Bentofix® Carbofol® Secugrid® - Nyamasoga Landfill -Uganda

Package solution for a barrier system

- **Project Name**
  Nyamasoga Landfill, Hoima District, Uganda
- **Landfill operator**
  EnviroServ Uganda (ESU)
- **Designer**
  Jones & Wagener,
  Engineering & Environmental Consultants
- **Product**
  Bentofix® NSP 4900 GRI GCL3
  Carbofol® 406 2.0 MF/s
  Carbofol® 406 1.5 MF/MF
  Secugrid® 200/40 R6

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Challenge

The Nyamasoga Landfill in Uganda is a critically important hazardous waste facility in the oil-rich Hoima District. The 44 ha site is in close proximity to drilling pads and a proposed refinery. The site is also something of a trailblazer. In the absence of any governing hazardous waste barrier standards in the country for such a site, the facility owner chose a fully modernised design with geosynthetics from Naue for environmental security.

EnviroServ Uganda (ESU) operates the facility, which has been designed to handle drilling fluids, mud cuttings, and other industrial and processing wastes not suitable for municipal solid waste burial.

Solution

The designer was commissioned to design the hazardous waste containment strategy, including waste cells, leachate management systems, stormwater management, access roads, and more. The designer‘s technical specification finally led to the supply of Carbofol® geomembranes, Bentofix® geosynthetic clay liners (GCLs), and Secugrid® geogrids to solve the site’s challenging parameters. The local soils were characterised by sandy clays with pockets of gravel interspersed. Weathered rock was present between 2.5 and 4.5m below the surface. This limited the maximum cell depth to 5m, to minimise rock excavation and prevent groundwater perching.

Additionally, the area was hilly, including being extremely steep at some edges. The design engineers created a C-shaped cell plan on the north side of the property, with the center points of the C having the lowest elevation. This is where the primary stormwater management cells were set, creating a very efficient design.

With only a highway running along the southern edge of the plot, access roads were constructed along all other sides of the atypical, wedge-shaped location.

The modular layout included four cells, each of which was further halved by a 3m berm from the bottom of the cell. Security berms with 4m crests were built around the cells, both for slope stability and stormwater management. The external sides of the slopes were designed at 2:1 (horizontal:vertical) and the internal sides at 3:1.

In the absence of guidance within Uganda’s environmental codes, the South African lined facility regulations and design specifications common to oil operations in the region are used.

This produced designs for waste containment and stormwater management following South Africa’s Class A approach, which is a double liner system.

Due to a water table that perched at 5.2m, seepage was detected into the system during excavation. Thus, a geocomposite drainage layer was included in the design. Natural filter materials were too expensive to source for the site.

The absence of easily sourced filter material was only one of the sourcing challenges presented by the location. A bentonite-enhanced soil layer was expected, for example; but, bulk sourcing such a clay layer was not possible in the area. Thus, the design was amended to include two GCL layers instead of just one.

This innovative design solution gave the site greater security, better economics, and a quicker, safer installation. It also underscored how geosynthetics provide exceptional performance and affordability for emerging infrastructures.

Further enhancing the site’s security was the specification of textured HDPE geomembranes for optimal frictional performance within the cell topography. This included a mix of double-textured geomembranes and mono-textured geomembranes.

The following Naue geosynthetics have been supplied to site:

- 59,400m^2 Bentofix®
- 22,185m^2 Carbofol®
- 1,425m^2 Secugrid®

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