

Cover at Landfills



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Introduction

- Different types of Landfill Cover.....
 - Daily Cover
 - Intermediate Cover
 - Temporary Capping
 - Final Capping



Typical Landfill scene.....



Typical Landfill Cover problems

- Inadequate coverage
- Inadequate depth
- Inappropriate materials for odour control
- Poor coverage of flanked areas
- Poor characterisation & consistency of cover materials
- Inappropriate cover used for prolonged periods
- Damage from vehicle movements
- Erosion



Eroded Cover



Partially stabilised organic fines



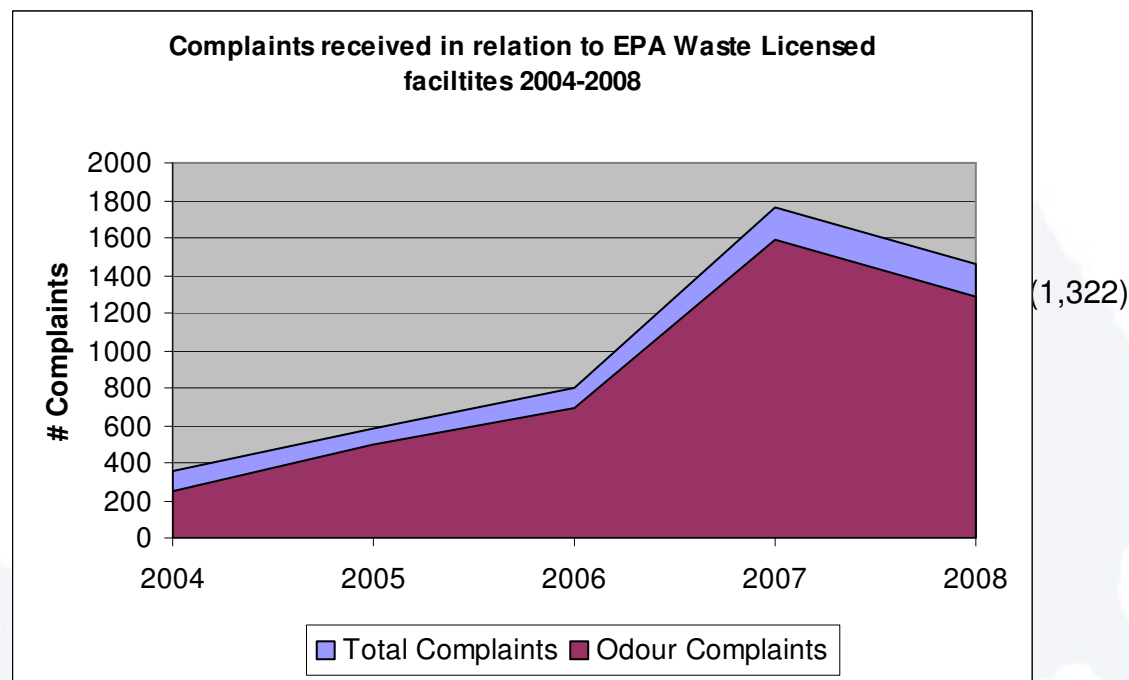
Partially stabilised organic fines (2)



Name that cover material?.....



Landfill Odours



- ~50% of Odour Complaints relate to “fresh waste” smells, not landfill gas
- OMI studies show significant VOC fugitive emissions from covered areas

What is “Cover material”?

- **“Bricks, crushed concrete, tarmac, earth, soil, sub-soil, stone, rock or other similar natural materials; or other cover material the use of which has been agreed by the Agency.”**

What is the purpose of Daily Cover?

...a temporary barrier, or buffer, between deposited waste and the external environment to minimise the impact during operational stage

Main Function.....

- Control nuisances
 - Litter
 - Odours
 - Dust
 - Flies
 - Birds
 - Vermin

What is the purpose of Daily Cover? (contd.)

Secondary Functions.....

- Change nature of gaseous emissions - VOC oxidation
- Improve fire control and gas management (by reducing Oxygen ingress)
- Reduce leachate generation (by reducing rainwater ingress)
- Minimise visual intrusion
- Improve stability/trackability for vehicles

Working Face



What should Daily Cover NOT do?

- Be itself a source of odours
- Encourage or give rise to nuisances – e.g. flies, dust, birds
- Cause pollution
- Breach licence requirements – e.g. waste types acceptable
- Degrade over time to cause secondary problems
- Impede the proper functioning of site infrastructure
- Be a feedstock for future landfill gas production, or conflict with BMW diversion targets

Types of Daily Cover

Traditionally:

- Soil (150mm)
- Free draining - Low clay content

Alternative daily cover materials.....

- Hessian
- Geo-synthetic materials
- Plastic film
- Woodchip
- Stabilised biowaste
- Inert fines
- Auto Shredder Residue

Factors affecting type of daily cover used.....

- Cost
- Availability
- Potential loss of revenue - e.g. void space
- Workability on-site
- Exposure of site
- Distance to, and sensitivity of nearest receptor(s)
- Consistency and quality of supply
- Predominant nuisance issues with site
- Site design and landfill operational practices
- Biowaste diversion targets

Stability of “Compost-like Outputs”

Stabilised Biowaste or *CLOs* used as landfill Cover should.....

- Be properly stabilised
 - e.g. meet Respiration Activity (AT_4) standard of 10 mg O₂/g DM
- Comply with Animal By-products sanitisation requirements
- Be agreed with the Agency

*“Bio-stabilised residual waste shall only be used as landfill cover **where it has been stabilised in accordance with Condition 5.2.12** (or meets the requirements of an alternative protocol as may be agreed under Condition 5.2.10), **complies with any requirements of the Department of Agriculture, Fisheries and Food relating to the management of animal by-products and has been agreed in advance with the Agency.**”*

Cover Application techniques

- Cover application methods should....
 - Allow for covering of all exposed waste - incl. flanks
 - Ensure waste remains covered if conditions change (e.g. wind picks up)
 - Be easy and convenient to install relatively quickly

- Cover application methods should NOT....
 - cause nuisance (e.g. dust blow)
 - compromise stability
 - cause damage to other previously covered areas

Best Practice



- Only use suitable cover material(s) for each site
- Ensure suitable cover practices are employed
- Be aware of weaknesses / limitations of cover management practices (e.g. surface run-off)
- Avoid vehicles tracking over areas with cover
- Maintain a stockpile on-site
- Have a back-up cover material on-site
- Use a combination of cover methods
- Store cover materials appropriately (e.g. within lined cell)

Best Practice (2)



- Have some inert cover on-site for fire control
- Use pre-constructed clay berms on flank areas
- Ensure *CLOs* are properly stabilised
- Ensure *CLOs* comply with ABP requirements
- Regularly characterise & test the specification of materials (e.g. level of stabilisation)
- Have documented procedures – include in LEMP and OMP
- Minimise size of working face
- Regularly assess the effectiveness of cover management practices



Haul Roads.....

- Typically constructed of hardcore or recovered C&D waste
 - Tranverse waste body
 - Potentially significant pathway for fugitive landfill gas emissions
 - Needs to be considered in assessing effectiveness of landfill cover management plan
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- Best practice to underlay with a gas barrier membrane

Haul Roads

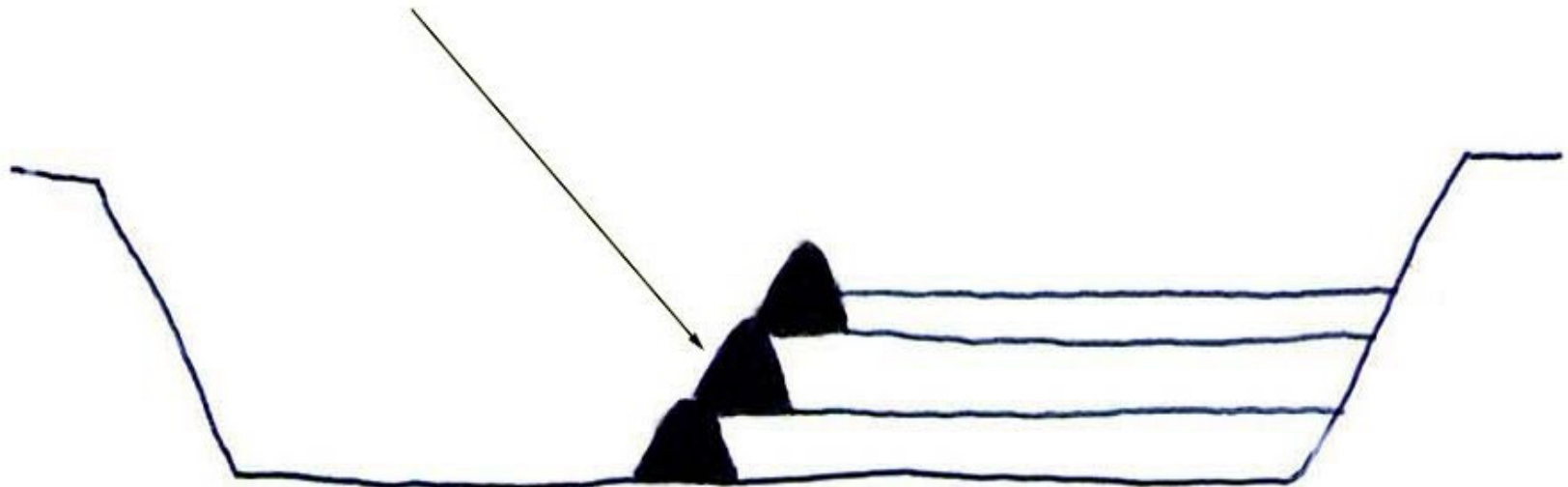


Inappropriate covering on flank areas



Benched Flank Construction

Clay berms stepped in from each other at the start of each lift



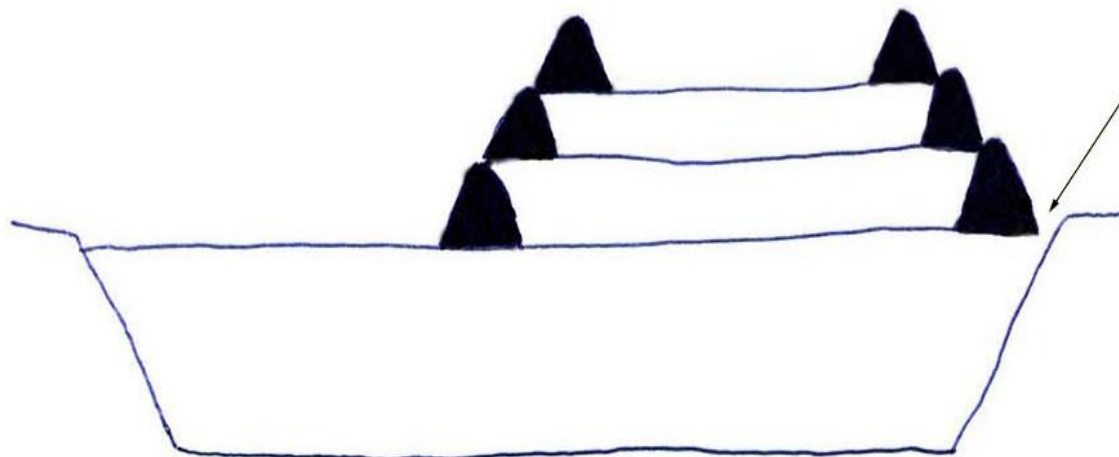


Where does landfill stop?



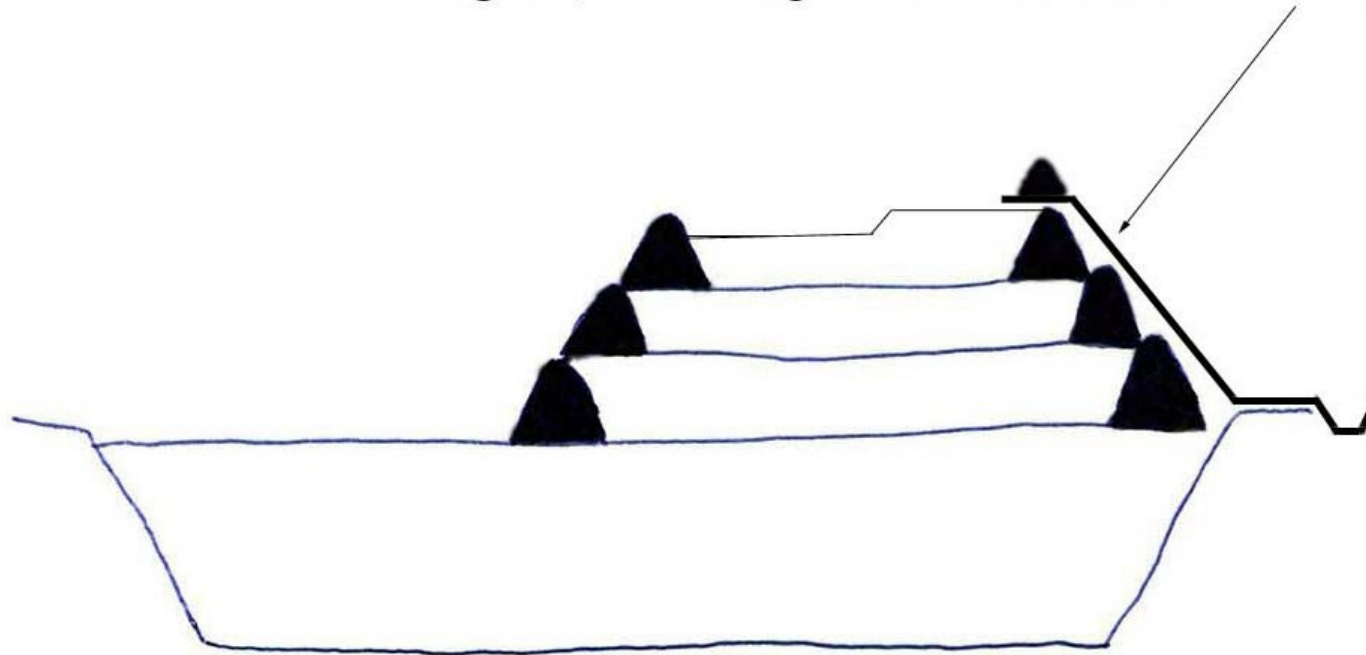
Benched Flank Construction (outer slope)

First clay berm set back from edge of lined cell to delineate edge of cell, and allow contaminated run-off drain back into cell



Benched Flank with Geomembrane Barrier

LLDPE liner on side slope (anchored on top with a clay berm, and with a SW drain at base) - can prevent rainwater ingress, LFG escape and leachate breakouts on side slopes



Intermediate Cover

For partially filled areas (with daily cover) to be left unused for >7 days

- Needs to:

- control nuisances
- minimise escape of odours and landfill gas
- reduce the infiltration of rainfall / lateral egress of leachate
- be functional over a prolonged period

- Effectively a semi-impermeable barrier

- Usually Soil (>300mm)

Temporary Capping

For completed areas prior to Final Cap Installation

- Needs to:
 - control nuisances
 - minimise escape of odours and landfill gas
 - **minimise the infiltration of rainfall / lateral egress of leachate**
 - be functional over a prolonged period
 - **be seeded**
 - **Improve visual appearance**
 - **be repaired when necessary (e.g. following erosion)**
- Effectively a robust and near-impermeable barrier
- Usually Soil (500mm – 1,000mm)
- Now to include a gas barrier membrane
- Flanks on interfill areas should include a gas barrier membrane

Final Capping

...a permanent barrier between deposited waste and the external environment to minimise the long-term impact, and in particular to control the escape of landfill gas and the generation or management of leachate

- Should be:
 - In accordance with Licence Conditions
 - Properly designed – attention to perimeter detailing
 - Properly supervised during construction
 - CQA tested after installation
- OMI leakage surveys identifying significant LFG leakage around gas wells

Further Information

- Odour Monitoring Ireland Report for EPA (Unpublished): *Independent Assessment of the Adequacy and Suitability of Various Alternative Daily and Intermediate Cover Materials at EPA Licensed Landfills in Ireland*
- EPA Landfill Manual (1997): *Landfill Operational Practices*
- EPA Landfill Manual (2000): *Landfill Site Design*

Summary

- Present Landfill Cover practices often inadequate at controlling all nuisances
- Greater focus needed to improve Odour control
- Greater focus needed to improve control of flank areas
- Licensees should devise appropriate site-specific landfill cover strategies
- Document these and agree with EPA where necessary

“Appropriate Cover for Appropriate Use”

The End

