Geosynthetic Reinforced Soil

Earthworks and Foundation

Fortrac® geogrids: Houses on the Hill
Recycling, Sustainability and Regeneration
Provides Nuneaton with a monster embankment

The situation
A disused quarry in Tuttle Hill, Nuneaton, East Midlands, has been regenerated in order to provide a new housing site for Redrow Homes. The former quartzite and diorite quarry, ceased operation in the late 1990’s and covers an area of 40 acres. The quarry consists of a large ‘main void’ and smaller partially in-filled ‘shallow void’.

The solution
In order to facilitate the regeneration of the site for housing the ‘shallow void’ was in-filled in order to provide a stable development platform, whilst the ‘main void’ is to be left as an open body of water.

The reclamation works comprised the following main activities:

- Excavation of loose Fill from the shallow void
- Selected removal of overhanging/excess rock contours by limited drilling and blasting or mechanical ripping
- Preparation and processing of materials on site for placement
- Construction of a 35m high Fortrac® geogrid reinforced soil slope between the ‘shallow’ and ‘main’ voids
- Placement of engineered fill behind the reinforced soil block to provide a stable development platform for housing

The design
HUESKER had provided design assistance and advice at an early stage with regard to the design of such a high embankment and the selection of a BBA certified geogrid.
The analysis of the reinforced soil embankment had to satisfy a number of temporary and permanent conditions: during construction, during recharge of the quarry lake (causing potential inundation settlement of the engineered fills) and an allowance for a rapid lowering of the water in the quarry lake. Also future water level rises had to be taken into consideration at design stage.

Of particular concern was the post construction movement of the embankment. The vertical settlement was satisfied during construction by adopting an end-product compaction specification, whilst the horizontal movement risk was minimised by selecting a low strain criteria using Fortrac® geogrids to maintain relative density of the overall fill.

The design of the reinforced soil slope comprised layers of high strength polyester geogrid. A range of HUESKER’s Fortrac® geogrids were used within the slope with ultimate tensile strengths ranging between 400kN/m and 55kN/m. Primary anchor lengths varied from 35m to 8m in length.

The slope face is formed using a wraparound type structure. At Midland Quarry, due to the presence of the quarry lake, the risk of wave action on the slope face required the use of gabion stone, installed within the front section of the slope face for the lower two thirds of the slope height. The upper third of the slope comprises a topsoil face to aid vegetation above the water line. The wraparound face construction is formed using a temporary climbing shutter system.

The advantages

- Very flexible solution in construction and engineering
- Minimal and reliable calculated settlements
- Creates a maximum development plateau for housing
- Very economical solution
- Sustainability through use of site won materials, imported former waste materials and Fortrac® geogrids

Location: Nuneaton, England, UK
Client: C.A. Blackwell (main contractor)
Main Client: Redrow homes
Overall client: Warwickshire County council
Design: Arup, P&S Consulting Engineers
Year of construction: 2007 – 2008
Product: Fortrac® - Geogrids

Fortrac® is a registered trademark of HUESKER Synthetic GmbH.