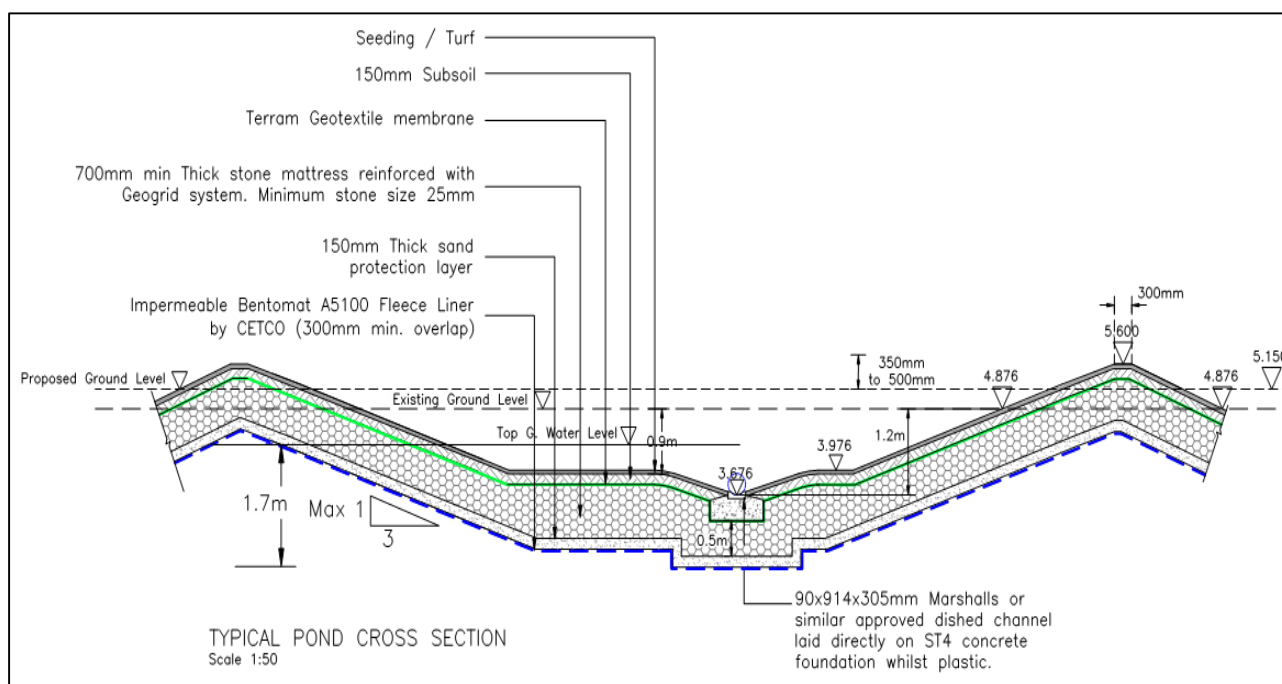


Uplift Calculations (New Barn Lane, North Bersted 99 Unit Scheme)



Uplift (UPL) limit state design

$$G_{dst;d} + Q_{dst;d} \leq G_{stb;d} + R_d$$

Design Destabilising Actions $\leq$ Design Stabilising Actions

Destabilising Actions

Uplift = Pond depth – Ground water level + Pond construction depth;

Therefore, Uplift = 1.2m – 0.5m + 1.0m = 1.7m

Density of water = $1000 \text{ kg/m}^3 \times 9.81 \times 10^{-3} = 9.81 \text{ kN/m}^3$

Therefore, characteristic uplift force acting on the pond (per m^2) is:

$$Q_{dst;k} = 9.81 \text{ kN/m}^3 \times 1.7\text{m} = 16.68 \text{ kN/m}^2$$

$$\text{Design Uplift Force, } Q_{dst;k} \times \gamma_{Q_{dst;d}} = 16.68 \text{ kN/m}^2 \times 1.1 = 18.35 \text{ kN/m}^2$$

Stabilising Actions

* Shear resistance was assumed to be negligible; $R_d = 0$

Material Densities of pond construction materials;

$$\text{Loose Rock} = 1950 \text{ kg/m}^3 \times 0.50\text{m} \times (9.81 \times 10^{-3}) = 9.56 \text{ kN/m}^2;$$

$$\text{Sand} = 1905 \text{ kg/m}^3 \times 0.15\text{m} \times (9.81 \times 10^{-3}) = 2.80 \text{ kN/m}^2;$$

$$\text{Concrete} = 2400 \text{ kg/m}^3 \times 0.35\text{m} \times (9.81 \times 10^{-3}) = 8.24 \text{ kN/m}^2;$$

$$\text{Bentomat} = 4.1 \text{ kg/m}^2 \times (9.81 \times 10^{-3}) = 0.04 \text{ kN/m}^2;$$

$$\Sigma = 20.64 \text{ kN/m}^2$$

$$G_{\text{stb;d}}; \text{ pond construction materials} = 20.64 \text{ kN/m}^2$$

Design Permanent Stabilising Force

$$G_{\text{stb;d}}; \text{ pond construction materials} \times \gamma_{\text{dst;d}}$$

$$G_{\text{stb;d}} = 20.64 \text{ kN/m}^2 \times 0.9$$

$$G_{\text{stb;d}} = 18.58 \text{ kN/m}^2$$

The design inequality for UPL can now be ascertained, thus:

$$18.35 \text{ kN} \leq 18.58 \text{ kN}; \text{ OK}$$

*Further Assumptions

1- Ground water level of 0.5m as instructed by Arun District Council due to lack of data provided for borehole WS103.

2- No standing storm water was considered to be in the pond.

DOCUMENT CONTROL RECORD

Document Issue:

Rev	Date	Issue Status	Prepared by	Checked by
-	21 November 2018	First Issue	J Valadas	RF
A	24 November 2018	Calculations revised	J Valadas	KTG
B	18 December 2018	Calculations revised	J Valadas	KTG
C	25 January 2019	Calculations revised	J Valadas	KTG
D	28 January 2019	Calculations revised	J Valadas	KTG/RF
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