

**SOLID WASTE PERMITTING
SUBMISSION INSTRUCTION NO. 6**

**CLOSURE AND POST-CLOSURE CARE PLANS
FOR SOLID WASTE DISPOSAL and MANAGEMENT FACILITIES**

Developed by:

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I. CLOSURE PLAN (SOLID WASTE DISPOSAL FACILITIES)

A Closure Plan is required for all solid waste disposal facilities and should be submitted with the Part B Application or Part B Modification Application as Attachment IV to DEQ Form SW PTB. [9 VAC 20-81-160.B., 360.2., 370, 470.A.2. and 480.D.]

Format The format used for the Closure Plan should encourage clear analysis and presentation of the proposed landfill closure design. The Closure Plan should start with a title page and table of contents followed by the following sections and discussions. The title page should identify the facility name and permit number, the permit applicant, document date, and document preparer information. In addition, the header or footer of each page should include the facility name, permit number, document title, revision date, and page number.

A. Closure Purpose

Provide an introduction that identifies the type of solid waste disposal facility and acreage to be closed under this plan. Describe how implementing the closure plan minimizes the need for post-closure maintenance and controls and/or minimizes surface run-off and the escape of waste decomposition products. [9 VAC 20-81-160.A.]

B. Closure Timeframes

Provide the anticipated date when wastes will no longer be received, the date when completion of final closure is anticipated, and intervening milestone dates that will allow tracking of the progress of closure. Discuss when specific portions of the landfill will reach final grades and be closed, referencing the appropriate Design Plans as necessary. Calculations substantiating the site life for each cell/phase/area to be closed should be provided as an attachment to this plan or to the Design Report (PTB Attachment VI). [9 VAC 20-81-160.B.1.a. and 470.A.2.]

C. Closure of Surface Impoundments and Lagoons

If a surface impoundment or lagoon is used to collect, store, and/or treat leachate generated by the solid waste disposal facility, information regarding the closure and decontamination of the unit shall be discussed here. [9 VAC 20-81-370.A.]

1. Removal

Describe how liquid wastes, waste residues, contaminated system components (i.e. liners, etc.), and contaminated subsoils will be removed and disposed.

2. Stabilization

Describe procedures to stabilize remaining waste residues in order to provide a competent bearing surface for the proposed final cover system. Indicate the required bearing strength and provide documentation and calculations as an attachment to this Closure Plan.

3. *Decontamination*

Describe how structures and equipment will be decontaminated.

4. *Final Cover*

Describe the final cover system to be installed. The final cover system shall meet the requirements of [§ 9 VAC 20-81-160.D.2.](#)

D. *Closure of Landfill Units*

1. *Final Cover Design*

Describe the final cover system to be installed, as indicated on DEQ Form SW PTB. Any additional layers to the pre-approved alternate final cover systems shall be discussed here. If the facility selected the "Additional Alternate" Final Cover Design on DEQ Form SW PTB, the liner layers shall be discussed here, and the demonstration assessing the design's suitability should be provided in PTB Attachment XVI (see [Section V](#) below for additional information). Information on acceptable alternate cover designs can be found in [Guidance Memo 03-1993: Clarification of Required Final Cover Designs and Acceptable Alternate Designs.](#) For facilities proposing multiple cover systems, the following discussions should be provided for each proposed cover design, as applicable.

This section should reference design plans that are provided either as an attachment to this plan (see [Attachment 2](#) below, suitable for stand-alone Closure Plans) or PTB Attachment III (suitable for permits with Design Plans and Report). [9 VAC 20-81-160.D.2. and 470.B.]

In addition, the next several sections indicate the appropriate Technical Specifications should be referenced as provided in PTB Attachment VII. If the Closure Plan is being prepared as a stand-alone document (i.e. for a facility that does not have Design Plans or a Design Report as part of its permit), these Technical Specifications and the CQA Plan should be submitted as [Attachment 3](#) to the Closure Plan.

a. *Infiltration Layer*

Provide a description of the infiltration layer to be installed. Be sure to address the layer's height, material, and hydraulic conductivity. Reference the appropriate Technical Specification(s) provided in PTB Attachment VII. [9 VAC 20-81-160.D.2.c.(1), d.(1), and f.(1)]

b. *Barrier Layer*

Provide a description of the barrier layer to be installed. Be sure to address the type and thickness of the geomembrane or geosynthetic clay liner and reference the appropriate Technical Specification(s) provided in PTB Attachment VII. [9 VAC 20-81-160.D.2.d.(2) and e.(1)]

c. Erosion Control / Protective Cover Layer

Provide a description of the erosion control/protective cover layer. Be sure to address the layer's thickness, material, and ability of the layer to protect the infiltration layer from the effects of erosion, frost, and wind. Reference the appropriate Technical Specification(s) provided in PTB Attachment VII. [9 VAC 20-81-160.D.2.c.(2), d.(3), e.(2), and f.(2)]

Describe how the calculations have demonstrated that the universal soil loss for the erosion control/protective cover layer is less than 2 tons/acre/year. Discuss the erosion control measures used so minimize soil loss while vegetation is being established.

d. Vegetative Support Layer

Provide a description of the vegetative support layer, addressing the layer's thickness, material, and ability to sustain native plant growth. Discuss the proposed cover crop, referencing the appropriate Technical Specification(s) provided in PTB Attachment VII. [9 VAC 20-81-160.D.2.d.(4), e.(3), and f.(2)]

2. *Final Slopes*

Provide information that addresses the minimum and maximum slopes for the side slope and flatter, top slope areas. Discuss the design features that protect the final slopes from the effects of runoff and erosion. Reference appropriate calculations demonstrating the stability of the layers of the final cover system under both static and seismic conditions. [9 VAC 20-81-160.D.3.]

3. *Run-off Controls*

Provide a description of design, construction, and maintenance controls for the stormwater management system. Reference the Design Plans (PTB Attachment III or [Attachment 2](#) of this plan) and stormwater calculations as appropriate. [9 VAC 20-81-160.B.1.e.]

4. *Settlement, Subsidence, and Displacement*

Describe the effects of potential subsidence/settlement on the ability of the final cover to minimize infiltration. Provide an estimate of the maximum amount of settlement of the final cover system that may occur. Additionally, an estimate of the settlement that must occur to result in failure of the final cover system must be provided for each component of the final cover. [9 VAC 20-81-160.D.]

E. *Closure of Storage and/or Treatment Units*

If the solid waste disposal facility operates one or more solid waste management facilities under their Solid Waste Permit, information addressing removal of waste materials and unit closure should be discussed here. Information to be provided is addressed below in [Section II](#). [9 VAC 20-81-360.2. and 480.D.]

F. Schedule for Closure

Provide a schedule for completion of closure. If the closure time period is to exceed the time limit specified in the regulations, provide justification for the extension of the period and the description of steps necessary to eliminate any significant threat to human health and the environment from the unclosed but inactive facility. [9 VAC 20-81-160.C.2.]

G. Closure Implementation

1. Posting

Describe how closing the site will be posted and how customers will be notified. Discuss the barriers to be erected to restrict access during and after completion of closure activities. [9 VAC 20-81-160.D.5.a.]

For facilities that will remain open as a convenience center or that will continue to operate solid waste management units for waste storage and/or treatment, indicate how access to the landfill will be restricted.

2. Notification

Provide the name of the local land recording authority that will be notified upon the completion of closure and the wording of the notification to appear on the survey plat and deed of the facility. The survey plat shall identify by number all groundwater monitoring well and landfill gas monitoring probe locations. Example language is provided in [Figure 1](#) below. [9 VAC 20-81-160.D.5.b. and c.]

Figure 1 Recommended Language for Survey Plat and Deed Notation

This property has been used for the management and disposal of solid waste. Any future use of the site shall not disturb the integrity of the final cover, liners, or any other components of the containment systems, or the function of the monitoring system unless necessary to comply with the Virginia Solid Waste Management Regulations or approved by the Department of Environmental Quality.

3. Certification

Provide the wording of the certification from a registered professional engineer indicating that the closure has been completed in accordance with the requirements of the regulations and the approved Closure Plan. Example language is provided in [Figure 2](#). Please note that the certification must be submitted with the results of the CQA/QC program. [9 VAC 20-81-160.D.4. and D.5.d.]

**Figure 2 Recommended Language for P.E. Closure Certification
for Solid Waste Disposal Facilities**

{For partial closure} I certify that partial closure has been completed in accordance with the Closure Plan dated [date on the Closure Plan] for permit number [permit number] issued to [permittee], with the exception of the following discrepancies:

Signature of Professional Engineer
Date and Stamp

{For full closure} I certify that closure has been completed in accordance with the Closure Plan dated [date on the Closure Plan] for permit number [permit number] issued to [permittee], with the exception of the following discrepancies:

In addition, a sign(s) was(were) posted on [date of posting] at the landfill entrance notifying all persons of the closing [and state other notification procedures if applicable] and barriers [indicate types] were installed at [location] to prevent new waste from being deposited.

A survey plat prepared by [name and credentials of professional land surveyor or qualified person in accordance with Title 54.1 of the Code of Virginia] was submitted to the [local land recording authority] on [date]. A copy of the survey plat is attached to this certification.

A notation was recorded on the deed to the landfill property on [date]. A copy of the revised deed is attached to this certification.

Signature of Professional Engineer
Date and Stamp

H. Closure Cost Estimate

Provide an estimate for the cost of closing the landfill at the point in the facility's active life when closure would be the most expensive. At any given time during the facility's active life, this estimate should cover the cost of closing all acreage for which a Certificate-to-Operate has been granted but the area has not been certified closed.

The cost estimate shall be based on the costs of hiring a third party to close the facility and may not incorporate any salvage value that may be realized from the sale of wastes, facility structures or equipment, land or other facility assets at the time of partial or final closure. Landfill Cost Estimate Worksheet 1 (CEW-01) provided on the DEQ Website

(<http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/Forms.aspx>) is available for use in determining the facility's closure cost estimate.

If the solid waste disposal facility maintains areas for the storage and/or treatment of solid wastes, additional funds should be provided for the removal of those materials at the time of closure, as discussed in [Section II.E.](#)

See [Guidance Memo 04-2011: Financial Assurance for Stockpiles of Materials for Beneficial Use or Other Uses](#) regarding the need for financial assurance to cover stockpiles of materials with beneficial uses. This guidance does not apply to the storage of less than 20 cubic yards of material prior to its removal from the SWMF for beneficial use, recycling, or further recovery. [9 VAC 20-70-90.A. and 111.A.]

I. Attachments

1. *Site Life and Cell/Phase/Area Capacity Calculations.*

Provide calculations substantiating the information provided in [Section I.B.](#)

2. *Closure Design Plans*

Items related to closure of the landfill as discussed in [Section I.D.1.](#) should be included on design plans provided in this attachment or in design plans provided as PTB Attachment III. At a minimum, design plans showing (1) status of the facility at the midpoint of the permit period, (2) facility contours at final closure, and (3) details of cover layers and thicknesses, slopes, and overall dimensions should be provided. If on-site soil is to be used for closure activities, a plan sheet must be provided that indicates location of borrow sources, the quantity of soil available from each borrow source and the soil characteristics. [9 VAC 20-81-470.B.]

3. *CQA Plan and Technical Specifications*

The CQA Plan and Technical Specifications should be provided as PTB Attachment VII; however, in the case of stand-alone Closure Plans, these documents may be submitted as attachments to the Closure Plan. Please see *Submission Instruction No. 2: Design Plans and Report for Solid Waste Disposal Facilities* for detailed instructions regarding the information to be provided in these documents.

4. *Universal Soil Loss Demonstration*

Provide calculations substantiating the information provided in [Section I.D.1.c.](#)

5. *Slope Stability*
Provide calculations showing the factors of safety are adequate to prevent (sliding, tearing, or pullout) failure of the cover layers based on the final slopes indicated in [Section I.D.2](#).
6. *Stormwater Calculations*
Provide an estimate of peak run-off and volume (based on a 25-year 24-hour storm) and calculations indicating the size of the designed drainage swales, piping, and/or ditches are sufficient to handle this flow. Calculations provided should substantiate information provided in [Section I.D.3](#).
7. *Settlement, Subsidence, and Displacement*
Provide calculations addressing the potential cover settlement, subsidence, and displacement, considering immediate settlement, primary consolidation, secondary consolidation, and liquefaction. Include information on potential foundation compression, potential soil liner settlement, and potential waste consolidation resulting from waste dewatering, biological oxidation and decomposition, and chemical conversion of solids to liquids. Calculations presented here should substantiate information provided in [Section I.D.4](#).
8. *Closure Cost Estimate*
Provide a copy of the closure cost calculations substantiating the closure cost estimate provided in [Section I.H](#).

II. CLOSURE PLAN (SOLID WASTE MANAGEMENT FACILITIES)

A Closure Plan is required for all solid waste management facilities. This submission instruction should be used to develop a Closure Plan to be submitted with a Part B Application or Part B Modification Application as Attachment IV to DEQ Form SW PTB for those facilities pursuing a full solid waste permit, or to be maintained in the facilities operating record in accordance with [9 VAC 20-81-410.A.2.e.\(2\)](#) for those facilities pursuing permit-by-rule status. [9 VAC 20-81-360.2. and 480.D.]

Format The format used for the Closure Plan should encourage clear analysis and presentation of the proposed steps for closing the solid waste management facility. The Closure Plan should start with a title page and table of contents followed by the following applicable sections and discussions. The title page should identify the facility name and permit number, the permit applicant, document date, and document preparer information. In addition, the header or footer of each page should include the facility name, permit number, document title, revision date, and page number.

A. Closure Purpose

Provide an introduction that identifies the type of solid waste management facility to be closed and describe how implementing the closure plan minimizes or eliminates the post-closure escape of uncontrolled leachate, surface run-off, or waste decomposition products to the groundwater, surface water, or to the atmosphere. [9 VAC 20-81-360.1.]

B. Closure Timeframes

Provide the anticipated date when wastes will no longer be received, the date when completion of final closure is anticipated, and intervening milestone dates that will allow tracking of the progress of closure. VSWMR § 9 VAC 20-81-360.3.a. specifies that closure shall occur within six (6) months after receiving the final volume of waste; if the planned closure activities will take longer than this timeframe to complete, the applicant shall provide supporting information here so the Director can make his determination. [9 VAC 20-81-360.2.a., 360.3.a., and 480.D.]

C. Inventory Removal & Disposal

[9 VAC 20-81-360.1. and 480.D.]

1. *Waste Removal*

Describe how stored solid waste and residuals will be removed and disposed.

2. *Decontamination*

Describe how the solid waste management facility will be decontaminated, including procedures that will be followed during closure to manage solid waste residues, contaminated system components (i.e. liners), contaminated subsoils, structures, and equipment contaminated with waste or leachate.

3. *Sampling & Testing Program*

Describe the sampling and testing program to be employed to verify decontamination of subsoils and equipment. If it is determined that all contaminated subsoils cannot be practicably removed or decontaminated, the facility shall close the facility and perform post-closure care in accordance with standards established for solid waste disposal facilities ([§ 9 VAC 20-81-160](#) and [§ 9 VAC 20-80-170](#), respectively).

D. *Closure Implementation*

1. *Posting*

Describe how closing the site will be posted and how customers will be notified. Discuss the barriers to be erected to restrict access during and after completion of closure activities. [9 VAC 20-81-360.3.b.]

2. *Certification*

Provide the wording of the certification from a registered professional engineer indicating that the closure has been completed in accordance with the requirements of the regulations and the approved Closure Plan. Example language is provided in [Figure 3](#) . [9 VAC 20-81-360.2.e.]

Figure 3 Recommended language for P.E. Closure Certification for Solid Waste Management Facilities

I certify that closure has been completed in accordance with the Closure Plan dated [\[date on the Closure Plan\]](#) for permit number [\[permit number\]](#) issued to [\[permittee\]](#), with the exception of the following discrepancies:

In addition, a sign(s) was(were) posted on [\[date of posting\]](#) at the facility entrance notifying all persons of the closing [\[and state other notification procedures if applicable\]](#) and barriers [\[indicate types\]](#) were installed at [\[location\]](#) to prevent new waste from being deposited.

Signature of Professional Engineer
Date and Stamp

3. *Post-Closure Use*

Specify any proposed alternate uses of the facility once closure has been completed. [9 VAC 20-81-480.D.]

E. *Closure Cost Estimate*

All facilities except for those owned and operated by State or Federal Agencies shall demonstrate financial assurance for closure, post-closure, and/or corrective action

costs in accordance with the Financial Assurance Regulations for Solid Waste Disposal, Transfer, and Treatment Facilities ([9 VAC 20-70](#)). [9 VAC 20-81-480.C.]

For solid waste management facilities, the amount of financial assurance shall cover the estimated cost to close the facility at the point in the facility's active life when the extent and manner of its operation would make closure the most expensive. The closure cost estimate should include costs associated with removal of solid waste and leachate/wastewater remaining on site at closure; decontamination of equipment, containers, and/or structures; testing to ensure the facility has not contaminated underlying soils and/or groundwater (if contamination of underlying soils or groundwater is anticipated); and any other potential costs associated with closing the facility. These costs and how they are calculated may vary depending on the type and design of the solid waste management facility proposed.

See [Guidance Memo 04-2011: Financial Assurance for Stockpiles of Materials for Beneficial Use or Other Uses](#) regarding the need for financial assurance to cover stockpiles of materials with beneficial uses. This guidance does not apply to the storage of less than 20 cubic yards of material prior to its removal from the SWMF for beneficial use, recycling, or further recovery.

III. POST-CLOSURE CARE PLAN

The Post-Closure Care Plan should be submitted with the Part B Application or Part B Modification Application as Attachment V to DEQ Form SW PTB. A Post-Closure Care Plan is only required for those facilities closing with waste remaining in place. [9 VAC 20-81-170.A.2. and 470.A.3.]

Format The format used for the Post-Closure Care Plan should encourage clear analysis and presentation of the proposed landfill closure design. The Post-Closure Care Plan should start with a title page and table of contents followed by the following sections and discussions. The title page should identify the facility name and permit number, the permit applicant, document date, and document preparer information. In addition, the header or footer of each page should include the facility name, permit number, document title, revision date, and page number.

A. Post-Closure Period

Provide an introduction that identifies the type landfill and the length of the post-closure care period required under [§ 9 VAC 20-81-170.B.2.](#)

B. Post-Closure Contact

Indicate the name, address, and telephone number of the person or office to contact during the post-closure period. [9 VAC 20-81-170.A.2.b.]

C. Inspection, Monitoring, and Maintenance Plan

Provide a description of the inspection, monitoring, and maintenance activities to take place during the post-closure care period for each of the following:

1. Security Control Devices

Indicate the frequency of inspections to be performed to ensure the landfill security has not been breached. Identify procedures for repairing and/or replacing security features if found damaged.

2. Final Cover Integrity

Indicate the frequency of inspections to be performed to assess the condition of the final cover and maintenance activities to be performed to correct for the following conditions:

- a. Erosion damage;
- b. Final cover settlement, subsidence, and displacement;
- c. Bare or dead vegetative cover; and
- d. Presence of woody-stemmed vegetation.

Also, be sure to indicate how often landfill areas will be reseeded and/or fertilized and mowed. The post-closure cost estimate provided in Section III.E should account for the frequencies stated here.

3. *Run-on and Run-off Controls*

Indicate the frequency of inspections to be performed to assess the condition of stormwater run-on and run-off controls and maintenance activities to be performed to remove sediment and/or vegetation from conveyance and storage structures.

4. *Leachate Collection System*

Indicate the frequency of inspections, monitoring, and maintenance activities relating to the leachate collection system. Indicate the disposition of collected leachate, the frequency of discharge or disposal, and the facility's response to leachate seeps as required under [§ 9 VAC 20-81-210](#).

5. *Groundwater Monitoring System*

The facility shall maintain a Groundwater Monitoring Plan (GMP) as described in *Submission Instruction No. 5, 11, or 12: Groundwater Monitoring and Sampling & Analysis Plans* that should address inspection, monitoring, and maintenance of the groundwater monitoring system. This plan should be included as PTB Attachment X with the Part B Application or Part B Modification Application and should be referenced here.

In accordance with [§ 9 VAC 20-81-370.A.2.b.](#), facilities operating surface impoundments or lagoons shall install a groundwater monitoring system and initiate groundwater monitoring in accordance with the requirements of [§9 VAC 20-81-250](#) upon closure. Facilities that have closed a surface impoundment or lagoon and don't already have a Groundwater Monitoring Plan in place shall submit a GMP at closure for review and approval.

6. *Landfill Gas Monitoring System*

Indicate the frequency of inspections and maintenance activities relating to the landfill gas monitoring system. The monitoring frequency should be established in the facility's Landfill Gas Management Plan (LFGMP) and/or Landfill Gas Remediation Plan (LFGRP) as described in *Submission Instruction No. 13: Landfill Gas Management, Remediation, and Odor Plans for Solid Waste Disposal Facilities*, which should be included as PTB Attachment IX with the Part B Application or Part B Modification Application and should be referenced here.

If a LFGMP has not been incorporated into the facility's permit, information regarding the frequency of landfill gas monitoring as required under [§ 9 VAC 20-81-200](#) shall be discussed here.

[9 VAC 20-81-170.A.1., 170.A.2.a., and 470.A.3.,]

D. *Post-Closure Uses*

Describe the planned uses of the property during and after the post-closure period. Discuss the measures that will be taken to protect the integrity of the landfill cover

and other waste management features and to and protect public health and safety based on post closure care use. Provide for the notification of approval by DEQ if the site use changes during the post-closure care period. [9 VAC 20-81-170.A.2.c.]

E. Post-Closure Cost Estimate

Provide an estimate for the cost of conducting post-closure care in accordance with the Post-Closure Care Plan. The cost estimate shall be based on the costs of hiring a third party to conduct post-closure care over the entire post-closure care period. Landfill Cost Estimate Worksheet 2 (CEW-02) provided on the DEQ Website (<http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/Forms.aspx>) is available for use in determining the facility's post-closure cost estimate. [9 VAC 20-70-90.B. and 112.A.]

F. Post-Closure Care Termination

Procedures for terminating Post-Closure Care are provided in [Waste Guidance Memo 01-2007: Post-Closure Care Termination](#). The format of the termination request, evaluation, and certification is addressed in *Submission Instruction No. 10: Termination of Post-Closure Activity Evaluation*. [9 VAC 20-81-170.B.3. and C.]

G. Attachments

1. Inspection Checklist

Provide a copy of the inspection checklist(s) to be used during the post-closure care period to track self-inspections performed in accordance with [Section III.C.](#) of this Post-Closure Care Plan.

2. Post-Closure Care Cost Estimate

Provide a copy of the closure cost calculations substantiating the closure cost estimate provided in [Section III.E.](#)

IV. ALTERNATE FINAL COVER DEMONSTRATION

If the solid waste disposal facility selected the “Additional Alternate” Final Cover Design on DEQ Form SW PTB, the liner layers shall be discussed in the Closure Plan ([Section I.](#) above), and the demonstration assessing the design’s suitability should be provided in PTB Attachment XVI. Facilities proposing to use an alternate final cover design shall provide a revised Closure Plan and Alternate Final Cover Demonstration at least 180 days prior to the date the facility anticipates beginning closure. [9 VAC 20-81-160.B.4. and 160.D.2.f.]

A. Infiltration Layer

Provide documentation and calculations indicating the proposed infiltration layer achieves an equivalent reduction in cap infiltration as 18 inches of earthen material that has a hydraulic conductivity less than or equal to the hydraulic conductivity of the landfill unit’s bottom liner or a hydraulic conductivity no greater than 1×10^{-5} cm/sec, whichever is less. [9 VAC 20-81-160.D.2.c.(1) and D.2.f.(1)]

B. Erosion Layer

Provide documentation and calculations indicating the proposed erosion layer will be a minimum of 24 inches thick and will be capable of maintaining native plant growth and will provide for protection of the infiltration layer from the effects of erosion, frost, and wind. Reference applicable sections of the Closure Plan as necessary. [9 VAC 20-81-160.D.2.f.(2)]