Feasibility Assessment for Landfill Phytocap

Red Bank Plains, Queensland, Australia

Client

Veolia Environmental Services Wattle Glen Landfill Facility

Highlights

- Conduct feasibility study for C&D waste as part of a final cover
- Performed assessments using UNSAT-H modeling
- Performed hydraulic testing at DBS&A Soil Testing and Research Laboratory

The Veolia Environmental Services Wattle Glen South Landfill Facility is a landfill that receives construction and demolition waste in Red Bank Plains, Queensland, Australia. As part of a team, DBS&A was contracted by Veolia to conduct a feasibility study on potential on-site materials for the landfill final cover. The feasibility study assessed a variety of possible cover profiles using on-site soils, in particular, screened construction and demolition (C&D) debris.

To characterize the suitability of a phytocap, or evapotranspiration (ET) cover, for final closure at Wattle Glen, DBS&A selected the UNSAT-H model, which requires numerous climatic and vegetative data as model input. The DBS&A Soil Testing and Research Laboratory performed saturated hydraulic conductivity testing and moisture retention analyses of soil and C&D material samples. Testing results eliminated certain combinations of materials from consideration. Vegetation was another important input into the modeling analysis. Vegetation was assigned representative parameters of regional grasses and shrubs, rather than one specific type of vegetation. Leaf area index, an indicator of vegetative cover thickness, was assigned based on published values for a mixture of grasses and shrubs.

After an initial round of modeling, two materials were selected for additional analysis. Each material was modeled separately, as well as in different combinations and thicknesses of layers of the materials. Sensitivity analyses were performed to address probable questions related to extremes in climate, particularly precipitation, and issues related to vegetation, including a catastrophic event such as a fire. Covers were modeled without vegetation for a single material cover and both dual layer covers; with minimal drainage during the wettest year on record for two of the three covers. All three covers used some amount of screened C&D waste and showed low drainage during modeling scenarios of multiple consecutive wet years. Modeling of long-term performance suggested that each cover could meet the assumed maximum 1,000 liters per hectare per day drainage requirements by storing and releasing (evapotranspiring) water over the modeled period.

The hydraulic testing and modeling resulted in identification of several potential viable cover profiles containing a component of C&D waste that could be used as part of the final closure of the Wattle Glen (South) facility. The use of modeling prior to field verification enabled identification of a range of potentially successful covers, allowing flexibility during installation based on materials available—rather than field verification alone, which requires compliance with one installation approach. The results of the modeling also narrowed the suitable cover options and demonstrated a potential waste product could be an asset for final closure of the site.