ENERGYSOLUTIONS

EC-0230
Revision 7

RADIOACTIVE WASTE PROFILE RECORD

A. GENERATOR AND WASTE STREAM INFORMATION

GENERAL: Complete this form for one waste stream. Contact EnergySolutions at (801) 532-1330 if you have any questions while completing this form. Please indicate "N/A" if a category does not apply.

1. GENERATOR INFORMATION

Generator Name: Savannah River Nuclear Solutions EPA ID #: SC1890008989

Generator Contact: Glenn Siry Title: Lead Technical Advisor

Mailing Address: P.O. Box A

Aiken, SC 29808-0900 Utah Site Access Permit #: 011000020

Phone: 803-507-8470 Fax: 803-208-3611 Email: glenn.siry@srs.gov

Contractor Name: Savannah River Nuclear Solutions Location of Waste (City, State): Savannah River Site, Aiken, SC

Name & Title of Person Completing Form: Glenn Siry, Lead Technical Adv. Phone: 803-208-8876 Email: glenn.sriy@srs.gov

2. WASTE STREAM INFORMATION

Waste Stream ID: 9021-33 Waste Stream Name: SRS DUO State of Origin: SC

Revision: 0 Date: 11/16/2008 Volume (ft^3): 110260 Delivery Date: December 8, 2009

CHECK APPROPRIATE BOXES BELOW. Please verify the required forms requested below are completed and submitted with the Radioactive Waste Profile Record.

HAZARDOUS WASTE: Is the waste classified as hazardous waste as defined by 40 CFR 261?

N ☒ If **NO**, complete and attach the **"Low-Level Radioactive Waste Certification Attachment"**.
Y ☐ If **YES**, complete and attach the **"Hazardous Waste Certification Attachment"** and check applicable box below.
Has the waste been treated to meet applicable treatment standards per 40 CFR 268? Y ☐ N ☒
Is the waste to be treated by EnergySolutions? Y ☐ N ☒

LOW-LEVEL RADIOACTIVE WASTE: Is the radioactive waste defined as Low-Level Radioactive Waste in accordance with the Low-Level Radioactive Waste Policy Amendments Act of 1985 or in DOE Order 435.1?

Y ☒ If **YES**, a current copy of a LLRW Compact Export letter authorizing export must be submitted if applicable. This authorization is applicable for non-DOE LLRW (i.e., Mixed Waste, NORM/NARM, 11e.(2) material, and waste from DOE do not require a Compact Export Letter).
N ☐ If **NO**, check appropriate box: NORM/NARM ☐ 11e.(2) Byproduct Material ☐ Other: _____

SPECIAL NUCLEAR MATERIAL: Does the waste stream contain material with uranium enriched in U-235 or any of the following radionuclides: U-233, Pu-236, Pu-238, Pu-239, Pu-240, Pu-241, Pu-242, Pu-243, or Pu-244?

Y ☒ N ☐ If Yes, complete and attach the "SNM Exemption Certification" form (EC-0230-SNM). Supporting statements, analytical results, and documentation must be included with the submittal.

PCB WASTE: Does the waste contain Polychlorinated Biphenyls (PCB) that are regulated for disposal per 40 CFR 761?

Y ☐ N ☒ If Yes, complete and attach the "PCB Waste Certification" form (EC-98279).

ASBESTOS: Does the waste contain Asbestos Containing Material?

Y ☐ N ☒ If Yes, Asbestos Containing Material must be managed in accordance with applicable federal regulations. Provide a detailed description of the waste containing asbestos in Section B.5 of the waste profile.

RADIOACTIVE WASTE PROFILE RECORD

B. WASTE PHYSICAL PROPERTIES & PACKAGE INFORMATION

1. GENERAL CHARACTERISTICS

Does the waste contain free liquids? Y ☐ N ☒ If **Yes**, what is the percent of free liquid by waste volume? _____ %

If **Yes**, is the liquid aqueous (water-based)? Y ☐ N ☐

Does the waste contain absorbent? Y ☐ N ☒ Density range of the waste: 2.5 – 4.5 g/cc ☒ lb/ft^3 ☐

List percentage of waste type by volume: Soil 0% Concrete & Metal 0% DAW 0% Resins 0% Sludge 0%

Other constituents and percentage by volume? 100% DUO

2. MATERIAL SIZE

Gradation of Material: Indicate the percentage of waste material that would **pass through** the following grid sizes. For example, 95% of the material would pass through a 12" square, 90% passes through a 4" square, 80% passes through a 1" square, etc.

12" 100 % 4" 100 % 1" 100 % 1/4" 100 % 1/40" 97.6 % 1/200" 48.4 %

Does the waste stream contain oversize debris (i.e., no dimension < 10 inches and any dimension > 12 feet)? Y ☐ N ☒
If Yes, include a detailed description (i.e., weight, size, drawings, etc.) of the oversize debris in the narrative of Section B.5.

3. MOISTURE CONTENT

For soil or soil-like materials, please use **Std. Proctor Method ASTM D-698** to determine the optimum moisture content. The waste material must not exceed 3 percentage points above optimum moisture upon arrival at EnergySolutions' disposal facility unless approved by EnergySolutions.

Optimum Moisture Content: n/a % at Maximum Dry Density (lb/ft^3): n/a

Average Moisture Content: 4 % Moisture Content Range: 3% - 5%

4. WASTE SHIPPING & PACKAGING

Transportation Mode: ☐ Highway ☒ Rail

Shipping & Container Packages: (Check all that apply) ☒ Drums* (≤ 85 gallons) ☐ Boxes (≤ 100 ft^3) ☐ Soft-Sided Bags (≤ 10 yd^3)

☐ Intermodal ☐ Sealand ☒ Gondola** ☐ Box Car

Other:

*Palletized drums are preferred by the disposal site. Please specify in the "Other" field if drums will not be palletized.
**Dimensions of gondola railcars must be between 48 to 65 feet in length and 8.5 to 12.5 feet in height as measured from the top of the rail to the top of the railcar unless approved by EnergySolutions.

5. NARRATIVE DESCRIPTION AND HISTORY OF WASTE

Please submit a narrative description and history of the waste as an attachment to the Radioactive Waste Profile Record. This attachment should include the following:

- Process that generated the waste
- Waste material physical composition and characteristics
- Radiological and chemical characterization method
- Basis for determining manifested radionuclide concentrations
- Description and amounts of absorbents, if applicable
- Basis of non-hazardous or hazardous waste determinations
- Treatment processes, if applicable
- Product information or Material Safety Data Sheets associated with the waste as applicable
- Information requested in other sections of this form

RADIOACTIVE WASTE PROFILE RECORD

Waste Stream ID: 9021-33 Revision: 0 Date of Revision: *11/16/2008*

C. RADIOLOGICAL INFORMATION

Obtain sufficient samples to adequately determine a range and weighted average of activity in the waste. Attach the gamma spectroscopy or radiochemistry data supporting the radionuclide information listed below.

1. Does the waste material contain accessible surfaces with contact dose rates greater than 500 mR/hr? Y ☐ N ☒

2. Does the waste material contain any of the following isotopes: Aluminum-26, Berkelium-247, Calcium-41, Californium-250, Chlorine-36, Rhenium-187, Terbium-157, or Terbium-158? Y ☐ N ☒

3. Please list the following information for each isotope associated with the waste. Provide an explanation in the narrative description of Section B.5 if the waste contains localized "hot spots" or elevated concentrations that significantly exceed the upper concentration range. If additional space is needed, provide an Attachment C.3 to this profile record formatted as below.

Isotope	Manifested Upper Concentration (pCi/g)	Weighted Avg. per Container (pCi/g)	Isotope	Manifested Upper Concentration (pCi/g)	Weighted Avg. per Container (pCi/g)
Tc-99	49,370	49,370			
Np-237	33.6	5.68			
Pu-238	1.42	0.208			
Pu-239	5.09	1.25			
Pu-240	1.14	0.34			
Pu-241	17	4.04			
Pu-242	0.012	0.00429			
U-Dep	325,000	311,000			

RADIOACTIVE WASTE PROFILE RECORD

LOW-LEVEL RADIOACTIVE WASTE CERTIFICATION ATTACHMENT

This form is required only if the checkbox for Hazardous Waste on page one has been checked No. Otherwise, complete the Hazardous Waste Certification Attachment instead of this attachment. EnergySolutions may waive the chemical laboratory analyses if the material is not amenable to chemical sampling and analysis (e.g., debris items including metal pieces, concrete, plastic, etc.). Justification for waiving the chemical analyses must be provided in Section B.5.

D. MINIMUM REQUIRED CHEMICAL ANALYSIS

The following parameters must be analyzed by a Utah or NELAC certified laboratory. Typical SW-846 analytical methods have been listed. Other approved methods are acceptable. Attach the most recent or applicable chemical analytical results representing the waste.

1. GENERAL CHEMICAL PARAMETERS

SW-846 Analytical Methods

PFLT: Pass Pass / Fail **Method 9095** Not applicable for liquid radioactive waste streams.

2. 40 CFR 261.24 Table 1 – Contaminants of Toxicity Characteristic

Metals: Methods 6010 & *7470 ☐ TCLP (mg/L) or ☒ Total (mg/kg)

Arsenic	0.623	Chromium	1.65	Selenium	0.0275
Barium	0.0775	Lead	1.24	Silver	0.203
Cadmium	0.085	*Mercury	0.005		

Organics, Pesticides/Herbicides: Methods 8081/*8151 ☐ TCLP (mg/L) or ☒ Total (mg/kg)

Endrin	ND	Toxaphene	ND	Chlordane	ND
Lindane	ND	*2,4-D	ND	Heptachlor	ND
Methoxychlor	ND	*2,4,5-TP Silvex	ND		

Organics, Semi-Volatile: Method 8270 ☐ TCLP (mg/L) or ☒ Total (mg/kg)

o-Cresol	ND	Hexachlorobenzene	ND	Pentrachlorophenol	ND
m-Cresol	ND	Hexachlorobutadiene	ND	Pyridine	ND
p-Cresol	ND	Hexachloroethane	ND	2,4,5-Trichlorophenol	ND
Total Cresol	ND	Nitrobenzene	ND	2,4,6-Trichlorophenol	ND
2,4-Dinitrotoluene	ND				

Organics, Volatile: Method 8260 ☐ TCLP (mg/L) or ☒ Total (mg/kg)

Benzene	ND	1,4-Dichlorobenzene	ND	Methyl ethyl keytone	ND
Carbon Tetrachloride	ND	1,2-Dichloroethane	ND	Tetrachloroethylene	ND
Chlorobenzene	ND	1,1-Dichloroethylene	ND	Trichloroethylene	ND
Chloroform	ND	Vinyl Chloride	ND		

3. Was the waste at the point of generation a RCRA hazardous waste per 40 CFR 261? Y ☐ N ☒

If Yes, list former hazardous waste codes and former underlying hazardous constituents. List worst-case concentrations for each hazardous constituent. If additional space is needed, provide an Attachment D.3 to this profile record formatted as below. Attach the most recent chemical analytical results demonstrating compliance with applicable treatment standards.

If No, indicate "N/A" in Section D.3 below.

RADIOACTIVE WASTE PROFILE RECORD

D. 3.	Former EPA HW Codes or Underlying Hazardous Constituents	Treatment Standard (mg/kg unless noted as mg/L TCLP or Technology Code)	Worst Case Concentration (mg/kg unless noted as mg/L TCLP)
	None	n/a	n/a

4. OTHER CHEMICAL CONSTITUENTS

List any other chemical constituents of concern (e.g., PCBs, chelating agents, etc.) and worst-case concentrations. If additional space is needed, provide an Attachment D.4 to this profile record formatted as below.

Other Chemical Constituents	Worst-Case Concentration (mg/kg unless noted as mg/L TCLP)	Other Hazardous Constituents	Worst-Case Concentration (mg/kg unless noted as mg/L TCLP)
Cu	0.128	none	n/a
Uranium Trioxide	100%		
Zn	0.728		

5. LABORATORY CERTIFICATION

☒ **UTAH or NELAC CERTIFIED**
The Utah or NELAC certified laboratory holds a current certification for the applicable chemical test methods insofar as such official certifications are given. Please provide a copy of the laboratory's current certification letter for each parameter analyzed and each method used for chemical analyses required by this form.

☐ **OTHER LABORATORY CERTIFICATION** (Describe below)

6. CERTIFICATION

I certify that sample results representative of the waste described in this profile were or shall be obtained using state- and EPA-approved analytical methods. I also certify that where necessary representative samples were or shall be provided to EnergySolutions and to qualified laboratories for the analytical results reported herein. I further certify that the waste described in this record is not prohibited from land disposal in 40 CFR 268 (unless prior arrangements are made for treatment at EnergySolutions) and that all applicable treatment standards are clearly indicated on this form. I also certify that the information provided on this form is complete, true, and correct and is accurately supported and documented by any laboratory testing as required by EnergySolutions. I certify that the results of any said testing have been submitted to EnergySolutions. I certify that the waste does not contain any prohibited items listed in EnergySolutions' Radioactive Material License.

Generator's Signature: on behalf of DOE Title: Lead Technical Advisor Date: 11/23/2009

ATTACHMENT B.5
PHYSICAL PROPERTIES

Generator Name: Savannah River Nuclear Solutions Waste Stream ID: 9021-33
Revision #: 0 Revision Date: 11/16/2008

OVERWRITE THIS SECTION TO COMPLETE YOUR NARRATIVE

Items to include in this attachment as applicable:

- Process that generated the waste

Irradiated assemblies from the Savannah River Site reactors are processed in one of two large chemical processing plants (one in the 200-F Area and one in 200-H Area). Lu both F and H chemical processing plants, the first step is to dissolve the fuel, a process that liberates volatile fission products and generates solutions with high concentrations of radioactivity. The initial separation yields solutions of plutonium, uranium, or neptunium product, and a high-activity liquid waste containing non-volatile fission products. After the fission products are removed sufficiently from the product solutions, further processing converts the material from solution form to solids. The end result of this process is the generation of uranium trioxide powder.

- Waste material physical composition and characteristics

The physical form of the waste is a dry powder that is stoichiometrically 83.22% uranium. The uranium atomic distribution is 99.86% U-238, 0.00741% U-236, 0,133% U-235, and 0.000507% U-234 average. (process knowledge, see above)

- Radiological and chemical characterization method

Characterization is based upon analytical data from analysis of a representative samples of the wastestream. Thirty-three samples were taken from random drums and analyzed for radiological and chemical parameters. Details of the results of the analysis are presented in document number NMM-ETS-2002- 00184 (attached). There are not any exclusions, extensions exemptions, variances, or delistings associated with this waste stream.

- Basis for determining manifested radionuclide concentrations

Characterization is based upon analytical data from analysis of a representative samples of the wastestream.

- Description and amounts of absorbents, if applicable

None

- Basis of non-hazardous or hazardous waste determinations

Process Knowledge and Sample Results

- Treatment processes, if applicable

None

- Product information or Material Safety Data Sheets associated with the waste as applicable

None; waste is 100% Depleted Uranium Tri-Oxide

- Information requested in other sections of this form

For waste streams with SNM, please include the information requested in items 3a through 3d of the SNM Exemption Certification (form EC-0230-SNM) including:

- How the waste was generated, Please see above
- Physical forms in the waste, solid/oxide; powder
- Uranium chemical composition (if applicable); tri-oxide
- How the waste was characterized , Process Knowledge and Sample Results
- The range of SNM concentrations, 0% EU, < 10pCI/gm of all Pu isotopes
- Analytical results with error values , see report attached
- Spatial distribution uniformity of SNM , The uranium tri-oxide is a solid form extracted from a liquid solution. There is no process to concentrate SNM into a portion of the powder so the SNM is distributed homogeneously throughout the waste form.
- Determination of manifested concentrations, The average concentration of each isotope detected in the 33 samples will be used to manifest the waste. The total activity will only vary with the total weight of the containers with in each loaded railcar.

For waste streams containing PCBs regulated for disposal, please provide a description of the PCB waste categories listed on the PCB Waste Certification form (EC-98279), n/a

For profiles containing large components (e.g., single items > 20,000 lbs), please provide the following information: N/A

- Drawings illustrating dimension, weight, access ports to void spaces and lifting points

ATTACHMENT B.5
PHYSICAL PROPERTIES

- Photographs of the object
- Radiological characterization and surveys including dose rates and surface contamination levels
- Packaging, rigging, loading and transportation plans

ENERGYSOLUTIONS

SPECIAL NUCLEAR MATERIAL EXEMPTION CERTIFICATION

The Special Nuclear Material Exemption Certification form must be completed and signed by each generator certifying to the following conditions. Please attach this form and all required information to the Radioactive Waste Profile Record (EC-0230). **A completed and signed copy of this form must also accompany each waste manifest.**

Waste Stream ID: 9021-33 Manifest No._____

1. Check applicable category below for the waste stream:

√	Uranium Enrichment Percent	Weight Percent of Chemicals in Condition 2c	Weight Percent of Materials in Condition 2d	U-235 Concentration (pCi/g)	Measurement Uncertainty* (pCi/g)
☐	< 10 %	≤ 20 %	≤ 1 %	≤ 1,900	≤ 285
☐	Unlimited	≤ 20 %	≤ 1 %	≤ 1,190	≤ 179
☐	Unlimited	Sum of both ≤ 45 % of waste by weight		≤ 680	≤ 102
☐	Unlimited	Unlimited	Unlimited	≤ 26	≤ 10
☒	Not Applicable - Enriched U-235 is not present in the waste.				

* A concentration value is used for the maximum measurement uncertainty limit rather than a percentage value to allow greater flexibility for generators with waste having very low SNM concentrations.

2. Certify to the following requirements by checking each box:

☒ a. Concentrations of SNM in individual waste containers do not exceed the applicable values listed in the above table and SNM isotope concentrations listed in Table 1.

☒ b. The SNM is homogeneously distributed throughout the waste or the SNM concentrations in any contiguous mass of 600 kilograms (1,323 lbs) do not exceed on average the specified limits. (Based on process knowledge or testing).

☒ c. Except as allowed by Condition 1, the waste does not contain "pure forms" of chemicals containing carbon, fluorine, magnesium, or bismuth in bulk quantities (e.g., a pallet of drums, a B-25 box). By "pure forms," it is meant that mixtures of the above elements such as magnesium oxide, magnesium carbonate, magnesium fluoride, bismuth oxide, etc. do not contain other elements. (Based on process knowledge or testing).

☒ d. Except as allowed by Condition 1, the waste does not contain total quantities of beryllium, hydrogenous material enriched in deuterium, or graphite above one percent of the total weight of the waste. (Based on process knowledge, physical observations, or testing).

☒ e. Waste packages do not contain highly soluble forms of uranium greater than 350 grams of uranium-235 or 200 grams of uranium-233. If the waste contains mixtures of U-233 and U-235, the waste meets the sum of the fractions rule. Highly soluble forms of uranium include, but are not limited to: uranium sulfate, uranyl acetate, uranyl chloride, uranyl formate, uranyl fluoride, uranyl nitrate, uranyl potassium carbonate, and uranyl sulfate. (Based on process knowledge or testing).

☐ f. For containers of liquid waste with more than 600 kilograms of waste, the total activity (pCi) of SNM in the manifested container does not exceed the SNM concentration in the above table or Table 1 times 600 kilograms of waste (based on process knowledge or testing). For example, the maximum activity of Pu-239 in any manifested container of liquid waste is 6.0 mCi (6.0E+09 pCi) as shown below:

$$10{,}000\,\frac{pCi}{g} \times 600{,}000\,g = 6.0X10^{9}\ pCi = 6.0\ mCi\ Pu-239$$

SPECIAL NUCLEAR MATERIAL EXEMPTION CERTIFICATION

Table 1. Maximum concentrations of SNM in individual waste containers (refer to above table for U-235 limits).

Radionuclide	Maximum Concentration (pCi/g)	Measurement Uncertainty (pCi/g)	Radionuclide	Maximum Concentration (pCi/g)	Measurement Uncertainty (pCi/g)
U-233	75,000	11,250	Pu-241	350,000	50,000
Pu-236	500	75	Pu-242	10,000	1,500
Pu-238	10,000	1,500	Pu-243	500	75
Pu-239	10,000	1,500	Pu-244	500	75
Pu-240	10,000	1,500			

3. **Indicate that the following information is attached to the Radioactive Waste Profile Record by checking each box. (Note: Only the two-page Special Nuclear Material Exemption Certification form needs to be included with each manifest).**

   ☒ a. Provide a description of how the waste was generated, list the physical forms in the waste, and identify the uranium chemical composition.

   ☒ b. Provide a general description of how the waste was characterized (including the volumetric extent of the waste, and the number, location, type, and results of any analytical testing), the range of SNM concentrations, and the analytical results with error values used to develop the concentration ranges.

   ☒ c. Describe the process by which the waste was generated showing that the spatial distribution of SNM must be uniform, or other information supporting spatial distribution.

   ☒ d. Describe the methods to be used to determine the concentrations on the manifests. These methods could include direct measurement and the use of scaling factors. Describe the uncertainty associated with sampling and testing used to obtain the manifest concentrations.

4. **Generator's certification of compliance with the SNM exemption:** I certify that the information provided on this form is complete, true, and correct and is based on process knowledge, physical observations, or approved laboratory testing. I also certify that sampling and radiological testing of waste containing SNM was performed in accordance with EnergySolutions' Radioactive Material License and that any supporting documentation and analytical results have been submitted to EnergySolutions.

~~Authorized~~ Signature	Printed Name	Title	Date
on behalf of USDOE	GLENN W. SIM	LEAD TECHNICAL ADVISOR	11.27.2009

SRS
savannah river site
TM

WESTINGHOUSE SAVANNAH RIVER COMPANY
INTEROFFICE MEMORANDUM

NMM-ETS-2002-00184
Revision 0
Tracking Number: 10049
D/A: DOE/ADM 17-17.a
Retention: Permanent

November 4, 2002

To: S. A. Williams, 221-F
D. L. McWhorter, 704-10F

From: K. S. Parkinson, 703-F

DEPLETED URANIUM OXIDE SAMPLING RESULTS

Approximately 33,000 drums of depleted uranium trioxide (UO3) drums are stored at the Savannah River Site. The UO3 was the product of the FA-Line process that ran from the 1950s to the late 1980s. A disposition path for a portion of the drums, which are primarily located in buildings 728-F and 730-F, is to send them to Envirocare of Utah for disposal. In order to prepare for disposal to Envirocare, samples from some of the UO3 drums were sent to SRTC for analysis. In addition, a sample was sent to a Utah Certified Laboratory offsite. The constituents that were analyzed included Envirocare Waste Acceptance Criteria (WAC) limits, and Resource Conservation and Recovery Act (RCRA) limits.

Thirty-three samples were taken from UO3 drums for analysis by SRTC, and by Envirocare's Utah-certified laboratory (BWXT Services, Inc). All samples analyses (average and maximum individual drum) are within the parameters specified by Envirocare of Utah.

The details of the SRTC radionuclide results are given in Attachement 1; and in summary, are compared to the Envirocare limits, below:

Constituent	Envirocare WAC Limit, nCi/g			SRTC Analytical Results, nCi/g, avg	SRTC Analytical Results, nCi/g, max
	Class A	Class B	Class C		
Alpha emitting TRU with ½ life > 5 yrs.	10		100		
Np-237				**0.00568**	**0.0335**
Pu-238				**0.000208**	**0.00142**
Pu-239				**0.00125**	**0.00509**
Pu-240				**0.00034**	**0.00114**
Pu-242				**0.0000043**	**0.000012**
Am-241				**<0.0142 ***	**<0.025 ***
Pu-241	350		3,500	**0.00404**	**0.017**
Ra-226	10		100	**<0.317 ***	**<0.600 ***

Constituent	Envirocare WAC Limit, Ci/m^3			SRTC Analytical Results, Ci/m^3, avg	SRTC Analytical Results, Ci/m^3, max
	Class A	Class B	Class C		
Sr-90	0.04	150	7,000	**1.25E-04 ***	**1.17E-03 ***
Cs-137	1.0	44	4,600	**<3.22E-05 ***	**5.59E-05 ***
Tc-99	0.3	----	3	**0.1313**	**0.2495**
I-129	0.008	----	0.08	**4.94E-05 ***	**9.04E-05 ***

- These numbers were all reported as "less than", and below the detectable limits for each material.

Constituent	Envirocare WAC Limit	SRTC Analytical Results, atomic %, avg	SRTC Analytical Results, atomic %, max
U-233	Not applicable	Not present	Not present
U-234	Not applicable	**5.07E-06**	**7.56E-06**
U-235	Not applicable	**1.33E-03**	**1.51E-03**
U-236	Not applicable	**7.41E-05**	**9.61e-05**
U-238	Not applicable	**0.9986**	**0.9987**
Specific gravity	Not applicable	N/A	N/A

The uranium results, above, are given in atom %, and were determined for six samples. This is a measure of mass fraction for each isotope. Attachment gives results for all thirty-three uranium samples as measured by alpha spectrometry, and are reported as "activity %." Comparison of these are in good agreement.

In addition to the above analyses performed by SRTC, the following constituents were analyzed at BWXT Services in Lynchburg, VA (Ref. 1). This Utah-certified laboratory completed their results on September 15, 2002, and the results were reported to WSRC on October 7, 2002.

Constituent	RCRA Limit, ppm *	Certified Lab Analytical Results, ppm *
Arsenic	5.0	**0.623**
Barium	100.0	**0.0775**
Benzene	0.5	**<0.1 (undetected)**
Cadmium	1.0	**0.085**
Carbon tetrachloride	0.5	**<0.1 (undetected)**
Chlordane	0.03	**<0.01 (undetected)**
Chlorobenzene	100.0	**<0.1 (undetected)**
Chloroform	6.0	**<0.1 (undetected)**
Chromium	5.0	**1.65**
o-Cresol	200.0**	**N/a**
m-Cresol	200.0**	**N/a**
p-Cresol	200.0**	**N/a**
Cresol	200.0**	**<0.1 (undetected)**
2,4-D	10.0	**<0.005 (undetected)**
1,4-Dichlorobenzene	7.5	**<0.1 (undetected)**
1,2-Dichloroethane	0.5	**<0.1 (undetected)**
1,1-Dichloroethylene	0.7	**<0.1 (undetected)**
2,4-Dinitrotoluene	0.13	**<0.1 (undetected)**
Endrin	0.02	**<0.001 (undetected)**
Heptachlor (and its epoxide)	0.008	**<0.0005 (undetected)**
Hexachlorobenzene	0.13	**<0.1 (undetected)**
Hexachlorobutadiene	0.5	**<0.1 (undetected)**
Hexachloroethane	3.0	**<0.1 (undetected)**
Lead	5.0	**1.24**
Lindane	0.4	**<0.0005 (undetected)**
Mercury	0.2	**0.005**
Methoxychlor	10	**<0.005 (undetected)**
Methyl ethyl ketone	200.0	**<0.1 (undetected)**
Nitrobenzene	2.0	**<0.1 (undetected)**
Pentachlorophenol	100.0	**<0.1 (undetected)**
Pyridine	5.0	**<0.1 (undetected)**
Selenium	1.0	**0.0275**
Silver	5.0	**0.203**
Tetrachloroethylene	0.7	**<0.1 (undetected)**
Toxaphene	0.5	**<0.01 (undetected)**
Trichloroethylene	0.5	**<0.1 (undetected)**
2,4,5-Trichlorophenol	400.0	**<0.1 (undetected)**
2,4,6-Trichlorophenol	2.0	**<0.1 (undetected)**
2,4,5-TP (Silvex)	1.0	**<0.005 (undetected)**
Vinyl chloride	0.2	**<0.1 (undetected)**

* Results reported as Parts per Million (ppm) are "mg/L" for liquids, and "mg/kg" for solids.

** If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used. The limit for total cresol is 200 mg/L.

In order to meet the Envirocare WAC, the UO_3 must meet the limits for Class A waste.

Constituent	Envirocare WAC Limit, ppm *	Certified Lab Analytical Results, ppm *
Copper	not applicable	**0.128**
Zinc	~9,000+ mg/L	**0.728**
Cyanide	~25 ppm	**<0.005**
Hydrogen sulfide	~25 ppm	**<25.0**
Paint Filter Test	not applicable	**No Free Liquids**
pH (soil pH-method 9045)	not applicable	**4.18**
Is it an oxidizer or reducer?	not applicable	**N/a**
Photo-ionizing sniffer (gross organic)	not applicable	**N/a**
Specific gravity	not applicable	**N/a**

The following constituents will <u>not</u> be analyzed based on the reasons listed, below.

Constituent	Reason not analyzed
Pesticides and herbicides ^	Not entered in process
Volatile organic compounds ^	Removed during evaporation operation
C-14	Process knowledge
Ni-59	Process knowledge
Total of all radionuclides with less than 5-year half- life	Process knowledge, and life of the isotopes
H-3	Process knowledge
Co-60	Process knowledge, and life of the isotope
Ni-63	Process knowledge
Nb-94	Process knowledge
Pu-244	Process knowledge
Am-242m	Process knowledge
Am-243	Process knowledge
Cm-242	Process knowledge, and life of the isotope
Cm-243	Process knowledge
Cm-244	Process knowledge
Cm-245	Process knowledge
Cm-246	Process knowledge
Cm-247	Process knowledge
Cm-248	Process knowledge
Cm-250	Process knowledge
Bk-247	Process knowledge
Cf-249	Process knowledge
Cf-250	Process knowledge
Cf-251	Process knowledge

^ Pesticides, herbicides and volatile organic compounds will be analyzed for in the composite sample that will be shipped to the Utah Certified Laboratory. For the overall inventory of the UO_3 drums, pesticides, herbicides and volatile organic compounds can be ruled out based on process knowledge.

The process that generated the uranium trioxide ceased operation in the late 1980s; therefore, based on this knowledge, any isotope with a half-life of less than 5 years (more than two half-lives have passed) will be present in quantities low enough to meet the Class A requirement. In addition, the uranium solution that was used to generate the UO_3 was processed through two solvent extraction cycles, which removed most of the fission products, and other radioactive and chemical impurities. Additionally, the uranium solution was processed through evaporators, which removed any volatile organic compounds from the solution. Because of this process knowledge, the above constituents that will not be analyzed, and will be present in the UO_3 in trace quantities only.

Ref. 1:
WSRC-SRTC Waste Characterization Support, Customer SOW: UO3 Solid Sample, SRTC Number AB80151N, NEL Services Project Number 1199-001-23-70, Data Report Number 0208003, SDG Number 0208003, J. L. Clark, BWXT to D. Ferrara, WSRC, October 9, 2002.

Distribution cc:

S. J. Robertson, 707-F
M. E. Logan, 221-F
M. A. Collins, 221-F
P. J. Breidenbach, 221-14F
S. J. Howell, 221-F
R. S. Peters, 703-F
D. C. Wood, 703-F
R. D. Redd, 707-C
M. R. Simpkins, 716-2A
D. L. Gillas, DOE, 703-F

Attachment 1

SRTC Sample Results

Sample	Tc-99 nCi/g	Am-241 *(<) pCi/g	Ra-226 *(<) pCi/g	Cs-137 *(<) pCi/g	Sr-90 *(<) pCi/g	Np-237 pCi/g	Pu-238 pCi/g	Pu-239 pCi/g	Pu-240 pCi/g	Pu-241 pCi/g	Pu-242 pCi/g	I-129 *(<) pCi/g UO3	U-234 activity %	U-235+236 activity %	U-238 activity %
1	44.2	6	120	6	8.6	0.44	0.114	0.53	0.14	2.80		13	6.57	1.72	91.70
2	57.5	24	500	19	5.9	2.34	0.099	0.69	0.15	1.00	0.00034	7	7.28	1.74	90.98
3	21.2	21	450	17	3.4	0.33	0.065	0.48	0.12	1.00		7	6.63	2.04	91.33
4	33.3	17	330	14	6.7	4.61	0.129	0.84	0.17	1.00		4	6.82	1.86	91.32
5	15.7	25	600	20	7.2	12.8	0.086	0.95	0.23	2.50		12	6.67	1.73	91.60
6	19.1	20	390	15	14	8.89	0.163	0.40	0.10	1.00		10	7.07	1.76	91.17
7	18.5	16	314	13	8	14.3	0.090	0.34	0.10	1.60		9	6.91	1.85	91.23
8	24.5	16	310	12	7.7	3.85	1.420	0.91	0.48	10.00		4	6.67	1.71	91.62
9	90.2	10	240	9	50.7	6.52	0.350	3.43	1.14	11.00		8	6.72	1.98	91.30
10	79.7	21	470	19	32.7	2.43	0.244	0.48	0.18	3.80		6	6.55	1.70	91.75
11	89.8	16	370	14	23.4	13.6	0.240	3.10	0.68	13.00		20	6.75	1.70	91.55
12	79.7	11	250	10	29.3	11.9	0.090	1.15	0.29	2.70		14	6.18	2.04	91.78
13	37.5	11	260	10	46.6	8.55	0.230	5.09	1.14	17.00		18	6.74	1.95	91.31
14	75.3	13	340	12	31.2	1.3	0.123	2.46	0.55	7.50	0.012	20	7.09	1.70	91.21
15	34.2	17	360	13	40	6.38	0.127	0.36	0.09	0.90		16	6.63	1.74	91.63
16	74.2	12	300	11	68.2	33.5	0.099	0.66				16	6.70	1.86	91.44
17	41.4	11	230	10	28.4	6.08	0.125	1.63	0.50	4.00		17	6.70	2.07	91.24
18	64.7	11	230	8	38.3	2.86	0.081	0.75	0.20	1.00		19	6.71	1.86	91.43
19	16.1	10	210	7	51	10.2	0.043	3.74	0.86	11.00		26	6.32	1.97	91.71
20	14.9	6	170	5	45.6	11.3	0.088	1.07	0.27	1.00		32	6.92	2.25	91.83
21	27.2	14	300	13	27.1	1.92	0.094	0.50	0.12	1.10	0.00053	33	6.69	1.73	91.58
22	8.1	9	250	8	28.6	0.77	0.149	0.81	0.22	3.40		27	10.42	2.11	87.46
23	15.7	18	380	15	45.7	1.67	0.186	1.81	0.52	5.30		24	9.46	2.11	88.43
24	9	16	340	13	26.9	0.69	0.242	1.30	0.36	1.00		27	11.55	2.51	85.94
25	93.8	13	280	11	45.7	1.18	0.178	0.88	0.24	2.60		26	10.71	2.41	86.88
26	92.7	9	250	9	100.5	0.65	0.560	0.79	0.22	2.70		7	10.90	2.36	86.74
27	32.5	10	280	10	59.1	0.94	0.181	0.79	0.22	2.80		30	10.41	2.27	87.32
28	55.3	25	550	21	28	1.61	0.154	0.74	0.21	3.40		34	9.72	2.26	88.02
29	53.8	16	410	14	57.9	11.1	0.420	0.79	0.18	1.00		24	9.91	2.84	87.25
30	88.5	10	190	10	32.9	0.87	0.123	0.85	0.22	4.00		27	9.20	2.27	88.52
31	93.7	16	350	15	78.9	1.04	0.250	1.02				26	11.32	2.77	85.91
32	54.3	9	190	7	438.2	1.32	0.155	1.09	0.32	2.50		22	8.61	2.80	88.59
33	73	9	240	9	35.8	1.58	0.153	0.82	0.24	1.70		28	9.99	1.83	88.18
Avg, pCi/g	**49.37**	**14.18**	**316.79**	**12.09**	**47.04**	**5.682**	**0.208**	**1.25**	**0.34**	**4.04**	**0.00429**	**18.58**	**7.99**	**2.05**	**90.41**
Avg, Ci/m3	0.1313	3.77E-05	8.43E-04	3.22E-05	1.25E-04	1.51E-05	5.52E-07	3.33E-06	8.98E-07	1.08E-05	1.14E-08	4.94E-05	2.12E-05	5.44E-06	2.40E-04
Max, pCi/g	**93.8**	**25**	**600**	**21**	**438.2**	**33.5**	**1.42**	**5.09**	**1.14**	**17**	**0.012**	**34**	**11.55**	**2.84**	**91.83**
Max, Ci/m3	0.249508	6.65E-05	1.60E-03	5.59E-05	1.17E-03	8.91E-05	3.78E-06	1.35E-05	3.03E-06	4.52E-05	3.19E-08	9.04E-05	3.07E-05	7.55E-06	2.44E-04

Attachment 2

	U-234	U-235	U-236	U-238
Sample	**atom %**	**atom %**	**atom %**	**atom %**
3a	4.37E-06	1.27E-03	6.52E-05	0.9987
3b	4.09E-06	1.26E-03	6046E-05	0.9987
9a	4.02E-06	1.26E-03	6.43E-05	0.9987
9b	4.05E-06	1.25E-03	6.38E-05	0.9987
17a	4.45E-06	1.26E-03	6.59E-05	0.9987
17b	4.14E-06	1.26E-03	6.56E-05	0.9987
20a	4.52E-06	1.27E-03	6.75E-05	0.9987
20b	4.33E-06	1.29E-03	6.72E-05	0.9986
25a	7.56E-06	1.51E-03	9.61E-05	0.9984
25b	7.07E-06	1.51E-03	9.49E-05	0.9984
30a	6.23E-06	1.41E-03	8.81E-05	0.9985
30b	5.98E-06	1.40E-03	8.63E-05	0.9985
Avg	**5.07E-06**	**1.33E-03**	**7.41E-05**	**0.99861**

Note: Assumes bulk density of 2.66 g UO3/cm3