

Guidance for the Proper Characterization and Classification of Low Specific Activity Materials and Surface Contaminated Objects for Disposal - 12405

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Abstract

Regulatory concerns over the proper characterization of certain waste streams led the CH2M HILL Plateau Remediation Company (CHPRC) to develop written guidance for personnel involved in Decontamination & Decommissioning (D&D) activities, facility management and Waste Management Representatives (WMRs) involved in the designation of wastes for disposal on and off the Hanford Site. It is essential that these waste streams regularly encountered in D&D operations are properly designated, characterized and classified prior to shipment to a Treatment, Storage or Disposal Facility (TSDF). Shipments of waste determined by the classification process as Low Specific Activity (LSA) or Surface Contaminated Objects (SCO) must also be compliant with all applicable U.S. Department of Transportation (DOT) regulations as well as Department of Energy (DOE) orders. The compliant shipment of these waste commodities is critical to the Hanford Central Plateau cleanup mission.

Due to previous problems and concerns from DOE assessments, CHPRC internal critiques as well as DOT, a management decision was made to develop written guidance and procedures to assist CHPRC shippers and facility personnel in the proper classification of D&D waste materials as either LSA or SCO. The guidance provides a uniform methodology for the collection and documentation required to effectively characterize, classify and identify candidate materials for shipping operations. It should be noted that the Hanford Transportation Safety Document (TSD) (DOE/RL-2001-36), in Section 8.3.1.5 specifies the use of the NUREG 1608 for the classification of LSA/SCO materials. A primary focus is to ensure that waste materials generated from D&D and facility operations are compliant with the DOT regulations when packaged for shipment. At times this can be difficult as the current DOT regulations relative to the shipment of LSA and SCO materials are often not clear to waste generators. Guidance is often sought from NUREG 1608/RAMREG-003 [3]: a guidance document that was jointly developed by the DOT and the Nuclear Regulatory Commission (NRC) and published in 1998. However, NUREG 1608 [3] is now over thirteen years old and requires updating to comply with the newer DOT regulations.

Similar challenges present themselves throughout the nuclear industry in both commercial and government operations and therefore, this is not only a Hanford Site problem. Shipping radioactive wastes as either LSA or SCO rather than repacking it is significantly cheaper than other DOT radioactive materials shipping classifications particularly when the cost of packages is included. Additionally, the need to “repackage” materials for transport can often increase worker exposure, necessitated by “repackaging” waste materials into DOT 7A Type A containers.

Background

CH2M HILL Plateau Remediation Company is currently performing site remediation activities for radioactive materials and mixed wastes for cleanup at the DOE Hanford Site, in Richland, Washington. These remediation activities also involve D&D activities at various Hanford Site facilities that need to be demolished which generates “new waste” streams as well as extracting previously packaged waste drums and boxes known as “legacy” waste containers. The legacy waste came from two primary sources: (1) Hanford generated waste from the plutonium production and cleanup activities and (2) other DOE nuclear weapons and research sites. A significant percentage of the Hanford Site waste was generated in support of our nation’s Cold War activities at the Hanford Site as well as other DOE site locations across the nation. The Hanford Site stopped receiving waste from other DOE site locations in the late 1990s. An estimated 10,000 of these waste containers, most of which are 250 liter (55-gallon) steel drums, will need to be extracted from the burial grounds. However, some of the “legacy” waste is also boxes of various sizes, some of which are as large as 54.6 cubic meters (1,950 cubic feet).

Once unearthed, the packages undergo a thorough inspection for integrity and then if necessary are repackaged. The waste containers will then subsequently be transported to an offsite commercial TSDF for treatment (e.g. size reduction, compaction, macro encapsulation). One such TSDF is Perma Fix Northwest, located adjacent to the Hanford Site, which will open the waste containers, process the waste and return processed waste to the Hanford Site for disposal or subsequent transportation to the DOE Waste Isolation Pilot Project (WIPP) in Carlsbad, New Mexico for final disposition.

These waste containers consists primarily of dry active waste (DAW) such as paper, clothing, and personnel protective equipment, as well as materials such as soils, rubble and contaminated debris from D&D operations. The waste matrixes in these containers are often candidates for meeting the definition of LSA I and LSA II. Additionally, some of the waste material consists of radioactively contaminated metals and equipment such as glove boxes, pumps and piping and other solid objects which could possibly meet the definition of a SCO I and SCO II.

The characterization information for each waste container has been collected and entered into the Hanford Solid Waste Information Tracking System (SWITS). The characterization information on each container includes information on the physical contents in the containers (e.g. tools, rags, debris, metals), radionuclides present in the waste matrix and the activity and net weight of the waste material as well as other DOT hazardous materials classification data. Additionally, the SWITS database also contains Environmental Protection Agency and Washington State Department of Ecology waste designation information.

Enhanced processes for retrieving the “legacy waste” containers from the burial trenches include subsequent activities that include non-destructive assay (NDA), venting and non-destructive evaluation/real-time radiography (RTR) which is essentially x-raying the container to better identify its contents as well as to identify items prohibited for disposal at the DOE WIPP or other commercial TSDFs. It should be noted that for extremely large boxes these methods are not always possible, if greater than 2.4 meters x 1.2 meters x 1.2 meters (8’ x 4’ x 4’).

For CHPRC shipments the information provided by SWITS data sheets show that many of the previously packaged containers have less than an A₂ quantity of radioactive material per

package. However this information often varies by burial ground. So it is not uncommon for many of the waste packages to contain greater than an A₂ quantity of radioactive material per package, depending on the particular burial ground trench the waste containers were retrieved from. In some cases however, little or no survey data is available which would show the level of contamination for the individual objects inside these legacy waste packages.

Burial records and SWITS data from reports are also reviewed to assist in ascertaining the particular contents of each container. For Hanford Site newly generated wastes from D&D operations additional information is collected and reviewed about plant operations at the time the waste was generated to aid in obtaining Acceptable Knowledge (AK) of the waste matrix. Other factors such as process knowledge and reasoned judgment are also utilized to characterize the waste matrix of each waste container in order to make a DOT classification as a LSA or SCO.

Development of a guidance document

Because of the complexity of LSA and SCO regulations, conflicting guidance from NUREG 1608 [3] guidance document, obscurities in a recently developed guidance document on the same topic by the DOE Head Quarters Office of Transportation, and recent DOT letters of interpretation and Notice of Violations (NOV) issued to several DOE contractors, the CHPRC management felt that it was prudent to provide additional guidance to CHPRC personnel. The objective of this guidance document or standard is to specifically address LSA and SCO waste materials and to provide written direction to CHPRC project personnel involved in remediation activities such as retrieval of waste and D&D operations. This standard will also be utilized by WMRs and authorized shippers involved in the proper designation of wastes for shipping determinations.

It is envisioned that this standard will be utilized at CHPRC D&D waste and remediation retrieval activities whose waste streams need to be properly designated, characterized, and classified and packaged prior to transportation to TSDFs. The standard should aid in the compliant shipment of DOT materials determined to meet the definition of LSA and SCO waste materials by CHPRC personnel. This function is critical to the Hanford Central Plateau cleanup mission.

This standard is intended to assist all generators of radioactive waste in the planning, characterization and packaging of radioactive waste for subsequent shipping to TSDFs. This document will assist in providing a uniform method for the collection and documentation of information required to properly characterize, classify, and identify candidate materials as LSA and SCO for shipping operations. The primary focus is to ensure these materials are compliant with the DOT regulations as promulgated in Title 49 Code of Federal Regulations (CFR) [1], Subchapter C – Hazardous Material Transportation, Parts 171 to 180.

NUREG-1608 Guidance

Prior to the CHPRC development of an internal standard or guidance document for the packaging transportation of LSA and SCO waste materials, the most frequently used document by both government and commercial radioactive materials shippers is the NUREG 1608 [3]. This document was developed in 1998 by the DOT in conjunction with the US NRC with the

primary purpose of assisting shippers in the preparation of LSA and SCO waste materials for shipment in compliance with the Federal regulations. Guidance is provided on the classification, categorization, packaging and transportation of LSA and SCO materials. It should be recognized that the information in the NUREG-1608 [3] document is only intended for guidance. This document is not the law, nor should it be construed as having the force or effect of the NRC and DOT regulations as codified in 10 CFR 71 and 49 CFR 171-180.

The DOT does not expect a generator to physically separate the materials prior to putting this material into a packaging. It is not the intent of the DOT transportation regulations to require segregation of waste materials solely for the purpose of categorization as either a LSA or SCO. If qualitative judgment and experience indicates that there is no reason to believe that the SCO contamination limits on the objects would be exceeded, then the objects could be mixed in a single package, along with material which is characterized as LSA. This separation of the LSA and SCO materials can be done conceptually through reasoned judgment or process knowledge.

The NUREG 1608 [3] guidance document permits “co-mingling” of LSA and SCO materials provided that the total quantity in the package is less than an A_2 quantity. This allowance for “co-mingling” is one of the most important pieces of guidance coming from NUREG-1608 [3] document and deals with allowing a mixture of an LSA and a SCO in one package. This situation happens frequently since both LSA and SCO materials are often included in the same waste matrix and it often makes operational, economic, and radiological protection sense to mix these wastes together in a single package. Neither the NRC nor the DOT discourage this practice because from the technical standpoint, the packaging, marking, labeling, and modal-specific requirements for transporting LSA and SCO materials are essentially identical. When mixing LSA and SCO materials in a single package, both the non-radioactive objects and the LSA materials should meet their respective DOT definitions before being mixed together; then when mixed, the contents of a package should be considered LSA if the shipment is less than an A_2 quantity.

Unless radioactivity/dose rate information to the contrary is known, it is generally acceptable to assume uniform contamination over the surfaces of the smaller objects. It should be noted that smaller objects are considered to be less than 280 cubic meter (cm^3) (17 in^3). This is approximately the size of a standard baseball. However, if the activity for the LSA or SCO materials is greater than an A_2 quantity, a more rigorous approach is needed.

Characterization of Materials

Waste characterization is required to ensure proper documentation of types and quantities of radionuclides in the waste matrix. The DOE M 435, 1-1 Radioactive Waste Management Manual [2], requires using direct or indirect methods to characterize low level waste (LLW) materials.

Characterization of radiological waste involves data analysis of the waste materials to be transported. The use of process knowledge is a key component of the waste characterization and DOT classification methodology. A thorough knowledge of the waste matrix and how the waste was produced is needed to effectively characterize the LLW thereby eliminating unnecessary, redundant and expensive physical and chemical testing and analysis. Regulators have broadly

interpreted “waste knowledge” or “AK” of waste to include information such as process knowledge which refers to detailed information (e.g. nondestructive assays, waste analysis data or studies) on waste generated from processes similar to that which generated the waste originally. The LLW maybe be characterized by waste knowledge, sampling, and/or laboratory analysis or a combination of these processes.

The waste stream approval process evaluates generator-supplied data for waste streams to determine whether they meet the Waste Acceptance Criteria (WAC) for the applicable TSDF. This data is collected from the waste generator on a waste profile sheet form and is normally submitted in advance to the appropriate TSDF to which the waste is destined to be shipped.

It is imperative to involve all affected parties participating in waste characterization early in the process. This would include facility personnel, WMRs and shipper personnel. Thorough preparation up front in the process helps to minimize cost, reduce time, and personnel exposure (both radiological and chemical). It is anticipated that an interdisciplinary team approach be utilized by CHPRC at the Hanford Site. This team at a minimum should be made up of facility personnel (e.g. waste generator), WMRs and shippers needed to effectively resolve potential issues before and during the waste characterization and DOT classification process. It should be noted that activities during the generation and preparation of the waste for eventual packaging and transport to a treatment, storage, or disposal facility affect the full characterization and DOT classification process.

Both legacy and newly generated waste from D&D operations is often packaged for offsite or onsite shipment before the shippers have performed a DOT hazard classification; the waste generator and WMRs are responsible for ensuring the waste is subject to the DOT Hazardous Materials Regulations in 49 CFR Parts 171-180 and is classified in accordance with the WAC and DOT regulations.

Waste characterization is required to ensure proper documentation of types and quantities of radionuclides. Characterization data is used to implement the measures listed below:

- Protect human health and the environment
- Ensure the integrity of the TSDF liner is maintained when utilized at a disposal facility such as the Hanford Site Environmental Remediation Disposal Facility.
- Facilitate efficient use of the available disposal space.
- Comply with both the DOT and TSDF waste acceptance requirements.

Characterization may be based on historical analytical data, process knowledge, sample collection and analysis, or a combination these methods.

The waste stream approval process evaluates generator-supplied data from waste streams to determine at a minimum the following effective waste characterization information:

- Physical and chemical characteristics
- Volume of the waste including stabilization and absorbent media
- Weight of container and contents

- Identities, activities and concentrations of major radionuclides
- Generating source

Waste characterization can be based on AK about a process or event, analytical data of the waste, waste from a similar process, a combination of these, and/or a wide variety of facility records. The following are some examples of the types and sources of what can be used to support characterization through the use of AK:

- Historical records including historical analytical data
- Description of the waste generating operations and or process
- Manufacture/Procurement specifications
- Lab analysis and direct assay results
- Material Safety Data Sheets
- Procedures, work packages, field notes
- Material balance/accountability and concentration calculations.
- Packaging load sheets
- Radiation surveys
- Reference documents (i.e. SAX Dangerous Properties of Industrial Materials)

Process knowledge should be traceable to the waste being characterized and documented in writing. Waste characterization and classification methodologies utilized must adequately address chemical, radiological and physical characteristics of the wastes materials. For example the waste characterization process must be able to consider the anomalies that may be present in the various waste streams. Therefore, various methodologies may be needed in order to perform an effective characterization of the waste.

Characterization and Handling of LSA-SCO Shipments Less than an A₂ Quantity

Newly Generated Waste

Since data is more readily available for newly generated wastes, due diligence must be taken to obtain the data necessary in order to make the proper characterization and subsequent DOT classification of waste materials coming from these waste streams as either LSA or SCO. It can be reasonably assumed that many waste packages could be a mixture of both LSA and SCO materials in the same container. Mixing of LSA and SCO materials in the same package is allowed by the DOT regulations and is addressed in NUREG 1608 [3] Guidance Document (section 6.1). Both LSA and SCO materials are required to meet the same packaging requirements. Additionally, it should be noted that the Emergency Response Guide instructions for LSA and SCO materials as well as the transport mode requirement are essentially the same.

It is important to clarify that the DOT fully expects that the mass of the candidate SCO materials cannot be considered and used when determining the mass of the LSA materials. To do so would skew the activity per gram determinations needed to qualify a material as an LSA. Estimates and reasoned judgments can be used to make a valid LSA-SCO determination without the need to physically segregate the material. It is not expected by the DOT or DOE HQ Environment Management Division, Office of Transportation and Packaging as detailed in their respective guidance documents that for materials which the radioactive specific activity is less

than an A_2 quantity to physically separate LSA and SCO materials just for the purpose of DOT classification. Therefore, the first step should be to ascertain the A_2 value or fraction of an A_2 of the waste matrix to be shipped. Per NUREG-1608 [3], Section 6.1.1, the DOT proper shipping name for a shipment that is less than 1 A_2 containing both LSA and SCO materials would be “Radioactive Material, LSA I or II.” This process should be followed, regardless of the respective amounts of the two materials (e.g., LSA, SCO) provided the total quantity of the material is less than 1 A_2 . The CHPRC procedure for the on or off site transportation of radioactive materials and or wastes also requires that radiation survey reports must be generated for all containers prior to shipment. Generally, containers less than 1 A_2 with radiation readings of between .005 mSv and .05 mSv (0.5 mr/hr and 5 mr/hr) are considered adequately distributed for LSA II classification. Containers exceeding these limits must have at least a six-point survey to make a qualitative decision on LSA II classification.

SCO is another category of waste that is common to closure project activities. As discussed previously, SCO materials are non-radioactive items that have become contaminated with fixed and/or removable radioactive material. Common examples of SCO waste include tools, desks, cabinets, computers, laboratory cabinets, bench tops, fume hoods, ducting, etc. The CHPRC Plutonium Finishing Plant (PFP) project has developed a technical basis document which provides the basis for a program to characterize LSA as well as SCO waste that could be utilized by other D&D site locations. Statistical methods for characterizing LSA and SCO wastes for classification are defined in the document.

For shipments of materials that do not meet the definition of a LSA, but instead contain equipment or materials contaminated with a radioactive material, these materials should be better classified as an SCO material. It is anticipated that most SCO packages will contain less than 1 A_2 and would therefore qualify to be shipped in packages meeting the DOT general packaging requirements such as an industrial package (IP)-1 container for disposal. Therefore, since these containers would be less than 1 A_2 in quantity, a reasonable argument could be used to categorize the great majority of these candidate SCOs without the need for detailed, quantitative measurements of fixed, accessible contamination or total fixed and non-fixed inaccessible surface contamination surveys. This approach is discussed in Section 3.3.1 to NUREG-1608 [3]. This document states that a categorization as SCO-II can be accomplished without the need for detailed quantitative measurements under the following conditions:

- The package is an authorized package under 49 CFR 173.427(b) (4).
- The shipment is a domestic shipment.
- The package is shipped as exclusive use.
- The non-fixed contamination on the accessible surfaces of all objects does not exceed the SCO-II limits.
- The total activity on the object(s) (fixed plus non-fixed), divided by the mass of the object(s) does not exceed $10^{-4} A_2$ / gram limit for a LSA II solid and the activity is reasonably considered to be distributed throughout. (Note: This is not an LSA determination, but rather it is to ensure there are no obvious point source materials in the container.)
- The alpha emitter in the package does not exceed 0.025 A_2 .

Note: Waste containing Transuranics will most likely exceed this.

It is not necessary to survey every SCO item in order to characterize the object. The AK of the process in which the objects were used, contamination levels where the objects are stored, and statistical sampling can all be used to infer the contamination levels for a population of items. However, any contamination measurement in excess of the applicable SCO limits in 49 CFR 173.403 would cause the material to not meet the definition of a SCO material. Similarly, SCO candidate materials utilizing reasoned judgment or process knowledge to classify the waste as SCO, if it is inferred that the candidate SCO materials "could" exceed the SCO limits in 49 CFR 173.403, then the materials should be shipped as a DOT Type A shipment.

Statistical methods can also be employed that allow inference of contamination levels for a large population of objects based on a survey of a limited number of members of that population. As contamination levels or waste concentration values approach limits for transportation or disposal, more rigor is invested in the analysis.

Previously Packaged Waste

At the Hanford Site under the CHPRC contract when previously packaged waste shipments are prepared for transport, the WMRs and shipper jointly review the SWITS data sheets. If the data package contains a mixture of LSA materials such as DAW as well as candidate SCO material such as hardware and metal objects, the shipper and WMRs use reasoned judgment as well as any process knowledge available to ascertain what percentage of the materials are LSA as opposed to candidate SCO materials. If the shipment contains a mixture of LSA and candidate SCO materials less than 1 A₂, the DOT proper shipping name of LSA is utilized to represent the entire package. The shipper and or WMRs will also review SWITS data or burial records to ascertain the presence of potential high energy/activity objects and to verify that a sealed source is not inadvertently included in the waste package.

Additionally, if it is known that the waste materials are highly-stratified or have a significant non-uniform distribution, a more detailed analysis may have to be done as this material may not qualify as an LSA material. The bottom line is that the known or assumed contents of the radioactive package must be evaluated. Since the activity of the container is less than 1 A₂, only the use of a qualitative method is required. This determination can be made through reasoned argument, reference to other shipments of similar materials, calculations and radiation measurements. It should be noted that since the activity of the waste container is less than 1 A₂, there is no need to quantitatively address the distribution of the nuclides in the LSA material.

Characterization and handling of LSA-SCO shipments greater than an A₂ Quantity

Newly Generated Waste

Typically, LSA waste greater than 1 A₂ should be characterized by performing a preliminary qualitative characterization at the point of generation, followed by a quantitative (nondestructive assay) characterization of the waste after packaging has been completed.

For waste containers with an activity of greater than 1 A₂ the use of qualitative (e.g., process knowledge, reasoned judgment, calculations) as well as quantitative (e.g., sample, real time radiology) data is needed. For "newly generated" wastes since the materials generally have not been packaged prior to characterization and or the process knowledge and historical knowledge

is more readily available, a more accurate characterization of these materials, as well as the DOT classification for LSA or SCO materials is more easily obtainable and defensible.

Previously Packaged Waste

When a retrieval package is prepared for transport the WMRs and shipper both review the SWITS data sheets as well as any other information that is available to them to assist in the characterization of the waste package. Retrieval or “legacy” waste should be treated as an “unknown”, which will require some sort of formal waste characterization and DOT classification review. Additionally, process knowledge and other characterization information are verified as much as possible. If the data package contains a mixture of LSA materials and DAW as well as candidate SCO material such as hardware and metal objects, the shipper and WMRs should use reasoned judgment as well as any process knowledge available to ascertain what percentage of the materials are LSA as opposed to candidate SCO materials.

If the package contains both LSA and SCO materials, the activity is greater than 1 A_2 and it is determined that the majority of the radioactive activity, based on weight, can be attributed to the candidate SCO materials as opposed to the LSA material, the shipment would be classified for DOT purposes as a SCO. The converse would apply if the activity of the LSA materials were deemed the major contributing factor in the proper shipping name selection. The shipper and or WMRs will also need to review SWITS data or burial records to ascertain if there may be any “high energy/activity” objects such as a possible sealed source included in the container. Sealed sources would normally not meet the definition of a LSA and or SCO material. Additionally, it is known that the waste materials are highly-stratified or have a significant non uniform distribution, a more detailed analysis may have to be done as this material may not qualify as an LSA material. Since the activity of the container is greater than 1 A_2 the use of a qualitative method as well as quantitative methods is required.

Documentation to support the classification of the LSA and SCO material must be detailed enough to identify the isotopes in the package. This would include determining if the material consists of beta/gamma emitters, or high toxicity alpha emitters. The waste matrix must be known as much as reasonably expectable as this information is not only critical for the DOT classification process, but also for waste characterization process and compliance with the TSDF waste disposal profile. The generator should perform a nondestructive analysis on a sampling of a predetermined percentage of the retrieval waste containers from a particular waste lot to verify the information is correct. Data from the samples of a particular waste lot can then be used to support the waste characterization and DOT classification of similar containers from these lots.

Determinations can also be made through reasoned argument, reference to other shipments of similar materials, calculations and radiation measurements. The factor of ten method, or something similar, should be utilized to verify that the material is “distributed throughout” in order to meet the definition of a LSA II material. Since the waste is already packaged it is not always feasible or safe because of As Low as Reasonably Achievable (ALARA) concerns for personnel to open up the packages. Therefore, radiation surveys of the outside of the containers can be used to verify that the activity is within a factor of 10. If the radiation readings on the outside of the small container (e.g. standard waste box) or 250 liter or 386 liter (55 or 85 gallon) drum are within a factor of 10 from a minimum of six survey points, the material in the package

is considered to be “distributed throughout”. Larger containers would generally require more than a six-point survey to be performed as determined by the authorized shipper in conjunction with Radiation Control organization. For larger containers or boxes it is recommended that a minimum of a sixteen-point survey be performed.

For shipments greater than $1 A_2$, it is recommended that a substantial percentage of the containers of a particular waste stream would need to have an NDA evaluation and a predetermined percentage of the containers would need to be through the RTR evaluation. From the NDA and RTR data a “bounding case” scenario could be developed using this data as well as process knowledge, reasoned judgment, SWITS data and burial records. It should be noted however, that it is not always possible to RTR or NDA large containers due to the sheer size of these containers.

Packages of questionable integrity should be repackaged or placed in an outer container to provide a more robust packaging subsequent to transport on or off site to a TSDF. For example there are several large containers located at the Hanford Site Centralized Waste Complex that are comprised of large fiberglass-reinforced wooden boxes which contain a mixture of LSA and candidate SCO materials. These large boxes will be placed in larger DOT 7A metal container that was specially manufactured and tested for this sort of payload. The inner container will contain greater than $1 A_2$ and up to $100 A_2$ of radioactive materials. The $100 A_2$ limit is imposed because of the potential for combustible materials. Because the large fiberboard box is being repackaged into the large “super” DOT 7A type A container, the entire contents to include the outside surface of the inside the fiberglass reinforced package is then considered in the LSA and candidate SCO material determination. This additional weight can then be used as waste material for the calculation of the specific activity per gram for the LSA determination. It is anticipated that this could increase the weight percentage of materials so that the LSA material may become the primary contributor in the waste matrix and the “candidate” SCO materials secondary. If the majority of the waste materials (e.g. >50%) in the container as determined by weight is ascertained to be “candidate” LSA materials, the DOT proper shipping name would therefore be “Radioactive material Low Specific Activity (LSA II) UN 3321.” This would eliminate the need to have smears of the internal waste materials. Smear data, however, could now be taken on the external surface of the internal fiberglass wrapped internal container. In most cases, this surface would probably not be contaminated enough to even meet DOT limits for a SCO material.

As previously stated for shipments of waste containers on site that do not or cannot meet the definition of LSA or SCO, the CHPRC does have the option of transporting these materials using a Type A package. The CHPRC presently utilizes several specially built large DOT 7 A packages (e.g. Super 7 A). Additionally, for shipments destined to an onsite TSDF, the DOE-RL Transportation Safety Document (DOE/RL-2001-36) can be utilized. The DOE-RL TSDF has approved the Special Packaging Approvals or Package Specific Safety Document which allows for the transportation of waste materials that cannot meet the full DOT regulations using a DOE-Richland Operations (RL) approved package. These risk-based packages are transported via a “road closure” thereby taking the shipments “out of commerce”. The CHPRC also frequently utilizes this mechanism to transport waste to the Perma Fix Northwest TSDF, located adjacent to the Hanford Site. This method of transport also requires a “road closure” which is coordinated

with the Benton County Sheriff Department, City of Richland Police Department as well as the Hanford Patrol.

Additionally, all retrieval wastes packages are carefully inspected to look for container integrity issues and to verify that the packages meet the DOT requirements for handling and subsequent transport. If any of the retrieval packages fail the rigorous integrity inspection, they will be repackaged. During this repackaging effort, the contents of the suspect container will be reviewed and smears taken to further support the DOT classification of the repackaged material. In this situation as in the scenario outlined above, the waste package that needs to be “repackaged” now becomes part of the waste matrix and is handled as described above.

One-Touch Philosophy

The proper characterization of D&D waste packages as well as the determination of the DOT classification determinations is essential to the CHPRC “one touch” philosophy. The premise behind the one-touch philosophy for the handling, packaging, and transporting of waste for CHPRC at the Hanford Site has to do with the waste materials being handled from the point of generation to the waste TSDF facility without the need to be handled several times, opened, or repackaged. The acceptance criteria at either an offsite TSDF location (e.g., Clive, Perma Fix Northwest) or for the Hanford onsite disposal at the ERDF facility (e.g., WCH-191) as well the proper characterization of the waste and DOT classification is paramount in order that a proper package for the materials be defined (e.g. IP-1, IP-2, Type A, Type B). The timely and compliant acceptance of the waste at a TSDF facility as well as its handling, treatment and disposal must be in full compliance with all applicable federal and state regulations as well as the specific WAC for the disposal facility. If not the waste will not be received and may have to be returned to the generator or a NOV could be written against the shipping organization.

The one-touch philosophy is also important to reducing the amount of time that personnel handle waste packages which will ultimately reduce the radiation exposure and assist in CHPRC’s commitment to reducing exposure to radioactive materials and ionizing radiation levels in concert with ALARA goals to protect the health and safety of employees as well as the public.

Retrieval waste often presents challenges in this area as the data available on this waste may not be as complete as needed or the DOT classification is based on past regulatory guidance, such as waste materials previously being shipped to the Hanford Site for disposal as LSA in accordance with past DOT regulations prior to the category of SCOs being established in 1995. Therefore, waste acceptance criteria at the time the waste were accepted at the Hanford Site may need to be reviewed. To do this, the inter-disciplinary team is used to review the data sheets on the waste containers. This review is also needed to ascertain if the waste would meet the current definition of LSA or SCO. The team also reviews NDA data to determine the radioactive isotopes involved and their approximate activity in order to determine how to safely package and transport this waste.

Process knowledge from the facilities where the waste originated is needed and must be factored into the decision as to what the waste matrix is. Waste containers that are not in good condition are over packed in new containers that meet the DOT requirements or if needed in 7A Type A containers. Additionally, if there is not enough information to make the LSA/SCO

determination the waste materials are over packed or repackaged into Type A containers or shipped via the DOE-RL TSDF.

The key to the one-touch philosophy is that the waste materials must be packaged in compliance with all applicable DOT regulations and shipped for direct disposal. In order to make this possible the generator of the waste must be brought in early in the planning cycle to work with the WMRs as well as the Transportation and Packaging personnel.

Wastes are also acceptable onsite that are amenable to in-trench treatment (i.e., metals stabilization, mercury amalgamations, encapsulation and grouting) provided the waste is packaged and shipped for direct disposal and does not require any further treatment and processing, other than being unloaded from the vehicle and placed in the disposal cell for in-trench mixing or grouting and subsequent disposal as approved by DOE-RL.

For newly generated waste such as waste originating from site D&D operations, an integrated team approach is also utilized. Buildings that are scheduled to go through the D&D operation are reviewed by a team that is made up of WMRs, shippers, and D&D project personnel. Additionally, historical information from the building is also reviewed and radiation contact readings as well as smearable contamination data are ascertained on prospective materials to be disposed of. Sample data is also requested to help to determine upfront which materials can be shipped as non-regulated materials or possibly as radioactive materials limited quantity or as LSA and SCO. The building or site as an entity should be able to have the waste stream categorized and much of the waste material DOT classified prior to the start of D&D operations. This should not require that every square foot of a facility or every piece of material be surveyed and smeared prior in order to classify this material. Instead assumptions will be made that like materials from a similar facility location, would have similar waste stream characteristics as well as smearable contamination data. The use of this technique is acknowledged in NUREG-1608 [3].

It is anticipated that CHPRC waste management and transportation and packaging organizations will need to work closely with the waste generator to ensure the development of processes and procedures that drive the waste generators to prepare the waste for direct disposal and treatment and/or the direct transfer to a qualified TSDF. It is anticipated that the one-touch philosophy will be incorporated into the CHPRC site procedures, characterization and waste packaging requirements as well as waste classification and transportation requirements for the efficient handling of waste from the point of generation to the final TSDF facility or site disposal trench.

A critical factor to the success of this concept is the proper understanding and classification of waste materials into the DOT proper shipping classifications of LSA and SCO. For example glove boxes from facilities such as the PFP should be decontaminated as much as possible to remove contamination from each glove box to the maximum extent possible. The primary goal is to attempt to reduce the amount of Transuranic waste created that would need to be sent to the Waste Receiving and Processing facility located in the 200 West Area of the Hanford Site for subsequent packaging and transport to the WIPP facility in Carlsbad, New Mexico. Also another concern in addition to ALARA concerns is to reduce the personnel hazard from size reducing the materials for packing into standard waste box containers. Through the decontamination of these

glove boxes as well as the proper characterization and DOT classification of these materials as candidate SCO materials, it can be demonstrated that the waste meets the definition of a LLW. The SCO waste materials can then be packaged in low cost packages meeting the general packaging requirements such as IP-1 containers, as well as intermodal container, large freight container or standard waste boxes and prepared for transport to a disposal facility. The package is handled and shipped one time to a disposal facility, unloaded, possibly grouted in place for stabilization.

Building debris (e.g., rubble) from D&D operations will normally be characterized and classified as a LSA material. A D&D program manager should engage shippers and WMRs personnel early in the process. An integrated team made up of WMRs, shipper, and a project lead is normally used to work with the D&D facility program manager to characterize the waste as well as perform the DOT classification of the waste and to oversee the packaging and transport of the waste to its intended disposal facility. Figure 1 shows a diagram of the DOT waste shipping process used at CHPRC as detailed in more detail in the guidance document.

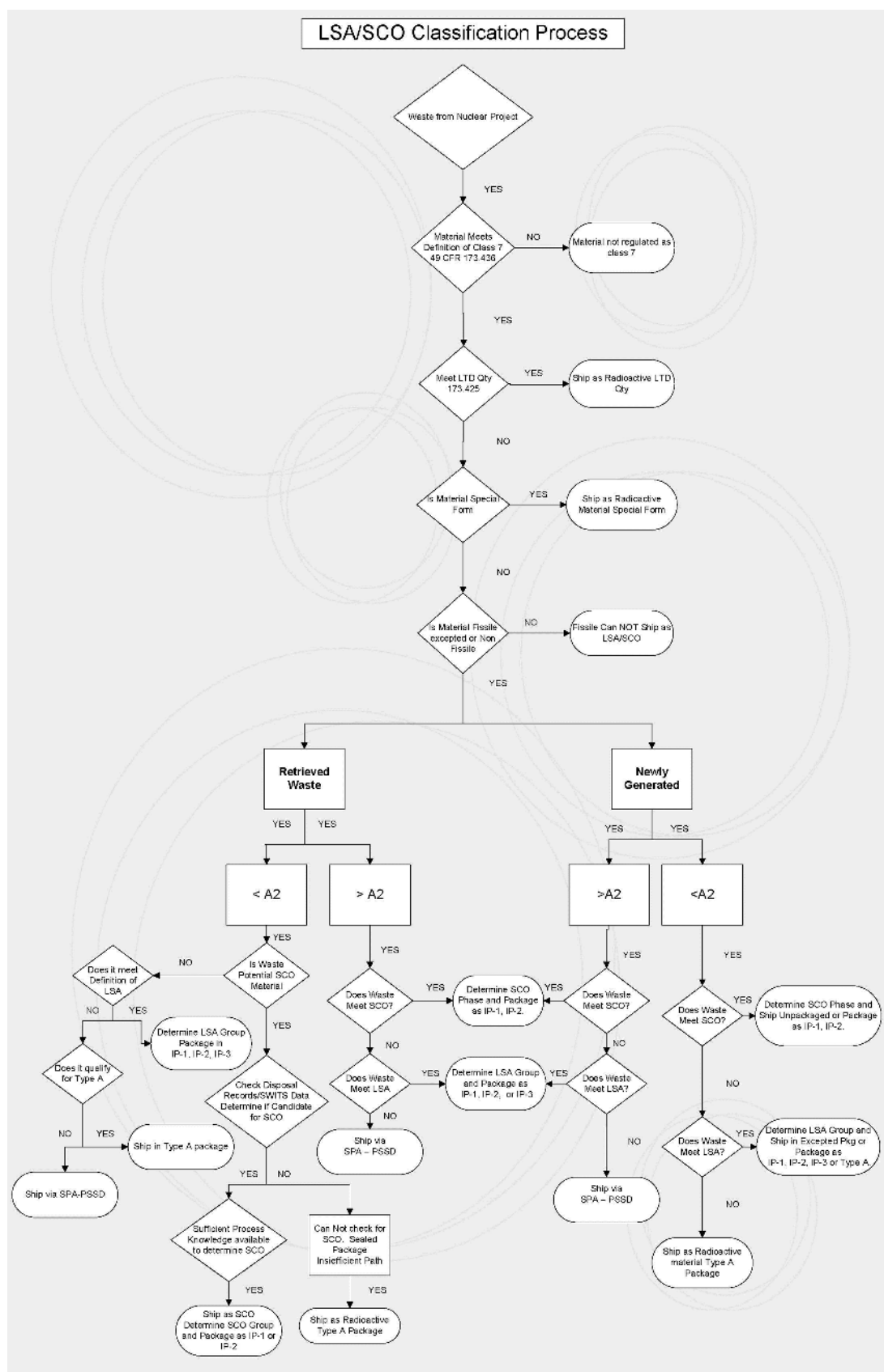


Fig. 1 LSA/SCO Classification Process

Summary

The DOT compliant shipment of radioactive LSA and SCO materials can at times be confusing and complicated to D&D personnel. The identification of these materials, the complexities, obscurities, and nuances inherent in the present DOT regulations, as well as, subsequent myriad of packaging options can present problems for the proper shipment of waste streams to TSDFs. For this reason, CHPRC developed an internal guidance document or standard to assist personnel in the decision process for the shipment of LSA and SCO materials. It should be noted that the Hanford TSD (DOE/RL-2001-36), in Section 8.3.1.5 specifies the use of the NUREG 1608 for the classification of LSA/SCO materials. The CHPRC LSA/SCO document does not deviate from this requirement but instead adds clarification as applicable. Additionally, economic, practical, worker safety, radiological and chemical exposure must be considered when making a waste determination, as well as the possible additional detailed characterization data needed which could result in increased ALARA concerns and impose additional costs and schedule delays in the cleanup of site. The CHPRC one-touch philosophy for the disposition of LLW from the point of generation to the TSDF is being utilized at the Hanford Site in order to lower logistical cost for the handling and packaging of LLW and to increase efficiencies.

References

1. Title 49, *Code of Federal Regulations*, subchapter C – Hazardous Material Transportation, October 1, 2009
2. DOE M 435.1-1, *Radioactive Waste Management Manual*
3. NUREG-1608/RAMREG, *Categorizing and Transporting Low Specific Activity Materials and Surface Contaminated Objects*, 1998, U.S. Nuclear Regulatory Commission and U.S. Department of Transportation, Washington, D.C.
4. PRC-PRO-TP-157, “Offsite Hazardous Materials Shipments,” CH2M HILL Plateau Remediation Company, Richland, Washington

Acroynms and Abbreviations

AK	Acceptable Knowledge
ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
CHPRC	CH2M Hill Plateau Remediation Company
D&D	Decommission and Demolition
DAW	Dry Active Waste
DOE	Department of Energy
DOT	U.S. Department of Transportation
IP	Industrial Packaging
LLW	Low Level Waste
LSA	Low Specific Activity
NDA	Non-Destructive Assay
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
PFP	Plutonium Finishing Plant
RTR	Real Time Radiology
SCO	Surface Contaminated Object
SWITS	Solid Waste Information Tracking System
TSD	Transportation Safety Document
TSDF	Treatment, Storage, and Disposal Facility
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Project
WMRs	Waste Management Representatives