Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221

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NMED Hazardous
Waste Bureau

Mr. Steve Zappe, WIPP Project Leader
Hazardous Waste Permits Program
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2905 E. Rodeo Park Drive, Bldg. 1
Santa Fe, NM 87505

Subject: Transmittal of Approved Hanford WSPF Number RLRFETS.001, Transuranic Mixed Inorganic Homogeneous Solid Waste

Dear Mr. Zappe:

The Department of Energy, Carlsbad Field Office (CBFO) has approved the Hanford Waste Stream Profile Form (WSPF) RLRFETS.001.

Enclosed is a copy of the approved form as required by Section B-4(b)(1) of the WIPP Hazardous Waste Facility Permit No. NM4890139088-TSDF.

If you have any questions on this matter, please contact me at (505) 234-7357 or (505) 706-0066.

Sincerely,

Kerry W. Watson
CBFO Assistant Manager
Office of National TRU Program

Enclosure

cc: w/o enclosure
J. Kieling, NMED
C. Walker, TechLaw
M. Strum, WTS
R. Chavez, WRES
L. Greene, WRES
WIPP Operating Record
S. Calvert, CTAC
CBFO M&RC

CBFO:NTP:KWW:VW:04-0281:UFC:5822

040737

WIPP WASTE STREAM PROFILE FORM

Waste Stream Profile Number RLRFETS.001
Generator Site Name: Hanford Technical Contact: Scott Bisping
Generator Site EPA ID: WA7890008967, Technical Contact phone number: 509-372-0851
Date audit report approved by NMED: June 23, 2000; recertified February 1, 2002, August 8, 2002, February 25, 2003, December 5, 2003; and July 2, 2004
Title, version number, and date of documents used for WAP certification: HNF-2599, Hanford Site Transuranic Waste Characterization Quality Assurance Project Plan, Rev. 10 (10/08/03); DOE/WIPP-02-3122, CH-TRU Waste Acceptance Criteria, Rev. 0.1, (07/25/02); HNF-2600, Hanford Site Transuranic Certification Plan, Rev. 12 (10/28/03); "Safety Analysis Report for the TRUPACT-II Shipping Package," Docket No. 9218, Rev. 19A (03/02); TRUPACT II – Authorized Methods for Payload Control (TRAMPAC), Rev. 19c (04/03); WIPP Waste Acceptance Criteria, Revision 7, DOE/WIPP-069, November 1999
Did your facility generate this waste? X[1] Yes __No If no, provide the name and EPA ID of the original generator: _____

Waste Stream Information
WIPP ID: RLRFETS.001 Summary Category Group: S3000
Waste Matrix Code Group: Inorganic homogeneous solids Waste Stream Name: RFETS01
Description from the WTWBIR[2]: RL-W409; 2345Z non-surpl fac mt prg D&D TRU
Defense Waste: XYes ☐ No Check one: XCH ☐ RH Number of SWBs: N/A Number of Drums: 299 55-gal. drums
Number of Canisters: N/A
Data package numbers supporting this waste stream characterization: See page 12 of 13
List applicable EPA Hazardous Waste Codes[3] D004, D005, D006, D007, D008 D009, D010, D011, F001, F002, and F005
Applicable TRUCON Content Codes: RH130E, RH130F, RH130G, RH130H

Acceptable Knowledge Information

Required Program Information

- Map of site: References 1 and 3
- Facility mission description: References 1 and 3
- Description of operations that generate waste: References 1, 2, and 3
- Waste identification/categorization schemes: References 1 and 3
- Types and quantities of waste generated: References 1, 2, and 3
- Correlation of waste streams generated from the same building and process, as appropriate: References 1 and 3
- Waste certification procedures: References 1 and 3

Required Waste Stream Information

- Area(s) and building(s) from which the waste stream was generated: References 1 and 2 (Figure A-1)
- Waste stream volume and time period of generation: References 1, 2, and 3
- Waste generating process description for each building: References 1, 2, and 3
- Process flow diagrams Reference 2 (Figure A-2)
- Material inputs or other information identifying chemical/radionuclide content and physical waste form: References 1 and 2
- Which Defense Activity generated the waste: (check one) Reference 2 (Section 2.2)

☐	Weapons activities including defense inertial confinement fusion	☐	Naval reactors development
☐	Verification and control technology	☐	Defense research and development
X	Defense nuclear waste and material by products management	☐	Defense nuclear materials production
☐	Defense nuclear waste and materials security and safeguards and security investigations		

Supplemental Documentation:

- Process design documents N/A
- Standard operating procedures: N/A
- Safety Analysis Reports: N/A
- Waste packaging logs N/A
- Test plans/research project reports: Note 4
- Site data bases: Note 4
- Information from site personnel: Note 4
- Standard industry documents: N/A
- Previous analytical data: Note 4
- Material safety data sheets: N/A
- Sampling and analysis data from comparable/surrogate Waste: Note 4
- Laboratory notebooks: N/A

Sampling and Analysis Information
Radiography: N/A

WIPP WASTE STREAM PROFILE FORM

Visual Examination: N/A

Visual Examination Technique: ZO-160-080, "Pipe-N-Go Operations," Rev. C, change 4, July 13, 2001

Headspace Gas Analysis

VOCs: DO-080-009, "Obtain Headspace Gas Samples of TRU Waste Containers," Rev. J-0, April 14, 2003; LA-523-410, "Determination of Volatile Organic Compounds in TRU/Mixed Waste Container Headspace," Rev. K-0, April 7, 2003; LO-080-407, "Cleaning Summa Canisters for TRU Headspace Gas Sampling," Rev. G-O, April 08, 2003; LO-090-450, "TRU Project Sample Chain of Custody, Storage, Acceptance, and Disposal," Rev. F-0, April 8, 2003.

Flammable: DO-080-009, "Obtain Headspace Gas Samples of TRU Waste Containers," Rev. J-0, April 14, 2003; LA-523-410, "Determination of Volatile Organic Compounds in TRU/Mixed Waste Container Headspace," Rev. K-0, April 7, 2003

Other gases (specify): N/A

Homogeneous Solids/Soils/Gravel Sample Analysis

Total metals: ACMM-8909, "Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel," Rev. 7, April 7, 2003; ACMM-2901, "Determination of Metals by ICP-AES for TRU Waste Characterization," Rev. 2, Apriol 7, 2003; ACMM-2810 "Determination of Mercury by CVAA for TRU Waste Characterization," Rev. 2, April 7, 2003

PCBs: N/A

VOCs: ACMM-9260, "Volatile Organic Compounds by Gas Chromatography Mass Spectrometry," Rev. 9, July 10, 2003

Nonhalogenated VOCs: ACMM-9441, "Determination of Nonhalogenated Volatile Organics by Gas Chromatography," Rev. 8, April 7, 2003

Semi-VOCs: ACMM-9500, "Sample Preparation for Semivolatile Organic Compounds and Polychlorinated Biphenyls," Rev. 8, July 10, 2003; ACMM-9270, "Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry," Rev. 5, April 7, 2003

Other (specify): N/A

Waste Stream Profile Form Certification:

I have reviewed the information in this Waste Stream Profile Form and have found the information consistent with the information in the analytical batch data reports.

M. J. Horkota — Signature of SQAO

Michael J Horkota SQAO — Printed Name and Title

7/12/04 — Date

NOTE:

(1) RFETS generated the ash during the period 1958 to 1989 and shipped it to Hanford as a residue for Pu recovery. Hanford processed (i.e., calcined) and managed the material as a residue until Nov. 1999, when it was packaged (including mixing with surrogate material and placing into billet cans and POCs) by Hanford for disposal as waste.

(2) This waste is identified in the TWBIR as RL-409; the WIPP ID assigned corresponds to the WSPF number.

(3) AK, radiography, visual examination, headspace gas analysis, and/or homogeneous solids/soils/gravel sample analysis were used to determine EPA Hazardous Waste Codes. The attached signed summary reports document this determination.

(4) See Section 5 of M4T00-TRU-03-533, "Hanford Site Transuranic Waste Management Waste Specific Acceptable Knowledge Documentation for TRM Incinerator Ash from Rocky Flats," for a list of supplemental references used to compile AK. This section provides records management system tracking numbers, document titles, revision numbers, dates, authors, and a brief summary for waste stream-specific supplemental AK information documents.

I hereby certify that I have reviewed the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Signature of Site Project Manager

David C. DeRosa — Printed Name and Title

ALT. Site Project Manager

7/12/04 — Date

REFERENCE LIST

1. HNF-3461, "Hanford Site Transuranic Waste Management Program Acceptable Knowledge Document for Retrievably Stored Contact-Handled Waste," Rev. 7, June 17, 2002.
2. M4T00-TRU-03-533, "Hanford Site Transuranic Waste Management Waste Specific Acceptable Knowledge Documentation for TRM Incinerator Ash from Rocky Flats," Rev. 5, October 31, 2003.
3. HNF-5482, "Hanford Site Transuranic Waste Management Acceptable Knowledge Documentation for the Plutonium Finishing Plant," Rev. 8, December 12, 2003.

RECONCILIATION WITH DATA QUALITY OBJECTIVES

I certify by signature (below) that sufficient data have been collected to determine the following project-required waste parameters for WSPF#: RLRFETS.001

Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

		Reconciliation Parameter
1	√	Waste Matrix Code as reported in WWIS.
2	√	Waste Material Parameter Weights for individual containers as reported in WWIS.
3	√	The matrix parameter category identified is consistent with the type of sampling and analysis used to characterize the waste.
4	√	Container mass and activities of each radionuclide of concern as reported in WWIS.
5	√	Appropriate packaging configuration and DAC were met and documented in the headspace gas sampling documentation and the drum age was met prior to sampling.
6	√	The TRU activity reported in WWIS demonstrates with a 95% probability that the waste is TRU waste and not low-level radioactive waste.
7	√	Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for each VOC in headspace gas of the waste containers in the waste stream/waste stream lot were assigned as required.
8	√	Identify VOCs and quantify the concentrations of VOC constituents in the total waste inventory to ensure compliance with the environmental performance standards of 20.4.1.500 NMAC (incorporating 40 CFR 11§264.601(c)), and to confirm hazardous waste identification by acceptable knowledge.
9	√	Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, number of samples collected for VOCs were calculated and compared with the program required quantitation limits and regulatory threshold limits, as reported in Data Summary Report Table 3, and EPA Hazardous Waste Codes were assigned as required (Matrix Parameter Summary Categories S3000 and S4000).
10	√	Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, number of samples collected for SVOCs were calculated and compared with the program required quantitation limits and regulatory threshold limits, as reported in Data Summary Report Table 4, and EPA Hazardous Waste Codes were assigned as required (Matrix Parameter Summary Categories S3000 and S4000).
11	√	Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, number of samples collected for metals were calculated and compared with the program required quantitation limits and regulatory threshold limits, as reported in Data Summary Report Table 5, and EPA Hazardous Waste Codes were assigned as required (Matrix Parameter Summary Categories S3000 and S4000).
12	√	Sufficient numbers of samples (as established by completeness rate) were taken to meet statistical sampling requirements, as documented on Summary Data Report Table 1.
13	√	Only validated data were used in the above calculations, as documented through the site data review and validation forms and process.
14	√	Waste containers were selected randomly for sampling, as documented in site procedures.
15	√	The potential flammability of TRU waste headspace gases.
16	√	Whether the waste stream exhibits a toxicity characteristic under 40 CFR Part 261, Subpart C.
17	√	Whether the waste stream can be classified as hazardous or nonhazardous at the 90% confidence level.
18	√	Whether all TICs were appropriately identified and reported in accordance with the requirements of the QAPjP Section B3-1.
19	√	Whether the overall completeness, comparability, and representativeness QAOs were met for each of the analytical and testing procedures as specified in the QAPjP Sections B3-2 through B3-9.
20	√	Whether the PRQLs for all analyses were met.
21	**N/A**	Sufficient numbers of waste containers were visually examined to determine with a reasonable level of certainty that the UCL_{90} for the miscertification rate is less than 14 percent.

Check (√) indicates that data or acceptable knowledge are sufficient to determine the waste parameters and that the waste parameters have been reported in the listed document or database. N/A indicates parameter does not apply to waste stream.

Signature of Site Project Manager	Printed Name	Date
	DAVID C. DeROSA	7/12/04

DATA SUMMARY REPORT: HEADSPACE GAS SUMMARY DATA

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

ANALYTE	# Samples above MDL	Transform applied[a]	Normality test (pass/fail)[a]	Mean[b] (ppmv)	SD[b, c] (ppmv)	UCL_{90}[b, c] (ppmv)	Transformed PRQL[a]	PRQL (ppmv)	EPA Code[d, e] (F001-5); (D004-D043)
1,1,1-Trichloroethane	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F001, F002
1,1,2-Trichloro-1,2,2-trifluoroethane	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F001, F002
Acetone	0	N/A	N/A	5.00	0.00	N/A	N/A	100	N/A
Benzene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F005
Butanol	0	N/A	N/A	5.00	0.00	N/A	N/A	100	N/A
Carbon disulfide	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F005
Carbon tetrachloride	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F001
Chlorobenzene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F002
Chloromethane	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
Ethyl benzene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
Ethyl ether	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
m or p-Xylene[f]	0	N/A	N/A	2.00	0.00	N/A	N/A	10	N/A
Methanol	0	N/A	N/A	5.00	0.00	N/A	N/A	100	N/A
Methyl ethyl ketone	0	N/A	N/A	5.00	0.00	N/A	N/A	100	F005
Methyl isobutyl ketone	0	N/A	N/A	5.00	0.00	N/A	N/A	100	N/A
Methylene chloride	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F001, F002
o-Xylene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
Tetrachloroethylene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F001, F002
Toluene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F005
Trichloroethylene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	F001, F002
1,1,2,2-Tetrachloroethane	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
1,1-Dichloroethane	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
1,1-Dichloroethylene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
1,2-Dichloroethane	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
Bromoform	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
Chloroform	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
cis-1,2-Dichloroethylene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
trans-1,2-Dichloroethylene	0	N/A	N/A	1.00	0.00	N/A	N/A	10	N/A
Cyclohexane[g]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,2,4-Trimethylbenzene[g]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,3,5-Trimethylbenzene[g]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hydrogen[h]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: QAPjP, Table B3-2.

DATA SUMMARY REPORT: HEADSPACE GAS SUMMARY DATA

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

ADDITIONAL TARGET ANALYTE[i]	# Samples[i]	Mean (ppmv)[i]
N/A	N/A	N/A

TENTATIVELY IDENTIFIED COMPOUNDS[j]	Maximum Observed Estimated Concentrations (ppmv)[j]	# Samples Containing TIC[j]
N/A	N/A	N/A

Did the data verify the acceptable knowledge and the EPA waste codes assigned to the waste stream? √Yes ☐ No

If not, describe the basis for assigning the EPA Hazardous Waste Codes:

Signature of WSPF Preparer — SCOTT BISPING Printed Name — 7/12/04 Date

NOTES:

[a]A total of 10 samples were analyzed. Because there were no detectable concentrations above the method detection limit (MDL), transformation of the data is unnecessary.

[b]N/A indicates no detectable measurements available for statistics. Based on the fact that the analytes were reported as less than detection limit (LTD) in all 10 samples, it is concluded that their median concentrations are all less than the reported LTDs with 99.99+% ($1-0.5^{10}$) confidence and, as such, well less than the Program Required Quantitation Limit (PRQL).

[c] Because there was no variance in the reported analyte values, there is no standard deviation. Therefore, the calculation of UCL_{90} is not meaningful for statistical analysis. Comparison of the mean with the PRQL revealed no cases where any analyte exceeded the PRQL value.

[d] N/A in this column indicates no EPA HWN is applicable. EPA HWNs have been applied to the waste on the basis of AK information received from RFETS.

[e]Listed and toxic characteristic codes include only those that are listed in the WIPP hazardous waste facility permit.

[f]m-Xylene and p-xylene cannot be distinguished as a single analyte in the laboratory and are reported as such.

[g]These compounds are from the TRAMPAC and are flammable VOCs that do not appear in the QAPjP or the WIPP WAP. These are not part of the target analyte list, but samples may be analyzed for these compounds.

[h]Hydrogen will only be sampled as necessary to support aspiration criteria as shown in WMP-400, Section 7.1.7.

[i]N/A indicates no additional target analytes.

[j]There were no 40 CFR 261, Appendix VIII, tentatively identified compounds (TICs) outside of the target analyte list detected in greater than 25% of the headspace gas samples for this waste stream. N/A indicates that no TICs were observed.

DATA SUMMARY REPORT SOLID SAMPLING SUMMARY

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-DCD-03-480.1

Determination of Number of Retrievably Stored Waste Containers to Sample (S3000, S4000)

Preliminary Estimates of Mean, Variance, and Coefficient of Variation:
Attach a table(s) that correlates container identification numbers to data packages if different from containers used for characterization.

Description of Source Data: Preliminary samples were collected and analyzed in compliance with all requirements (specified in the WIPP Waste Analysis Plan Section B2-2a). The samples collected met the requirement for being counted as part of the total number of calculated required samples. Sufficient preliminary samples were collected to demonstrate compliant sampling – ie., collection of additional samples other than the preliminary samples was not required.

Samples Randomly Selected from Waste Stream (yes/no)? Yes

Treatment of less-than-detectable measurements: This pertains only to data for analytes in which at least one detectable measurement was obtained. Raw data were evaluated using one half the method detection limit (MDL) for less-than-detectable observations.

Analytes that are listed spent solvents and therefore not included in the calculation to determine the number of containers to sample: benzene; carbon disulfide; carbon tetrachloride; chlorobenzene; 1,2-dichlorobenzene; isobutanol; methyl ethyl ketone; methylene chloride; pyridine; tetrachloroethylene; toluene; 1,1,1-trichloroethane; 1,1,2-trichloro-1,1,2-trichloroethane; trichloroethylene; and trichlorofluoromethane.

Selected coefficient of variation and associated analyte: 0.86 Antimony

Total Calculated number of containers to sample: (based on preliminary sample size for evaluating the waste stream).

Attach preliminary estimates: See M4T00-DCD-03-480.1. Preliminary estimates are identical to final results because sufficient preliminary samples were collected and analyzed in compliance with all requirements for being used as required samples.

Retrievably Stored Waste Sampling Results

Analytes that are listed spent solvents and therefore not included in the UCL_{90} estimate calculation to determine the toxicity characteristic: benzene; carbon disulfide; carbon tetrachloride; chlorobenzene, 1,2-dichlorobenzene; isobutanol; methyl ethyl ketone; methylene chloride; pyridine; tetrachloroethylene; toluene; 1,1,1-trichloroethane; 1,1,2-trichloro-1,2,2-trifluoroethane; 1,1,2-trichloroethane; trichloroethylene, and trichlorofluoromethane

Largest Coefficient of Variation and associated analyte: 0.86 Antimony

Comparison of largest coefficient of variation with coefficient of variation selected from preliminary estimate: 0.86 Antimony Sample size = 2.2

Treatment of less-than-detectable measurements: This pertains only to data for analytes in which at least one detectable measurement was obtained. Raw data were evaluated using one half the method detection limit (MDL) for less-than-detectable observations.

Transformations applied to data and justification: Transformations were not applied to data for UCL_{90} comparison to less than detectable values.

Drums overpacked for shipment/WWIS tracking (Yes/No)? No
If yes, overpack container identification number: No
Sampled drums included in waste stream lot reported here (Yes/No)? Yes
If no, WSPF # including sampled drums:

Newly Generated Waste Sampling Results

Batch or continuous process? NA[1]
Samples randomly selected from Waste Stream? (yes/no) NA[1]
Sample locations (part of process): NA[1]
Treatment of less-than-detectable measurements: NA[1]
Transformations applied to data and justification: NA[1]

[1] *Control charting for this waste stream was determined not to be applicable and sampling and analysis was conducted using a retrievable stored characterization strategy.*

Signature of WSPF Preparer | Scott Bisping, Printed Name | 7/12/04, Date

DATA SUMMARY REPORT: METALS SUMMARY DATA

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

ANALYTE	# Samples above MDL	Transform applied	Normality test (pass/fail)	Mean[a] (mg/kg)	SD[a] (mg/kg)	UCL_{90}[a] (mg/kg)	Transformed PRQL	PRQL (mg/kg)	EPA Code[b] (D004-11)
Antimony	5	ln	fail	5.54	0.94	6.18[c]	4.61	100	N/A
Arsenic	5	ln	fail	1.84	0.43	2.13	4.61	100	D004
Barium	5	ln	fail	7.72	0.49	8.06	7.60	2000	D005
Beryllium[d]	5	none		382.0	159.0	491		100	N/A
Cadmium	5	ln	fail	4.06	0.43	4.35	3.40	20	D006
Chromium	5	ln	fail	7.37	0.29	7.57	5.3	100	D007
Lead	5	ln	pass	9.15	0.30	9.36	4.62	100	D008
Mercury	0	none[e]		0.03	0.04	N/A[e]		4	D009
Nickel	5	ln	fail	7.97	0.50	8.31[c]	4.61	100	N/A
Selenium	0	none[e]		0.15	0.00	N/A[e]		20	D010
Silver	5	ln	fail	3.68	0.41	3.96	3.05	100	D011
Thallium	4	ln	fail	0.21	0.19	0.34	3.0	100	N/A
Vanadium	5	none		13.8	3.56	16.24		100	N/A
Zinc	5	none		1500	291.5	1699.91[c]		100	N/A

Did the data verify the acceptable knowledge and the EPA waste codes assigned to the waste stream? √Yes ☐ No

If not, describe the basis for assigning the EPA Hazardous Waste Codes.

Signature of WSPF Preparer — SCOTT BISPING (Printed Name) — 7/12/04 (Date)

NOTES:

[a] A total of 5 samples were analyzed for each analyte. Statistics calculated based on raw data using ½ the minimum detection limit (MDL) values for all less-than-detectable observations without transforming these values. Data were tested for normality using the Shapiro-Wilk test and transformed as necessary. A best fit for normality was achieved for beryllium, vanadium, and zinc using untransformed data; however, normality was not found. Normality was achieved using a lognormal transformation for lead.

[b] N/A in this column indicates that associated EPA HWN codes were not assigned or do not exist. EPA codes have been assigned on the basis of AK information (arsenic, mercury, selenium, and silver, barium, cadmium, chromium, and lead). No AK re-evaluation or re-assignment of HWNs were required for any of these constituents.

[c] Although the calculated UCL_{90} exceeded the PRQL, there are no corresponding EPA HWN codes for these metals. A code is therefore not applied.

[d] Beryllium parts were used in the manufacture/assembly of weapons components, and residual beryllium contamination of plutonium parts may have occurred. Combustibles fed to the incinerator may have been contaminated with beryllium and therefore, trace quantities of beryllium are present in the ash waste stream. However, the beryllium is not unused commercial chemical product, and therefore is not a P015-listed waste.

[e] An insufficient number of positive sample detects were available to perform these statistics.

Source: QAPjP, Table B3-8

DATA SUMMARY REPORT: TOTAL VOC SUMMARY DATA

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

ANALYTE	# Samples above MDL[a]	Transform applied[b]	Normality test (pass/fail)[b]	Mean (mg/kg)	SD (mg/kg)[b]	UCL_{90} (mg/kg)[b]	Transformed PRQL[b]	PRQL (mg/kg)[c]	EPA Code (F001-5; D018-40,43)[d]
Benzene	0			0.41	0.16	0.518		10	F005
Bromoform	0			0.20	0.01	0.212		10	NA
Carbon disulfide	0			0.20	0.01	0.212		10	F005
Carbon tetrachloride	0			0.34	0.02	0.354		10	F001
Chlorobenzene	0			0.20	0.01	0.212		2,000	F002
Chloroform	0			0.20	0.01	0.212		120	NA
1,4-Dichlorobenzene	See SVOC Table								
ortho-Dichlorobenzene	See SVOC Table								
1,2-Dichloroethane	0			0.20	0.01	0.212		10	NA
1,1-Dichloroethylene	0			0.20	0.01	0.212		14	NA
trans-1,2-Dichloroethylene	0			0.34	0.02	0.354		10	NA
Ethyl benzene	0			0.20	0.01	0.212		10	NA
Methylene chloride	0			0.34	0.02	0.354		10	F001, F002
1,1,2,2-Tetrachloroethane	0			0.27	0.02	0.283		10	NA
Tetrachloroethylene	0			0.20	0.01	0.212		14	F001, F002
Toluene	0			0.20	0.01	0.212		10	F005
1,1,1-Trichloroethane	0			0.20	0.01	0.212		4	F001, F002
1,1,2-Trichloroethane	0			0.20	0.01	0.212		10	F002
Trichloroethylene	0			0.14	0.01	0.140		10	F001, F002
Trichlorofluoromethane	0			0.20	0.01	0.212		10	F001, F002
1,1,2-Trichloro-1,2,2-trifluoroethane	0			0.20	0.01	0.212		10	F001, F002
Vinyl chloride	0			0.20	0.01	0.212		4	NA
m&p-Xylene	0			0.34	0.02	0.354		10	NA
o-Xylene	0			0.14	0.01	0.140		10	NA
Acetone	0			55.20	72.87	105.161		100	NA[e]
Butanol	0			55.20	72.87	105.161		100	NA[e]
Ethyl ether	0			66.20	111.30	142.506		100	NA[e]
Isobutanol	0			75.80	109.12	150.613		100	F005
Methanol	0			82.80	110.18	158.335		100	NA[e]
Methyl ethyl ketone	0			62.20	76.82	114.870		100	F005
Pyridine	0			55.20	72.87	105.161		100	F005

Source: QAPjP, Table B3-4

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

ADDITIONAL TARGET ANALYTE	# Samples[e]	# Samples above MDL[f]	Mean (mg/kg)[f]
N/A	N/A	N/A	N/A

TENTATIVELY IDENTIFIED COMPOUNDS	Maximum Observed Estimated Concentrations (mg/kg)[g]	# Samples Containing TIC[g]
N/A	N/A	N/A

Did the data verify the acceptable knowledge and the EPA waste codes assigned to the waste stream? √Yes ☐ No

If no, describe the basis for assigning EPA Hazardous Waste Codes.

Signature of WSPF Preparer | SCOTT BISPING Printed Name | 7/12/04 Date

5 samples total

NOTES:

[a] A total of 5 samples were analyzed. When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used without transforming these values. Note that the MDL for a given analyte may vary from sample to sample.

[b] With no detectable concentrations, minimum sample size and UCL_{90} for analyte mean concentration is not calculable and transformations were not applied.

[c] RTLs correspond to the analyte PRQL for analytes that are F-listed hazardous waste constituents or to the applicable total RTL value as calculated: RTL (mg/kg)=(TC level in mg/L)(volume of extraction fluid in L)/(weight of sample in kg).

[d] N/A in this column indicates no EPA HWN is applicable. EPA HWNs have been applied to the waste on the basis of AK information received from RFETS.

[e] Although these compounds are listed in 40 CFR 261.31 as F003-listed solvents, the waste was not ignitable at the point of generation. Thus, the F003 HWN is not applicable to this waste.

[f] N/A indicates no additional target analytes.

[g] N/A indicates no tentatively identified compounds were present.

DATA SUMMARY REPORT: TOTAL SVOC SUMMARY DATA

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

ANALYTE	# Samples above the MDL[a]	Transform applied[b]	Normality test (pass/fail)[b]	Mean (mg/kg)	SD (mg/kg)[b]	UCL_{90} (mg/kg)[b]	Transformed PRQL[b]	PRQL (mg/kg)[c]	EPA Codes (D027-38)[d]
ortho-Cresol	0			0.20	0	N/A		4,000	N/A
Cresols	0			0.30	0	N/A		4,000	N/A
1,4-Dichlorobenzene	0			0.20	0	N/A		150	N/A
ortho-Dichlorobenzene	0			0.20	0	N/A		40	N/A
2,4-Dinitrophenol	0			0.10	0	N/A		2,000	N/A
2,4-Dinitrotoluene	0			0.15	0	N/A		2.6	N/A
Hexachlorobenzene	0			0.15	0	N/A		2.6	N/A
Hexachloroethane	0			0.20	0	N/A		60	N/A
Nitrobenzene	0			0.20	0	N/A		40	N/A
Pentachlorophenol	0			0.10	0	N/A		2,000	N/A
Pyridine	See VOC Table								
Aroclor 1016[e]	0			NA	NA	NA		40	NA
Aroclor 1221[e]	0			NA	NA	NA		40	NA
Aroclor 1232[e]	0			NA	NA	NA		40	NA
Aroclor 1242[e]	0			NA	NA	NA		40	NA
Aroclor 1248[e]	0			NA	NA	NA		40	NA
Aroclor 1254[e]	0			NA	NA	NA		40	NA
Aroclor 1260[e]	0			NA	NA	NA		40	NA

TARGET ANALYTE[f]	# Samples[f]	Mean (mg/kg)[f]
N/A	N/A	N/A

Source: QAPjP, Table B3-6

WSPF #: RLRFETS.001
Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

TENTATIVELY IDENTIFIED COMPOUNDS	Maximum Observed Estimated Concentrations (mg/kg)[g]	# Samples Containing TIC[g]
N/A	N/A	N/A

Did the data verify the acceptable knowledge and the EPA waste codes assigned to the waste stream? √Yes ☐ No

If no, describe the basis for assigning EPA Hazardous Waste Codes.

Signature of WSPF Preparer | SCOTT BISPING Printed Name | 7/12/04 Date

5 samples total

NOTES:

[a] A total of 5 samples were analyzed. When a measurement is reported as below detection, one-half the analysis method detection limit (MDL) is used without transforming these values. Note that the MDL for a given analyte may vary from sample to sample.

[b] With no detectable concentrations, minimum sample size and UCL_{90} for analyte mean concentration is not calculable and transformations were not applied.

[c] RTLs correspond to the analyte PRQL for analytes that are F-listed hazardous waste constituents or to the applicable total RTL value as calculated: RTL (mg/kg)=(TC level in mg/L)(volume of extraction fluid in L)/(weight of sample in kg).

[d] N/A in this column indicates no EPA HWN is applicable.

[e] Transformer oils containing polychlorinated biphenyls (PCBs) have been identified in a limited number of waste streams included in the organic sludges waste matrix code (S3200). Therefore, waste streams included in the solidified organics final waste form (and other waste streams in which AK identifies the presence of PCBs) shall be analyzed for PCBs.

[f] No entry indicates no additional target analytes.

[g] No entry indicates no tentatively identified compounds.

WIPP WASTE STREAM PROFILE FORM

WSPF #: RLRFETS.001

Site Project Office Letter Report #(s): M4T00-TRU-03-480.1

RFETS ASH BILLET CAN/CIN/BATCH DATA REPORT CORRELATION

Billet Can Identifier	Container Identification No.	VE Batch Data Report No.	NDA Batch Data Report No.	Headspace Gas Batch Data Report No.	RCRA Analysis Metals Report No.	RCRA Analysis SVOC Report No.	RCRA Analysis NHVOC Report No.	RCRA Analysis VOC Report No.
100-01-01-168	RHZ-214-30157	PFP-VE-2001-002	PFP-TB-2001-020	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-01-175	RHZ-214-30284	PFP-VE-2001-003	PFP-TB-2001-021	WSCF-030422R0	N/A	N/A	N/A	N/A
100-00-12-114	RHZ-214-30286	PFP-VE-2001-002	PFP-TB-2000-013	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-01-152	RHZ-214-30286	PFP-VE-2001-002	PFP-TB-2001-020	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-01-202	RHZ-214-30301	PFP-VE-2001-004	PFP-TB-2001-023	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-01-163	RHZ-214-30312	PFP-VE-2001-003	PFP-TB-2001-020	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-02-233	RHZ-214-30318	PFP-VE-2001-006	PFP-TB-2001-025 Add 1	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-02-295	RHZ-214-30337	PFP-VE-2001-009	PFP-TB-2001-029 Add 1	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-03-313	RHZ-214-30346	PFP-VE-2001-009	PFP-TB-2001-031	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-02-272	RHZ-214-30439	PFP-VE-2001-008	PFP-TB-2001-028 Add 1	WSCF-030422R0	N/A	N/A	N/A	N/A
100-01-02-246	RHZ-214-30445	PFP-VE-2001-007	PFP-TB-2001-026 Add 1	WSCF-030422R0	N/A	N/A	N/A	N/A
100-03-07-001	RHZ-214-31586	PFP-VE-2003-033	PFP-TB-2003-182	N/A	ALD03023M	ALD03020S	ALD03023N	ALD03020V
100-03-07-003	RHZ-214-31505	PFP-VE-2003-033	PFP-TB-2003-182	N/A	ALD03023M	ALD03020S	ALD03023N	ALD03020V
100-03-07-005	RHZ-214-31562	PFP-VE-2003-033	PFP-TB-2003-182	N/A	ALD03023M	ALD03020S	ALD03023N	ALD03020V
100-03-07-007	RHZ-214-31562	PFP-VE-2003-033	PFP-TB-2003-172	N/A	N/A	N/A	N/A	N/A
100-03-07-008	RHZ-214-31562	PFP-VE-2003-033	PFP-TB-2003-184	N/A	N/A	N/A	N/A	N/A
100-03-07-010	RHZ-214-31628	PFP-VE-2003-033	PFP-TB-2003-182	N/A	ALD03023M	ALD03020S	ALD03023N	ALD03020V
100-03-07-006	RHZ-214-31628	PFP-VE-2003-033	PFP-TB-2003-173	N/A	N/A	N/A	N/A	N/A
100-03-07-012	RHZ-214-31639	PFP-VE-2003-033	PFP-TB-2003-182	N/A	ALD03023M	ALD03020S	ALD03023N	ALD03020V

ACCEPTABLE KNOWLEDGE WASTE STREAM SUMMARY FORM

Site: Hanford

Waste Stream Profile #: RLRFETS.001

Waste Stream Name/Waste Stream Lot Number: RFETS01

Waste Stream/Waste Stream Lot Number: RFETS01

Generator Site: 200 West Area: Plutonium Finishing Plant

Waste Stream Generation Building(s): Building 234-5Z

Waste Stream Volume: 62.2 m^3 (approximately 299 55-gal drums)

Waste Stream Generation Time Period: 2000-2001

TRUCON Codes: RH130E, RH130F, RH130G, RH130H

WIPP Identification Number(s): RLRFETS.001

Summary Category Group: S3000 – Inorganic Homogeneous Solids

Waste Matrix Code Group: Inorganic homogeneous solids

Waste Matrix Code: Ash (S3111)

Waste Description

This narrative provides a waste stream description of Rocky Flats Environmental Technology Site (RFETS, formerly the Rocky Flats Plant) transuranic (TRU) incinerator ash stored at the Plutonium Finishing Plant (PFP). The ash was generated from the RFETS Building 771 residue recovery incinerator. Hanford received the ash from RFETS with the goal of recovering the plutonium in the ash via dissolution and chemical processing. The information in this document describes the mandatory waste stream specific acceptable knowledge, including a description of the RFETS process that generated this stream. PFP processing information can be found in HNF-5482 "Hanford Site Transuranic Waste Management Acceptable Knowledge Documentation for Plutonium Finishing Plant." Overall Hanford Site program acceptable knowledge information can be found in HNF-3461, "Hanford Site Transuranic Waste Management Program Acceptable Knowledge Documentation for Retrievably Stored Contact-Handled Waste."

The ash material in this waste stream was originally classified as a process residue, from which plutonium could be recovered through dissolution. Tests were performed at Hanford to determine the optimal process for performing this recovery. However, before the material could be processed to recover the plutonium, the demand for plutonium ended, obviating the need to complete processing. The ash was subsequently declared to be a waste, and has been processed and packaged for eventual disposal at the Waste Isolation Pilot Plant (WIPP). The dates of generation for the waste stream reflect the time period during which the residues were packaging into POCs for disposal at WIPP, and not the period during which the ash was originally generated.

TRU WASTE MANAGEMENT

RFETS ash materials have been packaged by Hanford personnel into pipe overpack containers (POCs) in preparation for storage at the CWC. During packaging, the material was removed from feed cans, sieved, and loaded into billet cans. The billet cans are maximum 2.6 L in size and are slip lid cans that are untaped. The packaging operation included blending the ash with surrogate material for safeguards purposes. PFP personnel performed the Visual Examination (VE) technique at the time of packaging, following the "Pipe-N-Go Operations" procedure (ZO-160-080), to confirm the material parameters and waste matrix code, and to confirm that there were no prohibited items. Finally, the billet cans were bagged out of the glovebox, assayed, placed into POCs, and the layers of confinement recorded for each can.

The Hanford subpopulation of the RFETS incinerator ash has been packaged into 372 billet cans packaged in 299 POCs (62.2 m^3). The POCs are packaged in accordance with the "Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant (WIPP)." From September 2000 to March 2001, the incinerator ash was packaged in the 234-5Z Building, Glovebox HC-46F located in Room 170. The completed POCs are currently stored at the Central Waste Complex (CWC) awaiting approval for disposal at WIPP.

TWBIR

The Hanford RFETS ash waste stream contained (before packaging) recoverable amounts of plutonium and was originally considered a process residue rather than a waste. Following its designation as a waste, processing and packaging for disposal, and removal from the PFP facility as a waste, the Hanford RFETS ash waste stream has been assigned Transuranic Waste Baseline Inventory Report (TWBIR) number RL-W409. The description of RL-W409 includes a variety of noncombustible and combustible TRU wastes generated from cleanout and decontamination and decommissioning (D&D) of the Plutonium Finishing Plant and Plutonium Processing Facility. Although this material is not specifically identified in the TWBIR description, the ash is a D&D waste generated from the 234-5Z Building and as such is part of the RL-W409 waste stream.

The Summary Category Group, Waste Matrix Code Group and Waste Matrix Code are based on acceptable knowledge. In accordance with the description listed in the TWBIR, the stream contains inorganic solids (pulverized ash) generated at the RFETS, which was subsequently

calcined and packaged at PFP. The waste contains less than 10% cellulosics, plastic, and rubber (in the form of packaging material).

Waste Matrix Codes

The Summary Category Group determined for the waste stream is S3000, Inorganic Homogeneous Solids, and the Waste Matrix Code is S3111, Ash. The Waste Matrix Code Group is inorganic homogeneous solids. The RFETS ash material is a mixture of coarse, granular, fine, and very fine particulate materials. Tramp materials, such as small pieces of metal, may also be present in the ash.

Material Disposition

The aggregate plutonium concentration in the ash waste stream was approximately 11.5 weight percent before repackaging of the waste for shipment (Hanford 2000). The incorporation of surrogate materials during packaging of the waste for shipment to WIPP has reduced all individual waste item (i.e., billet can) plutonium concentrations to below 8 percent by weight in accordance with procedure ZO-160-080, "Pipe-n-Go Operations." This complies with the fiscal year (FY) 1999 Energy and Water Development Appropriations Act Section 308 that prohibited disposal of waste containing concentrations of plutonium "in excess of 20 percent by weight for the aggregate of any material category." This prohibition has appeared in subsequent Appropriations Acts, and is currently reiterated in Section 309 of the FY 2004 Appropriations Act (H.R. 2754).

Waste Material Parameters

The following are the waste material parameters included in this waste stream. This information has been confirmed by VE technique, which was performed during packaging operations.

Inorganic materials:

- Iron based metals/alloys (billet cans, slip-lid cans)
- Other inorganic materials (ash, silica sand, graphite)

Organic materials (such as plastics, paper, rubber, cloth, wood):

- Plastics (waste material) used exclusively to bag out glovebox waste and for contamination control during and after bagging out waste.

Waste Packaging

Waste packaging for this waste stream includes:

- Steel packaging material (55 gallon drum (DOT Specification 7A, Type A) with the inner pipe assembly for the POC)
- 110 mil plastic liner for the POC
- Fiberboard used as shock absorbing dunnage for the pipe component

There are four or less layers of confinement for this waste stream.

Following calcining at Hanford to resolve problems related to pressurization of the waste cans in storage, PFP personnel packaged the incinerator ash into 299 POCs in preparation for storage at the CWC. During the packaging operation, VE technique was performed in accordance with the "Pipe-N-Go Operations" procedure (ZO-160-080), to confirm the material parameters and waste matrix code, to confirm that absence of prohibited items, to confirm the contents were properly characterized, and to confirm that there were no prohibited items. The containers in this waste stream suitable for certification were packaged according to WIPP Waste Analysis Plan (WAP) and WIPP Waste Acceptance Criteria (WAC) requirements. Container records have been reviewed and confirm that this waste stream does not contain items prohibited by the WIPP WAC.

As part of the packaging at Hanford for disposal at WIPP, the material was removed from feed cans, sieved (to homogenize the waste material, improving source geometry for nondestructive assay), and loaded into billet cans. Tramp materials were removed from the ash to facilitate sieving, but were re-introduced to the waste stream. Also during sieving, to reduce the attractiveness (from a safeguards and security standpoint) of the materials, the ash was mixed with inert surrogate material, initially a graphite powder/silica sand mix. This is a nonhazardous, nonradioactive, reagent grade, graphite (Litz 2000 U.S. Silica 1997) that was approved for this use by the Hanford Safeguards and Security department and, in the amounts and concentrations used in the surrogate, does not present a criticality hazard. Initial surrogate mixture was 5 percent by weight graphite and 95 percent by weight silica sand. This mixture was replaced with the exclusive use of silica sand in November 2000, (Schlegel 2000). Of the total population of 299 POCs in this waste stream, 26 POCs contain the graphite/silica sand mixture; the remaining 273 POCs contain only the silica sand as surrogate material. In accordance with procedural requirements and for safeguards purposes, the Pu concentration was reduced to less than 8 weight percent Pu in accordance with the "Pipe-N-Go Operations" procedure. The billet cans were bagged out of the glovebox, and the layers of confinement were recorded for each can. Finally, the bagged cans were assayed by a Segmented Gamma Assay System and were loaded into POCs. Except for bag out, packaging, and inert surrogate materials, no other materials, chemicals, or wastes were introduced during the packaging of the Hanford RFETS ash waste stream for shipment to WIPP.

Prohibited Items

During packaging of the ash materials into billet cans and billet cans into the POCs, the VE technique was performed to verify that the waste stream does not contain prohibited items and to verify AK information regarding the waste stream. This technique has confirmed that this waste does <u>not</u> contain any of the following prohibited items:

- Liquids
- Corrosives
- Reactives
- Ignitables
- Pyrophorics

- Explosives
- Compressed gases
- Sealed containers > 4 L
- Pressurized containers
- Non-mixed hazardous wastes
- Incompatible wastes

Waste Generating Process

From 1952 through 1990, RFETS had two primary defense missions: the production of triggers for nuclear weapons and the processing of retired weapons for plutonium recovery. The plant also supported weapons development programs responsible for fabricating, testing, and assembling parts with new geometries or metal compositions. Figure A-1 shows a map of RFETS that identifies the buildings that generated TRU waste on site (Ballenger 2000).

RFETS Incinerator Process

During production of triggers for nuclear weapons, and the processing of retired weapons for plutonium recovery, RFETS generated significant quantities of combustible materials (e.g., plastics, rubber, paper, and wood) contaminated with small amounts of actinides, primarily plutonium and americium. Incineration to reduce the combustible bulk was one method used to recover plutonium from these materials. The Building 771 residue recovery incinerator operated from 1958 until 1989, when site operations ceased. Combustibles processed through the incinerator were generated at RFETS.

The determination of whether a drum contained waste or residue (i.e., waste-type material containing recoverable amounts of plutonium) was based on an economic discard limit (EDL). The EDL compared the cost of manufacturing plutonium in a reactor to recovering the plutonium from specific process residues.

If a drum of combustible materials assayed above the EDL, the drum was sent for incineration in Building 771, Glovebox 37. Drums of RFETS combustibles were accumulated until approximately 200 drums were available for a production run. The drum contents were introduced into the drum sorting area where glass, metal, and other non-burnable items were segregated from the feed. The incinerator consisted of three chambers: a firebox where combustibles were initially introduced to the system, a main burner chamber where ash would fall through the firebox grate into a catch pan and continue to burn, and an afterburner section. Combustibles were placed on the incinerator grate inside the firebox and ignited using a match. Additional combustibles were placed into the firebox until the temperature reached 450°C (the temperature was digitally displayed on the control panel). At that point, oxygen was turned on in the main and afterburner chambers and adjusted to a flow of 8 cubic feet per minute for both chambers using oxygen rotometers (oxygen was used to assist combustion and controlled to prevent the system from overheating) (Wastren 2003).

Combustibles were added until the operating temperature of 800 ± 50°C was reached. Combustibles were added as necessary to maintain this temperature to ensure complete burning

occurred and to prevent exhaust gases from overcoming the cooling capacity of the scrubber system. Ash was removed from the catch pan at least once every hour during incinerator operation, placed in a one-gallon can, and allowed to cool. Ash from the afterburner was removed at least twice per shift and combined with the main chamber ash. The ash was transferred into an adjacent glovebox where it was sieved to remove tramp metal and then reduced to a fine powder in a ball mill. Figure A-2 provides a flow diagram of the incineration process (Wastren 2003, Ballenger 2000).

During recovery operations at RFETS, the pulverized ash and soot were transferred to a separate glovebox in Building 771 for dissolution and subsequent recovery of the plutonium. The ash was mixed with calcium fluoride and then dissolved with steam heated nitric acid in three air-lift cascade dissolvers. The resulting plutonium nitrate solution was filtered to remove the undissolved solids. The solids, or heel, were dried on a hotplate. Because the heel often assayed above the EDL, it was typically recycled back through the dissolution process three or more times. Incinerator ash and ash heel feeds were processed through the late 1970s, but because of off-gas silicon dioxide plugging problems, the dissolution of these materials was discontinued (Wastren 2003).

Due to historical problems with dissolution of the ash, RFETS and Hanford made an agreement to ship incinerator ash to Hanford for plutonium recovery studies. Over 400 cans of pulverized incinerator ash were packaged at RFETS, assigned Item Description Code 428 for tracking purposes, and shipped to Hanford. The first shipment occurred in October 1983 and was composed of 18 incinerator ash cans. The remaining inventory of cans was shipped to Hanford between July 1985 and 1986 (Sutter 2003). This entire inventory is the subject of the present AK discussion.

The ash originally received from RFETS was initially stored at Hanford in sealed cans. The ash contained miscellaneous tramp metal, bits of unburned feed material, and carbon from the incomplete oxidation of feed material. Prior to shipment to Hanford, the ash had been processed through a ball mill (Ballenger 2000). Because pressurization of the sealed cans resulted from radiolysis of residual organic materials, the ash was calcined at Hanford prior to storage and repackaging. The calcination involved heating the ash in tube furnace HA-40-F (processing during the mid-1980s) and in furnace HC-21C (51 cans in 1995). The incinerator ash was calcined at 650^{0}C for four hours with oxygen feed. The calciners were equipped with two paddles to stir/agitate the ash and ensure ash-oxygen content (Bonadie 1984, Venetz 2000). No additional materials were added to the ash during this calcination process.

Thermal Treatment of Waste Matrix

Section B-3a(1)(ii) of the WIPP Hazardous Waste Facility Permit NM4890139088-TSDF states that wastes may qualify for reduced headspace sampling, if the following criteria are met:

- The waste stream or waste stream lot must consist of more than 10 containers.

- The waste stream must have either been generated using a high-temperature thermal process or been subjected to a high-temperature thermal process after generation that resulted in the reduction of matrix-related volatile organic compounds (VOCs) in the headspace to concentrations below the program required quantitation limits (PRQLs) in Permit Attachment B3, Table B3-2. of the waste.

- The site must have documentation demonstrating that high-temperature thermal processes were used.

The RFETS ash waste stream will consist of 299 POCs, therefore meeting the first criteria. Volatile organic compounds are not present in this waste stream as they would have been volatilized or destroyed at the temperatures involved in thermal processing of the materials (ash) in the waste. Processing of waste materials occurred at temperatures of 750 to 850°C, resulting in the ash that makes up this waste stream. Additionally, after receipt at Hanford the ash materials were calcined at 650°C to further process organic materials that may have been present in the ash. Consequently, because of this processing at elevated temperatures, VOCs are not expected to be present in the headspace gas of the POCs.

Details of these processes are well documented in the AK record; thus meeting the other criteria for eligibility. In addition, no organic materials or chemicals were introduced into the process during or following thermal treatment. The absence of organic compounds was verified by headspace gas sampling performed on 10 POCs of the waste stream. These POCs were randomly selected from the entire population of RFETS ash POCs using the techniques presented in Section B2-2b of the WIPP WAP (M4T00-DCD-03-074). No VOCs were detected during the analysis of these samples. Therefore, the RFETS ash waste is eligible for reduced headspace gas sampling as waste from a high-temperature thermal process.

RCRA Hazardous Waste Determination

In accordance with Resource Conservation and Recovery Act (RCRA) requirements, the U.S. Environmental Protection Agency (EPA) hazardous waste numbers (HWNs) assigned to the Hanford RFETS incinerator ash waste stream are based on the characterization of incinerator feed materials (i.e., those with recoverable quantities of plutonium), which included combustible, plastic, or Ful-Flo filters. A review of the EPA HWNs was performed for the waste inputs generated during the time the incinerator was operational. During this review, it was determined that all of the toxicity characteristic metals, several toxicity characteristic organics, and F-listed solvents may have contaminated the incinerator feed materials. The following discussions present an overview of available information for each parameter of interest.

Characteristic of Ignitability

Based on the management history and EPA guidance, the Hanford RFETS ash waste stream does not meet the definition of ignitability as defined in 40 CFR 261.21. The materials are not liquid and the VE technique was performed during packaging to ensure liquids are not added to the containers. This material will not cause fire through friction, absorption of moisture, or

spontaneous chemical changes. This material is not a compressed gas as defined in 49 CFR 173.151 or a pyrophoric material. This material is not an oxidizer as defined in 49 CFR 173.300. Additionally, because the material was processed through an incinerator at RFETS and calcined at Hanford for storage, all ignitable materials that may have been in the waste have been stabilized and are no longer ignitable. The materials in this waste stream are therefore not ignitable wastes (D001).

Characteristic of Corrosivity

The materials in this waste stream do not meet the definition of corrosivity as defined in 40 CFR 261.22. The materials are not liquid and the VE technique was performed during packaging to ensure liquids are not present in the containers. The materials in this waste stream are therefore not corrosive wastes (D002).

Characteristic of Reactivity

Based on the management history and EPA guidance, the Hanford RFETS ash waste stream does not meet the definition of reactivity as defined in 40 CFR 261.23. Based on experience with the materials at Hanford, the materials are stable and will not undergo violent chemical change. The materials will not react violently with water, form potentially explosive mixtures with water, or generate toxic gases, vapors, or fumes when mixed with water. The materials do not contain cyanides or sulfides, and are not capable of detonation or explosive reaction. Additionally, because the material was processed through an incinerator at RFETS and calcined at Hanford for storage, all reactive materials that may have been in the waste have been stabilized and are no longer reactive. The VE technique was used at the time of packaging to verify that the waste stream does not contain liquids, explosives, compressed gases, or reactive waste. The materials in this waste stream are therefore not reactive wastes (D003).

Toxicity Characteristic

This waste stream is assigned the following HWNs in accordance with 40 CFR 261.24: D004 (Arsenic), D005 (Barium), D006 (Cadmium), D007 (Chromium), D008 (Lead), D009 (Mercury), D010 (Selenium), and D011 (Silver) (Ballenger 2000, Simiele 2000). Feed materials to the RFETS incinerator consisted of process wastes including plastics (polyvinyl chloride, polyethylene, and polypropylene), paper, liquids, drybox gloves, filters, metal, and wood (Venetz 2000). These items became contaminated during plutonium processing operations at RFETS. Metals in these items that were present were concentrated during the incineration process, and may be present in the ash at concentrations above regulatory levels. These designations were also historically applied to the identical waste stream at RFETS.

Toxicity characteristic (TC) organics such as pesticides, herbicides, and semi-volatiles were not included in any part of the plutonium processing operation and are not present in the ash. In addition, thermal processing of the materials during incineration would have destroyed any other organic compounds present; therefore no TC characteristic organic codes apply. No hazardous constituents were introduced during calcining of the ash or blending with surrogate materials at

Hanford. Therefore, this waste stream does not exhibit the characteristic of toxicity for RCRA organics (D012 – D043).

Listed Waste Codes

The following HWNs are assigned to the waste as a hazardous wastes from a non-specific source (40 CFR 261.31): F001, F002, and F005 (Ballenger 2000, Simiele 2000). These HWNs were applied in accordance with the derived-from rule (Wastren 2003) because solvents listed under these HWNs were used at RFETS in the processes that generated items that were sent to the incinerator. In addition, the RFETS incinerator ash materials were previously characterized at RFETS as F003. However, based on current EPA guidance, the waste is not ignitable and should not be characterized as F003 hazardous waste at Hanford. Certain processes at RFETS did use F003-listed solvents during the time period of incinerator operations. However, these residues do not meet the definition of an F003-listed waste as defined in 40 CFR 261.31 because they did not contain spent solvent mixtures/blends containing, before use, one or more F003-listed solvents and a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, or F005. Because the F003 does not apply to the feed materials, it does not apply to the ash derived from the incineration process (Wastren 2003).

Beryllium parts were used at RFETS in the manufacture/assembly of weapons components, and residual beryllium contamination of plutonium parts may have occurred. Combustibles fed to the incinerator may have been contaminated with beryllium and therefore, trace quantities (less than 1% by weight) of beryllium is present in the ash waste stream. However, the beryllium is not unused commercial chemical product, and therefore is not a P015-listed waste (RFETS 2002). Additionally, none of the materials in this waste stream are discarded commercial products (e.g., U134 hydrofluoric acid), off-specification species, container residues (from a RCRA standpoint), or a spill residue. Therefore, no container in this waste stream exhibits the other listed waste codes (P, U, and K codes) per 40 CFR 261.32 - 261.33.

Washington State Dangerous and Toxic Waste Determination

Washington State Dangerous

The ash materials include metal oxides and possibly metal hydroxide salts. Based on procedures presented in Washington (state) Administrative Code (WAC) 173-303-090(6)(a)(iii), if the ash materials were mixed with an equal amount of water, the resultant pH may be 12.5 or greater. Therefore, in accordance with WAC 173-303-090(6)(a)(iii), the Washington State Dangerous Waste Code assigned to this waste stream is WSC2.

WSC2 is a state code that identifies solid corrosive materials. WSC2 is a solid or semi-solid, and when mixed with an equal weight of water results in a solution, the liquid portion of which has a pH less than or equal to 2, or greater than or equal to 12.5. This is different than D002 as defined by RCRA 40 CFR 261.22. The RCRA definition applies only to liquid corrosive wastes.

Washington State Toxic

WAC 173-303-100(5) describes the approach for evaluating a toxic constituent(s) to determine whether the code for a Washington Toxic Waste should be assigned to the waste. This approach uses a formula that considers the sum of the dose concentrations associated with the various constituents in the waste. Toxicity characteristic constituents identified through AK were evaluated for application of Washington State waste toxic waste codes. Based on available toxicity information and preliminary sampling results (for concentrations of these constituents in the ash), state-specific toxic waste codes were not required to be assigned to the waste.

TSCA-Regulated Constituents

This waste stream does not contain any polychlorinated biphenyls (PCB)regulated by the Toxic Substances Control Act (TSCA). Acceptable knowledge (AK) documents do not indicate that PCBs were part of the materials processed through the incinerator in Building 771 (Ballenger 2000). There is no indication that asbestos was introduced into the incinerator feed, used in the processing or was added to the material during waste processing and packaging.

Radionuclides

Nondestructive assay was performed at the PFP in accordance with procedure ZA-948-345, "Assay of Plutonium Using the Segmented Gamma Scan Assay System." The radionuclides that are expected to be in this waste stream include the following: weapons-grade and fuel grade plutonium (Pu-238, 239, 240, 241, and 242), americium-241, neptunium-237, uranium-233, depleted uranium, and enriched uranium (Ballenger 2000, Simiele 2000).

Additional AK was obtained for radionuclides (cesium-137 [Cs-137] and strontium-90 [Sr-90]) anticipated to occur in trace quantities in the waste to comply with WIPP WAC requirements. Scaling factors, which documented a known relationship between Sr-90 and Cs-137, as well as between U-234 and U-235 and U-238, were determined using historical information. The scaling factors for the activity relationships are as follows (Clinton 2002a, 2002b, and 2002c):

- U-234/U-235 $\simeq$ 30
- U-234/U-238 ~ 2
- Cs-137/Sr-90 ~ 1.1

Defense Waste Determination

The Department of Energy (DOE) and its predecessor agencies were engaged in a broad range of activities that fall under the heading of atomic energy defense activities. These activities include:

- Naval reactors development
- Weapons activities, including defense inertial confinement fusion
- Verification and control technology
- Defense nuclear materials production

- Defense nuclear waste and materials by-product management
- Defense nuclear materials security and safeguards and security investigations
- Defense research and development

The U.S. government produced and acquired a total of 111.4 metric tons (MT) of plutonium. About 93 percent (103.4 MT of plutonium) came from government defense production reactors (67.4 MT from Hanford and 36.1 MT from the Savannah River Site) and can be considered defense-generated. During processing of plutonium contaminated combustible wastes at RFETS for plutonium recovery, approximately 200 drums of waste were accumulated before beginning an incinerator production run. During the incinerator production run, these accumulated drums were campaigned through the incinerator without regard as to the origin of the plutonium in the drum. Ash from the incinerator was placed into cans on a regular basis during the production run, again without regard as to the origin of the plutonium, thus commingling plutonium from the different sources (e.g., Hanford, Savannah River).

A review of AK reference sources indicates that there are several sources of the plutonium-containing materials processed as a result of the weapons production program at the RFETS. Plutonium metal was recovered from retired warheads and weapons manufacturing residues. Specifically, this incinerator ash was generated during the incineration of combustible materials originating during weapons production activities with the intent of recovering plutonium metal from the ash for recycling back into the weapons production process (RFETS 2002).

Since its receipt from RFETS, the incinerator ash has been stored in the PFP. This material has been repackaged and removed from the PFP as part of the DOE effort to cleanout, decontaminate, and decommission the PFP. This facility has been a contributing source of defense related transuranic elements for the DOE and predecessor agencies. Historical missions of this facility have included defense nuclear materials production, defense nuclear waste and materials by-product management, and defense nuclear materials security and safeguards. Consequently, the Hanford RFETS ash waste stream is eligible for disposal at the WIPP as defense waste.

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3. M4T00-TRU-03-533, "Hanford Site Transuranic Waste Management Waste Specific Acceptable Knowledge Documentation for TRM Incinerator Ash from Rocky Flats," December 2, 2003.
4. HNF-5482, "Hanford Site Transuranic Waste Management Acceptable Knowledge Documentation for the Plutonium Finishing Plant," Rev. 8, December 12, 2003.
5. LTR-03-001, "Use of Rocky Flats Environmental Technology Site Headspace Gas and Homogeneous Solids Sampling and Analysis Data for Characterization and Certification of Incinerator Ash Stored at Hanford, dated March 26, 2003."
6. Litz, J.E. (2000), "Material Safety Data Sheets for Graphite and Silica Sand"
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8. Schlegel, S.C. (2000), "Approval of New Surrogate Material for Pipe-&-Go"
9. Ballenger, R.J. (2000), "Acceptable Knowledge from Rocky Flats Environmental Technology Site for SS&C and Incinerator Ash"
10. Sutter, C. (2000), "Timeframe that RFETS Ash was shipped to Hanford"
11. Bonadie, E.P. (1984), "Process Flowsheet for HA-40-F Calcination"
12. Venetz, T.J. (2000), "Incinerator Ash and Low Assay Plutonium Oxide Residues White Paper"
13. Simiele, C. (2000), "Waste Profile Sheet: Rocky Flats Ash Residues"
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15. RFETS (2002), "Acceptable Knowledge TRU/TRM Waste Stream Summaries, Section 7.3: TRM Incinerator Ash"
16. Clinton, R. (2002a), "Sr-90/Cs-137 Determination"
17. Clinton, R. (2002b), "U234 to U235 and U234 to U238 Ratios for Appendix E of Hanford Site Transuranic Waste Certification Plan for NDA"
18. Clinton, R. (2002c), "Sr-90 to Cs-137 Ratio for Appendix E of Hanford Site Transuranic Waste Certification Plan for NDA"
19. Hanford, 2002, "Hanford Site Plutonium Finishing Plant Residues/Legacy Holdup"
20. M4T00-DCD-03-074, "Transmittal of the Random Selection of Containers for Reduced Headspace Gas Sampling and Analysis Campaigns for Waste Streams Rocky Flats Ash, RFETS01, Sand Slag and crucible, SS&C01, and Hanford Ash, MHASH01," April 9, 2003.

APPENDIX A

M4T00-TRU-03-487
WSPF# RLRFETS.001

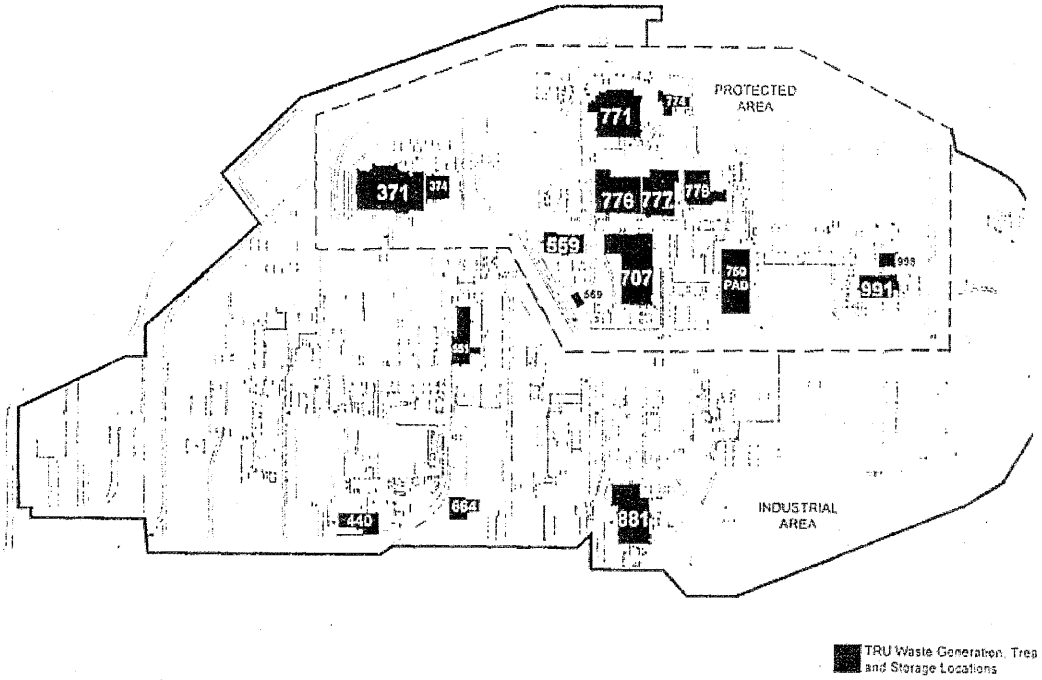

Figure A-1. Map of the RFETS.

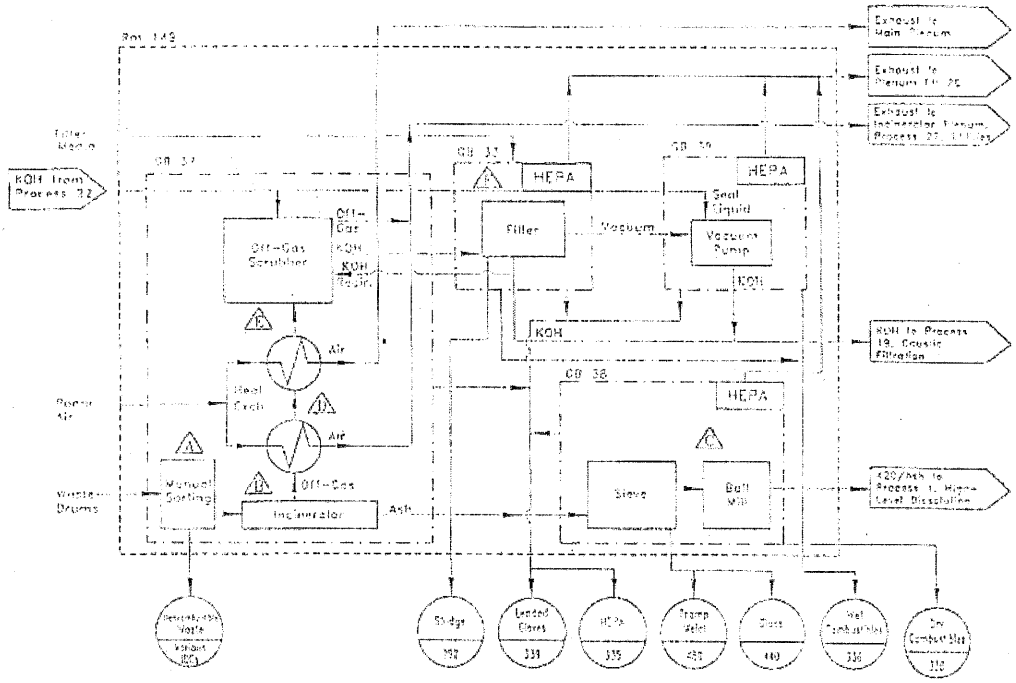

Figure A-2. RFETS incinerator process.