

**Matthew Gregory
TACP Architects
Pembroke House
Ellice Way
Wrexham Technology Park
LL13 7YT**

Our ref: 2752-CAU-XX-XX-RP-C-0301.A0-C1

16th April 2018

Dear Mr Gregory,

Re: Infiltration Testing at the former Gredington Arms Public House, Wrexham

I am writing in reference to the planning application (P/2017/0122) submitting to Wrexham County Borough Council regarding the above site, which currently remains undetermined. With regard to the officer's delegated report the application is due to be refused for the following reasons:

- Inappropriate development within the countryside.
- Insufficient detail to demonstrate whether the development will have an impact upon protected species.
- Insufficient detail to demonstrate the sustainable disposal of surface waters.

Caulmert Ltd was commissioned by TACP Architects Ltd (TACP) to undertake an infiltration investigation of soils in accordance with Building Research Establishment Digest (BRE) 365 Soak Away Design:2016 [1] at the former Gredington Arms, Llan-y-Pwll (the Site). This letter presents details of works undertaken and the results obtained, and specifically addresses point three of the officer's comments regarding disposal of surface waters. Points one and two are being dealt with under separate correspondence and are not considered as part of this report.

Objective and Scope

The objective of the works is to determine the Site's suitability for sustainable drainage systems to manage the surface water for the proposed development. This report should be read in conjunction with Caulmert's previous letter report (ref: 2752-CAU-XX-XX-RP-C-0300.A0-C1, dated 22nd September 2017).

The proposed scope of works included the excavation of 1 (no.) trial pit and the undertaking of infiltration testing in the pit in accordance with the methodology detailed in BRE 365 (2016) [1] and



British Standard Code of Practice for Site Investigations: 2015 (BS5930) [2]. However, during the investigation it was decided to undertake a second test in a trial pit adjacent to the first (10m to the southwest).

Trial pit SA-1 was backfilled with a coarse rounded gravel to 1.70m from original ground level to prevent collapse of the excavation during the testing period. Trial pit SA-2 was not filled with gravel and the infiltration test was conducted in the open pit, which remained stable during the testing period.

Site Location and Description

The Site is located at the former Gredington Arms public house on Holt Road, Llan-y-pwll, Holt, Wrexham, LL13 9SD, and is centred approximately on National Grid Reference SJ 336790, 351905.

At the time of the investigation (20th March 2018), the Site comprised the former Gredington Arms public house at the west of the Site, with a metalled road to the north of the buildings that slopes up and into a level car parking area. The Site slopes down from north to south between the A534 Wrexham Road in the north and Holt Road to the south. The car park area and former pub gardens are situated on a flat level area at the approximate mid-point of the slope, with narrow earth benches cut into the slope down towards Holt Road.

The infiltration testing was undertaken at the eastern end of the Site in an area that will comprise soft landscaping. The site layout and the location of the trial pits is shown on Figure 2.

Geological Setting

The information provided by the British Geological Survey (BGS) indicated the possibility of two different superficial deposits to be present at the site. These comprised either glaciofluvial sheet deposits (sand and gravel) in the north of the Site, or Till (clay, silt and sand) in the southern part of the Site. The transition between the two strata was indicated to be approximately along the alignment of Holt Road to the south of the Site.

The bedrock strata beneath the Site comprises the Kinnerton Sandstone Formation (sandstone) of the Triassic Period.

Investigation Findings

The findings of the investigation are summarised in Table 1 below. The exploratory logs are provided in Appendix 1.

Table 1 - Summary of Ground Conditions

Strata	Depth Range (mBGL)		Thickness (m)
	From	To	
Made Ground - MOT Type 1 aggregate/ topsoil/ clay/ sand	Ground level	1.10 (SA-1) 2.00 (SA-2)	1.10 (SA-1) 2.00 (SA-2)
Superficial deposits (glaciofluvial sheet deposits)	1.10 (SA-1) 2.00 (SA-2)	3.25 (SA-1) 2.95 (SA-2)	2.15 (SA-1) base not proved 1.25 (SA-2) base not proved

The ground conditions on the Site were similar between the two soakaway locations and are consistent with the BGS records.

The ground conditions encountered can be summarised as made ground of MOT Type 1 aggregate (trial pit SA-1) or topsoil (trial pit SA-2) over a mixture of clay and sand containing many waste fragments including bricks, concrete, slate, metal and plastic. The greatest thickness of made ground (2.00m) was encountered in trial pit SA-2 at 2.00m. Possible made ground strata was encountered in trial pit SA-1, which was orange-brown sand that contained a fragment of pottery. It is possible the pottery fragment may have fallen into the strata from the made ground above.

The made ground was found to directly overlie the natural superficial strata of orange-brown sand (glaciofluvial sheet deposits) to the maximum depth reached by the investigation.

Anecdotal evidence indicated that an access road for the sand and gravel quarry crossed the northern part of the Site to join Holt Road west of the former public house. The presence of the MOT Type 1 aggregate encountered in trial pit SA-1, and the kerb along the northern edge of the former pub beer garden corroborates this information.

The Kinnerton Sandstone Formation (bedrock strata) was not encountered at the depth reached by the investigation works.

No groundwater was recorded in either of the soakaway test sites, and no visual or olfactory evidence of contamination was identified.

Infiltration Testing Results

Soakaway test data and infiltration rate calculations are included at Appendix 2 and the results are summarised in Table 2 below.

Table 2 - Infiltration Testing Results

Test Location	SA-1		SA-2	
	(Cycle 1)	(Cycle 2)	(Cycle-1)	(Cycle 2)
V _{p75-25} (m ³)	0.39	0.37	0.76	Not possible to calculate coefficient of permeability
a _{p50} (m ²)	6.49	6.27	4.46	
T _{p75-25} (min)	185	195	259	
Coefficient of Permeability (m/hr)	0.020	0.018*	0.040*	
Definition Vp75-25: The storage volume of the pit between 75% and 25% of the depth. ap50: The area of the base and side of pit at 50% of depth. Tp75-25: Time taken for the pit to empty from 75% to 25% of the depth of the pit. * Test terminated before Vp75 achieved - includes interpolated data.				

The infiltration testing results indicated medium to poor coefficient of permeability across the Site. The infiltration test calculations are included in Appendix B.

Conclusions

The ground conditions on the Site were broadly similar between the soakaway locations, where a layer made ground of maximum thickness 2.00m was found overlying natural superficial strata of orange-brown slightly silty sand, which was observed to the base of each trial pit (maximum depth 3.25m). The exploratory hole logs are included as Appendix 1.

No groundwater was encountered in either trial pit to the maximum depth of 3.25mBGL.

Based upon the proposed development, the ground conditions encountered and the results of the infiltration testing it is considered that the discharge of surface water to the ground is feasible at the Site. A drainage strategy following SuDS infiltration techniques will be required to service the proposed development.

Any infiltration system will need to be installed below any made ground deposits and drain into the natural sand strata.

If you have any queries in relation to the above report please do not hesitate to contact me.

Yours sincerely,



Paul Clayden BSc. (Hons) MCIWM FGS
Principal Geo-environmental Consultant
On behalf of Caulmert Ltd

cc. Clive Cunio (Caulmert Ltd)
cc. Steve Barber-Bailey (Caulmert Ltd)
Encls. Appendix A - Trial Pit Logs
Appendix B - Infiltration Testing Results Plots

FIGURES



Figure 1 - Exploratory Hole Layout Plan



APPENDIX A
TRIAL PIT LOGS



		Project: Gredington Arms, Wrexham		Trial Pit: SA-1	
Excavation date: 20/03/2018		Logged by: PAC		Client: TACP Architects Ltd	
Project ID: 2752		Elevation (mAOD) -		Coordinates -	
Depth (m)		Description			Samples
From	To				
0.00	0.25	Medium dense grey silty sandy fine to coarse angular to sub-angular aggregate of limestone (MOT type 1 sub-base). With many rootlets in top 5cm (MADE GROUND).			None taken
0.25	1.10	Firm to stiff reddish-brown silty slightly sandy slightly gravelly CLAY. Gravel is fine to coarse angular to rounded including brick, slate, tile, limestone and mixed natural lithologies. Occasional large cobble (kerb-stone) and part and whole bricks. Concrete or sandstone obstruction on face B, possible kerb-stone. With occasional layers and pockets of orange-brown sand (MADE GROUND).			
1.10	2.00	Medium dense dark brown silty clayey fine and medium SAND with occasional rootlets. Rare fine to coarse sub-rounded to rounded gravel of mixed lithology and one piece of pottery. Damp (POSSIBLE MADE GROUND).			
2.00	3.25	Dark orange-brown becoming light orange-brown silty fine and medium SAND. Rare fine to coarse sub-rounded to rounded gravel of mixed lithology. Damp (MADE GROUND).			
Trial pit terminated at 3.25m depth.					
Excavated by – JCB 3CX wheeled backhoe loader. Plan Dimensions of Pit – 3.00 x 0.70 x 3.25m (L:W:D). Groundwater – Damp below 1.10m. Stability – Sides stable during excavation except in made ground where large cobbles encountered. Contamination – None observed.					

Trial Pit Photographs



		Project: Gredington Arms, Wrexham		Trial Pit: SA-2	
Excavation date: 20/03/2018		Logged by: PAC		Client: TACP Architects Ltd	
Project ID: 2752		Elevation (mAOD)		-	
Coordinates		-			
Depth (m)		Description		Samples	
From	To				
0.00	0.35	Tall grass over soft dark brown silty sandy slightly gravelly Clay with many rootlets. Gravel is fine to coarse angular to rounded including brick, metal, plastic and mixed natural lithology (MADE GROUND - TOPSOIL).		None taken.	
0.35	2.00	Firm to stiff reddish-brown silty slightly sandy slightly gravelly CLAY with frequent cobbles of brick, slate, concrete and metal. Gravel is fine to coarse angular to rounded including brick, slate, tile, limestone and mixed natural lithologies (MADE GROUND).			
2.00	2.95	Orange-brown slightly silty fine and medium SAND.			
Trial pit terminated at 2.95m depth.					
Excavated by – JCB 3CX wheeled backhoe loader.					
Plan Dimensions of Pit – 3.00 x 0.70 x 2.95m (L:W:D).					
Groundwater – Damp from 2.00m.					
Stability – Sides spalling to 2.00m during excavation due to presence of large cobbles and bricks.					
Contamination – None observed.					

Trial Pit Photographs:



APPENDIX B
INFILTRATION TESTING RESULTS



Client:	TACP Architects Ltd	Site:	Gredington Arms
Calculated:	P Clayden	Checked:	S Barber-Bailey
Date:	21.03.2018	Date:	

Soakaway tests were carried out on Tuesday 20th March 2018
Weather: Warm and Sunny

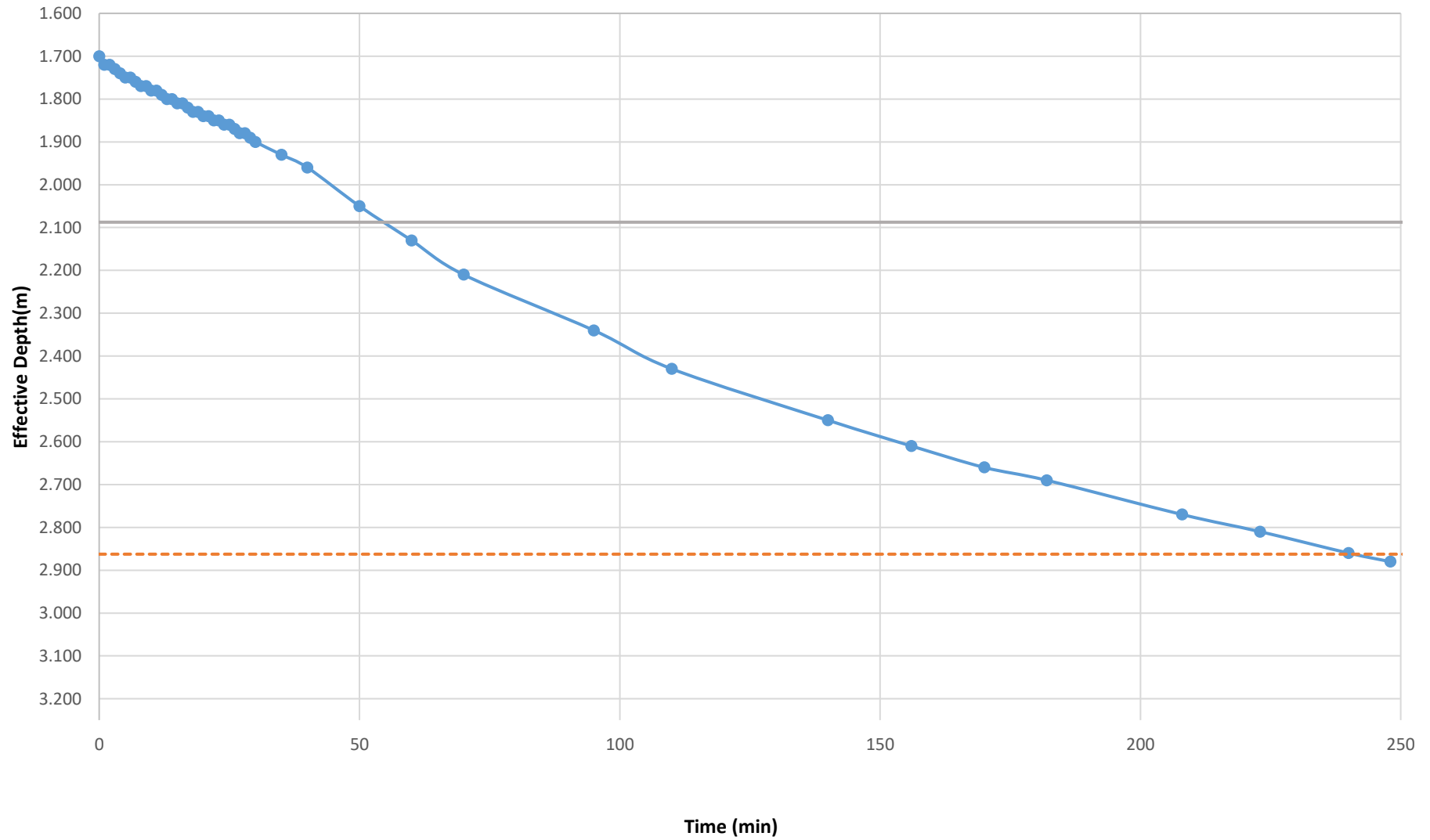


SA1 Cycle 1

	Units	Minutes	Depth (m)
Depth to water level	1.7 m	0	1.70
Effective Storage depth	1.55 m	1	1.72
Length	2.4 m	2	1.72
Width	0.7 m	3	1.73
Vp75	2.86 m	4	1.74
Vp25	2.09 m	5	1.75
Vp75-25	0.39 m3	6	1.75
ap50	6.49 m2	7	1.76
tp75	240 mins	8	1.77
tp25	55 mins	9	1.77
tp75-25	185 mins	10	1.78
q	0.0003 m/min	11	1.78
Infiltration Coefficient	20 mm/hr	12	1.79
Infiltration Coefficient	0.020 m/hr	13	1.80
Coefficient of Permeability	5.43E-06 m/s	14	1.80
		15	1.81
		16	1.81
Proportion of Volume displaced by gravel (70%)	0.7	17	1.82
		18	1.83
		19	1.83
		20	1.84
		21	1.84
		22	1.85
		23	1.85
		24	1.86
		25	1.86
		26	1.87
		27	1.88
		28	1.88
		29	1.89
		30	1.9
		35	1.93
		40	1.96
		50	2.05
		60	2.13
		70	2.21
		95	2.34
		110	2.43
		140	2.55
		156	2.61
		170	2.66
		182	2.69
		208	2.77
		223	2.81
		240	2.86
		248	2.88

Gredington Arms: SA-1 Cycle 1

Water Level v25 v75



Client:	TACP Architects Ltd	Site:	Gredington Arms
Calculated:	P Clayden	Checked:	S Barber-Bailey
Date:	21.03.2018	Date:	

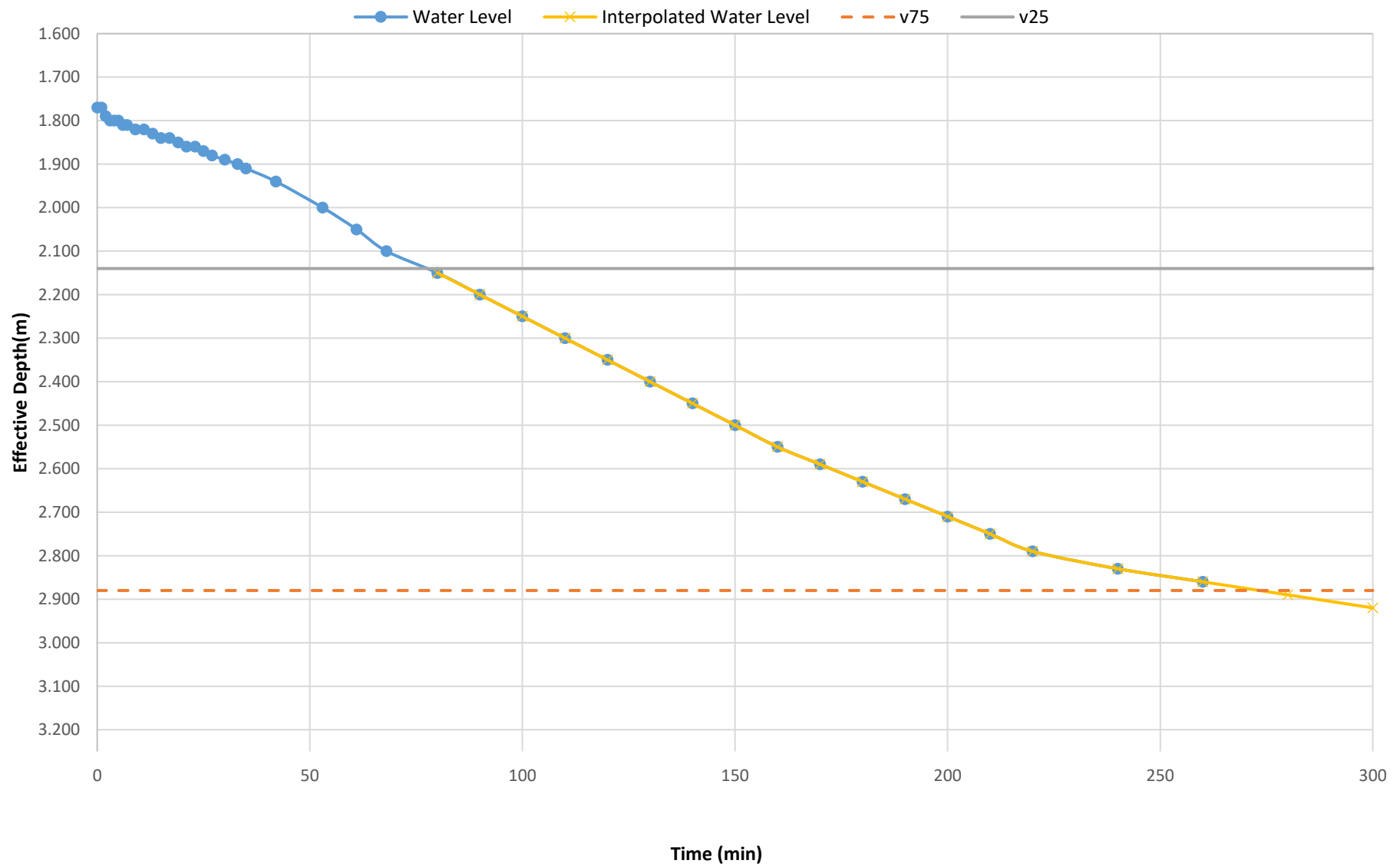
Soakaway tests were carried out on Tuesday 20th March 2018
Weather: Warm and Sunny



SA1 Cycle 2

	Units	Minutes	Depth (m)
Depth to water level	1.77 m	0	1.77
Effective Storage depth	1.48 m	1	1.77
Length	2.4 m	2	1.79
Width	0.7 m	3	1.80
Vp75	2.88 m	4	1.80
Vp25	2.14 m	5	1.80
Vp75-25	0.37 m3	6	1.81
ap50	6.27 m2	7	1.81
tp75	273 mins	9	1.82
tp25	78 mins	11	1.82
tp75-25	195 mins	13	1.83
q	0.0003 m/min	15	1.84
Infiltration Coefficient	18 mm/hr	17	1.84
Infiltration Coefficient	0.018 m/hr	19	1.85
Coefficient of Permeability	5.09E-06 m/s	21	1.86
		23	1.86
		25	1.87
Proportion of Volume displaced by gravel (70%)	0.7	27	1.88
		30	1.89
		33	1.9
		35	1.91
		42	1.94
		53	2
		61	2.05
		68	2.1
Interpolated data		80	2.15
		90	2.2
		100	2.25
		110	2.3
		120	2.35
		130	2.4
		140	2.45
		150	2.5
		160	2.55
		170	2.59
		180	2.63
		190	2.67
		200	2.71
		210	2.75
		220	2.79
		240	2.83
		260	2.86
		280	2.89
		300	2.92

Gredington Arms: SA-1 Cycle 2



Client:	TACP Architects Ltd	Site:	Gredington Arms
Calculated:	P Clayden	Checked:	S Barber-Bailey
Date:	21.03.2018	Date:	

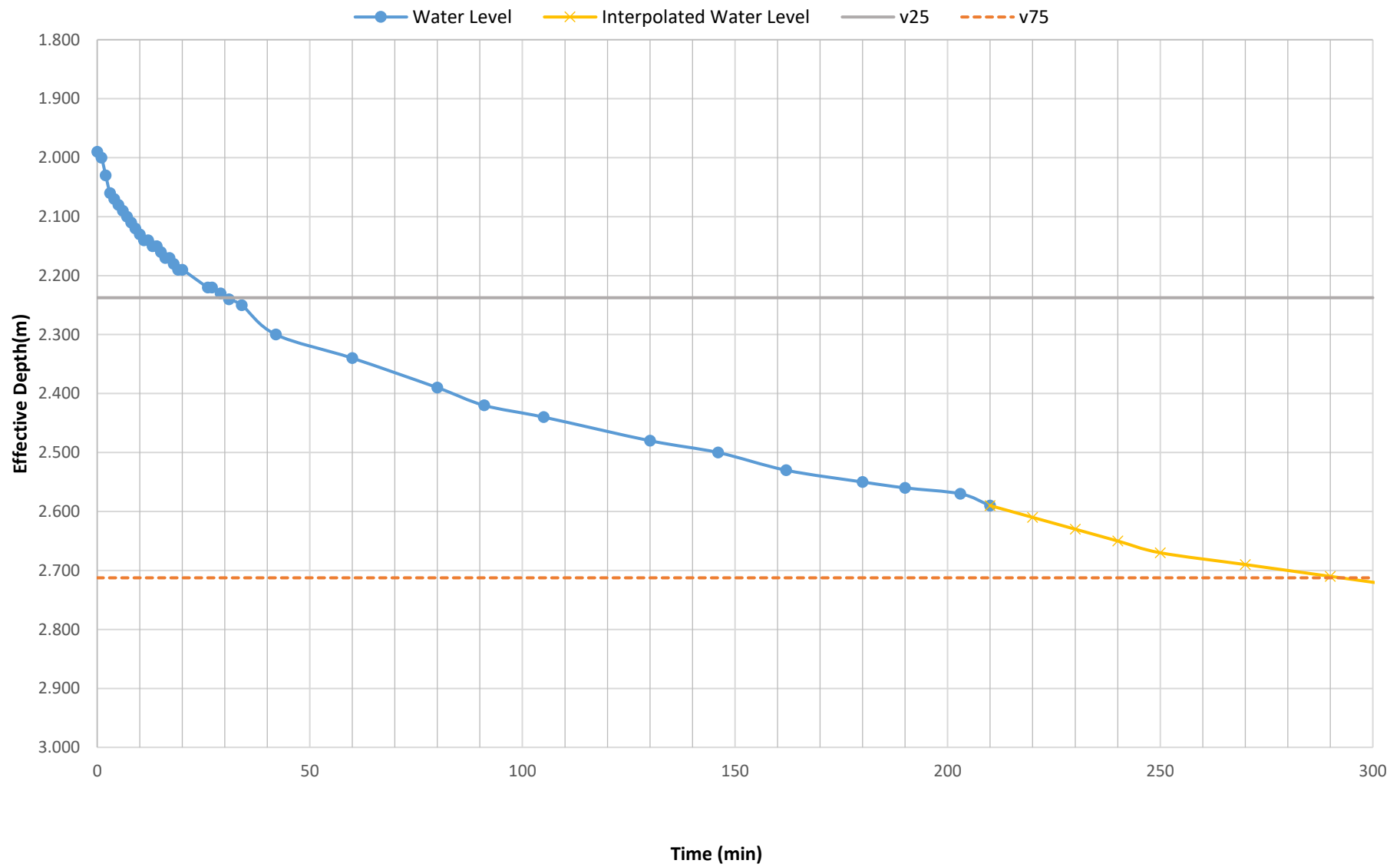
Soakaway tests were carried out on Tuesday 20th March 2018
Weather: Warm and Sunny



SA-2 Cycle 1

	Units	Minutes	Depth (m)
Depth to water level	2.00 m	0	1.99
Effective Storage depth	0.95 m	1	2.00
Length	2.30 m	2	2.03
Width	0.70 m	3	2.06
Vp75	2.71 m	4	2.07
Vp25	2.24 m	5	2.08
Vp75-25	0.76 m ³	6	2.09
ap50	4.46 m ²	7	2.10
tp75	290 mins	8	2.11
tp25	31 mins	9	2.12
tp75-25	259 mins	10	2.13
q	0.0007 m/min	11	2.14
Infiltration Coefficient	40 mm/hr	12	2.14
Infiltration Coefficient	0.040 m/hr	13	2.15
Coefficient of Permeability	1.10E-05 m/s	14	2.15
		15	2.16
Proportion of volume displaced by gravel (0%)	0	16	2.17
		17	2.17
		18	2.18
		19	2.19
		20	2.19
		26	2.22
		27	2.22
		29	2.23
		31	2.24
		34	2.25
		42	2.3
		60	2.34
		80	2.39
		91	2.42
		105	2.44
		130	2.48
		146	2.5
		162	2.53
		180	2.55
		190	2.56
		203	2.57
		210	2.59
Interpolated data		220	2.61
		230	2.63
		240	2.65
		250	2.67
		270	2.69
		290	2.71
		310	2.73

Gredington Arms - SA-2 Cycle 1



Gredington Arms - SA-2 Cycle 2

