Textiles in the Environment

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CTT Group

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Geosynthetics

- Synthetic polymer or natural material used in:
  - Geotechnical engineering:
    - Embankments, erosion control, sediment control, retaining structures, reservoirs, dams
  - Environmental engineering
    - Landfill liners and cover, waste lagoon containment
  - Transportation
    - Airfields, roads, railroads
  - Mining
    - Waste containment, heap leach pad containment and stability

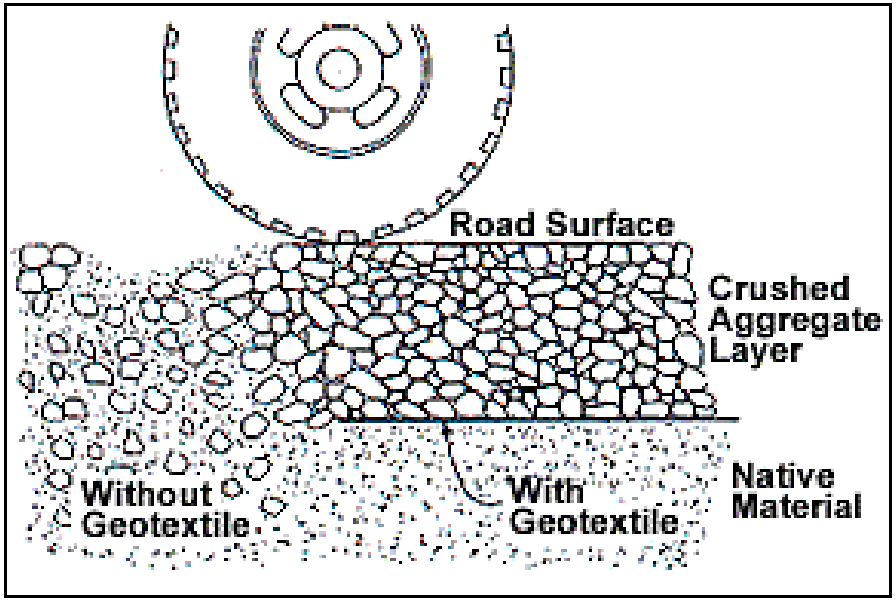
http://www.layfieldgeosynthetics.com/pages/ContractorsBuilders/default.aspx

Purpose

- Geosynthetics add properties to soil:
  - Tensile strength
  - Facilitate the removal of water, add shear strength
  - Separate different soil types
  - Thin, chemical resistant barrier

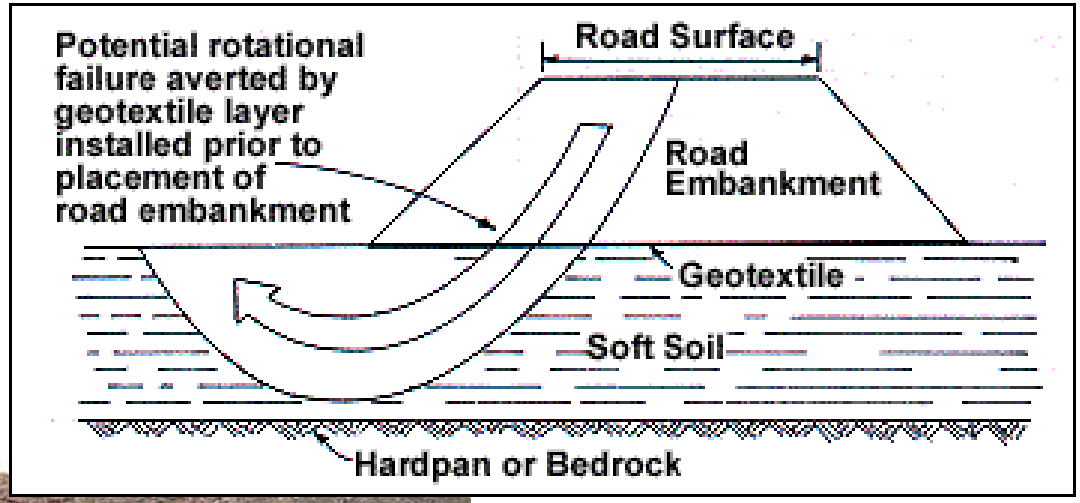
Separation

http://www.canadaculvert.com/woven.php



http://www.na.fs.fed.us/spfo/pubs/stewardship/accessroads/geotextiles.htm

Reinforcement



http://www.na.fs.fed.us/spfo/pubs/stewardship/accessroads/geotextiles.htm

http://www.armtec.com/en-ca/products-and-services/soil-retention/geosynthetics.aspx

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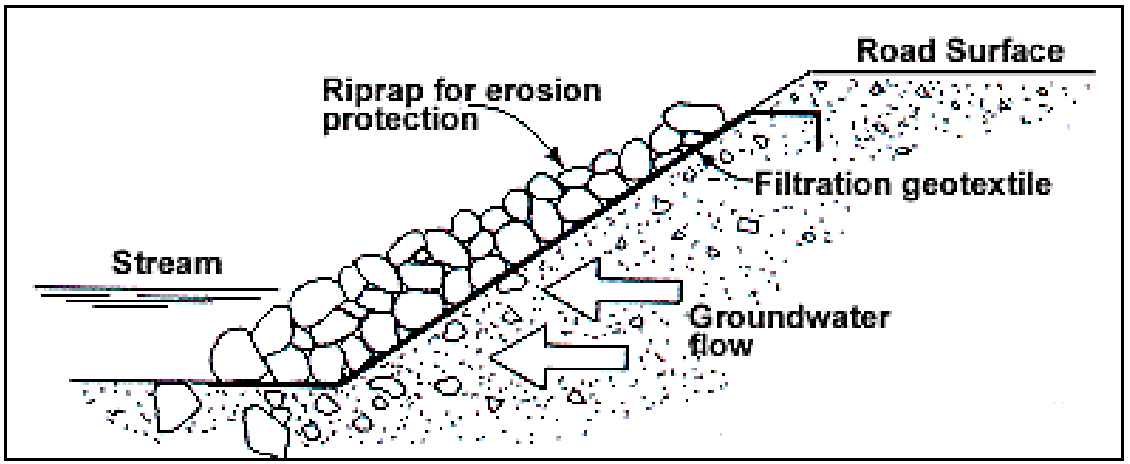
Filtration



http://www.na.fs.fed.us/spfo/pubs/stewardship/accessroads/geotextiles.htm

Drainage

http://www.invisiblestructures.com/draincore2.html

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Liquid or Gas Barrier

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Geosynthetics

- Geotextiles
- Geomembranes
- Geonets
- Geosynthetic clay liners
- …

Geotextiles

- Woven or nonwoven textile sheet
- Separate soils
- Reinforcement
- Filtration
- Component of other geomaterials

http://www.geo-synthetics.com/gsi_rental_equipment.html

Geomembranes

- Solid sheet, polymer or geotextile with bitumen
- Liquid or gas barrier

Geogrids

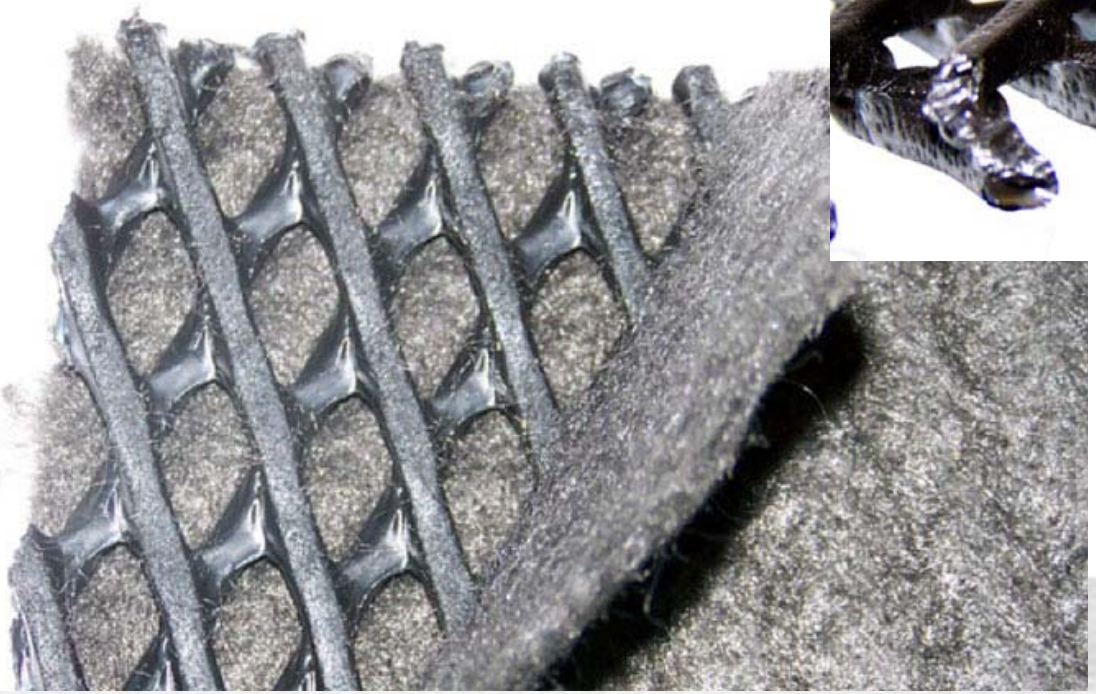
- **reinforcement**

http://www.geo-synthetics.com/gsi_rental_equipment.html

Geonets

- **Drainage**

www.globalsynthetics.com.au



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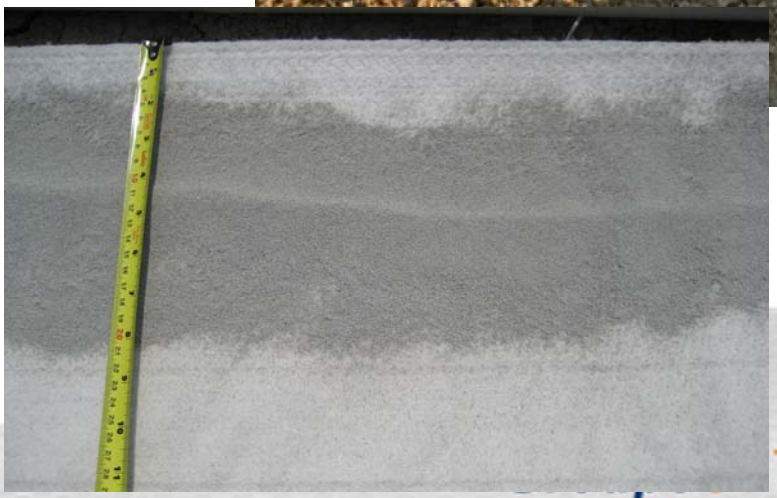
Geosynthetic Clay Liners (GCLs)

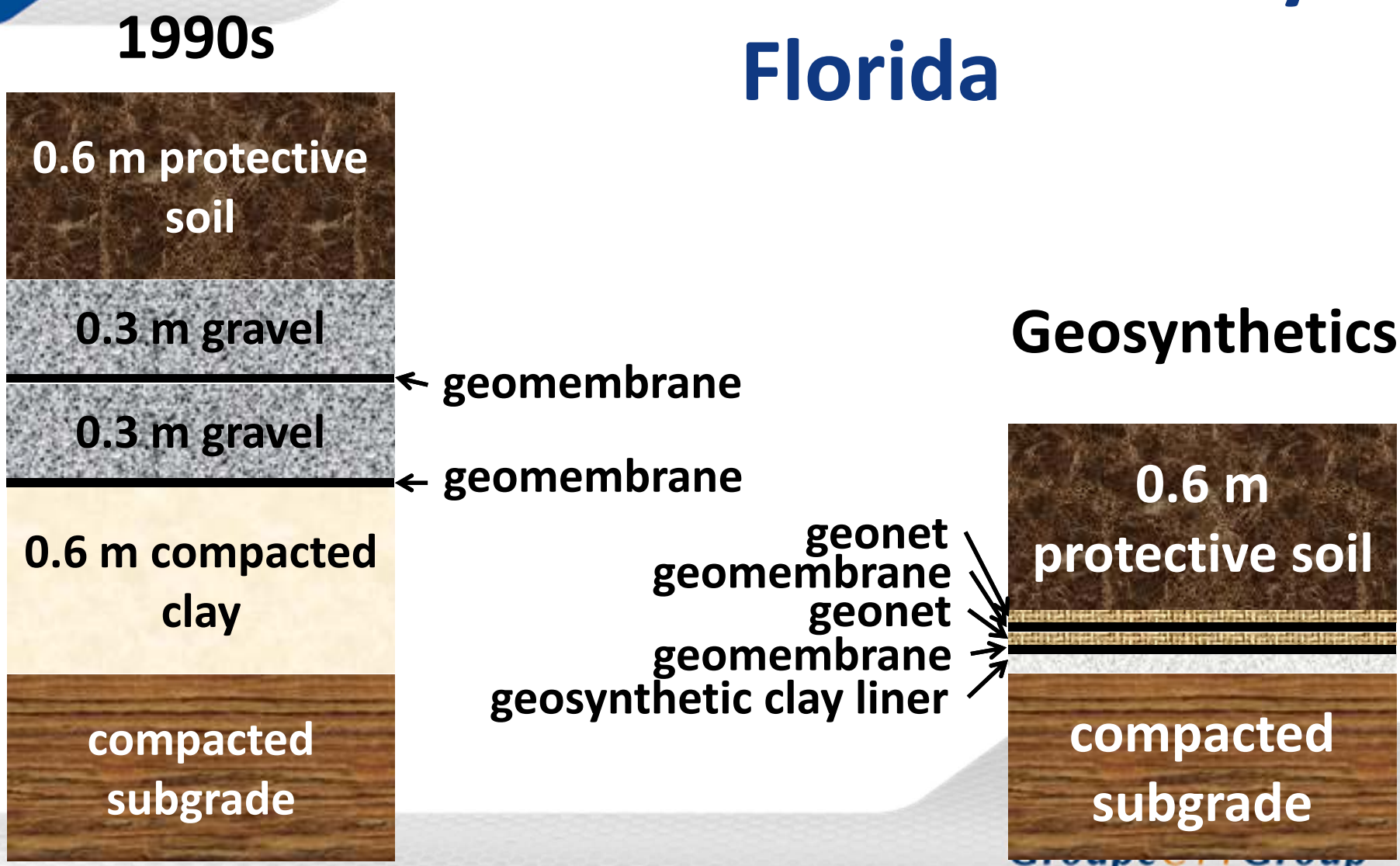
– Liquid barrier



Common Polymers

- Polyethylene
- Polypropylene
- Polyester
- Nylon
- Polyvinyl Chloride

Landfill Liner Case Study: Florida



Hullings and Boudreau (2012)

Landfill Liner Case Study: Florida

- 1990s construction
  - 4.2 kg CO_2/metric ton waste

- Geosynthetic construction
  - 1.35 kg CO_2/ metric ton waste
  - Increased landfill air space (1 m x area of landfill)
  - Reduced truck traffic

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Hullings and Boudreau (2012) http://geosyntheticsmagazine.com/articles/0412_f2_sustainable_landfill.html

Advantages

- Manufactured quality control
- Advantages over soil:
  - Faster installation
  - Less material
    - Less natural material from quarries
    - Less material to transport on site, less dump trucks
    - Lighter weight
    - Lower costs
  - Published standards (ASTM, ISO, Geosynthetic Research Institute)
  - In-house and third party testing

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Disadvantages

- **Long term performance**
  - **Additives (antioxidants, UV screeners, fillers)**
  - **Relevant testing**
- **Clogging in some situations**
- **Careful transportation, storage and installation**

Summary

- Functions
  - Separation
  - Reinforcement
  - Filtration
  - Barrier
- Types
- Reduced material and cost

Thank you!

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