

Landfill decommissioning - Repurposing Case History

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Abstract

Along with the property where the Generations Schools Sandown Institute campus is built, the closed and capped Tableview Landfill in Parklands North on Cape Town's West Coast was bought for repurposing into the playing fields of a world-class sporting complex, where the artificial turf grass facility has been expertly designed by Rondebosch-based consultants Messrs. De Villiers Sheard. This is an ideal use for a decommissioned landfill area, as these are not considered to provide good conditions for rigid structures due to the expensive provisions that need to be included to negate the possibility of long-term settlement. Should such settlement occur on a sports field area, it can easily be corrected. This paper will describe how the scrubby vegetation, including Port Jackson willow on the landfill cap was removed and the surface levelled with a selected subgrade layer, comprising varied soils including ferricrete, sand and silty sand and with compacted depth varying from over 1m to approximately 500mm. The extensive geosynthetic drainage provisions required to keep the artificial turf surfaces playable even in a rainy Cape Winter will be described. This case history should provide a useful how-to for all future decommissioned landfills in South Africa. As of November 2018, The Department of Environmental Affairs (DEA) had identified 826 landfill sites across South Africa (including landfills in Cape Town and Johannesburg) on the brink of reaching full capacity (Githathu, M., November 2019). Whether these landfills become sports fields, fields of solar panels to relieve our ever-stressed Eskom, or even just covered with vegetation to make them look aesthetically pleasing, we need to think further than the reduction, reuse, or recycling of waste, because there will always be a residue left to handle, and landfills are inevitable along with the decommissioning thereof.

Keywords: *Landfill decommissioning, Geotextile, subsoil drainage, Landfill gas, Landfill capping.*

1 Introduction

Many South African Landfills are approaching their full capacity. As of November 2018, the then Department of Environmental Affairs (DEA) had identified 826 landfill sites across South Africa (including landfills in Cape Town and Johannesburg) on the brink of reaching full capacity. Studies show that the number of waste facilities have grown from 42 in 2008 to 1086 in 2015 (Tomita and Slotow 2020), with the distances to the nearest settlements decreasing from 68.3km in 2008 to 8.5km in 2015. These figures are shocking, especially since the global trend to reduce, reuse, and recycle. With all these landfills being so close to rural communities, it is evident that repurposing of landfills needs to play a bigger role during decommissioning. If managed correctly, capped landfills can be repurposed as sports fields, playgrounds, community gathering areas, solar panel fields, etc. to these communities.

2 Project Description

In January 2020, the Generation Schools Sandown Institute, a boutique middle and high school campus, opened its doors to students from the ages of 12 years to Exit. Sandown, a new Milnerton Estates Ltd +R 3 billion development, adjoins Parklands North on the Cape Town's West Coast, and the campus is situated adjacent to a beautiful wetland which is part of the Sandown Fynbos Corridor, with a variety of resident wildlife. A world class Sporting Complex is being built in three phases, with phase one opening in 2021. This sports complex is built over the closed and capped Cape Town City Council Tableview Landfill, and the challenge was to ensure that the sportsfields layerworks would not be contaminated by the underlying material, or interfere with the landfill cap effectiveness.

3 Solution

During an investigation into the potential for the generation of landfill gas, no evidence of any significant gas emissions or lateral migration into the surrounding soil could be detected.

This is due to the mostly inert composition of the waste (mainly builder's rubble) remaining in the closed landfill site, Nonetheless, lateral migration of gas will be monitored in four water quality monitoring wells installed around the site.

The scrubby vegetation, including Port Jackson willow on the landfill cap was removed and the surface levelled with a selected subgrade layer, comprising varied soils including ferricrete, sand and silty sand and with compacted depth varying from over 1m to approximately 500mm. A layer of non-woven continuous-filament polyester geotextile was placed over this surface as a separation layer, and this was followed by a compacted 150 mm layer of free-draining G5 with associated drainage provisions. This was then overlaid by a 30 mm coarse, free-draining crusher run layer, and then the artificial turf placed. See the section details further on (Figure 1, 2 and 3).

This is an ideal use for a closed landfill area, as decommissioned landfills are not considered to provide good conditions for rigid structures, due to the possibility of long-term settlement. Should such settlement occur in a sports field, it can be corrected inter alia by a layer of top dressing.



Figure 1. Surface and Stormwater Layout Plan

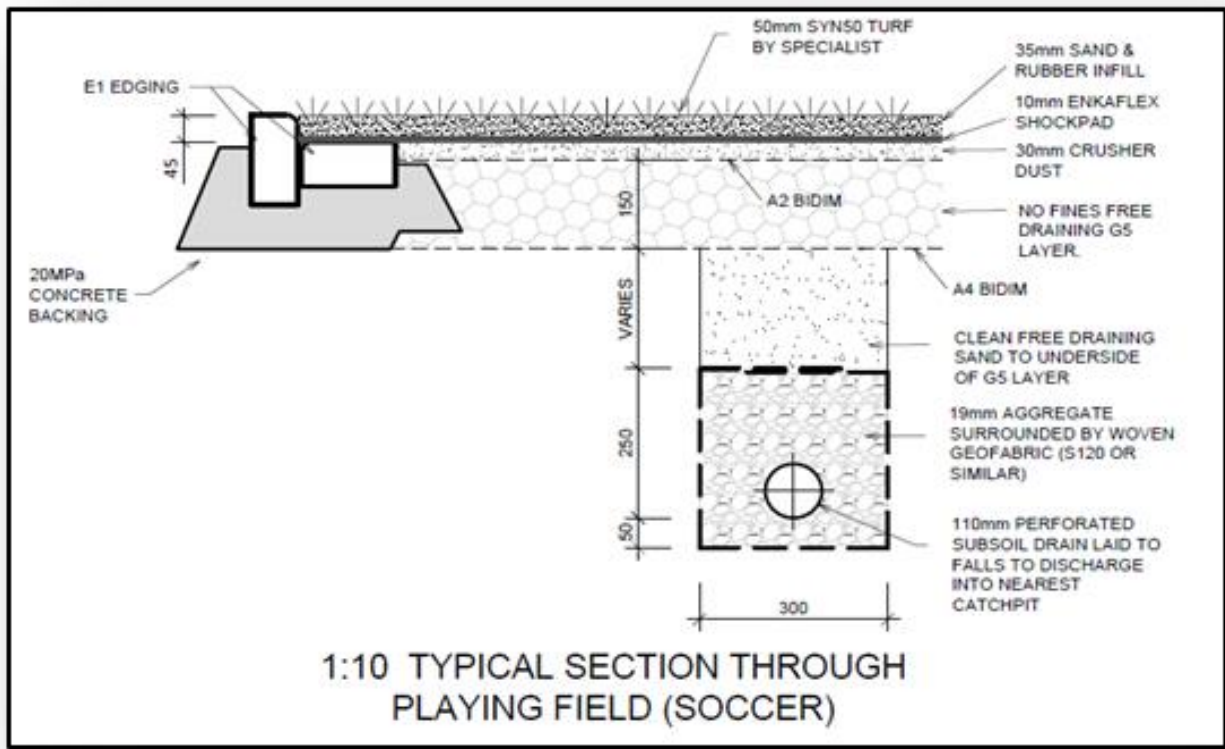


Figure 2. Section Detail – Soccer Field

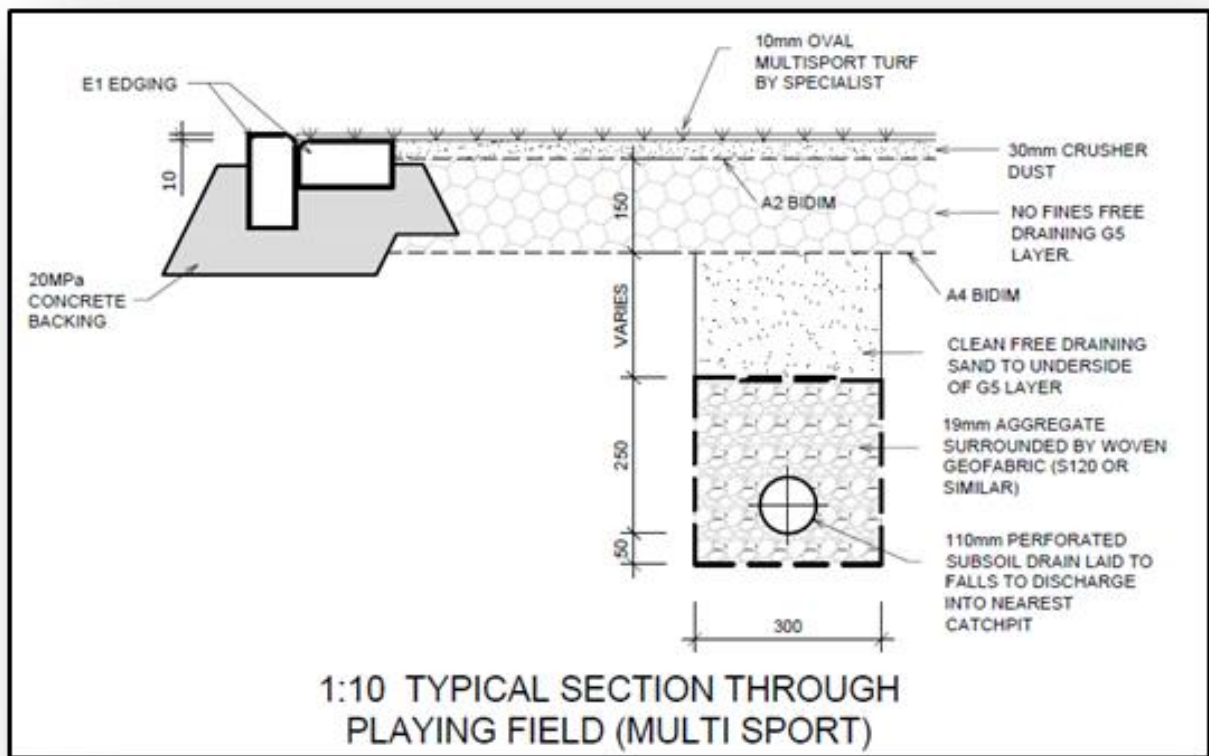


Figure 3. Section Detail – Multi Sport playing field

Drainage Provisions

The entire sports field facility is equipped with an extensive drainage system. Details supplied by consulting engineers Messrs de Villiers Sheard.

4 Benefit

Non-woven continuous-filament polyester geotextile provides high strength, and good resistance to puncture in the harsh installation conditions expected on this project (see figure 4, 5, and 6).

Further benefits this type of geotextile in this application, is a high elongation before break characteristic that makes for good conformability and stress relief in the event of any differential settlement in the landfill body, while the high porosity of the product provides for optimum filtration and drainage characteristics. In addition, the location of this tough layer of geotextile would prevent the loss of granular drainage aggregate into any crack that may form in the landfill cap below the sportsfields.

Being manufactured from 100% recycled polyester, it can also be classed as a ‘Green’ product, as the 10 200 m² of geotextile used represents around 58 000 two-litre soft drink bottles that did not end taking up volume on a landfill.



Figure 4. 10 200 m² of non-woven polyester geotextile being laid



Figure 5. Non-woven polyester geotextile being covered with G5 gravel



Figure 6. Non-woven polyester geotextile being covered with G5 gravel



Figure 7. Clearing Work on the Landfill Begins, Sunningdale Ephemeral Pan Wetland in Right Bottom Foreground



Figure 8. Sports Complex Earthworks Under Construction. The Project Looks Over the Sandown Fynbos Corridor and the Sunningdale Ephemeral Pan.

Large land areas for the Fynbos Corridor and the Ephemeral Pan will be ceded to the City of Cape Town as public assets and the extension of the biodiversity network.



Figure 9. Sandown Institute Campus with Closed Tableview Landfill Cap in the Background



Figure 10. Concept View of Phase 1 of the Sandown Institute Sports Complex



Figure 11. Concept Picture of Completed Project

5 Conclusion

We live in an era where we have an array of geosynthetic solutions and technology to overcome physical and design challenges. We need to use these to ensure that the built environment of today provides an even brighter future for the children of tomorrow. The benefits of a repurposed landfill is evident, because despite waste minimization and avoidance practice, there will always be a residue left to handle, and landfills are inevitable along with the eventual decommissioning thereof.

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