0047069

Request Number 88

Jacobs Engineering Group
Engineering Information Request - TWRS EIS

Requested By: Mike Harker Date: 5/23/95

Phone Number: 736-0616 Fax Number:

Request Information: Provide chemical constituents and concentrations that would be in the air emissions for the following routine operations: Tank farm, evaporator, fill and cap, In Situ vitrification, intermediate separations vit., intermediate separations vit., No separations vit, no separations calcination, extensive separations vit., extensive separations pretreatment, comb. vitrification, comb. pretreatment., comb. fill and cap., WESF basin storage, WESF retrieval and overpack, staged implementation vit, staged implementation pretreatment

Need Date: ASAP

Response: see attached

Data Source/Accuracy:

Prepared By: Colin Henderson

Date Sent/Faxed:

Concurrence:
Marc Nelson - Project Manager

MAR 1997
RECEIVED
EDMC

H:\USERS\CHENDERS\EIR\ENINFRQ.088

ENGINEERING INFORMATION REQUEST -88

Tank farm routine operations:
See attached spreadsheet titled Tank Farm Emissions From Current Operations. These tables provide the estimated chemical and radiological emissions from the existing tank farms. The release parameters associated with the tanks are indicated along with the type of ventilation. Passive ventilation refers to tank ventilation that occurs as a result of changes in atmospheric pressure as opposed to active ventilation where an exhauster is used to continually ventilate the tank.

Evaporator:
The operating emissions for the 232-A evaporator are provided in the attached spreadsheet for Tank Farm Emissions.

Fill and Cap:
The emissions from filling a tank with gravel were estimated using the current tank farm emissions. The emissions during the fill operation were estimated to be ten times higher on an hourly basis than routine emissions. The filling of a tank with gravel would take approximately 3 days of actual operations to complete. Estimated emissions on a tank farm by tank farm basis are provided in the attached spreadsheet titled Fill and Cap.

In Situ Vitrification:
The emissions during operations for the In Situ Vitrification alternative are provided in the attached spreadsheet titled ISV emissions.

Intermediate Separations:
The emissions are provided in the attached spreadsheet titled High Level Emissions and Lowlevel emissions. The spreadsheets identify the constituents in the stack gas from the High Level vitrification plant and the Low Level vitrification plant. The VOC emissions released from the tanks during waste retrieval operations is estimated at 3 times the annual rates provided in the spreadsheet for emissions from current operations. The emissions associated with retrieval would apply to all of the alternatives with out of tank waste treatment.

Note: this is for retrieval and transfer of the wastes from the tanks to the treatment facilities and treatment of the wastes. The emissions from pretreatment and treatment are combined in the LLW vitrification plant and released from a single stack.

No Separations (vitrification):
The routine emissions from the No Separations (vitrification) plant would be released out of an elevated stack. The chemical constituents and the concentrations are provided in the attached spreadsheet titled

No Separations (calcination):
The routine emissions from the No Separations (calcination) plant would be released out of an elevated stack. The chemical emissions from the calcination would be essentially the same except for the N0x which would be 5 times the levels reported for the No Separations (vitrification) alternative.

Extensive Separations:
The emissions from extensive separations should be in the same general levels as the emissions from the Intermediate Separations alternative. A spread sheet of the stack emissions for the extensive separations emissions based on the material balance calculations has not been performed due to lack of time. If any individual components identified in the Intermediate Separations spreadsheet tables are of interest they can be provided on an as needed basis. Table 9-5 attached from the extensive separations data package provides a summary of the non radiological emissions. Any of the emissions identified can be converted to concentrations using the formula at the bottom of the table. The Extensive Separations alternative is assumed to have a single stack where the off-gasses from the LLW, Separations, and HLW processes would be combined prior to release.

In Situ/ Ex Situ Combination:
(comb. fill and cap, comb. vitrification, and comb. pretreatment)

This alternative is a combination of the Fill and Cap alternative for those tanks left in place and Intermediate Separations alternative for those wastes retrieved. The chemical constituents and concentrations released during operations should be similar to the two above mentioned alternatives.

WESF Storage Basin:
The emissions data provided for the WESF capsule storage basins was limited to radionuclides. No chemical emissions were reported and the nature of the activities associated with continued storage of the cesium and strontium capsules in water filled basins should result in minimal chemical emissions.

WESF Retrieval and Overpack:
Retrieval of the cesium and strontium capsules from the water basins and overpacking into canisters would result in negligible chemical emissions.

Staged Implementation (pretreatment and vitrification)

This alternative consists of building two Low Activity waste processing plants (20 mt/day capacity) and one HLW waste treatment facility (one mt/day capacity) to process approximately 10% of the tank waste. The waste types identified to date for retrieval and treatment during this phase are liquid DST wastes. These wastes are fairly well characterized and are considered the easiest wastes to process. The chemical constituents and concentrations released during operations of this alternative would be similar in type and concentration to the Intermediate Separations alternative.

TPA STACK STREAMS

SEPARATIONS AND LLW VITRIFICATION

STREAMS
907=702+706+434+522+645+903
917=911+914
factor=(200 mt/day/3.87E5)*91.8583lb/hr=4.747E-2

	702	706	434	522	645	903	sum of streams	907
MT gas	1.39E+04	0	2.78E+06	0	2.61E+05	0		3.05E+06
MT solid	0	0	1.94E-03	0	1.55E-04	0		1.05E-06
Total MT	1.39E+04	0.00E+00	2.78E+06	0.00E+00	2.61E+05	0.00E+00	3.05E+06	3.05E+06
Factor	4.75E-02	4.75E-02	4.75E-02	4.75E-02	4.75E-02	4.75E-02		4.75E-02
mass flow rate (lb/hr)	659.833	0	131966.6	0	12389.67	0		144783.5
molecular weight	27.63	28.26	28.76	28.76	37.61			29.5
temperature deg F	177	130	438	442	150			420.4278
flow scfm	153.187		29433.64	0	2113.125		31699.95	31482.25

TPA STACK STREAMS

SEPARATIONS AND LLW VITRIFICATION

STREAMS
907=702+706+434+522+645+903
917=911+914
factor=(200 mt/day/3.87E5)*91.8583lb/hr=4.747E-2

	911	914	917	total flow 907+917 scfm	total flow acfm
MT gas	0	4.87E+05	4.87E+05		
MT solid	0	3.92E+02	1.96E-01		
Total MT	0.00E+00	4.87E+05	4.87E+05		
Factor	4.75E-02	4.75E-02	4.75E-02		
mass flow rate (lb/hr)	0	23136.5	23117.9	167901.40	
molecular weight	29	29	29		
temperature deg F			150	382.64	
flow scfm		5117.624	5113.51	36595.76	58404

HLW STREAMS

TPA HLW STREAMS	702	706	340	522	645	903		907
MT gas	7.19E+02	0	1.80E+05	0	2.09E+04	0		2.02E+05
MT solid	0	0	1.26E-04	0	9.89E-06	0		6.78E-08
Total MT	7.19E+02	0.00E+00	1.80E+05	0.00E+00	2.09E+04	0.00E+00	2.02E+05	2.02E+05
Factor	7.32E-02	7.32E-02	7.32E-02	7.32E-02	7.32E-02	7.32E-02		7.32E-02
mass flow rate (lb/hr)	52.6308	0	13176	0	1529.88	0		14786.4
molecular weight	27.63	28.26	28.75	28.75	38.13			29.68229
Temperature deg F	180	130	447	447	150			423.7172
flow scfm	12.21878	0	2939.778	0	257.3708		3209.367	3197.618

TPA HLW STREAMS	911	914	917		
MT gas	0	3.16E+04	3.16E+04		
MT solid	0	2.54E+01	1.27E-02		
Total MT	0.00E+00	3.16E+04	3.16E+04		
Factor	7.32E-02	7.32E-02	7.32E-02		
mass flow rate (lb/hr)	0	2314.979	2313.121	17099.52	
molecular weight	29	29	29		
Temperature deg F			150	385.96	
flow scfm	0	512.06	511.65	3709.26	5943

Note: the 150 deg F temp for streams 917 (both HLW and LLW) is a best estimate, no data was provided

HIGH LEVEL Emissions

TPA HLW stack flows								
LIQUID COMPONENTS								
	Regulated	stream						
		907	917	totals mt	ANNUAL AVE	24 hour avg.	peak hourly	peak conc.
VOLUME					TOTAL/23 year	ann ave/219	(daily ave/24)x2.6	peak hrly/stack flow
SP. GRAVITY				metric tons	kg/year	kg/ 24 hr	kg/hr	grams / cubic meter
Cs and Ba,(MCi)								
Sr and Y, (MCi)								
Tc, (MCi)								
Am, (MCi)								
Np, (MCi)								
Pu-239, (MCi)								
Pu-240, (MCi)								
Pu-241, (MCi)								
TRU, (MCi)								
Total MCi								
Total Mass Flow,(MT)		2.02E+05	3.16E+04	233600	1.02E+07	4.64E+04	5.02E+03	4.98E+02
Total Cr, (MT)								
Total Na, (MT)	WAC-460-160							
Total Si,(MT)	PP							
Total P, (MT)								
Total NO2-, (MT)								
Total NO3-, (MT)								
Ag+	WAC-460-130							
Al(OH)4-	WAC-460							
Am+3								
As+5	WAC-460							
B+3								
Ba+2	WAC-460 ?							
Be+2	40CFR/WAC460							
Bi+3								
C 14				4.54E-04	1.97E-02	9.01E-05	9.76E-06	9.67E-07
Ca+2								
Cd+2	WAC-460-130							
Ce+3								

Cl-									
Cl2	WAC-460-160	4.17E+00		4.17	1.81E+02	8.28E-01	8.97E-02	8.88E-03	← 4.4E-5 following treatment.
CO	WAC-460-160	2.03E+02		203	8.83E+03	4.03E+01	4.37E+00	4.32E-01	
CO2	WAC-460-160	1.69E+04		16900	7.35E+05	3.36E+03	3.63E+02	3.60E+01	
CO3-2	WAC-460-160								
Cr(OH)4-	WAC-460-160								
Cs+									
Cu+2	WAC-460-160								
F-									
F2	WAC-460-160	6.21E+01		62.1	2.70E+03	1.23E+01	1.34E+00	1.32E-01	← 6.6E-04 following treatment
Fe+3									
H2									
H2O		3.14E+03		3140	1.37E+05	6.23E+02	6.75E+01	6.69E+00	
H2S	WAC								
Hg	WAC-460-160								
Hg+2	WAC								
I-									
I2	WAC-460	2.14E+01		21.4	9.30E+02	4.25E+00	4.60E-01	4.56E-02	
K+									
Kerosene									
La+3									
Li+									
Mg+2									
MnO2	WAC-460-160								
Mo+6									
N2		1.42E+05	2.50E+04	167000	7.26E+06	3.32E+04	3.59E+03	3.56E+02	
Na+									
NH3	WAC-460-160	1.83E+01		18.3	7.96E+02	3.63E+00	3.94E-01	3.90E-02	
Ni+3	WAC-460-130								
NO	PP	9.98E-02		0.0998	4.34E+00	1.98E-02	2.15E-03	2.13E-04	
NO2	PP	4.28E+00		4.28	1.86E+02	8.50E-01	9.21E-02	9.12E-03	
NO2-									
NO3-									
Np+4									
O2		3.95E+04	6.63E+03	46130	2.01E+06	9.16E+03	9.92E+02	9.82E+01	
OH-									
Pb+4	WAC/40CFR								

PO4-3								
POLY								
Pu+4								
S								
Si+4								
SO2	PP	4.60E+00		4.6	2.00E+02	9.13E-01	9.89E-02	9.80E-03
SO4-2								
Sr+2								
S								
TcO2								
TcO4-								
TOC								
UO2+2	WAC-460							
V+5								
W+6	WAC460							
ZN+2								
Zr=4								
ZRO2:2H2O								
SOLIDS COMPONENTS								
Cs and Ba,(MCi)		1.69E-10	3.41E-05	3.41E-05	1.48E-03	6.77E-06	7.33E-07	7.26E-08
Sr and Y, (MCi)		2.64E-10	5.33E-05	5.33E-05	2.32E-03	1.06E-05	1.15E-06	1.14E-07
Tc, (MCi)		1.48E-14	2.99E-09	2.99E-09	1.30E-07	5.94E-10	6.43E-11	6.37E-12
Am, (MCi)		2.38E-13	4.81E-08	4.81E-08	2.09E-06	9.55E-09	1.03E-09	1.02E-10
Np, (MCi)		2.32E-16	4.70E-11	4.7E-11	2.04E-09	9.33E-12	1.01E-12	1.00E-13
Pu-239, (MCi)		6.17E-14	1.25E-08	1.25E-08	5.43E-07	2.48E-09	2.69E-10	2.66E-11
Pu-240, (MCi)		1.57E-14	3.18E-09	3.18E-09	1.38E-07	6.31E-10	6.84E-11	6.77E-12
Pu-241, (MCi)		1.83E-13	3.71E-08	3.71E-08	1.61E-06	7.37E-09	7.98E-10	7.90E-11
TRU, (MCi)		4.99E-13	1.01E-07	1.01E-07	4.39E-06	2.01E-08	2.17E-09	2.15E-10
Total MCi		4.33E-10	8.75E-05	8.75E-05	3.80E-03	1.74E-05	1.88E-06	1.86E-07
Total Mass Flow,(MT)		6.78E-08	1.27E-02	0.0127	5.52E-01	2.52E-03	2.73E-04	2.70E-05
Total Cr, (MT)		9.91E-11	2.00E-05	2E-05	8.70E-04	3.97E-06	4.30E-07	4.26E-08
Total Na, (MT)	WAC-460-160	6.29E-09	1.18E-03	0.00118	5.13E-02	2.34E-04	2.54E-05	2.51E-06
Total Si,(MT)	PP	1.57E-08	2.95E-03	0.00295	1.28E-01	5.86E-04	6.34E-05	6.28E-06
Total P, (MT)		7.33E-10	1.37E-04	0.000137	5.96E-03	2.72E-05	2.95E-06	2.92E-07
Total NO2-, (MT)								
Total NO3-, (MT)								

Ag+								
Ag2O		3.70E-12	7.48E-07	7.48E-07	3.25E-05	1.49E-07	1.61E-08	1.59E-09
Al+3								
Al2O3		4.68E-09	8.76E-04	0.000876	3.81E-02	1.74E-04	1.88E-05	1.87E-06
Am+3								
Am2O3		7.62E-14	1.54E-08	1.54E-08	6.70E-07	3.06E-09	3.31E-10	3.28E-11
As+5	WAC							
As2O5		1.92E-12	3.88E-07	3.88E-07	1.69E-05	7.70E-08	8.34E-09	8.26E-10
B+3								
B2O3	WAC-460-160	4.75E-09	8.89E-04	0.000889	3.87E-02	1.76E-04	1.91E-05	1.89E-06
Ba+2	?							
BaO	WAC	8.63E-12	1.76E-06	1.76E-06	7.65E-05	3.49E-07	3.79E-08	3.75E-09
Be+2	40CFR/WAC							
BeO		5.40E-14	1.09E-08	1.09E-08	4.74E-07	2.16E-09	2.34E-10	2.32E-11
Bi+3								
Bi2O3		5.47E-10	1.11E-04	0.000111	4.83E-03	2.20E-05	2.39E-06	2.36E-07
C 14								
Ca+2								
CANCRINITE								
CaO	WAC-460-160	5.11E-10	9.57E-05	9.57E-05	4.16E-03	1.90E-05	2.06E-06	2.04E-07
Cd+2	WAC-460-130							
CdO		2.27E-11	4.58E-06	4.58E-06	1.99E-04	9.09E-07	9.85E-08	9.75E-09
Ce+3								
Ce2O3		7.44E-10	1.39E-04	0.000139	6.04E-03	2.76E-05	2.99E-06	2.96E-07
Cl-								
CO3-2								
Cr+3	WAC-460-160							
Cr2O3		1.45E-10	2.93E-05	2.93E-05	1.27E-03	5.82E-06	6.30E-07	6.24E-08
Cs+								
Cs2O		2.40E-12	4.84E-07	4.84E-07	2.10E-05	9.61E-08	1.04E-08	1.03E-09
Cu	WAC-460-160							
Cu+2	WAC-460-160							
CuO		2.34E-12	4.72E-07	4.72E-07	2.05E-05	9.37E-08	1.02E-08	1.01E-09
CuSO4								
F-	WAC							
Fe+3								
Fe2O3	WAC-460-160	3.27E-09	6.13E-04	0.000613	2.67E-02	1.22E-04	1.32E-05	1.31E-06

Hg+2	WAC-460-160							
I-	WAC ?							
K+								
K2O		6.32E-11	1.28E-05	1.28E-05	5.57E-04	2.54E-06	2.75E-07	2.73E-08
La+3								
La2O3		6.16E-11	1.25E-05	1.25E-05	5.43E-04	2.48E-06	2.69E-07	2.66E-08
Li+								
Li2O		1.36E-09	2.54E-04	0.000254	1.10E-02	5.04E-05	5.46E-06	5.41E-07
Mg+2								
MgO	WAC-460-160	4.70E-11	9.51E-06	9.51E-06	4.13E-04	1.89E-06	2.05E-07	2.03E-08
MnO2	WAC-460-160	5.64E-10	1.06E-04	0.000106	4.61E-03	2.10E-05	2.28E-06	2.26E-07
Mo+6								
MoO3		3.04E-12	6.16E-07	6.16E-07	2.68E-05	1.22E-07	1.32E-08	1.31E-09
Na+								
Na20		8.48E-09	1.59E-03	0.00159	6.91E-02	3.16E-04	3.42E-05	3.39E-06
Ni+3	WAC-460-160							
Ni2FeCN6								
Ni2O3		2.32E-11	4.69E-06	4.69E-06	2.04E-04	9.31E-07	1.01E-07	9.99E-09
NiO		6.12E-10	1.15E-04	0.000115	5.00E-03	2.28E-05	2.47E-06	2.45E-07
NO2-								
NO3-								
Np+4								
NpO2		3.74E-13	7.56E-08	7.56E-08	3.29E-06	1.50E-08	1.63E-09	1.61E-10
OH-								
P2O5		1.68E-09	3.14E-04	0.000314	1.37E-02	6.23E-05	6.75E-06	6.69E-07
P2O5:24H2O								
Pb+4	PP/WAC							
Pb02	WAC	9.48E-12	1.92E-06	1.92E-06	8.35E-05	3.81E-07	4.13E-08	4.09E-09
PO4-3								
Pu+4								
PuO2		1.21E-12	2.45E-06	2.45E-06	1.07E-04	4.86E-07	5.27E-08	5.22E-09
Si+4								
SiO2		3.37E-08	6.31E-03	0.00631	2.74E-01	1.25E-03	1.36E-04	1.34E-05
SO4-2								
Sr+2								
SrO		1.07E-10	2.17E-05	2.17E-05	9.43E-04	4.31E-06	4.67E-07	4.62E-08
Tc2O7		1.36E-12	2.76E-07	2.76E-07	1.20E-05	5.48E-08	5.94E-09	5.88E-10

HIGH LEVEL Emissions

TcO4-								
TOC								
UO2+2	WAC-460							
UO3	WAC-460	4.52E-09	8.46E-04	0.000846	3.68E-02	1.68E-04	1.82E-05	1.80E-06
V+5								
V2O5	WAC-460-160	8.39E-13	1.70E-07	1.7E-07	7.39E-06	3.38E-08	3.66E-09	3.62E-10
WO2		1.10E-12	2.23E-07	2.23E-07	9.70E-06	4.43E-08	4.80E-09	4.75E-10
WO3		5.16E-15	1.04E-09	1.04E-09	4.52E-08	2.06E-10	2.24E-11	2.22E-12
ZN+2	WAC-460-160							
ZNO	WAC-460-160	2.97E-12	6.00E-07	6E-07	2.61E-05	1.19E-07	1.29E-08	1.28E-09
Zr+4								
ZRO2	WAC-460-160	1.86E-09	3.49E-04	0.000349	1.52E-02	6.93E-05	7.51E-06	7.43E-07
ZRO2:2H2O								
material balance based on TPA data package Rev B revcd. 3/16/95								
annual ave based on 23 year operations period								
24 hour ave. based on annual ave/number of operating days per year (365 days@60% OE=219 days)								
peak hourly rate based on plant capacity of 20 mt/operating day								

TPA LLW stack flows								
LIQUID COMPONENTS								
	Regulated	stream						
		907	917	totals mt	ANNUAL AVE	24 hour avg.	peak hourly	peak conc.
VOLUME					TOTAL/19	ann ave/219	(daily ave/24)x1.3	peak hourly/stack flow
SP. GRAVITY				metric tons	kg/year	kg/ 24 hr	kg/hr	grams/cubic meter
MASS FLOW MT		3.05E+06	4.87E+05	3.54E+06	1.86E+08	8.50E+05	4.60E+04	4.64E+02
Total Cr	WAC-460							
Total Na								
Total Si								
Total P	WAC-460-160							
Total NO2-,(MT)	PP							
Total NO3-, (MT)		2.05E+01		2.05E+01	1.08E+03	4.93E+00	2.67E-01	2.69E-03
Cs and Ba, (MCi)								
Sr and Y, (MCi)								
Tc, (MCi)								
Am, (MCi)								
Np, (MCi)								
Pu-239,(MCi)								
Pu-240,(MCi)								
Pu-241,(MCi)								
Total TRU, (MCi)								
Total (MCi)								
Ag+	WAC-460-130							
Al+3	WAC-460							
Am+3								
As+5	WAC-460							
B+3								
Ba+2	WAC-460 ?							
Be+2	40CFR/WAC460							
Bi+3								
C 14				7.46E-04	3.93E-02	1.79E-04	9.71E-06	9.79E-08
Ca+2								
Cd+2	WAC-460-130							
Ce+3								

Cl-									
Cl2	WAC-460-160	3.10E+02		3.10E+02	1.63E+04	7.45E+01	4.04E+00	4.07E-02	←2.0E-4 following treatment
Cm+3									
CO	WAC-460-160	2.35E+03		2.35E+03	1.24E+05	5.65E+02	3.06E+01	3.08E-01	
CO2		1.89E+05		1.89E+05	9.95E+06	4.54E+04	2.46E+03	2.48E+01	
CO3-2	WAC-460-160								
Cr(OH)4-	?								
Cs+									
Cu+2	WAC-460-160								
DPCD									
F-									
F2	WAC-460-160	1.12E+03		1.12E+03	5.89E+04	2.69E+02	1.46E+01	1.47E-01	7.35E-4 following treatment
Fe+3									
H+		3.33E-01		3.33E-01	1.75E+01	8.00E-02	4.33E-03	4.37E-05	
H2									
H2O		5.83E+04		5.83E+04	3.07E+06	1.40E+04	7.59E+02	7.65E+00	
H2S	WAC								
Hg	WAC-460-160								
Hg+2	WAC								
I-									
I2	WAC-460	5.45E+02		5.45E+02	2.87E+04	1.31E+02	7.09E+00	7.15E-02	
K+									
Kerosene									
La+3									
Li+									
Mg+2									
MnO2	WAC-460-160								
Mo+6									
N2		2.21E+06	3.85E+05	2.60E+06	1.37E+08	6.24E+05	3.38E+04	3.40E+02	
Na+									
Nb+5									
NH3	WAC-460-160	1.63E+01		1.63E+01	8.58E+02	3.92E+00	2.12E-01	2.14E-03	
Ni+3	WAC-460-130	9.66E-02		9.66E-02	5.08E+00	2.32E-02	1.26E-03	1.27E-05	
NO	PP	3.11E+00		3.11E+00	1.64E+02	7.47E-01	4.05E-02	4.08E-04	
NO2	PP	1.39E+02		1.39E+02	7.32E+03	3.34E+01	1.81E+00	1.82E-02	
NO2-									
NO3-		2.05E+01		2.05E+01	1.08E+03	4.93E+00	2.67E-01	2.69E-03	

Np+4								
O2		5.95E+05	1.02E+05	6.97E+05	3.67E+07	1.68E+05	9.07E+03	9.14E+01
OH-								
OLIGIMER								
Pb+4	WAC/40CFR							
PO4-3								
POLY								
Pu+4								
Si+4								
SO2	PP	2.09E+02		2.09E+02	1.10E+04	5.02E+01	2.72E+00	2.74E-02
SO4-2								
Sr+2								
S								
TcO2								
TcO4-								
TOC								
UO2+2	WAC-460							
V+5								
W+6	WAC460							
ZN+2								
Zr+4								
ZRO2:2H2O								
SOLIDS COMPONENTS								
Cs and Ba, (MCI)		1.23E-12	2.49E-07	2.49E-07	1.31E-05	5.98E-08	3.24E-09	3.27E-11
Sr and Y, (MCI)		4.74E-12	9.59E-07	9.59E-07	5.05E-05	2.30E-07	1.25E-08	1.26E-10
Tc, (MCI)		6.48E-14	1.31E-08	1.31E-08	6.89E-07	3.15E-09	1.71E-10	1.72E-12
Am, (MCI)		2.15E-14	4.35E-09	4.35E-09	2.29E-07	1.05E-09	5.66E-11	5.71E-13
Np, (MCI)		2.58E-17	5.21E-12	5.21E-12	2.74E-10	1.25E-12	6.78E-14	6.83E-16
Pu-239, (MCI)		4.17E-17	8.43E-10	8.43E-10	4.44E-08	2.03E-10	1.10E-11	1.11E-13
Pu-240, (MCI)		1.03E-15	2.09E-10	2.09E-10	1.10E-08	5.02E-11	2.72E-12	2.74E-14
Pu-241,(MCI)		3.71E-15		3.71E-15	1.95E-13	8.92E-16	4.83E-17	4.87E-19
Total TRU,(MCI)		3.04E-14	5.41E-09	5.41E-09	2.85E-07	1.30E-09	7.04E-11	7.10E-13
Total MCI		6.07E-12	1.23E-06	1.23E-06	6.47E-05	2.96E-07	1.60E-08	1.61E-10
Total Mass Flow (MT)		1.05E-06	1.96E-01	1.96E-01	1.03E+01	4.71E-02	2.55E-03	2.57E-05
Total Cr (MT)	WAC460-160	3.89E-10	7.28E-05	7.28E-05	3.83E-03	1.75E-05	9.48E-07	9.55E-09
Total Na (MT)		1.94E-07	3.63E-02	3.63E-02	1.91E+00	8.72E-03	4.73E-04	4.76E-06

Total Si (MT)		2.89E-07	5.41E-02	5.41E-02	2.85E+00	1.30E-02	7.04E-04	7.10E-06
Total P (MT)	WAC460-160	3.65E-09	6.83E-04	6.83E-04	3.59E-02	1.64E-04	8.89E-06	8.96E-08
Total NO2-, (MT)	PP							
Total NO3-, (MT)								
Ag+	WAC460-160							
Ag2O	WAC460-160	8.79E-13	1.78E-07	1.78E-07	9.37E-06	4.28E-08	2.32E-09	2.33E-11
Al+3								
Al2O3		5.23E-08	9.79E-03	9.79E-03	5.15E-01	2.35E-03	1.27E-04	1.28E-06
Am+3								
Am2O3		6.89E-15	1.39E-09	1.39E-09	7.32E-08	3.34E-10	1.81E-11	1.82E-13
As+5	WAC							
As2O5		2.95E-12	5.96E-07	5.96E-07	3.14E-05	1.43E-07	7.76E-09	7.82E-11
B+3								
B2O3	WAC-460-160	4.17E-12	8.43E-07	8.43E-07	4.44E-05	2.03E-07	1.10E-08	1.11E-10
Ba+2	?							
BaO	WAC	2.20E-12	4.46E-07	4.46E-07	2.35E-05	1.07E-07	5.81E-09	5.85E-11
Be+2	40CFR/WAC							
BeO		5.67E-13	1.15E-07	1.15E-07	6.05E-06	2.76E-08	1.50E-09	1.51E-11
Bi+3								
Bi2O3		1.88E-10	3.80E-05	3.80E-05	2.00E-03	9.13E-06	4.95E-07	4.98E-09
C 14								
Ca+2								
CANCRINITE								
CaO	WAC-460-160	1.05E-07	1.96E-02	1.96E-02	1.03E+00	4.71E-03	2.55E-04	2.57E-06
Cd+2	WAC-460-130							
CdO		5.95E-12	1.20E-06	1.20E-06	6.32E-05	2.88E-07	1.56E-08	1.57E-10
Ce+3								
Ce2O3		6.97E-12	1.41E-06	1.41E-06	7.42E-05	3.39E-07	1.84E-08	1.85E-10
Cl-								
Co3-2								
Cr+3	WAC-460-160							
Cr2O3		5.68E-10	1.06E-04	1.06E-04	5.58E-03	2.55E-05	1.38E-06	1.39E-08
Cs+								
Cs2O		1.71E-14	3.45E-09	3.45E-09	1.82E-07	8.29E-10	4.49E-11	4.53E-13
Cu	WAC-460-160							
Cu+2	WAC-460-160							
CuO		5.53E-13	1.12E-07	1.12E-07	5.89E-06	2.69E-08	1.46E-09	1.47E-11

CuSO4								
F-	WAC							
Fe+3								
Fe2O3	WAC-460-160	5.14E-11	1.04E-05	1.04E-05	5.47E-04	2.50E-06	1.35E-07	1.36E-09
Hg+2	WAC-460-160							
I-	WAC ?							
K+								
K2O		6.62E-13	1.43E-07	1.43E-07	7.53E-06	3.44E-08	1.86E-09	1.88E-11
La+3								
La2O3		6.45E-13	1.30E-07	1.30E-07	6.84E-06	3.12E-08	1.69E-09	1.71E-11
Li+								
Li2O		3.10E-14	6.27E-09	6.27E-09	3.30E-07	1.51E-09	8.16E-11	8.22E-13
Mg+2								
MgO	WAC-460-160	4.00E-12	8.08E-07	8.08E-07	4.25E-05	1.94E-07	1.05E-08	1.06E-10
MnO2	WAC-460-160	5.41E-11	1.09E-05	1.09E-05	5.74E-04	2.62E-06	1.42E-07	1.43E-09
Mo+6								
MoO3		1.82E-11	3.69E-06	3.69E-06	1.94E-04	8.87E-07	4.80E-08	4.84E-10
Na+								
Na20		2.62E-07	4.90E-02	4.90E-02	2.58E+00	1.18E-02	6.38E-04	6.43E-06
Ni+3	WAC-460-160							
Ni2FeCN6								
Ni2O3		1.43E-11	2.89E-06	2.89E-06	1.52E-04	6.95E-07	3.76E-08	3.79E-10
NiO		3.74E-14	7.57E-09	7.57E-09	3.98E-07	1.82E-09	9.85E-11	9.93E-13
NO2-								
NO3-								
Np+4								
NpO2		4.15E-14	8.38E-09	8.38E-09	4.41E-07	2.01E-09	1.09E-10	1.10E-12
OH-								
P2O5		8.35E-09	1.56E-03	1.56E-03	8.21E-02	3.75E-04	2.03E-05	2.05E-07
P2O5;24H2O								
Pb+4	PP/WAC							
Pb02	WAC	5.65E-12	1.14E-06	1.14E-06	6.00E-05	2.74E-07	1.48E-08	1.50E-10
PO4-3								
Pu+4								
PuO2		8.15E-14	1.65E-08	1.65E-08	8.68E-07	3.97E-09	2.15E-10	2.16E-12
S								
Si+4								

SIO2		6.18E-07	1.16E-01	1.16E-01	6.11E+00	2.79E-02	1.51E-03	1.52E-05
SO4-2								
Sr+2								
SrO		1.00E-12	2.02E-07	2.02E-07	1.06E-05	4.85E-08	2.63E-09	2.65E-11
Tc2O7		5.98E-12	1.21E-06	1.21E-06	6.37E-05	2.91E-07	1.58E-08	1.59E-10
TcO4-								
TOC								
UO2+2	WAC-460							
UO3	WAC-460	2.26E-10	4.56E-05	4.56E-05	2.40E-03	1.10E-05	5.94E-07	5.98E-09
V+5								
V2O5	WAC-460-160	2.76E-13	5.59E-08	5.59E-08	2.94E-06	1.34E-08	7.28E-10	7.33E-12
WO2		7.27E-17		7.27E-17	3.83E-15	1.75E-17	9.46E-19	9.54E-21
WO3		2.35E-12	4.75E-07	4.75E-07	2.50E-05	1.14E-07	6.18E-09	6.23E-11
ZN+2	WAC-460-160							
ZNO	WAC-460-160	1.12E-11	2.25E-06	2.25E-06	1.18E-04	5.41E-07	2.93E-08	2.95E-10
Zr+4								
ZRO2	WAC-460-160	3.25E-09	3.28E-07	3.31E-07	1.74E-05	7.96E-08	4.31E-09	4.35E-11
ZRO2:2H2O								
material balance based on TPA data package Rev B recvd 3/16/95								
annual average based on 19 year operations period								
24 hour ave. based on annual ave/number of operationg days per year (365 days @ 60% OE=219 days)								
peak hourly rate based on plant capacity of 200 mt /operating day								

ISV.EMIS

ISV Emissions

	Operating Emissions			
Component	Total Emission	Annual Emissions	Average Hourly	Peak Hourly
	Curies	based on 5 yrs of ISV		
		Curies/year	Ci/hr	Ci/hr
Am-241	1.00E-06	2.00E-07	4.57E-12	6.85E-12
C-14	5.30E+03	1.06E+03	2.42E-02	3.63E-02
Cs-137	3.50E-04	7.00E-05	1.60E-09	2.40E-09
I-129	1.60E+01	3.20E+00	7.31E-05	1.10E-04
Pu-239,240	3.30E-07	6.60E-08	1.51E-12	2.26E-12
Ru-106	3.80E-13	7.60E-14	1.74E-18	2.60E-18
Sm-151	6.30E-06	1.26E-06	2.88E-11	4.32E-11
Sr-90	5.40E-04	1.08E-04	2.47E-09	3.70E-09
Tc-99	3.20E-07	6.40E-08	1.46E-12	2.19E-12
Zr-93	3.90E-08	7.80E-09	1.78E-13	2.67E-13
	kg	kilograms/year		
Particulate	6.00E+04	1.20E+04	2.74E-01	4.11E-01
S0x	0	0.00E+00	0.00E+00	0.00E+00
CO	0	0.00E+00	0.00E+00	0.00E+00
Hydrocarbons	11	2.20E+00	5.02E-05	7.53E-05
N0x	3.60E+05	7.20E+04	1.64E+00	2.47E+00
Aldehydes	N/A		0.00E+00	0.00E+00
Organic Acids	N/A		0.00E+00	0.00E+00
NH3	5.60E+04	1.12E+04	2.56E-01	3.84E-01

Assumptions: Each tank farm will have a confinement facility

There will be 4 vitrification systems in place with at least two in operation at all times

One stack for each Tank Farm Confinement Facility (may be conservative)

May have two systems operating in one tank farm or may vitrify tanks in different tank farms at the same time resulting in emissions from two stacks.

The WHC data package does not address this issue.

The radiological emissions are 100% PM10

Average hourly emissions based on 5 yrs operations @ 24 hrs per day with two ISV systems in operation

Peak hourly emissions based on 3 ISV systems in opertions simultaneously

Reference WHC-SD-WM-EV-101 In Situ Rev 0 (Public Release)

No Separations Stack Flows								
LIQUID COMPONENTS								
	Regulated	stream						
		907	917	totals mt	ANNUAL AVE	24 hour avg.	peak hourly	peak hourly concentration
VOLUME					TOTAL/14 year	ann ave/219	(daily ave/24)x1.7	peak hourly/stack flow rate
SP. GRAVITY				metric tons	kg/year	kg/ 24 hr	kg/hr	grams/ cubic meter
MASS FLOW MT		2.88E+06	4.63E+05	3.34E+06	2.39E+08	1.09E+06	7.72E+04	2.07E+03
Al	WAC-460-160							
Fe								
Cr	WAC-460							
Na								
Si								
P	WAC-460-160							
NO2, NO3	PP							
Cs and Ba								
Sr and Y								
Tc								
TRU								
Total MCi								
Ag+	WAC-460-130							
Al+3	WAC-460							
Am+3								
As+5	WAC-460							
B+3								
Ba+2	WAC-460 ?							
Be+2	40CFR/WAC460							
Bi+3								
C 14								
Ca+2								
Cd+2	WAC-460-130							
Ce+3								
Cl-								
Cl2	WAC-460-160	4.87E+02		4.87E+02	3.48E+04	1.59E+02	1.13E+01	3.02E-01
Cm+3								
CO	WAC-460-160	2.30E+03		2.30E+03	1.64E+05	7.50E+02	5.31E+01	1.43E+00

UNMITIGATED
1.5E-03
FOLLOWING
OFF GAS
TREATMENT.

CO+3	WAC-460-160							
CO2	WAC-460-160	1.82E+05		1.82E+05	1.30E+07	5.94E+04	4.20E+03	1.13E+02
CO3-2	WAC-460-160							
Cr+3	WAC-460-160							
Cs+								
Cu+2	WAC-460-160							
F-								
F2	WAC-460-160	1.17E+03		1.17E+03	8.36E+04	3.82E+02	2.70E+01	7.25E-01
Fe+3								
FeCn6-3								
H+								
H2								
H2O		4.81E+04		4.81E+04	3.44E+06	1.57E+04	1.11E+03	2.98E+01
H2S	WAC							
Hg	WAC-460-160							
Hg+2	WAC							
I-								
I2	WAC-460	2.36E-01		2.36E-01	1.69E+01	7.70E-02	5.45E-03	1.46E-04
K+								
Kerosene								
La+3								
Li+								
Mg+2								
MnO2	WAC-460-160							
Mo+6								
N2		2.10E+06	3.66E+05	2.47E+06	1.76E+08	8.04E+05	5.70E+04	1.53E+03
Na+								
Nb+5								
NH3	WAC-460-160	1.87E+01		1.87E+01	1.34E+03	6.10E+00	4.32E-01	1.16E-02
Ni+3	WAC-460-130							
NO	PP	3.52E+02		3.52E+02	2.51E+04	1.15E+02	8.13E+00	2.18E-01
NO2	PP	1.40E+02		1.40E+02	1.00E+04	4.57E+01	3.23E+00	8.68E-02
NO3-								
Np+4								
O2		5.48E+05	9.72E+04	6.45E+05	4.61E+07	2.10E+05	1.49E+04	4.00E+02
OH-								
Pb+4	WAC/40CFR							

Unmitigated 3.6E-03 following off-gas treatment.

Rb+								
Re+7								
Rh+3	WAC							
Ru+3								
Sb+5	WAC-460-160							
Se+6	WAC							
Si+4								
Sm+3								
Sn+4	WAC-460							
SO2	PP	1.27E+03		1.27E+03	9.07E+04	4.14E+02	2.93E+01	7.87E-01
SO4-2								
Sr+2								
S								
TcO2								
TcO4-								
Te+6	WAC-460-160							
Th+4								
Ti+4								
Ti+3								
TOC								
UO2+2	WAC-460							
V+5								
W+6	WAC460							
ZN+2								
ZRO2:2H2O								
SOLIDS COMPONENTS								
Total Mass Flow		9.94E-07	1.86E-01	1.86E-01	1.33E+01	6.07E-02	4.30E-03	1.15E-04
Al (summary)	WAC460-160	1.31E-08	2.45E-03	2.45E-03	1.75E-01	7.99E-04	5.66E-05	1.52E-06
Fe (summary)		2.21E-09	4.13E-04	4.13E-04	2.95E-02	1.35E-04	9.54E-06	2.56E-07
Cr (summary)	WAC460-160	4.45E-10	8.33E-05	8.33E-05	5.95E-03	2.72E-05	1.92E-06	5.16E-08
Na (summary)		1.84E-07	3.45E-02	3.45E-02	2.46E+00	1.13E-02	7.97E-04	2.14E-05
Si (summary)		2.49E-07	4.65E-02	4.65E-02	3.32E+00	1.52E-02	1.07E-03	2.88E-05
P (summary)	WAC460-160	5.09E-09	9.52E-04	9.52E-04	6.80E-02	3.11E-04	2.20E-05	5.90E-07
NO2, NO3	PP							
Cs and Ba (MCi)		2.50E-10	5.05E-05	5.05E-05	3.61E-03	1.65E-05	1.17E-06	3.13E-08
Sr and Y (MCi)		3.48E-10	7.03E-05	7.03E-05	5.02E-03	2.29E-05	1.62E-06	4.36E-08
Tc (MCi)		9.91E-14	2.00E-08	2.00E-08	1.43E-06	6.52E-09	4.62E-10	1.24E-11

TRU (MCi)		5.10E-13	1.03E-07	1.03E-07	7.36E-06	3.36E-08	2.38E-09	6.39E-11
Total MCi		6.11E-10	1.24E-04	1.24E-04	8.86E-03	4.04E-05	2.86E-06	7.69E-08
Ag+	WAC460-160							
Ag2O	WAC460-160	1.19E-12	2.40E-07	2.40E-07	1.71E-05	7.83E-08	5.54E-09	1.49E-10
Al+3								
Al2O3		2.47E-08	4.62E-03	4.62E-03	3.30E-01	1.51E-03	1.07E-04	2.86E-06
Am+3								
Am2O3		1.17E-13	2.36E-08	2.36E-08	1.69E-06	7.70E-09	5.45E-10	1.46E-11
As+5	WAC							
As2O5		3.23E-12	6.52E-07	6.52E-07	4.66E-05	2.13E-07	1.51E-08	4.04E-10
B+3								
B2O3	WAC-460-160	1.06E-07	1.98E-02	1.98E-02	1.41E+00	6.46E-03	4.57E-04	1.23E-05
Ba+2	?							
BaO	WAC	6.56E-12	1.33E-06	1.33E-06	9.50E-05	4.34E-07	3.07E-08	8.25E-10
Be+2	40CFR/WAC							
BeO		6.90E-14	1.40E-08	1.40E-08	1.00E-06	4.57E-09	3.23E-10	8.68E-12
Bi+3								
Bi2O3		7.86E-10	1.47E-04	1.47E-04	1.05E-02	4.79E-05	3.40E-06	9.11E-08
C 14								
Ca+2								
CANCRINITE								
CaO	WAC-460-160	8.17E-09	1.53E-03	1.53E-03	1.09E-01	4.99E-04	3.53E-05	9.49E-07
Cd+2	WAC-460-130							
CdO		3.02E-11	6.11E-06	6.11E-06	4.36E-04	1.99E-06	1.41E-07	3.79E-09
Ce+3								
Ce2O3		7.48E-10	1.40E-04	1.40E-04	1.00E-02	4.57E-05	3.23E-06	8.68E-08
Cl-								
Cm+3								
Cm2O3		6.51E-17		6.51E-17	4.65E-15	2.12E-17	1.50E-18	4.04E-20
Co+3								
Co2O3		2.86E-12	5.79E-07	5.79E-07	4.14E-05	1.89E-07	1.34E-08	3.59E-10
Co3-2								
Cr+3	WAC-460-160							
Cr2O3		6.51E-10	1.22E-04	1.22E-04	8.71E-03	3.98E-05	2.82E-06	7.56E-08
Cs+								
Cs2O		3.22E-12	6.52E-07	6.52E-07	4.66E-05	2.13E-07	1.51E-08	4.04E-10
Cu	WAC-460-160							

Cu+2	WAC-460-160							
CuO		3.07E-12	6.22E-07	6.22E-07	4.44E-05	2.03E-07	1.44E-08	3.86E-10
CuSO4								
F-	WAC							
Fe+3								
Fe2O3	WAC-460-160	3.16E-09	5.91E-04	5.91E-04	4.22E-02	1.93E-04	1.37E-05	3.66E-07
H+								
Hg+2	WAC-460-160							
I-	WAC ?							
K+								
K2O		4.32E-09	8.74E-04	8.74E-04	6.24E-02	2.85E-04	2.02E-05	5.42E-07
La+3								
La2O3		1.14E-10	2.30E-05	2.30E-05	1.64E-03	7.50E-06	5.31E-07	1.43E-08
Li+								
Li2O		3.78E-08	7.07E-03	7.07E-03	5.05E-01	2.31E-03	1.63E-04	4.38E-06
Mg+2								
MgO	WAC-460-160	7.58E-09	1.42E-03	1.42E-03	1.01E-01	4.63E-04	3.28E-05	8.80E-07
MnO2	WAC-460-160	5.75E-10	1.08E-04	1.08E-04	7.71E-03	3.52E-05	2.50E-06	6.70E-08
Mo+6								
MoO3		3.16E-11	6.39E-06	6.39E-06	4.56E-04	2.08E-06	1.48E-07	3.96E-09
Na+								
Na20		2.49E-07	4.65E-02	4.65E-02	3.32E+00	1.52E-02	1.07E-03	2.88E-05
Nb+5								
Nb2O5		2.39E-18		2.39E-18	1.71E-16	7.80E-19	5.52E-20	1.48E-21
Ni+3	WAC-460-160							
Ni2FeCN6								
Ni2O3		3.72E-11	7.52E-06	7.52E-06	5.37E-04	2.45E-06	1.74E-07	4.66E-09
NiO		6.10E-10	1.14E-04	1.14E-04	8.14E-03	3.72E-05	2.63E-06	7.07E-08
NO2-								
NO3-								
Np+4								
NpO2		1.35E-13	2.73E-08	2.73E-08	1.95E-06	8.90E-09	6.31E-10	1.69E-11
OH-								
P2O5		1.16E-08	2.18E-03	2.18E-03	1.56E-01	7.11E-04	5.04E-05	1.35E-06
P2O5:24H2O								
Pb+4	PP/WAC							
Pb02	WAC	9.23E-11	1.87E-05	1.87E-05	1.34E-03	6.10E-06	4.32E-07	1.16E-08

PO4-3								
Pu+4								
PuO2		7.26E-13	1.47E-07	1.47E-07	1.05E-05	4.79E-08	3.40E-09	9.11E-11
Rb+								
RbO2		2.23E-13	4.50E-08	4.50E-08	3.21E-06	1.47E-08	1.04E-09	2.79E-11
Re+7								
Re2O7		1.40E-13	2.83E-08	2.83E-08	2.02E-06	9.23E-09	6.54E-10	1.75E-11
Rh+3								
Rh2O3		1.36E-12	2.75E-07	2.75E-07	1.96E-05	8.97E-08	6.35E-09	1.70E-10
Ru+3								
Ru2O3		1.71E-12	3.46E-07	3.46E-07	2.47E-05	1.13E-07	7.99E-09	2.15E-10
Sb+5								
Sb2O5		6.20E-12	1.25E-06	1.25E-06	8.93E-05	4.08E-07	2.89E-08	7.75E-10
Se+6								
SeO3		9.56E-12	1.93E-06	1.93E-06	1.38E-04	6.29E-07	4.46E-08	1.20E-09
Si+4								
SiO2		5.32E-07	9.95E-02	9.95E-02	7.11E+00	3.25E-02	2.30E-03	6.17E-05
Sm+3								
Sm2O3		9.35E-14	1.89E-08	1.89E-08	1.35E-06	6.16E-09	4.37E-10	1.17E-11
Sn+4	WAC-460-160							
SnO2		6.19E-14	1.25E-08	1.25E-08	8.93E-07	4.08E-09	2.89E-10	7.75E-12
SO4-2								
Sr+2								
SrO		1.10E-10	2.22E-05	2.22E-05	1.59E-03	7.24E-06	5.13E-07	1.38E-08
Tc2O7		9.14E-12	1.85E-06	1.85E-06	1.32E-04	6.03E-07	4.27E-08	1.15E-09
TcO4-								
Te+6	WAC-460-160							
TeO3	WAC-460-160	8.63E-13	1.75E-07	1.75E-07	1.25E-05	5.71E-08	4.04E-09	1.08E-10
Th+4								
ThO2		3.89E-11	7.87E-06	7.87E-06	5.62E-04	2.57E-06	1.82E-07	4.88E-09
Ti+4								
TiO2		1.86E-12	3.76E-07	3.76E-07	2.69E-05	1.23E-07	8.69E-09	2.33E-10
Ti+3								
Ti2O3		1.54E-11	3.11E-06	3.11E-06	2.22E-04	1.01E-06	7.19E-08	1.93E-09
TOC								
UO2+2	WAC-460							
UO3	WAC-460	4.41E-09	8.26E-04	8.26E-04	5.90E-02	2.69E-04	1.91E-05	5.12E-07

V+5								
V2O5	WAC-460-160	2.15E-13	4.34E-08	4.34E-08	3.10E-06	1.42E-08	1.00E-09	2.69E-11
WO2		4.26E-11	8.61E-06	8.61E-06	6.15E-04	2.81E-06	1.99E-07	5.34E-09
WO3		1.03E-11	2.09E-06	2.09E-06	1.49E-04	6.82E-07	4.83E-08	1.30E-09
ZN+2	WAC-460-160							
ZNO	WAC-460-160	7.30E-12	1.48E-06	1.48E-06	1.06E-04	4.83E-07	3.42E-08	9.18E-10
ZRO2	WAC-460-160	2.06E-09	3.86E-04	3.86E-04	2.76E-02	1.26E-04	8.92E-06	2.39E-07
ZRO2:2H2O								
		material balance based on data package recvd. 11/8/94						
		annual ave based on 14 year operations period						
		24 hour ave. based on annual ave/number of operating days per year (365 days @ 60% OE)						
		peak hourly rate based on plant capacity of 200 mt /operting day						

Ex Situ Intermediate Separations (TPA)
Waste Treatment Facility Construction Emissions

Pollutant	Unit	As Reported in Data pkg	Reduction Factor	Modified TPA Emission	Selective Retrieval Emission	Selective Retrieval annual emissions
Particulate	kg	1.30E+05	0.58	6.90E+04	34500	3833
S0x	kg	1.60E+04	0.92	1.29E+04	6450	717
CO	kg	3.20E+07	0.3	1.00E+07	5000000	555556
Hydrocarbons	kg	1.60E+06	0.34	5.50E+05	275000	30556
N0x	kg	1.90E+06	0.56	9.50E+05	475000	52778
Aldehydes as HCHO	kg	5.60E+04	0.0091	5.10E+02	255	28
Organic Acids	kg	n/a				
Thermal Releases	J	8.00E+14				
Fugitive Dust	metric ton	840		497	248.5	28

note: the 497 metric tons of fugitive dust taken from the data pkg appendix. The 840 t number appears in error.

Construction duration is 9 years for the main facilities. The construction of the LLW disposal vaults would begin following construction of the LLW vitrification plant and would continue as required through the operations period as required.

Request Number 81

Jacobs Engineering Group
Engineering Information Request - TWRS EIS

Requested By: John Kuhn Date: 09/13/95

Phone Number: (904) 332-3318 Fax Number: (904) 333-6631

Requested Information: Data for the selective retrieval alternative. Please refer to the attached sheets for detailed information.

Need Date: 09/22/95

Response:

Data Source/Accuracy:

Prepared By: Date Sent/Faxed:

Concurrence:
Marc Nelson - Deputy Project Manager

Selective Retrieval

Reference	Required Item
4.1.1	Location of transfer annexes, and waste storage/sampling facility. Will locations be the same as for the ex-situ alternatives (TA1W, TA2E, TA1W, etc)?
4.1.1	Emissions from construction of transfer annexes and storage sampling facility. If a simple scaling of the emissions is being done, providing the scale factor is sufficient.
4.1.2	Will the location of the pretreatment facility be the same as ST-L? If not, please provide the location of the pretreatment facility.
4.1.2	Emissions from construction of pretreatment facility. I am assuming that these emissions would occur within the area source (ST-L) and would be combined with the emissions from the construction of the LLW vitrification facility and the support facilities. Please confirm. If emissions are to be scaled from previously determined emissions from TPA, providing scale factor would suffice.
4.1.3	Please identify the tanks that will have contents retrieved, and those that will be "filled and capped".
4.1.3	Will the location of the HLW vit facility correspond to source ST-H? If not, please give location.
4.1.4	I am assuming that these emissions will be accounted for in the emissions from construction of the HLW vit plant. Please confirm
4.1.5	I am assuming that these emissions will be accounted for in the emissions from construction of the LLW vit plant.
4.2.2	Previously, we have data only for emissions of radionuclides from the retrieval portion of the extensive retrieval alternatives. The assumptions were that the non-radiological pollutant releases from these operations are negligible. We propose to use the same radionuclide emissions from the "selective retrieval" retrieval operations as was used for the ex-situ scenarios, and to continue to assume that the emissions of non-radiological pollutants from retrieval operations are negligible. Please confirm.
4.2.4	Need emissions of radionuclide and non-radiological components during RF drying operations. Your breakdown shows 45 drying systems being operated continuously. How many tank farms does this represent? Does each drying system have its own stack? What are the stack parameters and locations?

4.2.4 We have no data concerning the gravel stock piles and filling operations. If these emissions are significant, please provide emissions data. I assume that these emissions would be similar as those for the fill and cap alternative.

4.2.4 I am assuming that the emissions from the HLW and LLW plants will be scaled from the emissions given for the TPA alternative. Please give the new emissions or the scale factor. Will the stack parameters be the same as for the TPA? If not, please provide the new stack parameters.

4.2.5, 4.2.6, 4.2 7 I am assuming that these impacts are negligible. Please confirm.

fedex 9/26

Request Number 081

Jacobs Engineering Group
Engineering Information Request - TWRS EIS

Requested By: John Kuhn (ESE) Date: 09/14/95

Phone Number: (904) 332-3318 ext 6058 Fax Number: (904) 333-6631

Request Information: Data for the Selective Retrieval alternative. See attached sheets for detailed information.

Need Date: 9/22/95

Response: see attached

Data Source/Accuracy:

Prepared By: Colin Henderson

Date Sent/Faxed:

Concurrence:
Marc Nelson - Project Manager

H:\USERS\CHENDERS\EIR\ENINFRQ.081

ENGINEERING INFORMATION REQUEST: 081

SUBJECT: Selective Retrieval

Reference

4.1.1 The transfer annexes, and waste storage/sampling facility would be located in the same areas as identified for the Extensive Retrieval (Ex Situ Vitrification) alternative.

4.1.1 Emissions from the construction of the transfer annexes and storage/sampling facility can be estimated by scaling the emissions for Extensive Retrieval by 50%.

4.1.2 The combined pretreatment LAW vitrification plant would be located in the same area as ST-L.

4.1.2 Emissions from the construction of the pretreatment facility and the low activity waste (LAW) would occur within the ST-L area source. Construction emissions can be scaled at 50%. See attached table for treatment facility construction emissions. These construction emissions are scaled from the modified TPA construction emissions.

4.1.3 Tanks that will be retrieved for exsitu processing are identified in the attached figure. A listing of the retrieved tanks is as follows:

241-AN tank farm: AN-102,103, 104,105,107
241-AW tank farm: AW-101
241-AZ tank farm: AZ-101, 102
241-SY tank farm: SY-101, 103
241-A tank farm: A-101, 102, 104, 106
241-B tank farm: B-101, 108, 109, 110, 111, 202
241-BX tank farm: BX-101, 102, 104, 105, 106, 109, 110, 111, 112
241-BY tank farm: BY-101, 103, 104, 105, 106, 107, 110, 111
241-C tank farm: C-102, 103, 104, 105, 106, 107
241-S tank farm: S-101, 107, 109, 110, 111, 112
241-SX tank farm: SX-103, 104, 105, 106, 111, 114, 115
241-T tank farm:T-105, 112
241-TX tank farm: TX-109, 110, 113, 114, 115, 116, 117, 118
241-TY tank farm: TY-103, 105
241-U tank farm: U-101, 110

All other tanks will be filled and capped.

4.1.3 The location of the HLW vit facility will correspond to ST-H.

4.1.4 The emissions from the construction of the storage pads for interim storage of HLW are accounted for in the emissions for the HLW vit plant.

4.1.5 The emissions from the construction of the LLW disposal vaults are accounted for in the emission estimates made for the alternative. (I don't think the construction emissions were broken down to be facility specific)

4.2.2 Retrieval air emissions: assume non radiological air emissions are ~~zero.~~ Use 3X Continued
Assume radiological air emissions due to retrieval operations are 50% of the Extensive Retrieval (Ex Situ Vitrification) alternative.

4.2.4 Radio frequency drying of the tanks has been deleted. The emissions from gravel filling for selective retrieval can be scaled using the following factors:

89 out of 149 of the SSTs will be filled with gravel.

18 of the 28 DSTs will be filled with gravel.

See Engineering Information Request 080 for Fill and Cap Emissions. Associated with the fill and cap of the DST would be 3 years of continuous evaporator operations to reduce the liquids in the 18 DSTs that are not retrieved. Three years is obtained from 5 yrs for evaporating contents of 28 DSTs X (18/28). The emissions from continuous evaporator operations are provided in the response to Eng. Inf. Req. -078.

4.2.4 The locations for the gravel stock piles would be the same as identified for the Fill and Cap alternative.

4.2.4 The attached tables show the percentages of the various radionuclides that are recovered under the Selective Retrieval alternative. For the purpose of estimating air emissions it appears that we would be conservative for most isotopes by saying that 90% of the inventory gets retrieved and thus the air radiological air emissions for selective retrieval are 90% of those estimated for Extensive Retrieval (Ex Situ Vitrification). The exception to this is the C-14 which is recovered at approximately 95%.

Since the total volume of waste retrieved under Selective Retrieval for exsitu processing is approximately 50% of the total waste volume the non radiological operating emissions should be scaled at 50%.

Note: Specific recovery percentages of chemical constituents for selective retrieval will be developed in the future. Refinement of the Selective Retrieval chemical emissions would be possible at that time.

The stack parameters are assumed to be the same as the Extensive Retrieval (Ex Situ Vitrification) alternative. The volumetric flow rate in the off-gas system would be lower but the stack diameter is assumed to be reduced to yield the same exit velocities.

4.2.5 The air emissions from 4.2.5, 4.2.6, and 4.2.7 are considered negligible

Continued Operations :

See attached continued operations phase out schedule for phase out of continued operations during the waste treatment operations. See Eng. Inf. Request -078 for continued operations emissions.

TABLE 2

Percentage of the SST inventory recovered from 60 tanks for the Selective Retrieval alternative (based on 99% retrieval)				
Gmcl				
Ac225	74.28			
Ac227	89.37			
Am241	89.22			
Am242	91.09			
Am242m	91.09			
Am243	92.60			
At217	74.27			
Ba135m	N/A			
Ba137m	88.32			
Bi210	82.97			
Bi211	89.36			
Bi213	74.28			
Bi214	83.72			
C14	92.89			
Cm242	91.09			
Cm244	93.89			
Cm245	93.89			
Cs135	84.79			
Cs137	88.32			
Fr221	74.29			
Fr223	89.38			
I129	91.65			
Nb93m	77.38			
Ni59	N/A			
Ni63	78.79			
Np237	89.57			
Np239	92.59			
Pa231	90.46			
Pa233	89.58			
Pa234m	91.42			
Pb209	74.27			
Pb210	82.96			
Pb211	89.36			
Pb214	83.72			
Pd107	91.97			
Po210	82.91			
Po213	74.26			
Po214	83.71			
Po215	89.37			
Po218	83.71			
Pu238	74.21			
Pu239	78.55			
Pu240	79.83			
Pu241	81.48			
Ra223	89.37			
Ra225	74.28			
Ra226	83.72			
Ru106	36.50			

Sb126	72.34			
Sb126m	72.33			
Se79	91.67			
Sm151	71.82			
Sn126	72.31			
Sr90	65.38			
Tc99	91.62			
Th227	89.37			
Th229	74.31			
Th230	81.60			
Th231	91.08			
Th233	N/A			
Th234	91.42			
Tl207	89.37			
U233	78.32			
U234	80.43			
U235	91.07			
U238	91.42			
Y90	65.38			
Zr93	66.40			

TABLE 3

Percentage of the DST inventory recovered from 10 DSTs					
for the Selective Retrieval alterative (based on 99% retrieval)					
Radionuclides					
(Ci)					
Na, kgs	77.68				
14C	98.79				
90Sr	87.14				
90Y	87.14				
99Tc	91.44				
137Cs	89.36				
137Ba	89.36				
154Eu	97.60				
235U	N/A				
238U	N/A				
237Np	97.87				
238Pu	11.92				
239Pu	28.27				
240Pu	26.13				
241Pu	23.98				
241Am	70.66				
Curies	88.69				

Continued Operatio. .ase Out Schedule

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
No Action																
Min Retrieval (In Situ Vit)																
Waste Treatment 2008-2013 Number of Tanks Treated														30	59	89
% of tanks remaining under continued operations	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	83%	67%	50%
Min Retrieval (Fill and Cap)																
Waste Treatment 2006-2013 Number of Tanks Treated												22	44	66	89	111
% of tanks remaining under continued operations	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	88%	75%	63%	50%	38%
Selective Retrieval																
Retrieval 2001-2023, Number of Tanks Treated							3	6	9	12	15	18	21	24	27	30
Fill and Cap 2006-2013												13	27	40	54	67
Total Tanks Treated							3	6	9	12	15	32	48	64	81	97
% of tanks remaining under continued operations	100%	100%	100%	100%	100%	100%	98%	97%	95%	93%	91%	82%	73%	64%	54%	45%
Extensive Retrieval (Ex Situ Vit)																
Retrieval 2001-2023, Number of Tanks Treated							8	15	23	31	38	46	54	62	69	77
% of tanks remaining under continued operations	100%	100%	100%	100%	100%	100%	96%	91%	87%	83%	78%	74%	70%	65%	61%	57%
Extensive Retrieval (No Separations)																
Retrieval 2001-2018, Number of Tanks Treated							10	20	30	39	49	59	69	79	89	98
% of tanks remaining under continued operations	100%	100%	100%	100%	100%	100%	94%	89%	83%	78%	72%	67%	61%	56%	50%	44%
Extensive Retrieval (Extensive Separations)																
Retrieval 2001-2024, Number of Tanks Treated							7	15	22	30	37	44	52	59	66	74
% of tanks remaining under continued operations	100%	100%	100%	100%	100%	100%	96%	92%	88%	83%	79%	75%	71%	67%	63%	58%

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
118	148	177											
33%	17%	0%											
133	155	177											
25%	13%	0%											
33	37	40	43	46	49	52	55	58	61	64	67	70	
80	94	107											
114	130	147	150	153	156	159	162	165	168	171	174	177	
36%	26%	17%	15%	14%	12%	10%	9%	7%	5%	3%	2%	0%	
85	92	100	108	115	123	131	139	146	154	162	169	177	
52%	48%	43%	39%	35%	30%	26%	22%	17%	13%	9%	4%	0%	
108	118	128	138	148	157	167	177						
39%	33%	28%	22%	17%	11%	6%	0%						
81	89	96	103	111	118	125	133	140	148	155	162	170	177
54%	50%	46%	42%	38%	33%	29%	25%	21%	17%	13%	8%	4%	0%
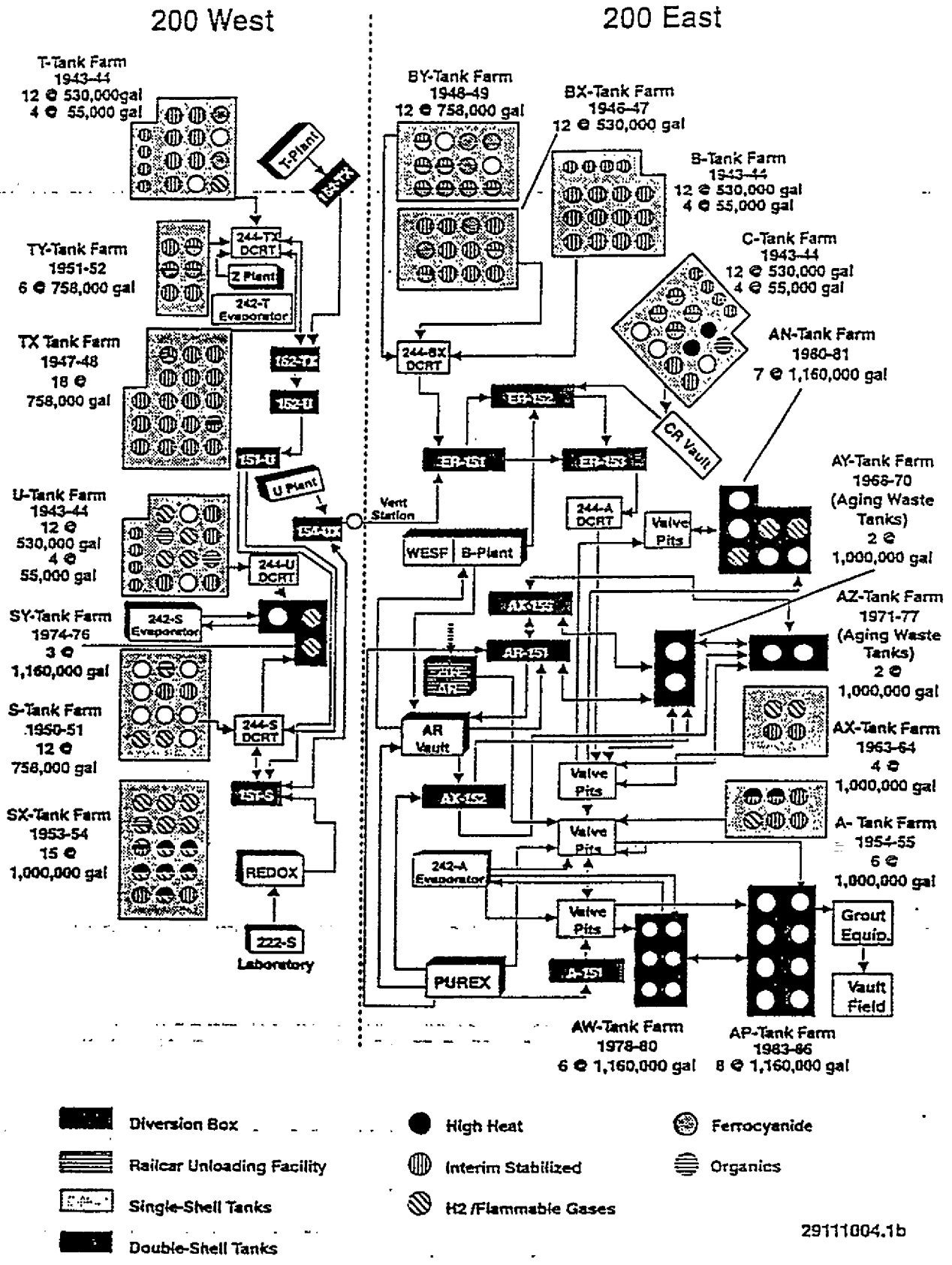
Figure 1-4. Hanford Site Tank System Schematic Diagram.