U.S. Department of Energy Interim Guidance on Packaging, Transportation, Receipt, Management, Short-Term and Long-Term Storage of Elemental Mercury

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Revision Log

Revision/Date	Reason for Revision
Revision A March, 2023	This document combines and updates the *U.S. Department of Energy Interim Guidance on Packaging, Receipt, Management, and Long-Term Storage of Elemental Mercury* (November 2009) and *Guidance for Short-Term Storage of Elemental Mercury by Ore Processors* (May 2019). It reflects the applicable statutory requirements in the Frank R. Lautenberg Chemical Safety for the 21st Century Act, Public Law No. 114-182, including provisions for interim storage by ore processors and the requirements in the Mercury Export Ban Act of 2008, Public Law No. 110-414. This document also incorporates current assumptions related to the facility designation and elemental mercury suitable for acceptance at the DOE facility. This guidance document supersedes and rescinds the previously issued *U.S. Department of Energy Interim Guidance on Packaging, Transportation, Receipt, Management, and Long-term Storage of Elemental Mercury* (November 2009) and the *Guidance for Short-Term Storage of Elemental Mercury by Ore Processors* (May 2019).

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LIST OF ACRONYMS

ACGIH	American Conference of Government Industrial Hygienists
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials (now ASTM International)
AWS	American Welding Society
ASME	American Society of Mechanical Engineers
B&PVC	Boiler and Pressure Vessel Code
BMP	best management practice
CAA	central accumulation area
CCTV	closed-circuit television
CFR	U.S. Code of Federal Regulations
CWI	certified welding inspector
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EIS	Environmental Impact Statement
EM	Office of Environmental Management
EMS	environmental management system
EPA	U.S. Environmental Protection Agency
ES&H	environment, safety, and health
HAZMAT	hazardous materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HMR	Hazardous Materials Regulations
IATA	International Air Transportation Association
IMDG	International Maritime Dangerous Goods
ISO	International Organization for Standardization
LDR	Land Disposal Restriction
LQG	Large Quantity Generator
LTEMSF	Long-Term Elemental Storage Facility
MEBA	Mercury Export Ban Act (of 2008)
MSDS	Material Safety Data Sheet
MSHA	Mining Safety and Health Act
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
QA	quality assurance
QAP	quality assurance plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RMERC	Retorting of Mercury (LDR treatment standard)
SAA	Satellite Accumulation Area
SEIS	Supplemental Environmental Impact Statement
SQG	Small Quantity Generator
TLV	threshold limit value
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
U.S.C.	United States Code
VSQG	Very Small Quantity Generator
WAC	waste acceptance criteria
WAP	waste analysis plan

UNITS OF MEASURE

Length, Area, and Volume:

L	liter(s)
mL	milli (10^{-3}) liter(s)
psig	pounds of force per square inch above atmospheric pressure (i.e., as indicated on a pressure gage, typically for fluid pressure, or material stress)
vol%	percent by volume

Mass/Density:

mg	milli 10^{-3}) gram
kg	kilo (10^{3}) gram(s)
MT	metric ton(s) (1000 kg)

Material Concentration:

ppm	part(s) per million
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter

1.0 INTRODUCTION

The *Mercury Export Ban Act of 2008*, Public Law No. 110-414, enacted October 14, 2008 (MEBA of 2008) as amended by the *Frank R. Lautenberg Chemical Safety for the 21st Century Act*, Public Law No. 114-182, enacted June 22, 2016 (Chemical Safety Act of 2016), established new requirements pertaining to elemental mercury and certain mercury compounds.[1] Those requirements are located in the *Toxic Substances Control Act* (TSCA), Public Law No. 94-469 and the *Solid Waste Disposal Act of 1965*, Public Law 89-272, as amended by the *Resource Conservation and Recovery Act of 1976* (RCRA), Public Law 94-580, and subsequent amendments. Among other things, MEBA of 2008, and the Chemical Safety Act of 2016, collectively referred to herein as MEBA, amended TSCA and RCRA to ban the export of elemental mercury and certain mercury compounds, as well as provided for long-term and interim (i.e., short-term) management and storage of elemental mercury. Specifically, MEBA of 2008 required the U.S. Department of Energy (DOE) to designate a facility or facilities for the purpose of long-term management and storage of elemental mercury referred to herein as the Long-Term Elemental Mercury Storage Facility [LTEMSF]), 42 U.S.C. § 6939f(a), and to issue guidance on recommended standards and procedures for receipt, management, and long-term storage of elemental mercury, 42 U.S.C. § 6939f(d)(1). The Chemical Safety Act of 2016 provided for interim onsite storage of elemental mercury[2] for certain generators, while awaiting availability of the DOE-designated LTEMSF.[3] It further required DOE to issue guidance on recommended standards and procedures for management and short-term onsite storage.

This draft guidance document was developed by DOE after consultation with the U.S. Environmental Protection Agency (EPA), as well as the U.S. Department of Transportation (DOT). The public, stakeholders, and affected States are invited to provide comments on this draft guidance document. The Department will consider all comments received during the public comment period, modify the guidance document as appropriate, and conduct any needed follow-up consultation with EPA and potentially affected States. Once finalized and issued, this guidance document will supersede the previously issued *U.S. Department of Energy Interim Guidance on Packaging, Receipt, Management, and Long-Term Storage of Elemental Mercury* (November 2009) *(2009 Long-Term Storage Guidance)* and *Guidance for Short-Term Storage of Elemental Mercury by Ore Processors* (May 2019) (*2019 Short-Term Storage Guidance*). At that time, the previously issued guidance documents will be rescinded.

Elemental mercury managed under the authority of MEBA is a hazardous waste and subject to RCRA regulations. The existing regulatory framework for management of hazardous wastes, including packaging, transportation, and storage, as described in Title 40, Parts 260 through 270 of the Code of Federal Regulations (CFR), establishes the necessary standards for safe management of elemental mercury. Further, implementation of requirements by regulators for issuing and maintaining operating permits for any hazardous waste Treatment, Storage, and Disposal Facilities (TSDFs), in accordance with 40 CFR 260 – 270, ensures that appropriate site-specific procedures are established to ensure worker and environmental safety. Accordingly, this guidance document cites the key existing regulations that are germane to long-term and short-term storage scenarios for elemental mercury, based on updated DOE planning assumptions, and in the context of the statutory requirements established by TSCA and RCRA, as amended by MEBA. Consequently, the standards cited do not represent new requirements for packaging, transportation, receipt, management, and storage of such materials.

[1] This guidance uses the terms "MEBA, as amended" or simply "MEBA" to refer to the combined statutory requirements represented by MEBA of 2008 and the Chemical Safety Act of 2016.

[2] This guidance uses the terms "mercury" and "elemental mercury" interchangeably to denote the waste that will be transported to and stored at the DOE-designated LTEMSF.

[3] This guidance uses the terms "DOE-designated LTEMSF" and "LTEMSF" interchangeably to denote the facility or facilities that DOE designates for management and long-term storage of elemental mercury, pursuant to MEBA.

Moreover, the following information is not intended to be a complete representation of the applicable regulations. Rather, it is intended as a useful summary of certain key regulatory requirements; however, it does not cover all applicable statutory and regulatory requirements, nor does it address potentially more stringent State requirements. Additionally, as a DOE facility, the LTEMSF may have other operating requirements imposed through applicable DOE orders and standards.

In summary, this guidance document is not a regulation, but a compilation of key existing requirements that support the safe handling, packaging, transportation, receipt, and storage (short-term and long-term) of elemental mercury. It does not change or substitute for any statutory or regulatory provisions. This document does not impose legally binding requirements, nor does it confer legal rights. To the extent that terms such as "should," "shall," "must," "required," "requirement," and similar phrases are used, the purpose is to describe existing standards. In some instances, best management practices (BMPs)[4], are also included; however, as noted, these do not impose any new regulatory or legally binding requirements. Rather, they are intended to provide an appropriate level of detail to assist the reader in understanding the general expectations for management and operation of a RCRA-permitted elemental mercury storage facility, in accordance with existing regulatory requirements.

1.1 BACKGROUND

The DOE Office of Environmental Management, after consultation with the U.S. Environmental Protection Agency (EPA) and all appropriate State agencies in potentially affected States, issued the *2009 Interim Storage Guidance* document to establish basic standards and procedures for packaging, transportation, receipt, management, and long-term storage of elemental mercury at a DOE-designated facility or facilities, as mandated by MEBA of 2008, Section 5(d)(1). Subsequently, the Chemical Safety Act of 2016 amended MEBA of 2008 and provided for onsite interim storage of elemental mercury that is generated as a result of ore processing and/or related pollution control activities and is destined for DOE's LTEMSF. It also required DOE to issue additional guidance for short-term management and storage of elemental mercury by the covered generators. Accordingly, DOE issued the *2019 Short-Term Storage Guidance* to address this requirement. Both guidance documents were based on the planning assumptions during the timeframes they were developed.

Neither MEBA of 2008 nor the Chemical Safety Act of 2016 mandate a revision to either the *2009 Long-Term Storage Guidance* or *2019 Short-Term Storage Guidance* documents; however, since their initial issuance, some key underlying assumptions have changed and this revision, which addresses both long-term and short-term storage, reflects those changes, as discussed below.

1. **Omission of Example Procedures**: The *2009 Long-Term Storage Guidance* included standards and example procedures for receipt, management, and long-term storage of elemental mercury. These procedures, as presented in the various sections of that document, provided annotated outlines or templates of what was envisioned to be included in the LTEMSF procedures for all aspects of operation. In general, these templates described suggested processes used to meet the expectations of the applicable standards. However, the Operator(s) of the DOE-designated LTEMSF, whether a commercial or federal government RCRA-permitted TSDF,[5] will likely leverage existing procedures, as well as develop new procedures as required for critical operations specific to management of elemental mercury. These procedures must ensure compliance with the applicable federal regulations as well as state and local regulations. New and/or revised procedures are expected to require review

[4] Applicable BMPs are taken from various technical guidelines resulting from the Minamata Convention and United Nations Environment Programme (UNEP) Basel Convention and related working groups, as well as the American Conference of Governmental Industrial Hygienists (ACGIH) and DOE experience, among others.

[5] This guidance uses the generic term "TSDF" to refer to RCRA-permitted facilities operated by either commercial entities or federal agencies.

and approval by the regulators. Accordingly, DOE determined that it is not appropriate to include example procedures in this guidance document, but rather to rely on the LTEMSF Operator(s), in coordination with their local regulators, to develop and implement these procedures.

2. **Waste Container Contents**: The *2009 Long-Term Storage Guidance* contained a key assumption that the elemental mercury accepted for storage in the DOE-designated LTEMSF would be at least 99.5 percent by volume (vol%) elemental mercury. DOE does not carry this assumption forward in this guidance. Instead, DOE assumes the generators will comply with applicable RCRA hazardous waste treatment and packaging requirements for highly concentrated elemental mercury, prior to receipt at the DOE LTEMSF. DOE's interpretation of the term "elemental mercury" used in MEBA, *see*, *e.g.*, 42 U.S.C. § 6939f(a), is that only elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria is acceptable for storage in its long-term management and storage facility: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury.[6]

   In accordance with 40 CFR 268.40, retorting, or "RMERC," is the treatment standard for removal of mercury from nonwastewater wastes that contain greater than 260 milligrams per kilogram (mg/kg) total mercury (i.e., High Mercury-Inorganic Subcategory). 40 CFR 268.42 defines RMERC as follows: "*Retorting or roasting in a thermal processing unit capable of volatilizing mercury and subsequently condensing the volatilized mercury for recovery."* The intended result of this treatment standard is that it renders the remaining residue (i.e., the non-mercury component of the waste stream) as non-hazardous when it meets the Toxicity Characteristic Leach Procedure (TCLP) limit of 0.20 milligrams per liter (mg/l) for mercury (note this may require repeating the RMERC process), assuming no other regulated hazardous constituents are present, such that it can be safely disposed. Historically, the elemental mercury recovered from wastes in this manner was available for recycle or reuse, domestically and/or internationally. Under the provisions of MEBA, a prohibition on the export of elemental mercury was established.

   The RMERC treatment standard is applicable to mercury wastes that are designated as having toxic characteristics, as well as those on other specific lists of regulated hazardous chemicals, in accordance with RCRA definitions in 40 CFR 261, which include D009 and U151, respectively. The U-List identifies hazardous wastes from discarded commercial chemicals that were manufactured or formulated for commercial or manufacturing use, which consist of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient (see 40 CFR 261.33). "Technical Grade" elemental mercury is generally considered to be 99vol% elemental mercury, which is offered for sale by multiple commercial chemical suppliers.[7]

   Based on the criteria discussed above, expected elemental mercury generation sources and the related actors discussed, this revised guidance does not assume any DOE-specified minimum purity for elemental mercury accepted for management and long-term storage at the DOE-designated facility. Rather, the guidance document focuses on applicable RCRA and DOT regulations related to the accepted waste and compatibility of the waste with the containers, as discussed in more detail below.

3. **Generators:** In general, elemental mercury generators can be grouped into three primary categories: 1) ore processors, 2) commercial recyclers, and 3) chlor-alkali plants. Generation of mercury by ore

[6] Elemental mercury that has previously been treated to 99.5 vol% elemental mercury will be accepted at the DOE facility. This is included to capture treatment that some generators have already undertaken in order to meet DOE's original 99.5 vol% criteria.

[7] American Elements (https://www.americanelements.com/mercury-liquid-7439-97-6) and Trade India (https://www.tradeindia.com/products/technical-grade-liquid-mercury-6884611.html) are examples of commercial suppliers that provide 99 vol% "Technical Grade" elemental mercury (websites accessed on April 18, 2022).

processors typically occurs due to retorting as part of their required pollution control activities and represents the majority of the potential projected receipts at a DOE-designated LTEMSF. Similarly, commercial recyclers use retorting to separate elemental mercury from certain waste media, as well as collect commercial/technical-grade elemental mercury from discarded components. Finally, the chlor-alkali plants generate elemental mercury during decommissioning of electrolytic cells that use commercial/technical-grade elemental mercury in the process All of these generation sources are expected to produce relatively pure elemental mercury waste streams; however, each must be evaluated on a case-by-case basis by the LTEMSF Operator(s), in consultation with appropriate regulators[8], to determine that they meet one of the three criteria set forth above for acceptability.

MEBA established provisions allowing certain generators (i.e., ore processors) to accumulate elemental mercury onsite[9], without a RCRA permit, if certain conditions have been met, including that they have certified that they will transfer it to the DOE-designated LTEMSF for long-term management and storage once available.

4. **Containers and Compatibility:** The principal objective regarding the containers accepted for storage in the DOE-designated LTEMSF is that they are lined with, or made of, materials that will not react with and are compatible with the elemental mercury to be stored and do not pose a risk of accelerated corrosion and container failure over time (40 CFR 264/265.172). Currently, there are two primary containers of interest, which are in common commercial use for packaging, transportation, and storage of elemental mercury, that meet the applicable DOT regulations in 49 CFR 173. These include a three-liter (3-L) flask, with a 35-kg capacity, and a one metric ton (1-MT) container. Both are constructed of mild steel and are unlined such that the contents are in direct contact with the container inside surfaces[10]. Due to their prevalent use, these are the assumed predominant containers to be received at the DOE-designated LTEMSF.

   Given the uncertain duration of long-term storage for elemental mercury,[11] the requirement for compatible materials is particularly relevant and important to safe management of the inventory. The primary contaminants of concern are those that can exist as secondary phases floating on top of the elemental mercury (i.e., as opposed to the trace amounts of very small particles of metals or amalgams that may be suspended in the elemental mercury). These could be solid phases of mercury salts, such as calomel (mercury chloride) and cinnabar (mercury sulfide), or aqueous phases of water, acid solutions, and chloride salt solutions. Any of these secondary phases of contaminants could eventually lead to failure of unlined containers made of mild steel. DOE will only accept elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury.

   No secondary phases of contaminants, based on process knowledge developed in accordance with 40 CFR 262.11(d) or visual examination, as determined appropriate by the Operator(s) of the DOE-designated LTEMSF in coordination with their regulators, including solid and liquid phases, are acceptable for receipt at the DOE-designated LTEMSF, ensuring compliance with compatibility

[8] Operators of TSDFs are required to develop a Waste Analysis Plan in accordance with 40 CFR 264/265.13. However, EPA recognizes that state hazardous waste management programs may be more stringent and/or broader in scope. See *Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste*, EPA 530-R-12-001, April 2015.

[9] Other generators must be permitted under section 3005(c) of the Solid Waste Disposal Act (42 U.S.C. 6925(c)) and meet all the MEBA certification requirements, to store elemental mercury and not be subject to the storage prohibition of section 3004(j) of the Solid Waste Disposal Act (42 U.S.C. 6924(j)).

[10] Bethlehem Apparatus (https://www.bethlehemapparatus.com/shipping-containers) and VaporLok™ (http://www.vaporlokproducts.net) are examples of commercial suppliers of 3-L flasks and 1-MT containers for elemental mercury storage and transportation (websites accessed on April 18, 2022).

[11] Currently, there is no disposition path for elemental mercury in the U.S. Storage will be required until a treatment and disposal path has been established, which requires EPA approval. Thus, the required storage duration is uncertain.

requirements set forth in 40 CFR 264/265.172, and 49 CFR 173.24(c). Based on the operations that generate significant portions of the elemental mercury inventories that are anticipated to be transferred to the LTEMSF, process knowledge, once validated, is expected to be acceptable for characterizing the container contents to the extent required to treat, store, or dispose of the waste. Periodic validation via analysis and/or visual examination will be performed in accordance with the applicable regulations, described in 40 CFR 264/265.13, in consultation with the Operator(s) of the DOE-designated LTEMSF, and in compliance with 40 CFR 268.7 to re-validate the basis for acceptable process knowledge.

Note that if lined mild steel containers or other containers that are not subject to corrosion (e.g., stainless steel, plastic, etc.) are used by any generator, the presence and/or concentrations of the aforementioned contaminants would not pose a corrosion risk. However, the same restrictions may still be applied by the LTEMSF Operator(s) to allow for potential combining of containers and/or future re-containerization, if required. For purposes of this guidance document, the predominant containers are assumed to be unlined, mild steel 3-L flasks and 1-MT containers, which represent the bounding scenario.

5. **Onsite Short-Term Storage by Ore Processors**: Section 10(c) of the Chemical Safety Act of 2016 amended Section 5 of MEBA of 2008 to include the provision for temporary accumulation by generators "*producing elemental mercury incidentally from the beneficiation or processing of ore or related pollution control activities*" (i.e., ore processors). Section 10(c)(2)(C) of the Act specifically states that, if DOE is unable to accept elemental mercury for reasons beyond the control of the generator, ore processors who meet the applicable requirements specified therein *"may accumulate the mercury produced onsite that is destined for a facility designated by the Secretary [of Energy] under subsection (a) for more than 90 days without a permit issued under section 3005(c) of the Solid Waste Disposal Act (42 U.S.C. 6925(c)), and shall not be subject to the storage prohibition of section 3004(j) of that Act (42 U.S.C. 6924(j))*." Ore processors that elect to conduct onsite short-term storage of elemental mercury that is destined for the DOE-designated LTEMSF will be subject to all RCRA regulations applicable to generators accumulating hazardous waste on site, as set forth in 40 CFR 262.17[12], with the exception of the accumulation times, which are specifically exempted in the Chemical Safety Act of 2016. That same section in the Chemical Safety Act of 2016 also required that DOE *"develop and make available guidance that establishes procedures and standards for the management and short-term storage of elemental mercury*" produced by these ore processors. Accordingly, DOE issued the *2019 Short-Term Storage Guidance*.

   As previously discussed, DOE has not yet identified a specific TSDF(s) that will be designated as the LTEMSF. Ore processors are the only generators granted exemption from the RCRA storage prohibitions and allowed to accumulate elemental mercury onsite beyond 90 days in non-permitted temporary storage. Based on the technologies used in the pollution control systems operated by the ore processors, the elemental mercury acceptable for short-term storage is typically generated via retorting (i.e., RMERC). Accordingly, it is expected to exhibit a relatively high percent by volume of elemental mercury, although there is a potential for contaminants to be present as secondary phases in the containers. This guidance document includes changes to the *2019 Short-Term Guidance* by specifying the criteria for elemental mercury which DOE will accept and by adding emphasis to the requirements for compatible waste containers and compliance with the requirements of 40 CFR 264/265.172. The approach for ensuring compliance should be determined in consultation with and approval by the regulators for the affected ore processors.

[12] EPA reorganized and updated the RCRA generator requirements in November 2016, after Congress passed the Chemical Safety Act. The Act specified that ore processors storing onsite must meet the requirements of 40 CFR 262.34(a)(1)-(4). Those requirements have been relocated to 40 CFR 262.17(a) as noted in 81 FR 85732, 85739 (Nov. 28, 2016).

1.2 PURPOSE

This document is intended to provide general guidance on standards that are reflective of current Federal regulations for the packaging, transportation, receipt, management, short-term, and long-term storage of mercury generated in the United States. As such, this guidance emphasizes the standards that are expected to be implemented, in compliance with the existing regulatory requirements, as well as applicable BMPs, for any facility or facilities designated by DOE as a LTEMSF, in accordance with MEBA. Accordingly, this guidance refers to existing Federal regulations issued by EPA, DOT, Occupational Safety and Health Administration (OSHA), etc., as well as Federal law (MEBA), as standards applicable to hazardous waste, and specifically elemental mercury. In the future, this guidance document is expected to be superseded by the TSDF's RCRA permit, permit conditions, and any corresponding documents incorporated by reference in the permit (e.g., site-specific standards, procedures, and Waste Acceptance Criteria [WAC][13]) of the Operator(s) and the facility(ies) designated by DOE as the LTEMSF. The host State(s) may have additional hazardous waste and other regulations with which generators, transporters, and the LTEMSF must comply. While the standards described in this guidance are primarily focused on long-term storage of elemental mercury in the DOE-designated LTEMSF, as noted, some are also applicable to short-term storage at ore processing facilities. These are identified throughout the guide in text boxes, as appropriate.

This guidance addresses the following major objectives:

1. To identify key RCRA requirements for use in complying with relevant standards and procedures for the LTEMSF;

2. To assist generators and the LTEMSF Operator(s) in preparing for the long-term management and storage of elemental mercury; and

3. To identify existing regulations that are applicable to short-term storage at ore processor facilities.

This guidance document is intended to be a reference for all generators and transporters of elemental mercury, ore processors that elect to conduct onsite short-term storage, and Operator(s) of any permitted TSDFs that provide interim storage of elemental mercury awaiting designation of the LTEMSF, as well as the eventual LTEMSF Operator(s). Specifically, potential users of this guidance document may include the following:

- Past generators, current owners, and custodians of elemental mercury;
- Recyclers of mercury-bearing materials, wastes, and products (e.g., companies that recover mercury from dental amalgams and fluorescent lamps);
- Major industrial generators of elemental mercury, including the minerals mining industry (i.e., ore processors), and chlor-alkali (chlorine and caustic soda production) industry;
- Private and government contractors managing stockpiled elemental mercury;
- Shippers of elemental mercury;
- TSDF Operator(s) providing interim storage; and
- Future Operator(s) of the DOE-designated LTEMSF.

[13] The term "WAC" is used generically in this guide to refer to the requirements document prescribed by the TSDF Operator to ensure compliance with its operating permit.

This guidance provides general direction to (1) generators who will ensure the compatibility of the container contents (i.e., mercury and contaminants) and the overall integrity of the containers for short-term and/or long-term storage, as applicable; (2) transporters who will load, secure, and transfer the mercury to the storage facility; and (3) the Operator(s) of the LTEMSF that will be responsible for unloading the elemental mercury from the transport vehicle, verifying that waste acceptance requirements have been met, and operating the LTEMSF in compliance with its RCRA permit.

1.3 SCOPE, MAJOR ASSUMPTIONS, AND CONTENT

As required by MEBA of 2008, as amended, this document outlines existing applicable standards for the receipt (including acceptance criteria and transfer/transport requirements), management, short-term storage, and long-term storage of elemental mercury. While the document is focused primarily on storage at the LTEMSF, as appropriate, it also identifies the subset of those standards that are applicable to short-term storage conducted at ore processing facilities. In addition to this Introduction, this guidance covers the following major topics:

- Section 2: Standards Applicable to Generators,
- Section 3: Standards for Transportation of Elemental Mercury,
- Section 4: Standards for Receipt/Verification of Elemental Mercury and Mercury Containers,
- Section 5: Standards for Operating the LTEMSF;
- Section 6: Standards for Emergency Response;
- Section 7: Standards for Waste Management at the LTEMSF; and
- Section 8: Standards for Training Related to the LTEMSF.

Major assumptions and bounding conditions include the following:

1. The elemental mercury to be shipped to and stored at the LTEMSF is considered a RCRA hazardous waste. DOE will only accept elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury.

2. The contents of elemental mercury containers should not include any contaminants that are corrosive to the container material of construction (e.g., for unlined, mild steel this would include, but not be limited to, visible secondary solid phases of mercury salts and other aqueous phases of water, acid solutions, or chloride salt solutions). This is in accordance with RCRA requirements described in 40 CFR 264/265.172. Commercially available, unlined, mild steel 3-L flasks and 1-MT containers are assumed to be the predominant containers received at the DOE-designated LTEMSF. Other container types that are not subject to corrosion (e.g., stainless steel, plastic) could potentially be shipped to the facility. However, similar restrictions for these contaminants may be implemented to allow for combining contents from small containers into larger containers and/or other re-containerization to support handling and storage efficiencies.

3. Based on the operations that generate a significant portion of the elemental mercury inventories that are anticipated to be transferred to the LTEMSF, process knowledge, once developed and validated in accordance with 40 CFR 262.11, should be acceptable for ensuring compliance with compatibility requirements set forth in 40 CFR 264/265.172, and 49 CFR 173.24(c).

4. Periodic validation via analysis and/or visual examination will be performed in accordance with the applicable regulations described in 40 CFR 264.13 in consultation with the Operator(s) of the DOE-designated LTEMSF, and in compliance with 40 CFR 268.7.

5. The DOE-designated LTEMSF will not accept elemental mercury contained in environmental media or consumer products (fluorescent lamps, batteries, etc.) or elemental mercury contained in manufactured items (manometers, thermometers, switches, etc.). However, elemental mercury recycled from these materials and that meets one or more of the three criteria listed above would be accepted at the LTEMSF

6. The DOE-designated LTEMSF will not accept elemental mercury that contains any discernible radiological contaminants. This should be validated via measurement and/or process knowledge.

7. The LTEMSF Operator(s) will preapprove, prior to shipment to the facility, all elemental mercury storage containers that meet applicable DOT requirements. As previously noted, commercially available, mild steel, unlined 3-L flasks and 1-MT containers are assumed to be the predominant containers used and are preferred for handling and storage efficiency. Other containers **may** be accepted on a case-by-case basis, as agreed upon between the generator and the LTEMSF Operator(s), in accordance with the RCRA permit and specified waste acceptance requirements. These will be on an exception basis, limited in occurrence, such that their acceptance is assumed to not significantly impact operating costs.

8. The DOE-designated LTEMSF will be a RCRA-regulated/permitted facility, storing only discarded elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury.

9. The DOE-designated LTEMSF should include capabilities to safely receive, store, handle, re-package/overpack, and manage until such time that a treatment and disposal path is approved by EPA and implemented.

SHORT-TERM ONSITE STORAGE – The following assumptions and bounding conditions apply to ore processors that elect to conduct onsite short-term storage, in accordance with the 2016 Chemical Safety Act.

10. Elemental mercury, while a hazardous waste due to its toxicity, is not currently defined as an acutely hazardous waste (40 CFR 261.30), accordingly, 40 CFR 262 does not define a maximum accumulated amount for large quantity generators (LQGs).

11. Ore processors that elect to conduct onsite short-term storage of elemental mercury will be subject to all RCRA regulations applicable to generators accumulating hazardous waste on site, as set forth in 40 CFR 262.17(a), with the exception of the accumulation times, which are specifically exempted in the Chemical Safety Act of 2016. This allowance is specific to Large Quantity Generators (LQGs) only, as defined in 40 CFR 262.13. The Chemical Safety Act of 2016 provides for onsite temporary storage by LQG ore processors, subject to various requirements, including that the generator has obtained an EPA identification number in accordance with 40 CFR 262.18. Specific implementation requirements would be determined in consultation with the appropriate regulators.

12. Central accumulation areas (CAAs) and/or Satellite Accumulation Areas (SAAs)[14] (as applicable) operated by ore processors conducting onsite short-term storage of elemental mercury must be maintained and operated in compliance with applicable requirements of 40 CFR 262.17(a), and 40 CFR 262.15, respectively, such that the integrity of the containers is not compromised during the storage period (i.e., no visible corrosion or leaks).

13. Recordkeeping and labeling requirements for hazardous waste containers stored in CAAs/SAAs will be maintained in accordance with 40 CFR 262 requirements for the duration of short-term storage.

14. In addition to RCRA, the ore processors that elect to conduct onsite short-term storage will be responsible for identifying and complying with the applicable DOT Hazardous Materials Regulations (HMR) (e.g., 49 CFR Subchapter C) and OSHA requirements (e.g., 29 CFR 1910.1200) and applicable National Fire Protection Association (NFPA) standards (e.g., NFPA 704), Mine Safety and Health Act (MSHA) (U.S.C. 30, Chapter 22), and other applicable consensus codes, standards, and regulations, including state regulations.

15. Short-term onsite storage of elemental mercury by the ore processors may be subject to financial assurance requirements of state statutes and regulations. For example, the State of Nevada establishes bonding and financial assurance requirements in the Nevada Administrative Code 519A.345(8)(c) and 519A.360, which may be impacted if specific quantities are accumulated. Other states may have similar regulations. Ore processors should consult with the appropriate state authorities to determine the applicability of such requirements.

1.4 RCRA APPLICABILITY

MEBA states that the elemental mercury managed and stored at the DOE-designated LTEMSF shall be subject to the requirements of the *Solid Waste Disposal Act* (as amended), and specifically Subtitle C Hazardous Waste Management, commonly known as RCRA. These requirements include applicable management standards consistent with the definition of a discarded/abandoned material in 40 CFR 261.2(a)(2) and 40 CFR 261.2(b). In general, elemental mercury, when discarded, is either a listed or characteristic hazardous waste, depending on its origin, and is restricted from land disposal. Unused elemental mercury (either as a commercial chemical product or off-specification commercial chemical product in accordance with 40 CFR 261.33) that is discarded/abandoned is a "listed hazardous waste" with the waste code U151. Used/spent elemental mercury when discarded/abandoned, is classified as a "characteristic waste" with the waste code D009 if it exhibits the toxicity characteristic (see 40 CFR 261.24).

MEBA of 2008 [see Sect. 5(g)(2), also 42 U.S.C. § 6939f] contains a specific exemption from the RCRA prohibitions on storage of hazardous wastes that are restricted from land disposal.[15] The elemental mercury accepted at the DOE-designated LTEMSF will be in storage pending EPA approval of a treatment and disposal path for *non-radioactively contaminated elemental mercury wastes*. This timeframe is currently uncertain.

MEBA does not affect the sale, recovery, or other use (other than prohibiting export) of mercury by persons (other than Federal agencies) in the United States, and it does not prohibit continued storage of commodity elemental mercury by persons (owners, recyclers, or Federal agencies). The DOE-designated

[14] Satellite Accumulation Areas (SAAs) may also be used by ore processors. SAAs are subject to requirements in 40 CFR 262.15. Similar to 40 CFR 262.17(a), SAAs are also subject to 40 CFR 262 Subpart M for emergency preparedness requirements.

[15] 40 CFR 268.50 establishes a storage prohibition for hazardous waste at permitted TSDFs of one year, unless it can be demonstrated that a longer time period is justified to accumulate a sufficient amount to facilitate proper recovery, treatment, or disposal.

LTEMSF will accept and store only elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury.

Additionally, the Chemical Safety Act of 2016 provides an exemption from accumulation time limits that allows short term storage on site for LQG ore processors until such time that the DOE-designated LTEMSF is available[16]. Accordingly, the ore processors, in consultation with their regulators, should review their current practices (e.g., container type/integrity/contents/management, emergency response plans, etc.) and adjust them as necessary to ensure that the elemental mercury can be safely handled and stored while awaiting transport to the DOE-designated LTEMSF.

It is the generator's responsibility to determine whether the elemental mercury to be shipped to the DOE-designated LTEMSF is a listed or characteristic hazardous waste (U151 or D009) and to document that determination in accordance with the applicable requirements of 40 CFR 262.11 and 40 CFR 262.40(c). In addition, for any elemental mercury with waste code D009 to be accepted at the DOE-designated LTEMSF, the generator is responsible for documenting that it has been generated as the result of RMERC treatment technology. The generator must work with the LTEMSF Operator(s), once DOE has designated such facility, to determine, consistent with 40 CFR 264.13, the necessary waste analysis (e.g., process knowledge, sample analysis, etc.) required to confirm that the elemental mercury is compliant with the TSDF permit, requirements of which are often delineated in a facility-specific WAC or similar document. This documentation must also satisfy the requirements of the LTEMSF Waste Analysis Plan (WAP), per 40 CFR 264.13(b). During the waste acceptance/review process, the LTEMSF Operator(s) will confirm and accept or reject the generator's waste determination that is documented on the generator's Waste Profile form. If accepted, the LTEMSF will then approve the waste for transfer/shipment to the facility. If a generator's waste determination is rejected, the LTEMSF Operator(s) will work with the generator to resolve issues.

1.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) EXPECTATIONS

A DOE-designated LTEMSF will be a "facility of DOE," in accordance with Section 5(a)(1) of MEBA of 2008, and DOE will provide an appropriate level of oversight and guidance. While RCRA regulations do not provide specific requirements for maintaining an effective QA/QC program, this is an administrative requirement for any facility of DOE, either owned or leased, as delineated in DOE Acquisition Regulations (DEAR) 48 CFR 970.5204-2. Accordingly, the Operator(s) of the DOE-designated LTEMSF(s) are expected to implement QA/QC protocols in accordance with their corporate Quality Assurance Programs (QAPs) or other facility-specific QAP that must be aligned with the tenants of a national or international consensus standard, such as International Organization for Standardization (ISO) 9001 *Quality Management Systems - Requirements*[17], using an appropriately graded approach. Potential areas of management, performance, and assessment to be addressed may include the following, as applicable:

1. Program organization and management process,
2. Personnel training and qualification,
3. Quality improvement,

[16] 40 CFR 262.17(a) establishes hazardous waste accumulation time limits for LQGs of 90 days, although extensions can be granted for an additional 90 days.

[17] DOE Order 414.1D *Quality Assurance* invokes ISO-9001 as an appropriate consensus standard for non-nuclear facilities, to be applied using an appropriately graded approach.

4. Documents and records,

5. Work performance,

6. Design performance,

7. Procurement performance,

8. Inspection and acceptance testing,

9. Performance of management assessments, and

10. Performance of independent assessments.

These areas cover all aspects of operation of the LTEMSF, so are inherent to the following sections that describe the applicable standards and requirements and are not repeated in those discussions. As a BMP, DOE strongly encourages generators and transporters to also implement QA/QC protocols consistent with the above to best facilitate transfer of mercury to the LTEMSF and prevent rejection of shipments by the LTEMSF Operator(s).

1.6 DEFINITION OF "STANDARDS" AS USED IN THIS GUIDANCE DOCUMENT

Standards, as presented in the various sections of this document, identify measurable controls and requirements from existing applicable regulations. They also identify appropriate methods for implementing these requirements. In some instances, there are no specific regulatory standards (e.g., QA/QC). For these cases other applicable criteria are cited (e.g., ISO 9001 for QA/QC, UNEP Basel Convention technical guidelines, American Conference of Governmental Industrial Hygienists [ACGIH], and others) and suggested as BMPs for establishing operating standards.

In general, standards indicate a level of attainment expected in key areas such as RCRA for environmental, safety, and health (ES&H), DOT for transportation, and OSHA/MSHA for worker and environmental safety. Specifically, requirements for standards include applicable regulations in the following areas:

- *Protection of the Environment*, which identify key requirements for compliance with RCRA regulations. This guidance often identifies specific citations from Title 40 of the CFR to assist users for purposes of implementation related to execution of MEBA.

- *Transportation*, which identify key requirements for compliance with DOT regulations regarding transportation of hazardous materials. This guidance often identifies specific citations from Title 49 of the CFR to assist users for purposes of implementation related to execution of MEBA.

- *Labor*, which identify key requirements for compliance with the Department of Labor OSHA. This guidance often identifies specific citations from 29 CFR Part 1910 ("Occupational Safety and Health Standards") to assist users for purposes of implementation related to execution of MEBA.

Other applicable standards cited in this guidance include, but are not limited to, requirements from the American National Standards Institute (ANSI), and NFPA.

The standards described in the following sections are presented from a perspective that assumes the DOE-designated LTEMSF is operating. For the citations throughout that are germane to onsite short-term accumulation, these standards and BMPs should be implemented into ongoing hazardous waste management practices at the applicable ore processing facilities.

In general, and in accordance with the TSDF permit, periodic review of the standards and procedures should be performed to ensure that the LTEMSF operations are compliant with Federal regulations and regulatory audit requirements. Contractual requirements may also drive additional requirements, BMPs, operational reviews, and surveillances.

2.0 STANDARDS APPLICABLE TO GENERATORS

2.1 INTRODUCTION

This section identifies key existing regulatory requirements (e.g., RCRA and DOT) and BMPs, as well as other criteria that are likely to apply to generators that will transfer/ship elemental mercury to the RCRA-permitted DOE-designated LTEMSF. The generator requirements under RCRA that could apply are based on the facility's generator status under EPA (i.e., determined by quantities and types of hazardous waste generated monthly). This section is not intended to provide an exhaustive list of all the regulatory requirements for generators that may apply to the LTEMSF, once designated. It is the generator's responsibility to determine whether the mercury being shipped was generated in the U.S. and meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury.

This section also generally describes the types of documentation that the generator will need to complete and obtain approval for from the LTEMSF Operator(s) prior to shipment. Generator documentation should demonstrate that the waste (elemental mercury) to be shipped meets the LTEMSF WAC for container contents, configuration, and condition. The generator is responsible for the cost of any required analyses, the cost for repackaging to meet the WAC,[18] preparation of the Waste Profile, and shipment to the LTEMSF, as well as the fee assessed for long-term management storage.[19]

To facilitate safe and effective storage, mercury must be shipped in closed containers in good condition to meet DOT and RCRA requirements. Mild steel, unlined 3-L flasks and 1-MT containers are assumed to be the predominant types and are preferred for handling and storage efficiency. The LTEMSF Operator(s) may, on a limited case-by-case basis, accept other sizes of containers assuming that the container contents meet the WAC for long-term storage, and that doing so does not significantly impact operating costs. Any containers other than 3-L and 1-MT would require pre-acceptance by the receiving facility prior to shipment, and concurrence by DOE. The LTEMSF Operator(s) will approve all elemental mercury storage containers in accordance with specified waste acceptance requirements.

The DOE-designated LTEMSF Operator(s) will screen the generator's documentation on mercury, the containers, and/or the pallets prior to shipment to ensure all applicable regulatory requirements/ acceptance criteria are met. Container contents, container integrity, and the absence of mercury contamination on exposed surfaces are expected to be key elements of the LTEMSF WAC. If a received container or pallet does not meet the designated storage facility's WAC, either the containers or pallets may be returned to the generator, or the mercury may be repackaged at the generator's expense, as determined by agreement between the generator and the LTEMSF Operator(s). If a leak is identified upon receipt inspection, re-containerization or over-packing may be required, in accordance with the LTEMSF established emergency response procedures, which are required for any RCRA-permitted TSDF.

In addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the LTEMSF Operator(s) must comply.

[18] The DOE storage facility will not accept elemental mercury contained in batteries or elemental mercury in elemental mercury-containing equipment (e.g., thermometers, thermostats, barometers, manometers, valves, switches, barometers, gauges, relays, etc.).

[19] DOE will establish a fee, in accordance with MEBA, and after designation of a facility.

2.2 STANDARDS – SPECIFIC REGULATORY REQUIREMENTS AND BMPs

2.2.1 Key RCRA Requirements[20]

RCRA requires generators to determine if their solid wastes are hazardous wastes. 40 CFR 262.11 defines a three-step hazardous waste determination process that any person who generates a solid waste, as defined in 40 CFR 261.2, is required to follow. First, the generator is required to determine if the solid waste is excluded from RCRA regulation in 40 CFR 261.4. Second, if the waste is not excluded, the generator is required to determine if it is listed in Subpart D of Part 261. Third, for compliance with the land disposal restrictions or if the waste is not listed in Subpart D of Part 261, the generator is required to identify all relevant hazardous waste characteristics in Subpart C of Part 261.

Under RCRA, unused elemental mercury (either the commercial chemical product or an off- specification commercial chemical product) that is discarded is a "listed hazardous waste" with the waste code U151 [see 40 CFR 261.33(f)]. Used/spent elemental mercury when discarded would be classified as a "characteristic waste" with the waste code D009 if it exhibits the toxicity characteristic (see 40 CFR 261.24). To preserve instrumentation, any sample with visible elemental mercury can be presumed to be D009. However, for purposes of compliance with the Land Disposal Restrictions (LDRs) or if the waste is not listed in Subpart D of Part 261, the generator must identify all relevant hazardous waste characteristics listed in Subpart C of Part 261.

40 CFR Part 262 establishes the "Standards Applicable to the Generators of Hazardous Waste." As defined in 40 CFR 260.10, a hazardous waste "generator" is "*any person, by site, whose act or process produces hazardous waste identified or listed in part 261 of this chapter or whose act first causes a hazardous waste to become subject to regulation*". In accordance with 40 CFR 262.13, generators are divided into three categories based upon the quantity of waste they produce:

- LQGs generate more than 1 kilogram per month of acute hazardous waste, or greater than or equal to 1,000 kilograms of non-acute hazardous waste per month[21], or greater than 100 kilograms per month of residue from an acute hazardous waste spill cleanup.

- Small Quantity Generators (SQGs) generate less than or equal to 1 kilogram of acute hazardous waste per month, *and* between 100 and 1000 kilograms of non-acute hazardous waste per month, *and* less than or equal to 100 kilograms per month of residue from an acute hazardous waste spill cleanup.

- VSQGs generate 1 kilogram or less per month of acute hazardous waste, less than or equal to 100 kilograms of non-acute hazardous waste, *and* less than or equal to 100 kilograms per month of residue from an acute hazardous waste spill cleanup.

Each class of generator is required to comply with its own set of requirements (per 40 CFR 262.14 – 262.17).

Under RCRA, generators are required to accurately characterize their wastes. They may make a hazardous waste determination by testing or applying their knowledge of the waste's chemical and physical properties as specified in 40 CFR 262.11. DOT has similar requirements, as described in 49 CFR 172.101(c)(11). For shipment of elemental mercury to the DOE-designated LTEMSF, waste

[20] The information in this document is not intended to be a complete representation of EPA's regulations for generators. It is intended as a summary for generator informational use only and does not cover all RCRA requirements nor does it address potentially more stringent State requirements for generators. Additionally, as a DOE facility, the LTEMSF may have other operating requirements imposed through applicable DOE orders and standards.

[21] Per 40 CFR 260.10, *Acute hazardous waste* means hazardous wastes that meet the listing criteria in 40 CFR 261.11(a)(2) and therefore are either listed in 40 CFR 261.31 with the assigned hazard code of (H) or are listed in 40 CFR 261.33(e).

characterization may be based on sampling and analysis, acceptable knowledge, or a combination of both. Acceptable knowledge may include process knowledge (e.g., information about chemical feedstocks and other inputs to the production process); knowledge of products, by-products, and intermediates produced by the manufacturing process; chemical or physical characterization of wastes; information on the chemical and physical properties of the chemicals used or produced by the process or otherwise contained in the waste; testing that illustrates the properties of the waste; or other reliable and relevant information about the properties of the waste or its constituents. A test other than a test method set forth in Subpart C of 40 CFR 261, or an equivalent test method approved by the Administrator under 40 CFR 260.21, may be used as part of a person's knowledge to determine whether a solid waste exhibits a characteristic of hazardous waste. However, such tests do not, by themselves, provide definitive results. Persons testing their waste must obtain a representative sample of the waste for the testing, as defined at 40 CFR 260.10.

Waste characterization using process knowledge must be periodically reevaluated to confirm that the technical basis used to establish the process knowledge is still representative of the actual process that generates the waste and the characteristics of the resulting waste stream. The required periodicity for validating the waste characterization data should be included in the WAP, but at a minimum the waste determination must be re-confirmed if the process generating the hazardous waste has changed or an inspection indicates that the waste received at the TSDF does not match the accompanying Waste Manifest [40 CFR 264.13(a)(3)]. Additionally, RCRA requires that all TSDFs, in this case the DOE-designated LTEMSF, have sufficient characterization data for wastes to be received to ensure safe and compliant storage, treatment, and eventual disposal. For elemental mercury, the acceptable knowledge provided by the generators, combined with the process information, and periodic validation analysis is assumed to be sufficient; however, the actual requirements will be determined by the LTEMSF Operator(s) in consultation with their state regulators.

In accordance with 40 CFR 262.40(a), generators must keep a copy of each manifest signed in accordance with 40 CFR 262.23(a) for three years from the date the waste was accepted by the initial transporter or until a signed copy has been received from the DOE-designated LTEMSF after receipt and acceptance of the waste. This signed copy must be retained as a record for at least three years from the date the waste was accepted by the initial transporter. Additionally, per 40 CFR 262.11(f), hazardous waste generators must maintain records supporting its hazardous waste determinations, including records that identify whether a solid waste is a hazardous waste, as defined by 40 CFR 261.3. The records must include, but are not limited to, results of any tests, sampling, waste analyses, or other determinations made (e.g., acceptable knowledge); records documenting the tests, sampling, and analytical methods used to demonstrate the validity and relevance of such tests; records consulted in order to determine the process by which the waste was generated, the composition of the waste, and the properties of the waste; and records which explain the knowledge basis for the generator's determination. The generator is required to also keep any exception reports for a minimum of three years from the due date of the report.

VSQGs do not have specific recordkeeping requirements under RCRA, but it is advisable that they retain waste analyses/waste characterization records to prove their exempt status. It is also advisable for VSQGs to maintain records regarding their on-site waste accumulation totals to document their exempt status.

SHORT-TERM ONSITE STORAGE – The preceding standards are also applicable to ore processors that are conducting short term storage of elemental mercury at their facilities. Information provided to the DOE EM indicates that this is current practice.

VSQGs are not required under RCRA to use manifests or retain manifests, but the DOT requirements would still apply to the shipment; therefore, VSQGs would need to issue a shipping paper and meet DOT requirements for recordkeeping.

2.2.2 Elemental Mercury Waste Approval Process and Documentation

The LTEMSF Operator(s) shall establish a waste approval process and define documentation that the generator must submit. Elemental mercury would not be shipped until the receiving facility accepts the generator's documentation. The requirements for generators outlined below are driven by the regulations issued by EPA, DOT, OSHA, statutory requirements under MEBA, as amended, and QA/QC expectations.

2.2.3 Generator Requirements Before Shipment

Generators must demonstrate that the waste mercury containers to be shipped meet the LTEMSF WAC, once established. At a minimum, it is expected that the generator will submit the following required documentation to the LTEMSF Operator(s) and obtain approval to transport the waste to the facility prior to shipment:

1. A Waste Profile form, or similar, for each separate elemental mercury waste stream; and

2. A copy of the draft manifest and LDR form[22] for the initial shipment of the waste represented in the Waste Profile form.

Based on BMPs from RCRA-permitted TSDFs, both commercial and federal, information in the Waste Profile should include, but not be limited to, generator information and waste characterization (applicable RCRA waste codes, sampling and analyses results, and/or documented acceptable knowledge). For example, depending on the generating source and container type used, the Waste Profile should document (1) the container contents and validate that no other hazardous constituents are present (i.e., D009 and U151 codes only), (2) for D009 coded elemental mercury, that generation was a result of RMERC treatment technology, (3) for elemental mercury previously treated that it was treated to 99.5 vol% elemental mercury, (4) that there are no radioactive constituents or contamination in the mercury, (5) the absence of prohibited materials (e.g., water, chloride salts solutions, nitric acid solutions, or other possible corrosion agents for unlined, mild steel containers), (6) the U.S. point of generation of the mercury, and (7) that the containers, and potentially pallets, used are suitable for long-term storage of elemental mercury. The Waste Profile should identify the minimum informational requirements that must be supplied for the LTEMSF Operator(s) to properly evaluate the waste stream and approve the waste shipment based on the Waste Profile. However, the LTEMSF Operator(s) may request additional information not included on the Waste Profile to ensure full compliance with the facility WAC.

As a BMP, all documentation should be submitted to the LTEMSF Operator(s) according to the schedule set by the LTEMSF Operator(s) to allow for a complete review and approval by the storage facility.

2.2.3.1 Mercury characterization documentation

As part of the Waste Profile, the generator provides appropriate characterization data (i.e., sample analysis, visual inspection/records, and/or acceptable knowledge) as determined to be sufficient to meet

SHORT-TERM ONSITE STORAGE – CAAs should be managed in accordance with 40 CFR 262.17 requirements, which restricts storing wastes that are incompatible with the containers. Ore processors conducting short term storage at their facilities should perform sufficient analyses and/or apply acceptable knowledge to confirm that the elemental mercury containers do not include nitric acid solutions, chloride salts solutions, water, and other possible corrosion agents, including visible secondary solid phases of mercury salts (e.g., calomel, cinnabar), or any added radiological constituents. This will ensure that the integrity of the containers is maintained during onsite storage and facilitate subsequent transport to the DOE-designated LTEMSF when available, minimizing the potential for leaks and need for re-containerization.

[22] VSQGs may use shipping papers or manifests depending on agreement with the receiving storage facility.

RCRA requirements in 40 CFR 262.11, and in consultation with the LTEMSF Operator(s). For the assumed mild steel, unlined containers, the impurities in the waste shall not be capable of corroding carbon steel, in accordance with 40 CFR 264/265.172, and 49 CFR 173.24(e). Specifically, to prevent degradation of the container, nitric acid solutions, chloride salts solutions, water, and other known or suspected corrosion agents are prohibited, including visible secondary solid phases of mercury salts (e.g., calomel, cinnabar). The mercury shall be free of any added radiological constituents. In accordance with 40 CFR 264/265.13, the WAP (discussed later) to be implemented by the DOE-designated LTEMSF is expected to provide the generator with the specific data and methods that are acceptable for characterizing the elemental mercury container contents. The WAP will be developed by the LTEMSF Operator(s), in consultation with DOE, and approved by the appropriate regulators as part of the permitting process (i.e., new permit application or permit modification request).

2.2.3.2 Mercury containers

The elemental mercury should arrive at the DOE-designated LTEMSF in DOT-approved (i.e., compliant with 49 CFR 173.24) and RCRA-compliant containers. They are assumed to be constructed of mild steel (American Society for Testing and Materials [ASTM][23] A36 steel), with 3-L or 1-MT sizes being preferred, to facilitate safe and efficient storage operations. Other container materials and size options may be acceptable at the discretion of the LTEMSF Operator(s), as previously discussed; however, to facilitate potential repackaging (e.g., combining smaller containers or partially filled containers, replacing leaking or suspect containers), compatibility with mild steel of the contents of all containers accepted at the DOE-designated LTEMSF will likely be required. Welding of carbon steel must comply with American Welding Society (AWS) D1.1, *Structural Welding Code—Steel*. If using stainless steel for container material, AWS D1.6, *Structural Welding Code—Stainless Steel* applies. The listed standards provide clear instructions on proper welding techniques and procedures.

Additionally, while not specifically required by American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PVC) based on the service, as a BMP all mercury containers should be pressure tested to at least 15 pounds of force per square inch gage (psig), in accordance with the protocol described in the ASME B&PVC. This test will also satisfy International Air Transport Association Packing Instruction 803 (IATA 5.0.2.9, 13.8 psig), for 3-L (i.e., less than 35 kg) flasks, although air transportation is not anticipated.

As a BMP from UNEP Basel Convention technical guidelines, for elemental mercury storage containers fabricated using ASTM A36 structural steel, or other carbon steel, the outer surface should be coated with an epoxy, alkyd enamel, or other equivalent direct-to-metal corrosion resistant coating. A light color is preferred to assist in visual detection of leaks. The inner surface should not be coated. Threads on openings should also not be coated, although thread sealant (e.g., polytetrafluoroethylene tape or equivalent) is recommended for threaded seal plugs to minimize vapor releases after mercury has been introduced into the container.

The generator should provide adequate documentation about the manufacturing (e.g., supplier cutsheets or similar) and history of the containers in the Waste Profile. Information such as images and approximate dimensions may be required by the LTEMSF Operator(s). Containers with corrosion, dents, cracks, or other structural concerns, should be avoided, although minor dents may be acceptable, at the discretion of the LTEMSF Operator(s), and if determined to meet DOT specifications. If a container arrives at the storage facility with undocumented damage, the container may be sent back to the generator. If the container is to be returned and loss of containment is suspected, it should be overpacked before shipment. As a BMP, it is suggested that the generator photographically document the condition of the containers prior to shipping for their own records.

[23] The American Society for Testing and Materials is now an international standards organization and known as ASTM International.

To ensure the structural integrity of the container, the containers sent to the DOE-designated LTEMSF are preferred to have only been used for storage of elemental mercury. If a container is reused, the generator should document in the Waste Profile that the containers have been adequately cleaned, not damaged from any previously contained materials, and that those materials would not adversely react with mercury.

SHORT-TERM ONSITE STORAGE – Ore processors conducting short term storage at their facilities should package all elemental mercury in one of these two sizes of containers fabricated to these standards, and labelled per RCRA requirements and as recommended herein, to the extent practical, to facilitate subsequent transport to the DOE-designated LTEMSF. Based on the available information, this is the current practice among generators.

2.2.3.3 Container labeling

A container of elemental mercury should arrive at the storage facility properly labeled with the correct information, in accordance with 40 CFR 262, Subpart C and 49 CFR 172.304 (note that more detailed DOT requirements for marking, labeling, and placarding packages can be found in 49 CFR 172, Subparts D through F). The preferred location for the label on a 3-L container is the shoulder. For a 1-MT container there are two preferred label locations—one on the top near the plug and one on the side, as shown in Figure 2.1. As a BMP, the preferred orientation of the side label is perpendicular to the "C" channels. This orientation causes the label to be facing the correct direction in the spill tray. The preferred label locations will ensure the labels are readily visible and, thereby, facilitate the inspection of the container labels at receipt and during storage. Alternative label positions are acceptable if container design does not suit the suggested locations.

SHORT-TERM ONSITE STORAGE – Labeling practices must be implemented by ore processors conducting short term onsite storage in SAAs and CAAs, in accordance with 40 CFR 262.15 and 262.17, respectively. As a BMP, ore processors should consider implementing other applicable RCRA and DOT labeling requirements to facilitate subsequent transport to the DOE-designated LTEMSF. Based on the available information, this is the current practice among generators.

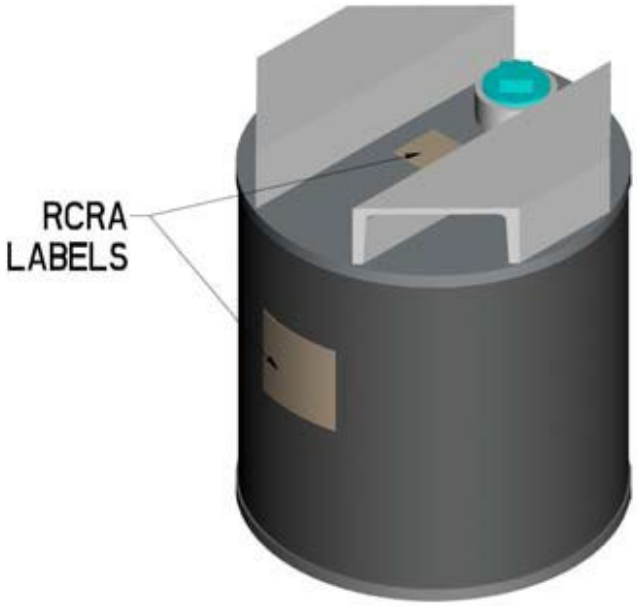

Figure 2-1. *Preferred RCRA label placement on a 1-MT container.*

2.2.3.4 Pallets

All generator shipments require approval by the LTEMSF Operator(s) of the pallet configuration prior to shipment (e.g., materials of construction, spill containment, etc.). Depending on the containers used, box or flat pallets may be appropriate. If 3-L containers are used, a box pallet may be the preferred choice, while the 1-MT containers may be preferred on conventional flat pallets, although these details will be determined in consultation with and at the discretion of the LTEMSF Operator(s). At a minimum, all applicable DOT packaging requirements should be met for transportation, but as a BMP, two metal bands should be used to secure 1-MT containers to the pallets. Use of spill trays/pallets capable of containing at least 10% of the mercury or the volume of the largest container on the pallet may be required by the LTEMSF Operator(s) for transport, or they may be added by the LTEMSF Operator(s) as part of the storage configuration, in accordance with 40 CFR 264.175(b). Requirements for acceptable materials of construction of the pallets (and potentially spill trays/pallets), structural requirements, and documentation will be at the discretion of the LTEMSF Operator(s), but at a minimum, must meet the requirements of 40 CFR 264.175. The pallet specification document with load rating should be provided as part of the Waste Profile.

Additional DOT requirements for shipping the mercury containers are discussed in Section 3.

SHORT-TERM ONSITE STORAGE –Although not specifically applicable to generators, as a BMP, ore processors accumulating elementary mercury should consider implementing the use of spill trays/pallets capable of containing at least 10% of the mercury or the volume of the largest container on the pallet, and other applicable features as described in 40 CFR 264.175(b).

3.0 STANDARDS FOR TRANSPORT OF ELEMENTAL MERCURY

3.1 INTRODUCTION

This section provides information associated with the packaging and movement of mercury, including RCRA and DOT requirements[24]. This section is not intended to provide an exhaustive list of the regulatory requirements for packaging and transportation that may apply to the elemental mercury that is transferred to the LTEMSF. The elemental mercury is expected to be shipped primarily using ground transport methods in non-bulk packaging. Under 49 CFR (*Transportation Regulations*) non-bulk packaging for mercury means a packaging that has a maximum capacity of 450 L (119 gal) or less as a receptacle for a liquid. For other transportation modes (i.e., air or water), specific requirements are established by the International Air Transport Association (IATA) (e.g., Packaging Instruction 803), and the International Maritime Dangerous Goods (IMDG) code (e.g., Packaging Instruction 800). If these transportation modes are anticipated, the generator should consult those publications. As previously described, shipments can only be initiated after the DOE-designated LTEMSF has approved the generator's waste documentation outlined in Section 2, in accordance with regulatory requirements.

In addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the LTEMSF Operator(s) must comply.

SHORT-TERM ONSITE STORAGE –Ore processors conducting short term onsite storage should implement the standards related to transportation of the elemental mercury (e.g., DOT-approved packagings, labeling, and configurations) at the point of generation to facilitate subsequent transport to the DOE-designated LTEMSF. Based on the available information, this is the current practice of generators.

3.2 STANDARDS – SPECIFIC REGULATORY REQUIREMENTS AND BMPs

Both RCRA and the Hazardous Materials Transportation Act (implemented by DOT) regulate the transport of hazardous wastes. Under these statutes, specific pre-transport regulatory requirements must be met before shipment of hazardous wastes and specific transport requirements must be met during shipment. The pre-transport requirements under RCRA (40 CFR 262 Subpart C) and DOT (49 CFR 171.1(b)) are designed to help reduce the risk of loss, leakage, or exposure during shipment of hazardous materials and to communicate information on potential hazards posed by the hazardous material in transport. The waste acceptance/receiving requirements at the DOE-designated LTEMSF must also be considered once established. These regulations affect both the generator (as the shipper) and the transporter (i.e., carrier); each has their own responsibilities.

3.2.1 Key RCRA Requirements

Generators and transporters are subject to RCRA regulations governing the shipment of hazardous wastes. Generators must comply with the manifest system (see 40 CFR Part 262, Subpart B). A generator can only offer hazardous wastes for off-site shipment to a transporter that has an EPA Identification Number [40 CFR 262.18(c)]. Before a hazardous waste may be shipped off-site, the generator must determine:

- the proper identification of the hazardous waste (40 CFR 262.11);
- the proper packaging for the hazardous waste (40 CFR 262.30);

[24] The information in this document is not intended to be a complete representation of the regulations covering transport of hazardous wastes. It is intended as a summary for generator informational use only.

- the necessary RCRA and DOT labeling, marking, and placarding requirements (40 CFR 262.31–262.33); and

- the information necessary to complete and sign the hazardous waste manifest for the waste shipment (40 CFR 262.20–262.25).

The pre-shipment review of the manifest (and the associated LDR form) by the LTEMSF Operator(s) is intended to ensure that the manifest accurately represents the waste defined in the generator's Waste Profile.

Hazardous waste transporters are individuals or entities that move hazardous waste from one site to another by highway, rail, water, or air (defined in 40 CFR 260.10). The RCRA regulations addressing transporter requirements are found in 40 CFR Part 263. Regulated activities include transporting hazardous waste from a generator's site to a facility that can recycle, treat, store, or dispose of the waste. The regulations do not apply to on-site transportation of hazardous waste at either the generator site or a TSDF (see 40 CFR 263.10). Transporters who store manifested hazardous wastes for 10 days or less during transportation (e.g., at a transfer facility) in containers meeting the independent requirements of 40 CFR 262.30 are not required to obtain a RCRA permit for that storage (40 CFR 263.12). Some states impose specific notification and operating requirements for transfer facilities.

Requirements for transporters include the following (see 40 CFR Part 263):

- Obtaining an EPA identification number (available from your state environmental office) (40 CFR 263.11),

- Complying with the manifest system and recordkeeping (40 CFR 263.20–263.25),

- Responding appropriately to hazardous waste discharges (40 CFR 263.30–263.31), and

- Complying with all applicable DOT regulations (see 49 CFR Parts 171–185)[25] and DOT's hazardous materials safety website).

3.2.2 Key DOT Requirements

In the United States, the packaging and transport of all hazardous materials, including hazardous wastes, are regulated by the DOT, and the regulations are found in 49 CFR Parts 171-180 (*Hazardous Materials Regulations (HMR)*) and Part185 (*Transportation*) (49 CFR 171.3 specifically addresses hazardous wastes). Mercury is classified as a corrosive (Hazard Class 8) material and subsidiary toxic (Hazard Division 6.1) material. Elemental mercury is only subject to regulation when transported by air or water unless it meets the HMR definition of a hazardous waste or a hazardous substance (see 49 CFR 171.8). Mercury is on the List of Hazardous Substances in 49 CFR 172.101, Appendix A and is regulated for ground transportation if shipped in quantities of one pound or more per package. Finally, mercury waste subject to EPA waste manifesting requirements is also regulated for ground transportation. As such, there are specific requirements for the ground, water, and air shipments of mercury. General shipper responsibilities on appropriately classifying, describing, and packaging mercury are contained in 49 CFR Parts 172 and 173. Additionally, as previously discussed in Section 2.2.3.3., specific DOT marking, labeling, and placarding for packages are delineated in 49 CFR 172, Subparts D through F.

[25] Additional information can be found on the DOT Pipeline and Hazardous Materials Safety Administration website at https://www.phmsa.dot.gov/about-phmsa/offices/office-hazardous-materials-safety.

3.2.2.1 General DOT requirements for transport of hazardous materials

General DOT requirements related to transport of hazardous materials are described in 49 CFR 172. In addition to the labeling requirements previously discussed, the associated subparts describe the requirements for shipping papers, emergency response information, training, and safety and security plans, including when they are applicable. These subparts establish the hazards communications requirements for transporting hazardous materials, including elemental mercury.

Packaging. A hazardous material is required to be packaged in accordance with DOT regulations. Per 49 CFR 173.22, "Shipper's responsibility," a person offering a hazardous material for transportation "shall class and describe the hazardous materials in accordance with parts 172 and 173…" and "shall determine that the packaging or container is an authorized packaging, including part 173 requirements…", among other responsibilities. General requirements for packagings and packages are found in 49 CFR 173.24. These requirements apply to all types of packagings including bulk, non-bulk, new, used, specification, and non-specification. For mercury, the specific types of packagings that are acceptable for transport and storage incidental to transportation are discussed in the following section.

Shipment. Portions of 49 CFR 173.24 that are especially germane to the shipment of mercury include the following.

- 173.24(b)(1) "there will be no identifiable (without the use of instruments) release of hazardous materials to the environment."
- 173.24(b)(2) "The effectiveness of the package will not be substantially reduced…[by] minimum and maximum temperatures, changes in humidity and pressure, and shocks, loadings, and vibrations, normally encountered during transportation."
- 173.24(b)(3) "There will be no mixture of gases or vapors in the package which could, through any credible spontaneous increase of heat or pressure, significantly reduce the effectiveness of the packaging."
- 173.24(b)(4) "There will be no hazardous material residue adhering to the outside of the package during transport."

While only 173.24(b)(1) specifically states "without the use of instruments," it has generally been interpreted that each of these requirements is met through un-aided visual or other un-aided indications or observations that no issue exists that could create an unsafe condition.

Compatibility issues. 49 CFR 173.24(e)(1) states that there should be no "corrosivity, permeability, softening, premature aging, or embrittlement" issues created by pairing the hazardous material with the packaging. Since elemental mercury managed under MEBA can remain in storage for extended periods of time (i.e., multiple years versus months, as allowed for other hazardous wastes), and the containers used for transportation will also be used for long-term storage, the need to ensure that no contaminants are present in concentrations that would be corrosive to the container's materials of construction is particularly important. Additionally, the use of any aluminum-based packaging must be avoided as well as any other packaging material that is attacked by, or reactive with, mercury.

Closure requirements. 49 CFR 173.24(f) requires that the closure must be designed such that "there is no identifiable release of hazardous materials" (including when the effects of temperature, pressure, and vibration are considered) during use and that the "closure is leakproof and secured against loosening." A closure that is part of a specification package must conform to all of the specifications for the packaging.

Venting issues. 49 CFR 173.24(g) addresses venting of packages to reduce internal pressure. At all temperatures normally incident to shipping, the vapor pressure of elemental mercury is significantly less than 1 psig, so venting issues are not relevant and are therefore not further addressed.

Outage (headspace) and filling limits. 49 CFR 173.24(h) refers to Section 173.24a. This section addresses *Additional general requirements for non-bulk packaging and packages*. The primary areas of concern for mercury transport are:

- (a)(5)—vibration, "each non-bulk package must be capable of withstanding, without rupture or leakage, the vibration test procedure specified in Section 178.608 of this subchapter."
    - The vibration test procedure simulates a vibration incident during transport under relatively severe conditions by placing the package on a vibration table, finding the vibration frequency that causes the package to just lift off the ground, and then allowing the package to be subjected to this frequency for a continuous hour.
- (b) non-bulk packaging filling limits.
    - Subsection 173.24a(b) is generally not applicable as long as specification packaging is not used. Should specification packaging be used, then packagings designed and marked for use with high specific gravity liquids such as mercury must be used.
- (d) liquid filling requirements.
    - Subsection 173.24a(d) states, "liquids must not completely fill a receptacle at a temperature of 55°C (131°F) or less." Therefore, consideration of expansion of mercury at this elevated temperature (131°F) must be considered when shipping packagings are being filled.

3.2.2.2 Specific DOT requirements for transport of mercury

49 CFR 173.164 addresses the specific requirements for transporting mercury in non-bulk packagings. Subsection 173.164(a) addresses air transport, Subsection 173.164(d) addresses transport other than by aircraft, and subsection 173.164(e) discusses exempt quantities. These subsections are described in greater detail below. (Additional information and requirements are provided in applicable entry(ies) in the Hazardous Materials Table in 49 CFR 172.101.) Subsections 173.164(b) and (c) address manufactured articles. As such, these subsections are not germane to this standard and are not discussed further. It is anticipated that the primary form of mercury transport will be ground. As such, these authorized packaging requirements are covered in 173.164(d). For transportation by other than aircraft, mercury must be packaged:

1. in any packaging which meets the requirements of 49 CFR Part 178 at the Packing Group III performance level; or
2. in non-specification reusable metal packagings.

Item (2) above is particularly important in the transport of mercury. Virtually all non-air transport of elemental mercury is performed in non-specification reusable metal packagings. When these packagings are used, it is important to ensure that all of the general requirements for hazardous materials packaging described above are met. As noted, the containers typically come in two sizes: 3-L size that holds 35 kg (approximately 76 pounds) of elemental mercury and an approximately 19.5-gallon size that holds 1,000 kg (1-MT) (approximately 2200 pounds) of elemental mercury. Specification packagings may also be used. As stated above, specification packagings must meet the Packing Group III performance level. These containers must comply with DOT ground transport specifications.

3.2.2.3 DOT training requirements

DOT (49 CFR 172.702) requires that each employer whose employees work with hazardous materials (HAZMAT) must train these employees. “HAZMAT employees” include those who prepare the packages for shipping, prepare, sign or review the paperwork i.e., hazardous materials shipping papers, load trucks, drive the vehicles, or unload or receive the hazardous materials.

A HAZMAT employee who performs any of these functions may not perform the function unless he or she has been trained in the requirements of hazardous materials (generally, identification, classification, labeling, marking, placarding, packaging, etc.) that apply to that function. It is the duty of each HAZMAT employer to comply with the applicable requirements of the HMR and to ensure that each HAZMAT employee is thoroughly instructed. In addition, HAZMAT employers must ensure that each HAZMAT employee is tested by appropriate means on the training subjects covered in 49 CFR 172.704.

4.0 STANDARDS FOR RECEIPT/VERIFICATION OF ELEMENTAL MERCURY AND MERCURY CONTAINERS

4.1 INTRODUCTION

This section discusses standards anticipated for the DOE-designated LTEMSF for receipt and acceptance of elemental mercury (i.e., not mercury-contaminated materials), elemental mercury containers, and/or pallets, and inventory tracking. This section is not intended to provide an exhaustive list of the regulatory requirements for receipt/verification that may apply to operations at the LTEMSF. Instead, it addresses those that are key to a permitted TSDF storing hazardous waste (elemental mercury) under RCRA. As a RCRA permitted TSDF, the DOE-designated LTEMSF is expected to have implemented appropriate standards, in accordance with DOE and RCRA requirements, for safe operations for hazardous waste management. The purpose of the information provided herein is to describe the assumed receiving, handling, inspecting, and testing activities conducted by the facility prior to transferring the waste into storage. Specifically, it addresses the physical receipt and inspection of the shipped containers of elemental mercury and associated pallets into the storage facility after the storage facility management has approved the generator's waste characterization and packaging via a completed Waste Profile form. The verification steps for the elemental mercury are required to confirm that only elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury is accepted at the DOE-designated LTEMSF and to confirm the absence of prohibited constituents (such as nitric acid solutions, chloride salts solutions, water, or other possible corrosion agents), regardless of container materials of construction; and confirm the absence of radioactive constituents or contamination.

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the LTEMSF Operator(s) must comply.

The mercury should arrive at the designated DOE storage facility in DOT-approved and RCRA-compliant containers. The DOE-designated LTEMSF Operator will use an appropriate visual inspection to ensure the containers and pallets meet the WAC. Air monitoring may also be used to determine if any containers are releasing vapors due to leaking seals or other damage. After the DOE-designated LTEMSF Operator accepts the waste and containers, the containers will be marked to show their date of receipt and, as a BMP, separated in the facility by size to optimize the storage space requirements.

The verification and acceptance criteria are largely based on RCRA's requirements for container storage operations (40 CFR 264.170–.179 and 40 CFR 265.170–.178), in consultation with regulators, as well as generator pre-transport requirements (40 CFR 262.30–.34), and BMPs to ensure safe/efficient storage. Movements/transfers of intact containers between the Receiving area and Storage area would not require further verification as long as container tracking is sufficient to tie waste characterization back to the generator and/or fingerprinting results.

There are certain other requirements that will apply to the DOE-designated LTEMSF to allow receipt of elemental mercury from off-site generators. For example, facilities that receive hazardous waste from an off-site source must inform the generator in writing that the facility has the appropriate permit(s) for accepting the waste [40 CFR 264/265.12(b)]. This notification is part of the storage facility operating record and shall be addressed in the waste acceptance review process and in the storage facility procedures for waste acceptance and recordkeeping.

4.2 STANDARDS - SPECIFIC REGULATORY REQUIREMENTS AND BMPs

4.2.1 Key RCRA Requirements

Under RCRA, TSDFs must verify the composition (i.e., hazardous constituents and characteristics) of incoming waste to treat, store, or dispose of the waste properly. The LTEMSF WAP will outline the verification procedures, including specific characterization methods, and periodicity of validation (i.e., for confirming process parameters as acceptable knowledge) necessary to ensure proper treatment, storage, or disposal (40 CFR 264/265.13).

The LTEMSF Operator(s) shall ensure that the containers are properly labeled with the required information (see Section 3). At the time of waste acceptance into the Storage area, the staff shall mark each container with the date and track receipt in their operating records. The staff shall ensure that the labels/markings are visible for inspection (40 CFR 264/265.174). The 3-L container should be labeled on the shoulder. The 1-MT container should be labeled in two places—one on the top near the plug and one on the side as shown in Section 2, Figure 2.1. The preferred label locations will ensure the labels are readily visible and, thereby, facilitate the inspection of the container labels at receipt and during storage. Alternative label placements may be considered if container design is not compatible with the suggested label arrangements.

The LTEMSF Operator(s) shall retain documentation pertaining to waste receipt and acceptance in the facility operating record (40 CFR 264/265.73). Such records include, but are not limited to: unmanifested hazardous wastes, manifest discrepancies, container inspections and verification checks (including results and chain of custody).

4.2.2 Specific Requirements and BMPs for LTEMSF Receipt of Mercury

The LTEMSF Operator(s), in consultation with DOE and appropriate regulators, is responsible for defining the inspection requirements; however, typically, as a BMP, concentrations of mercury vapor in the trucks should be measured as a first step to monitor the personnel breathing zone, particularly near the containers. After the mercury vapor concentration is verified to be below the action level, the pallets and the containers should be visually inspected while on the truck. The visual inspection focuses on looking for spilled mercury or obvious mercury contamination on container surfaces, validating and completing the RCRA manifest, and judging the structural integrity of the pallets. If a spill is found, cleanup procedures shall be implemented. If the number of containers or type of waste does not match the manifest, the generator shall be notified, and a discrepancy report filed within 15 days of receipt of the waste (40 CFR 264/265.70 to .72). Containers that have corrosion, structural damage, or are a different type from that presented in the generator documentation may be returned to the generator at the generator's expense. Related documentation is assumed to be managed per established facility operating procedures.

After the containers and pallets pass the initial inspection on the vehicle, as a BMP, the pallets should be transported into a designated Receiving area for further inspection. In the Receiving area, the containers will be visually inspected for the following: (1) any mercury leak not discovered during the prior inspection on the truck, (2) obvious structural damage to the integrity of the containers or pallets (substantial dents or cracks), (3) mercury contamination (e.g., beads) on the exterior surface of the containers or the pallets (inspection completed using the unaided eye), (4) extensive container corrosion, especially on or near welds and the plug, and (5) identification of container types to ensure the information and images provided by the generator matches what is received. Any containers that fail the visual inspection will receive further review to decide if the container may be placed into storage, sent back to the generator, or if the mercury will be transferred to a new container. As a BMP, upon placement of any such container into storage, continuing evaluations of that container's condition (i.e., beyond the weekly inspections for the facility required under 40 CFR 264.175) should be conducted. Additionally, as

a BMP, the container inspection should be completed while wearing appropriate personal protective equipment (PPE). Overpacking the container is not recommended.

If leaking containers are found, as a BMP, they should be transferred to a designated area in the facility for either re-containerizing or overpacking. For re-containerization, the area should have an isolated ventilation system to allow safe transfer of the mercury into new storage containers (i.e., 3-L or 1-MT, as appropriate), which are then closed and sealed per applicable LTEMSF operating procedures. This area should also be used to clean the damaged container in accordance with RCRA requirements (40 CFR 261.7). Overpacking may not require isolated ventilation, but a designated area with controlled access should be used as a BMP. Similar container types in such shipment may be further scrutinized before being accepted into the storage facility. Any mercury containers that are returned to the generator will follow the RCRA requirements under 40 CFR 264/265.72 for that return shipment. The containers and pallets that pass the acceptance/verification process shall be placed into the storage facility and their placement location recorded.

The use of acceptable knowledge by the generator to characterize the elemental mercury container contents is intended to minimize the need to open containers and handle the elemental mercury, reducing the risk to workers and the environment. However, the LTEMSF Operator(s) may choose to collect physical samples (i.e., random sampling) for analysis and verification of the container contents (referred to as "fingerprinting"). If this is required, the frequency (i.e., statistical representativeness), sampling strategies, and analytical methods will be determined in consultation with the State regulators and documented in the LTEMSF WAP.

It should be noted that the receipt acceptance and verification activities could result in secondary wastes, such as spill cleanup residues, contaminated personal protective equipment, contaminated sampling equipment/debris, etc. These wastes will be subject to a determination of whether it is a hazardous waste and must be managed appropriately at the point of generation.

4.2.3 Requirements for Disposition of Manifest Issues

Manifest discrepancies include significant differences between the quantity or type of hazardous waste designated on the manifest and the quantity or type of hazardous waste that a facility actually receives; rejected wastes; and container residues. More specifically, significant differences are any discrepancies in weight (for bulk waste, over 10% weight difference), piece count (for batch or containerized waste shipments, one container per truckload), or waste type. Upon discovering a significant difference in quantity or type, the LTEMSF Operator(s) must try to reconcile the discrepancy with the generator or transporter. Any discrepancies not resolved within 15 days of waste receipt must be reported to the EPA Regional Administrator with an explanatory letter and a copy of the manifest (40 CFR 264/265.72).

5.0 STANDARDS FOR OPERATING THE LTEMSF

This section discusses the standards to define for the minimum functions at a DOE- designated LTEMSF including minimum capabilities, personnel safety, operating principles, air monitoring, records management, security, receipt, and facility inspections. This section is not intended to provide an exhaustive list of the regulatory requirements for operating the LTEMSF. Instead, it addresses those that are key to a permitted TSDF storing hazardous waste (elemental mercury) under RCRA. Subsequent Sections 6, 7, and 8 address overarching requirements related to various aspects of LTEMSF operations including spill response and emergency response, waste and container management, and training. It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the LTEMSF must comply.

5.1 STANDARDS – LTEMSF MINIMUM CAPABILITIES

5.1.1 Introduction

This section provides guidance on the minimum required capabilities for the DOE-designated LTEMSF. The guidance is aimed at identifying key features to facilitate safe and efficient storage operations as governed by law, regulations, and good engineering practice, and applicable BMPs. This section provides RCRA- based guidance for the DOE-designated LTEMSF. The major functions within the storage facility include waste receipt and/or shipping, waste repackaging and/or verification, and long-term waste storage. A secondary function includes personnel work areas to support the day-to-day work as well as recordkeeping and equipment storage. All these functions facilitate overall RCRA compliance, but RCRA facility design requirements are either general or are specific to the container storage operations. The RCRA design standards are addressed following a discussion of the four conceptual (functional) areas anticipated in the DOE-designated LTEMSF.

A RCRA-permitted facility must be designed, constructed, maintained, and operated to prevent releases of hazardous waste or hazardous constituents to air, soil, or surface water (40 CFR 264.31)—this general requirement would apply to all areas within the LTEMSF. An interim status facility (a facility that may undergo renovations during the interim status period in order to meet the higher permitted conditions) must be maintained and operated to minimize such releases (40 CFR 265.31).

While an interim status facility may need to undergo renovations to meet the RCRA standards for a permitted facility, RCRA defines the process to do so and sets limits. The RCRA requirements for a container Storage area are intended to minimize releases.

5.1.2 Primary LTEMSF Functions

The DOE-designated LTEMSF is envisioned to have designated areas to support four primary functions: Receiving and Shipping, Handling (i.e., decontamination, re-containerization), Storage, and Office Administration. These are described as follows:

1. The *Receiving and Shipping* area is the operational interface area to and from the facility. This area supports trucker docking, offloading, and determination of status on receipt by inspection and subsequent transfer to either the Handling or Storage areas. It also allows for inspection, packaging, marking, manifesting, and trucker docking and loading for off-site shipments of elemental mercury containers or samples. As a BMP, it should be an enclosed area, adjacent to both the Handling and Storage areas, with truck offload ports, equipment for offload and inspection, and bare chairs and desks for employees conducting field inspection and manifest review.

2. The *Handling* area provides an enclosed, separate, dedicated location for potentially contaminated work such as emergency transfer of the contents of a leaking container,

bulking operations, and/or limited storage of containers. As a BMP, the area should have an isolated filtered ventilation draw (i.e., separate from other areas of the LTEMSF) and a stockpile of PPE.

3. The *Storage* area is the core of operations and comprises the bulk of the facility. This enclosed area has ample storage and aisle space for careful, tracked placement and retrieval of all containers (e.g., 3-L and 1-MT). Walls, roof, and a base underlying the containers must minimize releases (40 CFR 264/265.31). This also provides protection of the containers from weather impacts, supporting the long-term structural integrity of the containers. The area has appropriate ventilation and fire protection measures to ensure worker safety (see Section 5.2). This area (or the office area) also includes space for storage of emergency response (spill cleanup) supplies. The area and placement of containers should allow for easy and accessible placement, inspection, and retrieval of the mercury containers.
4. The *Office Administration* area is dedicated to management, operations, recordkeeping, training, and all other Office Administration functions supporting the overall mercury program. A key consideration is that, as a staff occupancy area, it is not in a hazardous area and so should be physically separate from the other areas.

5.1.3 General RCRA Considerations

The LTEMSF must be operated in accordance with either RCRA interim status standards, in accordance with 40 CFR 265[26], or the conditions in a RCRA hazardous waste facility permit, under 40 CFR 264. A RCRA-permitted facility must be designed, constructed, maintained, and operated to prevent releases of hazardous waste or hazardous constituents to air, soil, or surface water [40 CFR 264.175(a)]. It is expected that some containers will have trace mercury contamination (e.g., beads) on the outside and that there will be some trace mercury contamination (e.g., beads) on pallets. As a result, in the event of fire, the firewater discharged from sprinklers in the Storage or Handling area could entrain trace mercury contamination. Therefore, containment of firewater should be a consideration in the design of the permitted facility.

SHORT-TERM ONSITE STORAGE –For ore processors conducting short term storage at their facilities, RCRA interim status standards do not specifically apply. However, all RCRA requirements for operating CAAs/SAAs are applicable (40 CFR 262.17/40 CFR 262.15). As a BMP, additional RCRA interim status requirements should be considered for implementation. A tailored approach may be appropriate.

5.1.4 RCRA Containment Storage System

Per 40 CFR 264.175(a), permitted facilities storing wastes containing free liquids[27] must have a containment system, explicitly addressed as follows:

40 CFR 264.175(b)(1) requires a base free of cracks and gaps and sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed.

- The spill trays/pallets and/or epoxy-based floor coatings will both be impervious to mercury

[26] Any TSDFs operating under interim status are assumed to have appropriate standards in place for safe management of elemental mercury prior to receipt, as approved by their regulators.

[27] The paint filter test is used to determine the presence of free liquids. Mercury, due to its surface tension, normally passes the paint filter test and is not considered a free liquid. However, because elemental mercury is liquid and readily spreads when spilled, this guidance document assumes that the LTEMSF will require containment based on the definition of free liquid under 40 CFR 260.10: "free liquids" means liquids which readily separate from the solid portion of a waste under ambient temperature and pressure."

leaks and spills and fire protection water. Primarily, the spill trays/pallets are targeted to collect container leaks and spills, while the floor coating is intended mainly for sprinkler water but also backup containment and protection for leaks and spills and for accumulation of droplets from volatilized mercury that could potentially occur over time.

40 CFR 264.175(b)(2) requires containers to be elevated or otherwise protected (e.g., floors sloped) from contact with accumulated liquids.

- Sloped storage racks can accomplish this as well, as can spacers placed under the containers as an alternative. Joint health and safety and operational review may allow sloped floors. However, in particular cases (e.g., on loading dock ramps), sloping of the facility floor may not be appropriate. Instead, the intent of 40 CFR 264.175(b)(2) is that containers are "protected from contact with accumulated liquids." The intent can be met by elevating the containers above the floor.

According to 40 CFR 264.175(b)(3), containment capacity must be sufficient for 10% of the volume of the containers or the volume of the largest container, whichever is greater.

- Use of pallets with spill trays/pallets will meet this requirement by having free volume space sufficient for the greater of the maximum container volume or 10% of the total stored mercury volume within the pallet, as well as the use of sealed and bermed floors in the storage and handling areas.

Per 40 CFR 264.175(b)(4), run-on (from precipitation) must be prevented unless there is excess capacity of the system to contain it.

- The facility will have a foundation, roof and walls that should prevent run-on from entering the facility. This fully enclosed configuration also contributes to overall container integrity over time.

Per 40 CFR 264.175(b)(5), spilled or leaked waste and accumulated precipitation must be removed in a manner to prevent overflow.

- The LTEMSF Operator(s) must promptly respond to leaks and spills to prevent overflow of the required containment system.

5.1.5 RCRA Air Emission Requirements

The RCRA Air Emission Standards establish performance, design, operation, monitoring, recordkeeping, and maintenance requirements for certain hazardous waste management units and their associated equipment and air emission control devices. These standards are found under three subparts in 40 CFR part 264 (for permitted facilities) and part 265 (for interim status facilities) and are applicable to hazardous waste TSDFs and certain LQGs. Specifically, Subpart AA addresses air emissions from process vents associated with certain types of hazardous waste management processes, Subpart BB addresses leaks from certain types of equipment; while Subpart CC regulates organic air emissions from tanks, surface impoundments, and containers.

As a RCRA-permitted TSDF, the DOE-designated LTEMSF is assumed to have the appropriate air emission controls in place to support ongoing hazardous waste management activities, if required. Based on the criteria that DOE will only accept elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury , the assumption is that this storage would not entail new regulated processes or equipment, the elemental mercury containers will not include organics at 10 ppm by weight or more, and there are no

other drivers that are expected to trigger new requirements under Subparts AA, BB, or CC for additional air emissions controls beyond what may already be in place. However, Subpart CC could apply to a limited extent.

Subpart CC requires generators to make a Subpart CC determination for their hazardous waste at the point of generation (40 CFR 265.1084) and the facility to provide its determination in its permit application and Waste Analysis Plan.[28] Subpart CC applies to containers storing hazardous wastes containing at least 500 ppm by weight volatile organics. TSDFs receiving hazardous wastes must know whether the waste is Subpart CC regulated or not to determine whether Subpart CC could apply to their operation. Hence, Subpart CC status of the elemental mercury is to be documented in the Waste Profile submitted by the generator. Other than the Subpart CC determination, including recordkeeping (see Section 2), other Subpart CC requirements should not apply. The facility's permit application and waste analysis plan document its determination as to Subparts AA, BB, and CC applicability. If the Subpart CC determination is not made/documented for a container, then the waste would be considered Subpart CC regulated and proper controls implemented if required. The actual emission controls are based on the size of the container, light material service (which is determined by the vapor pressure of the organic constituents), and whether the container is used in a waste stabilization process. The TSDF would also make Subpart CC determinations for wastes generated during facility maintenance or operations.

SHORT-TERM ONSITE STORAGE –Similarly, ore processors conducting short-term onsite storage are not expected to be impacted by these requirements (i.e., no new air emissions controls are expected to be needed) since the storage areas are not specifically RCRA-permitted storage, rather they are CAAs/SAAs, and operated in accordance with the applicable RCRA regulations. Additionally, the Ore Processors will not be processing the elemental mercury after it is placed in storage.

5.2 STANDARDS – PERSONNEL SAFETY

5.2.1 Introduction

As a RCRA-permitted, commercial TSDF, management of ES&H functions and activities is assumed to be an integral but visible part of the LTEMSF Operator(s)'s work planning and execution process. However, this will be confirmed by DOE through a Sufficiency Review, or similar. The LTEMSF Operator(s) is assumed to have a corporate ES&H program that is based on national or international consensus standards, such as ISO 14001 *Environmental Management Systems*, which can be adapted, as appropriate, to management of long-term elemental mercury storage management. Operations related to worker safety should also be compliant with the OSHA regulations (29 CFR 1900, et seq.) This section will identify some of the key safety requirements that are anticipated to apply to the DOE-designated LTEMSF.

Safety requirements may be imposed at the Federal, State, Tribal, or local level. This section will discuss Federal requirements. State, Tribal, and local requirements are usually consistent with the Federal regulations, but there may be additional criteria unique to the State or locality in which the LTEMSF is located.

SHORT-TERM ONSITE STORAGE –For short term storage at ore processor facilities, company-specific ES&H plans should be reviewed, modified as appropriate, and implemented that ensure safety to personnel and the environment. At a minimum, these should be compliant with applicable sections of OSHA/MSHA, as appropriate.

[28] The RCRA permitting regulations require TSDFs to address waste determinations for RCRA Organic Air Emission Standards' applicability in their Waste Analysis Plans as provided in 264.13(a)(1) and 264.13(b)(6). These include determination of organic concentrations in wastes for Subpart AA (264.1034(d), for Subpart BB (264.1063(d), and for Subpart CC (264.1083), among others.

5.2.2 Key RCRA Requirements

The relevant material in the RCRA regulations is found in 40 CFR 264/265.14 through 40 CFR 264/265.16, and includes the following:

- 40 CFR 264/265.14 provides that the owner or Operator must prevent the unknowing entry, and minimize the possibility for the unauthorized entry, of persons or livestock onto the active portion of his facility.

- 40 CFR 264/265.15(a) provides that the owner or Operator must inspect the facility for malfunctions and deterioration, Operator errors, and discharges which may be causing or may lead to (1) release of hazardous waste constituents to the environment or (2) a threat to human health. The owner or Operator must conduct these inspections often enough to identify problems in time to correct them before they harm human health or the environment.

- 40 CFR 264/265.15(b)(1) provides that the owner or Operator must develop and follow a written schedule for inspecting and monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards.

- 40 CFR 264/265.16(a) provides that facility personnel must successfully complete a program of classroom instruction or on-the- job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirements of this part. More generally, 40 CFR 264/265.16 further provides that the training program must be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems. Training topics include (1) procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment, (2) key parameters for automatic waste feed cut-off systems, (3) communications or alarm systems, (4) response to fires or explosion, (5) response to groundwater contamination incidents, and (6) shutdown of operations.

- 40 CFR 264/265.16(b)–(d) requires that initial training must be completed within 6 months of employment, documented, and reviewed annually [40 CFR 264/265.16(b)–(d)].

The RCRA requirements that impact safety are generally covered by other requirements discussed under security, training, and emergency response.

5.2.3 Requirements for LTEMSF Worker Health and Safety

The LTEMSF Operator(s) must also comply with the safety and health standards that are applicable to the hazards at the workplace. At an elemental mercury storage operation, the following standards and BMPs will likely apply:

- 29 CFR 1904.4 through 1904.11, 1904.29 through 1904.33; 1904.44, and 1904.46, "Recording and Reporting Occupational Injuries and Illnesses"

- 29 CFR, Part 1910, "Occupational Safety and Health Standards"

- 29 CFR, Part 1926, "Safety and Health Regulations for Construction"

- ACGIH, "Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices," (2005) when the ACGIH TLVs are lower (more protective) than permissible exposure limits in 29 CFR Part 1910. When the ACGIH TLVs are used as exposure

limits, contractors must nonetheless comply with the other provisions of any applicable expanded health standard found in 29 CFR Part 1910.

- ANSI Z88.2, American National Standard for Respiratory Protection
- ANSI Z49.1, Safety in Welding, Cutting and Allied Processes, Sections 4.3 and E4.3
- NFPA 70, National Electrical Code
- NFPA 70E, Standard for Electrical Safety in the Workplace

Compliance with these standards does not relieve the LTEMSF Operator(s) from complying with any additional specific safety and health requirement that it determines to be necessary to protect the safety and health of workers. General functional safety areas that may apply to the LTEMSF include (1) fire protection, (2) industrial hygiene, (3) occupational medicine, (4) motor vehicle safety, and (5) electrical safety, as well as others.

Working standards are covered in detail in the OSHA regulations under 29 CFR Part 1910. Subparts which may be applicable to various aspects of the LTEMSF operation include the following:

- Subpart A (General)
- Subpart B (Adoption and Extension of Established Federal Standards)
- Subpart D (Walking-Working Surfaces)
- Subpart E (Means of Egress)
- Subpart F (Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms)
- Subpart G (Occupational Health and Environmental Control)
- Subpart H (Hazardous Materials)
- Subpart I (Personal Protective Equipment)
- Subpart J (General Environmental Controls)
- Subpart K (Medical and First Aid)
- Subpart L (Fire Protection)
- Subpart M (Compressed Gas and Compressed Air Equipment)
- Subpart N (Materials Handling and Storage)
- Subpart O (Machine and Machine Guarding)
- Subpart P (Hand and Portable Powered Tools and Other Hand-Held Equipment)
- Subpart Q (Welding, Cutting, and Brazing)
- Subpart S (Electrical)
- Subpart Z (Toxic and Hazardous Substances)

5.2.4 Reporting Requirements for Health and Safety

Health and safety records must be kept up to date and reported to regulatory agencies and employees in a timely manner. OSHA reporting requirements are covered in 29 CFR Part 1904, "Recording and Reporting Occupational Injuries and Illnesses."

Medical and exposure monitoring records shall be maintained and communicated to employees per OSHA requirements. Regular biological monitoring of workers can document mercury exposure. Although no biological monitoring test acceptable for routine use has yet been developed for mercury vapor, total inorganic mercury can be measured in the urine or blood.

5.2.5 Use of Personal Protective Equipment

Requirements for hazards controls to ensure worker safety at any facility or facilities of DOE are established in 10 CFR 851 *Worker Safety and Health*, which are based on the following hierarchy:

- Elimination or substitution;
- Engineering controls;
- Work practices and administrative controls that limit worker exposure; and
- Personal protective equipment.

After the preferred measures have been applied, PPE may be required for some parts of the operation. OSHA and other industry standards shall be applied in selecting and using protective equipment, and workers must be trained and qualified to use this equipment. Some of the applicable standards are listed as follows:

- 29 CFR 1910.132, "Personal Protective Equipment"
- 29 CFR 1910.133, "Eye and Face Protection"
- 29 CFR 1910.134, "Respiratory Protection"
- 29 CFR 1910.135, "Head Protection"
- 29 CFR 1910.138, "Hand Protection"
- ANSI Z41, Personal Protection—Protective Footwear
- ANSI Z87.1, Occupational and Educational Eye and Face Protection
- ANSI/AIHA Z88.2, Practices for Respiratory Protection
- ANSI/AIHA Z88.6, Respirator—Physical Qualifications for Personnel
- ANSI/AIHA Z88.7, Color Coding of Air-Purifying Respirator Canisters, Cartridges and Filters
- ANSI/AIHA Z88.10, Respirator Fit Testing Methods
- ANSI Z89.1, Industrial Head Protection

5.2.6 Workspace Air Monitoring

This guidance provides the criteria for using mercury vapor analyzers to monitor the breathing air in the workspace to ensure that workers' exposures to mercury vapors stay within the specified allowable concentration. These are based on OSHA, EPA, ACGIH, and National Institute for Occupational Safety and Health (NIOSH) recommendations and BMPs. There are no RCRA requirements for this objective. This guidance applies to the LTEMSF Operator(s).

SHORT-TERM ONSITE STORAGE –Ore processors conducting short term storage of elemental mercury at their facilities should review and implement the applicable standards discussed herein, in accordance with applicable regulatory requirements and BMPs. At a minimum, use of handheld mercury vapor monitors should be implemented for worker safety.

5.2.6.1 Specific Requirements

The Immediately Dangerous to Life or Health (IDLH) value established by NIOSH for the concentration of mercury vapor in breathing air is 10 mg/m^3, although it is not considered as a human carcinogen (i.e., an A4 substance). There are various recommended maximum safe concentrations that have been promulgated, each representing a different basis for the limit. OSHA (29 CFR 1910.1000) limits the concentration of mercury vapor exposure to personnel to 0.1 mg/m^3 (i.e., the *permissible* exposure limit [PEL], which is the time weighted average [TWA] maximum a worker can be exposed to in an 8-hour period, and is the legal limit), while NIOSH recommends a TWA of 0.05 mg/m^3 (i.e., based on up to 10 hours of exposure as the *recommended* exposure limit [REL], but this is not a legal limit). Further, the ACGIH has assigned mercury vapor a TLV of 0.025 mg/m^3 as an 8-hour TWA. However, the ACGIH TLV is considered the maximum "Workday Concentration" level to which a worker can be exposed *daily for their full working lifetime*. The Workday Concentration is based on a normal 8-hour workday and a 40-hour workweek. When the ACGIH values are lower than the OSHA values, 10 CFR 851.23 requires that the ACGIH values be used for the protection of personnel. Mercury vapor analyzers that are used for protection of human health must be capable of accurately measuring concentrations of mercury vapor in breathing air that exceed the specified allowable concentration.

5.2.6.2 Laws and regulations

29 CFR Part 1910—Occupational Safety and Health Standards 29 CFR 1910.134—Respiratory Protection

29 CFR 1910.1000—Air Contaminants

OSHA Compliance Directive 02-02-006—Inorganic Mercury and its Compounds

5.2.6.3 QA/QC requirements

In alignment with the BMPs described in OSHA *Safety and Health Information Bulletin: Calibrating and Testing Direct-Reading Portable Gas Monitors*, mercury vapor analyzers should be calibrated at least as frequently as specified by the manufacturer of the instrument. Mercury vapor analyzers that are used for protecting human health shall be removed from service upon reaching the calibration due date, when a "bump" test[29] is failed, or when a situation occurs that could affect analyzer calibration. Analyzers that

[29] A "bump" test, which is also called a "periodic function test" is a *qualitative* test in which a detector is exposed to a target gas at an exposure time and concentration that is high enough to trigger all alarm indicators. The user confirms that the appropriate alarms have been activated. This verifies that all of the alarms are working and that the gas can reach the sensors. Bump tests also can indicate issues that calibration checks cannot, such as incorrect definition of the "unsafe" concentration or a block or damaged alarm speaker.

are to be calibrated should be conspicuously labeled, tagged, or otherwise marked to ensure removal from service and to prevent inadvertent use. After the instrument has been recalibrated and certification has been received, it may be placed back into service.

5.2.6.4 Air Monitoring Criteria

As a BMP, when conducting inspections of containers, the concentration of mercury vapor in breathing air should be ≤0.025 mg/m^3 on an 8-hour TWA unless personnel wear appropriate respiratory protection. Inspection personnel must wear appropriate personal protective clothing. Contaminated PPE or other wastes may be generated as a result of air monitoring activities. These wastes should be collected and managed appropriately at the point of generation.

5.3 STANDARDS – RECORDKEEPING

5.3.1 Introduction

Records management is the planning, controlling, directing, organizing, training, promoting, and other managerial activities involving the life cycle of information, including creation, maintenance (use, storage, retrieval), and disposal of records, regardless of media. The LTEMSF Operator(s) should create records that document their activities, file records for safe storage and efficient retrieval, and dispose of records according to established schedules. Records may be in many formats: paper, electronic, audio-visual, maps, etc. Records document the organization, functions, policies, decisions, procedures, operations, and other activities of the agency. RCRA imposes recordkeeping requirements that would apply to the DOE-designated LTEMSF:

The recordkeeping required by RCRA is designed to track hazardous waste from its generation (cradle) to final disposition (grave). The manifest system tracks each shipment of hazardous waste, while the operating record and other required reports summarize facility activity over time. The facility operating records, including forms and reports, should provide a set of records designed to document compliance with RCRA requirements. All required RCRA records must be available for inspection by regulators.

5.3.2 Key RCRA Requirements

This section is not intended to provide an exhaustive list of the regulatory requirements for recordkeeping that may apply to the LTEMSF. Instead, it addresses those that are key to a permitted TSDF storing hazardous waste (elemental mercury) under RCRA. Similarly, this section does not include an exhaustive list of the specific records that would be kept. However, key records are identified herein.

The RCRA requirements for recordkeeping are designed to ensure that regulated parties maintain sufficient records to demonstrate that hazardous wastes were properly characterized and managed from the point of generation (by the generator) until final disposition.

Recordkeeping (e.g., waste tracking) is critical to the cradle-to-grave management system that RCRA imposes for hazardous wastes. All parties that manage a hazardous waste (generators, transporters, and TSDFs) have responsibilities for issuing or maintaining records. This section focuses primarily on the TSDF recordkeeping requirements. In general, RCRA records pertaining to TSDF operations are the facility's operating record (40 CFR 264/265.73); however, additional recordkeeping requirements can also be imposed, depending on the facility's operations.

SHORT-TERM ONSITE STORAGE –Onsite storage in a CAA will require recordkeeping in accordance with 40 CFR 262.11. The requirements specific to a permitted storage facility presented herein are not necessarily required for short term storage at the ore processors facilities; however, as a BMP, these standards should be considered and applied in a graded approach, as appropriate.

The storage/maintenance of RCRA required records must, at a minimum, comply with RCRA requirements, whether the records are maintained on paper or in electronic systems. For example, generators may keep manifests in a central location (either onsite or at a corporate or agency central office that is not onsite) [40 CFR 262.40(a)] (for more information on generator records, refer to Section 2 and 3). TSD facilities must retain copies of manifests onsite (anywhere at the TSDF site, (but not necessarily in the building used for storage of elemental mercury) (40 CFR 264/265.71) (refer to Sections 4 and 5.8).

Generally, RCRA records must be maintained for a minimum of three years (with some exceptions), and those records must be accessible to regulators for inspections. Electronic recordkeeping systems may be used, per EPA guidance; however, such systems must store and print out high-quality images including handwritten signatures (when applicable); must ensure the record accuracy, integrity, and security of the data; and provide features that allow reasonable access by inspectors. Facility or container inspection records are maintained at the TSDF. Records associated with generator waste acceptance (waste analyses, acceptable knowledge, documentation, waste profiles, etc.), manifests/notifications, waste fingerprinting results, and/or permitting of the facility are typically stored in waste management office file systems. Training records may be kept in central training files at the TSDF. Records would also include correspondence to or from regulators such as reports, notifications, permit applications, etc. Some reports/submittals including permit applications require certification of the accuracy of the document and must be signed by an authorized representative of the facility. Waste receipt and waste generation records shall include sufficient information to meet biennial reporting[30] requirements for TSDFs.

State requirements and RCRA hazardous waste facility permits may be more restrictive and may implement additional recordkeeping requirements. RCRA recordkeeping requirements for the DOE-designated LTEMSF focus on manifesting (wastes received and stored versus wastes shipped), wastes generated by the facility, waste minimization efforts, the facility operating record, required reports and plans (closure plan and contingency plan), notifications and permit applications, and personnel training records.

The majority of RCRA records must be maintained for a minimum of three years. Retention time is automatically extended in cases of unresolved enforcement action. Some RCRA records must be maintained for longer periods of time. An example is training records (refer to Section 8.2 for more information). As a BMP, it is expected that TSDF waste tracking, inspection, and/or spill records be kept for the life of the facility. Retention of waste treatment/disposal records may be useful in averting liability under Comprehensive Environmental Response, Compensation and Liability Act investigations of off-site treatment/disposal facilities. It is recommended that the TSDF assign accountability for RCRA recordkeeping requirements within their organization to ensure the requirements will be met.

[30] Some States require annual reporting using specific forms.

5.4 STANDARDS – FACILITY SECURITY

The purpose of this standard is to enumerate elements necessary for ensuring the physical security of the elemental mercury stored in the DOE-designated LTEMSF. The security provided for the facility must prevent inadvertent or deliberate unauthorized access to the facility and the Storage area. This standard identifies the minimum design and operational requirements to secure the LTEMSF. Accountability systems for individual containers are not considered part of physical security.

SHORT-TERM ONSITE STORAGE – The RCRA requirements related to security are not expected to impact ore processors that conduct onsite short-term storage because the security programs in place to protect the operations and products (e.g., gold and silver) are expected to meet or exceed those required by RCRA. Nevertheless, the security measures described in this section should be considered as BMPs.

5.4.1 Key RCRA Requirements

Regulatory requirements for storage facility security will, at a minimum, include requirements from RCRA, and state and local regulations. In addition, certain site-specific security provisions may be applicable.

The LTEMSF shall meet the standards for a hazardous waste TSDF under the requirements of RCRA, 40 CFR Part 264 (facilities) and 40 CFR Part 265 (interim status facilities). Sections 264.14 and 265.14 list these security requirements.

- The owner or Operator must prevent the unknowing entry, and minimize the possibility for the unauthorized entry, of persons or livestock onto the active portion of the facility, unless he/she can demonstrate to the EPA Regional Administrator that (1) physical contact with the waste, structures, or equipment within the active portion of the facility will not injure unknowing or unauthorized persons or livestock which may enter the active portion of a facility and (2) disturbance of the waste or equipment, by the unknowing or unauthorized entry of persons or livestock onto the active portion of a facility, will not cause a violation of the requirements of this part. [This demonstration must be included in Part B of the permit application required under 40 CFR Part 270 (“EPA Administered Permit Programs: Hazardous Waste Permit Program”).]

- Unless the owner or Operator has made a successful demonstration as described above, a facility should have (1) a 24-hour surveillance system (e.g., television monitoring or surveillance by guards or facility personnel) which continuously monitors and controls entry onto the active portion of the facility or (2) (i) an artificial or natural barrier (e.g., a fence in good repair or a fence combined with a cliff), which completely surrounds the active portion of the facility; and (ii) means to control entry, at all times, through the gates or other entrances to the active portion of the facility (e.g., an attendant, television monitors, locked entrance, or controlled roadway access to the facility).

- Unless the owner or Operator has made a successful demonstration under the first bullet, a sign with the legend, “Danger—Unauthorized Personnel Keep Out,” should be posted at each entrance to the active portion of a facility, and at other locations, in sufficient numbers to be seen from any approach to this active portion. The legend must be written in English and in any other language predominant in the area surrounding the facility and must be legible from a distance of at least 25 ft. Existing signs with a legend other than “Danger—Unauthorized Personnel Keep Out” may be used if the legend on the sign indicates that only authorized personnel are allowed to enter the active portion, and that entry onto the active portion can be dangerous.

Under RCRA (40 CFR 264/265.15), the physical protection systems (barriers, signs, etc.) must be checked/inspected according to the schedule set in the facility's inspection plan (refer to Section 5.6 for more information).

5.4.2 Equivalency and Exceptions

A waiver from the security requirements can be requested in accordance with 40 CFR 270.14(b)(4) if determined to be appropriate.

5.5 STANDARDS – INSPECTIONS OF MERCURY CONTAINERS, STORAGE FACILITY, AND FACILITY EQUIPMENT AND MATERIALS

This standard is written to address key RCRA inspection requirements for storage of hazardous waste [40 CFR 264/265.15, 40 CFR 264/265.171–.174, 264/265.73(b)(5), 270.14(b)(5)]. Under RCRA, the inspection program is designed to ensure that TSDFs are properly maintained and that hazardous wastes are handled compliantly. The facility (including equipment) and wastes must be inspected for malfunction, deterioration, Operator(s) errors, and discharges (40 CFR 264/265.15). The inspection provisions are conducted according to a written inspection schedule that is kept at the facility. The schedule identifies the types of problems to be looked for and sets the frequency of inspection, which may vary. Some frequencies are set by the regulations; other inspection frequencies may be specified as conditions within the RCRA facility permit; while others may be set by the facility based on the anticipated rate of deterioration of the equipment and the probability of an incident. Specific records must be maintained.

Inspections shall be conducted by trained inspectors. Inspection requirements defined under the RCRA hazardous waste facility permit, when issued, may be more stringent and must be followed. Inspection records must be maintained in a log or summary for at least three years, and the record must contain the required information per 40 CFR 264/265.15(c, d). Any observed deterioration or malfunction of equipment or structures found during inspections shall be remedied in accordance with 40 CFR 264.174 (citing 40 CFR 264.15(c) & 264.171), as appropriate. Where hazards are imminent or have already occurred, remedial action must be taken immediately. If a tailored approach is implemented, it should be documented with justification.

Additional inspection and equipment calibration requirements may be defined in the LTEMSF Operator(s) QAPs.

SHORT-TERM ONSITE STORAGE –While the inspection requirements for TSDFs in 40 CFR 264/265 are not specifically applicable to short-term storage at the ore processors' facilities, 40 CFR 262.17 states that generators must inspect CAAs at least weekly to look for leaking containers and deterioration/corrosion. Additional requirements are found in Subpart M of 40 CFR 262.

5.5.1 Specific Requirements and BMPs

5.5.1.1 Key RCRA requirements

RCRA regulations require periodic inspections of the storage facility and equipment (40 CFR 264/ 265.15). The facility inspections are performed to identify any potential problems related to malfunctions and deterioration of equipment or structures, Operator errors, and discharges which may lead to the release of hazardous waste constituents to the environment or pose a threat to human health. A written schedule must be developed, followed, and kept at the facility for inspecting all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment. Inspections must be conducted often enough to identify problems before they become harmful to human health or the environment. The schedule (or plan) identifies the types of problems that might be encountered and the

frequency of inspection. Frequency is based on the rate of deterioration of equipment and the probability of an incident unless a frequency is set by Federal/State regulations or in the facility permit conditions. As a result, inspection frequencies (and their respective logs) can vary from daily, weekly, monthly, to even annually.

Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use [40 CFR 264/265.15(b)(4)].

At least once a week, container Storage areas must be visually inspected for leaking containers and for deterioration of containers and the containment system (40 CFR 264/265.174). Additional inspection criteria may be derived from other RCRA requirements, such as labeling (40 CFR 262.31), closed containers (40 CFR 264/265.173), aisle space (40 CFR 264/265.35), and/or the facility's written inspection schedule [40 CFR 264/265.15(b)]. That schedule should also cover required equipment, such as telephones, alarms, fire extinguishers, spill response materials, security, signage, and access controls (refer to Section 5.1 for facility design requirements).

Inspections shall be carried out by personnel who have been trained in the conduct of inspections and the associated recordkeeping requirements [40 CFR 264/265.16(a)(1) and 40 CFR 264/265.15(d), respectively].

As noted, recordkeeping requirements for inspections are detailed in 40 CFR 264/265.15(d). The owner or Operator must record inspections in a log, including the date and time of the inspection, the name of the inspector, observations made, and the date and nature of any repairs. These records must be kept for a minimum of three years from the date of inspection. Any observed deterioration or malfunction of equipment or structures found during inspections must be remedied. Where hazards are imminent or have already occurred, remedial action must be taken immediately. Inspection requirements defined under the RCRA hazardous waste facility permit, when issued, may be more stringent and must be followed.

5.5.1.2 Key OSHA Requirements

The OSHA requirements are found in 29 CFR Part 1910. In particular, requirements for hazardous waste operations and emergency response (1910.120), respiratory protection (1910.134), and air contaminants (1910.1000) must be applied as required. The ACGIH has assigned mercury vapor a threshold limiting value (TLV) of 0.025 mg/m^3 as a time-weighted average (TWA) for a normal 8-hour workday and a 40-hour workweek, which is lower than the OSHA recommendations. When the ACGIH values are lower than the OSHA values, 10 CFR 851.23 requires that the ACGIH values be used for the protection of personnel.

5.5.2 Equivalency and Exceptions

The storage facility can request waivers from some RCRA requirements if an equivalency can be sufficiently justified [see 40 CFR 270.14(b)(4)]. As an example, the DOE storage facility could request waiver from the weekly container inspection requirements specified in 40 CFR Parts 264/265.174 (for leaking containers, deterioration of containers and the containment system caused by corrosion or other factors). The waiver could be based on several factors: (1) container integrity conditions imposed by the WAC; (2) existing evidence at similar facilities for the low frequency of leaks, deterioration, etc., and (3) the negligible amount of internal corrosion caused by mercury in the specified containers. Given the significant number of containers that could eventually be stored, the facility could suggest an alternate frequency, such as inspecting one quarter of the inventory each week and therefore, the total inventory would be checked every 28 days.

6.0 *STANDARDS FOR EMERGENCY RESPONSE*

6.1 INTRODUCTION

This section discusses standards required for specific emergency responses to incidents that could occur at the DOE-designated LTEMSF. It is not intended to be an exhaustive listing of every applicable regulatory requirement. RCRA regulations (40 CFR 264/265.30–.37 and 264/265.50–.56) establish requirements for the design and implementation of emergency response programs to minimize the impacts to human health or the environment from releases of hazardous constituents or wastes from TSDFs. The general RCRA requirements for emergency response are addressed here. More detailed guidance is provided in the Standards subsections. The first addresses isolated spills from leaking containers of elemental mercury, and the second addresses emergencies resulting from fires, natural disasters, and/or external events. In the discussion of isolated elemental mercury leaks, descriptions are provided of various approaches that the LTEMSF Operator(s) may take for transferring elemental mercury into suitable non-leaking containers.

The RCRA preparedness and prevention standards are intended to minimize and prevent emergency situations at TSDFs. Under RCRA, a TSDF must be prepared to respond to emergencies. Contingency plans and emergency procedures provide the owner and Operator with mechanisms to respond effectively to emergencies. The goal of these requirements is to minimize hazards resulting from fires, explosions, or any unplanned release of hazardous waste or constituents to air, soil, or surface water. To help guide these activities, the owner and Operator must maintain a written contingency plan at the facility and must carry out that plan immediately in the event of an emergency. These regulations require maintenance and routine testing of emergency equipment, alarms, minimum aisle space (to accommodate movement of personnel and equipment during emergencies), and provisions for contacting local authorities (police, fire department, hospitals, and emergency response teams) involved in emergency responses at the facility. The local authorities must be familiar with the facility and properties of the hazardous waste(s) handled at the facility. If more than one local authority is involved, a lead authority must be designated. The LTEMSF Operator(s) are expected to be the lead authority. If state or local authorities decline to enter into such arrangements, the owner and Operator must document the refusal in the facility operating record (See 40 CFR 264/265.30–.37).

Per 40 CFR 264/265.18 (location standards), RCRA TSDFs are generally on sites that minimize catastrophic events caused by flooding or earthquakes. The flood and seismic standards of 40 CFR 264.18 do not apply to interim status facilities but would apply if the facility seeks a RCRA hazardous waste facility permit. In addition, RCRA facilities must be operated and maintained in a manner that minimizes the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water. Specifically, 40 CFR 264/265.32 requires that a facility must have an internal communication or alarm system, a phone or radio capable of summoning emergency assistance, firefighting equipment, and adequate water supply. Further, 40 CFR 264/265.33 and 264/265.34 require that this equipment be maintained and tested regularly, and that all personnel have access to an alarm system or emergency communication device. In addition, the facility must have aisle space that is sufficient to ensure easy movement of personnel and equipment unless the owner/Operator demonstrates that it is unnecessary based on the nature of the hazardous waste stored (40 CFR 264/265.35). Lastly, TSDF staff must be trained to respond to emergencies in accordance with the contingency planning (40 CFR 264/265.16).

If more than one emergency coordinator is listed, a primary contact must be designated. Among other things, the plan must include a list of all emergency equipment and evacuation plans, where applicable. If the facility has already prepared an emergency or contingency plan in accordance with other regulations (e.g., Spill Prevention, Control, and Countermeasures [SPCC] Plan), amending the existing plan to incorporate hazardous waste management provisions is sufficient to fulfill the RCRA requirements (40 CFR 264/265.52).

SHORT-TERM ONSITE STORAGE –. In 40 CFR 262.17, the conditions for exemption from RCRA permitting and section 3010 notification requirements, as well as 40 CFR 124, 264 through 267, and 270 requirements are described for LQGs. Short-term storage was originally assumed to not extend past January 1, 2020; however, the likely length of short-term onsite storage at ore processor facilities depends on a number of factors related to the implementation of MEBA and is currently uncertain. As a result, elemental mercury amounts in excess of prior assumed quantities could potentially accumulate at some ore processor sites in this timeframe. This could potentially represent an increased risk to human health and the environment in the event of a catastrophic event, such as a fire or explosion at the facility. Subpart M of 40 CFR 262 (40 CFR 262.250 – 265) describes **Preparedness, Prevention, and Emergency Procedures for Large Quantity Generators**. In 40 CFR 262.263, *Amendment of contingency plan*, the contingency plan for a LQG must be reviewed, and immediately amended, if necessary whenever "*The generator facility changes - in its design, construction, **operation**, maintenance, or **other circumstances** - in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency.*" [emphasis added]. Accumulating significant amounts of elemental mercury onsite may increase the potential for releases of hazardous waste. Some of the requirements and procedures prescribed in Subpart M must be re-evaluated to determine if changes are required to ensure adequate protection of human health and the environment. Specific requirements that must be re-evaluated include, at a minimum:

- Fire protection equipment capabilities, including water supply (40 CFR 262.252);
- Emergency response arrangements with local authorities (40 CFR 262.256); and
- Contingency Plan adequacy (40 CFR 262.260 – 263).

It is likely that current capabilities and practices of LQG ore processors will be sufficient. However, re-evaluation is required by the applicable regulations. Determination of actions needed, if any, to ensure adequacy of these capabilities and practices should be conducted in consultation with the appropriate state authorities. Ore processors within the state of Nevada may also be subject to Nevada Administrative Code (NAC) 459.9533, which indicates that mercury storage in excess of 200,000 pounds (i.e., approximately 90.7 MT) could be subject to the Nevada Chemical Accident Prevention Program (CAPP) requirements at Nevada Revised Statute (NRS) 459.380, et. seq., and NAC 459.952, et. seq. Note that NRS 459.3814 may exclude short-term storage of elemental mercury from CAPP requirements provided its management is conducted in accordance with the MSHA (30 U.S.C. 801, et. seq.) and 42 U.S.C. 7412(r), *Prevention of Accidental Releases* (Risk Management Program). Other states may have similar requirements. Affected ore processors should confer with their appropriate regulators to determine the applicability of such statutes and codes.

As a member agency of the U.S. National Response Team, EPA recommends that a combined emergency plan be based on the *Integrated Contingency Plan (One Plan) Guidance* https://www.nrt.org/sites/2/files/NRT%20ICPG.pdf, accessed December 28, 2022). A copy of the contingency plan (and any revisions) must be maintained at the facility and provided to all local authorities that may have to respond to emergencies (40 CFR 264/265.53). The contingency plan must be reviewed and amended when the applicable regulations or facility permits are revised, the plan fails in an emergency, or there are changes to the facility, the list of emergency coordinators, or the list of emergency equipment (40 CFR 264/265.54). Some states require an annual review of plans.

The emergency coordinator is responsible for assessing emergency situations and making decisions to respond. There must be at least one employee either on the facility premises or on call to fill this role. This person must have the authority to commit the resources needed to carry out the contingency plan. (See 40 CFR 264/265.55).

In the event of an imminent or actual emergency situation, the emergency coordinator must immediately activate internal facility alarms or communication systems and notify appropriate state and local authorities. In cases where there is a release (i.e., due to an accident, error, or natural phenomenon, such as earthquake), fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and extent of any released materials. At the same time, the coordinator must assess possible hazards to human health and the environment. If the coordinator determines that the emergency threatens human health or the environment outside of the facility and finds that evacuation of local areas may be advisable, the coordinator must notify appropriate authorities and either the designated government official for the area or the National Response Center (phone: 1-800-424-8802). During an emergency, measures must be taken to ensure that fires, explosions, and releases do not occur, recur, or spread. If the facility stops operation, the coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment [See 40 CFR 264/265.56(a)–(f)].

After an emergency, any residue from the release, fire, or other event must be treated, stored, or disposed of according to all applicable RCRA regulations. The coordinator must ensure that all emergency equipment is cleaned and fit for use before operation is resumed. The owner or Operator must document in the facility operating record events that required the implementation of the contingency plan. Within 15 days of the accident, the owner or Operator must submit a written report describing the incident to the EPA Regional Administrator [40 CFR 264/265.56(g)–(j)].

The facility's permit is expected to address emergency preparedness and prevention plans and procedures per RCRA requirements (40 CFR 264/265 and 40 CFR 270) and will include a copy of the facility's Contingency Plan.

6.2 STANDARDS – RESPONSE TO SPILLS OF ELEMENTAL MERCURY

Spills of mercury do not present serious short-term hazards to people or the environment except when exposed to high heat (e.g., fire) or significant mechanical energy (e.g., high winds or powerful flows of water). The first priority in a spill situation is to stabilize the environment around the spill so that energy sources or human activities do not disperse the spilled mercury. Once the situation is stabilized, emergency responders can proceed with deliberation to recover spilled mercury and then to decontaminate the area.

The purpose of this section is to describe the minimum standards and procedures for responding to spills of elemental mercury. This section addresses spills of mercury that occur at the facility during (a) passive storage, (b) movement of mercury containers within the facility, and (c) receipt of mercury from off-site suppliers.

6.2.1 Specific Requirements and BMPs

6.2.1.1 Key RCRA requirements

RCRA requires that spills of hazardous waste in TSDFs must be cleaned up in a timely manner [40 CFR 264.175(b)(5)]. The emergency coordinator determines when to implement the RCRA contingency plan. It must be implemented in the event of fires, explosions, or unplanned sudden or non-sudden releases of hazardous waste which could threaten human health or the environment. The facility contingency plan identifies the criteria which trigger implementation of the plan and/or trigger outside notifications to regulators or DOE. Small spills inside RCRA containment systems (pallets with spill trays or berms) are not expected to force the implementation of the RCRA contingency plan, although larger spills could, and this threshold should be quantified in the Operating Procedures and the contingency planning. All employees performing their duties around stored mercury are to be trained in what to do in the event of a suspected spill. Personnel responsible for responding to a spill are to be trained in the procedures for containing and remediating a mercury spill safely.

Spill response supplies should be inspected monthly, as a BMP, or at a frequency defined by their RCRA permit, to ensure that an adequate inventory is always available. The results of the inspection are documented on a log sheet and placed in the facility operating record.

The most likely cause of a spill is a container that develops a leak. When the source of the spill is identified, the mercury contents in the container may be transferred immediately to another container (Handling area) or the container and mercury contents may be temporarily placed in an overpack to prevent additional spills, per established procedures. After a leaking container is emptied, the new container is labeled, packaged, and stored properly. The empty container is evaluated to determine whether it may be handled as non-RCRA material.

Incident reports shall comply with facility requirements, and RCRA requirements (40 CFR 264/265.56).

6.2.1.2 Key OSHA requirements

Employees assigned to respond to emergencies shall be trained and certified as specified in 29 CFR 1910.120(p)(8)(iii) to the hazardous materials technician level [29 CFR 1910.120(q)(6)(iii)]. All other staff shall have sufficient awareness training to recognize that a response situation exists, summon a fully trained employee, and not attempt to handle the situation themselves [i.e., first responder awareness level, 29 CFR 1910.120(q)(6)(i)].

6.2.1.3 Best Management Practices

Except during and immediately after cleaning up a spill, sufficient supplies, tools, and PPE are on hand to treat two successive spills without restocking. If, at any time, the inventory of tools and supplies falls below the level needed to respond to a single spill, all movement of mercury at the facility ceases. After cleanup of a spill, the residual contamination on building surfaces should be evaluated to ensure that safe working conditions are restored.

The facility management determines the minimum number of spill response personnel who must be deployed before beginning a spill cleanup. This number is published in the spill response plan, and no spill cleanup is to be started or performed with fewer trained spill response personnel in attendance.

Visible pools or drops of mercury are to be recovered by mechanical means to the extent feasible. Small drops of mercury are to be recovered by hand-powered miniature vacuums or sponges, as appropriate. Larger spills of mercury are to be recovered by a specialized mercury vacuum, which generally includes ultra-low particulate air filtration. Regular vacuum cleaners, including high-efficiency particulate air-filtered vacuum cleaners, are not to be used because the mercury vapor can amalgamate with the copper wiring in the motor and eject mercury vapor into the air. When all practical mercury recovery has been completed, mercury decontamination is to begin.

Under no circumstances shall energetic jets, streams of fluids, or heat be applied to areas contaminated with spilled mercury.

6.2.2 LTEMSF Emergency Response Equipment Features

As noted above, suitable types and amounts of emergency response equipment must be available at the facility. The type and amounts of emergency response equipment are defined in the facility's RCRA contingency plan and reflect the types and amounts of hazardous wastes stored. Typical emergency response equipment includes fire extinguishers, protective clothing, gloves, shoe covers/boots, safety goggles, respirators, tools (non-sparking if needed), unused containers and/or overpacks. Spill cleanup equipment/materials typically include suitable absorbents (vermiculite, clay, sulfur powder, zinc or copper flakes, pads and/or booms), wipes, eye droppers, stiff cards or cardboard, tape, suitable cleaning solvents, and specialized mercury vacuum. Consideration should be given toward eye washes and/or self-

contained breathing apparatus. Spill kits may be suitable for use in the Receiving area and Handling area; whereas more substantial supplies/equipment should be stored and used within the Storage area, as a BMP. Some sites have HAZMAT vehicles and/or supply storage buildings to supplement the supplies maintained at the TSDF that may include additional basic supplies but also specialty equipment, such as an emergency generator, exhaust fan, and floodlights.

6.2.3 Equivalency and Exceptions

The storage facility can request exemptions from RCRA requirements if the exemption can be sufficiently justified [see 40 CFR 270.14(b)(6)]. As an example, the LTEMSF may request an exemption from the requirement to store spill control and decontamination equipment at the facility [40 CFR 264/265.52(e)]. The exception may be based on the need to ensure the equipment stays clean/useable between spill response events. It may be best to store containers of sulfur and/or the specialized mercury vacuum near the facility rather than in it to avoid possible inadvertent contamination between spill events.

6.3 STANDARDS – EMERGENCIES IMPACTING THE LTEMSF

The LTEMSF may be threatened by externally triggered events, such as severe weather, earthquake, accidents, explosions, fire, malevolent actions, or other actions that result in release of hazardous waste. The response to these larger events will involve more responders, including those from the local community, and greater coordination with local groups. The requirements governing emergency preparedness and contingency planning for facilities managing hazardous wastes are described in 40 CFR 262 Subpart M, 40 CFR 264/265 Subpart D, and 29 CFR 1910 Subpart E.

Combined, these requirements can be addressed if the following standard components are included in the LTEMSF emergency preparedness and contingency plans and procedures:

- Planning (determining in advance what will be done in response to particular emergencies),
- Preparedness (having procedures, equipment, personnel in place to respond),
- Readiness assurance (ongoing process of verifying and demonstrating readiness to respond),
- Response (the actual mobilization of people, equipment, and resources during an emergency), and
- Recovery (planning for and actions after the response to return the facility to normal operations).

Specific minimum requirements related to the contents of contingency plans, emergency response equipment, communications, and coordination with local authorities are described in 40 CFR 262 Subpart M.

6.3.1 Minimum Program Requirements for Emergencies

The minimum requirements of Emergency Preparedness and Contingency Planning are program administration, training and drills, exercises, and readiness assurance (self-assessment and audits). The following 10 response elements must be addressed.

1. Emergency response organization—One individual is assigned to control the aspects of the facility response (i.e., Emergency Coordinator per 40 CFR 264.55). If the initial response units come from the local authorities or outside sources, the coordinator works with the responding Incident Commander following the National Incident Management System or local incident command system. An expert in dealing with mercury may be assigned to be part of the response.

2. Off-site response interfaces—Coordination with Tribal, State, and local organizations responsible

for off-site emergency response. These are defined by RCRA [40 CFR 264.52(c), 40 CFR 265.52(c)].

3. Emergency facilities and equipment—Material to support the response, notify employees, and evacuate people safely. Similar requirements exist under OSHA (29 CFR 1910.38 and Appendix to Subpart E), RCRA (40 CFR 264/265.32, .35, .37) and NFPA 101-2000.

4. Emergency categorization—Existing criteria for designating an Operational Emergency within 15 min after event recognition, per 40 CFR 262.265.

5. Notifications and communications—Capability to notify workers, emergency response personnel, and response organizations and/or regulators [40 CFR 262.254/256/261(c), 40 CFR 262.265(d)].

6. Consequence assessment—Required consequence assessment capabilities are generally determined by other Federal, State, and local ordinances, but must meet the requirements of 40 CFR 262.265(b) and (c).

7. Protective actions and reentry—Plans for evacuation or sheltering and accountability for employees, as may be required for other plans. Also includes planning for reentry and protection of reentry personnel (29 CFR 1910.120).

8. Emergency medical support—Requirements for site medical programs are determined by 29 CFR 1910.151, and NFPA 99-2005. The planning defines the interface between the medical plan and emergency plan.

9. Emergency public information—All emergencies require some public information response and are to have plans to establish a media center when needed [40 CFR 262.265(d)].

10. Termination and recovery—Termination of an emergency must be coordinated with all the off-site agencies responsible for off-site emergency response and conducted consistent with established criteria to resume operation. Termination is to be followed by an investigation of the event, preparation of any required reports [e.g., 40 CFR 262.265(i)], and development of corrective actions when appropriate.

6.3.2 Additional Considerations

All off-site responders, including medical response, must be given the opportunity to become familiar with the arrangement and hazards of the facility (as part of the coordination). Because mercury is a toxic metal, firefighting personnel and others who may have occasion to enter a mercury Storage area under fire conditions shall be cautioned that highly toxic mercury vapor may be present. In alignment with the expectations of 29 CFR 1910.1200, and as a BMP, there should be a caution sign on all entrances to the elemental mercury Storage area stating the following, or similar:

> CAUTION—MERCURY, METALLIC—Highly toxic by skin absorption and inhalation of fume or vapor.

Employees and responders must train on the emergency response plan. Employees are to receive training on the response plan when they begin to work at the storage facility or if the plan changes. Refresher training is to be provided annually for those with some response role (40 CFR 264/265.16). If there is a site or qualified local hazardous material response team, the facility employees may only be responsible for reporting the emergency and evacuating the facility. OSHA has emergency response training requirements under hazardous waste operations (includes training on the Incident Command System) and egress [29 CFR 1910.120(p)(8)(iii), 29 CFR 1910.120(q)(6), 29 CFR 1910.120, and 29 CFR 1910.38(e)].

Facility responders should also be trained on the National Incident Management System (NIMS) so that they can coordinate the response with the off-site response groups.

There must also be an annual building evacuation exercise consistent with 41 CFR 102-74.360, NFPA standards and local regulations, and at least annual tests of the communications systems used to contact local authorities.

6.3.3 Equivalency and Exceptions

Emergency plans required under RCRA (40 CFR 264/265, Subpart D, 40 CFR 262 Subpart M) and OSHA (29 CFR 1910.38) may be incorporated into existing plans.

7.0 STANDARDS FOR WASTE MANAGEMENT AT THE LTEMSF

7.1 INTRODUCTION

This section discusses standards for waste management practices at the DOE-designated LTEMSF. It is not intended to be an exhaustive listing of every applicable regulatory requirement. Only a subset of RCRA TSDFs is required to have a formalized waste management plan.[31] Container storage facilities are not required to have a formalized waste management plan. However, all generators and TSDFs must have a waste minimization program [40 CFR 262.27); 40 CFR 264.73(b)(9)]. All TSDFs must also have a WAP, which is included in the RCRA facility permit. They must also have corresponding waste acceptance requirements (i.e., described in WAC or similar document) that are also defined by their RCRA facility permit. Information pertaining to the wastes (waste description, container/waste compatibility information, WAP, special requirements for wastes generated off-site, and LDR information) that will be stored at the facility is addressed in the Waste Characteristics section of the permit. Similarly, a facility must summarize its container management practices as part of the facility's Process Information (40 CFR 264/265.171–174, 40 CFR 270.15). Container management practices include the steps to empty containers, the handling of empty containers (40 CFR 261.7), identification of waste discrepancies on the manifest or shipping paper (40 CFR 264/265.72), and unmanifested wastes (40 CFR 264/265.76).

This section of the guidance focuses on the waste management requirements defined under RCRA that are applicable to the DOE-designated LTEMSF (permitted or interim status). The basic requirements for a waste minimization program, the WAP, and container management practices are outlined. The information contained in this section outlines the various waste management elements that apply to container storage operations as a permitted storage facility but also as a waste generator. Waste acceptance requirements are summarized in Section 4. The WAC is broader than the WAP. The WAC is written to inform the generator what is required to obtain approval from the LTEMSF Operator(s) to ship wastes there. The WAC includes generator documentation (forms and/or instructions and sequencing/timing of submittals) that must be submitted to the facility for waste acceptance, defines packaging and labeling requirements, as well as waste analysis, QA/QC requirements and/or waste restrictions. The WAC can outline the process to obtain variances from any of the facility requirements, can address the process for the facility's handling of nonconforming wastes, and can also include the fee structure. The facility may issue a waste acceptance procedure that implements the WAC.

Minor differences exist between the waste management requirements for permitted and interim status units. Those differences are noted. State requirements may be more stringent than the Federal requirements. State requirements are not addressed herein.

SHORT-TERM ONSITE STORAGE –While the waste management requirements for TSDFs in 40 CFR 264/265 are not specifically applicable to short-term storage at the ore processors' facilities, 40 CFR 262 describes the requirements for generators for management and handling of waste and waste containers, including spill clean-up waste, as well as waste minimization expectations. Nevertheless, as a BMP, other RCRA TSDF requirements should be considered for applicability.

[31] Waste management plans are only required for surface impoundments, waste piles, land treatment units, or landfills managing dioxin, furan, or phenol wastes (40 CFR 270.17, .18, .20, or .21).

7.2 STANDARDS – WASTE MANAGEMENT

7.2.1 Key RCRA Requirements

Specific waste management criteria associated with the DOE-designated LTEMSF will include the following RCRA requirements.

- 40 CFR 261.7—Residues of Hazardous Waste in Empty Containers
- 40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste
- 40 CFR 264/265.12—Required Notices
- 40 CFR 264/265.13—General Waste Analysis
- 40 CFR 264/265.17—General Requirements for Ignitable, Reactive, or Incompatible Wastes
- 40 CFR 264/265.72—Manifest Discrepancies
- 40 CFR 264/265.73—Operating Record
- 40 CFR 264/265.75—Biennial Report
- 40 CFR 264/265.76—Unmanifested Waste Report
- 40 CFR 264/265.77—Additional Reports
- 40 CFR 264/265.171–.174—Condition of Containers; and Compatibility of Waste with Container, Management of Containers, and Inspections
- 40 CFR 264/265.177—Special requirements for incompatible wastes
- 40 CFR 270.14—General Requirements of Part B of the Hazardous Waste Permit Application

7.2.2 Required Waste Management Features

Proper hazardous waste management is the goal of Subtitle C of RCRA, and therefore, planning for waste generation, waste acceptance, and waste handling are critical elements toward ensuring compliance with the requirements. The information in this section outlines the requirements for container storage operations as a permitted storage facility but also as a waste generator for wastes generated during day-to-day operations.

7.2.2.1 RCRA description of waste minimization program requirements

RCRA requirements for a waste minimization program are included in 40 CFR 262.27 and 264.73(b)(9).

One of the objectives of RCRA is to reduce or eliminate the generation of hazardous waste as expeditiously as possible [RCRA Section 1003(b); 42 USC § 6902(b)]. When preparing a manifest, hazardous waste generators, which include TSDFs that generate hazardous wastes as part of their operations, are required to certify that they have taken steps to minimize the amount of hazardous waste that they generate. LQGs must certify on each manifest that they have "a program in place" to reduce the volume and toxicity of the hazardous waste they generate; SQGs must certify that they have made a good faith effort to minimize their waste generation (40 CFR 262.27). Generators must also submit a biennial report indicating their efforts to reduce the volume and toxicity of wastes. TSDFs describe their waste

reduction program in their permit application. Regulators can inspect a facility at any time to determine whether a program is actually in place.

7.2.2.2 RCRA required waste management elements

RCRA requirements for container management practices conducted at the storage facility include 40 CFR 261.7; Part 262; 264/265.13; 264/265.17; 264/265.35; 264/265.72, .73, and .76; 264/265.171–.174; and 40 CFR 270.14(b)(2), (3), (5), and (8).

Permitted and interim status TSDFs must manage the hazardous wastes they generate or receive in a manner which complies with the regulations. As such, a TSDF is required to describe its container management practices in its Part B permit application, and those practices can become a condition of the permit when issued. Interim status and permitted facilities typically issue and maintain, at a minimum, internal procedures that outline compliant hazardous-waste-handling steps to facilitate overall compliance.

7.2.2.3 RCRA permitted or interim status storage practices

Storage facilities must meet RCRA standards for the handling of containers of hazardous wastes (40 CFR 264/265.171–.174, 264/265.35). Container storage practices are outlined in the Part B permit application as part of the facility's Process Information [40 CFR 264.171–.174, 264.35, 270.14(b)(5) and (8)]. The information to be included in the permit application is as follows:

- A complete description of the containers that will be used for storing hazardous waste. The primary focus is to document compatibility of the waste with the containers to be used for storage. Information can include testing, literature, or past operating experience that will reinforce the selection of containers.

- Movement and handling of containers is described and is intended to demonstrate how handling practices will minimize events that would compromise the integrity of a container or the containment system. The types of equipment to be used must be provided. This section describes exactly how containers will be placed in the unit (e.g., number of containers, stacking, etc.) and how they are moved (e.g., containers are moved by forklift). Containers must not be handled, opened, or stored in a manner that may cause them to leak.

- Information on the maximum number of containers, stack height, storage arrangement, and container volumes must be provided. This section should indicate that adequate aisle space will be maintained to permit inspections and to implement emergency response actions.

- The container inspection process and corrective actions taken in response to inspections are summarized. Relevant inspection parameters must be defined and typically include signs of deterioration from corrosion, leaking containers, and illegible or missing labels/markings.

- Information regarding opening and closing of containers of wastes must also be provided. In general, containers should enter the storage unit closed and remain closed unless it is necessary to sample the container or to transfer the container contents into another container.

- Labeling and marking practices must be described. A brief description of the container identification, tracking, and recordkeeping process should be provided. (Note: The waste tracking systems should be designed to facilitate preparation of the required reports under RCRA, including waste minimization efforts and biennial reports.)

7.2.2.4 RCRA requirements for incompatible wastes

RCRA requirements for incompatible wastes are included in 40 CFR 264/265.17; 264/265.177; and 270.14(b)(9). Special care must be taken in handling ignitable, reactive, or incompatible wastes (40 CFR 264/265.17). Ignitable and reactive wastes must be protected from ignition sources (e.g., requires the use of non-sparking equipment). "No Smoking" signs must be conspicuously placed where ignitable and reactive wastes are stored, and separate smoking areas must be designated [40 CFR 264/265.17(a)]. TSDFs must also take precautions to prevent waste reactions [40 CFR 264/265.17(b)]. Owners and Operators for whom 40 CFR 264.17(a) and (b) are applicable must document their compliance with those sections [40 CFR 264.17(c)].

TSDFs must describe the precautions taken at the facility when managing ignitable, reactive, or incompatible wastes in their RCRA Part B permit application [40 CFR 270.14(b)(9)] as part of the general information required. Alternatively, if the facility will not manage ignitable, reactive, or incompatible wastes, then this should be stated in the permit, WAC, and in facility procedures. This is expected to be the case for the LTEMSF.

7.2.2.5 RCRA residues of hazardous waste in empty containers

The regulations regarding the management of empty containers and residues remaining in empty containers are found in 40 CFR 261.7. These regulations set out procedures for establishing when a container or inner liner that held a hazardous waste is "empty." Since "RCRA empty" containers no longer contain hazardous waste, these regulations are also used to determine when containers are no longer subject to the RCRA requirements. To distinguish between the usual meaning of the word "empty" and the strict regulatory definition, the phrase "RCRA empty", as cited above, is sometimes used. Any hazardous waste remaining in either a "RCRA empty" container or inner liner (see below for the specific criteria) is not regulated as a hazardous waste. Therefore, these regulations allow containers or inner liners meeting the provisions in 40 CFR 261.7 to be reused for other purposes, recycled, or discarded as solid waste, since the container is no longer considered to hold hazardous waste. Separate standards are set for acute, gaseous, and non-acute hazardous wastes. If "RCRA empty" containers will be reused at a TSDF, then the TSDF must address their procedures with regard to steps to be taken to prevent reactions, fires, or other releases in their permit application as part of the Procedures to Prevent Hazards [40 CFR 270.14(b)(9)] and in facility procedures. Under RCRA, a container or an inner liner removed from a container holding non-acute hazardous waste, such as elemental mercury, is empty under the following conditions.

- All wastes have been removed using practices commonly employed industry-wide to remove wastes from containers or liners, such as pouring, pumping, aspirating, and draining [40 CFR 261.7(b)(1)(i)] and

- No more than 2.5 centimeters (one inch) of material remains in the container or liner [40 CFR 261.7(b)(1)(ii)], or

- No more than 3 percent by weight of the total capacity of the container remains for containers with a capacity of 119 gal or less, and no more than 0.3 percent by weight remains of the total capacity for containers with a capacity greater than 119 gal [40 CFR 261.7(b)(1)(iii)(A) and (B)].

Residues removed from a container that is not RCRA empty or that result from rendering a container empty are fully subject to the RCRA Subtitle C hazardous waste requirements. The above RCRA standards would apply to mercury transfer operations conducted at the storage facility. When responding to leaks, staff at the facility would transfer the mercury from a leaking container into a new, unused container and label and store the new waste container and manage the container that leaked appropriately.

If that container meets the "RCRA empty" standard, [32] the container could be recycled for its metal content or managed as solid waste. Those containers that previously leaked would not be suitable for reuse as containers.

7.2.2.6 RCRA manifest discrepancies

RCRA regulations for handling discrepancies in waste manifests are included in 40 CFR 264/265.72. Additional facility-specific procedures for management and disposition of manifest may be included in TSDF waste management planning and/or an internal procedure regarding waste acceptance.

7.2.2.7 RCRA unmanifested hazardous waste reports

If a TSDF accepts waste from off-site without a manifest, an unmanifested waste report must be prepared in accordance with 40 CFR 264/265.76. Additional facility-specific requirements for management and disposition of unmanifested hazardous wastes may be included in their waste management procedures.

7.2.2.8 RCRA reports to EPA Regional Administrator

Reports that must be made to the EPA Regional Administrator include, but are not limited to, reports of releases, fires and explosions, groundwater contamination and monitoring data, and facility closure (40 CFR 264/265.77). Releases may also trigger Comprehensive Environmental Response, Compensation, and Liability Act and Emergency Planning and Community Right-to-Know Act reporting.

7.2.2.9 RCRA secondary (newly generated) facility wastes

If the storage facility initiates a waste shipment involving its stored hazardous wastes, a new manifest must be prepared to comply with Part 262 generator standards [40 CFR 264/265.71(c)]. Additionally, if the storage facility generates hazardous wastes as part of its operations (e.g., waste-flammable paint, waste solvents, spill cleanup residues, mercury-contaminated PPE, etc.), then the storage facility would be considered a RCRA generator per Part 262. Compliance with the Part 262 regulations can include satellite and 90-day accumulation areas under 40 CFR 262.15 that are exempt from permitting. The use of generator accumulation areas would only be available to the hazardous wastes that are generated by the TSDF onsite.

7.2.2.10 RCRA WAP requirements

The general requirements for conducting waste analysis are found in:

- 40 CFR 262.11, for generators that do not treat, store, or dispose of hazardous waste;
- 40 CFR 264.13, for permitted TSDFs, including 40 CFR 264.13(a)(4) and (c) for all off-site TSDFs (generators who treat prohibited wastes in tanks, containers, and/or containment buildings to meet LDR treatment requirements should also follow the general waste analysis provisions in 40 CFR 264.13/265.13); and

[32] The facility may choose to implement a more conservative standard for emptying containers because strict compliance with these RCRA requirements could result in a residual of almost three kilograms remaining in the "RCRA empty" container, which is not acceptable for recycle of the metal or direct disposal as solid waste. Accordingly, repeated emptying of mercury residues from "RCRA empty" containers may be required in facility-specific procedures. It is also reasonable to expect that, even after these procedures, additional mercury contamination (e.g., beads) may coalesce over time and require collection and management as hazardous waste. However, it is important to point out that such procedures are not required by RCRA regulations.

- 40 CFR 265.13, for TSDFs operating under interim status[33].

The following discussion provides details related to the typical standards for developing a WAP for a RCRA-permitted commercial TSDF that receives a wide variety of hazardous wastes (i.e., waste codes, waste forms, packaging sizes, etc.) from many diverse types of generators. However, since the LTEMSF will only accept elemental mercury that was generated in the U.S. and that meets one (or more) of the following criteria: 1) U151 coded waste, 2) D009 coded waste generated as a result of RMERC treatment technology, and/or 3) mercury that was previously treated to 99.5 vol% elemental mercury, and most of the generators produce the waste in similar processes, it is likely that a tailored approach to development of the WAP requirements will be acceptable. Leveraging the generator's process knowledge as acceptable will significantly reduce the risk to workers associated with opening sealed containers, collecting physical samples, and then having those samples analyzed. There will be requirements to periodically re-validate the characteristics of the elemental mercury waste produced by the generators' operations, in accordance with RCRA requirements (40 CFR 264/265.13). For such re-validation, fingerprinting will likely be used, as well as detailed analysis; however, the intent is to minimize these activities to the extent practical, while collecting sufficient data to ensure that the elemental mercury containers can be safely stored and managed in the long-term.

A WAP is required for all TSDFs. The WAP must be written and kept on site. The facility's WAP (or elements thereof) must be included in its Part B permit application [40 CFR 270.14(b)(2) and (3)]. Documentation of waste analysis procedures in a WAP should help ensure compliance with RCRA waste identification requirements. TSDFs need to verify the composition (i.e., hazardous constituents and characteristics) of incoming waste in order to ensure only that only elemental mercury meeting the established criteria is accepted and in order to treat, store, or dispose of the waste properly. A WAP outlines the verification procedures, including specific sampling methods, necessary to ensure proper treatment, storage, or disposal (40 CFR 264/265.13). The facility's WAC can be used to guide the development of the WAP. Key elements of the WAC for the LTEMSF that could guide the WAP include container contents, including the presence of constituents that could foster corrosion of containers such as water, nitric acid solutions, chloride salts solutions, other possible corrosion agents, secondary phases of mercury salts, and presence of radioactive constituents or contamination.

However, the WAP should also address analyses for wastes generated by the facility as a result of its operations. Those newly generated wastes would be subject to a waste determination at the point of generation and should be segregated, at least until characterization is complete, from the wastes in permitted storage. The facility should ensure that the newly generated wastes are not incompatible with the stored wastes and that the facility permit addresses management of these volumes and types of solid or hazardous waste, which may include use of CAAs and/or SAAs under 40 CFR 262.
Before a facility treats, stores, or disposes of any hazardous waste, the facility must obtain a detailed chemical and physical analysis of a representative sample of the waste [40 CFR 264/265.13(a)]. As previously described, this information may be supplied either through routine sampling and laboratory analysis or through acceptable knowledge, once the process generating the waste has been validated via representative sampling and analysis. Acceptable knowledge may include process knowledge (e.g., information about chemical feedstocks and other inputs to the production process); knowledge of products, by-products, and intermediates produced by the manufacturing process; chemical or physical characterization of wastes; information on the chemical and physical properties of the chemicals used or produced by the process or otherwise contained in the waste; testing that illustrates the properties of the waste; or other reliable and relevant information about the properties of the waste or its constituents.

[33] For additional information related to WAP requirements and contents see https://www.epa.gov/sites/default/files/2015-04/documents/tsdf-wap-guide-final.pdf and https://www.epa.gov/system/files/documents/2022-05/LDR_InformationBulletin_4-29-22.pdf.

However, generators must obtain a representative sample of the waste for initial and subsequent validation, as defined at 40 CFR 260.10.

The WAP must, at a minimum, contain the following basic elements [40 CFR 264/265.13(b)&(c)]:

- Parameters to be analyzed,
- Testing and analytical methods,
- Sampling methods used to obtain representative samples,
- Frequency of waste re-evaluation,
- The waste analyses that offsite generators have agreed to supply, including acceptable knowledge and accepted processes; and
- Procedures to ensure that the waste received from the off-site generator matches the identity of the waste designated on the accompanying manifest.

The waste analysis must be repeated periodically to ensure that the information on a given waste is accurate and up to date [40 CFR 264/265.13(a)(3)]. At a minimum, the waste analysis must be repeated (1) when the TSDF is notified or has reason to believe that the process or operation generating the hazardous wastes has changed or (2) when inspection indicates that the hazardous waste received does not match the information on the accompanying manifest (e.g., manifest discrepancy).

A WAP documents the procedures that the facility will use, or accept from the generator, to obtain a representative sample of the waste and to conduct a detailed chemical and physical analysis of this representative sample for routine waste characterization, or when required to establish or re-validate process knowledge. The WAP also can describe special handling procedures for proper transportation, treatment, storage, or disposal of the wastes. Sampling procedures would outline the chain-of-custody and recordkeeping requirements for sampling to ensure sample results can be tied back to a specific container.

Formal documentation of waste analysis procedures in a WAP offers many advantages, including the following:

- Allowing for planning and analyzing several waste analysis options before making a selection;
- Establishing a reliable and consistent internal management mechanism for properly identifying wastes on site;
- Ensuring that all participants in waste analysis have identical information (e.g., a hands-on operating manual), thereby promoting consistency and decreasing the likelihood that errors will be made;
- Ensuring that facility personnel changes or absences do not lead to lost information;
- Reducing the facility's liabilities by decreasing the instances of improper handling or management of wastes;
- Assisting in demonstrating to regulators that the facility is in compliance with all regulations applicable to proper waste identification, thereby ensuring a safe operating environment and protection of human health and the environment.

Because RCRA is a self-implementing program, the burden is on the TSDF to demonstrate that it is operating in compliance with all applicable regulations. The facility is responsible for any violations that occur at the facility, regardless of any good faith effort the facility made to obtain information. As a result, TSDFs commonly implement a system of corroborative testing for the hazardous wastes they receive. However, the specifics of the WAP will be determined by the LTEMSF Operator(s), in consultation with their regulators.

Abbreviated waste analysis, often referred to as "fingerprint analysis," is conducted generally for key parameters. For elemental mercury, fingerprinting checks could include presence of other metals;[34] specific gravity; color; [35] presence of water; [36]presence of chloride salts solutions, nitric acid solutions, other possible corrosion agents; pH [37]; and verification of no radioactive constituents or contamination. Those parameters should give information that can be used to help verify that the waste matches the expected characteristics for that waste. Fingerprint analysis can be used to indicate that the waste received matches the description on the manifest, and that the waste matches the waste type that the facility has agreed to accept. However, fingerprint analysis is not a substitute for conducting a complete waste analysis and, therefore, may not be defensible if a waste is misidentified by the generator but still passed the fingerprint test. The decision to conduct abbreviated corroborative testing using fingerprint analysis on a few select parameters or to conduct a complete analysis to verify the profile, and frequency of each, will ultimately be decided by the LTEMSF Operator(s) through consultation with their regulators.

Selecting WAP parameters

An accurate representation of a waste's physical and chemical properties is critical in determining viable waste management options, in compliance with 40 CFR 264.13. Accordingly, as a BMP, facility WAPs should specify waste parameters that provide sufficient information to ensure the following:

- Compliance with applicable regulatory requirements (e.g., LDR regulations, newly identified or listed hazardous wastes),
- Conformance with permit conditions (i.e., ensure that wastes accepted for management fall within the scope of the facility permit, and process performance standards can be met), and
- Safe and effective waste management operations (i.e., ensure that no wastes are accepted that are incompatible or inappropriate given the type of management practices used by the facility).

WAPs include provisions to ensure that waste management units meet the special requirements for ignitable, reactive, and incompatible wastes (40 CFR 264/265.17). Incompatible wastes, if brought together, may result in heat generation, toxic gas generation, and/or explosions. Therefore, a WAP must address measures to identify potentially ignitable, reactive, and incompatible wastes. The information provided by the waste manifest and fingerprint testing can be supplemented with other testing to identify incompatible wastes.

Sampling strategies

If sampling is determined to be required at the LTEMSF, then development and application of a sampling strategy is a prerequisite to obtaining a representative sample capable of producing scientifically viable data. These strategies should be selected or prepared prior to actual sampling to organize and coordinate

[34] By total metals analysis or hand-held X-ray fluorescence analyzer if detection limits are sufficiently accurate.
[35] By visual inspection.
[36] By visual inspection and/or analyses.
[37] If two phases are observed.

sampling activities, to maximize data accuracy, and to minimize errors attributable to incorrectly selected sampling procedures. At a minimum, a sampling strategy should address the following:

- Objectives of collecting the samples
- Types of samples needed (e.g., grab or composite)
- Selection of sampling locations
- Number of samples
- Sampling frequency
- Sample collection and handling techniques to be used

In addition, the following factors should also be taken into consideration since they can influence the sampling development process:

- Physical properties of the wastes to be sampled
- Chemical properties of the wastes to be sampled
- Special circumstances or considerations (e.g., complex multi-phasic waste streams, highly corrosive liquids)

Two major sampling approaches may be employed to collect representative samples. These approaches are summarized as follows:

- *Authoritative Sampling*—Where sufficient historical, site, and process information is available to accurately assess the chemical and physical properties of a waste, authoritative sampling (also known as judgment sampling) can be used to obtain representative samples. This type of sampling involves the selection of sample locations based on knowledge of waste distribution and waste properties (e.g., homogeneous process streams) as well as management unit considerations. Accordingly, the validity of the sampling is dependent upon the accuracy of the information used. The rationale for the selection of sampling locations is critical and should be well documented.

- *Random Sampling*—Due to the difficulty of determining the exact chemical and physical properties of hazardous waste streams that are necessary for using authoritative sampling, the most commonly used sampling strategies are random (not to be confused with haphazard) sampling techniques. Generally, three specific techniques—simple, stratified, and systematic random—are employed.

By applying these procedures, which are based upon mathematical and statistical theories, representative samples can be obtained from nearly every waste sampling scenario. Given the expected overall homogeneity of the elemental mercury to be received at the DOE-designated LTEMSF, authoritative sampling could be utilized, when required, to define sampling requirements for waste analyses by the generator and the LTEMSF itself. For any newly generated waste at the LTEMSF, random sampling may be needed to ensure results are representative.

In general, the RCRA regulations do not specify when to sample or how many samples should be taken. EPA-approved procedures are typically used when determining how many samples to take, but other statistically based procedures can be approved. The higher number of samples taken increases the accuracy of the results; hence, some TSDFs sample 10% of the containers they receive, with some wastes/containers specifically excepted from sampling. The DOE-designated LTEMSF may use its

knowledge (e.g., homogeneity) of the mercury to be accepted when determining the protocol for fingerprinting [e.g., the cube root procedure, Method D 140-70 (ASTM].

Use of waste profiles and pre-acceptance reviews

It is common practice for TSDFs that receive wastes from an off-site generator (or other facility) to require the submittal of a Waste Profile (or comparable document) to the TSDF as a pre-acceptance condition. A Waste Profile provides a comprehensive description of each waste stream (see Section 2).

The level of pre-acceptance reviews can vary based on the variety of wastes typically managed. The level of screening required for an off-site storage facility receiving only elemental mercury could be less than that required for a TSDF accepting all RCRA wastes. Off-site TSDFs, such as the LTEMSF, may require that the generator provide detailed information regarding:

- The process that generates the waste,
- The physical and chemical description of the waste,
- The analytical procedures and results used to characterize the waste or acceptable knowledge documentation,
- Whether any prohibited constituents are present,
- EPA hazardous waste codes; and
- Certifications and notifications as applicable to LDR wastes.

As an off-site TSDF, the LTEMSF will also be required to comply with additional requirements relating to procedures that help minimize the potential for the facility to accept incorrectly identified or unacceptable waste shipments (40 CFR 264/265.13(c)). For the LTEMSF, the WAP must define the procedures which will be used to inspect and, if necessary, analyze each movement[38] of hazardous waste received at the facility to ensure that it matches the identity of the waste designated on the accompanying manifest or shipping paper.

The LTEMSF WAP will specify the waste analysis data that the generator of the waste provides to substantiate its waste determination. In accordance with 40 CFR 264.13(b) and (c), it is important that the WAP include descriptions of the procedures to be taken by the TSDF to determine how well the generator's data represents the wastes to be managed. The TSDF should determine whether recharacterization of the waste is necessary if a shipment of a particular waste is determined, through pre-acceptance screening, to be significantly different from the waste as characterized and identified from the pre-shipment sample and/or waste manifest. These procedures and waste recharacterization procedures should be specified in the WAP. Alternatively, the facility may reject the entire shipment of waste and return the waste to the generator.[39] As an off-site facility, the DOE-designated LTEMSF Operator(s) should, at a minimum, visually inspect the containers and compare the contents of each shipment, as indicated on the container labels, to the accompanying manifest to confirm the waste matches that

[38] Movement within the areas of the DOE storage facility does not require additional analysis. However, the use of container tracking numbers and tamper indicating devices from receipt and throughout storage should ensure that the waste characterization can be tied back to the generator.

[39] Note that DOT has different recognized hazard classes than EPA. See 49 CFR 173.2 for an overview of DOT hazard classes. DOT and EPA also have different classification criteria. For example, compare 40 CFR 261.22 and 49 CFR 173.136 for characterizing corrosivity. For hazardous wastes, a tentative classification may be made as described in 49 CFR 172.101(c)(11), but classification according to DOT's HMR is preferred.

identified on the manifest, in accordance with 40 CFR 264.13(a)(4) (see Section 4). The shipment received on site should be confirmed to meet permit specifications and regulatory requirements in accordance with the approved WAP.

8.0 STANDARDS FOR TRAINING RELATED TO THE LTEMSF

This section discusses standards that establish requirements of training for elemental mercury container storage and management. It is not intended to be an exhaustive listing of every applicable regulatory requirement.

8.1 INTRODUCTION

RCRA requires training for facility personnel and these requirements are described in the following subsection (Section 8.2). The LTEMSF Operator(s) shall be responsible for training personnel for all tasks involved with the LTEMSF in accordance with applicable RCRA, OSHA, and DOT requirements. To address this responsibility, a Training Program, as required per 40 CFR 270, must be included in Part B of the RCRA permit application. As a BMP, such a Training Program should identify positions and training requirements for those positions (modules, frequency and duration), and required records generated from the training activities. Training regarding RCRA, QA/QC, DOT, and ES&H requirements generally constitute the major elements of training. Training may be implemented via classroom, on-the-job, self-study, or web-based modules depending on the audience, content, and whether the module is the initial one or a refresher. For example, initial RCRA training may be classroom or on the job; refresher training may be self-study or web-based.

This standard is applicable to personnel who are assigned to work at the facility. Training may include RCRA, QA/QC, ES&H, DOT, and mercury container/facility inspections/operations, including emergency response.

SHORT-TERM ONSITE STORAGE – Ore processors conducting short term storage at their facilities, must implement RCRA training programs and requirements in accordance with 40 CFR 262.17(a)(7) commensurate with the hazards represented. This is understood to be the current practice.

8.2 STANDARDS - TRAINING

8.2.1 Key RCRA Requirements

RCRA training requirements can be found at 40 CFR 264.16. Generally, RCRA requires that facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures facility compliance with RCRA. That training program must also include training for emergency response. Training must be directed by a person trained in hazardous waste management procedures and include instructions that teach facility personnel hazardous waste management procedures and contingency plans relative to the positions in which they are employed. In addition, RCRA training also requires the following:

- LTEMSF personnel successfully complete the appropriate RCRA training within 6 months after the date of their employment, assignment to the facility, or to a new position at a facility, whichever is later. Employees who have not completed this training must not work unsupervised.
- LTEMSF personnel take part in an annual review of their initial RCRA training.

The LTEMSF Operator(s) must maintain the following documents and records at the LTEMSF:

- The job title for each position at the facility related to hazardous waste management, and the name of that employee filling each job;
- A written job description for each position in the above bullet; and

- A written description of the type and amount of both introductory and continuing training for assigned RCRA positions.

Training records of current personnel must be kept until closure of the LTEMSF; for former personnel, training records must be kept for three years from the date last worked.

To ensure RCRA compliance, at a minimum, the following RCRA sections should be included in the Training Plan. This program identifies positions that are required to complete specific training modules related to the following:

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

- 40 CFR 264.15(c, d) – General Inspection Requirements
- 40 CFR 264.16 – Personnel Training
- 40 CFR 264.171 – Condition of Containers
- 40 CFR 264.172 – Compatibility of Waste with Containers
- 40 CFR 264.173 – Management of Containers
- 40 CFR 264.174 – Inspections
- 40 CFR 264.73(b) – Operating Record
- 40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
- 40 CFR 265.15(c)&(d) – General Inspection Requirements
- 40 CFR 265.16 – Personnel Training
- 40 CFR 265.171 – Condition of Containers
- 40 CFR 265.172 – Compatibility of Waste with Containers
- 40 CFR 265.173 – Management of Containers
- 40 CFR 265.174 – Inspections
- 40 CFR 265.73(b) – Operating Record
- 40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program
- 40 CFR 270.14(b) – Contents of Part B: General Requirements

The RCRA hazardous waste facility permit should describe the RCRA training program for facility personnel. Personnel assigned to review/accept/sign generator waste determinations, manifests, or shipping papers must also have sufficient training in RCRA waste identification/characterization, LDR, and DOT.

For emergency response, the training shall ensure that facility personnel can respond effectively to emergencies that might occur at the facility. Hence, familiarization with facility-specific emergency

response procedures (for spills, fires, explosions), emergency equipment (including spill control equipment, fire control, etc.), and emergency systems (facility communications or alarm systems) is critical. Facility staff who are trained for emergency response training per OSHA [29 CFR 1910.120(p)(8) and 1910.120(q)—HAZWOPER] need not have separate RCRA emergency response training, provided the training per OSHA meets the requirements of RCRA [40 CFR 264/265.16(a)(4)].

The plan must address the frequency of training, including the annual review of initial RCRA training required under 40 CFR 264/265.16.

8.2.2 Key DOT Requirements

DOT (49 CFR 172.702) requires that each employer whose employees work with hazardous materials must train each of its HAZMAT employees. "HAZMAT employees" include those who prepare the packages for shipping; prepare, sign, or review the paperwork; load trucks; drive the vehicles; or unload or receive the hazardous materials.

A HAZMAT employee may not perform a DOT function unless he or she has been trained in the requirements of hazardous materials (generally identification, classification, labeling, marking, placarding, packaging, etc.) that apply to that function. The LTEMSF Operator(s) will ensure that each HAZMAT employee of the LTEMSF is thoroughly instructed and is tested by appropriate means on the training subjects covered in 49 CFR 172.704.

Since DOT training is designed to be job specific, some employees may only require a basic knowledge of DOT whereas others may require extensive (basic and 40 hour) training.

8.2.3 Key ES&H Requirements

Section 5(d)(2) of the MEBA requires that operational training and emergency training are conducted for all staff who have responsibilities related to elemental mercury management, transfer, storage, monitoring, or response. The LTEMSF Training Program should ensure that all workers exposed or potentially exposed to hazards are provided with training and information on that hazard in order to perform their duties in a safe and healthful manner. It should include, but not be limited to:

- Training and information for new workers, before or at the time of initial assignment to a job involving exposure to a hazard;
- Periodic training as often as necessary to ensure that workers are adequately trained and informed; and
- Additional training when safety and health information or a change in workplace conditions indicates that a new or increased hazard exists.

29 CFR Part 1910 **(**known as the "Hazard Communications" or "Right-to-Know" standards) requires hazard communication (HAZCOM) information and training for employees such as:

- The physical and health hazards associated with hazardous chemicals, including those contained in unlabeled pipes, in the work area;
- Methods and observations used to detect the presence or release of hazardous chemicals (e.g., monitors, alarms, odors, appearance);
- Measures employees may take to protect themselves from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment;

- Information on operations in the work area where hazardous chemicals are present (an explanation of the labeling system and the material safety data sheets [MSDSs]);

- How to access a list(s) of hazardous chemicals present in the work area and associated MSDSs; and

- The location of the facility's written Hazard Communication Program.

This training may be accomplished through completion of General HAZCOM training and job-specific ES&H training. The Training Plan provides guidance for the critical operational ES&H requirements. Emphasis shall be given to health and safety requirements during the receipt, handling, and sampling of elemental mercury and associated waste.