NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
POND SEALING OR LINING – GEOMEMBRANE OR GEOSYNTHETIC CLAY LINER
CODE 521
(Ft.^{2})

DEFINITION

A liner for an impoundment constructed using a geomembrane or a geosynthetic clay material.

PURPOSE

This practice is applied to:

- Reduce seepage losses from an impoundment for water conservation.
- Protect soil and water from contaminants.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where in-place natural soils have excessive seepage rates.

CRITERIA

General Criteria Applicable to all Purposes

Design. The facility to be lined must meet all applicable NRCS standards. All inlets, outlets, ramps, and other appurtenances may be installed before, during, or after the liner placement, but must be done in a manner that does not damage or impair the proper operation of the liner.

Design and install the liner in accordance with manufacturer's recommendations and applicable specifications, found in Tables 3 and 4.

Follow manufacturer's recommendations with regard to protection from weather and ultraviolet exposure.

Design liners to withstand all anticipated internal and external loads, and resist agitation scouring.

Materials. Geomembrane and geosynthetic clay liner (GCL) materials must meet the requirements in Tables 1 – 4.

Safety. Include appropriate safety features in the design to minimize the hazards of the completed pond facility. Use warning signs, fences, ladders, ropes, bars, rails, and other devices, as appropriate, to ensure the safety of humans, wildlife, and livestock.

Underliner Drainage and Venting. Design the drainage and venting system beneath the geomembrane liner based on subsurface conditions such as soil type and groundwater levels. Liners used for waste storage require venting at the top of slope. For clean water applications, incorporate a drainage and venting system when conditions exist that may result in floating of the geomembrane liner. Ponds with an underliner drainage system must have a bottom slope of at least 1 percent.

Do not install a drainage layer or venting system beneath a GCL, as they could compromise the liner.

Table 1. Minimum Geomembrane Thickness Criteria

Type	Name	Minimum Thickness	
		Manure & Wastewater	Clean Water
HDPE	High Density Polyethylene	60 mil [Note 1]	30 mil
LLDPE	Linear Low Density Polyethylene	60 mil	30 mil
LLDPE-R	Reinforced Linear Low Density Polyethylene	Not Applicable	24 mil
PVC	Polyvinyl Chloride	Not Applicable	30 mil
EPDM	Ethylene Propylene Diene Terpolymer	60 mil	45 mil
FPP	Flexible Polypropylene	Not Applicable	30 mil
FPP-R	Reinforced Flexible Polypropylene	Not Applicable	24 mil
PE-R	Reinforced, Slit – Film, Woven Polyethylene	Not Applicable	24 mil

[Note 1] 1 mil = 1/1000 of an inch

Table 2. Minimum Bentonite Content for Geosynthetic Clay Liners

Type	Minimum Bentonite Content	
	Manure & Wastewater	Clean Water
GCL	0.75	

Table 3. Reference Specifications for Geomembranes

Type	Applicable Specification
HDPE	WI FOTG Construction Specification 202, Polyethylene Geomembrane Lining
LLDPE	WI FOTG Construction Specification 202, Polyethylene Geomembrane Lining
LLDPE-R	NRCS Material Specification 594, Geomembrane Liner
PVC	NRCS Material Specification 594, Geomembrane Liner
EPDM	WI FOTG Construction Specification 205, Ethyl Propylene Diene Monomer (EPDM) Geomembrane Lining
FPP	NRCS Material Specification 594, Geomembrane Liner
FPP-R	NRCS Material Specification 594, Geomembrane Liner
PE-R	NRCS Material Specification 594, Geomembrane Liner

Table 4. Reference Specifications for Geosynthetic Clay Liners

Reference Specifications for Geosynthetic Clay Liners	
Type	**Applicable Specification**
GCL	WI FOTG Construction Specification 203, Geosynthetic Clay Liner

Groundwater and Leakage Drainage. If a soil investigation indicates that the groundwater level may be near the invert elevation of the pond, install groundwater monitoring wells to verify the expected water table location. Use NRCS Conservation Practice Standard (CPS) Monitoring Well (CPS 353). In some situations, monitoring wells may need to be installed for a year or more to determine the groundwater levels and gather enough information to properly determine the required flow capacity of the drainage system. If the monitoring wells indicate a seasonal high water table within 2 feet of the pond bottom, install subsurface or other type of drainage to control the potential uplift pressures.

Gas Venting. All pond liners with anchor trenches require venting near the top of the side slopes. Design and install venting in accordance with the manufacturer's recommendations, with a spacing not to exceed 20 feet between vents. Investigate the need for additional venting beneath wastewater pond liners as part of the design. If the investigation determines the potential of gas buildup under the liner, the liner must be vented in accordance to the manufacturer's recommendations. Site conditions conducive to gas production include sites which have been subject to long-term seepage of animal waste into the foundation soil, sites with naturally occurring organics in the soil, or fine-grained foundation soils where fluctuating groundwater levels may trap gases present in the soil. If site conditions are determined to be conducive to gas production, the bottom of the liner must include features to allow gas to flow along the bottom and up the side slopes to the liner vents in the crown.

Subgrade Preparation. Prepare the subgrade to conform to manufacturer's recommendations. The subgrade materials must be free from sharp, angular stones, and the surface free from oversized particles, or any objects that could damage the liner. The subgrade surface must provide a smooth, flat, and unyielding foundation for the liner. Do not use sub-liner soil that contains sharp, angular stones or any objects that could damage the liner. No standing water, mud, vegetation, snow, frozen subgrade, or excessive moisture may be present at the time of liner placement. The maximum allowable particle size of sub-liner soil is 3/8 inch for geomembrane liners and 1/2 inch for GCLs.

Liner protection. Protect liners from mechanical damage from all sources, including equipment access points and agitation operations. If pond management plans indicate locations where agitation operations may result in abrasion or other mechanical damage to the liner, provide protective measures. Measures to ensure the integrity of the liner include increasing the liner thickness above the minimum values listed in table 1 or providing protective ramps and aprons at agitation locations. For GCL liners, analyze the wastewater, subgrade soil, and cover soil to ensure that undesirable cation exchange (calcium and magnesium for sodium) will not occur in the GCL.

Anchorage. Anchor the liner to prevent uplift due to wind or slippage down the side slope, in accordance with manufacturer's recommendations.

Penetrations. Install penetrations through the liner in accordance with manufacturer's recommendations. Penetrations associated with waste storage must be watertight.

Cover Soil. PVC and GCL liners shall be covered with a minimum of 12 inches of soil, with an additional 12 inches on side slopes, unless protected from erosion for a total of 24 inches of soil measured perpendicular to the finished surface (see Table 6). Cover soil may be used on other liners but is not required unless essential for the proper performance, protection, and durability of the installation. Do not use cover soil that contains sharp, angular stones or any objects that could damage the liner. The maximum allowable particle size of soil cover material is 3/8 inch for geomembrane liners and 1/2 inch for GCLs. Use cover materials that are stable against slippage down the slope under all operational and exposure conditions, such as rapid drawdown or saturation by precipitation or snowmelt.

Place cover soil within 24 hours after placement of the liner to minimize the potential for damage from various sources, including precipitation, wind, and ultraviolet light exposure.

Cover soil for GCLs must provide uniform confinement pressure as recommended by the manufacturer.

Additional Criteria for Waste Storage Facilities.

Table 5 and 6 summarizes the liner and separation distance requirements for waste storage facilities. Table 7 describes sub-liner soil requirements. All waste storage facilities shall also meet the requirements of Wisconsin Conservation Practice Standard (WI CPS) Waste Storage Facility (WI CPS 313). Wisconsin Construction Specifications 202, 203, 204 and 205 contain construction requirements for geomembrane and geosynthetic clay liners. All designs must meet these requirements.

The geomembrane shall be installed with intimate contact to the soil below. Intimate contact does not exclude the use of trenches for gas venting or leak detection. The plasticity index (PI) shall be determined in accordance with ASTM D4318 and the percent fines in accordance with ASTM D1140.

The geomembrane must have a leak detection line to a free outlet or observation well.

The leak detection line must enter into an observation and pumping port. This port must be monitored for discharge and pollutants. If pollutants are identified, the port must be pumped until the source is identified and repairs can be completed. If discharging to the surface, evaluate the effects of out-letting to perennial or intermittent waterways.

Poured-in-place concrete slabs shall meet requirements of WI CPS Pond Sealing or Lining – Concrete (WI CPS 522), if the geomembrane will be joined to the concrete. All connections between the geomembrane and concrete shall be liquid tight and structurally sound.

Liner protection installation over the geomembrane shall be completed by methods that will maintain the integrity and performance of the liner. Liner protection placed on top of the geomembrane shall be structurally sound, but liquid-tightness is not required. Concrete liner protection poured on top of the geomembrane shall be separated from the geomembrane by a sacrificial layer of the same weight geomembrane and a cushioning layer of 10 oz/sy non-woven geotextile. The sacrificial layer shall not be welded to the geomembrane liner. Liner protection placed on slopes shall be designed with provisions to ensure stability.

Sand bedding may be used in conjunction with a geomembrane liner, but the design must include a method to remove sand from the waste stream before it enters the waste storage facility. Multiple liners may be installed to address the accumulation of sand in the waste storage facility.

Use WI CPS 313 criteria to determine subsurface saturation and bedrock depth.

Sub-Liner Soils. Sub-liner soil requirements are listed in Table 7. These sub-liner soils can be placed or in situ materials. There is no compaction requirement for in situ materials. Sub-liner soil is required under the footprint of all waste storage facilities. For structures, the sub-liner soil must be wrapped around to the top of the footing to provide continuous protection. For pre-engineered structures, requirements for sub-liner soil configurations are included in the approval letter for the manufacture, written by the SCE.

Sub-liner soil thickness is in addition to any soil liner or soil cover requirement.

Table 5. Geomembrane Liner System Criteria for Waste Storage Facility Impoundments Note 1

Liner Material		
Geomembrane Component	See Table 1	
Soil Component		
% Fines	≥ 40%	≥ 40%
Plasticity Index (PI)	≥ 7	—
Thickness	≥ 2 feet	≥ 4 feet
Compaction of Placed Material	WI FOTG Construction Specification 204, Earthfill for Waste Storage Facilities	
Subgrade preparation requirements	WI FOTG Construction Specification 202, Polyethylene Geomembrane Lining and 205, Ethyl Propylene Diene Monomer (EPDM) Geomembrane Lining	
Sub-Liner Soil (Soil Directly Below Soil Component)		**See Table 7**
Separation Distances		
Well Distance Note 2	≥ 250 feet	≥ 250 feet
Sinkholes or Other Karst Features	≥ 400 feet	≥ 400 feet
Subsurface Saturation	≥ 4 feet	≥ 6 feet
Bedrock	≥ 4 feet	≥ 6 feet
Impoundment		
Inside Slope	2.5:1 or flatter.	
Other		
Liner Protection Required	Stationary agitation and pumping locations	Minimum dimension of 20 feet wide x 30 feet long x 4 inches thick concrete pad or sump in bottom and 20 feet wide ramp with 18-inch curb to the top of the facility with provisions for liner integrity. Ramps shall be located to be accessible to the agitation equipment used.
	Scraping and other mechanical means of removing accumulated solids and sand	Protect with hard surfacing designed for the expected conditions and loads, a minimum of 4 inches thick concrete.
Vent system	Required for all facilities. The system shall be designed in such a manner to vent gas from the system. Waste and runoff shall be prevented from entering the venting system. Liquid detection points may be installed as part of the system.	
Liner Installation	WI FOTG Construction Specification 202, Polyethylene Geomembrane Lining and 205, Ethyl Propylene Diene Monomer (EPDM) Geomembrane Lining	

Note 1 This liner may be used to meet the requirements of Wisconsin Administrative Code, Chapter NR 213 (NR 213), with additional restrictions (e.g. soils investigations, separation distances, liner properties, maintenance requirements). See NR 213 and WI AWMFH 313 companion document.

Note 2 Community water system wells may require larger separation distances (see Wisconsin Administrative Code, Chapter NR 811 (NR 811)).

Table 6. Geosynthetic Clay Liner (GCL) System Criteria for Waste Storage Facility Impoundments [Note 1]

Liner Material		
Geosynthetic Clay Liner Component	See Table 2 and 4. Non-woven needle punched. Manufacturer's specifications and WI FOTG Construction Specification 203, Geosynthetic Clay Liner.	
Soils Component		
% Fines	≥ 40%	≥ 40%
Plasticity Index (PI)	≥ 7	—
Thickness (from bottom and sides)	≥ 2 feet	≥ 4 feet
Compaction of placed material	WI FOTG Construction Specification 203, Geosynthetic Clay Liner	
Liner Cover Material Thickness		
Bottom	≥ 1 foot	≥ 1 foot
Side Slopes	≥ 2 feet	≥ 2 feet
Compaction of Placed Materials	WI FOTG Construction Specification 203, Geosynthetic Clay Liner	
Sub-Liner Soil (Soil Directly Below Soil Component)		**See Table 7**
Separation Distances		
Well Distance [Note 2]	≥ 250 feet	≥ 250 feet
Sinkholes or Other Karst Features	≥ 400 feet	≥ 400 feet
Subsurface Saturation	≥ 4 feet	≥ 6 feet
Bedrock	≥ 4 feet	≥ 6 feet
Impoundment		
Inside Slope [Note 3]	3:1 or flatter	
Other		
Liner Protection	Agitation and Pumping Locations	Minimum dimension of 20 feet wide x 30 feet long x 4 inches thick concrete pad or sump in bottom and 20 feet wide ramp or a 16 feet wide ramp with 18-inch high curb to top of facility. GCL continues under the concrete pad or sump. Poured in place concrete slabs shall meet requirements of WI CPS 522.
	Scraping and Other Mechanical Means of Removing Solids and Sand	Sand bedding may be used in conjunction with a geosynthetic clay liner, but the design must include a method to remove sand from the waste stream before the waste is stored in the liner or the liner must be protected to allow mechanical removal of the sand. Poured in place concrete slabs shall meet requirements of WI CPS 522.
Liner Installation	WI FOTG Construction Specification 203, Geosynthetic Clay Liner.	

[Note 1] This liner may be used to meet the requirements of NR 213, with additional restrictions (e.g. soils investigations, separation distances, liner properties, maintenance requirements). See NR 213 and WI AWMFH 313 companion document.

[Note 2] Community water system wells may require larger separation distances (see NR 811).

[Note 3] The GCL and soil cover shall be stable at the designed side slope.

Table 7. Sub-Liner Soil Requirements for Waste Storage Facility Impoundments

	Minimum Soil Requirements			
	A	**B**	**C**	**D**
% Fines	≥ 20%	≥ 20%	≥ 40%	Foundry Sand [Note 1]
Plasticity Index (PI)	≥ 7	—	≥ 12	—
Thickness (bottom and sides)	≥ 1.5 feet	≥ 2 feet	≥ 8 inches	≥ 1.5 feet
Compaction of Placed Material	WI Spec 204	WI Spec 204	WI Spec 300	WI Spec 204

[Note 1] The foundry sand must be ferrous foundry sand with only minimal concentrations of hazardous constituents, cores and other oversize materials crushed or removed, and at least 5% bentonite content. A site specific WDNR approval is required under Wisconsin Administrative Code, Chapter NR 538 (NR 538) that may specify greater separation distances and parameters not addressed by this standard. An NR 538 Category I or II ferrous foundry sand may be appropriate.

CONSIDERATIONS

Designs for waste storage facilities should consider leakage through the liner due to liner damage. Giroud and Bonaparte (1989) recommends designing the drainage system based on a frequency of one hole (0.16 square-inch) per acre of surface area. Therefore, drainage and venting systems are strongly recommended for all waste storage facilities.

Minimize the number of penetrations through the liner for pond management appurtenances. Detail the trenching and backfilling of pipes to prevent charging of the underside of the liner with subsurface water.

For HDPE liners associated with waste water with penetrations over 2 inches in diameter, consider using concrete pads matching the slope with embedded channels to connect the liner, instead of manufactured boots.

PVC geomembranes are not recommended for aquatic production. The stabilizers in the PVC liner material leach out and may be harmful to aquatic species. Consult with manufacturers before selecting a geomembrane material used for aquatic production.

Where access is needed, consider installing concrete ramps with embedded channels to connect the liner. Pond corners are typically good locations for concrete ramps due to the flatter slopes. Consider placing the access ramp at a corner location.

If the entire waste storage pond is lined and access is needed on the bottom, consider placing concrete over the liner, bedded with geotextile.

Consider the use of a geosynthetic such as a geonet or geocomposite under the liner to facilitate collection, drainage of liquids, and venting of gas. If geocomposite materials are used for drainage and/or venting, use materials recommended by the manufacturer in the system design. Use Geosynthetic Research Institute (GRI) Standard GC8, “Standard Guide for the Allowable Flow Rate of a Drainage Geocomposite” to determine the allowable flow rate of the geocomposite. Slope the pond bottom a minimum of 1 percent to permit positive flow of the liquids or gases. In most cases, the geocomposite will serve both purposes of drainage and venting. For large impoundments, the bottom may need to be sloped in multiple directions in order to decrease the required drainage and venting flow travel distances.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for a geomembrane or GCL for a pond or a waste storage impoundment that describe the requirements for applying the practice to achieve its intended purpose. This should include:

- Layout of the containment facility, collection points, waste transfer locations or pipelines, and topography of the site.
- Soils investigation and subgrade details, including tolerances on smoothness of the finished grade.
- Required properties of selected liner, geosynthetics, and cushion materials.
- Quantities of liner materials, cover soil, and geosynthetic materials as needed.
- Subsurface drainage and venting details.
- Construction and material specifications.
- Safety requirements for installed liner.
- Details of liner installation, seaming requirements, and requirements for attachments and appurtenances.
- Minimum qualifications of installers and quality control testing requirements.
- Warranty requirements, if desired.
- Fence and signage requirements, if required.
- Applicable Wisconsin Construction Specifications

OPERATION AND MAINTENANCE

Prepare a plan for O&M of the liner and facility consistent with the purposes of the type of liner chosen, intended life, safety requirements, and design criteria. Include site-specific information regarding design capacity and liquid level of the facility and repair procedures for liner material. Maintenance activities required for this practice consist of those operations necessary to prevent and repair damage to the geomembrane or GCL. These include, but are not limited to:

- Excluding animals and equipment from the treated area.
- Repairing damage to the liner and restoring the liner and cover to its original thickness and condition.
- Removing roots from trees and large shrubs at first appearance.
- Monitoring leak-detection system.
- Protecting the liner during filling and agitation procedures.
- Provide guidance on items to inspect periodically, including:
- Visible portions of the liner for tears, punctures, or other damage.
- Liner interface with inlets, outlets, ramps, or other appurtenances for damage.
- Liquid level in the facility.
- Ballooning of the liner indicating presence of gas beneath the liner.

REFERENCES

ASTM D 5887, Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.

ASTM D 5890, Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.

ASTM D 5891, Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

ASTM D 5993, Test Method for Measuring of Mass Per Unit of Geosynthetic Clay Liners.

ASTM D 6102, Guide for Installation of Geosynthetic Clay Liners.

ASTM D 6214, Test Method for Determining the Integrity of Field Seams Used in Joining Geomembranes by Chemical Fusion Methods.

ASTM D 6392, Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.

ASTM D 6497, Guide for Mechanical Attachment of Geomembrane to Penetrations or Structures.

ASTM D 7176, Specification for Non-Reinforced Polyvinyl Chloride (PVC) Geomembranes Used in Buried Applications.

ASTM D 7272, Test Method for Determining the Integrity of Seams Used in Joining Geomembranes by Pre-manufactured Taped Methods.

ASTM D 7408, Specification for Non Reinforced PVC (Polyvinyl Chloride) Geomembrane Seams.

ASTM D 7465, Specification for Ethylene Propylene Diene Terpolymer (EPDM) Sheet Used in Geomembrane Applications.

Daniel, D.E., and R.M. Koerner. 1993. Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities. EPA/600/R-93/182 (NTIS PB94-159100).

Geosynthetic Research Institute, GRI Standard GC8, Standard Guide for the Allowable Flow Rate of a Drainage Geocomposite.

Geosynthetic Research Institute, GRI Test Method GT12(a) – ASTM Version, Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials.

Geosynthetic Research Institute, GRI Test Method GM13, Standard Specification for Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.

Geosynthetic Research Institute, GRI Test Method GM17, Standard Specification for Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes.

Geosynthetic Research Institute, GRI Standard GM18, Standard Specification for Test Methods, Test Properties and Testing Frequencies for Flexible Polypropylene (fPP and fPP-R) Nonreinforced and Reinforced Geomembranes.

Geosynthetic Research Institute, GRI Test Method GM19, Standard Specification for Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.

Geosynthetic Research Institute, GRI Test Method GM21, Standard Specification for Test Methods, Properties, and Frequencies for Ethylene Propylene Diene Terpolymer (EPDM) Nonreinforced and Scrim Reinforced Geomembranes.

Geosynthetic Research Institute, GRI Test Method GM25, Standard Specification for Test Methods, Test Properties and Testing Frequency for Reinforced Linear Low Density Polyethylene (LLDPE-R) Geomembranes.

Giroud, J.P., and R. Bonaparte. 1989. Leakage through liners constructed with geomembranes—Part 1. Geomembrane Liners. In Geotextiles and Geomembranes, vol. 8, pgs. 27–67.

Koerner, R.M. 2005. Designing with Geosynthetics, 5th ed. Pearson Prentice Hall, Upper Saddle River, NJ.

U.S. Department of Agriculture, Natural Resources Conservation Service. National Engineering Handbook, Part 642, Specifications for Construction Contracts.

U.S. Department of Agriculture, Natural Resources Conservation Service. National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook. (AWMFH)

U.S. Department of Agriculture, Natural Resources Conservation Service. Conservation Practice Standard Monitoring Well (Code 353).

DEFINITIONS

Bedrock – The solid or consolidated rock formation typically underlying loose surficial material such as soil, alluvium or glacial drift. Bedrock includes but is not limited to limestone, dolomite, sandstone, shale and igneous and metamorphic rock.

Note: Although solid or consolidated bedrock can sometimes be removed with typical excavation equipment, these materials are included in the above definition.

Clean Water – Water that has not been mixed with manure, wastewater or other contaminants

Geomembrane – Very low permeability synthetic membrane liner or barrier used with any geotechnical engineering related material so as to control fluid migration in a man-made project, structure or system. (ASTM D 4439)

Geosynthetic Clay Liner (GCL) – A manufactured hydraulic barrier consisting of clay bonded to a layer or layers of geosynthetic materials.

Impoundment – A waste storage facility constructed of earthen embankments and/or excavations for the purpose of storing waste. An impoundment may be lined or unlined.

Intimate Contact – Direct contact between liner materials (concrete, GCL, and geomembrane) and soil.

Karst features – Refers to areas of land underlain by carbonate bedrock (limestone or dolomite). Typical land features in karst areas include sinkholes, network of interconnected fissures, fractures, disappearing streams, closed depressions, blind valleys, caves, and springs. See the companion document in Chapter 10 of the AWMFH for additional discussion of karst features.

Percent Fines (% Fines) – Percentage of given sample of soil which passes through a #200 sieve.

Permeability – The coefficient of permeability (K) is a measure of the ability of soil to transmit liquids. It is used to compute the flow rate of liquid through a soil liner for specific conditions of soil thickness and fluid head (e.g., $1x10^{-7}$ cm/s).

Plasticity Index, (PI) – A soil property indicating moldability. Measured by ASTM D4318.

Sinkholes – Closed, usually circular depressions which form in karst areas. Sinkholes are formed by the downward migration of unconsolidated deposits into solutionally enlarged openings in the top of bedrock.

Sub-Liner Soil – The soil directly below the bottom of the liner, having at least 20% fines. This may be placed or in situ material.

Structure – A waste storage facility consisting of constructed surfaces, tanks, or walls for the purpose of storing waste above or below the ground surface.

Wastewater – Milking center waste, flush water, leachate from feed holding areas, and similar waste materials generated at the animal production area.