Landfill Leachate Collection System (LCS)

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Engineered Landfills – Key Components

Gas Collection System
Final Cap
Liner and Leachate Collection System (LCS)
Surface Water Management System

Landfill Leachate Collection System (LCS) - Functions

• Collect and Remove Leachate from the landfill
• Reduces leachate head on the liner – reduction in leakage of leachate constituents into GW
• If leachate is not removed landfills, it will seep out from the sides and will cause slope stability failure (sliding or slumping) of the landfill (e.g. – landfill sliding in Manila – Philippines)
Components of LCS

- Geotextile separator
- Drainage Material
- Leachate Collection pipes (can be made of PVC or HDPE) – HDPE pipes are superior as they are flexible and tolerant to more chemicals than PVC
- Leachate Riser Pipes – to pump out leachate from the LCS without the need to making a hole in the liner
LCS – Drainage Materials Used

- Peak Gravel (k ≈ 1 cm/s) ← Best material
- Coarse Sand (k ≈ 0.01 cm/s)
- Geocomposite Drainage Layer (k ≈ 1 cm/s – only 0.5 cm thick product)
- Shredded Tires ← not good as may compress under waste load and wires may damage geomembrane liner

LCS – Operational Issues

- Clogging of drainage material
- Deposits on leachate collection pipes
- Need access for cleaning equipment in the pipes
- Drainage aggregates shall be inert – shall contain almost no carbonates as carbonates may react with acid in the leachate and “eat away” the drainage aggregates.

Schematic of LCS
Waste
Bottom Liner
Leachate Sump

Leachate Treatment & Disposal
Submersible Pump

Schematic of LCS Riser Pipe

LCS – HDPE Riser Pipes at Jackson Landfill

Schematic of Leachate Head Buildup

Leachate Impingement

Leachate Surface/Head

Max. Leachate Head (shall be ≤ 0.3 m)
LCS Design for Max Leachate Head

Leachate Impingement Rate = q

Giroud's Equation:

\[ H_{\text{max}} = \frac{L \left( \frac{4(q/k)}{\tan^2(\beta)} + \tan(\beta) \right)^{0.5} - \tan(\beta)}{2\cos^2(\beta)} \]

\( k = \text{Hydr. Conductivity of LCS Material} \)

LCS – Example Problem