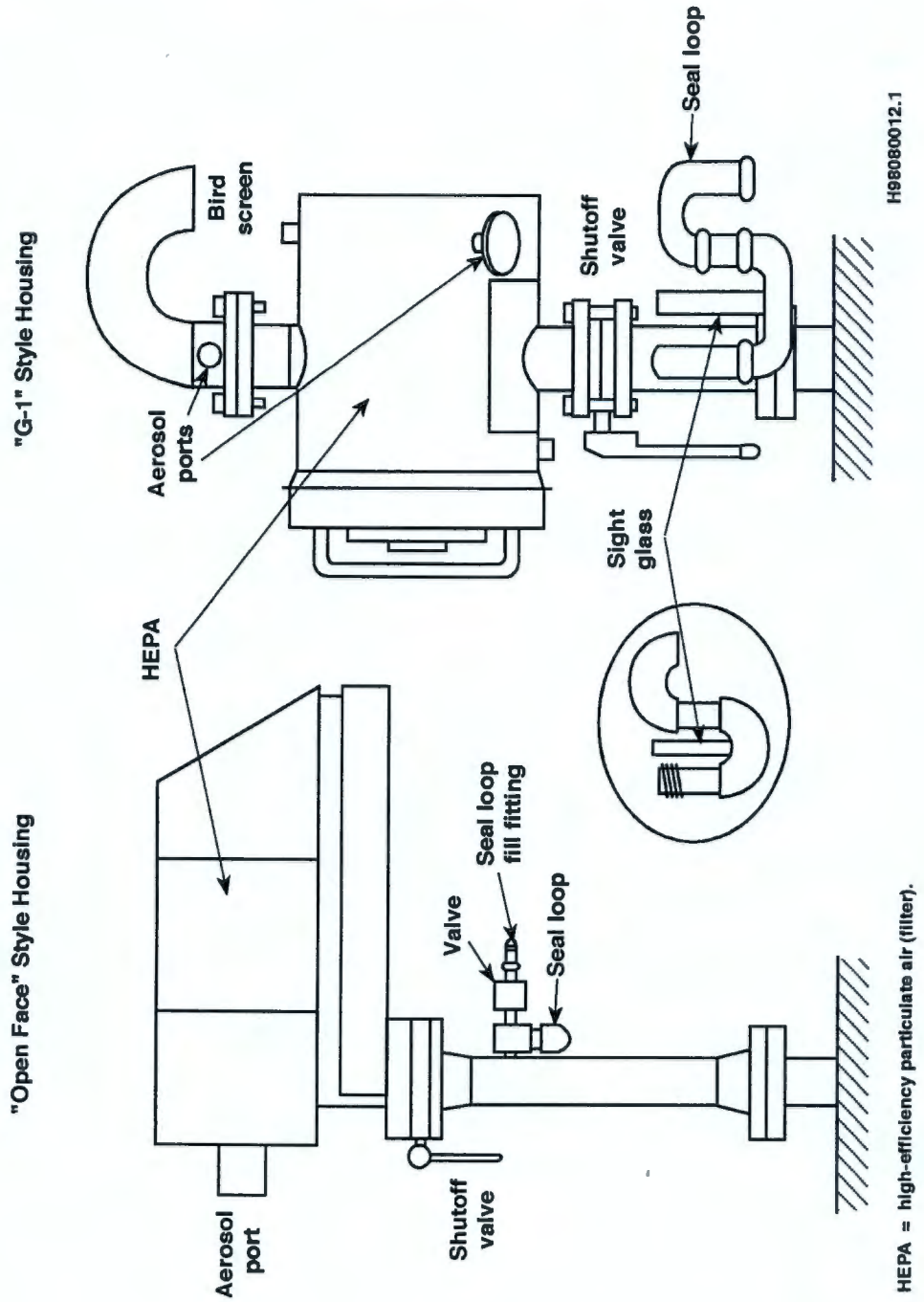
Currently, the 241-AZ-151 catch tank is vented through the 241-AZ-702 ventilation system. The 241-AZ-301 catch tank will be ventilated using a HEPA filter with a manufacturer rated removal efficiency of 99.97 percent. This passive ventilation system will produce variable flow rate through the tank, primarily dependent upon atmospheric pressure fluctuations and temperature differences between the tank headspace and atmosphere. Nominal passive flow rate through a passive tank ventilation have been estimated to be between 4 to 10 cubic feet per minute (cfm). Air flows due to condensate collection into this tank and pumping out of this tank have been estimated to be between 0.027 cfm to 0.668 cfm. For tie-ins to a contaminated ventilation system to install condensate lines, ALARACT 16, *Tank Farm ALARACT Demonstration For Work On Potentially Contaminated Ventilation System Components,* will be followed.

7.0 DRAWING OF CONTROLS

Regulatory Citation: Provide conceptual drawings showing all applicable control technology components from the point of entry of radionuclides into the vapor space to release to the environment.

Proposed controls are administrative. See Figures 1 through 4. Controls proposed for the 241-AZ-301 catch tank is a breather HEPA filter installed in a G-1 style housing unit. Figure 5 depicts a typical G-1 style housing unit used for tank passive breathing ventilation systems. The figures do not show the ventilation system tie-ins covered under ALARACT 16.

Figure 5. Typical Breather Filter Configuration



8.0 RADIONUCLIDES OF CONCERN

Regulatory Citation: Identify each radionuclide that could contribute greater than ten percent of the potential-to-emit TEDE to the MEI, or greater than 0.1 mrem/yr potential-to-emit TEDE to the MEI.

Radionuclides that could contribute greater than 10 percent of the PTE TEDE to the MEI or greater than 0.1 mrem/yr PTE TEDE to the MEI are: Sr-90, Am-241, and Cs-137. This is based upon applying the CAP 88 PC values listed in HNF-3602, Revision 1 (for the 200 West Area), directly to the inventory listed in Section 10. Appendices A through D contain tables that summarize the PTE for the project pipe cutting activities. Appendix E contains a table that summarizes the PTE for the pit work. Appendix contains a table that summarizes the PTE for soil excavation.

9.0 EFFLUENT MONITORING SYSTEM

Regulatory Citation: Describe the effluent monitoring system for the proposed control system. Describe each piece of monitoring equipment and its monitoring capability, including detection limits, for each radionuclide that could contribute greater than ten percent of the potential-to-emit TEDE to the MEI, or greater than 0.1 mrem/yr potential-to-emit TEDE to the MEI, or greater than twenty-five percent of the TEDE to the MEI, after controls. Describe the method for monitoring or calculating those radionuclide emissions. Describe the method with detail sufficient to demonstrate compliance with the applicable requirements.

The potential, unabated total effective onsite dose for all associated activities for the E-525 Project is 3.7E-02 mrem/yr. Therefore, in accordance with 40 CFR 61, Subpart H, continuous monitoring will not be performed to verify emissions.

Soil Excavation

For manual excavation, monitoring will be performed as discussed in the latest approved version of ALARACT Demonstration 5, *ALARACT Demonstration for Soil Excavation (Using Hand Tools,* HNF-4327. For guzzler excavation, monitoring will be performed as discussed in the latest approved NOCs for the guzzler, AIR 98-037 and AIR 98-1215.

Pit Work

Monitoring will be performed as discussed in the latest approved version of ALARACT Demonstrations 6, *ALARACT Demonstrations for Pit Work*; 13, *ALARACT Demonstration for Installation, Operation, and Removal of Tank Equipment*; and 14, *ALARACT Demonstration for Pit Work.* If a portable temporary radioactive air emission unit is used, monitoring will be performed as discussed in the latest approved notice of construction for the portable temporary radioactive air emission unit.

Pipe Cuts

Continuous monitoring by a health physics technician will occur during cutting of the pipe. Contamination surveys will be performed as required by the latest revision of RPP-7933.

Passive Ventilation of the 241-AZ-301 Catch Tank

The passive ventilation system on 241-AZ-301 will not have any type of monitoring instrumentation associated with it for the monitoring of radionuclides. As such the Hanford Site Operating Permit 00-05-006 has defined periodic confirmatory monitoring for passively vented tanks as the analysis of radiological smears taken at the outlet side of the breather filter housing.

Periodic confirmatory measurements will be conducted annually by verifying the levels of smearable contamination on the inside surface of the ducting downstream of the HEPA filter or on the outside of the screen covering the outlet of the vent, should one exist. Contamination levels below 10,000 disintegrations per minute per 100 square centimeters beta/gamma and 200 disintegrations per minute 100 square centimeters alpha are used to verify low emissions from these passively vented tanks. It is anticipated if any operations are conducted under passive ventilation, periodic confirmatory measurements will be taken of the breather filter exhaust annually.

The quality and detection limits of these analyses are controlled via the current revisions of the work package or procedures used by tank farm operations and radiological control organizations.

10.0 ANNUAL POSSESSION QUANTITY

Regulatory Citation: Indicate the annual possession quantity for each radionuclide.

The annual possession quantity in Tanks 241-AW-102 and 241-SY-101 consists of the highest curie value for each radionuclide listed in Tables 5 and 6. The analyte list and data listed in Tables 6 and 7 are from the Tank Waste Information Network System 3 database, "Best Basis Inventory, Best Basis Summary" as of December 2002. Refer to the respective appendices where the annual possession quantity, calculations, and assumptions are provided for each activity.

Table 6. Tank Inventory Data for Tank 241-AW-102.

Analyte	Total Inventory (Ci)	Analyte	Total Inventory (Ci)
3H	2.18E+00	226Ra	1.63E-04
14C	2.06E+00	227Ac	1.86E-03
59Ni	7.17E-01	228Ra	9.77E-02
60Co	2.60E+01	229Th	2.51E-03
63Ni	7.05E+01	231Pa	4.40E-03
79Se	1.97E-00	232Th	1.11E-02
90Sr	9.62E+04	232U	3.66E-01
90Y	9.62E+04	233U	1.50E-00
93Zr	1.58E+01	234U	1.41E-00
93mNb	1.51E+01	235U	5.43E-02
99Tc	4.06E+02	236U	1.01E-01
106Ru	5.52E-05	237Np	1.81E+01
113mCd	6.50E+01	238Pu	5.04E+00
125Sb	3.00E+01	238U	1.03E-00
126Sn	2.17E+00	239Pu	6.57E+01
129I	3.65E-01	240Pu	1.56E+01
134Cs	2.01E+00	241Am	3.18E+02
137Cs	6.00E+05	241Pu	3.30E+02
137mBa	5.67E+05	242Cm	6.24E+01
151Sm	1.20E+04	242Pu	1.91E-03
152Eu	3.00E+00	243Am	2.69E-02
154Eu	5.34E+01	243Cm	9.56E-02
155Eu	6.61E+01	244Cm	1.78E-00

Table 7. Tank Inventory Data for Tank 241-SY-101.

Analyte	Total Inventory (Ci)
3H	8.14E+02
14C	3.71E+00
59Ni	1.10E+00
60Co	8.16E+01
63Ni	1.03E+02
79Se	8.92E-01
90Sr	7.15E+04
90Y	7.15E+04
93Zr	5.78E+00
93mNb	5.26E+00
99Tc	9.32E+02
106Ru	9.37E-05
113mCd	1.11E+02
125Sb	5.23E+01
126Sn	3.69E+00
129I	7.67E-01
134Cs	1.31E+00
137Cs	8.91E+05
137mBa	8.43E+05
151Sm	2.05E+04
152Eu	5.21E+00
154Eu	5.56E+02
155Eu	6.37E+02

Analyte	Total Inventory (Ci)
226Ra	2.73E-04
227Ac	2.84E-03
228Ra	1.05E-01
229Th	4.71E-03
231Pa	7.52E-03
232Th	2.15E-02
232U	1.00E-01
233U	4.11E-01
234U	1.16E-01
235U	4.69E-03
236U	3.64E-03
237Np	7.21E-01
238Pu	1.15E+00
238U	1.05E-01
239Pu	4.14E+01
240Pu	7.05E+00
241Am	4.58E+02
241Pu	5.92E+01
242Cm	1.20E+00
242Pu	4.56E-04
243Am	1.63E-02
243Cm	9.70E-02
244Cm	8.51E-01

11.0 PHYSICAL FORM

Regulatory Citation: Indicate the physical form of each radionuclide in inventory: Solid, particulate solids, liquid, or gas.

Radionuclides in the tank are in the form of particulate solids, liquids, and gases. Gaseous radionuclides are expected to be H-3, C-14, Ru-106, and I-129. Radionuclides in the soil and pits are expected to be particulates.

12.0 RELEASE FORM

Regulatory Citation: Indicate the release form of each radionuclide in inventory: Particulate solids, vapor, or gas. Give the chemical form and ICRP 30 solubility class, if known.

The radionuclides are all assumed to be released as particulate except for H-3 and C-14. These are assumed to be released as a combination of particulates and gas. In addition, though Ru-106 and I-129 are assumed to be released as particulate, it is not assumed that the high-efficiency particulate air (HEPA) filters serve as effective abatement.

13.0 RELEASE RATES

Regulatory Citation: Release rates. (a) New emission unit(s): Give predicted release rates without any emissions control equipment (the potential-to-emit) and with the proposed control equipment using the efficiencies described in subsection (6) of this section. (b) Modified emission unit(s): Give predicted release rates without any emissions control equipment (the potential-to-emit) and with the existing and proposed control equipment using the efficiencies described in subsection (6) of this section. Provide the latest year's emissions data or emissions estimates. In all cases, indicate whether the emission unit is operating in a batch or continuous mode.

Release rates are determined for pipe cuts by multiplying the annual possession quantity determined in Section 10.0 by a release fraction of 1.0E-03 and 1.0E+00 (40 CFR 61) (Appendix D). Appendices A through D are where the calculations and assumptions for the project pipe cutting activities are shown. Prior to waste transfers raw water is flushed through the transfer lines to the tanks to ensure they are not plugged and check for line integrity. After waste transfers raw water is also flushed through the lines to the tanks to clean the lines, the lines are also allowed time to drain. The volume of water used to flush the lines is based upon engineering calculations and varies depending upon the volume of the transfer lines. Since it is difficult to know what residual waste is in the lines after flushing and draining a conservative approach was taken. The emission calculation is based upon the assumption that the line was full of waste for 6 inches on each side of the cut, for a total of twelve inches of waste. All of the radionuclides in the 12 inches of waste were also assumed to be emitted.

The unabated emissions estimate for project pit work was based on smearable contamination data from the 241-AN-A valve pit. The 241-AN-A valve pit is an average size pit that was selected because it had the highest levels of smearable contamination—based on Radiological Survey Report DSTP-00268. The calculations and assumptions for the E-525 Project pit work may be found in Appendix E. Calculations are based on a continuous operation over the course of a calendar year.

Unabated emissions for manual soil excavation activities were determined by assuming the entire volume of soil excavated (50,000 feet) was at the same contamination concentration and the

40 CFR 61, Appendix D release factor for particulates was applied to the total volume. Release rates are based on continuous operation over the course of a calendar year. The calculations and assumptions for manual soil excavation can be found in appendix F.

Release rates from the 241-AZ-301 Catch Tank HEPA filter were based on 241-AZ-702 condensate samples taken on 12/17/02. These sample results are attached. The sample results were given in terms of pCi/L of condensate. The total quantity of radionuclides available for release in a year was determined by applying the 40 CFR 61, Appendix D release factor for particulates to the total volume of condensate that would be accumulated in a year.
The total quantity of condensate that would be accumulated in a year was determined by multiplying the 0.29 gallon per minute tank design accumulation rate by the number of minutes in a year.

14.0 LOCATION OF THE MAXIMALLY EXPOSED INDIVIDUAL

Regulatory Citation: Identify the MEI by distance and direction from the emission unit(s). The MEI is determined by considering distance, windrose data, presence of vegetable gardens, and meat or milk producing animals at unrestricted areas surrounding the emission unit.

The MEI is determined using CAP-88 PC dispersion factors, which are derived for use on the Hanford Site and published in HNF-3602, "*Calculating Potential-to-Emit Releases and Doses for Facility Environmental Monitoring Plans and Notices of Construction*," Revision 1.

Values used for Project E-525 came from Tables 4-9 and 4-10 of HNF-3602, Rev. 1, for the 200 East and West Areas, with an effective release height <40 meters. Tables 4-9 and 4-10 give values in two separate columns for an offsite maximum public receptor (MPR) and an onsite MPR. Values from both columns were used to determine the maximum dose. Their results showed the maximum dose received by the offsite MPR. For the 200 East Area, the maximum public receptor is 20,200 meters east-southeast of the 200 East Area and for the 200 West Area, maximum public receptor location is 22,000 meters southeast of the 200 West areas.

15.0 TOTAL EFFECTIVE DOSE EQUIVALENT TO THE MAXIMALLY EXPOSED INDIVIDUAL

Calculate the TEDE to the MEI using an approved procedure (see WAC 246-247-085. For each radionuclide identified in subsection (8) of this section, determine the TEDE to the MEI for existing and proposed emission controls, and without any emission controls (the potential-to-emit) using the release rates from subsection (13) of this section. Provide all input data used in the calculations.

Work activities with PTE for which approval is requested are passive ventilation of the 241-AZ-301 catch tank through a HEPA filter, pipe cutting, pit work, and soil excavation. Emission and dose calculations for pipe cutting are shown in Appendices A, B, C, and D. Emission and dose calculations for pit work are shown in Appendix E, and potential unabated emissions for soil

excavation activities can be found in Appendix F. Emissions from the 241-AZ-301 breather filter are estimated in Table 8.

The TEDE to the MEI resulted in emissions to the nearest offsite receptor of approximately 3.7E-02 mrem/yr. The activities and corresponding doses contributing to that 3.7E-02 mrem/yr are shown in Table 7.

The total effective dose equivalent (TEDE) from all calendar year 2008 Hanford Site air emissions (point sources and diffuse and fugitive sources) was 0.11 mrem (DOE/RL-2009-14). The emissions resulting from the activities covered by this NOC, in conjunction with other operations on the Hanford Site, will not exceed the National Emission Standard of 10 millirem per year (40 CFR 61, Subpart H).

Table 7. Corresponding Doses.

Activities	TEDE TO THE MEI mrem/year (unabated) offsite	TEDE TO THE MEI mrem/year (unabated) onsite
241-AZ-301 Emission	1.5E-05	1.7E-05
1" Pipe Cuts East Area	1.5E-03	4.6E-04
3" Pipe Cuts West Area	3.3E-02	3.5E-03
Pit Work	8.0E-06	7.2E-07
Soil Excavation	2.9E-03	2.4E-03
Total	3.7E-02	6.4E-03

Table 8: 241-AZ-301 Potential Emissions

Radionuclide	Sample/Sample Date/Result (pCi/L)			Max Result			40 CFR 61, App D Release Fraction	CAP-88 East Area		Potential Emissions	
	12/17/2002							OffSite MPR	OnSite MPR	OffSite MPR	OnSite MPR
	W020001057	W020001058	W020001059	pCi/L	Ci/gal	Ci/yr		mrem/Ci		mrem/Yr	
Gross Beta	9.2E+04	1.1E+05		1.1E+05	4.2E-07	6.3E-02	1.0E-03	2.40E-01	2.70E-01	1.5E-05	1.7E-05
Sr-90	4E+03	4.6E+03	1.0E+00	4.6E+03	1.7E-08	2.7E-03	1.0E-03	1.10E-01	9.50E-03	2.9E-07	2.5E-08
Cs-137	1.08E+05	1.0E+05		1.1E+05	4.1E-07	6.2E-02	1.0E-03	2.40E-01	2.70E-01	1.5E-05	1.7E-05
Pu-239/240	1.3E+00	1.2E+00	7.4E-02	1.3E+00	4.9E-12	7.5E-07	1.0E-03	8.20E+00	9.50E+00	6.2E-09	7.1E-09
Am-241	2.8E+01	2.3E+01	2.1E+01	2.8E+01	1.1E-10	1.6E-05	1.0E-03	1.30E+01	1.50E+01	2.1E-07	2.4E-07
									Beta:	1.5E-05	1.7E-05
									Sum of Radionuclides:	1.5E-05	1.7E-05
									Abated Emissions:	1.5E-06	1.7E-06

Notes: Data used did not include data flagged with a Result Qualifier (RQ) of "U".
"U" is defined as: analyte was sampled for but not detected.
Tank size is 1200 gallons

	gal/min	gal/yr	gal/day	Days to fill Tank
Design flow rate of condensate:	0.29	152,424	418	2.9

16.0 COST FACTOR IF NO ANALYSIS

Provide cost factors for construction, operation, and maintenance of the proposed control technology components and system, if a BARCT or ALARACT demonstration is not submitted with the NOC.

Equivalency of an ALARACT demonstration of this type of work is provided in Section 6.0, "Proposed Controls," and Section 9.0, "Monitoring." Therefore, no cost factors are provided.

17.0 DURATION OR LIFETIME

Regulatory Citation: Provide an estimate of the lifetime for the facility process with the emission rates provided in this application.

The E-525 Project construction activities are expected to conclude approximately 18 months after its onset, and the project is scheduled to begin construction in the September 2003 time frame. The current estimated project completion is September 30, 2011.

18.0 STANDARDS

Regulatory Citation: "Indicate which of the following control technology standards have been considered and will be complied with in the design and operation of the emission unit(s) described in this application: . . ."

ASME/ANSI AG-1, ASME/ANSI N509, ASME/ANSI N510, ANSI/ASME NQA-1, 40 CFR 60, Appendix A Methods 1, 1A, 2, 2A, 2C, 2D, 4, 5, and 17, and ANSI N13.1

The December 18, 1998, WDOH-approved Categorical Guzzler NOC (AIR 98-1215), and the December 23, 1997, WDOH-approved Tank Farm A Complex NOC (AIR 98-037) discuss how the guzzler meets the standards.

Other activities described in this NOC such as hand excavation, pipe cutting activities, and pit work do not use powered ventilation units or HEPA filtration; therefore, the following standards do not apply:

- American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI) AG-1 - This equipment-specific code consists of five primary sections which include fans, ductwork, HEPA filters, dampers, and quality assurance.
- ASME/ANSI N509 - This standard deals with the individual nuclear air cleaning components and how these relate to the overall system.

- ASME/ANSI N510 - This standard pertains to the testing of nuclear air cleaning systems.
- ANSI/ASME NQA-1 - This standard pertains to the National Emission Standards for Hazardous Air Pollutants Quality Assurance Project Plan for radioactive airborne emissions.
- 40 CFR, Appendix A - This standard pertains to sampling capability of ventilation sources.
- ANSI N13.1 - This standard pertains to continuous monitoring of ventilation systems.

The passive ventilation system for 241-AZ-301 has been designed to meet the required WAC-246-247-110 control technology standards as described in Table 9.

Table 9. Breather Filter Standards Comparison.

Standard	Does design comply?	Notes
ASME/ANSI AG-1	Yes	HEPA filter housing design meets ASME AG-1.
ASME/ANSI N509	Yes	HEPA filters on the Hanford Site are purchased following a site standard specification that lists requirements from AG-1. Also the filter housings are purchased to meet requirements in AG-1 for single filter, side access housings.
ASME/ANSI N510	Yes	Filters are testable per ANSI N510 and the housing will contain testing devices that meet requirements under AG-1.
ANSI/ASME NQA-1	Yes	Current version of QA program is performed in accordance with TFC-PLN-02, "Quality Assurance Program Description".
ANSI N13.1	NA	Confirmatory measurements will consist of smears on the filter.
40 CFR 60, Appendix A Test Methods: 1, 1A, 2, 2A, 2C, 2D, 4	NA	ASME N510 filter testing requires airflow measurements. Other methods not required because flow rates vary based upon barometric breathing.
40 CFR 60, Appendix A Test Methods: 5, 17	NA	These methods are for sampling system designs. Periodic confirmatory measurements will be taken via smears in lieu of a sampling system.

19.0 REFERENCES

40 CFR, "Protection of Environment," Appendix A, *Code of Federal Regulations,* as amended.

40 CFR 60, "Standards for Performance of New Stationary Sources," *Code of Federal Regulations,* as amended.

40 CFR 61, "National Emission Standards for Hazardous Air Pollutant." *Code of Federal Regulations,* as amended.

AIR 98-037, Notice of Construction, Washington State Department of Health "Short Form Radioactive Air Emissions Notice of Construction (NOC) For Guzzler Excavation and Backfilling Activities In Support of the 200 East Area A Farm Complex," letter dated January 30, 1998.

AIR 98-1215, Notice of Construction, Washington State Department of Health "Categorical Guzzler Notice of Construction," letter dated December 18, 1998.

ANSI/ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities*, American Society of Mechanical Engineers, New York, New York.

DOE/RL-2006-29, Rev. 0, 2006, *Calculating Potential-to-Emit Radiological Releases and Doses,* U.S. Department of Energy, Richland, Washington.

DOE/RL-2009-14, Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2008, U.S. Department of Energy, Richland, Washington.

HNF-3602, Revision 1, *Calculating Potential-to-Emit Release and Dose for FEMP and NOCs.* Fluor Hanford, Richland, Washington.

HNF-4327, Revision 1A, 2002, *Control of Airborne Radioactive Emissions for Frequently Performed TWRS Work Activities (ALARACT Demonstrations)*, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-7933, Revision 0, 2001, *Radiological Containment Selection, Design & Specification Guide,* CH2M HILL Hanford Group, Inc., Richland, Washington.

TFC-PLN-02, Rev. F-2, 2010, *Quality Assurance Program Description,* Washington River Protection Solutions, Richland, Washington.

WAC 197-11-845, *State Environmental Policy Act,* "SEPA Rules, Department of Social and Health Services," *Washington Administration Code*, as amended.

WAC 246-247, "Radiation Protection – Air Emissions," *Washington Administrative Code,* as amended.

APPENDIX A

EMISSION AND DOSE CALCULATIONS FOR 1" PIPE CUTS (ONSITE) EAST AREA

APPENDIX A - EMISSION AND DOSE CALCULATIONS FOR 1"PIPE CUTS, (ONSITE) EAST AREA

1 inch, Schedule 40 pipe	1.05	Inch inside Diameter
Area of 1" pipe interior	0.86	inches^2
Total pipe volume (TPV), 12" length	0.17	liters
Release Fraction (RF)	1.00E-03	
Total Waste in Tank (TW)	3.03E+05	liters

Analyte	Tank Inventory	Average Concentration (Ci/L)	Number of Pipe Cuts	annual possession quantity (ci)	Potential to Emit (ci/yr)	Unit Dose Factor, mrem/Ci **(onsite)***	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
	A	B=A/TW	C	D=B*C*TPV	E=D*RF	F	G=E*F	H=G/(□G)
3H	2.18E+00	7.20E-06	100	1.22E-04	1.22E-07	7.10E-06	8.68E-13	0.00%
14C	2.06E+00	6.80E-06	100	1.16E-04	1.16E-07	1.80E-04	2.08E-11	0.00%
59Ni	7.17E-01	2.37E-06	100	4.02E-05	4.02E-08	2.90E-04	1.17E-11	0.00%
60Co	2.60E+01	8.59E-05	100	1.46E-03	1.46E-06	3.00E-01	4.38E-07	0.10%
63Ni	7.05E+01	2.33E-04	100	3.96E-03	3.96E-06	6.90E-05	2.73E-10	0.00%
79Se	1.97E+00	6.51E-06	100	1.11E-04	1.11E-07	1.50E-01	1.66E-08	0.00%
90Y	9.62E+04	3.18E-01	100	5.40E+00	5.40E-03	2.60E-04	1.40E-06	0.31%
90Sr	9.62E+04	3.18E-01	100	5.40E+00	5.40E-03	9.50E-03	5.13E-05	11.23%
93mNb	1.51E+01	4.99E-05	100	8.47E-04	8.47E-07	1.20E-03	1.02E-09	0.00%
93Zr	1.58E+01	5.22E-05	100	8.86E-04	8.86E-07	1.30E-03	1.15E-09	0.00%
99Tc	4.06E+02	1.34E-03	100	2.28E-02	2.28E-05	1.40E-03	3.19E-08	0.01%
106Ru	5.52E-05	1.82E-10	100	3.10E-09	3.10E-12	1.30E-02	4.03E-14	0.00%
113mCd	6.50E+01	2.15E-04	100	3.65E-03	3.65E-06	1.50E-01	5.47E-07	0.12%
125Sb	3.00E+01	9.91E-05	100	1.68E-03	1.68E-06	3.30E-02	5.55E-08	0.01%
126Sn	2.17E+00	7.17E-06	100	1.22E-04	1.22E-07	4.10E-02	4.99E-09	0.00%
129I	3.65E-01	1.21E-06	100	2.05E-05	2.05E-08	2.20E-02	4.51E-10	0.00%
134Cs	2.01E+00	6.64E-06	100	1.13E-04	1.13E-07	4.70E-02	5.30E-09	0.00%
137Cs	6.00E+05	1.98E+00	100	3.37E+01	3.37E-02	2.00E-03	6.73E-05	14.74%
137mBa	5.67E+05	1.87E+00	100	3.18E+01	3.18E-02	1.00E-11	3.18E-13	0.00%
151Sm	1.20E+04	3.96E-02	100	6.73E-01	6.73E-04	8.40E-04	5.66E-07	0.12%
152Eu	3.00E+00	9.91E-06	100	1.68E-04	1.68E-07	3.10E-01	5.22E-08	0.01%
154Eu	5.34E+01	1.76E-04	100	3.00E-03	3.00E-06	2.50E-01	7.49E-07	0.16%
155Eu	6.61E+01	2.18E-04	100	3.71E-03	3.71E-06	9.80E-03	3.63E-08	0.01%
226Ra	1.63E-04	5.38E-10	100	9.14E-09	9.14E-12	2.50E-01	2.29E-12	0.00%
228Ra	9.77E-02	3.23E-07	100	5.48E-06	5.48E-09	7.00E-02	3.84E-10	0.00%
227Ac	1.86E-03	6.14E-09	100	1.04E-07	1.04E-10	1.80E+01	1.88E-09	0.00%
229Th	2.51E-03	8.29E-09	100	1.41E-07	1.41E-10	2.00E+01	2.82E-09	0.00%
232Th	1.11E-02	3.67E-08	100	6.23E-07	6.23E-10	1.00E+01	6.23E-09	0.00%
231Pa	4.40E-03	1.45E-08	100	2.47E-07	2.47E-10	1.40E+01	3.46E-09	0.00%
232U	3.66E-01	1.21E-06	100	2.05E-05	2.05E-08	1.30E+01	2.67E-07	0.06%
233U	1.50E+00	4.95E-06	100	8.42E-05	8.42E-08	3.70E+00	3.11E-07	0.07%
234U	1.41E+00	4.66E-06	100	7.91E-05	7.91E-08	3.70E+00	2.93E-07	0.06%
235U	5.43E-02	1.79E-07	100	3.05E-06	3.05E-09	3.50E+00	1.07E-08	0.00%
236U	1.01E-01	3.34E-07	100	5.67E-06	5.67E-09	3.50E+00	1.98E-08	0.00%
238U	1.03E+00	3.40E-06	100	5.78E-05	5.78E-08	3.30E+00	1.91E-07	0.04%
237Np	1.81E+01	5.98E-05	100	1.02E-03	1.02E-06	1.40E+01	1.42E-05	3.11%
238Pu	5.04E+00	1.66E-05	100	2.83E-04	2.83E-07	8.90E+00	2.52E-06	0.55%
239Pu	6.57E+01	2.17E-04	100	3.69E-03	3.69E-06	9.50E+00	3.50E-05	7.67%
240Pu	1.56E+01	5.15E-05	100	8.75E-04	8.75E-07	9.50E+00	8.31E-06	1.82%
241Pu	3.30E+02	1.09E-03	100	1.85E-02	1.85E-05	1.50E-01	2.78E-06	0.61%

APPENDIX A - EMISSION AND DOSE CALCULATIONS FOR 1"PIPE CUTS, (ONSITE) EAST AREA

1 inch, Schedule 40 pipe	1.05	Inch inside Diameter
Area of 1" pipe interior	0.86	$inches^2$
Total pipe volume (TPV), 12" length	0.17	liters
Release Fraction (RF)	1.00E-03	
Total Waste in Tank (TW)	3.03E+05	liters

Analyte	Tank Inventory	Average Concentration (Ci/L)	Number of Pipe Cuts	annual possession quantity (ci)	Potential to Emit (ci/yr)	Unit Dose Factor, mrem/Ci **(onsite)***	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
242Pu	1.91E-03	6.31E-09	100	1.07E-07	1.07E-10	9.10E+00	9.75E-10	0.00%
241Am	3.18E+02	1.05E-03	100	1.78E-02	1.78E-05	1.50E+01	2.68E-04	58.60%
243Am	2.69E-02	8.88E-08	100	1.51E-06	1.51E-09	1.50E+01	2.26E-08	0.00%
242Cm	6.24E+01	2.06E-04	100	3.50E-03	3.50E-06	5.00E-01	1.75E-06	0.38%
243Cm	9.56E-02	3.16E-07	100	5.36E-06	5.36E-09	1.00E+01	5.36E-08	0.01%
244Cm	1.78E+00	5.88E-06	100	9.99E-05	9.99E-08	8.00E+00	7.99E-07	0.17%
				7.70E+01	7.70E-02		4.57E-04	100.00%

APPENDIX B

EMISSION AND DOSE CALCULATIONS FOR 1" PIPE CUTS (OFFSITE) EAST AREA

APPENDIX B - EMISSION AND DOSE CALCULATIONS FOR 1"PIPE CUTS, (OFFSITE) EAST AREA

1 inch, Schedule 40 pipe	1.05	Inch inside Diameter
Area of 1" pipe interior	0.86	inches^2
Total pipe volume (TPV), 12" length	0.17	liters
Release Fraction (RF)	1.00E-03	
Total Waste in Tank (TW)	3.03E+05	liters

Analyte	Tank Inventory	Average Conc. (Ci/L)	Number of Pipe Cuts	annual possession quantity (ci)	Potential to Emit (ci/yr)	Unit Dose Factor, mrem/Ci **(offsite)***	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
	A	B=A/TW	C	D=B*C*TPV	E=D*RF	F	G=E*F	H=G/(□G)
3H	2.18E+00	7.20E-06	100	1.22E-04	1.22E-07	2.50E-05	3.06E-12	0.00%
14C	2.06E+00	6.80E-06	100	1.16E-04	1.16E-07	1.90E-03	2.20E-10	0.00%
59Ni	7.17E-01	2.37E-06	100	4.02E-05	4.02E-08	3.10E-04	1.25E-11	0.00%
60Co	2.60E+01	8.59E-05	100	1.46E-03	1.46E-06	2.50E-01	3.65E-07	0.02%
63Ni	7.05E+01	2.33E-04	100	3.96E-03	3.96E-06	2.60E-04	1.03E-09	0.00%
79Se	1.97E+00	6.51E-06	100	1.11E-04	1.11E-07	1.30E-01	1.44E-08	0.00%
90Y	9.62E+04	3.18E-01	100	5.40E+00	5.40E-03	3.40E-04	1.84E-06	0.12%
90Sr	9.62E+04	3.18E-01	100	5.40E+00	5.40E-03	1.10E-01	5.94E-04	38.96%
93mNb	1.51E+01	4.99E-05	100	8.47E-04	8.47E-07	2.10E-03	1.78E-09	0.00%
93Zr	1.58E+01	5.22E-05	100	8.86E-04	8.86E-07	5.80E-03	5.14E-09	0.00%
99Tc	4.06E+02	1.34E-03	100	2.28E-02	2.28E-05	2.30E-02	5.24E-07	0.03%
106Ru	5.52E-05	1.82E-10	100	3.10E-09	3.10E-12	1.60E-02	4.96E-14	0.00%
113mCd	6.50E+01	2.15E-04	100	3.65E-03	3.65E-06	1.30E-01	4.74E-07	0.03%
125Sb	3.00E+01	9.91E-05	100	1.68E-03	1.68E-06	2.60E-02	4.38E-08	0.00%
126Sn	2.17E+00	7.17E-06	100	1.22E-04	1.22E-07	4.70E-02	5.72E-09	0.00%
129I	3.65E-01	1.21E-06	100	2.05E-05	2.05E-08	1.50E-06	3.07E-14	0.00%
134Cs	2.01E+00	6.64E-06	100	1.13E-04	1.13E-07	7.80E-02	8.80E-09	0.00%
137Cs	6.00E+05	1.98E+00	100	3.37E+01	3.37E-02	2.10E-02	7.07E-04	46.39%
137mBa	5.67E+05	1.87E+00	100	3.18E+01	3.18E-02	8.60E-14	2.74E-15	0.00%
151Sm	1.20E+04	3.96E-02	100	6.73E-01	6.73E-04	5.80E-04	3.90E-07	0.03%
152Eu	3.00E+00	9.91E-06	100	1.68E-04	1.68E-07	1.90E-01	3.20E-08	0.00%
154Eu	5.34E+01	1.76E-04	100	3.00E-03	3.00E-06	1.50E-01	4.49E-07	0.03%
155Eu	6.61E+01	2.18E-04	100	3.71E-03	3.71E-06	6.30E-03	2.34E-08	0.00%
226Ra	1.63E-04	5.38E-10	100	9.14E-09	9.14E-12	3.60E-01	3.29E-12	0.00%
228Ra	9.77E-02	3.23E-07	100	5.48E-06	5.48E-09	1.50E-01	8.22E-10	0.00%
227Ac	1.86E-03	6.14E-09	100	1.04E-07	1.04E-10	1.10E+01	1.15E-09	0.00%
229Th	2.51E-03	8.29E-09	100	1.41E-07	1.41E-10	1.20E+01	1.69E-09	0.00%
232Th	1.11E-02	3.67E-08	100	6.23E-07	6.23E-10	6.20E+00	3.86E-09	0.00%
231Pa	4.40E-03	1.45E-08	100	2.47E-07	2.47E-10	8.90E+00	2.20E-09	0.00%
232U	3.66E-01	1.21E-06	100	2.05E-05	2.05E-08	8.60E+00	1.77E-07	0.01%
233U	1.50E+00	4.95E-06	100	8.42E-05	8.42E-08	2.40E+00	2.02E-07	0.01%
234U	1.41E+00	4.66E-06	100	7.91E-05	7.91E-08	2.40E+00	1.90E-07	0.01%
235U	5.43E-02	1.79E-07	100	3.05E-06	3.05E-09	2.30E+00	7.01E-09	0.00%
236U	1.01E-01	3.34E-07	100	5.67E-06	5.67E-09	2.30E+00	1.30E-08	0.00%
238U	1.03E+00	3.40E-06	100	5.78E-05	5.78E-08	2.10E+00	1.21E-07	0.01%
237Np	1.81E+01	5.98E-05	100	1.02E-03	1.02E-06	8.90E+00	9.04E-06	0.59%
238Pu	5.04E+00	1.66E-05	100	2.83E-04	2.83E-07	5.90E+00	1.67E-06	0.11%
239Pu	6.57E+01	2.17E-04	100	3.69E-03	3.69E-06	6.40E+00	2.36E-05	1.55%
240Pu	1.56E+01	5.15E-05	100	8.75E-04	8.75E-07	6.40E+00	5.60E-06	0.37%
241Pu	3.30E+02	1.09E-03	100	1.85E-02	1.85E-05	1.00E-01	1.85E-06	0.12%

APPENDIX B - EMISSION AND DOSE CALCULATIONS FOR 1"PIPE CUTS, (OFFSITE) EAST AREA

1 inch, Schedule 40 pipe	1.05	Inch inside Diameter
Area of 1" pipe interior	0.86	$inches^2$
Total pipe volume (TPV), 12" length	0.17	liters
Release Fraction (RF)	1.00E-03	
Total Waste in Tank (TW)	3.03E+05	liters

Analyte	Tank Inventory	Average Conc. (Ci/L)	Number of Pipe Cuts	annual possession quantity (ci)	Potential to Emit (ci/yr)	Unit Dose Factor, mrem/Ci **(offsite)***	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
242Pu	1.91E-03	6.31E-09	100	1.07E-07	1.07E-10	6.1E+00	6.54E-10	0.00%
241Am	3.18E+02	1.05E-03	100	1.78E-02	1.78E-05	9.80E+00	1.75E-04	11.47%
243Am	2.69E-02	8.88E-08	100	1.51E-06	1.51E-09	9.80E+00	1.48E-08	0.00%
242Cm	6.24E+01	2.06E-04	100	3.50E-03	3.50E-06	3.20E-01	1.12E-06	0.07%
243Cm	9.56E-02	3.16E-07	100	5.36E-06	5.36E-09	6.60E+00	3.54E-08	0.00%
244Cm	1.78E+00	5.88E-06	100	9.99E-05	9.99E-08	5.20E+00	5.19E-07	0.03%
				7.70E+01	7.70E-02		1.52E-03	100.00%

APPENDIX C

EMISSION AND DOSE CALCULATIONS FOR 3" PIPE CUTS (ONSITE) WEST AREA

APPENDIX C - EMISSION AND DOSE CALCULATIONS FOR 3" PIPE CUTS (ONSITE) WEST AREA (2 Sheets)

3 inch, Schedule 40 pipe	3.07	Inch inside Diameter						
Area of 3" interior	7.39	sq inches						
Total pipe volume (TPV), 12" length	1.45	liters						
Release Fraction (RF)	1.00E-03							
Total Waste in Tank (TW)	1.12E+06	liters						
Analyte	Tank Inventory	Average Conc. (Ci/L)	Number of pipe cuts	APQ (Ci)	Potential to Emit (Ci/yr)	Unit Dose Factor, mrem/Ci **(onsite)**	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
	A	B=A/TW	C	D=B*C*TPV	E=D*RF	F	G=E*F	H=G/Sum of G
3H	8.14E+02	7.27E-04	230	2.42E-01	2.42E-04	1.10E-05	2.67E-09	0.00%
14C	3.71E+00	3.31E-06	230	1.10E-03	1.10E-06	3.00E-04	3.31E-10	0.00%
59Ni	1.10E+00	9.82E-07	230	3.28E-04	3.28E-07	3.30E-04	1.08E-10	0.00%
60Co	8.16E+01	7.29E-05	230	2.43E-02	2.43E-05	3.40E-01	8.26E-06	0.24%
63Ni	1.03E+02	9.20E-05	230	3.07E-02	3.07E-05	7.80E-05	2.39E-09	0.00%
79Se	8.92E-01	7.96E-07	230	2.66E-04	2.66E-07	1.60E-01	4.25E-08	0.00%
90Y	7.15E+04	6.38E-02	230	2.13E+01	2.13E-02	2.90E-04	6.17E-06	0.18%
90Sr	7.15E+04	6.38E-02	230	2.13E+01	2.13E-02	1.10E-02	2.34E-04	6.76%
93mNb	5.26E+00	4.70E-06	230	1.57E-03	1.57E-06	1.30E-03	2.04E-09	0.00%
93Zr	5.78E+00	5.16E-06	230	1.72E-03	1.72E-06	1.50E-03	2.58E-09	0.00%
99Tc	9.32E+02	8.32E-04	230	2.78E-01	2.78E-04	1.80E-03	5.00E-07	0.01%
106Ru	9.37E-05	8.37E-11	230	2.79E-08	2.79E-11	1.50E-02	4.19E-13	0.00%
113mCd	1.11E+02	9.91E-05	230	3.31E-02	3.31E-05	1.60E-01	5.29E-06	0.15%
125Sb	5.23E+01	4.67E-05	230	1.56E-02	1.56E-05	3.70E-02	5.76E-07	0.02%
126Sn	3.69E+00	3.29E-06	230	1.10E-03	1.10E-06	4.60E-02	5.05E-08	0.00%
129I	7.67E-01	6.85E-07	230	2.28E-04	2.28E-07	8.10E-03	1.85E-09	0.00%
134Cs	1.31E+00	1.17E-06	230	3.90E-04	3.90E-07	1.00E-01	3.90E-08	0.00%
137Cs	8.91E+05	7.96E-01	230	2.65E+02	2.65E-01	2.50E-03	6.63E-04	19.15%
137mBa	8.43E+05	7.53E-01	230	2.51E+02	2.51E-01	1.70E-12	4.27E-13	0.00%
151Sm	2.05E+04	1.83E-02	230	6.10E+00	6.10E-03	9.50E-04	5.80E-06	0.17%
152Eu	5.21E+00	4.65E-06	230	1.55E-03	1.55E-06	3.40E-01	5.27E-07	0.02%
154Eu	5.56E+02	4.96E-04	230	1.66E-01	1.66E-04	2.80E-01	4.64E-05	1.34%
155Eu	6.37E+02	5.69E-04	230	1.90E-01	1.90E-04	1.10E-02	2.09E-06	0.06%
226Ra	2.73E-04	2.44E-10	230	8.13E-08	8.13E-11	2.90E-01	2.36E-11	0.00%
228Ra	1.05E-01	9.38E-08	230	3.13E-05	3.13E-08	7.90E-02	2.47E-09	0.00%

APPENDIX C - EMISSION AND DOSE CALCULATIONS FOR 3" PIPE CUTS (ONSITE) WEST AREA (2 Sheets)

3 inch, Schedule 40 pipe	3.07	Inch inside Diameter
Area of 3" interior	7.39	sq inches
Total pipe volume (TPV), 12" length	1.45	liters
Release Fraction (RF)	1.00E-03	
Total Waste in Tank (TW)	1.12E+06	liters

Analyte	Tank Inventory	Average Conc. (Ci/L)	Number of pipe cuts	APQ (Ci)	Potential to Emit (Ci/yr)	Unit Dose Factor, mrem/Ci **(onsite)**	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
	A	B=A/TW	C	D=B*C*TPV	E=D*RF	F	G=E*F	H=G/Sum of G
227Ac	2.84E-03	2.54E-09	230	8.46E-07	8.46E-10	2.00E+01	1.69E-08	0.00%
229Th	4.71E-03	4.21E-09	230	1.40E-06	1.40E-09	2.20E+01	3.09E-08	0.00%
232Th	2.15E-02	1.92E-08	230	6.40E-06	6.40E-09	1.10E+01	7.04E-08	0.00%
231Pa	7.52E-03	6.71E-09	230	2.24E-06	2.24E-09	1.50E+01	3.36E-08	0.00%
232U	1.00E-01	8.93E-08	230	2.98E-05	2.98E-08	1.50E+01	4.47E-07	0.01%
233U	4.11E-01	3.67E-07	230	1.22E-04	1.22E-07	4.20E+00	5.14E-07	0.01%
234U	1.16E-01	1.04E-07	230	3.45E-05	3.45E-08	4.20E+00	1.45E-07	0.00%
235U	4.69E-03	4.19E-09	230	1.40E-06	1.40E-09	4.00E+00	5.59E-09	0.00%
236U	3.64E-03	3.25E-09	230	1.08E-06	1.08E-09	3.90E+00	4.23E-09	0.00%
238U	1.05E-01	9.38E-08	230	3.13E-05	3.13E-08	3.70E+00	1.16E-07	0.00%
237Np	7.21E-01	6.44E-07	230	2.15E-04	2.15E-07	1.60E+01	3.44E-06	0.10%
238Pu	1.15E+00	1.03E-06	230	3.42E-04	3.42E-07	1.00E+01	3.42E-06	0.10%
239Pu	4.14E+01	3.70E-05	230	1.23E-02	1.23E-05	1.10E+01	1.36E-04	3.91%
240Pu	7.05E+00	6.29E-06	230	2.10E-03	2.10E-06	1.10E+01	2.31E-05	0.67%
241Pu	5.92E+01	5.29E-05	230	1.76E-02	1.76E-05	1.60E-01	2.82E-06	0.08%
242Pu	4.56E-04	4.07E-10	230	1.36E-07	1.36E-10	1.00E+01	1.36E-09	0.00%
241Am	4.58E+02	4.09E-04	230	1.36E-01	1.36E-04	1.70E+01	2.32E-03	66.93%
243Am	1.63E-02	1.46E-08	230	4.85E-06	4.85E-09	1.70E+01	8.25E-08	0.00%
242Cm	9.70E-02	8.66E-08	230	2.89E-05	2.89E-08	5.70E-01	1.65E-08	0.00%
243Cm	9.70E-02	8.66E-08	230	2.89E-05	2.89E-08	1.20E+01	3.47E-07	0.01%
244Cm	8.51E-01	7.60E-07	230	2.53E-04	2.53E-07	9.00E+00	2.28E-06	0.07%
			TOTALS	5.66E+02	5.66E-01		3.46E-03	100.00%

APPENDIX D

EMISSION AND DOSE CALCULATIONS FOR 3"PIPE CUTS (OFFSITE) WEST AREA

APPENDIX D - EMISSION AND DOSE CALCULATIONS FOR 3" PIPE CUTS (OFFSITE) WEST AREA

3 inch, Schedule 40 pipe	3.07	Inch inside Diameter
Area of 3" interior	7.39	sq inches
Total pipe volume (TPV), 12" length	1.45	liters
Release Fraction (RF)	1.00E-03	
Total Waste in Tank (TW)	3.03E+05	liters

Analyte	Tank Inventory	Average Conc. (Ci/L)	Number of pipe cuts	APQ (Ci)	Potential to Emit (Ci/yr)	Unit Dose Factor, mrem/Ci **(offsite)**	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
	A	B=A/TW	C	D=B*C*TPV	E=D*RF	F	G=E*F	H=G/Sum of G
3H	8.14E+02	2.69E-03	230	8.96E-01	8.96E-04	2.50E-05	2.24E-08	0.00%
14C	3.71E+00	1.22E-05	230	4.08E-03	4.08E-06	2.00E-03	8.17E-09	0.00%
59Ni	1.10E+00	3.63E-06	230	1.21E-03	1.21E-06	2.40E-04	2.91E-10	0.00%
60Co	8.16E+01	2.69E-04	230	8.98E-02	8.98E-05	1.90E-01	1.71E-05	0.05%
63Ni	1.03E+02	3.40E-04	230	1.13E-01	1.13E-04	2.00E-04	2.27E-08	0.00%
79Se	8.92E-01	2.94E-06	230	9.82E-04	9.82E-07	1.00E-01	9.82E-08	0.00%
90Y	7.15E+04	2.36E-01	230	7.87E+01	7.87E-02	2.60E-04	2.05E-05	0.06%
90Sr	7.15E+04	2.36E-01	230	7.87E+01	7.87E-02	8.80E-02	6.93E-03	20.98%
93mNb	5.26E+00	1.74E-05	230	5.79E-03	5.79E-06	1.60E-03	9.26E-09	0.00%
93Zr	5.78E+00	1.91E-05	230	6.36E-03	6.36E-06	9.90E-04	6.30E-09	0.00%
99Tc	9.32E+02	3.08E-03	230	1.03E+00	1.03E-03	1.80E-02	1.85E-05	0.06%
106Ru	9.37E-05	3.09E-10	230	1.03E-07	1.03E-10	1.20E-02	1.24E-12	0.00%
113mCd	1.11E+02	3.66E-04	230	1.22E-01	1.22E-04	1.00E-01	1.22E-05	0.04%
125Sb	5.23E+01	1.73E-04	230	5.76E-02	5.76E-05	2.10E-02	1.21E-06	0.00%
126Sn	3.69E+00	1.22E-05	230	4.06E-03	4.06E-06	3.70E-02	1.50E-07	0.00%
129I	7.67E-01	2.53E-06	230	8.44E-04	8.44E-07	7.60E-02	6.42E-08	0.00%
134Cs	1.31E+00	4.32E-06	230	1.44E-03	1.44E-06	7.80E-02	1.12E-07	0.00%
137Cs	8.91E+05	2.94E+00	230	9.81E+02	9.81E-01	2.10E-02	2.06E-02	62.39%
137mBa	8.43E+05	2.78E+00	230	9.28E+02	9.28E-01	8.60E-14	7.98E-14	0.00%
151Sm	2.05E+04	6.77E-02	230	2.26E+01	2.26E-02	5.80E-04	1.31E-05	0.04%
152Eu	5.21E+00	1.72E-05	230	5.73E-03	5.73E-06	1.90E-01	1.09E-06	0.00%
154Eu	5.56E+02	1.83E-03	230	6.12E-01	6.12E-04	1.50E-01	9.18E-05	0.28%
155Eu	6.37E+02	2.10E-03	230	7.01E-01	7.01E-04	6.30E-03	4.42E-06	0.01%
226Ra	2.73E-04	9.01E-10	230	3.00E-07	3.00E-10	3.60E-01	1.08E-10	0.00%

APPENDIX D - EMISSION AND DOSE CALCULATIONS FOR 3" PIPE CUTS (OFFSITE) WEST AREA

3 inch, Schedule 40 pipe	3.07	Inch inside Diameter
Area of 3" interior	7.39	sq inches
Total pipe volume (TPV), 12" length	1.45	liters
Release Fraction (RF)	1.00E-03	
Total Waste in Tank (TW)	3.03E+05	liters

Analyte	Tank Inventory	Average Conc. (Ci/L)	Number of pipe cuts	APQ (Ci)	Potential to Emit (Ci/yr)	Unit Dose Factor, mrem/Ci **(offsite)**	TEDE to the MEI (mrem/yr)	Percentage of Potential-to-emit Dose
	A	B=A/TW	C	D=B*C*TPV	E=D*RF	F	G=E*F	H=G/Sum of G
228Ra	1.05E-01	3.47E-07	230	1.16E-04	1.16E-07	1.50E-01	1.73E-08	0.00%
227Ac	2.84E-03	9.37E-09	230	3.13E-06	3.13E-09	1.10E+01	3.44E-08	0.00%
229Th	4.71E-03	1.55E-08	230	5.18E-06	5.18E-09	1.20E+01	6.22E-08	0.00%
232Th	2.15E-02	7.10E-08	230	2.37E-05	2.37E-08	6.20E+00	1.47E-07	0.00%
231Pa	7.52E-03	2.48E-08	230	8.28E-06	8.28E-09	8.90E+00	7.37E-08	0.00%
232U	1.00E-01	3.30E-07	230	1.10E-04	1.10E-07	8.60E+00	9.47E-07	0.00%
233U	4.11E-01	1.36E-06	230	4.52E-04	4.52E-07	2.40E+00	1.09E-06	0.00%
234U	1.16E-01	3.83E-07	230	1.28E-04	1.28E-07	2.40E+00	3.06E-07	0.00%
235U	4.69E-03	1.55E-08	230	5.16E-06	5.16E-09	2.30E+00	1.19E-08	0.00%
236U	3.64E-03	1.20E-08	230	4.01E-06	4.01E-09	2.30E+00	9.21E-09	0.00%
238U	1.05E-01	3.47E-07	230	1.16E-04	1.16E-07	2.10E+00	2.43E-07	0.00%
237Np	7.21E-01	2.38E-06	230	7.94E-04	7.94E-07	8.90E+00	7.06E-06	0.02%
238Pu	1.15E+00	3.80E-06	230	1.27E-03	1.27E-06	5.90E+00	7.47E-06	0.02%
239Pu	4.14E+01	1.37E-04	230	4.56E-02	4.56E-05	6.40E+00	2.92E-04	0.88%
240Pu	7.05E+00	2.33E-05	230	7.76E-03	7.76E-06	6.40E+00	4.97E-05	0.15%
241Pu	5.92E+01	1.95E-04	230	6.52E-02	6.52E-05	1.00E-01	6.52E-06	0.02%
242Pu	4.56E-04	1.50E-09	230	5.02E-07	5.02E-10	6.10E+00	3.06E-09	0.00%
241Am	4.58E+02	1.51E-03	230	5.04E-01	5.04E-04	9.80E+00	4.94E-03	14.97%
243Am	1.63E-02	5.38E-08	230	1.79E-05	1.79E-08	9.80E+00	1.76E-07	0.00%
242Cm	9.70E-02	3.20E-07	230	1.07E-04	1.07E-07	3.20E-01	3.42E-08	0.00%
243Cm	9.70E-02	3.20E-07	230	1.07E-04	1.07E-07	6.60E+00	7.05E-07	0.00%
244Cm	8.51E-01	2.81E-06	230	9.37E-04	9.37E-07	5.20E+00	4.87E-06	0.01%
			TOTALS	2.09E+03	2.09E+00		3.30E-02	100.00%

APPENDIX E
EMISSION AND DOSE CALCULATIONS FOR PIT WORK

APPENDIX E - EMISSION AND DOSE CALCULATIONS FOR PIT WORK							
Release Fraction (RF)	1.00E-03						
Total Surface Area (TSA) of individual Pit*	4.46E+05	cm^2	4.80E+02	ft^2			
Multiplier (estimated entries) (M)	60						
Smear Sample Calculations	Max Smear Removable Concentration ($dpm/100\ cm^2$)*	Conversion ($dpm/100cm^2$) to (Ci/cm^2)	Max Smear Concentration (Ci/cm^2)	Annual Possession Quantity (Ci)	Unabated Release (Ci/yr)	Offsite Dose Factor (mrem/Ci)	**Unabated And Abated Dose (mrem/yr)**
	A	B	C = A*B	D =(TSA)*C*(M)	E =RF*D	G	**G**
Alpha (Am-241)	20	4.50045E-15	9.00E-14	2.41E-06	2.41E-09	1.20E-05	2.89E-14
Beta (Sr-90)	600,000	4.50045E-15	2.70E-09	7.22E-02	7.22E-05	1.10E-01	7.95E-06
Total				7.23E-02	7.23E-05		**7.95E-06****

Notes:

*For conservatism, the highest levels of smearable contamination noted on historical Radiological Survey Report, (DSTP-00268) for the 241-AN-A-Valve Pit, was used. This pit is an averaged sized pit.

**Emissions from pit coring activities are included since the total surface area of the pit was used for these calculated emissions. Using the rationale that the radionuclides deposited on the inside of the pit walls can only be released once, the total unabated dose rate is considered bounding.

APPENDIX F

POTENTIAL UNABATED EMISSIONS AND DOSE FOR SOIL EXCAVATION ACTIVITIES

POTENTIAL UNABATED EMISSIONS AND DOSE FOR SOIL EXCAVATION ACTIVITIES

POTENTIAL UNABATED EMISSIONS AND DOSE FOR SOIL EXCAVATION ACTIVITIES

MAXIMUM CONTAMINATED SOIL EXCAVATED	50,000	FEET^3
SOIL DENSITY	98	POUNDS/FEET^3
TOTAL MASS OF SOIL (TMS)	2.22E+09	GRAMS
MAXIMUM ALPHA READING (MA)	5	CPM
MAXIMUM BETA/GAMMA READING (MB)	10,000	CPM
RELEASE FRACTION (RF)	1.00E-03	

Based on initial unit dose factors.

ASSUMED ISOTOPE	CONVERSION FACTOR (pCi/gram)/cpm[1]	ANNUAL POSSESSION QUANTITY[2] Ci	Potential-to-emit, Ci/yr	Unit Dose Factor, mrem/Ci[3]	Potential-to-Emit Dose, mrem/yr[5]	% UNABATED OFFSITE DOSE
	A	**B=A*TSM*MA(MB)/1E12**	**C =B*RF**	**D**	**E =C*D**	**F =E/(sum of E)**
Sr-90	3.54E-01	7.87E-00	7.87E-00	1.10E-01	4.33E-04	29.69%
Am-241	1.42E+01	1.58E-01	1.58E-01	1.30E+01	1.03E-03	70.31%
TOTAL		**8.032E+00**	**8.03E-03**		**2.92E-03**	**100.00%**

Based on updated unit dose factors.

Notes:

[1]Weight of Soil X Field Instrument Reading X Conversion Factor.

[2]HNF-2418, Soil Contamination Standards for Protection of Personnel, March 1998, P. D. Rittmann

[3]Taken from Westinghouse Hanford Company Facility Effluent Monitoring Plan. No onsite public receptor at that time.

[4]HNF-3602, Rev 1, Calculating Potential-to-Emit Releases and Doses for FEMPs and NOCs.

[5]The abated dose is the same as the Potential-to-Emit dose, as no abatement controls are used.