

TANA TORAJA AIRPORT PARAMESH
SOUTH SULAWESI, INDONESIA

REINFORCED SOIL SLOPE

Product: Paralink, Terramesh System/Green, MacTex MXL, MacLine SDH

Preamble

Tana Toraja regency is located in the South Sulawesi province of Indonesia. It hosts every year thousands of tourists coming to admire not only the breathtaking landscapes and the biodiversity of the region, but also the places of the rituals and the ceremonies of the Toraja ethnic group. It has been named as the second tourist destination after Bali by the Indonesian Ministry of Tourism. Until now, the only way for travelers to approach Tana Toraja was a tough and uncomfortable 8/10 hours journey starting from the city of Makassar. Therefore, the Indonesian government, pursuing the tourism development of the area, planned to build a touristic airport in Tana Toraja with a multi-year project starting in 2014 and coming to end in 2017

Problem

The new airport runway is 2 km long and approximately 210 m wide, suitable for ATR type aircrafts. Since a plane surface is required for the construction of the runway, and due to the presence of hills and spurs clashing with the runway area, massive cut and fill earth works have to be undertaken in order to get the required level of runway. Thus, the filling soil has to be retained with technically suitable and economically feasible structures. It is worth to note that the maximum embankment height to be retained is almost 40 m. The main technical constraints have been: the high seismicity of the area, the heavy rainfall encountered every year and the presence of clay shale foundation soils. Clay shales are originally dry and hard with high shear strength, but when they absorb water during the unloading process, they can rapidly turn to stiff or even to soft clay with extremely low shear strength. For this reason, excavation and construction operations require noteworthy care and adequate planning in order to minimize the exposure of the foundation soils to weathering agents. Different types of retaining structures have been considered during the design stages: traditional concrete walls, bored piles and hybrid MSE walls (Paramesh). The evaluation criteria have been:

- **Permeability:** the retaining structures should have a very permeable facing in order to rapidly drain the rainfall waters and to dissipate the hydrostatic pressure developed in the backfilling soil
- **Flexibility:** the retaining structures should have a flexible behavior in order to accommodate potential differential settlements and to absorb dynamic shocks
- **Construction schedule**
- **Overall cost**

Client:

INDONESIAN MINISTRY OF PUBLIC WORKS

Designer:

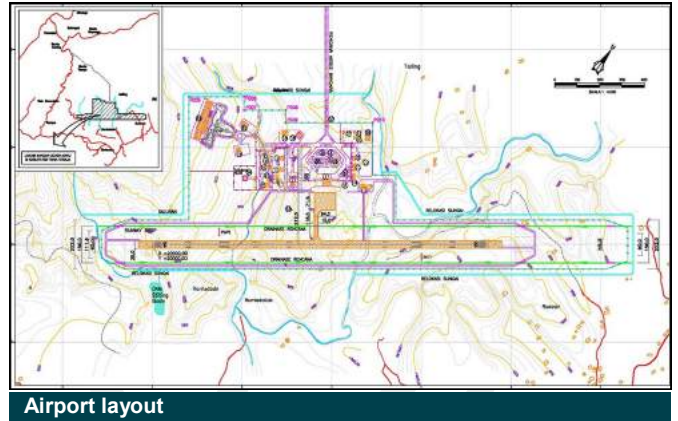
PT BREMA

Products used:

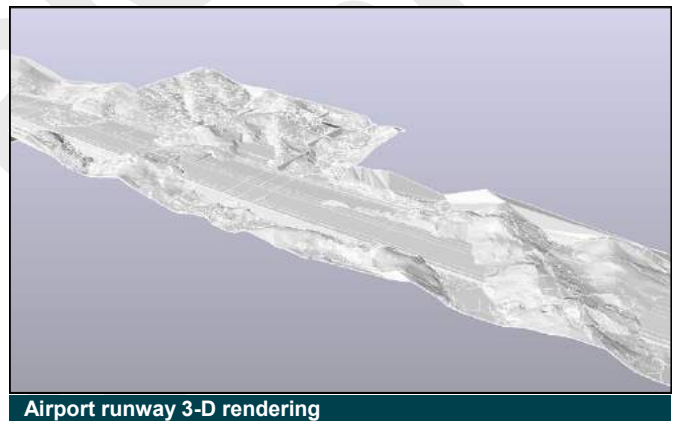
TERRAMESH, PARALINK, MACTEX MXL, MACLINE

Date of construction

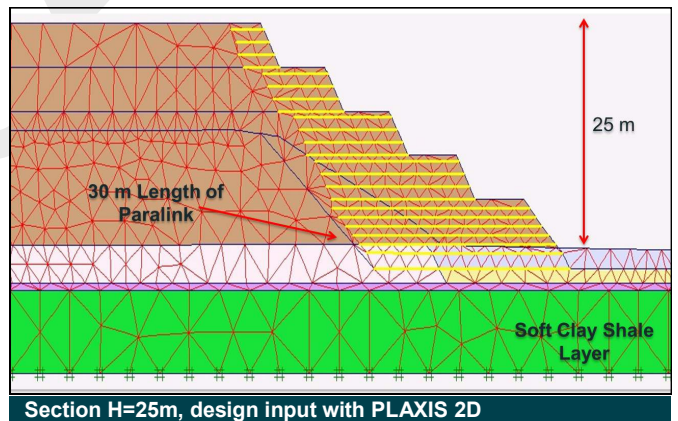
OCT 2015 — JAN 2016



Airport layout



Airport runway 3-D rendering



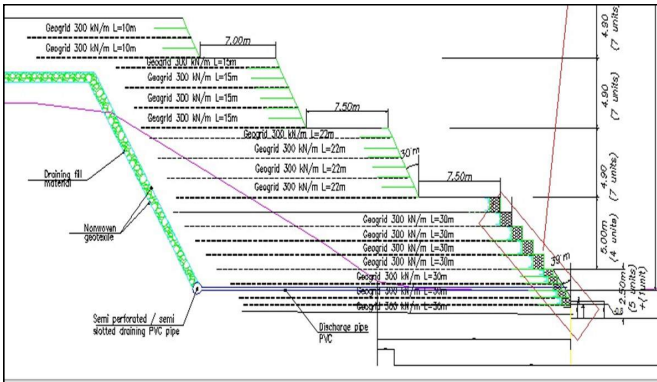
Section H=25m, design input with PLAXIS 2D

Solution

Based on all the above criteria, Maccaferri hybrid MSE structures (DT + Paralink) have been selected as the best solution.

In October 2015, the construction of the first Paramesh retaining structure using Maccaferri products started. It has a maximum retained height equal to 25 m, distributed in 5m-high berms. The berms are realized using both Terramesh System and Green Terramesh elements (60 degrees). The primary reinforcements are Paralink geogrids having an ultimate tensile strength equal to 300 kN/m.

The design has been carried out first with the Maccaferri in-house Limit Equilibrium Method software Macstars W, then with the commercial FEM software PLAXIS.



Typical section, H=25m



Aerial photo of the Paramesh under construction, Nov 2015



Terramesh System and Green Terramesh installation



Paralink installation, Nov 2015



Stage 1, progress in December 2015



Stage 1, progress in January 2016



Stage 1 completed, February 2016

PT. Maccaferri Indonesia
 Plaza Aminta, Jl. TB. Simatupang, Kav. 10
 2nd Floor, Suite #204, Jakarta Selatan, 12310
 P: 021-7506555 F: 021-7506553
www.maccaferri.com/id

Maccaferri operates under strict quality assurance and management procedures. Please visit the website of your local subsidiary for details of their Certifications.