

PERMIT ATTACHMENT A FACILITY DESCRIPTION

A.1 INTRODUCTION

This Permit Attachment contains general information pertaining to Sandia National Laboratories (SNL; the Facility) and the treatment and storage units covered by this Permit. The Facility is owned by the U.S. Department of Energy (DOE) and operated by National Technology and Engineering Solutions of Sandia, LLC (NTESS).

The Facility is located on Kirtland Air Force Base (KAFB) immediately south and southeast of the Albuquerque city limits in Bernalillo County, New Mexico. The Facility occupies five Technical Areas and additional test areas as defined in Permit Section 1.6 (see Figure 1 in Permit Attachment L (*Figures*)).

The Facility is a multidisciplinary laboratory engaged in research and development of weapons and alternative energy sources. The Facility is managed for the DOE by NTESS, a wholly owned subsidiary of Honeywell International with work also performed for others.

The major Facility research and administration functions are located at five Technical Areas (TAs), designated I through V. TAs I, II, and IV are located north of the Tijeras Arroyo and Arroyo del Coyote (see Figure 2 in Permit Attachment L (*Figures*)). TAs III and V occupy contiguous tracts of land south of the Tijeras Arroyo and west of Arroyo del Coyote.

The individual units permitted under this Permit include: (1) the Hazardous Waste Handling Unit; (2) the Thermal Treatment Unit; (3) the Radioactive and Mixed Waste Management Unit; (4) the Auxiliary Hot Cell Unit; (5 through 9) Five Manzano Storage Bunkers; and (10) the Corrective Action Management Unit (CAMU). All the Permitted Units are shown on Figure 2 (*Unit Location Map*) in Permit Attachment L (*Figures*).

The following information contains unit descriptions, including the dimensions, materials of construction, and operational procedures and requirements. Additional information on the CAMU is presented in Permit Attachment H (*Post-Closure Care Plan*).

A.2 TA-I: HAZARDOUS WASTE HANDLING UNIT

The Hazardous Waste Handling Unit (HWHU) is located south of TA-I, north of the entrance to TA-II; and occupies 1.35 acres on Facility property between TA-I and TA-II (see Figure 2 in Permit Attachment L (*Figures*)). The HWHU is a fenced compound with several buildings and three hazardous waste management areas used for storage and packaging of hazardous and mixed wastes (see Figure 3 in Permit Attachment L (*Figures*)). Hazardous and mixed wastes are transported to off-site RCRA-permitted facilities for treatment or disposal.

A.2.1 HWHU Container Types

Waste containers that may be managed at the HWHU include but are not limited to 30 and 55-gallon steel, polyethylene, and fiber drums; fiberglass-reinforced plastic or plywood boxes; various steel boxes; metal over pack boxes; cardboard shipping containers; gas cylinders; roll-off bins; lab pack containers; various small containers; bags; and some oversized, irregularly-shaped containers or large self-contained items (e.g. a large piece of equipment containing hazardous or mixed waste in which the hazardous component of the item is located within the interior of the item, or is covered with an inert material, such as plastic sheeting, if located on the exterior of the item).

A.2.2 HWHU Designated Waste Management Areas

Appendix A.1 in Permit Attachment L (*Figures*) contains photographs of the three designated hazardous and mixed waste management areas at the HWHU. The three hazardous or mixed waste management areas are shown on Figure 4 of Permit Attachment L (*Figures*). These include:

1. The Hazardous Waste Packaging Building (Building 959),
2. The Hazardous Waste Storage Building (Building 958), and
3. Two modular storage buildings - Buildings 958B and 958C.

Two covered, bermed, open concrete-lined areas that are not used for the management of hazardous or mixed wastes are located at the HWHU; one is located in the northeast corner of the Unit, and the other is located on the west side of Building 959.

The following sections provide descriptions of the storage layout, location, and secondary containment systems of each hazardous waste management area and the bermed areas. Storage capacities are listed in Attachment J, Table J-1.1.

A.2.3 TA-I: HWHU Hazardous Waste Packaging Building 959

The Hazardous Waste Packaging Building 959 is the easternmost hazardous waste management area and is a 1,800-square-foot (ft²) pre-cast concrete building with an eave height of 12 feet (ft) (see Figure 4 in Permit Attachment L (*Figures*)). Eight waste-holding cells with half-height concrete masonry walls and a waste packaging area are located in the building. The packaging area contains a fume hood and flexible ventilation hoses attached to a local negative-pressure ventilation system that exhausts to the exterior of the building.

All the cells and part of the packaging area have recessed floors that are constructed of reinforced concrete and are covered with metal grating. Waste containers in the cells are placed on shelves over the metal grating or directly on the metal grating. The load-bearing capacities of the metal grating and the reinforced concrete floor are 450 and 2,000 pounds per ft², respectively. The floor and the bottom seven inches of wall surface in each recessed area are covered with an epoxy-based chemical-resistant coating or equivalent protective coating, and shall be maintained as needed to be free from cracks and gaps. Figures 5 and 6 in Permit Attachment L (*Figures*) are the floor plans of Buildings 959 and 958, respectively.

The individual shelves are covered with removable chemical-resistant grating, and they have edges to hold the containers in place. The shelves are not designed to provide secondary containment. The recessed areas provide secondary containment. The recessed area in each holding cell is 5 feet by 4.5 feet and 7 inches deep, with a capacity of 98 gallons. The recessed floor area under the packaging area is 5 feet by 12 feet and 7 inches deep, with an actual capacity of 261 gallons. The capacity for each holding cell is limited to 71 gallons, and the capacity for the packaging area is limited to 191 gallons.

Wastes are stored in the Hazardous Waste Packaging Building. In addition, wastes are prepared for shipment to off-site treatment and disposal facilities (e.g., lab packs are prepared by placing small containers into larger containers filled with absorbent material).

Water reactive wastes are not managed in the Hazardous Waste Packaging Building, except on a temporary basis during receipt, repackaging, and staging activities which shall not exceed 3 days. Water reactive wastes shall be protected from contact with water when managed in Building 959.

A.2.4 TA-I: HWHU Hazardous Waste Storage Building 958

The Hazardous Waste Storage Building 958 is located west of the Hazardous Waste Packaging Building (see Figure 9 in Permit Attachment L (*Figures*)). The Hazardous Waste Storage Building is a 3,520-ft² precast concrete building with an eave height of 14 ft and contains eight separate and recessed waste storage cells for segregation of waste (see Figure 11 in Permit Attachment L (*Figures*)). The floors of Cells 1, 2, 3, 4, 6, 7, and 8 are constructed of reinforced concrete and metal grating. The floor of Cell 5 is constructed of reinforced concrete. The floor and bottom 5 inches of the walls are coated with an epoxy-based chemical-resistant coating, or equivalent protective coating, and shall be maintained as needed to be free from cracks and gaps. The load-bearing capacity of the metal grating and reinforced concrete are 450 and 2,000 pounds per ft², respectively. The storage cells vary in size, secondary-containment capacity, and waste-container capacity.

The recessed areas under the grating provide the secondary containment in Cells 1, 2, 3, 4, 6, 7, and 8. The volume of the entire recessed area provides the secondary containment capacity in Cell 5. For example, the recessed area in Cell 1 is 11.75 feet by 14.67 feet by 5 inches deep, with a capacity of 542 gallons.

Water reactive wastes shall not be managed in the Hazardous Waste Storage Building, except on a temporary basis during receipt, repackaging, and staging activities which shall not exceed 3 days. Water reactive wastes shall be protected from contact with water when managed in Building 958.

A.2.5 TA-I: HWHU Modular Storage Buildings 958B and 958C

The modular storage buildings are located west of Building 958 (see Figures 4 and 7 in Permit Attachment L (*Figures*)) and are used for storage of wastes such as ignitable solids and water reactives.

The exterior dimensions of each modular storage building are 22-ft long, 8-ft wide, and 8-ft high. The buildings are constructed of welded 10- and 12-gauge steel supported by structural steel sections. Each building has three doors, each with a three-point locking system to provide access and security. Each has a 6-inch-deep integral spill containment reservoir under the entire building; the containment capacity is 500 gallons. The secondary-containment sub-floor is constructed of continuously welded 10-gauge steel, which is painted to provide additional protection against degradation of the secondary containment. The floors are vinyl ester fiberglass gratings. The load-bearing capacity of the floor for each structure is 250 pounds per square foot. The inside walls and ceiling are also painted. The sumps shall be maintained to be free from cracks and gaps. Each building rests on structural supports that elevate it and allow visual checks of the underside of the spill containment reservoir if there is evidence of deterioration on the interior surfaces noted during inspections performed according to the Inspection Plan in Permit Attachment E.

A.2.6 TA-I: HWHU Covered Open Storage Areas

A covered, open, bermed, concrete-lined area is located in the northeast corner of the HWHU. This area is not used for management of hazardous or mixed wastes.

An empty drum crusher is located within the covered area on the west side of Building 959. Only drums that meet the regulatory definition of empty will be crushed in the drum crusher. This area is not used for management of hazardous or mixed wastes.

A.2.7 TA-I: Unit Operations at the HWHU

The Permittees shall store at the HWHU only the hazardous and mixed wastes bearing U.S. EPA Hazardous Waste Numbers listed in Permit Attachment B (*Authorized Wastes*).

Containers shall be inspected for integrity when the wastes arrive at the HWHU, before they are placed in storage in either Building 959 or 958. Containers in poor condition shall not be placed in storage; the containers shall be over packed or the hazardous or mixed wastes in them shall be transferred to containers in good condition. The shelves in Building 959 shall be lined with absorbent pads under removable grating in areas where containers of liquids are stored. Containers shall be inspected regularly following the Inspection Plan contained in Permit Attachment E (*Inspection Plan*). Any liquids released from hazardous or mixed waste containers are to be contained in the absorbent pads under the removable grating on which the waste containers are placed and shall be cleaned up upon discovery.

Upon discovery of any accumulated liquids in a secondary containment system Unit personnel shall take action to evaluate and remove the liquids in accordance with Permit Section 3.6..

A.2.8 TA-I: Preventing Hazards in Unloading and Loading of Waste at the HWHU

Loading and unloading operations occur outdoors on the south side of Buildings 958 and 959 in the area immediately adjacent to a hazardous waste management area to minimize the distance that the waste must be moved. All loading and unloading areas shall be level, and the asphalt or

concrete or other pavement shall be maintained in good condition. Loading and unloading areas shall be free of overhead and other obstructions to visibility and operations.

Containers too large to hand carry shall be transported within the HMWU with drum dollies, or pallet jacks, or other appropriate equipment. Containers shall be handled in a manner to prevent shifting or falling.

A.2.9 Preventing Run-Off or Run-On (Flooding) at the HWMU

The land around the HWHU is nearly level, sloping gently towards the south and west. The perimeter of the paved areas of the HWHU is higher than the surrounding land on all sides, preventing sheet-flow run-on of surface water from surrounding areas. The western edge of the paved area is steeply sloped at the edge, rising to a level at least 6 inches above the surface outside the Unit, further preventing run-on and run-off from the HWHU. Within the HWHU, the paved areas are sloped toward a 74,800-gallon catchment pond located at the northwest corner of the Unit. During normal operations, the catchment pond collects only storm water. The catchment pond is not intended to provide secondary containment for hazardous waste. Figure 8 in Permit Attachment L (*Figures*) shows the drainage control features at the HWHU.

A.2.9.1 TA-I: HWHU Catchment Pond Operating Procedures

A lined pond is located on the northwest side of the HWHU. The pond is capable of holding 10,000 cubic feet of liquid and is designed to receive storm water and snowmelt run-off from the HWHU. Run-off collected in the pond shall be evaluated before discharge. If the run-off is known or likely to be contaminated with hazardous waste constituents from a spill, leak, or other release, it will be sampled. The pond shall be inspected for evidence of contamination (e.g., surface sheen) during the weekly inspection. Inspection results and any remediation shall be recorded in the Operating Record. If there is no reason to suspect the storm water is contaminated with hazardous constituents based on the Unit Operating Record and the inspection, the storm water shall be managed in accordance with the current Unit storm water discharge permit.

If sampling and analysis are required due to known or suspected contamination, a water sample shall be collected within 5 days of when the Permittees becomes aware of the known or suspected contamination. The analytical results, together with information from the Operating Record, shall be used to characterize the water in accordance with Permit Attachment C (*Waste Analysis Plan*). If the run-off present in the pond is determined to be hazardous waste, the waste water shall be removed within 5 working days of the determination. The type and quantity of waste water present in the pond, the date of the incident, and the date of removal of the waste water shall be recorded in the Operating Record.

A.2.10 HWHU Container Management Practices

Requirements regarding the management of hazardous and mixed waste storage containers, information on container handling, the condition of containers, aisle space, compatibility of waste with containers, and storage configuration are contained in Section 2.10 of Permit Part 2, and in Part 3 of this Permit.

In Building 958, if containers are stacked, they shall be in a stable configuration that does not exceed the load-bearing capacity of the reinforced concrete or the grating.

In Building 959, containers shall be stored in the holding cells. If containers are stacked, they will be in a stable configuration that does not exceed the load-bearing capacity of the reinforced concrete or the grating.

In Buildings 958B and 958C, if containers are stacked, they will be in a stable configuration that does not exceed the load-bearing capacity of the floor.

In all buildings, containers holding hazardous or mixed waste liquids without absorbent shall not be stacked without separation or some other means to allow Unit personnel to clearly identify the source of liquid, if liquid is discovered in the secondary containment area.

A.3 TA-III: THE THERMAL TREATMENT UNIT

The Thermal Treatment Unit (TTU) is located in a fenced area on a concrete pad outside the south end of Building 6715 in Technical Area (TA)-III, and occupies 196 square feet. The location of the TTU at the Facility is indicated in Figure 9 of Permit Attachment L (*Figures*). Figure 2 of Permit Attachment L (*Figures*) illustrates its location in Technical Area III. Figure 10 of Permit Attachment L (*Figures*) shows the TTU waste management area. The TTU loading and unloading areas are shown on Figure 11 in Permit Attachment L (*Figures*). The area surrounding the TTU is occupied by test areas and controlled operations (industrial land use). Drainage control features (e.g., run-on/run-off, drainage barriers) are shown on Figure 12 of Permit Attachment L (*Figures*). Figure 13 in Permit Attachment L (*Figures*) shows access control features at the TTU. Appendix A.2 in Permit Attachment L (*Figures*) contains photographs of the hazardous waste management area at the TTU.

The TTU is used for treatment of reactive and ignitable hazardous waste exhibiting the hazardous characteristic of reactivity (D003) and ignitability (D001) that is generated during operations in Building 6715, and may also bear EPA Hazardous Waste Numbers D002, D011 and F003, depending on the presence of nitric acid, silver, and spent solvents. Explosive silver acetylide/silver nitrate (SASN) slurry is formulated from raw ingredients as needed for tests. SASN is present in the solid and liquid wastes treated at the TTU. Pentaerythritol tetranitrate (PETN) (an explosive) is sometimes included in the tests and would also be present in the wastes. SASN is categorized as a primary explosive, and each discrete crystal (when dry) has the potential to detonate. SASN can be initiated by the energy of bright light (by raising the surface temperature to the auto-ignition temperature of 457 degrees Fahrenheit) or small contact shock. (Wilden, 1986).

A.3.1 TA-III: TTU Hazardous Waste Management Area

The TTU consists of a square burn pan constructed of 0.375-inch steel, 2 feet 6 inches on a side and 6 inches deep with ancillary equipment (see Figure 14 in Permit Attachment L (*Figures*)). The burn pan is located near the center of a square curbed slab of concrete 14 ft on a side lined with 0.5-in. steel, with a 4-in. high, steel-lined concrete curb around the edge. The bottom of the burn pan is elevated approximately 10 inches to 12 inches above the floor by steel beams. The burn

pan is enclosed within a square cage approximately 4 ft on a side, consisting of expanded metal screen approximately 8-ft high with a nearly solid metal roof having slots for tracks and cables. An expanded metal screen door, remotely activated from inside Building 6715, provides access to the burn pan. Moveable steel panels are attached to the lower part of two sides of the cage to control airflow as needed.

An enclosure on the east side of the cage houses three propane burners, which are remotely activated from inside Building 6715. The burners shall be positioned to heat the burn pan and ignite the wastes in the burn pan and flammable vapors above the pan. An 8-foot earthen berm and a fence surround the burn cage of the TTU.

A.3.2 TA-III: Unit Operations at the TTU

The treatment of waste at the TTU is designed to deactivate reactive and ignitable components of the waste. The wastes treated at the TTU are generated as a result of the formulation of silver acetylide/silver nitrate (SASN) slurry, its application to test articles, and cleanup activities during and after the tests. The waste may also contain the explosive pentaerythritol tetranitrate (PETN); however, PETN is rarely used in the process. The TTU was specifically built to treat SASN slurry and SASN-contaminated waste because of the hazards associated with managing this waste.

Treatment residues may contain other constituents such as ash (carbon) produced from burned solid items (e.g., paper, filters), and treatment events may release gases (i.e., nitrogen, water vapor, carbon dioxide, carbon monoxide, diatomic oxygen, and traces of nitrous oxides) produced by the decomposition of SASN, PETN, acetone, and acetonitrile. Elemental silver is present in the treatment residues when SASN is treated at the TTU.

Liquid wastes to be treated may be transferred from Building 6715 to the TTU through flexible transfer hoses utilizing a remotely operated peristaltic pump. The hoses are contained inside a metal channel to provide secondary containment. The flexible hoses and channel terminate approximately 5 feet from the burn pan and metal tubing will be used to transfer the waste the final distance into the burn pan.

Liquids or solids to be treated may also be containerized and manually loaded into the burn pan. Solid items are saturated (wetted with or submerged) in water as needed to protect personnel from explosive hazards before transfer to the burn pan.

Liquids that might accumulate at the TTU will be contained within a secondary containment system (i.e., the entire steel-lined concrete pad that drains through a filter into a catch tank) as described in Section A.3.4.

A circular tank located north of the Unit and south of Building 6715 is primarily utilized as a process tank for collecting cleaning water from test operations. Water from this tank is sampled and analyzed. If this wastewater contains unreacted SASN explosive, then the contents of the tank will be treated at the TTU; otherwise, the wastewater collected in this tank is not treated at the TTU. This process tank is a part of building 6715 test operations but not part of the treatment unit.

Because the TTU is located outside, it is difficult to prevent equipment deterioration; however, the Unit and its ancillary equipment are inspected regularly according to the inspection schedule in Permit Attachment E (*Inspection Plan*) to ensure proper operation and waste management at the TTU. If deterioration sufficient to affect the operation, safety, or effectiveness of the TTU is identified, the affected equipment will either be repaired or replaced before any treatment of hazardous waste takes place.

A.3.3 Preventing Hazards in Unloading and Loading at the TTU

Loading activities include the placement of wastes into the burn pan, and may include loading containers of treatment residue and drums of water from the catch tank onto flatbed trucks or other suitable vehicles, as applicable. Vehicles that will transport wastes shall be loaded on the paved area south or southeast of Building 6715 as shown in Figure 11 of Permit Attachment L (*Figures*). This surface shall be maintained to be level and in good condition. There shall also be sufficient room for vehicles to safely maneuver in the loading area.

Liquid wastes may be pumped to the burn pan through the Waste Transfer Tubing. Solid and liquid waste that cannot be pumped to the TTU burn pan shall first be wetted with or submerged in water, then placed manually into the burn pan for treatment.

Unloading activities include removal of treatment residue from the burn pan. Treatment residues shall be managed in accordance with Section 5.5.4 of Permit Part 5. Water from the catch tank may be pumped into 55-gallon drums or other suitable containers, characterized according to Permit Attachment C, and managed appropriately. If the water is contaminated with unreacted explosive, the water shall be treated at the TTU.

A.3.4 Operation of Containment Systems at the TTU

Liquids that might accumulate at the TTU will be contained within a secondary containment system (i.e., the entire steel-lined concrete pad that drains through a filter into a catch tank). The system is sufficiently impervious to contain spills or accumulated precipitation until the liquid is removed. The secondary containment system provided by the steel-lined concrete pad is designed to contain at least 21 gallons of waste, representing the maximum volume of hazardous waste in the TTU burn pan at any one time. The catch tank has a containment capacity of at least 157 gallons.

Because the TTU is located outside, the steel-lined concrete pad periodically collects water from precipitation events, and the water drains through a filter into a catch tank. The Permittees shall manage the water in the tank to prevent overflow and ensure that sufficient capacity is available to accommodate precipitation.

The pad shall be inspected and cleaned as needed, and maintained in accordance with Permit Attachment E. The water shall be managed as specified in Permit Section 5.6.1. The filter shall be characterized in accordance with Permit Attachment C (*Waste Analysis Plan*) and shall be managed accordingly. If the filter is known or suspected to contain unreacted explosive, it shall be treated in the TTU.

A.4 TA-III: RADIOACTIVE AND MIXED WASTE MANAGEMENT UNIT

The Radioactive and Mixed Waste Management Unit (RMWMU) consists of several buildings within a fenced area located at the southeastern corner of Technical Area III (TA-III), west of the Chemical Waste Landfill, and occupies 135,472 square feet. The RMWMU is used for storage, treatment, and packaging of hazardous and mixed wastes generated as a result of Facility operations and corrective action activities. Hazardous and mixed wastes and treatment residues are transported to off-site permitted facilities for treatment, storage and disposal.

The location of the RMWMU at the Facility is indicated in Figure 15 of Permit Attachment L (*Figures*). Figure 2 of Permit Attachment L (*Figures*) illustrates its location in Technical Area III. Figure 16 of Permit Attachment L (*Figures*) illustrates the six hazardous and mixed waste management areas at the RMWMU. Appendix A.3 in Permit Attachment L (*Figures*) contains photographs of the hazardous waste management areas at the RMWMU.

Waste containers that may be managed at the RMWMU include but are not limited to 30 and 55-gallon steel, polyethylene, and fiber drums; fiberglass-reinforced plastic or plywood boxes; various steel boxes; metal over pack boxes; cardboard shipping containers; gas cylinders; roll-off bins; lab pack containers; various small containers; bags; and some oversized, irregularly-shaped containers or large self-contained items (e.g. a large piece of equipment containing hazardous or mixed waste in which the hazardous component of the item is located within the interior of the item, or is covered with an inert material, such as plastic sheeting, if located on the exterior of the item).

A.4.1 RMWMU Designated Waste Management Areas

The RMWMU has six designated hazardous and mixed waste management areas. These include Buildings 6920, 6921, 6925, and 6926; two modular storage buildings; and the outdoor waste storage area (i.e., paved areas within the RMWMU fence to the north, east, and west of Building 6920).

In each waste management area (except where noted), containers holding liquid hazardous or mixed wastes shall be stored on portable spill pallets or pans. These are commercially available units consisting of a tub made of a heavy-duty inert material such as polyethylene or polypropylene with a heavy-duty inert plastic grating cover. The containers of liquids (up to and including 85-gallon overpack containers) will be stored on grating. Any liquids released from the containers drain through the grating into the tub. The pallets come in various sizes and capacities designed for use with 55-gallon drums or other standard containers, as required by 40 CFR § 264.175(b)(1-3).

Each pallet will have sufficient capacity to hold the contents of the largest container of liquid waste stored on it. Containers shall be stored in a stable configuration; the weight shall not exceed the load-bearing capacity of the grating or the pallet.

Hazardous and mixed wastes will be stored inside one of the buildings, inside transportainers in the outdoor storage area, or outside in the outdoor storage area. Transportainers are 10- to 40-cubic-yard transportable containers, which typically have doors at one end and can be lifted onto

a large flatbed truck for transportation. Wastes in the containers will be protected from precipitation by the buildings, transportainers, or other appropriate means, and by the slope of the pavement and concrete pads outside the buildings that direct storm water toward the retention pond, in accordance with 40 CFR §264.175.

The following sections provide descriptions of each structure and the waste management areas. Storage capacities are listed in Attachment J, Table J-1.1.

A.4.1.1 TA-III: Building 6920 at the RMWMU

The principal structure at the RMWMU is Building 6920. The floor plan for Building 6920 is presented on Figure 17 in Permit Attachment L (*Figures*). The waste management areas in Building 6920 include waste staging, repackaging, and storage areas, and treatment areas. Building 6920 is a single-story concrete and steel structure housing approximately 5,800 square feet of waste management area. The floors are 6-inch reinforced, sealed concrete on compacted sub-grade sloped to sumps with no outlets. Walls are 8-inch load-bearing concrete masonry unit with pre-finished metal building panels in some areas. Non-grouted cells of the 8-inch concrete masonry unit exterior walls are filled with vermiculite insulation. The staging area at the east end of the building has 14-foot (ft) high reinforced concrete walls. Inner partitions are 8-inch reinforced concrete masonry unit.

A.4.1.1.i North Bay of Building 6920

In the RMWMU waste treatment, storage, and repackaging are performed in the north bay of Building 6920 (see Figure 17 in Permit Attachment L (*Figures*)). Treatment in the North Bay will be limited to physical treatment and macroencapsulation.

The floor in the North Bay slopes from the doorways toward one or more shallow (6-in.-deep) blind sumps, some of which are covered with grating. Containers of liquid hazardous and mixed wastes will be stored on portable spill pallets or pans. Floors, (including the sumps), and the walls in the waste management areas of Building 6920 are painted. The floors shall be maintained as needed to be free from cracks and gaps.

The RMWMU North Bay includes two enclosed areas that are equipped with a negative-pressure exhaust system. The exhaust passes through a high-efficiency particulate air (HEPA) filter train before being released to the environment through an exhaust stack. The filters remove particulates entrained in the airflow.

A.4.1.1.ii South Bay of Building 6920

In the RMWMU, waste treatment, storage, and repackaging are performed in the South Bay of Building 6920 (see Figure 17 in Permit Attachment L (*Figures*)). Wastes are stored in the main bay and in the airlocks at either end. Treatment in the South Bay will be limited to chemical and thermal deactivation, stabilization/solidification, amalgamation, macroencapsulation, and physical treatment.

The floor in the south bay slopes from the doorways toward shallow (6-inches-deep) blind sumps covered with grating along the south wall which provides secondary containment. Containers of liquid hazardous or mixed wastes are stored over the sump in the south bay or on portable spill pallets or pans. Floors (including the sumps), and the walls in the waste management areas of Building 6920 are painted. The floors and sump shall be maintained as needed to be free from cracks and gaps.

In the RMWMU, there are four small rooms in the South Bay. A commercially available fume hood with a negative-pressure ventilation system is located in one of these rooms. A second local ventilation system is located in another of the rooms. The exhaust from both of these systems is combined and passes through a HEPA filter train before being released to the environment through the exhaust stack. The filters remove particulates entrained in the airflow of each system.

A.4.1.2 TA-III: Building 6921 at the RMWMU

Building 6921, the Waste Assay Unit, is located east of Building 6920 (see Figure 16 of Permit Attachment L (*Figures*)). The Permittees treat, repackage, and store hazardous and mixed wastes in the waste management areas. The Building 6921 floor plan is presented on Figure 18 of Permit Attachment L (*Figures*). Building 6921 is a single-story structure constructed with interior walls of 8-inch concrete masonry unit and metal studs. The roof is comprised of steel bar joists with metal decking, rigid insulation, and single-ply membrane roofing. The floors are 6 inches thick concrete slab-on-grade. The floors throughout the waste management areas shall be maintained as needed to be free from cracks and gaps. The total area of the waste management areas is approximately 1,450 ft².

Building 6921 waste treatment area, (see Figure 18 in Permit Attachment L (*Figures*)) is equipped with a commercially available fume hood with a negative-pressure ventilation system. The ventilation airflow from the hood passes through a HEPA filter train before being released to the environment through an exhaust stack. The filters remove particulates entrained in the airflow.

Treatment in Building 6921 is limited to chemical and thermal deactivation, stabilization/solidification, amalgamation, macroencapsulation, and physical treatment.

A.4.1.3 TA-III: Buildings 6925 and 6926 at the RMWMU

Buildings 6925 and 6926 are used for storage, repackaging, and some treatment of hazardous and mixed waste at the RMWMU. Treatment shall be limited to macroencapsulation in Building 6925.

The floor plans for RMWMU Buildings 6925 and 6926 are presented on Figure 19 of Permit Attachment L (*Figures*). Building 6925 has a total storage area of approximately 4,000 ft². Building 6926 also has a total storage area of approximately 4,000 ft². Each is a prefabricated steel building erected on a reinforced concrete slab floor and foundation. The concrete floors in both buildings will be maintained as needed to be free from cracks and gaps. Steel rollup doors are located on the south wall of each building, on the east wall of Building 6925 and on the west wall of Building 6926. Personnel doors are located on the east, south, and west sides of each building.

A.4.1.4 TA-III: RMWMU Modular Storage Buildings (TP150 and TP153)

There are two modular storage buildings located west of Building 6920 used for storage of reactive and ignitable hazardous and mixed wastes (see Figure 16 of Permit Attachment L (*Figures*)).

The exterior dimensions of each modular storage building are 23-ft long, 9-ft wide, and 8.6-ft high. The structures are constructed of welded 10- and 12-gauge steel supported by structural steel. Each building has double doors with inside handle. The inside walls and ceiling of each building are painted..

Each modular storage building has a 5.5-inch deep integral spill containment reservoir constructed of welded 10-gauge steel under the entire building; the capacity is 650 gallons. The inside surfaces (bottom and sides) of each reservoir are painted to provide additional protection against degradation of the secondary containment. The sumps shall be maintained as needed to be free from cracks and gaps. Containers shall be stored on painted steel grating or equivalent over the sumps. The grating shall be maintained as needed to support the containers and elevate them above any accumulated liquid. Each building shall rest on structural supports that elevate it and allow visual checks of the underside of the spill containment reservoir if there is evidence of deterioration on the interior surfaces noted during inspections performed according to the Inspection Plan in Permit Attachment E.

A.4.1.5 TA-III: Outdoor Waste Storage Area of the RMWMU

The outdoor waste storage area consists of the asphalt-paved areas to the north, east, and west of Building 6920 and within the RMWMU fence (see Figure 16 of Permit Attachment L (*Figures*)). The outdoor waste storage area may be used for storage of containerized hazardous and mixed wastes. It has an area of approximately 48,500 ft². The area is curbed, and paved.

Containers of hazardous and mixed wastes may be stored inside enclosed steel transportainers. Containers that are stored outside shall meet the requirements of this Permit Attachment and Permit Parts 2 and 3.

A.4.2 TA-III: RMWMU Container Management Practices

Requirements for management of hazardous and mixed waste containers, information on container handling, the condition of containers, aisle space, compatibility of waste with containers, and storage configuration at the RMWMU are described in Permit Section 2.10 and Permit Part 3.

Containers shall be stacked in a stable configuration that does not exceed the load-bearing capacity of the floor or secondary containment system. Containers holding hazardous or mixed waste liquids without absorbent shall not be stacked without separation or some other means to allow Unit personnel to clearly identify the source of liquid, if liquid is discovered in the secondary containment area.

A.4.3 TA-III: Preventing Hazards in Loading/Unloading at the RMWMU

Loading and unloading activities take place on paved areas, typically immediately outside the buildings. The ramp on the west side of Building 6926 slopes gently up to the dock, allowing forklift operators to drive onto trailers of trucks parked at the dock. The dock and ramp will be maintained in good condition and is covered to provide protection from weather. Unit personnel typically use the loading dock for loading and unloading waste from trucks.

All containers shall be handled in a manner to prevent shifting or falling. Containers too large to hand carry shall be transported using forklifts, drum dollies, pallet jacks, or other appropriate equipment.

A.4.4 TA-III: Preventing Run-On and Run-Off (or Flooding) at the RMWMU

The area around the RMWMU slopes gently toward the west. Sheet-flow run-on of surface water from surrounding areas outside the Unit will be prevented from entering the waste management areas. The elevated gravel road located outside the east fence of the Unit diverts water flowing from areas farther to the east. An 8-in. curb at the east edge of the pavement and an asphalt-lined drainage swale along the eastern edge of the Unit (inside the fence) divert run-on from the gravel road toward the south away from the Unit. On the south and west sides, the Unit is higher than the surrounding land. On the north side, the Unit and a narrow ledge of land outside the fence are higher than the surrounding land. Thus, run-on from all directions is prevented from entering the Unit.

The paved areas within the Unit are surrounded by an 8-inch curb, further preventing run-on and run-off. The outside storage area slopes toward the south and west. The concrete pads outside the doors and the pavement surrounding Buildings 6920, 6921, 6925, and 6926 all slope away from the doors and toward shallow drainage channels that run between buildings 6920, 6925, and 6926. The channels lead to the synthetic-material-lined water retention pond at the southwest corner of the Unit, and will divert storm water from roof downspouts and the paved areas in the RMWMU into the water retention pond. Normally, the water retention pond collects only storm water. It is not intended to provide secondary containment for waste.

A.4.5 TA-III: Treatment Operations at the RMWMU

Waste treatment is performed at the RMWMU for one or more of the following reasons:

1. To meet land disposal restrictions (LDRs);
2. To allow for the safe storage of the waste; and/or
3. To meet treatment, storage, or disposal facility (TSDF) requirements

Waste treatment practices currently involve various technologies at the RMWMU, and include the following methods.

1. Chemical deactivation: The Permittees may chemically deactivate wastes exhibiting the hazardous waste characteristics of ignitability, corrosivity, or reactivity in either Building 6920 or Building 6921.

2. Thermal deactivation: The Permittees may thermally deactivate wastes exhibiting the hazardous waste characteristics of ignitability or reactivity in either Building 6920 or Building 6921.
3. Stabilization: The Permittees may stabilize and solidify wastes in either Building 6920 or Building 6921.
4. Amalgamation: The Permittees may amalgamate elemental mixed mercury wastes in either Building 6920 or Building 6921.
5. Macro-encapsulation (performed in Buildings 6920, 6921, or 6925): The Permittees may macroencapsulate hazardous or mixed waste debris or other wastes subject to a variance from the treatment standards granted by the Department pursuant to 40 CFR 268.44.
6. Physical treatment: The Permittees may conduct physical treatment of hazardous or mixed wastes in either Building 6920 or Building 6921.

Treatment quantities are listed in Attachment J, Table J-1.2. All of the treatment at the RMWMU is batch treatment. Treatment will be conducted in containers unless the physical properties of the waste and the nature of the treatment process require treatment without containers (e.g., deactivation of thermal batteries and some physical treatment). Liquid wastes shall be treated in batches of 60 gallons or less.

Waste treatment may generate secondary waste streams (treatment residues). Treatment residues may undergo additional on-site treatment only by the methods described in this Section (A.4.5) to meet LDRs or may be sent to an appropriate off-site facility for additional treatment prior to disposal. The waste treatment processes described in this section are intended to address hazardous characteristics in hazardous and mixed wastes, including:

1. Wastes that are solid and exhibit the hazardous characteristics of ignitability or reactivity that may be chemically deactivated to eliminate the characteristic.
2. Debris, and wastes containing hazardous waste toxicity characteristic metals (excluding elemental and high mercury subcategories), that may be macroencapsulated to reduce or eliminate the leaching potential of the waste or hazardous constituent(s).
3. Wastes that are solid and with hazardous constituents that may be physically separated from larger items and the size of individual pieces reduced.
4. Pressurized containers that may be punctured or opened to release their contents.
5. Liquid waste exhibiting the characteristics of ignitability, corrosivity, and/or reactivity that may be chemically or thermally deactivated to remove the hazardous characteristic(s).
6. Liquid waste and particulates containing toxicity characteristic metals (excluding elemental mercury and high mercury subcategories) that may be stabilized and/or solidified to reduce or eliminate the leaching potential.
7. Reactive wastes (including explosive wastes) that may be treated using thermal deactivation techniques.
8. Elemental mercury that may undergo amalgamation to reduce or eliminate the leaching potential.

Each of the waste treatment technologies or processes listed above is described in the following sections.

A.4.5.1 Chemical Deactivation

Chemical Deactivation will be performed in containers in the treatment areas only in Buildings 6920 and 6921. Whenever possible, treatment will take place within the fume hoods that are present in each building, as appropriate to protect human health and the environment. Containers vary in size depending on the quantity of waste to be treated, and include laboratory glassware, 5-gallon buckets, and 55-gallon drums.

Chemical deactivation refers to a number of chemical processes that can eliminate the hazardous waste characteristics of ignitability, corrosivity, and/or reactivity. Chemical deactivation can be accomplished by several technologies, such as neutralization or chemical oxidation. The intent of this section is to identify and describe specific methods or treatment trains which may be used at the RMWMU to deactivate ignitable, corrosive, and reactive hazardous and mixed waste. Deactivation may or may not result in the final waste form, depending on the process, and may be used as the first method in a series of treatment steps.

Deactivation processes will be conducted under carefully controlled conditions so that hazardous and mixed waste with the characteristic of reactivity is allowed to react in a slow, nonviolent manner. Deactivation of reactive wastes shall be conducted in small batches such that process control can be easily maintained. Hydrides, deuterides, and tritides are deactivated by slow addition to an ice water bath. Deactivation of water-reactive metals such as elemental sodium and lithium involves the slow and controlled addition of an appropriate alcohol/water solution. Alcohol/water will be added until the water reactive potential of the waste has been eliminated. Deactivation of pyrophoric metal powders and particulates may be achieved by mixing waste in a Portland cement matrix.

Water-soluble oxidizers in particulate form will be slowly dissolved in water to deactivate them as the first step in the treatment process. The resulting solution may undergo further treatment (e.g., neutralization and stabilization). Water-soluble concentrated liquid oxidizers such as hydrogen peroxide will be diluted with water in a controlled manner to make them safer to handle before deactivation with an appropriate chemical agent such as iron filings.

The reactive material in thermal batteries may be deactivated through introduction of an electrical current that induces a chemical reaction in the material, deactivating it and generating heat. Batteries are treated one at a time in this manner; this process is not conducted in containers due to the need to dissipate the heat generated during the chemical reaction.

Chemical deactivation to remove the characteristic of corrosivity is the process of removing excess acidity or alkalinity from an aqueous liquid waste. Other uses may include pH (Potential Hydrogen - a measure of the acidity or basicity of an aqueous solution) adjustment to facilitate subsequent treatment; such pre-treatment through deactivation may be necessary to prevent corrosive damage to equipment, deter undesirable reactions, and preclude the formation of unwanted byproducts.

Reagents added to achieve a desired pH are combined with liquid waste in a mixing vessel or directly in the waste container. Common deactivating reagents include, but are not limited to, sodium hydroxide, for acid wastes; and phosphoric acid for alkaline wastes. The selection of

reagents is dependent on the quantity of reagent required, cost, availability, and the potential byproduct(s). These deactivation processes are conducted under carefully controlled conditions in which the reagent is added to the waste slowly and mixed thoroughly. This allows the reaction to proceed in a nonviolent manner and allows the energy to be dissipated effectively. Ice may be used if needed to cool the mixture during the reaction. In the case of reactions that are expected to be strongly exothermic, wastes will be treated in small batches in containers (similar to the deactivation of reactive wastes) such that process control can be easier to maintain.

A.4.5.2 Thermal Deactivation

The Permittees shall perform thermal deactivation of reactive wastes, including batteries, explosives and explosive components in a Sandia National Laboratories-designed and tested portable deactivation device that meets the regulatory definition of a container. The device is a thick-walled stainless steel vacuum apparatus equipped with an internal heated covered tray and sensors to measure temperature and pressure. The device was designed to contain a detonation of 25 grams TNT-equivalents of reactive hazardous or mixed waste. The inside diameter of the cylinder is 8 inches, and it is 18 inches long. The thermal deactivation device is portable and may be used in any of the treatment areas in Building 6920 or 6921. It is shown in Figure 20 in Permit Attachment L (*Figures*).

Reactive waste is placed on the covered tray, inserted into the cold unit, the unit is sealed and filled with an inert atmosphere (e.g., nitrogen), and the temperature of the tray is slowly raised until reaching a temperature at which the reactive waste being treated decomposes. The Permittees will use waste characterization data and/or published chemical information (e.g., “DOE Explosives Safety Manual” [DOE, 2002] or other chemical or engineering handbook) as appropriate to determine the required temperature to decompose the reactive waste. The temperature will be maintained for two hours or longer as appropriate, to complete the decomposition of the waste. The unit will be cooled and decomposition gases will be vented to a fume hood with a high-efficiency particulate air filtration system.

A.4.5.3 Stabilization and Solidification

The Permittees will perform stabilization in containers in the treatment areas only in Buildings 6920 and 6921 at the RMWMU. Whenever possible, treatment will take place within the fume hoods that are present in each building to protect human health and the environment. Stabilization is the process of binding hazardous metals so that the metals become chemically part of the matrix or are physically bound within the matrix. The primary use of stabilization is to immobilize toxicity characteristic metals but many stabilization agents also eliminate free liquids. Typical waste forms often suitable for stabilization and/or solidification include liquids, sludge, soils, and particulate-type wastes.

Process equipment for mixing waste and binder materials depends on the type of reagents used and the volume of waste to be treated. In-drum mixing is typically used for large volume waste quantities. Once waste and binder have been thoroughly mixed in a container, the mass is allowed to cure and/or set. Smaller batches may be mixed by hand in smaller containers (e.g., 5-gallon pails, and tubs and trays of various sizes) and allowed to cure.

Development of appropriate formulas is waste specific. Stabilization agents for toxic metals may include Portland cement, pozzolans, thermoplastics, organic polymers, and clays. Other waste forms may require proprietary reagents that are available for specific applications. Additional reagents may be added to reduce constituent leachability, reduce cure or set time, and increase strength.

Waste characteristics that are important to the success of the stabilization and/or solidification process for liquids may include volume percent of water, oil, solvents, or other organics, pH and hazardous constituents. Waste characterization data shall be used to determine whether waste is amenable to stabilization, any necessary pretreatment requirements, and the appropriate binding agent.

Once the stabilization or solidification method is selected, the binding agent is identified based on chemical compatibility with the waste form and hazardous constituents present. Pretreatment may be required to assure compatibility between the waste, the binding agent, and the containers (e.g., neutralization of liquid wastes to an acceptable pH range of 5.0 to 11.0). Once the proper binding agents have been identified, bench-scale testing is performed to determine optimum amounts of each agent. In the case of low volume waste streams (e.g., less than approximately 0.26 gallons), bench-scale testing may not be practical and treatment is performed without bench-scale testing using the manufacturer's suggested quantities or by estimating binding agent quantities from previous experience. Stabilization is performed by combining predetermined quantities of binding agents with the waste and mixing the combination thoroughly, as appropriate. The resulting mixture is staged to allow an appropriate cure time.

A.4.5.4 Amalgamation

The Permittees shall perform amalgamation of small quantities (about 2 ounces) of elemental mercury in small (e.g., laboratory) containers in the treatment areas only in Buildings 6920 and 6921 at the RMWMU. The amalgamation process for liquid elemental mercury involves mixing mercury waste with a powdered base metal. The amalgamation process is intended to immobilize elemental mercury into a solid leach-resistant form that has minimal potential for emission of mercury vapor.

The two important operating parameters for effective treatment are: (1) the ratio of base metal to mercury, and (2) the efficiency of mixing. Copper or zinc is typically used as a base metal, but tin, nickel, gold, and sulfur may also be used. The base metal may be pretreated with acid to improve the effectiveness of the amalgamation reaction. For the small quantities of mercury that are treated at the RMWMU, hand mixing the mercury and base metal using a mortar and pestle or mechanical mixing shall be used to create an amalgam with uniform properties.

A.4.5.5 Macro-Encapsulation

The Permittees will perform macroencapsulation in containers only in Buildings 6920, 6921, and 6925 at the RMWMU. Macro-encapsulation is the process of completely encasing waste within a polymer coating or concrete, or within a jacket of inert inorganic materials. The primary use of

macroencapsulation is to immobilize wastes such as debris-type solids containing hazardous constituents by completely surrounding the waste with a leach-resistant coating.

The Permittees will perform macroencapsulation using one of three processes:

1. Encasing the waste in concrete, within a larger container that serves as a mold.
2. Coating the waste with polymer agents within a mold. Polymers used for macroencapsulation include, but are not limited to, asphalt, polyethylene, thermosetting plastics, and resins that can be polymerized under ambient temperatures in the presence of a catalyst. Equipment used for macroencapsulation may include molds, polymer extrusion equipment, and resin mixing equipment. In-drum macroencapsulation may also be performed with the drum acting as the mold. Temperature control of polymer macroencapsulation processes is critical and will be carefully maintained to assure that adequate coating occurs.
3. For example, the Permittees perform macroencapsulation with a chemically inert resin (typically polyethylene), using 30-gallon containers (metal baskets). Each basket containing the solid waste items is placed in a 50-gallon mold (similar in size and shape to a 55-gallon drum). The basket is designed to fit into the mold with one to two inches of clearance on all sides, the top, and the bottom. The mold containing the basket and waste items is then filled with melted resin that is heated using a commercially available extrusion unit. Each basket is used only once because it becomes encapsulated within the inert resin and is part of the final waste form. After the resin cools and solidifies, the mold is removed, the waste form is turned over and more polyethylene is added to form final caps on the ends. The completed waste form is a cylinder slightly smaller than a 55-gallon drum.
4. Placing the waste, along with inert void-filling materials as appropriate, inside a commercially available container made of inert or non-corroding materials such as polyethylene or stainless steel and sealing the container to encapsulate the waste. This method is not used to treat D008 radioactive lead solids.
5. Placing the waste in a container may consist of an outer shell with a liner of inert or non-corroding material such as polyethylene resin or stainless steel. After the wastes and inert void-filling materials as applicable, are placed in the container, the resin is heated to seal the container and lid (e.g. using a resistance-heated wire system embedded in the container lid). Non-corroding materials such as stainless steel are also available as containers and liners; the stainless steel is welded closed to seal the container and encapsulate the wastes. The Permittees use containers of various sizes, depending on the volume and dimensions of waste items to be macroencapsulated.

A.4.5.6 Physical Treatment

The Permittees will perform physical treatment (volume reduction) of hazardous or mixed waste only in Buildings 6920 and 6921. Such treatment includes:

1. Reducing waste volume by using commercially available tools (e.g., hammers, screwdrivers, wrenches, pliers, saws, drills, cutters, etc.) to separate items with hazardous constituents from larger items or from each other, including removal of coating and filler materials.

2. Removing coating and filler materials (e.g. resins) by dissolution in containers (e.g., trays or pails) in order to facilitate separation of items with hazardous waste constituents from each other or from other items. Whenever possible, dissolution will take place within the fume hood(s) that are present in each building.
3. Reducing the size of waste items by using tools (e.g. mallets, cutters, etc.) to crush or cut items into smaller pieces.
4. Puncturing aerosol cans within a container to allow recovery of the contents. The liquid contents of the aerosol cans are collected in the container, and any gaseous propellants are filtered through a carbon filter attached to the container.
5. Releasing pressurized contents of containers other than aerosol cans (e.g., gas cylinders). Organic gaseous contents are filtered through a carbon or other appropriate filter. All contents will be vented to a chemical fume hood with a high-efficiency particulate air filtration system.

A.4.6 Treatment Effectiveness

Treatment effectiveness will be verified through evaluation of the treated waste in accordance with Permit Attachment C (*Waste Analysis Plan*).

The Permittees will evaluate treatment effectiveness by appropriate methods for each batch of waste treated. In many cases (e.g. stabilization), the Permittees treat small samples of a batch of waste using a single agent in various proportions or using various agents to determine which is most effective. That process is then used in treating the rest of the waste, and the data demonstrating that the treatment is effective for the samples may be used to demonstrate effectiveness for the rest of the waste, when appropriate.

A.4.6.1 Chemical Deactivation

The Permittees will also verify treatment effectiveness using one or more of the following methods, as appropriate:

1. Visual check for completeness of chemical reaction for solid items of waste that were treated to remove the characteristic of reactivity (e.g., color change or structural change).
2. Visual check or ignitability test for liquid wastes that were treated to remove the characteristic of ignitability.
3. Document check to determine whether treated waste is an oxidizer as defined in 40 CFR § 261.21(a)(4).
4. Visual check for liquid wastes that were treated to remove the characteristic of reactivity.
5. Fingerprint chemical check for the presence of sulfides and cyanides if their presence caused the waste to be reactive.
6. Fingerprint check for pH of liquid wastes that were treated to remove the characteristic of corrosivity.
7. Knowledge of process to determine whether chemical reaction(s) were completed. Such knowledge of process shall be based on stoichiometry or the measurement of other properties (e.g., temperature or time). The Permittees shall attempt to use the applicable methods listed above before using knowledge of process as the sole means of verifying

treatment effectiveness.

A.4.6.2 Thermal Deactivation

The Permittees will also verify treatment effectiveness through proper operation of the unit (maintaining specified decomposition temperature for specified length of time). In some cases, personnel may visually check for evidence of chemical reaction (e.g., color change or structural change) in a waste solid.

A.4.6.3 Stabilization and Solidification

The Permittees will also verify treatment effectiveness using one or more of the following methods, as appropriate:

1. Visual check for the presence of free liquids.
2. Paint filter test to determine whether free liquids are present if the treated waste is amorphous and may contain some liquids.
3. Laboratory analysis of samples of the treated waste using the TCLP for hazardous waste toxicity characteristic metals. If the stabilization is intended to meet the treatment standards in 40 CFR § 268.40, the analysis will include underlying hazardous constituents as described in Permit Attachment C (*Waste Analysis Plan*).

A.4.6.4 Amalgamation

Treatment is effective by using the specified method as discussed in Permit Attachment A, Section A.4.5.4.

A.4.6.5 Macro-encapsulation

The Permittees will verify treatment effectiveness by visually checking each macroencapsulated item to verify that it is completely encased in the inert resin or concrete. For containers with inert liners, the Permittees shall check the seal of the liner and/or container.

A.4.6.6 Physical Treatment

The Permittees will also verify treatment effectiveness by one or more of the following methods, as appropriate:

1. Visual inspection that items with hazardous waste constituents have been completely separated from other items.
2. Visual inspection that pieces are the desired size.
3. Visual inspection that punctured aerosol cans are empty and the contents are containerized.
4. Leaving a container for a time to allow it to continue venting after visual and/or audible evidence indicates it is empty. The length of time would be determined by the size of the container, the contents, and the strength of the evidence.

A.5 TA-V: THE AUXILIARY HOT CELL UNIT

The auxiliary hot cell unit (AHCU) within the Facility is shown in Figure 21-A of Permit Attachment L (*Figures*). The location of the AHCU at TA-V is shown on Figure 21-B in Permit Attachment L (*Figures*). Appendix A.4 in Permit Attachment L (*Figures*) contains photographs of the hazardous waste management areas at the AHCU.

A.5.1 TA-V: Designated Waste Management Areas at the AHCU

The AHCU is located within the high bay of Building 6597 and comprises four designated waste management areas, which are shown on Figure 22 of Permit Attachment L (*Figures*). These waste management areas include:

1. The Auxiliary Hot Cell;
2. The work area near the hot cell, which includes the fume hood;
3. The storage silos; and
4. The container storage area.

Storage capacities are listed in Attachment J, Table J-1.1. Treatment quantities are listed in Table J-1.2.

A.5.1.1 TA-V: AHCU Hot Cell

The Auxiliary Hot Cell is located in the high bay area of Building 6597. Waste management activities are repackaging hazardous and mixed wastes for shipment to off-site Treatment, Storage, or Disposal Facilities (TSDFs), and treatment of hazardous and mixed wastes by reducing waste volumes using tools to separate items with hazardous waste constituents from larger items. The outside dimensions of the hot cell are 16 feet (ft) 8 inches square and 16 ft 2 inches high. Inside space dimensions are 100 square feet with a height of 13-ft 10 inches. The inside surfaces are lined with stainless steel. An 18-inch thick concrete foundation mat supports the hot cell. The hot cell walls are constructed of inner and outer pre-cast concrete panels that are held apart by threaded rods. The space between the panels is filled with sand. The roof sections are also constructed of reinforced concrete panels with sand between them. Each individual roof panel is designed to structurally support one 5,000-pound point load. Each roof section supports a roof port and roof plug. The hot cell is equipped with manipulator arms that allow personnel to handle items remotely.

A.5.1.2 TA-V: AHCU Work Area and Fume Hood

The work area is located in the corner of the high bay, north and east of the hot cell and the permanent shield wall. Activities include treatment and storage. Treatment methods will be limited to deactivation, stabilization/solidification, macroencapsulation, and physical treatment. Personnel also repackage wastes for shipment to off-site TSDFs. From time to time, a temporary tent-like room may be erected in the work area north of the hot cell and east of the permanent shield wall to accommodate containerized mixed wastes or large mixed waste items. If the mixed waste item or container must be handled remotely, the temporary room will be built directly against the permanent shield wall to allow the use of the manipulators at the shield wall. Each time the

temporary room is erected, package-specific considerations will determine details of the design; however, basic construction will consist of polyvinyl chloride or metal framing, clear or translucent plastic roof and walls, and plastic doors. The temporary room will operate at a slight negative pressure.

A 6-ft-wide walk-in fume hood is located in the work area northeast of the Auxiliary Hot Cell. It can accommodate two 55-gallon drums placed side by side. Unit personnel treat and repackage hazardous and mixed wastes in the fume hood. The fume hood is included in the maximum storage capacity for the overall work area.

A.5.1.3 TA-V: AHCU Storage Silos

Four 10-inch inside-diameter, 15-ft deep floor silos and two 30-inch inside-diameter, 15-ft deep floor silos are located in the work area north of the hot cell and east of the permanent shield wall. These silos have removable locking-type shield plugs. The tops of the silos are raised slightly above the floor level to reduce the possibility of water entry into the silo.

Two additional storage silos are located within the hot cell. Each silo is 10-inch inside diameter. One silo is 15-ft deep and the other is 11-ft 8-inch deep.

Each silo is constructed of concrete, and each is lined with a removable welded stainless steel sleeve. The sleeves do not provide secondary containment for the small quantities of liquid (about 2 ounces) wastes that may be stored in the silos. Secondary containment is provided by outer storage containers. The silos are used only for storage of mixed wastes that exhibit high external radiation dose rates that are hazards to personnel.

A.5.1.4 TA-V: AHCU Container Storage

Containers of hazardous and mixed wastes may be stored in the high bay, south and west of the hot cell. The floor of the storage area is painted and shall be maintained as needed to be free from cracks and gaps.

Container storage practices applicable to the AHCU, which include container types and labeling, container handling, and the condition of containers, compatibility of waste with containers, the presence of liquids in containers, and the condition of containers are presented in Part 3 of this Permit.

Waste containers that may be managed at the AHCU include but are not limited to 30 and 55-gallon steel, polyethylene, and fiber drums; fiberglass-reinforced plastic or plywood boxes; various steel boxes; metal over pack boxes; cardboard shipping containers; gas cylinders; roll-off bins; lab pack containers; various small containers; bags; and some oversized, irregularly-shaped containers or large self-contained items (e.g. large pieces of equipment containing hazardous or mixed waste in which the hazardous component of the item is located within the interior of the item, or is covered with an inert material, such as plastic sheeting, if located on the exterior of the item).

In the work area and storage areas, containers holding liquid hazardous or mixed wastes shall be stored on portable spill pallets or pans. These are commercially available units consisting of a tub made of a heavy-duty inert material such as polyethylene or polypropylene with a heavy-duty inert plastic grating cover. The containers of liquids (up to and including 85-gallon overpack containers) will be stored on grating. Any liquids released from the containers drain through the grating into the tub. The pallets come in various sizes and capacities designed for use with 55-gallon drums or other standard containers, as required by 40 CFR § 264.175(b)(1-3).

Each pallet will have sufficient capacity to hold the contents of the largest container of liquid waste stored on it. Containers shall be stored in a stable configuration; the weight shall not exceed the load-bearing capacity of the grating or the pallet.

A.5.1.5 TA-V: AHCU Container Management Practices

Requirements for management of ignitable, reactive, or incompatible wastes at the AHCU are described in Permit Section 2.10. Requirements regarding the management of hazardous and mixed waste storage containers, information on container handling, the condition of containers, aisle space, compatibility of waste with containers, and storage configuration are contained in Part 3 of this Permit.

A.5.2 TA-V: Preventing Hazards in Loading/Unloading at the AHCU

Loading and unloading activities are performed just inside the rollup door on the north side of Building 6597 and may also be performed just inside the rollup door on the south side of the high bay (see Figure 23 in Permit Attachment L (*Figures*)). The floor is level and maintained in good condition. There also is sufficient room for safely operating vehicles and equipment. All containers shall be handled in a manner to prevent shifting and falling. Containers too large to hand carry shall be transported using forklifts, drum dollies, pallet jacks, or other appropriate equipment.

A.5.3 TA-V: Preventing Run-on and Run-Off (or Flooding) at the AHCU

The land surrounding the AHCU slopes gently toward the west. Sheet-flow run-on of surface water from surrounding areas outside TA-V is prevented from entering TA-V by a diversion berm. The diversion berm lies east of TA-V and diverts storm water to the north and south.

The floor of the high bay in Building 6597 is slightly higher than the surrounding ground, and should direct storm water away from the building. The asphalt and concrete pavement around the AHCU slope toward a storm drain that directs storm water toward the west.

Drainage control features (e.g., run-on/run-off, drainage barriers) at the AHCU are shown on Figure 24 of Permit Attachment L (*Figures*).

A.5.4 TA-V: Treatment Operations at the AHCU

Treatment methods for hazardous and mixed wastes that will be treated in containers at the AHCU are:

1. Chemical deactivation of wastes exhibiting the hazardous waste characteristics of ignitability, corrosivity, or reactivity will be performed in the work area, including the fume hood and hot cell.
2. Stabilization and solidification of hazardous or mixed wastes will be performed in the work area, including the fume hood and hot cell.
3. Macro-encapsulation of hazardous or mixed waste debris or other wastes subject to a variance from the treatment standards granted by the Department according to 40 CFR 268.44 will be performed in the work area, including the fume hood, or the hot cell.
4. Physical treatment will be performed in the work area, including the fume hood, or the hot cell.

The waste treatment processes described in this section are intended to address hazardous waste characteristics in hazardous and mixed wastes, including the following:

1. Solid items of waste exhibiting the hazardous waste characteristics of ignitability or reactivity that may be chemically deactivated to eliminate the characteristic(s).
2. Debris, and wastes exhibiting toxicity characteristic metals (excluding elemental and high mercury subcategories), that may be macroencapsulated to reduce or eliminate the leaching potential of the hazardous waste constituent(s).
3. Liquid waste exhibiting the hazardous waste characteristics of ignitability, corrosivity, or reactivity that may be chemically deactivated to remove the characteristic(s).
4. Liquid wastes and particulates exhibiting toxicity characteristic metals (excluding elemental mercury and high mercury subcategories) that may be stabilized and/or solidified to reduce or eliminate the leaching potential of the hazardous waste constituents.
5. Solid items of waste with hazardous constituents that may be physically separated from larger items and the size of individual pieces may be reduced.

The following will be managed as hazardous or mixed wastes (in accordance with LDRs).

1. Treatment residue derived from the treatment of listed hazardous or mixed wastes.
2. Treated waste containing listed hazardous or mixed wastes.
3. Treated waste, which continues to exhibit hazardous waste characteristics, or does not meet treatment standards for underlying hazardous waste constituents.

The description of each waste treatment technology or process to be applied at the AHCU, are identical to those presented in Section A.4.5 of this Attachment (i.e., Chemical Deactivation, Stabilization/Solidification, Macroencapsulation, and Physical Treatment).

A.6 MANZANO BASE: MANZANO STORAGE BUNKERS

The Manzano Bunkers (MSBs), which are owned by Department of Defense and leased to the Department of Energy, are located at the Manzano Base on Kirtland Air Force Base, approximately

one mile east of the exit road leading to the entrance of TA-III and TA-V and at the end of Pennsylvania Avenue. The location of the MSBs within the Facility is shown on Figures 2 and 25 in Permit Attachment L (*Figures*).

The Manzano Storage Bunkers (MSBs) comprise five Units, each with approximately 1600 to 2400 square feet of space, and are used for storage of hazardous and mixed wastes. These are Bunkers 37034, 37045, 37055, 37057, and 38118. Figure 26 of Permit Attachment L (*Figures*) shows the general layout of the MSBs and their location at the Manzano Base and depicts the locations of the waste management areas at the MSBs. Appendix A.5 in Permit Attachment L (*Figures*) contains photographs of the hazardous waste management areas at the MSBs.

A.6.1 Manzano Base: Designated Waste Management Areas at the MSB

The walls, roof, and floor of each bunker are constructed of concrete and are covered by earthen materials. The walls and roof of each bunker are rounded. There are three types of bunkers at the Manzano Base. These include Type B (37034); Type C (37118); and Type D bunkers (37045, 37055, and 37057). The following sections provide descriptions of the specific bunker storage structures, and their locations. Storage capacities are listed in Attachment J, Table J-1.1.

A.6.2 Manzano Base: MSB Type B Bunker (37034)

The Type B bunker consists of an access tunnel leading to a main chamber that is used for storage of hazardous and mixed wastes. Figure 27 of Permit Attachment L (*Figures*) illustrates the floor plan for the subject Type B bunker. The Type B bunker access tunnel is approximately 20 feet (ft) long, 12 ft wide and 12.5 ft high. The main chamber is approximately 81 ft long, 26.5 ft wide and 12.8 ft high. The bunker is covered by at least 2 ft of earthen fill over a 6-in. thick concrete roof. The soil surface above and around the bunker is sloped for water to drain away from the bunker. Access to the waste management area of the bunker is through two sets of double doors that are 9 ft high and 9 ft wide. One set is at the entrance to the access tunnel, and the other set is at the entrance to the main chamber.

A.6.3 Manzano Base: MSB Type C Bunker (37118)

Bunker 37118 does not have an access tunnel and consists entirely of a main chamber used for storage of hazardous and mixed wastes. Figure 28 of Permit Attachment L (*Figures*) shows the floor plan of Type C Bunker 37118. The main chamber is approximately 83 ft long, 29 ft wide and 12.8 ft high. A 6-in. drain tile is located outside the bunker perimeter. Access to the main chamber is through a set of double doors 8 ft wide and 9.5 ft high. The bunker is covered by at least 2 ft of earthen fill over a 6-in. thick concrete roof. The soil surface over and around the bunker is sloped for water to drain away from the bunker.

A.6.4 Manzano Base: MSB Type D Bunkers (37045, 37055, and 37057)

The Type D bunkers being permitted consist of an access tunnel leading to a main chamber. Only the main chamber is used for storage of hazardous and mixed wastes. Figure 29 of Permit Attachment L (*Figures*) is a typical floor plan of a Type D bunker. The access tunnels vary in

length from 76 feet to 110 feet and are 9 ft wide and 11 to 12 ft high. The main chamber in each Type D bunker is approximately 61 ft long, 26.5 ft wide and 12.5 ft high. Access to the waste management area of each bunker is through two sets of double doors that are 9 ft high and 9 ft wide. One set is at the entrance to the access tunnel, and the other set is at the entrance to the main chamber. Each bunker is covered by at least 2 ft of earthen fill over a 6-in. thick concrete roof. The soil surface over and around each bunker is sloped so that water drains away from each bunker.

A.6.5 Manzano Base: Unit Operations at the Manzano Storage Bunkers

The Manzano Storage Bunkers are used to store any of the hazardous and mixed wastes bearing EPA's Hazardous Waste Numbers listed in Permit Attachment B (*Authorized Wastes*).

The MSB are not occupied by any SNL personnel except when managing waste or performing inspections. All personnel will sign in on a log before entering each bunker and will sign out when they leave. Personnel work in pairs and maintain contact with each other. All personnel will be trained to check that during each visit to the MSB everyone has signed out and exited the bunker before turning off the lights and closing and locking the doors.

In each Manzano Storage Bunker, containers holding liquid hazardous or mixed wastes will be stored on portable spill pallets and pans. These are commercially available units consisting of a tub made of a heavy-duty inert material such as polyethylene or polypropylene with a heavy-duty inert plastic grating cover. The pallets come in various sizes and capacities. They are designed for use with 55-gallon drums or other standard containers, and meet the requirements of 40 CFR § 270.15(a-b) and 40 CFR § 264.175(b)(1-3). The pallets and pans are designed to be resistant and impervious to corrosives and other liquids. Containers of liquids (up to and including 85-gallon overpack containers) shall be stored on the grating. Any liquids released from the containers drain through the grating into a tub.

Each pallet has sufficient capacity to hold the contents of the largest container of liquid waste stored on it. Containers shall be stored in a stable configuration; the weight will not exceed the load-bearing capacity of the grating or the pallet.

Waste containers that may be managed at the MSB include but are not limited to 30 and 55-gallon steel, polyethylene, and fiber drums; fiberglass-reinforced plastic or plywood boxes; various steel boxes; metal over pack boxes; cardboard shipping containers; gas cylinders; roll-off bins; lab pack containers; various small containers; bags; and some oversized, irregularly-shaped containers or large self-contained items (e.g. large pieces of equipment containing hazardous or mixed waste in which the hazardous component of the item is located within the interior of the item, or is covered with an inert material, such as plastic sheeting, if located on the exterior of the item).

A.6.6 Manzano Base: MSB Container Management Practices

Other requirements for management of containers, and methods employed for storage of hazardous and mixed waste at the MSB are described in detail under Permit Section 2.10 and in Permit Part 3.

A.6.7 Manzano Base: Preventing Hazards During Loading/Unloading at the MSB

Loading and unloading activities take place on the paved areas immediately outside each of the bunker Units. The surface is sloped gently away from the door, and the pavement is maintained in good condition at each bunker. There is sufficient room for safely operating vehicles. All containers shall be handled in a manner to prevent shifting and falling. Containers too large to hand carry shall be transported using a forklift, drum dolly, hand truck, or other appropriate equipment.

A.6.8 Manzano Base: Preventing Run-on and Run-Off (or Flooding) at the MSB

Sheet-flow run-on of surface water from surrounding areas and run-off from each of the MSB bunkers is prevented from entering or leaving the waste management areas by the design and construction of the bunkers. The MSB are constructed of concrete and covered by earthen materials. The slope of the earthen materials covering each of the bunkers prevents run-on of storm water. The concrete provides a barrier to moisture. In Type B and Type C bunkers, a 6-ft drain tile is located on the exterior perimeter, so that any water that percolates through the earthen fill is drained away from the bunkers. The drive at the front of each bunker is level or sloped gently away from the bunker doors. Drainage control features (e.g., run-on/run-off, drainage barriers) are shown on Figure 30 in Permit Attachment L (*Figures*).

A.7 THE CORRECTIVE ACTION MANAGEMENT UNIT

The CAMU is a 3.75-acre area located in the southeast corner of TA-III at SNL as shown in Figure 2 and Figure 31 of Permit Attachment L (*Figures*). The CAMU was used for treatment, storage, and containment of RCRA Subtitle C- and Toxic Substances Control Act (TSCA)-regulated wastes that were generated during remediation work at the Chemical Waste Landfill located adjacent to and at the southeast portion of the Unit. The Unit was closed with wastes remaining in place in the containment cell. All aboveground facilities, including the Bulk Waste Staging Area, Containerized Waste Staging Area, Treatment Pad, and the Sprung™ Structures have been clean-closed. The CAMU containment cell contains approximately 31,800 cubic yards of hazardous and toxic wastes. The CAMU containment cell also contains soils having low levels of tritium (up to 20,000 picocuries per liter soil moisture). The containment cell is covered with a 5-foot-thick cover system consisting of a layer of 60-mil high-density polyethylene on top of the waste, which, in turn, is covered by bedding sand, pea gravel, filter sand, a native soil blend, and a topsoil layer.

The CAMU incorporates a less-than-90-day waste accumulation area (leachate storage area) north of the containment cell. This area is used to store leachate periodically pumped from the containment cell leachate collection and removal system (LCRS). The leachate is placed into 55-gallon drums. The leachate consists of wastewater containing low levels of hazardous constituents, polychlorinated biphenyls (PCBs), and tritium.

A.7.1 CAMU Access

Figure 32 of Permit Attachment L (*Figures*) presents the configuration of the CAMU and delineates the containment cell, which is subject to post-closure care. A contiguous four-strand,

barbed-wire fence delineates this boundary. Locked gates located at the northern and southern perimeter boundaries provide access to the CAMU containment cell and leachate storage area. A complete description of the security procedures applied at the CAMU is in Section H.4 of Permit Attachment H (*Post-Closure Care Plan for the Corrective Action Management Unit*).

A.7.2 General Description of the CAMU

Prior to closure, the CAMU consisted of four waste staging areas: the bulk waste staging area; the Sprung™ structures, the containerized waste staging area, and the treated waste staging area. Operating areas also included a treatment pad with two temporary treatment systems, and a containment cell. Support areas at the CAMU included an equipment decontamination pad, storm-water retention ponds, and less-than-90-day storage areas for the containment-cell leachate collection tanks and the decontamination-pad wash water storage tanks. All hazardous waste and hazardous waste residues were removed from the waste staging areas, treatment pad, and support areas at the CAMU, and the pad and areas were closed under the New Mexico Hazardous Waste Management Regulations. The CAMU containment cell was closed with waste remaining in place. The containment cell and supporting infrastructure are subject to the post-closure requirements contained in Permit Part 7 of this Permit, and are subject to the regulations at 20.4.1.500 NMAC, incorporating 40 CFR §§ 264.117 through 264.120 and 264.552(e)(6).

A.7.3 CAMU Leachate Management

Whenever leachate is being pumped, poured, or otherwise handled, Unit personnel shall meet all applicable preparedness and prevention requirements in Permit Part 2. Unit personnel shall implement the Contingency Plan (Permit Attachment D) in response to emergencies.

The Permittees shall clean up spills promptly in accordance with Permit Section 2.12, and shall notify the Department in accordance with Permit Part 2. At least two verification samples shall be collected and analyzed to ensure complete cleanup has been achieved. Additional verification samples may be required by the Department depending on the magnitude of the spill. Quality control samples shall also be collected in accordance with the applicable requirements in Permit Part 8.

A.7.4 CAMU Leachate Collection and Removal

The LCRS sump shall be inspected on a quarterly basis for the presence of leachate in accordance with Permit Attachment E, Section E.10.4. Leachate shall be pumped into 55-gallon drums or other suitable containers, characterized according to Permit Attachment C, and managed appropriately.

A.7.5 CAMU Less-Than-90-Day Accumulation Area

Hazardous waste managed at the CAMU includes leachate generated from the LCRS and personal protective equipment (PPE) waste generated during the management and sampling of leachate. Hazardous constituents may include, but are not limited to, organic compounds, semivolatile organic compounds, and toxic and heavy metals. The leachate may also be contaminated with low

levels of PCBs and tritium. The U.S. EPA Hazardous Waste Number for leachate is F039. Containers of hazardous waste managed within the CAMU less-than-90-day waste accumulation area shall be managed in accordance with applicable regulations in 20 NMAC 4.1.300, incorporating 40 CFR Part 262.34(a).

The less-than-90-day waste accumulation area consists of a rectangular area covered with aggregate. Containerized leachate shall be accumulated in 55-gallon drums or other suitable containers on spill containment pallets to prevent the accidental discharge of leachate to the ground surface. The containers shall be staged in a manner that maintains sufficient aisle space to allow the unobstructed movement of personnel and equipment to any portion of the less-than-90-day waste accumulation area. No more than 100 containers of leachate shall be accumulated in the area at any given time.

A.7.6 Description of the CAMU Containment Cell

The CAMU containment cell consists of an engineered liner and final cover systems that are designed to minimize the migration of hazardous waste and constituents into the environment. In addition to the cell liner and final cover systems, the containment cell incorporates a vadose zone monitoring system (VZMS) and a leachate collection and removal system (LCRS). Details of the CAMU containment cell size plan, liner details and associated features are presented in Figures 33, 34, and 35 of Permit Attachment L (*Figures*).

The CAMU containment cell contains approximately 31,800 cubic yards of remediation wastes that were generated as part of corrective action activities at the chemical waste landfill (CWL), a hazardous waste landfill located adjacent to the CAMU.

A.7.6.1 Containment Cell Liner System

The containment cell liner system includes bottom liner and sidewall liner components.

A.7.6.2 Bottom Liner Components

The bottom liner components include the following in descending order:

1. Leachate Collection and Removal System
2. Geomembrane liner
3. Geosynthetic clay liner

Each of these bottom liner components is discussed in detail as follows.

A.7.6.3 The Leachate Collection and Removal System

The leachate collection and removal system (**LCRS**) is designed to collect and withdraw leachate from the cell. The LCRS includes a lined sump in the north end of the containment cell, a collection pipe in a central trench located above the geomembrane liner, a pump that removes leachate that collects in the sump, and a geocomposite drainage layer.

The central trench traverses the bottom of the containment cell from the south to the north and is sloped approximately 1 percent toward the north. The bottom of the containment cell is sloped approximately 2 percent to drain toward the central trench. The trench receives leachate from the geocomposite drainage layer. The collection pipe in the bottom of the trench is constructed of slotted 4-inch-diameter polyvinyl chloride (PVC) pipe and provides access for a portable pump to the LCRS sump. The pump delivers leachate to 55-gallon drums or other suitable containers. Additional details of the leachate collection process and system inspection/maintenance/repair are presented in Sections E.9 and H.4.3 of Permit Attachments E and H.

A.7.6.4 Geomembrane Liner

A 60-mil high-density polyethylene (HDPE) geomembrane liner lies across the entire containment cell and below the LCRS and acts as the initial barrier to minimize leachate migration from the CAMU. A second 60-mil HDPE liner is located in the LCRS sump area to provide redundant protection in this area.

A.7.6.5 Geosynthetic Clay Liner

A Geosynthetic clay liner (GCL) underlies the geomembrane and functions as a leachate barrier layer in the event that the overlying HDPE geomembrane fails. The GCL is located directly above the prepared wicking materials in the bottom of the cell and over the prepared side slopes. The GCL consists of non-woven, geotextile with its outer layers needle-punched through an inner layer of low-permeability sodium bentonite.

A.7.6.6 Sidewall Liner Components

The sidewall liner components include the following in descending order:

1. Protective cover sheet
2. Geomembrane
3. GCL
4. Prepared subgrade

A.7.6.7 Protective Cover Sheet

A 60-mil HDPE cover sheet lies above the LCRS trench on the north and south side slopes of the cell. The protective cover sheet is field-welded to the geomembrane liner at the edges of the LCRS trench.

A.7.6.8 Geomembrane

A 60-mil HDPE geomembrane liner comprises the uppermost layer on the sidewalls of the cell. The geomembrane provides the initial barrier to minimize leachate migration from the CAMU.

A.7.6.9 GCL

The sidewall liner GCL is identical to the bottom liner GCL described in Section A.7.8.5 of this Permit Attachment.

A.7.6.10 Prepared Subgrade

The prepared subgrade lies below and in direct contact with the GCL. The base below the subgrade was compacted and was constructed to be free of roots, debris, large voids, and rocks greater than 0.5 inch in diameter.

A.7.6.11 Final Cover System

The final cover system design incorporates a capillary barrier and vegetative cover. A HDPE liner is positioned at the base of the final cover system. In addition to the vegetative cover component, engineering controls will be applied to minimize erosion of the final cover. These include slope, surface-water runoff, and perimeter surface-water flow control. The crown of the final cover slopes to the north, south, east, and west at a 3-percent grade. Transition slopes range from 8:1 to 4:1. This design facilitates low-profile mounding and gentle slopes that enhance resistance to erosion caused by wind and precipitation. A plan-view drawing of the completed containment cell showing the final cover configuration and associated perimeter drainage pathways is presented on Figure 36 in Permit Attachment L (*Figures*).

The final cover system components, as shown on Figure 37 of Permit Attachment L (*Figures*), include the following in descending order:

1. Topsoil and native soil blend
2. Filter sand and pea gravel
3. Bedding sand and HDPE liner

A.7.6.12 Topsoil and Native Soil Blend Layers

The purpose of the topsoil and native soil blend layers is to provide a growing media for the vegetative cover, which consists of native plants. This enhances evapotranspiration and reduces infiltration. The 6-inch-thick topsoil layer is comprised of existing surface soil stripped from the containment cell area during CAMU construction, other surface soil from the Facility, and surface soil from off-site locations with properties similar to the soil in the vicinity of the CAMU. The uppermost portion of the topsoil layer contains a 1-inch-thick gravel mulch layer used to armor the cover surface and reduce the effects of erosion.

The 36-inch-thick native soil blend layer underlies the topsoil layer and was constructed to be free of organic matter, rubble, trash, and deleterious substances. The topsoil layer provides a suitable root bed for the vegetative cover while the underlying native soil blend layer allows for more moisture storage and facilitates further root penetration.

A.7.6.13 Filter Sand/Pea Gravel Layers

A capillary barrier, comprised of a 4-inch-thick filter sand layer and a 6-inch-thick pea gravel layer, lies beneath the native soil blend. The sand layer beneath the native soil blend promotes lateral movement of percolating water and reduces the migration of fines from the native soil blend into the underlying pea gravel layer.

A.7.6.14 Bedding Sand Layer and HDPE Liner

An 8-inch-thick bedding sand layer underlies the pea gravel layer and provides protection to the underlying HDPE liner. The HDPE liner is included in the final cover design as an additional measure of protection. The flexible HDPE membrane liner consists of a 60-mil-thick, textured HDPE produced from specially formulated polyethylene resin. The HDPE liner lies over the waste material, buttress soil, and extended slope, and is keyed into an anchor trench along the perimeter of the containment cell.

A.7.6.15 Vadose Zone Monitoring System (VZMS)

The VZMS is designed to provide real-time information on containment cell performance with respect to early detection of any leaks from the containment cell.

The VZMS consists of the following three subsystems:

1. The Primary Subliner (PSL) Monitoring Subsystem
2. The Vertical Sensor Array (VSA) Monitoring Subsystem
3. The CWL and Sanitary Sewer Line (CSS) Monitoring Subsystem

The three subsystems, shown on Figures 38 and 39 of Permit Attachment L (*Figures*), are used in an integrated fashion to detect any leakage from the containment cell, and to provide information that can be used to distinguish false detections caused by leakage from the sanitary sewer line or constituent migration from the CWL.

A.7.6.16 Primary Subliner Monitoring Subsystem

The Primary Subliner (PSL) Monitoring Subsystem is the primary monitoring subsystem of the VZMS and is designed to provide early leak-detection capability. It consists of five parallel-trending, sub-horizontal, vitrified clay pipes (VCPs) located 5 feet below the containment cell bottom liner, with horizontal spacing of 17 to 27 feet (see Figures 38 and 39 in Permit Attachment L (*Figures*)). A PVC access tube is connected to the ends of each VCP to facilitate the deployment of a neutron probe for moisture monitoring. The neutron probe is manually moved through the VCP during monitoring events. Figure 40 of Permit Attachment L (*Figures*) presents a cross-sectional view of the PSL monitoring subsystem components.

A.7.6.17 VSA Monitoring Subsystem

The VSA Monitoring Subsystem will be used to monitor both lateral and vertical soil gradient information on *in situ* soil moisture, temperature, and soil gas, as required (see Table H-1 of Permit

Attachment H). It consists of 11 vertical boreholes located below the containment cell, including one beneath the LCRS sump (see Figure 38 and Figure 39 in Permit Attachment L (*Figures*)). Each borehole contains a sampling point at 5 and 15 feet below the containment cell liner, as well as the following three components: a time-domain reflectometry soil-moisture content probe, a temperature sensor, and an active soil-gas sampler. Instrumentation cabling and tubing is ducted to the surface outside of the containment cell liner perimeter. Figure 41 of Permit Attachment L (*Figures*) presents a cross-sectional view of the VSA Monitoring Subsystem components.

A.7.6.18 Chemical Waste Landfill and Sanitary Sewer Line Monitoring Subsystem

The Chemical Waste Landfill and Sanitary Sewer Line (CSS) Monitoring Subsystem is designed to detect and identify leakage of moisture and hazardous constituents from the sanitary sewer line should such leakage occur, as well as volatile organic compounds that could potentially migrate from the CWL toward the containment cell. The CSS subsystem consists of six vertical, 20-foot-deep boreholes, spaced approximately 100 feet apart in a line parallel to the sanitary sewer line (see Figures 38 and 39 in Permit Attachment L (*Figures*)). Each borehole is equipped with a well screen suitable for soil gas sampling or for deployment of a neutron probe for soil moisture monitoring. Figure 42 of Permit Attachment L (*Figures*) presents a cross-sectional view of the CSS monitoring subsystem components.