

PERMIT ATTACHMENT H POST-CLOSURE CARE PLAN FOR THE CORRECTIVE ACTION MANAGEMENT UNIT

H.1 INTRODUCTION

This post-closure care plan addresses the post-closure activities that shall be performed at the Corrective Action Management Unit (CAMU) by the Permittees. The CAMU is used for the containment of hazardous and toxic wastes that were generated during remediation activities at the Chemical Waste Landfill (CWL), which is located 100 yards southeast of the CAMU. The CWL is regulated by a stand-alone Post-Closure Care Permit.

This post-closure plan incorporates the requirements of 40 CFR § 264.117 through § 264.120 and § 264.552(e)(6). Post-closure care of the CAMU began on October 15, 2003, and shall continue for 30 years after that date, except that the 30-year post-closure care period may be shortened or extended, as specified in Part 7 of this Permit.

Additional information on post-closure waste management practices to be conducted at the CAMU, and a description of the Unit is provided in Permit Attachment A (*Facility Description*).

During the post-closure care period, the CAMU containment cell shall be monitored and maintained in a manner that shall ensure protection of human health and the environment. The potential for exposure shall be minimized by means of employing the following:

1. Engineered barriers shall be maintained to minimize the migration of leachate into the surrounding environment;
2. Security measures shall be maintained to restrict access to the area; and
3. Inspections, maintenance, and repairs shall be performed as needed and in accordance with Permit Attachment E and this Permit Attachment.

H.2 STORM-WATER DIVERSION STRUCTURES

During post-closure care, the function of storm-water diversion structures associated with the containment cell is to prevent storm-water run-on and runoff from eroding the final cover and to reduce the amount of water that potentially could infiltrate into the final cover. As shown in Figure 36 of Permit Attachment L (*Figures*), the two storm-water diversion structures associated with the containment cell are the site diversion ditch and the containment cell perimeter drainage swale. Storm-water run-on is diverted away from the containment cell by the site diversion ditch where it is directed toward existing surface-water drainage features. Storm-water runoff from the containment cell cover is directed to the perimeter drainage swale where it is discharged off-site via an outfall.

H.3 SECURITY

Figure 32 of Permit Attachment L (*Figures*) shows the post-closure perimeter boundary for the CAMU containment cell area. A contiguous four-strand, barbed-wire fence with two main gates

delineates this boundary. The gates are locked when authorized personnel are not present at the CAMU; only authorized personnel control access. Warning signs stating, “*Danger—Unauthorized Personnel Keep Out*” are posted on all sides of the CAMU fence at 100-foot intervals, at the main gate, and at the emergency exit. The warning signs are legible from a distance of at least 25 feet, visible from any approach to the CAMU, and are posted in both Spanish and English.

H.4 MAINTENANCE AND REPAIRS

Maintenance and repairs shall be conducted as required in this Permit Attachment and in accordance with Permit Attachment E, Section E.3 and Table E-6.

H.4.1 Final Cover System

Water shall be prevented from ponding on the surface of the CAMU cover in any area in excess of 100 square feet. The Permittees shall prevent the establishment of deep-rooted plants, such as shrubs and trees by identifying such species during quarterly inspections and eliminating them before they become established. The plants shall be killed within 60 days or as soon as seasonal conditions are favorable for eliminating them.

Cover damage that exceeds the limits described in Permit Attachment E, Section E.10.2 and Table E-6, shall be repaired within 60 days to a condition that meets or exceeds the original design. Repair specifications shall include, but not be necessarily limited to, the following.

Animal intrusion burrows, settlement areas, and areas of erosion shall be backfilled and compacted using non-contaminated soil with properties similar to the soil used to construct the final cover. The soil shall meet the original construction specifications for the CAMU final cover. The Permittees shall make reasonable attempts to relocate animals prior to backfilling their burrows.

Areas with no vegetation in excess of 200 square feet shall be reseeded in accordance with the original construction specifications for the CAMU final cover. If seasonal conditions (e.g. temperature) are not appropriate for establishing vegetation within 60 days, repairs shall be completed as soon as possible when appropriate conditions occur. Where necessary, the topsoil layer and gravel mulch surface shall be repaired to provide a suitable seedbed. The repair shall be done using materials meeting the original specifications of the CAMU final cover.

H.4.2 Storm-Water Diversion Structures

Based upon the results of the storm-water diversion structure inspections, erosion or damage that exceeds the limits described in Permit Attachment E, Section E.10.3 and Table E-6 shall be repaired within 60 days to a condition that meets or exceeds the original design. Silt and debris accumulations that exceed the above specified limits shall be removed within 60 days.

H.4.3 LCRS

The LCRS pump and plumbing shall be maintained/repared as necessary to maintain them in good condition based upon the results of quarterly inspections. Maintenance/repairs shall be done within 60 days of discovery that the maintenance/repairs are needed.

H.4.4 VZMS

The VZMS components shall be maintained/repared within 60 days, as needed, to maintain them in good condition, based upon inspection results. Activities shall include, but not be limited to, maintaining protective casings, access covers/doors, and instrumentation access boxes, ensuring the PSL and CSS compression caps are in good repair, cleaning or replacing locks as necessary, and maintaining calibration and proper operating condition of all electronic monitoring systems. Maintenance/repair activities shall also include ensuring that all aboveground VZMS components are protected from the weather.

H.4.5 Security Fencing and Signage

The fence, gates, and warning signs shall be maintained/repared within 60 days, as needed, to maintain them in good condition, as indicated by quarterly inspections. Activities shall include, but are not limited to, the following as needed: removing excessive accumulations of wind-blown plants and debris, repairing broken wire sections and posts, repairing and oiling gates, cleaning or replacing locks, and repairing or replacing warning signs.

H.5 VADOSE ZONE MONITORING SYSTEM LEAK DETECTION MONITORING FREQUENCY AND ASSESSMENT

Sampling and analysis plans (SAPs) for the PSL, VSA, and CSS monitoring subsystems are included in Sections H.6, H.7 and H.8 of this Permit Attachment, respectively, and related Sandia National Laboratories/NM (SNL/NM) Field Operating Procedures (FOPs) are summarized in Table H-2. The purpose of these SAPs is to document procedures for the collection and reporting of consistent, reliable, defensible, and comparable sampling results. Other instructions are provided in SNL/NM FOPs; however, the requirements of the SAPs in this Permit Attachment shall take precedence over any cited FOPs. The most current versions of these FOPs shall be consulted for the purpose of conducting vadose zone monitoring.

The Permittees shall provide to the New Mexico Environment Department (the Department) within 60 days of the effective date of this Permit in hard copy and electronic format the current versions of the FOPs cited in this Permit Attachment. The Permittees shall provide the Department with any updated versions of the FOPs within 30 days of their acceptance by the Permittees. If any requirement or procedure is found by the Department to be unacceptable for reasons including, but not limited to, the requirement or procedure will or could prevent the acquisition of representative and reliable sampling results, the requirement or procedure shall be replaced by the Permittees with a different requirement or procedure that is acceptable to the Department.

TABLE H-1 Vadose Zone Monitoring System Post-Closure Monitoring Frequency, Parameters, and Methods				
Time Frame	Monitoring Frequency	Monitoring System	Monitoring/Sampling Parameter	Monitoring Method
Years 2–30 after closure ^a	Quarterly	PSL	Moisture Content	Neutron Probe
		VSA	Soil Moisture Content Temperature	TDR probe Temperature Sensor
		CSS	Moisture Content	Neutron Probe
	Annually ^b	VSA	Active Soil Gas	EPA Method TO-14 or equivalent, as revised and updated ^c
		CSS		

TDR Time domain reflectometer

a Closure of the Unit was completed in October 2003.

b Active soil-gas sampling shall be conducted annually unless increased soil moisture is detected, in which case active soil-gas sampling shall be conducted on a quarterly basis.

c Method TO-14 or an equivalent method such as TO-15 that includes the same analyte list, method detection limits equal to or lower than the TO-14 limits, and provides the same or higher level of data quality. Methods from *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Second Edition* (EPA/625/R-96/010b), 1999, as revised and updated.

Table H-2 Applicable SNL Operating Procedures^a	
Procedure Number	Procedure Title
FOP 08-20	Soil Moisture Determination Utilizing Neutron Logging
FOP 08-21	Soil Moisture Monitoring Using Time Domain Reflectometry
FOP 08-22	Soil Vapor Sampling

^a Sandia National Lab's Procedures (procedures will be used as revised and updated)

H.5.1 Frequency

During the initial stages of the post-closure care period, the primary subliner (PSL), vertical sensor array (VSA), and chemical waste landfill and sanitary sewer line monitoring subsystems

(CSS) of the vadose zone monitoring system (VZMS) were monitored on a monthly and annual basis for one year. Monitoring shall continue on a quarterly and annual basis for the remainder of the monitoring period unless corrective action is required because of a release of hazardous waste or constituents. A summary of the VZMS post-closure monitoring frequency, parameters, and methods are presented in Table H-1 of this Permit Attachment.

H.5.2 Assessment

As part of each monitoring event, soil moisture content and soil gas results obtained from the VZMS shall be evaluated to determine if there has been leakage or a release of soil gas from the containment cell and, if so, the character and magnitude of the leak or release.

H.5.2.1 Soil Moisture

In the case of a soil moisture increase greater than 4 percent above baseline (expressed as gravimetric percent moisture content at CSS and PSL locations or expressed as volumetric percent moisture content at VSA locations) at any monitoring location(s), the Permittees shall immediately confirm the result by collecting and analyzing additional samples. If a second analysis confirms that the trigger level has been exceeded, the Permittees must notify the Department in writing within seven days after receipt of the second analysis confirming that the trigger level has been exceeded during the particular sampling event. Within 180 days, the Permittees shall evaluate the soil moisture data to determine the likely location and source of the moisture and report the results in writing to the Department. If the likely source is the sanitary sewer line, the Permittees shall continue monitoring and shall take action if necessary to locate, reduce, and/or eliminate the source of the moisture.

If the likely source is the containment cell, the Permittees shall initiate corrective action as specified below.

H.5.2.2 Soil Gas

If a soil-gas sample result exceeds a trigger level of 20 parts per million by volume (ppmv) total volatile organic compounds (VOCs), the Permittees shall immediately confirm the result by collecting and analyzing additional samples. If a second analysis confirms that the trigger level has been exceeded, the Permittees must notify the Department in writing within seven days after receipt of the second analysis confirming that the trigger level has been exceeded during the particular sampling event.

H.5.2.3 Corrective Action

The Permittees shall submit, within 180 days of confirmation that the trigger level for soil gas has been exceeded, an evaluation of soil gas data in the vicinity of the CAMU, including data for the CWL. The evaluation shall include a determination of the source of the soil gas, and an evaluation of whether the increased soil gas will cause groundwater contamination of any hazardous constituent to exceed the cleanup levels specified in Permit Part 8. After the Department has reviewed and approved the evaluation, and the source is determined to be the

CAMU, the Permittees shall submit, within 180 days, an application for a permit modification to establish a corrective action program for the CAMU. The application must include at a minimum, a detailed description of the corrective action that will be taken by the Permittees to reduce the concentrations of soil gas to levels that will not exceed the trigger level of 20 ppmv total VOCs, and the action that will be taken to reduce the concentrations of soil gas to levels that will not cause groundwater contamination of any hazardous constituent to exceed the cleanup levels specified in Permit Part 8. The application shall also include a plan for a soil-gas monitoring program that will demonstrate the effectiveness of the corrective action.

For soil moisture, if the Permittees have determined that the likely source of increased moisture is the containment cell, the Permittees shall submit within 180 days an application for a permit modification to establish a corrective action program for the CAMU. The application must include at a minimum, a detailed description of the corrective action that will be taken by the Permittees to stop the release.

All applications for corrective action shall contain a schedule for implementation of the corrective action, and shall describe any necessary characterization and cleanup of the vadose zone and groundwater that must be accomplished to protect human health and environment in accordance with the requirements of Permit Section H.1 and Permit Part 8.

H.6 SAMPLING AND ANALYSIS PLAN FOR THE CAMU PRIMARY SUBLINER MONITORING SYSTEM

The Primary Subliner (PSL) is one of three vadose zone monitoring systems associated with the Corrective Action Management Unit (CAMU) containment cell. Monitoring using the PSL Monitoring Subsystem shall be conducted to verify containment cell integrity and performance. This Sampling and Analysis Plan (SAP) describes the monitoring and sampling strategy for the PSL that shall be used during post-closure care.

The PSL is the primary monitoring system for the containment cell. It consists of five parallel-trending, horizontal, vitrified clay pipes (VCPs) located 5 feet below the containment cell bottom liner, with horizontal spacing of 17 to 27 feet. A polyvinyl chloride access tube is connected to the ends of each VCP to facilitate the deployment of a neutron probe for moisture monitoring. The access tubes open on the north and south sides of the containment cell. A neutron probe is manually moved through the VCP during monitoring events.

Monitoring requirements for the post-closure care period are specified in Table H-1 of this Permit Attachment.

H.6.1 Monitoring Methods

Moisture monitoring in the PSL subsystem involves measuring soil moisture content through each VCP using a neutron probe. The moisture sensor will be a California Pacific Nuclear (CPN) 503DR Hydroprobe Moisture Depth Gauge, or equivalent. The CPN 503DR probe uses a 50.0-millicurie americium-241:beryllium neutron source for moisture content measurement. With the custom-made cable-and-winch system available at the Facility, the CPN 503DR probe

can be configured to move through each VCP while communicating with the control box on the surface.

Following neutron logging, the calculated moisture content data shall be entered onto a computer spreadsheet for evaluation. Moisture monitoring shall be conducted in accordance with FOP 08-20 (most current version).

H.6.2 CPN 503DR Hydroprobe Moisture Depth Gauge QA/QC and Correlation

The CPN 503DR Hydroprobe Moisture Depth Gauge is used to measure absorption of emitted neutrons and is a geophysical technique to measure soil moisture content. The assumption is made that the hydrogen in soil moisture is the dominant absorber of the emitted neutrons.

The CPN 503DR probe shall be operated in accordance with FOP 08-20. The standard count measures the proper function of the gauge electronics and also compensates for the source decay. This measurement shall be performed daily when the probe is used, as described in the FOP.

The correlation of neutron counts to soil moisture content using the CPN 503DR neutron probe was initially performed in a vessel that duplicated as closely as possible the *in situ* characteristics at the field measuring location. The probe was inserted into the access tube within the vessel, and count readings were taken for a known soil moisture content in the repacked native soil. The resulting neutron count/soil moisture content relationship was used to develop the initial correlation currently used for the instrument, which associates a neutron count to a known soil moisture content. To ensure the accuracy of the moisture measurement using the correlation formula the neutron probe must be recalibrated to account for source decay and drift of the electronic counting system. During calibration the probe response is restored to the same condition as existed when the correlation formula was determined. The probe shall be returned to the manufacturer annually for calibration.

H.7 SAMPLING AND ANALYSIS PLAN FOR THE CAMU VERTICAL SENSOR ARRAY MONITORING SYSTEM

The Vertical Sensor Array (VSA) monitoring subsystem provides both lateral and vertical gradient information on *in situ* soil moisture, soil temperature and soil gas. Sampling and analysis via the VSA monitoring system shall be conducted to verify the integrity and performance of the CAMU containment cell. This Sampling and Analysis Plan (SAP) describes the monitoring and sampling strategy that shall be used for the VSA during post-closure care.

The VSA monitoring subsystem consists of 11 vertical boreholes located below the containment cell. Each borehole contains sampling points at 5 and 15 feet below the containment cell liner. The sampling points contain the following three components: a time-domain reflectometry (TDR) soil-moisture 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. The cabling and tubing connection ends for each VSA borehole are located within individual weatherproof, aboveground enclosures positioned around the perimeter of the containment cell.

H.7.1 Monitoring and Sampling Strategy

Monitoring requirements for the VSA are also outlined in Table H-1 of this Permit Attachment.

TDR moisture monitoring and temperature monitoring will be conducted in accordance with FOP 08-21.

H.7.2 Sampling Methods and Analytical Procedures

The soil gas-sampling package consists of a 2-inch-diameter and 6-inch-long, end-capped and slotted polyvinyl chloride screen at the sampling location, connected to the ground surface by 1/4-inch-inside-diameter Teflon™ tubing. Except as required herein, soil gas sampling shall be conducted in accordance with FOP 08-22.

Laboratory sample custody, data management, reporting, and sample disposal shall be performed in accordance with established laboratory procedures. Analytical procedures shall follow established laboratory standard operating procedures based upon the referenced EPA method. Active soil gas sampling shall be conducted for volatile organic compounds included in EPA Methods TO-14 or equivalent analytical method.

Except as required herein, Table H-2 of this Permit Attachment lists the field procedures that will be used in support of this SAP. These procedures provide instructions for conducting VSA monitoring and sampling operations. For each scheduled sampling event on Table H-2, field and laboratory quality assurance (QA) samples shall include duplicate samples and trip and field blanks in accordance with the procedure and the TO-14 or equivalent analytical method.

H.7.3 Time-Domain Reflectometer and Data Acquisition Software and QA/QC

The TDR100 Time-Domain Reflectometer and PC-TDR software will be operated in accordance with the FOP 08-21 and the Campbell Scientific, Inc. TDR100 Instruction Manual (Campbell Scientific, Inc., April 2002).

The reflectometer will be operated and tested according to the operator's manual as discussed in FOP 08-21. Predetermined settings for the cable length, waveform, and probe for each monitoring location are entered into the PC-TDR software to ensure capture of the waveform signal to determine soil volumetric water content.

H.8 SAMPLING AND ANALYSIS PLAN FOR THE CHEMICAL WASTE LANDFILL AND SANITARY SEWER LINE MONITORING SYSTEM AT THE CAMU

The Chemical Waste Landfill (CWL) and Sanitary Sewer Line (CSS) monitoring subsystem is designed to allow detection and identification of leakage from the sanitary sewer line, as well as volatile organic compounds (VOCs) that could potentially migrate from the CWL towards the CAMU containment cell. This SAP describes the monitoring and sampling strategy that shall be used for the CSS monitoring system during post-closure care.

The CSS monitoring subsystem is located east of the containment cell and consists of six vertical, 20-foot-deep boreholes, spaced approximately 100 feet apart in a line parallel to the north-south oriented sanitary sewer line. Each borehole is equipped with galvanized steel casing suitable for deployment of a neutron probe for soil moisture monitoring and a sampling port used to collect soil gas samples.

H.8.1 Monitoring and Sampling Strategy

Monitoring shall also be conducted as specified in Table H-1 of this Permit Attachment. The CSS monitoring system shall be used to perform the following activities:

1. Detect liquid releases from the sanitary sewer line, thereby providing information to eliminate false positive detections at the other vadose zone monitoring systems. Potential releases from the sanitary sewer line would be of an aqueous nature and could contain nitrates and perhaps phosphates and sulfates. VOCs originating from the sanitary sewer line are not anticipated; and
2. Detect VOC vapors migrating northwest through the vadose zone toward the containment cell from residual contamination at the CWL.

A neutron probe shall be used at the CSS monitoring locations to measure soil moisture. During a monitoring event, the probe is manually lowered to the selected monitoring point inside the galvanized steel casing. Moisture monitoring within the CSS shall be conducted following FOP 08-20.

H.8.2 Sampling Methods and Analytical Procedures

The CSS monitoring points shall also be used for soil gas sampling to detect and identify VOC vapors that may potentially migrate toward the containment cell from residual contamination at the CWL. Except as required herein, soil gas sampling shall be conducted in accordance with FOP 08-22.

An analytical laboratory under contract to the Permittees for the Facility shall be used to provide the analytical services. Laboratory sample custody, data management, reporting, and sample disposal shall be performed in accordance with established laboratory procedures. Active soil gas sampling shall be conducted for VOCs included in EPA Methods TO-14 or equivalent analytical method.

Except as required herein, Table H-2 of this Permit Attachment lists the field procedures that shall be used in support of this SAP. These procedures provide instructions for CSS monitoring and sampling operations. For each scheduled sampling event prescribed by Table H-1 of this Permit Attachment, field and laboratory quality assurance (QA) samples shall include duplicate samples.

The Permittees shall perform the QA/QC checks and correlations for the CPN 503DR Hydroprobe Moisture Depth Gauge as set forth in Section H.6.2 of this Permit Attachment, and shall operate the probe in accordance with FOP 08-20.

H.9 ANNUAL REPORT

The Permittees shall submit to the Department a certified annual report describing the post-closure care conducted at the CAMU for the previous year. The annual report shall be submitted no later than March 31 of every year that post-closure care takes place. The report shall summarize the results of required inspection and maintenance/repair activities indicating whether repairs were effective and met the applicable CAMU construction or Permit maintenance specifications. The report shall also summarize sampling results, leachate generation, and any problems, leaks, or releases that either endangered or presented significant potential to endanger human health or the environment and what was done to mitigate such problems, leaks, or releases.

H.10 CERTIFICATION OF COMPLETION OF POST-CLOSURE CARE

Within 60 days of the end of the post-closure care period for the CAMU, the Permittees shall submit to the Department, by registered mail, a written certification that post-closure care for the CAMU was performed in accordance with the specifications of this Permit including this Permit Attachment. Responsible officials of the Permittees, as well as an independent registered professional engineer, shall sign the certification. Documentation supporting the independent registered professional engineer's certification of completion of post-closure care shall be furnished by the Permittees to the Department upon request. In addition, the Permittees shall prepare a final post-closure care report summarizing pertinent information regarding post-closure monitoring, maintenance, and repair activities and any variances from this Permit Attachment and the reasons for the variances. The post-closure care report shall be provided with the certification to the Department within 60 days of the end of the post-closure period. Transmittal of the report shall include a request from the Permittees for the Department to approve termination of post-closure care for the CAMU. However, submittal of the latter request does not obligate the Department to terminate post-closure care, and the Department instead, may extend the period of post-closure care if necessary to protect human health and the environment pursuant to 40 CFR § 264.117(a)(2)(ii).