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SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
RADIOACTIVE MATERIAL LICENSE

Pursuant to the Atomic Energy and Radiation Control Act, Section 13-7-40 et. seq. of S.C. Code of Laws of 1976, as amended, and Supplements thereto, and the South Carolina Department of Health and Environmental Control Regulation 61-65, Radioactive Material (Title A), and in reliance on statements and representations heretofore made by the applicant, 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 South Carolina Department of Health and Environmental Control now or hereafter in effect and to any conditions specified below.

Amendment No. 45 amends

LICENSEE		3. License Number
1. Name	Chem-Nuclear Systems, Inc. Barnwell Waste Management Facility A Subsidiary of Waste Management, Inc.	097 in its entirety.
2. Address	P.O. Box 726 Barnwell, S.C. 29812	4. Expiration Date December 31, 1992

5. Radioactive Material (Element and Mass Number)	6. Chemical and/or Physical Form	7. Maximum Radioactivity and/or quantity of material which licensee may possess at any one time.
A. Any radioactive material excluding source material and special nuclear material.	A. Dry packaged radioactive waste except as authorized in this license.	A. 50,000 curies.
B. Source material.	B. Dry packaged radioactive waste except as authorized in this license.	B. 60,000 pounds.

8. Authorized Use:
A and B.

Radioactive material as low-level radioactive waste may be received, stored, and disposed of by shallow land burial. The licensee shall comply with all applicable terms and conditions of the Southeast Interstate Low-Level Radioactive Waste Management Compact and Section 5 of the Low-Level Radioactive Waste Policy Amendments Act of 1985 (P.L. 99-240), regarding volume limitations and allocation of disposal capacity; provided however, the licensee shall not receive an

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annual volume of more than one million, two hundred thousand (1.2 million) cubic feet of waste per calendar year beginning January 1, 1986; however, the licensee is authorized to increase the volume in ten (10) per centum increments in accordance with the provisions of Section 5 (a) (3) (b) of the Low-Level Radioactive Waste Policy Amendments Act of 1985; provided the Department is notified in writing no later than thirty (30) days in advance of such increases.

Unless otherwise authorized by the Department, only radioactive waste consigned for burial shall be received at the location specified in Condition No. 9 of this license. The maximum radioactivity and/or quantity of radioactive material indicated in Item 7. A and B applies only to above ground activities.

General Conditions

9. Unless otherwise specified, the authorized place of use is a site located approximately five miles northwest of Barnwell, South Carolina, in the Seven Pines School District, Red Oak Township, Barnwell County, South Carolina, within the boundary of the land area described in Lease Agreement dated April 6, 1976, as amended.
10. The licensee shall comply with the provisions of Department Regulation 61-63, Radioactive Material, (Title A), Part I - General Provisions; Part II - Licensing of Radioactive Materials; Part III - Standards for Protection Against Radiation; Part VI - Notices, Instructions, and Reports to Workers; Inspections, and Part VII - Licensing Requirements for Land Disposal of Radioactive Waste; Department Regulation 61-83, Transportation of Radioactive Waste Into or Within South Carolina.
11. Operations authorized by this license shall be conducted in accordance with Chem-Nuclear Systems, Inc. procedures and subsequent revisions and additions approved by the Department. However, the licensee may, upon notification to the Department but without Department approval, make minor changes to these procedures provided that:
 - a. The change does not affect requirements of any other license condition in this license;

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General Conditions continued

- b. The change does not increase the potential for personnel exposure;
- c. The change does not diminish operational safety;
- d. The change does not increase the potential for release of radioactive material to unrestricted areas; and
- e. The change does not reduce the licensee's record keeping and reporting system.

The licensee shall maintain records of these changes including evaluations which provide the basis for the change.

- 12. Operations shall be conducted by or under the supervision of: John S. Zawacki, Joseph J. Still, George Hurst, Michael T. Ryan (RPO), William B. House or other individuals designated by the licensee's Radiation Protection Officer upon successful completion of the licensee's training program.
- 13. The licensee shall, to the extent necessary, continue the employment of all personnel involved in the operation of the Barnwell Waste Management Facility in accordance with all requirements of the license and applicable regulations and, in the event replacement of employees becomes necessary, only individuals of comparable qualifications and experience will be hired.
- 14. The licensee shall insure that all site personnel have satisfactorily completed the training program requirements as specified in the Chem-Nuclear Systems, Inc. Barnwell Site Training Program. Changes and additions to the program shall be submitted to the Department for review. Time intervals for personnel indoctrination, training, examination, certification, retraining specified in Standard Operating Procedures S20-AD-004, "Barnwell Radioactive Waste Burial Site Personnel Training" shall not be changed without Department approval.
- 15. A documented weekly inspection of site operations and the restricted area of the site for compliance with applicable conditions of this license shall be conducted by a named designee in Condition 12.

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General Conditions Continued

16. The transportation of radioactive materials and radioactive waste within the State of South Carolina shall be in accordance with applicable regulations of the U.S. Department of Transportation, the U.S. Nuclear Regulatory Commission, Section RHA 2.22, Department Regulations 61-63, Radioactive Material, (Title A), and Department Regulation 61-83, "Transportation of Radioactive Waste Into or Within South Carolina."
17. The licensee shall maintain all records and shipment manifests pertinent to the transportation, receipt, and disposal of radioactive material at the location specified in Condition 9 of this license until authorization is given by the Department for transfer of disposal of such records.
18. The licensee shall maintain a record for each shipment of waste disposed of at the site. As a minimum, the record shall include:
 - a. the date of disposal of the waste;
 - b. the location of waste in the disposal site;
 - c. the condition of the waste packages received;
 - d. any discrepancy between the waste listed on the shipment manifest or shipping papers and the waste received in the shipment;
 - e. a description of any evidence of leaking or damaged packages or radiation or contamination in excess of applicable regulatory limits; and
 - f. a description of any repackaging operations of any of the waste packages in the shipment.
19. A monthly site receipt and burial activities report shall be submitted no later than the 10th day of the following month to the Chief, Bureau of Radiological Health, S.C. Department of Health & Environmental Control, 2600 Bull Street, Columbia, South Carolina 29201.

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General Conditions Continued

20. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 5, 6, and 7 of this license and conduct site operations in accordance with statements, representations, operating procedures, and disposal criteria, heretofore made by the licensee or his authorized representative in application for and subsequent to issuance of S.C. Radioactive Material License No. 097, and amendments thereto.
21. Unless otherwise specified in this license, the licensee shall make no changes in the personnel training program, the internal safety audits, Safety Review Board, ALARA Review Committee, Site Criteria, or Procedures Manual and Standard Operating Procedures, without approval from the Department.

Receipt, Acceptance and Inspection Conditions

22. The licensee shall not accept radioactive waste for storage or disposal unless the shipper has completed the required information for the waste shipment on a Barnwell Waste Management Facility's Radioactive Shipment Manifest form or approved equivalent. Such form or revisions thereto shall be approved by the Department.
23. The licensee shall not accept radioactive waste for storage or disposal unless the shipper of such waste has a valid, unsuspended Radioactive Waste Transport Permit issued by the S.C. Department of Health and Environmental Control.
24. The licensee shall not accept radioactive waste for storage or disposal unless the shipper has provided a properly executed Department Form, DHEC-803, Radioactive Waste Shipment Certification Form, Part I and II. For shipments consisting of more than 75 cubic feet or containing more than one (1) curie shall also be accompanied by a properly completed and executed Department Form, DHEC-802, Radioactive Waste Shipment Prior Notification and Manifest Form.
25. The licensee shall only accept radioactive waste shipments for storage or disposal which have been inspected by a representative of the Department.

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26. Notwithstanding other conditions of this license, the licensee shall not accept radioactive waste for storage or disposal unless he has received advance written notification of any waste shipment containing unusual hazards or potential hazards including but not limited to, physical, gaseous, chemical, pyrophoric, or excessive removable contamination on disposal containers shipped inside casks or excessive internally contaminated casks, and unexpected high radiation levels at disposal container surfaces.
 27. The licensee shall immediately notify the Department or the Department's on-site representative of any waste shipments where a violation of applicable regulations or license conditions has been found.
 28. The licensee shall notify the shipper and the Department when any shipment of radioactive waste or part of a shipment has not arrived within 60 days after the advance copy of the shipment manifest or shipping papers was received by the licensee.
 29. The licensee shall notify the shipper when it has been determined that a radioactive waste shipment or part of a shipment cannot be accepted for disposal by the licensee.
 30. The licensee shall acknowledge receipt of the waste within 7 days of its acceptance for disposal by returning a signed copy of the shipment manifest or shipping papers to the shipper. The licensee shall indicate on the returned copy of the shipment manifest or shipping papers any discrepancy between waste descriptions listed on the manifest or papers and the waste materials received in the shipment.

Waste Characteristics and Waste Form Conditions

31. The licensee shall not accept any radioactive waste for storage or disposal unless the shipper has marked each package, as specified by the licensee, to identify its classification as either Class A, stable or unstable, Class B, or Class C waste, and certifies that the waste materials have been classified and prepared for disposal in accordance with the following waste classification table:

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Waste Classification Table

CONCENTRATION LIMITS IN CURIES/
 CUBIC METER

RADIONUCLIDES

Table I (long-lived)

Class A Class B Class C

C-14.....	≤ 0.8		≤ 8
C-14 in activated metal.....	≤ 8		≤ 80
Ni-59 in activated metal.....	≤ 22		≤ 220
Nb-94 in activated metal.....	≤ 0.02		≤ 0.2
Tc-99.....	≤ 0.3		≤ 3
I-129.....	≤ 0.008		≤ 0.08

CONCENTRATION LIMITS IN NANOCURIES/GRAMS

Alpha emitting transuranics with half-life greater than 5 years...	≤ 10		≤ 100
Pu-241.....	≤ 350		≤ 3500
Cm-242.....	≤ 2000		≤ 20000

Table II (short-lived)

CONCENTRATION LIMITS IN CURIES/
 CUBIC METER

Class A Class B Class C

Total of all with half-life less than 5 years.....	≤ 700	≥ 700	
H-3.....	≤ 40	≥ 40	
Co-60.....	≤ 700	≥ 700	
Ni-63.....	≤ 3.5	≤ 70	≤ 700
Ni-63 in activated metal.....	≤ 35	≤ 700	≤ 7000
Sr-90.....	≤ 0.04	≤ 150	≤ 7000
Cs-137.....	≤ 1	≤ 44	≤ 4600

* curies/cubic meter is equivalent to microcuries/cubic centimeters.

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Condition 31. continued

a. The concentration of a radionuclide or radionuclide mixture may be averaged over the volume of the waste and, if used, the solidification agent or matrix if the waste form is a homogeneous mixture. The concentration of radionuclides in filters/sealed sources encapsulated with a solidification agent or matrix shall be averaged over the volume of the filters/sealed sources not the solidification agent. The volume of packaging, containers, liners or overpacks shall not be included in this calculation, nor shall the volume of the waste mixture be artificially increased by the addition of non-disperable solids or objects even if considered as waste.

If expressed in units of nanocuries per gram, concentrations may be averaged over the weight of the waste and, if used, the solidification agent if homogeneous, except in the case of encapsulated filters which shall be over the weight of the filter. The weight of packaging containers, liners or overpacks shall not be included in this calculation, nor shall the weight of the waste mixture be artificially increased by the addition of heavy, non-disperable solids or objects even if considered as waste.

- b. The waste is Class A if none of the listed radionuclides are present. Radium waste as authorized by Condition 44 of this license shall be Class A, stable or unstable.
- c. There are no upper limits in Class B waste for the first three (3) radionuclides listed.
- d. There are no Class B values for the last nine (9) radionuclides listed. their presence classifies the waste as either Class A or Class C according to their concentrations.
- e. The waste class for mixtures of the listed radionuclides is determined by deriving for each radionuclide the ratio between its concentration in the mixture and its concentration limit in the table and adding the resulting ratio values for each radionuclide group. All limits used in the calculation must be for the same waste class. The sum of the ratios for each radionuclide group must be less than 1.0 or the waste is of a higher classification than that used for the calculation.

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- f. If Class C limits are used in the calculation and the sum of ratios for either group is equal to or exceeds 1.0, the waste is not acceptable for disposal without prior written approval from the Department.
- g. If concentrations for any single radionuclide exceed the Class C values in the table, the waste is not acceptable for disposal without prior written approval from the Department.
- 32. A. Unless otherwise specified in this license, the licensee shall not receive any liquid radioactive waste regardless of the chemical or physical form. Absorbent materials may be placed in packages of dry, solid waste to absorb unintentional and incidental amounts of liquids. Further, liquids in the interstitial spaces of transport casks and containers shall be removed to the extent practical.
- B. Solidified radioactive waste shall have no detectable free standing liquids in excess of one-half percent (0.5%) by waste volume of non-corrosive liquids per container.
- C. In lieu of the requirements of paragraph B. above, solidified waste containing non-corrosive liquids in excess of one-half percent (0.5%) by waste volume, and less than one percent (1%) noncorrosive liquids by waste volume, may be received and disposed of in high integrity containers approved by the Department.
- 33. A. Unless otherwise specified, the licensee shall only receive aqueous liquids and other applicable waste forms which have been solidified or otherwise stabilized with one of the following solidification media:
 - 1. Vinyl Ester Styrene
 - 2. Cement
 - 3. Bitumen (see Subparagraph E. below)
 - 4. Vinyl Chloride
- B. Solidification media and processes used to stabilize Class A aqueous liquids and other applicable waste forms containing isotopes with greater than five (5) year half-lives having a total specific activity of all these isotopes of 1 microcurie/cubic centimeter or greater, and all applicable Class B and C waste, shall meet and have been evaluated in accordance with the "Stability Guidance" requirements of the U.S. Nuclear Regulatory Commission's Low-Level Licensing Branch, Technical Position on

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Waste Form, dated May 1983, or other evaluation criteria specifically approved by the NRC or the Department.

- C. Solidified Class A aqueous liquids and other applicable waste forms with a specific activity of less than 1 microcurie/cubic centimeter, shall meet the requirements of the "Solidified Class A Waste Products" of the NRC Branch Technical Position on Waste Forms, dated May 1983.
- D. Other solidification media and processes shall be acceptable for which a topical report has been prepared and received approval from the U.S. Nuclear Regulatory Commission, and final approval by the Department.
- E. The licensee shall only receive for disposal, full formula, oxidized bitumen (asphalt) solidified waste, and certified as such by the waste generator. Regardless of the waste classification, bitumen solidified waste received for disposal shall be a free-standing monolith and shall not demonstrate the characteristic of a free flowing, viscous fluid.

The licensee shall dispose of bitumen solidified waste in trenches commensurate with the applicable waste classification, and in all cases, provide sufficient backfill material to fill all voids around the waste to provide structural stability and minimize trench subsidence. The licensee may construct segregated trenches for disposal of bitumen waste provided approval is granted by the Department.

- 34. Except as specifically provided in this license, the licensee shall not accept liquid radioactive waste packaged in absorbent materials, or where absorbent materials have been used to absorb liquids rather than properly solidified with an approved media.
- 35. Regardless of the waste classification of Condition 31, and unless otherwise authorized by the Department, the licensee shall not receive evaporator bottoms or concentrates, residues, sludges, or other waste which may contain free standing liquids, unless they are solidified in accordance with Condition 33, and meet the requirements as specified in Condition 32.

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- 36. The licensee may receive resins and filter media in a dewatered form provided that the free standing liquid requirements of Condition 32 and the requirements of Condition 38 are met.
- 37. The licensee shall not receive containers of ion exchange resins or filter media (dewatered or solidified) unless records of complete radiological analyses (quantitative and qualitative) are provided. The records must specify the specific activity of each radionuclide expressed in microcuries/cubic centimeter and transuranic radionuclides in nanocuries/gram.
- 38. Regardless of the waste classification of Condition 31, ion exchange resins and filter media containing isotopes with greater than five (5) year half-lives having a specific activity of all these isotopes of 1 microcurie/cubic centimeter or greater must be stabilized by solidification in accordance with Condition 33 and meet the free standing liquid requirements of Condition 32.B. However, in lieu of solidification, the Department will authorize disposal of these waste forms meeting the free standing liquid requirements of Condition 32.C. in approved high integrity containers or other approved methods of stabilization.
- 39. A. The licensee shall not receive solidified Class A waste containing isotopes with greater than five (5) year half-lives having a totally specific activity of all these isotopes of 1 microcurie/cubic centimeter, and Class B and C waste, unless it is structurally stable and provides reasonable assurance that the waste will maintain its general physical dimensions and its form under the expected disposal condition, which include the weight of soil overburden and compaction equipment, the presence in the burial environment of moisture and microbial activity, and factors internal to the waste itself such as radiation effects and chemical changes.
- B. Structural stability can be provided by the waste form itself if it is a solid monolith, processing the waste to a stable form or placing the waste in a high integrity container that provides stability after disposal. Such containers shall have prior approval of the Department. Polyethylene high integrity containers which serve to provide stability for Class B and C wastes must additionally be placed in a Departmentally approved concrete overpack, which are to be provided by the site operator.

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- C. Void spaces within the waste and between the waste and its packaging shall be reduced to the extent practicable, but in no case shall less than eighty-five percent (85%) of the capacity of the containers be filled for Class A Stable, Class B and Class C waste unless placed in a High Integrity Container or in a concrete overpack. The licensee may allow a variance from this condition in certain instances, but only after receiving a written justification from the waste generator prior to receiving the waste shipment. Variance justifications and approvals shall be maintained for review by the Department.
40. Except as specified in the waste classification table of Condition 31 of this license, the licensee shall not receive waste containing any transuranic radionuclides. Radioactive waste containing transuranic radionuclides specified in Condition 31 are acceptable provided that the transuranic radionuclides are evenly distributed within a homogeneous waste form and are incidental to the total radioactivity. This license does not authorize the receipt of disposal of components or equipment primarily contaminated with transuranic radionuclides, on vehicles, equipment, or components, with contamination limits in excess of those specified in Condition 55 in a controlled environment.
41. Household or industrial smoke or gas detectors containing Americium-241 foils which may exceed the transuranic radionuclide limit specified in Condition 31 of this license may be accepted for disposal provided the entire detector is received for disposal.
42. The licensee shall not receive or dispose of sealed sources or special form radioactive materials containing more than 5 curies of radioactive material with half-lives greater than 5 years except in a container which provides long term containment. Such containers are subject to approval by the Department. Irradiated metal components which have similar characteristics of special form radioactive materials are subject to Department review for disposal container requirements.
43. The licensee shall not receive toluene, xylene, dioxane, scintillation liquids which exhibit hazardous properties or other organic liquids or solids with similar chemical properties or containers which have at any time contained any of the liquids mentioned above. However, after complete incineration, the ash and/or residue from these wastes are acceptable notwithstanding the requirements of Condition 45 of this license, unless otherwise authorized by the Department.

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44. Unless otherwise authorized by the Department the licensee shall not receive any radioactive waste containing Radium except for:
- Radium contained in solid homogeneous waste forms in which the Radium activity is incidental to the total activity and the concentration of Radium has not been technologically enhanced or,
 - Radium contained in the following devices: self-luminous dials, hands of dials, timepieces, compasses, and electron tubes provided that the entire device is received and buried, or
 - Radium contained in biological research waste.
45. The licensee shall not receive radioactive waste in the forms of incinerator ash or powder which may be dispersable unless solidified with a media specified in Condition 33 of this license, or packaged to prevent dispersion as specifically approved by the Department. In lieu of solidification, these waste forms may be received in high integrity containers approved by the Department, provided the waste is stabilized with a binding matrix.
46. The licensee shall not receive waste containing chelating agents with concentrations greater than 8 percent by weight. Radioactive waste containing chelating agents within the range of 0.1 to 8 percent by weight shall not be accepted by the licensee unless stabilized by solidification with a media specified in Condition 33 of this license. The concentration limits apply to wastes prior to solidification; dilution by solidification media is not allowable. Wastes containing chelating agents shall be segregated from Class B and C wastes by at least ten (10) feet in the all directions in the burial trench. Use of a Departmental approved concrete overpack constitutes adequate separation.
47. The licensee may only receive gaseous radioactive materials of Krypton 85 and Xenon 133 for burial provided they meet the following criteria:
- Burial containers must be U.S. Department of Transportation specification cylinders or U.S. Nuclear Regulatory Commission approved sealed sources.
 - Internal pressure of containers may not exceed 1.5 atmospheres.
 - Total activity of containers shall not exceed 100 curies each.

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48. A. Unless otherwise authorized, the licensee shall not receive for storage nor disposal any mixed low-level radioactive waste defined as waste that satisfies the definition of low-level radioactive waste specified in the Low-Level Radioactive Waste Policy Amendments Act of 1985 (P.L. 99-240), and contains waste that either (1) is listed as hazardous waste in Subpart D, 40 CFR 261, or (2) causes the waste to exhibit any of the hazardous waste characteristics indentified in Subpart C, 40 CFR Part 261.
- B. The licensee may however receive waste that has been treated by acceptable methods to render it nonhazardous and therefore not subject to the jurisdiction of the Resource Conservation and Recovery Act (RCRA). Waste which may contain discrete quantities of hazardous or toxic materials may be evaluated for disposal by the licensee and such evaluations provided to the Department for consideration of approval.
49. The licensee shall not receive radioactive waste that is readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperature, or of explosive or exothermic reaction with water.
50. The licensee shall not receive radioactive waste which contains or is capable of generating quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling or disposing of the waste. This does not apply to radioactive gaseous waste packaged in accordance with Condition 47 of this license.
51. The licensee shall not receive or dispose of any pyrophoric material or flammable solids. These materials contained in wastes shall be treated, prepared and packaged to be nonflammable and the final waste form rendered nonpyrophoric and nonflammable prior to transportation and receipt.
52. The licensee shall not receive or bury oil or petroleum based materials in any physical form. However, this does not prohibit the receipt and disposal of waste containing incidental or trace amounts of oil or petroleum based materials which have been absorbed, provided that the amount of absorbed oil and petroleum based materials does not exceed one percent (1%) by waste volume in a container.

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53. The licensee shall not receive radioactive waste containing hazardous biological, pathogenic, or infectious material unless treated to reduce to maximum extent practicable the potential hazard from the materials. In addition, radioactive waste containing biological, pathogenic, or infectious material shall be doubly packaged in new or properly recertified 17-H DOT specification containers or equivalent as follows:
- a. First, the inner container having a capacity of 55-gallon or less shall have a water tight liner at least 4 mils thick hermetically sealed after filling.
 - b. The biological material shall be thoroughly layered in the inner container in a ratio of thirty (30) parts biological material to at least one (1) part slaked lime and ten (10) parts absorbent, which shall be agricultural grade 4 vermiculite or medium grade diatomaceous earth, by volume. The addition of formaldehyde is strictly prohibited.
 - c. The closure on the inner container shall be made with a 16-lug closing tool or standard lid with securely attached ring and bolt. Lever locks are not acceptable.
 - d. The outer container, 55-gallon capacity for a 30-gallon inner container, or 83-gallon capacity for a 55-gallon inner container, shall be filled initially with at least 4 inches of absorbent material, specified in b., the inner container in an upright position, and the remaining volume filled with the absorbent material; then securely closed and properly sealed.
 - e. Containers of small capacity may be used provided that the volume of the outer container is at least 1.5 times the volume of the inner container.

Contamination Limit Conditions

54. For receipt at the Barnwell Site, all shipments shall comply with contamination control limits as prescribed in U.S. Department of Transportation Regulations, 49 CFR 173.443.

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Enclosed radioactive material transport vehicles used solely for transporting radioactive materials and marked "For Radioactive Material Use Only" and accessible surface of transport casks and trailers shall not be released from the site if contamination limits exceed the following:

- a. Fixed contamination of 10 mR/hr on contact with the interior surface or 2 mR/hr at 1 meter from the interior surface.
- b. Removable contamination of 2200 dpm/100 sq. cm. Beta-gamma or 220 dpm/100 sq. cm. Alpha. This applies to interior and exterior surfaces.
- c. Fixed contamination of 0.5 mR/hr on contact with any exterior surface.

Internally contaminated (fixed or removable) shipping casks released from the site are subject to applicable shipping regulations of the U.D. Department of Transportation. The licensee shall also inform the recipient of such casks in advance of the contaminated nature of the cask. Records of such notifications shall be retained for review by the Department.

55. Vehicles used solely for transporting radioactive material and are not marked "For Radioactive Material Use Only" shall not be released from the site if the contamination limits exceed the following:
 - a. Fixed contamination of 0.5 mR/hr at any accessible surface.
 - b. Removable contamination of 2200 dpm/100sq. cm. Beta-gamma, or 220 dpm/100sq. cm. Alpha.
56. Vehicles or items for unrestricted use shall not be released from the site if the contamination limits exceed the following:
 - a. Fixed contamination of 0.1 mR/hr at any accessible surface.
 - b. Removable contamination of 220 dpm/100sq. cm. Beta-gamma, or 22 dpm/100sq. cm. Alpha.
57. The licensee shall perform sandblasting for decontamination purposes on vehicles, equipment, or components, with contamination limits in excess of those specified in Condition 55 in a controlled environment.

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58. The licensee shall not use its vehicle wash-down facility for any vehicles or equipment with removable contamination limits in excess of those specified in Condition 55 unless specifically approved by the Department.

General Packaging Conditions

59. All radioactive waste shall be packaged and loaded in accordance with applicable U.S. Department of Transportation Regulations, U.S. Nuclear Regulatory Commission Regulations 10 CFR Part 71, the requirements of this license, and the disposal site criteria.
60. Unless otherwise authorized, all radioactive waste shall be received and buried in closed containers. Containers which have been altered, and solidification or encapsulation media intended to serve as containers or container closures, are not acceptable unless approved by the Department. Loose radioactive waste and solidification residuals within shipping casks are prohibited.
61. The licensee shall not receive any package to be used as the final burial container that is corroded to the point of degradation or damaged. Any package used as the final burial container shall be of such material and construction that there will be no significant chemical, galvanic, or other reaction among the packaging components, or between the packaging components and the package contents.
62. The licensee shall, to the extent practicable, repair or repackage any damaged package used as the final burial container if such packages are approved for acceptance by the Department.
63. Prior to burial, the licensee shall, to the extent practicable, remove all liquids from waste packages found in excess of allowable limits if such packages are approved for acceptance by the Department.
64. The licensee shall not receive shipments of radioactive materials unless appropriate lifting devices of sufficient length have been provided and securely attached to containers and palletized shipments within a cask.

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65. The licensee is not authorized to open any packages at its facility, except for the following:
- For purposes of repairing or repackaging damaged containers.
 - For purposes of inspecting to insure compliance with this license.
 - For purposes of returning outer shipping containers.
 - For purposes of confirming package contents.

Site Design, Construction and Maintenance Conditions

66. Construction of waste burial trenches shall be in accordance with CNSI Procedure S20-AD-008, "Trench Construction" Class A waste trenches will be constructed in accordance with Drawing No. B-215-D-004, "Class A Trench Construction Details." Class B/C waste trenches will be constructed in accordance with Drawing No. B-215-D-007, "Class B/C Trench Construction Details." Any changes to these drawings, specifications, or procedures must have approval from the Department before implementation.
67. The licensee shall not begin construction of any trench prior to approval of the Department as to location, trench bottom elevation and intended use.
68. The licensee shall not initiate burial operations in newly excavated trenches until the Department has inspected and approved the trenches. An initial inspection will be made by the Department upon completion of excavation of the trench, sumps, french drain inside the trench, drainage ditches adjacent to the trench and installation of sumps and standpipes. An intermediate inspection will be made by the Department after the french drain and sumps have been filled. A final inspection will be made by the Department upon completion of construction. Trench backfill and completion shall be performed in accordance with CNSI Procedure S20-AD-008, "Trench Construction."
69. Construction of slit trenches shall be in accordance with CNSI Drawing No. B-215-D-0011, "Slit Trench Construction Details." Trench backfill and completion shall be performed in accordance with CNSI Procedure S20-AD-008, Trench Construction. An initial inspection shall be made by the Department at the completion of excavation, and final inspection shall be made at the completion of construction before burial begins.

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70. A. Backfilling shall be performed for each trench design in accordance with CNSI Procedure S20-AD-008. Completed trenches shall at no time be used for stockpiling large volumes of earth not withstanding provisions for a final grading plan.
- B. The licensee shall design trench covers to minimize to the extent practicable water infiltration, to direct percolating or surface water away from the disposed waste, and to resist degradation by surface geologic processes and biotic activity.
71. Open trenches to include trenches under construction and partially filled trenches shall be protected to prevent runoff water from entering trenches. Radioactive waste shall not be placed into trench areas where water has accumulated. Burial of radioactive waste into trenches with unusual amounts of water shall immediately cease until the origin of water has been determined and corrective action taken.
72. The licensee shall use proper surface water management techniques on the site to insure that:
- Erosion is minimized.
 - Surface runoff is directed away from the trenches.
 - Accumulation of standing water is minimized.
 - Standing water in the immediate disposal area is prevented.
73. All monitoring wells, sumps, disposal tubes, and protrusions into the trenches, shall be sufficiently capped or covered to prevent the introduction of extraneous material or infiltration of water. All well and sump pipes shall be protected from damage.
74. The licensee shall, at least monthly, perform an inspection of completed trenches to ascertain any erosion, settling, cracking, subsidence, or loss of ground cover grasses and make corrections immediately. Documentation of the inspection findings and all repairs even if the repairs were performed as a routine maintenance function shall be made and incorporated into a permanent record and submitted with the stabilization plan for final site closure.

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- 75. The licensee shall initiate closure and stabilization measures as each trench is filled and covered. Interim or final grades shall be established and seeding of trench covers shall commence at no more than one year following final trench burial operations. Active waste disposal operations must not have an adverse effect on completed closure and stabilization measures.
- 76. The licensee shall use any reasonable means, including but not limited to fencing and security personnel, to prevent unauthorized entry into the restricted area of the site.
- 77. The boundaries and locations of each disposal trench shall be accurately located and mapped by means of a land survey. Temporary trench boundary markers and trench identification markers shall be erected upon completion of backfill operations until permanent markers are installed.
- 78. A series of markers, one at the end of each completed trench and on each corner, shall be installed upon completion of the seeding of trench covers. End monuments shall be constructed of granite. Trench corner markers shall be constructed in accordance with CNSI Drawing No. B-215-C-0010. The following information shall be inscribed on the end monument, and this information shall be reported to the Chief, Bureau of Radiological Health, S.C. Department of Health and Environmental Control, 2600 Bull Street, Columbia, S.C. 29201:
 - a. Total activity of radioactive material in curies total amount of source material in pounds, and total amount of special nuclear material in grams in the trench.
 - b. Date of completion of the burial operations; and
 - c. Volume of waste in the trench.

Burial Operation Conditions

- 79. Unless specifically authorized by the Department, the licensee shall not exhume previously buried waste.

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80. Wastes designated as Class A, unstable, pursuant to Condition 31 of this license, and solidification Class A waste which do not meet the stability requirements of Condition 33.B., must be segregated from other wastes by placing in a separate disposal trench or by other methods specifically approved by the Department which will minimize trench subsidence and achieve long-term stability to eliminate ongoing active site maintenance.
 81. Wastes designated as Class C pursuant to Condition 31 of this license, shall be disposed of so that the top of the waste is a minimum of 5 meters below the top surface of the cover or shall be disposed of with intruder barriers that are designed to protect against an inadvertent intrusion for at least 500 years. Such intruder barrier designs must be specifically approved by the Department.
 82. The licensee shall handle and emplace packages of radioactive waste in disposal trenches in such a manner that maintains packaging integrity during handling, emplacing, and subsequent backfilling. Waste packages deposited in trenches shall be protected from any adverse operations which may cause damage to them.
 83. The licensee shall emplace radioactive waste packages in such a manner to minimize voids between packages and permits voids between packages to be filled with earth to reduce future trench subsidence.
 84. Licensee personnel shall wear appropriate protective clothing, apparatus, and gloves at all times while handling or disposing of radioactive waste.
 85. The licensee shall be a "Registered User" of all licensed casks delivered to the site containing radioactive waste for disposal.
 86. At least one health physics technician shall be present during all waste handling, offloading and disposal operations.
 87. The licensee shall maintain radiation levels at the edge of open trenches at or below 100mR/hr.
 88. Uncovered waste shall not extend more than 100 ft. beyond the back-filled portion of the trench.

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89. The licensee shall bury containers of Krypton 85 and Xenon 133 gaseous radioactive materials in upright positions in the trench with a minimum spacing of ten (10)ft. between gas containers.
90. Unless specifically authorized, the licensee shall not store any package containing radioactive waste for a period greater than six months from the date of receipt of the package prior to burial. Radioactive waste shall not be stored in the trench area or an open environment for a period greater than ten (10) days from receipt, and shall be protected from damage and inclement weather conditions.

91. Deleted

Environmental Surveillance Conditions

92. The licensee shall conduct an on-site monitoring and environmental monitoring program capable of detecting the potential contribution of radioactive material and hazardous constituents from the site to the environment. The monitoring program shall be performed in accordance with CNSI Procedures - Barnwell Site.
93. Should any samples taken from the monitoring wells, or air samples reveal increases in the concentration of radioactive material which were determined prior to commencement of the burial operations, the licensee shall perform further surveys to determine whether or not the increase is due to the land burial operations. The licensee shall notify the Chief, Bureau of Radiological Health, S.C. Department of Health and Environmental Control, within 48 hours of any such increases.
94. The licensee shall submit results of all scheduled environmental sampling and analysis to the Department quarterly.
95. Monitoring wells in clusters will be placed outside the trenches but in the trench area. Specific locations shall be determined through consultation. The initial well of a cluster will be core drilled to the water table and a representative sample of the core shall be submitted to the Department. The depth and number of additional wells in the cluster are to be determined by the geotechnical observations in the initial core. All wells shall be grouted, sealed and capped.

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Site Closure & Stabilization Conditions

96. As radioactive material buried may not be transferred by abandonment or otherwise, unless specifically authorized by the Department, the expiration date of this license applies only to the above ground activities and to authority to bury radioactive material wastes at the site specified in Condition 9. The license continues in effect and the responsibility and authority for possession of buried radioactive material wastes continues until the Department finds that the plan established for preparation of the Barnwell Site for transfer to another person has been satisfactorily implemented in a manner to reasonably assure protection of the public health and safety and the Department takes action to terminate the licensee's responsibility and authority under this license. All requirements for environmental monitoring, site inspection, maintenance and site security continue whether wastes are being buried or not.
97. The licensee shall develop a site closure and stabilization plan that addresses, at a minimum, the following performance objectives:
- Bury all waste in accordance with the requirements of the license.
 - Disassemble, decontaminate, as required, and dispose of all structures, equipment, and materials that are not to be transferred to the site custodian.
 - Document the arrangements and the status of the arrangements for orderly transfer of site control and for long term care by the government custodian. Also document the agreement, if any, of state or federal governments to participate in, or accomplish, any performance objective. Specific funding arrangements to assure the availability of funds to complete the site closure and stabilization plan must be made.
 - Direct gamma radiation from buried wastes should be essentially background.
 - Demonstrate by measurement and/or model during operations and after site closure that concentrations of radioactive material which may be released to the general environment in ground water, surface water, air, soil, plants, or animals will not result in an annual dose exceeding an equivalent of 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public.

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- f. Render the site suitable for surface activities during custodial care. Planned custodial care may be limited to activities such as vegetation control, minor maintenance, and environmental monitoring. However, use of the site surface for activities such as parking lots may be planned. Final conditions at the site must be acceptable to the government custodian and compatible with its plan for the site.
 - g. Demonstrate that all trench elevations are above water table levels taking into account the complete history of seasonable fluctuations.
 - h. Eliminate the potential for erosion or loss of site or trench integrity due to factors such as groundwater, surface water, wind, subsidence, and frost action. For example, an overall site surface water management system must be established for humid sites to drain rainwater and snowmelt away from the burial trenches. All slopes must be sufficiently gentle to prevent slumping or gullyng. The surface must be stabilized with established short rooted grass, rock, riprap, or other measures. Trench caps must be stabilized to minimize erosion, settling, or slumping of caps.
 - i. Demonstrate that trench markers are in place, stable, and keyed to benchmarks. Identifying information must be clearly and permanently marked.
 - j. Compile and transfer to the Department complete records of site maintenance and stabilization activities, trench elevation and locations, trench inventories, and monitoring data for use during custodial care for unexpected corrective measures and data interpretation.
 - k. Establish a buffer zone surrounding the site sufficient to provide space to stabilize slopes, incorporate surface water management features, assure that future excavation on adjoining areas would not compromise trench or site integrity, and provide working space for unexpected mitigating measures in the future. The buffer zone must also be transferred to the custodial agency. The buffer zone may generally be less than 300 feet but not less than 100 feet.

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- l. Provide a secure passive site security system (e.g., a fence) that requires minimum maintenance.
 - m. Stabilize the site in a manner to minimize environmental monitoring requirements for the long-term custodial phase and develop a monitoring program based on the stabilization plan.
 - n. Investigate the causes of any statistical increases in environmental samples which have occurred during operation and stabilization. In particular, any evidence of unusual or unexpected rates or levels of radionuclide or hazardous constituent migration in or with the groundwater must be analyzed and corrective measures implemented.
 - o. Eliminate the need for active water management measures, such as sump or trench pumping and treatment of the water to assure that wastes are not leached by standing water in the trenches.
 - p. Evaluate present and zoned activities on adjoining areas to determine their impact on the long-term performances of the site and take reasonable action to minimize the effects.
98. A preliminary plan for preparation of the site for transfer to another person who would only passively hold the site shall be submitted for review. The plan shall be consistent with Condition 97 of this license and shall include demonstration that funds are being set aside or other measures being taken are adequate to finance the site closure plan. The plan shall also include preliminary estimates of costs, environmental impacts, data needs, personnel needs, material and equipment needs, planned documentation and quality assurance, and detailed plan for trench locations and elevations, expected capacities, planned surface contours, and buffer zones.
99. A reassessment of current operating practices shall be submitted. The reassessment shall consider the objectives of the site plan specified in Condition 98 and any changes in operation at the site which would enhance implementation of the plan.
100. The licensee shall submit an updated plan and operational assessment every five (5) years for review.

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101. One (1) year prior to the anticipated transfer of the site and buried radioactive materials to another person (including an agency of the U.S. Government) the licensee shall submit a final version of the site preparation plan including a schedule for implementation of all remaining elements prior to transfer, and a description of the mechanics of orderly transfer in coordination with the transferee.

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For The South Carolina Department
of Health And Environmental Control

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