



MDEQ – UPPER PENINSULA SOLID WASTE OPERATOR
TRAINING

WATER ISSUES AT LANDFILLS



Presented by:

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Water Issues at Landfills



LANDFILL
→

Outline:

A. Leachate Collection System

A.1. Design Considerations

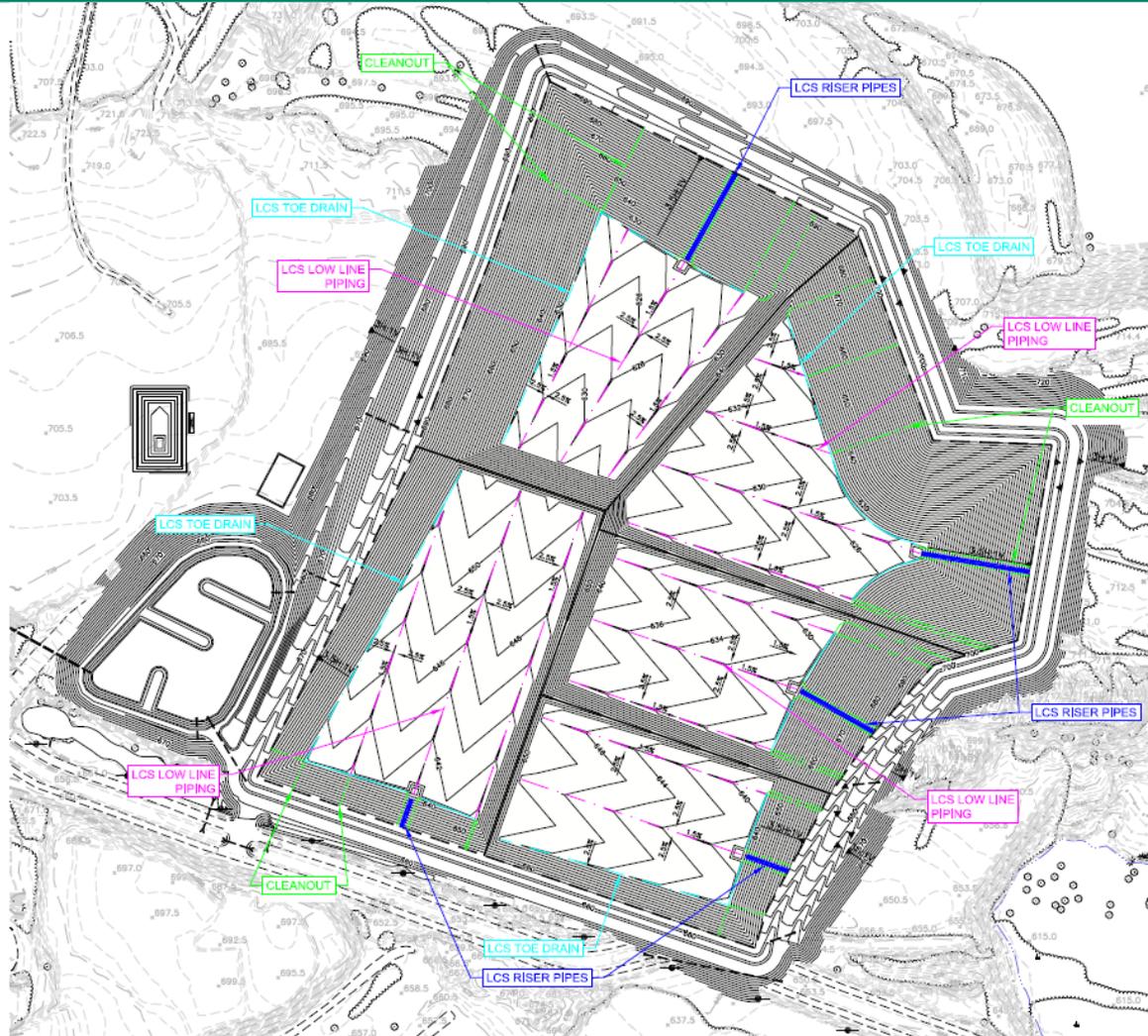
A.2. Construction and Operational Considerations

B. Closure Cover / Storm Water

B.1. Design Considerations

B.2. Construction and Operational Considerations

A.1. – Typical Leachate Collection System Plan





Trivia Question #1

Question:

What is the largest storm event that an Owner/Operator of a landfill must manage according to the Part 115 Rules?



Trivia Question #1

Question: What is the largest storm event that an Owner/Operator of a landfill must manage according to the Part 115 Rules?

Answer: A 25-year 24-hour event

Rule 435

(1) The owner and operator of a type II landfill shall design, construct, and maintain both of the following systems:

(a) A run-on control system to prevent flow onto the active portion of the landfill during the peak

discharge from a 25-year, 24-hour storm.

(b) A runoff control system from the active portion of the landfill to collect and control at least the

water volume that results from a 24-hour, 25-year storm.

(2) The owner and operator of a type II landfill shall manage runoff from the active portion of the landfill that does not have interim cover as leachate in accordance with R 299.4432.

(3) The owner and operator of a type II landfill shall control runoff from the active work area of the landfill and shall institute erosion control measures as necessary to comply with part 91 of the act.

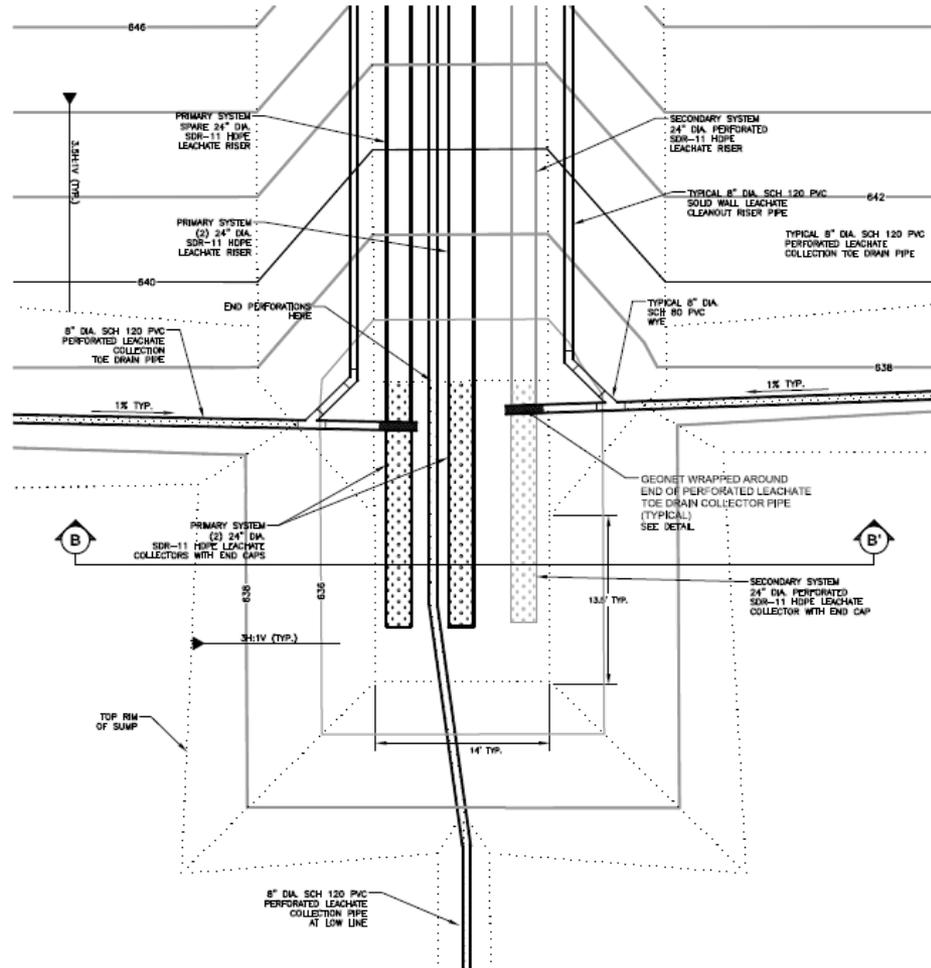


A.1. – Some Design Considerations

- n Piping – pay attention to fitting types, connections, where does the pipe need to flow?
- n Gravel should not pass into perforations (<5% fines)
- n Drainage Sand – avoid erosion, and fines (<5% is allowed)
- n Control silt run-on from adjacent cell (interim cover).
- n Sump controls – include in elevations design so you know your leachate levels and know when problems can occur.
- n Test sump during construction.
- n Use simple designs to control water and leachate – rain flaps and gutters, smaller cells, fill progression, storm water routing away from active areas.



A.1. – Typical Leachate Collection Sump Plan

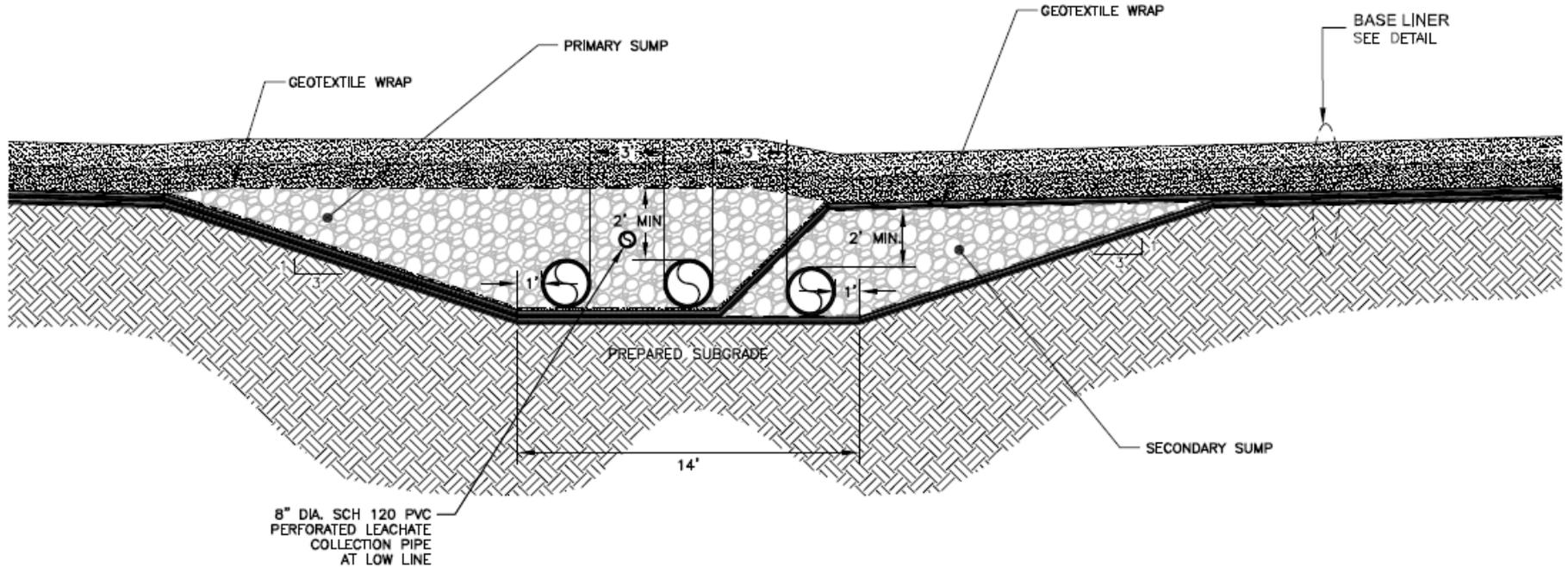


LEACHATE COLLECTION SUMP (TYPICAL)

NOT TO SCALE



A.1. – Typical Leachate Collection Sump Section

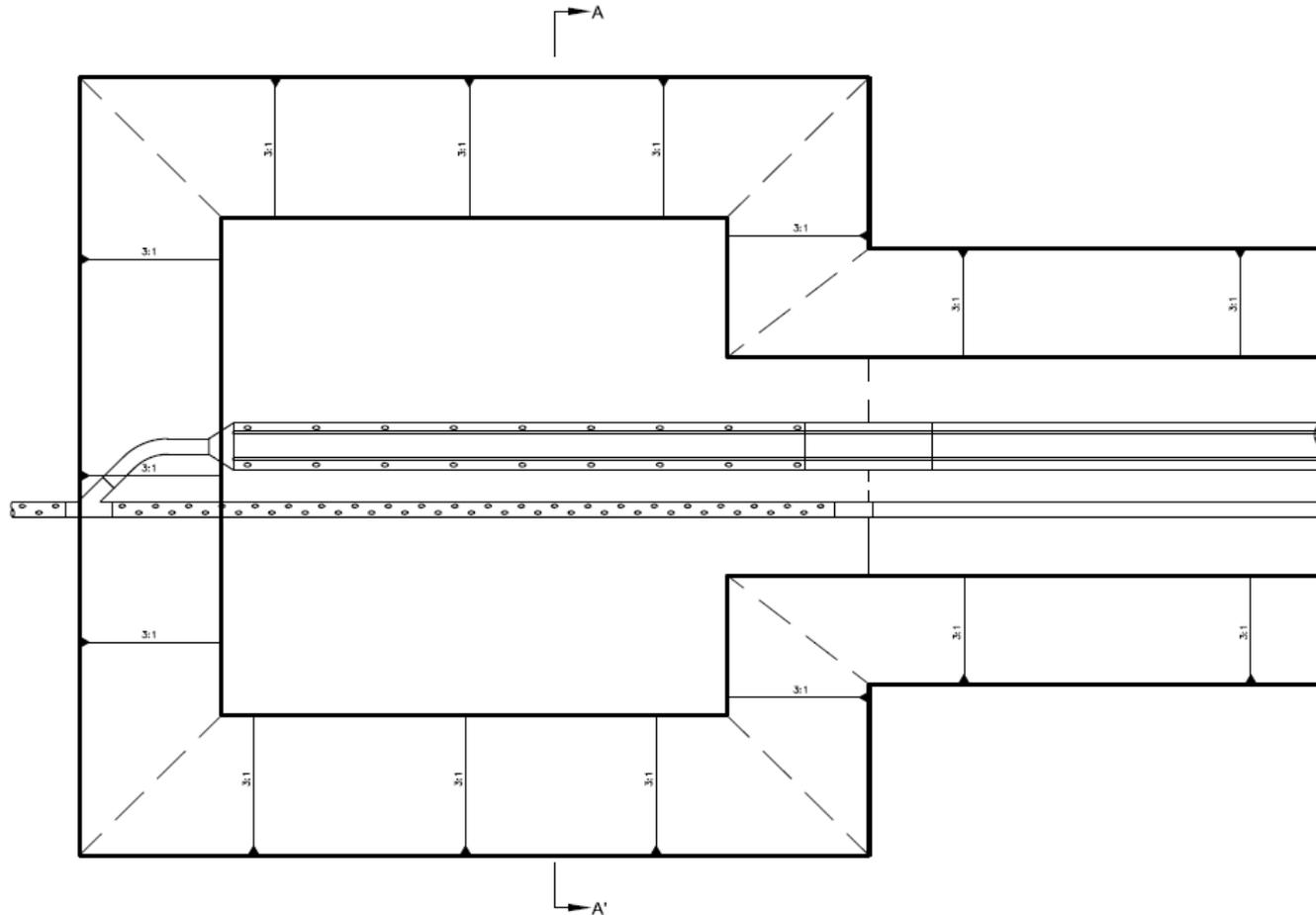


LEACHATE COLLECTION SUMP CROSS SECTION

NOT TO SCALE

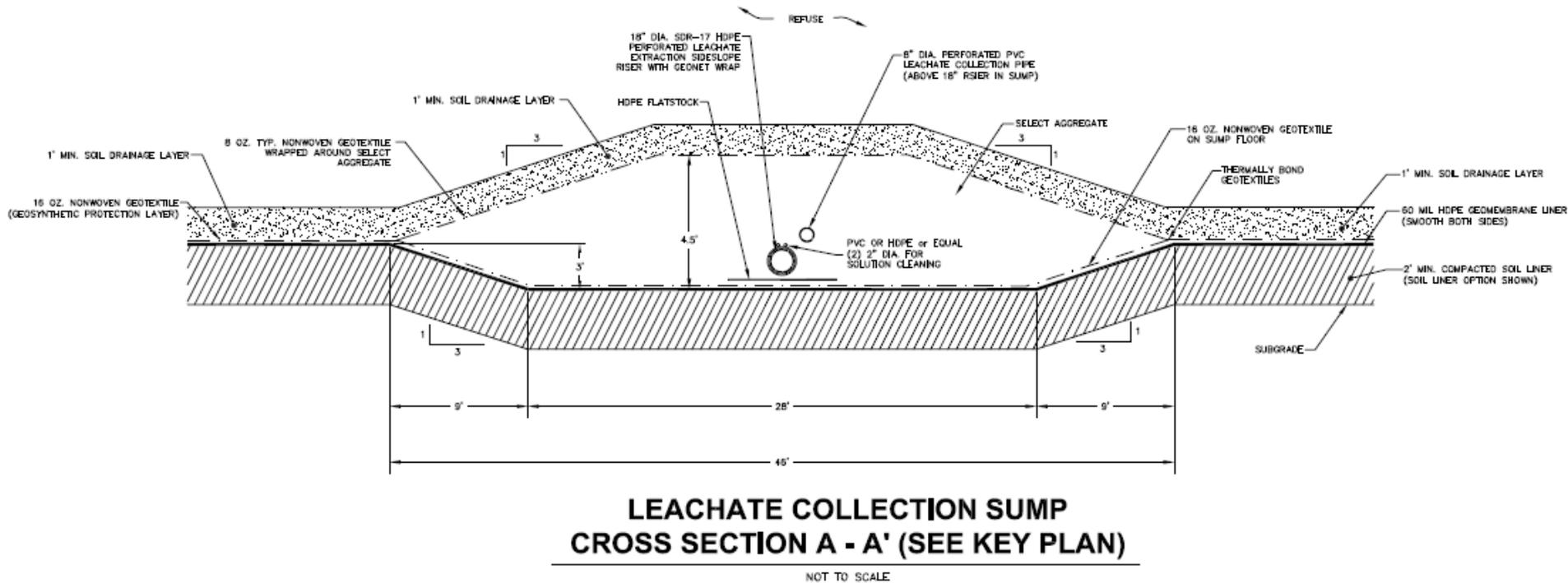


A.1. – Complicated Leachate Collection Sump Plan





A.1. – Complicated Leachate Collection Sump Section





Trivia Question #2

Question:

What rainfall event triggers a 7 day grace period regarding the maximum 12-inch water level above the sump?



Trivia Question #2

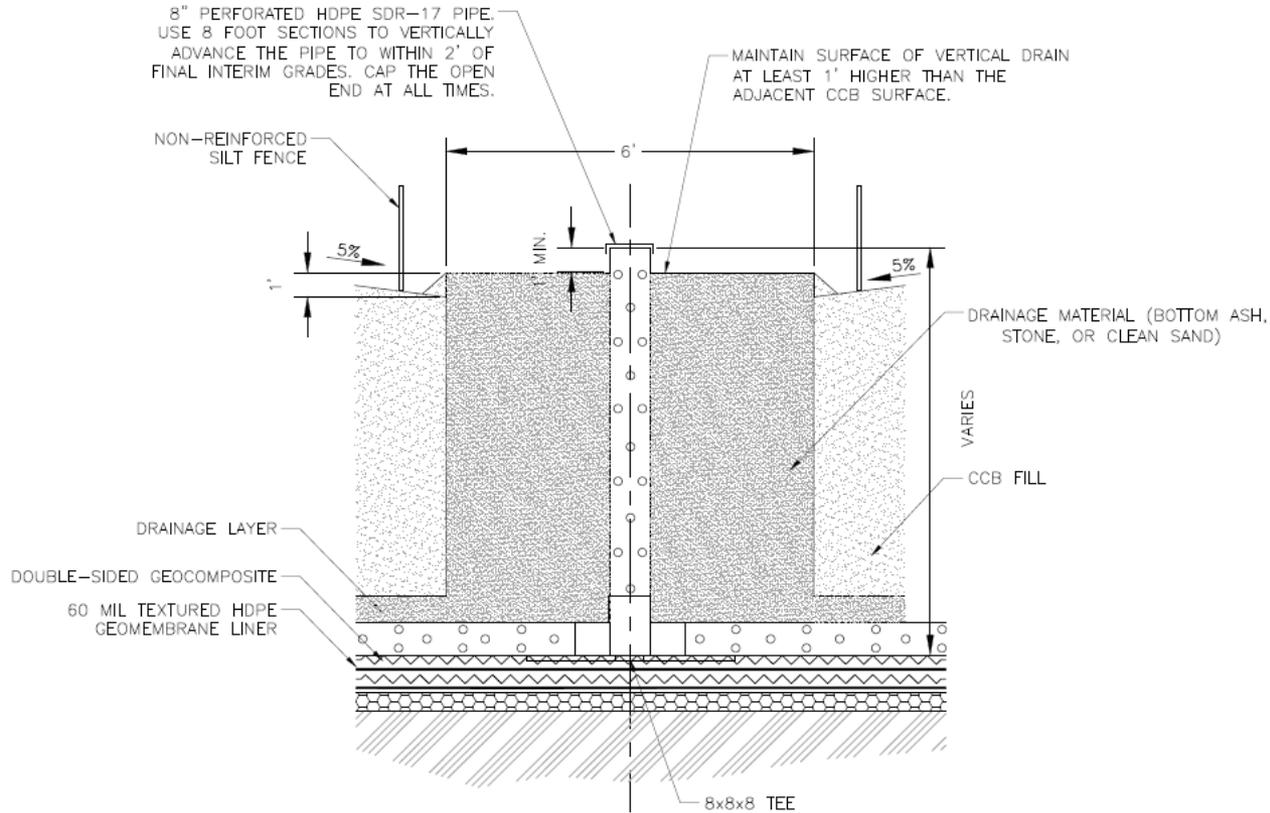
Question: What rainfall event triggers a 7 day grace period regarding the maximum 12-inch water level above the sump?

Answer: 0.1 inch in a 24 hour period.

Rule 432.

(1) The owner and operator of a type II landfill shall remove leachate from a disposal unit as frequently as necessary to ensure that the leachate depth on the liner, excluding the sump, is not more than 1 foot, except after a significant storm event. The leachate depth on the liner shall not be more than 1 foot for more than 7 days after a significant storm event. A significant storm event is a storm that generates 0.1 inches or more of rainfall in 24 hours.

A.1. – Innovative Chimney Design

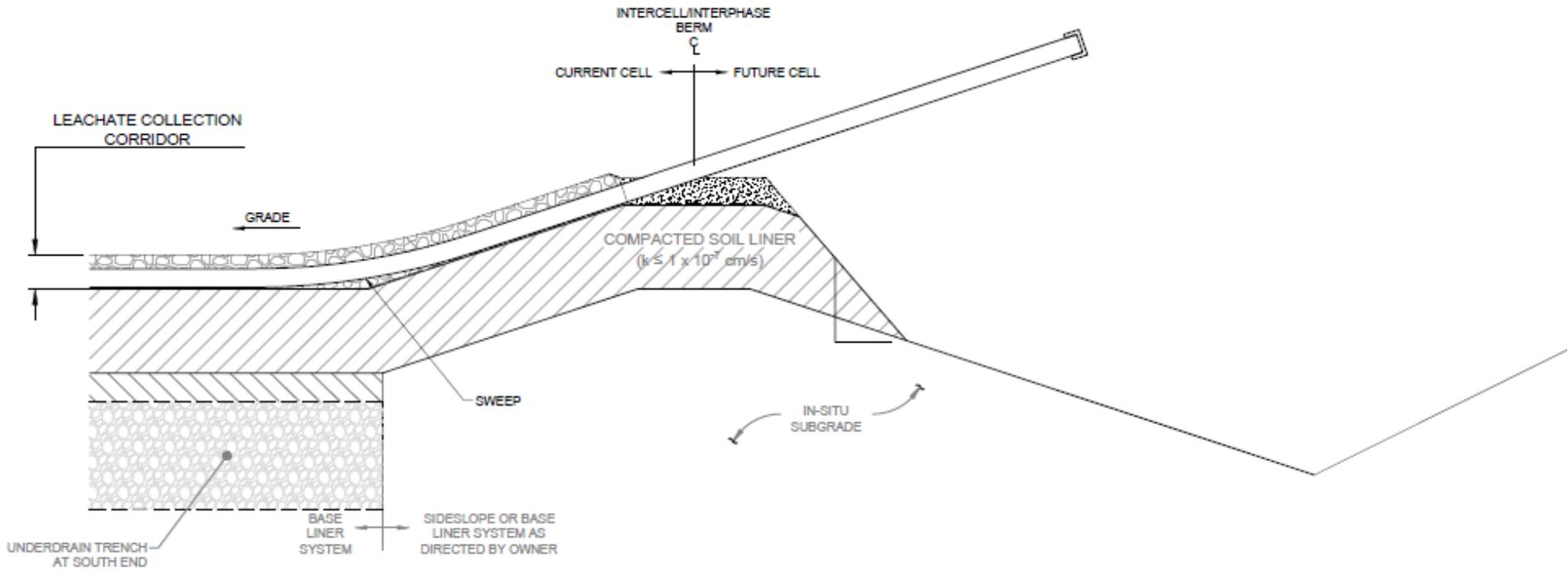


CHIMNEY DRAIN DETAIL

NOTE: GEOSYNTHETICS EXAGGERATED FOR CLARITY
NOT TO SCALE



A.1. – Sweep Design





A.1. – Design Issues

n Pipe Connection Issues



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A.1. – Design Issues

- n Improper Grading and Planning
- n Lack of Interim Cover





A.2. – Constructions & Operational Considerations

- n Construction Quality Assurance (CQA)
 - n Review final designs
 - n Communication regarding changes during construction
 - n Leak detection

- n Regular cleaning of leachate collection system (sumps, cleanouts, collection pipes)

- n Routine Cleaning is every 6 months to every 2 years.
 - n Depending on number of cleanout pipes, jetting is <\$5,000 typically.
 - n May “camera” lines; <\$5,000 typically

- n Follow fill progression plans.



Trivia Question #3

Question:

Does the active portion of a landfill have interim cover (per the Part 115 Rules)?



Trivia Question #3

Question: Does the active portion of a landfill have interim cover (per the Part 115 Rules)?

Answer: No.

Rule 101

(f) "Active portion" means that part of a facility or unit that has received or is receiving wastes and that has not been partially or finally closed in accordance with these rules. The active portion does not include areas that have interim cover which complies with R 299.4429(7) or a constructed unit or portion of a unit that has not received waste.



A.2. – Testing Sumps

- n Pump Controls Example – Test Sump during construction





A.2. – LCS Maintenance

n Erosion





A.2. - LCS Maintenance

n Fines Fouling of Sand Drainage Layers





A.2. - LCS Maintenance

n Fouling of Sand Drainage Layers



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A.2. – CQA on Piping

n Pipe Fitting Issues – Wrong Fitting





A.2. - CQA on Piping

n Pipe Fitting Issues





A.2. – Daily and Interim Cover

n Improper Cover





A.2. - Proactively Managing Water

n Rain Gutter Example





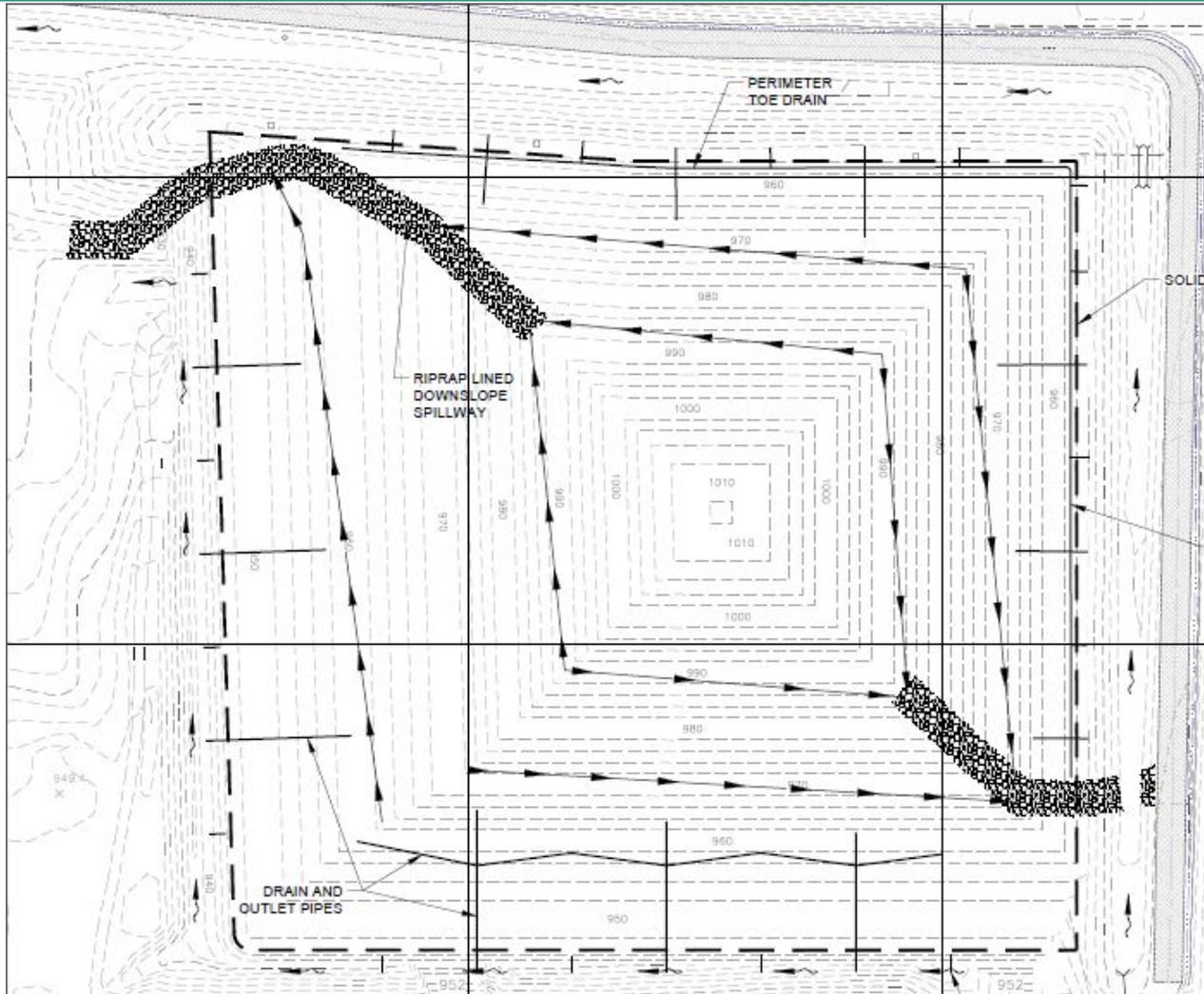
A.2. – Proactively Managing Water

n Another Rain Gutter Example



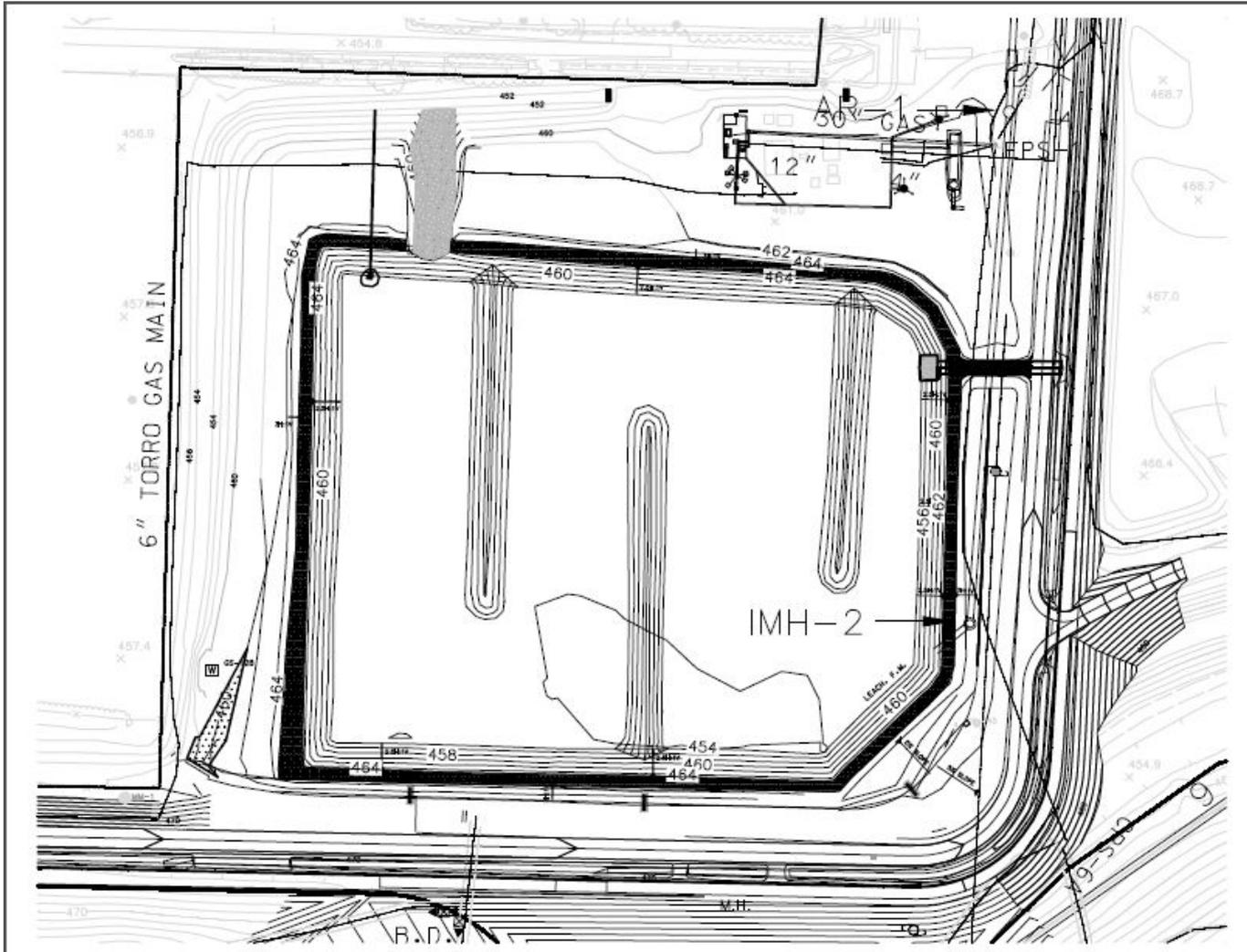


B.1. – Overview of Final Cover





B.1. – Overview of Sediment Basin





B.1. – Design Considerations

- n Storm water – consider drainage elevations and possible areas where storm water can back up into ditches.
- n Storm water berms $>1\%$ fall to avoid ponding after settlement.
- n Should have positive fall away from anchor trench and landfill perimeter.
- n Designing logical closure progression is key.
- n Simple design to control water and leachate – rain flaps and gutters, smaller cells, fill progression, storm water routing away from active areas.



Trivia Question #4

Question:

What is the maximum spacing (vertical elevation) between stormwater berms on a landfill cover per the Part 115 Rules?



Trivia Question #4

Question: What is the maximum spacing (vertical elevation) between stormwater berms on a landfill cover per the Part 115 Rules?

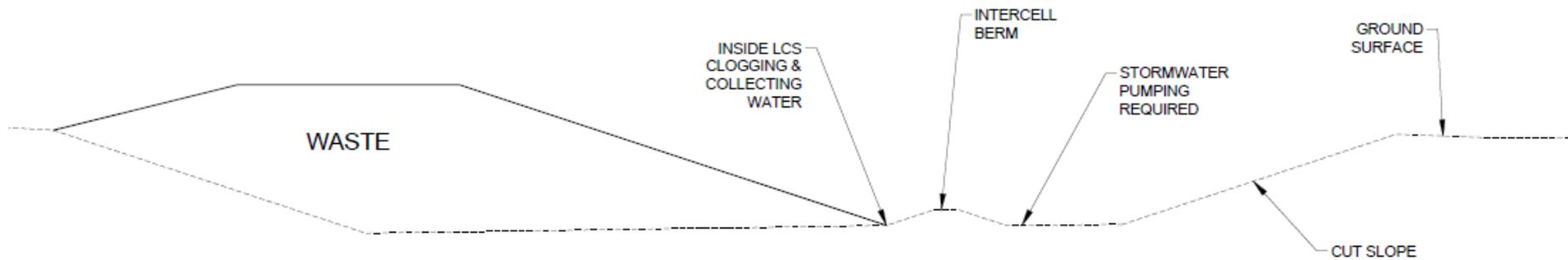
Answer: Trick question – there is none specified in the Part 115 Rules.

Rule 425

(8) ...The controls shall be sufficient to limit erosion to not more than 2 tons per acre per year after vegetation is established based on the universal soil loss equation or other method approved by the director.



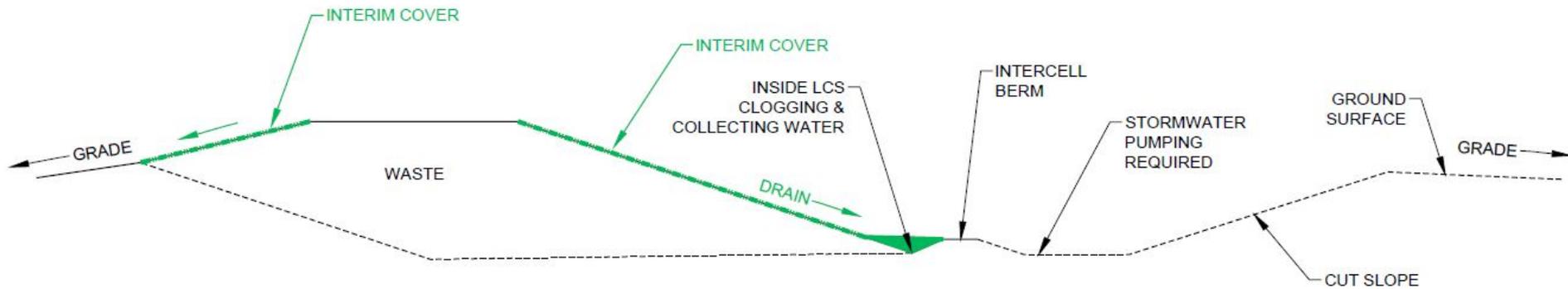
B.1. – Storm water – Avoid Treating as Leachate



TYPICAL SCENARIO



B.1. – Storm water – Avoid Treating as Leachate



TYPICAL SCENARIO



B.1. - Cover Grades - Design

n Improper Grading





B.1. – Berm Slope Design

n Inadequate Storm Water Management





B.2. – Construction & Operational Considerations

- n Construction Quality Assurance (CQA)
 - n Review final designs
 - n Communication regarding changes during construction

- n Sump controls are key to avoiding high leachate levels, these should be regularly checked and maintained.

- n Maintain cover.

- n Maintain vegetation.

- n Keep water away from anchor trenches.

- n Routine maintenance of storm water basins, ditches, piping.



B.2. – Outfall Trouble

n Pipe Heave When Not Properly Anchored





B.2. - Outfall Trouble

n Inadequate Storm Water Management





B.2. – Protect Work

n Inadequate Vegetation





B.2. – Routine Inspection

n Improper Maintenance





Trivia Question #5

Question:

What is the minimum soil thickness of interim cover and how long can you keep daily cover on a waste surface before you must add interim cover?



Trivia Question #5

Question: What is the minimum soil thickness of interim cover and how long can you keep daily cover on a waste surface before you must add interim cover?

Rule 429

(6) To minimize nuisance conditions, the operator of a landfill shall place 1 foot of compacted cover, which may include the 6-inch daily cover, on the surface of any lift that will be exposed for a period of 3 months or more before additional lifts are constructed.

(7) To minimize infiltration, the operator of a landfill may place interim cover on the surface of the landfill and manage runoff from the cover in accordance with R 299.4435. The extent of the interim cover shall be documented in the operating log at least quarterly and shall consist of either of the following:

(a) Not less than 1 foot of low-permeability soil that has a unified soil classification of SC, ML, CL, CL/ML or CH, or another soil type that has a permeability of 1.0×10^{-5} cm/sec or less after compaction. Interim soil cover shall be compacted to the extent necessary to minimize infiltration and prevent leachate discharges through the soil, but need not be compacted to the standards specified in R 299.4913.



Thank You

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