

**Iowa Department of Natural Resources
Solid Waste Section of Land Quality Bureau
Related to:
Request to Reduce or End Post Closure Care and
Preparation of Post Closure Care Reduction/Termination Plan**

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This document provides recommendations for developing a plan that will be used to determine when certain postclosure care activities at municipal solid waste landfills may be reduced or terminated. This document is applicable to closed Municipal Solid Waste Landfill (MSWLF) units.

Iowa Code 455B.304.6 gives the Environmental Protection Commission the latitude to either lengthen or shorten the post closure care period based on the potential for groundwater contamination. The Iowa Department of Natural Resources (DNR) has determined that post closure care activities may be significantly scaled-back or possibly terminated when equilibrium and stability has been confirmed for 5 and 15 years respectively and specified conditions regarding groundwater quality, storm water quality, settlement, slope stability, and vegetation quality are realized and sustainable . In addition, an environmental covenant is required that obligates current or future owners to fulfill requirements specifically identified in the covenant that are necessary to protect human health, safety and the environment in the future.

The DNR recognizes that the 30-year post closure period is an arbitrary period of time and desires clarification of conditions that may qualify the landfill site to a different post closure period of time. The DNR is informing the solid waste industry that certain site conditions are desirable to altering the post closure period so that the permit holders may take appropriate actions now with the intent of attaining the goal of reducing or ending of post closure while still protecting human health and the environment.

The following discussion is purposely left to be general in nature as the DNR recognizes the uniqueness of each landfill site with site conditions that can be best managed in a very site-specific manner that suits the site in a cost effective way.

Stabilization of the Municipal Solid Waste (MSW)

Leachate and gas emissions emanating from a MSWLF will decrease at a rate dependent on the design, construction, and operation of the landfill units. Equilibrium is defined as a condition where quantity/flow rate and composition of emissions (or the mass flow rate) from the stored MSW are relatively constant. The MSW is considered stable (or inert) when the MSW does not change with changing environmental factors such as the addition of moisture and/or changes in temperature.

Two extremes of landfill design and operation are the dry tomb approach and the moisture-enhanced operation. The dry tomb approach is a landfill operation where addition of moisture to the waste is minimized by: restrictions on disposal of liquids; run-on control systems; prevention of groundwater (GW) intrusion; and an impervious final cover. Reactions in a dry tomb landfill should be minimal since moisture is the limiting reactant. This type of landfill will likely reach equilibrium faster than a moisture-enhanced landfill, but the MSW will not be as thoroughly stabilized, and leachate and landfill gas (LFG) emissions could increase if - landfill containment is compromised after closure.

In moisture-enhanced landfills, moisture is added to the MSW before and/or after closure in order to promote stabilization of the MSW to a more inert mass. Moisture-enhanced landfills do not include higher moisture level bioreactor operations. Reactions in a moisture-enhanced landfill do not end with initial closure since previously added moisture allows reactions to occur after closure and a pervious cover will allow reactions to continue until the MSW is stabilized. A moisture-enhanced landfill will take longer to reach emission equilibrium than a dry tomb landfill because of the time that must be allowed for the MSW, microbes and liquids to fully react. The end result however, is a more stable landfill, which is less likely to create future problems that could affect public health, safety and the environment.

Stabilization Indicators and Trend Analysis

Trend analysis may be used to determine when equilibrium has been reached. This procedure involves the measurement and statistical analysis of leachate and LFG emission values, which indicate the physical, chemical and biological transformations occurring within the landfill units. Trend analysis of key leachate and LFG parameters can be used to define the degree of MSW stabilization. These parameters are not measurements of the MSW itself but are the by-products of the reactions between the MSW, microbes and available moisture.

DNR suggests collecting supplemental data at a frequency which can confirm expected trends

and explain variations of the key emission parameters so that actual trends can be determined. For example, compaction of the MSW as it degrades can be monitored by measuring the settlement or subsidence of the landfill surface.

Background

567 IAC 113.4(8)“b” requires:

“Closure permits. A request for a closure permit renewal or termination shall be filed at least 180 days before the expiration of the current permit. If the department finds that an MSWLF has completed all required postclosure activities and no longer presents a significant risk to human health or the environment, then the department shall issue written notification that a closure permit is no longer required for the facility.”

Iowa Code Chapter 455B.301“c”(15):

“Postclosure” and “postclosure care” mean the time and actions taken for the care, maintenance, and monitoring of a sanitary disposal project after closure that will prevent, mitigate, or minimize the threat to public health, safety, and welfare and the threat to the environment posed by the closed facility.

This policy requires the use of professional judgment by the DNR. It is the intent of this policy document to present the expectations of the DNR when receiving a request for ending or reducing post closure care (PCC).

Evaluating a landfill site for readiness to terminate post closure care may result in landfill sites that are not good candidates for ending all post closure care. However, landfill sites may still be deemed eligible for ending or reducing post closure care through the use of environmental covenants that may include land-use restrictions on the landfill property and/or adjacent properties, periodic inspections, scaled-down monitoring or reporting, or some other activity to address a site-specific concern.

Process

Each permit holder must take the following steps before PCC can be scaled back or otherwise ended:

- Prepare and submit a Post Closure Care Reduction/Termination (RTP) Plan that outlines how leachate, gas, water quality, and final cover stability will be assessed and the specific criteria that must be met in order to reduce or end PCC and meet the proposed end-use goals for the property.
- Identify present and future site conditions, if any, which are not conducive to reducing PCC.
- Establish a work plan and schedule for mitigation of existing conditions, if needed.
- Compare the mitigation schedule to current permit ending date and extend, if needed.
- Conduct a review of on-going supplemental activities initiated to end or reduce PCC to determine if goals have been met or modifications to the supplemental activities and schedule are needed.
- Work with the DNR to prepare and record an environmental covenant that is tailored to address remaining or future potential human health or environmental conditions at the site, and
- Modify the Closure permit.

Items of Consideration in preparation of a Post Closure Care Reduction/Termination Plan

1. Must be compatible with approved Post Closure Plan and proposed end use.
2. Proposed measurements, schedule and evaluation method must demonstrate equilibrium and stabilization of the MSWLF unit as indicated by trend evaluation of:
 - a. Leachate Parameters
 - b. Gas Parameters
 - c. Water Quality Parameters
 - d. Settlement, Ponding, Slope Stability (geotechnical evaluation) and Erosion
 - e. Climax Vegetation Establishment
3. Trend analysis demonstrates equilibrium for at least 5 years prior to a reduction in PCC for any PCC activity. The trend analysis period may be shortened for MSWLF units that closed before calendar year 2000. The determination of equilibrium for leachate and landfill gas emissions can be accomplished by quarterly sampling over a five-year demonstration period, during which there is no statistically significant difference in key parameter values with time. If there is a statistically significant difference in any of the key parameters, a new five-year demonstration period must begin. After one demonstration period in which key parameters are shown to be in equilibrium, reduction of appropriate activities may begin, after approval by DNR. After three consecutive demonstration periods in which key parameters are shown to be in equilibrium, appropriate activities may be terminated, after approval by DNR.

Reporting

The permit holder shall prepare an annual report in accordance with the approved RTP plan. The permit holder may be required to modify the PCCTR plan.

Plan Contents

The RTP plan should describe the following:

1. The criteria that will be used to determine when a particular post-closure care activity can be reduced or terminated,
2. Key monitoring parameters that will be used to determine the degree of equilibrium and/or the stability of the waste,
3. Supplemental monitoring parameters that will be used to interpret and validate trends in the key parameters,
4. Sampling points and sampling frequencies,
5. Equipment that will be used to collect the samples,
6. Methods (sampling and laboratory) that will be used to provide quality assurance and quality control, and
7. Statistical methods that will be used to evaluate the data.

Leachate Monitoring

The RTP plan should define the leveling out of leachate composition and quantity/flow rate (which together define the mass flow rate of a contaminant) that can signal the reduction and/or termination of PCC activities. Key leachate parameters for demonstrating the degree of municipal solid waste (MSW) equilibrium and/or stability include:

1. Quantity
2. Temperature
3. Five-day biochemical oxygen demand (BOD5)
4. Chemical oxygen demand (COD)
5. Ammonia (NH₃)
6. pH
7. Total suspended solids (TSS)

Routine leachate sampling typically measures leachate composition from combined landfill units prior to the leachate leaving the MSWLF site, but it does not necessarily represent the actual character of the leachate produced by an individual disposal unit. Samples that accurately represent the individual disposal unit are the best indicators of MSWLF unit equilibrium and/or stabilization.

If the request of the permit holder includes terminating the leachate collection system (LCS) then a minimum of an additional five years of PCC monitoring after terminating the LCS must occur to allow the landfill to reach a new equilibrium. Measurements from leachate

piezometers must indicate that five years is the appropriate length of time after LCS shutdown to reach a new equilibrium or the monitoring must continue until equilibrium is demonstrated.

Termination of a LCS is also contingent on demonstrating that the maximum measured concentrations of constituents in leachate, are less than the Ground Water Protection Standards (GWPS) for all compounds of concern. The DNR will, if needed, review submitted fate and transport modeling results to determine if these criteria are met.

In addition, the LCS cannot be shutdown if it is a component to any corrective measures being implemented for groundwater contamination, unless it can be shown that it is no longer necessary for corrective action.

Landfill Gas Collection System (GCS) Monitoring

The permit holder of any landfill that has a GCS may use data collected from the system to demonstrate the degree of MSW equilibrium and/or stability. The RTP plan should define the leveling out of landfill gas composition and flow rates which, either on their own or in combination with an evaluation of leachate generation, can show that equilibrium or stabilization has been reached and the PCC activities can be reduced or terminated without adversely affecting public health, safety and the environment. Key landfill gas parameters for demonstrating the degree of MSW equilibrium and/or stability include:

1. Flow rate
2. Methane (CH₄)
3. Non-methane organic compounds (NMOC)
4. Carbon dioxide (CO₂)
5. Oxygen (O₂)

Ideally, the landfill gas sampling frequency should match the leachate sampling effort since both leachate and landfill gas generation are typically the result of the same reactions within the MSW mass. The coordination of the two sampling efforts will allow comparison of the sampling results and provide a better confirmation of the trend analysis. Samples that accurately represent the individual disposal unit are the best indicator that the MSWLF unit has reached equilibrium and/or stabilization.

If the request of the permit holder includes terminating the GCS then a minimum of five years of PCC monitoring after terminating the GCS must occur to allow the landfill to reach a new equilibrium. If testing with gas probes indicates that that equilibrium has not been reached at the end of five years, the PCC monitoring period will continue until equilibrium is established.

In addition, the GCS cannot be shutdown if it is a component to any corrective measures being implemented for groundwater contamination, unless it can be shown that it is no longer necessary for corrective action.

The shutdown of the GCS must be in compliance with any approval from the Air Quality Bureau of the DNR.

Groundwater Quality

Any MSWLF unit that seeks to reduce or terminate PCC must demonstrate that if a contamination plume exists:

1. The parameters of concern are trending down in concentration levels,
2. The plume is not advancing even when a LCS and/or GCS or a remedial system is shut down,
3. Institutional control and/or environmental covenants that restrict land use and/or provide for continued monitoring are in place to protect human health.

The permit holder may seek to reduce a PCC activity if they can demonstrate that the reduced activity in no manner affects groundwater quality.

Storm Water Quality

The RTP plan shall show how storm water quality is not impacted by the MSWLF unit for the following aspects:

1. Erosion rates at a sustainable rate as determined by an approved erosion model such as the Revised Universal Soil Loss Equation or by direct measurement of sediment transport,
2. Leachate seeps,
3. Contamination plumes to a gaining stream or drainageway, and
4. And include environmental covenants that provide for continued site inspection.

Settlement

The RTP plan needs to demonstrate the rate of settlement will not cause ponding, erosion (e.g. terrace flow line failure or letdown failure) or unsafe conditions (unsafe slopes). It is recommended that topographic survey data will be used to make an evaluation. A stabilized final grade should indicate a surface that has a uniform slope between 3% and 25% and show no evidence of differential settlement (settlement trend curve is approaching a zero slope).

Slope Stability

The DNR expects the permit holder to demonstrate that all final slopes and planar surfaces are safe using a factor of safety of 1.5.

Vegetation

Noxious weeds are required to be eliminated from vegetated final caps. It is preferred that the climax vegetation species has been established.

Environmental Covenant

The landfill must have an environmental covenant that includes the following:

1. Requires ongoing maintenance of the final cover,
2. Shows the surveyed waste boundary and describes types of wastes present,
3. Prohibits waste disturbance without DNR notice,
4. Prohibits construction of structures on the waste footprint without DNR approval,
5. Prohibits well installations to an appropriate distance from the waste boundary, and
6. Any additional land use restrictions deemed necessary by the DNR to address unresolved concerns.

Collection of Supplemental Data

In addition to the key monitoring parameters described in this document, DNR suggests collecting the following supplemental data which can be used to interpret and confirm trends related to MSW equilibrium and/or stability, and to facilitate the establishment of a RTP Plan.

1. Landfill inputs, including:
 - a. MSW disposal data, including:
 - i. Quantity (tonnage)
 - ii. Composition
 - iii. Disposal sequence
 - iv. Disposal locations
 - b. Added moisture data, including, as available:
 - i. Quantity
 - ii. Composition
 - iii. Temperature

Examples of added moisture sources include: active area precipitation and storm water run-on; infiltration through intermediate and final cover; research, development, and demonstration (RD&D) liquids; and recirculated leachate and/or storm water

2. Landfill outputs including:
 - a. Toe drain, cleanout, and landfill gas (LFG) condensate data including:
 - i. Quantity
 - ii. Composition
 - iii. Temperature
 - b. Leachate seep and fugitive LFG emission data including:
 - i. Flow rate estimates
 - ii. Composition
 - iii. Locations
3. State of the waste, including:
 - a. Temperature of the MSW
 - b. Topographic changes in the surface of the landfill
4. Climatic data including:
 - a. Wind velocity
 - b. Temperature
 - c. Atmospheric pressure

Justification

The DNR believes that this policy addresses the concerns encountered in the implementation of 567 IAC 113.4(8)“b” and will continue to provide adequate protection of public health, safety and the environment. This approach allows the permit holder to plan ahead with the collection of data that directly affects the length of time for PCC.

The DNR intends to revise 567 IAC 113.4(8)“b” in the future to provide specific requirements for ending and reducing post closure care.

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Date