

Pump Station Buoyancy Calculations

OP No. OP2033
Project Courtney Drive Stage 2
Structure Pump Chamber
Date 16/04/2024
Revision 0

Template Date: 22/11/2022
Created by: BC
Document Number: 2033-80101
Calculation By: 0



Buoyancy Force

Coverslab Cut-out Volume	=	4.17 m ³	
Chamber Cut-out Volume	=	31.25 m ³	
Well Cut-out Volume	=	12.08 m ³	
Well Base Cut-out Volume	=	1.36 m ³	
Total Volume	=	48.85 m ³	
Buoyancy Force	=	478.70 kN	
Ultimate Buoyancy Factor	=	1.20	AS1170.0
Ultimate Buoyancy Force	=	574.44 kN	

Concrete Components Weight

Coverslab Weight*	=	80.41 kN
Well + Chamber Weight	=	379.70 kN
Total Weight	=	460.11 kN

0

Backfill Weight

Backfill Volume	=	2.99 m ³
Backfill Weight	=	23.92 kN

So,			
Total Downward Force	=	484.02 kN	
Effective Downward Factor	=	0.9	AS1170.0
Effective Downward Force	=	435.62 kN	

FOS = 0.76

Therefore, Additional ballast required

Concrete Ballast

Concrete Ballast Volume	=	5.50 m ³
Concrete Ballast Weight	=	76.95 kN

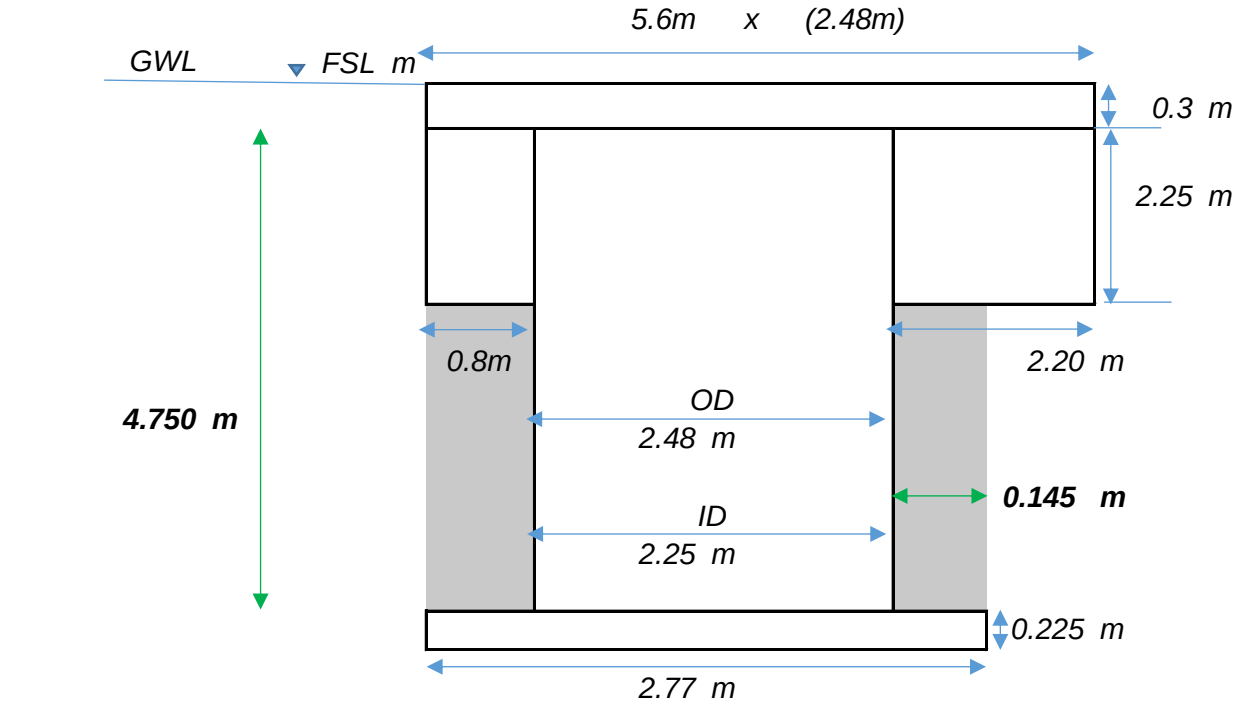
Revised Backfill Weight

Backfill Volume	=	19.50 m ³
Backfill Weight	=	156.00 kN

So,			
Total Downward Force	=	693.06 kN	
Effective Downward Factor	=	0.9	AS1170.0
Effective Downward Force	=	623.75 kN	

FOS = 1.09

Therefore, No additional ballast required



Aquatec have assumed the following for buoyancy calculations:

1. Ground water level at (Below Integral Valve Chamber)
2. Backfill density to be MIN 1800 kg/m³ (HOLD POINT)
3. Concrete density to be 2400 kg/m³
4. Water density to be 1000 kg/m³
5. Gravitational acceleation to be 9.8 m/s²

