RHS 8-7

GALLAHER RD.

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH
William R. Snodgrass Tennessee Tower 312 Rosa L. Parks Avenue, 15th Floor Nashville, Tennessee 37243
615-532-0364

RADIOACTIVE MATERIAL LICENSE

Amendment 144

Pursuant to Tennessee Department of Environment and Conservation Regulations, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules and regulations of the Tennessee Department of Environment and Conservation and orders of the Division of Radiological Health, now or hereafter in effect and to any conditions specified below.

LICENSEE	
1. Name: EnergySolutions Services, Inc.	3. License Number: R-73006-L24
2. Address: 1560 Bear Creek Road, Oak Ridge, Tennessee 37830	4. Expiration Date: December 31, 2024
	5. File No.: R-73006

6. Radioactive Material (Element and Mass Number)	8. Chemical and/or physical form	9. Maximum Radioactivity and/or quantity of material which licensee may possess at any one time.
SEE SUPPLEMENTARY SHEETS		

10. Authorized Use

SEE SUPPLEMENTARY SHEETS

CONDITIONS

11. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

For the Commissioner
Tennessee Department of Environment and Conservation

Date of Issuance: March 31, 2020 By: _____

Division of Radiological Health
Ronald J. Parsons, Environmental Consultant

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6. Radioactive Material (Element and Mass Number)	8. Chemical and/or Physical Form	9. Maximum Radioactivity and/or Quantity of Material Which Licensee May Possess at Any One Time
A. Mixed activation and fission products with atomic numbers 3-83 inclusive (not Carbon 14 or Iron 55)	A. Any form suitable for transport under U.S. DOT Regulations	A. 500 Curies
B. Hydrogen 3	B. Same as 8.A.	B. 500 Curies
C. Carbon 14.	C. Same as 8.A.	C. 100 Curies
D. Iron 55	D. Same as 8.A.	D. 500 Curies
E. Polonium 210	E. Same as 8.A.	E. 20 Curies
F. Radium 226	F. Same as 8.A.	F. 20 Curies
G. Thorium 232	G. Same as 8.A.	G. 20 Curies
H. Uranium-depleted and Natural	H. Same as 8.A.	H. 100 Curies
I. Uranium (not Uranium 233, Uranium 235, or Uranium 238)	I. Same as 8.A.	I. 2.5 Curies
J. Uranium 233	J. Same as 8.A.	J. 200 grams *
K. Uranium-enriched in Uranium 235	K. Same as 8.A.	K. 350 grams * of contained U-235
L. Plutonium	L. Same as 8.A.	L. 200 grams *
M. Americium 241	M. Same as 8.A.	M. 100 Curies

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N.	Transuranics (not Plutonium or Americium 241)	N.	Same as 8.A.	N.	2.5 Curies
O.	Radioactive materials with atomic numbers 84-91, inclusive (not Polonium 210, Radium 226, or Thorium 232)	O.	Same as 8.A.	O.	2.5 Curies
P.	Any radioactive material (except special nuclear)	P.	Sealed sources (Model numbers listed in NRC registry of Sealed Sources and Devices), surface-deposited disc and plane sources, and volumetric reference sources)	P.	No single source to exceed 5 millicuries. Total not to exceed 10 millicuries.

Note:
* For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified here for the same kind of special nuclear material. The sums of such ratios for all kinds of special nuclear material in combination shall not exceed "1" (i.e., unity).

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10. Authorized Use

10.A.through O. Receipt, possession, storage, unpacking, processing, decontamination, release for unrestricted use, repacking, and transfer of radioactive waste when packaged in accordance with U.S. Department of Transportation requirements for interstate commerce in accordance with statements, representations, and procedures contained in documents referenced in conditions of this license.

P. Instrumentation standardization and/or calibration sources.

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Conditions (continued)

12. The licensee shall comply with applicable provisions of 0400-20-04, 0400-20-05, 0400-20-10, and 0400-20-13 of "State Regulations for Protection Against Radiation."

13. Radioactive material authorized by this license shall be used and stored at Energy*Solutions* Services, Inc., 628 Gallaher Road, Kingston, TN 37763.

14. A. Radioactive material authorized by this license shall be used by, or under the supervision of, the following Authorized Users as specified:
Site Operations

1. An Operations Authorized User shall be on-site during all licensed operations as specified per Section VI, items B, C, D, and F of application dated May 29, 2014, with attachments.

2. A Radiation Safety Technician (RST) shall be present on-site during all licensed operations as specified per Section VI, items B, C, D, and F of application dated May 29, 2014, with attachments.

3. Operations Authorized Users

Brian Crabtree, Jeff Dickinson, Clint Evans, Leona Gillam, Eddie James, Keith Schillings, Donna Webb, Brian Parsons, Roger Jones, Chris Thurman, or Jack Clark

Site Logistics

1. A Logistics Authorized User shall be on-site during all licensed operations involving the movement and transshipment of radioactive material.

2. A Radiation Safety Technician (RST) shall be present on-site during all licensed operations as specified per Section VI, items A and E of application dated May 29, 2014, with attachments.

Site Logistics Authorized Users

Nick Arden, Brian Mayes, Fred Schulz, Jason Stafford, Brett Grizzard, Don McCullough, David Phillips, Tracy Shelton, Ronald Hamilton, Mike Phillips, Dwayne Wilkey, or Allen Duncan

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B. The Radiation Safety Officer for this license is Duane R. Quayle.

15. A. The licensee shall develop and maintain a written radiation protection manual that ensures the implementation of the radiation protection program in accordance with "State Regulations for Protection Against Radiation" (SRPAR), ALARA, and documents referenced in conditions of this license. Changes to this manual require prior written approval from the Department.

B. In addition, the licensee shall develop and implement written standard operating procedures to ensure all activities involving the handling and/or use of radioactive materials authorized by this license are carried out in a manner consistent with SRPAR, ALARA, the licensee's radiation protection manual, and the documents referenced in conditions of this license.

C. These procedures may be modified without prior approval of the Department when deemed appropriate and documented by the Radiation Safety Officer. However, adherence to the current procedures as written shall be considered a condition of this license. The written procedures required by this condition shall be available for inspection by the Department. A copy of the current procedures shall be forwarded to the Department upon request.

16. Bulk Survey for Release (BSFR)

A. The licensee is authorized to conduct the Bulk Waste Assay Program (BWAP) which includes Green is Clean (GIC) processing, Safe Check gamma processing, Safe Check non-gamma processing, and Decay Check. The BWAP shall be conducted in accordance with statements, representations, and procedures contained in documents referenced in conditions of this license. The Radium 226 disposal limit for Carter Valley Landfill, North Shelby Landfill, and South Shelby Landfill will be 5 pCi per gram.

B. The licensee is authorized to implement BWAP release limits for Carter Valley Landfill, North Shelby Landfill, and South Shelby Landfill disposal of Safe Check and Decay Check program licensed material in accordance with statements, representations, and procedures contained in application dated May 29, 2014, with attachments, letter dated April 15, 2015, with attachments, letter dated January 29, 2016, with attachments, including "Technical Basis for Safe Check and Decay Check Conditional Release Limits," Revision 6., and letters dated November 15, 2016, with attachments, August 3, 2017, with attachments, and the most current BSFR

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concentration limits established by the Division of Radiological Health for Carter Valley Landfill, North Shelby Landfill, and South Shelby Landfill.

C. Records of all disposals made under this condition shall be submitted quarterly to the Division of Radiological Health, William R. Snodgrass Tennessee Tower, 15th Floor, 312 Rosa L. Parks Avenue, Nashville, Tennessee 37243. Monitoring of materials for contamination for release as authorized by this condition is only to be conducted at the licensee's facilities specified in Condition 13 of this license, and not at customer or other job sites.

D. The licensee shall meet the requirements of the **March 2020 DRH-RAM-G-410-004-03192020 Licensing Requirements for Evaluation and Acceptance of Licensee Requests for the Disposal of Materials with Extremely Low Levels of Contamination in Class 1 (Subtitle D) Landfills (Bulk Survey for Release (BSFR)).**

E. For calendar year 2020 the licensee is approved to dispose of 3542 tons of material in the Carter Valley Landfill. This is a combined disposal limit with EnergySolutions R-73016-G25. For calendar year 2020 the licensee is authorized to dispose of 8054 tons of material in the North Shelby Landfill. For calendar year 2020 the licensee is authorized to dispose of 12403 tons of material in the South Shelby Landfill.

17. A. The Box Assay System shall be operated in accordance with the requirements and specifications found in the "Technical Basis for Design and Calibration of the Energy*Solutions* Box Assay System," Revision 2. Additionally, the waste density shall not exceed 3.0 g/cc, the volume of waste assayed in any single container shall have multiple counts to ensure each four-foot by six-foot cross section (or less) of the container or item is assayed by the system.

B. The Gardian Assay System shall be operated in accordance with the requirements and specifications found in the "Technical Basis for Design, Calibration, and Operation of the Gardian Mobile Assay System," Revision 0.

18. The licensee is authorized to release asphalt/concrete from areas previously used for radioactive material storage in accordance with statements, representations, and procedures contained in the Energy*Solutions* Radiation Safety Guide (RSG-1). Asphalt/concrete released in accordance with this condition shall not be reintroduced to the general public for use as fill or recycling. Excavated material containing no detectable radioactivity when assayed in accordance with the current BWAP program requirements may be used as clean fill at the licensee's nearby Bear Creek site.

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19. A. No radioactive material (excluding calibration and standardization sources) or radioactive waste (radioactive material that has no further use that is dispositioned for disposal) may be possessed under this license (to also include waste generated under the authority of this license) , from the time of receipt until its transfer from the facility, for a period of time greater than three hundred sixty five (365) days. The exceptions to this constraint are with respect to equipment, specifically licensed or otherwise authorized, and stored on-site for future use: (1) at a location authorized by an Energy*Solutions* Services, Inc. Tennessee Radioactive Material License or (2) at a location where such equipment is authorized by the agency having jurisdiction.

B. No radioactive material or radioactive waste may be stored so as to exceed the following stacking limits:

Container Type	Stacking Limit
1. Drums	3 high
2. B-25 Boxes	3 high
3. B-12 Boxes	5 high
4. Sea-Land Cont.	2 high
5. Any other strong tight container	10 feet nominal

20. Radioactive material, contaminated equipment, and empty radioactive material containers may be stored in accordance with statements representations, and procedures contained in documents referenced in this license, provided that radiation levels for unrestricted areas are not exceeded. This material must be stored in either locked DOT intermodal containers as described in Title 49 Code of Federal Regulations (CFR), Part 171.8 or DOT approved strong tight containers. In addition to these requirements the following criteria and restrictions must be adhered to whenever radioactive materials are stored:

1. Containers used for outside storage of radioactive materials must be capable of withstanding environmental conditions.

2. Radiation levels from stored empty containers shall not exceed an average of 0.5 mR/hr, and hot spot activity shall not exceed 2 mR/hr.

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3. Outside storage of containers with radioactive waste and/or DOT Empty containers is only permitted in paved (asphalt or concrete) areas. Storage on grass, dirt, or gravel is specifically prohibited.
4. Soil samples must be collected and analyzed at least quarterly along the edges of outside asphalt or concrete pads where radioactive materials are stored and along the perimeter fence to ensure that there is no buildup of radioactive contamination. Data from these samples must be maintained for inspection by the Department.

5. Each designated outside storage area shall be equipped with identifiable markers (sign postings) at each corner to clearly identify the boundary of the bonded storage area. In addition, the space between these markers can be painted or otherwise marked to identify the storage area.

6. Energy*Solutions* Empty containers are permitted to be stored on any surface (e.g. paved, grass, dirt, or gravel) within any area of the facility that is routinely monitored by the environmental sampling program for radioactivity per the RSG-1.

7. Green is Clean Empty containers may be stored in any location within the facility.

The combined authorizations for storage granted by this license shall not exceed a total of 91, 928.4 square feet.

21. The licensee shall maintain complete and accurate records of the receipt and disposal of radioactive material. The licensee shall, for radioactive material no longer useful for any purpose and for any equipment or supplies contaminated with such material for which further use and decontamination are not planned, define those materials as radioactive waste and treat them as such in accordance with the following provisions:

A. Radioactive waste material shall not be stored with non-radioactive waste.

B. A written record of all radioactive waste material shall be maintained until it has been determined by a suitable survey or radioassay that it has decayed to background levels or until it has been shipped to an authorized recipient in accordance with applicable regulations. Accountability of radioactive waste material prepared for shipment but not yet shipped from the licensee's premises shall be maintained by the licensee by an internal record system such that the licensee is constantly aware of the material's location and the proposed time of shipment. Individuals who are involved in the shipping of such material and/or the storage of

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such material prior to shipment, shall be trained in the precautions necessary for such handling and storage.

C. For material which has decayed to background levels as determined by radioassay or external level as measured with appropriately calibrated instruments, records shall indicate that the material was determined to be no longer radioactive and will indicate the methods and results of the survey or analysis.

D. Shipment records of radioactive waste material shall be maintained and the licensee shall require written confirmation from the authorized recipient of such material that this material has been received.

E. Transfer of radioactive waste to a land disposal facility or a licensed waste handler shall be done in accordance with 0400-20-05-.125 of "State Regulations for Protection Against Radiation."

F. All records and written confirmations required by this condition shall be maintained for inspection by the Department.

The requirements of this condition are in addition to any other requirements for the handling and/or disposal of radioactive material contained in this license and "State Regulations for Protection Against Radiation."

22. The licensee shall not accept either radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or radioactive materials or items from licensable activities for repackaging, processing, refurbishing, storage pending disposal or disposal unless the shipper of such waste possesses a valid license for delivery issued pursuant to 0400-20-10-.32 of "State Regulations for Protection Against Radiation."

23. Written assurances must be furnished by the facility shipping the radioactive material indicating that the facility may accept return of the material processed or unprocessed. In addition, for states outside the Southeast Compact the state or appropriate Compact must be a signatory to the Interregional Access Agreement for Waste Management or assurances shall be obtained from the appropriate state governor's office, the state radiation control program, and the appropriate Compact official, if any.

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24. The licensee shall establish in every contractual obligation relating to radioactive materials the ability to return radioactive materials, processed or unprocessed, to the prior licensed or exempt possessor.

25. A. Beta and/or gamma sealed sources containing more than 100 microcuries, and alpha sealed sources containing more than 10 microcuries, authorized by this license shall be tested for leakage and/or contamination at intervals not to exceed six (6) months. In the absence of a certificate from a transferor indicating that a test has been made within six (6) months prior to transfer, the sealed source shall not be put into use until tested.

B. The licensee is authorized to perform leak testing of sealed sources and analytical services for Energy Solutions facilities in accordance with statements, representations, and procedures contained in Tennessee Radioactive Material License Number R-73008.

C. The tests shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample, or in the case of radium, the escape of radon at the rate of 0.001 microcurie per 24 hours. The test sample shall be taken from the sealed source or from the surface of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak tests shall be kept in units of microcuries and maintained for inspection by the Department.

D. If the test reveals the presence of 0.005 microcurie or more of removable contamination, or in the case of radium, the escape of radon at the rate of 0.001 microcurie or more per 24 hours, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Department regulations. A report shall be filed within five (5) days of the test with the Division of Radiological Health, Tennessee Department of Environment and Conservation, William R. Snodgrass Tennessee Tower, 15th Floor, 312 Rosa L. Parks Avenue, Nashville, Tennessee, 37243, describing the equipment involved, the test results, and the corrective action taken.

26. The licensee shall not open or remove sealed sources containing radioactive material from their respective source holders.

27. The licensee is authorized to receive, possess, and use any radioactive material distributed under a general license, issued by the U. S. Nuclear Regulatory Commission, or another

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Agreement State, without being specifically referenced in Items 6, 8, 9 and 10 of this license. Notwithstanding any other conditions of this license, the general licensee may possess and use radioactive material received under the provisions of 0400-20-10 of "State Regulations for Protection Against Radiation" in accordance with the requirements provided at the time of the transfer of the radioactive material under the terms of the general license.

28. The following evaluations shall be performed for all process ventilation systems:

    1) Air balance within the RCA at least semi-annually, and following any ventilation system or process changes which could potentially alter the effectiveness of the system,

    2) Particulate removal efficiency of the main filtration system HEPA filters by DOP or comparable testing in accordance with pertinent ANSI standards immediately following installation of new HEPA filters or at least semi-annually.

29. In addition to other requirements of this license or of Chapter 0400-20-50-.60 of "State Regulations for Protection Against Radiation," the licensee shall conduct operations so that radiation levels in unrestricted areas would not cause an individual, assuming an occupancy of one (1), to receive a total effective dose equivalent in excess of 500 millirems in one calendar year. These radiation levels shall be appropriately monitored by the licensee, and records of such monitoring shall be maintained for inspection by the Department. For calculational purposes of this condition, the licensee shall base its anticipated exposure to a member of the public upon the sum of the maximally exposed TLD and the highest air concentration derived using the latest available pertinent data.

30. An exemption is granted to the requirements in 0400-20-05-.115(3) of "State Regulations for Protection Against Radiation" that a package received during normal working hours shall be monitored within 3 hours, and that a package not received during normal working hours shall be monitored no later than 3 hours after the beginning of the next working day. Instead, the licensee may monitor a package received during normal working hours within the shift that it is received, or for a package not received during normal working hours may monitor that package within the first shift of the next working day. This authorization does not relieve the licensee from monitoring packages as soon as practical after receipt.

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This exemption may be withdrawn or modified by the Department at any time it is determined necessary to protect the public health and safety or if it is found that the conditions on which this exemption is based have been violated.

31. No provision of this license relieves the licensee from compliance with other Federal, State, and local laws, ordinances, and regulations applicable to the licensee's activities.

32. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 8, and 9 of this license in accordance with statements, representations, and procedures contained in the following:
    - Application dated May 29, 2014, with attachments
    - Letters dated June 30, 2014, December 1, 2014, March 3, 2015, with attachments, and March 3, 2015, with attached Energy*Solutions* Tennessee Radiation Safety Guide (RSG-1), Revision 10, April 15, 2015, with attachments, January 29, 2016, with attachments, November 15, 2016, with attachments, August 3, 2017, with attachments, November 14, 2017, with attached Energy*Solutions* Tennessee Radiation Safety Guide (RSG-1) Revision 11, December 5, 2017, and November 19, 2019, with attachments.

Division of Radiological Health
DRH-RAM-G-410-004-03192020
Licensing Requirements for Evaluation and Acceptance of Licensee Requests for the Disposal of Materials with Extremely Low Levels of Contamination in Class 1 (Subtitle D) Landfills (Bulk Survey for Release (BSFR))

DISCLAIMER: This document is guidance only and does not create legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

EFFECTIVE DATE: MARCH 19, 2020

SIGNATURES:

Debra G. Shults
Director

Laura Vien
Drafter / Preparer

Reviewer (optional)

Office of General Counsel

I. PURPOSE

To outline the radioactive material licensing guidance on Licensing Requirements for Evaluation and Acceptance of Licensee Requests for the Disposal of Materials with Extremely Low Levels of Contamination in Class 1 (Subtitle D) Landfills.

II. SCOPE

This guidance is to be followed by licensees applying for BSFR authorization.

III. BACKGROUND

This replaces the March 2017 "Licensing Requirements for Evaluation and Acceptance of Licensee Requests for the Disposal of Materials with Extremely Low Levels of Contamination in Class 1 (Subtitle D) Landfills". Authorization for a program to dispose materials with extremely low levels of contamination in class 1 (Subtitle D) landfills (BSFR) is only for

domestic material generated in the United States and its territories. Material generated outside the United States or its territories are not eligible for disposal in the BSFR program.

IV. RESPONSIBILITIES

The licensee shall describe the operation of the requested landfill including but not limited to truck monitoring, waste dumping, working face operations, equipment maintenance, leachate collection, etc. The description should allow the reviewer to have a complete understanding of the daily operation of the site focusing on handling the conditionally disposed wastes. Each landfill submission shall be reviewed annually by the licensee to identify any changes that would require modification of the current license authorization and the technical basis on which it was submitted.

V. SCHEDULE

The results of this review shall be submitted to the Division within thirty days of the review along with any licensing changes that are required to bring the licensee into compliance with the annual dose limit. Changes that might increase the approved concentration limits or the annual mass disposal limits may also be submitted provided the changes are expected to last through the following year.

VI. REQUIREMENTS

Landfill Analysis Requirements

For each radionuclide and concentration requested, perform and submit an analysis verifying that the dose, to the maximally exposed individual, will not exceed 1 millirem per year (mrem/yr) total effective dose equivalent (TEDE). A separate analysis shall be submitted for each operation identified above and shall include the delivery driver, landfill workers affected and post landfill use, as outlined below, using the most current RESRAD computer code. For each analysis, use the entire useable disposal area of the landfill beginning when the conditional disposal program started.

Use site-specific data for each parameter to the maximum extent possible and provide supporting documentation and/or the justification for each choice. For parameters where site-specific data cannot be obtained and data comes from other sources (e.g., from the literature), provide supporting documentation and justify your reason for choosing the particular parameter value. For clarity on using and justifying site specific parameters refer to NUREG-1757, Vol. 2, Rev 1.

Site-specific parameter values may vary markedly within a single landfill (e.g., zone thickness, media characteristics, and distribution factors (kd) for different soil types). Those that are conservative for one radionuclide and pathway may not be conservative for other radionuclides and pathways. It may be necessary to run separate analyses on each radionuclide to determine the sensitivity to each parameter value or group of parameter values.

For each specific analysis noted above use the following guidelines:

1. Run each operational scenario outlined above using the RESRAD computer code and appropriate input parameter values and demonstrates that the dose for each operation will not exceed 1 mrem/yr TEDE. At a minimum, the external, inhalation, and soil pathways shall be analyzed and it shall be assumed that working face employees are on the landfill 25% of the year. Each parameter value shall be reasonable and verifiable by the landfill operator.

2. Run the resident farmer scenario, using the RESRAD computer code and appropriate input parameter values, with no cover, all pathways on, and show that the dose will not exceed 1 mrem/yr (TEDE) from 20 years post closure to 1000 years post closure. Consideration for child and infant doses should be made where appropriate.

The contribution from radon from technologically enhanced waste materials shall be included in all calculations where the possibility of radon exposure exists.

Unless the most restrictive value for each parameter over the entire useable area of the landfill is chosen in the analysis submitted, a new analysis will be required for each new phase of the landfill.

The Department may use the RESRAD probabilistic sensitivity and dose analysis for any parameters that cannot be documented and justified. Concentrations determined by this process will be used in the approval for a specific landfill. For guidance on the use of RESRAD probabilistic analysis, refer to the Yankee Rowe license termination plan submittal which can be found at the Yankee Rowe Site Closure website.

DRH may perform an analysis of possible leachate concentrations based on waste concentration limits, the area of the disposal site, and appropriate site parameters. These

leachate concentration values may in some cases be limiting on the waste concentrations which may be approved.

The most restrictive individual radionuclide concentration as determined above will be authorized for each landfill.

General Requirements

1. The radiation level at the surface of any conditionally disposed container shall not exceed 50 microrem/hr (µrem/hr) at each surface and 10 µrem/hr at 1 meter from each surface including the top and bottom of the container.

2. Each approval for a specific licensee is only for the area of the landfill approved for disposal by Solid Waste Management permit at the time of the request. Each licensee must submit an independent analysis for a requested landfill using the most current engineering geotechnical and hydrological data available and supply the supporting documentation for the data. Updated parameter values for an area of the landfill subsequently approved by Solid Waste Management must be submitted to re-evaluate the approved limits of an earlier authorization.

3. A sum of the fractions[1] rule shall be applied to mixtures of radionuclides in waste materials in each conveyance such that the total of all fractions does not exceed 1 and where the effective limit results in calculated doses that do not exceed 1 mrem/yr TEDE.

[1] Sum of the fractions rule: If radionuclides A, B, and C are present at concentrations *concA*, *concB*, and *concC*, and their respective limits are lim *A*, lim *B*, and lim *C*, then the following must be true:

$$\frac{concA}{\lim A} + \frac{concB}{\lim B} + \frac{concC}{\lim C} \leq 1$$

4. Intentional mixing of high and low density materials that results in the reduction of the radionuclide concentration of the waste is prohibited.

5. The intentional mixing of waste materials containing radionuclide concentrations above the conditional disposal limits with either clean materials or waste materials containing radionuclide concentrations below the conditional disposal limits, that results in the reduction of the radionuclide concentration, is prohibited.

6. In determining the radionuclide concentration, credit shall not be taken for the mass of clean materials used to solidify/stabilize waste materials.

7. Materials evaluated for conditional disposal must be analyzed in a container no larger than the smallest container in which the waste is received. Aggregation of containers or placing of smaller containers in larger ones for analysis is prohibited. Containers which initially fail the analysis may only be passed following re-analysis if the waste material which caused the failure has been identified and removed for alternative disposition.

8. The annual mass allowed for disposal at each landfill shall be limited by license condition for each licensee. The mass limit will be calculated by DRH based on the average of the total mass disposed at the landfill in the 3 years preceding the most recent completed year. (e.g. average of 2004, 2005, and 2006 for 2008). The total mass approved for conditional disposal will not exceed 5% nor be modeled to less than 2% of the three-year average disposed at the landfill.

9. If multiple licensees request authorization to utilize a specific landfill, and if the requested disposal masses would exceed 5% of the three-year average of mass disposed, each licensee's disposal mass authorization may be adjusted by the Division.

10. In determining the mass of conditionally disposed waste for purposes of General Requirement #8, an adjusted mass total may be determined by multiplying the actual mass of each package of waste by the dose fraction (dF) for that package calculated in General Requirement #3 and Footnote 1. The annual adjusted mass

sent to the landfill by the licensee would be the sum of all adjusted waste package masses. Waste packages with measured concentrations greater than the licensed disposal concentration limit are not eligible for this adjustment and shall not be disposed in a Tennessee landfill, except as provided in General Requirement #7.

11. The licensee shall submit a report of its conditionally disposed waste to the Division within 30 days of the end of each calendar quarter. The report shall include, for each landfill authorized, the total amount of waste mass in pounds (actual and adjusted), the radionuclides in each conveyance, the concentration in pCi/g of each radionuclide in each conveyance sent to a landfill, the corresponding total pCi of each radionuclide, and the fraction of the annual mass limit used to date.

12. For conditionally disposed waste shipments the licensee shall submit a report within 30 days of the end of each calendar quarter listing any rejected shipments, including shipments rejected for setting off radiation gate alarms at landfills.

13. Sealed sources, including but not limited to check sources, foils, and other items where the activity has been concentrated, shall not be acceptable for inclusion in materials considered for conditional disposal. Radioactive component parts from devices, instruments, and articles shall not be acceptable for inclusion in materials considered for conditional disposal.

14. Notwithstanding the radionuclide concentration limits determined by RESRAD for 1 mrem/yr dose, the licensee shall not exceed the USDOT activity concentration for exempt material values given in 49 CFR 173.436 or determined according to procedures in 49 CFR 173.433.

Waste Analysis Requirements

15. Gamma spectroscopy assay systems and techniques shall not be used as the sole assay methodology for waste materials conditionally disposed in landfills.

16. The licensee shall require from each generator a detailed isotopic and concentration analysis of the waste materials in each shipment including all hard-to-detect radionuclides. Process knowledge and generic scaling factors shall not be relied

upon solely for determining scaling factors. Process knowledge may be used to assist in determining the appropriate method and scope of the analysis. Scaling factors used for alpha, beta, and low energy gamma emitters present in a waste stream (e.g. reactor wastes, university wastes, lab wastes, etc.) shall be established and documented for each specific waste stream. Scaling factors shall be determined using an appropriate laboratory methodology (e.g., methodology established by NCRP, ANSI, or the NRC) and performed at least annually. Documentation shall include the equivalent of a uniform radioactive waste manifest (inbound to the processor), with all radionuclide and waste form data provided.

17. For each conveyance to a landfill, where scaling factors are utilized, documentation referencing the waste containers in the conveyance to the appropriate lab analysis (and QC analysis where applicable) must be maintained.

18. Waste stream analysis shall include quantification of radionuclides that exceed 0.1% of waste mixtures. All licensed radionuclides present at >0.1% (by activity) of any waste mixture shall be included in deriving pass/fail limits for conditionally disposed waste. Delisting of radionuclides in accordance with otherwise applicable guidance shall not be applied to the assay program.

19. Each licensee shall be able to demonstrate by measurement or calculation that the assay and laboratory methodologies utilized are able to detect the levels necessary to show compliance with the disposal limit for each radionuclide. The lower limit of detection for assays shall be at the 95% confidence level.

20. The licensee shall determine that the waste material is essentially homogeneous, and sampling shall be sufficient to demonstrate that the scaling factors are consistent throughout the volume of waste. The assay data used for comparison with the derived sum of the fractions limit (including scaled radionuclides) shall be the average of at least three assay measurements. Each individual assay measurement shall be within a factor of three times the average limit to ensure homogeneity.

21. A quantitative gamma spectrometry assay measurement shall be performed of each 400 ft3 of waste materials, using appropriate calibration factors, including geometry and density factors. The analysis shall be sufficient to achieve an LLD equivalent to or less than 10% of the conditional disposal limit for each radionuclide used as a basis for the application of factors to that waste stream. If a given radionuclide LLD

cannot be shown to be 10% or less of the applicable limit, then waste activity must be assumed to be present at the LLD value.

22. A representative QC sample shall be collected from each waste stream, when shipped in large containers (e.g., intermodals). Samples shall be counted to achieve an LLD equivalent to 10% of the conditional disposal limit for each radionuclide used as a basis for the application of scaling factors to that waste stream. If a given radionuclide LLD cannot be shown to be 10% or less of the applicable limit, then waste activity must be assumed to be present at the LLD value.

23. Any waste lacking a gamma component shall have an assay measurement performed of each 400 ft3 of waste materials. The assay shall be sufficient to achieve an LLD equivalent to or less than 10% of the conditional disposal limit for each radionuclide used as a basis for the application of scaling factors to that waste stream. If a given radionuclide LLD cannot be shown to be 10% or less of the applicable limit, then waste activity must be assumed to be present at the LLD value.

24. All licensees who have authorization for BSFR via their radioactive material licenses shall implement criteria that if the quantity of SNM exceeds 0.49 gram per manifested package, the material shall be rejected for disposal at the Class 1 (Subtitle D) landfill that was approved for disposal of BSRF material. The only exception to this process is if the material does pass BSFR (<1 mrem via sum-of-the-fractions) and the Class 1 (Subtitle D) landfill manages the SNM inventory per 10 CFR 74 - Material Control and Accounting of Special Nuclear Material, to include all general reporting requirements. The instrumentation used for BSFR must be capable of detecting the SNM quantity of 0.49 gram at the 95% UCL.

REVISION HISTORY TABLE

Revision Number	Date	Brief Summary of Change
0	2001	Initial guidance
1	07/01/2007	Guidance development
2	03/01/2010	Guidance format
3	06/01/2014	Added SNM requirements
4	03/01/2017	Change in reporting requirements for SNM
5	09/20/2018	Update to guidance format
6	03/19/2020	Clarification for domestic waste only