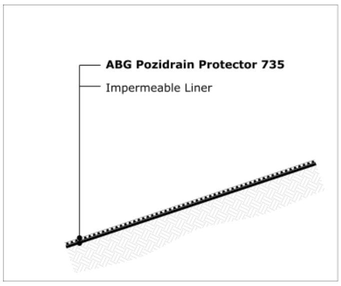
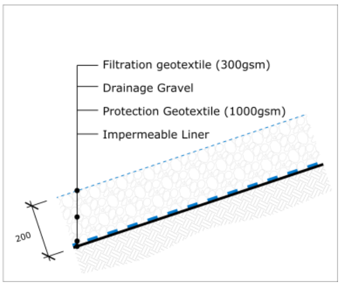
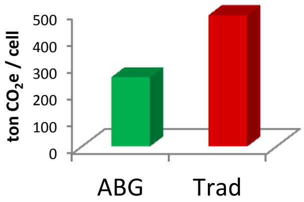
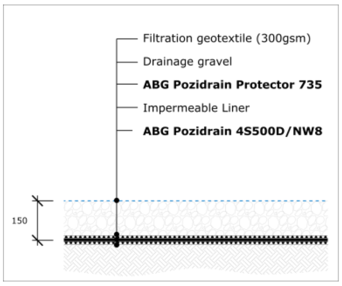
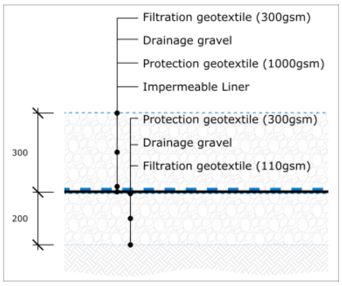
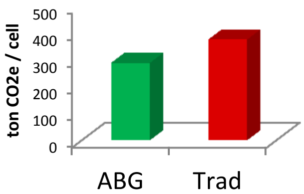
Carbon Footprint Reduction

ABG Landfill Lining Systems

Technical Note

Landfill lining systems typically consist of an impermeable liner with a drainage layer above to control leachate flows, and sometimes a drainage layer is required below the liner as well to control groundwater. Traditionally, these drainage layers comprise porous gravel between geotextiles to provide liner protection and filtration. In addition, the drainage layer(s) are often different on the slopes and base of a landfill to meet the varying hydraulic requirements. ABG proposes the use of **Pozidrain** drainage geocomposites to provide equal or better performance as well as a substantially reduced carbon footprint. Outlined below is a typical example of how much the carbon footprint of a landfill cell can be reduced using **Pozidrain** in lieu of the traditional granular drainage blankets.

Application	ABG System	Traditional Method	Carbon Saving
Slope Lining			**47%**  Saves **231 ton** CO_2e/cell
	• Light-weight drainage geocomposite • Quick installation • 100% virgin polymer	• Imported quarried drainage gravel with geotextile filters • Labour-intensive laying process	
Base Lining			**23%**  Saves **87 ton** CO_2e/cell

The assessment above is based on a typical landfill cell with a 150m x 150m base area, 1:2.5 slopes 25m in height, and a design thickness of up to 35m of municipal waste fill.

Using ABG Pozidrain the total carbon savings are 318 ton CO_2e per landfill cell which is equivalent to 1250 people flying from London to Paris and back!

Pozidrain Protector

http://www.abg-geosynthetics.com/products/pozidrain-protector.html

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creative geosynthetic engineering

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General Assumptions

The analysis method follows that described in the WRAP report (Corney, 2010). The carbon associated with four key stages is assessed a) removal and disposal of waste soil, b) the embodied carbon of imported materials, c) the transportation of imported materials to site, and d) construction on site. In this analysis the removal of waste material has been ignored. The assessment of embodied carbon is discussed below for each analysis.

The embodied carbon of the drainage gravel is assumed to be quarried crushed rock with an embodied carbon footprint of 0.0052 kgECO_2e/kg as per the ICE report (Hammond and Jones, 2011). The embodied carbon of all filter and protection geotextiles is based on 2.35 kgECO_2e/kg from 'Obtaining reliable embodied carbon values for geosynthetics' (Raja, 2015). The embodied carbon of ABG drainage geocomposites is based on internal ABG assessments (Heritage, 2019).

The transportation of imported materials is generally based on the installation site being 200 miles from ABG (or equivalent geosynthetics supplier) and 10 miles from the nearest quarry. Fuel economy is estimated as 4.4 miles/L for light ABG delivery wagons, and 2.2 miles/L for bulk aggregate transport. The weight of material transported per load varies for each item. The carbon footprint of burning diesel is assessed as 2.60 kgCO_2e/L (kilograms of carbon dioxide equivalent per litre of fuel) based on the value given for 'Diesel (average biofuel blend)' in the DEFRA report (Department for Environment Food & Rural Affairs, 2019).

The carbon footprint from emissions during construction is typically based on previous studies (Athanassopoulos & Vamos, 2011) and engineering judgement from ABG experience, assuming the fuel efficiency of the vehicles used is 25 L/hr.

References

Athanassopoulos, C., & Vamos, R. (2011) *Carbon footprint comparison of GCLs and Compacted Clay Liners*. In Geo-Frontiers 2011. Dallas.

Corney, N. et. al. (2010) *Sustainable Geosystems in civil engineering applications*, WRAP Geosystems Report MRF116-001

Department for Environment Food & Rural Affairs (2019) *UK Government GHG Conversion Factors for Company Reporting*.

Hammond, G. & Jones, C. (2011) *Inventory of Carbon & Energy (ICE) Version 2.0*, Sustainable Energy Research Team (SERT) Department of Mechanical Engineering, University of Bath, UK

Heritage, R. (2019) *Embedded Carbon of ABG Geosynthetics*, ABG Technical Note [Not yet published]

Raja, J., Dixon, N., Fowmes, G., Frost, M. and Assinder, P. (2015) *Obtaining reliable embodied carbon values for geosynthetics*. Geosynthetics International. [http://dx.doi.org/10.1680/gein.15.00020]

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