Nevada Test Site Waste Acceptance Criteria

Prepared by the

Department of Energy
Nevada Operations Office
Waste Management Division

Uncontrolled

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Introduction

This document provides the requirements, terms, and conditions under which the Nevada Test Site (NTS) will accept low-level radioactive and mixed waste for disposal; and transuranic and transuranic mixed waste for interim storage at the NTS.

Review each section of this document. This document is not intended to include all of the requirements; rather, it is meant as a guide toward meeting the regulations. All references in this document should be observed to avoid omission of requirements on which acceptance or rejection of waste will be based.

The Department of Energy/Nevada Operations Office (DOE/NV) and support contractors are available to assist you in understanding or interpreting this document.

For assistance, please call:

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To the best of our knowledge, this document is correct and the process and criteria stated within meet the U.S. Department of Energy and appropriate federal regulation requirements.

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Acronyms

ALARA	As Low As Reasonably Achievable
ALLW	Asbestiform Low-Level Waste
AMEM	Assistant Manager for Environmental Management
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BN	Bechtel Nevada
CAR	Corrective Action Request
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy/Nevada Operations Office
DOT	U.S. Department of Transportation
DQO	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
ETA	Estimated Time of Arrival
HRI	Human Readable Interpretation
LDR	Land Disposal Restrictions
LLW	Low-Level Waste
MC&A	Materials Control and Accountability
MW	Mixed Waste
NDEP	Nevada Division of Environmental Protection
NQA-1	Quality Assurance Program Requirements for Nuclear Facilities
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NTSWAC	Nevada Test Site Waste Acceptance Criteria
PCB	Polychlorinated Biphenyls
PCL	Package Certification Label
PK	Process Knowledge
PSDR	Package Storage and Disposal Request

QA	Quality Assurance
QC	Quality Control
RACM	Regulated Asbestos-Containing Material
RCRA	Resource Conservation and Recovery Act
RTR	Real-Time Radiography
RWAP	Radioactive Waste Acceptance Program
RWMS	Radioactive Waste Management Site
SAP	Sampling and Analysis Plan
SOW	Scope of Work; Statement of Work
SW-846	EPA Document SW-846, "Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods"
TCLP	Toxicity Characteristic Leaching Procedure
TRU	Transuranic
WAC	Waste Acceptance Criteria
WAP	Waste Acceptance Package
WCO	Waste Certification Official
WCPP	Waste Certification Program Plan
WMD	Waste Management Division
WP	Waste Profile

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1.0

Radioactive Waste Management at the Nevada Test Site

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Radioactive Waste Management at the Nevada Test Site

1.0

Purpose and Scope

1.1

This document establishes the U. S. Department of Energy, Nevada Operations Office (DOE/NV) waste acceptance criteria (WAC). The WAC includes requirements for the generator waste certification program, characterization, traceability, waste form, packaging, and transfer. The criteria apply to radioactive waste received at the Nevada Test Site (NTS) Area 3 and Area 5 Radioactive Waste Management Sites (RWMSs) for storage or disposal.

Policy

1.2

1.2.1 DOE/NV Policy

The DOE/NV policy is to:

- ensure safe and compliant storage and disposal of radioactive waste;
- protect the environment and personnel from chemical and radiological hazards in accordance with Title 40 Code of Federal Regulations (CFR), the Resource Conservation and Recovery Act (RCRA); 10 CFR 835, "Occupational Radiation Protection;" DOE Order 5820.2A, "Radioactive Waste Management;" state of Nevada and applicable Department of Transportation (DOT) regulations;
- ensure that present and future radiation exposures are kept as low as reasonably achievable (ALARA) and do not exceed the radiation protection standards established in 10 CFR 835, "Occupational Radiation Protection;"
- ensure Quality Assurance (QA) programs are established and implemented to fulfill the requirements of DOE Order 5820.2A, "Radioactive Waste Management;" and 10 CFR 830.120, "Quality Assurance," and
- be consistent with applicable federal, state, and local regulations.

1.2.2 Process

Waste will be accepted from generators approved by DOE/NV. The approval process is described in Section 2.0.

1.2.3 Waste Type

Low-Level Waste (LLW) and mixed waste (MW) will be accepted for disposal at the NTS. However, to verify current acceptance status of waste types, please contact DOE/NV Waste Management Division (WMD).

1.2.4 Regulators and Stakeholders

DOE/NV will facilitate appropriate regulatory oversight by state agencies and support the involvement of the stakeholders. Where appropriate, to the extent possible, and in accordance with applicable DOE/NV authority, DOE/NV will provide regulatory agencies and stakeholders access to information related to NTSWAC activities, including waste characterization data, from all generators. Upon request by such parties, arrangements may be made to observe NTSWAC-related facility evaluations and participate in other activities such as NTSWAC revisions.

1.3

Requirements

Requirements are identified by "shall" or "must." The source of the requirement is identified by a superscript number which correspond to the reference list. Statements not identified in this manner are provided as guidance. Section 2 requirements do not have corresponding references because the approval process is DOE/NV policy.

1.4

Responsibilities

The following offices and personnel have responsibilities for management and acceptance of radioactive waste at the NTS. The offices identified are within the DOE/NV, unless otherwise stated.

1.4.1 Manager

Responsibilities and authorities as assigned in DOE Order 5820.2A.

1.4.2 Assistant Manager for Environmental Management (AMEM)

Responsible for the DOE/NV Radioactive Waste Management Program according to DOE Order 5820.2A. Provides approval to waste generators to dispose of or store radioactive waste at the NTS and grants any deviations from the requirements of this document. Responsible for suspension of any generator. May delegate his/her responsibilities except for approval and suspension.

1.4.3 Director, Waste Management Division

Responsible for management of radioactive waste at the NTS. Responsible for radioactive waste management operation of the Areas 3 and 5 RWMSs in compliance with applicable DOE Orders and federal and state regulations.

1.4.4 Radioactive Waste Acceptance Program (RWAP) Personnel

Responsible for development, implementation, and maintenance of the RWAP and the NTSWAC. Responsible for providing guidance to generators shipping radioactive waste to the NTS.

1.4.5 Director, Safeguards and Security Division

Responsible for acceptance of documentation for classified/unclassified accountable or special nuclear material waste. Coordinates acceptance of classified waste shipments at the NTS.

2.0

Approval Process

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Approval Process

2.0

The approval process is a series of steps the generator and DOE/NV follow resulting in the generator receiving an approval to ship waste to the NTS. A flow chart of the approval process can be found in Appendix A.

All official interactions referenced in this section between the generator and DOE/NV should take place through the generator's appropriate oversight office. DOE/NV and contractor RWAP personnel will coordinate activities relating to the generator approval process.

Generator NTS WAC Program Development

2.1

Prior to program development, contact DOE/NV WMD to verify that waste is acceptable at NTS. The generator is responsible for development, implementation, and maintenance of an NTS WAC compliant program.

The documents listed below are required to be developed and/or completed. Contact DOE/NV WMD prior to document submission to determine the number of copies to be sent.

2.1.1 Waste Acceptance Package

The waste acceptance package (WAP) consists of waste profile(s), a waste certification program plan (WCPP), and a list of authorized certification personnel.

A master list of all procedures cited in the WAP should be included.

2.1.1.1 Waste Profiles

A Waste Profile (WP) or equivalent *must* be submitted for each waste stream. Characterization and WAC compliance is summarized on the WP (see Sections 3.0 and 4.0 for requirements). The WP *shall* be completed in accordance with Appendix B. The waste characterization documentation for the WP *shall* be in accordance with Section 4.0. WP(s) may be submitted at any time to DOE/NV.

The WP number *shall* be the waste stream identification number. This unique two-part, 13-character alphanumeric code identifies the generator and the generator's waste code. The first part of the number is a four-character alphanumeric code used by RWMS personnel to identify the generator (see Appendix C). The second part is a nine-character, generator-assigned alphanumeric code for each waste stream (e.g., BCLA-000000001, where BCLA is the RWMS designation for Lawrence Livermore National Laboratory (LLNL); and 000000001 is the LLNL-assigned waste stream code).

2.1.1.2 Waste Certification Program Plan

The WCPP *shall* be developed in accordance with Section 5.0.

2.1.1.3 Certification Personnel List

A list of the Waste Certification Official(s) and Package Certifier(s) *shall* be submitted. The telephone and telefax number for the WCOs *shall* be included. The current listing will be used by RWMS personnel to ensure signatures on certified packages and shipments are from authorized personnel. Any packages or shipments certified by personnel not on this list may be rejected by the RWMS.

2.1.2 Sampling and Analysis Plan

Sampling and Analysis Plans (SAPs) should be referenced in a WP or characterization package, but should not be a part of the WAP. SAP(s) will be reviewed as necessary to ensure that they support the associated analytical data through appropriate sampling approaches, sample collection, sample handling, quality control, and documentation.

2.2

RWAP Review of Generator Program

DOE/NV's review of a generator's NTSWAC program includes document reviews and an evaluation of the program implementation at the generator facility. The elements of DOE/NV review are summarized below.

2.2.1 WAP Review

The WAP will be reviewed against the NTSWAC. DOE/NV may provide comments to the generator which may entail a revision and resubmission of WP and/or the WCPP.

2.2.2 Facility Evaluation

Facility evaluations are scheduled according to periodic review requirements and generator discrepancies. Generator audits will be conducted on a triennial basis; however, annual evaluation of generator performance will be conducted to ensure conformance to requirements. If an audit cannot be conducted within 48 months of the previous audit, DOE/NV will determine if approval will continue until an audit can be conducted.

Due to changing regulatory requirements, NTS policies, and lessons learned through implementing the NTSWAC, any program aspect or waste stream involved in the reapproval process may be subject to a full review to ensure continued compliance.

This may entail imposing additional requirements or reversing previous decisions. Unannounced facility evaluations may be performed at the discretion of DOE/NV.

2.2.2.1 Audit

An audit of the generator's NTSWAC program will be conducted. The audit will verify, by examination and evaluation of objective evidence, that the documented program has been adequately implemented. This audit will include an on-site evaluation of NTSWAC program elements such as QA, characterization, and traceability from the point-of-generation to shipment.

An audit report will be issued. Deficiencies will be identified on Corrective Action Requests (CARs) which will be part of the audit report. CARs require the generator to document a root cause, corrective action, and action to preclude recurrence. The generator should provide a response to DOE/NV by the date identified on the CAR. Failure to provide a response to DOE/NV could lead to approval delays or suspension/approval withdrawal in accordance with Section 2.7.

2.2.2.2 Surveillance

A surveillance will be performed to verify the effectiveness of corrective action(s) resulting from an audit or for situations such as the addition of waste streams, annual assessments, discrepancies, and remote program locations (i.e., treatment vendors). Depending on the verification and validation necessary for DOE/NV to close the CAR(s), surveillance activities may not take place at the generator facility. CAR(s) may be issued as a result of a surveillance.

2.2.2.3 Annual Assessment

An annual assessment of generator performance will be conducted by the RWAP to ensure conformance to requirements. Annual assessments will be documented for areas such as program changes (including documentation and personnel), volume shipped, operational concerns, and review of the generator's current internal assessment. Based on the results of the annual assessment, an on-site evaluation may be necessary.

2.2.3 Waste Verification

DOE/NV may split a representative waste sample with the generator for independent analysis. The purpose of the verification sampling program is to independently assess and confirm the results of waste analysis performed by the generators.

Verification sampling of low-level radioactive waste is performed with the cooperation of the waste generator. DOE/NV may choose waste streams based on the annual volume, the potential for finding hazardous components, and the scope and complexity of the sampling process being performed.

For MW, DOE/NV may require verification sampling prior to the waste stream being approved.

Samples will be collected by the generator's sampling team under the observation of an RWAP representative. Split samples will be sent to the generator laboratory and to an independent laboratory chosen by DOE/NV. The samples will be analyzed by the same analytical methods. Results of the analyses from both laboratories will be compared by RWAP after data validation. Anomalous differences between the two sets of data will require further investigation.

2.3**Site Visit**

Generators may request site visits be conducted by RWAP personnel to provide guidance in the development and implementation of a program or program aspects that are consistent with the requirements of the NTSWAC. The program aspect(s) requiring assistance should be identified by the generator. This will ensure that appropriate RWAP personnel participate in the site visit. The site visit results will be documented, but will not require a response from the generator. The site visit document may be used in preparation for RWAP facility evaluations.

2.4**Approval**

RWAP personnel will recommend to the DOE/NV AMEM that approval be granted after the generator has demonstrated satisfactory implementation of the NTSWAC. The generator *must* submit a current copy of the WAP or revisions to DOE/NV WMD and RWMS personnel prior to recommendation for approval. A current WAP *must* be maintained with DOE/NV RWAP and RWMS personnel while the generator's approval to ship waste is in effect. The DOE/NV AMEM will provide written notice of approval, identifying acceptable waste stream(s) by identification number. Conditions will be identified in the DOE/NV approval letter.

2.5**Changes to Approved Programs**

Generators *shall* notify DOE/NV of changes to an approved program. Examples include: changes of the Waste Certification Official (WCO) or DOE contact personnel, changes or additions of waste profiles, and changes in characterization or certification program.

If a change is required, it will be reviewed according to the appropriate processes described in Section 2.2.

Depending on the significance of the change, the approval to ship may be temporarily suspended until the change(s) is reviewed and accepted. DOE/NV RWAP personnel reserve the right to conduct a surveillance of the revised activity.

2.6**Options for Low-Volume Generators**

Generators may qualify as low-volume generators (LVG) if their total volume of waste to be shipped to the NTS per fiscal year does not exceed 200 m³ (7,067 ft³).

LVGs *must* complete and submit a WAP as required in Section 2.1.1; however, they are conditionally exempt from the on-site facility evaluation process as described in Section 2.2.2. DOE/NV reserves the right to perform a limited-scope facility evaluation based on the uniqueness of the waste type, discrepancies identified by the NTS RWMS, or the generator's internal assessment results.

LVG's WAP will be reviewed by DOE/NV, with the primary focus on the characterization and

traceability of each waste stream. LVGs *must* meet the quality requirements described in Section 5.0, commensurate with their program for certifying the waste (e.g., apply required quality standards to the waste generation and characterization process without developing a full waste certification program). LVGs are granted an automatic deviation from developing a NTSWAC specific WCPP. However, the LVG's quality assurance approach *must* be covered under a sitewide quality assurance document or otherwise summarized and submitted as part of the WAP.

For some LVGs, it may not be cost effective to establish a program meeting the requirements of the NTSWAC. DOE/NV encourages LVGs to consider teaming with DOE/NV-approved generators as a solution to their waste disposal needs. LVG waste streams can often be dispositioned under the umbrella of an approved site's QA and waste management program. All arrangements between an LVG waste stream site and an approved generator should receive concurrence from DOE/Headquarters, the approved site's DOE oversight office, and DOE/NV.

Suspending or Withdrawing Approval

2.7

DOE/NV may suspend approval at any time if the quality of the generator's program does not meet NTSWAC. Completion of a project and closure of the associated waste stream(s) will result in the withdrawal of approval.

Suspension or withdrawal may be issued verbally by DOE/NV representatives and followed by official notification.

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3.0

Waste Criteria

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Waste Criteria

3.0

Waste accepted at the NTS *must* be radioactive and meet the waste form criteria outlined below.^{6,13} These requirements facilitate handling and provide health and safety protection for personnel at the disposal site. Waste streams not meeting these basic requirements will be evaluated individually (see Section 3.7).

General Waste Form Criteria

3.1

These waste form criteria are based on current DOE LLW management policies and practices.

3.1.1 Transuranics

The concentration of alpha-emitting transuranic nuclides with half-lives greater than 20 years *must not* exceed 100 nCi/g.^{6,8} The net weight of the waste (excluding the weight of the container and shielding) *must* be used to calculate the specific activity of the waste in each container.^{6,7} The following isotopes *shall*^{6,6} be considered when making the TRU waste determination: ²³⁶Np, ²³⁷Np, ²³⁸Pu, ²³⁹Pu, ²⁴⁰Pu, ²⁴²Pu, ²⁴⁴Pu, ²⁴¹Am, ²⁴²Am, ²⁴³Am, ²⁴³Cm, ²⁴⁵Cm, ²⁴⁶Cm, ²⁴⁷Cm, ²⁴⁸Cm, ²⁵⁰Cm, ²⁴⁷Bk, ²⁴⁹Cf, and ²⁵¹Cf.

3.1.2 Hazardous Waste

LLW offered for disposal *must not* exhibit characteristics of, or be listed as, hazardous waste as identified in Title 40 CFR, state of Nevada regulations, or state-of-generation hazardous waste regulations.^{3,4/5,6} State of Nevada regulations require that waste regulated as hazardous in the state-of-generation *must* be regulated as hazardous when brought into the state of Nevada.^{5,5}

3.1.3 Free Liquids

Wastes containing free liquids *must* be converted into a form that contains as little freestanding and noncorrosive liquid as is reasonably achievable.^{6,22} Liquid wastes should be solidified or packaged in sufficient absorbent to absorb twice the volume of the liquid, but liquid *must not* exceed 1 percent of the volume of the waste when the waste is in a disposal container; or 0.5 percent of the volume of the waste processed in stable form.^{1,1/6,22}

Please note when significant temperature differences exist between the generating site and the disposal site, provisions for additional absorbent materials should be made.

3.1.4 Particulates

Fine particulate wastes *shall* be immobilized so that the waste package contains no more than 1 weight percent of less-than-10-micrometer-diameter particles, or 15 weight percent of less-than-200-micrometer-diameter particles.^{7,6} Waste that is known to be in a fine particulate form or in a form that could mechanically or chemically be transformed to a particulate during handling and interim storage *must* be immobilized.^{7,6}

Secure packaging may be used in place of immobilization. Examples of acceptable packaging are: overpacking (i.e., 55-gallon drum inside 85-gallon drum); steel box, and drums and wooden boxes with a minimum of a sealed 6-mil plastic liner, unless the contents are individually wrapped and sealed in plastic.

3.1.5 Gases

LLW gases **must** be packaged at a pressure that does not exceed 1.5 atmospheres at 20°C.^{2.5/7.6} Compressed gases as defined by Title 49 CFR **shall not** be accepted.^{4.7/6.25} Examples of compliance methods include puncturing aerosol cans and removing the valve mechanism from expended gas cylinders.

3.1.6 Stabilization

Where practical, waste **must** be treated to reduce volume and provide a more stable waste form.^{6.19} Wastes **must not** react with the packaging during storage, shipping, handling, and disposal.^{6.17}

3.1.6.1 Structural stability can be accomplished by crushing, shredding, or placing a smaller piece inside an opening of a larger piece, such as nesting pipes.

3.1.6.2 Chemical stability and compatibility **must** be demonstrated to ensure no reactions occur and significant quantities of harmful gases, vapors, or liquids are not generated.^{6.16/6.24} Specifically when different waste forms are combined in a single waste container.

3.1.7 Etiologic Agents

LLW containing pathogens, infectious wastes, or other etiologic agents as defined in Title 49 CFR **shall not** be accepted.^{1.3}

3.1.8 Chelating Agents

LLW packages containing unbound (free) chelating or complexing agents which mobilize radionuclides **shall not** be accepted greater than 1 percent by weight of the waste form.^{6.18/7.6}

3.1.9 Polychlorinated Biphenyls (PCBs)

PCB-contaminated LLW **shall not** be accepted for disposal unless the PCB concentration meets municipal solid waste disposal levels of less than 50 ppm.^{3.16/5.1} Refer to Title 40 CFR, state of Nevada, and state-of-generation regulations for PCB disposal requirements.

3.1.10 Explosives

Waste **must not** be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.^{6.23}

3.1.11 Pyrophorics

Waste **must not** be pyrophoric.^{6.26} Pyrophoric materials contained in the waste **shall** be treated, prepared, and packaged to be nonflammable.^{6.26} Pyrophoric materials that are

treated, prepared, and packaged to be nonflammable.^{6,26} Pyrophoric materials that are blended in a hardened concrete matrix are considered to be treated to be nonflammable.

3.1.12 Sealed Sources

Sealed sources *shall* be segregated from other waste and handled as a separate waste stream.^{7,3} Sealed sources *shall* be characterized on an individual source basis.^{7,3}

Sources which contain TRU nuclides *shall* be evaluated against the TRU waste criteria individually, considering only the mass of the source itself (no packaging, extrinsic shielding, or other waste-diluting materials).^{7,3} If the source is encapsulated for physical integrity or uniformly distributed throughout a media such as plastic or soil, the capsule or other matrix may be utilized as part of the mass for TRU waste calculations (assuming the source was originally manufactured in this configuration). Concentration averaging over integral components of a sealed source is acceptable.

3.1.13 Low-Level Waste Containing Asbestos

Asbestiform Low-Level Waste (ALLW) is defined as any LLW containing Regulated Asbestos-Containing Material (RACM). ALLW *must* be packaged, marked, and labeled in accordance with the requirements of Title 40 CFR, state of Nevada, state-of-generation, and the NTS Management Plan for the Disposal of Low-Level Waste with Regulated Asbestos Waste, dated August 1996 or subsequent revisions.^{3,1/5,2} Packages containing ALLW *must* meet the applicable shipping requirements for the radioactive contents of the package.^{4,6} ALLW that is friable or otherwise capable of giving off friable asbestos dust *must* be wetted and packaged in a plastic bag which is not less than 6 mils in thickness, a combination of plastic bags which equal at least 6 mils in thickness, or a container which is lined with plastic.^{5,3}

If free liquid is present, absorbent *must* be added to ensure compliance with the free-liquids criteria.^{6,22} Sharp edges and corners in the package *must* be padded or protected to prevent damage to the plastic bag during handling, shipping, and disposal.^{7,6}

Each container used to dispose of ALLW *must* bear a label that contains one of the following statements:^{5,4}

(1) CAUTION CONTAINS ASBESTOS FIBERS AVOID OPENING OR BREAKING CONTAINER BREATHING ASBESTOS IS HAZARDOUS TO YOUR HEALTH	
(2) CAUTION CONTAINS ASBESTOS FIBERS AVOID CREATING DUST MAY CAUSE SERIOUS BODILY HARM	(3) DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD

ALLW *must* be segregated into a separate waste stream.^{7,9} Due to state notification requirements and disposal cell capacity, ALLW *must* be packaged separately from other waste streams.^{5,27,6} The NTS Management Plan for disposal of ALLW includes specific requirements for preshipment notification. Call DOE/NV WMD at (702) 295-3181 for assistance and a copy of the current NTS Management Plan.

3.1.14 Radioactive Animal Carcasses

Animal carcasses containing, or contained in, radioactive materials *shall* be packaged with the biological material layered with lime and placed in a metal container meeting applicable requirements.^{1,2/1,3} If the resultant waste matrix is capable of gas generation, the container *shall* be vented with a carbon composite High-Efficiency Particulate Air (HEPA)-rated filtration device.^{1,2/7,6} DOE/NV may require analysis of the waste decomposition gases. Animal carcasses preserved with formaldehyde *shall not* be accepted for disposal.^{3,5}

3.2

Waste Package Criteria

Waste packages *must* meet applicable DOE Orders, 10 CFR, 40 CFR, and 49 CFR requirements such as: design, nuclear safety, radiation levels, external contamination, activity limits, nuclear heating, and multiple hazards.

DOE/NV has adopted the following waste package criteria to assure that the NTS RWMSs are operated safely and efficiently.

3.2.1 Nuclear Criticality Safety

The quantity of fissile radioactive materials *shall* be limited so that an infinite array of such packages will remain subcritical.^{6,2} This quantity *shall* be determined on the basis of a specific nuclear safety analysis, considering credible accident situations, and taking into account the actual materials in the waste.^{6,1}

3.2.2 Closure

The package closure *must* be sturdy enough that it will not be breached under normal handling conditions.^{4,10}

3.2.3 Strength

The disposal package (packaging and contents) *must* be capable of supporting a uniformly distributed load of 16,477 kg/m² (3,375 lbs/ft²).^{7,4} This is required to support other waste packages and earth cover without crushing during stacking and covering operations. Actual physical testing or design engineering calculations can be used to demonstrate this requirement. This section does not apply to bulk waste, waste packaged in steel drums, or SEALAND® containers.

3.2.4 Handling

Waste packages *must* be provided with cleats, offsets, rings, handles, permanently attached or removable skids, other auxiliary lifting devices to allow handling by means of

forklifts, cranes, or similar handling equipment.^{7,6} Removable skids are preferred to assist in meeting NTS PA objectives for reducing disposal cell subsidence. Lifting rings and other auxiliary lifting devices on the package are permissible, provided they are recessed, offset, or hinged in a manner that does not inhibit stacking the packages. The lifting devices *must* be designed to a 5:1 safety factor based on the ultimate strength of the material.^{7,1} All rigging devices that are not permanently attached to the waste package *must* have a current load test based on 125 percent of the safe working load.^{2,1/2,2}

Handling procedures and ALARA documentation *must* be referenced on the WP for wastes requiring remote handling.^{7,6} The disposal site may request this documentation. Packages exceeding 200 mR/hr dose rate on contact are usually considered for remote handling.

3.2.5 Size

1.2- × 1.2- × 2.1-m (4- × 4- × 7-ft) or 1.2- × 0.6- × 2.1-m (4- × 2- × 7-ft) boxes (width × height × length, plus or minus 1/2 inch) or 208-liter (55-gallon) drums should be used. These sizes allow optimum stacking efficiency in disposal cells. Alternate packages (i.e. supersacks, burrito wraps) will be considered; however, RWMS operations personnel need to be consulted to ensure equipment compatibility.

Bulk waste generally exists in a form not suited to the conventional packaging requirements. Bulk LLW *must* meet the requirements of Title 49 CFR.^{4,11} Large items of bulk waste, such as machinery, may be considered for disposal unpackaged. For the transfer of unpackaged bulk material having external contamination, the contamination *must* be fixed, covered, or contained sufficiently for safe transfer.^{4,12}

Bulk waste shipping containers may be returned to the generator after decontamination. Decontamination and return of bulk waste shipping containers will incur additional operational costs for the generator.

3.2.6 Weight

In addition to the weight limits for specific packaging designs, packages *shall* not exceed 4,082 kg (9,000 pounds) per box and 544 kg (1,200 pounds) per drum.^{2,3} This weight limit does not apply to bulk waste.

3.2.7 Loading (Void Space)

Waste packages *must* be loaded to ensure that the interior volume is as efficiently and compactly loaded as practical to minimize void space.^{6,21} More than one waste stream may be packaged in a disposal container (see Appendix C and D). High-density loading will allow efficient RWMS space utilization and provide a more stable waste form that will reduce subsidence and enhance the long-term performance of the disposal site.

3.2.8 Package Protection

The following are precautions to protect the waste package after closure.

Once the package certification activities have been completed, the preshipment storage environment should be controlled to prevent package deterioration.

In-process packages *must* have controls to prevent intrusion.^{7.5} After package certification activities have been completed, the waste container *must* be secured.^{7.5} Package security would ensure that the package has not been breached after certification. Packages with features such as tamper indicating devices, clips, or banding that are not readily breakable and that, while intact, demonstrate that the package has not been opened will satisfy this requirement.

3.2.9 Marking and Labeling

Each waste package *must* be marked and labeled according to Appendix C.^{4.2}

3.2.10 Bar Coding

The shipment and package numbers *must* be bar coded according to the standards in Appendix C.^{7.6}

3.3

Radionuclide Reporting

Reportable radionuclides *shall* be reported on the WP and Package Storage and Disposal Request (PSDR).^{6.10/7.5} The WP is applied at a waste stream level. The PSDR is applied at a waste package level. Any radionuclides reported on the PSDR *must* also be identified on the WP.^{7.5} (See Appendices B and D for examples of WP and PSDR.)

3.3.1 Reportable Radionuclides

Radionuclides known or reasonably expected to be present in a waste stream meeting the following criteria *shall* be reported.^{6.9/6.10/6.15}

3.3.1.1 The activity concentration in the final waste form exceeds one percent of the Action Level (Table E-1).^{6.15/7.9} These radionuclides should require the most rigorous waste characterization.

3.3.1.2 The activity concentration in the final waste form exceeds one percent of the total activity concentration.^{6.15/7.9} The total activity concentration *shall* include the activity of all radionuclides except for those that are exempt from the reporting requirements as specified in Section 3.3.2.^{6.15/7.9} For these radionuclides and for those present at a level less than the detection limit of industry accepted characterization methods, Process Knowledge (PK) should be sufficient for characterization.

3.3.2 Exempt Radionuclides

Radionuclides meeting any of the following criteria are exempt from the reporting requirements:

3.3.2.1 Any radionuclide, as listed in Table E-2 (see page E-3), that will reach a state of transient or secular equilibrium with a parent radionuclide within the operational period of the disposal site.

3.3.2.2 Any radionuclide occurring at activity concentrations not exceeding background ranges for the region in which it was generated and material of interest.

Greater-than-Class C Waste**3.4**

Commercial waste designated as Greater-than-Class C (GTCC), as defined in 10 CFR 61.55 and DOE waste that, if commercially generated, would meet the GTCC definition, may be evaluated for disposal on a case-by-case basis depending on site-specific waste classification limits. This review may involve considering nonroutine disposal options (i.e., controlling depth of disposal, considering other waste forms and package integrity, limiting the other types of wastes disposed nearby) or the development of a specific radiological performance assessment.

Shipping Arrangements**3.5**

After a generator secures written approval from the DOE/NV AMEM to send waste to an NTS RWMS, the generator should contact Bechtel Nevada (BN) to arrange for transfer of the waste and accompanying records. BN will coordinate unclassified waste shipment transfers at NTS. Classified waste shipments will be coordinated by DOE/NV Safeguards and Security Division.

3.5.1 To expedite waste receipt and handling at NTS, waste generators should, at a minimum comply with the following:

3.5.1.1 Prior to departure, attach security seals to the trailer or on packages not enclosed in trailers.

3.5.1.2 Before a waste shipment arrives at the NTS, the generator *shall* enter the following prenotification information on the DOE/NV VAX traffic database.⁷⁶ If the generator is unable to enter information on the DOE/NV VAX, prenotification should be made by phone to BN. For classified/unclassified and accountable or special nuclear material shipments, generators should also contact DOE/NV Safeguards and Security Division (phone: 702-295-0082). For all shipments, the following information *must* be provided:⁷⁶

- Time of departure from shipping point and estimated time of arrival (ETA) at NTS;
- Carrier, trailer, and security seal numbers;
- Description of load (number and type of pieces [e.g., boxes, drums, SEALAND®], volume and weight);
- Waste type (LLW, MW, TRU, or Transuranic Mixed Waste); and
- Any additional information (e.g., special handling requirements).

3.5.2 Consign unclassified waste shipments to:

Bechtel Nevada
For U.S. Department of Energy
Waste Management
Nevada Test Site-Zone 2
Mercury, NV 89023

Consign classified/unclassified accountable or special nuclear material waste shipments to:

U.S. Department of Energy
Attn: Security Specialist
DOE/NV Safeguards and Security Division
For Bechtel Nevada
Waste Management
Nevada Test Site-Zone 2
Mercury, NV 89023

Because unclassified and classified shipments are consigned differently, they should be shipped separately; i.e., on different trailers and have different shipment numbers and separate shipping papers. Under small volume conditions, combined shipments can be arranged. Contact BN and DOE/NV Safeguards and Security Division for guidance.

3.5.3 If the shipment's ETA should change, the generator *shall* enter the changes on the DOE/NV VAX traffic database at the earliest opportunity and provide the new ETA.^{7,6} Generators unable to update information on the DOE/NV VAX account *shall* notify BN by phone.^{7,6} For classified shipments, generators should contact DOE/NV Safeguards and Security Division.

3.5.4 The hours for receiving waste at the RWMS are from 0700 to 1530, Monday through Thursday, except holidays. If a shipment arrives after 1530, trailers (except classified loads) may be left at the parking area outside gate 100 of the NTS after conferring with the NTS Duty Officer. Shipments may be subject to off-loading delays at any time due to NTS operational schedules.

3.6

Shipping Documentation

The following records are required:

3.6.1 When accountable quantities of nuclear materials are involved, a "Nuclear Material Transaction Report" (DOE/Nuclear Regulatory Commission [NRC] Form 741) *shall* be completed for transfers of nuclear material between facilities having differing Reporting Identification Symbols and received by the DOE/NV Safeguards and Security Division and RWMS prior to shipment arrival.^{6,3} For additional information, call Safeguards and Security at (702) 295-0082 and RWMS at (702) 295-6811. The shipment may be refused if a Form 741 is not on file.

3.6.2 For materials regulated by DOT, completed shipping papers with shippers certification, as required by Title 49 CFR, *must* accompany each shipment.^{4,1}

A "Uniform Hazardous Waste Manifest" or equivalent state-of-generation manifest, accompanied by the appropriate documentation, *shall* be used when shipping MW.^{3,6/3,15}

3.6.3 The original completed and signed PSDR or the original of an equivalent, *shall* accompany each shipment.^{6,12/7,6} An electronic version of the PSDR *shall* be transferred to BN prior to shipment arrival (internet address: wmdata).^{7,6} If the PSDR is considered

"classified," DOE/NV Safeguards and Security Division ([702] 295-0082) *must* receive the PSDR prior to arrival of waste.^{7,6} Classified shipments will not be accepted if a PSDR is not on file.

3.6.4 An appropriate Waste Certification Statement *shall* be signed by the WCO (see below).^{6,14/7,6}

Low-Level Waste Certification

I certify that containers:

(Container I.D. number[s])

do not contain hazardous waste as defined in Title 40 CFR 261 or _____ (state-of-generation) hazardous waste regulations:

- (1) according to the results of tests performed in accordance with the requirements as specified in Subpart C of Title 40 CFR 261; and/or
- (2) according to the supporting documentation provided to me about the materials and processes that produced this waste.

To the best of my knowledge, I believe the information I have submitted is true, accurate, and complete

Generator Waste Certification Official (Print Name/Sign) Date

Mixed Waste Certification for Land Disposal Restrictions:

I certify under penalty of law that I personally have examined and am familiar with the waste through analysis and testing or through knowledge of the waste to support this certification that the waste in containers:

(Container I.D. number[s])

complies with the treatment standards specified in Title 40 CFR 268, Subpart D, and all applicable prohibitions set forth in 40 CFR 268.32, RCRA Section 3004(d) or _____ (state-of-generation) hazardous waste regulations.

I believe that the information I submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting a false certification, including the possibility of a fine and imprisonment.

Generator Waste Certification Official (Print Name/Sign) Date

WAC Deviations

3.7

Deviations from the NTSWAC that do not compromise the performance objectives for the disposal site or violate permit requirements may be accepted. The following information *must* be included with the WP:^{6,20/6,27/7,5} the NTSWAC requirement that cannot be met; the justification for not meeting the requirement; the duration of the deviation, if applicable; and the action plan to correct the deviation, if applicable.

Example:

Requirement: NTSWAC, Revision 0, Section 3.1.E, Gases, requires that expended gas cylinders have the valve mechanism removed.

Justification: The pressure container and manifold valves cannot be removed, but each waste item will be documented by procedure and signed verification that the container/manifold internal pressure has been emptied to less than 1.5 atmospheres at 20°C. This method allows for direct venting, depressurization of the container/vessel without the potential of radioactive tritium gas exposure, and is in keeping with mandated DOE ALARA principles and practices. Even when a tritium vessel is depressurized, there is a certain amount of residual tritium that remains in the vessel. If the valve stem is removed, the cylinder will continue to emit tritium to the atmosphere and possibly result in exposure to personnel. The generator seeks to avoid unnecessary or accidental venting of tritium to the atmosphere by allowing the valve stem to remain on the vessel. The waste packaging procedure provides details about the handling of these waste items. The WCO procedure details the internal pressure verification.

Duration: The duration of the deviation is the lifetime of the waste stream.

Corrective Action: There is no action required.

3.8

Additional Criteria for Mixed Waste

MW offered for disposal *must* meet the applicable requirements of Title 40 CFR, state of Nevada, state of generation, package criteria and disposal site permit requirements for identification, treatment, and disposal.^{3.3/3.13/5.6}

3.8.1 Mixed Waste Generated Within the State of Nevada

3.8.1.1 Free Liquids

MW *must* contain no free liquids.^{3.11}

3.8.1.2 Treatment

MW accepted for disposal at the Mixed Waste Management Unit *must* meet applicable Title 40 CFR, "Land Disposal Restrictions."^{3.13}

3.8.1.3 Incompatible Wastes

Incompatible MW *must* be packaged in accordance with Title 40 CFR, "Special Requirements for Incompatible Wastes."^{3.12}

3.8.1.4 Marking and Labeling

MW packages of 416 liters (110 gallons) or less *must* be marked in accordance with Title 40 CFR.^{3.9} Marking and labeling of the waste packages *must* be for the hazardous and radioactive waste.^{3.7/3.8/4.3/4.4} Limited quantity MW *must* be classified according to the requirements for hazardous components as defined by Title 49 CFR.^{4.5/4.9}

3.8.1.5 Containers

The requirements of Title 40 CFR, "Use and Management of Containers," *must* be met.^{3.10}

3.8.2 Mixed Waste Generated Outside the State of Nevada

(Reserved for future use.) Call DOE Waste Management Division for information at (702) 295-3181.

3.9

Criteria for Transuranic/Transuranic Mixed Waste

(Reserved for future use.) Call DOE Waste Management Division for information at (702) 295-3181.

4.0

Waste Characterization

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Waste Characterization

4.0

Generators **must** characterize waste destined for disposal at NTS.^{6,9} When similar requirements are listed in separate regulations, the most stringent **shall** be met.^{7,5} Waste is considered MW until the generator, through chemical analysis, process knowledge (PK), or a combination of both, demonstrates the LLW or TRU waste contains no hazardous waste as identified in 40 CFR, state-of-generation, and state of Nevada hazardous waste regulations (Nevada Administrative Code [NAC] 444) and that the waste meets the WAC. For waste characterized as MW, generators **must** demonstrate that the MW meets the applicable 40 CFR Land Disposal Restrictions (LDR) and WAC.^{3,13} Generators **shall** characterize waste with sufficient accuracy to permit proper segregation, treatment, storage, and disposal.^{6,9} The characterization methods and procedures employed by the generator **shall** ensure that the physical, chemical, and radiological characteristics of the waste are recorded and known during all stages of the waste management process.^{6,9} Characterization methods should undergo a peer review by personnel with appropriate expertise.

Waste should be characterized prior to waste profile submittal. Generators **must** prepare and submit a Waste Profile (WP) for each waste stream (see Appendix B) which provides DOE/NV with a summary of waste characterization information.^{6,15/6,20/7.5} Generators **shall** provide waste characterization documentation that supports the WP (see Appendix E for examples) to DOE/NV for review during facility evaluations or upon DOE/NV request.^{6,9/6,20/7.5} Waste characterization documentation **shall** be traceable to the WP and disposal packages.^{6,10/6,27/8.8b} Isotopic distributions and corresponding activity concentrations **shall** be traceable to the package.^{6,10/6,27} Traceability to a parcel level **shall** be required if characterization is being conducted at that level (e.g., individual sealed sources, bags, or components characterized on an individual basis but packaged together).^{6,9/6,15/7.5}

Waste characterization may be conducted using process knowledge (PK), sampling and analysis, or a combination of both. The following sections provide specific information and requirements for these characterizations methods.

Process Knowledge

4.1

Process Knowledge (PK) is a characterization technique that relies on the generator's knowledge of the physical, chemical, and radiological properties of the materials associated with the waste generation process(es), the fate of those materials during and subsequent to the process, and associated administrative controls.

PK sources include historic records, historic analytical data, system descriptions, plans and drawings, manufacturing specifications, mass balance documentation, literature searches, living memory, and procedures.

When PK consists of historic analytical data, generators **must** document the data limitations.^{7,10} Historical data should be routinely verified through controlled analytical methods such as verification sampling and analysis; however, if the data can successfully undergo a full validation, this verification may not be necessary.

When PK relies on living memory, the individual's knowledge *must* be documented and signed by both the interviewer and the interviewee.^{8.17b} For telephone interviews, a statement outlining relevant information *must* be signed by the interviewer (and interviewee if possible).^{8.17b}

PK can be used for waste characterization in lieu of sampling and analysis if the generator's PK is of sufficient detail to qualify as acceptable. Acceptable PK is PK that is based on detailed information on the waste obtained from existing waste analysis data, studies on similar waste generating process(es), or detailed information relative to the properties of the waste that are known due to site-specific and/or process-specific factors.

Generators should conduct a documented evaluation of compiled PK against criteria. The generator should identify the following items in the evaluation: uncertainties, consistencies, limitations, and usefulness.

4.2

Sampling and Analysis

Generators *shall* obtain legally and scientifically defensible data that can be used to identify the physical, chemical, and radiological properties of the waste.^{3.27.7} When waste streams are characterized by sampling and analysis, the process *shall* be controlled and documented.^{8.9} Propagation of error throughout the sampling and analytical process *shall* be evaluated and considered when ascertaining usability of data for characterization of waste.^{6.9}

Sampling and Analysis Data Quality Objectives (DQOs) should meet Environmental Protection Agency (EPA) guidelines (see the seven-step process in EPA QA/G-4, "Guidance for the Data Quality Objectives Process," September 1994). A supplementary document is available from RWAP upon request which contains sample laboratory audit plates and EPA-type forms.

Generators *shall* demonstrate that controls are in place to trace each sample number to a specific package number.^{8.8b} All sampling and analysis efforts, including verification and confirmatory sampling, should include screening analyses such as gamma spectroscopy, gross beta, and gross alpha.

DOE/NV may evaluate sampling and analysis documentation to ensure that 1) samples will be representative of the waste inventory, 2) appropriate analytical procedures are used, and 3) sufficient quality controls have been established to allow measurement and documentation of data quality.

4.2.1 Data Validation

Data validation is a comprehensive analysis and review of analytical data, conducted against a set of predetermined criteria and leading to the assignment of relative useability (i.e., completely usable, estimated value, unusable) for each analytical result. The validation criteria should be developed using the DQO process and depend upon the type(s) of data involved and the purpose for which the data are collected. Data should be validated by technically qualified personnel who are independent of those performing the analyses.

A portion of all data, historical or current, should be validated prior to use of the data for characterization purposes. Validation reports should cite the guidelines or procedures used to validate the data.

The complete validation report should be available to DOE/NV, if requested. Validation reports should include:

- 4.2.1.1** Review and evaluation of the adequacy of the analytical methods used (taking into consideration expected contaminants, nuclide inventory, expected activity, decay mode, radiation energy, and any other relevant parameters).
- 4.2.1.2** An evaluation as to whether the requirements of the Scope/Statement of Work (SOW) have been met (i.e., required detection limits, 90 percent confidence, acceptable error, standards for precision and accuracy).
- 4.2.1.3** A data confidence statement and a determination of useability including an evaluation as to whether the DQOs have been met. DQOs and the other criteria are generally presented in the SOW, applicable procedures, and/or the SAP.

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5.0

Quality Assurance Requirements for Waste Certification Program

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Quality Assurance Requirements for Waste Certification Program

5.0

Generators *shall* develop, implement, and maintain a Waste Certification Program Plan (WCPP) to fulfill the requirements of DOE Order 5820.2A, "Radioactive Waste Management"; and 10 CFR Part 830.120, "Quality Assurance." American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities," has been selected as the standard of choice for the structure of this section of the NTSWAC. WCPPs should use this standard or a similar standard and provide a cross-walk like the one provided at the end of this section to ensure all Basic Requirements are addressed when using any other recognized standard (e.g., International Standard Organization 9001).

Organization

5.1

An organizational chart specific to the waste management organization *shall* be developed.^{8.1} It should depict the general management structure, functional responsibilities, levels of authority, and lines of communication as it affects waste management and certification organizations activities. A description of the responsibilities and activities of each organizational unit depicted should be provided. The chart should reflect organizations that generate, characterize, package, ship, and inspect; conduct audits and surveillances; and perform support functions (i.e., procurement, document control, RCRA oversight, and training). The chart *shall* indicate the independence of the WCO through direct access to a management level demonstrating sufficient authority and organizational freedom.^{7.5/8.1}

Each generator *shall* designate a WCO and an alternate(s) as applicable, who will be responsible for verifying implementation of the WCPP.^{7.5/8.1} The WCO *shall* ensure that waste packages, data, and waste shipments comply with the requirements of the NTSWAC.^{7.5/8.1} The alternate WCO *shall* report to the primary WCO for certification activities.^{7.5/8.1}

Each generator may designate Package Certifiers responsible for signing the Package Certification Label (PCL). Package Certifiers *shall* report to the WCO for certification activities.^{7.5/8.1}

The WCO(s) and Package Certifier(s) *shall* be independent of those who have direct responsibility for performing waste generation activities.^{7.5/8.1/8.1a}

QA Program

5.2

The generator *shall* establish and maintain a WCPP describing the quality affecting activities important to the waste certification process.^{6.14/8.2} The WCPP may reference higher-tier documents (e.g., sitewide QA program). The WCPP *shall* identify the activities and items to which it applies and provide control over activities to an extent consistent with their importance.^{8.2} The WCPP should contain or reference procedures used to certify the waste.

The WCPP *shall* provide for the planning and accomplishment of waste certification activities under suitably controlled conditions.^{8.2} Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity, and assurance that

prerequisites for the given activity have been satisfied. The WCPP *shall* provide for any special controls, processes, test equipment, tools, and skills to attain waste certification and for verification of quality.^{8.2}

The WCPP *shall* provide for indoctrination and training, as necessary, of personnel performing activities affecting waste certification to ensure that suitable proficiency is achieved and maintained.^{8.2}

Management of those organizations implementing the WCPP, or portions thereof, should regularly assess the adequacy of that part of the WCPP for which they are responsible and ensure its effective implementation.

5.3

Design Control

Items, facilities, or processes to be designed and constructed to satisfy or confirm that wastes meet certification requirements, *shall* be defined, controlled and verified.^{8.3} Waste treatment processes require specific controls to verify design parameters related to volume, proper mixture, hydration, sizing of equipment for proper throughput, and product specification. Design of process or laboratory facilities may require consideration of safety standards for nuclear facilities, or a permit for MW treatment and storage.

Applicable design inputs *shall* be specified and translated into design documents.^{8.3} Design inputs, such as design bases, performance requirements, regulatory requirements, codes, and standards, *shall* be identified and documented, and their selection reviewed and approved by a responsible design organization.^{8.3a}

Design interfaces *shall* be identified and controlled.^{8.3} The responsible design organization *shall* prescribe and document the design activities to the level necessary to permit the design process to be implemented and verified.^{8.3b} Design analyses *shall* be performed in a planned, controlled, and documented manner.^{8.3c}

Design adequacy *shall* be verified by any competent person(s) other than those who designed the item.^{8.3c} This verification may be performed by the originator's supervisor, provided the supervisor does not specify a singular design approach or rule out certain design considerations and did not establish the design inputs used in the design. However, design adequacy verification may be performed by the originator's supervisor provided the supervisor is the only individual in the organization competent to perform the verification. The extent of design verification required is a function of the importance to safety, the complexity of the design, the degree of standardization, the state of the art, and the similarity with previously proven designs.

Generators *shall* document their review of the product or process design when the design is performed by others (e.g., containers designed by a vendor).^{8.17h}

Design changes *shall* be governed by control measures commensurate with those applied to the original design.^{8.3f}

Procurement Document Control**5.4**

Items and services critical to the waste certification program *shall* be procured under a controlled and documented system.^{8.7} Technical requirements *shall* be specified in the procurement documents.^{8.4a} The procurement documents *shall* specify and/or reference (as applicable) drawings, specifications, codes, standards, regulations, procedures, or instructions that describe the items or services to be furnished.^{8.4a} The procurement documents should include a statement that provides access to the Supplier's facilities and records for inspection or audit by the purchaser. The procurement documents *shall* specify any tests, inspections, and acceptance requirements of the purchaser.^{8.4a} The procurement documents *shall* require that the Supplier have a documented quality assurance program consistent with the applicable requirements of the item or service to be procured.^{8.4b}

The procurement documents *shall* identify the documentation required to be submitted for information, review and approval (i.e., certificates of conformance/compliance, radiological assay results, analytical results, inspection or test results, and supplier nonconformance disposition "use as is" or "repair").^{8.4c}

Procurement documents *shall* be reviewed to ensure they contain appropriate technical and quality requirements.^{8.4d} These reviews *shall* be recorded on the procurement documents or on documents traceable to the procurement documents.^{8.4c} The procurement document review should be conducted by personnel who have access to pertinent information and who have understanding of the requirements and intent of the procurement documents. Procurement document changes *shall* require the same degree of review and approval as the original.^{8.4c}

Instructions, Procedures, Drawings**5.5**

Activities affecting the quality of the waste certification program *shall* be prescribed by and performed in accordance with instructions, procedures, or drawings.^{8.5} These documents *shall* include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished.^{8.5}

Document Control**5.6**

A document control system *shall* be established to control waste certification documents (e.g., the WP(s), WCPP, and procedures).^{8.6} The document control system *shall* include the following as a minimum:^{8.6a/8.6b}

- 5.6.1 Identification of documents (including forms) important to waste certification activities to be controlled and their specified distribution.
- 5.6.2 Assignment of responsibility for preparing, reviewing, approving, and issuing documents.
- 5.6.3 Review of documents for adequacy, completeness, and correctness prior to approval and issuance.

- 5.6.4 A method to control document changes/revisions which includes the same review and approvals as the original documents.
- 5.6.5 Identification of the organizations responsible for the control and distribution of documents to ensure current versions are available in the workplace.

5.7**Control of Purchased Items and Services**

The procurement of items and services important to the waste certification program *shall* be controlled to ensure conformance with specified requirements (e.g., Type A containers, analytical or assay services, and calibration services).^{8.7} The selection of Suppliers *shall* be based on evaluation of their capability to provide items or services in accordance with the requirements of the procurement documents.^{8.7a} These evaluations *shall* provide evidence of quality furnished by the Supplier.^{8.7a} Based upon the complexity of the item or service, this may be accomplished through receipt inspections, source inspections, audits or surveillances as appropriate. As a minimum, Supplier audits or surveys *shall* be conducted on a triennial basis; however, annual reviews of supplier performance *shall* be conducted to ensure conformance to specified requirements is maintained.^{7.5/8.7a} When third party (e.g., Supplier Quality Information Group) audits are used, the generator *shall* perform a documented review of the audit and the lead auditor's qualifications.^{7.5/8.5} This review should be conducted by a certified lead auditor.

The extent of verification activities, including planning, should be a function of the relative importance, complexity, and quantity of the item or services procured and the Supplier's quality performance. Verification activities *shall* be accomplished by qualified personnel assigned to check, inspect, or audit the activities of Suppliers.^{8.7c}

5.8**Identification and Control of Items**

Controls *shall* be established to ensure the traceability of waste from the point of generation through shipment is maintained.^{8.8} Waste characterization documentation *shall* be traceable to the exact package in which the waste was placed.^{8.8}

Controls *shall* be established to ensure that only correct and accepted items (e.g., waste containers and liners, cement, solidifiers) are used in the waste certification process.^{8.8}

Identification *shall* be maintained on items or documents traceable to the items.^{8.8} Identification markings *shall* be applied using materials and methods which provide a clear and legible identification and do not detrimentally affect the function or acceptability of the item.^{8.8a}

Physical identification should be used to the maximum extent possible. Where physical identification on the item is either impractical or insufficient, physical separation, procedural control, or other appropriate means should be employed to maintain traceability.

Control of Processes**5.9**

Work *shall* be planned, authorized, and accomplished under controlled conditions using technical standards, instructions, procedures, or other appropriate means of a detail commensurate with the complexity and risk of the work.^{8.9a/8.9b}

Qualification of personnel, procedures, and equipment *shall* comply with specified requirements.^{8.9c}

Processes important to waste certification activities (e.g., characterization, RTR, radiological surveys, and waste treatment) *shall* have controls or verification steps identified as part of operating procedures.^{8.9d}

Inspection**5.10**

Inspections required to verify conformance of an item or activity to specified requirements *shall* be planned and executed.^{8.10} Responsibilities for performing inspections, characteristics to be inspected, inspection methods to be employed, acceptance criteria, and documentation requirements *shall* be specified.^{8.10}

Inspection activities *shall* be documented and controlled by instructions, procedures, drawings, specifications, procurement documents, checklists, travelers, or other appropriate means.^{8.10a}

Inspections *shall* be conducted by qualified personnel having no responsibility for performing or supervising the work being inspected.^{8.10}

Where a sample is used to verify acceptability of a group of items, the sampling procedure *shall* be based on recognized standard practices.^{8.10b}

Receipt inspections *shall* be conducted to verify conformance to procurement documents and design criteria (e.g., dimensions, configuration, materials, welding, required documentation).^{8.7c}

In-process inspections *shall* be conducted to ensure that specified process control requirements and/or WAC are achieved and maintained throughout the waste certification process.^{8.10c}

Final inspections *shall* be conducted to verify the quality and conformance of items or waste to specified requirements.^{8.10d} Final inspections *shall* include a review of the records, results, and resolution of nonconformances identified by prior inspections.^{8.10d}

Any modifications, repairs, replacements, or repackaging of waste performed subsequent to final inspection *shall* require reinspection to verify acceptability.^{8.10e}

Records of inspection *shall* identify the item inspected, date of inspection, inspector, type of inspection, and inspection results, and reference to information on action taken in connection with nonconformances.^{8.10f}

5.11**Test Control**

Tests required to verify conformance of an item or computer system (hardware and software) to specified requirements and to demonstrate satisfactory performance for service *shall* be planned and executed.^{8.11} Characteristics to be tested and test methods to be employed *shall* be specified.^{8.11} Test results *shall* be reviewed and their conformance with acceptance criteria evaluated and documented.^{8.11}

Unless otherwise designated, test requirements and acceptance criteria *shall* be provided or approved by the organization responsible for the design of the item to be tested (e.g., waste process; computer system).^{8.11a} Test requirements and acceptance criteria *shall* be based upon specified requirements contained in applicable design or other pertinent technical documents.^{8.11a}

Computer systems *shall* undergo data testing to verify the ability to obtain valid results.^{8.11c} Data testing *shall* be initiated upon installation and after significant modification of a computer system.^{8.11f}

Test procedures *shall* include or reference test objectives and provisions for ensuring that prerequisites for the given test have been met.^{8.11b} In lieu of specially prepared written test procedures, appropriate sections of related documents, such as ASTM methods, Supplier manuals, equipment maintenance instructions, or approved drawings or travelers with acceptance criteria can be used. If used, such documents *shall* include instructions to ensure the validity of the results.^{8.11b}

Test results *shall* be documented and evaluated by a responsible authority to ensure that test requirements have been satisfied.^{8.11c} Test records *shall*, as a minimum, be documented to identify the item tested, equipment used for the test, date of the test, test parameters, action taken in connection with any deviations noted, and the names of the individuals who conducted the test and evaluated the test results.^{8.11d}

5.12**Control of Measuring and Test Equipment**

Tools, gages, instruments, calibration standards, and other measuring and test equipment *shall* be controlled, calibrated, adjusted, and maintained at prescribed intervals or, prior to use, against certified equipment having known valid relationships to nationally recognized standards (e.g., National Institute of Standards and Technology).^{8.12b} If no nationally recognized standards exist, the bases for calibration *shall* be documented.^{8.12b}

The selection of measuring and test equipment *shall* be controlled to ensure that such items are of the proper type, range, accuracy, and tolerance to accomplish the function of determining conformance to specified requirements.^{8.12a}

The methods and intervals of calibration for each item *shall* be defined based on the type of equipment stability characteristics, required accuracy, intended use, and other conditions affecting measurement control.^{8.12c}

Measurement and test equipment *shall* be calibrated, utilized, and maintained in an environment controlled to the extent necessary to ensure continued accuracy.^{8.12d} Temperature, humidity, vibration, cleanliness, and other controlled factors should be considered.

When measuring and test equipment is found to be out of tolerance or calibration, an evaluation *shall* be made and documented of the validity of previous inspection or test results and of the acceptability of items previously inspected or tested.^{8.12c} Out-of-calibration devices *shall* be tagged or segregated and not used until they have been recalibrated.^{8.12c}

Records *shall* be maintained and equipment suitably marked to indicate calibration status.^{8.12c} Records of calibration should provide a description or identification of the item, calibration interval, date calibrated, calibration procedure, identification of the calibration standards, identification of the individual performing the calibration, calibration results, and any corrective actions taken. Equipment marking *shall* include, as a minimum, the date of calibration, the calibration due date, and any limitations.^{8.12c}

Users of measuring and test equipment should conduct and document operational readiness checks of equipment under their purview.

Handling, Storage, and Shipping

5.13

Waste *shall* be handled, stored, and shipped in accordance with applicable DOE, DOT, EPA, state, and local regulations and requirements.^{6.5} Handling, storage, packaging, and preservation of items *shall* be controlled to prevent change or loss and to minimize deterioration.^{8.13} Handling and storage considerations should include provisions for security and fire protection.

Inspection, Test, and Operational Status

5.14

The status of inspection and test activities *shall* be identified and placed on the items, and/or in the waste certification documents traceable to the items to ensure those items that have not passed inspections and tests are not inadvertently shipped.^{8.14} Status *shall* be maintained through indicators, such as segregation, tags, checklists, calibration indicators, PCL labels, markings, inspection travelers, stamps, inspection records, or other suitable means.^{8.14} The authority for applying and removing status indicators *shall* be specified.^{8.14}

Control of Nonconforming Items

5.15

Controls for nonconforming items *shall* provide for identification, documentation, evaluation, segregation when practical, disposition, and notification to the affected organizations including the WCO.^{8.15} Provisions should be established to ensure that anyone associated with waste operations and certification activities can identify nonconformances. Nonconforming items *shall* be conspicuously labeled, tagged, color coded, or otherwise marked to ensure their removal from the waste certification process and to prevent their inadvertent use.^{8.15a} The responsibility and authority for the evaluation and disposition of nonconforming items *shall* be defined.^{8.15c} Nonconforming characteristics *shall* be reviewed and the recommended disposition approved in accordance with documented procedures.^{8.15b} The disposition "use-as-is" or "repair" *shall* include technical justification.^{8.15d}

5.16**Corrective Actions**

A process *shall* be established for the identification and timely correction of conditions adverse to quality.^{8.16} The identification, root cause, corrective action, action to preclude recurrence, and an estimated completion date *shall* be documented.^{8.16} These processes *shall* ensure the appropriate level of management is involved in the correction of conditions adverse to quality (e.g., nonconforming items, programmatic deficiencies).^{8.16}

Conditions adverse to quality *shall* be tracked until successful resolution can be demonstrated.^{8.16}

5.17**Quality Assurance Records**

A Quality Assurance Record is a completed document that furnishes evidence of the quality of items, and/or activities affecting quality.

Records demonstrating compliance with waste certification criteria *shall* be specified, prepared, maintained, legible, identifiable, and retrievable.^{8.17} Requirements and responsibilities for record transmittal, distribution, retention, handling, corrections, control, maintenance, and disposition *shall* be established.^{8.17} The records system *shall* be defined, implemented, and enforced in accordance with written procedures, instructions, or other documentation.^{8.17a}

The generator *shall* maintain records for time periods equivalent to on-site records retention requirements, but not less than five years (or for time periods designated by other regulatory authority[s]).^{3.15/7.5/8.17c} Records *shall* be considered valid only if stamped, initialed, or signed and dated by authorized personnel.^{8.17b} Records should be indexed using a system which includes, as a minimum, record retention times and the location of the record within the record system. Mistakes or changes in records should have a single line drawn through the changed data and be initialed and dated. Correction fluids or tapes should not be used.

Records related to waste certification *shall* be stored in a single location properly secured and protected from damage, or maintained in dual storage that provides for replacement of lost or damaged records.^{8.17d/8.17f/8.17g} The generator *shall* control access to the record files.^{8.17c}

Records important to waste certification may include, but are not limited to, training; calibration; inspection; audit records; nonconformance reports with completed corrective actions; test records; laboratory reports; waste profile; shipping documents; and waste certification statements.

Audits/Surveillances**5.18**

Quality assurance audits *shall* be scheduled in a manner to provide coverage and coordination with ongoing quality assurance/certification activity.^{8.18} Audits *shall* be scheduled at a frequency commensurate with the status and importance of the activity.^{8.18a} Planned and scheduled audits should be conducted on an annual basis to ensure compliance with the requirements of the NTSWAC and the waste certification program.

Audit team members *shall* be independent of the audited activities.^{8.18c} The audit team leader *shall* be certified in accordance with a program meeting the requirements of NQA-1, Supplement 2S-3.^{8.18d/8.2a}

According to Basic Requirement 5.4, generators may contract an outside agency to conduct their audits. When the services of an outside agency are utilized, the generator is responsible for ensuring compliance with Basic Requirement 5.18.

The auditing organization *shall* develop an audit plan for each audit.^{8.18b} This plan *shall* identify the audit scope, requirements, audit personnel, activities to be audited, organizations to be audited, applicable documents, schedule, and written procedures or checklists.^{8.18b}

Audits *shall* be documented, reported to, and reviewed by responsible management, including the WCO.^{8.18c}

Surveillances should be scheduled and performed on waste activities. Unscheduled surveillances should also be conducted to augment the scheduled surveillances when scheduled dates are not met due to a lack of activity, to verify effectiveness of corrective actions resulting from a nonconformance, CAR, and/or audit/surveillance findings.

Personnel performing a surveillance should be qualified and be an individual other than those who performed or directly supervised the work.

The following criteria should be reviewed when conducting surveillances: qualification of personnel performing the activity, verification of procedural compliance, calibration of instruments used, and the proper completion of records generated as a result of the activity being performed.

NTSWAC
Crosswalk
Quality
Assurance

<u>NTSWAC</u>	<u>DOE Order 5700.6C</u>	<u>10 CFR Part 830.120</u>
Basic Requirement 5.1	Criteria 1	Criteria 1
Basic Requirement 5.2	Criteria 1, 2, & 9	Criteria 1,2, & 9
Basic Requirement 5.3	Criteria 6	Criteria 6
Basic Requirement 5.4	Criteria 7	Criteria 7
Basic Requirement 5.5	Criteria 5	Criteria 5
Basic Requirement 5.6	Criteria 4	Criteria 4
Basic Requirement 5.7	Criteria 7	Criteria 7
Basic Requirement 5.8	Criteria 5	Criteria 5
Basic Requirement 5.9	Criteria 5	Criteria 5
Basic Requirement 5.10	Criteria 8	Criteria 8
Basic Requirement 5.11	Criteria 8	Criteria 8
Basic Requirement 5.12	Criteria 5 & 8	Criteria 8
Basic Requirement 5.13	Criteria 5	Criteria 5
Basic Requirement 5.14	Criteria 8	Criteria 8
Basic Requirement 5.15	Criteria 3 & 5	Criteria 3 & 5
Basic Requirement 5.16	Criteria 3	Criteria 3
Basic Requirement 5.17	Criteria 4	Criteria 4
Basic Requirement 5.18	Criteria 10	Criteria 10

6.0

Waste Transportation and Receipt Information

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Waste Transportation and Receipt Information

6.0

This section provides general guidelines that generators should follow to expedite waste transportation and receipt. This section is "FOR INFORMATION ONLY" and will not be evaluated during facility evaluations.

It is requested the DOE/NV AMEM be notified when 1) the motor carrier(s) is being evaluated; 2) the motor carrier route selection is being reviewed; 3) a motor carrier discrepancy, noncompliance, or inadequate performance has been identified; or 4) there is a transportation incident or emergency situation. This notification will keep DOE/NV personnel informed of generator transportation plans, activities, and issues. DOE/NV personnel will be able to use the information provided to inform stakeholders of transportation activities of radioactive low-level waste destined for the NTS. DOE/NV personnel may request to participate in the review of transportation-related information.

Waste Transportation

6.1

Classified and unclassified waste shipments consigned to BN or to DOE/NV Safeguards and Security Division will be made in accordance with applicable DOE, DOT, EPA, state, and local hazardous waste regulations and requirements.

Generators are responsible for the evaluation of the motor carriers used for transporting radioactive waste. Motor carrier documentation (i.e., past carrier performance, prior evaluations, accident history, vehicle maintenance, etc.) should be reviewed to ensure the carrier is in compliance with 49 CFR, state, and local transportation requirements.

If carrier performance has been determined to violate federal, state or local transportation safety regulations a demonstration of corrective action may be required. Failure to initiate corrective action may result in waste refusal at the NTS.

Generators should review route selection with the carriers. Routes selected are required to minimize radiological risk. Information on accident rates, time in transit, population density, construction activities, and time of day should be considered when determining radiological risk. DOE/NV may provide driver advisories to inform generators of local driving conditions (i.e., road construction, detours, safety issues). The generators will be responsible for notifying carriers of changes to the routes.

6.2**Waste Receipt and Records**

BN will be responsible for inspecting radioactive waste shipments upon arrival and maintaining shipment records for DOE/NV.

6.3**Funding and Forecasting**

For information regarding funding and forecasting requirements contact DOE/NV WMD at (702) 295-3181.

6.4**Disposition of Noncompliant Conditions**

Radioactive waste shipments received at the NTS, that are not in compliance with requirements, will require resolution. The resolution will be handled through the use of one or more of the following alternatives depending upon the condition:

- 6.4.1 NTS RWMS may hold the waste packages and request the waste generator to provide written instructions to correct the condition before the waste package is accepted.
- 6.4.2 NTS RWMS may correct the condition and charge the waste generator for costs incurred.
- 6.4.3 NTS RWMS may require that the waste packages be returned to the generator's facilities for correction and charge the waste generator for costs incurred.
- 6.4.4 Repeated instances of noncompliant conditions could result in an increased frequency of surveillances and may result in a suspension of authorization to ship waste.
- 6.4.5 NTS RWMS may refuse a package and charge the waste generator for costs incurred.

6.5**Waste Refusal**

BN personnel will be responsible for notifying the appropriate DOE/NV personnel regarding any discrepant or refused radioactive waste shipments. Waste shipments may be refused at the NTS for conditions such as:

- 6.5.1 Failure to have sufficient funding transferred to BN to cover the cost of handling, disposal, or storage.
- 6.5.2 Failure to have DOE/NRC Form 741 on file at the NTS prior to the shipments' arrival.
- 6.5.3 Failure to have a signed certification statement accompanying the shipment.

Appendix A

Waste Generator Approval Process Flow Diagram

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Waste Generator Approval Process Flow Diagram

A

The following diagram identifies key process steps. Operations and logistics may influence the order in which these activities are conducted. A Site Visit (Section 2.3) may be requested by the generator at any time during the process.

Legend

CAP	- Corrective Action Plan
CAR	- Corrective Action Request
NTS	- Nevada Test Site
PC	- Package Certifier
PK	- Process Knowledge
RWMS	- Radioactive Waste Management Site
SAP	- Sampling and Analysis Plan or Procedure
WAC	- Waste Acceptance Criteria
WAP	- Waste Acceptance Package (WCPP, WP, Certification List)
WCO	- Waste Certification Official
WCPP	- Waste Certification Program Plan
WP	- Waste Profile
(XX)	- Corresponding section in NTSWAC text

Legend

CAP	- Corrective Action Plan
CAR	- Corrective Action Request
NTS	- Nevada Test Site
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WCO	- Waste Certification Official
WCPP	- Waste Certification Program Plan
WP	- Waste Profile
(XX)	- Corresponding section in NTSWAC text

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Appendix B

Nevada Test Site Waste Profile

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Nevada Test Site Waste Profile**B****Nevada Test Site Waste Profile, Revision 1****A. Generator Information**

1. WCO _____ Phone _____ Fax _____
2. Technical Contact _____ Phone _____ Fax _____
3. DOE Contact _____ Phone _____ Fax _____
4. Facility Name _____ Phone _____ Fax _____
Address _____
City _____ State _____ Zip _____
5. EPA Identification Number _____

B. General Waste Stream Information

1. Waste Stream Identification Number _____
Profile Revision Number _____ Profile Revision Date _____
2. Title of Waste Stream _____
3. Waste Category ☐ Low-Level ☐ Mixed Low-Level (Generated within Nevada only)
4. Characterization and Generating Process

☐ Yes ☐ No Process Description Continuation Page Attached
☐ Yes ☐ No Flow Diagram Attached
5. Estimated Rate of Generation ☐ One Time Only _____ m³
☐ Ongoing _____ m³/yr
6. Reason for Submittal (specify one)
☐ New Waste Stream
☐ Modification to Waste Stream Date Change Effective _____
☐ Terminate Waste Stream
☐ Profile for Currently Approved Waste Stream
7. ☐ Yes ☐ No Does this waste stream require a WAC deviation?
Attach information.

August 1997

D. RCRA Characterization

1. RCRA characterization by: (Check all that apply)

- ☐ Process Knowledge
☐ Sampling and analysis for complete characterization
☐ Confirmatory Sampling and Analysis

List documents that control RCRA determinations.

2. If sampling and analysis was used, attach Table 1 or an equivalent sample result summary that includes analytical results, upper confidence limits, and explanations of anomalies for all analyses analyzed.
3. Does the final waste form exhibit any characteristic of hazardous waste as defined in 40 CFR 261?
☐ Yes	☐ No	Ignitability
☐ Yes	☐ No	Corrosivity
☐ Yes	☐ No	Reactivity
☐ Yes	☐ No	Toxicity
4. ☐ Yes ☐ No Is the final waste form listed as defined in 40 CFR 261?
5. ☐ Yes ☐ No Is the waste hazardous per state-of-generation regulations?
If yes, identify hazardous components and state regulations.
6. ☐ Yes ☐ No Has the waste been treated?
Attach information which verifies WAC compliance.
7. ☐ Yes ☐ No Is the final waste form mixed waste?
If yes, attach information which verifies LDR compliance.

E. Radiological Properties

1. Radiological characterization by: (Check all that apply)

☐ Process Knowledge ☐ Sampling and Analysis ☐ Materials Control and Accountability
☐ Direct Measurement ☐ Gross Radiation Measurement ☐ Other _____

2. Were the following used in radiological characterization?
- ☐
- Scaling Factors
- ☐
- Ratios

3. Reference documents that describe the radiological characterization process.

4. Reference documents that describe the method of determining package activity.

5. List reportable radionuclides as defined in the WAC.

Radionuclide	Activity Range (Bq/m ³)	Activity Representative of Final Waste Form (Bq/m ³)
_____	_____ to _____	_____
_____	_____ to _____	_____
_____	_____ to _____	_____
_____	_____ to _____	_____
_____	_____ to _____	_____

- 6.
- ☐
- Yes
- ☐
- No Attach list of chemical form of radionuclide, if known. Page attached?

- 7.
- ☐
- Yes
- ☐
- No Does the waste contain transuranic waste creating nuclides as defined in the WAC? If yes, list below.

Transuranic Nuclide	Activity Range (nCi/g)	Activity Representative of Final Waste Form (nCi/g)
_____	_____ to _____	_____
_____	_____ to _____	_____
_____	_____ to _____	_____
_____	_____ to _____	_____

☐ Yes ☐ No

Transuranic Nuclide Continuation Page Attached?

8. ☐ Yes ☐ No Is the waste TRU?
List the documentation that demonstrates WAC compliance.

9. ☐ Yes ☐ No Is enriched uranium present? If yes, provide enrichment of U-235 by weight percent _____. Provide maximum mass U-235 per package _____ g/package. Reference controlling documents.

10. ☐ Yes ☐ No Are fissionable nuclides present? If yes, list below.

Nuclide	Maximum Activity Concentration (Bq/m ³)
_____	_____
_____	_____
_____	_____
_____	_____

- ☐ Yes ☐ No Transuranic Nuclide Continuation Page Attached?

F. Packaging Description

1. ☐ Yes ☐ No Does the waste meet each of the package criteria as defined in the WAC?
List the documentation that demonstrates WAC compliance.

2. Container type(s) _____
DOT Specification(s)/Description(s) _____
☐ Yes ☐ No ☐ N/A Does box meet 3,375 lb/ft² strength test?
3. Standard container external dimensions _____
Packaged bulk external dimensions _____
Bulk Shipment dimensions _____
4. Weight Range _____ kg to _____ kg
5. ☐ Yes ☐ No Waste stream includes unclassified material?
6. ☐ Yes ☐ No Waste stream includes classified material?
7. Estimated radiation dose rate at:
disposal package surface _____ to _____ mSv/h
1 meter _____ to _____ mSv/h.
8. Reference special handling procedures and ALARA documentation, if appropriate.

G. Signature

To the best of my knowledge, the information in this document and attachments is true and accurate. Willful and deliberate omissions have not been made. All known and suspected hazardous materials have been disclosed.

Technical Representative Printed Name_____
Signature_____
Date_____
WCO's Printed Name_____
Signature_____
Date

*Table B-1
Analytical
Results*

	Statistical Mean (mg/L)	Upper Confidence Interval		Statistical Mean (mg/L)	Upper Confidence Interval
TCLP Metals			TCLP Semivolatiles		
Arsenic	_____	_____	o-Cresol	_____	_____
Barium	_____	_____	m-Cresol	_____	_____
Cadmium	_____	_____	p-Cresol	_____	_____
Chromium	_____	_____	Cresol	_____	_____
Lead	_____	_____	2,4-Dinitrotoluene	_____	_____
Mercury	_____	_____	Hexachlorobenzene	_____	_____
Selenium	_____	_____	Hexachlorobutadiene	_____	_____
Silver	_____	_____	Hexachloroethane	_____	_____
TCLP Volatiles			Nitrobenzene	_____	_____
Benzene	_____	_____	Pentachlorophenol	_____	_____
Carbon Tetrachloride	_____	_____	2,4,5-Trichlorophenol	_____	_____
Chlorobenzene	_____	_____	2,4,6-Trichlorophenol	_____	_____
Chloroform	_____	_____	TCLP Pesticides and Herbicides		
1,4-Dichlorobenzene	_____	_____	Chlordane	_____	_____
1,2-Dichloroethane	_____	_____	2,4-D	_____	_____
1,1-Dichloroethylene	_____	_____	Endrin	_____	_____
Methyl ethyl ketone	_____	_____	Heptachlor	_____	_____
Pyridine	_____	_____	(and its hydroxide)	_____	_____
Tetrachloroethylene	_____	_____	Lindane	_____	_____
Trichloroethylene	_____	_____	Methoxychlor	_____	_____
Vinyl chloride	_____	_____	Toxaphene	_____	_____
			2,4,5-TP (Silvex)	_____	_____

Instructions

Attach a list of all procedures cited with their numbers and titles. Citations within the Waste Profile should provide only the procedure number.

- A.1 Name, phone number, and fax number of the Waste Certification Official that certifies the waste.
- A.2 Name, phone number, and fax number of the technical contact. The technical contact should be an individual who understands the characteristics of the waste profiled.
- A.3 Name, phone number, and fax number of the DOE Field Office/Area Office/Operations Office representative for the facility.
- A.4 Facility name and complete address. If the waste is being shipped from a location other than the stated facility include the address from which the waste is to be shipped.
- A.5 EPA identification number if shipping Mixed Waste.

- B.1 Waste stream number: unique two-part, 13-character alphanumeric code. First four characters are alphanumeric code for the facility found in Appendix C, page C-3. The second part is a generator determined nine-character alphanumeric code for the waste stream (e.g., LITN000000001, where LITN is the facility code for IT Corporation and 000000001 is the IT assigned waste stream code). Include the Profile revision number and date.
- B.2 Title of waste stream (e.g., laboratory trash, soil, sump sludge). Please use an abbreviated description for the title. The waste stream title will be used in the approval memoranda.
- B.3 Check the appropriate box for the waste category.
- B.4 Description of the process and/or information used as the basis for characterization. Shall include at a minimum: Waste characterization determination (RCRA-regulated; not regulated, transuranic); description of waste to include physical state, chemical and radiological composition; description of any treatment; origin of waste or generating process; method of characterization; and process knowledge summary.
Check "Yes" if additional pages are attached.
Check "Yes" if a process diagram is attached.
- B.5 Total amount of waste expected to be shipped under this waste profile. If the waste generation is ongoing indicate rate of production during the fiscal year.
- B.6 Reason for profile submittal and effective date of changes, if any.
- B.7 Check "Yes" if the waste stream requires a WAC deviation (see section 3.7).

- C.1 Check the appropriate box(es) for the description of the waste. If "Other", include waste form description.
- C.2 List waste stream components and their corresponding waste form code (found in appendix D as part of the PSDR i.e., PPE (39), cement(29)).
Indicate the estimated percent of material in the waste stream (i.e., 50% PPE, 25% paper). The percentages must total 100%.
- C.3 If the waste form was treated to meet the NTSWAC cite the procedure or process used to treat the waste. If a procedure was used to ensure compliance cite the procedure number. "N/A" is acceptable.

- D.1 Check the appropriate box(es) for how the RCRA determination was made. Cite process or procedure used for RCRA hazardous/nonhazardous determination.
- D.2 Attach sample result summary to waste profile.

- D.3 Check the appropriate box. If yes, see D.6
- D.4 Check the appropriate box. If yes, see D.6
- D.5 Check the appropriate box. List state of generation regulations.
- D.6 Check the appropriate box if the waste has been treated. If Yes, attach documentation that supports the treatment standard and final waste form conformance with the WAC.
- D.7 Check the appropriate box if the waste is MW. If Yes, attach documentation that verifies LDR compliance.

- E.1 Check the appropriate box(es) for how the radiological characteristics of the waste were determined.
- E.2 Check any that apply.
- E.3 List documentation that describes how the radiological characterization was controlled.
- E.4 List documentation that describes how package activity determination was controlled.
- E.5 List radionuclides required by Section 3.3.1. These concentrations should represent the final waste form.
- E.6 Attach a list of the chemical form of the radionuclides if applicable.
- E.7 Check Yes box if waste contains transuranic waste creating nuclides. If Yes, list transuranic nuclides, their activity range and a representative activity from the waste form. List documentation that controls TRU determinations if TRU nuclides are present in waste.
- E.8 Check Yes box if waste contains enriched uranium. If Yes, provide enrichment and maximum mass per package. List documentation that demonstrates control of the maximum mass per package.
- E.9 Check Yes box if waste contains other DOE defined (DOE Order 420.1) fissionable nuclides. If Yes, list the nuclides and their maximum concentration.

- F.1 Check Yes box if waste meets package criteria. List documentation that controls the package compliance.
- F.2 Specify type of containers and DOT specifications. If boxes are used, check the appropriate box for the strength requirement.
- F.3 State the external dimensions of the shipping containers.
- F.4 State the weight range for the containers
- F.5 Check Yes if the waste includes unclassified material
- F.6 Check Yes if the waste includes classified material. NOTE, F.5 and F.6 can both be Yes.
- F.7 State the estimated radiation dose rate at the package surface and at 1 meter.
- F.8 List any special handling procedures or ALARA documentation necessary for the waste.

- G. The Technical Representative and WCO must sign to certify that the information given on the profile is true and correct.

Appendix C

Marking and Labeling

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Marking and Labeling**C****Barcode****C.1**

Barcodes used on packages *must* meet the following standards:^{7.6}

- A. Code 39.
- B. Low- to medium-density; low-density preferred.
- C. 1.0"-high bar code.
- D. Human readable interpretation (HRI) 0.50" high printed, below the bar code.
- E. Spacing between bar code and HRI will be 0.10".
- F. Minimum left and right margin (quiet zones) will be at least 0.25".
- G. Bar codes and HRI will be stacked with a minimum separation of 0.50" and in the following order: shipment number, container number.
- H. A total of two bar code labels *must* be placed on each package near the top and on opposite sides.^{7.6} Drums *must* have a total of two bar code labels, one on top of the drum lid and one on the side near the top.^{7.6}

*Figure C-1
Bar Code
Label
Example*

Note: Example not actual size.

- I. A sample bar code **must** be submitted to BN prior to the first shipment to ensure that the RWMS equipment can be used to read the bar code.^{7,6} BN will provide bar codes for low-volume generators (less than ten shipments per year) that do not have the equipment to print bar codes. Contact BN at least one month in advance to arrange for the bar codes.

C.3**Marking and Labeling**

Packages **must** have the following markings and labels.^{6,14/7,6}

- A. Marking and labeling as required in Title 49 CFR, for additional Asbestos Labeling, see Section 3.1.13.^{4,2}
- B. "Package Certification Label" (PCL) (see Figure C-2), signed by the WCO or package certifier.^{6,14/7,6} If the waste is unpackaged bulk, a signed PCL **must** accompany the shipment papers.^{6,14/7,6} Low volume generators can obtain these labels from BN.
- C. Shipment number in the following sequence: Two alpha character generator-site-designator codes assigned by DOE/NV/WMD (see Section C-4); one alpha character for type of waste (L for LLW, M for MW, T for TRU, or X for Transuranic Mixed Waste); two numerical characters for current fiscal year; three numerical characters for shipment sequence. This number **must** be on the bar code.^{7,6} Example: MDL97001 indicates a shipment from the Mound Facility of LLW in fiscal year 1997 and the first shipment.

Figure C-2
Package
Certification
Label

NV-211 August 1997	USDOE
PACKAGE CERTIFICATION LABEL	
This label certifies this container and its contents meet the requirements of DOT (49 CFR), EPA (40 CFR), and NTSWAC for transportation and disposal.	
DATE: _____	
CERTIFIED BY (print): _____	
CERTIFIED BY (signature): _____	
Waste Certification Official	☐
Alternate Waste Certification Official	☐
Package Certifier	☐
RWMS DESIGNATION (i.e., ONLO, ARIR): _____	

- D. Package number *must* be six characters (alpha, numeric, or combination) with no duplication within the shipment.^{7.6} This number *must* be on the bar code.^{7.6}
- E. Package weight in units of kilograms and pounds *must* be included on the side of each waste package.^{2,3,7.6} This requirement can be met through the use of a label, additions to bar code labels, or by writing the weight on the side of the waste package.

Generator Waste Stream and Shipment Codes

C.4

<u>GENERATOR</u>	<u>RWMS DESIGNATION*</u>	<u>SITE DESIGNATOR**</u>
Aberdeen Proving Ground	USAA	AP
AlliedSignal	ABXK	AS
Babcock & Wilcox	IBWV	GW
Bechtel - NTS	LRV5	DP
DNA - NTS	LDN1	DT
Fernald	ONLO	WM
GA Technologies	BGAT	BG
Grand Junction	JMTC	GJ
IT Corp.	LITN	IT
Johnston Atoll	DDJA	JA
LLNL - California	BCLA	LL
Lovelace Foundation (ITRI)	ALVI	LV
Mound	AMDM	MD
Oak Ridge	MMES	MM
Pantex	AMHP	PX
Pinellas	AGEP	PN
RMI Extrusion Plant	ORMI	RM
Rocketdyne	BNRC	BN
Rocky Flats	ARIR	RF
Sandia - Albuquerque	ASLA	SA
Sandia - Livermore	ASLL	SL
U.S. Army Industrial Operations Command (IOC)	ISOC	RI

Note: Contact RWMS Contractor if generator site is not listed.

*RWMS Designation is the first four characters of the Waste Stream ID number.

**Site Designator is the first two characters of a shipment number.

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Appendix D

Package Storage and Disposal Request

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Package Storage and Disposal Request

D

Package Storage and Disposal Request, Revision 1

Every Package Storage & Disposal Request (PSDR) generated on a package level should fall within the boundaries on the WP for that waste stream. See Section 3.3 for reportable nuclides.

Shipment Number: _____ Prepared By: _____

Date: _____ Manifest No: _____

Package No. _____ Waste Form: _____ Completed Date: _____
 Container Code: _____ Waste Treatment: _____ Operation Type: _____
 External Volume (m³): _____ Gross Weight (kg): _____ Total Activity (bq): _____
 Waste Volume (m³): _____ Net Weight (kg): _____ Activity Date: _____
 Contact (mSv/h): _____ 1 Meter (mSv/h): _____
 Comment: _____

Waste Stream/Profile	Rev.	Rev. Date	Nuclide	Qty. (Bq)	Waste Form Description:
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Waste Stream/Profile	Rev.	Rev. Date	Nuclide	Qty. (Bq)	Waste Form Description:
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Package No. _____ Waste Form: _____ Completed Date: _____
 Container Code: _____ Waste Treatment: _____ Operation Type: _____
 External Volume (m³): _____ Gross Weight (kg): _____ Total Activity (bq): _____
 Waste Volume (m³): _____ Net Weight (kg): _____ Activity Date: _____
 Contact (mSv/h): _____ 1 Meter (mSv/h): _____
 Comment: _____

Waste Stream/Profile	Rev.	Rev. Date	Nuclide	Qty. (Bq)	Waste Form Description:
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Waste Stream/Profile	Rev.	Rev. Date	Nuclide	Qty. (Bq)	Waste Form Description:
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Package No. _____ Waste Form: _____ Completed Date: _____
 Container Code: _____ Waste Treatment: _____ Operation Type: _____
 External Volume (m³): _____ Gross Weight (kg): _____ Total Activity (bq): _____
 Waste Volume (m³): _____ Net Weight (kg): _____ Activity Date: _____
 Contact (mSv/h): _____ 1 Meter (mSv/h): _____
 Comment: _____

Waste Stream/Profile	Rev.	Rev. Date	Nuclide	Qty. (Bq)	Waste Form Description:
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Waste Stream/Profile	Rev.	Rev. Date	Nuclide	Qty. (Bq)	Waste Form Description:
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

If you have any questions on completing this document, contact Waste Management Department at (702) 295-6811. Data entered on the form *must* be legible. Hand-printing or typing of letters and numbers is preferred to handwriting. When using a decimal, it *must* be clearly defined. **DO NOT USE COMMAS!**

SHIPMENT NUMBER: Consists of 8 alphanumeric characters. Enter the shipment number in the following sequence: 2-digit generator code assigned by WMD, L (low-level), M (mixed), T (TRU), or X (TRU Mixed), last two digits of the current fiscal year (Oct. 1 - Sept. 30), and the consecutive number of shipments from the generating facility. **EXAMPLE:** DPL90001 represents Decon Pad, low-level waste, fiscal year 1990, and the first shipment sent to WMD for fiscal year 1990. The shipment number *must* be 8 characters in the above sequence.

MANIFEST NUMBER: Required only on mixed waste shipments, a 5-digit number.

PACKAGE NUMBER: 6 unique characters for each container in the shipment.

WASTE FORM CODES: Use the waste form code for the majority of the waste by volume.

20 - Charcoal	28 - EPA Hazardous	36 - Sealed Source or Device
21 - Incinerator Ash	29 - Demolition Rubble	37 - Paint or Plating
22 - Soil	30 - Cation Exchange Media	38 - Evaporator Bottoms/Sludges/Concentrates
23 - Gas	31 - Anion Exchange Media	39 - Compactible Trash
24 - Oil	32 - Mixed Bed Ion Exchange Media	40 - Noncompactible Trash
25 - Aqueous Liquid	33 - Contaminated Equipment	41 - Animal Carcasses
26 - Filter Media	34 - Organic Liquid (except oil)	42 - Biological Material (except animal carcasses)
27 - Mechanical Filter	35 - Glassware or Labware	43 - Activated Material (except activated material)
		44 - Activated Material
		45 - Other (Describe)

COMPLETION DATE: The date, in the formal DD/MMM/YYYY (e.g. 01/JAN/1992), that the last waste material was placed in the package.

CONTAINER CODE: 3-digit number that identifies the type of container. If your container is not listed, contact RWMS at (702) 295-6811.

<u>Code</u>	<u>Description</u>	<u>Length</u>	<u>Width</u>	<u>Height</u>	<u>EXTERNAL VOLUME</u>	
					<u>Cubic Feet</u>	<u>Cubic Meters</u>
100	Miscellaneous	N/A	N/A	N/A	N/A	N/A
101	30-gallon drum	N/A	N/A	N/A	6.999	0.1982
102	55-gallon drum	N/A	N/A	N/A	7.999	0.2265
103	83-gallon drum	N/A	N/A	N/A	13.999	0.3964
124	85-gallon drum	N/A	N/A	N/A	14.126	0.4000
200*	Half box	78"-90"	42"-56"	18"-30"	34.125-87.5	0.9663-2.4777
201*	Wooden half box	78"-90"	42"-56"	18"-30"	34.125-87.5	0.9663-2.4777
210*	Full box	78"-90"	42"-56"	18"-30"	79.625-163.33	2.2547-4.6250
211*	Wooden full box	78"-90"	42"-56"	18"-30"	79.625-163.33	2.2547-4.6250
220*	Cargo container	234"-246"	90"-102"	90"-102"	1096.875-1481.125	31.060-41.940
230	Supersack	N/A	N/A	N/A	N/A	N/A
240	Burrito Wrap	N/A	N/A	N/A	N/A	N/A

* External volumes reported for containers using these codes must be based on the containers' external dimensions. Volume should be within range specified.

WASTE TREATMENT CODES: Use the treatment code for the majority of the waste by volume.

Sorption

60 - SpeediDri
61 - Celetom
62 - Floor Dry/Superfine
63 - HiDri
64 - Safe T Sorb
65 - Safe N Dry
66 - Florco
67 - Forco X
68 - Solid A Sorb
69 - Chemsil 30

70 - Chemsil 50
71 - Chemsil 3030
72 - Dicaperl HP200
73 - Dicaperl HP500
74 - Zonolite Gd4
75 - Petroset
76 - Petroset
77 - Aquaset II
78 - Aquaset II
79 - Other (Describe)

Solidification

90 - Cement
91 - Concrete Encapsulation
92 - Bitumen
93 - Vinyl Toluene
94 - Vinyl Ester Styrene
95 - Other (Describe)
100 - No Sorption or Solidification

OPERATION TYPE: B for burial or R for retrievable storage.

EXTERNAL VOLUME: Total volume displaced by the container in cubic meters. Refer to CONTAINER CODE. Written in scientific notation X.XXXE±00.

GROSS WEIGHT: Total weight of container including waste and solidification or absorbent media in kilograms. Written in scientific notation X.XXXE±00.

TOTAL ACTIVITY: Total becquerels *must* equal the sum of becquerels for each nuclide reported. Written in scientific notation X.XXXE±00.

WASTE VOLUME: Actual volume of waste material in package (cubic meters).

NET WEIGHT: Total weight of waste and solidification or absorbent media, excluding container, in kilograms. Written in scientific notation X.XXXE±00.

ACTIVITY DATE: The date, in the formal DD/MMM/YYYY (e.g., 01/JAN/1992) that the activity of the package was determined.

CONTACT: Maximum radiation reading at the surface of the package in mSv/H: Written in scientific notation X.XXXE±00.

1 METER: Maximum radiation reading at 1 meter in mSv/h: Written in scientific notation X.XXXE±00.

COMMENTS: Comments such as enriched Uranium, special handling required, etc. in this field.

WASTE STREAM/PROFILE: Waste Stream Identification or profile number. 13 alphanumeric characters. First 4 characters will be the RWMS designation. next 9 alphanumeric characters will be assigned by the generator. EXAMPLE: LRY5000000001 represents waste from the NTS.

REVISION: Approved Waste Profile Revision number: profile revision *must* be a two digit number. If no profile has been approved for the waste stream, the number "99" *must* be used.

REVISION DATE: Approved Waste Profile Date: in the formal DD/MMM/YYYY. If no profile has been approved for the waste stream the date of the last DOE/NV approval letter for the waste stream *must* be used.

NUCLIDE: Valid nuclide description. Attach additional sheet to report more nuclides than space allows - dash is required in format.

QUANTITY: The quantity of the nuclide present in the container in becquerels. The sum of each nuclide reported *must not* exceed the total activity reported for the total package. Written in scientific notation X.XXXE±00.

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Appendix E

Waste Characterization

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Waste Characterization

E

Radiological Characterization Methods

E.1

Waste characterization methods are described below and are not intended to be all-inclusive. These methods can be used individually or in combination. The DOE/NV will use a graded approach in its acceptance of waste characterization methods. Generators are encouraged to develop innovative waste characterization plans designed for the specific conditions at their facilities.

The acceptability of a generator's waste characterization plan will be based on a determination that the level of effort is appropriate, given the potential of the waste stream to exceed the waste concentration action levels (Table E-1) and the physical limitations of the waste stream. Physical limitations may include waste matrices that cannot be representatively sampled at a reasonable cost with reasonable radiation exposure concerns. Generators are expected to identify, based on knowledge of their processes and facility, those radionuclides with a reasonable probability of exceeding 1 percent of the waste concentration action level. Waste streams or waste packages reasonably expected to exceed one percent of the waste concentration action levels (Table E-1) will require the greatest level of characterization and verification. Process knowledge will often be sufficient for characterization of radionuclides not having action levels or occurring at concentration less than one percent of the action level.

A. Materials Controls and Accountability (MC&A)

MC&A records are data developed from a mass balance of material entering and exiting a process. MC&A data can be used to estimate the activity concentration of waste streams. This method is expected to be most useful for generators possessing limited numbers of nuclides, such as special nuclear materials, in known activity concentrations.

B. Gross Radiation Measurements

Conversion factors can be developed that relate gross radiation measurements to the activity concentration of a waste stream. Generators using gross radiation measurements *shall* ensure that measurements are correlated with activity concentration on a consistent basis and that radionuclide distributions in the waste stream are initially determined and periodically verified.^{7,8} Generators *shall* document all methods used to develop conversion factors relating gross radiation measurements and activity concentration.^{7,8} Generators *must* consider waste package and detector geometry, shielding and attenuation effects, and the energy spectra and decay schemes of radionuclides in the waste when developing conversion factors.^{7,8}

C. Direct Measurement of Specific Radionuclides

Direct measurement of radionuclides may include sampling and analysis and nondestructive analysis of waste packages. Radiological characterization using sampling and analysis, including swipes taken for characterization purposes, *shall* be controlled.^{8,9}

Table E-1
Radio-
nuclide
Action
Levels for
Waste
Character-
ization
and
Reporting

NUCLIDE	ACTION LEVEL (Bq m-3)	NUCLIDE	ACTION LEVEL (Bq m-3)
Unlisted nuclide with a $t_{1/2} < 5$ yr	No Limit	^{227}Ac	1.0×10^{12}
^3H	5.6×10^{15}	^{229}Th	4.1×10^9
^{14}C	2.3×10^8	^{230}Th	3.1×10^9
^{36}Cl	1.1×10^{10}	^{232}Th	8.1×10^8
^{59}Ni	8.1×10^{12}	^{231}Pa	1.4×10^9
^{63}Ni	2.6×10^{14}	^{232}U	9.3×10^9
^{60}Co	No Limit	^{233}U	3.1×10^{10}
^{90}Sr	1.5×10^{12}	^{234}U	3.7×10^{10}
^{93}Zr	1.4×10^{13}	^{235}U	1.2×10^{10}
^{99}Tc	1.1×10^{11}	^{236}U	1.2×10^{11}
^{107}Pd	1.3×10^{14}	^{238}U	5.9×10^{10}
^{126}Sn	5.9×10^8	^{237}Np	7.0×10^8
^{129}I	3.0×10^9	^{236}Pu	2.3×10^{11}
^{133}Ba	No Limit	^{238}Pu	1.2×10^{11}
^{135}Cs	2.8×10^{12}	^{239}Pu	2.3×10^{10}
^{137}Cs	3.4×10^{11}	^{240}Pu	2.3×10^{10}
^{151}Sm	1.2×10^{15}	^{241}Pu	5.2×10^{11}
^{152}Eu	4.8×10^{13}	^{242}Pu	2.4×10^{10}
^{154}Eu	1.2×10^{16}	^{241}Am	1.8×10^{10}
^{210}Pb	1.3×10^{13}	^{243}Am	7.0×10^9
^{207}Bi	1.1×10^{11}	^{242}Cm	2.4×10^{13}
^{226}Ra	1.3×10^9	^{244}Cm	8.1×10^{12}
^{228}Ra	No Limit	^{248}Cm	6.3×10^9

^{90}Y , ^{93}Nb , $^{126\text{m}}\text{Sb}$, ^{126}Sb , $^{137\text{m}}\text{Ba}$

^{233}Pa , ^{225}Ra , ^{225}Ac , ^{221}Fr , ^{217}At , ^{213}Bi , ^{213}Po , ^{209}Tl , ^{209}Pb

^{239}Np , ^{231}Th , ^{227}Th , ^{223}Fr , ^{223}Ra , ^{219}Rn , ^{215}Po , ^{211}Pb , ^{211}Bi , ^{211}Po , ^{207}Tl

^{234}Th , $^{234\text{m}}\text{Pa}$, ^{234}Pa , ^{222}Rn , ^{218}Po , ^{214}Pb , ^{214}Bi , ^{214}Po , ^{210}Bi , ^{210}Po

^{240}U , $^{240\text{m}}\text{Np}$, ^{240}Np , ^{228}Ra , ^{228}Ac , ^{228}Th , ^{224}Ra , ^{220}Rn , ^{216}Po , ^{212}Pb , ^{212}Bi , ^{212}Po , ^{208}Tl

*Table E-2
Exempt
Radio-
nuclides.
The
progeny
radio-
nuclides
listed are
exempt
from
reporting
requireme
nts when a
parent
radio-
nuclide is
present.*

Determination of Waste Volume (or Mass)

E.2

Waste activity concentration *shall* be determined based on the volume (or mass) of the final waste form as offered for disposal.^{6.11} Measurement or analysis of samples may be performed prior to final processing if the measured activity concentration can be related to the final activity concentration. The volume (or mass) of the waste can usually be taken as the internal volume of the container (or mass of the contents) if the radionuclides are reasonably homogeneously distributed throughout the waste and the waste fills at least 90 percent of the waste container. When these conditions are not met, for example when the package contains significant void space or contains irregularly shaped equipment or components, the volume (or mass) *shall* be taken as the volume (or mass) occupied by the waste in the container.^{6.11}

NOTE: Waste activity concentration determinations based on mass are necessary to demonstrate compliance with Section 3.1.1, Transuranics.

E.3**Examples of Waste Characterization Documentation****A. Process knowledge documentation:**

Historical analytical data, literature searches, living memory, historic records, MC&A records, mass balance documentation, production specifications, certificates of traceability, plans and drawings, signed statements of living memory, system descriptions, work and operating procedures which generated waste, and Material Safety Data Sheets.

B. Evaluation of PK and historical data.**C. Independent review of program documents (may be in the form of a sign-off page within the approved document).****D. Reviewed and approved procedures:**

Direct measurement and/or survey processes, surface area estimations (when surface area of waste material is utilized in radiological characterization calculations), ratio/scaling factor information (approach to ratio/scaling factor development, application of ratios/scaling factors, justification for use of ratios/scaling factors, supporting calculations, operating procedures for assay equipment).

E. Evaluated Data, Validated Data, Sampling and Analysis Plan, Scope Of Work, and Laboratory Acquisition Document.**E.4****Radiological Characterization Flow Diagram Overview**

Figure E-1, the radiological characterization flow diagram, illustrates the approach that should be used in order to obtain adequate radiological characterization. The approach allows for the utilization of generally accepted radiological characterization methodologies and documentation. Radiological characterization documentation is outlined by markers (□) on the radiological characterization flow diagram.

Figure E-1
Radio-
logical
Character-
ization
Flow
Diagram

Figure E-1b
Radio-
logical
Character-
ization
Flow
Diagram

Phase II - Method Development

2 Radiological
Documentation

Phase III - Implementation A

2 Radiological
Documentation

Figure E-1c
Radio-
logical
Character-
ization
Flow
Diagram

Figure E-1d
Radio-
logical
Character-
ization
Flow
Diagram

Phase IV - Implementation B (Sampling and Analysis)

2 Radiological
Documentation

Appendix F

Glossary

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Glossary

F

Ambient: Any temperature or pressure experienced by the container during loading, shipping, and/or disposal operations.

Certified Waste: Waste that has been confirmed to comply with disposal site WAC under an approved certification program.

Chelating Agents: Amine polycarboxylic acids (e.g., EDTA, DPTA), hydroxy-carboxylic acids, and polycarboxylic acids (e.g., citric acid, carbolic acid, and gluconic acid).

Corrective Action: Measures taken to rectify conditions adverse to quality and, where necessary, to preclude repetition.

Disposal: The emplacement of LLW or MW in a manner which is considered permanent in that routine recovery is not provided for.

Facility Evaluation: A documented review to evaluate a generator's program to be in compliance with the waste acceptance criteria. Facility evaluations are conducted by RWAP personnel in the form of an audit, surveillance, annual assessment, or a combination of these.

Free Liquid: Liquids which readily separate from the solid portion of a waste under ambient temperature and pressure conditions (see Ambient).

Generator: An individual, facility, corporation, government agency, or other institution that offers waste material for certification, treatment, storage, or disposal.

Hazardous Waste Component: Waste identified or listed in Title 40 CFR 261, or that otherwise meets the RCRA definition of hazardous, or waste identified by applicable state-of-generation hazardous waste regulations.

Incompatible Waste: Waste type that might react adversely with its containment materials or commingled waste as defined in Title 40 CFR 260.10.

Item: An all-inclusive term used in place of any of the following: assembly, component, equipment, material, part, structure, or system. The term "item" may also include technical data, documents, computer codes, or samples.

Land Disposal Restricted Waste: Waste that is prohibited from land disposal in accordance with Title 40 CFR 268.

Low-Level Waste: Radioactive waste not classified as high-level waste, spent nuclear fuel, TRU waste, uranium mill tailings, MW or 11e(2) by-product material as defined in DOE Order 5820.2A. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as LLW, provided the concentrations of TRU is less than 100 nCi/g.

Mixed Waste: Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the RCRA. MW must meet the LDRs as listed in Title 40 CFR 268.

Nonconformance: A deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate.

Package: The packaging together with its contents; a container (usually a drum or box) of waste in final form for disposal, one or more of which may constitute a shipment.

Packaging: The assembly of components necessary to ensure compliance with DOT, EPA, and DOE/NV requirements. It may consist of one or more receptacles, absorbent materials, radiation shielding, spacing structures, thermal insulation, and devices for cooling or absorbing mechanical shocks. The conveyance, tie-down system, and auxiliary equipment may sometimes be designated as part of the packaging.

Parcel: An individual component, item, or bag of waste, two or more of which may make up a package.

Pyrophoric Material: A material which under normal conditions is liable to cause fires through friction, retain heat from processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create serious transportation, handling, or disposal hazards.

Qualification: The characteristics or abilities gained through education, training, or experience, as measured against established requirements, such as standards or tests, that qualify an individual to perform a required function.

Qualified: Having complied with the specific requirements or precedent conditions.

Quality Assurance: All those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service.

Radioactive Waste: Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended.

Radioactive Waste Management Site: Designated locations where radioactive waste handling, storage, or disposal operations are conducted.

Real-Time Radiography (RTR): X-ray unit used to examine waste packages.

Removable Contamination: Removable radioactive material on the package surface or shipping vehicle.

Supplier: Any individual or organization who furnishes items or services in accordance with a procurement document. An all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, consultant, and their subtier levels.

Tamper-Indicating Devices: Devices that may be used on containers and that, because of their uniqueness in design or structure, reveal violations of containment integrity.

Transuranic Mixed Waste: Waste containing both TRU and hazardous components.

Transuranic Waste: Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92, and half-lives greater than 20 years, in concentrations greater than 100 nCi/g.

Treatment: Any method, technique, or process designed to change the physical or chemical character of waste to render it less hazardous; safer to transport, store, or dispose; or reduce in volume. Five basic treatments are (a) volume reduction, (b) immobilization of radioactive/hazardous components, (c) change of composition, (d) removal of radioactive or hazardous components from the waste, and (e) solidification of liquids.

Uniform Hazardous Waste Manifest: The shipping document EPA Form 8700-22 originated and signed by the generator in accordance with the instructions included in the Appendix to Title 40 CFR 262.

Verification Sampling: A DOE/NV program which confirms the accuracy and precision of a generator's analytical data by obtaining split samples of the waste from the generator, and having them analyzed.

Waste Characterization: Determination of the physical, chemical, or radiological properties of waste.

Waste Stream: A unique form or type that encompasses all aspects of the waste from generation to storage or disposal. The uniqueness of the waste is a result of the waste having come from a similar source with the same (or very similar) physical and chemical characteristics; types and quantities of radionuclides; handling, packaging, and shipping procedures; characterization method and procedures; and certification method and procedures.

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- 1.1 10 CFR 61.56(a)(2)
- 1.2 10 CFR 61.56(a)(5)
- 1.3 10 CFR 61.56(a)(8)

Title 29 - Labor

- 2.1 29 CFR 1910.66(f)(4)(v)
- 2.2 29 CFR 1910.66(f)(4)(ix)
- 2.3 29 CFR 1910.178(o)(2)

Title 40 - Protection of Environment

- 3.1 40 CFR 61.140 - .157
- 3.2 40 CFR 260.11(a)
- 3.3 40 CFR 261
- 3.4 40 CFR 261.1(a)
- 3.5 40 CFR 261.33(a)
- 3.6 40 CFR 262.20(a)
- 3.7 40 CFR 262.31
- 3.8 40 CFR 262.32
- 3.9 40 CFR 262.32(b)
- 3.10 40 CFR 264.170 - .179
- 3.11 40 CFR 264.314(d)
- 3.12 40 CFR 265.177
- 3.13 40 CFR 268
- 3.14 40 CFR 268.7(a)(7)
- 3.15 40 CFR 268.7(a)(1),(2), and (3)
- 3.16 40 CFR 261.60 - .79

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- 4.2 49 CFR 172 Subparts D (172.300 - .338) and E (172.400 - .450)
- 4.3 49 CFR 172.310
- 4.4 49 CFR 172.403
- 4.5 49 CFR 173.2a(c)(5)
- 4.6 49 CFR 173.24
- 4.7 49 CFR 173.115(b)(1)
- 4.8 49 CFR 173.410(g)
- 4.9 49 CFR 173.423
- 4.10 49 CFR 173.425(b)(3)
- 4.11 49 CFR 173.427
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- 5.2 NAC 444.965 - .976
- 5.3 NAC 444.971(1)
- 5.4 NAC 444.971(2)

5.5 NAC 444.8565(2)(c)

5.6 NAC 444.8632

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6.1 420.1 4.3.2

6.2 420.1 4.3.3

DOE Order 5633.3B, "Control and Accountability of Nuclear Materials"

6.3 5633.3B II.5.a(2)

6.4 5633.3B II.7.b(2)(c)(1)

DOE Order 5820.2A, "Radioactive Waste Management"

6.5 5820.2A 5

6.6 5820.2A Attachment 2, 39

6.7 5820.2A II.3.a(2)

6.8 5820.2A II.3.a(3)

6.9 5820.2A III.3.d(1)

6.10 5820.2A III.3.d(2)

6.11 5820.2A III.3.d(2)(b)

6.12 5820.2A III.3.d(2)(d)

6.13 5820.2A III.3.e(2)

6.14 5820.2A III.3.e(3)

6.15 5820.2A III.3.e(5)(a)

6.16 5820.2A III.3.e(5)(e)

6.17 5820.2A III.3.e(5)(f)

6.18 5820.2A III.3.e(5)(g)

6.19 5820.2A III.3.f(2)

6.20 5820.2A III.3.g(3)

6.21 5820.2A III.3.i(5)(a)

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7.2 Memo for the Record from Wendy A. Griffin, 7-10-95, "Acceptance of the Lawrence Livermore National Laboratory, Livermore, California, Position Paper on Depleted Uranium Turnings." (Pyrophoric Position Paper)

7.3 Memo to Distribution from Wycoff, 08-07-96, "DOE/NV Position on Characterization and Disposal of Sealed Radioactive Sources."

7.4 Memo 9109-35 to Carol A. Shelton from Steve Okosisi, 11-21-95, "Request for Evaluation of NVO-325 Criteria to Ensure Safe and Compliant Radioactive Waste Disposal Operations."

7.5 DOE/NV RWAP Policy, Memorandum for the Record, "Approval of DOE Nevada Operations Office Positions for Criteria in the Nevada Test Site Waste Acceptance Criteria", September 20, 1996

- 7.6 DOE/NV Operations Policy, Memorandum for the Record, "Approval of DOE Nevada Operations Office Positions for Criteria in the Nevada Test Site Waste Acceptance Criteria", September 20, 1996
- 7.7 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, Chapter 1, Section 1.0
- 7.8 Low-Level Waste Licensing Branch, Technical Position on Radioactive Waste Classification, May 1983, Revision 0, Section C.1.c
- 7.9 DOE/NV Performance Assessment Policy, Memorandum for the Record, "Approval of DOE Nevada Operations Office Positions for Criteria in the Nevada Test Site Waste Acceptance Criteria", September 20, 1996
- 7.10 USEPA "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes" PB94-463603, OSWER 9938.4-03, April 1994, Section 1.5.2

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- 8.1a 1S-1.2.1(b)
- 8.2 NQA-1, Basic and Supplementary Requirements #2
- 8.2a 2S-3.1
- 8.3 NQA-1, Basic and Supplementary Requirements #3
- 8.3a 3S-1.2
- 8.3b 3S-1.3
- 8.3c 3S-1.3.1
- 8.3d 3S-1.3.1.a
- 8.3e 3S-1.4
- 8.3f 3S-1.5
- 8.3g 3S-1.6
- 8.4 NQA-1, Basic and Supplementary Requirements #4
- 8.4a 4S-1.2.2
- 8.4b 4S-1.2.3
- 8.4c 4S-1.2.5
- 8.4d 4S-1.3
- 8.4e 4S-1.4
- 8.5 NQA-1, Basic Requirement #5
- 8.6 NQA-1, Basic and Supplementary Requirements #6
- 8.6a 6S-1.2
- 8.6b 6S-1.3.1
- 8.7 NQA-1, Basic and Supplementary Requirements #7
- 8.7a 7S-1.3.1
- 8.7b 7S-1.5
- 8.7c 7S-1.5.1
- 8.7d 7S-1.8.2.3
- 8.8 NQA-1, Basic and Supplementary Requirements #8
- 8.8a 8S-1.2.3
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- 8.9 NQA-1, Basic and Supplementary Requirements #9
- 8.9a 9S-1.2

- 8.9b 9S-1.3
- 8.9c 9S-1.3.1.1
- 8.9d 9S-1.3.2
- 8.10 NQA-1, Basic and Supplementary Requirements #10
- 8.10a 10S-1.2
- 8.10b 10S-1.5.2
- 8.10c 10S-1.6.1
- 8.10d 10S-1.7.1
- 8.10e 10S-1.7.4
- 8.10f 10S-1.9
- 8.11 NQA-1, Basic and Supplementary Requirements #11
- 8.11a 11S-1.2
- 8.11b 11S-1.3
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- 8.11d 11S-1.5
- 8.11e 11S-2.2.1
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- 8.12 NQA-1, Basic and Supplementary Requirements #12
- 8.12a 12S-1.2
- 8.12b 12S-1.3.1
- 8.12c 12S-1.3.2
- 8.12d 12S-1.4
- 8.12e 12S-1.5
- 8.13 NQA-1, Basic Requirement #13
- 8.14 NQA-1, Basic Requirement #14
- 8.15 NQA-1, Basic and Supplementary Requirements #15
- 8.15a 15S-1.2(a)
- 8.15b 15S-1.4.1
- 8.15c 15S-1.4.2
- 8.15d 15S-1.4.4
- 8.16 NQA-1, Basic Requirement #16
- 8.17 NQA-1, Basic and Supplementary Requirements #17
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- 8.18d 18S-1.3.3
- 8.18e 18S-1.4
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