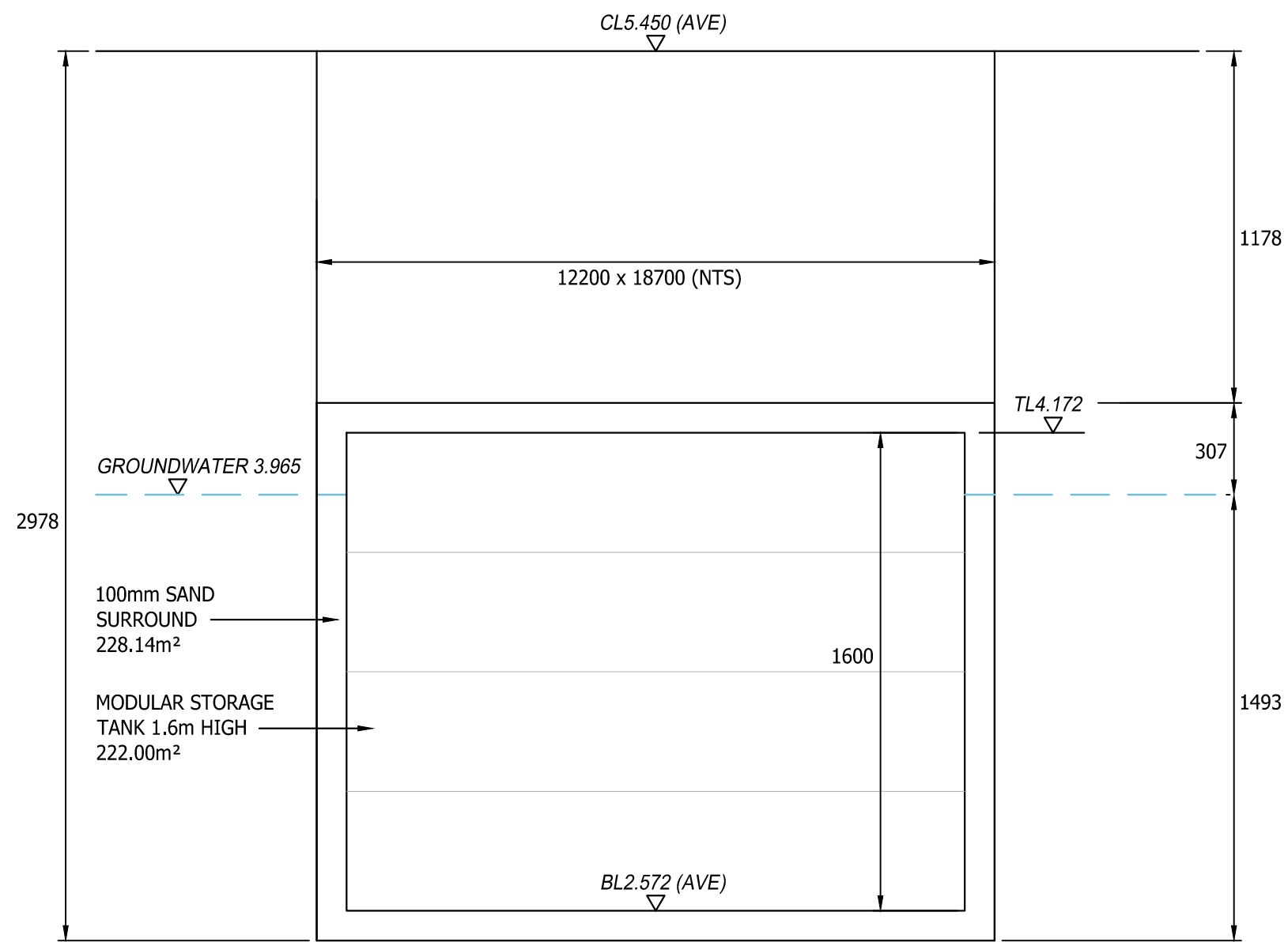




CENTRAL MODULAR STORAGE TANK (WITHOUT FLOTATION MITIGATION)

FLOTATION CALCULATIONS

WATER DISPLACED BY CHAMBER & SURROUND:

VOLUME = $m^2 \times h$
= $228.14^2 \times 1.493$
= $340.613m^3$

MASS = $pw \times V$
= $1000 \text{ kg/m}^3 \times 340.613$
= 340613 kg
 $x \text{ g (9.8 m/s}^2\text{)}$ = 3338007.4 N
= 3338.0075 kN

FACTOR OF SAFETY = 1.2

i.e. 3338.0074×1.2 = **4005.61 kN** (BUOYANCY FORCE)

TANK SELF-WEIGHT:

MODULAR UNITS = $1776 \times 9 \text{ kg ea.}$ = 15984 kg
 $x \text{ g (9.8 m/s}^2\text{)}$ = 156643.2 N
= **156.643 kN**

SAND SURROUND

SATURATED VOLUME = $(A_s \times H) - (A \times H)$
= $(18.7 \times 12.2 \times 1.493) - (18.5 \times 12.0 \times 1.393)$
= $340.613 - 309.246$
= $31.367m^3$

DENSITY OF SATURATED SAND = 1900 kg/m^3
i.e. 1900×31.367 = 59597.3 kg
 $x \text{ g (9.8 m/sec}^2\text{)}$ = 584053.9 N
= **584.5 kN**

UNSATURATED VOLUME = $(A_s \times H) - (A \times H)$
= $(18.7 \times 12.2 \times 0.307) - (18.5 \times 12.0 \times 0.207)$
= $70.038 - 45.954$
= $24.084m^3$

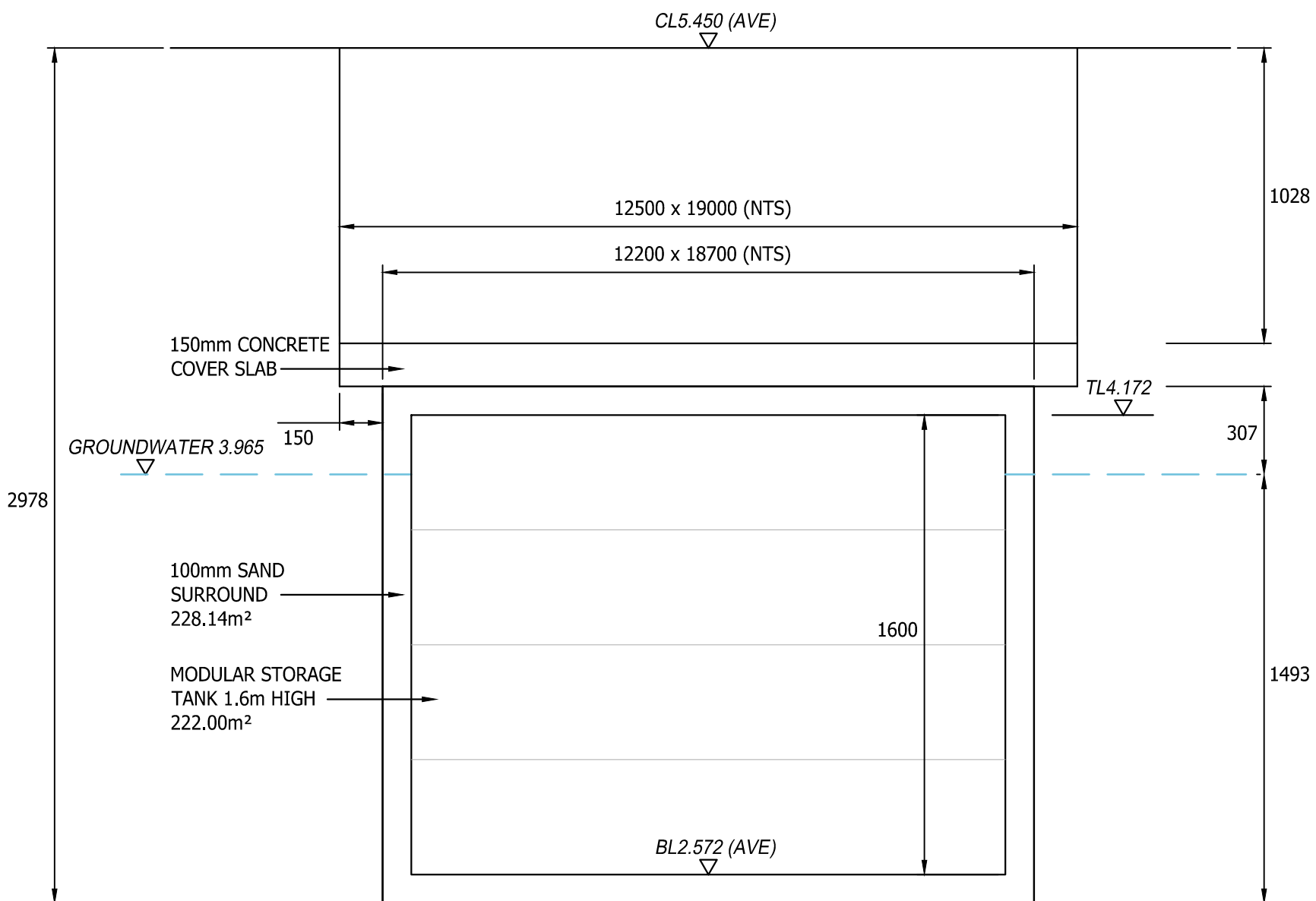
DENSITY OF UNSATURATED SAND = 1600 kg/m^3
i.e. 1600×24.084 = 38534.4 kg
 $x \text{ g (9.8 m/sec}^2\text{)}$ = 377637.12 N
= **377.63 kN**

UNSATURATED BACKFILL VOLUME = $228.14m^2 \times 1.178m$
= $268.749m^3$

DENSITY OF UNSATURATED BACKFILL = 1020 kg/m^3
i.e. 1020×268.749 = 274123.9 kg
 $x \text{ g (9.8 m/s}^2\text{)}$ = 2686414.2 N
= **2686.4 kN**

i.e. STORAGE TANK SELF-WEIGHT TOTAL
= $156.643 + 584.5 + 377.63 + 2686.4$
= **3805.17 kN**

4005.61 > 3805.17 kN ∴ NOT OK (FLOTATION)



CENTRAL MODULAR STORAGE TANK (WITH FLOTATION MITIGATION)

FLOTATION CALCULATIONS

WATER DISPLACED BY CHAMBER & SURROUND:

VOLUME = $m^2 \times h$
= $228.14^2 \times 1.493$
= $340.613m^3$

MASS = $pw \times V$
= $1000 \text{ kg/m}^3 \times 340.613$
= 340613 kg
 $x \text{ g (9.8 m/s}^2\text{)}$ = 3338007.4 N
= 3338.0075 kN

FACTOR OF SAFETY = 1.2

i.e. 3338.0074×1.2 = **4005.61 kN** (BUOYANCY FORCE)

TANK SELF-WEIGHT:

MODULAR UNITS = $1776 \times 9 \text{ kg ea.}$ = 15984 kg
 $x \text{ g (9.8 m/s}^2\text{)}$ = 156643.2 N
= **156.643 kN**

SAND SURROUND

SATURATED VOLUME = $(A_s \times H) - (A \times H)$
= $(18.7 \times 12.2 \times 1.493) - (18.5 \times 12.0 \times 1.393)$
= $340.613 - 309.246$
= $31.367m^3$

DENSITY OF SATURATED SAND = 1900 kg/m^3
i.e. 1900×31.367 = 59597.3 kg
 $x \text{ g (9.8 m/sec}^2\text{)}$ = 584053.9 N
= **584.5 kN**

UNSATURATED VOLUME = $(A_s \times H) - (A \times H)$
= $(18.7 \times 12.2 \times 0.307) - (18.5 \times 12.0 \times 0.207)$
= $70.038 - 45.954$
= $24.084m^3$

DENSITY OF UNSATURATED SAND = 1600 kg/m^3
i.e. 1600×24.084 = 38534.4 kg
 $x \text{ g (9.8 m/sec}^2\text{)}$ = 377637.12 N
= **377.63 kN**

CONCRETE COVER SLAB

CONCRETE COVER SLAB = $19.0 \times 12.5 \times 0.15$
= $35.625 m^3$

MASS = $35.625 \times 2500 \text{ kg/m}^3$
= 89062.5 kg
 $x \text{ g (9.8 m/sec}^2\text{)}$ = 872812.5 N
= **872.8 kN**

UNSATURATED BACKFILL VOLUME = $237.5m^2 \times 1.028m$
= $244.15m^3$

DENSITY OF UNSATURATED BACKFILL = 1020 kg/m^3
i.e. 1020×244.15 = 249033 kg
 $x \text{ g (9.8 m/s}^2\text{)}$ = 2440523.4 N
= **2440.5 kN**

i.e. STORAGE TANK SELF-WEIGHT TOTAL
= $156.643 + 584.5 + 377.63 + 872.8 + 2440.5$
= **4432.0 kN**

4432.0 > 4005.61 kN ∴ OK (NO FLOTATION)

GENERAL NOTES

- The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations, record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. any discrepancies shall be notified to gta prior to works commencing.
- Tender or billing drawings shall not be used for construction or the ordering of materials.
- Do not scale. All dimensions and levels to be site confirmed.
- This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements
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T1	INITIAL ISSUE		03.07.20	DMS	ds
Rev	Amendments		Date	Dsn	Chk
Status			INFORMATION		
Client					
Project			PEBBLE WALK, SINAH LANE HAYLING ISLAND, HANTS		
Title			FLOTATION CALCULATIONS MODULAR STORAGE TANK CENTRAL STORAGE TANK		
Date		JULY 2020		Scale @ A1	
Base Layout Ref.		1:20			
CAD File ref.					
Clients Ref.		Project Ref.		10162	
 Gloucester House, 66a Church Walk, Burgess Hill, West Sussex. RH15 9AS Tel.01444 871444 Web: www.gtacivils.co.uk					
Drawing Number			Rev.		
10162/1105			T1		