# ESH manual

## Environment, Safety, and Health

**Volume III**

**Part 32: Discharge to Water**

# Document 32.2 Management of Retention Tank Systems

**Recommended for approval by the ES&H Working Group**

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**Management of Retention Tank Systems***

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**Management of Retention Tank Systems**

# 1.0 Introduction

Research and development activities at Lawrence Livermore National Laboratory (LLNL) may generate wastewater that contains constituents in excess of sanitary sewer discharge limits. LLNL operates retention tank systems to collect such wastewater, store it temporarily until an appropriate disposal method is determined, and possibly treat the wastewater if it exceeds sewer discharge limits. Appendix A is a glossary that defines each type of wastewater as well as other terms used in this document.

Federal and state regulations governing retention tank systems have become increasingly stringent in recent years. Appendix B summarizes applicable federal and state environmental regulations. Increased regulatory oversight of retention tanks is in response to the potential for radioactive-contaminated or hazardous wastewater to leak or spill from a tank and enter the soil and possibly the groundwater. Proper design and operation of wastewater retention tank systems can reduce the risk of a release of wastewater to the environment.

When planning the installation or modification of a retention tank system, it is recommended that the authorizing organization consult the Permits and Regulatory Affairs Group (PRAG) in the Environmental Protection Department (EPD) to help assess options that may be available to reduce the volume or toxicity of the wastewater, and consequently the size, cost, and design constraints for the retention tank system.

To assist LLNL employees and their organizations in understanding and complying with Work Smart Standards (WSS) for wastewater retention tank systems, the Operations and Regulatory Affairs Division (ORAD) of EPD has prepared this document to describe:

- Roles and responsibilities of LLNL tank owners, tank operators, and EPD personnel.
- Overview of wastewater retention systems at LLNL.
- System design, construction, and installation.
- System operation and maintenance.
- Leak monitoring and leak detection.
- Spill response.
- Repair and closure.

Table 1 summarizes some of the key requirements and considerations during the life cycle of a retention tank system.

**Table 1. Overview of some key requirements and considerations for retention tank systems.**

| | |
|---|---|
| **Proposal or Planning Stage** | Contact the Environmental, Safety, and Health (ES&H) Team for review during the planning stage while preparing for the work authorization.<br>Waste minimization should be considered. (Consult with PRAG for details and see Appendix A for definitions.)<br>National Environmental Policy Act (NEPA) compliance, California Environmental Quality Act (CEQA) compliance, and other environmental regulatory requirements shall be determined (see Appendix B); documentation may be required before construction. [Consult the EPD Environmental Evaluations Group (EEG) for guidance.]<br>To ensure compliance with current tank regulations, contact the Water Guidance and Monitoring Group (WGMG) for guidance. |
| **Design** | See Section 3.0, Planning, Design, and Construction of New and Upgraded Retention Tank Systems, for additional information.<br>In general, a wastewater retention tank system shall be designed to have secondary containment, leak detection and monitoring, corrosion protection, and overflow and spill prevention control devices. (Contact WGMG for guidance.)<br>Retention tank systems with contents greater than or equal to 5% oil shall be included in the Spill Prevention Control and Countermeasures (SPCC) Plan. Overflow and spill prevention control devices are mandated. (Contact WGMG for guidance.)<br>For regulatory design requirements, see the Retention Tank Design and Construction Checklist in Appendix C. |
| **Construction and Installation** | See Section 3.0, Planning, Design, and Construction of New and Upgraded Retention Tank Systems, for additional information.<br>For hazardous and mixed waste tank systems, an engineering assessment that is certified by an independent, California-registered, professional engineer is mandated by law prior to use. (Contact WGMG for guidance.)<br>For regulated tank systems, various aspects of the construction activities are required to be certified by an independent professional engineer. |
| **Operation and Maintenance** | See Section 4.0, Operation and Maintenance, for additional information.<br>For hazardous and mixed waste tank systems, inspections are mandated by law (see Appendix D for an example of an Inspection Log).<br>For radioactive wastewater tank systems, daily inspections (or at a frequency agreed to by the WGMG environment analyst and tank owner) are required.<br>For nonhazardous wastewater tank systems, routine inspections are highly recommended.<br>Operation and maintenance activities shall be documented for hazardous and mixed waste tank systems.<br>Appendix E outlines the procedure for handling rainwater in secondary containment and provides a Berm Water Record of Observation and Release form. |

**Table 1. Overview of some key requirements and considerations for retention tank systems (cont'd).**

| | |
|---|---|
| **Leak Monitoring** | See the section, Leak Monitoring and Detection, for additional information.<br>Leak monitoring records shall be maintained for a minimum of three years for hazardous and mixed waste tank systems.<br>Any leak that occurs shall be stopped expeditiously. Leaks to secondary containment shall be recorded. Leaks to the environment shall be reported to the ES&H Team environmental analyst, or during off-hours to the Environmental Duty Officer (EDO). |
| **Spill Response** | See Section 5.2, Leak and Spill Follow-Up, for information. |
| **Repair and Closure** | See Section 7.0, Repair or Closure, for additional information.<br>For regulated tank systems, repairs need regulatory approval prior to the start of the repair.<br>Documentation of repairs shall be recorded for hazardous and mixed waste tank systems, and the documentation shall be maintained by the tank system owner for the life of the tank system or for at least five years. The same is recommended for radioactive and nonhazardous waste tank systems. Plans for major repairs and closures of hazardous and mixed waste tank systems require advance regulatory approval. (See Section 7.0, Repair or Closure.)<br>Disposal of regulated retention tank systems shall be documented in a Closure Report to the regulator. |

# 2.0 Overview of Wastewater Retention Tanks at LLNL

Requirements for the management of the life cycle of nonhazardous, hazardous, radioactive, and mixed wastewater retention tank systems are based on regulatory requirements, DOE orders, and LLNL-developed standards. This document also identifies best management practices that are recommended by LLNL.

Work Smart Standards address radioactive wastewater systems to ensure that such systems minimize the potential for a release to the environment in accordance with the Laboratory's "as low as reasonably achievable" goals. These standards are observed even though all present radioactive wastewater retention tanks receive wastewater with extremely dilute concentrations of radionuclides, the wastewater is normally disposed of through the sanitary sewer, and such tanks are not covered by any federal or state regulations.

It is LLNL policy that new nonhazardous, hazardous, radioactive, and mixed wastewater retention tank systems be built to hazardous waste standards. This policy helps ensure that tank owners can potentially change the way tank systems are used, that tank systems can meet changes in hazardous waste regulations, and that they reduce the potential for a release to the environment. Unpermitted releases to the

environment that could potentially affect surface and/or groundwater quality violate California's Porter–Cologne Water Control Quality Act.

LLNL wastewater retention tank systems consist of underground tanks, aboveground tanks, or a combination of underground and aboveground tanks; piping; pumps; and ancillary equipment for collecting dilute rinsewater and wastewater generated by research activities. Most wastewater retention tank systems collect and temporarily store dilute, nonhazardous rinsewater from rinsing operations that are part of various processes. The tank systems prevent discharges to the LLNL sanitary sewer system above discharge limits established by the city of Livermore, and they provide proper storage until appropriate disposal occurs.

When a retention tank nears capacity, the tank is isolated from the waste stream to prevent further collection of wastewater. A representative sample is collected and analyzed to determine whether the contents meet sanitary sewer discharge limits. Samples can be collected by the tank operator, a Hazardous Waste Management (HWM) field technician, or other qualified individuals as agreed by the tank owner.

Samples are analyzed for those constituents that could be present in the normal waste-generating process and that have the potential to enter the retention tank system. In the case of federal categorical processes, samples are analyzed for additional regulated parameters. WGMG is responsible for reviewing analytical data and approving all discharges to the LLNL sanitary sewer system.

If the results of sample analyses indicate that tank contents are within sanitary sewer discharge limits, the tank contents are released to the sanitary sewer. If the results of analyses show that the only pollutant parameter preventing release to the sanitary sewer is pH, then a pH adjustment reagent may be mixed into the tank's contents. If the results of sample analyses indicate that tank contents are not within discharge limits, HWM is contacted to arrange for proper treatment and/or disposal.

Liquids containing organic compounds should not be discharged to a tank system unless the system is specifically designed to store such chemicals. In some cases, environmental permits are required to operate a tank containing these materials. For example, if the volatile organic compound (VOC) concentration is equal to or greater than 10,000 parts per million (ppm) by weight, the tank will require an air permit. Refer to Document 31.2, "Permitting of Air Emission Systems," in the *ES&H Manual* for guidance on air regulations related to tanks. Contact your ES&H Team environmental analyst for assistance.

If Resource Conservation and Recovery Act (RCRA) hazardous waste containing 100 ppm by weight or more of VOCs is discharged to a retention tank, the tank is required to adhere to certain standards along with inspection, monitoring, and recordkeeping requirements. The tank standards require control of organic emissions,

and several control alternatives are available. Contact your ES&H Team environmental analyst for an evaluation of requirements or for assistance with proposed tank projects.

## 2.1 Responsibilities for Wastewater Retention Tank Systems

The program, or facility authorizing organization, is the tank owner and generally delegates the facility manager as the individual in its organization responsible for incorporating ES&H considerations into tank system designs with assistance from the ES&H Team during the design process. Tank owners are responsible for classifying a tank system as a nonhazardous, hazardous, mixed, or radioactive waste retention tank system. The ES&H Team environmental analyst and WGMG environmental analyst assist with this determination. Tank owners are responsible for ensuring that their retention tank systems are operated properly, including, as best management practice, routine inspections and maintenance, wastewater and sludge handling, spill response, and other activities related to the operation of retention tank systems. The tank operator performs operational and maintenance activities and is designated by the authorizing organization. The tank operator may be an HWM Division field technician or other qualified individual hired by that organization.

## 2.2 General Design and Operation Aspects of a Wastewater Retention Tank System

The use of two or more aboveground storage tanks is strongly recommended by EPD for all new systems and is recommended as an upgrade for existing systems because such a configuration provides system redundancy. While one tank is isolated and its contents are awaiting analysis and disposal, the other tank continues to receive wastewater, allowing programmatic activities to continue without interruption. When the level of wastewater in one tank reaches a predetermined height, incoming wastewater is directed to the other tank automatically or manually. A cross-connect pipe ensures the transfer of the tank contents in case the flow is not diverted to the empty tank because of mechanical or human error.

Careful consideration is given to tank system materials and proposed tank contents to ensure that wastewaters entering the system will not be incompatible with each other or the tank system materials.

Piping is configured to permit the transfer of wastewater between tanks, to circulate the contents before sampling and discharge, to provide for representative sampling, and to prevent the accumulation of sludge. When tank contents are to be removed, the pump is used to discharge the contents of the selected tank to a portable tank or tank truck for disposal, or to the sanitary sewer if the contents are within the sanitary sewer discharge limits.

Installation of two pumps in parallel configuration provides both pump-backup capability and increased flow capabilities for systems in which such considerations are appropriate. Self-priming centrifugal pumps are suggested where wastewater will be pumped from a source lower than the pump. Magnetically driven centrifugal pumps eliminate problems associated with failed seals. Diaphragm pumps are suggested where noise is not a consideration. The design of a wastewater retention tank system can be partially underground or aboveground, as described below.

### 2.2.1 Partially Underground System

Figure 1 shows the basic design and components of a well-designed, typical retention tank system that collects waste in an underground tank. The system shown receives wastewater via a gravity drain system from one or more buildings producing wastewater. The wastewater is directed through double-walled underground piping to Tank 1 (a lift station), located within an underground vault to allow for gravity flow. A level sensor with a high-level alarm activates the pump when the level of wastewater reaches a predetermined height (usually 75 to 90% of tank capacity, depending on system design), and the wastewater is pumped into one of two aboveground tanks.

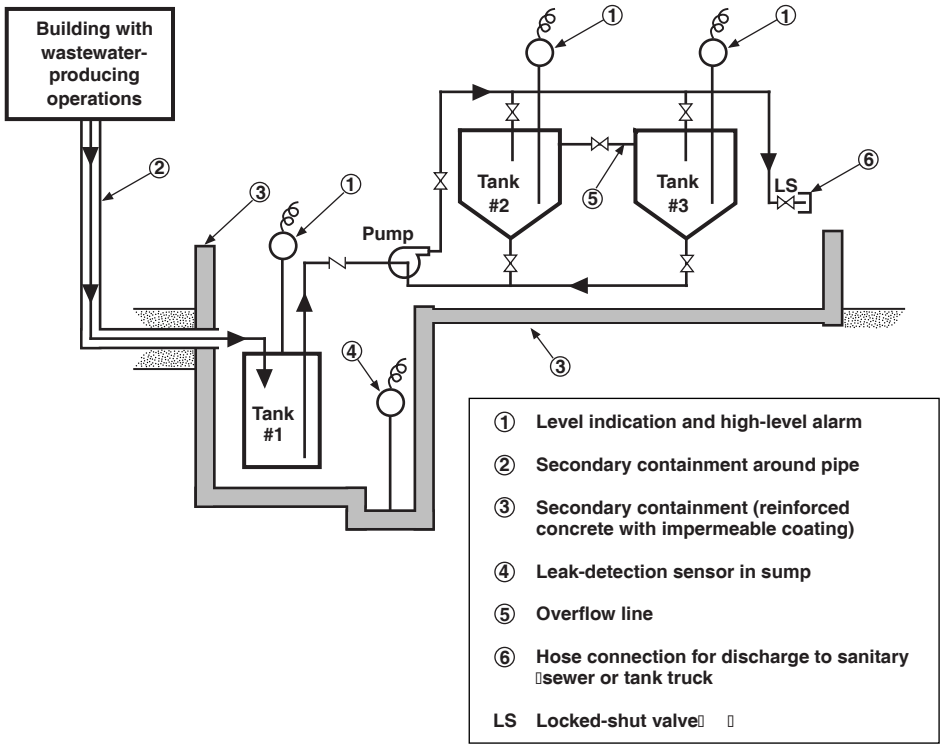


**Figure 1. Schematic of a traditional retention tank system.**

### 2.2.2 Aboveground System

A typical aboveground system consists of small lift stations (tanks) installed on the floor below the points of wastewater generation (drains). When a lift station fills with water, it pumps automatically through aboveground piping into the aboveground retention tanks. All portions of the aboveground system have secondary containment, which may be provided as double-walled lift stations, double-walled piping, and retention tanks installed in bermed areas. The building may provide secondary containment for indoor components where the floor does not drain, and where the possibility of water on the floor or dripping from overhead piping does not create unacceptable hazards.

# 3.0 Planning, Design, and Construction of New and Upgraded Retention Tank Systems

The tank owner is responsible for ensuring that Plant Engineering or the contractor plans, designs, and installs a retention tank system in compliance with the appropriate regulations. WGMG environmental analysts are available to provide guidance. Table 2 provides a summary of design features of retention tank systems and Appendix C, Retention Tank System Design and Construction Checklist, provides more detailed information. For design criteria standards for new or upgraded radioactive tank systems, refer to "Radioactive Waste Storage Facility and Tank System Design Criteria Standards" (UCRL-AR-133355, Rev. 1).

## 3.1 NEPA/CEQA Compliance Planning

EPD, through the Environmental Evaluations Group (EEG), provides guidance to planners or designers on the environmental evaluation documentation required for projects. Tank owners are responsible for notifying the EEG of any projects that may require National Environmental Policy Act (NEPA)/California Environmental Quality Act (CEQA) (See Appendix B) compliance. All tank projects shall be evaluated for NEPA/CEQA compliance, and a determination made of the level of documentation required. This process should begin early during the work planning phase.

## 3.2 Design Review

The design of any new or upgraded tank system shall be reviewed by the responsible ES&H Team. It is the responsibility of the tank owner to initiate the review process. As part of the ES&H review, the ES&H Team environmental analyst is responsible for providing WGMG the opportunity to review the tank system design. The review process is necessary to ensure that the design is in accordance with all applicable federal, state, and local environmental requirements.

**Table 2. Summary of retention tank system design features.**

- Tanks with conical bottoms; dual tanks for redundancy.
- Secondary containment for all tanks, piping, and ancillary equipment (pumps, valves, couplings, etc.).
- Overfill-protection devices, such as level indicators and high-level alarms.
- Spill-prevention devices, such as dry-disconnect couplings.
- Self-priming pumps.
- Locking valves on discharge piping.
- Control panel at tank site with alarms and indicators.
- Accessibility for leak-testing and waste removal.
- Adequate mixing capability to minimize sludge accumulation and ensure representative samples.
- Freeze protection for aboveground piping and valves.
- Protection from sunlight ultraviolet embrittlement of plastic components.
- Safe access for sample collection and pH adjustment.
- A leak monitoring capability that will detect leaks from primary containment into secondary containment.
- Size of each tank sufficient to hold four to six weeks of wastewater discharge.
- Engineering and administrative controls in place to prevent unapproved or illegal discharges.
- Removable covers or accesses sized for tank entry.
- Primary containment capable of resisting all expected loads, including seismic loads.
- Primary and secondary containment that is leak-tight and impervious to chemical attack.
- Bermed area or vault coated with an appropriate epoxy, resin, or grout.
- Secondary containment system designed to accumulate, temporarily store, and remove any wastewater or rainwater that enters it.
- Secondary containment sloped to a point of collection.
- Valves uniquely identified.

Hazardous and mixed waste underground storage tanks (USTs) are regulated by California UST regulations. Designs for these systems must be approved by the local agency prior to construction.

### 3.3 General Design Consideration

It is advisable to design a retention tank system so that all portions of the tank system can be easily inspected visually for leaks. Installation of underground tanks and piping should be avoided or minimized. A dual-tank system (as shown in Figure 1) is recommended so that a second tank is operational while wastewater from the first is being analyzed. The return of analytical results can take several weeks; therefore, it is recommended to size the tank system so that program operations can continue for a minimum of four to six weeks while the results of analyses are determined.

All retention tanks shall have the capability to mix the tank contents thoroughly to prevent sludge from accumulating and to ensure that contents are homogeneous for representative sampling. Typically, wastewater is mixed by recirculating the tank's contents. This is done by pumping wastewater draining from the bottom of the tank back into the top of the tank. Mixing may also be accomplished by pumping from a full tank into an empty tank or by employing air sparging or mechanical mixers.

For adequate mixing of solids by using pump recirculation, the required mixing intensity ranges from 0.5 to 2.0 horsepower per 1000 gallons or greater, depending on tank geometry. For systems that employ pump recirculation for mixing, a general guideline is that at least one complete recirculation of tank contents should occur prior to sampling or discharge. It should be possible to complete the necessary re-circulation in one hour or less. Contact WGMG for assistance with mixing criteria and design features.

From time to time, it becomes necessary to clean the tank system or to repair or replace worn parts. Accessibility to tanks and ancillary equipment and ease of maintenance are important considerations in design. The design should facilitate leak-testing of the tank system, including the secondary containment. Such testing may require that additional accesses, vent valves, breakdown joints, or other special devices, such as boots or flanges for double-walled piping, be installed.

The most common place for a retention tank system to develop a leak is the junction between the tank and its piping. This connection often experiences considerable fatigue from a variety of forces and eventually fails, or the seal at the connection might not be suitable or might not have been installed properly. It is important that all connections between the tank and its piping be carefully designed and installed. All seals, including gaskets above the normal, in-use liquid level, shall also be leak-tight and resistant to degradation by the tank contents. It is desirable to incorporate flexibility into the connection and to choose a sealing system that will be leak-tight for the useful life of the tank system.

Leaks are also caused by wastewater freezing, which can cause failure of piping, valves, and pumps. Freeze protection is required by the DOE for systems that could have standing water in exposed piping. Sight glasses are particularly vulnerable. Insulation and electrical heat-wrap tape are recommended for freeze protection. Other equipment sensitive to low ambient-air temperatures should be protected.

All outlets from retention tank systems require engineering and administrative controls to prevent unapproved or illegal discharges. Typical outlets are a berm drain, hose connection coupling, or sanitary sewer connection. Locking caps or locking valves on such outlets usually provide adequate control.

### 3.3.1 Primary Tank

Primary tanks are typically constructed of cross-linked polyethylene, fiberglass-reinforced plastic, or steel. Tanks supported by saddles or other devices that allow for direct viewing of the entire tank surface, including the bottom, are recommended. The best configuration is a cylindrical tank with a conical bottom supported on a steel frame. Tanks should allow for internal inspections by means of removable covers and access portals sized for personnel entry. Primary tanks are required to be completely leak-tight and compatible with and impervious to the material contained.

Obtaining certification from a tank manufacturer that a tank is leak-tight is advisable, and such certification is required for regulated underground storage tanks (USTs). A leak-tightness test of primary containment components is required for regulated USTs and should be performed on other newly constructed tanks and piping that are not visible.

The primary containment shall be capable of resisting all expected loads, including seismic loads; and an appropriate factor of safety shall be applied. Seismic and wind-load design requirements can be found in Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards. The design shall also consider the ability of supporting soil and tank foundations to support the total load of the system.

### 3.3.2 Secondary Containment

Secondary containment typically consists of a reinforced-concrete berm area, a reinforced-concrete vault, double-walled tank, or some equivalent structure. Secondary containment consisting of a covered, bermed area facilitates visual inspections and maintenance of the tank and ancillary equipment while minimizing rainwater collection.

Like the primary containment, secondary containment shall be completely leak-tight and impervious to chemical attack from materials contained in the primary tank. A bermed area or vault shall be coated with an appropriate epoxy, resin, or grout to make it leak-tight and impervious to chemical attack. Similarly, double-walled tanks can be lined, coated, or constructed of materials that make the system leak-tight and impervious to chemical attack. Secondary containment located below grade shall also prevent leaks of rain runoff and groundwater into the secondary container. Coating the exterior of a concrete containment structure with tar is highly recommended in addition to an epoxy-type coating of the interior.

Secondary containment shall be sloped to a point of collection; and, if possible, the point of collection should be easily visible. The low point in underground secondary containment can be used for placement of leak detection sensors and equipment for removal of liquid. Under normal conditions of use, secondary containment shall remain dry and completely free from liquids and debris.

The secondary containment system shall be designed to accumulate, temporarily store, and remove any wastewater that enters it. The secondary containment for a single aboveground tank system shall be capable of containing 100% of the volume of any spill from its primary tank. Secondary containment for a tank system with multiple aboveground tanks is required to contain either 100% of the volume of the largest tank or 10% of the aggregate volume of all the tanks, whichever is greater. Secondary containment for underground tanks is required to contain either 150% of the volume of the largest primary tank or 10% of the aggregate volume of all the tanks, whichever is greater.

Additional capacity to accommodate runoff from a 24-hour, 25-year storm is required for secondary containment open to rainfall. To minimize the possibility of rainwater entering the secondary containment, it is desirable to design a covered secondary containment system. Installation of a cover over a secondary containment structure minimizes both rainwater management and sunlight ultraviolet degeneration of unpainted plastic components.

Additional capacity is also required if the secondary containment structure could receive water from a fire-protection sprinkler system.

### 3.3.3 Ancillary Equipment

Each valve should have a unique identification label to facilitate operations such as mixing and pump-out. The tank system Operational Plan should refer to the valve identification labels. (For information on Operational Plans, see Section 4.0, Operation and Maintenance.) It is recommended that self-priming pumps be installed.

All ancillary equipment associated with hazardous, mixed waste, and radioactive waste retention tank systems that could come in contact with contained waste (such as pumps, valves, primary piping, and gaskets) shall have secondary containment and leak detection, be leak-tight, and remain completely impervious to chemical attack.

### 3.3.4 Leak Monitoring and Detection

The design of any retention tank system shall include a leak detection and leak monitoring capability that is designed and operated to detect the failure of either the primary and secondary containment structure or any release of liquid into the secondary containment system within 24 hours. Visual inspection of aboveground, visible portions of the system can substitute for a leak detection system, but such substitution is not recommended. Continuous monitoring is required for the underground portions of systems or where visual monitoring is not possible, such as the bottom of a tank in contact with a pad.

Many different types and configurations of continuous leak detection systems are available. Systems include sensors that detect leaks into the interstitial space (between primary and secondary containment) of a double-walled tank or piping, and sensors that detect liquid accumulating in a sump.

### 3.3.5 Overfill Protection and Spill Prevention

Overfill protection is required to prevent releases of wastewater to the environment from the accidental overfilling of tanks. Such protection typically consists of level indicators with high-level sensors connected to one or more audible/visual alarms. Alarms should be located so that prompt attention and response are ensured. In some cases, it may be desirable to locate a remote alarm at an emergency-response duty station. It is often convenient to automate the system by having the level indicators work in conjunction with an automatic shutoff or an automatic bypass to another tank. Manual shutoff and diversion to a standby tank may be adequate for low-flow tank systems. However, manual systems are operator-dependent and may not be effective in the event that alarms go unnoticed. Other types of overfill protection include ball valves in tank vents and cross-connect lines to adjacent tanks.

## 3.4 Verification of Tank System Construction Integrity

Prior to use, the tank system shall be shown to be structurally adequate and compliant with all applicable standards.

### 3.4.1 Engineering Assessments

To comply with Code of Federal Regulations (CFR), Title 40, Parts 264.192(a) and 265.192(a), and Title 22, California Code of Regulations (CCR), §§ 66264.192(a) and 66265.192(a), all new or upgraded hazardous waste or mixed waste tank systems require a written engineering assessment. For tank systems being changed from nonhazardous to hazardous or mixed waste storage, an engineering assessment shall be prepared before the tank system is used to store hazardous or mixed waste. The purpose of an engineering assessment is to demonstrate that a tank system is structurally adequate, is designed in accordance with all applicable standards, and does not allow the transmission of wastes to the environment. The engineering assessment is required to be certified by an independent, qualified, California-registered professional engineer and shall be on file before a system is used. A WGMG environmental analyst coordinates the preparation of the written engineering assessment. It is the responsibility of the tank owner or program representative to make the necessary information available to the WGMG environmental analyst. To complete an engineering assessment and to obtain the certification when required, a tank owner shall provide the following items:

- Engineering drawings.

- Construction specifications.
- Design standards, including seismic analysis.
- Corrosion inspection and certification of proper field installation of corrosion protection system (where corrosion protection is required) by a corrosion expert.
- Installation, inspection, and certification of proper installation by an independent engineer.
- Tightness test and certification of leak-tightness.
- A description of tank system operation.
- Waste characterization.
- Compatibility of waste with the tank system construction materials.

For specific requirements of the engineering assessment, the tank owner or engineer in charge of preparing the assessment should contact WGMG. The cost of an engineering assessment is the responsibility of the tank owner.

### 3.4.2 Completion of Installation Tightness and Performance Testing

Leak tightness testing of tank and piping primary and secondary containment structures is required for regulated underground storage tanks and for hazardous and mixed waste tank systems. Leak tightness testing is highly recommended for nonhazardous wastewater retention tank systems as a way to provide direct evidence that containment exists.

The leak tightness test can be visual if all portions, including the bottoms of tank(s) and ancillary equipment, can be inspected by direct viewing. If a visual test is not possible, as in the case of an onground tank or underground piping, then a hydrostatic test, precision test, or some other equivalent type of leak test is performed (see Section 3.3.4, Leak Monitoring and Detection, for details).

It is advisable that the tank owner complete a performance test prior to allowing the system to receive potentially contaminated wastewater. A performance test may be completed in conjunction with leak tightness testing of primary containment structures. The purpose of the performance test is to test the capabilities of the system. This may be done by filling a tank with city water and then using the system controls, pump(s), and valves to transfer water throughout the system in the intended modes of operation.

### 3.4.3 Certification of Proper Tank Installation

For USTs that are regulated by California UST regulations, and for USTs and aboveground storage tanks that are regulated by California hazardous or mixed waste

regulations, the installer shall certify that the installation was performed properly by qualified personnel and that the system was inspected before being placed in use. The certification is required to show that:

- The installation was performed by an installer who is trained and certified by the tank and piping manufacturers.
- The installer is certified or licensed by the Contractors State License Board or otherwise meets state requirements for tank installers.
- The underground storage tank, any primary piping, and any secondary containment system were installed according to the manufacturer's written installation instructions.
- All work listed in the manufacturer's installation checklist was completed.
- The installation was inspected and approved by the local agency or, if required by the local agency, inspected and certified by a California-registered professional engineer who has had education in and experience with UST installations.

The certification for USTs regulated by California shall be recorded on a form provided by the State Water Resources Control Board and be provided by WGMG to the local regulatory agency.

### 3.5 Emergency-Use Retention Tanks

LLNL maintains some retention tank systems that are usually empty, that do not accept a waste stream on a regular basis, and whose only purpose is to provide temporary storage for potentially hazardous, radioactive, or nonsewerable wastewater generated by an accident or failure within the facility (including spills and wastewater generated by fire suppression or decontamination wastewater). Emergency-use tanks are not required to be designed and constructed with secondary containment. After an emergency has passed, the contents of the emergency-use retention tank are isolated, a representative sample is collected, and the sample is analyzed. If the sample analysis report indicates that the emergency-use tank content is nonsewerable waste, HWM is contacted to arrange for proper treatment and/or disposal. If the wastewater is within limits for the sanitary sewer, the tank contents can be discharged to the sanitary sewer system at an EPD-approved location. For approved discharge locations, contact your ES&H Team environmental analyst.

After the emergency-use tank is emptied, it is evaluated for contamination, decontaminated if appropriate, and returned to use as an emergency-use retention tank.

# 4.0 Operation and Maintenance

The tank owner is responsible for ensuring that all electrical and structural components of a retention tank system are operated and maintained for safe operation. USTs regulated by California must have a permit to operate. WGMG coordinates completion of the local agency inspection of the tank system that is prerequisite to issuing the permit.

## 4.1 Operational Plan

The tank owner assigns tank operations to a properly trained HWM field technician or program person. The tank owner is required to prepare and make available to the tank operators for review and concurrence an Operational Plan describing operational requirements for the retention tank system and providing procedures and information necessary to safely operate the system (Operational Plans are not required for non-regulated tank systems). The Operational Plan shall include the following information:

- Purpose of the retention tank system, including a description of the waste stored.
- A list of authorized principal and backup operators.
- Operating procedures for all normal and emergency modes of operation.
- A schematic of the retention tank system showing the valves and controls used for different modes of operation.
- Sampling instructions, including mixing requirements.
- Inspection and monitoring instructions.
- Emergency response procedures.
- Any additional information that may be determined to be necessary or beneficial, such as the annual evaluation procedure.

## 4.2 System Operation

The HWM field technician or other properly trained and authorized operator of the retention tank system is responsible for ensuring that the system is operated safely and within its design envelope. The tank owner must ensure that the operator and a backup operator have training appropriate for proper system operation and, if the tank system contains hazardous or mixed waste, hazardous waste training as described in Document 40.1, "LLNL Training Program Manual," in the *ES&H Manual*..

It is the operator's responsibility to be familiar with all operations of the retention tank system. The operator shall:

- Arrange proper system valve lineups.
- Safely operate the control system, including leak detection and overfill prevention equipment.
- Perform inspections at the required frequency and monitor the condition of system components to reduce the risk of equipment failures or to provide fast spill response.
- Document inspections in a log, file the logs, and make the information available for review.
- Report problems and changes in system operation when they occur.
- Ensure that corrective action is promptly initiated and documented.
- Supervise manual transfer operations between tanks.
- Ensure that required maintenance is performed and documented.
- Ensure that waste sample collection, analysis, and disposal are scheduled and completed so that hazardous or mixed waste is stored only 90 days or less, unless the tank is part of the HWM Division's facilities permitted under RCRA.
- Document dates of start of storage and disposal.
- Manage rainwater collected in secondary containment systems.
- Ensure that the retention tank is properly labeled (e.g., as nonhazardous, hazardous, radioactive, or mixed).
- Report leaks and spills to the ES&H Team environmental analyst and the tank owner.
- Perform a mixing operation prior to sampling tank contents.
- Collect samples.
- Discharge the tank contents to the sanitary sewer system after obtaining authorization from WGMG.

To help ensure proper system operation, it is the responsibility of the tank owner to periodically review all discharges to the retention tank system. Any changes to the wastewater stream should be anticipated and reported to the WGMG environmental analyst before the changes actually occur so that material and chemical compatibility can be investigated, the environmental regulations reviewed for applicability, and the sampling and operational protocols modified if necessary.

If hazardous or radioactive material are discharged to a retention tank system that has been designed or operated as a nonhazardous wastewater retention tank, the operator shall:

1. Immediately notify the ES&H Team environmental analyst.
2. Have the retention tank contents analyzed for the concentrations of hazardous or radioactive constituents, and dispose of the wastewater as appropriate.
3. Arrange for the tank to be cleaned.

The tank owner shall:

1. Cease operations discharging to the retention tank.
2. Determine the source of the spill and whether it was a one-time accident or caused by a change in the waste stream.

   **Note:** If the waste stream has changed, causing the wastewater to be classified as hazardous, radioactive, or mixed waste, the classification of the retention tank system shall be changed. This change requires that the appropriate regulatory agency be notified and that the tank system be permitted if it stores hazardous or mixed waste or is an underground storage tank. An engineering assessment may be required.

### 4.3 Inspections

The goals of an inspection program are to permit early detection of potential trouble spots and to implement corrective action to minimize the probability of accidental releases of any wastewater. It is the responsibility of the tank owner to ensure that:

- For hazardous and mixed wastewater systems, the retention tank system is visually inspected on a daily basis.
- For radioactive wastewater systems, the retention tank system is visually inspected on a daily basis or at a frequency agreed to by the tank owner and the WGMG environmental analyst.
- For nonhazardous, nonradioactive retention tank systems, it is recommended that inspections be performed weekly or at a frequency agreed to by the tank owner and the WGMG environmental analyst.
- Records of inspections are maintained.
- Deficiencies are identified, and corrective action is promptly initiated and documented.

Daily inspections of aboveground portions of each hazardous and mixed waste retention tank system, including the visible portions of UST systems, are required. The regulatory definition of "daily" is different for tanks with secondary containment versus those without (see "daily" in Appendix A for details). For aboveground or onground hazardous and mixed waste retention systems, the tanks and ancillary equipment, when complete secondary containment is provided, need to be inspected only each operating day when any tank is in use. Operating days do not necessarily include weekends and holidays unless operations are conducted on those days.

At a minimum, inspections shall include visual examination of critical components (e.g., tanks, pumps, secondary containment, etc.) and leak detection data, if available. The following is a list of items that should be included in an inspection, where appropriate. This list is provided only as an example, and it is not intended to be appropriate for every retention tank system. The inspection should include a visual inspection for:

- Corrosion or releases from fixtures, joints, flanges, or pumps.
- Condition of materials (e.g., blisters or cracks).
- Leaks, cracks, buckles, and bulges in the tank shell.
- Signs of leaks, erosion, or corrosion in the area immediately surrounding externally accessible portions of the tank system.
- Monitoring and leak detection data (e.g., level indicators, monitoring wells, or leak detection devices).
- Overfill and spill control equipment.
- Functionality of instruments and controls (e.g., check for deterioration caused by heat, moisture, chemical attack, or dirt, loose or broken wires and connectors, power on, etc.).

Appendix D contains an example inspection log. The inspection log can be used to record the information required for documentation of inspections. Contact your WGMG environmental analyst for copies of the current log. Completed inspection logs and any documentation of corrective action shall be maintained by the operator for at least five years.

### 4.3.1 Annual Evaluation

The tank owner is responsible for ensuring that each component of a wastewater tank system is in good condition and functioning properly. Given the gradual deterioration of tank systems, largely through use or exposure to the elements, it is highly recommended that appropriate facility management, or designee, thoroughly inspect, test, and record the physical and operating condition of each tank system component annually. The evaluation should include all electronics (i.e., liquid-level sensors and controls, leak

monitoring systems, indicator lights, electronic valves, pump controls), liquid containment components (i.e., tank and piping, primary and secondary containment structures, valves, pumps, joints, etc.), and tank and piping support structures. The system should be compared with manufacturers' and as-built schematics. Facility management should maintain the written reports stemming from the evaluation for a period of three years.

### 4.3.2 Corrective Action Closeout

Any deterioration or malfunction identified during inspections or annual evaluations of tank systems shall be repaired, corrected, or otherwise mitigated by the operator or the tank owner on a schedule that ensures that the problem does not lead to an environmental or human health hazard.

## 4.4 Wastewater and Rainwater Management

Release of wastewater from retention tank systems to the sanitary sewer is strictly controlled.

No discharge may be made from any retention tank until the contents of the tank have been sampled, analyzed, and approved for discharge by WGMG. The WGMG environmental analyst and the ES&H Team environmental analyst assigned to support the tank owner work with tank owner personnel to determine which analyses shall be performed on the samples, based on information from the tank owner on the processes that produced the waste. Based on the results of the analysis, the WGMG Discharge Approval Manager (DAM) or designee, following established criteria, categorizes the contents as:

- Not disposable by way of the sanitary sewer.
- Nonhazardous waste that can be released to the sanitary sewer after pH adjustment.
- Waste that can be released to the sanitary sewer without neutralization.

### 4.4.1 Wastewater Sampling and Disposal

Prior to sampling, contents of the retention tank shall be thoroughly mixed to ensure that the contents are homogeneous and that settled sludge is resuspended. Mixing can be accomplished using a pump installed in the system, a portable pump, an air sparger, or a mechanical mixer. The time required to circulate retention tank contents depends on the size and configuration of the tank and the method of mixing. Contact a WGMG environmental analyst for assistance in determining proper mixing requirements for each tank.

Once the tank is mixed, an HWM field technician (or other responsible and trained employee arranged through special agreement) collects a representative sample of the tank contents and delivers it to the designated laboratory for the specified analyses. The results of analyses are forwarded to the WGMG DAM or designee, who reviews the results and determines whether the tank contents may be released to the sanitary sewer. The WGMG DAM or designee then notifies the tank operator, usually the HWM field technician, that the results are available.

If the WGMG DAM or designee determines that the contents are within sanitary sewer discharge limits, the WGMG DAM approves discharge to the sanitary sewer. If contents are nonhazardous and nonradioactive but are outside the sanitary sewer discharge limits for pH, the operator can contact HWM to perform a pH adjustment at the tank site. If the contents are not within other discharge limits for the sanitary sewer, the operator shall contact HWM to arrange for pump-out, treatment, and/or disposal of the contents.

### 4.4.2 Rainwater Management and Disposal

Upon the discovery of liquid thought to be rainwater in a secondary containment structure, the operator shall perform a thorough inspection of the system to help determine whether the liquid is rainwater or is the result of a leak from the tank system. If the liquid is determined to be rainwater, see Appendix E for information on handling rainwater in secondary containment and for the appropriate release form. If the liquid is not just rainwater, see Section 5.2 for proper handling.

## 5.0 Leak Monitoring and Detection

Leak monitoring and detection are vital to determine whether a release has occurred and to minimize or prevent releases to the environment. The use of a leak detection system in the interstitial space allows for detection of leaks from the primary containment while a secondary barrier remains in place to contain releases before they can enter the environment.

Regulations for hazardous waste tanks require that a leak monitoring system be "designed and operated so that it will detect the failure of either the primary and secondary containment structure or any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours" (40 CFR 264.193[c][3], 40 CFR 265.193[c][3], 22 CCR § 66264.193[c][3], and 22 CCR § 66265.193[c][3]). Thus, if a continuous leak detection system is not operational on a hazardous or mixed wastewater retention tank system, the secondary containment is required to be checked for spills, leaks, or rainwater accumulation at least once every day, including holidays and weekends.

Radioactive waste retention systems shall include a leak-detection method. The design of a radioactive waste tank system shall include a release-detection method, or combination of methods, that allows detection of a release from any portion of the radioactive waste tank system that routinely contains or transports waste. The release detection frequency shall be based on the probability of a significant environmental impact occurring if there were a leak between monitoring times. At a minimum, release detection must be performed semiannually.

## 5.1 Monitoring and Leak Response Plans

Retention tank systems that are subject to California UST regulations are required to have a written Monitoring Plan and a written Leak Response Plan. Monitoring Plans include visual monitoring of aboveground portions of retention tank systems where feasible. For underground portions, or where visual monitoring is not feasible (such as at the bottom of a tank in contact with a pad), an alternative monitoring method shall be employed. For double-walled systems, continuous monitoring of interstitial spaces between the primary and secondary containment is used.

The Leak Response Plan describes how to respond to an alarm or another indication of a release. This plan should provide a procedure for determining whether the alarm is valid, determining the location of the leak, ceasing tank operations, and removing the tank contents.

Contact your WGMG environmental analyst, who will assist in completing the Monitoring Plan and the Leak Response Plan.

## 5.2 Leak and Spill Follow-Up

When a spill occurs, or a leak is seen or is detected by leak detection equipment or leak tightness testing, the operator:

1. Visually determines the source, where possible.
2. If a leak is indicated by a leak detection equipment alarm, verifies that the alarm is not caused by equipment malfunction (false alarm).
3. Ceases operation of the tank system.
4. Determines if material has entered the environment (outside secondary containment).
5. Classifies the release (see Section 6.0).
6. Immediately contacts an ES&H Team environmental analyst during normal working hours [or the Environmental Duty Officer (EDO) during off hours] for assistance

with response and in reporting releases to the environment to the appropriate regulatory agencies.

7. Initiates actions to stop material from entering the environment, if safe to do so.
8. Removes wastewater from the tank and/or secondary containment within 24 hours (required by regulations for hazardous or mixed waste tank systems).

For reportable leaks or spills, WGMG:

1. Ensures the tank owner has been notified of the leak or spill.
2. Reports releases to the environment to appropriate regulatory agencies within 24 hours of leak detection and submits a written report within 30 days (for hazardous or mixed waste tank systems). For leaks from hazardous or mixed waste USTs, an additional report is made within five days of leak detection to the appropriate regulatory agency.
3. Arranges for a precision test to verify and locate the leak using a hydrostatic test, helium leak test, or other test to locate the leak.
4. Determines whether soil remediation is required.

When a leak or spill has been confirmed, the tank owner:

1. Ensures operations discharging to the tank system are discontinued.
2. Decides whether to repair or close the tank system.
3. Ensures that, for hazardous and mixed waste retention tank systems, if the leak or spill originated from ancillary equipment without secondary containment, unless the integrity of those parts can be checked visually, secondary containment is provided for those parts before returning the system to service.
4. Ensures that, if extensive repairs are made to a hazardous or mixed waste retention tank system, the tank is re-certified by a California-registered professional engineer.

When historical contamination is found that requires remediation, the Environmental Restoration Division (ERD) generally takes on remediation responsibilities from WGMG. When current operations are determined to be the cause of contamination, WGMG is normally responsible for coordinating follow-up actions unless other arrangements are made. Depending on the type and extent of the leak, considerable time may be required to investigate the leak, make repairs, perform any necessary remediation and re-certifications, and retest the system before the tank system can be returned to service. Some actions, such as repairs, may also require regulatory agency approval before the tank system can be used again.

Documentation of repairs for hazardous and mixed waste retention tanks shall be recorded and maintained by the tank owner for the life of the tank system, or for at least five years. This procedure is also recommended for radioactive and nonhazardous tanks as a best management practice. Contact WGMG for specific and current requirements and procedures.

# 6.0 Leak and Spill Classification

The primary aim of release response is to protect human health and the environment. LLNL separates leaks and spills into two categories: small and large.

## 6.1 Small Release

A small release is defined as one in which all of the following are true:

- The release results in no injury, or in a minor injury requiring simple first aid.
- The nature and potential hazards of the released material are known.
- The release presents no actual or potential threat to human health or the environment.

## 6.2 Large Release

A large release is defined as one in which any one or more of the following is true:

- A fire or explosion is involved in the incident.
- Injuries result that require medical treatment other than simple first aid.
- The incident requires evacuation of the building or the facility.
- The nature of the material and its potential hazards are not known or are in question.
- The waste cannot be identified.
- Released waste migrates to a storm sewer or drain.
- Personnel regard the incident as unsafe to manage without the aid of the LLNL Fire Department.

If there is any doubt as to the proper spill response, contact the LLNL Fire Department immediately by calling 911 for either the Livermore site or Site 300. If you are on a cellular phone, call (925) 447-6880.

# 7.0 Repair or Closure

## 7.1 Tank System Repair

Replacement tank system components are considered to be new components. As such, they are required to comply with all requirements for construction. State regulations require that a Closure/Modification Plan be submitted and approved before major repairs can be undertaken for USTs storing hazardous or mixed waste.

If extensive repairs are made to a hazardous or mixed waste retention tank system, the tank and components may need to be certified by a California-registered professional engineer.

## 7.2 Out-of-Service Tank System

On occasion, a tank owner may remove a tank system temporarily from service or inactivate it. The tank owner may, however, intend to use the tank again and not intend either formal temporary or permanent closure. Under such circumstances and when no formal, approved temporary Closure Plan is in place, certain requirements for shutdown, surveillance, and maintenance still apply. To be considered out of service, all tanks and ancillary equipment that California classifies as hazardous shall be emptied. All waste shall be removed, and no liquids or sludges shall be visible, although stains or scaly residues may be present. The tank may need to be decontaminated.

Inactive, out-of-service tanks, ancillary equipment, and the secondary containment system of hazardous and mixed waste retention tanks are required to be inspected daily (see Section 4.3), and the inspections shall be documented as if the tanks were in service. Continued daily inspection of radioactive wastewater retention tanks and regular inspection of nonhazardous wastewater retention tanks are also recommended.

## 7.3 Closure Activities

All components of the tank system to be closed shall be removed except when the tank owner, the ES&H Team environmental analyst, and WGMG agree to close-in-place all or some of the tank system components and either of the following two conditions apply:

1. Removal is not feasible (e.g., piping is under a building).
2. No contamination remains at the site. The absence of contamination shall be documented with information that releases to the environment have not occurred during the life of the system, that the system does not leak as determined by leak-

tightness testing, and that contamination does not remain on, in, or from the system as determined by collection and analysis of samples.

Closure planning and documentation, including a closure plan and closure report, are completed by WGMG and the ES&H Team environmental analyst with input from the tank owner. The tank owner pays for closure planning, activities, and documentation.

The primary purpose of the closure plan is to identify how and where samples will be collected to ensure there is no contamination remaining at the site and how any contaminated materials will be managed.

Samples may be collected from the surfaces of liquid containment components to allow a determination of the appropriate mode of disposal. The tank owner pays for analysis of such samples. However, based on knowledge of kinds and concentrations of contaminants contained by the system during its use, the system may be characterized for disposal by HWM without the collection and analysis of surface samples.

Tank system components shall be decontaminated by HWM, as needed for demolition or disposal. Components with hazardous fixed contamination may be removed by HWM. Plastic tanks and system components should not be reused on site or off site because of the cost of documenting the absence of internal contamination compared with the cost of the plastic tanks. This is additionally important for unpainted plastic tanks that have experienced long-term exposure to sunlight. Metal tanks may be reused on site but, given liability concerns, off-site use should be approved by the Laboratory Counsel.

Closure soil samples shall be collected below the sites of underground pipes and tanks. Soil samples shall be collected below the sites of aboveground tanks unless it is documented that releases to the environment from aboveground tanks have not occurred. The tank owner pays for analysis of such soil samples.

If the results of analyses of soil samples show soil contamination, then excavation to remove contaminated soil, and the collection and analysis of additional soil samples, may be necessary. The tank owner pays for excavation and sample analysis. In rare instances in which site contamination requires ongoing monitoring, the project is transferred to ERD.

Closure may be supported by completion of hydrostatic leak-tightness testing of underground piping and/or underground tanks. Failed leak-tightness tests may be followed by helium injection and detection tests to locate leak sites. Leak-tightness testing showing no leaks may result in reducing the requirements for soil samples, depending on site-specific risk factors, including age and construction of the system, and knowledge of the history of the contents. Leak-tightness testing is coordinated by ORAD and paid for by the tank owner.

System demolition and size reduction of system components are paid by the tank owner. Some materials may be acceptable for disposal at a sanitary landfill, including asphalt and concrete rubble, fill gravel and soil, and occasionally primary liquid containment components. Analysis of samples, management and transportation of materials, and landfill fees are paid by the tank owner. The ES&H Team environmental analyst and WGMG environmental analyst provide guidance and may direct these activities, as negotiated with the tank owner.

Tank system cleaning effluent, waste residue, and system components are managed by HWM. The tank owner does not pay for disposal by HWM. Site restoration, other than ERD remediation, is completed by the tank owner.

Upon completion of the closure activities, a closure report is completed by WGMG with information provided by the tank owner as needed. The report incorporates the following elements, as applicable:

- Documentation of communication with regulators.
- A report of closure leak-tightness testing.
- A drawing of the tank system showing those portions of the system removed and remaining.
- A drawing showing excavations.
- A drawing showing temporary piles of closure materials.
- Drawings showing sample collection sites.
- Photographs.
- Results of sample analyses.
- Hazardous waste disposal requisitions.
- Hazardous waste manifests.
- Sanitary-landfill approval profile reports.

If a tank is permitted to store hazardous waste for longer than 90 days, additional requirements apply that add to the procedures and documentation required for closure. In such cases, the ES&H Team environmental analyst or the WGMG environmental analyst should be contacted for additional information. For tanks permitted to store hazardous waste longer than 90 days, PRAG is also involved.

Closure plans and reports completed for state-regulated hazardous and mixed waste USTs must be submitted to, reviewed, and approved by the local agency before the closure is complete.

# 8.0 Training

The management of wastewater in retention tanks is one of the responsibilities of HWM field technicians, all of whom must complete a comprehensive training program. The specific training requirements for HWM field technicians are spelled out in the Laboratory Training and Information Network (LTRAIN). This training involves lectures and on-the-job training (OJT) regarding the management of hazardous, radioactive, and mixed wastes.

Specific formalized training is offered on the management of retention systems, hazardous waste, spill response, and low-level waste generation. The following classes are offered by EPD that benefit the operator of wastewater retention systems. (These courses are recommended, unless required as a generator.)

| | |
|---|---|
| EP0001-001 | Waste Retention Tank Management |
| EP0006 | Hazardous Waste Generation and Certification |
| EP3045 | Spill Prevention, Control, and Countermeasure Training |
| EP0110 | Low-Level Waste Generation and Certification |

# 9.0 Roles and Responsibilities

All workers and organizations responsible for retention tank systems shall refer to Document 2.1, "Laboratory and ES&H Policies, General Worker Responsibilities, and Integrated Safety Management," in the *ES&H Manual* for a list of general responsibilities. Specific responsibilities are listed below each title.

## 9.1 Facility Authorizing Organization (Tank System Owner)

- Classifies the tank system as a nonhazardous, hazardous, mixed or radioactive waste retention tank system.
- Ensures that ES&H controls are incorporated into the design, construction, installation, operation, and closure.
- Ensures completion of any required installation certification, inspections, and annual evaluation.
- Ensures that designs for new construction have input from the ES&H Team or the WGMG environmental analyst.

- Assigns tank system operation to properly trained HWM technician or program person.
- Ensures that the Operational Plan is complete and current and that all required logs and documents are maintained for specified time period.
- Ensures that system is in good condition.
- Ensures that system design allows for safe and efficient operation.
- Reviews periodically all discharges to the tank system.
- Provides tank operators appropriate on-the-job training to ensure that the operators can operate the equipment safely and correctly.
- Advises WGMG of changes in wastewater pollutant components.
- Ensures the prompt correction of deficiencies identified by inspections.

### 9.2 Tank Operator (refer to Section 4.2 for a more detailed list of responsibilities)

- Operates the tank system as agreed to by the tank owner and HWM.
- Operates the tank system properly and safely within its design envelope.
- Performs inspections and maintains an inspection log.
- Reports problems, changes in operation, and releases to the tank owner.
- Ensures that storage of hazardous or mixed waste is less than 90 days and the storage period is documented.
- Corrects or reports deficiencies and records correction of deficiencies identified by inspections.
- Collects samples.
- Reports leaks and spills to the tank owner and ES&H Team environmental analyst or the LLNL Fire Department.
- Initiates spill response.
- Manages disposition of accumulations of rainwater.
- Discharges tank contents according to WGMG authorization.

### 9.3 HWM Division

- Characterizes tank system components during closure.
- Arranges for or performs proper treatment and disposal of nonsewerable waste and tank components with hazardous or radioactive fixed contamination.
- Provides trained HWM field technicians.
- Decontaminates tank system components during closure.

### 9.4 WGMG Environmental Analyst

- Coordinates preparation of an engineering assessment with the tank owner.
- Provides guidance regarding tank regulations.
- Provides guidance regarding tank operation.
- Provides guidance on inspection frequency for radioactive and nonhazardous tank systems.
- Obtains required tank permits.
- Assists with design for construction of new tanks or tank modifications.
- Oversees installation and construction.
- Monitors system condition and operation.
- Prepares required plans and reports.
- Coordinates leak-tightness testing.
- May collect samples.
- Reports release to regulatory agency, as required.
- Ensures completion of post leak and release responsibilities.
- Ensures that the tank owner is notified of a release.
- Manages tank closure and closure reporting.
- Assists tank owner with classification of the tank system.

### 9.5 WGMG Discharge Approval Manager

- Reviews sampling analysis data and authorizes mode of disposition of tank contents.

### 9.6 ES&H Team Environmental Analyst

- Reviews designs.
- Ensures that WGMG tank analyst has the opportunity for design input.
- Ensures that WGMG analyst is notified of a release.
- Assists with air-emissions permitting.
- Determines sampling analyses to be performed.
- Assists tank owner with classification of the tank system.

### 9.7 EEG Environmental Analyst

- Provides guidance on environmental evaluation documentation (NEPA/CEQA) and compliance.

### 9.8 PRAG Environmental Analyst

- Provides guidance regarding waste minimization.
- Provides guidance regarding hazardous waste regulations.
- Provides guidance regarding releases to air and obtains air permits.

### 9.9 Environmental Duty Officer

- Provides guidance on leak and spill responses during off-hours.

### 9.10 Installer

- Certifies system installation.

### 9.11 Environmental Restoration Division (ERD)

- Performs remediation on historical contamination.
- Performs ongoing monitoring, if required after tank closure.

# 10.0 Work Standards

## 10.1 Work Smart Standards

CA Health & Safety Code, §§ 25270–25270.13, Above Ground Storage of Petroleum.

CA Health & Safety Code, §§ 25280–25299.7, Underground storage of hazardous substances.

CA Health & Safety Code §§ 25299.10–25299.43, petroleum underground storage tank cleanup.

CA Water Code § 13000 et seq., Porter Cologne Water Quality Control Act.

22 CCR §§ 66264.1-66264.1102 and appendices, Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, & Disposal Facilities.

22 CCR § 66264.196, Response to leaks or spills and disposition of leaking or unfit-for-use tank systems.

22 CCR §§ 66265.190–66265.200, Tank Systems (Hazardous Waste).

22 CCR § 66265.196, Response to leaks or spills and disposition of leaking or unfit-for-use tank systems.

23 CCR §§ 2610–2728, Underground Tank Regulations.

23 CCR §§ 2730-2802, Underground Tank Tester Regulations.

40 CFR 110, Discharge of Oil.

40 CFR 112, Oil Pollution Prevention.

40 CFR 261, Identification and Listing of Hazardous Waste.

40 CFR 262, Standards Applicable to Generators of Hazardous Waste.

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

40 CFR 265, Interim Status Standards for Owners & Operators of Hazardous Waste Treatment, Storage & Disposal Facilities.

40 CFR 280, Technical Standards and Corrective Action Requirements for Owners of Underground Storage Tanks.

40 CFR 281, Approval of State Underground Storage Tank Programs.

CA Health & Safety Code § 25270 - 25270.13, Aboveground Storage of Petroleum.

DOE O 420.1A, Facility Safety, Paragraph 4, excluding ANSI/ANS 8.9, ANSI/ANS 8.10, and ANSI/ANS 8.17.

DOE O 5400.1, Chapter III, Paragraphs 4(b) and 4(c), Pollution Prevention and Waste Minimization.

DOE O 5400.1 Chapter III, Paragraph 4.a., Groundwater Protection Management Program, and Chapter IV, paragraph 1.a. Requirement for Environmental Monitoring, 3. Preoperational Monitoring of facilities, sites, and operations, 4. Environmental Monitoring Plan, 5. Environmental Monitoring General Requirements, 6. Meteorological Monitoring Requirements, and 10c. Laboratory Quality Assessment.

DOE O 5400.1 Chg 1, General Environmental Protection Program, § 5, Policy.

DOE O 5400.5 Chg. 2, Chapter I, Paragraph 5.b., Treatment of Liquid Radioactive Waste Streams (using BAT).

DOE O 5400.5 Chg. 2, Chapter I, Paragraph 7, Discharges to Sanitary Sewer.

DOE O 5400.5 Chg. 2, Chapter II, Paragraph 3d (2), Controlling long-term buildup of radionuclides in solids.

DOE O 5400.5 Chg. 2, Radiation Protection of the Public and the Environment, Chapter II, Paragraph 1.d., Public dose limits for drinking water pathway.

DOE O 5400.5 Chg. 2, Chapter II, Paragraph 1 (except 1.a, 3.c, and 1.c.), Requirements for Radiation Protection of the Public and the Environment; Public Dose Limits, 2. ALARA, 5. Release of property having residual radioactive material, 6. Demonstration of Compliance with the Dose Limits.

DOE O 5400.5 Chg. 2, Chapter III, Derived Concentration Guides for Air and Water.

DOE O 5400.5 Chg. 2, Chapter IV, Residual Radioactive Material (Surface Contamination Guidelines, Authorized Limits).

DOE O 5400.5 Chg 2, Radiation Protection of the Public & Environment, Paragraph 5, Policy.

DOE O 5820.2A, Radioactive Waste Management (except Chapter I: High Level Waste).

UCRL-AR-133355, Radioactive Waste Storage Facility and Tank System Design Criteria Standards.

33 USC § 1251 et seq., Federal Water Pollution Control Act of 1948 as Amended by the Clean Water Act.

42 USC § 6991 et seq., Regulation of Underground Storage Tanks.

**Other References**

DOE O5480.4, Environmental Protection, Safety, and Health.

Document 31.2, "Permitting of Air Emission Systems," in the *ES&H Manual*.

Kennedy, R. P., S. A. Short, J. R. McDonald, M. W. McCann, Jr., R. C. Murray, and J. R. Hill, Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-AR-15910 (1990).

Document 40.1, "LLNL Training Program Manual," in the *ES&H Manual*.

U.S. Department of Energy, Environmental Protection, Safety, and Health, U.S. Department of Energy, Washington, D.C., DOE Order 5480.4 (1981).

U.S. Environmental Protection Agency, Hazardous Waste Tanks Systems Inspection Manual, U.S. Environmental Protection Agency, Office of Waste Programs Enforcement, RCRA Enforcement Division, Washington, D.C., OSWER 9938.4 (1990).

# Appendix A

## Acronyms and Glossary

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|---|---|
| Aboveground tank | A device meeting the definition of "tank" (see below) that is situated so that the entire surface area of the tank is completely above the plane of the adjacent surrounding surface, and the entire surface area of the tank (including the tank bottom) can be visually inspected. In this document, the use of aboveground tank also includes onground tanks (see below). |
| ALARA | As low as reasonably achievable. |
| Ancillary equipment | Devices (including, but not limited to, piping, fittings, flanges, valves, lift stations, and pumps) connected to the retention system used to distribute, meter, or control the flow of wastewater from its point of generation to storage or treatment tank(s), between waste storage and treatment tanks to a point of disposal onsite, or to a point of shipment for disposal offsite. |
| CCR | California Code of Regulations. |
| CEQA | California Environmental Quality Act. |
| Certification | A signed statement of professional opinion based on knowledge and belief. |
| CFR | Code of Federal Regulations. |
| Close-in-place | The practice of leaving a tank and/or piping in place, such as underground, after it is removed from service and officially closed. The practice involves removing any contamination from the tank and any associated piping left in place, filling the tank with an inert material (such as concrete), sampling underneath the tank for possible contamination of soil, and possibly providing long-term monitoring of the tank site by new or existing groundwater or vadose-zone monitoring wells. |

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| Closure | The process by which a tank is taken out of service (removed if possible) and decontaminated (if required), the surrounding soil is analyzed for contamination, and any required remediation is identified. |
| Component | The tank or any ancillary equipment of the tank system. |
| Corrosion expert | A possessor of thorough knowledge of the physical sciences and the principles of engineering and mathematics acquired by a professional education and related practical experience and who is qualified to engage in the practice of corrosion control on buried or submerged metal piping systems and metal storage tanks. Such a person shall be certified by the National Association of Corrosion Engineers or shall be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control on buried or submerged metal piping systems and metal tanks. |
| Daily (operating day) | For tank systems with full secondary containment, daily means once per day for every day that the facility is normally open for business, or every day the program is operating equipment that produces waste and introduces that waste to the retention tank system. For hazardous waste and mixed waste tank systems without full secondary containment, daily means once per day every day whether or not the facility is open for business, including weekends and holidays. |
| DAM | Discharge Approval Manager. In this document, a designation used by the Water Guidance and Management Group for the individual responsible for approving disposition of retention tank wastewater. |
| DOE | U.S. Department of Energy. |
| EDO | The Environmental Duty Officer is an environmental professional from the Environmental Protection Department who is assigned and required to respond to and provide guidance on all environmental incidents 24 hours a day, including holidays and weekends. |
| EEG | Environmental Evaluations Group in ORAD. |

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| Empty tank | A tank minus what can practically be pumped out during normal operating conditions. After pumping, the tank is considered empty by federal regulatory definition even though waste residues may be present. |
| EPD | Environmental Protection Department at Lawrence Livermore National Laboratory (LLNL). |
| ERD | Environmental Restoration Division in the Environmental Protection Department. |
| ES&H Team environmental analyst | As used in this document, a member of the Environmental Operations Group (EOG) of the Operations and Regulatory Affairs Division (ORAD) who is assigned to a particular Environmental, Safety, and Health (ES&H) Team to provide guidance to LLNL programs on environmental issues. As a member of the ES&H Team, the EOG environmental analyst forwards those tank projects needing environmental regulation compliance review to WGMG, may help coordinate the review and tracking of tank project activities with WGMG, and may act as the contact between the program and Environmental Protection Department personnel. |
| ES&H Teams | Environmental, Safety, and Health Teams consist of members assigned from Laboratory Site Operations to support programs in environmental, safety, and health issues. |
| Hazardous wastewater | Wastewater that contains hazardous waste constituents as defined by 22 CCR 66693 and 40 CFR 261. |
| HWM | Hazardous Waste Management Division in the Environmental Protection Department. |
| HWM field technician | An HWM Division staff member whose duties include supporting a program in the operation of retention tanks by assisting with the management of hazardous or potentially hazardous wastewater. |
| In use | A tank system that is storing product or waste. Once product or hazardous or mixed waste is added to the system, daily inspections shall commence. |

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| Incompatible wastewater | Wastewater that is: (1) unsuitable for placement in a particular device or facility because it may cause corrosion or decay of containment materials (e.g., container inner liners or tank walls); or (2) unsuitable for commingling with another wastewater or material under uncontrolled conditions because the commingling might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, mists, fumes or gases, or flammable fumes or gases. |
| Interstitial space | The space between the primary and secondary containment systems. |
| Leak detection system | A system capable of discovering or determining either a failure of the primary or secondary containment structure or the presence of liquid or waste in the secondary containment structure. |
| LLNL | Lawrence Livermore National Laboratory (Livermore site and Site 300). |
| Mixed wastewater | Wastewater that meets the criteria for hazardous wastewater and radioactive wastewater. |
| NEPA | National Environmental Policy Act. |
| Nonhazardous wastewater | Wastewater that does not meet any of the criteria for hazardous waste or radioactive waste but may be nonsewerable (i.e., contain constituents above LLNL's sanitary sewer discharge limits). |
| Onground tank | A device meeting the definition of "tank" (see below) that is situated so that the entire surface area of the tank is completely above the plane of the adjacent surrounding surface, and the bottom surface is in contact with the surrounding surface so that the bottom surface cannot be visually inspected. In this document, the use of aboveground tank also includes onground tanks. Onground tanks should be raised, at a minimum, by placement on plastic mats or other grating devices to allow draining of bottom leaks to the low spot in the secondary containment. |
| ORAD | Operations and Regulatory Affairs Division of the Environmental Protection Department. |

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| Overfill protection | Equipment or design features intended to prevent releases of wastewater resulting from the overfilling of primary tanks. |
| PRAG | Permits and Regulatory Affairs Group in ORAD. |
| Program | Refers to LLNL organizations, operations, and support groups that may generate wastewater that is required to be temporarily stored in a tank prior to its disposal or discharge to the sanitary sewer. As used in this document, program also refers to the authorizing organization that is responsible for the design and/or operation of a retention tank system. |
| Radioactive wastewater | Aqueous waste that contains radionuclide(s) with gross alpha, gross beta, gamma, or tritium levels that are at or above the radiological limit(s) specified in DOE Order 5400.5, Radiation Protection of the Public and the Environment. |
| RCRA | Resource Conservation and Recovery Act. |
| RCRA hazardous waste | A hazardous waste as defined in 40 CFR 261.3. |
| Retention tank system | A wastewater storage tank and its associated ancillary equipment and containment system. The system includes all piping carrying wastewater from the entry point (e.g., sinks, floor drains, etc.) to the tank(s). |
| Secondary containment | External containment to prevent leaks from the primary containment from entering the environment. Examples of secondary containment include the outer shell of a double-walled tank or pipe; the coated, concrete trench for piping; the coated, concrete vault; and the coated, concrete pad and berm. |
| Sewer discharge limits | In this document, a set of threshold concentration values for organic, inorganic, and radioactive constituents as specified by LLNL based on regulatory and DOE requirements. |
| Sludge | Any material that has settled out from a mixture of a solid and liquid and does not contain freeflowing liquid. |
| SPCC | Spill Prevention Control and Countermeasures. |

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| Tank | A stationary device that is designed to contain an accumulation of liquids, that is constructed primarily of nonearthen materials (e.g., concrete, steel, or plastic), and that provides structural support. Discussion of tanks in this document is limited to retention tanks; petroleum- and chemical-product storage tanks are excluded. Portable tanks are specifically exempt from tank requirements because they are considered containers and are not fixed to one location. |
| Tank operator | A person (or persons) responsible for day-to-day operation of a retention tank system. |
| Tank owner | The Program, or authorizing organization responsible for the retention tank system. |
| Underground storage tank (UST) | A device meeting the definition of "tank" of which at least 10% of its volume (including any connected piping) is below the ground surface. For the purposes of this document, the definition of underground tank also includes in-ground tanks, which are tanks situated such that a portion of the tank wall is within the ground, thereby preventing visual inspection of that portion of the tank that is in the ground. A vaulted tank is normally considered an underground tank as used at LLNL. If the vaulted tank meets the requirements of the California Health and Safety Code, Section 25283.5(e), then it may be exempted from California UST regulations. |
| Upgraded tank system | Any existing tank system that is modified to meet the design and construction criteria of a new tank system as mandated by federal, state, or local regulations. |
| UST | Underground storage tank. |
| VOC | Volatile organic compound. |
| Waste minimization | The reduction, to the extent feasible, of waste through source reduction or recycling activities. Waste minimization results in a reduction of the total quantity of waste or reduction of its toxicity, or both, as long as the reduction is consistent with minimizing present and future threats to human health and the environment. |

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| Wastewater | Liquid waste consisting mostly of water from rinse operations that has the potential of containing hazardous or nonsewerable levels of contaminants. The contaminants could be hazardous, radioactive, or a combination of both. |
| WGMG | Water Guidance and Monitoring Group in ORAD. |

# Appendix B

# Environmental Regulations

For informational purposes, this appendix summarizes federal and state regulations governing the installation, operation, and closure of retention tank systems at LLNL.

**Federal Regulations**

Retention tank systems collecting hazardous wastewater at LLNL are subject to the requirements of the U.S. Environmental Protection Agency's Standards Applicable to Generators of Hazardous Waste, 40 Code of Federal Regulations (CFR) 262. Specifically, Part 262.34 incorporates by reference the 40 CFR 265, Subpart J, regulations governing the design, operation, and closure of tank systems for tanks used to store hazardous wastes for a period of less than or equal to 90 days. These are the implementing regulations for the Resource Conservation and Recovery Act (RCRA). The requirements of 40 CFR 265, Subpart J, apply to all tank systems, both aboveground and belowground, used for storing or treating hazardous waste. The regulations set forth requirements for:

- Design and installation of new tank systems and components, as well as assessment of the integrity of existing systems.
- General operating conditions.
- Secondary containment and release detection, in addition to a schedule for retrofitting existing systems. (Existing hazardous waste storage tanks installed prior to January 12, 1987, shall be upgraded to meet new installation requirements by January 12, 1989, or when the system is 15 years old, whichever is later, according to 40 CFR 265.193.)
- Inspections.
- Response to leaks or spills.
- Closure and postclosure care.
- Management of ignitable, reactive, or incompatible wastes.

In August 1992, the State of California was granted authority to enforce RCRA regulations, including 40 CFR 265.

40 CFR 112 requires the preparation and implementation of a Spill Prevention Control and Countermeasures (SPCC) Plan to prevent the discharge of oil into the environment. By definition, "oil" includes oil of any kind, petroleum products, and their wastes. Under 40 CFR 112, retention tanks that contain oily wastewater shall be included in the facility's SPCC Plan. The Water Guidance and Monitoring Group (WGMG) coordinates LLNL's SPCC activities. The regulations attempt to ensure that tank systems are

designed and operated to prevent any release of oily products and oily wastewater to the environment by requiring a method of spill containment (such as berms or sorbent materials), corrosion protection, testing, inspections, and operating procedures, etc.

The National Environmental Policy Act of 1969 (NEPA), the basic national charter for protecting the environment, requires all federal agencies to use a systematic decision-making approach to ensure that environmental implications associated with any proposal are considered along with economic and technical considerations. Regulations implementing NEPA created a process for evaluating federal actions consisting of three analysis levels, depending on whether the action could significantly affect the environment. The three levels are: (1) Categorical Exclusion, which applies to specific categories of actions that do not individually or cumulatively have a significant impact on the quality of the human environment; (2) Environmental Assessment, which is a document containing sufficient analysis and evidence of an action and its alternatives to support a conclusion that an action will not have a significant impact on the environment or that an Environmental Impact Statement shall be prepared; and (3) Environmental Impact Statement, a detailed evaluation of an action and its alternatives conducted when a federal agency anticipates its action may significantly impact the environment.

**State Regulations**

The state of California regulates underground storage tanks (USTs) through the implementation of California Code of Regulations (CCR), Sections 2610-2728. These regulations set forth:

- Construction and monitoring standards for new UST systems.
- Monitoring and testing standards for existing UST systems.
- Unauthorized-release reporting requirements.
- Conditions that shall be met to make repairs to a primary container.
- Closure requirements for USTs.

Enforcement of state regulations, including inspections and approvals, is the responsibility of the appropriate local agency (e.g., a county health department or local fire department). Different agencies within a county and/or state may have responsibilities for different actions.

In August 1992, the state of California received authorization to enforce RCRA regulations. State regulations are as or more stringent than the federal regulations. Hazardous waste storage tanks are regulated under 22 CCR. 22 CCR 66262.34 incorporates by reference, tank design and operation requirements of 22 CCR 66265.190 through 66265.199. Under 22 CCR, a hazardous waste facility permit is required if a tank

stores hazardous waste for more than 90 days, if hazardous waste is treated in the tank, or if the tank capacity is greater than 5,000 gallons or 45,000 pounds, whichever is greater. Enforcement of these regulations is by the California Department of Toxic Substances Control (DTSC) but can be deferred by agreement to a local agency, such as the county health department or other agencies responsible for underground storage tanks.

Above Ground Storage of Petroleum, California Health and Safety Code, Sections 25270-25270.13, contains requirements for facilities with more than 1320 gallons total, or more than 660 gallons storage in an individual tank, of aboveground storage of oil or oily wastes (> 5% oil). The regulations require that applicable facilities: (1) file a storage statement of tank locations, sizes, ages, and contents; (2) pay a fee; (3) prepare a Spill Prevention Control and Counter Measures (SPCC) Plan in accordance with 40 CFR 112 (see discussion of SPCC Plan requirements in the Federal Regulations section); and (4) establish a monitoring program if the Regional Water Quality Control Board determines that a discharge from an aboveground tank facility will affect either surface waters/sensitive ecosystems or groundwater.

The California Environmental Quality Act (CEQA) of 1970 was enacted as a state equivalent of the federal NEPA. CEQA requires that California governmental and quasigovernmental agencies (such as Regional Water Quality Control Boards) evaluate proposed projects over which they have some level of approval, execution, planning, or permitting authority to determine whether significant impacts to the environment could occur. The state of California requires CEQA review of quasi-governmental agencies. To date, however, such agencies have not required input to their CEQA review processes from LLNL when applying for various tank permits.

**DOE Orders**

DOE orders are internal directives that provide policy, guidelines, and requirements by which DOE operations will be managed. DOE Order 5480.4 specifies requirements for the application of mandatory environmental protection, safety, and health standards. The provisions of the order are applicable to retention tank systems and are to be followed during facility design, construction, operation, modification, and decommissioning (i.e., closure). The order also provides standards and guidelines that are not mandatory but are best management practices. DOE Order 5820.2A specifies guidance on the management of radioactive waste. The order includes guidelines for the design and operation of containers, including tanks, used to store radioactive and mixed waste. This order applies mostly to high-level radioactive waste storage tanks, which are not currently present at LLNL, but it also contains guidelines for storage and disposal of low-level waste.

DOE Order 5400.5 establishes DOE standards and requirements for protecting the public and environment against undue risk from radiation. Potential exposures are required to be as far below the limits as is reasonably achievable (ALARA). DOE facilities are

required to have the capabilities to monitor routine and nonroutine releases. Chapter IV of DOE Order 5400.5 presents radiological protection requirements and guidelines for cleanup of residual radioactive material.

# Appendix C

## Retention Tank System Design and Construction Checklist

**Tank ID:**

**Note:** Items identified with an asterisk (*) are required by state or federal regulations for hazardous and mixed waste wastewater retention tank systems.

### A. Administrative

1. _____ The proposed project has approved NEPA documentation.

2. _____ The tank system has been assigned an identification number by the Operations and Regulatory Affairs Division's (ORAD's) Water Guidance and Monitoring Group (WGMG).

3. _____ ORAD, including WGMG, has reviewed and approved the design.

4. _____ The Environmental, Safety, and Health (ES&H) Team Leader has reviewed and approved the design.

5.* _____ Provisions for obtaining any required permits have been made. Permits are required for:

   Hazardous and mixed waste storage tanks if stored >90 days.

   Underground storage tanks (USTs) if regulated by the California UST regulations.

6.* _____ If the tank is a hazardous or mixed waste storage tank, an engineering assessment has been completed and stamped by an independent, California-registered, professional engineer before placing the tank in service.

7. _____ All documentation has been provided (e.g., drawings, specifications, installation inspection, leak test, and corrosion certifications, etc.).

**B. Primary/secondary containment**

1.* _____ The ability to leak test both primary and secondary containment for piping and tanks is provided. (Flanges or test valves for piping secondary containment are provided. It is recommended that a 4-inch minimum opening access and an overhead clearance of approximately 3 feet be provided for precision test equipment.

2.* _____ Both primary and secondary levels of containment have been provided for all tanks and underground piping and ancillary equipment, unless exempt.

3.* _____ The volume of secondary containment is adequate. See 40 CFR 265.193(d) and 22 CCR Section 66265.193(d). [“Adequate” means that secondary containment can hold 100% of tank volume for single tank, 100% of largest tank if multiple tanks are contained within the same secondary containment structure, 150% of largest tank if a UST, or 10% of total volume if greater, plus the volume from a 25-year, 24-hour storm (approximately 4 inches) if exposed to rainfall.]

4.* _____ Tanks storing incompatible liquids are not located in the same secondary containment area.

5. _____ Tank systems are properly vented and evaluated for air permitting or abatement if the expected waste stream will contain volatile organic compounds or could emit ignitable or explosive vapors.

6.* _____ The secondary containment will prevent both vertical and lateral migration of wastes into the environment.

7.* _____ Secondary containment is designed such that it prevents infiltration of groundwater or runoff from entering the secondary containment. Vaults are tar-coated on exterior and sealed on the inside, if necessary to prevent groundwater or rainwater infiltration.

8. _____ Water stops have been placed at all joints in the secondary containment structure, if any. (Applies to concrete vaults or tanks.)

9.* _____ The secondary containment is sloped to a collection point, and a means to remove any accumulated liquid is provided, e.g., submersible pump, drain pipe, access for vacuum hose, etc.

10. _____ The primary and secondary containments are leak-tight and completely impervious to the contained substance for the intended life of the structure.

11. _____ All outlets (berm drains, sanitary sewer connections, and hose connections) have locking valves, locking caps, or the equivalent.

**C. Leak detection**

1.* _____ The system has some method of leak detection. Automatic leak detection monitoring with alarm notification surveyed at least once every 24 hours is preferred; otherwise, use visual inspection every 24 hours that a tank system is in use.

2.* _____ For secondarily contained systems, a flow path is provided for leaks to be detected by automatic or visual detection (e.g., sloped to a sump, no obstructions to prevent flow, etc.).

**D. Documentation**

1.* _____ Drawings showing the actual location and orientation of the system, and the associated ancillary equipment, are provided in the form of as-built drawings.

2. _____ A piping and instrumentation diagram (P&ID) is provided, showing the direction of flow; identifying all valves, pumps, indicators, and controls with a number; and showing all connections and flanges.

3. _____ A diagram is provided showing the control panel layout and an elementary wiring schematic.

4. _____ An Operational Plan is provided for the system, including a system description, operator training requirements, operating procedures, system schematic, sampling instructions, inspection and monitoring instructions, emergency response procedures, and other information (as required).

5.* _____ A Monitoring Program that describes the monitoring requirements and procedures and leak response actions is provided. (This requirement applies only to California-regulated USTs, and it shall be approved by Alameda County for the Livermore site, or San Joaquin County for Site 300.)

6. _____ Two sets of the completed drawings and diagrams and one set of the construction specifications have been submitted to WGMG for that group's permanent files.

7. _____ A maintenance plan, including a list of components with their respective maintenance actions and schedule, has been provided to the tank system operator and WGMG.

8. _____ A complete list of the components being used has been compiled, indicating the manufacture's name, component name, and part number. (Verification of material compatibility is required; refer to checklist item G.1.)

9. _____ Vendor literature for tanks, level sensors, pumps, etc., including design standards, specification sheets, operating, maintenance, and installation instructions, and other general information, has been retained for future reference. (This is usually retained by Plant Engineering.)

10. _____ Copies of specification sheets for all materials of construction in contact with the waste are obtained from the respective manufacturers.

**E. Construction certifications**

1.* _____ Installation Inspection: Installation of the tanks has been inspected by a qualified, independent tank installation inspector or a similarly qualified professional engineer; and a signed certification statement has been provided.

2.* _____ Corrosion Protection: Components that are subject to corrosion are designed (for California-regulated USTs), inspected, and any field installation or fabrication of corrosion-resistant materials is supervised by an independent, certified corrosion expert, and the signed certification of proper installation of the corrosion protection system is provided.

3.* _____ Leak Test: All components of the tank system (e.g., tanks, piping, secondary containment, etc.) have been tested for leak-tightness prior to placing the system in service, and a certification is provided stating that the system is leak-tight.

4.* _____ Proper UST Installation**:** Certification by the owner or owner's agent that the UST was installed properly by qualified personnel and that the system was inspected before being placed into use. (This requirement applies only to California-regulated USTs; certification shall be provided to the local regulatory agency on Form C from the State Water Resources Control Board.)

5. _____ All of the signed certification statements listed above have been retained in a permanent file, and copies of the certification statements have been submitted to WGMG for that group's permanent files.

**F. Seismic analysis**

1.* _____ Plant Engineering, or a contractor, has completed a seismic analysis in accordance with Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards. Ensure that appropriate factors have been used, e.g., category (General Use, Low Hazard, etc.), accelerations, and seismic zone (Zone 4 for LLNL).

**G. Material compatibility**

1.* _____ The compatibility of all materials (tanks, coatings, liners, piping, pumps, valves, gaskets, O-rings, etc.) in contact with the substance(s) to be contained has been verified, or in-house tests have been performed to verify compatibility.

2. _____ Test documentation has been retained in permanent files.

**H. Overfill and spill prevention**

1.* _____ Spill prevention and removal capabilities are provided.

2.* _____ The system is provided with overfill protection (e.g., check valves, automatic shutoff, automatic bypass, level indication, high-level alarms, etc.).

**I. Corrosion protection**

1.* _____ Potential corrosion is addressed per 40 CFR 265.192 (a)(3) and 22 CCR Section 66265.192(a)(3). If metal is in contact with soil or water, a corrosion analysis by a corrosion expert shall be performed in accordance with regulations.

2. _____ Corrosion-resistant materials have been used and/or corrosion-resistant materials installed.

3. _____ All metal surfaces are painted or coated.

4. _____ Any plastic (e.g., PVC, fiberglass, etc.) piping or components are painted or coated for ultraviolet protection.

5.* _____ Field installation of corrosion protection system was supervised by and certification provided by a corrosion expert.

**J. General design considerations**

The design, at a minimum, has considered the following items:

1.* _____ Settlement, compression, and uplift. (Pad area is sufficient for load, "dead-man," or other device used for underground tanks, etc.)

2.* _____ Wind loading. (Appropriate tank holddown straps, bolts, cables, etc., were used.)

3.* _____ Venting. (Check size of vents versus expected flow rates from pumps or drains, height of vents to avoid spillage from overfilling, float-check valves if necessary, explosion relief vents for petroleum tanks, etc.)

4.* _____ Sufficient anchoring and supports are provided for piping, pumps, and tanks. (Tanks in vaults or berms shall be properly anchored to resist seismic or buoyant forces.)

5.* _____ Soil conditions (e.g., settling and erosion potential).

6.* _____ Freeze protection has been provided in the form of insulation, heat tape, or other means for piping, tanks, and other equipment that may be susceptible to freezing.

7. _____ Adequate access is provided for ease of maintenance, sampling, operation, and inspections.

8. _____ Vehicular traffic. (Access is provided for emergency vehicles; barricades are in place to protect equipment from vehicles, etc.)

9.* _____ All components of the tank system meet or exceed the applicable design and safety standards (DOE, Uniform Building Code, American Society for Testing and Materials, Underwriters Laboratory, etc.). Design standards used shall be clearly referenced on the drawings or in the construction specifications.

10.* _____ Backfill material is noncorrosive, porous, and homogeneous, and it has been carefully installed and uniformly compacted such that it supports the tank(s) and piping uniformly.

11.* _____ The proper depth of cover for all underground components has been provided to prevent damage from surface vehicular traffic.

12. _____ Dual storage tanks are provided to allow for sampling and analysis prior to disposal. Tank sizes are such that they ensure adequate capacity for expected flow rates and for four weeks of analysis turnaround time.

13. _____ System has mixing capability. Mechanical mixing or air sparging is recommended. If pump recirculation is used, adequate mixing intensity shall be provided (0.5 to 2.0 horsepower, or greater, depending on the tank geometry). An EPD air permits specialist shall evaluate sparging operations for possible permitting requirements.

14. _____ Flexible couplings or joints are provided where necessary. Long, straight runs of pipe terminating at a tank or other fixed object have been avoided.

15. _____ The tank system has had an operational test to verify that system controls and alarms operate as designed.

**K. Labeling**

1. _____ A permanent identification tag displaying the ID number of the tank assigned by WGMG is clearly visible and is affixed to the tank(s).

2.* _____ A permanent label describing the contents (e.g., hazardous waste, laboratory waste, toxic, radioactive, flammable, etc.) of the tank system is affixed to the tank(s).

3.* _____ If the tank(s) stores hazardous or mixed waste, a label is attached to each tank with a date entered for when the storage of hazardous or mixed waste began.

# Appendix D

## Inspection Log for Wastewater Retention Tank Systems

This appendix contains an example inspection log for wastewater retention tank systems. The inspection log can be used to record the information required for documentation of daily inspections of hazardous and mixed waste tank systems, as required by federal and state regulations. Contact your WGMG environmental analyst to determine the inspection frequency that is appropriate for a specific nonhazardous wastewater retention tank system.

Completed logs and any documentation of corrective action shall be maintained by the operator for at least five years for each hazardous, radioactive, and mixed waste retention tank in a tank system and shall be made available for review by WGMG or regulatory personnel. For nonhazardous systems, it is recommended that inspection records be kept and maintained by the program.

# Inspection Log for Wastewater Retention Tank System

**Tank System**_____ **Building Number**_____

Instructions: Enter checks in boxes, **except** enter your initials where corrective action is needed, and NA where the item is not applicable. Complete the **corrective action section** below.

| **Inspection date** | | | | | |
|---|---|---|---|---|---|
| **Valves**<br>1. Valve positions are correct | | | | | |
| 2. Pumpout and berm valves are locked | | | | | |
| **Overfill protection**<br>3. Remaining capacity is adequate | | | | | |
| 4. High-level alarms are working | | | | | |
| 5. Cross-connects and vents are open | | | | | |
| 6. Berms are leak tight | | | | | |
| 7. Secondary containment is dry | | | | | |
| **Electrical system**<br>8. Circuitry is protected from water | | | | | |
| 9. Indicator lights are working | | | | | |
| 10. Leak and level sensors are working | | | | | |
| 11. Automated controls are working | | | | | |
| **Safety**<br>12. Slip and fall hazards are controlled | | | | | |
| 13. PPE is available | | | | | |
| **System condition**<br>14. Plastic parts are not deteriorated | | | | | |
| 15. Good housekeeping is evident | | | | | |
| 16. No evidence of leaks or spills | | | | | |
| **Labeling**<br>17. Tank labels identify waste type | | | | | |
| 18. Piping indicates flow direction | | | | | |
| 19. Valves have unique identification | | | | | |
| **Certification**<br>20. Electrical components, past year | | | | | |
| 21. Containment/structural, past year | | | | | |
| **System procedures**<br>22. Operational plan is current | | | | | |
| **Inspector name**—printed | | | | | |
| **Inspector name**—signature | | | | | |

## Corrective actions

| **Item number** | **Date** | **Describe the problem and suggested actions** | **Describe the actions completed** | **Corrected by** | **Date action completed** |
|---|---|---|---|---|---|
| | | | | | |
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# Appendix E

## Procedure for Handling Rainwater in Secondary Containment and Release Forms

Following a rainstorm and when liquid is discovered in a secondary containment structure, tank operators need to verify that the liquid is rainwater only, then determine appropriate disposal. To determine whether the liquid is rainwater only or is the result of a leak or spill, inspection logs and historical records shall be reviewed (refer to additional guidance in Appendix E). Figure E-1 outlines the steps for releasing rainwater from secondary containment structures for nonhazardous waste systems. Figure E-2 outlines the steps for releasing rainwater from secondary containment structures for nonRCRA-permitted hazardous, radioactive, or mixed waste systems.

When reviewing inspection logs, check for unexplained changes in tank volume or exceptionally high levels. In addition, verify that all historic spills have been adequately cleaned and that postcleanup samples were taken. If regular and thorough inspections have not been done, the liquid shall be sampled to determine appropriate disposal.

To pass a visual inspection, the liquid shall not have discoloration, film or oily sheen, odor, or floating debris. If any of these conditions is present, the liquid cannot be released to the storm drain system and shall be sampled to determine appropriate disposal. Record the required observations on the Berm Water Record of Observation and Release form, a copy of which is contained at the end of this appendix.

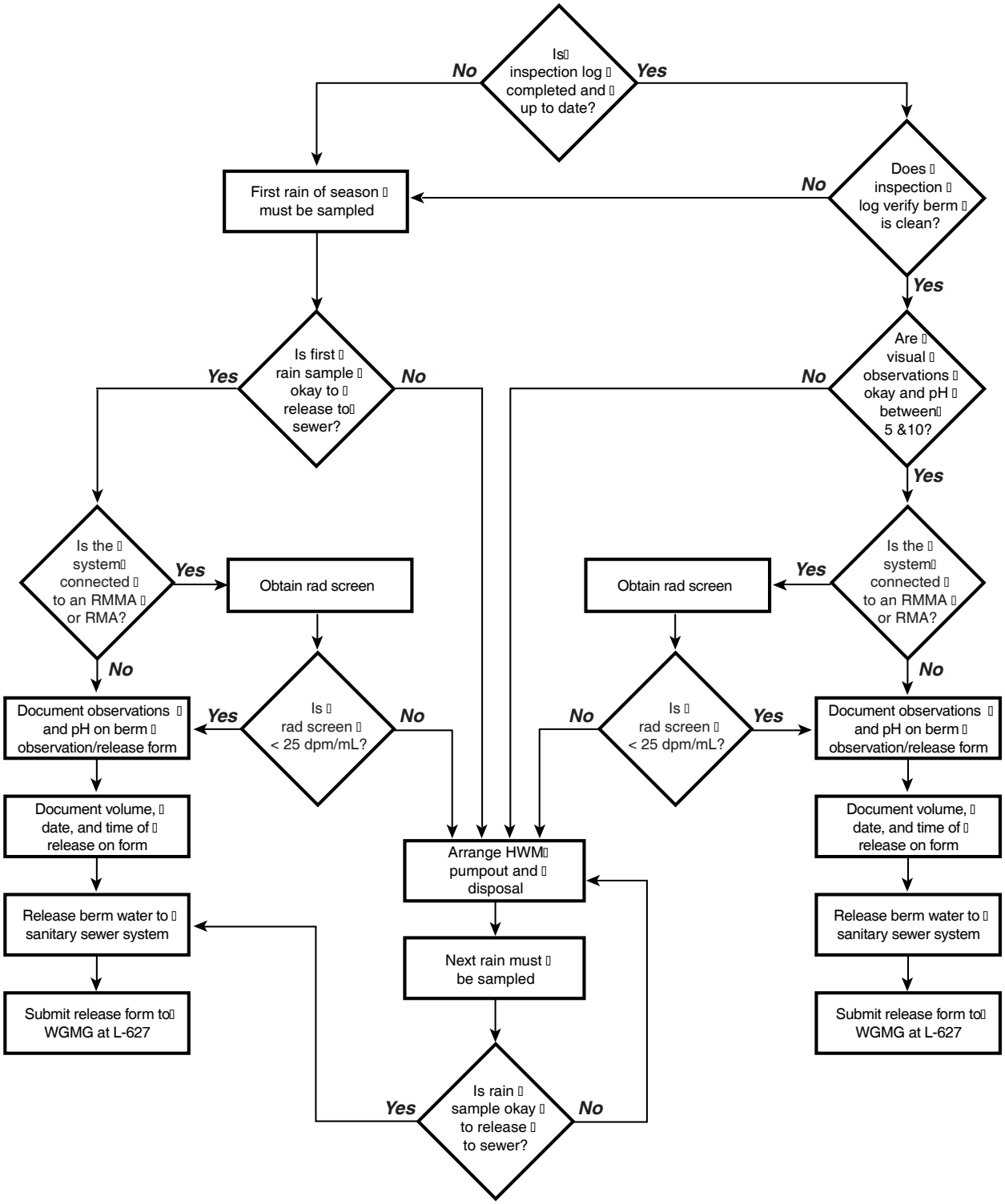


**Figure E-1. Rainwater releases to sanitary sewer from nonhazardous secondary containment.**

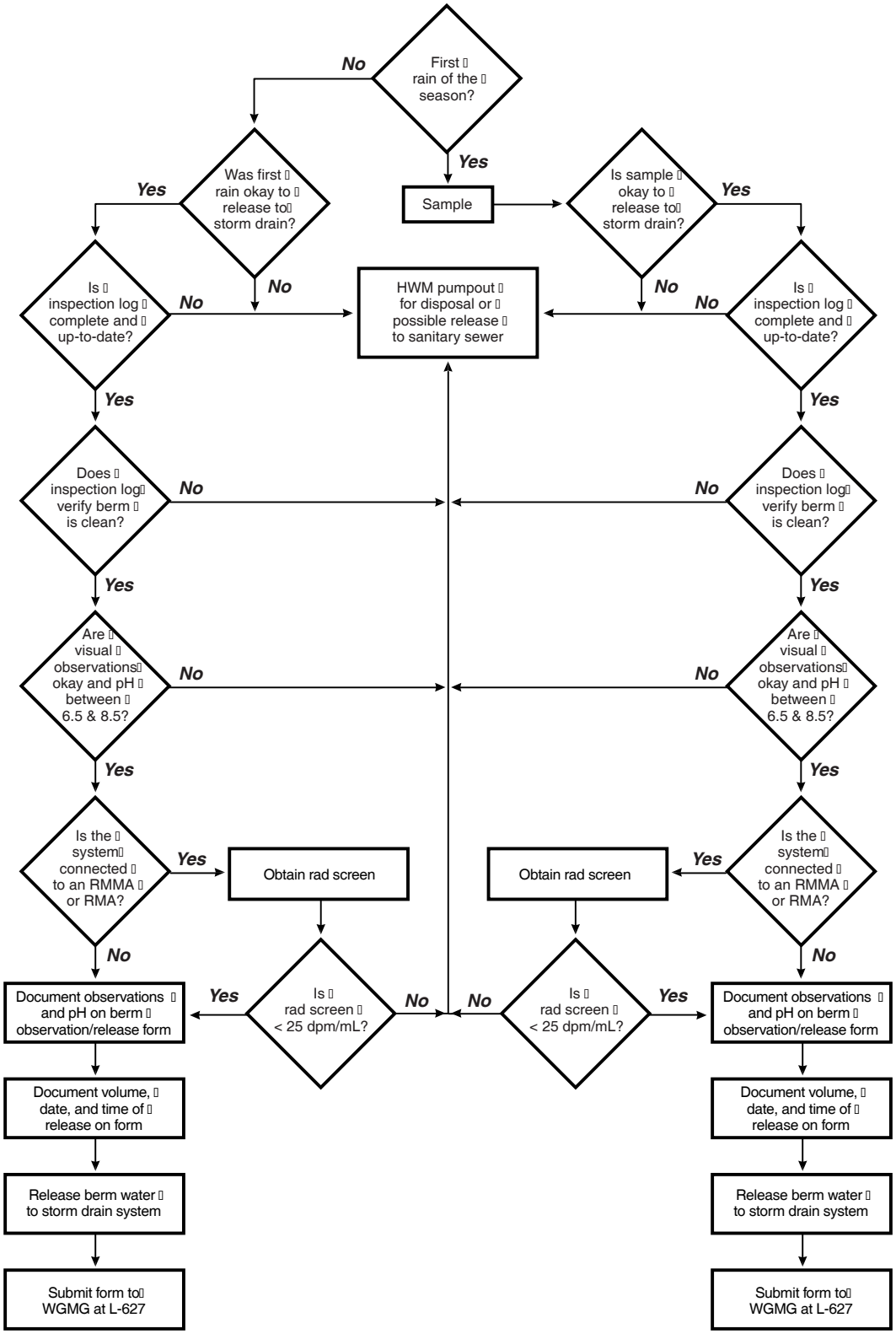


**Figure E-2. Rainwater releases to storm drain system from nonRCRA-permitted hazardous, radioactive, or mixed waste secondary containment.**

Rev. 7/00

# Berm Water Record of Observation and Release

Instructions: The following observations are required prior to each berm water release. Identify any suspended materials, floating objects, oil and grease, discolorations, odor, or any unnatural substance, and provide the pH measurement. Release is not authorized if any of these conditions is present. Forward the original copy of this form to the WGMG Discharge Approval Manager (DAM) at L-627.

Date of inspection: _____

Location: _____

Name: _____

Berm inspection log is current, complete, and there are no pending corrective items: __ Yes __ No

First rain of the season sampled: __ Yes Date_____ Sample No. _____

__ No (explain) _____

Comments:

**Field measurement results:**

pH measurement: _____ **If pH measurement is <5 or >10 for discharges to sanitary sewer, or is <6.5 or >8.5 for discharges to the storm drain system, contact the WGMG DAM at L-627.**

Meter type and number: _____

Meter calibration: _____

Volume: _____

Does this system service an RMA or RMMA: __ Yes __ No Rad screen results _____

Other:_____

**Floating or suspended materials present:** __ Yes __ No

**Kind of material:** Circle all that apply.

| | | | |
|---|---|---|---|
| visible spill | film or sheen | emulsion | sludge |
| leaves | sticks | plastic | packing material |
| paper | bottles | cans | other (specify):_____ |

Describe in comments section, at bottom, any floating suspended materials or substances in the berm.

_____

**Oil and grease**: __ Yes __ No Comments:

_____

**Discolorations**: __ Yes __ No Description:

_____

**Odor**: __ Yes __ No Description:

_____

**Final volume released to:** sanitary sewer __ storm drain system __ Other_____

**Time of release**:_____

**Locked berm valve**: time: _____ Initials: _____

Comments: