

Use of an innovative Geocomposite (Paradrain) to build a reinforced 2H:1V slope using clay and silty soils for a storm water management pond.

Ravin Nag, Maccaferri Canada

Jasmina Nikodinoska, P.Eng. Maccaferri Canada





Engineering a Better Solution

PROJECT DETAILS:



Project : Large Industrial Facility

Contractor : Newman Bros. Contracting

Project Geotech : Inspecsol – (Now GHD)

System : Paradrain – 50/15 geogrid reinforced slope with Reno

Mattress & MacMat

Project Engineering : Ausenco Sandwell



PROJECT BACKGROUND:



- A large industrial facility was expanding their production facility.
- As a part of expansion their process water from production is to be kept in detention ponds before it is released to a nearby creek.
- 3 ponds were required to handle this expansion.
- Due to size of the ponds and excavation required, the owners wanted to use the onsite material (clay soil) as backfill for the 2:1 pond slopes.
- Maccaferri worked on the proposal with Paradrain Geogrids which would end in large savings due to use of on-site clay material as fill. Import of granular is expensive and disposal of clay material is costly as well.



PRODUCT: PARADRAIN GEOGRID

- ParaDrain[™] is a new generation of advance geocomposites engineered to provide drainage to dissipate pore pressures in poorly draining soils while providing reinforcement.
- Manufactured from high tenacity, multifilament polyester yarns placed in tension, then co-extruded with polyethylene to form a polymeric strips with proprietary channel shape and cover with a non woven fabric to provide a drainage path.





DESIGN APPROACH



The design approach used by Clancy & Naughton (2008) consisted of:

Determining a suitable lift height of the reinforcement to allow dissipation of excess pore pressures in the body of the slope to 80 % of the initial value in a design period of approximately 24 hours. (24 hours was selected as the design time to facilitate the construction of one reinforcement layer per day),

Checking the stability of the slope using commercially available stability software for various assumed pore pressure regimes in the body of the reinforced slope. The magnitude of pore pressure in the analysis was quantified using the ru parameter defined as; the ratio of the magnitude of pore pressure to the vertical stress



DESIGN APPROACH



Design Using Paradrain

The design of slope using ParaDrain was broken down into a number of stages:

- Stage 1: To determine the properties of the marginal fill and height of each lift
- Stage 2: To calculate the time to dissipate the excess pore water pressure in each layer.
- Stage 3: To check that the dissipation time calculated in Stage 2 is acceptable.
- Stage 4: To estimate the settlement resulting from consolidation of the soil.
- Stage 5: To calculate the volume of water leaving each layer of soil.
- Stage 6: To design the slope for the ultimate limit state.
- Stage 7: To check that the transmissivity of the ParaDrain is adequate to remove the water leaving the soil at each layer.



SOIL PARAMETERS



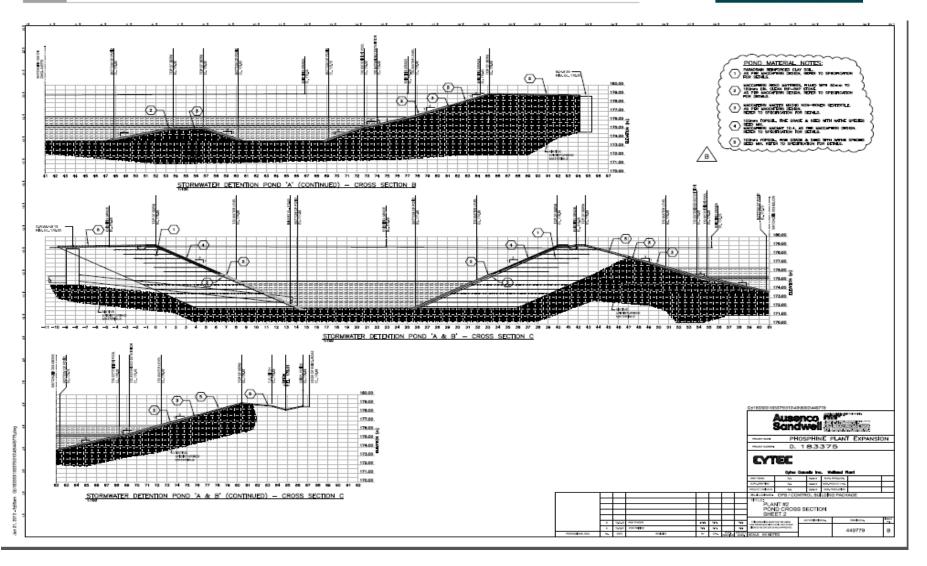
For this project soil parameters were provided by Geotechnical Report:

- 1. The Clay soil had a unit weight of 19kN/m3 and an angle of internal friction of 22°.
- 2. The clay soil had approximately 50% passing 75µm.
- 3. The optimum moisture content of the clay fill was 18%.
- 4.Cv-Coeficient of consolidation had 225m2/year and mv-coefficient of volume compressibility 0.5 m2/MN.



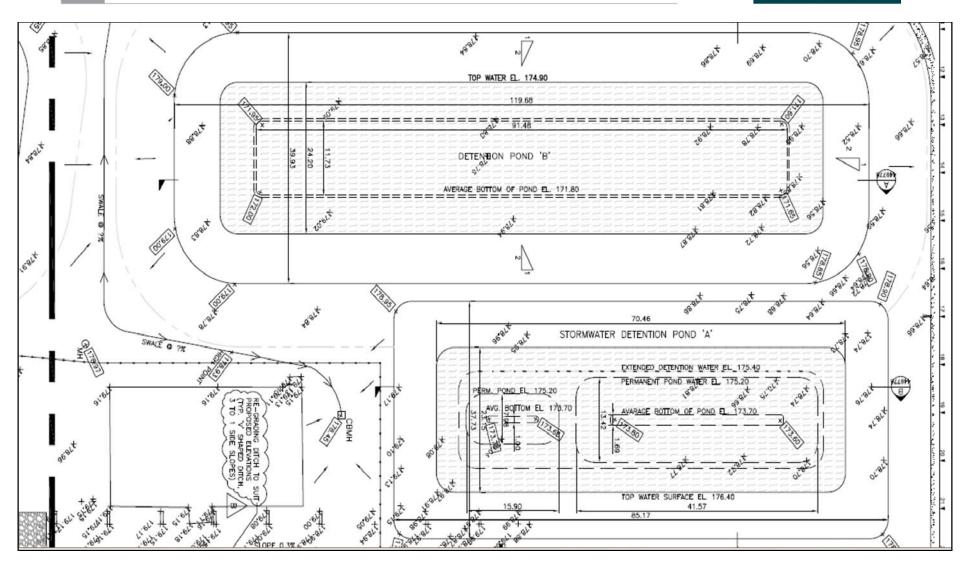
CONSTRUCTION DRAWINGS







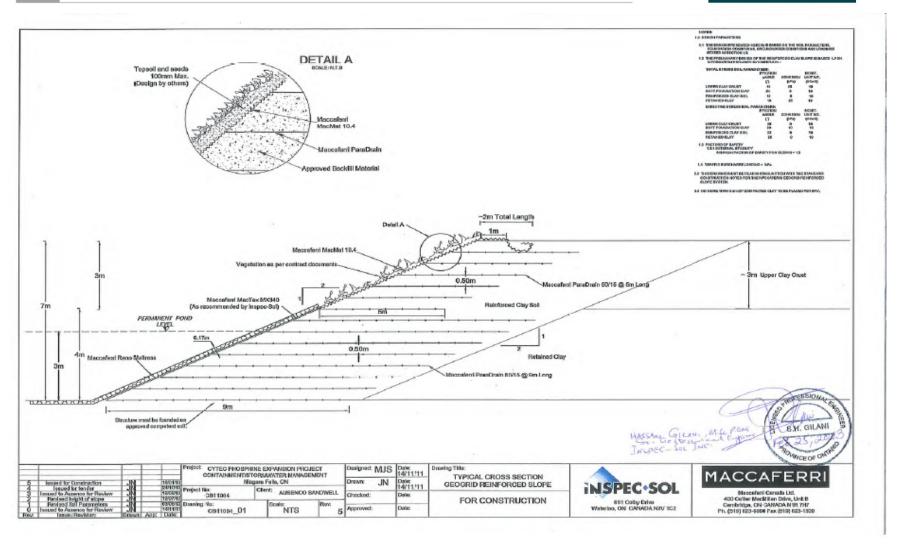
POND LAYOUT



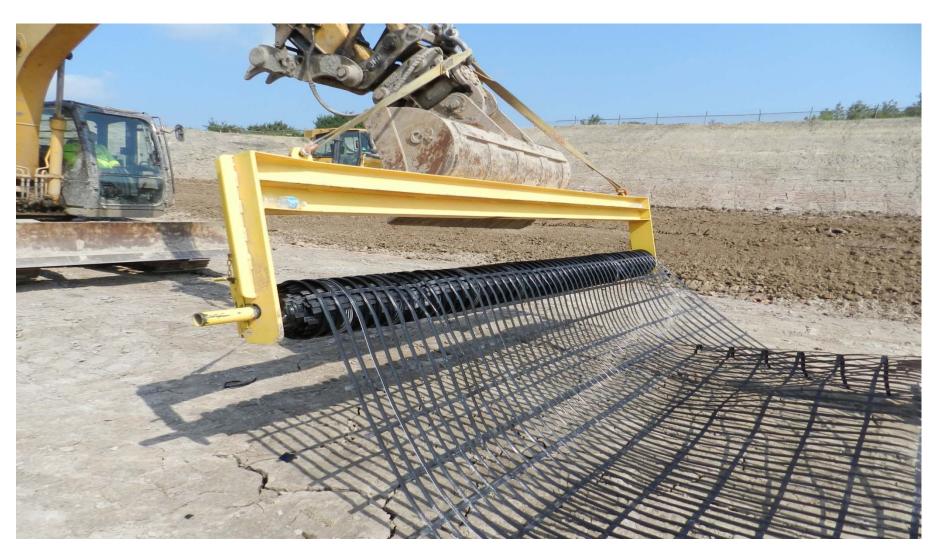


STAMPED DRAWINGS













INSTALLATION ON CURVES AND BENDS









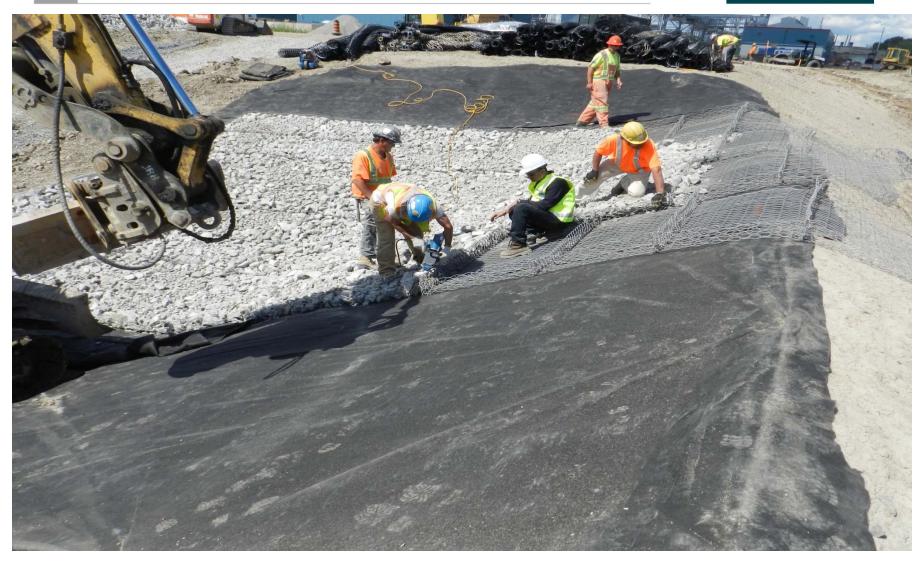




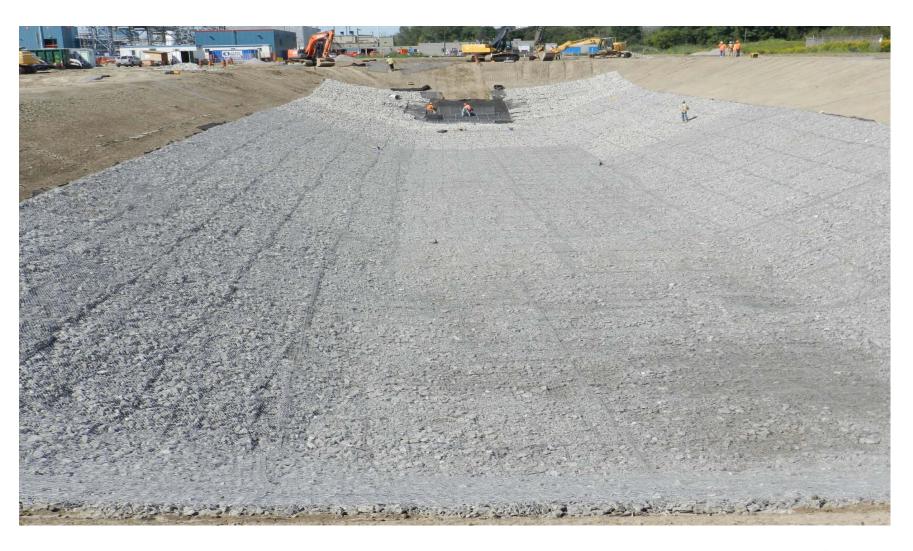






















COMPLETED CLAY SLOPE







THANK YOU







