

Graven Hill

A41 Roundabout Drainage Compliance Report

Date: May 2021
Client Name: Graven Hill Village Development Company
Document Reference: WIE11386-145-R-8-3-1

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

Issue	Prepared by	Checked & Approved by
First -30.04.21	Karhi Palanniyapan Senior Engineer	Nick Jones-Hill Senior Associate Director



1. Introduction

- 1.1. Graven Hill Village Development Company Ltd submitted an application "20/01830/F" to construct the roundabout to replace existing Pioneer Road/A41 junction to improve traffic flow from Graven Hill Development and to provide a future vehicular link to the adjacent Wretchwick Green development site at Oxfordshire County Council (OCC). On 4th February 2021 Oxfordshire County Council (OCC) as the lead local flood authority released condition on submitted Drainage Strategy "WIE11386-101-TN-1-1-2 June 2020". As part of the panning condition a compliae report to demonstrate how the scheme complies with the "Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire" has been requested to submit with other documents.
- 1.2. This technical note has been produced to demonstrate how proposed drainage design complies with above guide.

2. Compliance with Local Standards

The drainage strategy has been developed based on the standards set out in the Oxfordshire County Councils "Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire". Particularly Section 5 of the document gives guidance for surface water design, construction, operation and maintenance in Oxfordshire.

A. Peak Flow Control:

Peak flow discharge from the proposed roundabout has been worked out from the following part of the guidance.

- 2.1. **Local Standard L1:** *The greenfield runoff rate will need to be agreed with the LLFA, Environment Agency (EA), relevant sewerage undertaker and Canal and River Trust (CRT), where appropriate, and should take into account the 1 in 1 year, 1 in 30 year and 1 in 100 year rainfall events, including climate change allowances.*
- 2.2. Initial drainage design has been proposed with greenfield runoff rate of 2.8 l/sec which requires 530cu.m storage at the site. Open pond with greater depth can provide this storage volume. Due to safety of road users this option has been dropped.
- 2.3. **Local Standard L2:** *Evidence would need to be provided to support a higher rate of discharge than greenfield rates, and would have to be agreed by the relevant authorities as in L1. This section of the guidance not applicable as greenfield runoff design not used.*
- 2.4. **Local Standard L3:** *For brownfield or previously developed sites, where it is proposed to discharge runoff at rates greater than greenfield rates, evidence will be required to demonstrate why it is not feasible to achieve greenfield rates. The capacity of any existing drainage system within the site should also be assessed in order to determine the current discharge rates.*
- 2.5. The proposal is to replace existing road junction with new roundabout therefore it is considered as brownfield. Brownfield runoff rate has been worked out and 40% reduction applied. Proposed drainage has been designed to reduced flow rate.
- 2.6. **Local Standard L4:** *All flow control devices restricting the rate of flow should have a bypass feature to manage flows when a blockage occurs. The bypass can be an internal weir overflow within the chamber discharging to the outfall pipe or channel. An overflow shall be provided from any basin/pond etc safely routing flows to the discharge location.*
- 2.7. Flow control chamber with overflow weir will be provided.
- 2.8. **Local Standard L5:** *For all residential developments, the proposed impermeable area for the site used in all calculations should include an additional allowance of 10% to account for the potential of Urban Creep.*
- 2.9. Proposal is not residential development therefore it is not applicable.

3. Volume Control:

Peak volume from the proposed roundabout controlled would be controlled as set out in the following sections guidance.

- 3.1. **National Standard S4:** *Where reasonably practicable, for greenfield developments, the runoff volume from the development to any highway drain, sewer surface water body in the 1 in 100year, 6hour rainfall event should never exceed the greenfield runoff volume for the same event. This section of the guidance is not applicable as site classified as brownfield.*

- 3.2. **National Standard S5:** *Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100year, 6hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event but should never exceed the runoff volume from the development site prior to redevelopment for that event.* Proposed drainage calculation adopts peak flow control method as stated on Local Standard S3, therefore excess volume generated will be storage during the extreme storm events.
- 3.3. **National Standard S6:** *Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.* Surface water runoff from proposed roundabout designed to restrict to equivalent of 60% pre-development runoff using flow control device.

4. Flood Risk

- 4.1. The MicroDrainage drainage design shows that small amount of flooding occurs at the southern arm of the roundabout during 1 in 100year + 40% climate change storm event. This flooding has been routed out to adjacent highway ditch, therefore there is no risk to road users. A copy of the flood exceedance and routing plan provided.

5. Designing for Maintenance Considerations

All elements of the proposed surface water drainage system have been accompanied by a maintenance schedule that sets out how and when each element of the system should be inspected and maintained, who is responsible for the maintenance, and when each element may need replacement. The layout also shows maintenance access.

5.1. Runoff destinations

- 5.2. Restricted flow from roundabout proposed to outfall into existing sewer through highway ditch. Cherwell District Council has been consulted for any land drainage requirement, but it has confirmed that is not necessary.

5.3. Water Quality

- 5.4. Part of surface water runoff proposed to flow through swale, filter drain and highway ditch before it outfalls into existing sewer. Therefore, pollutants from the surface water runoff will be captured and treated before it terminates into sewer.

6. Demonstration that the SuDS Management Train has been appropriately applied.

- 6.1. The surface water drainage hierarchy has been considered and is assessed as follows:
- i. Use infiltration techniques, such as use soakaways;

The attached Ground Investigation Interpretative Report (Ref. WIE11386-145-1.1.3-GIR, March 2021) identifies the ground conditions beneath the existing highway construction and adjacent verge areas. They are summarised in Table 1 and the engineer verified logs are in Appendix B. These

show firm and stiff grey and orange-brown slightly sandy Clay, which becomes dark grey with depth. This is the Peterborough Member of the Oxford Clay Formation.

The main Ground Investigation for the overall development site, which includes the proposed A41 roundabout, proved the clays to depths in excess of 10m below existing ground level. In addition, as part of the main GI, a total of sixteen soakaway tests were undertaken on the, albeit very large adjacent development site, fourteen of which recorded no infiltration and two negligible infiltration.

Hence in view of the strata present beneath the proposed roundabout, and the data from the GI on the adjacent site, infiltration systems are not considered viable.

- ii. Discharge rainwater direct to a watercourse;

There are no watercourses within the vicinity of the Site. The nearest watercourse is approximately 610m to the northeast of the site. Third-party approval would be required to access the watercourse. Therefore, discharging directly to a watercourse is not feasible.

- iii. Discharge rainwater to a surface water drain;

Existing surface water sewer serving this area located within the client land adjacent areas directly outfalls into a watercourse. Therefore, surface water runoff from proposed roundabout to be discharged at agreed restricted rate to existing surface sewer.

- iv. Discharge to a combined sewer.

There are no combined sewers within the vicinity of the site.

7. Use of SuDS components

- 7.1. Although infiltration SuDS are not suitable in clayey soils, options to use swale, filter drains and open pond has been explored.
- 7.2. **Open Pond:** Initial drainage strategy submitted with planning application includes a open pond at the middle of the roundabout. Due to the safety of the road users OCC highways and drainage engineers has declined to use open pond.
- 7.3. **Swales:** Swales and filter drains have been used where possible. Existing ditch has been proposed to use to treat runoff and conveyance.
- 7.4. **Detention basin and Retention Ponds:** Due to space constrains these options are not feasible.

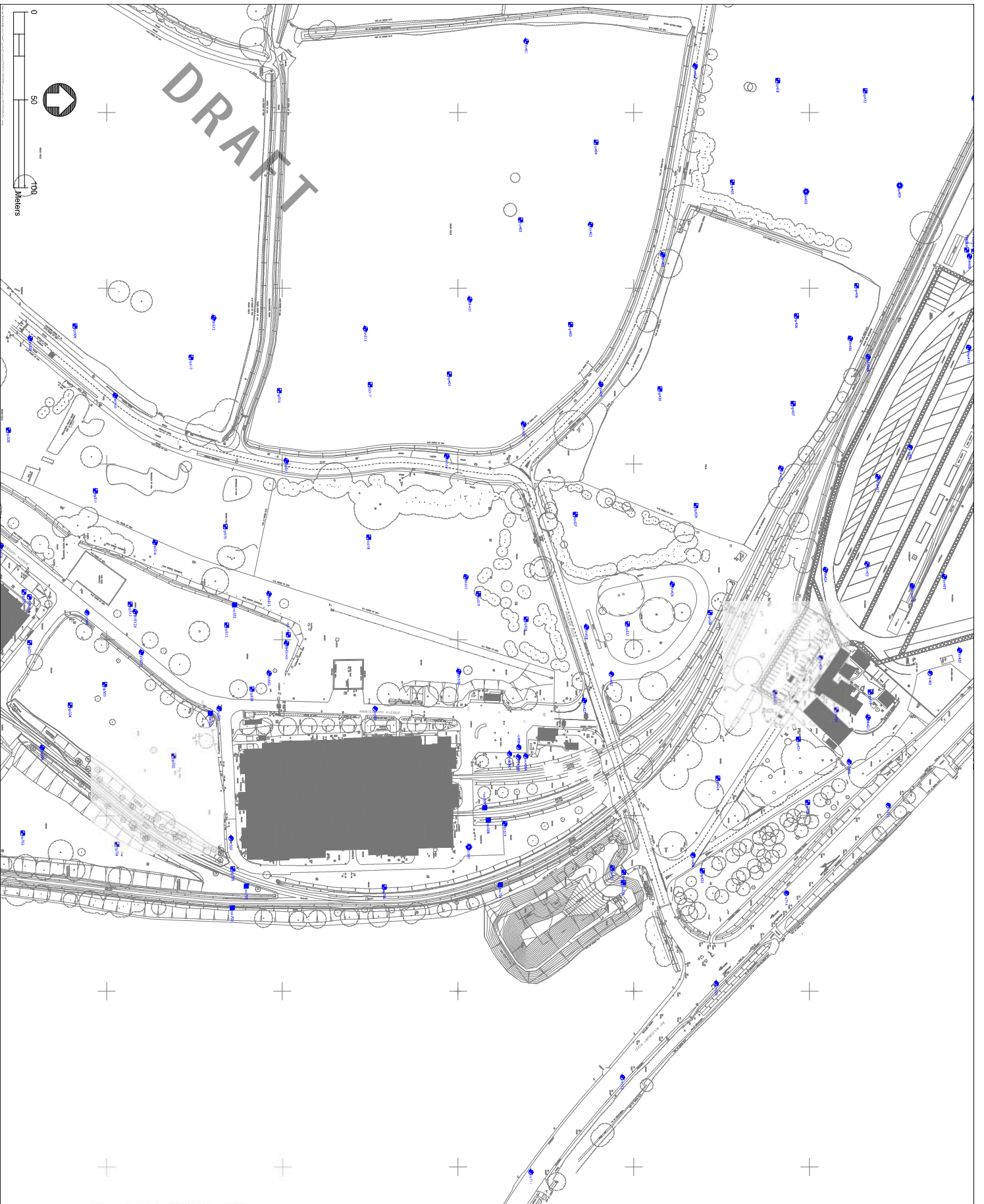
Other SuDS components like permeable paving, below ground cellular storage are not appropriate for heavily used public roundabout. Therefore, these options are not proposed.

8. Conclusion

- 8.1. Proposed drainage design has taken into account of all the sections of the guidance and site-specific SuDS has been implemented.
- 8.2. Drainage design has assessed volume and flow control sections of the guidance and appropriate method has been utilised to design.

APPENDICES

A. SOAKAWAY RESULTS



GEOTECHNICS
 geotechnical and geoenvironmental specialists

The Old Colne, Hemel Hempstead, Herts, SG9 6ND
 202, Longport Avenue, Hemel Hempstead, Herts, SG9 6ND
 Chester, CH4 4NF
 www.geotechnics.co.uk

Engineer: Waterrain Infrastructure & Environment Limited

Client: Gravel Hill Village Development Company Limited

Project: Gravel Hill, Bicester, Land Transfer Areas 2 (LTAs)

Drawing Title: EXPLORATORY HOLE LOCATION PLAN

Scale: 1:1000@A1

Project No: PC207899

Date: August 2020
 File Name: Geo-PC207899-001(4)

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

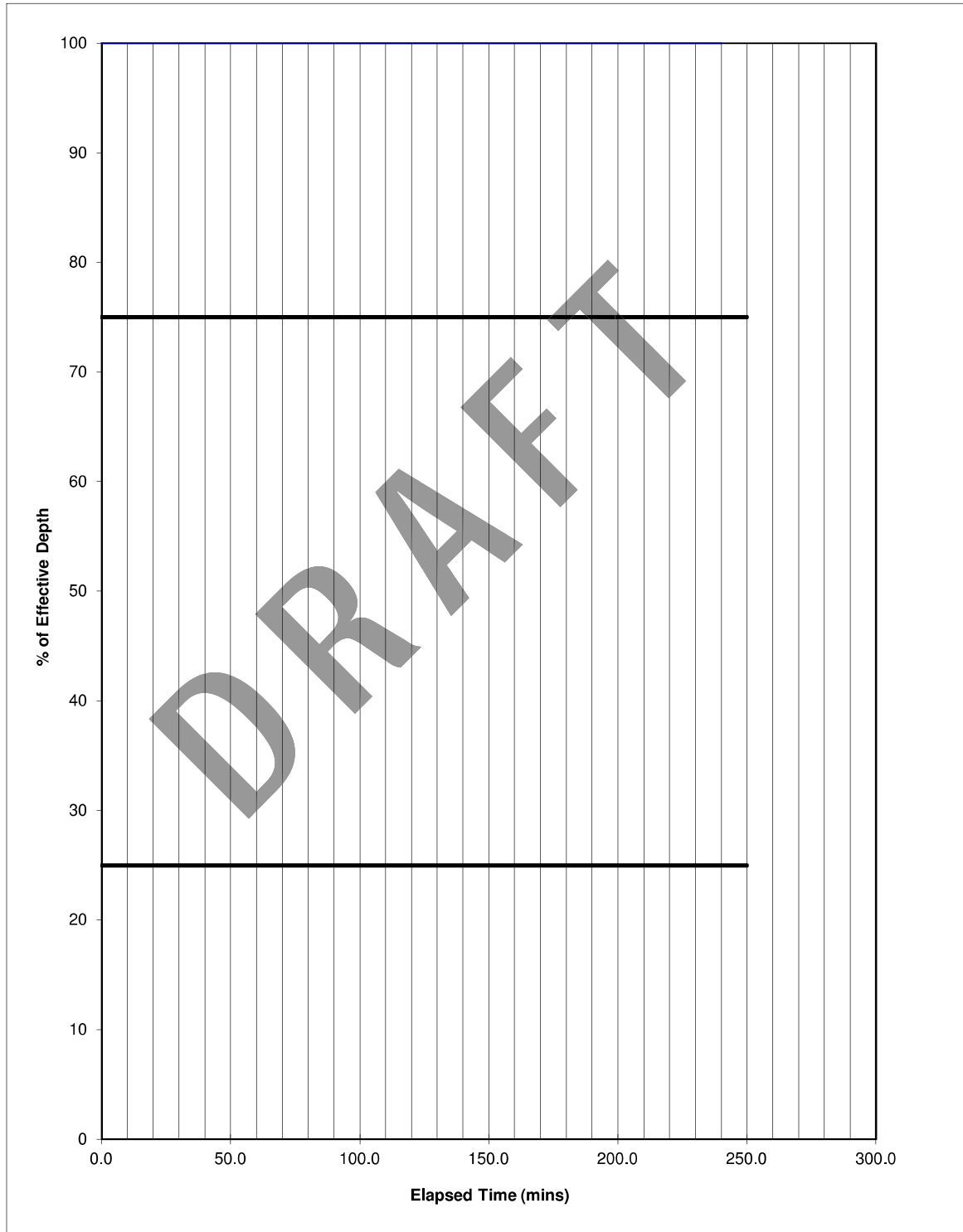
Trial Pit TP335

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 22/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 2

INSITU TESTING - Soakaway Test

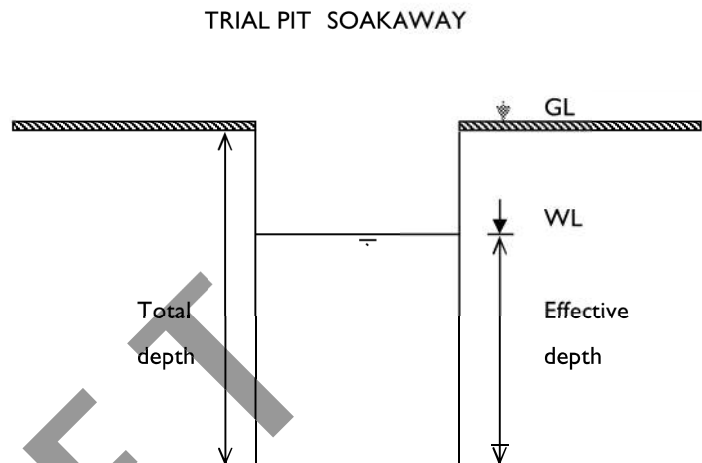
Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP401
 Test No I
 Project No PC207899
 Date 24/07/2020

Client Graven Hill Village Development Company Limited

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.80	0.80	100.00
1.00	1.80	0.80	100.00
2.00	1.80	0.80	100.00
3.00	1.80	0.80	100.00
4.00	1.80	0.80	100.00
5.00	1.80	0.80	100.00
10.00	1.80	0.80	100.00
15.00	1.80	0.80	100.00
20.00	1.80	0.80	100.00
30.00	1.80	0.80	100.00
45.00	1.80	0.80	100.00
60.00	1.80	0.80	100.00
90.00	1.80	0.80	100.00
120.00	1.80	0.80	100.00
180.00	1.80	0.80	100.00
240.00	1.80	0.80	100.00



Trial pit length = 2.600 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.600 m
 Effective depth (Head of Water) = 0.800 m

Initial depth from GL	=	1.800m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.600	2.000	
25%	0.200	2.400	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	* m/sec	

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 1

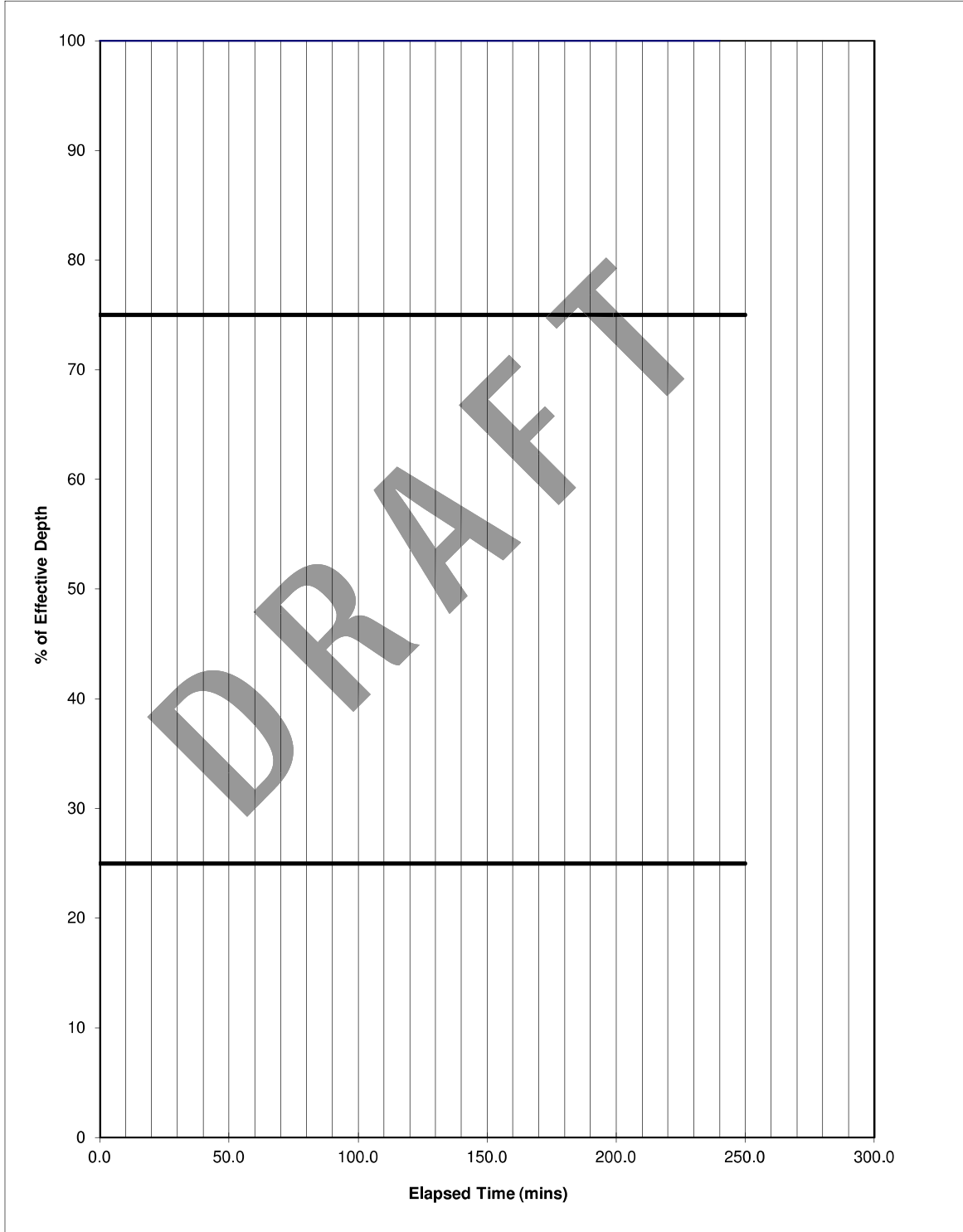
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP401
Test No I
Project No PC207899
Date 24/07/2020

Client Graven Hill Village Development Company Limited



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

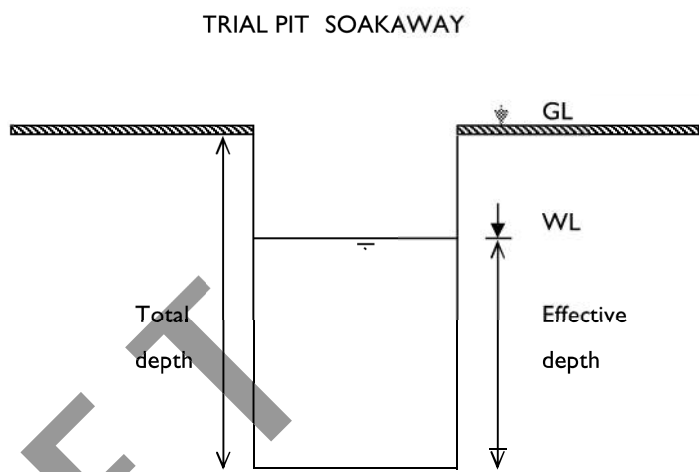
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP422
		Test No	I
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	20/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.60	1.00	100.00
1.00	1.60	1.00	100.00
2.00	1.60	1.00	100.00
3.00	1.60	1.00	100.00
4.00	1.60	1.00	100.00
5.00	1.60	1.00	100.00
10.00	1.60	1.00	100.00
15.00	1.60	1.00	100.00
20.00	1.60	1.00	100.00
30.00	1.60	1.00	100.00
45.00	1.60	1.00	100.00
60.00	1.60	1.00	100.00
90.00	1.60	1.00	100.00
120.00	1.60	1.00	100.00
180.00	1.60	1.00	100.00
240.00	1.60	1.00	100.00



Trial pit length = 2.500 m
Trial pit width = 0.600 m
Trial pit depth = 2.600 m
Effective depth (Head of Water) = 1.000 m

Initial depth from GL	=	1.600m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.750	1.850	
25%	0.250	2.350	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	* m/sec	

Remarks *No infiltration rate calculated as no fall in the water level recorded.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

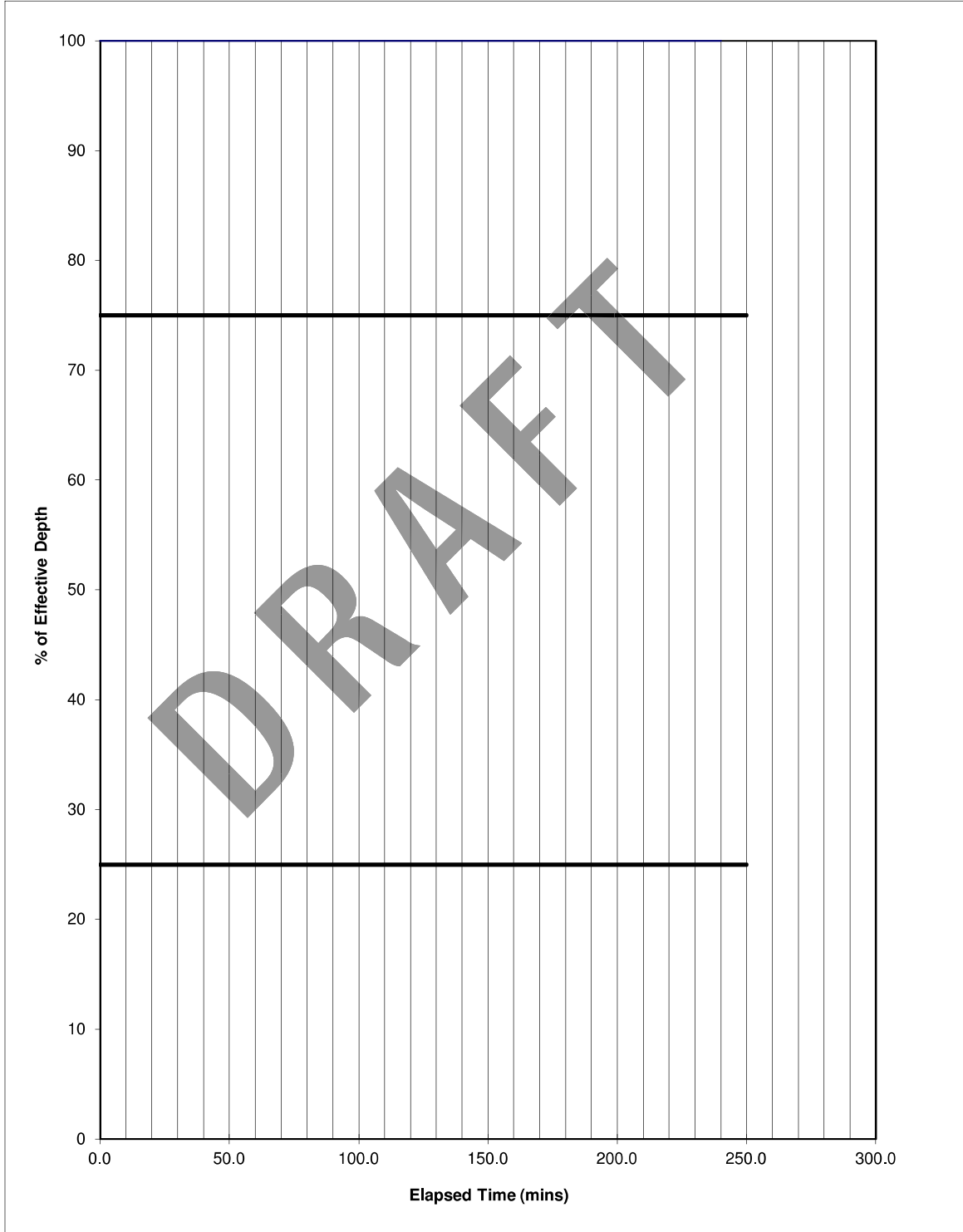
Trial Pit TP422

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 20/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 2

INSITU TESTING - Soakaway Test

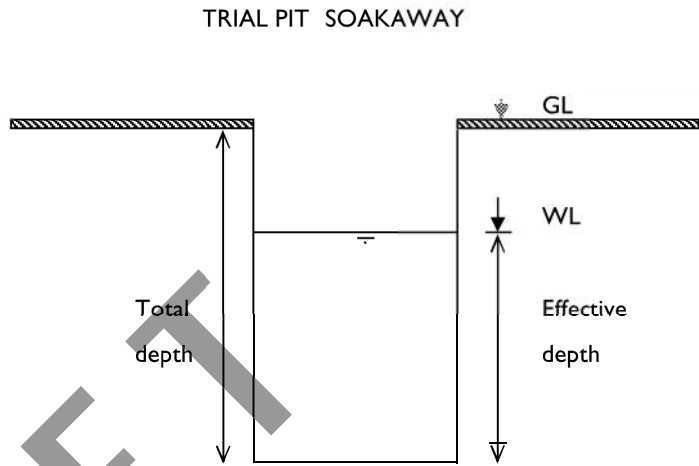
Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP423
Test No I
Project No PC207899
Date 20/07/2020

Client Graven Hill Village Development Company Limited

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.30	1.40	100.00
1.00	1.30	1.40	100.00
2.00	1.30	1.40	100.00
3.00	1.30	1.40	100.00
4.00	1.30	1.40	100.00
5.00	1.30	1.40	100.00
10.00	1.30	1.40	100.00
15.00	1.30	1.40	100.00
20.00	1.30	1.40	100.00
30.00	1.30	1.40	100.00
45.00	1.30	1.40	100.00
60.00	1.30	1.40	100.00
90.00	1.30	1.40	100.00
120.00	1.30	1.40	100.00
180.00	1.30	1.40	100.00
240.00	1.30	1.40	100.00



Trial pit length = 2.700 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.700 m
 Effective depth (Head of Water) = 1.400 m

Initial depth from GL	=	1.300m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	1.050	1.650	
25%	0.350	2.350	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	* m/sec	

Sheet 1

Remarks *No infiltration rate calculated as no fall in the water level recorded.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

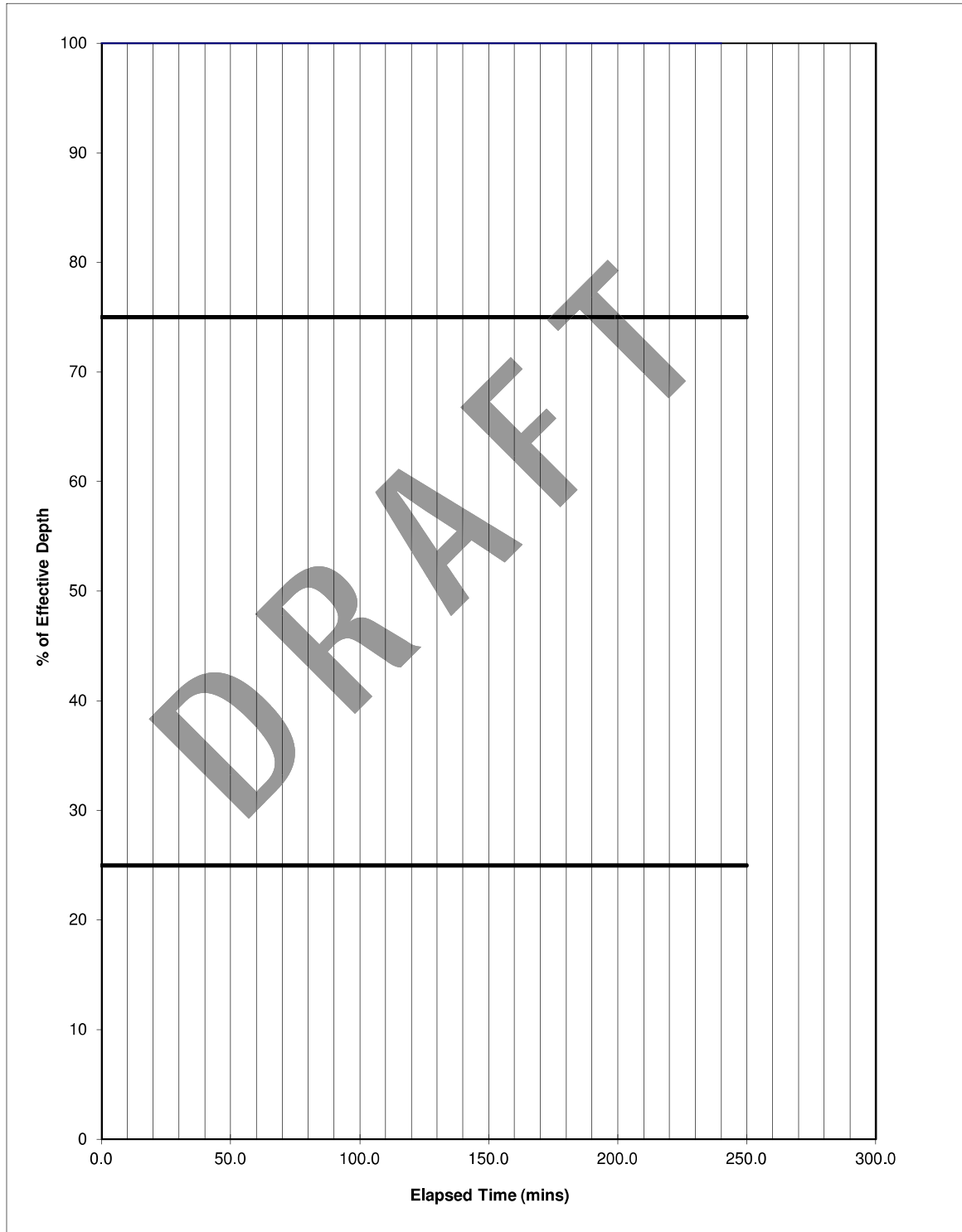
Trial Pit TP423

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 20/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

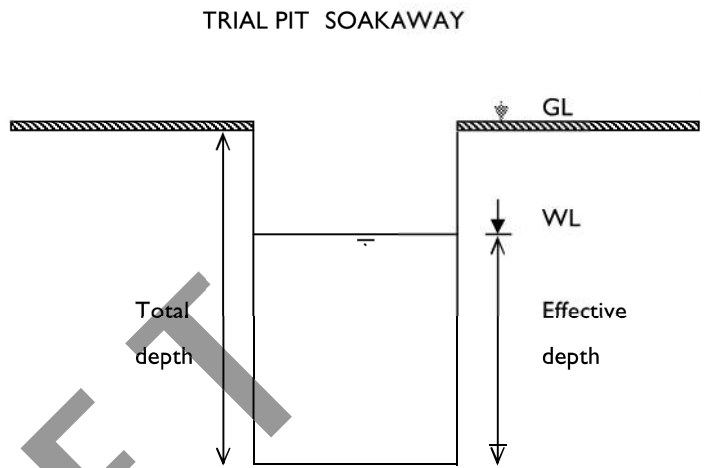
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP426
		Test No	I
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	24/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.58	0.92	100.00
1.00	1.58	0.92	100.00
2.00	1.58	0.92	100.00
3.00	1.58	0.92	100.00
4.00	1.58	0.92	100.00
5.00	1.58	0.92	100.00
10.00	1.58	0.92	100.00
15.00	1.58	0.92	100.00
20.00	1.58	0.92	100.00
30.00	1.58	0.92	100.00
45.00	1.58	0.92	100.00
60.00	1.58	0.92	100.00
90.00	1.58	0.92	100.00
120.00	1.58	0.92	100.00
180.00	1.58	0.92	100.00
240.00	1.58	0.92	100.00



Trial pit length	=	2.500 m
Trial pit width	=	0.600 m
Trial pit depth	=	2.500 m
Effective depth (Head of Water)	=	0.920 m

Initial depth from GL	=	1.580m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.690	1.810	
25%	0.230	2.270	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	* m/sec	

Remarks *No infiltration rate calculated as no fall in the water level recorded.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

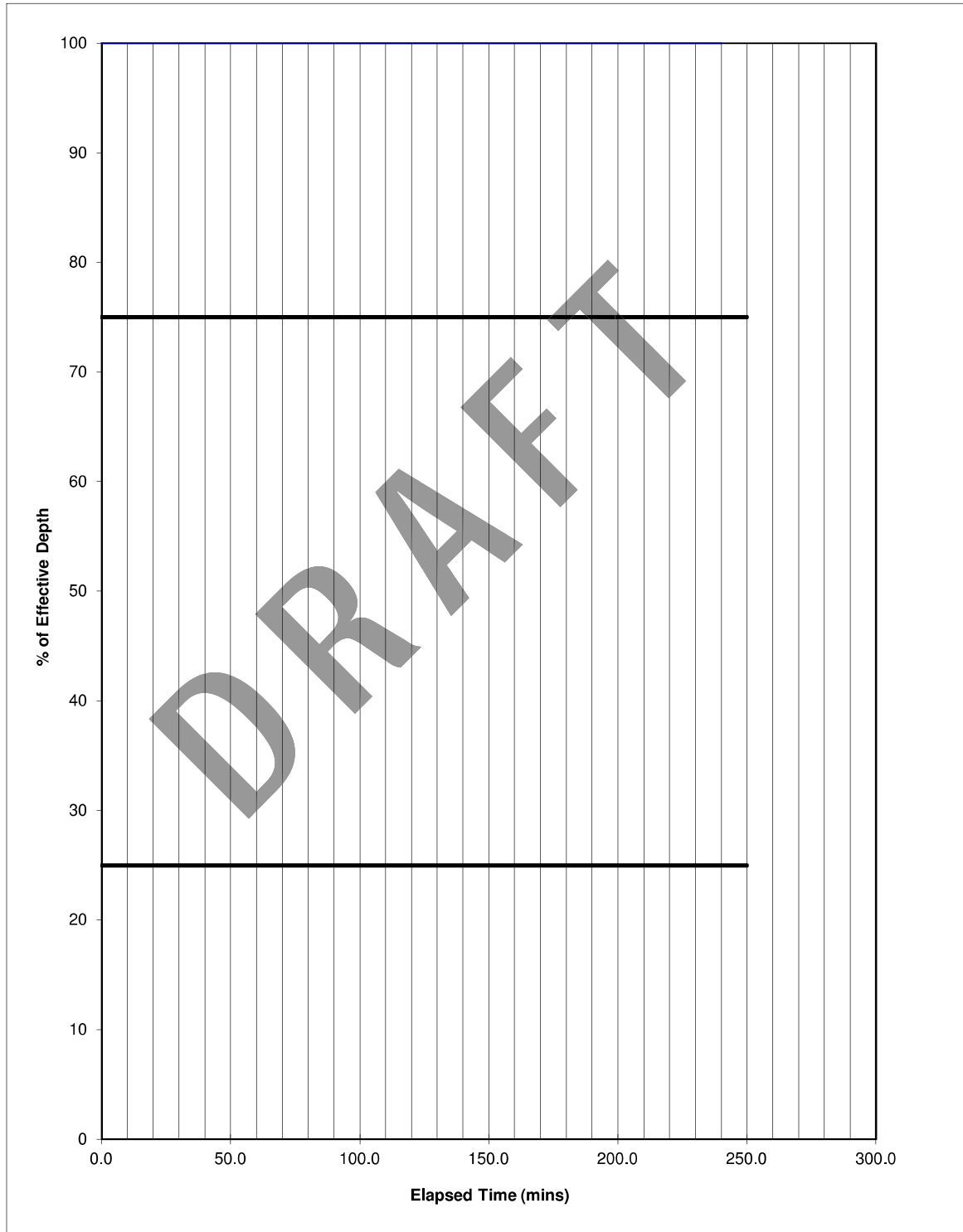
Trial Pit TP426

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 24/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

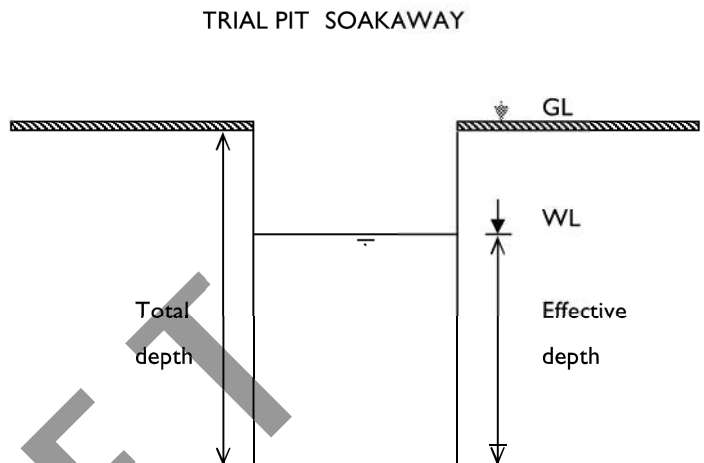
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP436
		Test No	I
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	23/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.89	1.11	100.00
1.00	1.89	1.11	100.00
2.00	1.89	1.11	100.00
3.00	1.89	1.11	100.00
4.00	1.89	1.11	100.00
5.00	1.89	1.11	100.00
10.00	1.89	1.11	100.00
15.00	1.89	1.11	100.00
20.00	1.89	1.11	100.00
30.00	1.89	1.11	100.00
45.00	1.89	1.11	100.00
60.00	1.89	1.11	100.00
90.00	1.89	1.11	100.00
120.00	1.89	1.11	100.00
180.00	1.89	1.11	100.00
240.00	1.89	1.11	100.00



Trial pit length = 2.500 m
 Trial pit width = 0.600 m
 Trial pit depth = 3.000 m
 Effective depth (Head of Water) = 1.110 m

Initial depth from GL	=	1.890m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.833	2.168	0.00
25%	0.278	2.723	0.00
Vp75-25	=	0.833	m3
ap50	=	4.941	m2
tp75-25	=	0.000	min
Soil Infiltration, f	=	*	m/sec

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 1

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

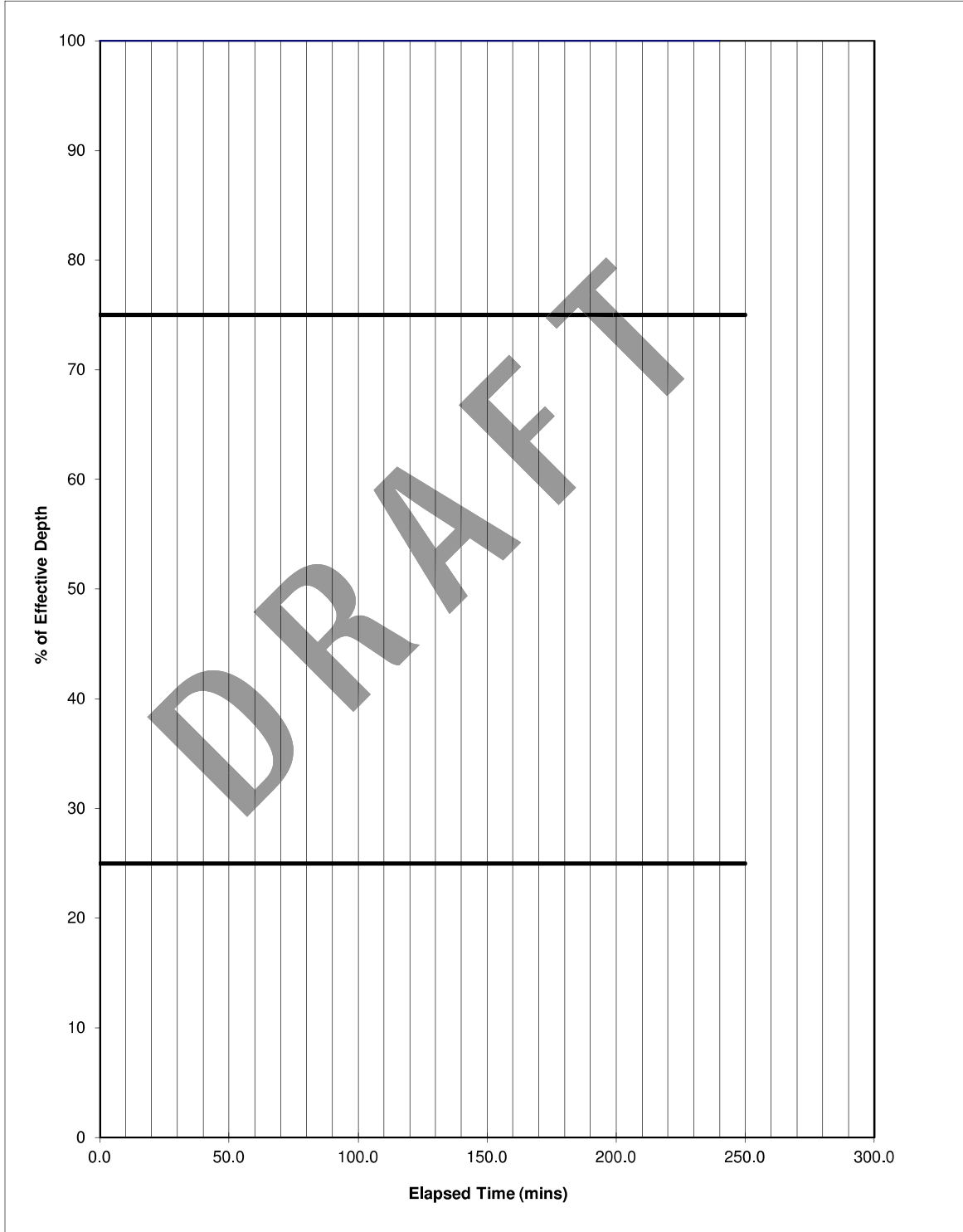
Trial Pit TP436

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 23/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 2

INSITU TESTING - Soakaway Test

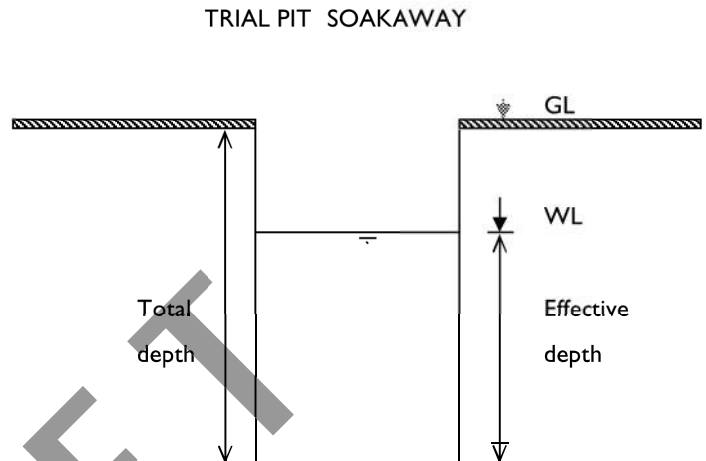
Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP608
 Test No I
 Project No PC207899
 Date 21/07/2020

Client Graven Hill Village Development Company Limited

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.65	0.95	100.00
1.00	1.65	0.95	100.00
2.00	1.65	0.95	100.00
3.00	1.65	0.95	100.00
4.00	1.65	0.95	100.00
5.00	1.65	0.95	100.00
10.00	1.65	0.95	100.00
15.00	1.65	0.95	100.00
20.00	1.65	0.95	100.00
30.00	1.65	0.95	100.00
45.00	1.65	0.95	100.00
60.00	1.65	0.95	100.00
90.00	1.65	0.95	100.00
120.00	1.65	0.95	100.00
180.00	1.65	0.95	100.00
240.00	1.65	0.95	100.00



Trial pit length = 2.700 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.600 m
 Effective depth (Head of Water) = 0.950 m

Initial depth from GL	=	1.650m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.713	1.888	
25%	0.238	2.363	
Vp75-25	=		m3
ap50	=		m2
tp75-25	=		min
Soil Infiltration, f	=	*	m/sec

Sheet 1

Remarks *No infiltration rate calculated as no fall in the water level recorded.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

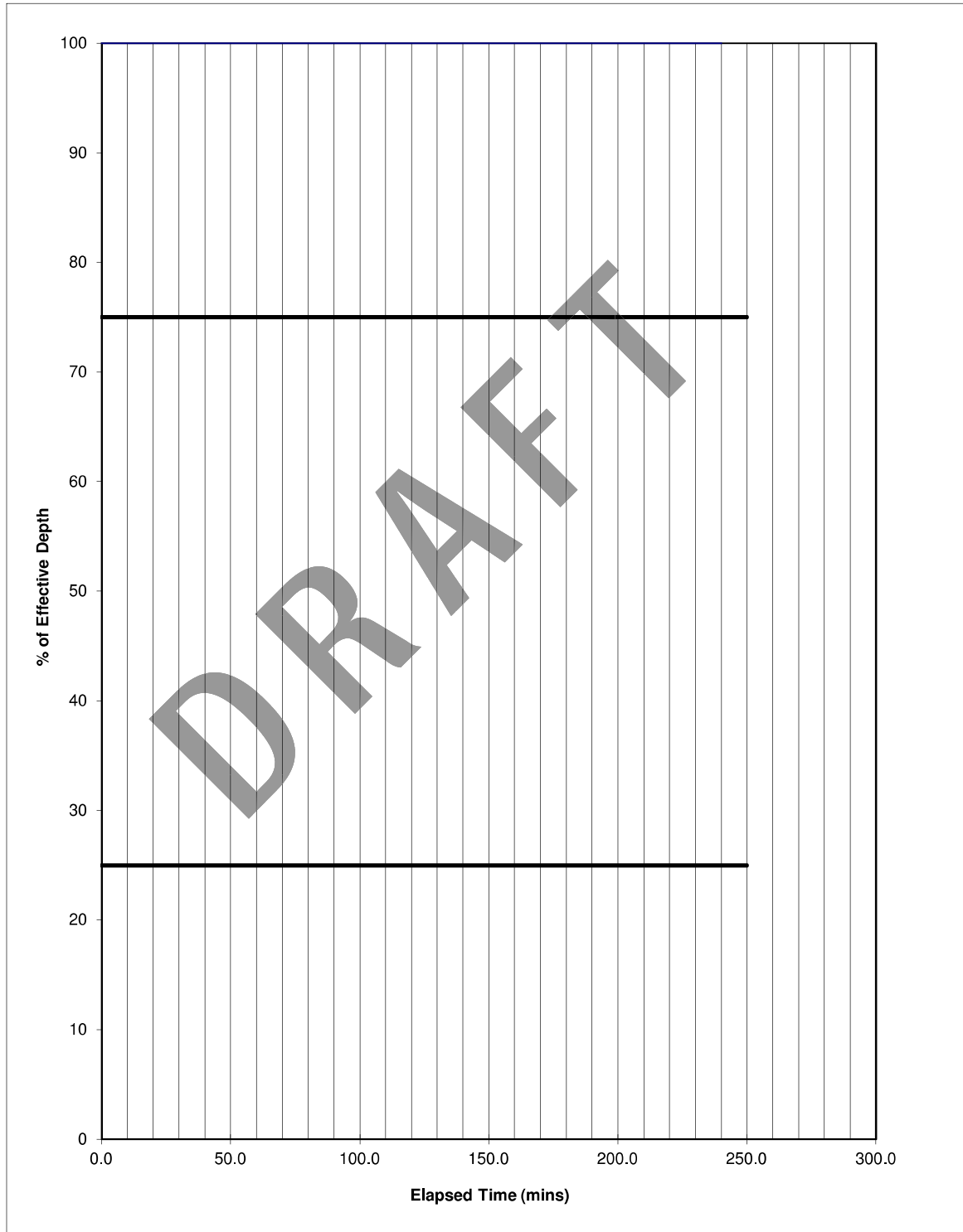
Trial Pit TP608

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 21/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

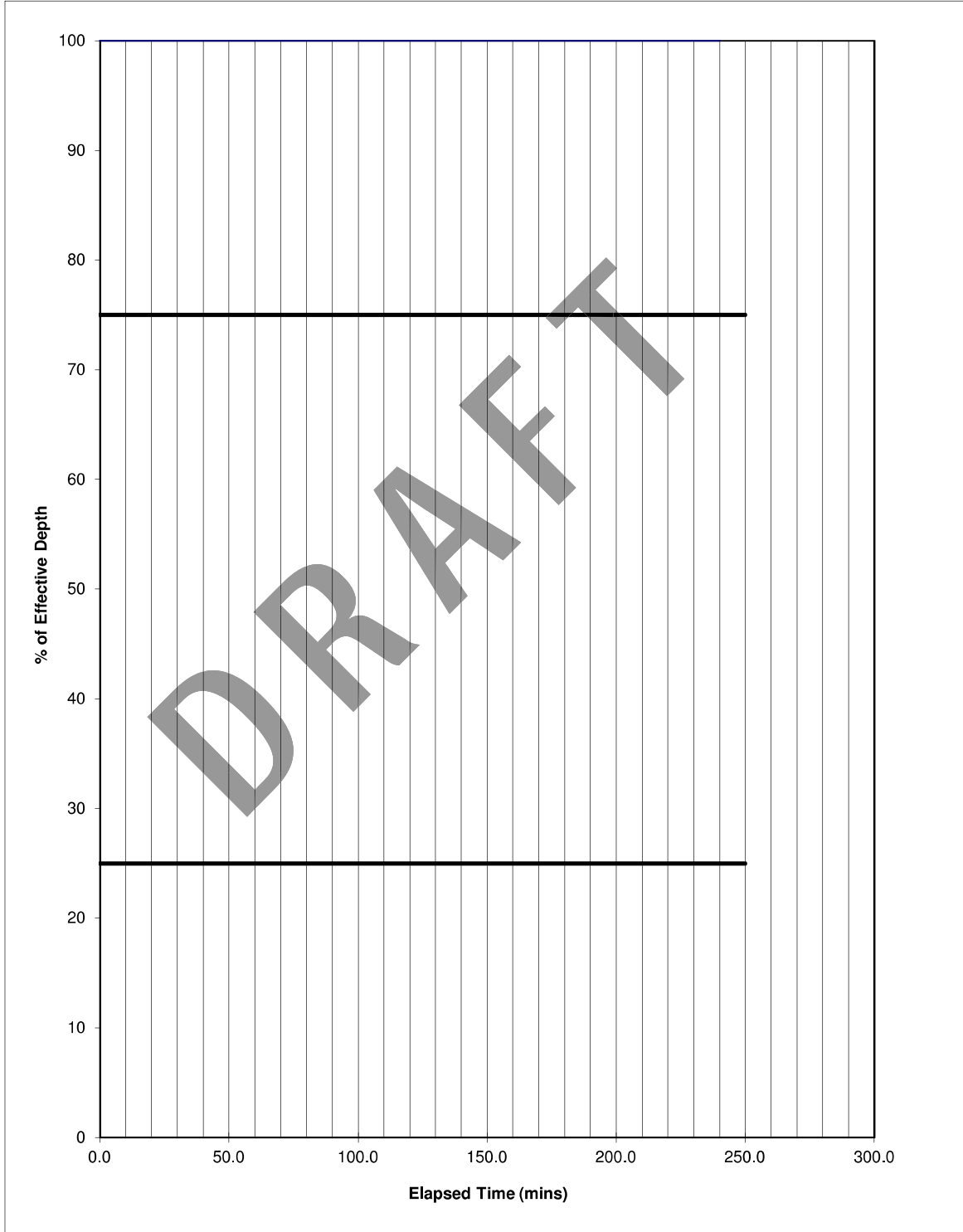
Trial Pit TP610

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 21/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

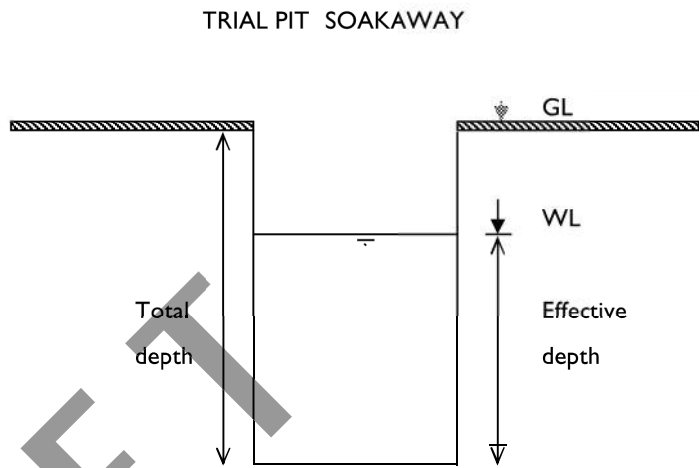
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP801
		Test No	I
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	13/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.25	1.45	100.00
1.00	1.25	1.45	100.00
2.00	1.25	1.45	100.00
3.00	1.25	1.45	100.00
4.00	1.25	1.45	100.00
5.00	1.25	1.45	100.00
10.00	1.25	1.45	100.00
15.00	1.25	1.45	100.00
20.00	1.25	1.45	100.00
30.00	1.25	1.45	100.00
45.00	1.25	1.45	100.00
60.00	1.25	1.45	100.00
90.00	1.25	1.45	100.00
120.00	1.25	1.45	100.00
180.00	1.25	1.45	100.00
240.00	1.25	1.45	100.00



Trial pit length = 3.700 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.700 m
 Effective depth (Head of Water) = 1.450 m

Initial depth from GL	=	1.250m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	1.088	1.613	
25%	0.363	2.338	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	* m/sec	

Sheet 1

Remarks *No infiltration rate calculated as no fall in the water level recorded.

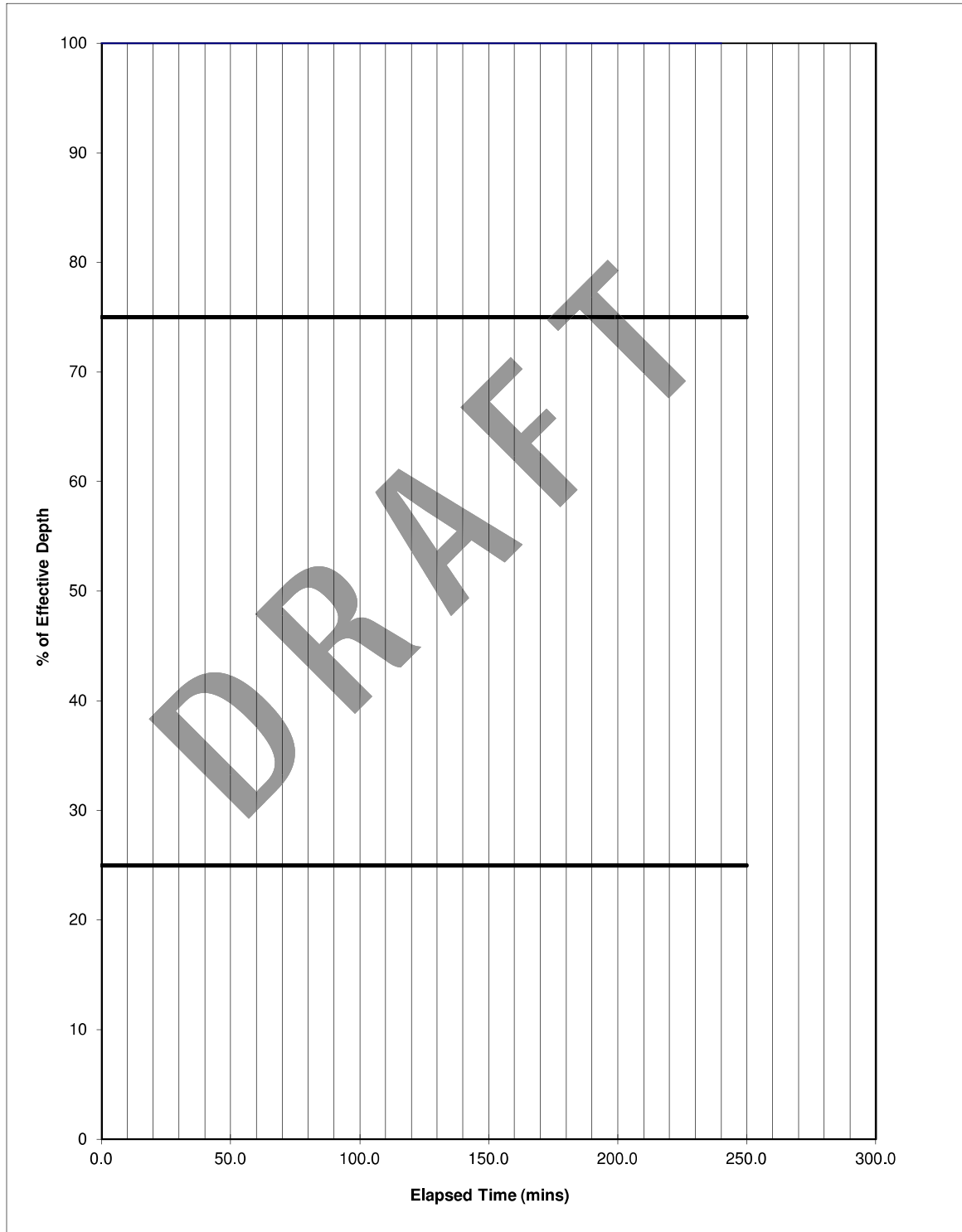
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP801
Test No I
Project No PC207899
Date 13/07/2020

Client Graven Hill Village Development Company Limited



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 2

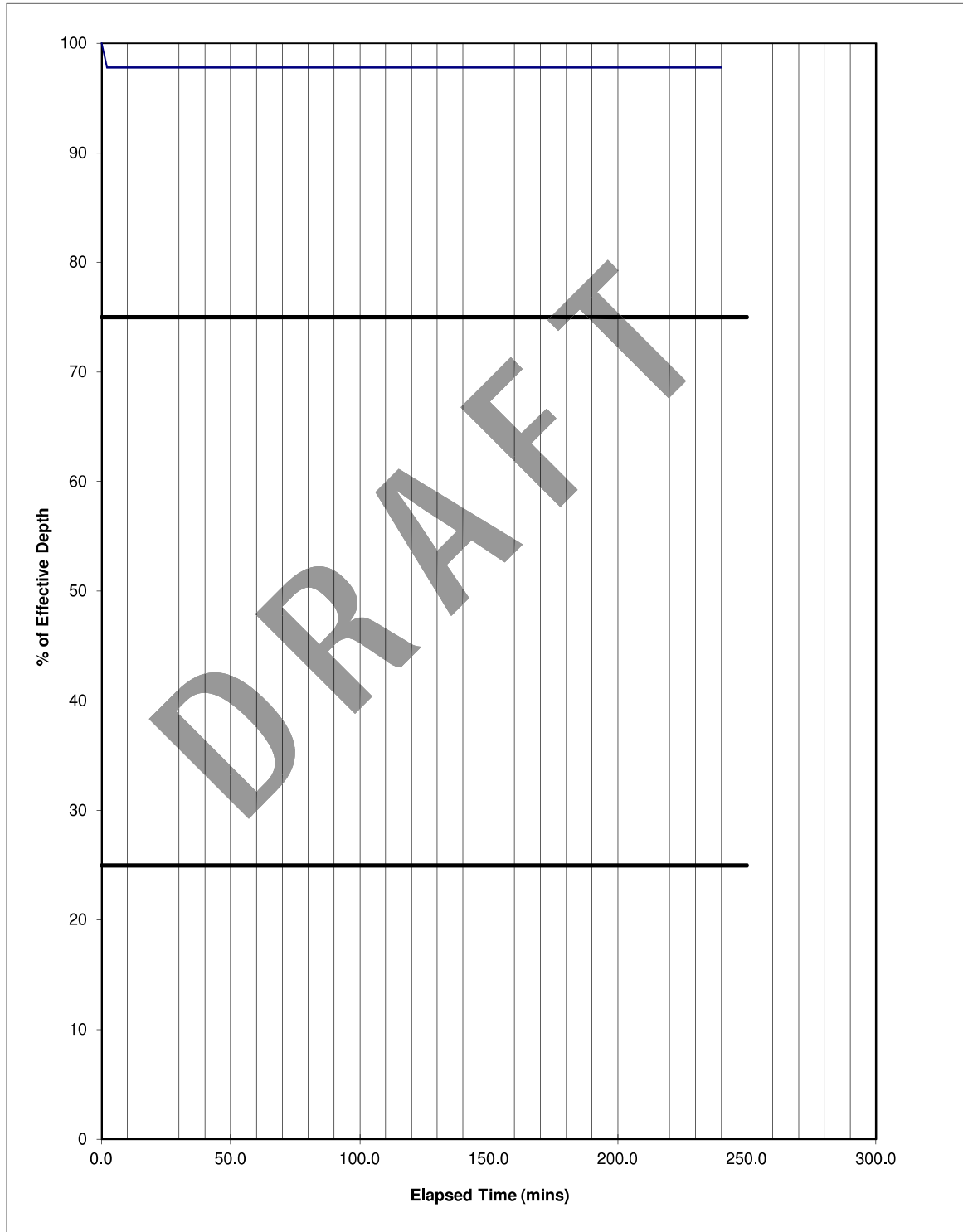
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP813
 Test No I
 Project No PC207899
 Date 14/07/2020

Client Graven Hill Village Development Company Limited



tp75	=
tp25	=

Remarks *Unable to estimate infiltration rate due to very low drop in water level.

Sheet 2

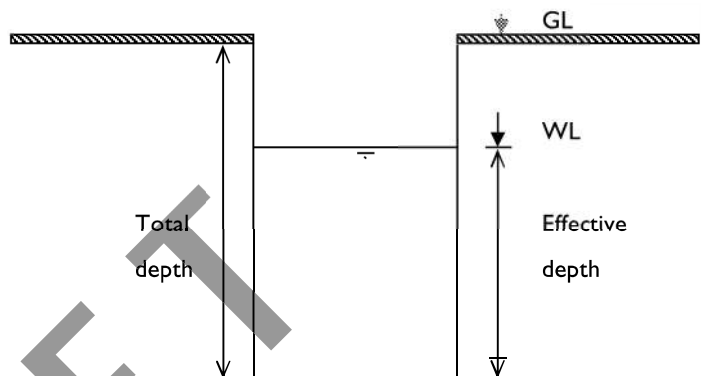
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP814
		Test No	I
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	14/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.52	0.98	100.00
1.00	1.52	0.98	100.00
2.00	1.52	0.98	100.00
3.00	1.52	0.98	100.00
4.00	1.52	0.98	100.00
5.00	1.52	0.98	100.00
10.00	1.52	0.98	100.00
15.00	1.52	0.98	100.00
20.00	1.52	0.98	100.00
30.00	1.52	0.98	100.00
45.00	1.52	0.98	100.00
60.00	1.52	0.98	100.00
90.00	1.52	0.98	100.00
120.00	1.52	0.98	100.00
180.00	1.52	0.98	100.00
240.00	1.52	0.98	100.00

TRIAL PIT SOAKAWAY



- Trial pit length = 2.500 m
- Trial pit width = 0.600 m
- Trial pit depth = 2.500 m
- Effective depth (Head of Water) = 0.980 m

Initial depth from GL	=	1.520m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.735	1.765	0.00
25%	0.245	2.255	0.00
Vp75-25	=	0.735	m3
ap50	=	4.538	m2
tp75-25	=	0.000	min
Soil Infiltration, f	=	*	m/sec

Sheet 1

Remarks *No infiltration rate calculated as no fall in the water level recorded.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

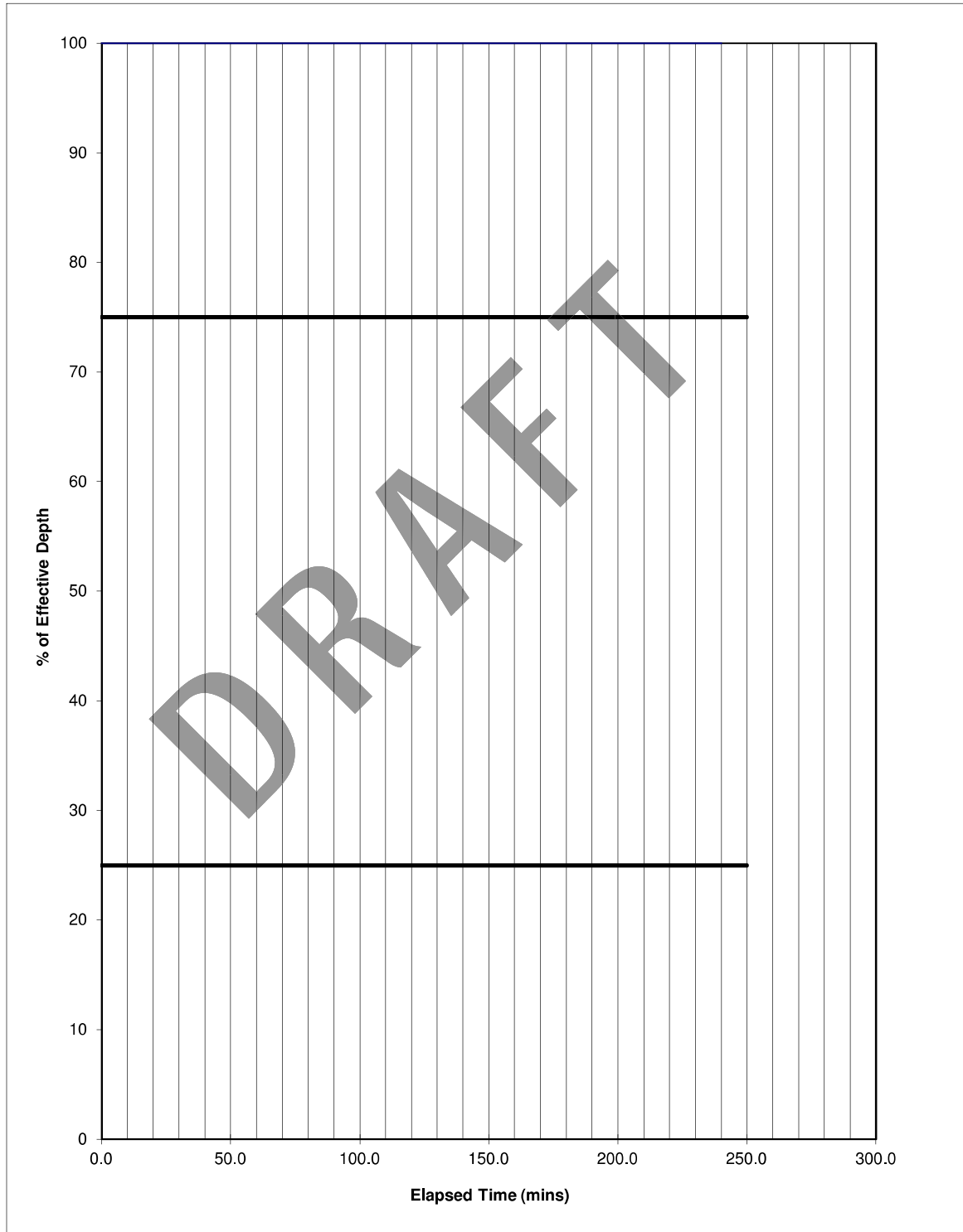
Trial Pit TP814

Test No 1

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 14/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

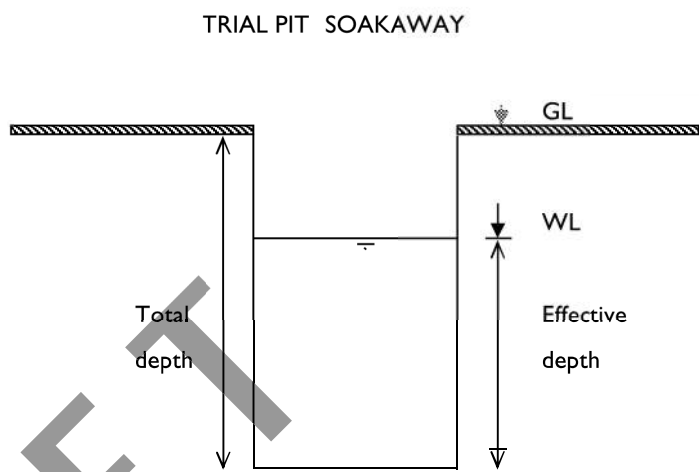
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2) Trial Pit TP815
 Test No I
 Project No PC207899
 Client Graven Hill Village Development Company Limited Date 15/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.75	0.95	100.00
1.00	1.75	0.95	100.00
2.00	1.75	0.95	100.00
3.00	1.75	0.95	100.00
4.00	1.75	0.95	100.00
5.00	1.75	0.95	100.00
10.00	1.75	0.95	100.00
15.00	1.75	0.95	100.00
20.00	1.75	0.95	100.00
30.00	1.75	0.95	100.00
45.00	1.75	0.95	100.00
60.00	1.75	0.95	100.00
90.00	1.75	0.95	100.00
120.00	1.75	0.95	100.00
180.00	1.75	0.95	100.00
240.00	1.75	0.95	100.00



Trial pit length = 2.700 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.700 m
 Effective depth (Head of Water) = 0.950 m

Initial depth from GL	=	1.750m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.713	1.988	0.00
25%	0.238	2.463	0.00
Vp75-25	=	0.770	m3
ap50	=	4.755	m2
tp75-25	=	0.000	min
Soil Infiltration, f	=	*	m/sec

Remarks *No infiltration rate calculated as no fall in the water level recorded.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

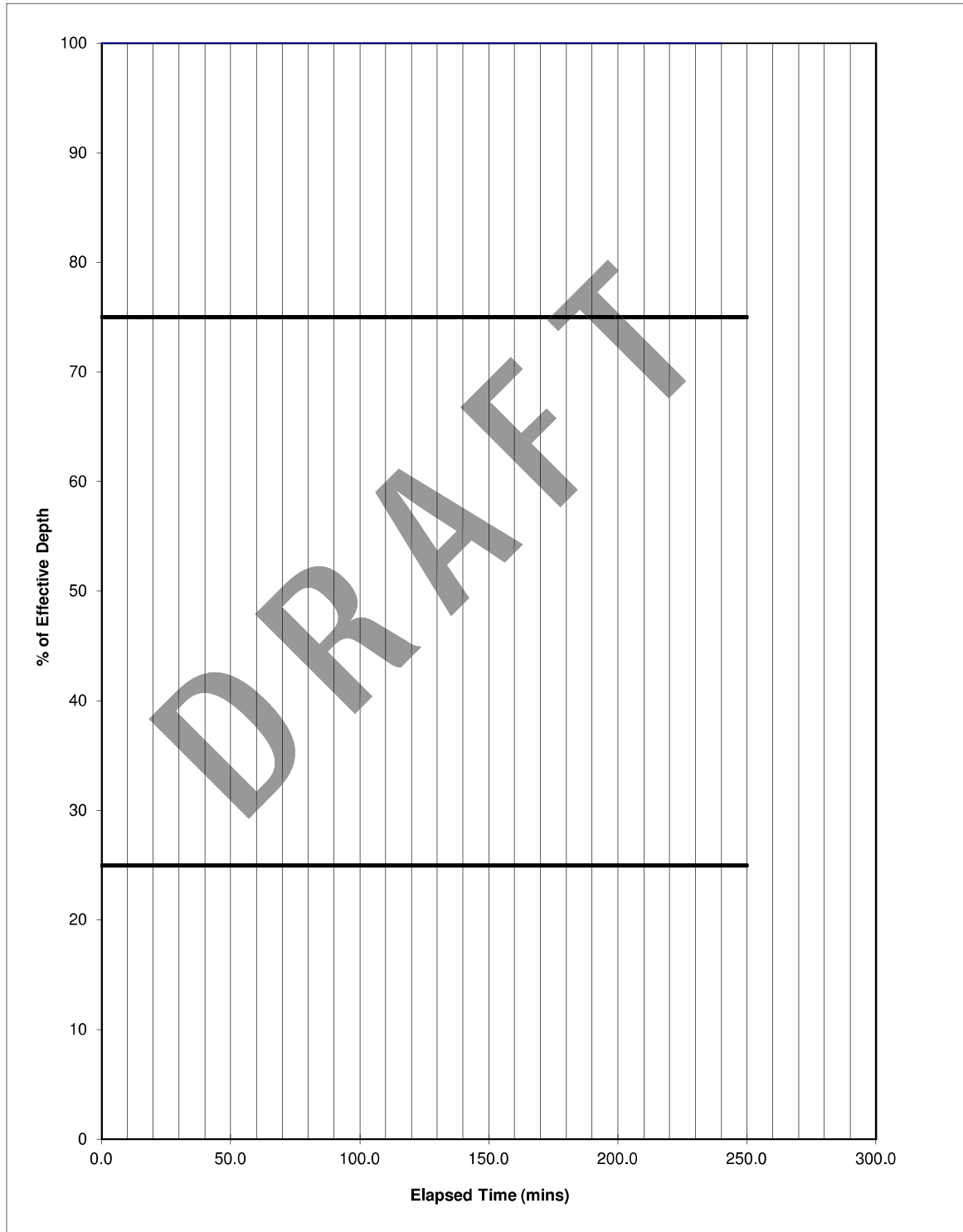
Trial Pit TP815

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 15/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

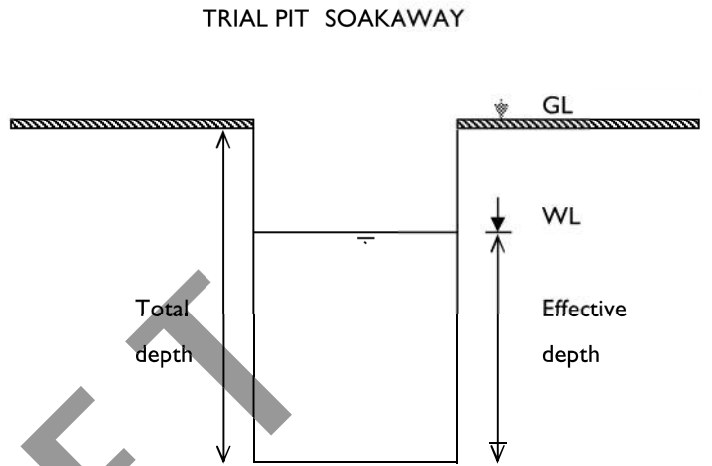
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2) Trial Pit TP817
 Test No I
 Project No PC207899
 Client Graven Hill Village Development Company Limited Date 17/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.81	0.89	100.00
1.00	1.81	0.89	100.00
2.00	1.81	0.89	100.00
3.00	1.81	0.89	100.00
4.00	1.81	0.89	100.00
5.00	1.81	0.89	100.00
10.00	1.81	0.89	100.00
15.00	1.81	0.89	100.00
20.00	1.81	0.89	100.00
30.00	1.81	0.89	100.00
45.00	1.81	0.89	100.00
60.00	1.81	0.89	100.00
90.00	1.81	0.89	100.00
120.00	1.81	0.89	100.00
180.00	1.81	0.89	100.00
240.00	1.81	0.89	100.00



Trial pit length = 2.400 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.700 m
 Effective depth (Head of Water) = 0.890 m

Initial depth from GL	=	1.810m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.668	2.033	
25%	0.223	2.478	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	*	m/sec

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 1

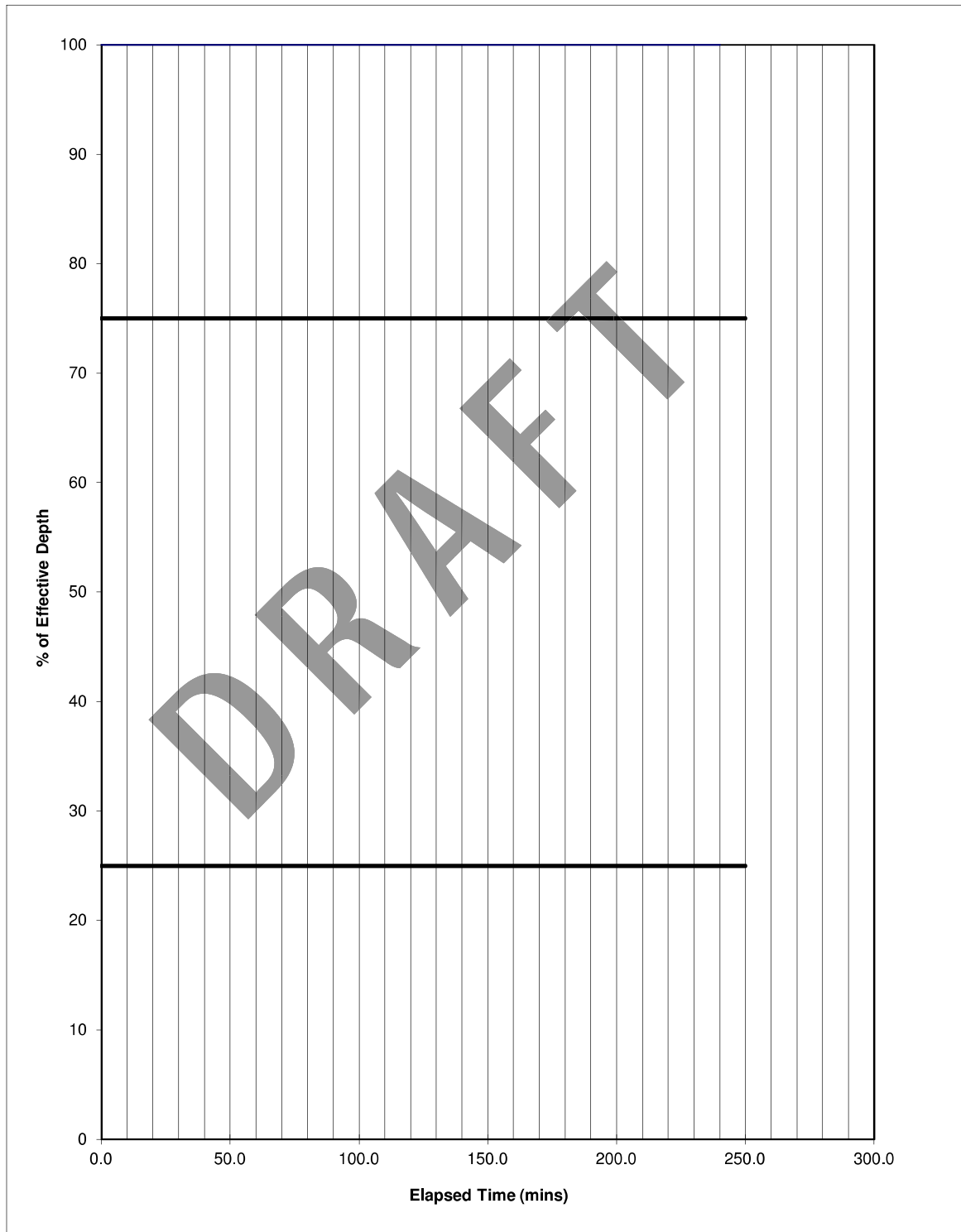
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP817
Test No I
Project No PC207899
Date 17/07/2020

Client Graven Hill Village Development Company Limited



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

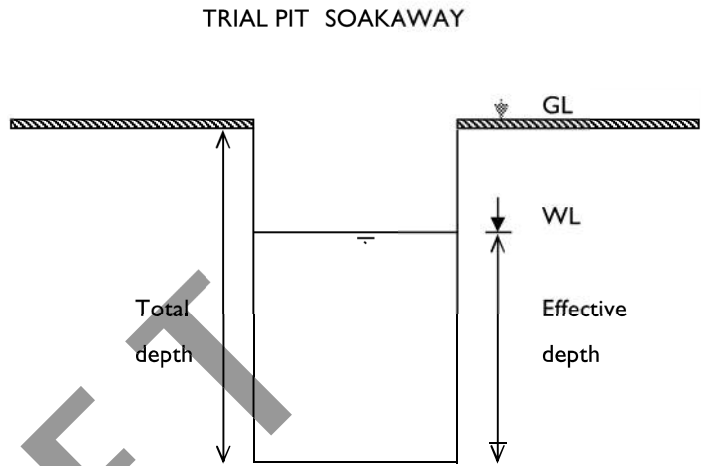
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP818
		Test No	I
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	16/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.50	1.00	100.00
1.00	1.50	1.00	100.00
2.00	1.50	1.00	100.00
3.00	1.50	1.00	100.00
4.00	1.50	1.00	100.00
5.00	1.51	0.99	99.00
10.00	1.51	0.99	99.00
15.00	1.51	0.99	99.00
20.00	1.51	0.99	99.00
30.00	1.51	0.99	99.00
45.00	1.51	0.99	99.00
60.00	1.51	0.99	99.00
90.00	1.52	0.98	98.00
120.00	1.52	0.98	98.00
180.00	1.52	0.98	98.00
240.00	1.52	0.98	98.00



Trial pit length = 2.400 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.500 m
 Effective depth (Head of Water) = 1.000 m

Initial depth from GL	=	1.500m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.750	1.750	
25%	0.250	2.250	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	* m/sec	

Remarks *Unable to estimate infiltration rate due to very low drop in water level.

Sheet 1

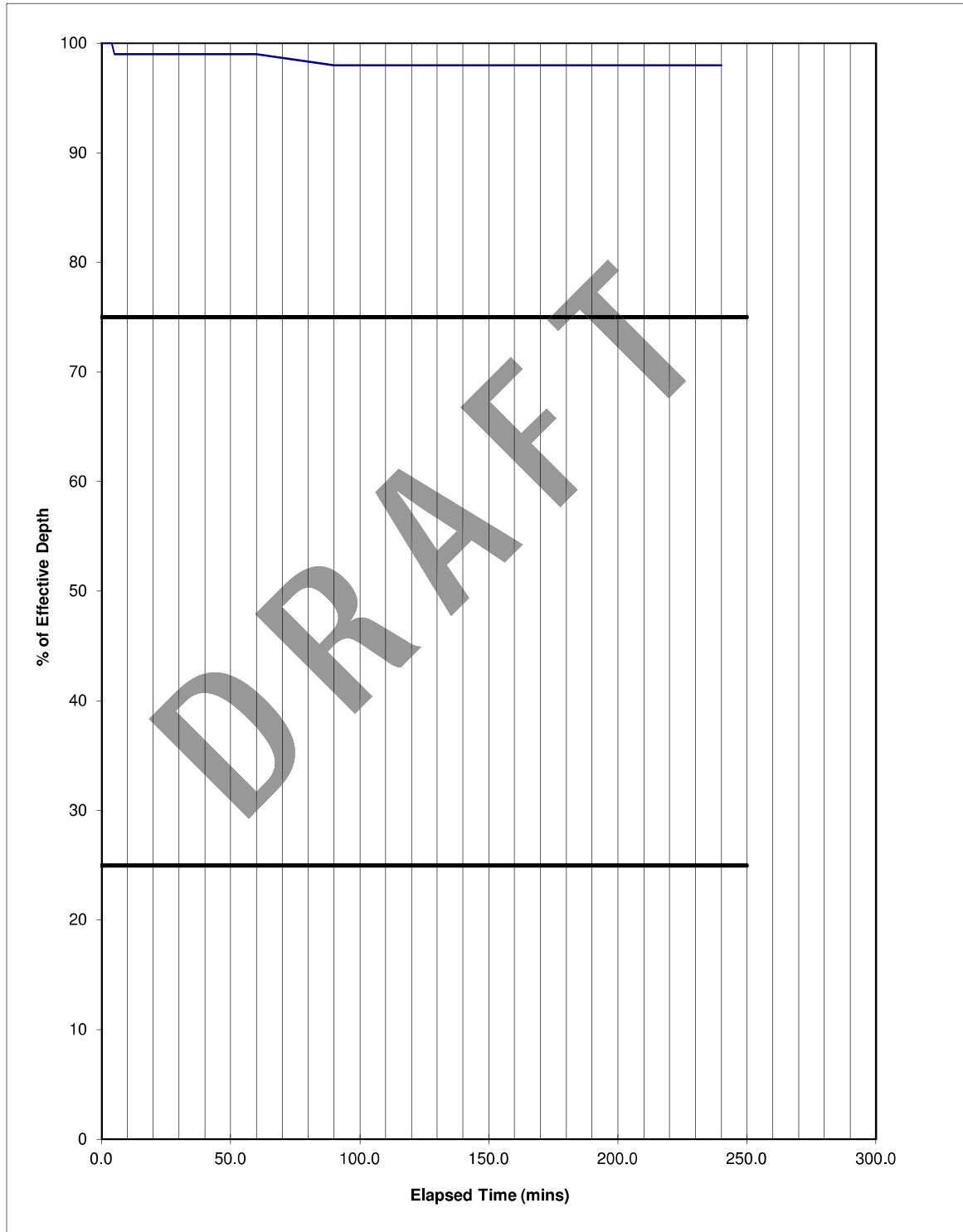
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

Trial Pit TP818
 Test No I
 Project No PC207899
 Date 16/07/2020

Client Graven Hill Village Development Company Limited



tp75	=
tp25	=

Remarks *Unable to estimate infiltration rate due to very low drop in water level.

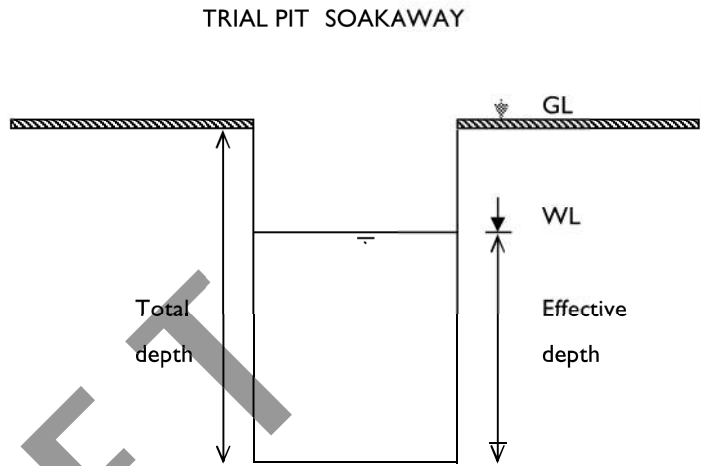
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP825
		Test No	I
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	15/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.65	0.85	100.00
1.00	1.65	0.85	100.00
2.00	1.65	0.85	100.00
3.00	1.65	0.85	100.00
4.00	1.65	0.85	100.00
5.00	1.65	0.85	100.00
10.00	1.65	0.85	100.00
15.00	1.65	0.85	100.00
20.00	1.65	0.85	100.00
30.00	1.65	0.85	100.00
45.00	1.65	0.85	100.00
60.00	1.65	0.85	100.00
90.00	1.65	0.85	100.00
120.00	1.65	0.85	100.00
180.00	1.65	0.85	100.00
240.00	1.65	0.85	100.00



Trial pit length = 2.700 m
 Trial pit width = 0.600 m
 Trial pit depth = 2.500 m
 Effective depth (Head of Water) = 0.850 m

Initial depth from GL	=	1.650m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.638	1.863	0.00
25%	0.213	2.288	0.00
Vp75-25	=	0.689	m3
ap50	=	4.425	m2
tp75-25	=	0.000	min
Soil Infiltration, f	=	*	m/sec

Remarks *No infiltration rate calculated as no fall in the water level recorded.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

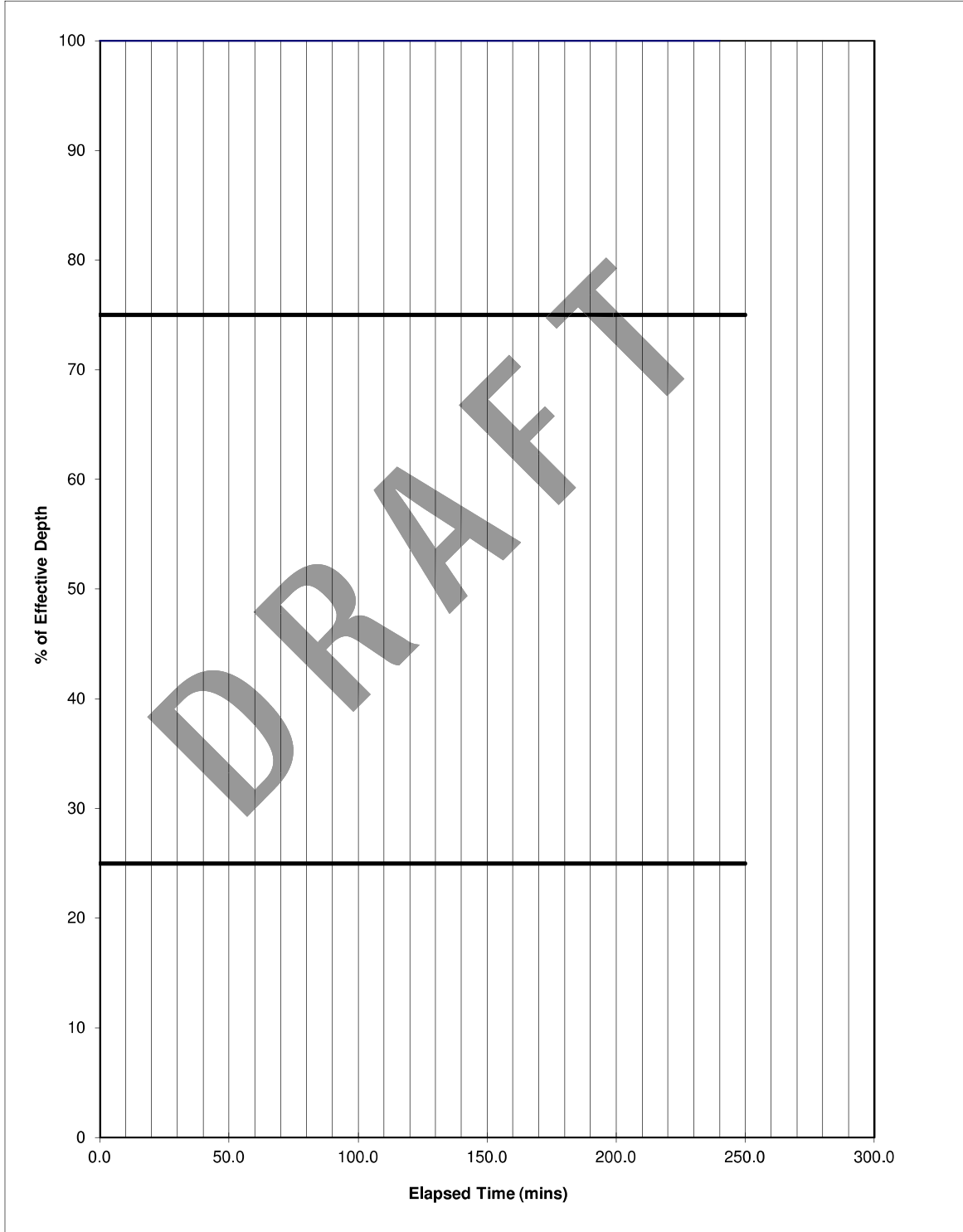
Trial Pit TP825

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 15/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

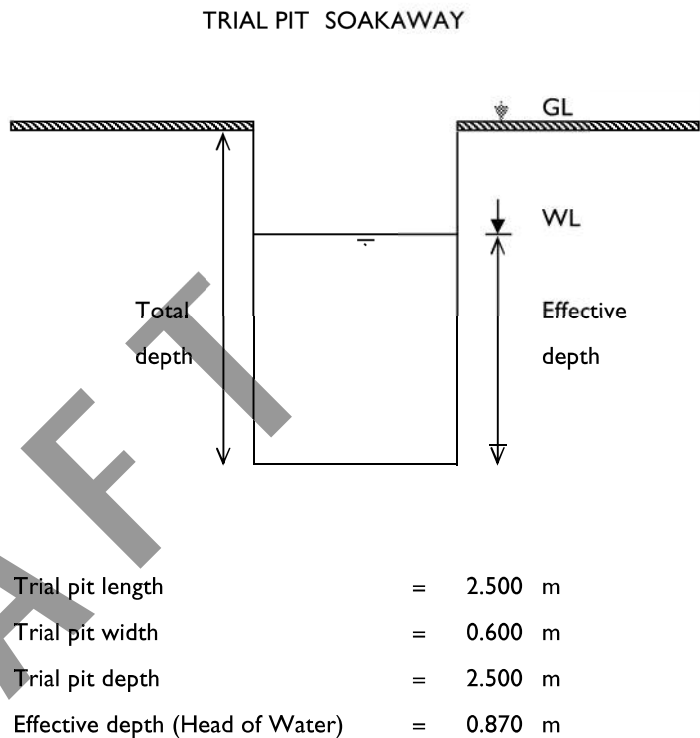
Sheet 2

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)	Trial Pit	TP835
		Test No	1
		Project No	PC207899
Client	Graven Hill Village Development Company Limited	Date	16/07/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.63	0.87	100.00
1.00	1.63	0.87	100.00
2.00	1.63	0.87	100.00
3.00	1.63	0.87	100.00
4.00	1.63	0.87	100.00
5.00	1.63	0.87	100.00
10.00	1.63	0.87	100.00
15.00	1.63	0.87	100.00
20.00	1.63	0.87	100.00
30.00	1.63	0.87	100.00
45.00	1.63	0.87	100.00
60.00	1.63	0.87	100.00
90.00	1.63	0.87	100.00
120.00	1.63	0.87	100.00
180.00	1.63	0.87	100.00
240.00	1.63	0.87	100.00



Initial depth from GL	=	1.630m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.653	1.848	
25%	0.218	2.283	
Vp75-25	=	m3	
ap50	=	m2	
tp75-25	=	min	
Soil Infiltration, f	=	* m/sec	

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 1

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project Ground Investigation for Graven Hill, Bicester, Land Transfer Area 2 (LTA2)

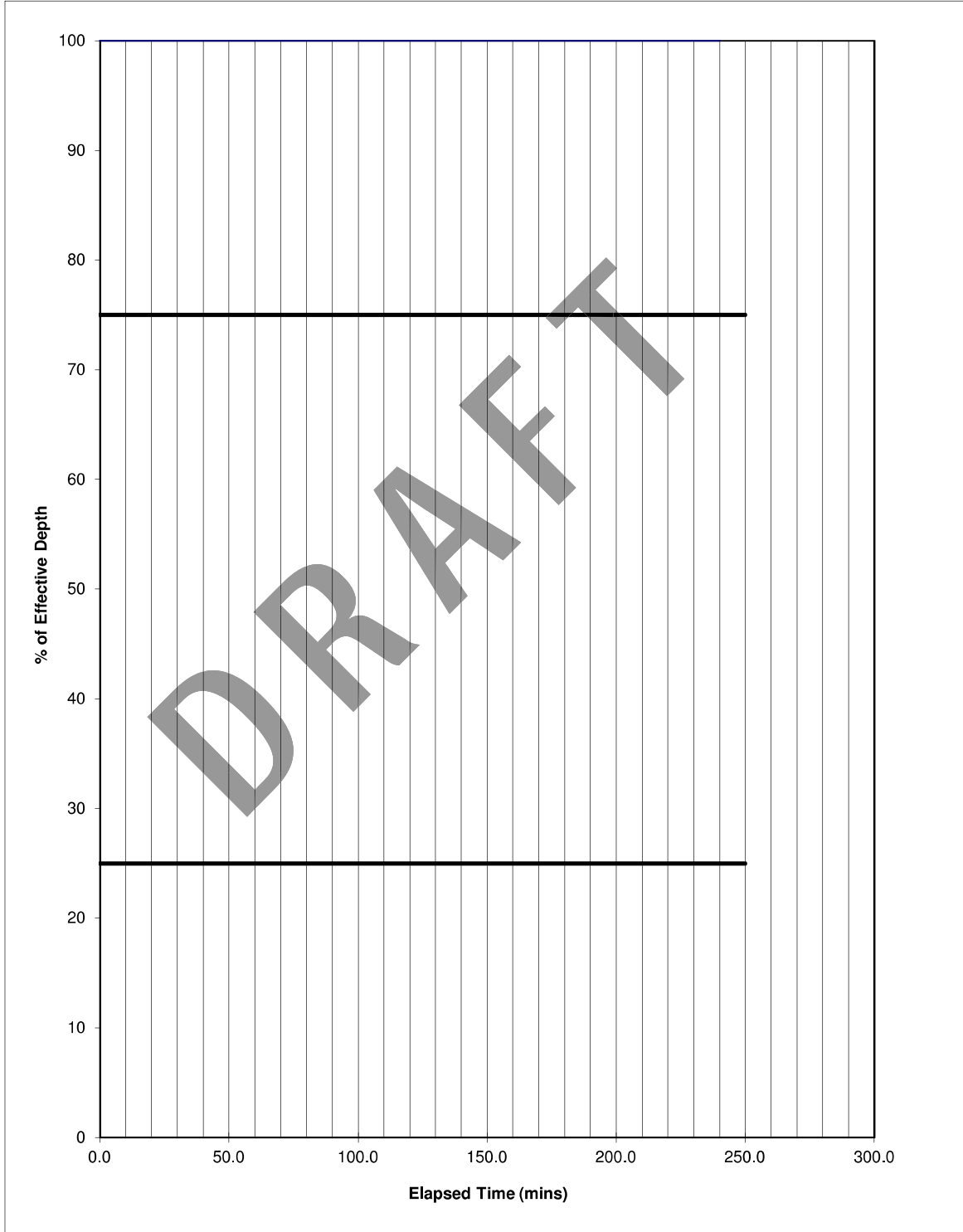
Trial Pit TP835

Test No I

Project No PC207899

Client Graven Hill Village Development Company Limited

Date 16/07/2020



tp75	=
tp25	=

Remarks *No infiltration rate calculated as no fall in the water level recorded.

Sheet 2