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**WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY  
SOLID AND HAZARDOUS WASTE DIVISION**

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**SOLID WASTE GUIDELINE #16**

**Landfill Closure and Post-Closure Process**

**1.0 Introduction**

The purpose of this document is three-fold:

- describe the closure and post-closure process for solid waste landfills,
- define the minimum level of documentation which is necessary to demonstrate completion of closure and post-closure activities, and
- define the performance criteria used by the SHWD to evaluate the adequacy of closure and post-closure activities.

*Closure* is the process which a landfill goes through after it stops receiving waste. The goal of this process is to design and construct a final cover system that minimizes the percolation of infiltrated precipitation into the waste. The final cover system is constructed to provide optimal rates of infiltration, evapotranspiration, and run-off which sustain vegetation, prevent erosion and require little or no maintenance.

*Post-closure* is the process which is used to allow a landfill to stabilize to the point where it no longer presents a threat to human health or the environment. During the post-closure period, the closed landfill is carefully and routinely monitored to insure that erosion and settlement do not compromise the final cover system. In addition, the landfill is monitored to detect ground water contamination and the migration of landfill gases.

The information in this document should not be interpreted by operators or SHWD staff as mandatory. Alternative approaches may be appropriate for certifying completion of closure and post-closure care. SHWD will review requests for alternative approaches on a case-by-case basis.

**2.0 Closure Process**

Closure applications must be submitted between 270 and 180 days prior to the date a facility scheduled to close. Most operating permit applications contain a detailed description of closure and

post-closure activities. If this is the case and the operator wants to implement the pre-approved closure and post-closure plan as written, the operator can simply submit a letter indicating that operations are scheduled to be terminated and that the pre-approved closure and post-closure plan will be implemented. The SHWD will then terminate the operating permit and issue a closure permit. If the operator would like to modify the pre-approved closure or post-closure plan, a revised closure permit application must be submitted for review and approval. Once the closure permit application is approved, the SHWD will issue a closure permit. It should be noted that "closure permits" are valid throughout the "closure" and "post-closure" period, and therefore do not have to be renewed.

Typical closure activities may include, but are not limited to, notifying the landfill users of the closure, constructing a final cover, emplacing topsoil, seeding, constructing surface water diversion systems, fencing, surveying and placing a notice on the deed. The specific closure activities and associated specifications should be well-defined in the closure permit application and the closure permit.

The closure process for sanitary landfills must begin within 30 days of the date on which a facility ceases to receive wastes, and must be completed within an additional 180 days. The closure process for industrial and construction/demolition landfills must begin within 9 months of the date on which a facility ceases to receive wastes and must be completed within an additional 12 months. Requests for additional time to complete closure are considered by the SHWD if the operator can demonstrate that the unclosed facility will not pose a threat to human health or the environment. Once all specified closure activities are completed, the operator is required to obtain SHWD approval of closure activities.

The operator should be advised that any environmental monitoring program specified in the closure permit must be continued during the closure process.

### **3.0 Closure Demonstration**

In order to obtain SHWD approval of closure activities, the operator must demonstrate that the site has been properly closed. At a minimum, the SHWD recommends that a closure demonstration should include the following documentation:

#### **3.1 Deed Notice**

The operator should provide a copy of the notice or deed instrument that has been filed with the county clerk's office, and the date of filing. The deed notice should contain a metes and bounds description of the facility boundaries, and descriptions of the wastes disposed, the environmental monitoring system, the surface water diversion system, and the final cover system, as applicable. It is also recommended that the deed notice contain a recommendation to notify the SHWD if disturbance of the site is anticipated. Appendix A contains an example of wording which can be used on a deed notice.

If the facility is located on land leased from the BLM, there is no deed to place a notice on. In this case, the BLM should be asked to place an appropriate notation on the Master Title Plat. For additional details on this process, please contact the Bureau of Land Management.

### 3.2 Posted Notification

For facilities which were open to the public, the operator should provide a publisher's affidavit verifying that the closure notice has been published in an area newspaper.

### 3.3 Final Cover (Compacted Soil)

The operator should provide verification from soil borings, test pits, etc. that the compacted soil layer and the topsoil layer have been placed at the required thicknesses. In addition, the results of field moisture and density testing should be provided to verify that the required construction specifications have been met (see Solid Waste Guideline #13). The locations of soil borings, test pits and field tests should be identified on a plot plan which is the same scale as the final contour map.

### 3.4 Final Cover (Engineered Containment System)

If the facility has an engineered containment system, the operator should provide a copy of the construction quality assurance and quality control reports, field notes, and as-built drawings.

### 3.5 Final Contour Map

If the final elevations or contours of the site vary significantly from those defined in the approved closure permit application, an as-built final contour map should be provided. The final contour map must be provided at a scale of 200 feet (or less) to the inch with five (5) foot contour intervals and contain a north arrow, written and bar scales, references to design details, original drawing and revision dates, and a specific drawing title and number. The final contour map must identify facility boundaries, monitoring wells, permanent surface water structures, settlement markers, the areal extent of all waste disposal units, and the areal extent of the final cover system, and any post-closure surface features (e.g., transfer station, recycling center, storage units). The SHWD recommends that the slopes of the final cover system be at least 3% but no more than 20%, unless erosion control measures are utilized.

When the final cover system is surveyed, it may be useful to establish the location and elevation of several points on the final cover system to allow for monitoring of settlement during the post-closure period.

### 3.6 Seeding

The operator should provide a complete description of reclamation activities, including the dates on which activities were completed. This description may include, but should not be limited to the methods and rates at which soil amendments, fertilizer, seed and mulch were applied. Seed mixtures should be verified with copies of seed bag tags.

### 3.7 Surveyed Corners

If not previously submitted, the operator must provide a plat and legal description, signed in accordance with W.S. 33-29-111 by a Wyoming licensed professional land surveyor, which identifies all corners with permanent survey caps. If permanent survey caps were established previously, it may be necessary to temporarily flag their location for the SHWD's closure inspection.

### 3.8 Surface Water Diversion

If the location, design or construction of the surface water diversion system has been altered significantly from the system defined in the approved closure permit application, as-built maps, cross-sections and construction details should be provided.

### 3.9 Other Activities

The operator should provide a detailed description of any other activities related to closure such as fencing, posting, etc.

### 3.10 Professional Engineer Certification

The operator must provide a closure certification statement which is signed, dated and stamped by a professional engineer who is licensed by the State of Wyoming. This statement must confirm that the provisions of the closure plan have been carried out and that the facility has been closed in compliance with the closure standards specified in the rules and regulations. See Appendix B for an example. Additional information or statements may be provided at the discretion of the professional engineer.

## **4.0 SHWD Evaluation of Closure Demonstrations**

Within sixty (60) days of receipt of a closure demonstration, the SHWD will conduct a review to determine if the information provided is complete and adequate. If the demonstration is incomplete or inadequate, the SHWD will notify the operator. When all of the required documentation is provided and approved, the SHWD may schedule a closure inspection to evaluate and verify the completion of

closure activities. Once the SHWD is satisfied that the site has been properly closed and closure activities documented, the SHWD will notify the operator in writing that closure has been approved and that the post-closure period specified in the closure permit can begin. At this point, the SHWD will also notify the operator that there is no longer a requirement to maintain financial assurance for closure of the facility. Any financial assurance mechanisms which are in place for this purpose will be promptly released.

The focus of the SHWD's review of the closure demonstration is to determine if the approved closure plan has been implemented and if it complies with the applicable closure standards. The focus of the closure inspection is to verify if the information provided in the closure demonstration is representative of the conditions at the site.

## **5.0 Post-Closure Process**

The post-closure period begins once the SHWD notifies an operator in writing that facility closure has been approved. The post-closure period for sanitary landfills which ceased receipt of waste before October 9, 1991, all construction demolition landfills, and industrial landfills excluded from groundwater monitoring under Chapter 3, Section 6(b)(i)(A)(VI) of the Solid Waste Rules and Regulations is a *minimum* of five (5) years. The post-closure period for industrial landfills required to conduct groundwater monitoring under Chapter 3, Section 6(b)(i) of the Solid Waste Rules and Regulations and all sanitary landfills which received waste after October 9, 1991 is a *minimum* of thirty (30) years, although owners can petition the SHWD to terminate the post-closure period earlier if they can demonstrate that the landfill has been stabilized. In all cases, the minimum post-closure period for these facilities is automatically extended until such time that the SHWD approves a petition to terminate the post-closure period. This petition must be accompanied by relevant information and demonstrate that the facility has been stabilized in a manner protective of human health and the environment.

The operator should be advised that any environmental monitoring program specified in the closure permit must be continued during the post-closure period.

## **6.0 Petitions to Terminate the Post-Closure Period**

At a minimum, the SHWD recommends that a petition to terminate the post-closure period should include the following documentation:

### **6.1 Ground Water Monitoring Data**

The operator should provide a detailed analysis of all available ground water monitoring data collected during the active life, closure process and post-closure period. Analysis of the data may utilize graphical and/or statistical methods. Copies of all groundwater data should be provided in both paper and electronic formats, as specified by the SHWD.

The purpose of this analysis is to demonstrate that ground water is not being impacted by the closed landfill. If impacts to ground water are detected, additional monitoring or corrective action may be necessary.

## 6.2 Methane Monitoring Data

The operator should provide a detailed analysis (graphical or statistical) of all available methane monitoring data. Unless the closure permit specifies otherwise, the SHWD recommends that this analysis include at least twelve (12) consecutive months of methane monitoring data or three (3) consecutive years of quarterly methane monitoring data at the end of the post-closure period. Data analysis should identify any increasing or decreasing trends. All methane data should be provided in both paper and electronic formats, as specified by the SHWD.

The purpose of this analysis is two-fold. The first purpose is to demonstrate that methane is not migrating beyond the facility boundary or into any permanent on-site structures at concentrations greater than 25% of the LEL for methane. The second purpose is to demonstrate that methane generation rates have stabilized or begun to decline. If methane continues to be a problem or a potential problem at the facility boundary, additional monitoring or corrective action may be necessary.

## 6.3 Leachate Monitoring Data

If a facility has a leachate collection system, the operator should provide a detailed description of the quantity and quality of leachate which has been generated during the post-closure period.

## 6.4 Post-Closure Inspection Reports

Copies of all of the operator's post-closure inspection reports should be provided to demonstrate that the site has been inspected on a regular basis to evaluate the integrity and stability of the final cover and surface water diversion systems. The SHWD recommends at least two (2) post-closure inspections per year. More frequent inspections (e.g., four per year) may be necessary until the vegetative cover is well-established. If post-closure inspections of the facility identify problems which require maintenance or repair, these problems and associated remedies should be discussed in detail.

The quality of the vegetative cover may be demonstrated by comparing photographs of the reclaimed areas to photographs of adjacent undisturbed areas. The SHWD recommends that photos be provided for at least the last five (5) years of the post-closure period. Inspections by a state or federal vegetation specialist may also be used to demonstrate the quality of the vegetative cover.

The purpose of these reports and photos is to demonstrate that the surface and subsurface of the landfill has stabilized and will not require further maintenance or repairs. If the subsurface of the landfill has not stabilized (i.e., waste decomposition is still causing settlement), additional monitoring of the final cover system may be necessary. Likewise, if the final cover system or surface water diversion system demonstrates an ongoing need for repairs due to erosion or poor vegetative growth, additional measures or time may be necessary to stabilize these features.

## 6.5 Periodic Settlement Measurements

The operator should be able to demonstrate that settlement has not created irregularities in the final cover surface which allow ponding and greater potential for the percolation of infiltrated moisture into the waste, or increase the potential for erosion. The operator should also be able to demonstrate that additional settlement will not occur or that it will not be significant enough to create problems.

As with post-closure inspection reports, periodic surveying of the final cover system can be used to demonstrate that the subsurface of the landfill has stabilized. The SHWD recommends that temporary elevation points be established at closure and surveyed throughout the post-closure period to allow evaluation of *trends* in settlement. As an alternative, the elevations and grades of the entire site at the end of the post-closure period can be compared to the elevations and grades at closure. This alternative approach is not recommended because it only provides a indication of the *total amount* of settlement which has occurred, and it may not be adequate to demonstrate that additional settlement will not occur or be significant.

## 6.6 Final Disposition of Environmental Monitoring System

If the operator wishes to plug and abandon any methane or ground water monitoring wells, a written request must be submitted to and approved by the SHWD before plugging and abandonment occurs. Requests should include a justification for plugging and abandonment, specify the wells affected, and describe the procedures to be used. These requests can be submitted separately or as part of the post-closure certification documentation. Plugging and abandonment of monitoring wells must be completed in compliance with the provisions of Chapter 11, Section 70 of the Water Quality Division Rules and Regulations.

If the monitoring wells are not going to be plugged and abandoned, the operator should provide a justification and a discussion of the planned use of the monitoring wells.

## 6.7 Landowner Concurrence

The landowner should confirm that the facility has been restored to a condition which is compatible with the post-closure use specified in the permit document, unless the operator and

the landowner have agreed to an alternative post-closure use. The landowner should also provide consent for any site improvements such as groundwater wells, buildings, fences or surface water structures which will remain after the closure permit is terminated.

## 6.8 Professional Engineer Certification

The operator must provide a post-closure certification statement which is signed, dated and stamped by a professional engineer who is licensed by the State of Wyoming. This statement must confirm that post-closure care has been completed in compliance with the post-closure plan and in a manner protective of human health and the environment. See Appendix C for an example. Additional information or statements may be provided at the discretion of the professional engineer.

Post-closure certification statements for sanitary landfills must be signed by a professional engineer. Post-closure certification statements for facilities which are not sanitary landfills may be signed by the operator.

## 7.0 SHWD Review of Petitions to Terminate the Post-Closure Period

Within sixty (60) days of receipt of a petition to terminate the post-closure period, the SHWD will conduct a review to determine if the information provided is complete and adequate. If the petition is incomplete or inadequate, the SHWD will notify the operator. The SHWD may deny or qualify its approval of the petition to terminate the post-closure period in cases where the supporting documentation is of poor quality, incomplete or inconclusive. When all of the required documentation is provided and approved the SHWD may schedule a final inspection to evaluate and verify the completion of post-closure activities. Once the SHWD is satisfied that the site has been properly stabilized and documented, the SHWD will notify the operator in writing that completion of the post-closure period has been approved and that the closure permit has been terminated. At this point, the SHWD will also notify the operator that there is no longer a requirement to maintain financial assurance for post-closure care of the facility. Any financial assurance mechanisms which are in place for this purpose will be promptly released.

The following performance criteria are used by the SHWD to evaluate a petition to terminate the post-closure period and conclude that a landfill has stabilized and will be protective of human health and the environment without further care or monitoring.

### 7.1 Groundwater

Groundwater data should demonstrate that there are no increasing trends in the concentrations of constituents and that there have been no exceedances of groundwater protection standards as a result of landfilling activities. Statistical or graphical analysis of the data should be used to identify significant increasing trends which are not present in the

background data set. Groundwater protection standards include Maximum Contaminant Levels (MCLs), Drinking Water Equivalent Levels (DWELs) and WQD Chapter 8 class of use standards. In the event that background levels of any constituent are higher than the MCL, DWEL or class of use standard, the background data set should be used as the groundwater protection standard. These performance criteria should be met for a minimum of five (5) consecutive years.

## 7.2 Methane

Methane data should demonstrate that there are no increasing trends in the concentration of methane *and* that there have been no exceedances of the methane standard (25% of the LEL). Statistical or graphical analysis of the data should be used to identify significant increasing trends. These performance criteria should be met for a minimum of twelve (12) consecutive monitoring events which have occurred at regular intervals. Monitoring events should occur no more frequently than monthly, but no less frequently than quarterly.

## 7.3 Leachate

If a facility has a leachate collection system, monitoring data should demonstrate that leachate is not being generated (and therefore does not have to be removed from the system). This performance criterion should be met for a minimum of five (5) consecutive years.

## 7.4 Settlement

Inspection and maintenance records or periodic settlement measurements should demonstrate that the waste decomposition and associated settlement rates are not increasing *and* that current rates are unlikely to compromise the integrity or performance of the final cover system. These performance criteria should be met for a minimum of five (5) consecutive years.

## 7.5 Vegetation

The vegetative cover, established during facility closure, should be well-established *and* comparable to adjacent, undisturbed areas with respect to the percentage of ground cover. These performance criteria should be met by the end of the post-closure period and based on conditions during the late spring or early summer (June or July).

## 7.6 Cover System

Inspection and maintenance records should demonstrate that the final cover system has not required maintenance or repairs to correct problems such as ponded water or erosion. This performance criterion should be met for a minimum of five (5) consecutive years.

## 7.7 Surface Water System

Inspection and maintenance records should demonstrate that the surface water diversion system has not required maintenance or repairs to correct problems such as ponded water or erosion. This performance criterion should be met for a minimum of five (5) consecutive years.

## 7.8 Other Issues

The post-closure documentation should demonstrate that there are no features or aspects of the facility which could pose a threat to human health or the environment if post-closure care and monitoring cease.

## 8.0 Liability Beyond the End of the Post-Closure Period

Landfill owners and operators have a duty to prevent future releases from their landfills, including those which occur after the end of the post-closure period, and to correct them if they occur. Closure and post-closure requirements are intended to prevent future releases from closed landfills. However, in the event that a future release does occur, certified compliance with those closure and post-closure requirements does not relieve the owners and operators from the duty to take corrective action as necessary to protect human health and the environment.

Landfill owners and operators should also be aware that closure and post-closure certification under this program does not control potential liability to third parties resulting from releases which occur during the operating life, closure period, post-closure period, or any time thereafter.

For the reasons cited above, the SHWD recommends that landfill owners maintain a minimal inspection and monitoring program once the facility has complied with the state's closure and post-closure regulatory program.

## 9.0 Further Information

Further information can be obtained from the following Solid and Hazardous Waste Division offices. Comments and suggestions for improvements are always appreciated.

Casper : (307) 473-3450

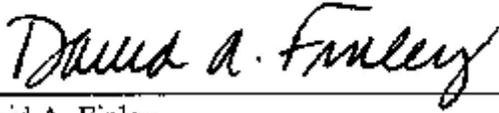
Cheyenne : (307) 777-7752

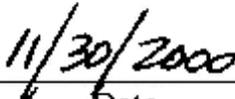
Lander : (307) 332-6924

## 10.0 Guideline Approval

I have reviewed and approved the policies and procedures described in this guidance document.

Signed

  
\_\_\_\_\_  
David A. Finley  
Administrator  
Solid and Hazardous Waste Division

  
\_\_\_\_\_  
Date

### Attachments

- Appendix A Sample Deed Notice
- Appendix B Sample Professional Engineer's Certification of Closure
- Appendix C Sample Professional Engineer's Certification of Post-Closure Care

### Guideline History

- July 9, 1996 : Original version
- November 30, 2000 : Added recommendations for final slopes. Defined the performance criteria used by SHWD to conclude that a site is properly closed. Added recommendations for methane monitoring and inspection frequency during the post-closure period. Added landowner concurrence to the list of documentation requested for petitions to terminate the post-closure period. Defined the performance criteria used by SHWD to conclude that a site is stabilized and protective of human health and the environment. Included operator's name in recommended wording of deed notice. Revised scope of the professional engineer's certification of post-closure care. Document format updated.

## Solid Waste Guideline #16 : Appendix A

### Sample Deed Notice

The following property, known as *[insert facility name]*, *[insert SHWD file number]*, has been used by *[insert operator's name]* for the disposal of solid waste : *[insert metes and bounds description]*.

The types of wastes disposed include *[insert description]*.

The environmental monitoring system at this site includes *[insert description]*.

The surface water control system at this site includes *[insert description]*.

The final cover system at this site includes *[insert description]*.

Disturbance or excavation of these wastes, the environmental monitoring system, the surface water control system or the final cover system should be avoided. The Wyoming Department of Environmental Quality, Solid And Hazardous Waste Division should be contacted prior to any excavation or other activity which may disturb this site.

## **Solid Waste Guideline #16 : Appendix B**

### **Sample Professional Engineer's Certification of Closure**

I certify that the provisions of the approved closure plan, signed [*insert date*], and closure permit, signed [*insert date*], for the [*insert facility name*], [*insert SHWD file number*], have been carried out and that the facility has been closed in compliance with the closure standards specified in Solid Waste Rules and Regulations Chapter [*insert chapter number*].

PE Seal, Signature and Date:

## Solid Waste Guideline #16 : Appendix C

### Sample Professional Engineer's Certification of Post-Closure Care

I certify that post-closure care of the *[insert facility name]*, *[insert SHWD file number]*, has been completed in compliance with the approved closure plan, signed *[insert date]*, and closure permit, signed *[insert date]*, and that the facility has been stabilized in a manner protective of human health and the environment. This certification is based, in part, on my review of the post-closure inspection reports and the environmental monitoring data for this facility. This certification is also based, in part, on my inspection of this facility on *[insert date]*. My inspection of this facility included the vegetative cover, final cover system, surface water diversion system and permanent survey monuments.

PE Seal, Signature and Date: