

| Appendix C – GEG Infiltration Report

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INFILTRATION TESTING REPORT



***LAND AT NORTH WEST BICESTER
BUCKNELL ROAD
OXFORDSHIRE
OX27 7HN***

APRIL 2021

Prepared for:



**Hallam Land
Management**



BROOKBANKS



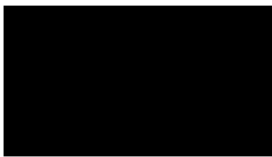
REPORT TITLE: INFILTRATION TESTING REPORT

Site Address: Land at North West Bicester
Oxfordshire
OX27 7HN

Performed By:
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1. INTRODUCTION

1.1 General

Geo Environmental Group (GEG) were commissioned by Brookbanks, on behalf of their client, Hallam Land Management (HLM), to undertake infiltration testing at the site known as 'Land at North West Bicester,' for the purpose of determining infiltration rates of the strata and the suitability for soakaway drainage.

1.2 Available Information

The following information was supplied by Brookbanks:

- 'Soakaway Test Locations,' Brookbanks, Drawing No. 10663-SK-01, dated 30th March 2021.
- Various utility company service drawings.

1.3 Proposed Site Development

The site is being considered for a residential development.

1.4 Scope

The works performed by GEG included:

- Trial pitting with infiltration testing in accordance with a specification supplied by Brookbanks.
- Calculation of infiltration rates, subject to ground conditions encountered.

Limitations to the scope of the report are outlined in Section 7.

2. SITE SETTING

2.1 Site Location

The site is located approximately 1.6 km to the north west of Bicester town centre, at the approximate National Grid Reference 457457E, 224174N. It lies on land to the east and west of Bucknell Road and to the north west of Lord's Lane and covers an area of approximately 185 hectares.

A section of the 1:25,000 Ordnance Survey (OS) map identifying the site location is shown in Figure 1 of Appendix A. The site layout plan is presented in Figure 2 (Appendix A) and a photographic record is provided in Appendix B.

2.2 Site Description

The site comprised 20 No. main agricultural fields divided by internal and external boundary hedgerows with occasional deciduous trees. Bucknell Road bisected the



south western section of the site and 3 No. small watercourses traversed the north eastern, eastern and southern sections of the site.

Site levels fell gently to the south east from an elevation of approximately 98m AOD in the north west to 80m AOD in the south east.

Hawkwell Farm lay adjacent to the south western boundary of the site, with Lord's Farm adjacent to the south with the suburbs of north west Bicester lying beyond.

3. GEOLOGY & HYDROGEOLOGY

3.1 Published Geology

Reference to the 1:50,000 scale British Geological Survey digital mapping of the area (solid and drift) indicates that the solid geology beneath the site comprises the Cornbrash Formation of the Jurassic period. The formation is described as bluish grey medium to fine grained limestone which weathers to an olive or yellowish brown. Thin argillaceous partings or interbeds of calcareous mudstone may also occur.

The Cornbrash Formation is underlain by the Forest Marble Formation (also of the Jurassic) which outcrops locally including in the vicinity of watercourses (due to the erosion of the Cornbrash Formation). The Forest Marble Formation is described as greenish grey, variably calcareous, silicate-mudstone.

Superficial deposits of Alluvium (clay, silt, sand and gravel) overlie the solid geology associated with the watercourses in the southern and eastern sections of the site.

No faults are conjectured to intersect the site at the surface.

3.2 Hydrogeology

3.2.1 Groundwater Designation

Environment Agency data indicates that the solid geology and superficial deposits beneath the site are designated as Secondary A Aquifers.

Secondary A Aquifers are defined as permeable layers capable of supporting water supplies at a local rather than a strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

3.3 Potential Water Infiltration Properties of the Strata

In terms of water infiltration, the strata of the solid geology are considered likely to be sufficiently permeable for soakaway drainage.

3.4 Groundwater Source Protection Zone

The site does not lie within a currently defined Groundwater Source Protection Zone (GWSPZ).



4. INTRUSIVE INVESTIGATION

The following section outlines the scope of the intrusive investigation undertaken by GEG and details the ground conditions encountered and the infiltration testing undertaken.

4.1 Scope of Works

The intrusive investigation was undertaken from 6th to 9th April 2021 and comprised the excavation of 12 No. infiltration test trial pits (IT01-IT12) at the locations determined by Brookbanks (as shown on Figure 2).

The infiltration trial pit depths ranged from 0.75m to 2.15m bgl targeting the most permeable strata present in each case.

All works were carried out in accordance with current British Standard guidance (BS: 5930 and BS: 10175) and infiltration testing in general accordance with BRE Digest 365 (Soakaway Design).

The ground conditions were logged by an experienced geo-environmental engineer from GEG. The strata encountered, groundwater levels/seepages, stability of excavations and depths of sampling are recorded on the trial pit logs presented in Appendix C.

4.1.1 Limitations of the Intrusive Investigation

No significant limitations were encountered during the intrusive investigation.

4.2 Strata Encountered

The ground conditions encountered are described below and broadly confirmed the published geology.

4.2.1 Made Ground

No Made Ground was encountered in the exploratory holes.

4.2.2 Topsoil

Typically soft CLAY topsoil was encountered across site to depths of 0.20m to 0.40m.

4.2.3 Alluvium

Alluvium was encountered underlying the topsoil in 1 No. exploratory hole (IT09) adjacent to a watercourse to a depth of 1.20m. It comprised medium dense silty gravelly (limestone and quartzite) SAND.

4.2.4 Cornbrash Formation

Strata of the weathered Cornbrash Formation was encountered underlying the topsoil across the majority of the site from depths of 0.20m to 0.40m to the base of the exploratory holes. It typically comprised horizons of soft to firm variably gravelly (limestone) CLAY, medium dense to dense GRAVEL of limestone, and locally (IT11)



medium dense slightly gravelly SAND with a low cobble content. Very weak LIMESTONE was encountered in the majority of the pits from depths of 0.75m to 1.70m, and locally directly underlying the topsoil from a depth of 0.20m (IT06).

4.2.5 *Forest Marble Formation*

Naturally reworked Forest Marble Formation was encountered underlying the Alluvium from a depth of 1.20m to 2.00m in IT09. It comprised stiff slightly gravelly (limestone and quartzite) CLAY, with a cobble-sized fragment of rotten wood with a dark organic staining at 1.00m.

Strata of the weathered Forest Marble Formation was encountered locally underlying the topsoil or naturally reworked Forest Marble Formation (IT04, IT05, IT08 & IT12) in the vicinity of the watercourses from depths of 0.25m to 0.30m to the base of the exploratory holes. It typically comprised horizons of soft to firm slightly gravelly (limestone) CLAY and medium dense variably gravelly (limestone) SAND locally with a low cobble content. Extremely weak to weak LIMESTONE was encountered locally from a depths of 1.10m to 2.00m, and locally directly underlying the topsoil from a depth of 0.25m (IT08).

However, it should be noted that as the Cornbrash and Forest Marble Formations are similar in composition and structure, differentiation between the strata are problematic.

4.2.6 *Groundwater*

Groundwater was not encountered in the majority of the exploratory holes during the intrusive investigation with the exception of a slow inflow at 0.70m in IT03.

4.2.7 *Reinstatement*

The trial pits were backfilled with arisings and left slightly mounded to allow for settlement.

4.3 Infiltration Tests

A total of 21 No. infiltration tests were undertaken in the 12 No. trial pits (IT01 to IT12) which were excavated to depths ranging from 0.75m to 2.15m bgl. The tests were undertaken in general accordance with BRE Digest 365.

Clean water was dispensed from a bowser at a rapid rate to fill each excavation as quickly as possible to the proposed depth of the invert levels and/or the most permeable strata. The excavations took less than 5 minutes to fill to their maximum capacity. Each test pit was filled to give a head of water of approximately 1.00m.

Measurements were then taken of the fall of water at suitable time increments to allow the infiltration rate to be calculated from the time taken for the water level to drop from 75% to 25% effective depth (where possible). If there was sufficient time, the tests were repeated a maximum of three times in accordance with BRE Digest 365.

On completion of the measurements, the infiltration pits were backfilled with arisings.



4.4 Calculated Infiltration Rates

The water level measurements from the infiltration tests are tabulated and graphically depicted on Figures D-1 to D-21 in Appendix D.

The effective depths reached during the tests and associated times are summarised in Table 1 below.

Table 1. Infiltration Test Results

Location	Test No.	Strata*	Effective Depth Reached	Time (mins)	Infiltration Rate (m/s)
IT01	1	CF	91%	264	N/A
IT02	1	CF	25%	74	3.66×10^{-5}
	2			73	3.64×10^{-5}
	3			82	3.13×10^{-5}
IT03	1	CF	42%	383	N/A**
IT04	1	FMF	100%	333	N/A
IT05	1	FMF	25%	402	7.20×10^{-6} [1]
IT06	1	CF	25%	141	1.45×10^{-5}
	2			92	2.06×10^{-5}
IT07	1	CF	25%	193	1.34×10^{-5}
	2			227	1.08×10^{-5} [2]
IT08	1	FMF	25%	343	8.87×10^{-6}
IT09	1	ALL/FMF	25%	20	1.45×10^{-4}
	2			18	1.81×10^{-4}
	3			19	2.03×10^{-4}
IT10	1	CF	25%	500	6.16×10^{-6} [1]
IT11	1	CF	25%	158	1.93×10^{-5}
	2			142	2.21×10^{-5}
IT12	1	FMF	25%	27	1.09×10^{-4}
	2			27	1.08×10^{-4}
	3			29	1.06×10^{-4}

* ALL = Alluvium; CF = Cornbrash Formation; FMF = Forest Marble Formation.

** Not strictly in compliance with BRE365 due to the presence of groundwater.



- [1] Based on extrapolated data (due to relatively slow infiltration rate).
[2] Based on extrapolated data (due to time constraints of running a second test).

5. CONCLUSIONS

Infiltration rates could not be calculated in 3 No. of the 12 No. infiltration test pit locations (IT01, IT03 & IT04) indicating that the ground conditions are unsuitable for traditional soakaway drainage in these locations.

The infiltration tests of the remaining 9 No. trial pits yielded infiltration rates of 8.87×10^{-6} m/s to 1.06×10^{-4} m/s.

It should be noted that the results from IT05, IT10 and the second test of IT07 were based on extrapolated data.

6. REFERENCES

1. British Standard Institute (1990) BS: 1377 Parts 1-9. Methods of Tests for Soils for Civil Engineering Purposes.
2. British Standard Institute (1999) BS: 5930 Code of Practice for Site Investigations. BSI, London.
3. BRE Digest 365 (September 1991) Soakaway Design.

7. LIMITATIONS

As with all intrusive site investigations, there is a possibility that there are local variations in ground conditions not identified by the current investigation.

The conclusions and recommendations stated herein are based on information available at the time of production. These may not necessarily apply if the site is to be utilised for a more or less sensitive purpose in the future, or if operational procedures or management alter over time.

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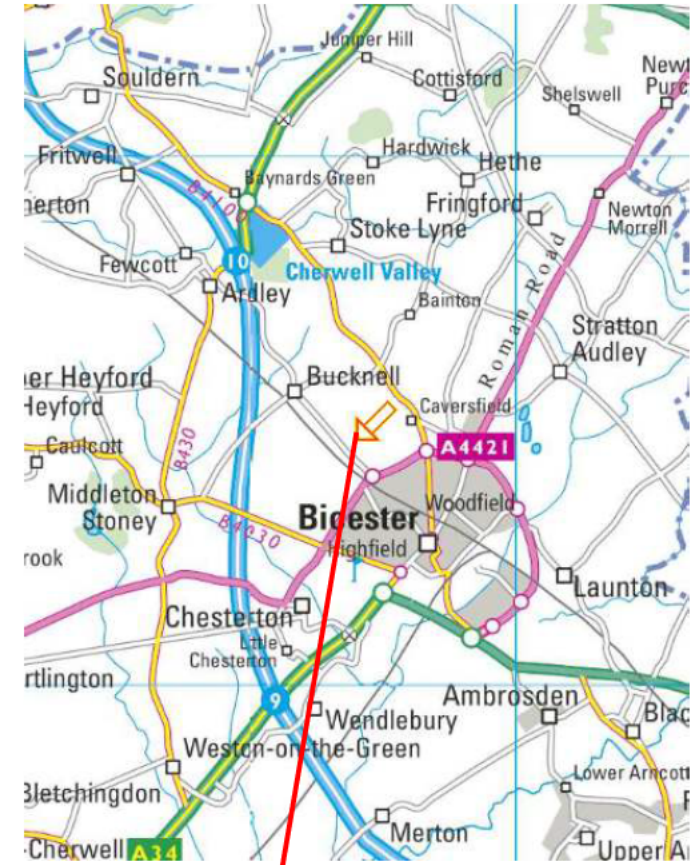
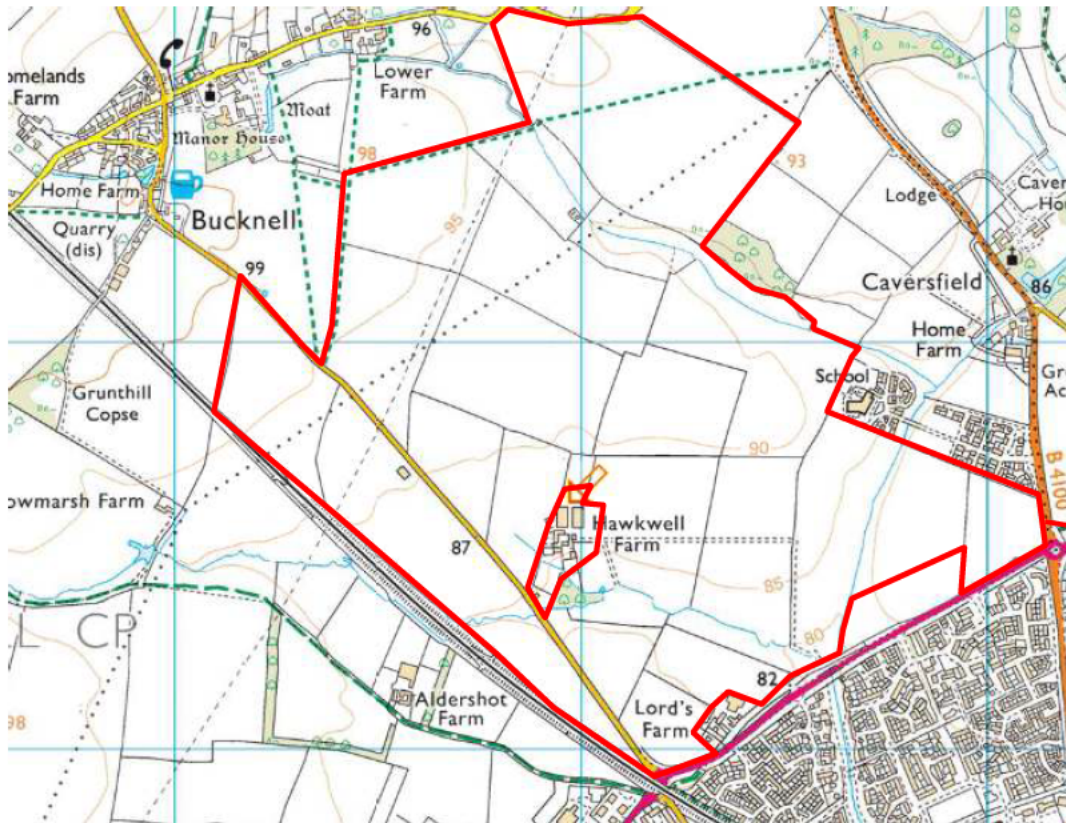
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APPENDIX A

FIGURES AND PLANS




SITE LOCATION

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TITLE: FIGURE 1: SITE LOCATION PLAN		CLIENT: BROOKBANKS / HLM		DRAWN/CHECKED: MP / MR		GEG House, 17 Graham Road Malvern, WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk, www.g-eg.co.uk	Geo Environmental Group	
SITE: LAND AT NORTH WEST BICESTER		PROJECT No.: GEG-21-678	SCALE: NTS	DATE: 13/04/21	REVISION: A			



TITLE: FIGURE 2: EXPLORATORY HOLE LOCATION PLAN		CLIENT: BROOKBANKS / HLM		DRAWN/CHECKED: MP / MR		GEG House, 17 Graham Road Malvern, WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk, www.g-eg.co.uk		Geo Environmental Group 	
SITE: LAND AT NORTH WEST BICESTER		PROJECT No.: GEG-21-678	SCALE: AS SHOWN	DATE: 13/04/21	REVISION: A				



APPENDIX B

PHOTOGRAPHIC RECORD



Photo 1: Excavation of trial pit IT01.



Photo 2: Arisings from trial pit IT01.



Photo 3: Excavation of trial pit IT02.



Photo 4: Arisings from trial pit IT02.

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Bicester**

Project No.: GEG-21-678



Photo 5: Excavation of trial pit IT03.



Photo 6: Arisings from trial pit IT03.



Photo 7: Excavation of trial pit IT04.



Photo 8: Arisings from trial pit IT04.

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Project No.: GEG-21-678



Photo 9: Excavation of trial pit IT05.



Photo 10: Arisings from trial pit IT05.



Photo 11: Excavation of trial pit IT06.



Photo 12: Arisings from trial pit IT06.

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Project No.: GEG-21-678



Photo 13: Excavation of trial pit IT07.



Photo 14: Arisings from trial pit IT07.



Photo 15: Excavation of trial pit IT08.



Photo 16: Arisings from trial pit IT08.

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Project No.: GEG-21-678



Photo 17: Excavation of trial pit IT09.



Photo 18: Arisings from trial pit IT09.



Photo 19: Excavation of trial pit IT10.



Photo 20: Arisings from trial pit IT10.

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Project No.: GEG-21-678



Photo 21: Excavation of trial pit IT11.



Photo 22: Arisings from trial pit IT11.



Photo 23: Excavation of trial pit IT12.



Photo 24: Arisings from trial pit IT12.

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Project No.: GEG-21-678



APPENDIX C

EXPLORATORY HOLE LOGS



Geo Environmental Group

Trial Pit Log

TrialPit No

IT01

Sheet 1 of 1

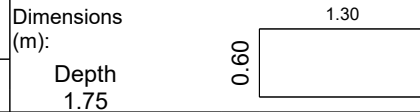
Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
06/04/2021

Location: North West Bicester, OX27 7HL



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.35			Medium dense yellowish grey fine to coarse sub-angular GRAVEL of limestone. (WEATHERED CORNBRAASH FORMATION)
				0.50			Firm grey and yellow slightly gravelly CLAY. Gravel is fine to coarse sub-angular limestone. (WEATHERED CORNBRAASH FORMATION)
				1.30			Dense light yellowish grey clayey GRAVEL with low cobble content. Gravel and cobbles are coarse sub-angular limestone. (WEATHERED CORNBRAASH FORMATION)
				1.70			Very weak light grey LIMESTONE. (CORNBRAASH FORMATION)
				1.75			End of Pit at 1.750m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: 0.00-0.50m unstable





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Trial Pit Log

TrialPit No

IT02

Sheet 1 of 1

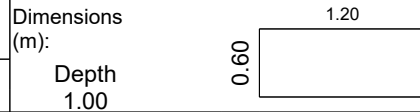
Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
06/04/2021

Location: North West Bicester, OX27 7HL



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.40			Dense grey GRAVEL of coarse sub-angular limestone. (WEATHERED CORNBASH FORMATION)
				0.90			Weak grey LIMESTONE. (CORNBASH FORMATION)
				1.00			End of Pit at 1.000m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: 0.00-0.40m slight collapse





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Trial Pit Log

TrialPit No

IT03

Sheet 1 of 1

Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
06/04/2021

Location: North West Bicester, OX27 7HL

Dimensions (m): 1.20

Depth
0.75

0.60



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.30			Soft yellowish brown slightly gravelly CLAY. Gravel is fine to coarse sub-angular limestone. (WEATHERED CORNBRAH FORMATION)
				0.70 0.75			Weak grey LIMESTONE. (CORNBRAH FORMATION) End of Pit at 0.750m

Remarks: 1. Groundwater encountered at 0.70m as slow inflow. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: 0.00-0.60m slight collapse





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Trial Pit Log

TrialPit No

IT04

Sheet 1 of 1

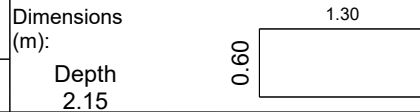
Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
09/04/2021

Location: North West Bicester, OX27 7HL



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.30			Medium dense orange and grey gravelly SAND with low cobble content. Gravel and cobbles are fine to coarse angular to sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION) <i>0.60-1.00m Becoming grey</i>
				1.00			Firm grey and yellowish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION)
				1.70			Firm grey and yellow very sandy slightly gravelly CLAY. Gravel is fine to coarse sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION)
				2.15			End of Pit at 2.15m

Remarks: 1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Equipment used: JCB 3CX. 4. Upon completion trial pit backfilled with arisings.

Stability: Stable





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Trial Pit Log

TrialPit No

IT05

Sheet 1 of 1

Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
09/04/2021

Location: North West Bicester, OX27 7HL

Dimensions (m): 1.10

Scale
1:25

Client: Brookbanks / HLM

Depth
1.50

0.60



Logged
JM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.25			Medium dense orangish brown silty gravelly SAND. Gravel is fine to coarse sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION)
				0.50			Medium dense light grey and yellowish grey clayey slightly gravelly SAND. Gravel is fine to coarse sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION)
				1.40			Weak grey and yellow LIMESTONE. (WEATHERED FOREST MARBLE FORMATION)
				1.50			End of Pit at 1.500m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Stable





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Trial Pit Log

TrialPit No
IT06
Sheet 1 of 1

Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
09/04/2021

Location: North West Bicester, OX27 7HL

Dimensions (m): 1.10
0.60
Depth 0.75

Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown very gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.20			Very weak grey and yellow LIMESTONE. (CORNBURASH FORMATION)
				0.75			End of Pit at 0.750m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Stable





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Trial Pit Log

TrialPit No

IT07

Sheet 1 of 1

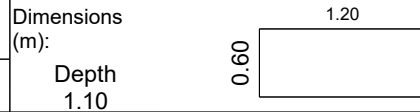
Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
07/04/2021

Location: North West Bicester, OX27 7HL



Scale
1:25

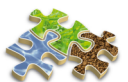
Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.20			Dense grey and yellow sandy GRAVEL of fine to coarse sub-angular limestone. (WEATHERED CORNBRASSH FORMATION)
				1.00			Very weak grey slightly sandy LIMESTONE. (WEATHERED CORNBRASSH FORMATION)
				1.10			End of Pit at 1.100m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Stable





Geo Environmental Group

Trial Pit Log

TrialPit No

IT08

Sheet 1 of 1

Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
07/04/2021

Location: North West Bicester, OX27 7HL

Dimensions (m): 1.20

Depth
1.40

0.60



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)	
				0.25			Extremely weak brownish grey and yellow slightly silty sandy LIMESTONE. (WEATHERED FOREST MARBLE FORMATION)	0.5
							<i>0.55-1.40m Becoming yellow</i>	1.0
				1.40			End of Pit at 1.400m	1.5
								2.0
								2.5
								3.0
								3.5
								4.0
								4.5

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Stable





Geo Environmental Group

Trial Pit Log

TrialPit No

IT09

Sheet 1 of 1

Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
07/04/2021

Location: North West Bicester, OX27 7HL

Dimensions (m): 1.40

Depth
2.10

0.60



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.20			Medium dense light grey silty gravelly SAND. Gravel is fine to coarse sub-angular limestone and quartzite. (POTENTIAL ALLUVIUM)
				1.20			Stiff grey and yellowish brown slightly gravelly CLAY. Gravel is fine to coarse sub-angular to rounded limestone and quartzite. (POTENTIALLY NATURALLY REWORKED FOREST MARBLE FORMATION)
							1.60m Cobble sized piece of rotten wood with dark organic staining
				2.00			Weak grey LIMESTONE. (FOREST MARBLE FORMATION)
				2.10			End of Pit at 2.100m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Stable





Geo Environmental Group

Trial Pit Log

TrialPit No

IT10

Sheet 1 of 1

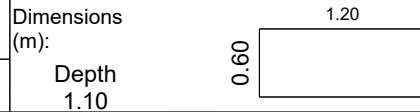
Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
08/04/2021

Location: North West Bicester, OX27 7HL



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.20			Dense light grey and yellow slightly sandy cobbles of limestone, (WEATHERED CORNBRAASH FORMATION)
				0.50			Firm yellow and grey sandy gravelly CLAY. Gravel is fine to coarse sub-angular limestone., (WEATHERED CORNBRAASH FORMATION)
				1.00			Weak grey LIMESTONE. (CORNBRAASH FORMATION)
				1.10			End of Pit at 1.100m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Stable





Geo Environmental Group

Trial Pit Log

TrialPit No
IT11
Sheet 1 of 1

Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
08/04/2021

Location: North West Bicester, OX27 7HL

Dimensions (m): 1.20

Depth
1.50

0.60



Scale
1:25

Logged
JM

Client: Brookbanks / HLM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.20			Soft yellowish brown very sandy slightly gravelly CLAY. Gravel is fine to medium sub-angular limestone. (WEATHERED CORNBRAH FORMATION)
				0.40			Medium dense grey slightly gravelly SAND with low cobble content. Gravel and cobbles are fine to coarse sub-angular limestone. (WEATHERED CORNBRAH FORMATION) <i>0.60-1.10m Becoming very gravelly</i>
				1.10			Firm grey and yellowish grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub-angular limestone. (WEATHERED CORNBRAH FORMATION)
				1.40			Weak grey LIMESTONE. (CORNBRAH FORMATION)
				1.50			End of Pit at 1.500m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Slightly unstable 0.00-0.30m





Geo Environmental Group

Trial Pit Log

TrialPit No
IT12
Sheet 1 of 1

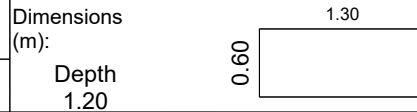
Project Name: Land at North West Bicester

Project No.
GEG-21-678

Co-ords: -
Level:

Date
08/04/2021

Location: North West Bicester, OX27 7HL



Scale
1:25

Client: Brookbanks / HLM

Logged
JM

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.00			Soft brown slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular limestone. (TOPSOIL)
				0.25			Soft brown sandy gravelly silty CLAY. Gravel is fine to coarse sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION)
				0.40			Medium dense greyish brown and yellow very gravelly SAND. Gravel is fine to coarse angular to sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION)
				0.70			Firm grey very gravelly CLAY. Gravel is fine to coarse sub-angular limestone. (WEATHERED FOREST MARBLE FORMATION)
				1.10			Weak light grey and yellow LIMESTONE. (FOREST MARBLE FORMATION)
				1.20			End of Pit at 1.200m

Remarks: 1. No groundwater encountered. 2. Trial pit refused on limestone. 3. Infiltration test undertaken in trial pit. 4. Equipment used: JCB 3CX. 5. Upon completion trial pit backfilled with arisings.

Stability: Stable





APPENDIX D

INFILTRATION TEST DATA

Figure D-1

GEG-21-678

Land at North West Bicester

IT01

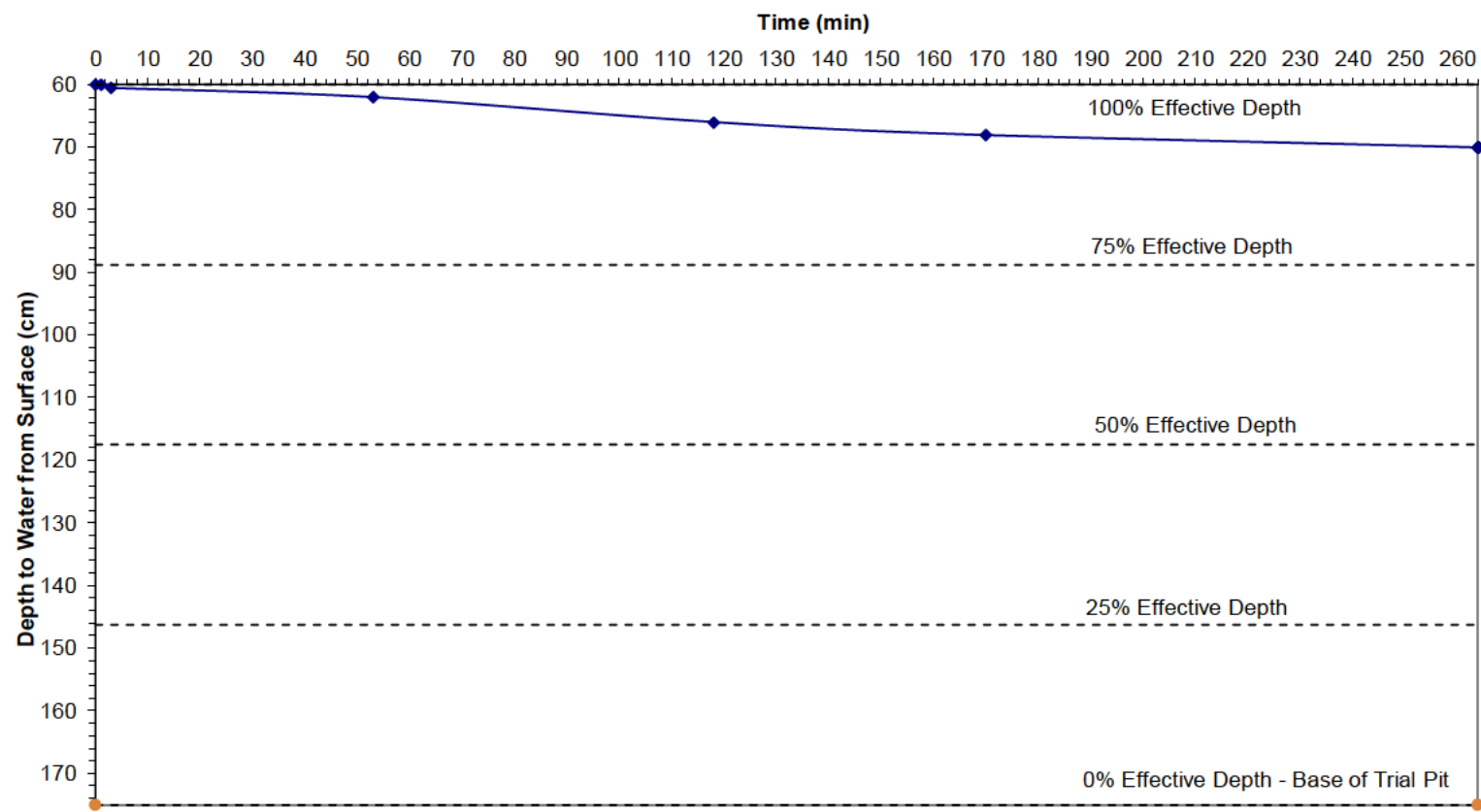


Figure D-2

GEG-21-678

Land at North West Bicester

IT02

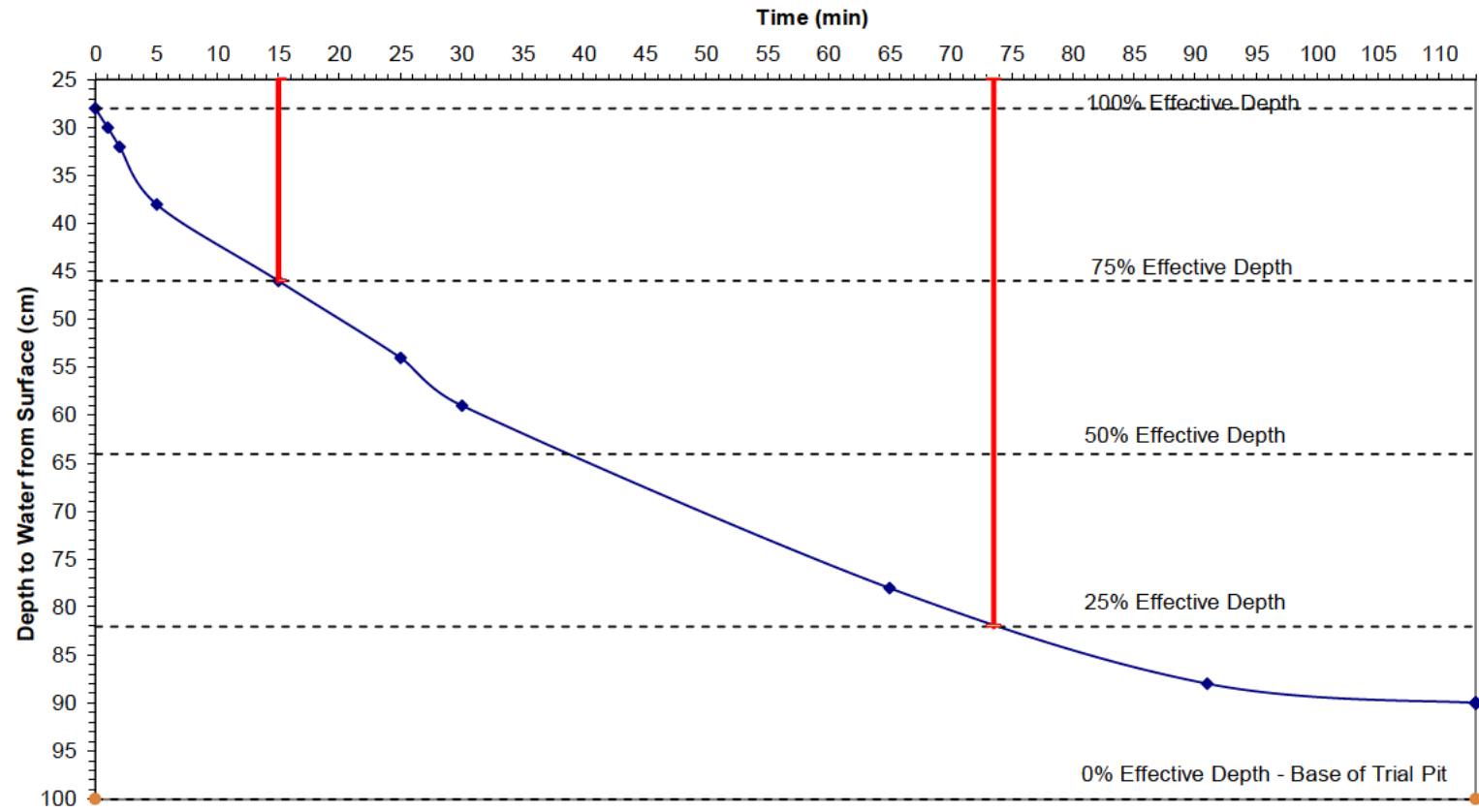


Figure D-3

GEG-21-678

Land at North West Bicester

IT02

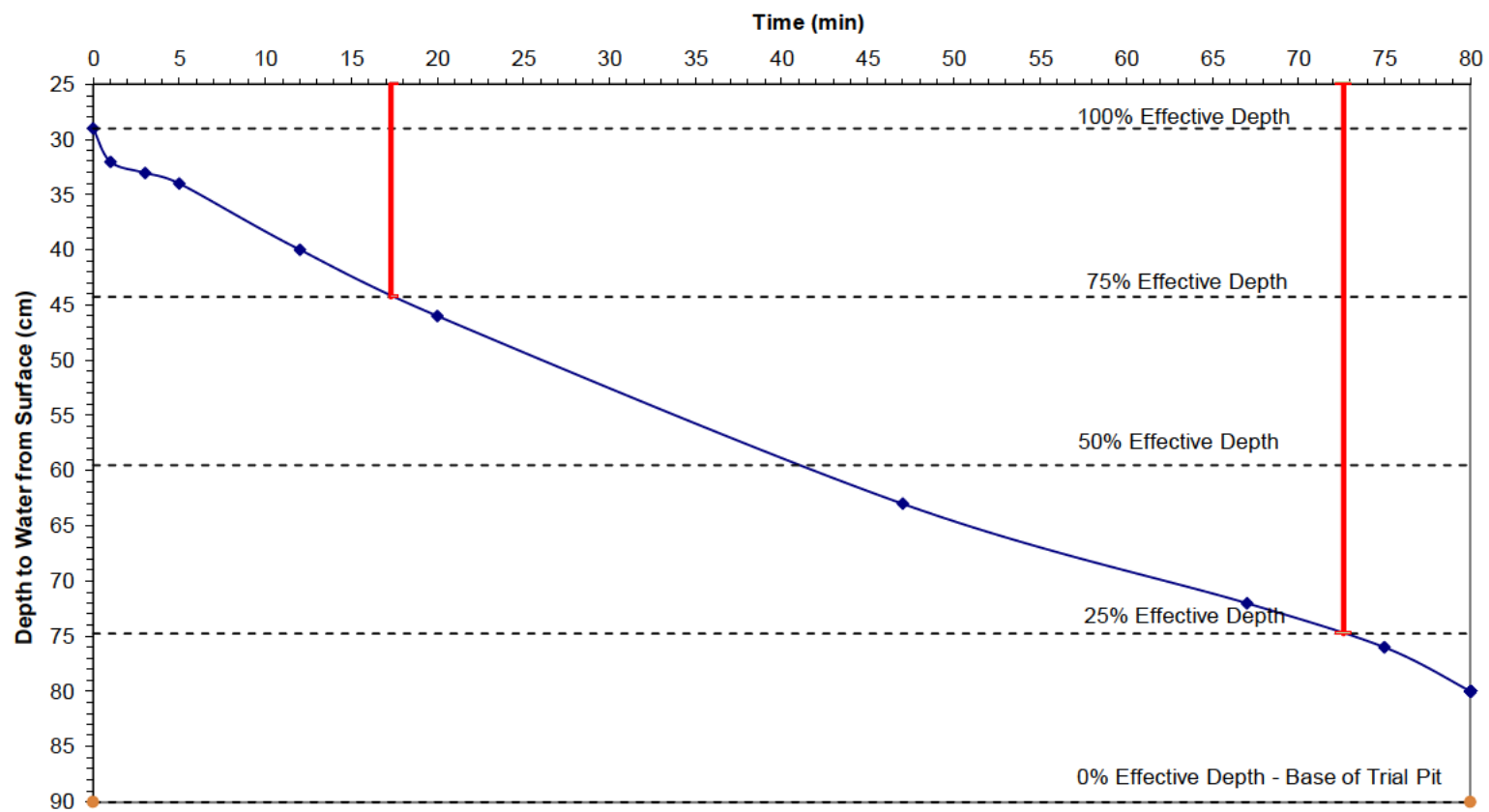


Figure D-4

GEG-21-678

Land at North West Bicester

IT02

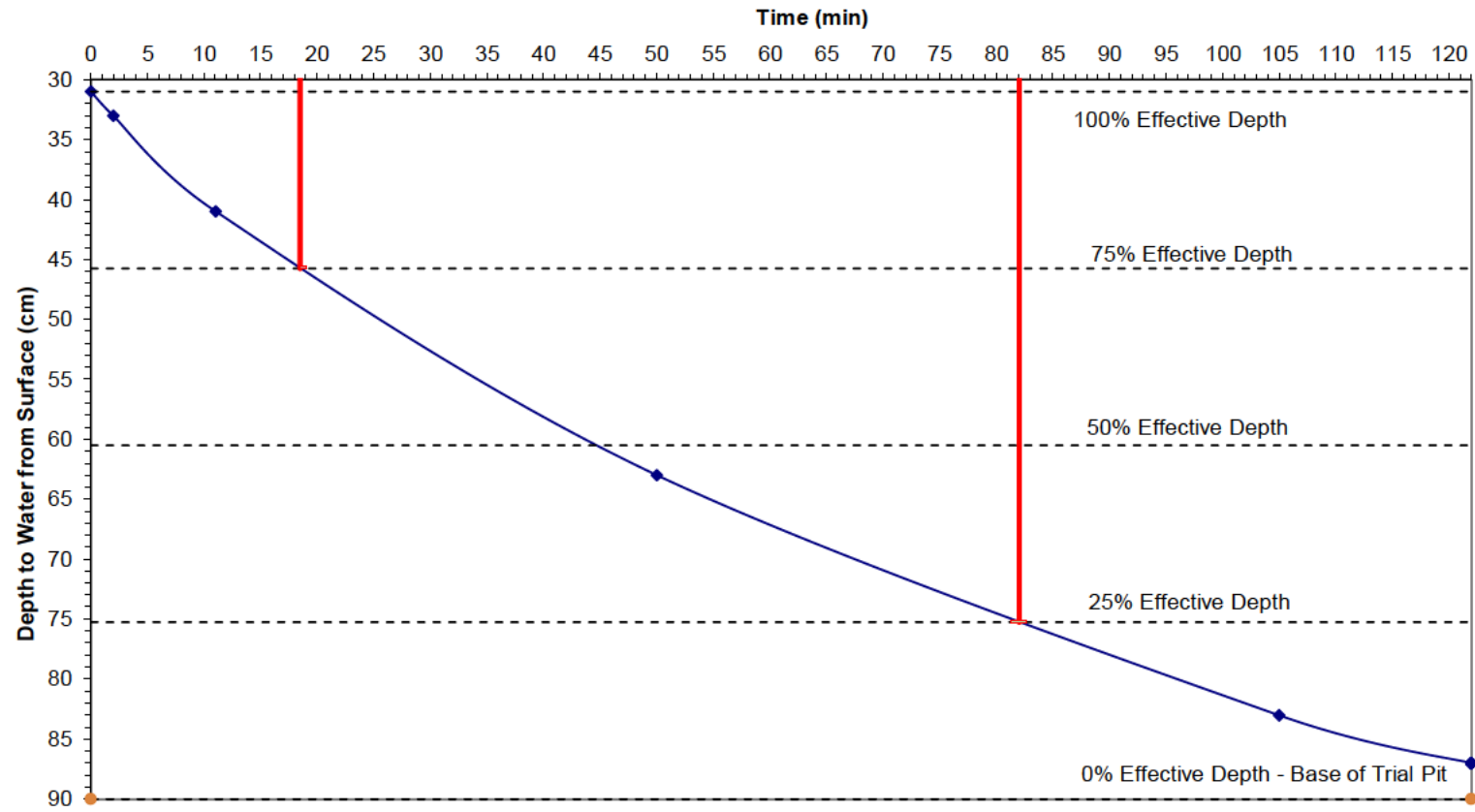


Figure D-5

GEG-21-678

Land at North West Bicester

IT03

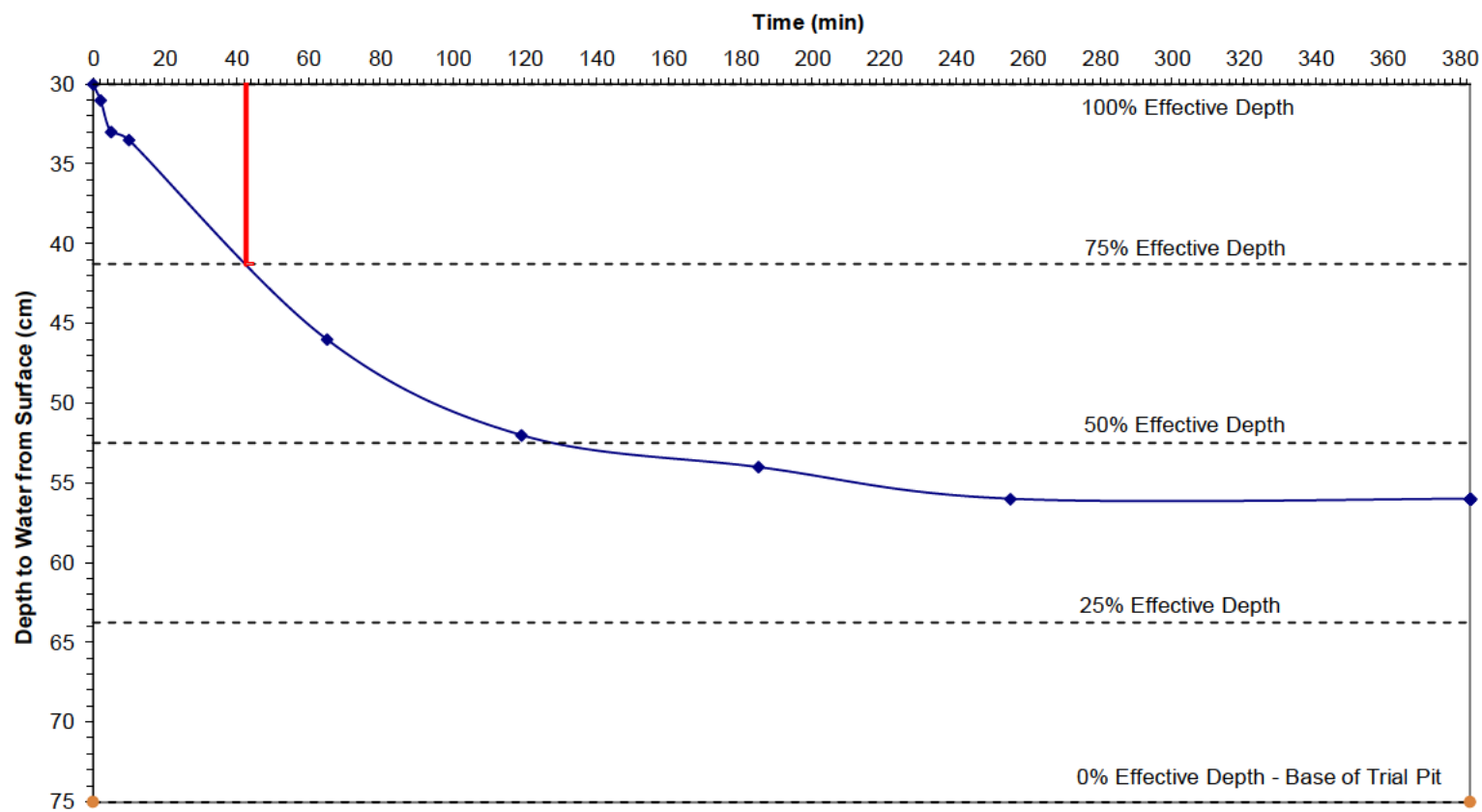


Figure D-6

GEG-21-678

Land at North West Bicester

IT04

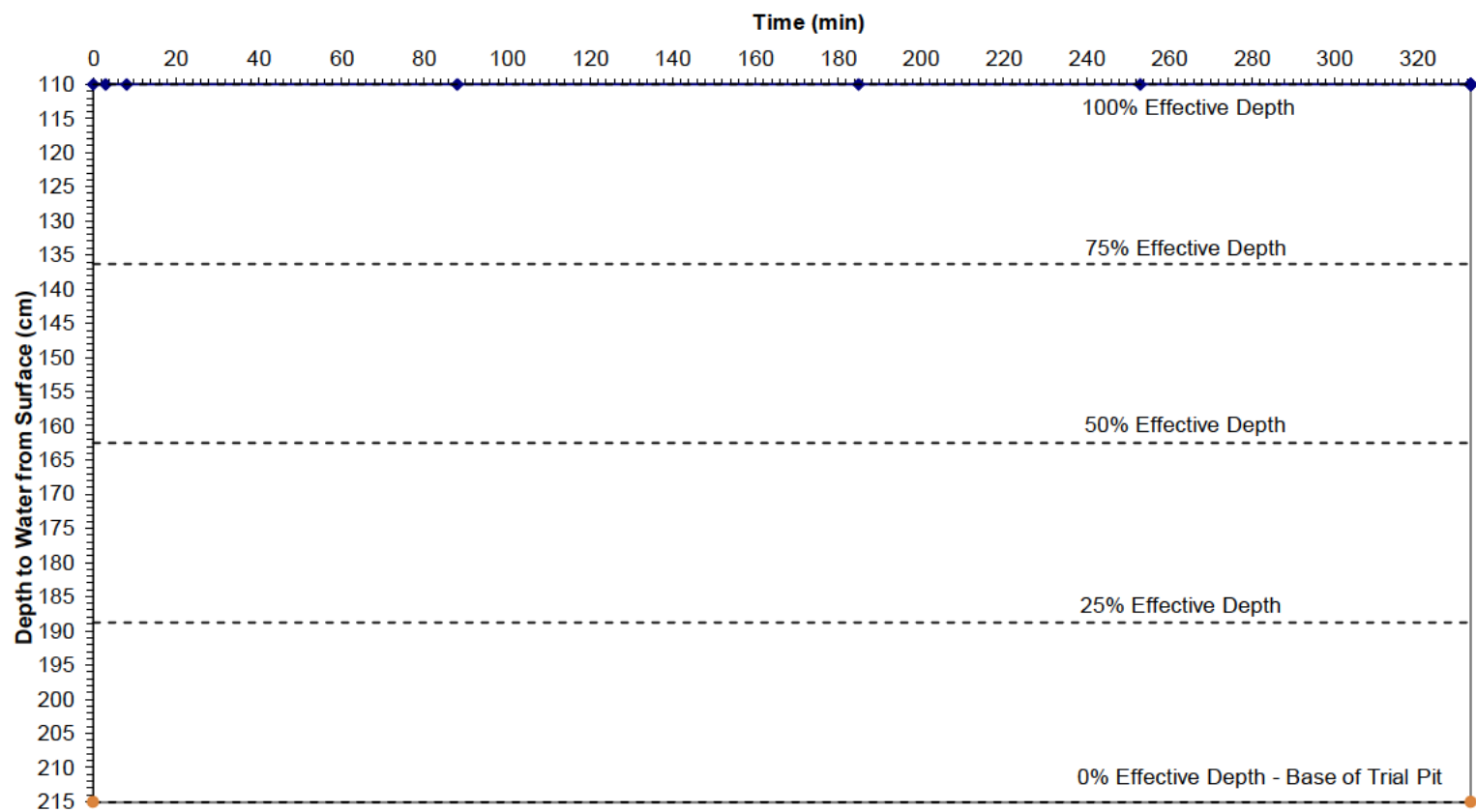


Figure D-7

GEG-21-678

Land at North West Bicester

IT05

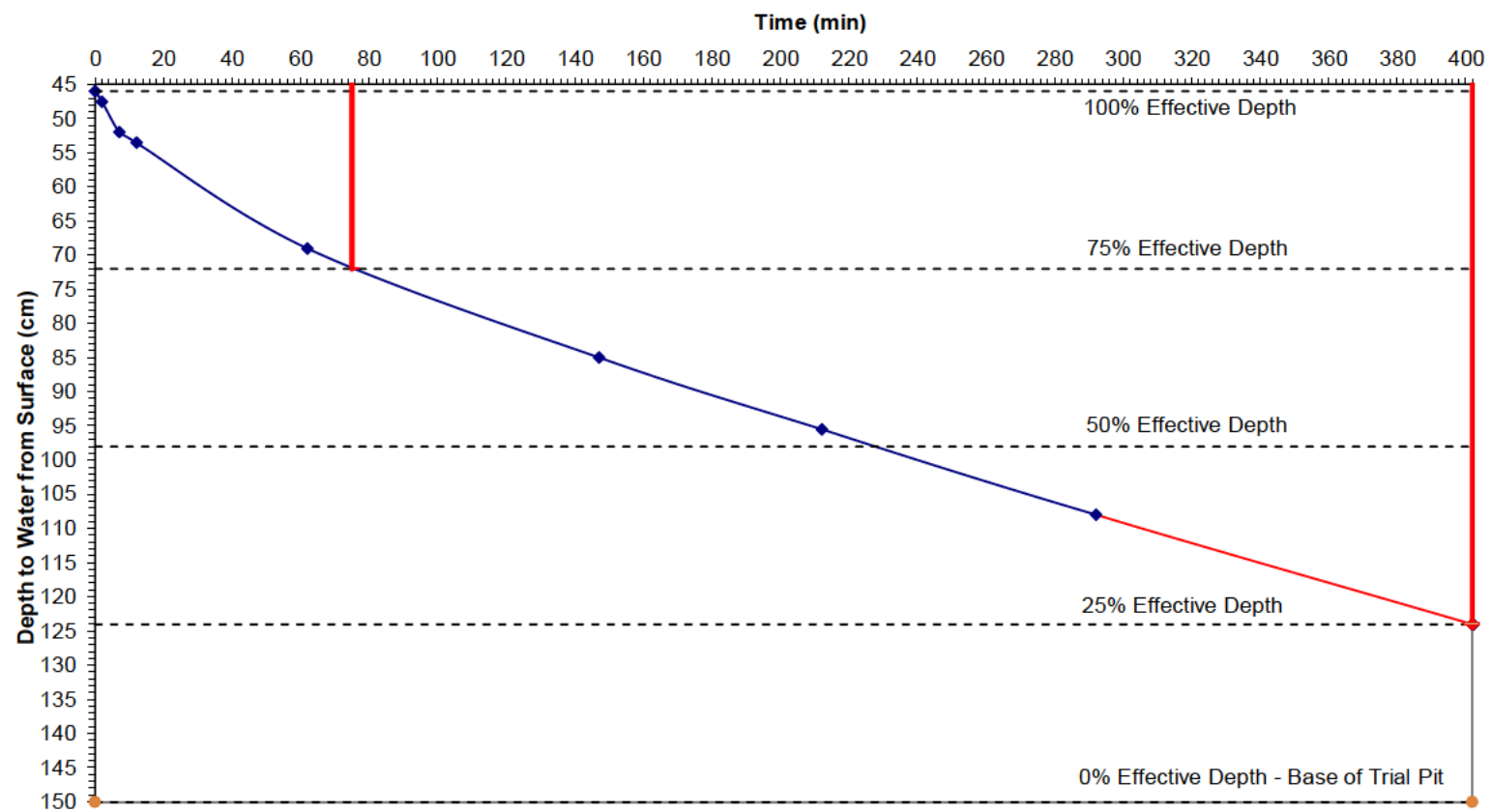


Figure D-8

GEG-21-678

Land at North West Bicester

IT06

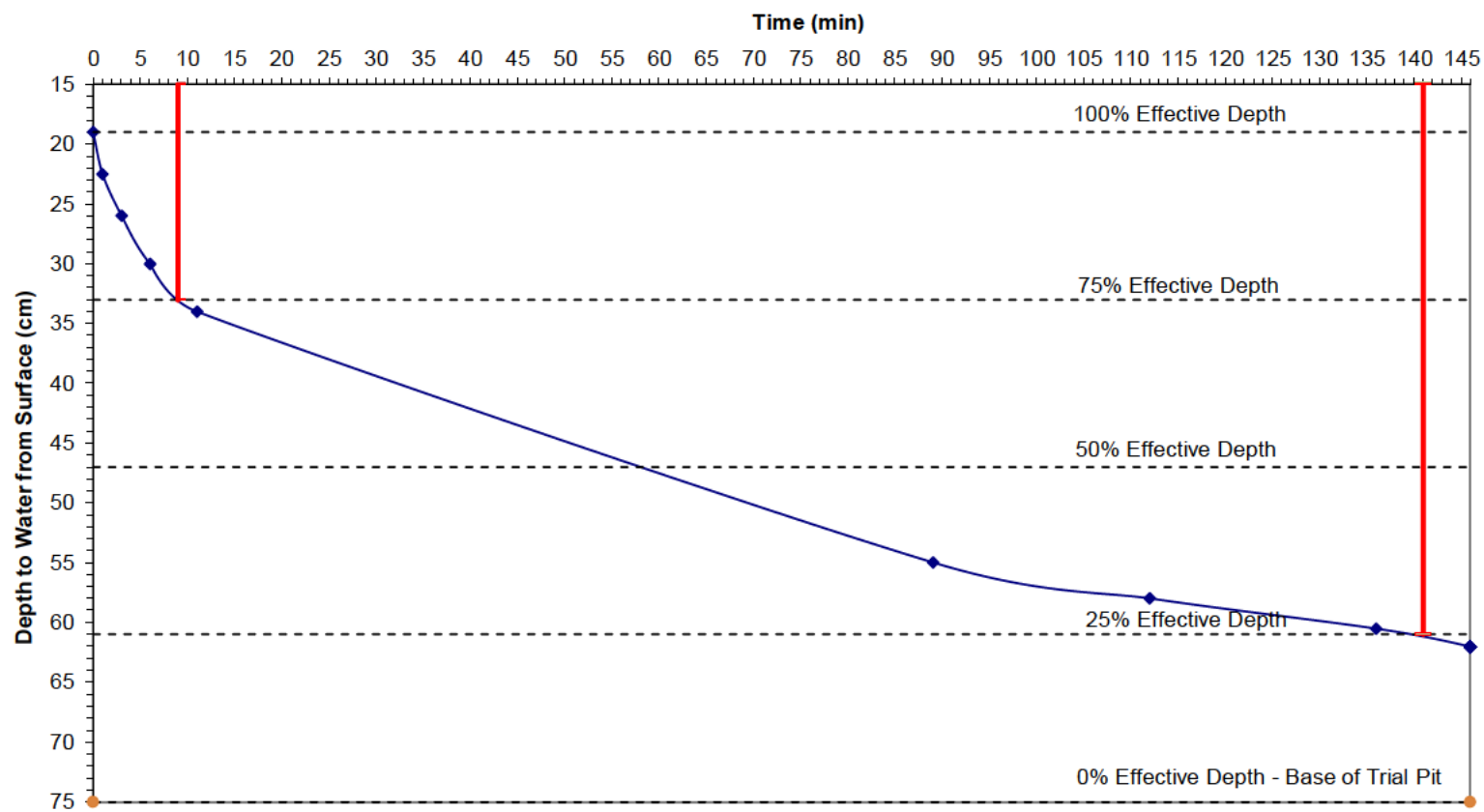


Figure D-9

GEG-21-678

Land at North West Bicester

IT06

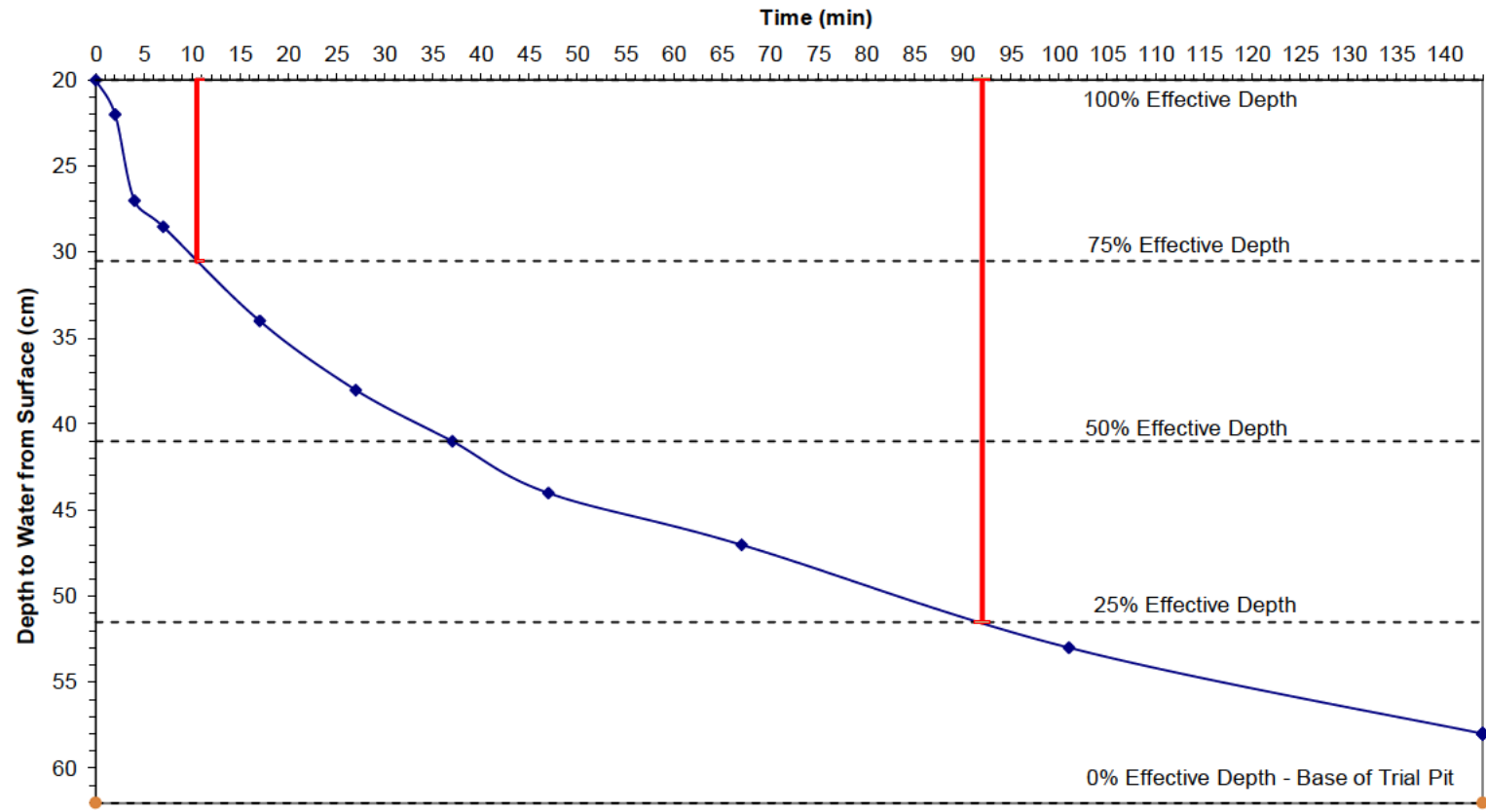


Figure D-10

GEG-21-678

Land at North West Bicester

IT07

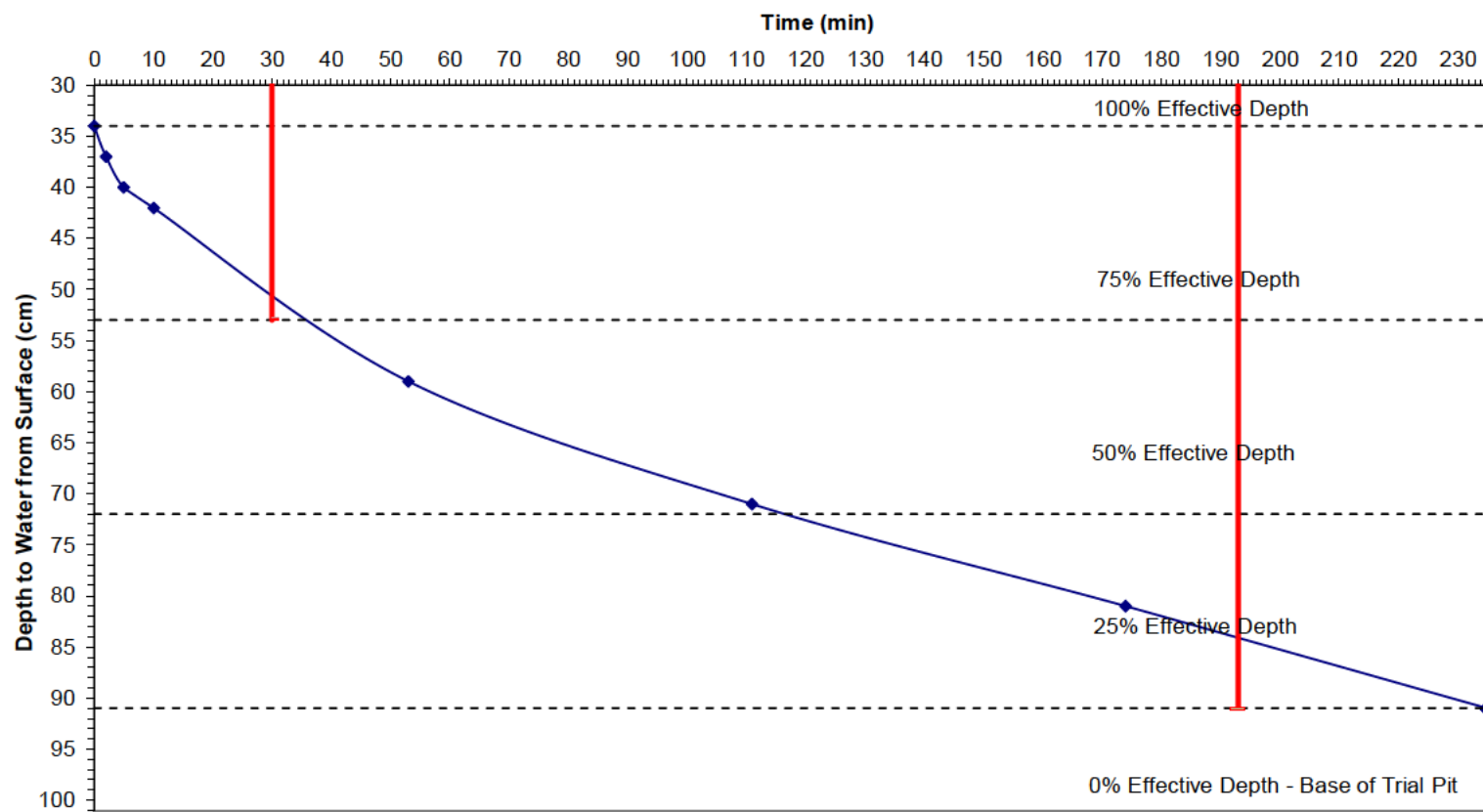


Figure D-11

GEG-21-678

Land at North West Bicester

IT07

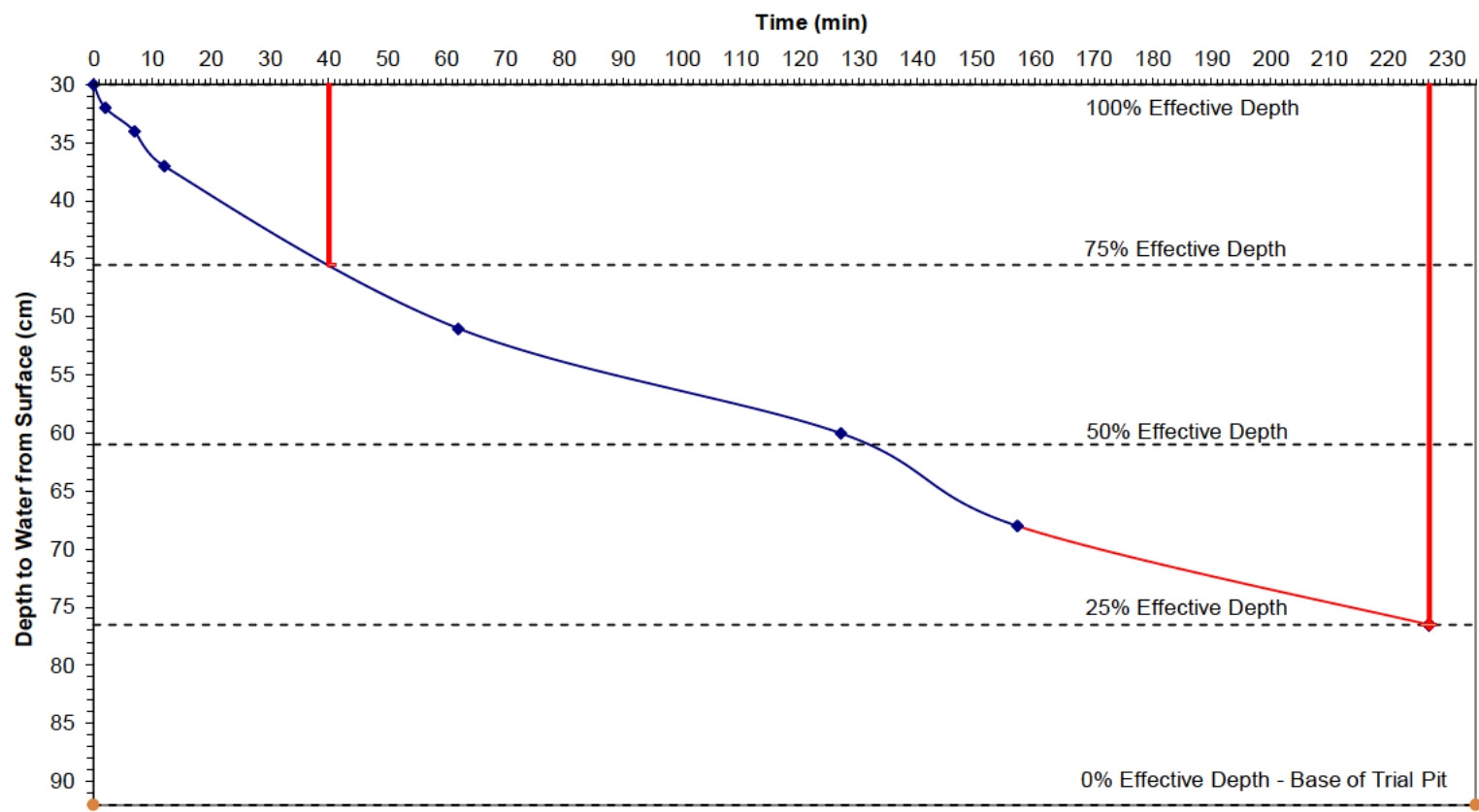


Figure D-12

GEG-21-678

Land at North West Bicester

IT08

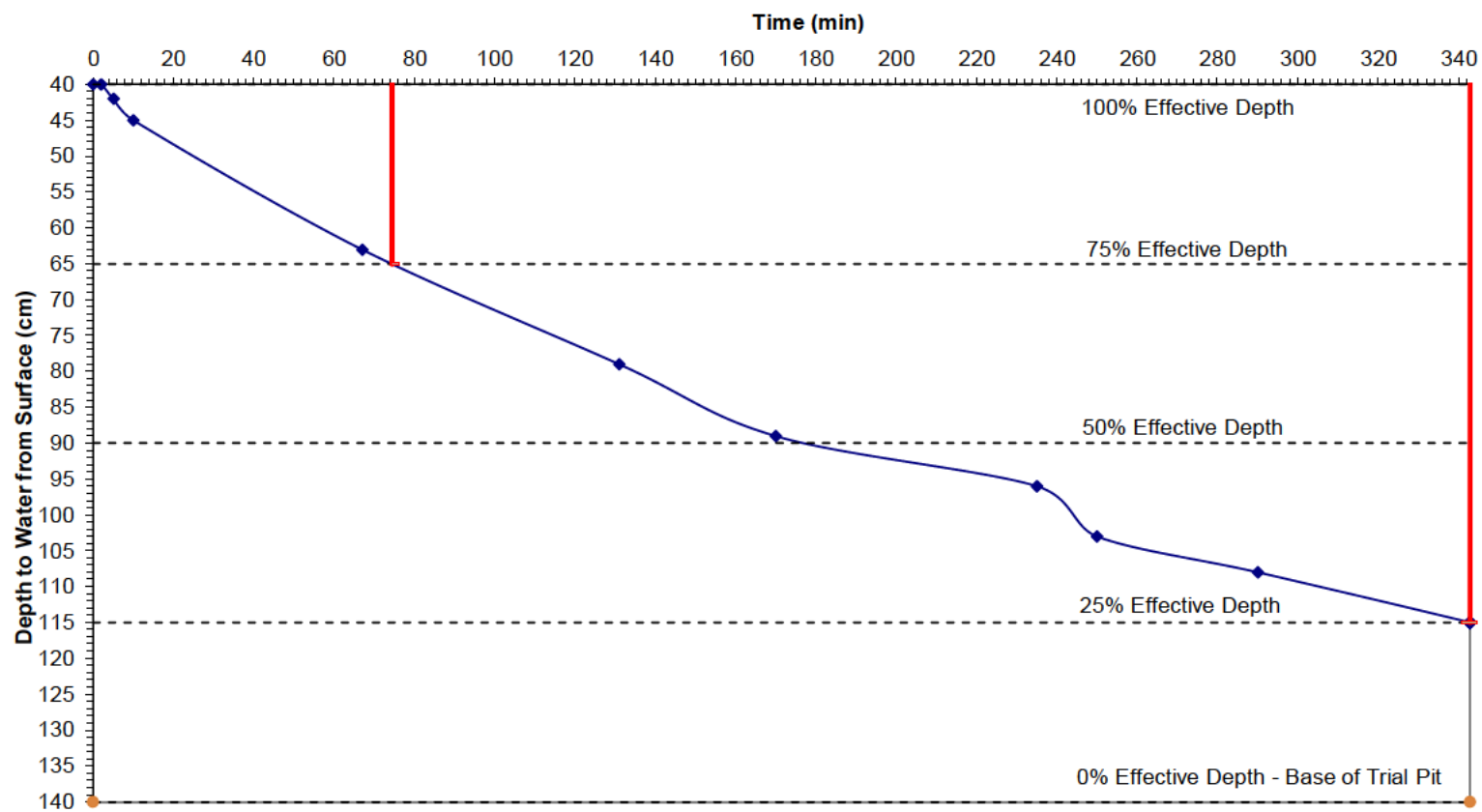


Figure D-13

GEG-21-678

Land at North West Bicester

IT09

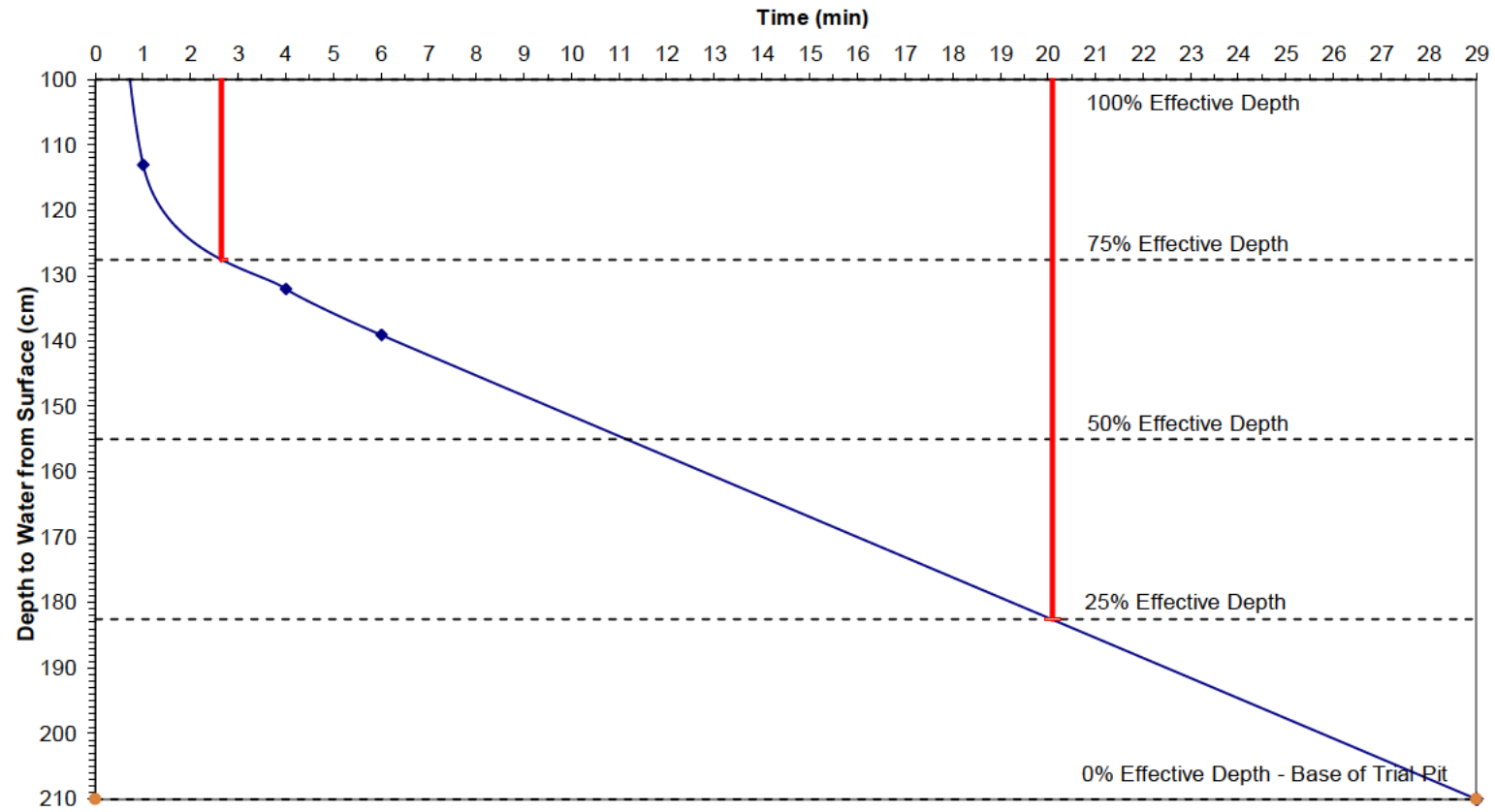


Figure D-14

GEG-21-678

Land at North West Bicester

IT09

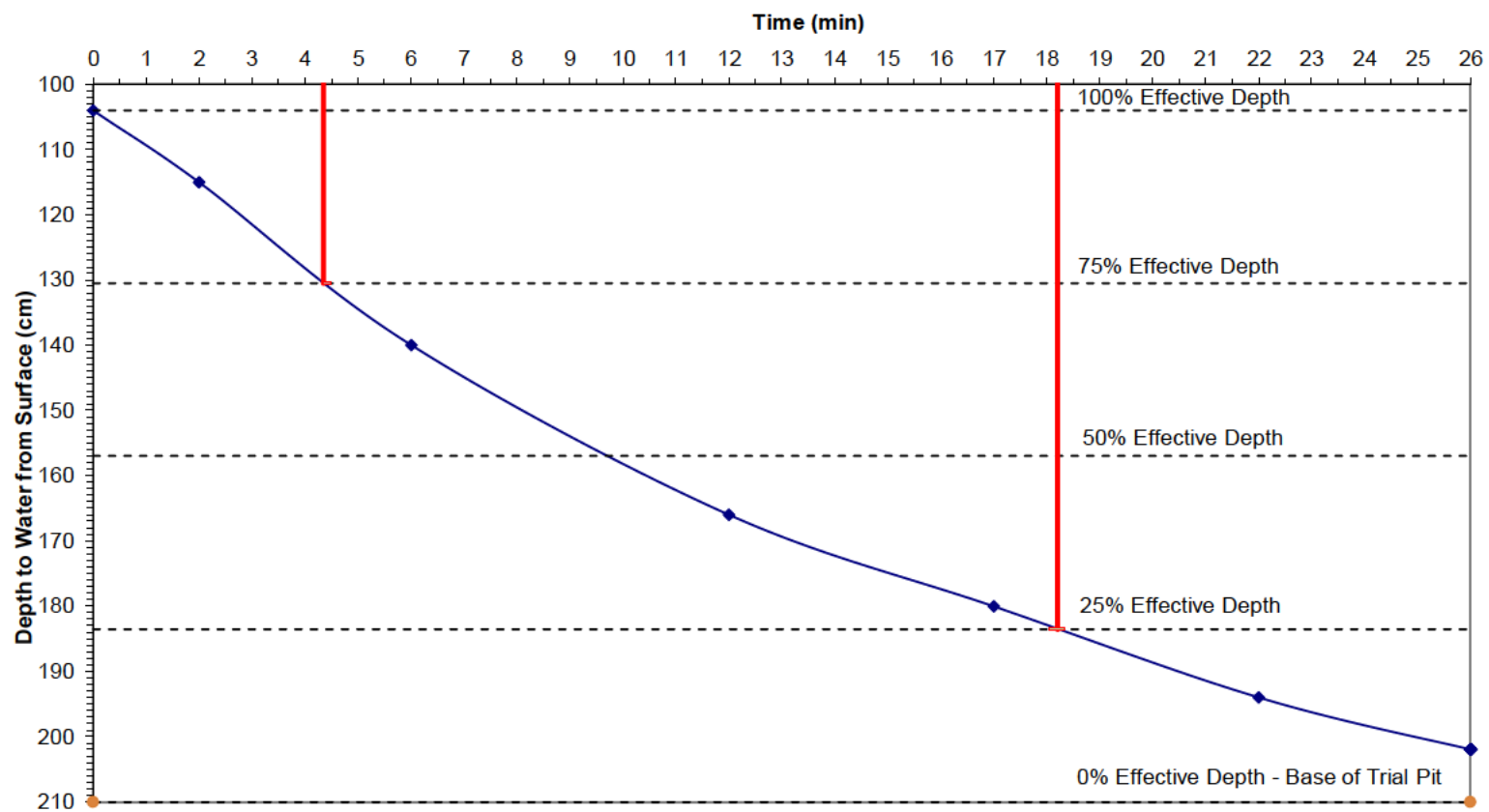


Figure D-15

GEG-21-678

Land at North West Bicester

IT09

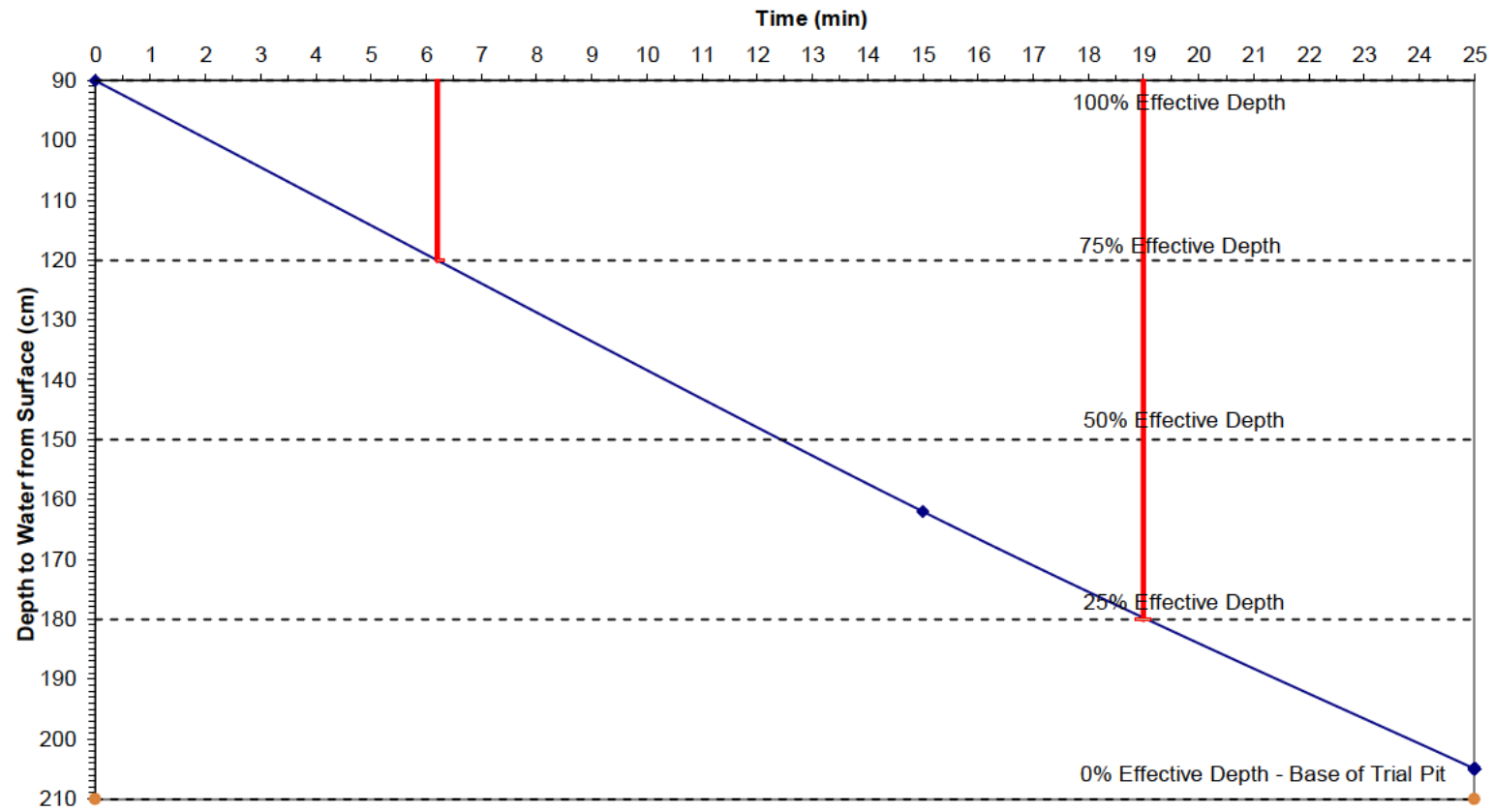


Figure D-16

GEG-21-678

Land at North West Bicester

IT10

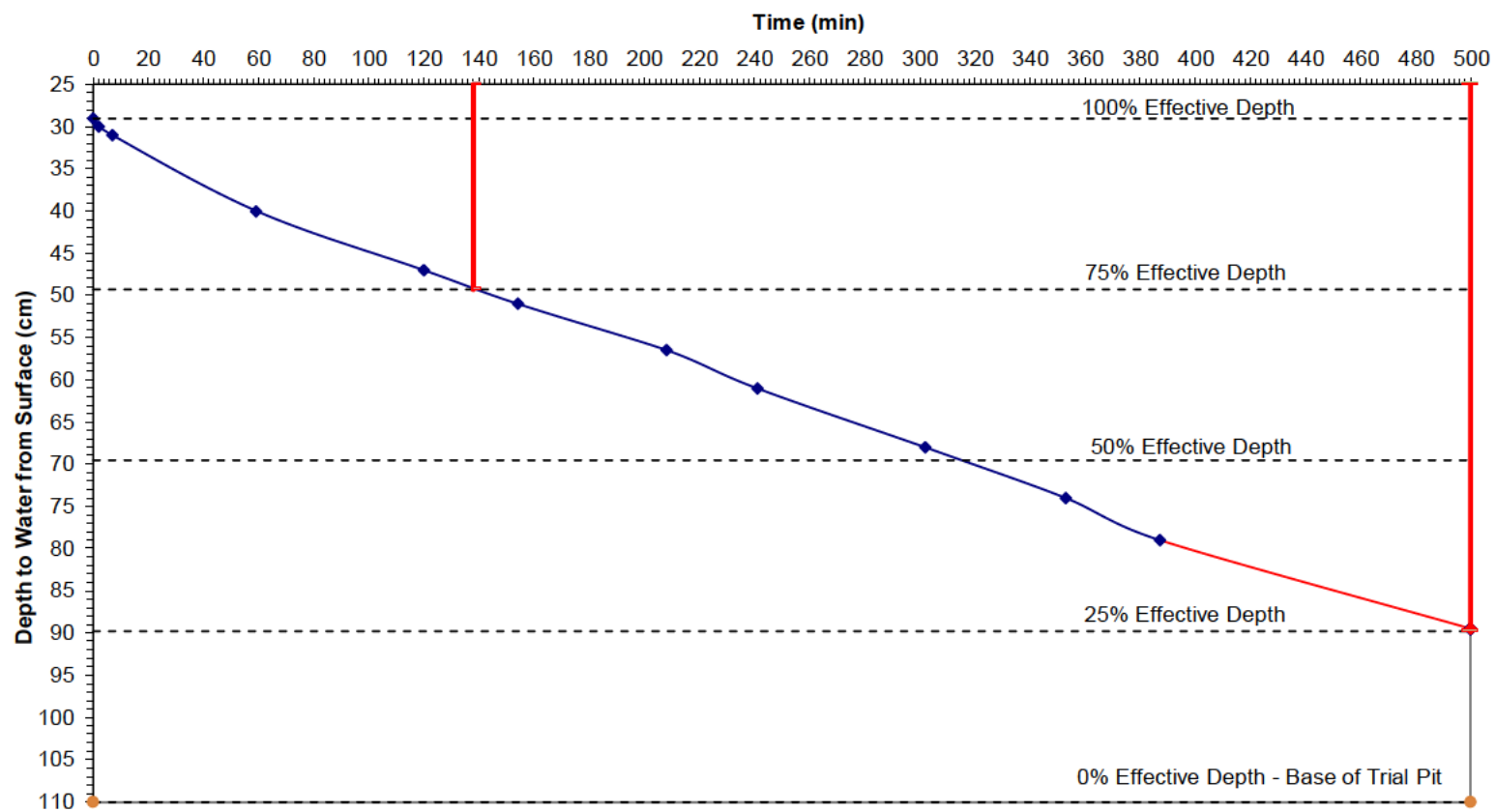


Figure D-17

GEG-21-678

Land at North West Bicester

IT11

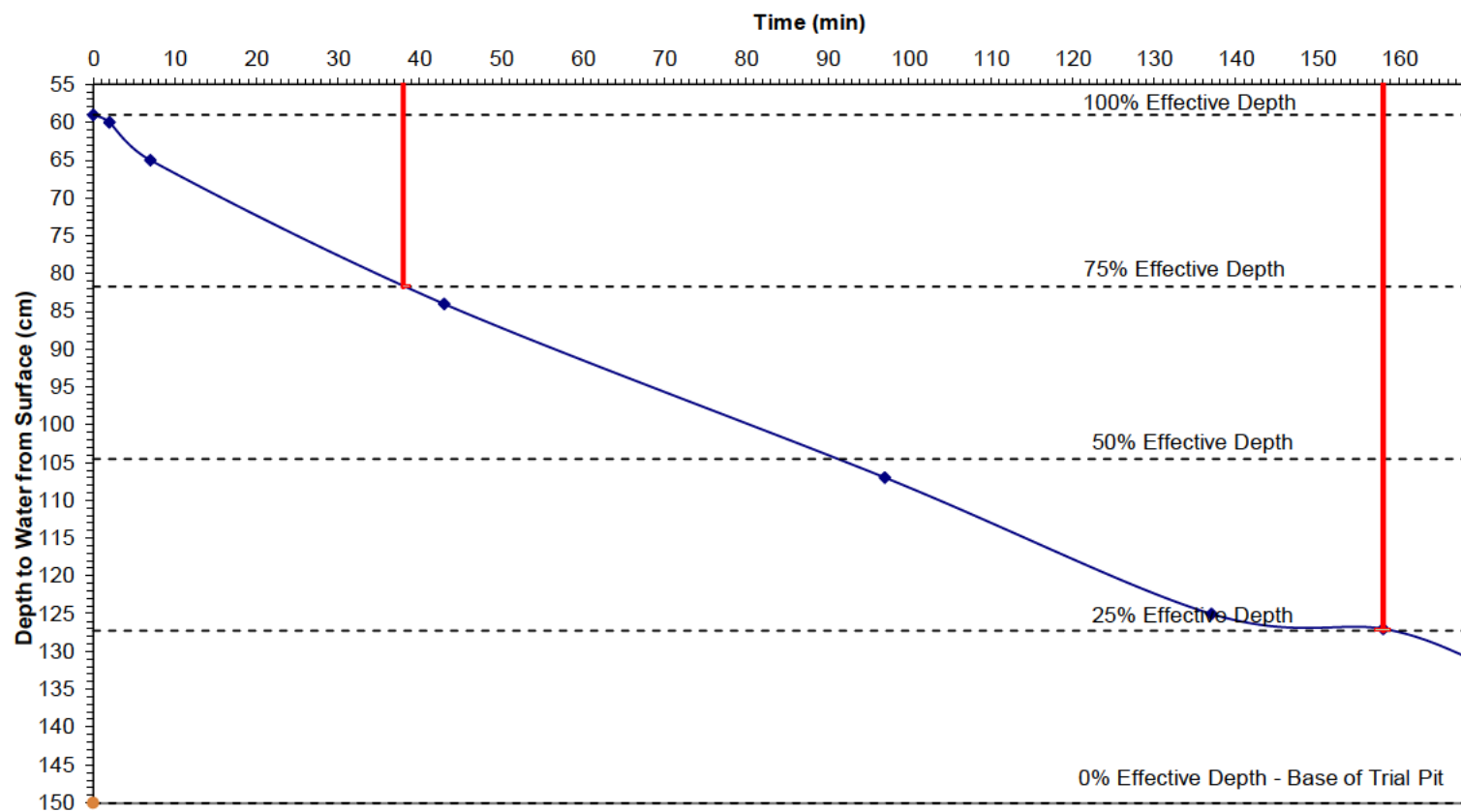
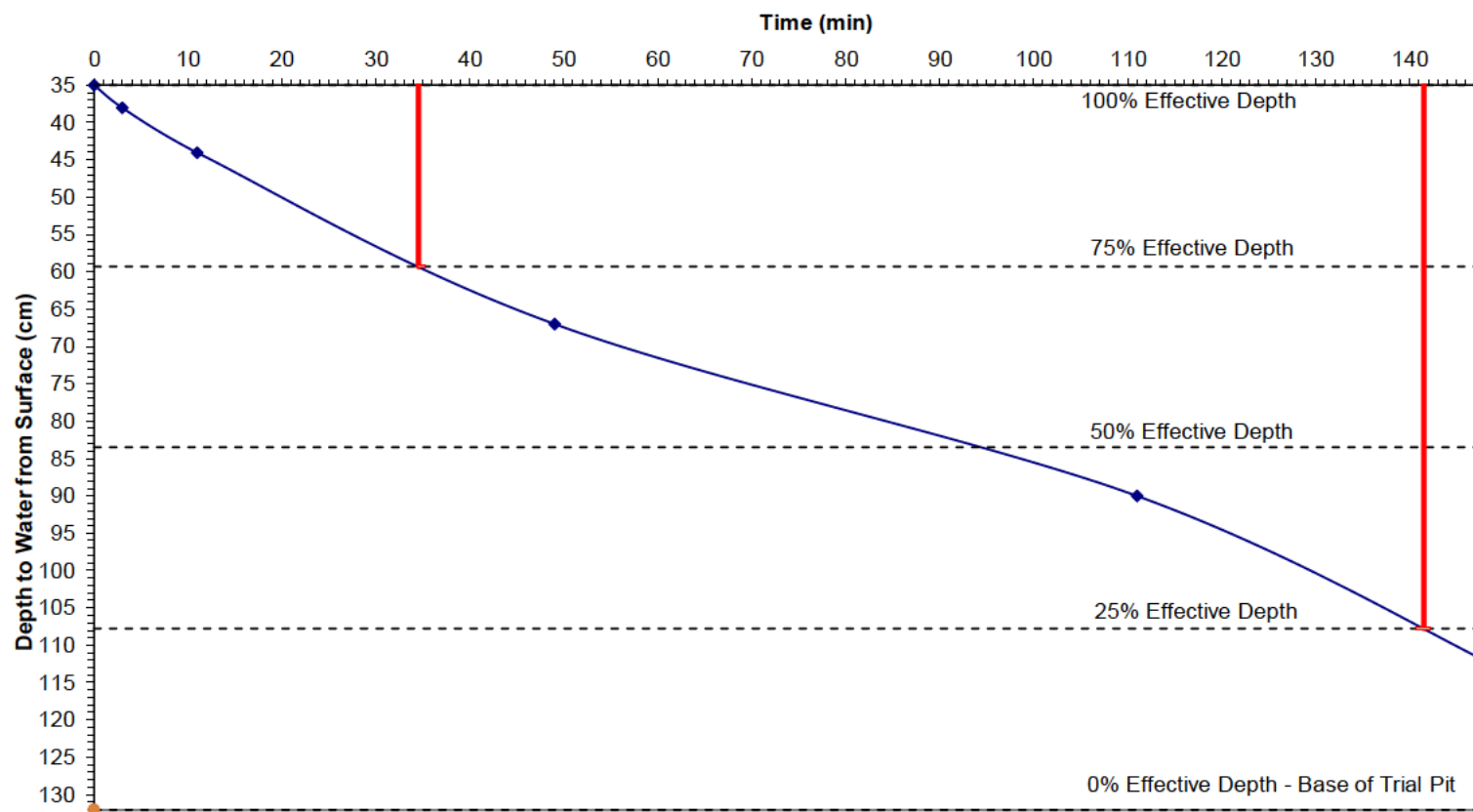


Figure D-18

GEG-21-678

Land at North West Bicester

IT11



**Appendix D
Infiltration Tests**

Project Name: Land at North West Bicester
Project Ref.: GEG-21-678
Trial Pit: IT12
Test No.: Test 1 of 3

Depth of Pit (cm): 120.00
 Depth of Water at Start of Depth (cm): 31.00
 Date of Test: 08 April 2021



Time (min)	Depth from Surface (cm)	% Effective Depth
0	31	100.0%
2	40	89.9%
7	58	69.7%
30	104	18.0%
39	120	0.0%
<i>End of Test</i>		

With Reference to: **Figure D-19**

Parameter	Symbol	Calculation	Units	IT12
Effective Depth of Trial Pit	d_p		m	0.89
Width of Trial Pit	w		m	0.60
Length of Trial Pit	l		m	1.30
Volume of Trial Pit	V	$= d_p \times w \times l$	m ³	0.69
Volume of Trial Pit at 50% Effective Depth	V _{50%}	$= V \times 0.5$	m ³	0.3471
Internal Surface Area of Trial Pit*	a _{p50%}	$= l \times w + d_p \times (w + l)$	m ²	2.47
Time to reach 75% Effective Depth	T _{p75%}		min	5.25
Time to reach 25% Effective Depth	T _{p25%}		min	26.80
Time 25% - 75%	T _{p75%-25%}	$= T_{p25\%} - T_{p75\%}$	min	21.55
Infiltration Rate	f	$= V_{50\%} / a_{p50\%} \times (T_{p75\%-25\%})$	m/s	1.09E-04

*To 50% Effective Depth (including base)

Note: Infiltration test pit refused at 1.20m on weak grey LIMESTONE.

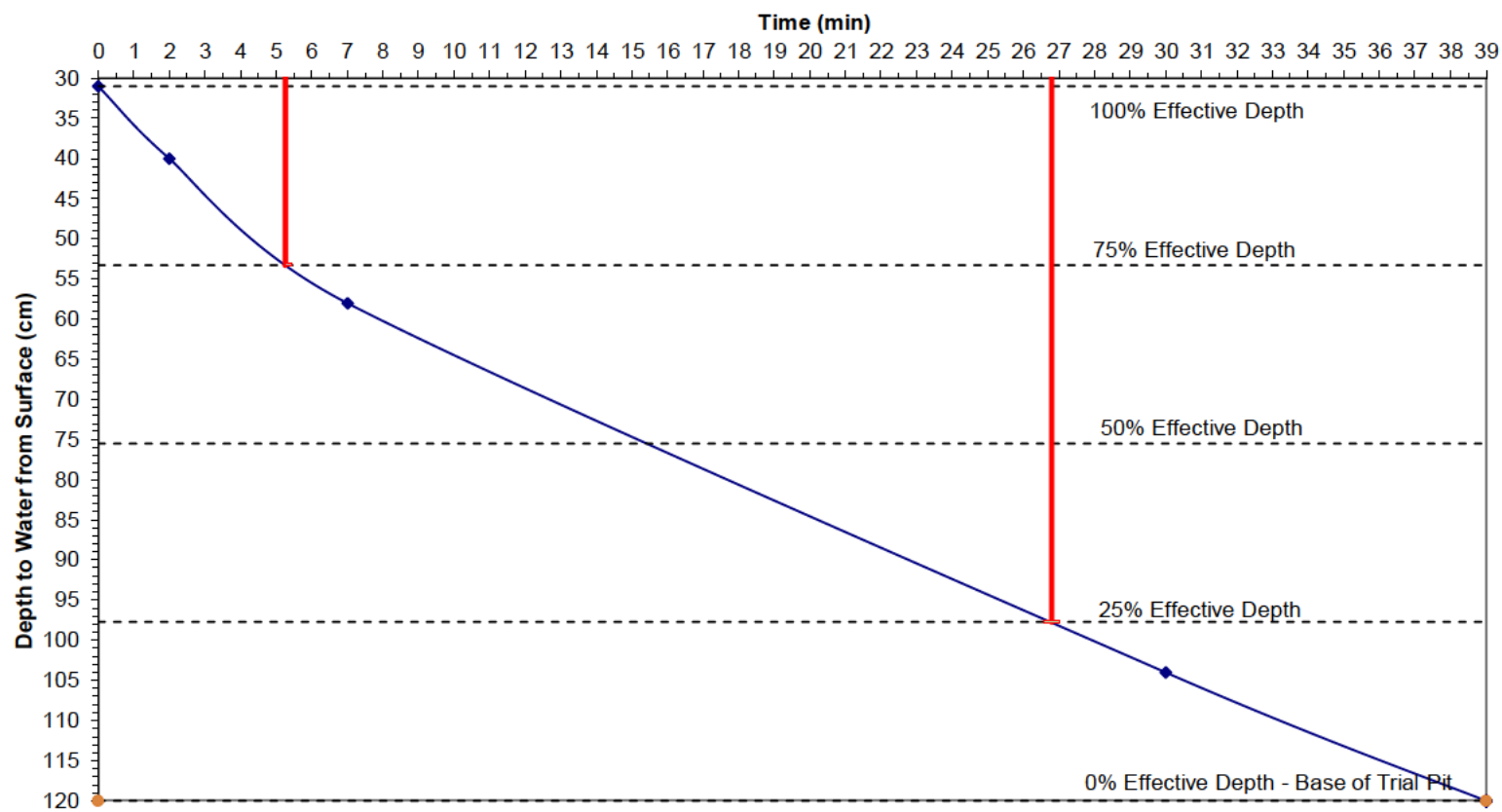
Engineer: JM
 Checked by: MP

Figure D-19

GEG-21-678

Land at North West Bicester

IT12



Appendix D
Infiltration Tests

Project Name: Land at North West Bicester
 Project Ref.: GEG-21-678
 Trial Pit: IT12
 Test No.: Test 2 of 3

Depth of Pit (cm): 120.00
 Depth of Water at Start of Depth (cm): 31.00
 Date of Test: 08 April 2021



Time (min)	Depth from Surface (cm)	% Effective Depth
0	31	100.0%
3	48	80.9%
8	60	67.4%
23	91	32.6%
36	114	6.7%
<i>End of Test</i>		

Parameter	Symbol	Calculation	Units	IT12
Effective Depth of Trial Pit	d_p		m	0.89
Width of Trial Pit	w		m	0.60
Length of Trial Pit	l		m	1.30
Volume of Trial Pit	V	$= d_p \times w \times l$	m ³	0.69
Volume of Trial Pit at 50% Effective Depth	$V_{50\%}$	$= V \times 0.5$	m ³	0.3471
Internal Surface Area of Trial Pit*	$a_{p50\%}$	$= l \times w + d_p \times (w + l)$	m ²	2.47
Time to reach 75% Effective Depth	$T_{p75\%}$		min	4.90
Time to reach 25% Effective Depth	$T_{p25\%}$		min	26.60
Time 25% - 75%	$T_{p75\%-25\%}$	$= T_{p25\%} - T_{p75\%}$	min	21.7
Infiltration Rate	f	$= V_{50\%} / a_{p50\%} \times (T_{p75\%-25\%})$	m/s	1.08E-04

*To 50% Effective Depth (including base)

With Reference to: **Figure D-20**

Engineer: JM
 Checked by: MP

Figure D-20

GEG-21-678

Land at North West Bicester

IT12

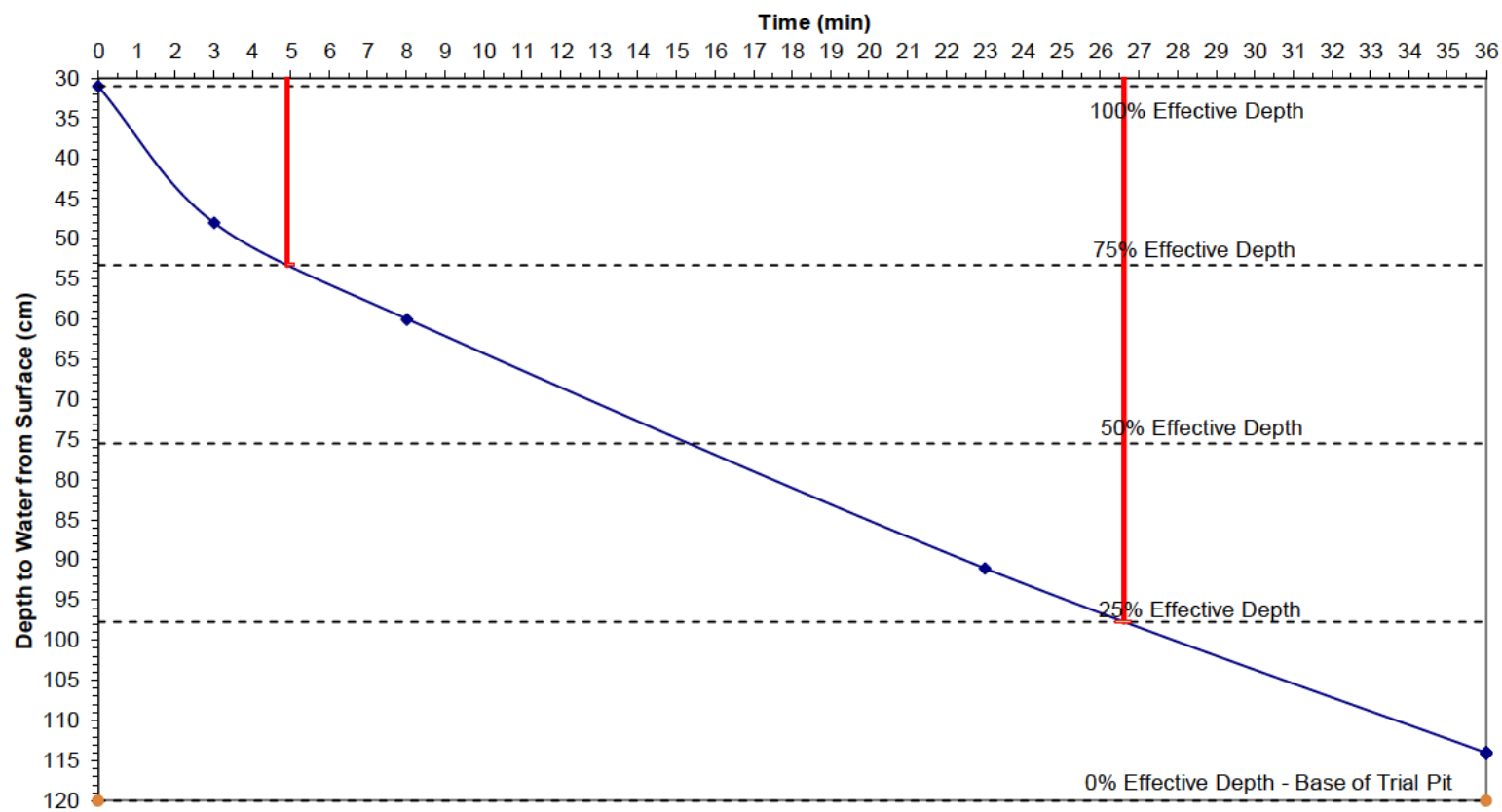
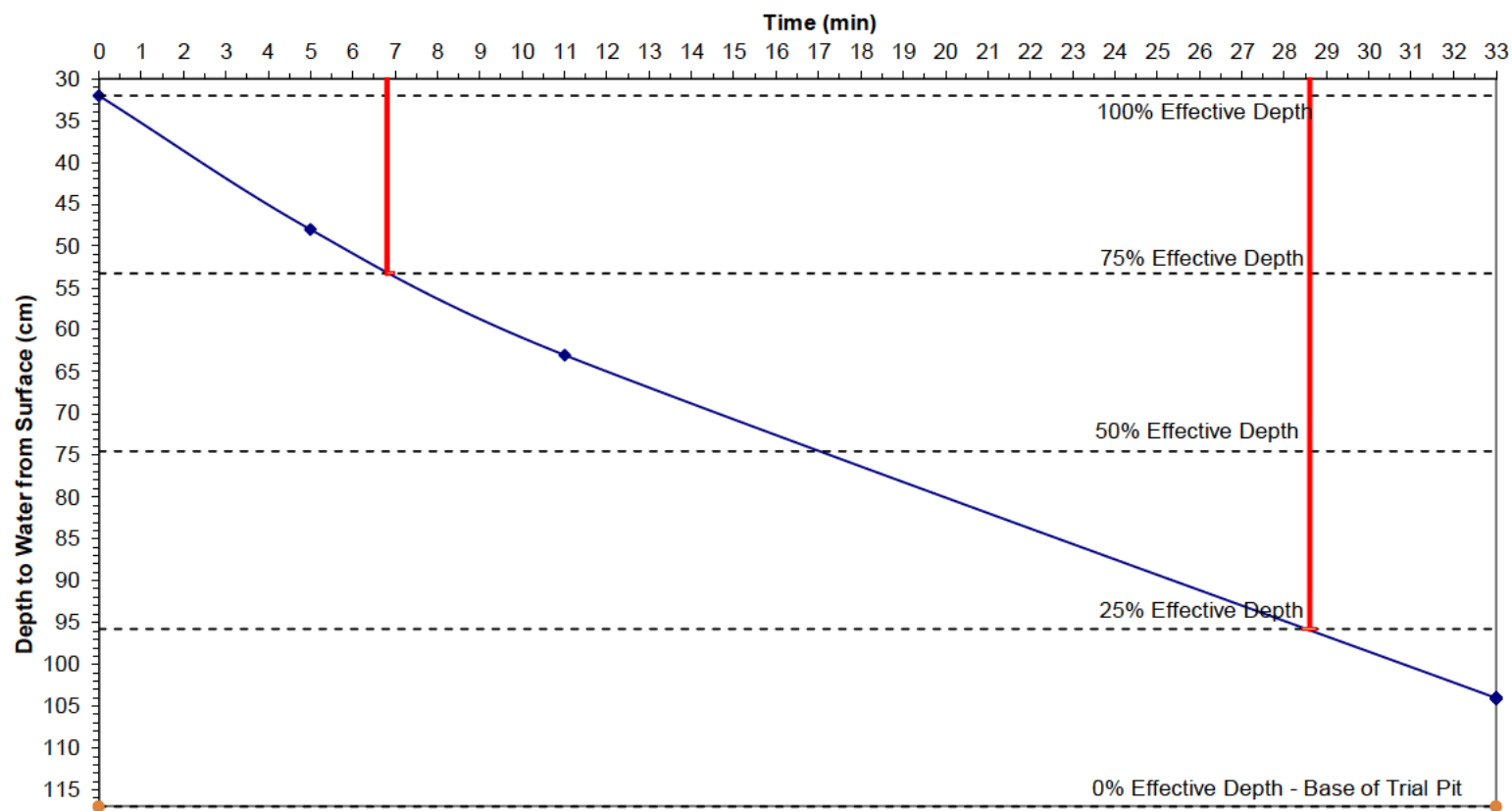


Figure D-21

GEG-21-678

Land at North West Bicester

IT12



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