

**WASTE ACCEPTANCE PLAN**

**FOR**

**LOW-LEVEL RADIOACTIVE WASTE  
DISPOSAL FACILITIES**

**WASTE CONTROL SPECIALISTS, LLC**

**ANDREWS, TEXAS FACILITY**

## TABLE OF CONTENTS

Section Title	Page
1.0 INTRODUCTION .....	5
2.0 WASTE CHARACTERISTICS AND WASTE FORM REQUIREMENTS .....	6
2.1 Radiological Parameters .....	6
2.2 Gases .....	7
2.3 Free Liquids .....	7
2.3.1 CWF .....	7
2.3.2 FWF .....	8
2.4 Hazardous Waste Regulated under RCRA Subtitle C .....	8
2.4.1 CWF .....	9
2.4.2 FWF .....	9
2.5 Other Restricted Hazards .....	9
2.6 Packaging Criteria .....	10
2.7 Waste Form and Stability Requirements .....	10
2.8 Other Performance Requirements .....	11
2.9 License Conditions .....	12
2.10 ALARA Information .....	12
3.0 CATEGORIES OF WASTE FOR RECEIPT VERIFICATION .....	12
3.1 Bulk Soil/Soil-Like Waste .....	13
3.2 Bulk Debris .....	13
3.3 Containerized Soil-Like Waste .....	14
3.4 Containerized Debris .....	14
3.5 High Container Dose Rate Waste .....	14
3.6 Cask Wastes .....	15
3.7 Exceptions to Intrusive Sampling and/or Inspection .....	15
4.0 GENERATOR AND WASTE APPROVAL PROCESS .....	16
4.1 Generator Certification .....	16
4.1.1 Requirements for All Generators .....	17
4.1.2 Required Generator Audits .....	18
4.2 Profile Approval .....	19
4.2.1 Waste Profile Form .....	20
4.2.2 Profile Review .....	21
4.2.3 Pre-Shipment Sample .....	23
4.2.4 Final Profile Review .....	24
5.0 WASTE RECEIPT .....	25
5.1 Pre-Shipment Review .....	25
5.2 Shipment Inspection, Surveying and Compliance Reviews .....	25
5.3 Additional Waste Verification .....	26
5.3.1 Analytical and External Assay Procedures .....	27
5.3.2 Bulk Soil/Soil-like Waste .....	29
5.3.3 Bulk Debris .....	29
5.3.4 Containerized Soil/Soil-like Waste .....	30
5.3.5 Containerized Debris .....	30

5.3.6	High Contact Dose Rate Wastes .....	30
5.3.7	Cask Wastes .....	30
6.0	DISCREPANCY RESOLUTION.....	30

## LIST OF TABLES

<b>Table Title</b>	<b>Page</b>
TABLE 1 WASTE DISPOSITION REQUIREMENTS FOR STABILITY .....	11

## 1.0 INTRODUCTION

Waste Control Specialists, LLC (WCS) is authorized by the Texas Commission on Environmental Quality (TCEQ) to operate a near-surface land disposal facility for Low Level Radioactive Waste (LLRW) and Low Level Mixed Waste (LLMW). As these terms are used herein, LLRW is all waste that meets the definition of “*low-level radioactive waste*” in 30 TAC 336.2(76) other than LLMW, and LLMW is waste that is a combination of both hazardous waste and LLRW, consistent with the definition of “*mixed waste*” in 30 TAC 336.2(80). This Waste Acceptance Plan (WAP) presents the approach employed by WCS for obtaining, reviewing, and verifying waste information so that LLRW and LLMW are managed safely and in compliance with applicable regulations and license conditions.

Separate disposal units for Commercial and Federal waste will be constructed, operated, and closed consistent with TCEQ requirements. The Commercial Waste Facility (CWF) accepts commercial radioactive materials in accordance with the Texas Compact rules and regulations, and will not accept LLMW. The Federal Waste Facility (FWF) accepts radioactive materials from government facilities and actions, and can accept a combination of wastes that are LLRW and LLMW. Each disposal facility has separate entrance gates and perimeter control fencing. The FWF includes two separate units: the FWF Non-Canister Disposal Unit (FWF-NCDU) and the FWF Canister Disposal Unit (FWF-CDU). The FWF and CWF are referred to collectively as the “LLRW disposal facilities”.

LLRW and LLMW is classified by federal and state low level waste regulations as Class A, Class B or Class C based on the activity and half-lives of various radioisotopes. The FWF-CDU and the CWF will receive containerized Class A, Class B, and Class C waste. With the exception of large components, the waste containers will be placed inside round or rectangular canisters within these disposal units. Each canister will be filled with a flowable concrete grout to eliminate internal void spaces, and void spaces between the canisters will be back filled with granular fill to eliminate spaces between canisters. Large components that will not fit into concrete canisters will be stabilized by the generator (i.e., voids will be filled with grout) prior to transport. WCS proposes to receive low activity Class A bulk waste that represents stable waste forms at the FWF-NCDU. Currently, bulk waste physically consists of soil as defined in this document. Bulk waste does not contain compactable trash such as PPE, rags, plastic, or other non-stable waste forms.

This WAP, in conjunction with Standard Operating Procedures (SOPs), establishes the steps by which WCS obtains and verifies waste information prior to contracting to receive a waste for disposal, confirms the suitability of each waste shipment before it is released by the generator for transport to WCS, and evaluates each shipment of waste arriving at the facilities for conformance with regulatory and operational acceptance criteria for the designated disposal unit. Implementation of the WAP and SOP’s ensures that sufficient information is known for each candidate waste to:

1. determine its acceptability for disposal at the CWF, the FWF-NCDU or the FWF-CDU in accordance with applicable State and Federal regulations and operational constraints associated with each disposal unit;

2. identify safe handling procedures that maintain worker radiological exposures to As Low As Reasonably Achievable (ALARA) criteria; and
3. ensure that each disposal unit receives only those wastes that are authorized to be disposed in that unit

Wastes that do not meet regulatory, license, and LLRW facilities requirements are not accepted for disposal. Generators who ship wastes to the LLRW facilities that do not meet regulatory requirements will be barred from shipping additional wastes to the LLRW facilities until they have been reinstated in accordance with this WAP.

## **2.0 WASTE CHARACTERISTICS AND WASTE FORM REQUIREMENTS**

In accordance with 30 TAC 336.362, WCS requires that LLRW meet certain waste characteristic and waste form criteria as discussed in Sections 2.1 through 2.9 below. Information is typically developed and reported by the waste generator as necessary to satisfy these criteria, as discussed in Section 4.2.1 of this WAP. This information is reviewed and confirmed by WCS to the extent necessary for verification of appropriate LLRW classification/characterization and hazardous waste determinations, as discussed in Sections 4.2.2 through 4.2.4 of the WAP. In the event that the generator does not provide all information necessary to satisfy the waste characteristic and form criteria identified below, WCS may elect to develop the missing information; otherwise, WCS will refuse to accept the waste.

### **2.1 Radiological Parameters**

LLRW and LLMW must be classified as Class A, B, or C waste; therefore, the presence and activity concentrations of the following radionuclides must be known:

C-14	Cs-137	Ni-59 in activated metal
Ra-226	Tc-99	Nb-94 in activated metal
Pu-241	Cm-242	Ni-63 in activated metal
I-129	H-3	C-14 in activated metal
Ni-63	Sr-90	Co-60
Alpha-emitting transuranics with half lives greater than 5 years		
Total of all radionuclides with less than a 5-year half life		

Activity concentrations must be known with sufficient precision to classify the waste according to the limits and ranges specified in Tables I and II of 30 TAC 336.362(a)(3)(D) and 30 TAC 336.362(a)(4)(E). Waste generators may obtain activity concentrations from a) direct measurement; b) from calculations using measured values as input; and/or c) from process knowledge that has measured values as a basis. Measurements must be made using properly calibrated industry standard equipment and using industry accepted methods. Waste classification should conform with applicable NRC guidance (May 1983 Branch Technical Position (BTP) on Radioactive Waste Classification, as modified by the January 1995 BTP on Concentration Averaging and Encapsulation).

The FWF-NCDU will only accept *low-radiation hazard Class A wastes* (Class A wastes with a dose less than 0.1 rem in one hour at a distance of 30 centimeters) that also meet the additional criteria found in Section 3.1 of this document. The FWF-CDU and the CWF will accept Class A, B and C wastes.

## **2.2 Gases**

LLRW and LLMW with radionuclides in gaseous form must be packaged such that the absolute pressure does not exceed 1.5 atmospheres at 20 degrees Celsius and total activity does not exceed 100 curies per container. Gaseous wastes will not be accepted in the FWF-NCDU.

## **2.3 Free Liquids**

LLRW is subject to restrictions on the amount of free liquids and free-standing liquids that may be present in the waste, with these restrictions varying according to the disposal unit into which the wastes will be placed. *Free liquids*, as this term is used in this WAP, is defined as those liquids that readily separate from a solid waste matrix under ambient temperature and pressure as qualitatively determined using the Paint Filter Test, EPA Method 9095B, consistent with the definition applicable to hazardous waste. *Free-standing liquids* are liquids that are present as a separate layer on the surface of a waste. Restrictions on free liquids differ for each of the disposal units, and in the FWF, restrictions on free liquids also differ for LLRW and LLMW. In all cases, free liquids that are present in a waste as-generated must be physically removed and/or treated as necessary to meet the restrictions applicable to the particular waste and its intended disposal unit.

There are two general types of processes that may be used to treat free liquids for compliance with this WAP, depending on whether the waste is LLRW, bulk LLMW, or containerized LLMW. These treatment processes are identified in this WAP as *solidification by absorption* and *solidification by stabilization*. *Solidification by absorption* is defined in this WAP as a process that involves physical absorption, where the liquid is drawn into the pores of a permeable solid, but does not include chemical binding processes. Solidification by absorption, as used herein, is typically termed “absorption” in the regulations and guidance applicable to low-level radioactive waste and “solidification” in the regulations and guidance applicable to hazardous waste. *Solidification by stabilization* is defined in this WAP as a process that includes a chemical reaction that binds liquids to the solid matrix (i.e., it is not a solely physical process). Solidification by stabilization, as used herein, is typically termed “solidification” in the regulations and guidance applicable to low-level radioactive waste and “stabilization” in the regulations and guidance applicable to hazardous waste.

### **2.3.1 CWF**

LLRW destined for disposal in the CWF must contain as little free-standing and non-corrosive liquid as possible. WCS will not accept LLRW for disposal in the CWF that has in excess of 1% by volume free-standing liquid in a waste container. If a waste does not meet this criteria in its as-generated form, the liquids must be solidified by stabilization, or the waste must be packaged in a quantity of non-biodegradable absorbent material that is sufficient to absorb twice the quantity of free-standing liquids, prior to shipment to the WCS LLRW facilities.

### **2.3.2 FWF**

The free liquid requirements identified below for the FWF-NCDU and the FWF-CDU have been established to ensure compliance with the low level radioactive waste disposal requirements at 30 TAC 336.362.(b)(1)(C) and (D) and the hazardous waste disposal requirements at 30 TAC 335.175 and 264.316 (adopted by reference at 30 TAC 335.152(a)(12)).

LLMW intended for disposal in the FWF-NCDU that contains free liquids at the point of generation must be solidified by stabilization prior to shipment to WCS. LLRW that is intended for disposal in the FWF-NCDU that contains free liquids at the point of generation must be solidified by absorption *or* solidified by stabilization prior to shipment to WCS. All bulk waste to be disposed in the FWF-NCDU must not contain any free-standing liquids or any free liquids as measured by EPA's Paint Filter Test.

LLMW intended for disposal in the FWF-CDU that contains free liquids at the point of generation must also be solidified by stabilization prior to shipment to WCS, and LLRW that is intended for disposal in the FWF-CDU that contains free liquids at the point of generation must be solidified by absorption *or* solidified by stabilization prior to shipment to WCS, unless one or more of the following conditions apply to the LLMW or LLRW containers:

1. the container is designed to hold free liquids for use other than storage, such as a battery or capacitor, and the quantity of free liquids is no greater than 1% by volume;
2. the container is an overpacked drum, or lab pack, meeting the requirements of 40 CFR 264.316, except that the inside containers must be surrounded by a nonbiodegradable absorbent material that is sufficient to absorb twice the quantity of the liquid contents of the inside containers.

## **2.4 Hazardous Waste Regulated under RCRA Subtitle C**

Waste that is hazardous waste as defined by 40 CFR Part 261 and regulated under RCRA Subtitle C consists of wastes that are specifically listed as hazardous waste (listed hazardous wastes) and wastes that are hazardous because they exhibit one or more hazardous waste characteristics (characteristically hazardous wastes). A waste is a characteristically hazardous waste if it exhibits one or more of the following hazardous characteristics:

1. Ignitability, as defined at 40 CFR 261.21,
2. Corrosivity, as defined at 40 CFR 261.22,
3. Reactivity, as defined at 40 CFR 261.23, or
4. Toxicity, as defined at 40 CFR 261.24.

A waste that exhibits a hazardous characteristic and is also listed as a hazardous waste is both a listed and characteristically hazardous waste.

Wastes that are classified as hazardous wastes solely due to exhibiting a hazardous characteristic are no longer hazardous wastes after the hazardous characteristic has been removed. However, under RCRA hazardous waste regulations, listed hazardous wastes continue to meet the definition of hazardous waste when disposed. All wastes that are hazardous at the point of generation must be treated or must otherwise meet the applicable Land Disposal Restrictions (LDRs) established in 40 CFR Part 268 prior to disposal at the WCS LLRW facilities.

### **2.4.1 CWF**

The CWF will not receive any wastes that are regulated as hazardous waste as shipped. Wastes that are hazardous at the point of generation solely due to exhibiting a hazardous characteristic can be disposed at the CWF, as long as the hazardous characteristic(s) have been removed and any underlying hazardous constituents that are restricted from land disposal under 40 CFR Part 268 have been treated to meet or otherwise can be demonstrated to meet the applicable LDRs established in 40 CFR Part 268.

The generator is required to provide full documentation that demonstrates that: (1) the waste has been properly characterized according to 40 CFR Part 262 requirements; (2) the waste to be shipped to the WCS CWF is not a hazardous waste, and (3) the waste, if only characteristically hazardous at the point of generation, has been treated to meet the of 40 CFR Part 268 LDRs. All waste that is only characteristically hazardous at the point of generation and sent for disposal at CWF as non-hazardous waste must be accompanied by a certification from the generator or treatment facility that the waste complies with the applicable LDRs of 40 CFR Part 268.

### **2.4.2 FWF**

The FWF will accept LLMW including listed hazardous waste and characteristically hazardous waste at the point of generation. Waste that is hazardous at the point of generation may be disposed in the FWF if the waste has been treated to remove any hazardous characteristic(s) and if the waste has been treated or otherwise meets any additional treatment standards that apply under the 40 CFR Part 268 LDRs. Any waste treatment required prior to land disposal must be completed before the waste is shipped to WCS under this license. All LLMW sent for disposal at the FWF must be accompanied by a certification from the generator or treatment facility that the waste complies with the applicable LDRs of 40 CFR Part 268.

In accordance with 30 TAC 335.175, additional restrictions on the disposal of liquids apply to both the LLMW and the LLRW to be disposed in the FWF-NCDU and the FWF-CDU. These restrictions on free liquids have been incorporated into the free liquid requirements identified above in Section 2.3.2.

## **2.5 Other Restricted Hazards**

In addition to the restrictions on hazardous waste identified in Section 2.4 above, 30 TAC 336.363(b)(1) establishes specific restrictions on non-radiological hazards associated with LLRW and LLMW to be disposed. WCS will not accept a waste for disposal in the CWF or FWF that contains hazardous, biological, pathogenic or infectious materials, unless the waste has first been treated to reduce the potential hazard from the non-radiological materials prior to receipt.

Pyrophoric wastes, which would also be characteristically hazardous due to ignitability and reactivity, will not be accepted, and pyrophoric materials contained in waste must be treated, prepared and packaged to be non-ignitable (e.g., non-flammable) and non-reactive. Wastes must not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water (such wastes would also be characteristically hazardous due to reactivity). In addition, wastes must not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste (which would include cyanide and sulfide-reactive hazardous



waste); however, this prohibition does not apply to radioactive gaseous waste packaged as described in Section 2.2 above.

## **2.6 Packaging Criteria**

Waste must be packaged in conformance with license conditions and applicable DOT regulations. Waste cannot be packaged for disposal in cardboard or fiberboard boxes. However, wastes may be shipped to WCS in cardboard or fiberboard boxes if allowed under applicable DOT regulations. Wastes that are received in cardboard or fiberboard boxes will be placed within reinforced modular concrete canisters at the WCS LLRW facilities prior to disposal.

## **2.7 Waste Form and Stability Requirements**

In accordance with 30 TAC 336.362(b)(2)(A), Class B and C waste must exhibit sufficient structural stability prior to disposal to ensure that the waste does not degrade and allow the overall stability of the disposal unit to be compromised through slumping, collapse, or other failure that could lead to water infiltration. A structurally stable waste form will generally maintain its physical dimensions and its form, under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, and microbial activity and internal factors such as radiation effects and chemical changes, consistent with NRC guidance in *Waste Form Technical Position, Revision 1* (WFTP). Structural stability can be provided by the waste form itself, by processing the waste to a stable form prior to acceptance at the WCS facilities, or by placing the waste in a disposal container or structure that provides stability after disposal. Compliance with the free liquids limitations identified in 30 TAC 336.362(b)(2)(B) is addressed in Section 2.3, above. Void spaces within the waste and between the waste and its package must be reduced to the extent practicable, in accordance with 30 TAC 336.362(b)(2)(C); in addition, the maximum void space within any waste container shall not exceed 7.5% based on engineering analyses performed to support the design of the FWF-CDU and the CWF.

For low-radiation hazard Class A waste (dose is less than 0.1 rem in one hour at a distance of 30 centimeters) that is disposed of in the FWF NCDU, the stability requirements of 30 TAC §336.362(b)(2)(A) and the NRC guidance contained in the WFTP do not apply. However, pursuant to 30 TAC 336.733(b), the subcategory of Class A waste that contains radionuclides with half-lives greater than 35 years including depleted uranium and waste consisting of transuranic radionuclides in concentrations less than 10 nanocuries/gram (nCi/g) is required to meet the stability requirements of 30 TAC §336.362(b)(2)(A) unless an alternative criteria is approved by TCEQ. All low-radiation hazard Class A wastes that meet these specific bulk waste stability requirements are designated in this WAP as Class A and will be verified through the profile approval process delineated in Section 4.2 of the WAP, including preshipment sample analyses of bulk soil/soil-like waste (see WAP Section 4.2.3), and through the additional waste verification procedure for incoming shipments of bulk wastes (see WAP Section 5.3). Verification of the adequacy of bulk waste placement is not within the scope of this WAP, but is addressed in LL-OP-7.1, "Non-Canister Soil Placement". All low-radiation hazard Class A wastes that do not meet the specific bulk waste stability requirements and all Class A wastes that do not qualify as low-hazard Class A wastes are designated in this WAP as Containerized Class A). Currently, Class A waste that contains radionuclides with half-lives greater than 35 years including depleted uranium and waste consisting of transuranic radionuclides in concentrations

less than 10 nanocuries/gram (nCi/g) must be handled as Containerized Class A. The waste disposition requirements that must be met for stability of Class A, Containerized Class A, B, and C waste to be disposed in the LLRW facilities are summarized in Table 1.

**TABLE 1**  
**WASTE DISPOSITION REQUIREMENTS FOR STABILITY**

Waste Class	Waste Type	Disposition Requirements
C	All	In Reinforced Modular Concrete Canisters (MCC)
B	All	In MCC
Containerized Class A	High-Radiation Hazard Class A Waste (wastes that would produce a dose of 0.1 rem/hr or more at a distance of 30 centimeters (cm))	In MCC
	Unstable Soil or Soil-like Waste (soil/soil-like wastes that do not meet the stability requirements of WAP Section 3.1)	In MCC
	Debris <sup>1</sup> including monoliths; lab wastes; biodegradable, compactible and/or compressible materials such as paper, plastic, cloth, trash, and wood; intact tanks, pressure vessels, and other large components	In MCC <sup>2</sup>
Class A	Soil or Soil-like Waste Meeting Bulk Waste Placement Criteria (see WAP Section 3.1) that would produce a dose of less than 0.1 rem/hr at a distance of 30 cm	As Bulk Waste

<sup>1)</sup> In the context of this waste acceptance plan, *debris* is comprised of typical debris and monoliths. *Typical debris* is solid material exceeding a 60 mm (2.4 in.) particle size that is intended for disposal and that is a manufactured object; plant or animal matter; or natural geologic material (e.g., rubble, lead bricks and shielding, wood, concrete, metal, personal protective equipment (PPE), lab wastes, and trash), consistent with the RCRA definition that is applicable to LLMW. *Monoliths* consist of solid concrete-like forms generated by stabilization of waste to reduce physical, chemical and/or radiological hazards.

<sup>2)</sup> Large components that will not fit into MCC's (e.g., steam generators, reactor vessels, reactor primary system components) will comprise their own high-strength steel "canisters". Large components will be evaluated on a case-by-case basis, and will require extensive pre planning. If they are hollow forms, like tanks or vessels, they must be backfilled with sand, waste, or grout to ensure voids are filled prior to final disposal.

## 2.8 Other Performance Requirements

The presence of chelating agents in the wastes is a factor that must be considered in conducting the required performance assessment for near-surface disposal of low-level radioactive waste, in accordance with 30 TAC 336.707(5). Chelating agents are used in decontamination processes to form chemical complexes that allow the removal of built-up radionuclides and corrosion products from the cooling systems of nuclear power plants using cation- or anion-exchange resins. These decontamination resins comprise the primary LLRW containing chelating agents and are anticipated to be generated by commercial generators within the Texas Compact, as discussed in Appendix 8.0-1, "Commercial Facility Inventory". Chelating agents have also been

identified as potential components in a few of the federal facility waste streams, discussed in Appendix 8.0-2, "Federal Facility Inventory".

The concern with the presence of chelating agents is the potential for formation of radionuclide-chelate complexes that could enhance radionuclide migration in soil, thereby increasing potential dose. Accordingly, WCS has established a maximum allowable limit on the weight percent of chelating agents that can be disposed within each disposal unit to minimize the potential for enhanced radionuclide migration. This limit, 8% by weight of the total waste mass in each disposal unit, will be met by maintaining running totals on the weight of wastes disposed and the weight of chelating agent disposed in each disposal unit. The generator is required to provide WCS with detailed documentation that establishes a conservative upper bound for the typical concentration of chelating agents in the each of the generator's waste streams, or documentation that clearly demonstrates the lack of chelating agents in each of the generator's waste streams.

## **2.9 License Conditions**

The criteria listed in Sections 2.1 through 2.8 above have been developed to ensure compliance with the requirements of the applicable regulations and conformance with appropriate guidance. If additional requirements are imposed by the license as issued, this section will be modified accordingly.

## **2.10 ALARA Information**

To identify safe handling procedures that maintain worker radiological exposures to ALARA criteria, the following parameters must be known:

- Gamma and neutron radiation fields
- Alpha and beta contamination levels
- Package configuration
- Isotopic concentrations

This information will be used by the Radiation Safety Officer (RSO) to determine if an existing Radioactive Work Permit (RWP) provides appropriate time, distance, and shielding provisions that minimize operating personnel exposure and, if not, to develop an appropriate RWP in accordance with LL-RS-1, "Radiation Work Permit". This information is also used as necessary to perform specific ALARA reviews in accordance with LL-RS-21, "ALARA Exposure Data Review".

## **3.0 CATEGORIES OF WASTE FOR RECEIPT VERIFICATION**

WCS has identified six categories of waste streams for the purpose of verifying that waste acceptance criteria have been met by incoming waste received for disposal. All incoming waste shipments are subject to verification by WCS consisting at a minimum of advance DOT paperwork review prior to authorizing each waste shipment (see Section 5.1 of the WAP) and incoming shipment inspection, surveying and compliance reviews upon arrival at the facility (see Section 5.2 of the WAP). Additional characteristic and classification verification procedures have been established for all of the six waste categories as discussed in Section 5.3 of the WAP.

The six waste categories have been identified based upon the ability to obtain representative waste samples, ALARA considerations, and other personnel protection concerns. As described for each of the waste categories in Sections 3.1 through 3.6 below, the additional characteristic and classification verification approach will use a combination of intrusive inspections, intrusive sampling, and external verification techniques. *Intrusive inspections* involve opening waste packages (or the shipping container where there is no internal waste packaging) and visually inspecting the actual waste material. *Intrusive sampling* involves collection of physical samples of the incoming waste materials in appropriate sample containers for *ex situ* analyses. In general, intrusive inspections will be conducted where this activity does not violate ALARA principles or otherwise represent an unacceptable health risk to inspection personnel as delineated in Section 3.7 below, and intrusive sampling will be conducted of intrusively inspected wastes that are sufficiently homogenous in physical form to allow collection of a representative sample using conventional methods. External verification methods will be used for wastes that will not be subject to intrusive sampling and/or intrusive inspection.

Waste acceptance criteria that are specific to bulk waste disposal and apply in addition to the acceptance criteria identified in WAP Section 2 are also identified in Sections 3.1 and 3.2, following.

### **3.1 Bulk Soil/Soil-Like Waste**

This waste category consists of low-radiation hazard Class A wastes composed predominantly of soil and soil-like materials that meet the bulk waste stability requirements identified below and are shipped in bulk containers such as intermodals, rollofs, and supersacks. These wastes will be accepted for disposal in bulk form in the FWF-NCDU if the following bulk waste stability requirements are met:

- The Waste meets the definition of Class A as defined in Section 2.7 above;
- The soil/soil-like waste meets the classification as a Group A-1-A through A-4 soil in accordance with ASTM D-3282/AASHTO M145;
- The average, in-place organic content does not exceed 5% based on visual observation and the average, as-received organic content of any individual waste shipment does not exceed 10% by visual observations or by testing using ASTM D-2974/AASHTO T267, as necessary.
- No debris is present in any waste shipment other than incidental items (no more than 1% based on visual observation).

Bulk Soil/Soil-Like (BS) wastes are comprised of a relatively homogeneous physical form that is amenable to collection of representative samples. These wastes typically exhibit a dose rate much less than 0.1 rem in one hour at a distance of 30 centimeters (cm); current waste data indicates the dose rate for these wastes is on the order of 0.002 to 0.005 rem/hr at 30 cm. Based on the relatively low hazard represented by these wastes and their relatively homogeneous form, they will be subject to intrusive inspection and sampling as delineated in WAP Section 5.3.

### **3.2 Bulk Debris**

Debris must be disposed in canisters.

### **3.3 Containerized Soil-Like Waste**

This category consists of wastes composed predominantly of soil and soil-like materials shipped in smaller containers such as B-25 boxes and 55-gallon drums, where at least 10% of the containers of each waste stream (defined in Sections 4.2 and 7.0 of the WAP) have a dose rate of less than 0.1 rem/hr at a distance of 30 cm. Containerized Soil-Like (CS) wastes will be received for disposal in the FWF-CDU and the CWF. These wastes are relatively homogeneous in physical form and amenable to collection of representative samples.

CS wastes, other than the exceptions identified below in Section 3.7, will be subject to intrusive inspection and sampling as delineated in WAP Section 5.3, given their relatively low hazard and relatively homogeneous physical form. Packages of CS wastes that are excepted from intrusive inspection and sampling will be managed in the same manner as high container dose rate wastes (see Section 3.5 of the WAP).

### **3.4 Containerized Debris**

This category consists of wastes composed predominantly of typical debris and monoliths, defined in Section 2.7 (Table 1, footnote 1) and Section 7.0 of this WAP, that is shipped in smaller containers such as B-25 boxes and 55-gallon drums, where at least 10% of the containers of each waste stream (defined in Sections 4.2 and 7.0 of the WAP) have a dose rate of less than 0.1 rem/hr at a distance of 30 cm. All Containerized Debris (CD) wastes may be accepted for receipt in the FWF-CDU or the CWF, since the debris must be placed within MCC's for disposal. Containers holding a mixture of typical debris and other material is managed as debris if the mixture is comprised primarily (50% or greater) of typical debris, by volume, based on visual inspection. Shielded containers are not included in this waste category. As noted above in Section 3.2, debris is not amenable to the collection of representative samples due to its physical nature.

CD wastes, other than the exceptions identified below in Section 3.7, will be intrusively inspected and subject to external assay procedures as delineated in WAP Section 5.3, given their relatively low hazard and the fact that collection of representative samples of these wastes is not practicable. Packages of CD wastes that are excepted from intrusive inspection will be managed in the same manner as high container dose rate wastes (see WAP Section 3.5).

### **3.5 High Container Dose Rate Waste**

This waste category consists of all unshielded, containerized wastes, where 90% or more of the containers of each waste stream (defined in Sections 4.2 and 7.0 of the WAP) have a dose rate between 0.1 rem/hr at a distance of 30 cm and 1 rem/hr at the surface of the container. High container dose rate (HCD) wastes will be shipped in containers such as B-25 boxes, 55-gallon drums, and high integrity containers. Decontamination resins, which are the most likely wastes to contain chelating agents as discussed in Section 2.8, are anticipated to fall within the HCD waste category or the cask waste category described in Section 3.6 below, based on the waste inventories in Appendices 8.0-1 and 8.0-2. Containerized wastes that would otherwise fall into the CS or CD categories but will not be opened due to specific health and safety issues as noted in Sections 3.3 and 3.4 above will be managed in the same manner as HCD wastes.

Containers with HCD wastes and containers managed as HCD wastes will not be opened at the WCS facilities for intrusive inspection or sampling due to ALARA and/or other health and safety

considerations, but will be inspected and verified via external assay procedures as delineated in WAP Section 5.3.

### **3.6 Cask Wastes**

This waste category consists of all shielded, containerized wastes. Dose rates will typically be greater than 1 rem/hr at the surface of the unshielded containers, but includes any waste required to be shipped in Type A or Type B DOT cask. As noted in Section 3.5 above, decontamination resins, which are the most likely wastes to contain chelating agents as discussed in Section 2.8, are anticipated to fall within the HCD waste category or the cask waste category, based on the waste inventories in Appendices 8.0-1 and 8.0-2.

Due to ALARA considerations, these containers will not be opened at the WCS facilities for intrusive inspection or sampling and will not be removed from their shielding until they have been moved into the designated disposal unit. However, the results of the radiological surveys of the incoming shielded containers will be evaluated for waste verification as delineated in WAP Section 5.3.

### **3.7 Exceptions to Intrusive Sampling and/or Inspection**

The following wastes will be identified during the waste profile review (see WAP Section 4.2) and will be excluded from intrusive sampling or inspection due to health and safety concerns:

- containers with wastes that could release radon or tritium gas upon opening;
- containers with wastes that could release fine, dispersible radioactive particulates (e.g., ash) upon opening;
- containers with biohazard wastes (biohazard wastes are required to be treated prior to shipment to the LLRW facilities as noted in WAP Section 2.5);
- containers holding wastes with sharps from any source (i.e., including sharps that are not biohazard waste); and
- any other containerized waste as may be authorized by the TCEQ.

## **4.0 GENERATOR AND WASTE APPROVAL PROCESS**

In order to be eligible to ship waste to either the CWF or the FWF, each generator shall be certified by WCS and issued a generator identification number as discussed in Section 4.1, following. In addition, no waste stream from a certified generator will be authorized for receipt unless an approved waste profile is in place for that waste, as discussed below in Section 4.2.

### **4.1 Generator Certification**

All generators are required to submit a generator certification package as described in Section 4.1.1, following, and in accordance with LL-OP-2.2, “Generator Certification”. Each generator certification package may be accompanied by multiple waste profiles, one for each waste stream the generator proposes to ship to WCS, but must be accompanied by at least one waste profile (see Section 4.2 below for the definition of a waste stream). An on-site audit is also required as described in Section 4.1.2, below, of all generators who intend to ship cask waste, HCD waste, and/or waste that is managed as HCD waste to the LLRW facilities, since these wastes are not subject to intrusive sampling and/or inspection upon receipt. Certified generators will be issued a generator identification number that must be re-issued through the generator certification process on an annual basis. Only generators with an approved generator identification number will be authorized to ship wastes to the CWF or the FWF.

Generators who ship wastes to either the CWF or the FWF that do not meet regulatory requirements or otherwise result in the occurrence of a major discrepancy shall be designated as non-compliant as described in WAP Section 6.0. WCS will suspend the generator identification number of any generator designated as non-compliant. Generators found to be non-compliant must apply for re-certification by resubmission of the generator certification package that has been revised to reflect measures taken to prevent the reoccurrence of the violation that resulted in the non-compliance per LL-OP-2.2, “Generator Certification”. Non-compliant generators are also required to successfully complete the audit process, regardless of the waste receipt categories associated with the generator’s wastes, in order to qualify for re-certification.

Any person who generates information upon which the classification and/or characterization of a waste is based is considered to be a generator requiring certification under this WAP. As a result, two or more entities may be considered to be co-generators of a waste for the purpose of this WAP. In these cases, each co-generator would require certification for those activities from which waste classification/characterization information was generated by that co-generator. All references to the singular term “generator” within this WAP, other than those associated with discrepancies, constitute references to all co-generators of a waste stream. References to a generator in the context of discrepancies shall include all co-generators who could have caused or contributed to the discrepancy.

Take as an example the situation where a waste is shipped by the original generator to a licensed facility for treatment. The generator and/or the treatment facility may intend to ship the treated waste to the WCS LLRW disposal facilities. Manifests accompanying the shipments sent to WCS may indicate the generator of record to be the treatment facility or the original generator of the waste, depending upon the arrangements between the original generator and the treatment facility and whether the waste from the original generator is commingled with wastes from other generators for treatment. Both the treatment facility and the original generator would be considered to be co-generators in most circumstances. However, if the treatment facility were to

blend wastes from more than one generator and perform comprehensive pre-treatment analyses of the waste blend such that information developed by the original waste generators was not necessary for classification or characterization of the ultimate, treated waste blend, the treatment facility would typically be considered to be the sole generator for certification purposes.

As another illustration, consider the case where a waste is proposed to be shipped to the WCS LLRW disposal facilities from a waste broker. If the waste broker performs no other activity other than consolidating waste containers for shipment (i.e., different wastes are not physically commingled), the original waste generators would be the primary generators for certification purposes. Since the broker is part of the shipping process, however, the broker would be considered a co-generator with respect to in-transport management and shipping, and the broker's shipping program would therefore require certification as part of the generator certification process.

#### **4.1.1 Requirements for All Generators**

Each generator shall submit a generator certification package to WCS to obtain certification as evidenced by a WCS-issued generator identification number. Unless a variance is requested and justified by the generator and approved by WCS with TCEQ concurrence, the generator certification package must contain documentation of all of the following programs:

- the waste classification/characterization program and the basis for its design, including sampling and analytical procedures and frequencies, quality assurance/quality control procedures, procedures for ensuring that free liquid and void space limitations are met upon receipt by WCS, procedures for verification of LDR compliance (for LLMW), and procedures for verification that LLRW is not hazardous;
- the program for determining the presence or absence of chelating agents, and, where chelating agents are present or potentially present, the methodologies for establishing a conservative upper bound for the typical concentration of chelating agents in each waste and the basis upon which the methodologies provide a conservative upper bound of chelating agent concentrations,
- the process control program establishing the procedures and systems in place to maintain consistency in the generating process and resultant wastes (required only when process knowledge is used in characterizing a waste);
- the waste packaging and shipping program; and
- the personnel training program applicable to persons responsible for all component steps in performing waste classification, characterization, packaging and shipping.

In addition, the generator certification package must include the generator's licensing information and their compliance history for the last three years, to include the findings of regulatory inspections and compliance audits and the resolution of any alleged non-compliant conditions or practices.



WCS will review each generator certification package and contact the generator if any clarification or additional information is needed. As noted in Section 4.1, above, an audit of a generator is an automatic condition of the certification process if any of the generator's wastes to be shipped to the LLRW facilities will not be subject to intrusive sampling and/or inspection upon receipt. If an audit is not an automatic condition of generator certification, and if the generator's documentation demonstrates that the waste characterization and associated programs are sound and sufficiently thorough, WCS will typically approve the generator certification package. However, if WCS identifies potential inadequacies or deficiencies in the generator's waste classification/characterization, packaging/shipping, or other associated programs, or if the generator's compliance history demonstrates a history of pertinent deficiencies and/or failures to prevent problem recurrence, WCS will typically require an on-site audit as described in Section 4.1.2 below to further evaluate the generator. As noted in Sections 3.5 and 3.6, decontamination resins are anticipated to fall within the HCD or cask waste categories and would therefore require a generator audit, during which the actual records for establishing chelating agent concentrations would be reviewed. In the event that a waste stream potentially containing chelating agents were to be proposed for disposal at the LLRW facilities, but an audit of the generator would either not be an automatic condition of generator certification or would not otherwise entail a review of the actual records for establishing chelating agent concentrations in the subject waste, a generator audit would be required and would include, at a minimum, review of these records at the generator facility. WCS may reject a generator based on the certification package review, the on-site audit, or failure to complete WCS approved corrective and preventative actions, as applicable.

Upon approval of the generator certification package, WCS will issue a generator identification number to the generator. The generator is to place its generator identification number on all documentation or correspondence sent to WCS regarding waste disposal at the LLRW facilities.

Annual re-certification is required for all generators. Generators requiring site audits as described in Section 4.1.2, following, are requested to submit an updated generator certification package at least 120 days prior to the expiration of the current certification to allow sufficient time for audit preparation and scheduling. Other generators are requested to submit an updated generator certification package at least 60 days prior to the expiration of the current certification. If information in the prior generator certification package remains accurate and inclusive of current programs, the generator may submit a properly executed and notarized certification statement that specifically enumerates each and every component of the prior certification package that remains accurate and inclusive, in lieu of re-submittal of the previously submitted documentation.

#### **4.1.2 Required Generator Audits**

If the waste profile information submitted with the generator certification package indicates that 90% or more of the waste packages of any of the generator's waste streams exceed WCS' cutoff criteria for intrusive inspection/sampling (a dose rate of 0.1 rem/hr or greater at a distance of 30 cm), WCS (or its authorized representative) will perform an on-site audit of the generator's LLRW and LLMW classification/characterization, chelating agent characterization, packaging/shipping, and other associated programs, practices, and records as part of the certification process for that generator. As noted in Section 4.1.1 above, WCS may also require an on-site audit for cause based upon review of the generator certification package. If the waste

profile information submitted with the generator certification package indicates that none of the generator's waste streams will exceed WCS' cutoff criteria for intrusive inspection/sampling, but the generator subsequently identifies one or more additional waste streams where WCS' cutoff criteria for intrusive inspection/sampling is exceeded, the generator must successfully complete an on-site audit and the waste profile review process for the additional waste (see Section 4.2, following) before WCS will agree to accept the additional waste. Any generator whose identification number is suspended due to non-compliance as described in WAP Section 6.0 must undergo an audit, regardless of the waste receipt categories associated with the generator's wastes, as part of the re-certification process required to reinstate their generator identification number.

Waste generator program audits will be conducted per procedure LL-OP-2.2 "Generator Certification" and the applicable portions of LL-QA-18.1, "Audits" (since this procedure addresses WCS internal audits, information/requirements pertinent to the WCS programs and departments that are audited are not applicable to generator audits). The purpose of the generator site audit is to verify that the generator's waste classification/characterization, chelating agent characterization, process control, and packaging/shipping programs are being implemented in accordance with the documentation that was provided to WCS in the generator's certification package. Successful completion of the site audit is required as a condition for certification of these generators and issuance (or re-issuance) of their generator identification number.

WCS will develop a specific audit plan for each generator to be audited. The audit plan will include audit procedures and/or checklists that reflect specific elements of the programs submitted in the generator certification package to determine compliance with the WCS WAP. The following activities, at a minimum, will be conducted as part of the generator site audit:

- Observe on-site waste handling procedures, including transfer, storage, processing, packaging, and shipment preparation procedures;
- Interview personnel with direct and supervisory responsibility for waste classification/characterization and waste handling;
- Observe the actions taken to ensure that wastes shipped to the LLRW facilities meet each waste acceptance criterion (absence or quantity of free liquids, void space in containers, non-hazardous waste determinations for LLRW, LDR compliance for LLMW, etc.).
- Observe the performance of measurements, analyses, calculations, or other methods used to classify and characterize radioactive waste;
- Review records documenting use of chelating agents and the basis for the generator's waste profile information (see Section 4.2.1 of the WAP) regarding chelating agents; and
- Review records documenting radioactive waste classification and characterization for waste shipments made during the previous year, regardless of the facility to which it was shipped, including, as applicable, process knowledge documentation.

## **4.2 Profile Approval**

The profile approval process involves multiple steps incorporating interdisciplinary review of generator-supplied information for waste acceptability, analysis of a pre-shipment sample, if applicable, and verification cross-checks. WCS will evaluate the waste profile information and

supporting documentation provided by the generator for each waste stream to ensure the waste is acceptable for receipt and disposal in the designated LLRW facility.

A generator must profile each waste stream separately. A *waste stream* consists of a waste from a discrete batch or continuous process, subject to the following limitations. Wastes generated by distinct processes must be profiled separately; however, wastes generated by sequential steps within an overall continuous process may be considered to be a single waste stream if the wastes from the sequential process steps are conveyed from the process in a common system. In no case may a waste stream covered by a single profile encompass more than one waste classification. If a single process generates wastes that may represent different waste classifications due to processing variables, each separate class of waste from that process must be profiled separately as distinct waste streams and must be segregated accordingly by the generator at the point of generation.

The profile approval process is conducted in accordance with LL-OP-2.1, “Waste Profile Approval”, and is summarized below.

#### **4.2.1 Waste Profile Form**

The generator must complete a separate Waste Profile Form (WPF) for each waste stream that is a candidate for disposal at the LLRW facilities and provide any supporting documentation necessary. The generator is required to certify that the characterization information provided on each WPF and supporting documentation is correct. The completed WPF and supporting documentation must demonstrate that the waste is compliant with regulatory requirements and license and permit conditions applicable to the LLRW facilities. Information to be provided with the WPF includes generator and license information; waste stream characteristics (regulatory classification; physical, chemical and radiological composition; chelating agent information); and shipping information. Radionuclide concentrations may be averaged in accordance with 30 TAC 336.362(a)(8) and 10 CFR 61.55(a)(8). Waste characterization and classification information, including radionuclide averaging, should conform with the May 1983 Branch Technical Position (BTP) on Radioactive Waste Classification, as modified by the January 1995 BTP on Concentration Averaging and Encapsulation. For LLMW, the WPF must also provide LDR information and documentation that the waste meets LDR treatment standards.

Analytical data is typically required to be submitted with the WPF. The data must be accompanied by an identification of the analytical method used for each parameter or constituent reported, and QA/QC results. The generator must employ analytical methods approved by recognized entities (EPA, DOE, ASTM) for waste analyses supplied with the WPF whenever possible. The generator may conduct analyses via other industry-accepted methods as necessary to classify and characterize the waste; however, the need to use these other methods shall be documented by the generator.

The generator may use process knowledge to augment analytical data in completing the WPF, as long as there is reasonable assurance that this approach can be correlated by bounding or other relationships to actual measurements or known quantities. In certain cases, process knowledge alone may be sufficient to adequately characterize a waste (e.g., spill cleanup residues from a previously characterized waste; containers that have been emptied of their prior contents where the composition of the prior contents is known). Process knowledge may include use of scaling factors to develop inferred concentrations of radionuclides based on measured concentrations of

other radionuclides or radionuclide material accountability. Documentation of the generator's Process Control Program will be required if process knowledge will be used in characterizing a waste stream that is a routinely-generated waste resulting from a commercial or industrial process. For other waste streams, including demolition wastes and other debris, the generator must thoroughly document the basis for classification and characterization of the waste stream and include any pertinent analytical data or known composition information for chemical and radioactive materials with which the waste materials may have been in contact. The methods identified in the May 1983 Branch Technical Position (BTP) on Radioactive Waste Classification, as modified by the January 1995 BTP on Concentration Averaging and Encapsulation are acceptable.

All wastes received at the WCS disposal facilities must meet the applicable requirements of 30 TAC 336.362(b)(1). Wastes received at the WCS disposal facilities for disposal must also meet the applicable waste form and stability requirements identified in WAP Section 2.7. Wastes to be received in the FWF-CDU or the CWF must also meet the requirements of 30 TAC 336.362 (b)(2), with the exception that WCS will place shipping containers into MCC's as necessary to conform with the disposal packaging and structural stability requirements in the cited regulations as noted in WAP Section 2.7. The WPF must provide sufficient documentation that the waste stream satisfies these waste form and stability requirements as shipped, or any of the requirements not met by the as-shipped waste will be met by virtue of the intended disposal mechanism at the WCS LLRW facilities. WCS may elect to determine some of this information on behalf of the generator through the analysis of the pre-shipment sample.

The generator's WPF and supporting documentation, in conjunction with the information in the generator's certification package, must demonstrate reasonable assurance that the waste is correctly classified as Class A, Containerized Class A, B, or C, that any and all hazardous characteristics and constituents have been identified, and that the concentration of any chelating agents have been conservatively established. The combined documentation must include the methodology used to classify/characterize the waste and the basis on which the classification/characterization was established, and must clearly demonstrate that the basis for classification/characterization is adequate and appropriate.

Generators are required to re-certify the WPF information on an annual basis. When the process generating a waste or the character of a waste changes from the information presented in the current WPF, a new WPF must be submitted to WCS for review and approval prior to scheduling additional shipments of the waste.

#### **4.2.2 Profile Review**

As the first step in the waste profile review process, WCS will review the WPF and supporting documentation for completeness and work with the generator as required to obtain a complete and accurate profile. Once complete, the profile information will be entered into the electronic waste tracking database, and a Waste Acceptance Specialist (WAS) will review the waste profile information for compliance with this WAP, the LLRW license, and applicable regulations.

The WAS will review the radiological, chemical, physical, and biological information provided by the generator, in conjunction with the description of the sampling and analysis program provided as part of the generator certification package. The identified radionuclides and activity concentrations reported by the generator are reviewed with reference to Tables I and II of 30

TAC 336.362(a)(3)(D) and 30 TAC 336.362(a)(4)(E) to verify the generator's determination of waste classification and characterization of radionuclides. Chemical characterization information is also reviewed; for the CWF Facility, this review focuses on the generator information that documents the waste as generated or as treated is non-hazardous, and for wastes that are characteristically hazardous at the point of generation, that any underlying hazardous constituents have been treated to meet the LDRs. For the FWF Facility, chemical characterization information is reviewed primarily to identify any hazardous characteristics of the as-generated waste and LDR information and treatment verification data. Profile information for both facilities is also reviewed with the generator certification package information to verify that the candidate waste complies with the chemical and biological restrictions in 30 TAC 336.362(b)(1) and that the generator's characterization of chelating agents is appropriately conservative, the generator's records documenting the characterization of chelating agents were successfully audited, and the incremental contribution of the weight fraction of chelating agents in the waste will not have the potential to cause the limit on the weight percent of chelating agents that can be disposed within each disposal unit to be exceeded.

In addition to review of the radiological and chemical characterization information, the WAS will review the physical characterization information for conformance with the criteria applicable to waste form, presence of liquids, and gaseous wastes. Review of physical information on gaseous wastes is conducted to verify that the generator has certified that the packaging will ensure that the absolute pressure does not exceed 1.5 atmospheres at 20 °C and total activity does not exceed 100 curies per container. For non-gaseous wastes, physical information must demonstrate that free liquids and free-standing liquids in the waste will not exceed the limitations on these liquids applicable to the designated disposal unit as specified in Section 2.3 of this WAP. Physical information for waste that is intended for disposal as bulk waste in the FWF-NCDU will be reviewed to determine if it appears to conform with the requirements in Sections 3.1 and 3.2 of this WAP for assuring structural stability. Photographic documentation of debris waste streams may be required by WCS as part of the profile review process. Proposed waste packaging will be reviewed to ensure that it is in compliance with license conditions and applicable DOT and TCEQ regulations.

For HCD wastes, wastes managed as HCD wastes, and cask wastes, the waste profile review procedure will be completed once the initial WAS' review results in a determination that the waste profile information is compliant and the initial WAS' review has been confirmed by a second WAS' review and verification of compliance. Any issues identified by the second WAS must be resolved before the profile is approved and forwarded to appropriate personnel for establishment of appropriate PPE requirements and radiation work procedures. If the initial WAS' review results in the determination that the waste or information associated with the profile does not comply with, cannot be brought into compliance with, or cannot be substantiated as being in compliance with the WAP, the license and/or applicable regulations, including but not limited to the waste classification, waste characterization, or chelating agent evaluation, the profile will not be approved, and the customer will be notified.

For all other wastes (i.e., wastes that are not HCD wastes or managed as HCD wastes, and wastes that are not cask wastes), applicable sampling and analytical requirements will be documented for the pre-shipment sample and incoming shipments once the initial WAS' review results in a compliant waste profile determination. The WPF and associated information will be forwarded to a second WAS for verification of compliance. Any issues identified by the second

WAS must be resolved before the profile review process moves forward. If the waste profile information indicates the waste is acceptable, WCS will conditionally approve the profile, pending results from the pre-shipment sample analyses, and establish applicable PPE requirements and radiation work procedures.

#### **4.2.3 Pre-Shipment Sample**

The generator shall provide a pre-shipment sample to WCS for each waste profile that will be subject to intrusive verification sampling and analysis. Each time a generator is required to submit a new profile packet, a new pre-shipment sample will be required to be provided after the profile has been conditionally approved (including annual re-certification, if the generator indicates that changes in the nature of the waste or the waste generation process have occurred). The conditions that require a generator to submit a new profile packet for a previously approved waste stream are identified in Section 4.2.1 of this WAP. The generator must provide proper Chain of Custody documentation and a signed certification that the sample is representative of the entire waste population to be shipped to WCS. The Chain of Custody must accompany the sample.

Once a pre-shipment sample is received, WCS will perform and/or contract with an approved off-site laboratory to perform analyses for radiological classification, characterization, and fingerprinting; hazardous waste verification (hazardous characteristics for LLRW and treatment verification pursuant to the Land Disposal Restrictions (LDR) of 40 CFR Part 268 for LLMW), and chemical/physical fingerprinting. At the present time, WCS utilizes approved off-site laboratories for hazardous constituent analyses, alpha spectroscopy, and liquid scintillation. If the concentration of any radionuclide present in the waste stream exceeds the license limits of all off-site laboratories approved by WCS, these analyses will not be performed on the pre-shipment sample. This category of waste stream will be subject to a focused on-site generator audit that concentrates on the characteristics that would have been verified through off-site laboratory analysis, in conjunction with the chemical/physical fingerprint analyses and radiological fingerprint parameters performed by WCS, prior to approval of any shipment associated with the profile.

Analyses of pre-shipment samples will be performed for the following parameters, as appropriate for the specific waste, using the referenced analytical methods.

##### *Radiological Classification, Characterization, and Fingerprinting*

- Gamma emitting radionuclides- gamma spectroscopy (HASL-300). This analysis is used for classification, characterization, and fingerprinting.
- Gross alpha and gross beta (HASL-300). These parameters are used for fingerprinting.
- Non-gamma emitting radionuclides (HASL-300/alpha spectroscopy/liquid scintillation/other approved methods as appropriate). These analyses will only be performed if the combined activity of alpha and/or beta emitting nuclides are indicated on the WPF to represent 60% or more of the total waste activity, or if the concentrations of these radionuclides are key to establishing the proper waste classification. These analyses are used for classification and characterization.

NOTE: Indirect measurements or scaling factors may also be used if the process has been validated with direct measurements. Non-gamma emitting radionuclides may be scaled from gamma analysis if the generator has appropriate process knowledge.

*Hazardous Waste Verification - LLRW*

- Ignitability, corrosivity, and reactivity characteristics, D001-D003 (SW-846)
- Toxicity characteristics, D004-D043 (SW-846 TCLP or total analyses)

*Hazardous Waste Verification - LLMW*

- All applicable LDR-required analytical per 40 CFR Part 268.48 (SW-846 TCLP or total analysis)

*Chemical/Physical Fingerprint Analyses*

- Free Liquids- Paint Filter Liquids Test (SW-846 9095A)
- Reactivity/water compatibility (ASTM D 5058 or equivalent method)
- Cyanide screen (ASTM D 5059 or equivalent method)
- Sulfide screen (ASTM D 4978 or equivalent method)
- pH/corrosivity (ASTM D 4980 or equivalent method)
- Flammability (ASTM D 4982 or equivalent method)
- Density (ASTM D 5057 or equivalent method)

*Bulk Soil Waste Verification*

- Soil Classification (ASTM D 3282/AASHTO M145 or equivalent method)
- Moisture Density Relationship (ASTM D1557 or equivalent method)
- Total Organic Content (ASTM D 2974/AASHTO T267 or equivalent method)

Off-site laboratories are qualified by WCS according to LL-QA-7.1, "Supplier Qualification" before they are approved for use and at least once every three years thereafter. Analytical data generated by off-site laboratories are reviewed by WCS to ensure the data were obtained using proper preparatory and analytical methods, that appropriate QA/QC procedures were followed, and that QA/QC data were within acceptable limits. This review will be cross-checked and approved by the Laboratory Manager prior to use of the off-site generated laboratory data.

#### **4.2.4 Final Profile Review**

For each waste profile that will be subject to intrusive verification sampling and analysis, the WAS will review the analytical data generated from the analysis of the pre-shipment sample for conformance with the WPF and associated documentation and compliance with the WCS WAP, the WCS LLRW license, and applicable regulations. The WAS will evaluate the analytical data for the pre-shipment data to determine the waste class indicated and to develop a radiological and chemical/physical characterization. The results of this evaluation will be compared to the WPF and associated documentation to ensure the pre-shipment sample conforms with the WPF information. The WAS will attempt to resolve any profile non compliance issues with the generator. Once any outstanding issues have been resolved, the WAS will develop a baseline pass/fail criterion for each of the radiological and chemical/physical fingerprint parameters for

comparison to fingerprint results from future shipments. The profile review documentation will then be completed and forwarded to a second WAS or the RSO for review.

The second WAS or RSO will review the documentation to verify WPF conformance and compliance with the WAP, the license, and applicable regulations. Any issues identified by the second reviewer must be resolved before the profile will be approved. The RSO will resolve any issues that cannot be resolved between the WAS reviews, or may conduct and complete the compliance verification review. If it is determined that the waste or information associated with the profile does not comply with, cannot be brought into compliance with, or cannot be substantiated as being in compliance with the WAP, the license and/or applicable regulations, including but not limited to the waste classification, waste characterization, or chelating agent evaluation, the profile will not be approved, and the customer will be notified.

## **5.0 WASTE RECEIPT**

Inspections, radiological surveys, sample collection and analyses, as applicable, and acceptance of incoming waste shipments will be performed and documented in accordance with the appropriate facility SOP's and Radiological Work Permit(s). These procedures are described below.

### **5.1 Pre-Shipment Review**

The generator must obtain prior authorization from WCS for each waste shipment to be sent to the LLRW disposal facilities in accordance with LL-OP-2.3, "Waste Shipment Authorization". The generator must receive written or e-mail confirmation from WCS that the shipment has been approved prior to shipping the waste. The generator is required to comply with all DOT, TCEQ, EPA, and NRC shipping requirements.

Upon receipt of a generator's request for shipment, WCS requires the generator to provide advance DOT paperwork to WCS for review. The advance DOT paperwork must include copies of DOT manifests and all supporting documentation required for the waste to be transported to the WCS LLRW facilities. Once WCS has verified that the generator has current WCS certification and the waste(s) proposed for shipment are covered by a current, approved WPF(s), a WAS will review the shipping information for each waste to ensure that it conforms to the approved WPF, thereby confirming that the waste to be shipped meets the requirements for waste classification and waste form. WCS will also review the paperwork to ensure it is in compliance with applicable DOT, NRC, TCEQ, and EPA shipping requirements. If the shipping information conforms to the approved WPF, the WAS will notify and coordinate with appropriate facility management, including at a minimum, the RadWaste Manager and the RSO, to verify that the facility can safely receive and manage the proposed shipment(s). Upon verification that the facility can safely manage the waste shipment(s), WCS will establish a delivery schedule with the generator or shipper, issue written authorization to the generator for the waste shipment(s), and enter the appropriate information in the waste tracking database and facility schedules.

### **5.2 Shipment Inspection, Surveying and Compliance Reviews**

A Radiation Safety Technician (RST) will perform radiation and contamination surveys of the transportation vehicle upon arrival at the LLRW facilities in accordance with LL-OP-RS-10,



“Radioactive Material Receipt, Staging and Release Surveys” to verify compliance with applicable DOT, NRC, TCEQ, and EPA shipping requirements for surface radiation. Upon clearance to proceed, a WAS will conduct a safety inspection of the vehicle in accordance with LL-OP-2.4, “Arriving Vehicle Inspection Procedure”, to identify any safety issues. Any identified safety issues must be resolved in coordination with the LLRW RadWaste Manager and, as appropriate, the Health and Safety Manager and/or RSO, prior to entry to the FWF or CWF. In addition, the WAS will conduct a compliance review of the shipment as indicated in LL-OP-2.5, “Waste Shipment Compliance Verification”. During this review, the WAS will determine if the information, including DOT shipping information, radiological information, and hazardous waste information, as applicable, is compliant with the advance DOT paperwork, the WPF information, and applicable regulations. In addition, the WAS will visually inspect all containers and packages for integrity and labeling consistent with the manifest. If a moderate or major discrepancy is identified, it must be successfully resolved and documented as discussed in WAP Section 6.0 before the shipment is allowed to enter the designated receiving facility.

If the vehicle is allowed entry into the FWF or CWF, the WAS will review the sampling and associated PPE and ALARA requirements established for this activity during the WPF review process and accompany the vehicle to the applicable CWF or FWF staging building. An RST will perform radiation and contamination surveys of all incoming waste containers while they are on the transportation vehicle or as they are being offloaded as specified in LL-RS-10, “Radioactive Material Receipt, Staging and Release Surveys”. The WAS will inspect individual containers as they are being offloaded (or before, if feasible) for integrity, marking, labeling and conformance with the information on the manifest. The WAS will also determine the classification of each waste container based on the radionuclide information identified on the manifest and compare the WCS-determined waste class to the waste class identified by the generator on the manifest in accordance with LL-OP-2.6, “Waste Classification Verification Procedure”. If a moderate or major discrepancy is identified through the inspection process or the procedure to verify waste classification, it must be successfully resolved and documented as discussed in Section 6.0 before further management of the waste shipment is allowed.

### **5.3 Additional Waste Verification**

Containers that are subject to opening for sampling and/or inspection consist of the following waste categories as delineated in Section 3.0 of this WAP: bulk soil/soil-like (BS) wastes; containerized soil/soil-like (CS) wastes; and containerized debris (CD). Sampling methods shall conform with SW-846 or equivalent methods and applicable NRC and EPA guidance as appropriate; analytical procedures and methods are identified in Section 5.3.1 below. Sampling and inspection frequencies are specified in the following Sections 5.3.2 through 5.3.7 for each waste category identified in WAP Section 3.0. After WCS has developed proven track records of consistent and compliant waste shipments from generators, the specified frequencies may be reduced on a generator and/or waste-specific basis as approved by TCEQ.

As noted in WAP Section 3.7, the following wastes will not be opened and will therefore be excluded from intrusive inspection and sampling due to health and safety concerns:

- containers with wastes that could release radon or tritium gas upon opening;
- containers with wastes that could release fine, dispersible radioactive particulates (e.g., ash) upon opening;

- containers with putrescible wastes;
- containers with biohazard wastes (biohazard wastes are required to be treated as noted in WAP Section 2.5);
- containers holding wastes with sharps from any source (i.e., including sharps that are not biohazard waste); and
- any other containerized waste as may be authorized by the TCEQ.

Additional waste verification activities will be conducted and documented in accordance with LL-OP-2.1, “Waste Acceptance for Disposal”.

### 5.3.1 Analytical and External Assay Procedures

#### *Fingerprint Analyses*

Where samples of incoming waste shipments are collected for analysis, they will be analyzed for the following parameters as applicable to the category of waste being presented for disposal. Sample results will be compared to the baseline values established during the final profile approval step (WAP Section 4.2.4).

Parameter and Method	Type of Baseline
Free Liquids – Paint Filter Liquids Test (PFT), SW-846 9095A	Pass/Fail – test must always pass PFT (qualitative analysis)
Density – ASTM D 5057 or equivalent method	Numerical value obtained – results must fall within a given range as set by the profile and pre-shipment sample (quantitative analysis)
Soil Classification – ASTM D 3282/AASHTO M145 or equivalent (for bulk soil/soil-like waste only)	Pass/Fail – result must be sufficiently consistent with pre-shipment sample classification such that existing compaction requirements remain valid (qualitative evaluation by qualified geotechnical technician)
Reactivity/water compatibility – ASTM D 5058 or equivalent method	Positive/Negative – test must always be negative (qualitative analysis)
Cyanide screen – ASTM D 5059 or equivalent method	Positive or Negative – acceptable results may be positive or negative depending upon original analytical results – (qualitative analysis)
Sulfide screen – ASTM D 4978 or equivalent method	Positive or Negative – acceptable results may be positive or negative depending upon original analytical results – (qualitative analysis)
pH/corrosivity – ASTM D 4980 or	Numerical value obtained – results must fall

Parameter and Method	Type of Baseline
equivalent method	within a given range as set by the profile and pre-shipment sample (quantitative analysis)
Flammability Potential Screening- ASTM D 4982 or equivalent method	Positive or Negative – acceptable results may be positive or negative depending upon original analytical results – (qualitative analysis)
Gamma Spectroscopy (HASL-300) (if dose rate/activity is within acceptable range of instruments)	Numerical value obtained – results must fall within a given range as set by the profile and pre-shipment sample (quantitative analysis)
Gross alpha-HASL-300 (if dose rate/activity is within acceptable range of instruments)	Numerical value obtained- results must fall within a given range as set by the profile and pre-shipment sample (qualitative parameter; quantitative analysis)
Gross beta- HASL-300 (if dose rate/activity is within acceptable range of instruments)	Numerical value obtained- results must fall within a given range as set by the profile and pre-shipment sample (qualitative parameter; quantitative analysis)

Additional radiochemical analyses including non-gamma emitting nuclides may be performed by an outside laboratory, as determined by WCS, if required for classification or characterization verification.

#### *External Assay Procedures*

External assay procedures include in-situ gamma spectroscopy, comparison of actual shipment radiological survey data versus expected shipment dose rates modeled from pre-shipment information (e.g., using MicroShield®), and the “bonk/slosh” test for the presence of free-standing liquid.

Where incoming waste shipments are verified through in-situ gamma spectroscopy, waste containers will be examined by using an in-situ gamma detector(s) and appropriate computer software to generate reports of the concentrations and/or minimum detectable activities of gamma-emitting isotopes. The gamma spectroscopy equipment will be calibrated per the manufacturer’s instructions, and appropriate inputs will be made for container geometry, waste matrix, and environmental conditions. The gamma spectroscopy results, in combination with generator provided scaling factors, will be used to calculate the activities of significant alpha and beta-emitting components, when appropriate and applicable. Results must fall within an expected range developed by review of profile documentation and pre-shipment sample analysis (quantitative analysis). Typically, in-situ gamma spectroscopy will be performed in designated areas within the staging buildings.

Information the generator provides prior to shipment regarding the waste matrix, radionuclide concentration, package type and count, volume of waste, and transport configuration will be

entered into a software program (e.g., MicroShield®) for all shipments of cask wastes and, typically, for other waste categories, as well, to estimate the external dose rate from the shipment and individual packages. This serves two purposes: it assists in the radiological work permit planning for receipt and handling of wastes, and the model provides check values for the RST during pre-receipt vehicle surveys. The RST can compare the expected modeled dose rates to the actual dose rates observed during the vehicle survey in demurrage area. This coincides with the examination of shipment by the WAS, allowing the RST and WAS to immediately address a discrepancy between actual and modeled dose rates.

The “bonk/slosh” test is a widely utilized external assay procedure that provides useful information about the potential for free-standing liquids or void spaces within enclosed containers, allowing an indirect assessment of these possible conditions for wastes that present an unacceptable health risk to workers who would conduct direct inspections for such conditions. This test entails striking the external surface of each container that is not intrusively inspected with a blunt striking device in multiple locations around the container. Each strike should result in a relatively uniform tonal response. If one or more strikes yields a distinctly different tonal response, the container will be identified as a potential moderate or major discrepancy due to the presence of possible liquids or excessive void space, as determined by the WAS. In addition, if a liquid “sloshing” sound is heard while a container is being moved, the container will be identified as a probable major discrepancy due to the presence of free liquids.

### **5.3.2 Bulk Soil/Soil-like Waste**

All containers (100%) of BS waste will be opened and the contents will be visually inspected. The physical characteristics of the waste will be compared to the WPF information to verify conformance. If the physical characteristics of the incoming waste differs from the WPF information, the discrepancy must be satisfactorily resolved as described in WAP Section 6.0 prior to acceptance of the waste. The presence of free liquids constitutes a major discrepancy in physical characteristics.

At a minimum, the first ten shipments of each BS waste stream will be sampled. Thereafter, if all of the first ten shipments were received without any moderate or major discrepancies (see Section 6.0 of this WAP), 10% of all future shipments of the BS waste stream will be randomly sampled. Random sampling will be accomplished through the use of a random number generator to identify which of the next ten shipments will be sampled. Where a shipment is comprised of more than one bulk container, as in the case of Supersacks, the specific bulk container to be opened in the randomly-selected shipment will also be randomly selected using a random number generator. (Note that a bulk shipment would not consist of more than ten separate bulk containers; therefore, only one container in the randomly-selected shipment would be opened for inspection and sampling.)

If the first ten shipments of each BS waste stream are not all received without moderate or major discrepancies (see Section 6.0 of this WAP), sampling of all subsequent incoming shipments will continue until ten consecutive shipments have been received without a moderate or major discrepancy.

### **5.3.3 Bulk Debris**

All allowable DOT bulk containers of debris will be managed in accordance with Section 5.3.5.

#### **5.3.4 Containerized Soil/Soil-like Waste**

Ten percent of the containers from each CS waste stream in a shipment will be randomly selected using a random number generator for opening, and the contents will be visually inspected. Each CS waste container that is opened for inspection will also be sampled. Container samples from the same profile may be composited prior to analysis, providing the individual samples are physically consistent with the WPF and each other. All unopened containers are visually inspected for container integrity and consistent labeling as described in WAP Section 5.2 and subject to the bonk/slosh test for free-standing liquids. Typically, if a moderate or major discrepancy in waste type is discovered, the contents of all of the containers for that waste stream are inspected.

#### **5.3.5 Containerized Debris**

Ten percent of the containers from each CD waste stream in a shipment will be randomly selected using a random number generator for opening, and the contents will be visually inspected. No samples will be collected of containerized debris due to the heterogeneity of these wastes. The same containers of debris that are opened for inspection will be subject to in situ gamma spectroscopy as described in Section 5.3.1 above. All unopened containers are visually inspected for container integrity and consistent labeling as described in WAP Section 5.2 and subject to the bonk/slosh test for free-standing liquids. Typically, if a moderate or major discrepancy in waste type is discovered, the contents of all of the containers for that waste stream are inspected.

#### **5.3.6 High Contact Dose Rate Wastes**

Containers with HCD wastes will not be opened at the WCS facilities for inspection or sampling due to ALARA considerations. These wastes will be subject to in situ gamma spectroscopy and the bonk/slosh test for free-standing liquids as described in Section 5.3.1 above.

#### **5.3.7 Cask Wastes**

Due to ALARA considerations, containers shipped in casks and other shielding containers that will not be disposed within the disposal units will not be opened at the WCS facilities and will not be removed from their shielding until they have been moved into the designated disposal unit. As such, these wastes will be subject to verification through input of radiation screening results into MicroShield® software as described in Section 5.3.1 above.

### **6.0 DISCREPANCY RESOLUTION**

Discrepancies may be related to manifests and shipping documents, inspections, and waste analyses or external assays. Discrepancies associated with manifests and shipping documents usually involve missing or incorrect information. Discrepancies associated with inspections may involve damaged containers, containers with free liquids, or obvious differences in waste type. Discrepancies associated with waste analyses or external assays typically involve results that are inconsistent with the baseline criteria established during the profile review process for acceptance of shipments of the waste stream.

Any discrepancy between WPF information, waste analysis or verification results, as applicable, and/or the shipping manifest must be resolved with the generator prior to disposal. Discrepancies that cannot be resolved, present safety issues, or challenge regulatory requirements or license

conditions may require that the waste be returned to the generator. Shipments with discrepancies may be placed in the demurrage area pending resolution. Shipments with free liquids will either be returned to the generator or shipped off site for handling. Shipments with leaking or otherwise damaged containers may be managed according to this Plan and facility SOPs, or WCS may arrange to return the shipment or container(s) to the generator.

Discrepancies are classified by severity. Minor discrepancies are discrepancies that are clerical in nature, do not affect the safe and appropriate management of the waste in accordance with license conditions and regulatory requirements, and do not result in a nonconformance between the waste shipment and the waste profile. Major discrepancies are discrepancies that could result in a non-compliance with license conditions and/or regulatory requirements, discrepancies between the characteristics of the shipped waste and the waste profile that are indicative of substantive differences (e.g., wastes that are obviously different in type from that profiled), and discrepancies that could cause an unsafe working condition (e.g., a bulging drum that could rupture). Moderate discrepancies are discrepancies that would not normally result in a noncompliance with license conditions and/or regulatory requirements, but would typically represent a discrepancy between the incoming shipment analytical results and the acceptable concentration ranges established during the profile review process.

Generator discrepancies will be tracked individually and cumulatively on a certification-year basis and for all wastes shipped to WCS by each generator. Single incidences of minor discrepancies will not warrant any action other than resolution with the generator unless three or more minor discrepancies are recorded in a single certification year. If a generator accumulates three or more minor discrepancies over a single certification year, each sequence of three minor discrepancies will be deemed to represent one moderate discrepancy, and WCS will respond as described below for moderate discrepancies.

Each incidence of a moderate discrepancy will result in a hold being placed on future shipments and initiation of an evaluation by the Quality Department. If a moderate discrepancy is not resolved within 10 days, the discrepant shipment will be returned to the generator or to another authorized facility. If a generator accumulates three or more moderate discrepancies over a single certification year, each sequence of three moderate discrepancies will be deemed to represent one major discrepancy, and WCS will respond as described below for major discrepancies.

A major discrepancy will result in rejection of the shipment, classification of the generator as non-compliant, and suspension of the generator's identification number. An on-site audit is required to be completed with acceptable results prior to generator reinstatement. LL-OP-2.2, "Generator Certification" provides a list of conditions that may cause a generator identification number suspension and instructions on how the identification number may be reinstated. The generator will not be able to send waste shipments to WCS until the generator identification has been reinstated.

## 7.0 GLOSSARY

Debris – waste debris consisting of *typical debris* and *monoliths*:

*Typical debris* - solid material exceeding a 60 mm (2.4 in.) particle size that is intended for disposal and that is a manufactured object; plant or animal matter; or natural geologic material (e.g., rubble, lead bricks and shielding, wood, concrete, metal, personal

protective equipment (PPE), lab wastes, and trash), consistent with the RCRA definition that is applicable to LLMW.

*Monoliths* - solid concrete-like forms generated by stabilization of waste to reduce physical, chemical and/or radiological hazards.

Free liquids - those liquids that readily separate from a solid waste matrix under ambient temperature and pressure as quantitatively determined using the Paint Filter Test, EPA Method 9095B, consistent with the definition applicable to hazardous waste.

Free-standing liquids - liquids that are present as a separate layer on the surface of a waste.

Low-radiation hazard Class A wastes - Class A wastes with a dose less than 0.1 rem in one hour at a distance of 30 centimeters.

Intrusive inspection - opening waste packages (or the shipping container where there is no internal waste packaging) to visually inspect the actual waste material.

Intrusive sampling - collection of physical samples of the incoming waste materials in appropriate sample containers for *ex situ* analyses.

LLMW - waste that is a combination of both hazardous waste and LLRW, consistent with the definition of “*mixed waste*” in 30 TAC 336.2(80)

LLRW - all waste that meets the definition of “*low-level radioactive waste*” in 30 TAC 336.2(76) other than LLMW.

Monoliths – See definition within the definition of Debris.

Rubble - inert construction and demolition waste comprised of solid pieces of concrete and concrete products, reinforcing steel, asphalt pavement, brick, and/or rock and possibly including some soil; and larger, irregular structural items (e.g., piping, valves, structural shapes, metal ductwork and similar materials).

Solidification by absorption - a process that involves physical absorption, where the liquid is drawn into the pores of a permeable solid, but does not include chemical binding processes. Solidification by absorption, as used herein, is typically termed “absorption” in the regulations and guidance applicable to low-level radioactive waste and “solidification” in the regulations and guidance applicable to hazardous waste.

Solidification by stabilization - as a process that includes a chemical reaction that binds liquids to the solid matrix (i.e., it is not a solely physical process). Solidification by stabilization, as used herein, is typically termed “solidification” in the regulations and guidance applicable to low-level radioactive waste and “stabilization” in the regulations and guidance applicable to hazardous waste.

Typical Debris – See definition within the definition of Debris

Waste Stream - a waste from a discrete batch or continuous process from an individual generator, subject to the following limitations. Wastes generated by distinct processes must be profiled separately; however, wastes generated by sequential steps within an overall continuous process may be considered to be a single waste stream if the wastes from the sequential process steps are conveyed from the process in a common system. In no case may a waste stream covered by a single profile encompass more than one waste classification. If a single process generates wastes

that may represent different waste classifications due to processing variables, each separate class of waste from that process must be profiled separately as distinct waste streams and must be segregated accordingly by the generator at the point of generation.