

## **ATTACHMENT D**



## **ATTACHMENT D: POST-CLOSURE CARE PLAN**

### **D.1 Introduction**

The Permittee shall follow the post-closure care requirements in Permit Part III (Post-Closure Care of the Land Treatment Unit) and this attachment. The post-closure care plan consists of two monitoring sequences: detection monitoring below the treatment zone and detection monitoring in groundwater at the point of compliance (the aquifer) over the course of the post-closure care period. The treatment zone is defined as the top five feet of soil. Maintenance activities for the LTU include maintenance of the vegetative cover, control of run-on and run-off, upkeep of signage, upkeep of fencing, and control of wind dispersal (dust suppression).

### **D.2 SOIL AND GROUNDWATER BACKGROUND**

Background soil samples were collected in 1981 from the LTU, prior to any waste application. Additionally, no hazardous waste has been applied to Cell 3 of the LTU, which has been routinely sampled. Data from the 1981 sampling event and from Cell 3 have been used historically as the background data set. Metals concentration in samples obtained from Cell 3 are used as the background concentrations for determining statistically significant increases in hazardous constituents.

Beneath the LTU, a perched water-bearing unit called the Chinle slope wash lies on top of, but is not part of, the Chinle formation. This water bearing unit does not meet the regulatory definition of an aquifer that must be monitored as part of early detection monitoring; however, the Facility samples water from the Chinle slope wash as part of the groundwater monitoring program. Background samples for the Chinle slope wash have not been established. Metals concentrations detected in samples obtained from groundwater monitoring well MW-4 (up-gradient well) are used as background concentrations for groundwater monitoring of the Sonsela aquifer and used to determine any statistically significant increases in hazardous constituents. Detections of any constituents from the Modified Skinner List or detection of mercury or cyanide may generate additional requirements for sampling.

#### **D.2.a Statistically Significant Results**

If sampling results from any sampling event indicate a statistically significant increase in hazardous constituents as defined by 40 CFR 264.278(f) and §264.97(h), then sampling frequency may be modified after consultation with the NMED. If a statistically significant increase is indicated and verified, the Permittee shall submit notification to NMED as required by 40 CFR 264.278(g) and a permit modification of the sampling schedule may be required to further characterize the release.

### **D.3 DETECTION MONITORING**

Unsaturated zone monitoring is intended to determine whether migration of hazardous constituents from the treatment zone has occurred. The number and depth of samples have been selected to adequately detect potential migration of hazardous constituents and also to evaluate the successful treatment, degradation, transformation, and immobilization of constituents in the

treatment zone. The unsaturated zone monitoring includes sampling soil in the zone of infiltration (ZOI), the treatment zone, and groundwater in the Chinle slope wash. Analytical parameters include the constituents on the modified Skinner List, total petroleum hydrocarbons (TPH) as gasoline range organics (GRO) and diesel range organics (DRO). The modified Skinner List is a subset of 40 CFR 261 Appendix VIII constituents and identifies the specific hazardous constituents of concern that are typically found in refinery waste. SMW-4 is used to monitor the Chinle slope wash.

Detection monitoring for groundwater is composed of the monitoring of the Sonsela aquifer and the detection monitoring system consists of MW-1, MW-2, MW-4, and MW-5 and shallow monitoring wells SMW-3, SMW-5, and SMW-6. MW-4 is located up-gradient of the LTU to provide background values. The uppermost aquifer beneath the LTU is the Sonsela, which is a confined aquifer that generally flows to the north/northeast under the LTU. The number and depth of samples and analytical methods have been selected to effectively monitor conditions. Detection monitoring will yield samples that represent the quality of groundwater hydraulically up-gradient groundwater in the Sonsela aquifer that would not be affected by LTU operations and samples that represent the quality of down-gradient groundwater passing the point of compliance. The point of compliance is a vertical subsurface located at the hydraulically down-gradient limit of waste management unit that extends down into the uppermost aquifer underlying the unit.

### **D.3.a Sampling Schedule**

The sampling schedule for the ZOI and the treatment zone provides a sampling frequency based on maximum protection of human health and the environment while minimizing disruption of the LTU and underlying sediments. ZOI (the upper 12 inches of the treatment zone) sampling will confirm treatment of hazardous constituents. During post-closure care, the ZOI shall be sampled three times with minimum disruption of the vegetative cover. Characterization of the ZOI was conducted during a sampling event in 1999. Event 1 (9th year of post-closure care) sampling was conducted in 2009. Event 2 (19th year of post-closure care) and Event 3 (30th year of post-closure care) will be conducted in 2018 and 2029, respectively. The schedule assumes the early sampling events demonstrate that there is no statistically significant increase for any analytes in the ZOI. Initial treatment zone sampling was conducted in 1999 and the sampling frequency parallels the ZOI sampling with the same sampling parameters.

The Chinle Slope wash is sampled using SMW-4. Background values for the Chinle Slope wash are not established and detection of any constituents above regulatory limits may generate additional sampling requirements. The Chinle Slope wash was sampled annually for three years, after three years the wash has been sampled biannually including sampling during Event 1 in 2009. SMW-4 will be sampled during 19 and 30 year post-closure sampling events and in accordance with the *Facility-Wide Groundwater Monitoring Work Plan*, which is updated annually as required by Permit Section IV.C.2.

## **D.4 GROUNDWATER AND SOIL SAMPLING**

Gallup Refinery shall notify the NMED a minimum of 15 days prior to a monitoring event. The Permittee must following proper sample collection and sample handling procedures as outlined in Permit Section IV.J.2 (Investigation, Sampling and Analysis Methods) when implementing

post-closure soil and groundwater sampling. Samples submitted for laboratory testing must be documented on a chain of custody form; all samples must have sample numbers and must be properly labeled.

Cells 1 and 2 of the LTU shall be divided into 6 foot by 6 foot grids (establishing the coordinate at the southeast corner of the LTU) and a random integer generator shall be used to select a minimum of two samples within each LTU cell. ZOI samples shall be collected from approximately one foot (12 inches) beneath the topsoil-ZOI surface. The treatment zone samples shall be taken from the bottom of the treatment zone (approximately five feet below the ground surface). For each monitoring event a total of two samples shall be taken from each boring, one from the ZOI and one from the treatment zone for a total of 12 LTU samples per event. This total does not include QC samples. Samples must not be composited for analysis. Samples will be analyzed for Modified Skinner List analysis and TPH (as GRO and DRO).

Boreholes for sampling shall be advanced using hollow-stem auger drill rig or other method approved in advance by NMED. All equipment and operation changes must be approved by the NMED. A split core barrel sampler shall be used to collect relatively undisturbed soil samples. The samples must be transferred directly to the sample container to maintain the integrity of the sample and prevent the loss of VOCs, if present. The Permittee must follow the requirements of Permit Section IV.J.2 for proper sample collection procedures. Soil screening guidelines are described in Permit Section IV.D (Cleanup Levels). Lithologic logging requirements are outlined in Permit Section IV.J.2.v.d (Logging of Soil Samples). All drill cuttings generated by borehole advancement for soil samples shall be spread within the LTU with little to no disruption of the vegetative cover. All borings shall be backfilled with hydrated bentonite to prevent migration from the treatment zone. Any changes to the sampling procedures must be reviewed by the NMED before sampling is conducted.

Groundwater samples are collected following the procedures outlined in Section IV.J.2.g (Groundwater Monitoring) of the Permit. One sample shall be collected from each monitoring well per sampling event for a total of four groundwater samples, not including the required QC samples.

All samples shall be documented and handled per Section IV.J.2.i (Documentation of Field Activities) in the Permit.

## **D.5 INSPECTIONS**

Inspections shall be conducted as discussed in Permit Section III.C. The LTU is in an isolated area and access is restricted to personnel involved with monitoring and maintenance activities. A Safe Work permit is also required to before entry into the LTU. Inspections of the LTU during post-closure care ensure the detection of structural defects that may occur. Inspections of the LTU shall be conducted each week and after every major precipitation event. The inspector shall inspect the LTU for water accumulation, odors, soil condition, wind erosion, dike conditions, warning sign condition, LTU monitoring equipment, gates, and fences. Dikes shall be inspected to ensure that integrity is maintained to effectively control storm water runoff and run on. The dikes shall be maintained at the minimum height of two feet above the surface of the LTU with a 2:1 sideslope. A record of the inspections, including the date of the inspection and the need for repairs or maintenance must be maintained in the Facility Operating Record. If

repairs are required, then the inspector issues a work order request for needed repairs. The Permittee shall maintain inspection checklists and work orders for all LTU inspections for at least three years.

## **D.6 RESPONSIBILITIES**

All individuals involved in the monitoring program must understand the responsibilities involved in the maintenance and monitoring of the LTU.

### **D.6.a Environmental Manager (EM)**

The EM is responsible for the overall design and implementation of the post-closure care monitoring plan. The EM approves procedures for the conduct of all post-closure monitoring plan activities and reviews and approves reports. The EM oversees interactions between the Gallup Refinery and the NMED regarding environmental monitoring of the LTU. The EM appoints a post-closure monitoring plan team leader and field team, assigning responsibilities as detailed below.

### **D.6.b Team Leader**

The team leader will coordinate and oversee inspections and field sampling activities, ensuring that sampling and associated procedures are followed and that QA/QC and safety guidelines are met. The team leader reviews and evaluates sample data, prepares and reviews LTU inspection logs and reports, and assures that the appropriate samples are collected and analyzed.

### **D.6.c Field Team**

The LTU field team consists of one or more scientists, engineers, or technicians who are responsible for the inspections, sample collection, handling, shipping, and preparation and maintenance of appropriate data sheets, and completion of sample chain of custody forms under the direction of the team leader in accordance with the post-closure care monitoring plan and Facility field procedures. The field team will inspect, maintain, and ensure proper calibration of equipment prior to use at the LTU and ensure site health and safety requirements are met. The field team must communicate with the EM regarding field problems and any changes to methods and procedures.

### **D.6.d Analytical Laboratory**

The contract laboratory used for sample analysis is responsible for supplying sample collection containers and shipping containers to the field team. The laboratory is responsible for performing analysis in accordance with the post-closure monitoring plan, EPA CLP analytical procedures and the data are supported by adequate documentation that meets the NMED's and EPA's requirements and in accordance with Permit Section IV.J.2.n (Documentation of Field Activities) and Section IV.J.3 (Chemical Analysis).

## **D.7 QUALITY ASSURANCE/QUALITY CONTROL**

The Quality Assurance/Quality Control (QA/QC) program must be implemented in accordance with Permit Section IV.J.3.a.iii. Samples shall be analyzed by a commercial laboratory that participates in the EPA's Contract Laboratory Program. Methods are selected to be consistent

with the EPA recommended procedures in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 1997 and as updated) (SW-846). Data analysis shall provide an objective and reliable means for interpreting data in relation to the objectives of the data collection program. The principal goal of data analysis is the comparison of a data point or data set to a fixed standard or to equivalent data collected at another location and time (such as background data or data collected at a control location).

#### **D.7.a Statistical Evaluation of Laboratory Data**

Data shall be analyzed using Cochran's approximation to the Behrens-Fisher Student's T-test. This test shall be used to evaluate soil and groundwater monitoring data for statistically significant differences during the post-closure period. Cochran's approximation to the Behrens-Fisher Student's T-test is:

$$t^* = (X_a - X_b) / ((S_m^2/N_m) + (S_b^2/N_b))^{1/2}$$

Where:  $t^*$  = t star

$X_a$  = mean of the sample

$X_b$  = mean of the background

$S_m^2$  = variance of the sample

$S_b^2$  = variance of the background

$N_m$  = number of samples

$N_b$  = number of background samples

$$t_c = (W_b t_b + W_m t_m) / (w_b + w_m)$$

Where:  $t_c$  = comparison t star

$W_b$  = variance / number of background samples

$t_b$  = t-table with  $(N_b-1)$  degrees of freedom from the 0.05 level of significance

$W_m$  = variance/number of samples

$t_m$  = t-table with  $(N_m-1)$  degrees of freedom at the 0.05 level of significance

The t-star ( $t^*$ ) is compared to the comparison t-star ( $t_c$ ) using the decision rule: If  $t^*$  is equal to or greater than  $t_c$ , then conclude that there most likely has been a significant increase in this parameter; if  $t^*$  is less than  $t_c$ , then conclude that there most likely has not been a change in this parameter.