Norwich Western Link

Drainage Strategy Appendix 14 : Ground Investigation Reports Part 1 of 8

Author: Ramboll

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Contents

1 Introduction

1.1.1 This document contains extracts of site investigation reports produced by WSP and Harrison Geotechnical Ltd and the Ground Investigation Report produced by Ramboll. The extracts are of relevant sections of the reports, intended to provide evidence of the statements made within the Drainage Strategy Report relating to ground conditions (Section 5.2.3), infiltration testing (5.2.5) & groundwater levels (Section 5.2.6).

Factual Ground Investigation Reports:

- 70061370-WSP-RP-GEO-0002 dated November 2020
- NCCT41793-HAG-VGT-FSC-RP-GI-0001 dated February 2022,
- NCCT41793-HAG-VGT-FSC-RP-GI-0002 dated October 2022
- NCCT41793-HAG-VGT-FSC-RP-GI-0003 'Woodland Campaign' dated November 2022

Ground Investigation Report:
- NCCT41793-RAM-HGT-FSC-RP-GI-0002 dated February 2023

1.1.2 We have included a summary of key information shown in this document in an accessible format. However, some users may not be able to access all technical details. If you require this document in a more accessible format please contact: norwichwesternlink@norfolk.gov.uk

Norfolk County Council

NORWICH WESTERN LINK

Ground Investigation Report

70061370-WSP-RP-GEO-0002
NOVEMBER 2020

CONFIDENTIAL

Norfolk County Council

NORWICH WESTERN LINK

Ground Investigation Report

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PROJECT NO. 70061370

OUR REF. NO. 70061370-WSP-RP-GEO-0002

DATE: NOVEMBER 2020

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2 EXISTING INFORMATION

2.1 INTRODUCTION

This section summarises the available information provided in the 2019 WSP Desk Study Report (WSP, 2019), while highlighting additional information obtained following the completion of this report and the confirmation of the chosen route option.

This report presents the information provided for the route C Option, as presented in the Desk Study Report. It should be noted that the proposed route of the Scheme has been updated several times since the completion of the desk study, therefore, some information reported in the Desk Study is marginally different from the currently proposed Scheme alignment and features.

The WSP Desk Study Report provided detail of the following subject areas:

- Geology
- Hydrology
- Hydrogeology
- Land Use
- Ground Stability
- Historical Development
- Unexploded Ordnance (UXO)

2.2 SOURCES OF INFORMATION

A summary of the relevant sources of information of the ground conditions used in this report is provided below:

- (British Geological Survey (BGS), 1975) Geology Map, Norwich, England and Wales Sheet 161. Solid and Drift Geology. 1:50 000.
- (British Geological Survey (BGS), 2014) Geology Map, Aylsham, England and Wales Sheet 147. Solid and Drift Geology. 1:50 000.
- (British Geological Survey (BGS), 1989) Memoir for geological sheet 161 (England and Wales) Geology of the country around Norwich.
- BGS Geology of Britain digital viewer. (https://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html) (British Geological Survey (BGS), 2019)
- Envirocheck Report (See Appendix B of the Desk Study Report (WSP, 2019)).

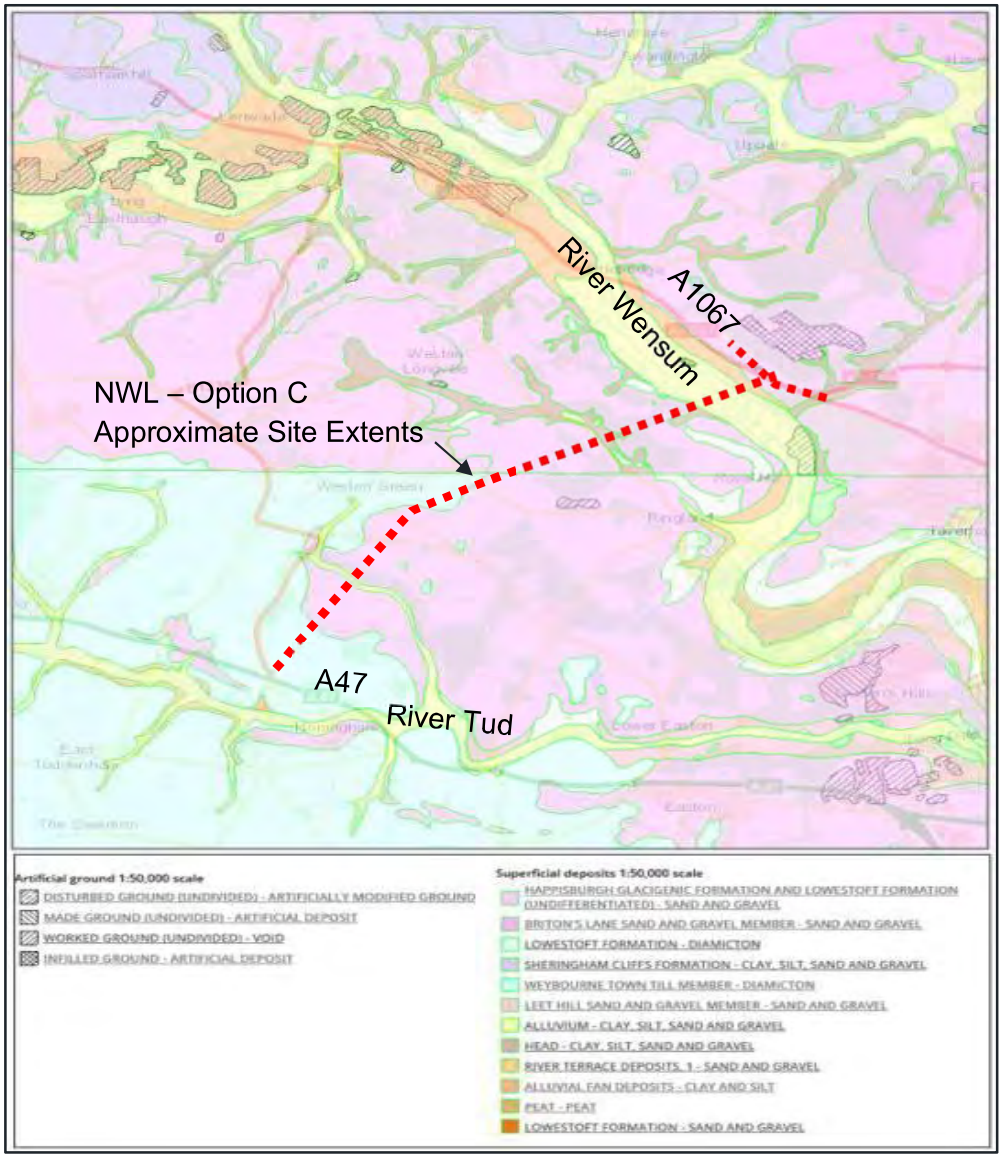
2.3 GEOLOGICAL MAPS AND MEMOIRS

The BGS 1:50,000 Geological Maps Sheets for the site are shown on the Norwich (Sheet 161 (1975) and Aylsham (Sheet 147 (British Geological Survey (BGS), 2014). As detailed in the Desk Study Report (WSP, 2019), the following geological sequence (starting from the top) is expected for the Option C route alignment:

- Made Ground
- Head Deposit
- Alluvium
- Colluvium
- River Terrace Gravel
- Glaciofluvial sands and gravels (Sheringham Cliff Formation)
- Till Members (Sheringham Cliff Formation)
- Lowestoft Formation
- Cretaceous Upper Chalk.

The BGS site geology and Option C alignment are shown in Figure 2-1

Figure 2-1 - Site Geology (Contains British Geological Survey material © UKRI. All Rights Reserved 2019)



Details of each geological strata present within the route C option of the scheme are presented in the WSP Desk Study (WSP, 2019).

2.4 GROUNDWATER

The Desk Study Report (WSP, 2019) identified that the extents of the scheme crossing the River Wensum Flood plain and the River Tud tributary are in Flood Zone 3 (assessed as having a greater than 1 in 100 (>1%) annual probability of fluvial flooding, or a greater than 1 in 200 (>0.5%) annual probability of tidal flooding). It further identified the Chalk stratum as a Principal Aquifer (layers of rock or drift deposits that have high level of water storage) and the Glaciofluvial sand and gravels as a Secondary A Aquifer (permeable layers capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers).

The implications of the groundwater levels and behaviour have been included into the geotechnical interpretation and engineering assessment in this report. More detailed and up to date information on the scheme's hydrology, hydrogeology, contamination, ecology and environmental aspects are, however, outside the scope of this report.

4 GROUND SUMMARY

4.1 GEOLOGY AND GROUND CONDITIONS

The ground conditions encountered within the exploratory holes and the preliminary interpretation of the stratigraphic units are presented in the geological long section drawings 70061370-WSP-DR-GEO- 0002 and 0003, attached in Appendix A.

The past boreholes, which were included in the WSP Desk Study (WSP, 2019) for the Route C alignment, have not been included in the above drawings, as all past exploratory holes were located more than 200m away from the proposed route alignment. An exploratory hole location plan is presented in Appendix A

As discussed in the Section 2.3 of this report the regional geology comprises multiple Middle Pleistocene formations that comprise both granular and cohesive components, as glaciofluvial sands & gravels, and till members, which overly the upper chalk bedrock between the river valleys to the north and the south. To simplify the ground conditions these geologies are considered undifferentiated and separated into their cohesive and granular components. Further differentiation between the geological horizons will be undertaken following the completion of the ground investigation.

4.1.1 TOPSOIL

Most of the site locations were on land regularly used for farming. Regular soil tilling was observed along which resulted in substantial quantities of topsoil. The deepest topsoil layer was encountered in BH010, which was circa 1.2m thick.

Topsoil was typically encountered between 0.1 and 1.2m deep and described as loose brown clayey silty, slightly gravelly, fine to medium SAND

4.1.2 MADE GROUND

Made Ground was encountered down to 0.7m depth below ground level (m bgl) in BH001 near a pre-existing concrete paved area. It was described on the logs as stiff light brown very sandy, slightly gravelly SILT/CLAY.

Made Ground was also encountered in WS113, WS122. At these locations the Made Ground was encountered to depths ranging between 0.0 to 0.5m BGL, with the deepest encountered at WS122. These windowless sample holes were carried out near the past alignment of Fakenham Road, which was present prior to the earliest available maps from 1883.

During the site investigation, some obstruction (mass concrete possibly from the old road alignment construction) was encountered up to 0.55m bgl. Made Ground in this area was variable from firm to stiff orangey brown CLAY, to gravelly, cobbly, slightly clayey, fine to coarse SAND.

Some household waste was observed near this area possibly due to fly tipping.

A marl pit was indicated near this section of Fakenham Road at that time, as reported in the Desk Study Report Ref No (WSP, 2019). Historic maps from Envirocheck also show the alignment of Fakenham Road in this area was modified (to its existing layout) between 1957 and 1975.

4.1.3 HEAD

Head deposits (up to 4.65 thick) were reported in BH001 and WS114.

This layer was originally described in BH001 as Alluvium and in WS114 it was previously described as Sheringham Cliff formation, which descriptions have now been revised.

The Head Deposits are described on the logs as Stiff to very stiff light brown, slightly gravelly CLAY. Gravel is fine to medium angular to sub angular chalk gravel. It was also recorded as medium dense grey gravelly, fine to medium SAND

Due to the limited presence on site, the Head Deposits are not included in the materials properties section of this report.

4.1.4 ALLUVIUM

Alluvial deposits were recorded in BH014-BH016 and TP404A to a depth of 15.5m BGL and were encountered as granular (e.g. Brown slightly silty very gravelly fine to coarse SAND). These exploratory holes are located in close proximity of the river Wensum.

During the ground investigation an additional location was identified as having alluvial deposits down to the depth of 2.0m in WS122.

The samples encountered between 0.2 to 2.0m in BH003 had organic odours and thus this stratum was included into the Alluvium section of this report.

4.1.5 GLACIOFLUVIAL SAND AND GRAVEL

For the purposes of this report all Sands and Gravels that comprise the granular material within the Middle Pleistocene geologies present within the scheme, are combined into a single geological group for simplicity. The combined sand and gravel strata include Sheringham Cliffs Formation, Lowestoft Formation and Happisburgh Glacigenic Formation.

The cohesive components of these geological groups, referred to as Tills, are further discussed in Section 4.1.6.

The granular fraction within this strata were typically described as predominantly sands and/or gravels, with varying silt content and gravels of either flint and/or chalk. Thickness of the strata, including the layers of the cohesive Till, varied between 0.4m to 30.5m, with thickest continuous layer encountered in BH005.

4.1.6 TILL MEMBERS (COHESIVE)

The Cohesive components of the Sheringham Cliffs Formation, Lowestoft Formation and Happisburgh Glacigenic Formation are considered as undifferentiated and referred to as the Till Members within this report. They were typically encountered as either SILT/CLAY interlayered within the granular glaciofluvial deposits or overlying the Upper Chalk, as Lowestoft Till

The Till Members were encountered in most of deep boreholes and were typically encountered immediately overlying the Upper Chalk, or as bands/layers within the Glacial Sands and Gravels. Thickness of the strata was recorded to range between 0.2m to 7.2m.

Lowestoft Till was logged as till with chalk gravels, whereas the general silt/clay layers within the granular glaciofluvial deposits were logged as till with flint gravels. Due to the similarities and overlap between these cohesive soils they have been classified as undifferentiated cohesive deposits.

4.1.7 CHALK

Chalk was encountered in the deeper boreholes, and was recovered across the site at the base of the investigated strata, either as low density or as a structureless Grade Dm Chalk (based on the CIRIA C574 classification system).

Following this classification, chalk was described as extremely soft at the top of the stratum, becoming blocky unweathered chalk from 13-20m bgl and down to the end of the borehole.

As exploratory hole logs provided a compilation of the CIRIA 574 and Mundford descriptions, both are listed below, for consistency.

Grade Dm (Grade VI – Mundford) and Grade Dc (Grade V – Mundford) Chalk was encountered down to approximately 20m bgl. From 20m bgl onwards the quality of the chalk improved to between Grade B2 (Grade II – Mundford) and Grade B3 (Grade III – Mundford) with some soft spots.

Chalk was generally off-white, composed of cream, locally slightly cobbly sandy SILT with some gravels. There were however some locations e.g. BH013, where the chalk was described as sandy silty subangular to rounded GRAVEL.

Gravel was described as very weak to weak medium density, white with occasional black and dark brown specks locally iron stained yellow brown and subangular to subrounded, fine to coarse

4.1.8 STRATA SUMMARY

Table 4-1 – SUMMARY OF GROUND CONDITIONS ENCOUNTERED

Stratum	Thickness (m)
Topsoil	0.3 to 1.2
Made Ground	0.25 to 1.2
Alluvium	1.0 to 4.7
Glaciofluvial Sands and Gravel *(undifferentiated)	2.1 to 30.10
Till Members – (cohesive)* (undifferentiated)	0.2 to 7.0
Upper Chalk Formation	33.20 **

* Geological strata's are interlayer, thicknesses represent layer dimensions and not total strata dimensions

** Thickness not proven

4.2 GROUNDWATER

Results from groundwater monitoring undertaken by Norwich Partnership Laboratory (NPL) between 27/09/2019 and 15/10/2020 are presented in Appendix E. Fifteen out of the total of twenty seven Boreholes/Windowless Sample holes monitored, were found to be dry throughout this period. The minimum water depth was recorded at the ground level (at BH013). Water levels less than 10m deep were only recorded in BH012-BH16, BH019 and BH020, which were located within the floodplain of river Wensum, and also in BH003 and WS103, which were located near a tributary of River Tud.

Groundwater readings from BH001 were consistently between 11.18 and 11.32m bgl.

Water levels of 11.85 to 13.33m bgl were recorded near the valley around Ringland Lane. BH005 and BH007 readings were deeper than 20m bgl.

Appendix B

EXPLORATORY HOLES LOGS

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Appendix B.1

CABLE PERCUSSION BOREHOLE LOGS

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NORFOLK PARTNERSHIP LABORATORY

Borehole Log

Sheet 1 of 4

Scheme	Ringland A47-A1067 Western Link Road	Job No.	PK1002D2	Borehole No.	001
Carried out for	CES Highways Projects	Date Started	27/08/2019	Date Finished	29/08/2019
Remarks:	Environmental samples taken at 0.5m, 1.0m and 2.0m. Dry. Pipe details incorrect.	Type of Rig	Hand tools+CP	Logged by	P. Gray
		Depth (m)	33.95	Ground Level (m AOD) 48.00	Drawn by GS
		Co-ords	609940 - 312567	Checked by	MLB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Loose brown gravelly, very sandy TOPSOIL. Gravel is sub-angular to sub-rounded fine to medium flint. MADE GROUND					01							
			Stiff light brown very sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-rounded fine to medium flint, chalk & granite subbase. MADE GROUND		0.45			02							
			Stiff to very stiff light brown, slightly gravelly CLAY. Gravel is fine to medium angular to sub angular chalk gravel. HEAD		0.70	1.00		05 04 06 07							
		250						10 11	S 14	23	38	17	20		
			Gravel becomes fine to coarse angular flint & chalk from 2.60m			2.00		13 14 15							
			Medium dense grey gravelly, fine to medium SAND. Gravel is angular to sub-angular fine to medium flint. HEAD		3.00	3.00		16 17	S 19	23	3939	1818	2121		
						4.00		18 19 20		25	37	17	20		
						5.00		21	S 61						
			Medium dense grey, very sandy, fine to coarse flint & chalk GRAVEL, SHERINGHAM CLIFFS FORMATION		5.35			22							
			Medium dense light brown very cobbly, fine to coarse rounded to sub-angular flint GRAVEL, in a light brown matrix of fine to coarse sand. SHERINGHAM CLIFFS FORMATION		6.00	6.00		24 25 23	S 65						
			Becoming clayey from 7.50m			7.00		27 28 29	S 47						
			Medium dense light brown slightly clayey, very gravelly, fine to medium SAND. Gravel is angular to sub-angular fine flint. SHERINGHAM CLIFFS FORMATION		8.00	8.00		30 31 32	S 58						
						9.00		33 34 35	S 39						

NORFOLK PARTNERSHIP LABORATORY

Borehole Log

Scheme	Ringland A47-A1067 Western Link Road	Job No.	PK1002D2	Borehole No.	001
Carried out for	CES Highways Projects	Date Started	27/08/2019	Date Finished	29/08/2019
Remarks:	Environmental samples taken at 0.5m, 1.0m and 2.0m. Dry. Pipe details incorrect.	Type of Rig	Hand tools+CP	Logged by	P. Gray
		Depth (m)	33.95	Ground Level (m AOD) 48.00	Drawn by GS
		Co-ords	609940 - 312567	Checked by	MLB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Medium dense light brown slightly clayey, very gravelly, fine to medium SAND. Gravel is angular to sub-angular fine flint. SHERINGHAM CLIFFS FORMATION					36	S 100						
								37							
								38							
			Loose yellowy brown slightly gravelly, medium SAND. Gravel is fine to medium angular to sub-angular flint & chalk. SHERINGHAM CLIFFS FORMATION		10.90	11.00		39	S 28						
								40							
						12.00		41	S 39						
								42							
								43							
			Medium dense yellowy brown slightly gravelly, fine to medium SAND. Gravel is fine rounded to sub-angular chalk. SHERINGHAM CLIFFS FORMATION		13.00	13.00		44	S 65						
								45							
								46							
						14.00		47	S 53						
								48							
								49							
						15.00		50	S 11						
								51							
								52							
						16.00		53	S 45						
								54							
								55							
			Medium dense light brown, slightly silty, slightly clayey, fine to medium SAND. SHERINGHAM CLIFFS FORMATION		17.00	17.00		56	S 24	20					
								57							
								58							
						18.00		59	S 32						
								60							
								61							
						19.00		62	S 15						
								63							
			Medium dense light brown slightly clayey, fine to medium SAND. SHERINGHAM CLIFFS FORMATION		19.45			64							

NORFOLK PARTNERSHIP LABORATORY

Borehole Log

Sheet 3 of 4

Scheme	Ringland A47-A1067 Western Link Road	Job No.	PK1002D2	Borehole No.	001
Carried out for	CES Highways Projects	Date Started	27/08/2019	Date Finished	29/08/2019
Remarks:	Environmental samples taken at 0.5m, 1.0m and 2.0m. Dry. Pipe details incorrect.	Type of Rig	Hand tools+CP	Logged by	P. Gray
		Depth (m)	33.95	Ground Level (m AOD) 48.00	Drawn by GS
		Co-ords	609940 - 312567	Checked by	MLB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Medium dense light brown slightly clayey, fine to medium SAND. SHERINGHAM CLIFFS FORMATION			21.00		65	S 16						
								66							
								67							
								68	S 23						
								69							
								70							
						22.00		71	S 29						
								72							
								73							
						23.00		74	S 29						
								75							
								76							
						24.00		77	S 27						
			Medium dense light brown slightly clayey , slightly silty, fine to medium SAND. SHERINGHAM CLIFFS FORMATION		24.50			79							
						25.00		80	S 27						
								81							
								82							
						26.00		83	S 29						
								84							
			Stiff grey slightly gravelly CLAY. Gravel is sub-rounded to rounded fine to medium chalk. LOWESTOFT TILL		26.50			85			15				
			Very soft to soft light grey gravelly, very sandy, clayey SILT. Gravel is fine to medium sub-angular to sub-rounded flint & chalk. LOWESTOFT TILL		27.00	27.00		86	S 38	14	21	12	9		
								87							
								88							
						28.00		89	S 29						
			Hard off white silt sized comminuted CHALK. (Grade VI, Dm). UPPER CHALK		28.20			90							
		200				29.00		91	S 17						
								92							

NORFOLK PARTNERSHIP LABORATORY

Borehole Log

Sheet 4 of 4

Scheme	Ringland A47-A1067 Western Link Road	Job No.	PK1002D2	Borehole No.	001
Carried out for	CES Highways Projects	Date Started	27/08/2019	Date Finished	29/08/2019
Remarks:	Environmental samples taken at 0.5m, 1.0m and 2.0m. Dry. Pipe details incorrect.	Type of Rig	Hand tools+CP	Logged by	P. Gray
		Depth (m)	33.95	Ground Level (m AOD)	48.00	Drawn by	GS
		Co-ords	609940 - 312567			Checked by	MLB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Hard off white silt sized comminuted CHALK. (Grade VI, Dm). UPPER CHALK					93							
								95 94							
						31.00			S 12						
						32.00									
			Hard off white gravelly, silt sized comminuted CHALK. (Grade V, Dc.) Gravel becoming moderately weak and low to medium density. UPPER CHALK		32.50			96							
						33.00		97							
								98	S 21						
					33.95	34.00									
						35.00									
						36.00									
						37.00									
						38.00									
						39.00									

Appendix B.4

TRIAL PIT LOGS

CONFIDENTIAL

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	Ringland A47-A1067 Western Link Road	Job No.	PK1002D2	Trial Pit No.	401A
Carried out for	CES Highways Projects	Date Started	29/08/2019	Date Finished	27/08/2019
Dimensions:	0.45m x 1.70m	Type of Rig	JCB 3CX	Logged by	GS
Remarks:	Dry & Stable. Environmental Samples taken at: 0.50m, 1.00m and 2.00m. CBR taken at 0.80-1.00m	Depth (m)	2.00	Ground Level (m AOD) 49.11	Drawn by GS
		Co-ords	609787 - 312486		Checked by MLB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown sandy TOPSOIL. TOPSOIL												
			Orangey brown slightly clayey, slightly silty, very gravelly medium SAND . Gravel is fine to coarse rounded flint & quartz, occasional sandstone. SHERINGHAM CLIFFS FORMATION		0.25										
			Orangey brown slightly clayey, slightly silty, slightly gravelly fine to medium SAND. Gravel is fine to medium rounded flint and quartz. SHERINGHAM CLIFFS FORMATION *Becoming gravelly from 1.20m*		1.00	1.00		02							
					2.00	2.00		04							
						3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	Ringland A47-A1067 Western Link Road	Job No.	PK1002D2	Trial Pit No.	401B
Carried out for	CES Highways Projects	Date Started	29/08/2019	Date Finished	27/08/2019
Dimensions:	0.45m x 2.10m	Type of Rig	JCB 3CX	Logged by	GS
Remarks:	Dry & Stable.	Depth (m)	2.50	Ground Level (m AOD)	49.08
		Co-ords	609795 - 312488	Drawn by	GS
				Checked by	MLB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown sandy TOPSOIL. TOPSOIL												
			Orangey brown very gravelly, slightly silty, slightly clayey, fine to medium SAND. SHERINGHAM CLIFFS FORMATION		0.35	1.00									
			Light brown fine to medium SAND. SHERINGHAM CLIFFS FORMATION		2.10	2.00		02							
					2.50	3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	Ringland A47-A1067 Western Link Road	Job No.	PK1002D2	Trial Pit No.	401C
Carried out for	CES Highways Projects	Date Started	29/08/2019	Date Finished	27/08/2019
Dimensions:	0.45m x 2.30m	Type of Rig	JCB 3CX	Logged by	GS
Remarks:	Dry & Stable.	Depth (m)	3.00	Ground Level (m AOD)	49.01
		Co-ords	609805 - 312489	Drawn by	GS
				Checked by	MLB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown sandy TOPSOIL. TOPSOIL												
			Orangey brown very gravelly, slightly silty, slightly clayey, fine to medium SAND. SHERINGHAM CLIFFS FORMATION		0.35										
						1.00									
			Light brown fine to coarse SAND. SHERINGHAM CLIFFS FORMATION		1.75										
						2.00									
			Light greyish brown, fine to medium SAND. SHERINGHAM CLIFFS FORMATION		2.10										
								01							
					3.00	3.00									
						4.00									

ferrovial construction

Norfolk County Council

RAMBOLL

NORWICH WESTERN LINK

DOCUMENT TITLE*:
Factual Ground Investigation Report

DOCUMENT NUMBER*	NCCT41793-HAG-VGT-FSC-RP-GI-0001

STATUS*	S5 - Suitable for Review and Acceptance (appointing party)	Date*:	15/02/2022
		Revision*:	P03
ASITE Task ID:			

Prepared by*	Checked by*	Approved by*
		
Rachael Leech Senior Geotechnical Engineer	Steve Williams Managing Director	Steve Williams Managing Director

*Details correct at time of upload to ASITE. Check ASITE for current document status, and Workflows Approval
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2. Contents

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Project:	Norwich Western Link
Reference No.:	NCCT41793_GI
Date:	February 2022
Prepared for:	Ferrovial Construction (UK) Limited
Investigation Supervisor:	Ramboll UK Limited

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Prepared For: **Ferrovial Construction (UK) Limited**

Investigation Supervisor: **Ramboll UK Limited**

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Location ID	Easting	Northing	Ground Level (maOD)	Test Date	Test Reference	Test Depth (m)	Test Level (maOD)
				29/10/2021	HPD01	25.60	-16.72
				02/11/2021	HPD02	40.40	-31.52
				03/11/2021	HPD03	51.60	-42.72
BHR18	613679.29	315335.05	8.88	10/11/2021	PIP01	17.00	-8.12
				11/11/2021	HPD01	25.70	-16.82
				12/11/2021	HPD02	35.80	-26.92
				15/11/2021	HPD03	45.30	-36.42
BHR21	613622.27	315346.62	8.97	12/10/2021	PIP01	9.90	-0.93
				13/10/2021	PIP02	19.90	-10.93
				14/10/2021	HPD01	29.80	-20.83
				19/10/2021	HPD02	48.90	-39.93
BHR22	613577.87	315308.50	11.78	19/11/2021	PIP01	6.30	5.48
				19/11/2021	HPD01	16.30	-4.52
				22/11/2021	HPD02	18.10	-6.32
				23/11/2021	HPD03	27.90	-16.12
				24/11/2021	HPD04	45.40	-33.62
BHR25	613521.11	315322.12	12.03	25/11/2021	PIP01	9.20	2.83
				26/11/2021	HPD01	20.90	-8.87

Table 3.2.10: Summary of pressuremeter testing locations and details.

3.2.11 Sampling and Soil Logging

Each drilling rig was directly supervised by an experienced geotechnical engineer. The supervising engineer was responsible for logging and subsampling soils recovered by cable percussive and window sampler rigs. Rotary and dynamic samples recovered using rotary drilling methods were transported to the main site compound where a team of experienced geotechnical engineers logged and subsampled the cores on site.

All geotechnical samples and boxes of core were transported directly to HGE geotechnical laboratory off site using an in-house transportation system. Schedules were compiled and sent to the Investigation Supervisor and Ferrovial within 48 hours of completion of each exploratory location to allow for subsequent testing to be scheduled.

All environmental samples were subject to a screening for volatile organic compounds (VOC) using a photo ionisation detector (PID) and were sent directly to the chemical testing laboratory within 24 hours of sampling. Chain of custodies were prepared and sent to the Investigation Supervisor and Ferrovial also within 24 hours of sampling to allow for subsequent testing to be scheduled.

3.2.12 Health and Safety Operation

Prior to commencement of any site work, a site induction was delivered by Ferrovial to all personnel which included an outline summary of the project, site rules, hazards and risks associated with working on the site. The HGE site agent delivered a daily site briefing to all operatives which also detailed specific hazards and risks identified as each task progressed and the measures emplaced in order address these. Toolbox talks on specific subjects were also delivered to site personnel intermittently throughout the project and a detailed record was kept of any incidents or events that occurred throughout the progression of the fieldwork.

3.3 Fieldwork Observations

3.3.1 Lithology

The exploratory locations across the site encountered a range of different soil types which are considered to be representative of the formations summarised in the following sections and in table 3.3.1.

Topsoil

Topsoil deposits were encountered within a majority of the locations across the site area. These deposits were broadly encountered to depths between 0.3 – 0.4m however were encountered to a maximum depth of 0.8m within TP21. Composition of these deposits varied locally however were generally described as granular soils with variation in the content of fines.

Made Ground

Very limited made ground was encountered during the investigation and was only recorded within 6no. locations across the site area. Where recorded, made ground was limited to surficial layers encountered to depths between 0.3 – 0.55m depth with anthropogenic constituents noted to comprise occasional or rare brick fragments.

Alluvium

Deposits considered representative of Alluvium were encountered within a small portion of the locations investigated, all of which were situated within the River Wensum valley floodplain. Soils were generally described as very soft to soft sandy clay however deposits of sandy silt and silty sand were also noted. The thickness of the Alluvium deposits was limited to depths generally less than 2m however were noted to extend to 2.4m depth within BHR17. Horizons of fibrous peat were frequently recorded within the alluvial soils and individual layers of pseudo-fibrous peat and amorphous peat were recorded at two locations (WS11 and BHR15) between depths of 0.4 – 0.6m and 0.5 – 1.95m respectively.

River Terrace Deposits

Granular soils considered representative of River Terrace Deposits were encountered within positions in a localised area north of the River Wensum. These soils were typically described as slightly silty to silty, gravelly to very gravelly medium to coarse sand with low to medium flint cobble content. Horizons of fine to coarse flint gravel were also typically encountered within this unit and in-situ testing indicates that these deposits were generally medium dense to dense. Overall, these soils were encountered to maximum depths of 6m and 6.5m in positions BHR02 and BHR03 respectively, however were also encountered to a maximum depth of 4.85m within WS05.

Lowestoft Till

Cohesive glacial deposits considered representative of the Lowestoft Formation were typically encountered within the far southwestern portions of the site. These deposits were generally described as firm to stiff sandy gravelly silty clay with local variation in the content of fines. Gravel constituents typically comprised fine to coarse chalk with varying amounts of flint and quartz however also included rare accounts of sandstone and rare flint cobbles. These deposits were largely encountered directly beneath topsoil deposits in the southwest of the site however were also encountered at depth beneath other glacial formations within some locations towards the central regions of the site. Overall, the thickness of these deposits was found to vary however the maximum depth these soils were encountered to was 34.6m within CP08.

Sheringham Cliffs Formation

Deposits considered representative of the Sheringham Cliffs Formation were frequently encountered across the entire site and were recorded within a vast proportion of the exploratory locations. Deposits comprised both granular and cohesive horizons although the granular horizons were observed to be the most prominent soil type of this formation with the cohesive horizons observed to be more localised.

Where granular soils were recorded, these were categorised as the *Sheringham Cliffs Formation Sand and Gravel.* These granular deposits typically comprised silty gravelly fine to coarse sand with local variation in the content of fines but also included limited horizons of sandy gravel. Gravel components mainly comprised flint however records of sandstone, chalk and quartz were occasionally noted throughout. A low to medium cobble content was also frequently observed with cobbles comprising flint. Localised pockets and lenses of sandy clay were also sporadically recorded throughout the granular strata at varying depths and thicknesses. Overall, deposits of the *Sheringham Cliffs Formation Sand and Gravel* were recorded to a maximum depth of 24.9m in CP08 however were observed to variable thicknesses throughout the site.

Where cohesive deposits considered representative of the *Sheringham Cliffs Formation Silts and Clays* were encountered these were typically described as firm to stiff slightly gravelly sandy clay with local variation in the content of fines. Gravel constituents typically comprised flint with rare accounts of chalk and sandstone also recorded. Localised pockets and lenses of sand were also occasionally observed throughout the cohesive strata. Two horizons of slightly sandy silt were recorded within WS19 and WS20 however no further silt deposits considered representative of the *Sheringham Cliffs Formation Silts and Clays* were recorded during the investigation. Overall, cohesive horizons of the *Sheringham Cliffs Formation Silts and Clays* were encountered to a maximum depth of 6.3m recorded in BHR35 however were observed to variable thicknesses throughout the site.

Glacial Deposits

Deposits referred to as *Glacial Sand and Gravel* or *Glacial Silts and Clays* have been categorised where it has been difficult to discern the distinct geological formation to which these deposits belong, but are otherwise considered to be a product of glacial activities. These glacial deposits were encountered across the entire site area to varying extents and were found amid other formations more easily distinguished.

Where granular deposits have been encountered these have generally been described as slightly silty gravelly fine to coarse sand with gravel typically comprising flint however occurrences of chalk, sandstone and quartz were also recorded. The content of fines and density of these deposits varied locally however they were typically found to be medium dense. The colour of these granular deposits was frequently recorded as yellowish brown or light brown with darker colours such as greyish brown and brown recorded within boreholes undertaken within the Wensum Valley floodplain. Overall, *Glacial Sand and Gravel* deposits were recorded to a maximum depth of 33.35m within BHR32 however were observed to variable thicknesses and extents throughout the site.

Cohesive deposits referred to as *Glacial Silts and Clays* were encountered within localised exploratory positions across the site area to a maximum depth of 34.9m recorded within BHR32. Both silt and clay deposits were recorded each with a wide variation in secondary constituents. Where gravel was recorded as a secondary constituent the lithology typically comprised flint however chalk was also commonly recorded.

Chalk

Both structureless and structured chalk bedrock deposits were encountered across the site underlying variable superficial soils to a maximum depth of 60.5m. Initially structureless chalk deposits were encountered and were described as either grade Dm deposits composed of silt or grade Dc deposits composed of gravel. Gravel clasts comprised chalk of varying density however flint gravel and cobbles were also commonly encountered.

Where structure was observed within the chalk strata, gradings were applied in accordance with CIRIA C574 to classify the chalk strata by the discontinuity apertures observed with subdivisions applied to the gradings dependent on the discontinuity spacing present. Chalk grades A – C were recorded over variable depths with variation in the discontinuity spacings observed. Density of the chalk was described as variably low to high with the corresponding strength recorded as very weak to moderately strong. Overall, the density of the chalk was generally observed to increase with depth.

During the ground investigation localised occurrences of sand deposits were encountered during advancement through the chalk stratum within BHR13 and BHR14. These occurrences of granular material appeared to be random and sporadic in their location and extent and could not be predicted. During the advancement of BHR13 the surface of the chalk bedrock as encountered at a depth of 10.1m before a layer of granular material described as greyish brown fine to medium sand was encountered between 20m and 20.9m depth. Between 49m and 50m depth, further granular material was encountered and was described as brownish grey slightly silty fine to medium sand. This material was coincident with sub-artesian groundwater and initially advanced 8m back up the borehole (blowing sands) as detailed on the appended rotary borehole record for BHR13. Further problems were encountered with blowing sands during the advancement of this borehole which thus resulted in early termination at 55m depth.

A similar occurrence was noted during the advancement of BHR14 however more substantial layers of granular material were encountered. These granular horizons within the chalk stratum were encountered at shallower depths between 10.5 – 11.30m and 12.4 – 19.1m and were not noted to be associated with sub-artesian groundwater and thus did not blow back up inside the casing. Whilst the presence of sand deposits within the chalk stratum proved to be problematic for the rotary drilling at this location they did not impede the advancement to the scheduled 60m depth as was the case for BHR13. Overall, the granular

deposits encountered at these locations have been characterised as *Glacial Sand and Gravel* deposits within the chalk stratum albeit their origins are unknown although likely associated with dissolution activity.

Geology	Depth Below Ground Level (m) Encountered		Thickness (Min / Max) (m)	Thickness (Average) (m)	Site Level Range Encountered (maOD)	
	Upper Boundary	Lower Boundary			Upper Boundary	Lower Boundary
Topsoil	Ground Level	0.10 - 0.80	0.10 - 0.80	0.39	8.70 - 57.58	8.30 - 57.23
Made Ground	Ground Level	0.04 - 0.57	0.04 - 0.57	0.31	15.80 - 58.66	15.40 - 58.51
Alluvium	Ground Level - 0.50	0.50 - 2.40	0.20 - 2.10	1.04	8.41 - 8.97	6.48 - 8.65
Peat	0.40 - 0.50	0.90 - 1.95	0.50 - 1.45	0.98	8.45	7.00 - 7.95
River Terrace Deposits	0.40	0.65 - 6.50	0.25 - 6.10	4.10	10.54 - 11.66	4.46 - 10.29
Lowestoft Till	0.25 - 31.00	0.60 - 34.60	0.35 - 7.75	3.37	24.71 - 51.33	21.11 - 49.98
Sheringham Cliffs Formation - Sand And Gravel	0.04 - 4.05	0.10 - 24.90	0.02 - 24.50	2.96	9.69 - 58.48	6.99 - 58.46
Sheringham Cliffs Formation - Silts And Clays	0.15 - 3.40	0.18 - 6.30	0.03 - 4.05	1.55	17.75 - 58.51	17.30 - 58.48
Glacial Sand and Gravel	0.30 - 24.90	1.00 - 33.35	0.10 - 29.85	6.39	4.46 - 54.52	-17.04 - 51.22
Glacial Silts and Clays	0.80 - 29.70	2.20 - 34.90	0.05 - 10.60	2.44	-8.02 - 41.30	-9.32 - 38.35
Structureless Chalk (Dm)	0.50 - 34.60	2.00 - 55.90	0.10 - 44.40	11.63	-9.32 - 26.37	-46.63 - 20.17
Structureless Chalk (Dc)	2.50 - 27.00	12.00 - 60.00	1.30 - 48.40	24.00	-8.62 - 20.17	-50.11 - 8.70
Structured Chalk	13.62 - 38.00	22.50 - 60.50	2.00 - 46.38	27.28	-17.80 - 14.17	-51.69 - 5.90

Table 3.3.1: Summary of stratum ranges encountered

3.3.2 Groundwater

Groundwater was encountered in some exploratory holes during the ground investigation as summarised in table 3.3.2 below. No groundwater was encountered at those locations not included within the table.

Exp Hole ID	Water Strikes			
	Depth Struck		Rose to	
	mbgl	maOD	mbgl	maOD
BHR02	2.60	8.38	2.40	8.58
BHR03	2.80	8.16	2.50	8.46
BHR12	8.00	1.21	6.00	3.21
BHR13	0.90	8.14	0.70	8.34
BHR14	0.90	8.37	0.60	8.67
BHR15	1.50	7.45	0.85	8.1
BHR16	Groundwater at surface for start of drilling at 0.00	8.91	-	-
BHR17	2.40	6.48	1.00	7.88
BHR18	1.00	7.88	0.50	8.38
BHR19	Groundwater at surface for start of drilling at 0.00	8.76	-	-
BHR20	1.10	7.6	1.10	7.6
BHR21	1.00	7.97	0.50	8.47
BHR22	2.60	9.18	-	-

Exp Hole ID	Water Strikes			
	Depth Struck		Rose to	
	mbgl	maOD	mbgl	maOD
BHR29	4.30	19.18	4.30	19.18
BHR35	0.90	35.28	0.69	35.49
BHR35	10.50	25.68	9.52	26.66
CP03	Seepage at 4.00	12.84	-	-
CPT05	1.00	35.52	0.90	35.62
WS05	4.00	8.06	3.46	8.6
WS06	5.00	8.05	4.40	8.65
WS07	2.00	8.16	1.10	9.06
WS10	1.00	8.09	0.10	8.99
WS11	1.00	7.85	0.00	8.85
WS12	2.00	7.15	1.50	7.65
WS12	6.00	3.15	5.50	3.65
WS29	4.45	38.9	-	-
WS31	4.16	42.95	-	-

Table 3.3.2: Summary of groundwater levels during drilling and excavation

3.4 In-Situ Testing

In-situ testing was undertaken for geotechnical purposes and is summarised below in table 3.4 with subsequent sections providing details regarding the test results.

Test Type and Reference	Stratum	Number of Results	Results (Range)	Comments / Limitations
Standard penetration test (BS EN ISO 22476-3:2005+A1:2011)	Alluvium	3	N = 0 – 26 N_{60} = 0 - 27	Values generally indicative of very loose granular deposits. 1no. N value of 26 was obtained within BHR17 is considered to be an outlier to the dataset.
	Peat	1	N = 7 N_{60} = 7	1no. N value obtained drilling BHR15. N value considered to be uncharacteristically high for peat deposits and should be treated with caution.
	River Terrace Deposits	14	N = 10 – 48 N_{60} = 8 - 36	Representative of loose to dense granular soils.
	Lowestoft Till	29	N = 8 – 33 N_{60} = 9 - 38	Representative of firm to very stiff cohesive soils
	Sheringham Cliffs Formation Sand and Gravel	160	N = 2 – 50 N_{60} = 2 - 60	Representative of very loose to very dense granular soils.
	Sheringham Cliffs Formation Silts and Clays	31	N = 3 – 50 N_{60} = 3 – 58	1no. N value of 50 was obtained during drilling WS15 and considered to be an outlier of the dataset N value range typically between 3 – 28 which is considered representative of soft to very stiff cohesive soils.
	Glacial Sand and Gravel	131	N = 4 – 50 N_{60} = 4 - 60	Representative of very loose to very dense granular soils.
	Glacial Silts and Clays	12	N = 7 – 50 N_{60} = 8 - 60	4no. N values of 50 were obtained during the drilling of BHR32 and BHR34. N value range typically between 7 – 26 which is considered representative of firm to very stiff cohesive soils.
	Structureless Chalk (Dm)	93	N = 0- 50 N_{60} = 0 - 58	

Test Type and Reference	Stratum	Number of Results	Results (Range)	Comments / Limitations
	Structureless Chalk (Dc)	50	N = 2 – 50 N_{60} = 3 - 64	Representative of uncompact to compact chalk deposits. Chalk grade difficult to determine from SPT values. A degree of higher N values observed within each chalk stratum are likely due to contact with very gravelly horizons, flint or chalk rock cobbles or inability to penetrate some structured chalk grades.
	Structured Chalk	69	N = 7 – 50 N_{60} = 7 -63	
Dynamic Cone Penetrometer (DMRB CS 229, Section 6)	All Strata	443 (51 DCP)	0.52-1300%	As a handheld probe the TRL DCP equipment can often be deflected or return anomalous readings due to obstructions. Difficulties can also occur when penetrating strongly stabilised layers or granular materials with large particles. Further discussed in section 3.4.2
Infiltration Testing (BRE DG 365 'Soakaway Design')	Sheringham Cliffs Formation – Sand and Gravel	12 (4 Tests)	1.2E-04 – 8.3E-07 m/s	3no. infillings undertaken within each test in accordance with BRE DG 365 methodology. Effective rates given for TP04 as discussed in section 3.4.3.
	Sheringham Cliffs Formation – Silts and Clays	3 (1 Test)	1.1E-06 - 8.9E-07 m/s	
	Chalk	21 (7 Tests)	5.2E-05 – 7.0E-07 m/s	
Falling Head Permeability Testing (BS EN ISO 22282-2: 20212)	Sheringham Cliffs Formation – Sand and Gravel	1	k = 1.0E-06 m/s	1no. falling head test performed within standpipe installation within CP03.
	Glacial Sand and Gravel	6	k = 3.1E-06 – 2.4E-07 m/s	Testing undertaken within CP11 and CP12. 6no. falling head tests performed within standpipe installations, 3no. tests per location.
Hand Penetrometer (BS 1377: 1990: Part 9 & Manufacturer's Instructions)	Alluvium	3	-	All tests failed – too soft
	Lowestoft Till	106	25 - 230 kPa	11 tests failed – too gravelly/ sandy Average result - 118.8kPa Indicative of low to very high strength clays
	Sheringham Cliffs Formation – Silts and Clays	68	33 - >220 kPa	9 tests failed – too gravelly/sandy Average result – 90.9kPa Indicative of low to very high strength clays
	Sheringham Cliffs Formation – Sand and Gravel	5	37 - 120 kPa	Testing undertaken on cohesive pockets and lenses recorded within granular strata. 2 tests failed Average result – 67.3kPa Indicative of low to high strength clays
	Glacial Silts and Clays	17	33 - >250 kPa	1 test failed Average result – 132.3kPa Indicative of low to very high strength clays
Hand Shear Vane (BS 1377: 1990: Part 9, Clause 4.4)	Topsoil	1	-	All tests failed – too soft/ sandy
	Alluvium	5	-	All tests failed – too soft/ sandy
	Lowestoft Till	90	33 - >240 kPa	28 tests failed - too gravelly/sandy Average result – 132.2kPa Indicative of low to very high strength clays
	Sheringham Cliffs Formation – Silts and Clays	29	40 - 120 kPa	12 tests failed - too gravelly/sandy Average result – 99.6kPa Indicative of low to high strength clays
	Glacial Silts and Clays	13	76 - >120 kPa	8 tests failed - too gravelly/sandy Average result – 103.2kPa Indicative of high strength clays

3.4.3 Infiltration Testing

Twelve soakaway tests were conducted at designated positions, the results of which are presented in table 3.4.3 below and are calculated in accordance with BRE Digest 365 'Soakaway Design'. Effective rates have been presented for testing undertaken within TP04 as each infilling did not drain to 25% of the pit depth within 24hours in accordance with BRE365 methodology. Instruction was received by the Investigation Supervisor to continue with the testing at this location.

Location ID -	Infilling 1 (m/s)	Infilling 2 (m/s)	Infilling 3 (m/s)	Recommended Design Infiltration Rate (m/s)	Soil depth at which rate applies (mbgl)	Strata
TP04	1.0E-06*	8.5E-07*	8.3E-07*	**8.3E-07***	2.84 - >4.00	Chalk
TP05	1.0E-06	8.3E-07	8.7E-07	**8.3E-07**	2.99 - >4.00	Sheringham Cliffs Formation – Sand and Gravel
TP06	2.1E-05	1.3E-05	1.4E-05	**1.3E-05**	3.08 - >4.00	Chalk
TP07	9.2E-06	7.3E-06	6.3E-06	**6.3E-06**	0.68 - >1.60	Sheringham Cliffs Formation – Sand and Gravel
TP11	3.2E-05	1.3E-05	1.1E-05	**1.1E-05**	2.93 - >4.00	Chalk
TP12	1.0E-06	7.0E-07	1.1E-06*	**7.0E-07**	2.72 - >4.00	Chalk
TP13	1.1E-06	9.8E-07	8.9E-07	**8.9E-07**	2.50 - >4.00	Sheringham Cliffs Formation – Silts and Clays
TP14	1.1E-04	8.3E-05	5.2E-05	**5.2E-05**	3.10 - >4.00	Chalk
TP37A	2.1E-04	1.2E-04	1.3E-04	**1.2E-04**	1.03 - >1.50	Sheringham Cliffs Formation – Sand and Gravel
TP38	8.1E-06	6.5E-06	6.2E-06	**6.2E-06**	1.73 - >3.50	Sheringham Cliffs Formation – Sand and Gravel
TP51	1.7E-06	1.5E-06	2.6E-06	**1.5E-06**	3.11 - >4.00	Chalk
TP52	4.1E-06	3.1E-06	3.6E-06	**3.1E-06**	3.10 - >4.00	Chalk
* Effective rate only based on maximum water depth achieved. Drainage to 25% of pit depth not achieved within 24hours in accordance with BRE DG 365.						

Table 3.4.3: Infiltration test result summary

3.4.4 Falling Head Permeability Testing

Falling head permeability testing was completed at 3no. locations (CP03, CP11 and CP12) during the ground investigation. It was requested by the Investigation Supervisor to undertake permeability testing during the drilling of CP03, however due to the nature of the material being tested, collapse of the hole occurred during attempt of the test. As such it was subsequently instructed for the borehole to be installed with a monitoring standpipe and a falling head test to be completed within the installation. Testing was also completed within borehole installations within CP11 and CP12. The testing completed at these locations was instructed to be undertaken in the fashion of an infiltration test by completing 3 infillings in an attempt to replicate worse case conditions as described in BRE365 methodology. The results of the permeability testing undertaken are presented within table 3.4.4 below and presented within Appendix C.

Location ID	Diameter of Installation (mm)	Response Zone (mbgl)		Response Zone (maOD)		Target Strata	Coefficient of Permeability (k)
		Top	Base	Top	Base		
CP03	50	0.60	2.00	16.24	14.84	Sheringham Cliffs Formation – Sand and Gravel	PRM 01 – 1.0E-06 m/s
CP11	50	11.00	12.00	39.86	38.86	Glacial Sand and Gravel	PRM 01 – 3.1E-06 m/s PRM 02 – 8.1E-07 m/s PRM 03 – 1.1E-06 m/s
CP12	50	8.50	9.50	43.18	42.18	Glacial Sand and Gravel	PRM 01 – 3.9E-07 m/s PRM 02 – 3.6E-07 m/s PRM 03 – 2.4E-06 m/s

Table 3.4.4: Permeability test result summary

DATASHEET: SITE INVESTIGATION METHODS

This datasheet provides basic details of the methods employed during the undertaking of site investigations. Detailed method statements may be provided if requested or further information may be obtained from the relevant British Standards or other quoted publications. Investigations are generally carried out in accordance with BS 5930:2015 + A1:2020, "Code of practice for ground investigations", BS 10175:2011+A2:2017, "Investigation of potentially contaminated sites – Code of Practice, and BS EN ISO 1997-2:2007, "Eurocode 7 – Geotechnical design – Part 2: Ground investigation and testing".

Prior to any excavation being undertaken, service plans are obtained and/or a service tracing team may be employed to locate and mark up service locations. A surface sweep using a cable avoidance tool (CAT) is undertaken, in order to avoid services and service inspection pits are generally hand excavated prior to commencing work with any mechanical plant.

CABLE PERCUSSIVE BOREHOLES

The cable percussive borehole drilling rig may be towed by a 4x4 pick up or similar vehicle, and is capable of forming cased boreholes to depths of up to 50m. The hole may be formed at diameters from 300mm down to the more typical 150mm, with disturbed samples obtained direct from the drilling tools. The equipment requires a minimum 2m access width, and the rig itself is 6m long (11m including tow). A rough 3m x 5m base area is required for drilling, but each site should be considered on specifics.

The technique can penetrate dense made ground, rubble and concrete or weathered rock/thin bands of rock using a chisel. However, in some cases these materials can form obstructions.

Sampling is generally carried out in accordance with BS EN ISO 22475-1:2006, "Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 – Technical principles for execution". A variety of disturbed samples can be obtained for both geotechnical and environmental purposes and undisturbed samples including U100 (thick walled OS-TK/W), UT100 (thin walled OS-T/W) and piston samples (PS-T/W) may be obtained. Standard in-situ testing may include Standard or Cone Penetration Tests (SPT/CPT) to BS EN ISO 22476-3:2005+A1:2011, "Geotechnical investigation and testing – Field testing – Part 3 – Standard penetration test"; vane testing in accordance with BS 1377-9:1990, "Methods of test for soils for civil engineering purposes" and permeability testing in accordance with BS EN ISO 22282-1-6:2012, Geotechnical investigation and testing – Geohydraulic testing – Parts 1 to 6.

Instrumentation/standpipes/monitoring wells can be installed, otherwise the borehole would be backfilled with spoil, or where instructed bentonite, concrete or sand may be used. Excess spoil is either removed from site or left in a tidy heap nearby.

In wet drilling conditions (beneath groundwater level) or where water needs to be added to facilitate drilling, the spoil can spread over a wide area through splashing and flow of the spoil from the tools, unless precautions are taken to prevent this. Conversely, the system can be very clean for instance when drilling through dry clay soil.

DYNAMIC CONTINUOUS SAMPLING (WINDOW SAMPLER) BOREHOLES

The dynamic continuous sampling (DCS) system comprises a series of varying diameter (100mm down to 36mm) steel tubes of either 1m length, and in the case of window (rather than windowless) having a slot or window cut along the side. The tubes are driven into the ground using a light percussive hammer attached to solid rods, and withdrawn by use of a jack. The hammer may be machine mounted (wheeled or tracked) or for restricted access work, hand held. The soil sample is forced up into the tube during the driving, samples being obtained directly through the slot or window, or in the case of windowless, in plastic liners in the steel tube. The sampler generally achieves depths of around 5m in favourable soils. Use of a super heavy tracked rig allows samples to be retrieved in liners to depths of up to 10m in suitable ground conditions.

Sampling can be carried out from the boreholes in accordance with BS EN ISO 22475-1:2006 and SPT testing can be undertaken in accordance with BS EN ISO 22476-3:2005+A1:2011. In addition small diameter standpipes/monitoring wells can be installed to facilitate the sampling and monitoring of gas and groundwater.

CONE PENETRATION TESTING

A 18 tonne or larger truck-mounted rig is normally used, with or without tracks, to undertake cone penetration tests (CPT). The CPT unit is equipped with a hydraulic ram to drive an electric piezocone of a type conforming to the requirements of clause 3.1 of BS1377: 1990: Part 9 or BS EN ISO 22476-1.

Cone measurements can include cone tip resistance, friction sleeve resistance and dynamic pore water pressure (piezometer) sampled at a 10mm resolution. Cone maintenance, checks and calibrations are carried out in accordance with recommendations of the International Reference Procedure for CPTU (ISSMGE, 1999).

ROTARY BOREHOLES

Rotary drilling is used in hard rock areas where cable percussive or auger methods are not suitable. Drilling fluid is generally used, which are passed from the surface through hollow drill rods to the face of the drill bit to cool and lubricate the bit and transport drill cuttings to the ground surface as well as stabilising the hole in certain circumstances. Drilling fluids used include water, mist, air and in some cases mud, polymers or foam.

There are two basic types of rotary drilling; open hole drilling, where the drill bit cuts all the material within the diameter of the borehole; and core drilling, where an annular bit, fixed to the bottom of the outer rotating tube of a core barrel, cuts a core, which is recovered within the innermost tube of the core barrel assembly and bought to the surface.

Open hole drilling is often used with casing to stabilise the drill hole and is generally used to form a rapid hole in soils or weak rock. The returns and the rate of penetration are the only means of recording information so the accuracy of rock descriptions and identification of the changes of strata are limited using this method. Rotary coring is used to recover good quality core samples of the materials being drilled with various methods and diameters available, depending upon anticipated strata and requirements.

Numerous rig types are available from small track mounted units able to work in limited access situations to large lorry mounted units requiring large operating areas.

MONITORING WELL INSTALLATIONS

All types of boreholes can be fitted with monitoring wells to enable subsequent sampling and monitoring of groundwater and ground gas levels. Monitoring wells are usually of upvc or hdpe material, although steel may also be used in certain circumstances. Various diameters are available from 19mm upwards, depending upon the size of the borehole. 38mm or 50mm diameter wells are

the most commonly used. Wells generally have slotted lower sections which may have a geomesh filter and then are surrounded with a filter medium such as single sized gravel. The upper sections are generally solid casing which is usually grouted to produce a seal with the surrounding ground. The top of the well is generally fitted with a removable cap that may include a gas valve to enable future gas monitoring. The installation is usually protected by a lockable cover set in a concrete base. Details of monitoring well installations and associated backfill are given on the relevant borehole records.

GROUNDWATER MONITORING

Groundwater monitoring is undertaken using an electronic dip meter, which records the depth to water in a standpipe or monitoring well. Alternatively, down-hole pressure transducers cab be utilised which can record variations over an extended period, which is particularly useful in monitoring variations due to tidal influences or when undertaking permeability tests or draw down tests or when undertaking soakaway testing. Where a non-aqueous phase liquid (e.g. floating hydrocarbon layer) is present, an interface meter is utilised to measure the thickness.

GROUND GAS MONITORING

Ground gas composition and flow monitoring may be undertaken where monitoring wells have been installed. Both flow (litres per hour) and composition (%) are measured using a portable infra-red multi-gas meter, calibrated for methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen. Records are also taken of atmospheric pressure, and relative pressure. The results are presented in the appendix of the report on the relevant records.

Ground gas monitoring can also be undertaken on a continuous basis using in-situ GasClam instrumentation where specific projects warrant accurate identification and quantification of the ground gas regime.

MACHINE EXCAVATED TRIAL PITS

Machine excavated trial pits are undertaken using a wheeled back-hoe or tracked 360 excavator. The hole is progressed, with the supervising Geotechnical Engineer taking samples and/ or carrying out in-situ testing as appropriate. No access may be made in to unstable/ contaminated pits, or into pits greater than 1.20m deep. Where man access is required, shoring can be provided and installed to maintain stability of the excavation. The trial pits are backfilled in compacted layers, with spoil heaped up in order to allow for future settlement. Pits may be taken to a maximum of 4.50m depth in favourable conditions.

Machine excavated trial pits require relatively large clear working areas in which to be carried out and can cause considerable disturbance to the ground surface.

HAND EXCAVATED TRIAL PITS

Hand excavated pits may be undertaken for a variety of reasons, which include service observation pits, obtaining near surface samples, and examining foundations of existing buildings. Pits are excavated using a shovel, postholers and other suitable equipment. Shoring is necessary where pits are to be extended greater than 1.2mbgl and deep excavations may take a considerable time to undertake. Detailed records of hand excavated pits are only normally recorded where foundation depths and detailed information is required.

TRIAL PIT SOAKAWAY TESTING

Soakaway tests are undertaken in machine excavated trial pits to determine the infiltration rate of the soils on a site in accordance with BRE Digest 365, “Soakaway design”. The trial pit is excavated using a mechanical excavator and vertical sides are trimmed square and accurate measurements of the pit dimensions are made. In granular soils the pit is backfilled with coarse single size gravel to the top of the natural soils to prevent collapse of pit sides upon filling with water. Where granular fill is used a temporary perforated monitoring well is installed over the depth of the trial pit prior to backfilling. This allows monitoring of the water level by an electronic dip-meter or pressure transducer. In cohesive soils, granular fill may not be required and a monitoring installation is replaced by a fixed datum bar placed across one end of the pit. The water level is monitored using a tape or dip-meter. The pit is rapidly filled with water from a bowser / tanker to fill the pit to its maximum effective depth in a short time. Care is taken to prevent the collapse of pit walls. The pit is filled and allowed to drain three times to 25% full where ground conditions and time constraints allow. The water level is recorded at intervals sufficiently close to define water level versus time. The three fillings should be on the same or consecutive days. The soil infiltration rate (f) is calculated from the time taken for the water level to fall from 75% to 25% effective storage depth in the pit, using the lowest f value the three tests for design.

TRL DYNAMIC CONE PENETROMETER TEST (TRL DCP)

The TRL (Transport Research Laboratory) Dynamic Cone Penetrometer is an instrument designed for the rapid in-situ measurement of the structural properties of existing road pavements constructed with unbound materials. Continuous measurements are made down to a depth of 850mm, or when extension rods are use, the subgrade strata beneath can be penetrated to a depth of 2 metres. These measurements are converted to CBR values and Layer Stiffness Modulus. Where pavement layers have different strengths the boundaries can be identified and the thickness of the layers determined, similarly with the strata beneath.

The TRL DCP uses an 8kg hammer dropping through a height of 575mm and a 60^0 cone having a maximum diameter of 20mm. (this punches a clearance hole to ensure there is no friction on the rods.) The instrument is held vertically and the hammer raised to the top of the instrument and allowed to fall freely. The resulting penetration of the rod is measured and the number of blows recorded for a penetration of about 10mm (the number of blows carried out per reading of penetration can be varied to suit the strength of the layer). After the DCP is carefully withdrawn by hand cones shall be checked by measurement regularly to check the wear and replaced when necessary. From the DTP Interim Advice Note 73/06 – Design Guidance for Road Pavement Foundations, a calculation is then applied to the mm//blow to calculate the CBR value, using the following relationship with was developed by the Transport Research Laboratory

$$\mathbf{Log_{10}(CBR) = 2.48\text{-}1.057 x Log_{10}(mm/blow)}$$

The following equation has been used (after Powell et al. 1984) to give an estimated value of Stiffness Modulus E, acknowledging a degree of uncertainty:

$$\mathbf{E = 17.6(CBR)^{0.65}\ MPa}$$

PRESSUREMETER TESTING

Pressuremeter testing comprises a type of in-situ test performed on soil and rock stratum to obtain geotechnical parameters relating to strength and stiffness, generally in accordance with one of the of the standards in the BS EN ISO 224676, Geotechnical investigation and testing' series. Apparatus may be inserted into the ground by either pushing, by pre-boring a hole into which the probe is placed or by the instrument self-boring its own hole. It is usually the case that pressuremeter testing is undertaken in conjunction with borehole operations whereby the drilling rig is used to facilitate emplacement of the apparatus to a designated depth within an active borehole. Once testing apparatus has been installed within the ground, increments of pressure are applied to a membrane contained inside the probe forcing it to expand and exert pressure against the surrounding material thus loading a cylindrical cavity. Expansion of the probe membrane may be achieved by using automated systems pressuring the equipment typically using air or a non-conduction fluid such as light oil. Testing comprises a series of pressure readings and consequent cavity displacement with the derived parameters appropriate to the horizontal plane. The pressuremeter output is conventionally logged on a computer connected to the test equipment to enable plotting of the loading curve in real time. Whilst pressuremeter testing is typically undertaken within a vertical cavity, specialist testing can also be undertaken considering alternate orientations.

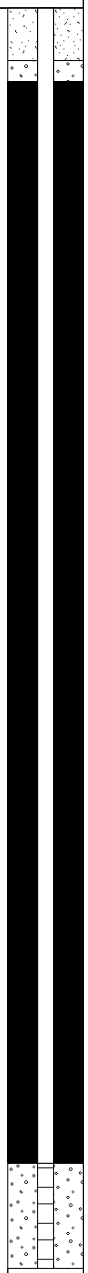
Cable Percussive Borehole Record

CP11 | Sheet 1 of 2

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609770.30	N: 312560.05
Location: Norwich Western Link	Consultant: Ramboll	Date: 29/09/2021	
	Plant used: Dando 3000 Cable Percussive Rig	SPT Hammer Serial No: 12-4 (ER: 62%)	

Geology Description	Depth (m)	Elevation (maOD) 50.86	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)
TOPSOIL. Dark brown slightly gravelly very sandy CLAY. Gravelle is angular to sub-rounded fine to coarse flint. Occasional rootlets.	0.35	50.51	B1	0.20		
			ES1	0.20		
			PID01	0.20	0.0ppm	
			B2	0.40		
Stiff orangish brown sandy gravelly CLAY with medium cobble content. Gravel is angular to sub-rounded fine to coarse flint. Cobbles are flint.			HV01	0.40	Material unsuitable for testing	
			D1	0.50		
			ES2	0.50		
			PID02	0.50	0.0ppm	
			D2	1.00		
			ES3	1.00		
			PID03	1.00	0.2ppm	
Firm becoming stiff light brown slightly sandy gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse chalk and flint.	2.20	48.66	SPT(C)	1.50	N=21 (2,5/5,6,5,5)	1.50 (Dry)
			B3	1.50 - 2.00		
			D3	1.50		
			D4	2.00		
			B4	2.20		
			SPT(S)	2.50	N=15 (2,3/3,4,4,4)	1.50 (Dry)
			D5	2.50		
			D6	2.50 - 2.95		
			D7	3.00		
			ES4	3.00		
			PID04	3.00	0.0ppm	
			SPT(S)	3.50	N=25 (2,2/5,5,6,9)	1.50 (Dry)
			D8	3.50		
			D9	3.50 - 3.95		
			D10	4.00		
			SPT(S)	4.50	N=28 (2,3/5,5,9,9)	1.50 (Dry)
			D11	4.50 - 4.95		
			D12	5.00		
			SPT(S)	5.50	N=31 (3,5/5,6,9,11)	1.50 (Dry)
			D13	5.50		
			D14	5.50 - 5.95		
			D15	6.00		
			D16	6.50		
			SPT(S)	7.00	N=29 (2,2/3,5,9,12)	1.50 (Dry)
			D17	7.00		
			D18	7.00 - 7.45		
			D19	8.00		
Dense light brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to medium flint with rare coarse flint.	8.10	42.76	B5	8.10		
			SPT(C)	8.50	N=36 (2,3/5,8,11,12)	8.50 (6.00)
			B6	8.50 - 9.00		
			D20	8.50		
			D21	9.00		
			D22	9.50		
			SPT(C)	10.00	N=46 (2,3/5,8,16,17)	10.00 (8.00)
			B7	10.00 - 10.50		
			D23	10.00		
			D24	10.50		
			D25	11.00		
			PRM01	11.00 - 12.00	3.1E-06 m/s	
			PRM02	11.00 - 12.00	8.1E-07 m/s	
			PRM03	11.00 - 12.00	1.1E-06 m/s	
			SPT(C)	11.50	N=49 (4,8/9,11,14,15)	11.50 (8.00)
	12.00	38.86	B8	11.50 - 12.00		
			D26	11.50		

Installation & Backfill



Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
		8.20 - 12.00	200							No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
12.00	150	12.00	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 19mm standpipe GL to 11.00m plain, 11.00m to 12.00m slotted with geosock, fitted with gas tap, bung and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 0.70m gravel, 0.70m to 11.00m bentonite pellets, 11.00m to 12.00m gravel.

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Drilled by: D. Bowman | Logged by: R. Knott | Checked by: R. Leech

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Cable Percussive Borehole Record

CP11

Sheet 2 of 2

Project ID:	**NCCT41793**	Client:	Ferrovial Construction (UK) Limited	E: 609770.30	N: 312560.05
Location:	Norwich Western Link	Consultant:	Ramboll	Date:	29/09/2021
		Plant used:	Dando 3000 Cable Percussive Rig	SPT Hammer Serial No: 12-4 (ER: 62%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 50.86	Sample / In-Situ Test Information: Type	Sample / In-Situ Test Information: Depth	Sample / In-Situ Test Information: Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
Borehole terminated at 12.00m: Target depth							29/09/2021 - 12.00 12.00 (8.00)	

Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
		8.20 - 12.00	200							No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
12.00	150	12.00	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 19mm standpipe GL to 11.00m plain, 11.00m to 12.00m slotted with geosock, fitted with gas tap, bung and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 0.70m gravel, 0.70m to 11.00m bentonite pellets, 11.00m to 12.00m gravel.

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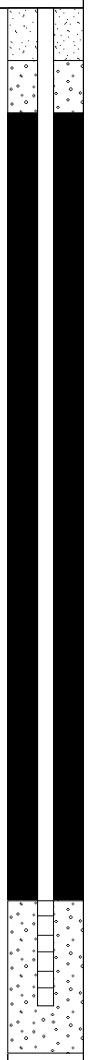
Cable Percussive Borehole Record

CP12 | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609788.89	N: 312605.35
Location: Norwich Western Link	Consultant: Ramboll	Date: 05/10/2021 - 08/10/2021	
	Plant used: Dando 2500 Cable Percussive Rig	SPT Hammer Serial No: AR3538 (ER: 60%)	

Geology Description	Depth (m)	Elevation (maOD) 51.68	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)
TOPSOIL. Dark brown slightly clayey fine SAND.			B1	0.00 - 0.35		
	0.35	51.33	ES1	0.20		
Soft orangish brown slightly sandy gravelly CLAY. Gravel is angular to rounded fine to coarse flint.			PID01	0.20	0.0ppm	
	0.70	50.98	B2	0.35 - 0.70		
Firm orangish brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to sub-angular fine to coarse flint, sandstone and chalk.			HV01	0.40	Material unsuitable for testing	
			ES2	0.50		
			PID02	0.50	0.0ppm	
			B3	0.70 - 1.00		
			HV02	0.70	Material unsuitable for testing	
			B4	1.00 - 1.50		
			ES3	1.00		
			HV03	1.00	Material unsuitable for testing	
			PID03	1.00	0.0ppm	
			SPT(S)	1.50	N=19 (2,4/4,4,4,7)	- (Dry)
			B5	1.50 - 2.00		
			D1	1.50 - 1.95		
			B6	2.00 - 2.50		
			ES4	2.00		
			PID04	2.00	0.0ppm	
	3.80	47.88	SPT(S)	2.50	N=15 (2,2/3,4,4,4)	1.20 (Dry)
Stiff greyish brown slightly silty CLAY with occasional gravel of angular to sub-angular fine to medium flint and chalk.			B7	2.50 - 3.00		
From 4.50m: Becoming grey.			D2	2.50 - 2.95		
			B8	3.00 - 3.50		
			ES5	3.00		
			PID05	3.00	0.0ppm	
	5.00	46.68	SPT(S)	3.50	N=20 (2,3/4,4,5,7)	1.20 (Dry)
Very stiff brownish grey and greyish brown slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse chalk and flint.			B9	3.50 - 4.00		
			D3	3.50 - 3.95		
			B10	4.00 - 4.50		
			SPT(S)	4.50	N=19 (1,2/3,4,5,7)	1.20 (Dry)
			B11	4.50 - 5.00		
			D4	4.50 - 4.95		
			B12	5.00 - 5.50		
						05/10/2021 - 5.00
						1.20 (Dry)
	6.70	44.98				06/10/2021 - 5.00
Very dense becoming dense yellowish brown slightly silty fine to medium SAND.						1.20 (Dry)
			SPT(S)	5.50	N=32 (2,5/5,7,10,10)	1.20 (Dry)
			B13	5.50 - 6.00		
			D5	5.50 - 5.95		
			B14	6.00 - 6.50		
						06/10/2021 - 6.70
						1.20 (Dry)
						08/10/2021 - 6.70
						1.20 (Dry)
			SPT(S)	7.00	50 (5,8/9,11,13,17 for 0mm)	1.20 (Dry)
	8.90	42.78	B15	7.00 - 7.50		
Dense yellowish brown slightly silty fine to coarse SAND and angular to sub-rounded fine to coarse GRAVEL with low cobble content and occasional thin bands of sandy clay. Gravel is flint. Cobbles are sub-angular flint.			D6	7.00 - 7.38		
			B16	7.50 - 8.00		
			B17	8.00 - 8.50		
			SPT(S)	8.50	N=44 (2,5/5,12,12,15)	8.50 (6.50)
	9.95	41.73	B18	8.50 - 8.90		
Borehole terminated at 9.95m: Approved by Ramboll			D7	8.50 - 8.95		
			PRM01	8.50 - 9.50	3.9E-07 m/s	
			PRM02	8.50 - 9.50	3.6E-07 m/s	
			PRM03	8.50 - 9.50	2.4E-07 m/s	
			B19	8.90 - 9.50		
			SPT(S)	9.50	N=43 (3,5/6,11,12,14)	9.50 (8.79)
			D8	9.50 - 9.95		
						08/10/2021 - 9.95
						9.50 (9.25)

Installation & Backfill



Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
										No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
9.50	150	9.50	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Hole terminated early with approval from Ramboll.
3. Installation: 50mm standpipe GL to 8.50m plain, 8.50m to 9.50m slotted, fitted with gas tap, bung and tophat cover.
4. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 8.50m bentonite pellets, 8.50m to 9.95m gravel.

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Cable Percussive Borehole Record

CP13

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609835.61	N: 312587.57
Location: Norwich Western Link	Consultant: Ramboll	Date: 08/10/2021	
	Plant used: Hand Excavated	SPT Hammer Serial No:	

Geology Description	Legend	Depth (m)	Elevation (maOD) 50.58	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
TOPSOIL. Greyish brown gravelly clayey fine to medium SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.		0.25	50.33					
Firm to stiff brown and orangish brown slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint.		0.60	49.98				08/10/2021 - 0.60 - (Dry)	
Borehole terminated at 0.60m: Land drain encountered								

Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
										No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)

Remarks:

1. Inspection pit from GL to 0.60m.
2. Hole terminated early due to land drain encountered.
3. Backfill: GL to 0.60m arisings.

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Cable Percussive Borehole Record

CP13A | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609835.61	N: 312587.57
Location: Norwich Western Link	Consultant: Ramboll	Date: 08/10/2021 - 11/10/2021	
	Plant used: Dando 2500 Cable Percussive Rig	SPT Hammer Serial No: AR3538 (ER: 60%)	

Geology Description	Depth (m)	Elevation (maOD) 50.58	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)
TOPSOIL. Greyish brown gravelly clayey fine to medium SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.	0.25	50.33	B1	0.00 - 0.25		
			D1	0.00 - 0.25		
Firm to stiff brown and orangish brown slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint.	0.55	50.03	ES1	0.10		
			PID01	0.10	0.1ppm	
Stiff to very stiff brown slightly gravelly CLAY. Gravel is angular to sub-angular fine to coarse flint.	1.30	49.28	B2	0.25 - 0.55		
			D2	0.25 - 0.55		
			PP01	0.40	100 kPa	
Very stiff yellowish grey and brown slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse chalk and flint.			ES2	0.50		
			PID02	0.50	0.0ppm	
			B3	0.55 - 1.00		
			D3	0.55 - 1.00		
			HV01	0.60	110 kPa	
			PP02	0.60	140 kPa	
			B4	1.00 - 1.30		
			ES3	1.00		
			PID03	1.00	0.0ppm	
			PP03	1.00	140 kPa	
			B5	1.30 - 1.50		
			B6	1.50 - 2.00		
			B7	2.00 - 2.50		
			ES4	2.00		
			PID04	2.00	0.1ppm	
			B8	2.50 - 3.00		
			ES5	3.00		
			UT1	3.00 - 3.45	Blows = 48. 95% recovered.	
			PID05	3.00	0.0ppm	
			D4	3.45 - 3.50		
	5.30	45.28	B9	3.50 - 4.00		
Very stiff brownish grey slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine and medium chalk and flint.			HV02	3.50	>120 kPa	
			PP04	3.50	150 kPa	
						08/10/2021 - 3.50 3.00 (Dry)
						11/10/2021 - 3.50 3.00 (Dry)
			B10	4.00 - 4.50		
	6.80	43.78	B11	4.50 - 5.00		
Medium dense yellowish brown slightly silty slightly gravelly medium to coarse SAND. Gravel is sub-angular fine to coarse flint.			UT2	5.00 - 5.45	Blows = 56. 100% recovered.	
			D5	5.45 - 5.50		
			B12	5.50 - 6.00		
			B13	6.00 - 6.50		
			B14	6.50 - 7.00		
			D6	6.80		
			SPT(S)	7.00	N=22 (4,4/6,6,5,5)	7.00 (Dry)
	8.45	42.13	B15	7.00 - 7.50		
Borehole terminated at 8.45m: Target depth			D7	7.00 - 7.45		
			B16	7.50 - 8.00		
			SPT(S)	8.00	N=27 (4,6/6,6,8,7)	8.00 (Dry)
			D8	8.00 - 8.45		
						11/10/2021 - 8.45 8.00 (Dry)

Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
										No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
8.00	150	8.00	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 19mm standpipe GL to 3.00m plain, 3.00m to 6.00m slotted, fitted with cap and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 3.00m bentonite pellets, 3.00m to 6.00m gravel, 6.00m to 8.45m bentonite pellets.

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Drilled by: A. Glossop | Logged by: J. Tomalin | Checked by: R. Leech

Rotary Borehole Record

BHR35 | Sheet 1 of 5

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 610524.05	N: 313328.75
Location: Norwich Western Link	Consultant: Ramboll	Date: 27/09/2021 - 04/10/2021	
	Plant used: Dando 2500 Cable Percussive Rig / Fraste Multidrill PL-G	SPT Hammer Serial No: AR3483 / FRASTE02 (ER: 72 / 77%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 36.18	T.C.R. (%)	S.C.R. (%)	R.Q.D. (%)	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
TOPSOIL. Dark brown silty gravelly medium to coarse SAND with low cobble content. Gravel is angular to sub-angular fine to coarse flint. Cobbles are sub-angular flint.							PID01	0.00	0.3ppm		
							B1	0.00 - 0.45			
							ES1	0.00 - 0.45			
							D1	0.40			
		0.45	35.73				B2	0.45 - 0.90			
Light brown very gravelly medium to coarse SAND with low cobble content. Gravel is angular to sub-rounded fine to coarse flint. Cobbles are sub-angular flint.							PID02	0.50	0.1ppm		
							ES2	0.50			
		0.90	35.28				D2	0.90			
Yellowish brown gravelly slightly silty fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.							PID03	1.00	0.0ppm		
							B3	1.00 - 1.50			
							D3	1.00			
							ES3	1.00			
From 1.30m: Bands of sandy silt.							D4	1.30			
		1.50	34.68				SPT(S)	1.50	N=26 (2,4/6,6,8,6)	1.50 (0.83)	
Medium dense yellowish brown gravelly slightly silty medium to coarse SAND. Gravel is angular to sub-angular fine and medium flint.							D5	1.50 - 1.95			
							PID04	2.00	0.1ppm		
							D6	2.00			
							ES4	2.00			
							SPT(C)	2.50	N=17 (3,3/4,4,4,5)	2.50 (0.79)	
							B4	2.50 - 2.95			
							D7	2.50 - 2.95			
							PID05	3.00	0.1ppm		
							D8	3.00			
							ES5	3.00			
		3.30	32.88				B5	3.30 - 3.50			
Firm yellowish grey slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint.							D9	3.30			
							UT1	3.50 - 3.95	Blows = 22. 100% recovered.		
From 3.70m: Becoming grey.							HV01	3.90	40 kPa		
							PP01	3.90	36 kPa		
							D10	3.95 - 4.00			
							SPT(S)	4.50	N=8 (1,2/2,2,2,2)	4.50 (4.38)	
							D11	4.50 - 4.95			
							PP02	4.75	53 kPa		
							D12	5.00			
							B6	5.50 - 5.95			
							D13	5.50 - 5.95			
							UT2	5.50 - 5.95	Blows = 35. 0% recovered.		
										27/09/2021 - 5.50	
							UT3	6.00 - 6.45	Blows = 37. 100% recovered.	5.50 (Dry)	
										28/09/2021 - 5.50	
										5.50 (Dry)	
		6.30	29.88								
Firm grey slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to medium flint and chalk.							D14	6.45 - 6.50			
							HV02	6.50	45 kPa		
							PP03	6.50	60 kPa		
							SPT(S)	7.00	N=14 (1,2/2,3,4,5)	7.00 (Dry)	
							PP04	7.00	73 kPa		
							D15	7.00			

Hole Diameter by Depth	
Depth (m)	Diameter (mm)
10.50	200
30.00	146

Casing Diameter by Depth	
Depth (m)	Diameter (mm)
10.50	200
30.00	146

Drilling Flush Details		
Depth (m)	Type	Return

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
27-09-2021	0.90	5.50		20	0.69	Medium flow
28-09-2021	10.50		10.00	20	9.52	Medium flow

Remarks:

1. Inspection pit from GL to 0.90m. Pit terminated early due to water strike and collapse.
2. Cable percussive drilling from 0.90m to 10.50m.
3. Dynamic sampling: L01 from 10.50m to 11.50m: 100% recovery, L02 from 11.50m to 12.50m: 0% recovery.
4. Installation: 50mm standpipe GL to 10.00m plain, 10.00m to 12.00m slotted with geosock, fitted with gas tap, bung and tophat cover.
5. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 10.00m bentonite pellets, 10.00m to 12.00m gravel, 12.00m to 30.45m bentonite pellets.

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Drilled by: A. Elshof / A. Glossop | Logged by: E. Amaziro / J. Tomalin | Checked by: R. Leech

Rotary Borehole Record

BHR35 | Sheet 2 of 5

harrisongroup ENVIRONMENTAL

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 610524.05	N: 313328.75
Location: Norwich Western Link	Consultant: Ramboll	Date: 27/09/2021 - 04/10/2021	
	Plant used: Dando 2500 Cable Percussive Rig / Fraste Multidrill PL-G	SPT Hammer Serial No: AR3483 / FRASTE02 (ER: 72 / 77%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 36.18	T.C.R. (%)	S.C.R. (%)	R.Q.D. (%)	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
Firm grey slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to medium flint and chalk.							D16	7.00 - 7.45			
Medium dense yellowish brown and greenish grey slightly gravelly silty fine to medium SAND with occasional thin bands of sandy clay. Gravel is angular to sub-angular fine to medium flint.		7.90	28.28				B7	7.90 - 8.30			
							D17	7.90			
							SPT(S)	8.50	N=17 (3,3/5,4,4,4)	8.00 (Dry)	
							D18	8.50 - 8.95			
From 9.30m: Becoming grey and greenish grey.											
Stiff grey slightly sandy CLAY with frequent bands of clayey sand.		9.50	26.68				B8	9.50 - 10.00			
							D19	9.50			
							PP05	9.60	118 kPa		
							UT4	10.00 - 10.45	Blows = 50. 100% recovered.		
Light grey slightly sandy clayey SILT with occasional gravel of angular to sub-angular medium flint.		10.50	25.68				HV03	10.45	Material unsuitable for testing		
From 10.50m to 10.74m: Fragmented medium flint.							PP06	10.45	Material unsuitable for testing		
At 10.80m: Orangish brown stain.		10.90	25.28				D20	10.45 - 10.50			
Structureless CHALK composed of white slightly sandy SILT with rare gravel of angular to sub-angular fine to medium flint. (Grade Dm)							W1	10.50			
							PP07	10.60	>250 kPa	28/09/2021 - 10.50 10.30 (9.52)	
										28/09/2021 - 10.50 10.30 (9.52)	
From 11.20m to 11.25m: Fragmented angular to sub-angular fine to medium flint.		11.50	24.68							28/09/2021 - 11.50 10.50	
NO RECOVERY.										29/09/2021 - 11.50 10.50 (8.40)	
Structureless CHALK composed of white slightly sandy slightly gravelly SILT. Gravel is very weak, low density, white sub-angular fine chalk with rare angular to sub-angular fine to medium flint. (Grade Dm)		12.50	23.68	67	0	0	SPT(S)	12.50	N=15 (3,3/3,4,4,4)	12.50 (0.60)	
							D21	12.50 - 12.95			
		14.00	22.18								

Hole Diameter by Depth

Depth (m)	Diameter (mm)
10.50	200
30.00	146

Casing Diameter by Depth

Depth (m)	Diameter (mm)
10.50	200
30.00	146

Drilling Flush Details

Depth (m)	Type	Return
12.50-14.00	WATER	100%

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
27-09-2021	0.90	5.50		20	0.69	Medium flow
28-09-2021	10.50		10.00	20	9.52	Medium flow

Remarks:

1. Inspection pit from GL to 0.90m. Pit terminated early due to water strike and collapse.
2. Cable percussive drilling from 0.90m to 10.50m.
3. Dynamic sampling: L01 from 10.50m to 11.50m: 100% recovery, L02 from 11.50m to 12.50m: 0% recovery.
4. Installation: 50mm standpipe GL to 10.00m plain, 10.00m to 12.00m slotted with geosock, fitted with gas tap, bung and tophat cover.
5. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 10.00m bentonite pellets, 10.00m to 12.00m gravel, 12.00m to 30.45m bentonite pellets.

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Drilled by: A. Elshof / A. Glossop | Logged by: E. Amaziro / J. Tomalin | Checked by: R. Leech

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Rotary Borehole Record

BHR35

Sheet 3 of 5

Project ID:	**NCCT41793**	Client:	Ferrovial Construction (UK) Limited	E: 610524.05	N: 313328.75
Location:	Norwich Western Link	Consultant:	Ramboll	Date:	27/09/2021 - 04/10/2021
		Plant used:	Dando 2500 Cable Percussive Rig / Fraste Multidrill PL-G	SPT Hammer Serial No: AR3483 / FRASTE02 (ER: 72 / 77%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 36.18	T.C.R. (%)	S.C.R. (%)	R.Q.D. (%)	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
NO RECOVERY. Flint band flushed core away. *From 14.80m to 14.90m: Black flint gravel band.* *From 15.35m to 15.50m: Rare cobble of flint 150mm x 100mm x 100mm*				10	0	0					
Structureless CHALK composed of white slightly gravelly SILT. Gravel is very weak, low density, white sub-angular fine chalk. (Grade Dm)		15.50	20.68	100	0	0	SPT(S) D22	15.50 15.50 - 15.95	N=10 (1,2/2,2,3,3)	15.50 (0.80) 29/09/2021 - 15.95 15.50 (0.80) 30/09/2021 - 15.95 15.50 (2.30)	
NO RECOVERY. Core washed down.		17.00	19.18	0	0	0					
Structureless CHALK composed of white slightly gravelly SILT. Gravel is very weak, low density, white sub-angular fine chalk with occasional angular to sub-angular fine flint. (Grade Dm) *From 20.00m to 20.44m: Zone of core loss.*		18.50	17.68	70	0	0	SPT(S) D23	18.50 18.50 - 18.95	N=12 (1,2/3,3,3,3)	18.00 (0.00)	
				70	0	0					

Hole Diameter by Depth

Depth (m)	Diameter (mm)
10.50	200
30.00	146

Casing Diameter by Depth

Depth (m)	Diameter (mm)
10.50	200
30.00	146

Drilling Flush Details

Depth (m)	Type	Return
14.00-15.50	WATER	100%
15.50-17.00	WATER	100%
17.00-18.50	WATER	100%
18.50-20.00	WATER	100%

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
27-09-2021	0.90	5.50		20	0.69	Medium flow
28-09-2021	10.50		10.00	20	9.52	Medium flow

Remarks:

1. Inspection pit from GL to 0.90m. Pit terminated early due to water strike and collapse.
2. Cable percussive drilling from 0.90m to 10.50m.
3. Dynamic sampling: L01 from 10.50m to 11.50m: 100% recovery, L02 from 11.50m to 12.50m: 0% recovery.
4. Installation: 50mm standpipe GL to 10.00m plain, 10.00m to 12.00m slotted with geosock, fitted with gas tap, bung and tophat cover.
5. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 10.00m bentonite pellets, 10.00m to 12.00m gravel, 12.00m to 30.45m bentonite pellets.

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Drilled by: A. Elshof / A. Glossop | Logged by: E. Amaziro / J. Tomalin | Checked by: R. Leech

Rotary Borehole Record

BHR35

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 610524.05	N: 313328.75
Location: Norwich Western Link	Consultant: Ramboll	Date: 27/09/2021 - 04/10/2021	
	Plant used: Dando 2500 Cable Percussive Rig / Fraste Multidrill PL-G	SPT Hammer Serial No: AR3483 / FRASTE02 (ER: 72 / 77%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 36.18	T.C.R. (%)	S.C.R. (%)	R.Q.D. (%)	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
Structureless CHALK composed of white slightly gravelly SILT. Gravel is very weak, low density, white sub-angular fine chalk with occasional angular to sub-angular fine flint. (Grade Dm)											
		21.50	14.68				SPT(S)	21.50	50 (25,0 for 0mm/40,10 for 17mm)	21.50 (0.00)	
Structureless CHALK composed of silty GRAVEL. Clasts are very weak, low density, white sub-angular fine to coarse chalk. Occasional sub-rounded medium to coarse flint gravel. (Grade Dc) *From 21.50m to 21.70m: Disturbance from SPT.* *From 21.70m to 21.90m: Rare cobble of flint 100mm x 80mm x 70mm.*				70	0	0					
From 23.00m to 23.55m: Zone of core loss.				63	0	0					
From 24.37m to 24.50m: Rare cobble of flint 130mm x 110mm x 100mm.		24.50	11.68				SPT(S)	24.50	N=24 (3,4/4,4,7,9)	24.50 (0.00)	
Structureless CHALK composed of slightly gravelly SILT. Gravel is very weak, low density, white sub-angular fine chalk with occasional angular to sub-angular fine to medium flint. (Grade Dm) *From 24.50m to 24.95m: Disturbance from SPT.* *From 24.95m to 25.30m: Zone of core loss.*				47	0	0				01/10/2021 - 24.95 24.50 (2.30) 30/09/2021 - 24.95 24.50 (2.30)	
NO RECOVERY.		26.00	10.18	0	0	0					
		27.50	8.68				SPT(S) D24	27.50 27.50 - 28.45	N=30 (3,4/4,5,7,14)	27.50 (0.00)	
Structureless CHALK composed of slightly sandy silty GRAVEL. Clasts are very weak, low density, white sub-angular fine to coarse chalk. Occasional angular to											

Hole Diameter by Depth

Depth (m)	Diameter (mm)
10.50	200
30.00	146

Casing Diameter by Depth

Depth (m)	Diameter (mm)
10.50	200
30.00	146

Drilling Flush Details

Depth (m)	Type	Return
20.00-21.50	WATER	100%
21.50-23.00	WATER	100%
23.00-24.50	WATER	100%
24.50-26.00	WATER	100%
26.00-27.50	WATER	100%

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
27-09-2021	0.90	5.50		20	0.69	Medium flow
28-09-2021	10.50		10.00	20	9.52	Medium flow

Remarks:

1. Inspection pit from GL to 0.90m. Pit terminated early due to water strike and collapse.
2. Cable percussive drilling from 0.90m to 10.50m.
3. Dynamic sampling: L01 from 10.50m to 11.50m: 100% recovery, L02 from 11.50m to 12.50m: 0% recovery.
4. Installation: 50mm standpipe GL to 10.00m plain, 10.00m to 12.00m slotted with geosock, fitted with gas tap, bung and tophat cover.
5. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 10.00m bentonite pellets, 10.00m to 12.00m gravel, 12.00m to 30.45m bentonite pellets.

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Drilled by: A. Elshof / A. Glossop | Logged by: E. Amaziro / J. Tomalin | Checked by: R. Leech

Rotary Borehole Record

BHR35

Sheet 5 of 5

Project ID:	**NCCT41793**	Client:	Ferrovial Construction (UK) Limited	E: 610524.05	N: 313328.75
Location:	Norwich Western Link	Consultant:	Ramboll	Date:	27/09/2021 - 04/10/2021
		Plant used:	Dando 2500 Cable Percussive Rig / Fraste Multidrill PL-G	SPT Hammer Serial No: AR3483 / FRASTE02 (ER: 72 / 77%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 36.18	T.C.R. (%)	S.C.R. (%)	R.Q.D. (%)	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
Structureless CHALK composed of slightly sandy silty GRAVEL. Clasts are very weak, low density, white sub-angular fine to coarse chalk. Occasional angular to sub-angular fine to medium flint gravel. (Grade Dc) *From 27.50m to 27.95m: Disturbance from SPT.*				70	0	0					
From 28.92m to 28.98m: Rare sub-angular medium flint gravel. *From 29.00m to 29.43m: Zone of core loss.* *From 29.43m to 29.50m: Rare sub-angular medium flint gravel.*				57	0	0	SPT(S) D25	30.00 30.00 - 30.45	N=20 (3,3/4,4,5,7)	30.00 (0.00)	
Borehole terminated at 30.45m: Target depth		30.45	5.73							01/10/2021 - 30.45 30.00 (2.30)	

Hole Diameter by Depth	
Depth (m)	Diameter (mm)
10.50	200
30.00	146

Casing Diameter by Depth	
Depth (m)	Diameter (mm)
10.50	200
30.00	146

Drilling Flush Details		
Depth (m)	Type	Return
27.50-29.00	WATER	100%
29.00-30.00	WATER	100%

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
27-09-2021	0.90	5.50		20	0.69	Medium flow
28-09-2021	10.50		10.00	20	9.52	Medium flow

Remarks:

1. Inspection pit from GL to 0.90m. Pit terminated early due to water strike and collapse.
2. Cable percussive drilling from 0.90m to 10.50m.
3. Dynamic sampling: L01 from 10.50m to 11.50m: 100% recovery, L02 from 11.50m to 12.50m: 0% recovery.
4. Installation: 50mm standpipe GL to 10.00m plain, 10.00m to 12.00m slotted with geosock, fitted with gas tap, bung and tophat cover.
5. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 10.00m bentonite pellets, 10.00m to 12.00m gravel, 12.00m to 30.45m bentonite pellets.

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Drilled by: A. Elshof / A. Glossop | Logged by: E. Amaziro / J. Tomalin | Checked by: R. Leech

Dynamic Continuous Sampling Borehole Record

WS29 | Sheet 1 of 1

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Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 610324.14	N: 313222.88
Location: Norwich Western Link	Consultant: Ramboll	Date: 30/09/2021	
	Plant used: Premier Compact 110 Series	SPT Hammer Serial No: 110.35 HAR (ER: 69%)	

Geology Description	Depth (m)	Elevation (maOD) 43.35	Type	Depth	Results / Remarks	Casing (Water)
TOPSOIL. Dark brown slightly gravelly clayey fine to medium SAND. Gravel is sub-angular to sub-rounded fine to coarse flint with rare brick. Occasional rootlets.			B1	0.20 - 0.30		
			ES1	0.20		
	0.40	42.95	PID01	0.20	0.0ppm	
Orangish brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint.			B2	0.50 - 0.60		
			D1	0.50		
			ES2	0.50		
			PID02	0.50	0.0ppm	
	1.10	42.25	D2	1.10		
Firm orangish brown slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint.			ES3	1.10 - 1.20		
			PID03	1.10	0.0ppm	
			SPT(C)	1.20	N=9 (1,2/2,2,2,3)	- (Dry)
			HV01	1.60	Material unsuitable for testing	
			D3	1.80 - 1.90		
			ES4	1.90 - 2.05		
	2.05	41.30	HV02	1.90	110 kPa	
Firm to stiff orangish brown mottled light grey slightly sandy gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse chalk with occasional flint.			PID04	1.90	0.0ppm	
			SPT(C)	2.00	N=10 (1,1/2,3,2,3)	- (Dry)
From 2.50m: Becoming greyish brown with orange staining.			HV03	2.60	76 kPa	
			D4	2.80 - 2.90		
			ES5	2.90 - 3.00		
At 2.95m: Band of brown clayey fine to coarse sand.			HV04	2.90	Material unsuitable for testing	
From 3.00m to 3.20m: Band of light brown very sandy clay.			PID05	2.90	0.0ppm	
			SPT(C)	3.00	N=7 (1,1/2,1,2,2)	- (Dry)
			HV05	3.10	Material unsuitable for testing	
			HV06	3.40	Material unsuitable for testing	
	3.70	39.65	D5	3.50 - 3.60		
Light brown slightly gravelly silty fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to medium flint and chalk.	4.00	39.35	SPT(C)	4.00	N=16 (1,4/5,3,3,5)	- (4.43)
From 3.85m to 3.90m: Pocket of grey slightly sandy gravelly clay. Gravel is chalk.						
Firm orangish brown slightly gravelly very sandy CLAY with occasional pockets of very clayey fine to coarse sand. Gravel is sub-angular to sub-rounded fine to medium flint and chalk.			HV07	4.60	Material unsuitable for testing	
			D6	4.80 - 5.00		
	5.00	38.35	SPT(C)	5.00	N=17 (3,3/2,4,4,7)	- (4.40)
Borehole terminated at 5.00m: Target depth						

Installation & Backfill

Window or Windowless Sampling Run Details

Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)
87	1.20	2.00	0.80	100
77	2.00	3.00	1.00	100
67	3.00	4.00	1.00	100
67	4.00	5.00	0.75	75

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
30-09-2021	4.45					

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 50mm standpipe GL to 3.50m plain, 3.50m 4.50m slotted, fitted with gas tap, bung and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 1.00m gravel, 1.00m to 3.50m bentonite pellets, 3.50m to 4.50m gravel, 4.50m to 5.00m bentonite pellets.
4. HV/PP tests not attempted within material disturbed by SPTs.

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Drilled by: K. Parr / J. Mace | Logged by: R. Knott | Checked by: R. Leech | **Fm-Hn-R-3068-Rev E**

Dynamic Continuous Sampling Borehole Record

WS32

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609877.39	N: 312590.55
Location: Norwich Western Link	Consultant: Ramboll	Date: 01/10/2021	
	Plant used: Premier Compact 110 Series	SPT Hammer Serial No: 110.35 HAR (ER: 69%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 49.88	Sample / In-Situ Test Information Type	Depth	Results / Remarks	Casing (Water)	Installation & Backfill
TOPSOIL. Dark brown slightly gravelly very sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint. Occasional rootlets.		0.30	49.58	B1	0.20 - 0.30			
				ES1	0.20			
				PID01	0.20	0.0ppm		
Brown slightly gravelly very clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint.		0.60	49.28	B2	0.50 - 0.60			
				ES2	0.50			
				PID02	0.50	0.0ppm		
Very stiff greyish brown occasionally mottled orangish brown slightly sandy gravelly CLAY. Gravel is sub-rounded to rounded fine to coarse chalk with occasional flint.				D1	0.80 - 0.90			
				PP01	0.80	>220 kPa		
				ES3	0.90 - 1.00			
				PID03	0.90	0.0ppm		
				SPT(C)	1.20	N=29 (5,5/7,7,7,8)	- (Dry)	
				PP02	1.60	>220 kPa		
				D2	1.80 - 1.90			
				ES4	1.90 - 2.00			
				PID04	1.90	0.0ppm		
				PP03	1.90	>220 kPa		
				SPT(C)	2.00	N=26 (3,4/4,7,7,8)	- (Dry)	
				PP04	2.60	180 kPa		
				D3	2.80 - 2.90			
				ES5	2.90 - 3.00			
Borehole terminated at 3.00m: Rig component broke		3.00	46.88	PID05	2.90	0.0ppm		
				PP05	2.90	160 kPa		
				SPT(C)	3.00	N=17 (3,3/4,4,4,5)	- (Dry)	

Window or Windowless Sampling Run Details

Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)
102	0.60	1.00	0.40	100
102	1.00	2.00	0.95	95
87	2.00	3.00	0.95	95

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
						No groundwater encountered

Remarks:

1. Inspection pit from GL to 0.60m. Pit terminated early due to hard stratum. Position CAT scanned before drilling.
2. Hole terminated early due to rig component breaking.
3. Backfill: GL to 3.00m arisings.
4. HV/PP tests not attempted within material disturbed by SPTs.

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Drilled by: K. Parr / J. Mace | Logged by: R. Knott | Checked by: R. Leech | **Fm-Hn-R-3068-Rev E**

Dynamic Continuous Sampling Borehole Record

WS33

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609807.85	N: 312541.27
Location: Norwich Western Link	Consultant: Ramboll	Date: 30/09/2021 - 01/10/2021	
	Plant used: Premier Compact 110 Series	SPT Hammer Serial No: 110.35 HAR (ER: 69%)	

Geology Description	Depth (m)	Elevation (maOD) 50.08	Sample / In-Situ Test Information Type	Depth	Results / Remarks	Casing (Water)
TOPSOIL. Dark brown slightly gravelly very sandy CLAY. Gravel is angular to sub-rounded fine to coarse flint. Occasional rootlets.			B1	0.20		
			ES1	0.20		
	0.30	49.78	PID01	0.20	0.0ppm	
Stiff brown slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint.			D1	0.50		
	0.60	49.48	ES2	0.50		
Very stiff greyish brown slightly sandy gravelly CLAY with low cobble content. Gravel is sub-angular to rounded fine to coarse chalk with occasional flint. Cobbles are flint.			PID02	0.50	0.0ppm	
			PP01	0.50	>220 kPa	
			ES3	1.00		
			PID03	1.00	0.1ppm	
			PP02	1.00	>220 kPa	
			SPT(C)	1.20	N=33 (5,6/6,9,8,10)	- (Dry)
			D2	1.30		
			PP03	1.60	>220 kPa	
			ES4	1.90		
From 2.00m: Becoming stiff and occasionally mottled orangish brown.			PID04	1.90	0.0ppm	
			SPT(C)	2.00	N=19 (2,3/4,5,5,5)	- (Dry)
			D3	2.30 - 2.40		
			PP04	2.60	190 kPa	
			ES5	2.90 - 3.00		
From 2.90m: Becoming mottled greyish brown, orangish brown and dark grey.			PID05	2.90	0.0ppm	
			PP05	2.90	130 kPa	
			SPT(C)	3.00	N=11 (1,2/3,3,2,3)	- (Dry)
			D4	3.30 - 3.40		
			PP06	3.60	170 kPa	
			PP07	3.90	200 kPa	
From 3.90m: Becoming dark grey.			SPT(C)	4.00	N=32 (3,6/8,8,7,9)	- (Dry)
			D5	4.30 - 4.40		
			PP08	4.60	140 kPa	
			PP09	4.90	>220 kPa	
Borehole terminated at 5.00m: Dense stratum	5.00	45.08	SPT(C)	5.00	N=26 (5,7/5,7,6,8)	- (Dry)

Window or Windowless Sampling Run Details

Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)
102	1.20	2.00	0.80	100
87	2.00	3.00	0.90	90
77	3.00	4.00	0.70	70
77	4.00	5.00	1.00	100

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
						No groundwater encountered

Remarks:

1. Inspection pit from GL to 1.20m 30/09/21.
2. Hole terminated early due to dense stratum.
3. Installation: 50mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted, fitted with gas tap, bung and tophat cover.
4. Backfill: GL to 0.50m concrete, 0.50m to 0.70m gravel, 0.70m to 1.00m bentonite pellets, 1.00m to 5.00m gravel.
5. HV/PP tests not attempted within material disturbed by SPTs.

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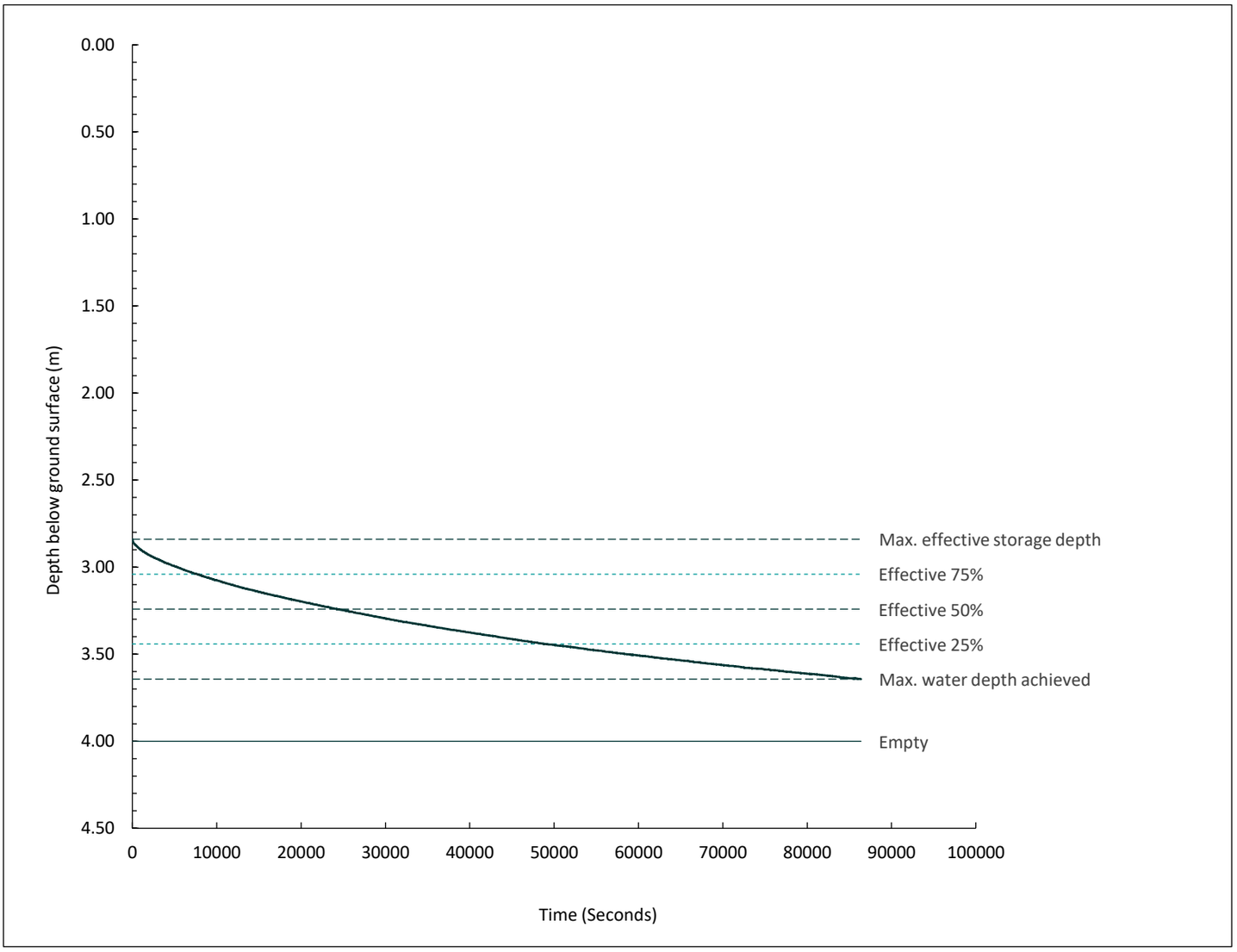
Drilled by: K. Parr / J. Mace | Logged by: R. Knott | Checked by: R. Leech | **Fm-Hn-R-3068-Rev E**

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP04

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614040.16	N: 315772.50
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.01 maOD
	Infilling 1	Test Date:	15/11/2021



Soil Infiltration Rate: 1.01E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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Water measuring device: Level Logger

Weather conditions: Sunny and dry

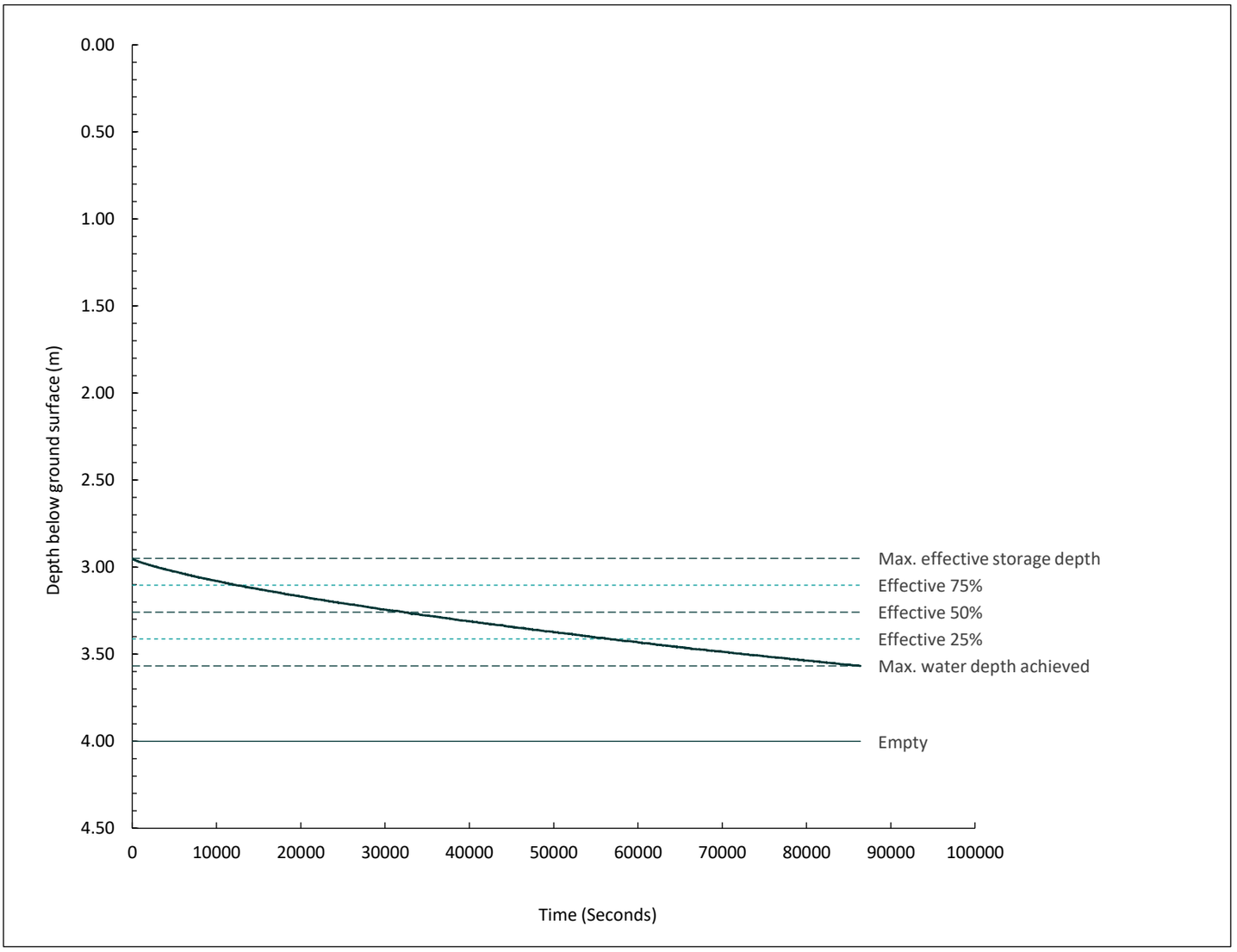
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Effective rate calculation based on maximum water depth achieved
2. Infiltration failed to reach 25% of test zone within 24 hours, as per BRE DG 365 guidance. Instruction from Ramboll to continue with subsequent infillings.

Operator: J. Blyth	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP04

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614040.16	N: 315772.50
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.01 maOD
	Infilling 2	Test Date:	16/11/2021



Soil Infiltration Rate: 8.51E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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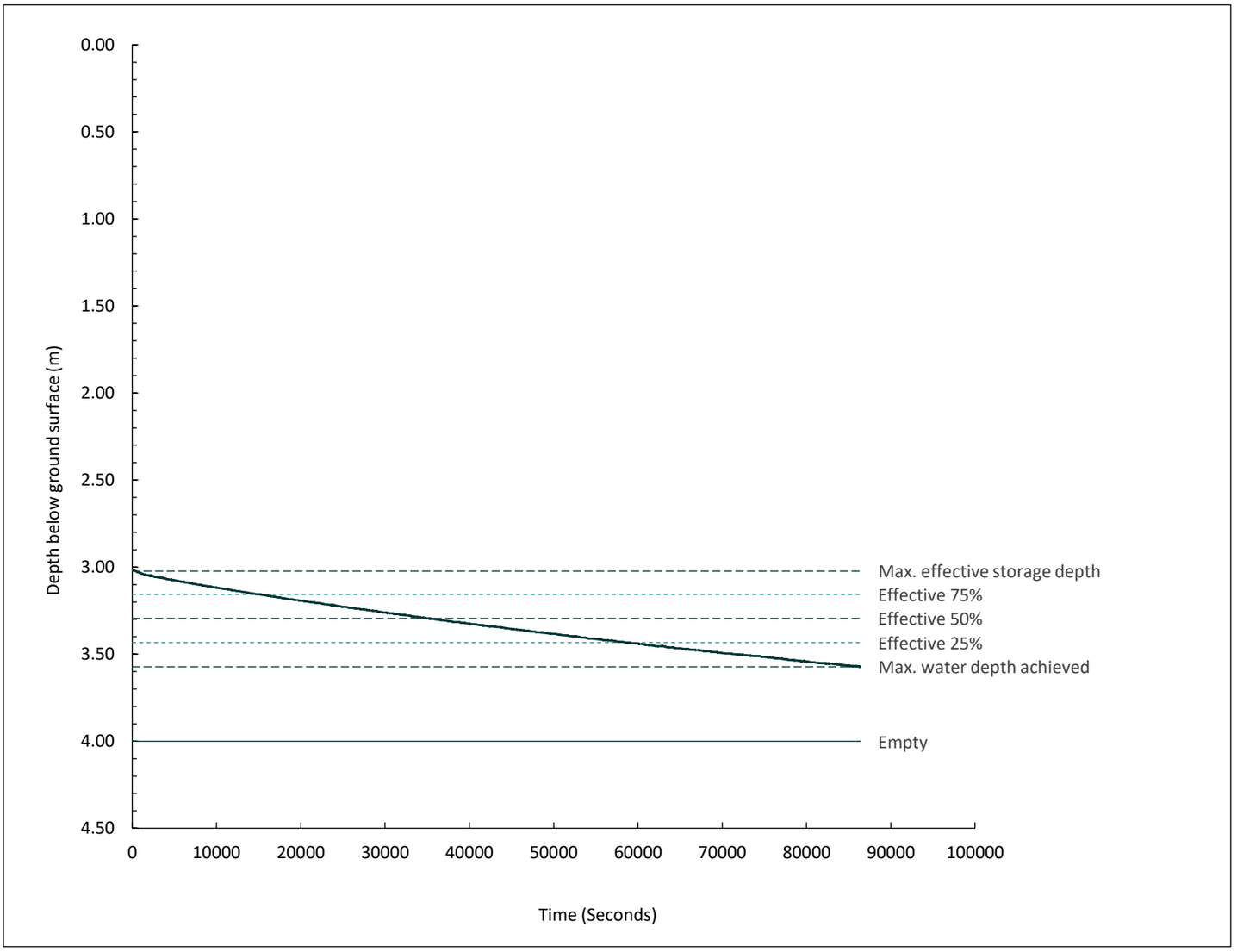
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Effective rate calculation based on maximum water depth achieved.

Operator: J. Blyth	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP04

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614040.16	N: 315772.50
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.01maOD
	Infilling 3	Test Date:	17/11/2021



Soil Infiltration Rate: 8.31E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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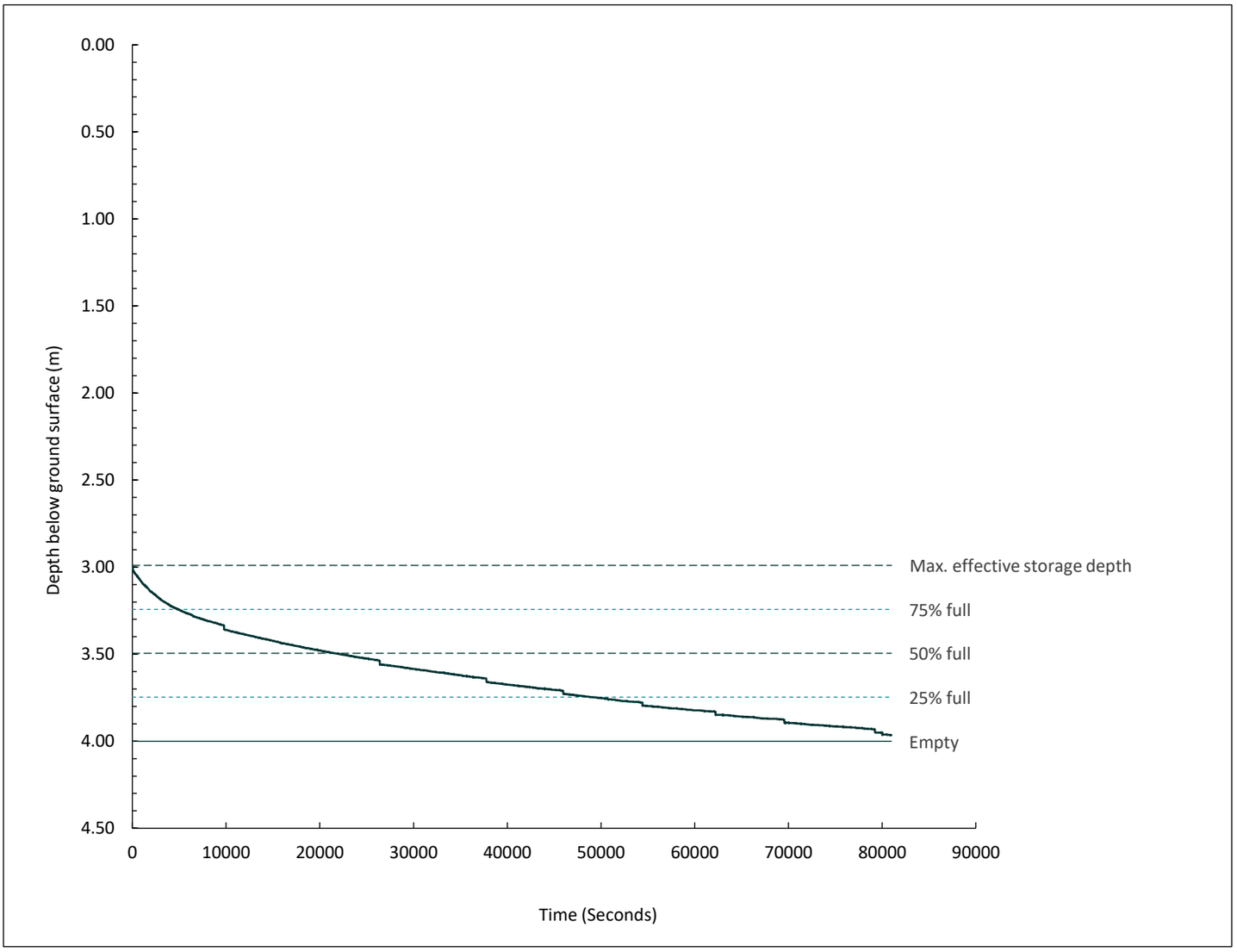
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Effective rate calculation based on maximum water depth achieved.

Operator: J. Blyth	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP05

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614023.83	N: 315788.06
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.01 maOD
	Infilling 1	Test Date:	15/11/2021



Soil Infiltration Rate: 1.00E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.60	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 22:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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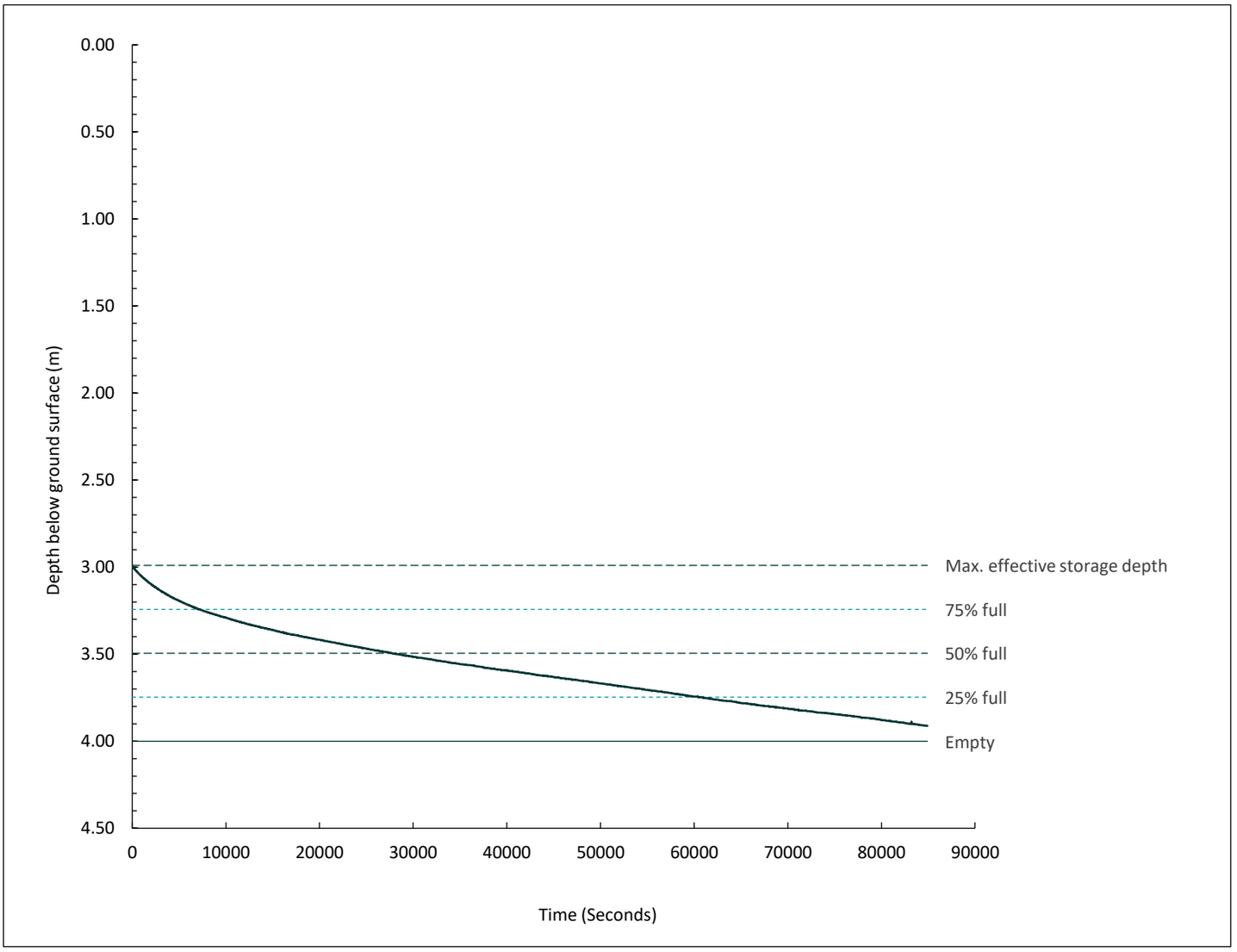
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Blyth	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP05

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614023.83	N: 315788.06
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.01 maOD
	Infilling 2	Test Date:	16/11/2021



Soil Infiltration Rate: 8.30E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.60	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:35	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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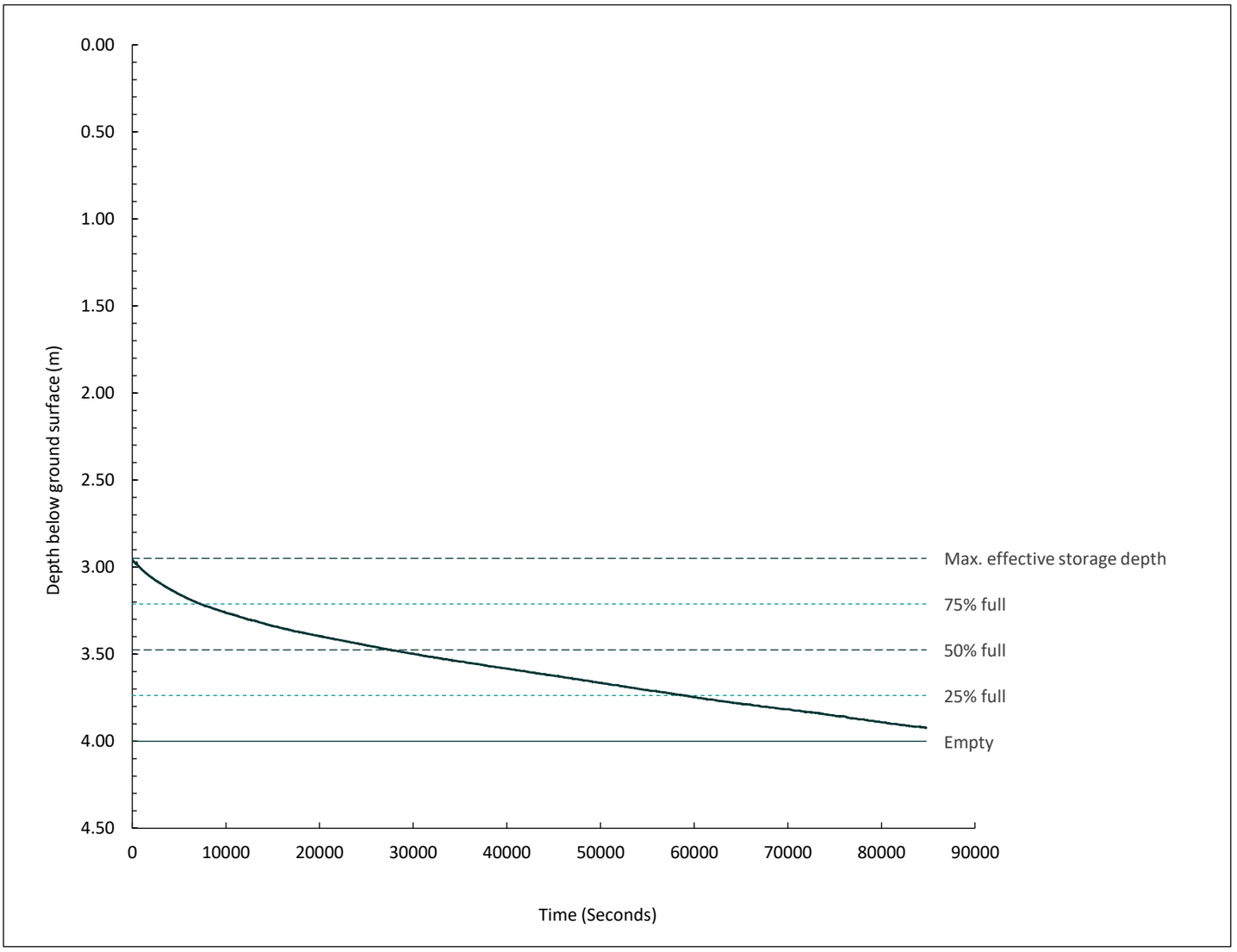
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Blyth	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP05

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614023.83	N: 315788.06
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.01maOD
	Infilling 3	Test Date:	17/11/2021



Soil Infiltration Rate: 8.70E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.60	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:33	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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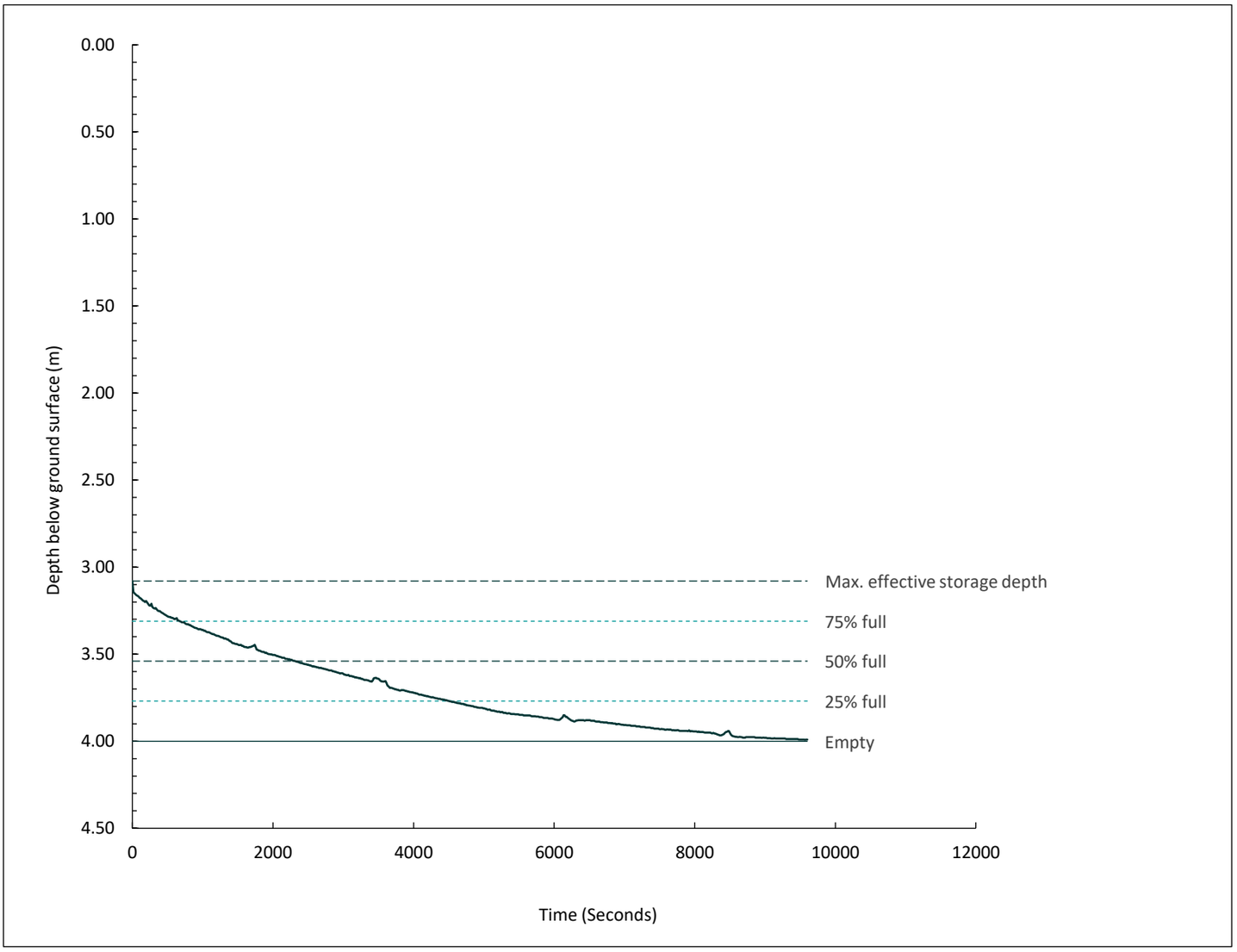
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Blyth	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP06

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613411.04	N: 315228.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	21.42 maOD
	Infilling 1	Test Date:	06/10/2021



Soil Infiltration Rate: 2.06E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
4.00	1.80	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 02:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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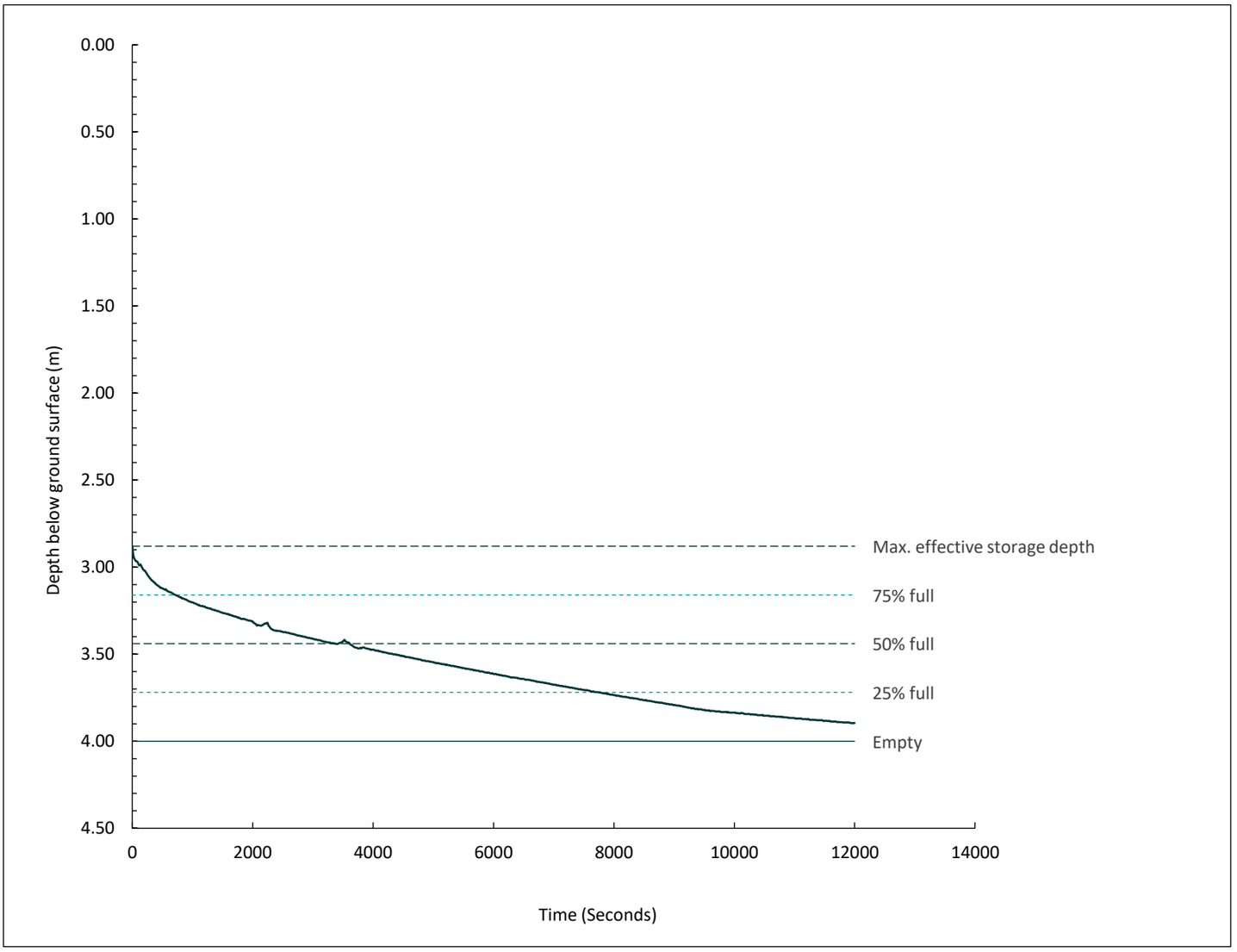
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP06

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613411.04	N: 315228.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	21.42 maOD
	Infilling 2	Test Date:	06/10/2021



Soil Infiltration Rate: 1.26E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
4.00	1.80	4.00	3.90

Fill Porosity: 30%	Test Duration (hh:mm): 03:20	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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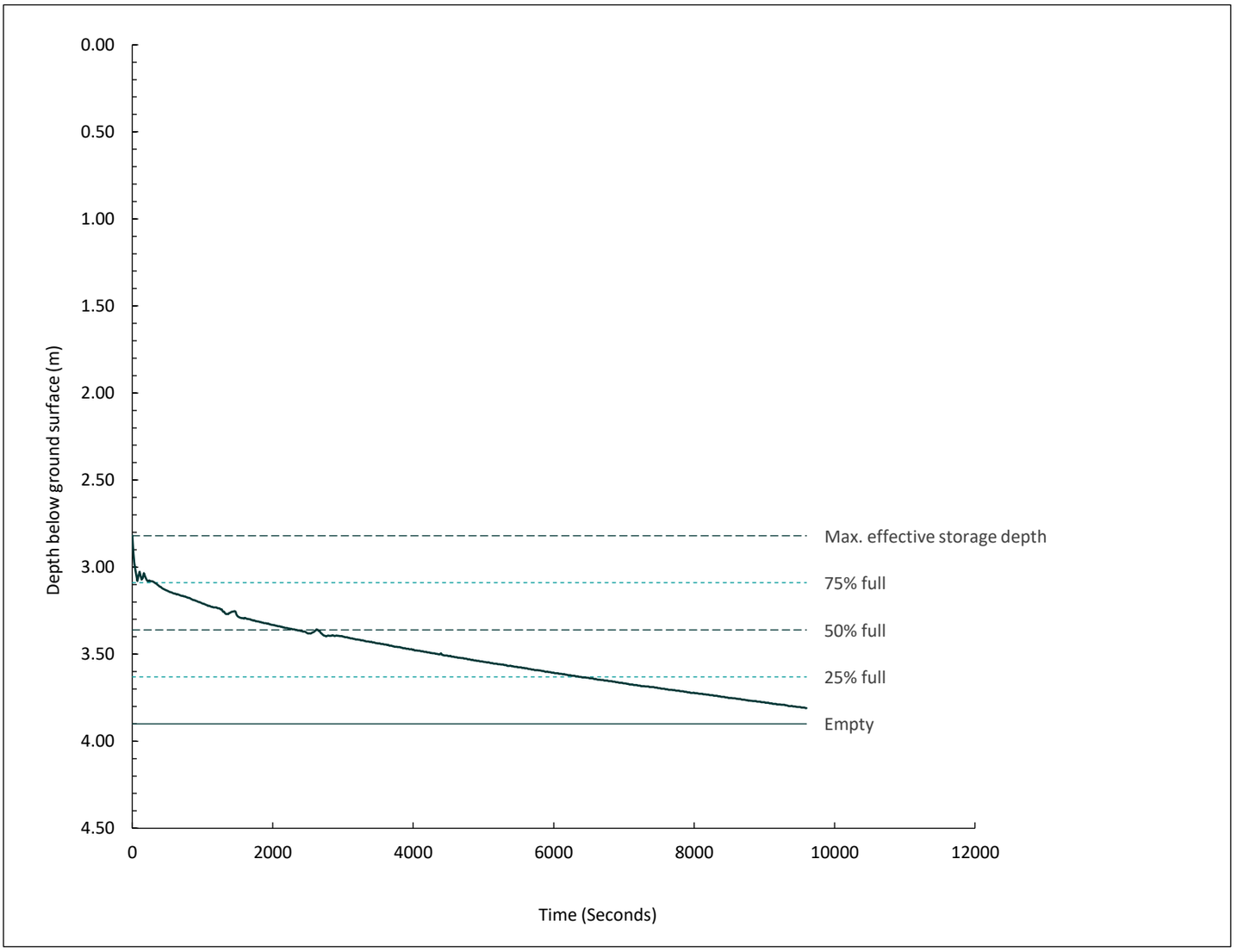
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Pit depth reduction as a result of sediment build-up during the test.

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP06

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613411.04	N: 315228.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	21.42maOD
	Infilling 3	Test Date:	07/10/2021



Soil Infiltration Rate: 1.43E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
4.00	1.80	3.90	3.90

Fill Porosity: 30%	Test Duration (hh:mm): 02:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

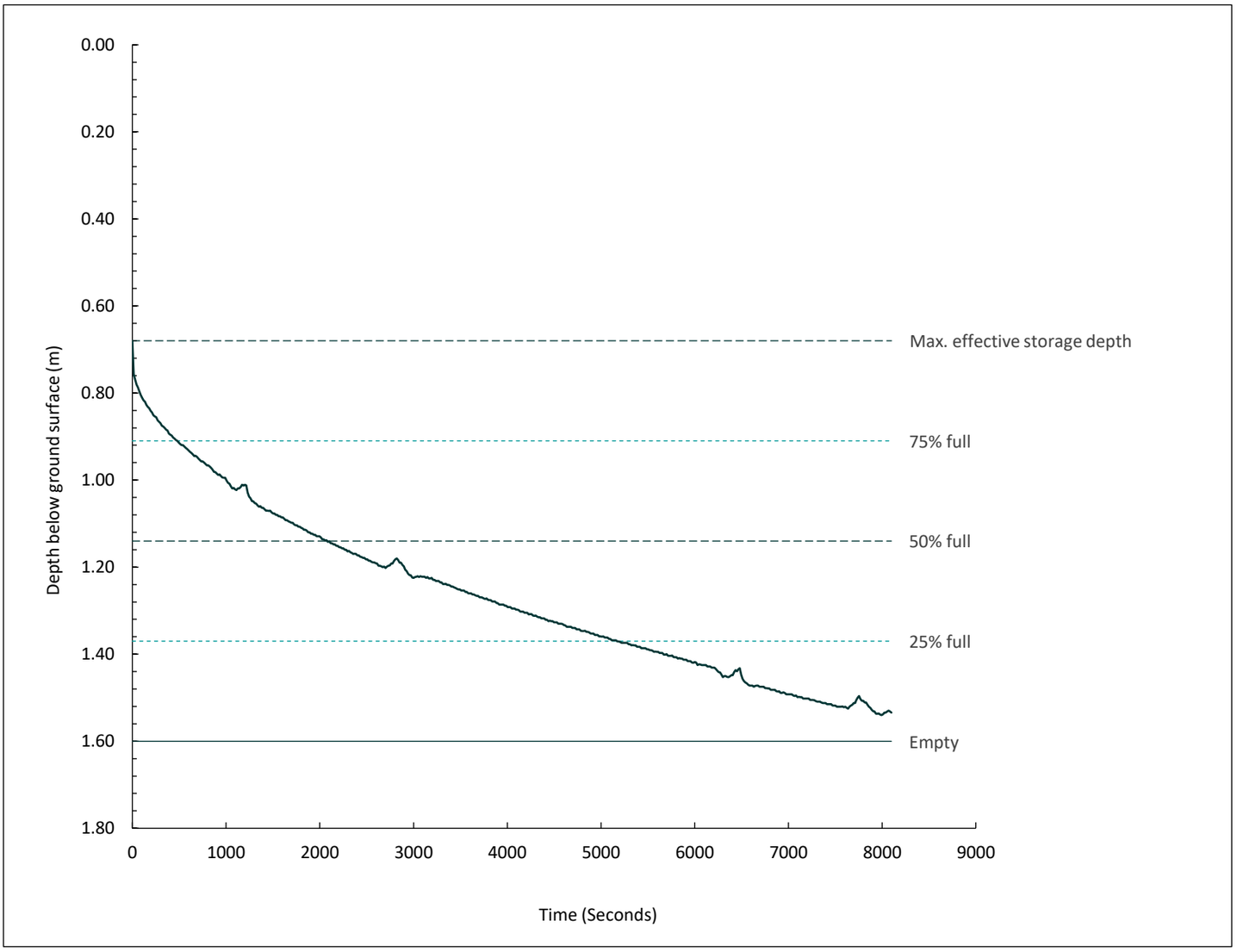
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP07

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613397.05	N: 315161.41
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.86 maOD
	Infilling 1	Test Date:	06/10/2021



Soil Infiltration Rate: 9.17E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	0.50	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 02:15	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

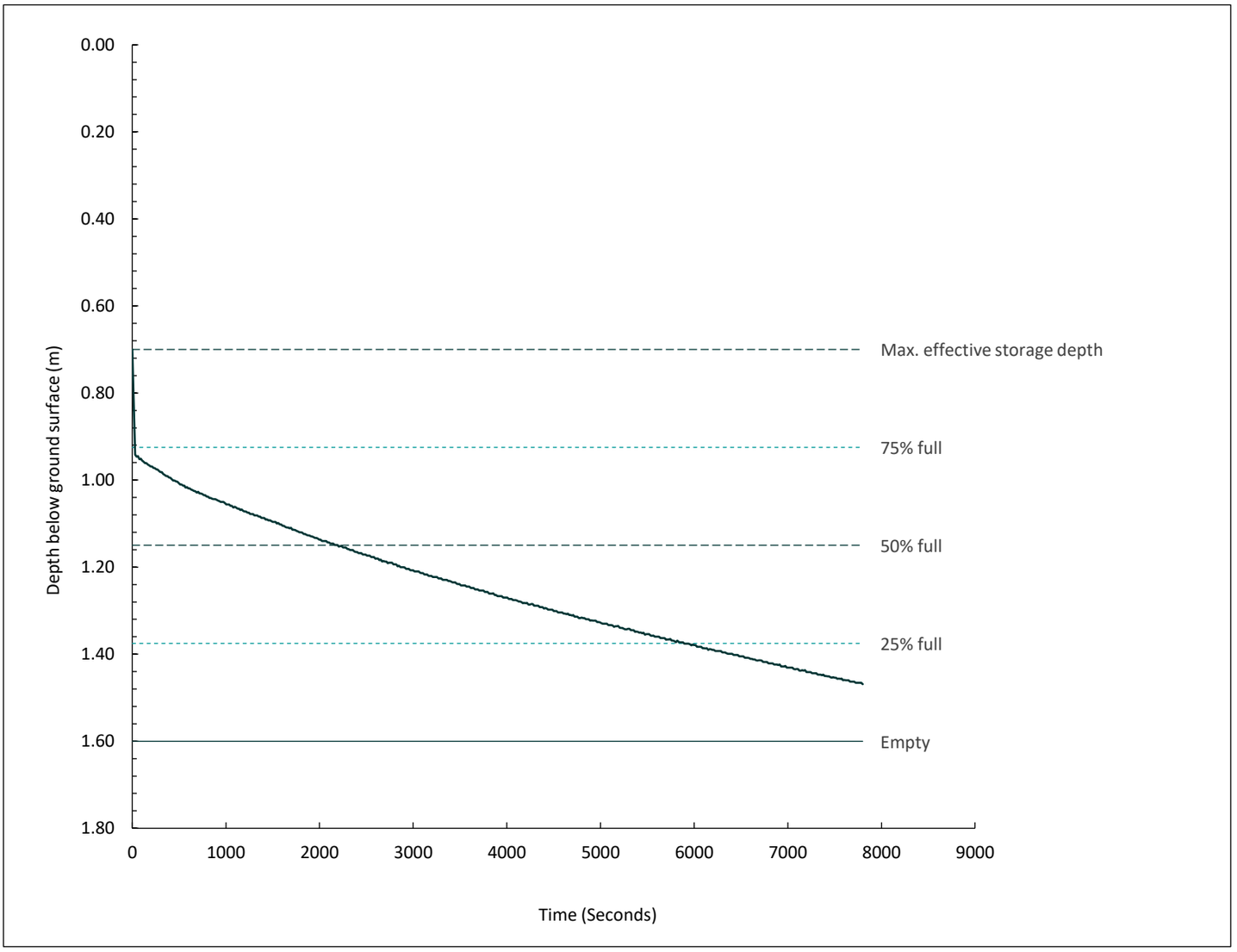
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP07

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613397.05	N: 315161.41
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.86 maOD
	Infilling 2	Test Date:	06/10/2021



Soil Infiltration Rate: 7.29E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	0.50	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 02:10	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

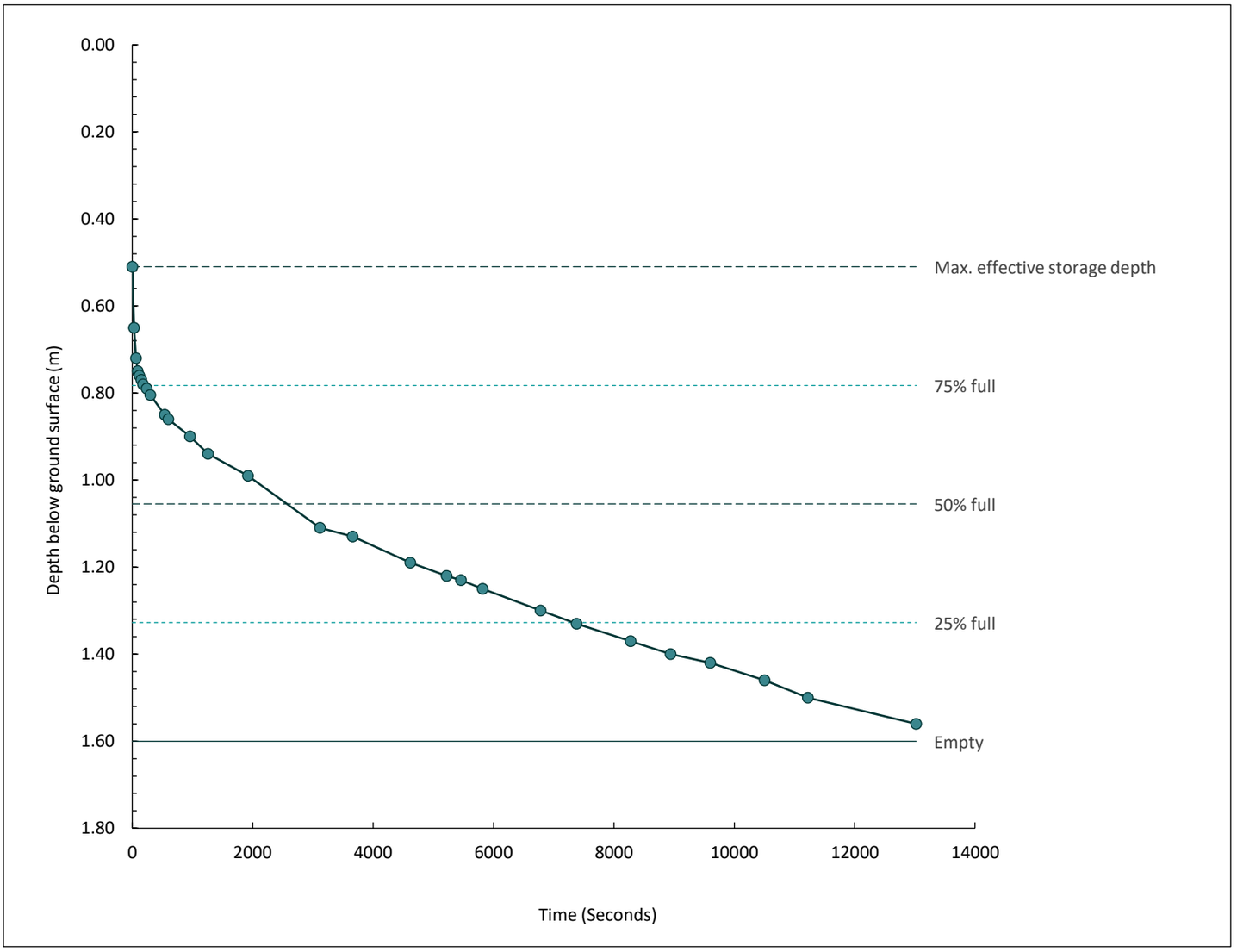
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP07

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613397.05	N: 315161.41
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.86maOD
	Infilling 3	Test Date:	07/10/2021



Soil Infiltration Rate: 6.34E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	0.50	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 03:37	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

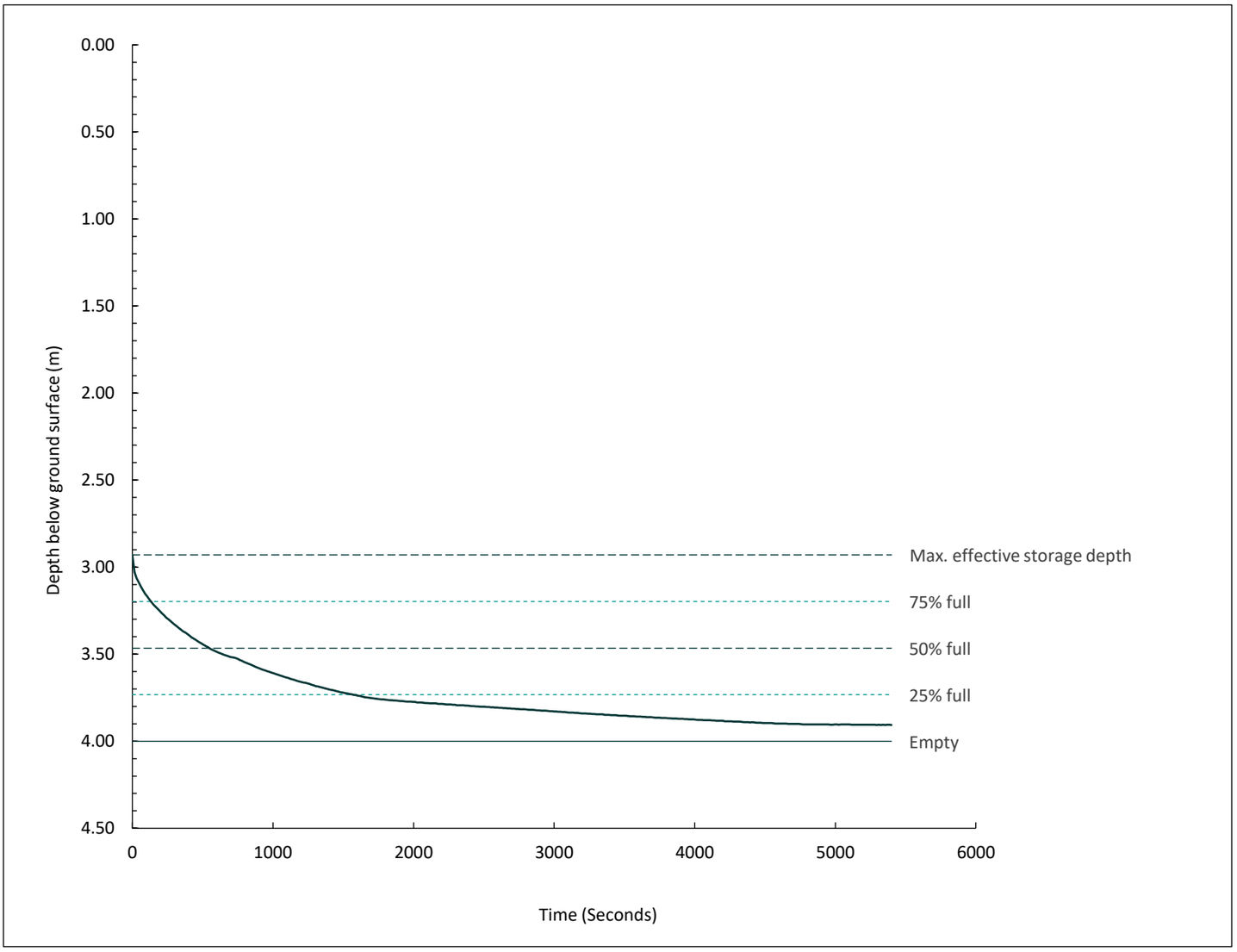
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Levellogger malfunction. Dip meter readings only.

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP11

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612735.24	N: 315055.90
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.54 maOD
	Infilling 1	Test Date:	04/11/2021



Soil Infiltration Rate: 3.15E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.60	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 01:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

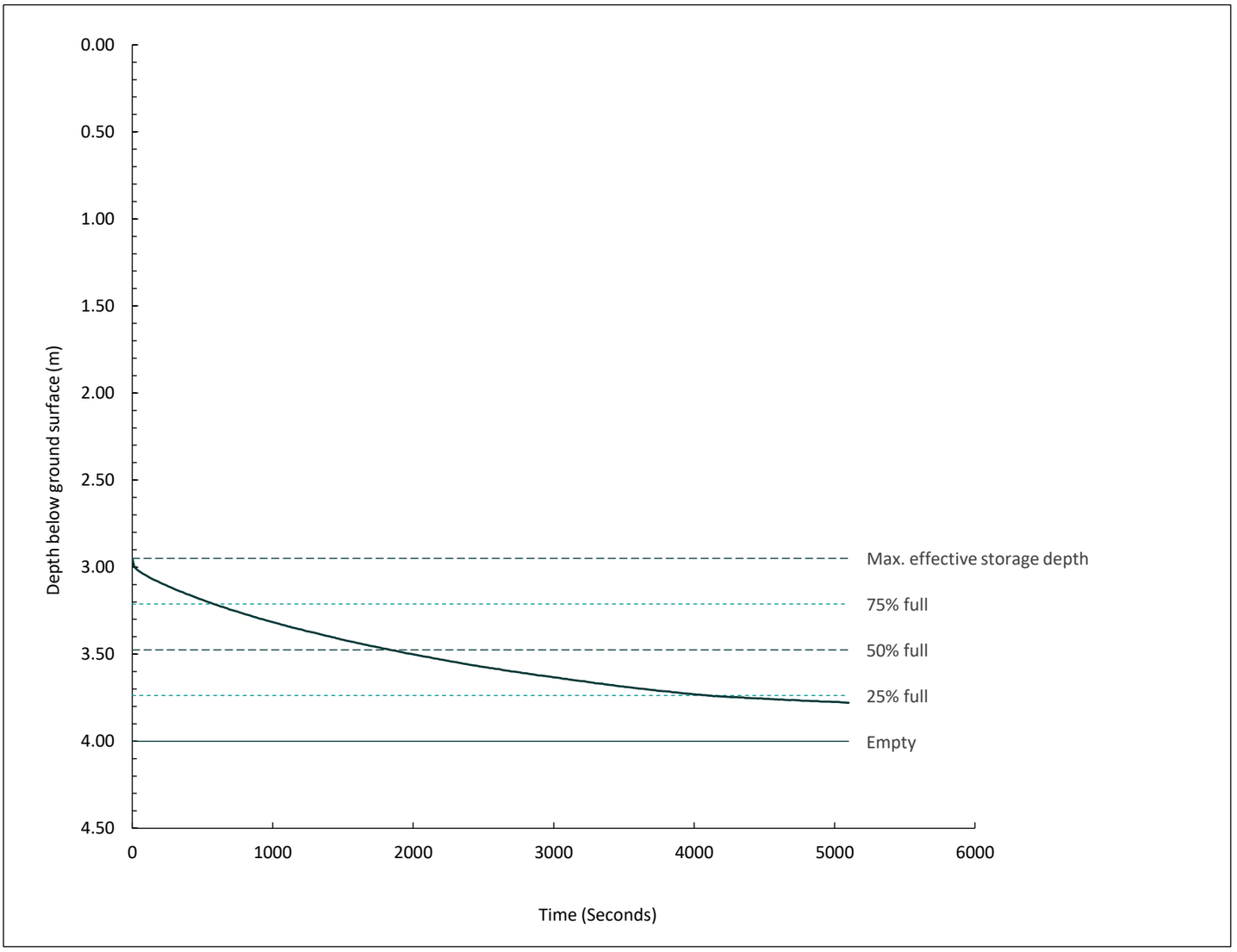
Water measuring device: Level Logger
Weather conditions: Sunny and wet
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP11

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612735.24	N: 315055.90
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.54 maOD
	Infilling 2	Test Date:	04/11/2021



Soil Infiltration Rate: 1.28E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.60	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 01:25	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

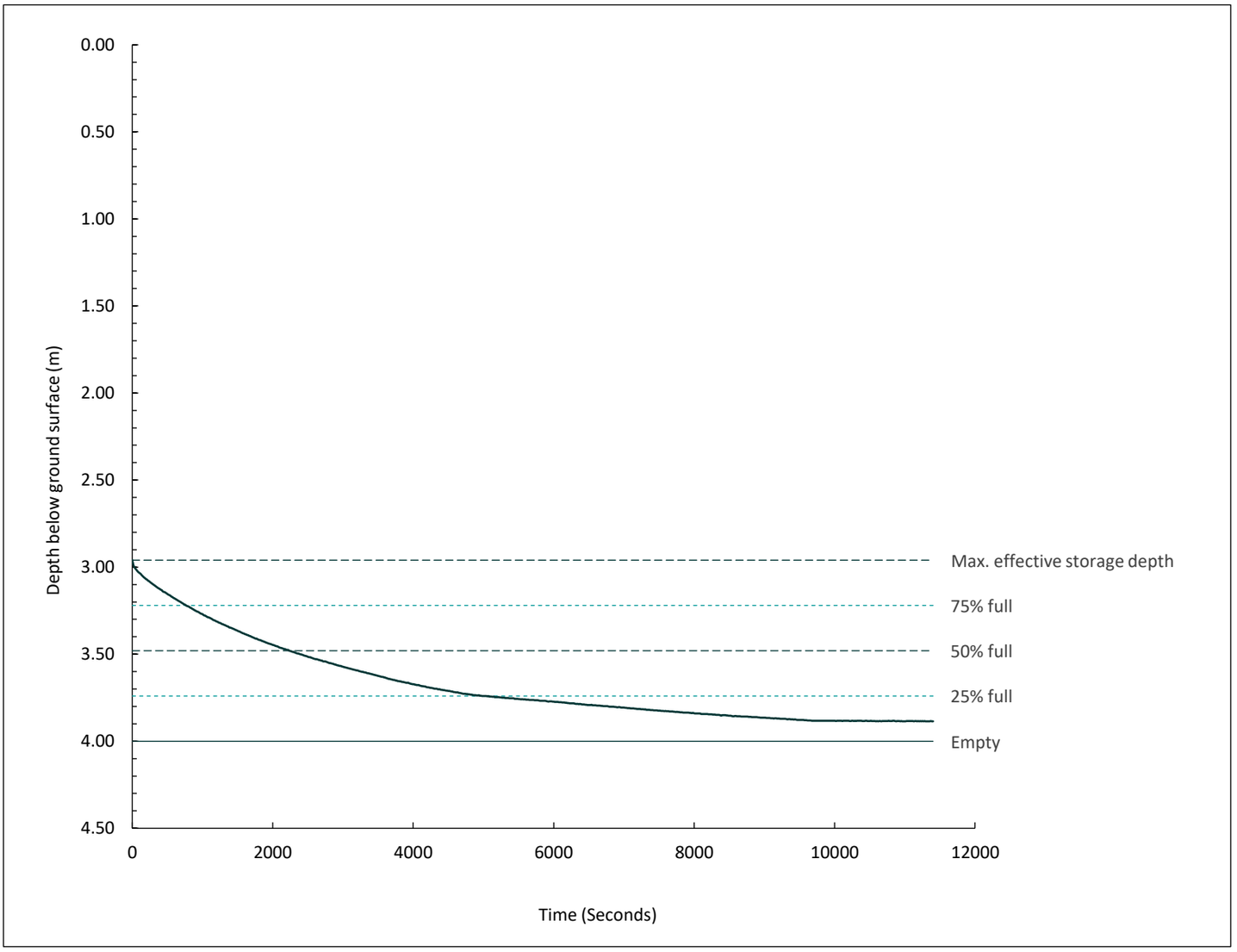
Water measuring device: Level Logger
Weather conditions: Sunny and wet
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP11

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612735.24	N: 315055.90
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.54maOD
	Infilling 3	Test Date:	04/11/2021



Soil Infiltration Rate: 1.06E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.60	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 03:10	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

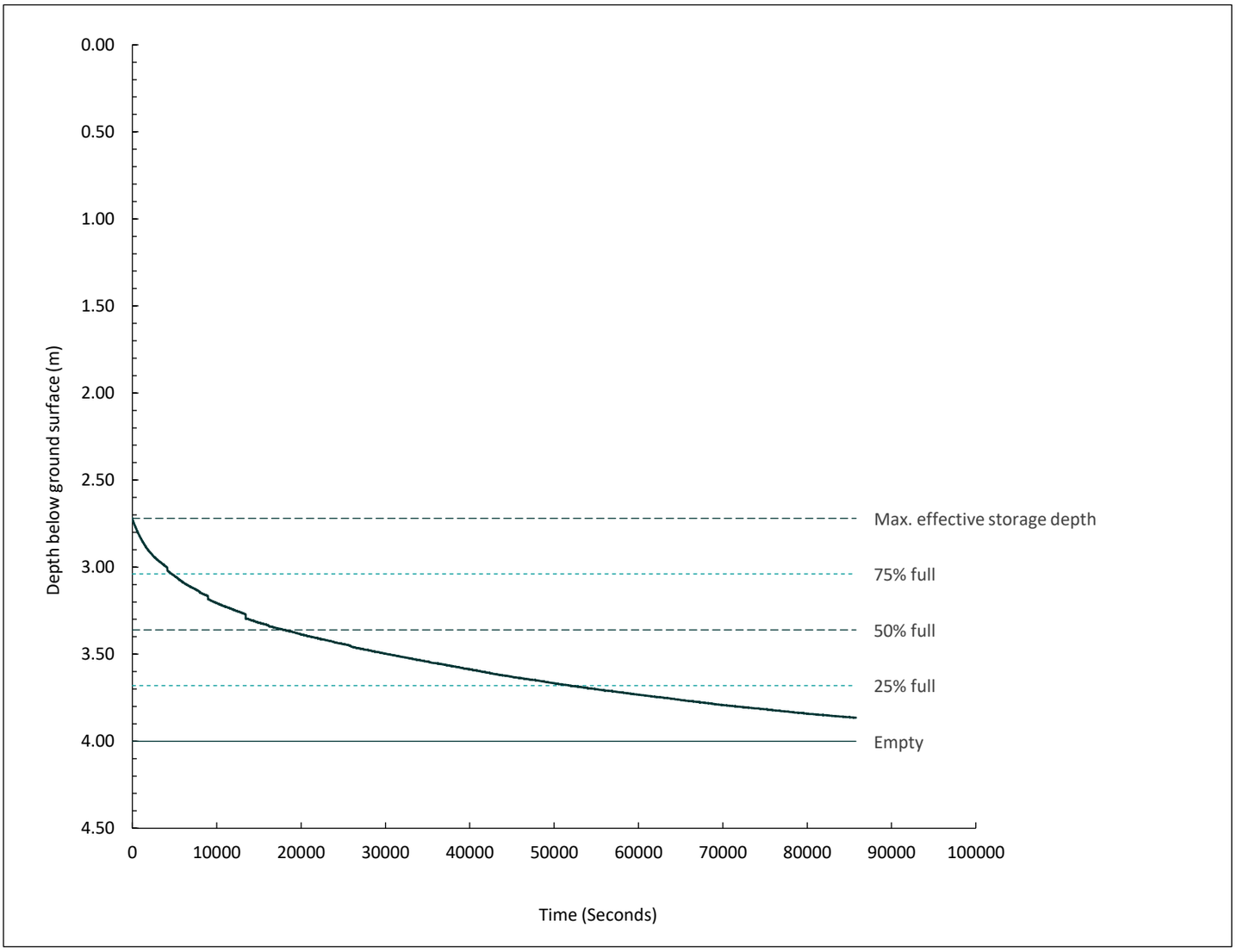
Water measuring device: Level Logger
Weather conditions: Sunny and wet
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP12

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612660.82	N: 315077.29
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.33 maOD
	Infilling 1	Test Date:	04/11/2021



Soil Infiltration Rate: 1.02E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

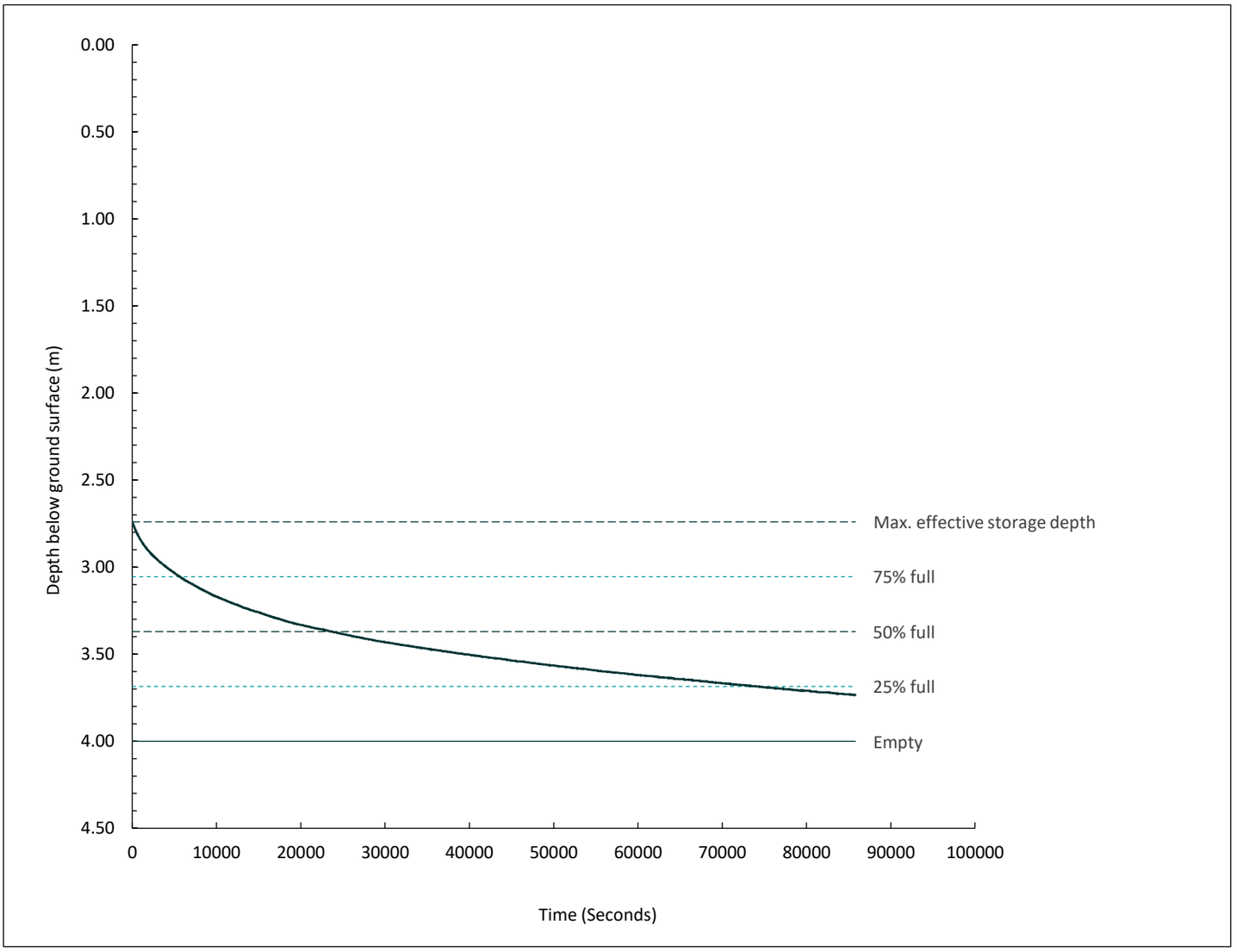
AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP12
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612660.82 N: 315077.29
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 22.33 maOD
	Infilling 2	Test Date: 05/11/2021



Soil Infiltration Rate: 7.02E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

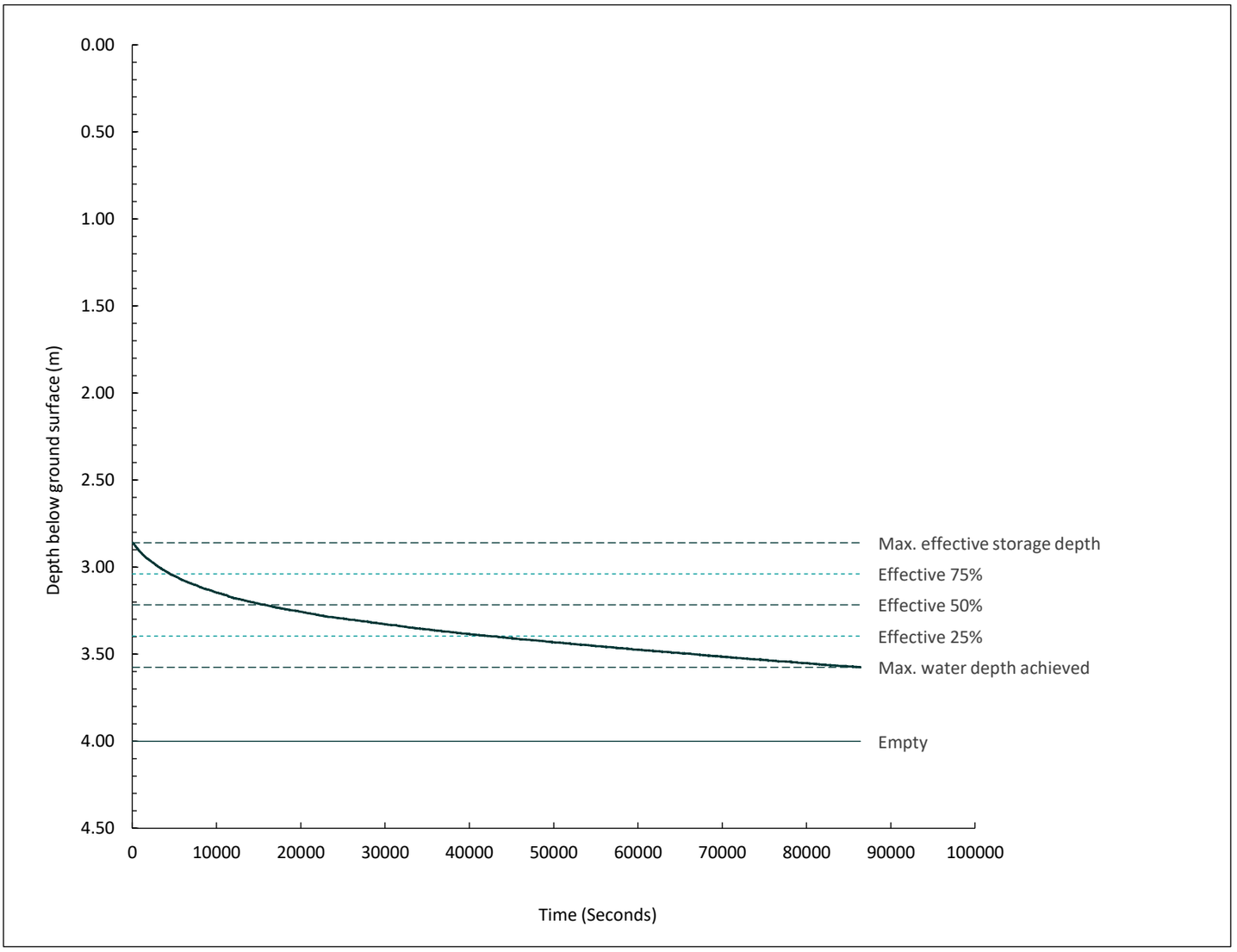
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP12

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612660.82	N: 315077.29
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.33maOD
	Infilling 3	Test Date:	08/11/2021



Soil Infiltration Rate: 1.06E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 23:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

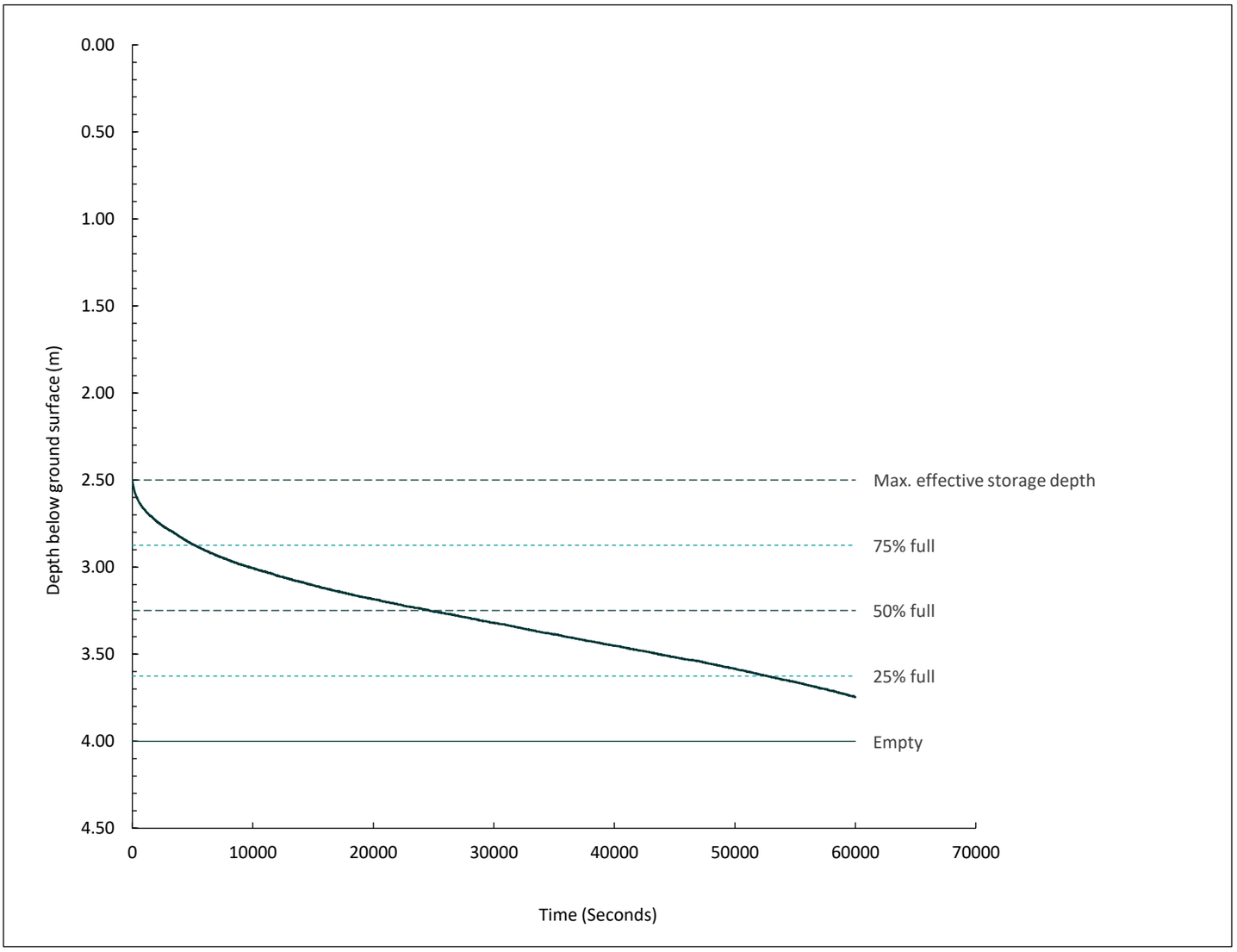
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Effective rate calculation based on maximum water depth achieved.

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP13

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612541.58	N: 315175.31
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	23.72 maOD
	Infilling 1	Test Date:	04/11/2021



Soil Infiltration Rate: 1.05E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 16:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

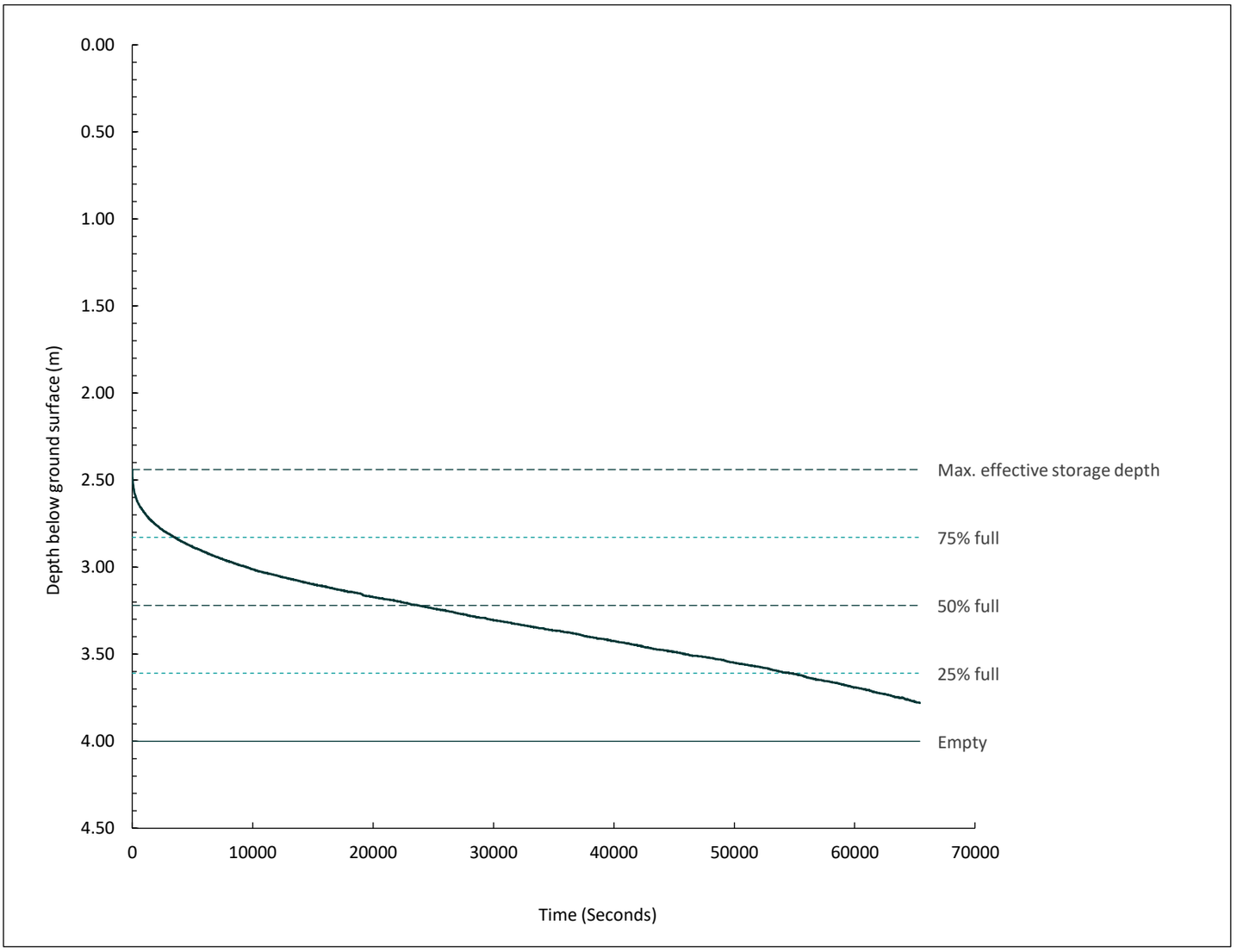
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP13

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612541.58	N: 315175.31
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	23.72 maOD
	Infilling 2	Test Date:	05/11/2021



Soil Infiltration Rate: 9.82E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 18:10	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

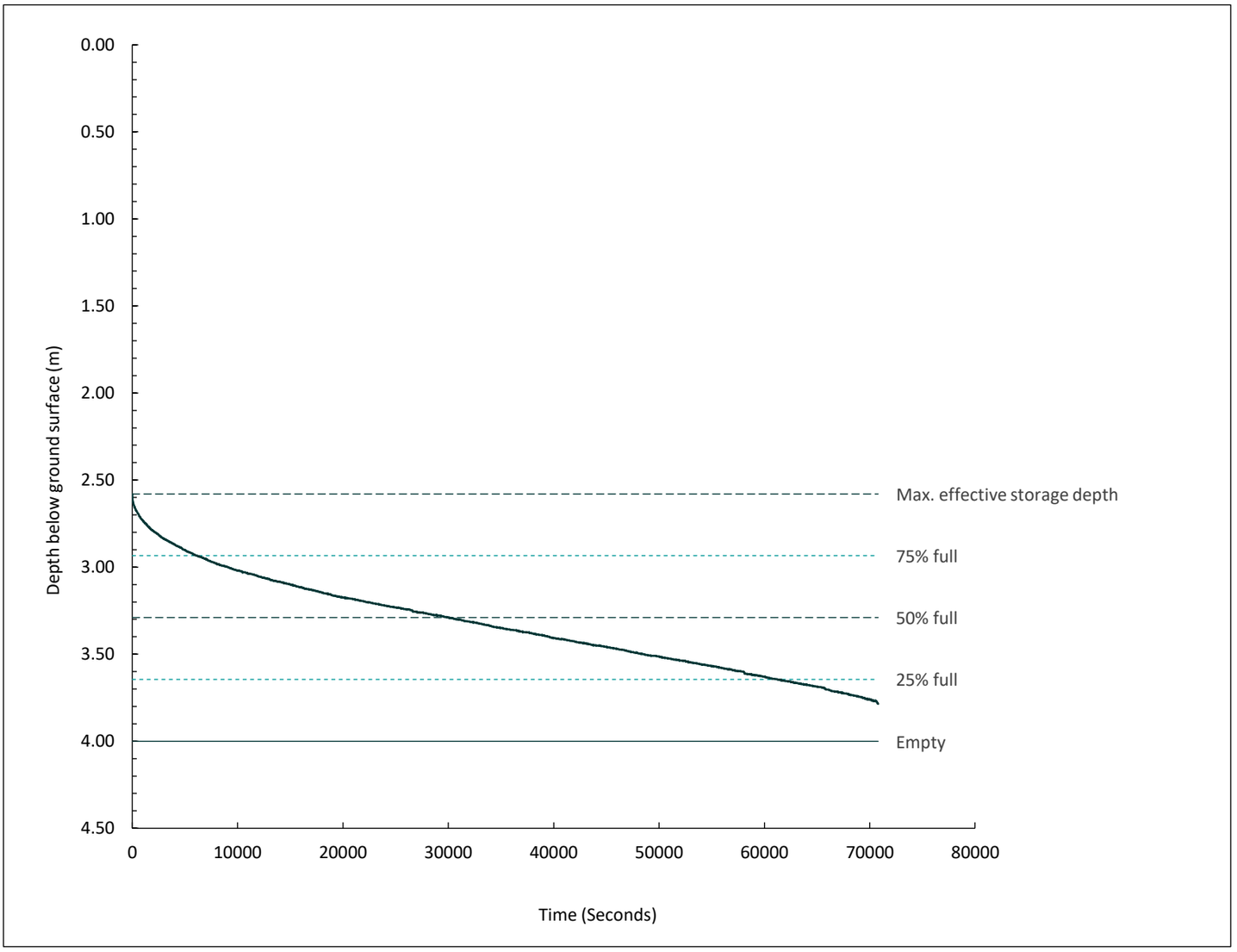
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP13

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612541.58	N: 315175.31
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	23.72maOD
	Infilling 3	Test Date:	08/11/2021



Soil Infiltration Rate: 8.91E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 19:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

Water measuring device: Level Logger
Weather conditions: Sunny and wet
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

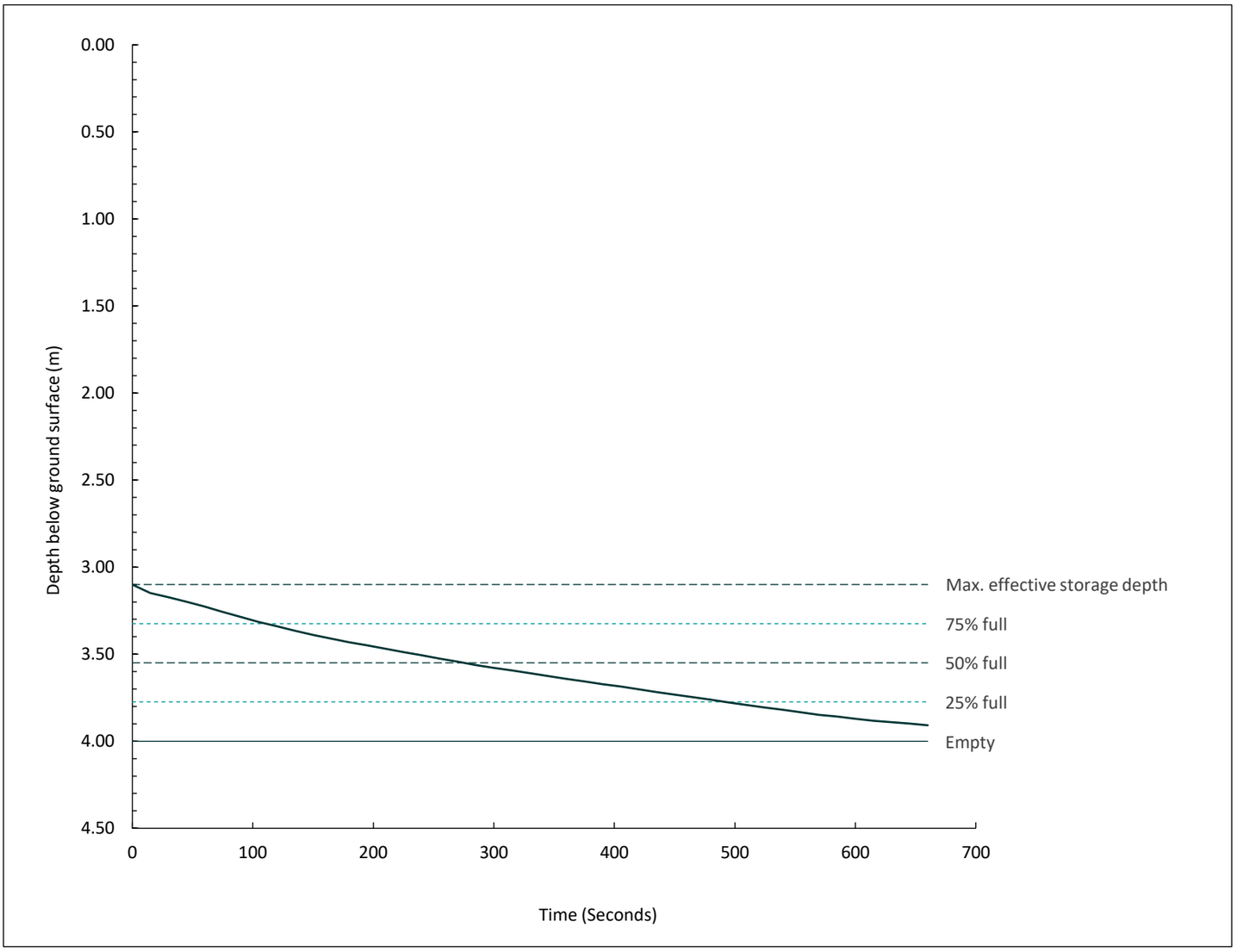
harrisongroup ENVIRONMENTAL

Soakaway Test

Location ID - Test Number

TP14

Project ID:	**NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612507.55 N: 315160.38
Location:	Norwich Western Link	Consultant: Ramboll	Ground Level: 23.70 maOD
		Infilling 1	Test Date: 04/11/2021



Soil Infiltration Rate: 1.13E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 00:11	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333

E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

Water measuring device: Level Logger

Weather conditions: Sunny and wet

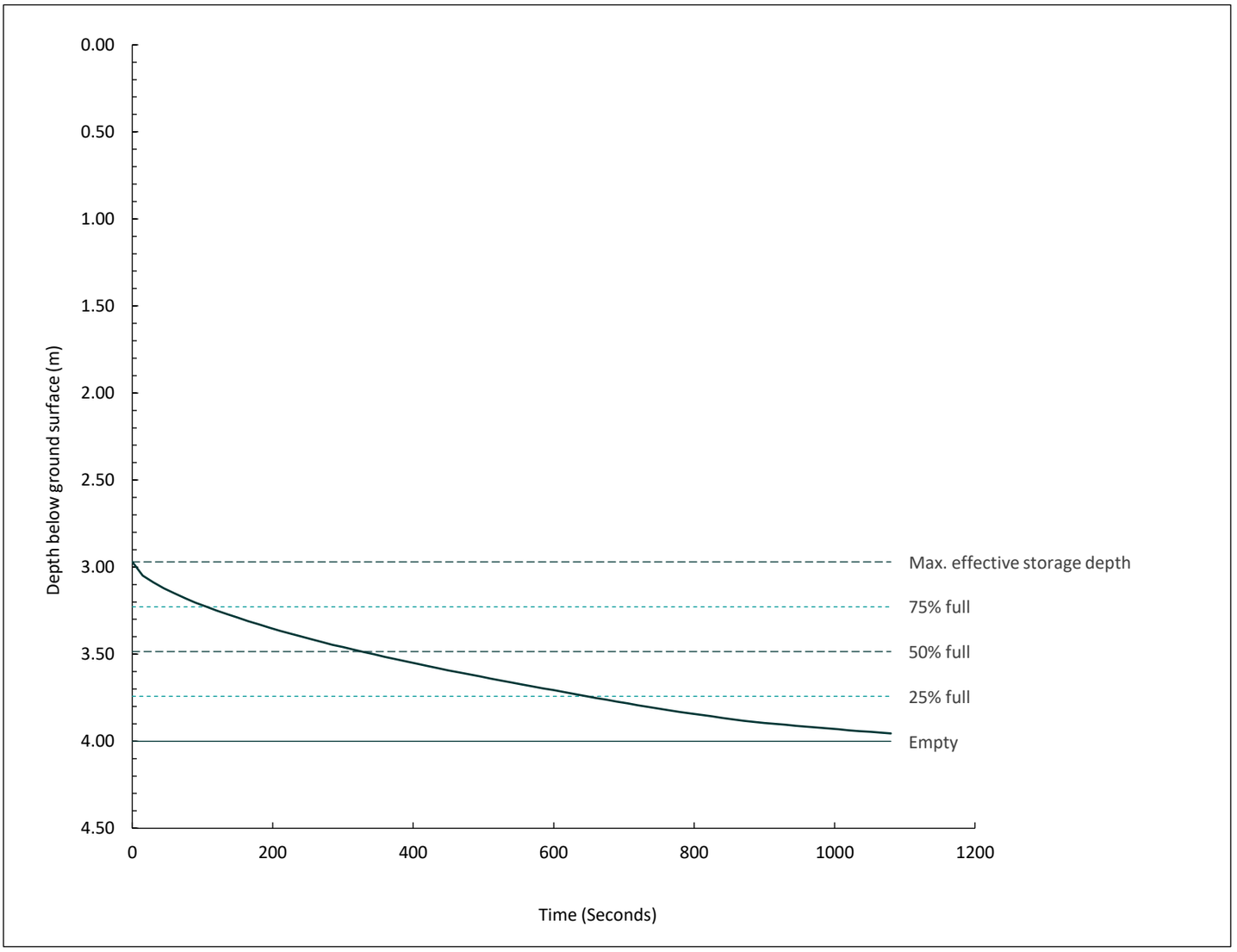
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP14

Project ID:	**NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612507.55 N: 315160.38
Location:	Norwich Western Link	Consultant: Ramboll	Ground Level: 23.70 maOD
		Infilling 2	Test Date: 04/11/2021



Soil Infiltration Rate: 8.33E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 00:18	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

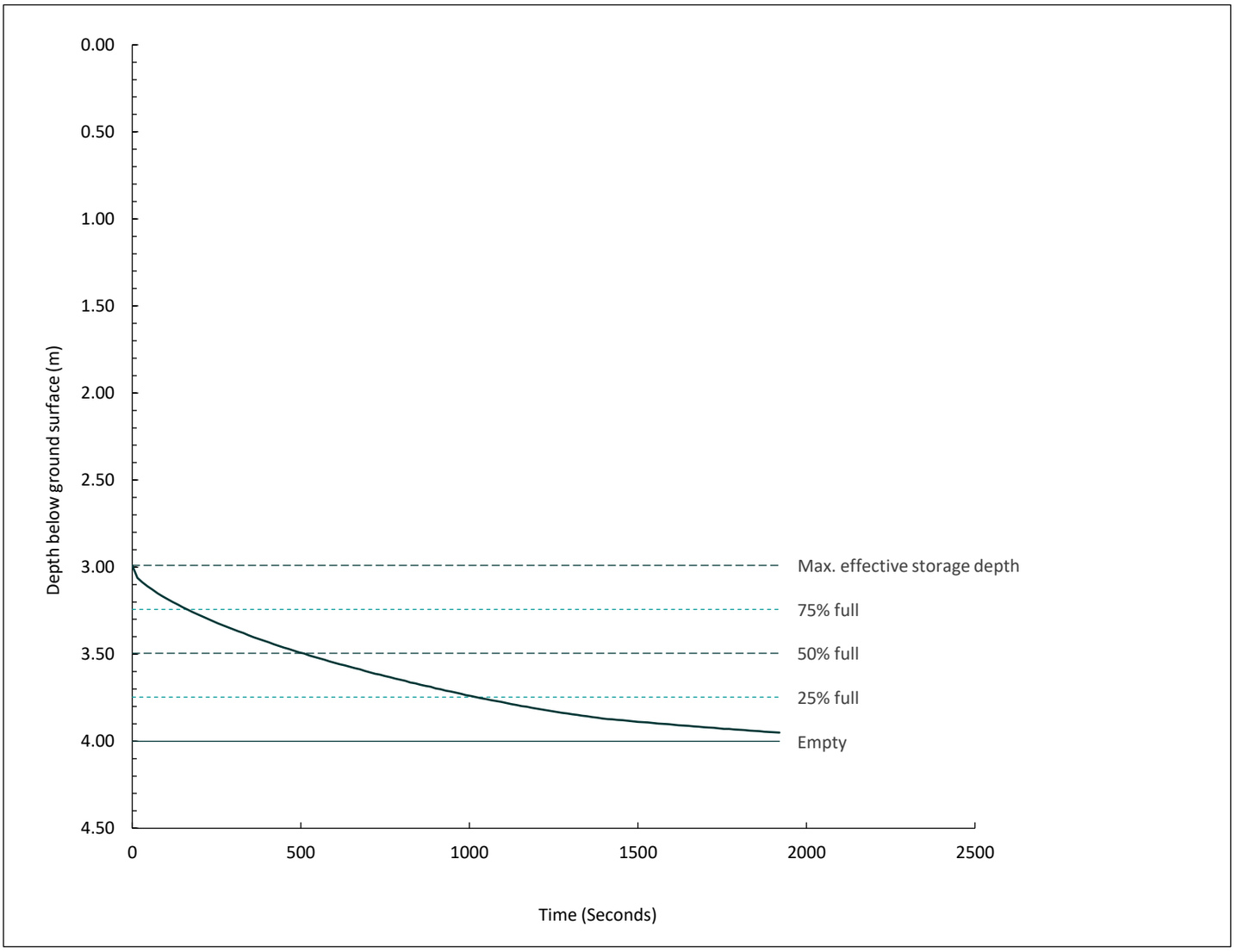
Water measuring device: Level Logger
Weather conditions: Sunny and wet
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP14

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612507.55	N: 315160.38
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	23.70maOD
	Infilling 3	Test Date:	04/11/2021



Soil Infiltration Rate: 5.22E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 00:32	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

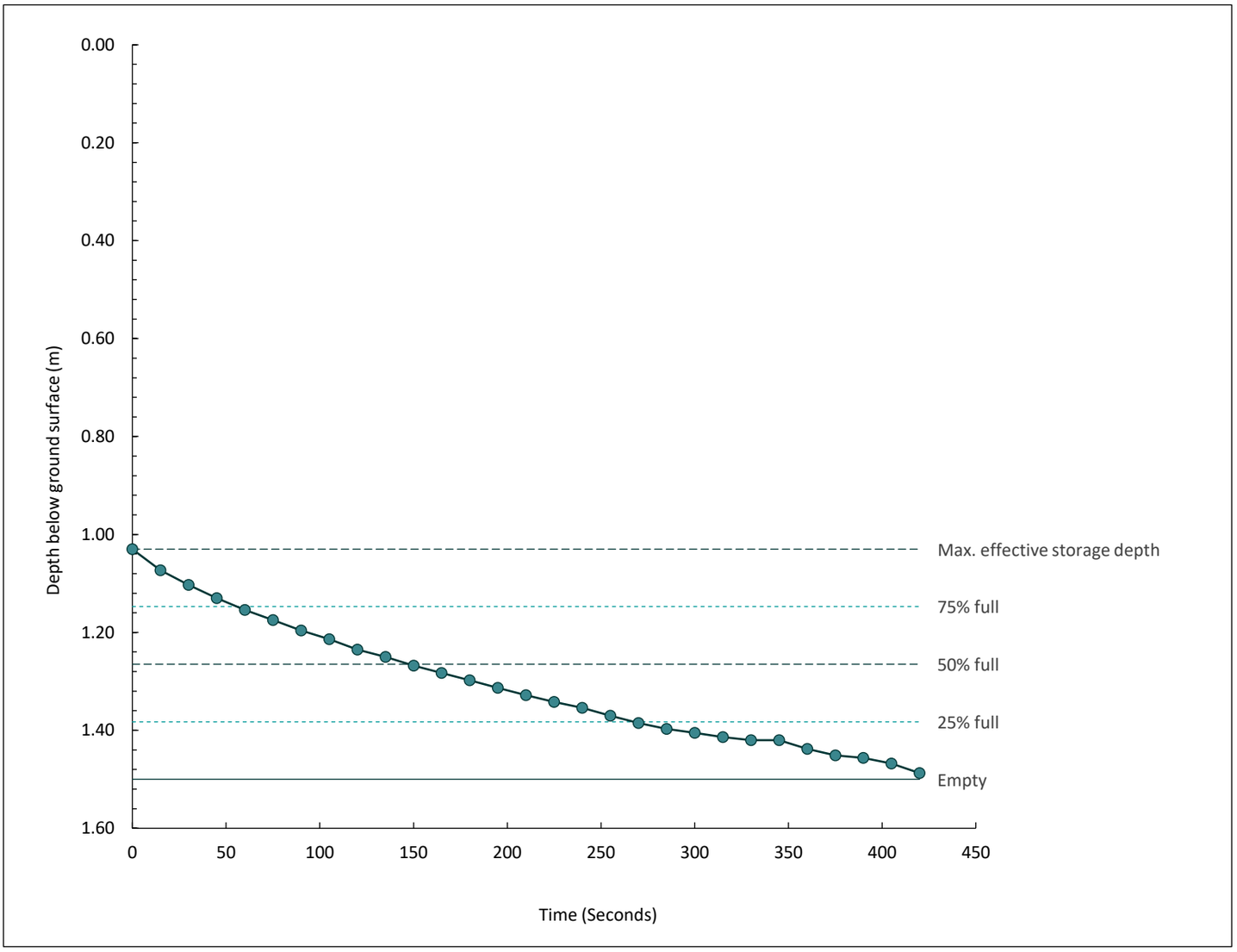
Water measuring device: Level Logger
Weather conditions: Sunny and wet
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP37A

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 610398.61	N: 313362.58
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	42.41 maOD
	Infilling 1	Test Date:	05/10/2021



Soil Infiltration Rate: 2.11E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	1.20	1.50	1.50

Fill Porosity: 30%	Test Duration (hh:mm): 00:07	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

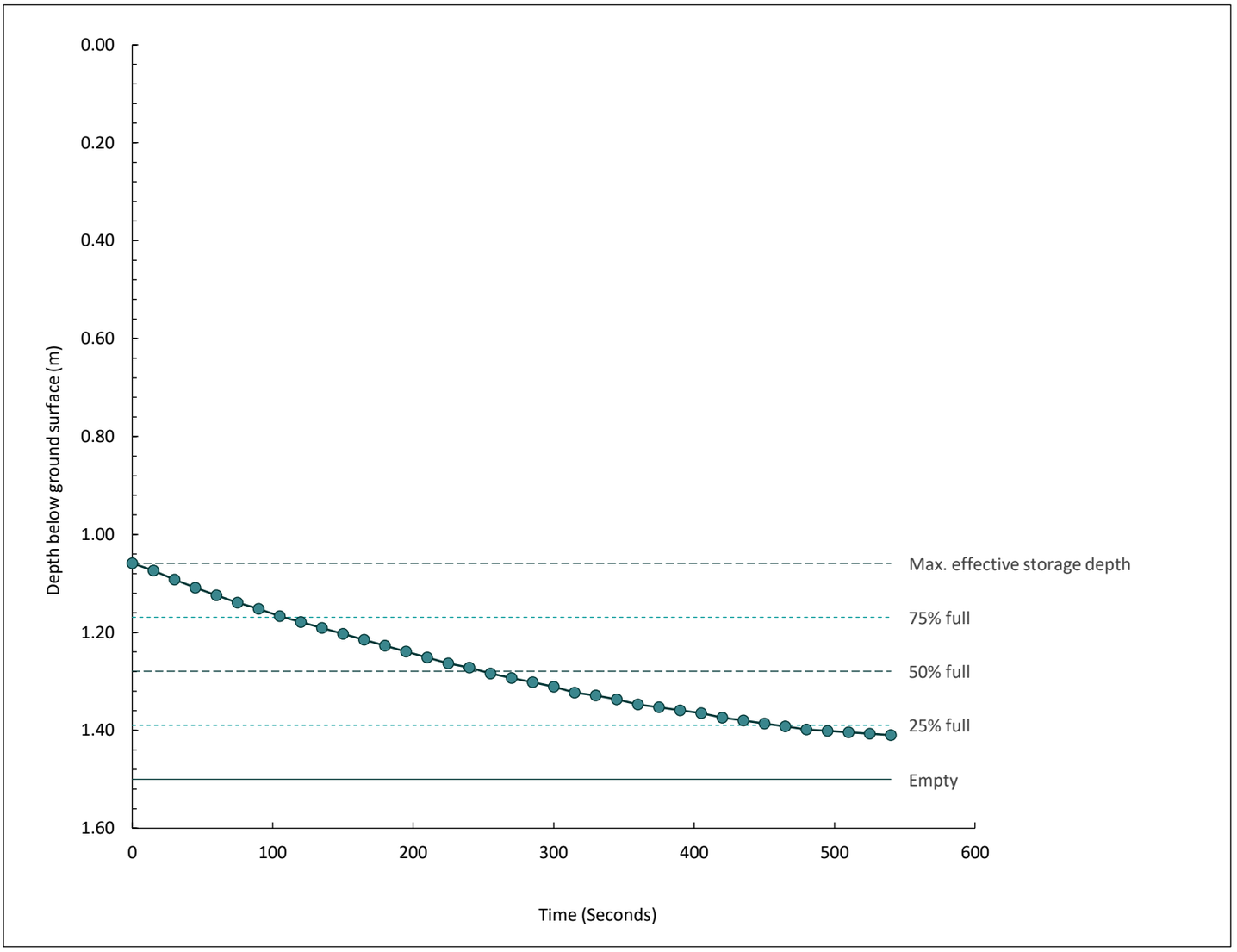
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP37A

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 610398.61	N: 313362.58
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	42.41 maOD
	Infilling 2	Test Date:	05/10/2021



Soil Infiltration Rate: 1.22E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	1.20	1.50	1.50

Fill Porosity: 30%	Test Duration (hh:mm): 00:09	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

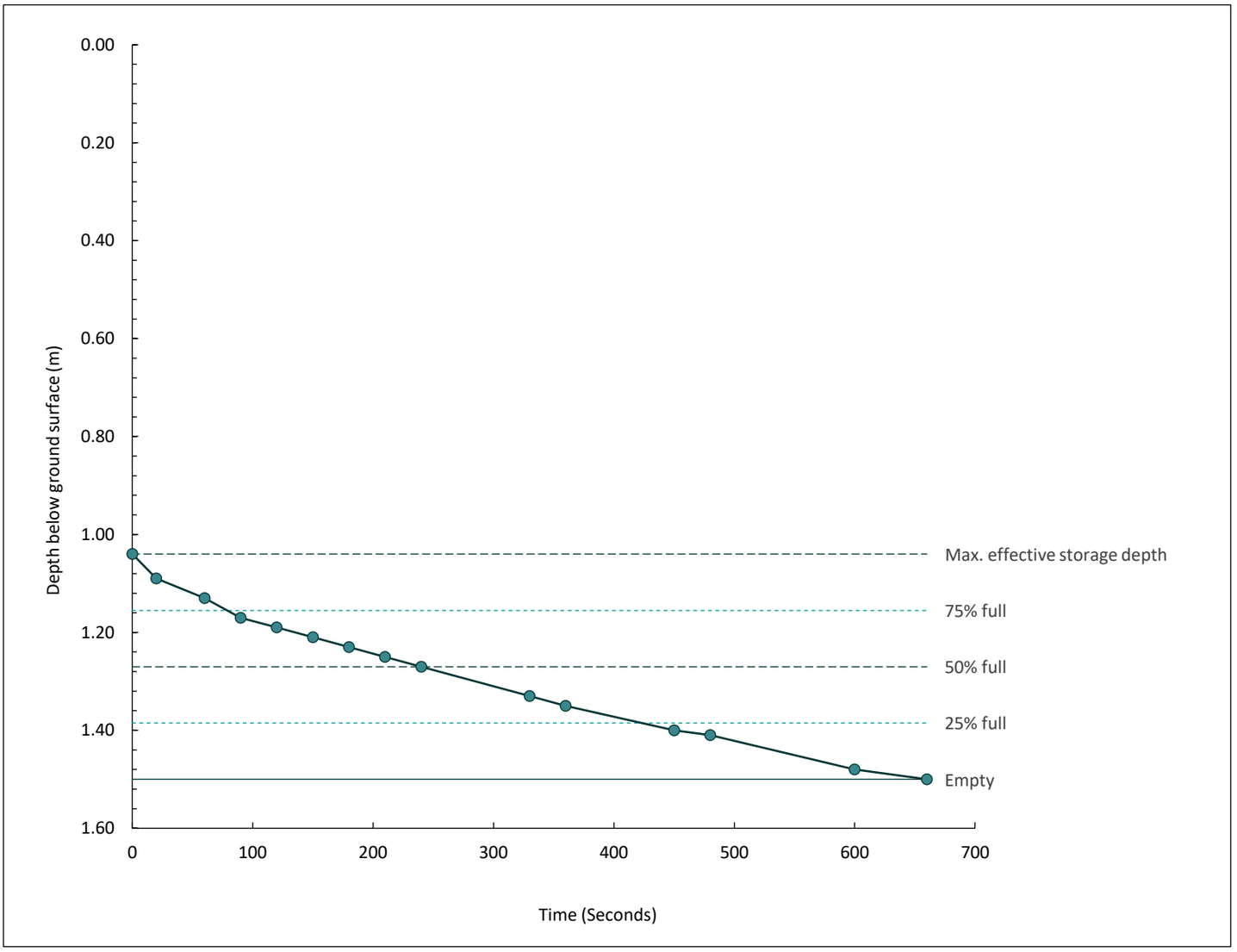
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP37A

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 610398.61	N: 313362.58
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	42.41maOD
	Infilling 3	Test Date:	05/10/2021



Soil Infiltration Rate: 1.28E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	1.20	1.50	1.50

Fill Porosity: 30%	Test Duration (hh:mm): 00:11	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

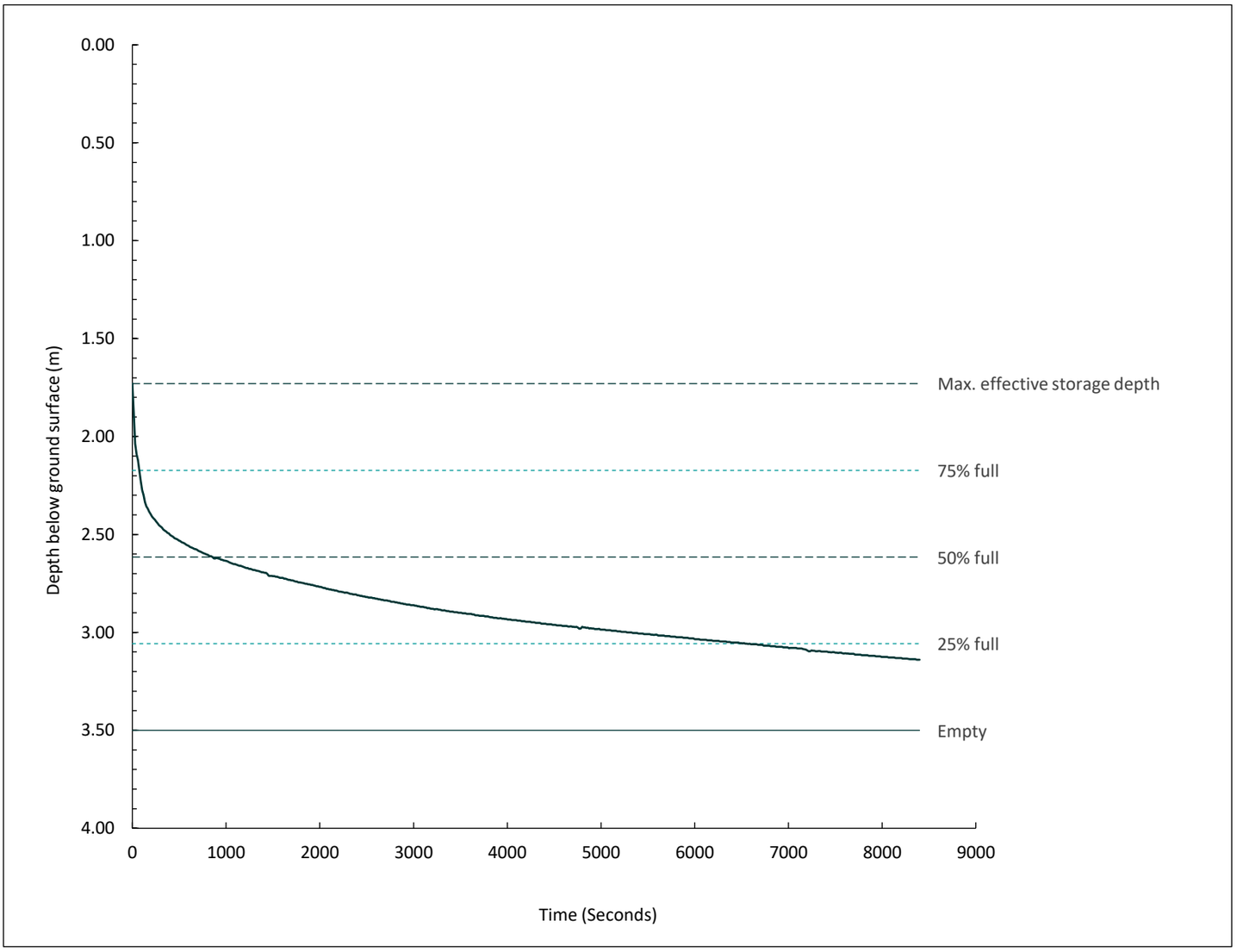
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Levellogger malfunction. Dip meter readings only.

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP38

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 610379.08	N: 313336.36
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	43.71 maOD
	Infilling 1	Test Date:	05/10/2021



Soil Infiltration Rate: 8.07E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.50	3.50	3.50

Fill Porosity: 30%	Test Duration (hh:mm): 02:20	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

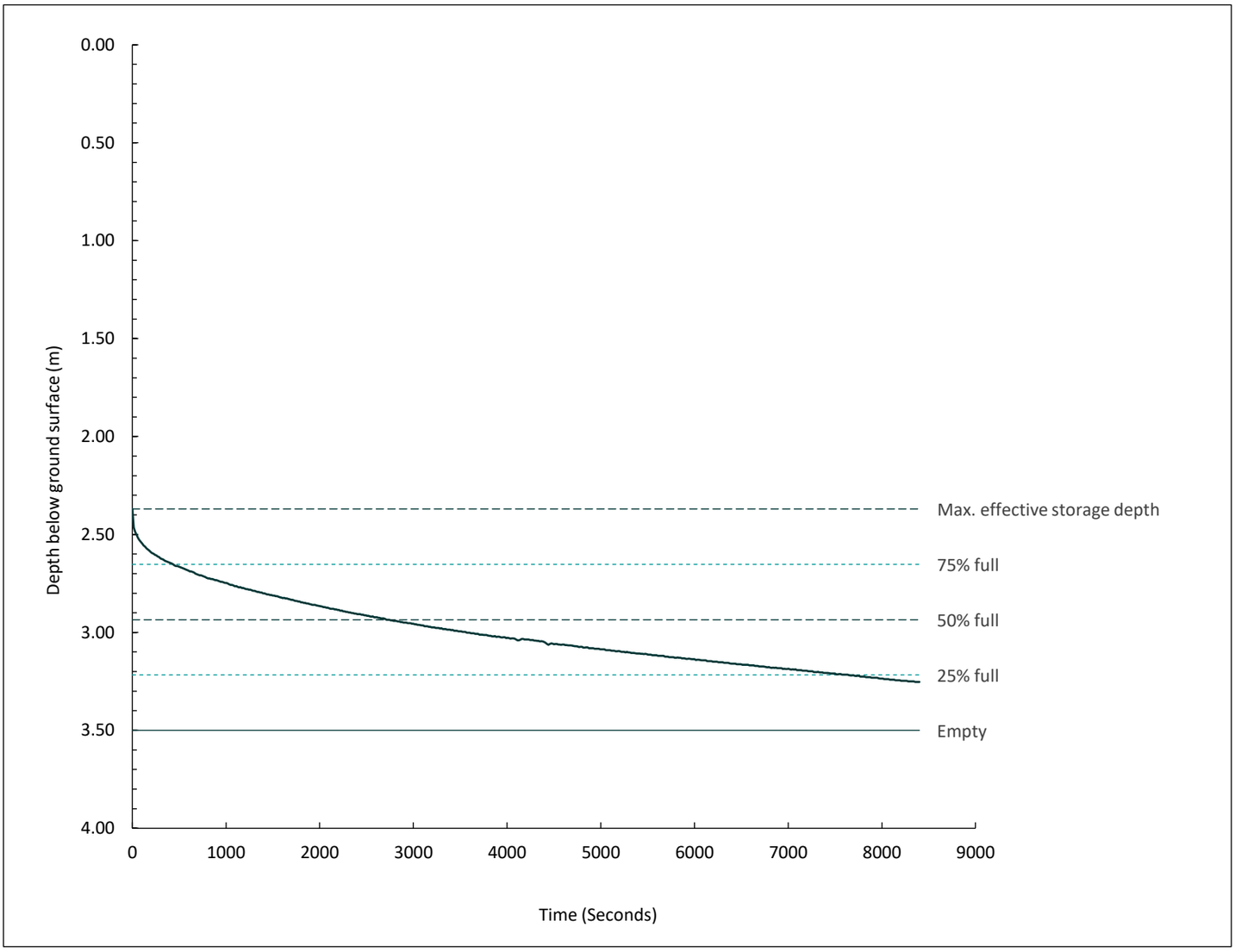
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP38

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 610379.08	N: 313336.36
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	43.71 maOD
	Infilling 2	Test Date:	05/10/2021



Soil Infiltration Rate: 6.51E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.50	3.50	3.50

Fill Porosity: 30%	Test Duration (hh:mm): 02:20	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

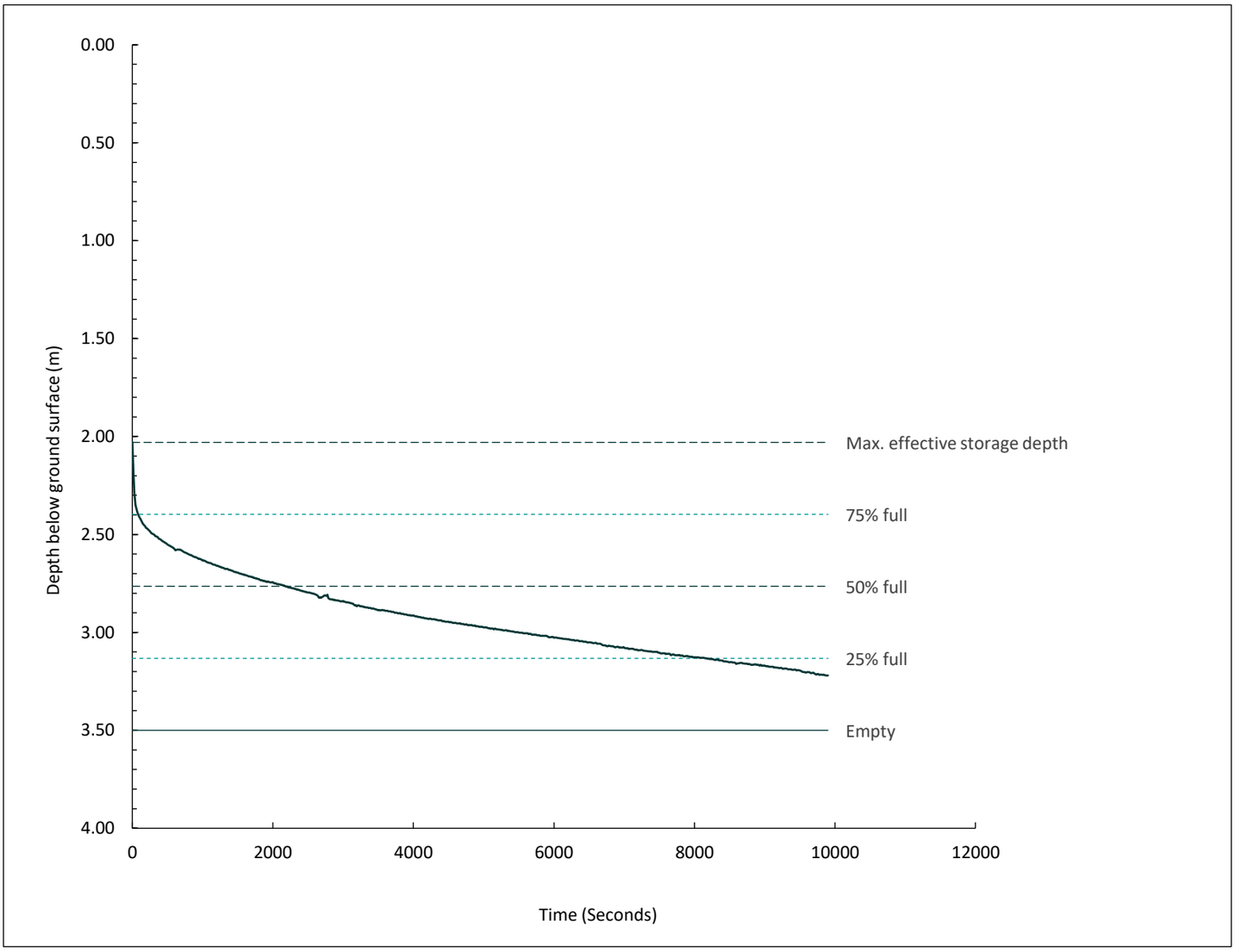
AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP38
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 610379.08 N: 313336.36
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 43.71maOD
	Infilling 3	Test Date: 05/10/2021



Soil Infiltration Rate: 6.21E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.50	3.50	3.50

Fill Porosity: 30%	Test Duration (hh:mm): 02:45	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

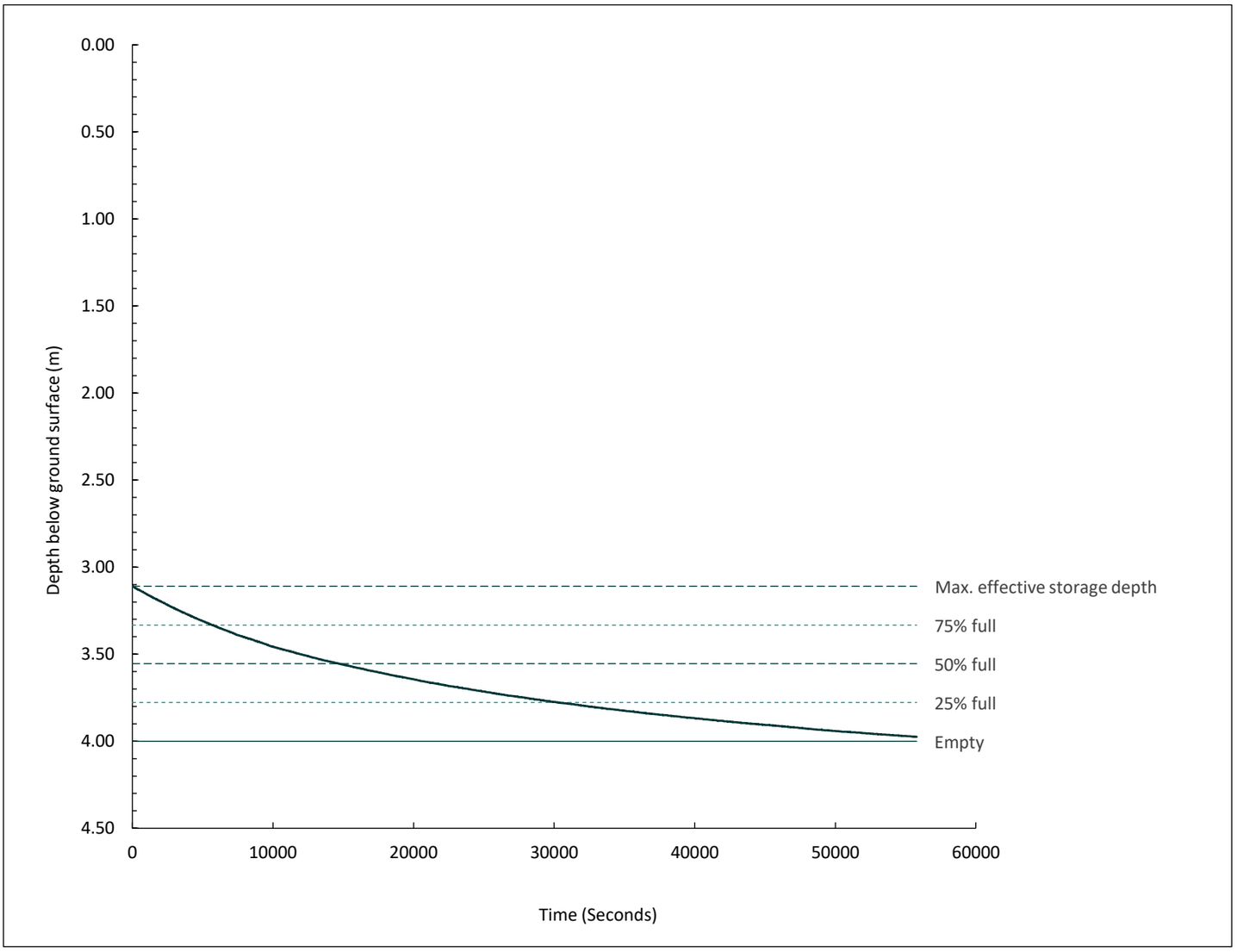
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP51

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614659.05	N: 315481.57
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.73 maOD
	Infilling 1	Test Date:	04/11/2021



Soil Infiltration Rate: 1.74E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.70	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 15:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

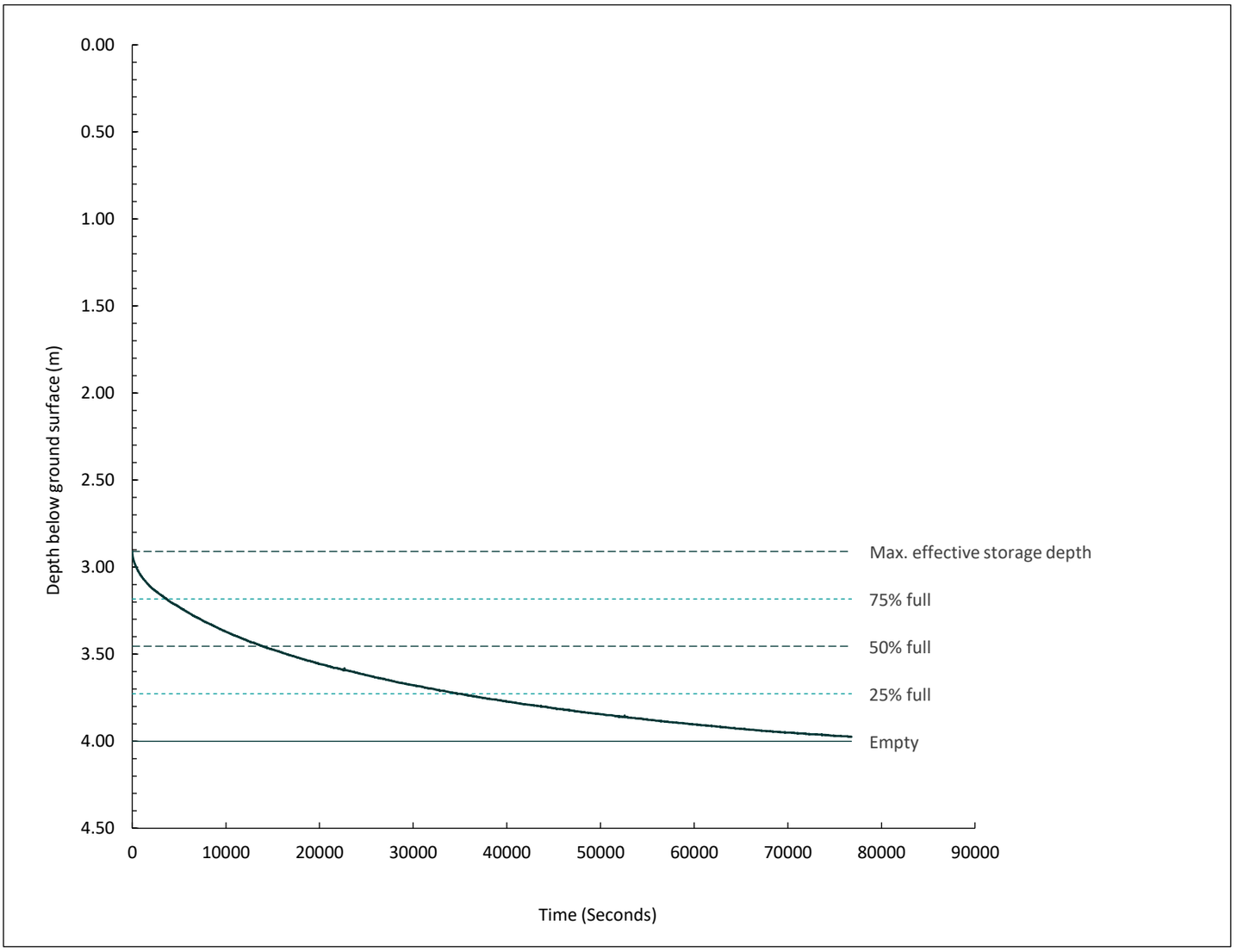
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP51

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614659.05	N: 315481.57
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.73 maOD
	Infilling 2	Test Date:	08/11/2021



Soil Infiltration Rate: 1.46E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.70	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 21:20	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

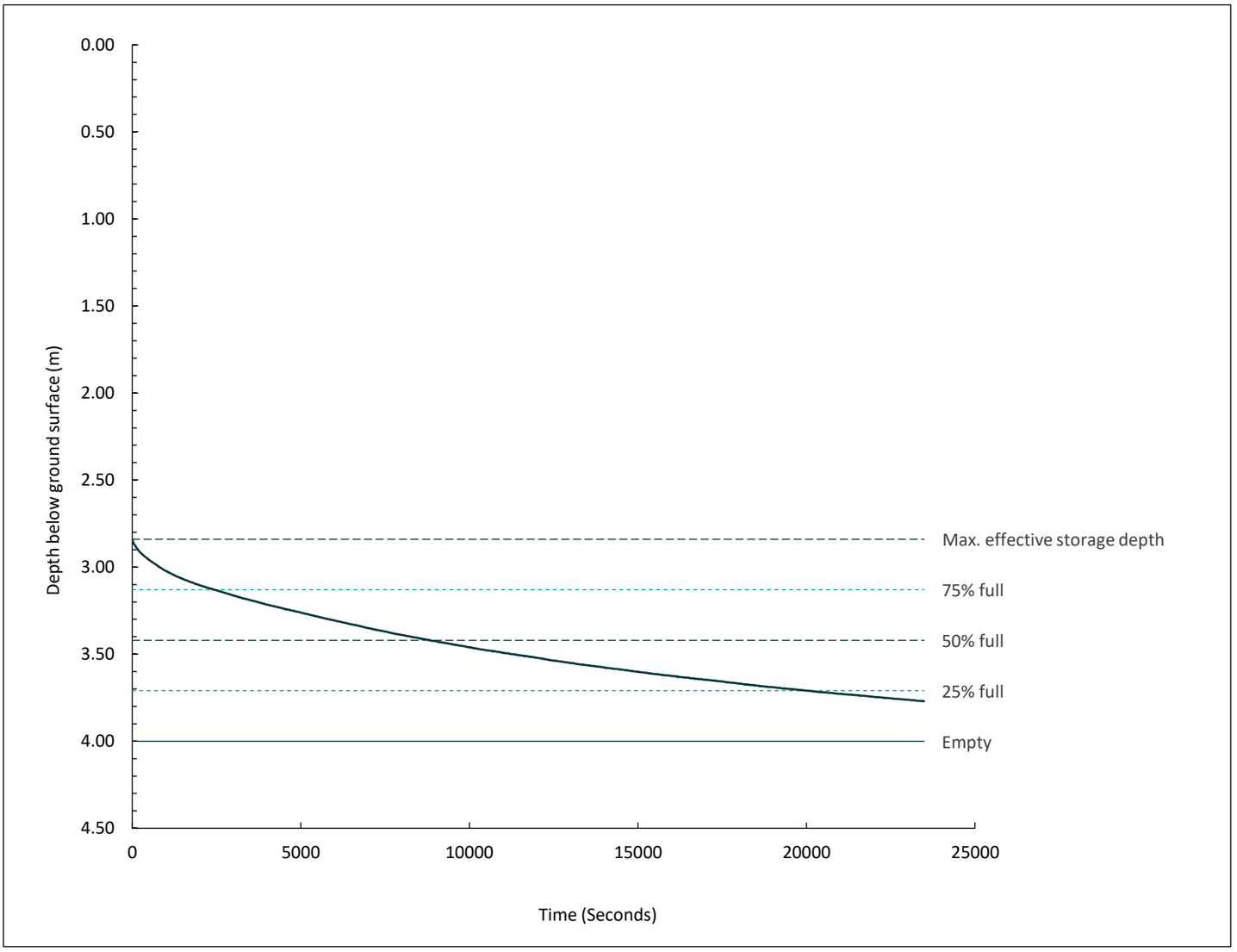
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP51

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614659.05	N: 315481.57
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.73maOD
	Infilling 3	Test Date:	09/11/2021



Soil Infiltration Rate: 2.64E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.70	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 06:31	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

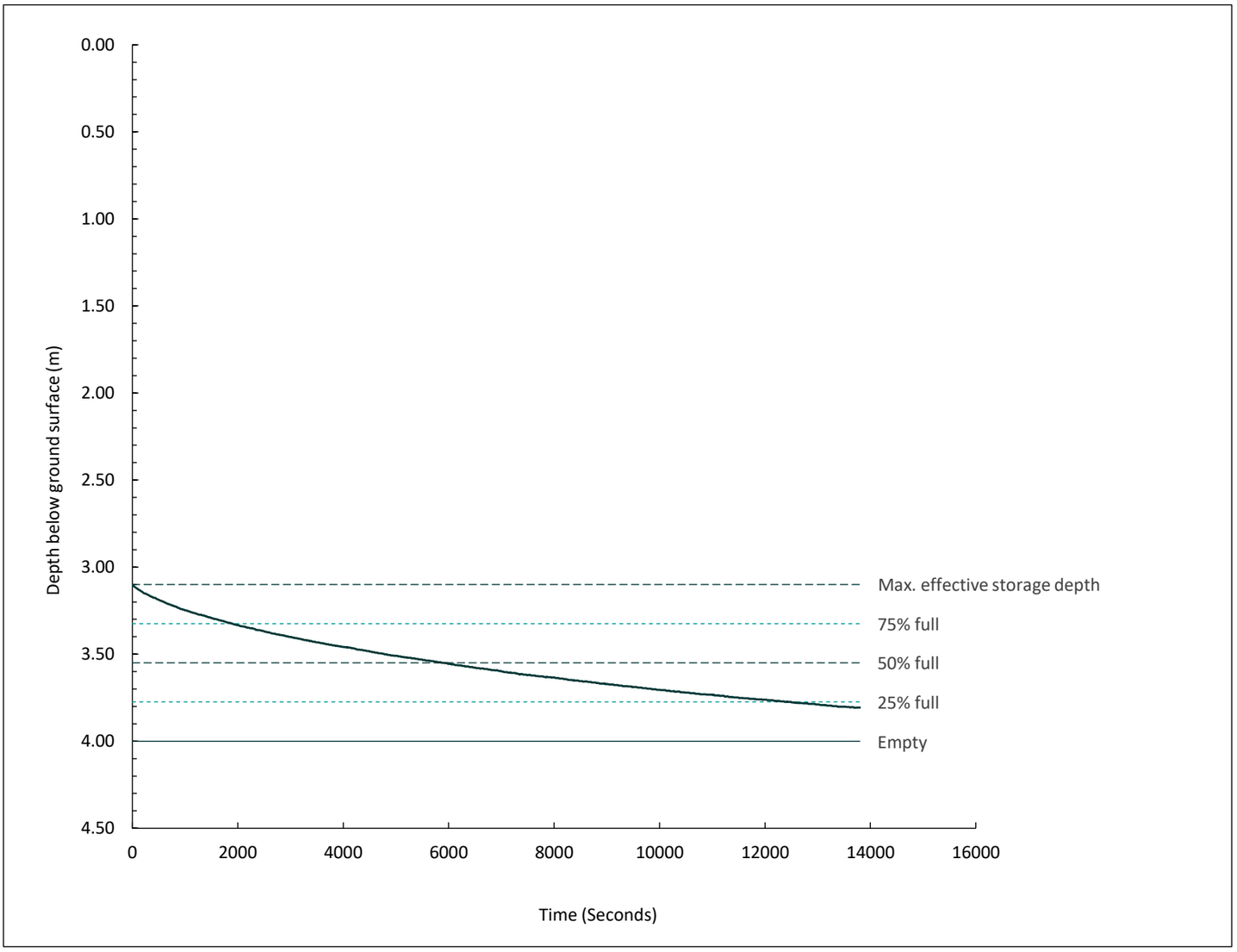
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Effective rate calculation based on maximum water depth achieved.

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP52

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614665.38	N: 315451.06
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.40 maOD
	Infilling 1	Test Date:	08/11/2021



Soil Infiltration Rate: 4.08E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 03:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

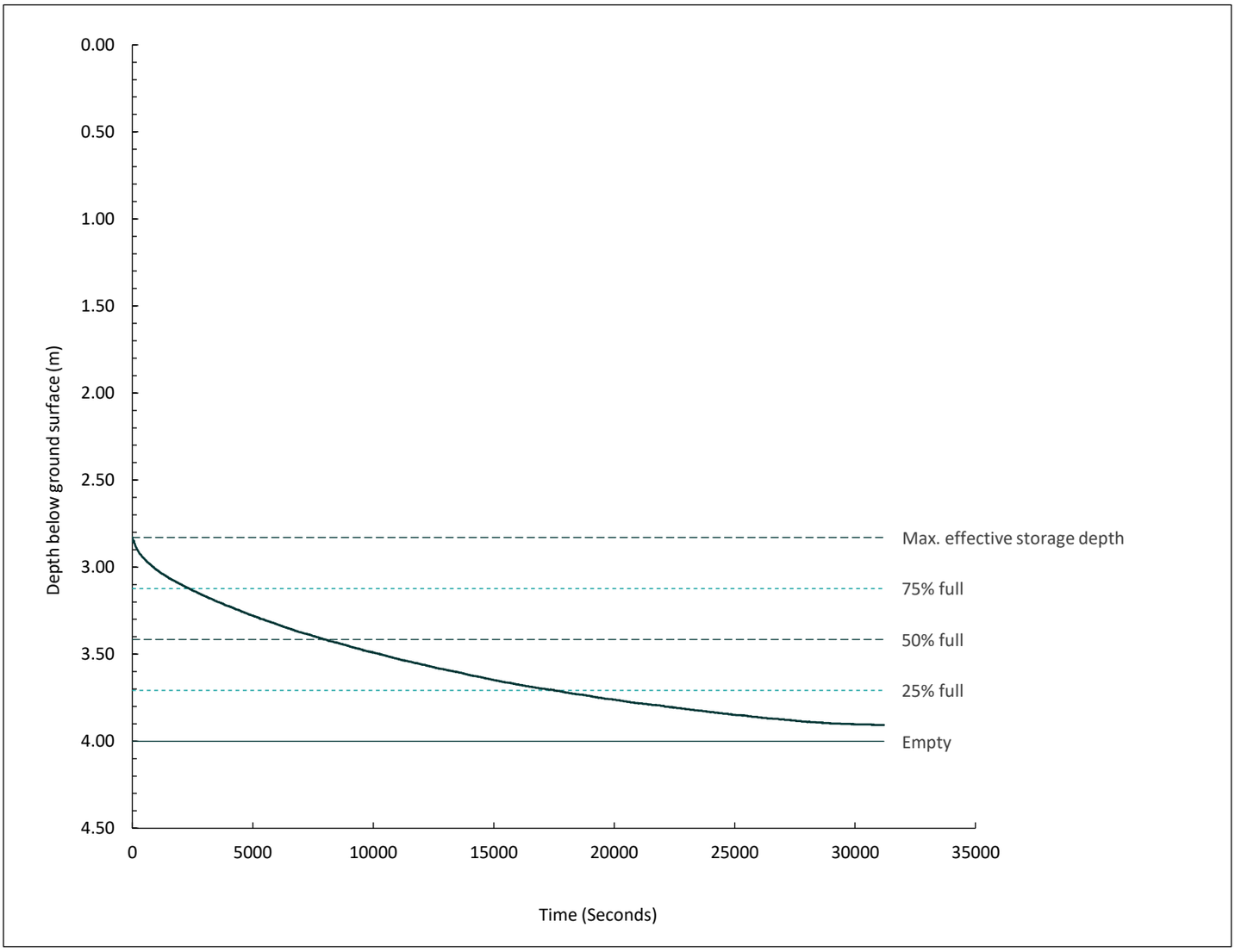
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP52

Project ID:	**NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 614665.38 N: 315451.06
Location:	Norwich Western Link	Consultant: Ramboll	Ground Level: 18.40 maOD
		Infilling 2	Test Date: 08/11/2021



Soil Infiltration Rate: 3.08E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 08:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

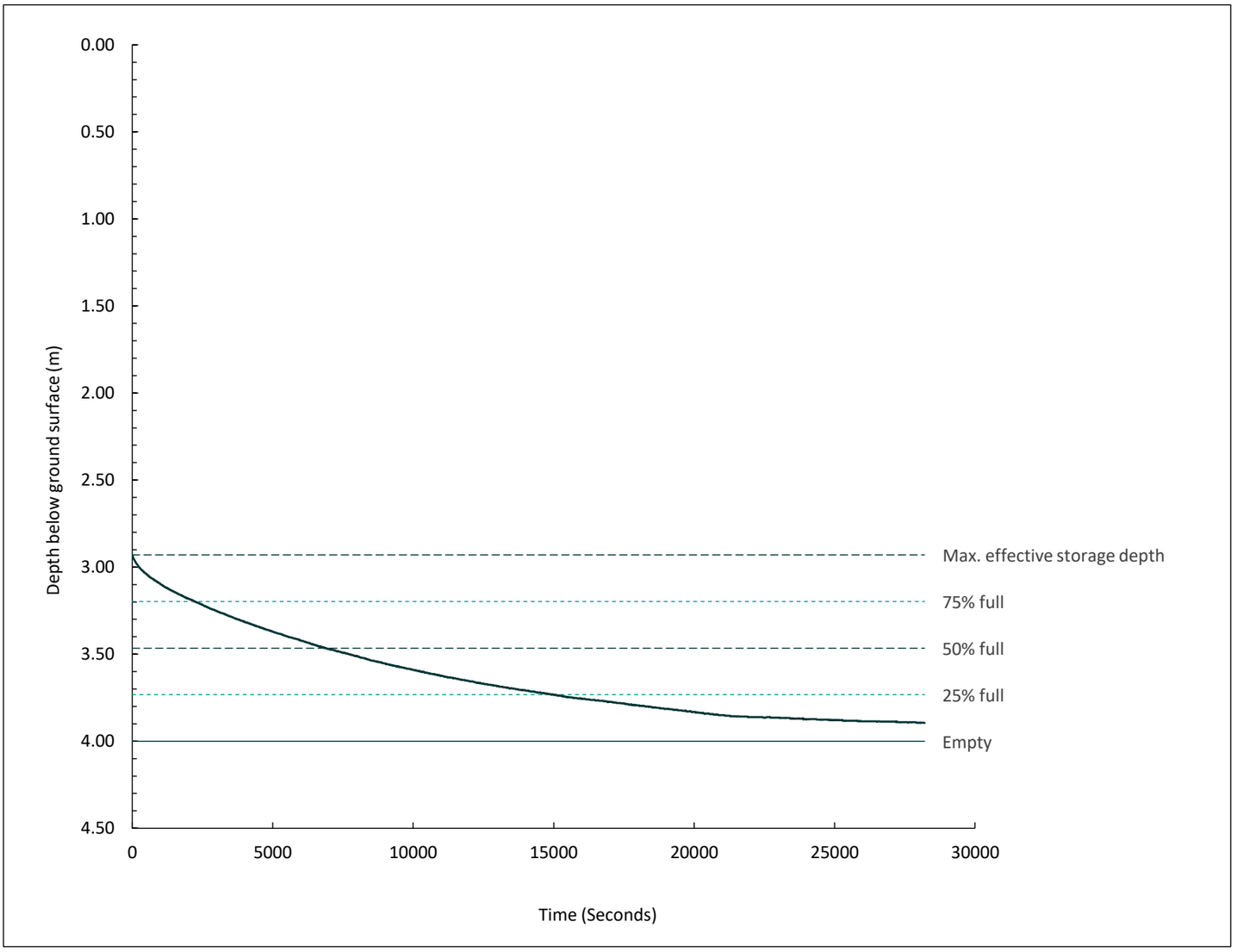
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP52

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614665.38	N: 315451.06
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.40maOD
	Infilling 3	Test Date:	09/11/2021



Soil Infiltration Rate: 3.57E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.50	4.00	4.00

Fill Porosity: 30%	Test Duration (hh:mm): 07:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: R. Knott	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

ferrovial construction

RAMBOLL

Norfolk County Council

NORWICH WESTERN LINK

DOCUMENT TITLE*:
Factual Ground Investigation Report

DOCUMENT NUMBER*	NCCT41973-HAG-VGT-FSC-RP-GI-0002

STATUS*	S4 - Suitable for Review and Authorisation	Date*:	07/10/2022
		Revision*:	P02
ASITE Task ID:			

Prepared by*	Checked by*	Approved by*
		
Rachael Leech Senior Geotechnical Engineer	David Ruiz Site Agent	Francisco Quesada Engineering Manager

*Details correct at time of upload to ASITE. Check ASITE for current document status, and Workflows Approval
*Note that Asite 'Purpose of Issue' Attribute is the same as the ISO19650 'STATUS'

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Revision History			
Rev No	Date	Summary of Changes	Section or Page Number
P01	16/09/2022	First Issue - Draft	Not Applicable
P02	07/10/2022	Second Issue – Following Ramboll Comment	Not Applicable

Document:	Factual Ground Investigation Report
Project:	Norwich Western Link – Alignment Refinement
Reference No.:	NCCT41793_GI-AR
Date:	October 2022
Prepared for:	Ferrovial Construction (UK) Limited
Investigation Supervisor:	Ramboll UK Limited

harrisongeotechnical
ENGINEERING

A division of Harrison Group Environmental Limited

Location ID	Easting	Northing	Ground Level (maOD)	Depth	Installed	Number of Samples	Termination Reason	Fieldwork Date(s)
WS214	613589.24	315079.63	18.46	1.20	N	7	Dense stratum	27/06/2022
WS215	614040.26	315783.95	16.21	2.00	Y	8	Dense stratum	23/05/2022
WS216	614297.87	315618.71	21.58	3.00	Y	12	Dense stratum	23/05/2022

Table 3.2.4: Summary of Dynamic Continuous Sampling (Window Sampler) boreholes.

3.2.5 Monitoring Wells

Monitoring standpipes were installed within a proportion of the window sampler, cable percussive and rotary boreholes drilled as summarised in table 3.2.5 below.

Detailed descriptions of the installations and their corresponding backfill materials are included on the relevant exploratory borehole logs presented in Appendix B.

Location ID	Pipe ID	Diameter of Installation (mm)	Response Zone (mbgl)		Response Zone (maOD)	
			Top	Base	Top	Base
BH201	PIPE1	19	1.50	8.00	24.51	18.01
BH203	PIPE1	50	1.00	4.00	14.88	11.88
BH206	PIPE1	50	2.50	6.50	10.27	6.27
BH210	PIPE1	50	50.00	55.00	-40.80	-45.80
BH210	PIPE2	50	1.00	2.00	8.20	7.20
BH221	PIPE1	50	40.00	45.00	-31.11	-36.11
BH226	PIPE1	50	4.00	8.00	7.50	3.50
BH228	PIPE1	50	9.00	12.00	6.60	3.60
BH229	PIPE1	50	1.00	6.00	23.06	18.06
BH231	PIPE1	50	5.00	25.00	20.08	0.08
BH233	PIPE1	50	9.00	24.50	20.67	5.17
BH233	PIPE2	50	1.00	4.00	28.67	25.67
BH235	PIPE1	50	15.00	16.00	16.38	15.38
BH235	PIPE2	19	3.00	7.50	28.38	23.88
BH236	PIPE1	19	2.00	6.50	32.69	28.19
BH237	PIPE1	50	9.00	10.00	26.65	25.65
BH241	PIPE1	50	8.50	10.40	30.98	29.08
BH243	PIPE1	50	1.00	13.00	39.20	27.20
BH245	PIPE1	19	2.00	2.50	21.23	20.73
BH246	PIPE1	50	1.50	3.00	22.43	20.93
WS211	PIPE1	50	2.50	3.00	21.48	20.98
WS212	PIPE1	50	2.00	4.00	20.00	18.00
WS213	PIPE1	50	1.00	5.00	14.42	10.42
WS215	PIPE1	50	1.00	2.00	15.21	14.21
WS216	PIPE1	50	1.00	2.00	20.58	19.58

Table 3.2.5: Summary of Monitoring Wells installed within boreholes.

3.2.6 Dynamic Cone Penetrometer Tests

Twelve dynamic cone penetrometer tests (DCP) were undertaken utilising a TRL-DCP as summarised in table 3.2.6 below. Testing was undertaken to gain estimated in-situ CBR values at designated locations across the site area.

3.3 Fieldwork Observations

3.3.1 Lithology

The exploratory locations across the site encountered a range of different soil types which are considered to be representative of the formations summarised in the following sections and in table 3.3.1.

Topsoil

Topsoil deposits were encountered within a majority of the locations across the site area. These deposits were broadly encountered to depths between 0.3 – 0.6m however were encountered to depths of 0.7m and 1.0m within WS215 and WS216 respectively. Composition of these deposits varied locally however were generally described as granular soils with variation in the content of fines.

Made Ground

Made ground was encountered during the investigation at limited locations across the site area and was generally recorded to depth between 0.2 – 0.6m. Where recorded between these depths, made ground was limited to surficial soils with anthropogenic constituents noted to comprise occasional or rare brick fragments. A greater extent of made ground was encountered at the location of trial trench TR205 where the trench was extended to expose the lateral extents of a feature considered to be a backfilled waste pit. Material comprised granular soil with anthropogenic constituents noted to include plastic, string, rope, pockets of ash, wood, charcoal, rubber and electrical cable fragments. A depth of possible made ground was also noted at the location of BH245 extending to a depth of 2.5m where materials considered to represent possible reworked material with occasional fine brick fragments were noted throughout.

Alluvium and Peat Deposits

Deposits considered representative of *Alluvium* and *Peat Deposits* were encountered within the River Wensum valley floodplain and immediate surrounding area. Alluvial soils comprised both granular and cohesive horizons. Cohesive horizons were generally described as very soft to soft slightly gravelly sandy clay, however deposits of silty clay were also noted. Where granular horizons were noted, these typically comprised gravelly silty fine to coarse sand with local variation in the gravel and fines content and variable record of organic content. Gravel horizons were also noted and described generally as very sandy to sandy fine to coarse flint gravel with variation in the fines content. The thickness of the *Alluvium* deposits was limited to depths generally less than 2m however were noted to extend to 2.4m depth within BHR212. Horizons of fibrous and pseudo-fibrous peat were frequently recorded within locations centred either side of the River Wensum and parts of the floodplain extending south from the river. *Peat* deposits were typically described as spongy but also included deposits described as plastic with a frequent organic odour noted throughout. Occasional granular material was also noted within the peat deposits and included sand and flint gravel fractions. Overall peat deposits were recorded to a maximum depth of 2.9m within BH209.

Head Deposits

Deposits considered representative of *Head* were only confidently identified at once location. It is considered that due to the predominantly granular nature of the superficial parent soils across the site area, identifying the presence of *Head Deposits* can prove difficult. Deposits encountered at the location of BH226 between 0.3 – 2.5m depth have been considered as *Head Deposits* described as loose brown gravelly slightly clayey fine to coarse sand with gravel of fine to medium flint. These deposits are considered to have been derived from parent superficial soils up-gradient to the south which are considered to be representative of the *Sheringham Cliffs Formation* and the *Head Deposits* have formed from natural washout and migration of material down gradient.

River Terrace Deposits

Granular soils considered representative of *River Terrace Deposits* were encountered within positions in a localised area north and south of the River Wensum. These soils were typically described as slightly silty to silty, gravelly to very gravelly fine to coarse sand with localised low to medium flint cobble content. Horizons of fine to coarse flint gravel were also typically encountered within this unit and in-situ testing indicates that these deposits were generally recorded as medium dense to dense. Overall, these soils were encountered to a maximum depth of 9.0m.

Lowestoft Till

Cohesive glacial deposits considered representative of the *Lowestoft Formation* were only encountered at a single location during the investigation towards the far south of the realignment scheme. These soils

were encountered within TP233 between 2.8-3.1m depth and were described as firm light grey mottled light brown slightly sandy gravelly clay with gravel of flint and chalk.

Sheringham Cliffs Formation

Deposits considered representative of the *Sheringham Cliffs Formation* were frequently encountered across the entire site and were recorded within a vast proportion of the exploratory locations. Deposits comprised both granular and cohesive horizons although the granular horizons were observed to be the most prominent soil type of this formation with the cohesive horizons observed to be more localised and at depth.

Where granular soils were recorded, these were categorised as the *Sheringham Cliffs Formation – Granular* unit. These granular deposits typically comprised silty gravelly fine to coarse sand with local variation in the content of fines but also included limited horizons of sandy gravel. Gravel components mainly comprised flint however records of sandstone, cemented ironstone, chalk and quartz were occasionally noted throughout. A low to medium cobble content was also frequently observed with cobbles comprising flint. Localised pockets and lenses of sandy clay were also sporadically recorded throughout the granular strata at varying depths and thicknesses with occasional records of interbedded sand and clay. Overall, deposits of the *Sheringham Cliffs Formation – Granular* were recorded to a maximum depth of 15.50m in BH250 however were observed to variable thicknesses throughout the site area.

Where cohesive deposits considered representative of the *Sheringham Cliffs Formation – Cohesive* unit were encountered, these were typically described as firm to stiff slightly gravelly sandy clay with local variation in the content of fines and gravel. Gravel constituents typically comprised flint with occasional accounts of chalk also recorded. Deposits described as gravelly silt with gravel comprising chalk and occasionally flint were also recorded in a limited number of locations. Localised pockets and lenses of sand were also occasionally observed throughout the cohesive strata with accounts of interbedded silt, clay and sand units. Overall, cohesive horizons of the *Sheringham Cliffs Formation Silts and Clays* were encountered to a maximum depth of 15.0m recorded in BHR243 however were observed to variable thicknesses throughout the site.

Glacial Deposits

Deposits referred to as *Glacial Sand and Gravel* or *Glacial Silts and Clays* have been categorised where it has been difficult to discern the distinct geological formation to which these deposits belong but are otherwise considered to be a product of glacial activities. These glacial deposits were encountered across the entire site area to varying extents and were found amid other formations more easily distinguished.

Where granular deposits have been encountered, these have generally been described as very gravelly to gravelly fine to coarse sand with variation in the fine and gravel content with gravel typically comprising flint, however occurrences of chalk and quartzite were also recorded. Horizons of sandy to very sandy gravel were also frequently noted and, in some cases, where the unit was described with main constituents comprising both sand and gravel fractions. The content of fines and density of these deposits varied locally however they were typically found to be medium dense to dense. The colour of these granular deposits was frequently recorded as yellowish brown, yellowish grey or light brown with darker colours such as greyish brown, orangish brown and brown also recorded predominantly within boreholes undertaken within the Wensum Valley floodplain. Overall, *Glacial Sand and Gravel* deposits were recorded to a maximum depth of 21.30m within BHR241 however were observed to variable thicknesses and extents throughout the site.

Cohesive deposits referred to as *Glacial Silts and Clays* were encountered within localised exploratory positions across the site area to a maximum depth of 23.3m recorded within BHR241. Both silt and clay deposits were recorded, each with a wide variation in secondary constituents. Where gravel was recorded as a secondary constituent the lithology typically comprised flint however chalk was also commonly recorded. Silt deposits considered representative of this unit were encountered within boreholes BH233 – 234, BH236 – 237, BH239 - 241 situated between parcels of woodland. Silt deposits were also encountered within TP213, TP22 -230 and TP234 north of Ringland Lane and it is possible that these deposits may represent the transition into the surface of the Chalk bedrock which was encountered at relatively shallow depths within this area.

Chalk

Both structureless and structured chalk bedrock deposits were encountered across the site underlying variable superficial soils to a maximum depth of 60.65m. Initially structureless chalk deposits were

encountered and were described as either grade Dm deposits composed of silt or grade Dc deposits composed of gravel and occasionally sand. Gravel clasts comprised chalk of varying density however flint gravel and cobbles were also commonly encountered.

Where structure was observed within the chalk strata, gradings were applied in accordance with CIRIA C574 to classify the chalk strata by the discontinuity apertures observed, with subdivisions applied to the gradings dependent on the discontinuity spacing present. Chalk grades A – C were recorded over variable depths with variation in the discontinuity spacings observed. Density of the chalk was described as variably low to high with the corresponding strength recorded as very weak to moderately strong. Overall, the density of the chalk was generally observed to increase with depth.

During the previous phase ground investigation localised occurrences of sand deposits were encountered during advancement of boreholes through the chalk stratum within the floodplain area. During this phase of investigation these occurrences were not noted within the boreholes positioned along the new alignment across the floodplain. A small sand lens was noted within BH235 from 10 – 10.2m depth described as brown fine to coarse sand, however no further sand horizons were noted within the chalk during the investigation. The small sand horizon encountered at BH235 has been characterised as *Glacial Sand and Gravel* deposits within the chalk stratum albeit the origin of this material is unknown but could possibly be associated with dissolution activity within the chalk.

Geology	Depth Below Ground Level (m) Encountered		Thickness (Min / Max) (m)	Thickness (Average) (m)	Site Level Range (maOD) Encountered	
	Upper Boundary	Lower Boundary			Upper Boundary	Lower Boundary
Made Ground - Granular	Ground Level	0.10 - 1.70	0.10 - 1.70	0.56	12.19 - 39.74	11.79 - 39.34
Made Ground - Cohesive	1.70	2.50	0.80	0.80	21.53	20.73
Topsoil	Ground Level	0.12 - 1.00	0.12 - 1.00	0.36	8.79 - 40.23	8.44 - 39.83
Peat	Ground Level - 0.80	0.30 - 2.90	0.23 - 2.72	1.01	8.41 - 9.06	6.13 - 8.65
Alluvium - Cohesive	0.20 - 0.80	0.45 - 0.90	0.10 - 0.55	0.27	8.22 - 9.17	8.12 - 8.62
Alluvium - Granular	0.20 - 1.15	0.60 - 2.40	0.25 - 2.10	0.73	7.68 - 10.20	6.61 - 9.90
Head Sand and Gravel	0.30	2.50	2.20	2.20	11.20	9.00
River Terrace Deposits	0.20 - 2.90	4.40 - 9.00	1.60 - 7.80	5.09	6.13 - 13.02	0.16 - 5.77
Sheringham Cliffs Formation - Granular	Ground Level - 1.10	0.45 - 15.50	0.05 - 15.15	3.00	8.77 - 39.83	6.97 - 37.19
Sheringham Cliffs Formation - Cohesive	0.37 - 14.20	0.95 - 15.00	0.10 - 13.40	2.16	8.36 - 36.78	7.86 - 33.11
Glacial Sand and Gravel	0.15 - 16.40	1.15 - 21.30	0.30 - 12.50	4.70	4.53 - 25.35	-4.71 - 24.65
Glacial Silts and Clays	0.45 - 15.40	1.40 - 23.30	0.10 - 9.05	2.20	21.77 - 33.11	16.18 - 32.01
Lowestoft Formation – Till	2.80	3.10	0.30	0.30	31.45	31.15
Structureless Chalk Dm	0.40 - 23.30	0.75 - 57.80	0.10 - 53.30	17.50	-4.28 - 23.45	-49.01 - 20.67
Structureless Chalk Dc	4.40 - 45.00	10.00 - 60.00	0.19 - 51.75	19.70	-36.11 - 19.45	-51.11 - 16.01
Structured Chalk	11.20 - 29.30	22.50 - 60.65	0.26 - 47.49	32.26	-11.46 - 12.25	-51.74 - 9.92

Table 3.3.1: Summary of Stratum Ranges encountered

3.3.2 Groundwater

Groundwater was encountered in some exploratory holes during the ground investigation as summarised in table 3.3.2 below. At some borehole locations it was not possible to capture the groundwater strike due to the use of casing and adding of water to the position to aid in the drilling process. Boreholes where no groundwater was either encountered or the strike not captured are not included in table 3.3.2 below.

Exp Hole	Water Strikes			
	Struck		Rose to	
	mbgl	maOD	mbgl	maOD
BH204	6.90	5.29	3.64	8.55
BH205	10.20	5.48	7.81	7.87
BH206	3.50	9.27	3.00	9.77
BH207	7.40	6.02	4.69	8.73
BH208	1.30	8.12	1.00	8.42
BH209	1.10	7.93	1.02	8.01
BH211	1.10	7.92	0.85	8.17
BH212	1.10	7.91	0.95	8.06
BH213	0.80	8.31	0.80	8.31
BH214	0.80	8.15	0.60	8.35
BH215	0.85	8.24	0.70	8.39
BH216	0.90	8.58	0.85	8.63
BH217	0.80	8.08	0.60	8.28
BH218	0.80	8.19	0.80	8.19
BH219	1.15	7.76	0.97	7.94
BH220	0.95	7.9	0.95	7.9
BH221	1.10	7.79	1.10	7.79
	2.50	6.39	0.40	8.49
BH222	1.15	7.74	1.15	7.74
BH223	0.50	8.29	0.50	8.29
	0.80	7.99	0.65	8.14
BH227	9.40	4.74	9.26	4.88
BH228	10.70	4.9	8.00	7.6
BH230	13.80	10.71	13.70	10.81
BH246	12.00	11.93	11.08	12.85
BH251	1.10	8.43	1.00	8.53
BH252	0.65	8.42	0.65	8.42
	0.95	8.12	0.65	8.42
BH253	1.00	7.91	0.87	8.04
BH255	Seepage at 1.20	7.96	-	-
BH257	1.00	8	0.80	8.2
BH258	1.00	7.98	0.80	8.18
TP241	1.10	8.33	0.90	8.53
TP242	1.00	8.02	0.90	8.12
TP243	0.88	8.07	0.81	8.14
TP244	1.15	8.44	1.10	8.49
TP245	0.80	7.98	0.60	8.18
TP246	0.85	8.1	0.75	8.2
TP247A	0.90	7.93	-	-
TP248	0.88	7.93	0.78	8.03
TP252	Seepage at 3.00	31.61	-	-
WS203	7.45	6.26	-	-
WS204	4.00	7.64	-	-

Table 3.3.2: Summary of Groundwater Levels captured during drilling and excavation

3.4 In-Situ Testing Results

In-situ testing was undertaken for geotechnical purposes and is summarised below in table 3.4 with subsequent sections providing details regarding the test results.

Test Type and Reference	Stratum	Number of Results	Results (Range)	Comments / Limitations
Standard penetration test (BS EN ISO 22476-3:2005+A1:2011)	Possible Made Ground	1	N = 10 N_{60} = 13	Value indicative of the lower end of medium dense granular deposits within BH245.
	Alluvium - Granular	2	N = 14 - 23 N_{60} = 9 - 20	Values generally indicative of medium dense granular deposits.
	Peat	4	N = 1 - 3 N_{60} = 1 - 3	Values considered to characteristic of peat deposits.
	Head Sand and Gravel	2	N = 8 N_{60} = 6	Representative of loose granular soils.
	River Terrace Deposits	40	N = 4 – 54 N_{60} = 3 - 54	Representative of very loose to very dense granular soils. N values typically in the range between 12 – 50 with N values of 4 and 7 obtained during drilling BH255 and BH204 respectively.
	Sheringham Cliffs Formation - Granular	151	N = 3 – 50 N_{60} = 3 - 63	Representative of very loose to very dense granular soils.
	Sheringham Cliffs Formation - Cohesive	25	N = 2 – 50 N_{60} = 2 – 57	1no. N value of 2 was obtained during drilling BH249 and 2no. N values of 50 were obtained during drilling BH241 and BH249. These values are considered to be outliers of the dataset. N value range typically between 4 – 37 which is considered representative of soft to very stiff cohesive soils.
	Glacial Sand and Gravel	97	N = 4 – 50 N_{60} = 3 - 57	Representative of very loose to very dense granular soils.
	Glacial Silts and Clays	10	N = 17 – 50 N_{60} = 19 - 61	Representative of firm to very stiff cohesive soils.
	Structureless Chalk Dm	202	N = 0- 50 N_{60} = 0 - 57	Representative of uncompact to compact chalk deposits. Chalk grade difficult to determine from SPT values. A degree of higher N values observed within each chalk stratum are likely due to contact with very gravelly horizons, flint or chalk rock cobbles or inability to penetrate some structured chalk grades.
	Structureless Chalk Dc	62	N = 2 – 50 N_{60} = 2 - 57	
	Structured Chalk	129	N = 6 – 50 N_{60} = 6 - 58	
Dynamic Cone Penetrometer (DMRB CS 229, Section 6)	All Strata	127 (12 DCP)	0.53-2500%	As a handheld probe the TRL DCP equipment can often be deflected or return anomalous readings due to obstructions. Difficulties can also occur when penetrating strongly stabilised layers or granular materials with large particles. Further discussed in section 3.4.2
Infiltration Testing (BRE DG 365 'Soakaway Design')	Sheringham Cliffs Formation - Granular	48 (17 Tests)	3.9E-05 – 6.6E-07 m/s	Infiltration rate not achieved for TP224 due infilling not reaching 50% effective storage depth within the test period. Effective rates generated for some tests as discussed further in section 3.4.3.
	Sheringham Cliffs Formation - Cohesive	6 (2 Tests)	3.1E-06 – 6.2-06 m/s	
	Sheringham Cliffs Formation – Granular/ Cohesive	6 (2 Tests)	4.3E-05 – 4.6-06 m/s	Testing undertaken across 2no. strata's within TP227, TP228 & TP229
	Glacial Silts and Clays/ Glacial Sand and Gravel	3 (1 Test)	1.3E-05 – 1.8E-05 m/s	Testing undertaken across 2no. strata's within TP230

Test Type and Reference	Stratum	Number of Results	Results (Range)	Comments / Limitations
Hand Penetrometer (BS 1377: 1990: Part 9 & Manufacturer's Instructions)	Sheringham Cliffs Formation - Cohesive	30	69 – 160 kPa	6no. tests failed – material unsuitable Average result – 115.3 kPa Indicative of medium to very high strength clays
	Glacial Silts and Clays	2	>220 kPa	Indicative of very high strength clay
Hand Shear Vane (BS 1377: 1990: Part 9, Clause 4.4)	Peat	11	12 – 42 kPa	1 test failed – material unsuitable Average result –19.7kPa Indicative of very low to medium strength. 2no. values of 42 and 31kPa were recorded in TP247 and TP247A respectively but are not considered representative of Peat deposits. Use with caution.
	Alluvium - Cohesive	2	45 kPa	1 test failed – material unsuitable Indicative of medium strength clay
	Sheringham Cliffs Formation - Cohesive	43	16 - 210 kPa	8 tests failed – material unsuitable Average result – 78.4kPa Indicative of very low to very high strength clay
Pressuremeter Testing (See Report for references)	Sheringham Cliffs Formation – Cohesive & Granular Glacial Silts and Clays Structureless and Structured Chalk	53 Tests	See appended Cambridge In-Situ test report for detailed geotechnical parameters. See section 3.4.5 for further summary details.	
Plate Loading Testing (BS 1377: 1990: Part 9, Clause 4.1)	Alluvium - Granular	2	MS: 1.75 - 2.30mm MSR: 18.3 - 22.2 MPa/m CBR: 1.5 - 2.1% MP: 88 kPa	**MS:** Maximum Settlement **MSR:** Modulus of Subgrade Reaction **CBR:** Derived California Bearing Ratio Value **MP:** Maximum Applied Pressure
	Sheringham Cliffs Formation - Granular	17	MS: 1.34 - 2.93mm MSR: 3.3 - 92.7 MPa/m CBR: 0.076 - 25% MP: 11.7 – 282 kPa	
	Sheringham Cliffs Formation - Cohesive	1	MS: 2.59mm MSR: 26.0 MPa/m CBR: 2.7% MP: 117.3 kPa	
	Glacial Sand and Gravel	1	MS: 2.82mm MSR: 13.5 MPa/m CBR: 0.88% MP: 88 kPa	
	Structureless Chalk Dm	2	MS: 1.16 - 3.42mm MSR: 61.0 - 297.8 MPa/m CBR: 12 - 190% MP: 219.8 – 776.7 kPa	
Light Weight Deflectometer (BS1924 Part 2 Clause 9.2) with Derived CBRs (DMRB CD 225 Equation 2.4)	Peat	2	MD: 2.407 - 2.770mm E: 9.3 - 11.3 MPa CBR: 0.37 - 0.50%	**MD:** Maximum Deflection **E:** Surface Stiffness Modulus **CBR:** Derived California Bearing Ratio Value
	Alluvium - Granular	4	MD: 0.212 - 0.794mm E: 41.0 - 156.3 MPa CBR: 3.8 - 30%	
	Alluvium - Cohesive	1	MD: 0.951mm E: 31.6 MPa CBR: 2.5%	
	Sheringham Cliffs Formation - Granular	26	MD: 0.104 - 1.977mm E: 16.0 - 255.5 MPa CBR: 0.86 - 65%	

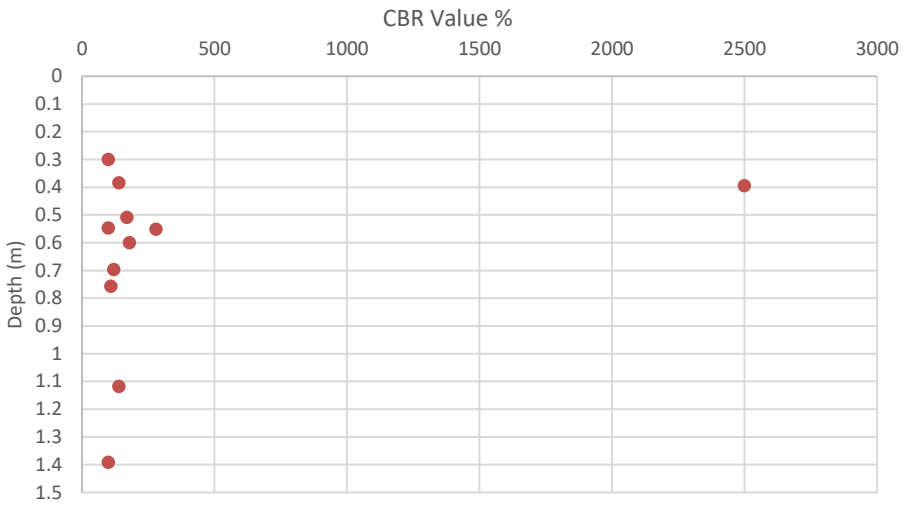

Figure 3.4.2b: Graphical summary of CBR values between 100-2500% vs Depth.

Further analysis of the dataset presented within figure 3.2.4b above indicates that all the elevated results were associated with DCP203, DCP203A, DCP206 and DCP214 with the value of 2500% associated with DCP203 at the depth of termination.

3.4.3 Infiltration Testing

Twelve soakaway tests were conducted at designated positions, the results of which are presented in table 3.4.3 below and are calculated in accordance with BRE Digest 365 'Soakaway Design'. An effective rate has been presented for testing undertaken within TP237 as only 1no. infilling was achieved and this infilling did not drain to 25% of the pit depth within 24hours in accordance with BRE365 methodology. No infiltration rate has been presented for TP224 as the water level failed to drain to 50% of the effective storage level within the test period and as such failed. Instruction was received by the Investigation Supervisor to continue with the testing at this location, however each infilling returned the same result.

Location ID	Infilling 1 (m/s)	Infilling 2 (m/s)	Infilling 3 (m/s)	Recommended Design Infiltration Rate (m/s)	Soil depth at which rate applies (mbgl)	Formation
TP205	5.1E-06	4.3E-06	3.8E-06	**3.8E-06**	0.83 - >1.80	Sheringham Cliffs Formation - Granular
TP206	9.5E-06	4.7E-06	4.0E-06	**4.0E-06**	0.82 - >1.80	Sheringham Cliffs Formation - Granular
TP207	6.5E-06	2.7E-06	1.3E-04	**2.7E-06**	2.03 - >3.10	Sheringham Cliffs Formation - Granular
TP208	6.1E-06	7.8E-06	4.2E-06	**4.2E-06**	0.70 - >1.60	Sheringham Cliffs Formation - Granular
TP209	6.6E-07	1.1E-06*	7.1E-07	**6.6E-07**	0.45 - >1.40	Sheringham Cliffs Formation - Granular
TP209A	1.8E-05	1.1E-05	1.1E-05	**1.1E-05**	1.86 - >2.80	Sheringham Cliffs Formation - Granular
TP210	1.4E-05	9.9E-06	8.2E-06	**8.2E-06**	0.40- >1.40	Sheringham Cliffs Formation - Granular
TP222	3.6E-06	3.1E-06	3.2E-06	**3.1E-06**	1.20 - >2.15	Sheringham Cliffs Formation - Cohesive
TP223	6.0E-06	6.8E-06	6.2E-06	**6.0E-06**	0.40 - >1.40	Sheringham Cliffs Formation - Granular
TP224	N/A**	N/A**	N/A**	**N/A****	0.40 - >1.40	Sheringham Cliffs Formation – Granular
TP224B	9.2E-06	7.2E-06	6.3E-06	**6.3E-06**	1.90 - >2.70	Sheringham Cliffs Formation – Granular
TP225	3.4E-06	2.4E-06	2.5E-06	**2.4E-06**	1.44 - >2.40	Sheringham Cliffs Formation – Granular

Location ID	Infilling 1 (m/s)	Infilling 2 (m/s)	Infilling 3 (m/s)	Recommended Design Infiltration Rate (m/s)	Soil depth at which rate applies (mbgl)	Formation
TP226	6.0E-06	6.2E-06	5.7E-06	**5.7E-06**	0.66 - >1.60	Sheringham Cliffs Formation – Cohesive
TP227	4.3E-05	2.3E-05	1.9E-05	**1.9E-05**	0.45 - >0.95	Sheringham Cliffs Formation – Granular AND Cohesive
TP228	1.2E-03	2.8E-04	1.4E-04	**1.4E-04**	0.28 - >1.30	Sheringham Cliffs Formation – Cohesive
TP229	5.7E-06	5.3E-06	4.6E-06	**4.6E-06**	0.70 - >1.70	Sheringham Cliffs Formation – Granular AND Cohesive
TP230	1.8E-05	1.5E-05	1.3E-05	**1.3E-05**	0.92 - >1.70	Glacial Silts and Clays AND Glacial Sand and Gravel
TP235	2.7E-05	2.3E-05	2.7E-05	**2.3E-05**	0.74 - >1.65	Sheringham Cliffs Formation – Granular
TP236	6.8E-05	4.0E-05	3.9E-05	**3.9E-05**	1.19 - >2.35	Sheringham Cliffs Formation – Granular
TP237	1.6E-06*****	N/A******	N/A******	**1.6E-06***	1.92 - >2.90	Sheringham Cliffs Formation - Granular
TP238	1.4E-06	1.2E-06	N/A	**1.2E-06**	1.41 - >2.40	Sheringham Cliffs Formation - Granular
TP239	2.9E-05	1.2E-05	1.4E-05	**1.2E-05**	0.48 - >1.00	Sheringham Cliffs Formation - Granular
TP240	8.1E-05	1.9E-05	1.4E-05	**1.4E-05**	0.32 - >0.60	Sheringham Cliffs Formation - Granular
***** Effective rate only based on maximum water depth achieved. Drainage to 25% of pit depth not achieved within 24hours in accordance with BRE DG 365.						
** Water level did not reach 50% effective storage depth within test period. Rate not calculated.						

Table 3.4.3: Infiltration Test result summary

3.4.4 Hand Penetrometer and Hand Shear Vane Testing

Hand penetrometer testing and hand shear vane testing was undertaken where possible throughout the ground investigation on cohesive materials. This included performing tests within hand excavated pits, during machine excavated trial pitting and trenching, upon window sample run recoveries, on UT100 cutting shoe samples and any material recovered from drilling that was considered suitable to test. The results display a degree of scatter as illustrated in figure 3.4.4 below.

4. Annex B – Zipped Appendices

Trial Pit Record

TP205 | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 614036.03	N: 315774.61
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 24/05/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			15.99	Type	Depth	Results / Remarks	
TOPSOIL. Brown gravelly clayey fine to coarse SAND. Gravel is angular to rounded fine and medium flint.				D1 ES1 LB1 PID01	0.10 0.10 0.10 - 0.40 0.10	 0.2ppm	
Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to rounded fine to coarse flint. *From 0.90m: Low cobble content. Cobbles are sub-rounded flint.* *From 1.20m to 1.25m: Band of light brown gravelly slightly clayey fine to coarse sand. Gravel is sub-angular to sub-rounded fine to coarse flint with rare fine chalk.* *From 1.60m: Pockets <50mm of sandy clay.*		0.50	15.49	D2 ES2 LB2 PID02 D3 ES3 LB3 PID03 D4 ES4 PID04	0.60 0.60 0.60 - 0.80 0.60 1.00 1.10 1.10 - 1.30 1.10 1.20 - 1.30 1.70 1.70	 0.6ppm 0.5ppm 0.4ppm	
Trial pit terminated at 1.80m: Target depth		1.80	14.19				

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 2.50m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.80m arisings, 0.80m to 1.80m gravel.
2. Pit orientation: 127°.
3. Pit corner coordinates: A: 614036.34mE, 315774.20mN; B: 614035.99mE, 315773.65mN; C: 614034.63mE, 315775.52mN; D: 614034.10mE, 315774.99mN.

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Trial Pit Record

TP206

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 614020.41	N: 315785.09
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 25/05/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			15.94	Type	Depth	Results / Remarks	
MADE GROUND. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint with rare brick and ceramics.				D1 ES1 LB1 PID01	0.10 0.10 0.10 - 0.40 0.10	 0.3ppm	
Reddish brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to rounded fine and medium flint.		0.50	15.44	D2 ES2 LB2 PID02	0.60 0.60 0.60 - 0.80 0.60	 0.2ppm	
From 1.40m: Becoming yellowish brown.				D3 ES3 PID03 D4 LB3	1.00 1.00 1.00 1.50 1.50 - 1.60	 0.5ppm 	
Trial pit terminated at 1.80m: Target depth		1.80	14.14	D5	1.80		

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 2.20m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.80m arisings, 0.80m to 1.80m gravel.
2. Pit orientation: 304°.
3. Pit corner coordinates: A: 614021.42mE, 315784.04mN; B: 614021.90mE, 315784.81mN; C: 614019.47mE, 315785.41mN; D: 614019.96mE, 315786.07mN.

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Trial Pit Record

TP207 | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 614060.23	N: 315774.23
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 25/05/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			16.75	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint. Occasional roots and rootlets 2-5mm.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
				PID01	0.10	0.2ppm	
		0.45	16.30				
Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint.				D2	0.50		
				ES2	0.50		
				PID02	0.50	0.3ppm	
				LB2	0.60 - 0.80		
				D3	1.00		
				ES3	1.00		
				PID03	1.00	0.3ppm	
From 1.40m: Becoming clayey.				D4	1.50		
				LB3	1.50 - 1.70		
		1.80	14.95	D5	1.80		
Yellowish brown and orangish brown slightly gravelly very clayey fine to coarse SAND with pockets of yellowish brown fine to coarse sand. Locally slightly gravelly sandy clay. Gravel is sub-angular to rounded fine to coarse flint.				ES4	2.00		
				LB4	2.00 - 2.30		
				PID04	2.00	0.5ppm	
				D6	2.50		
At 3.00m: Cobble of sub-angular flint.		3.05	13.70	ES5	3.00		
				PID05	3.00	0.3ppm	
Cream mottled light brown gravelly silty fine and medium SAND. Gravel is sub-angular to rounded fine and medium flint and frequent chalk. Frequent pockets of structureless chalk composed of silt.		3.10	13.65	B1	3.10		
				D7	3.10		
Trial pit terminated at 3.10m: Target depth							

Weather: Sunny and dry

Pit Stability: Stable

Shoring Used:

Pit Dimensions: L: 3.20m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 2.10m arisings, 2.10m to 3.10m gravel.
2. Pit orientation: 124°.
3. Pit corner coordinates: A: 614059.31mE, 315774.37mN; B: 614059.63mE, 315774.90mN; C: 614062.24mE, 315773.25mN; D: 614061.84mE, 315772.60mN.

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Trial Pit Record

TP208

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 614035.43	N: 315792.28
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 25/05/2022	

Geology Description	Legend	Depth	Elevation (maOD) 16.29	Sample / In-Situ Test Information			Installation & Backfill
				Type	Depth	Results / Remarks	
MADE GROUND. Brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to rounded fine to coarse flint with rare brick. Frequent roots and rootlets 2-5mm.				ES1 LB1 PID01 D1	0.10 0.10 - 0.30 0.10 0.20	 0.2ppm 	
Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint. Occasional rootlets <2mm to 0.60m. *From 1.00m: Becoming clayey.*		0.40	15.89	D2 ES2 LB2 PID02 D3 ES3 PID03	0.50 0.50 0.50 - 0.70 0.50 1.00 1.00 1.00	 0.3ppm 0.3ppm	
Orangish brown gravelly very clayey fine to coarse SAND. Locally very sandy clay. Gravel is angular to rounded fine to coarse flint. *From 1.40m to 1.45m: Band of yellowish brown gravelly slightly clayey fine to coarse sand. Gravel is sub-angular to rounded fine flint and chalk.*		1.30	14.99	D4 LB3	1.40 1.40 - 1.60	 	
Trial pit terminated at 1.60m: Target depth		1.60	14.69				

Weather: Sunny and dry

Pit Stability: Stable

Shoring Used:

Pit Dimensions: L: 2.40m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.60m arisings, 0.60m to 1.60m gravel.
2. Pit orientation: 303°.
3. Pit corner coordinates: A: 614034.26mE, 315791.72mN; B: 614034.77mE, 315792.34mN; C: 614036.65mE, 315791.10mN; D: 614036.18mE, 315790.50mN.

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Trial Pit Record

TP209 | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613609.60	N: 315087.91
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 22/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			18.31	Type	Depth	Results / Remarks	
TOPSOIL. Brown slightly gravelly slightly clayey fine to coarse SAND with low cobble content. Gravel is angular to sub-rounded fine to coarse flint. Cobbles are flint.				D1	0.10		
				ES1	0.20		
				LB1	0.20 - 0.30		
				PID01	0.20	0.4ppm	
Brown to orangish brown slightly gravelly slightly clayey fine to coarse SAND with low cobble content. Gravel is sub-angular to rounded fine to coarse flint with rare chalk. Cobbles are flint.		0.40	17.91				
From 0.70m: Becoming orangish brown with occasional pockets of yellow fine to coarse sand.				D2	0.50		
				ES2	0.50		
				PID02	0.50	0.1ppm	
				LB2	0.60 - 0.70		
		1.25	17.06				
Orangish brown slightly gravelly slightly clayey fine to coarse SAND with frequent large pockets of soft orangish brown mottled light grey sandy clay. Gravel is sub-angular to sub-rounded fine to coarse flint with rare chalk.		1.40	16.91	D3	1.30		
				ES3	1.30		
				LB3	1.30 - 1.40		
				PID03	1.30	0.1ppm	
Trial pit terminated at 1.40m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.00m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.40m arisings, 0.40m to 1.40m gravel.
2. Pit orientation: 284°.
3. Pit corner coordinates: A: 613606.40mE, 315091.48mN; B: 613606.55mE, 315090.90mN; C: 613603.64mE, 315090.18mN; D: 613603.49mE, 315090.76mN.

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Trial Pit Record

TP209A

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613605.02	N: 315090.83
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 11/07/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			18.36	Type	Depth	Results / Remarks	
TOPSOIL. Brown gravelly silty fine and medium SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.				LB1	0.10 - 0.20		
		0.20	18.16	D1	0.20		
Brown gravelly slightly silty fine and medium SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.				ES1	0.20		
				PID01	0.20	1.2ppm	
				D2	0.50		
				ES2	0.50		
				LB2	0.50 - 0.60		
		0.70	17.66	PID02	0.50	0.9ppm	
Light brown gravelly slightly silty fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.				D3	0.90		
				LB3	0.90 - 1.00		
				ES3	1.00		
				PID03	1.00	0.4ppm	
		1.20	17.16				
Orangish brown slightly gravelly silty fine and medium SAND with pockets of orangish brown silt. Gravel is sub-angular to sub-rounded fine to coarse flint.				LB4	1.30 - 1.40		
				D4	2.00		
				ES4	2.00		
				PID04	2.00	0.1ppm	
		2.30	16.06	LB5	2.30 - 2.40		
Orangish brown silty fine and medium SAND with frequent gravel of sub-angular to sub-rounded fine to coarse flint, pockets of orangish brown silt and pockets of very silty fine and medium sand.							
		2.80	15.56	D5	2.80		
Trial pit terminated at 2.80m: Target depth							

Weather: Sunny and dry

Pit Stability: Stable

Shoring Used:

Pit Dimensions: L: 2.70m x W: 0.70m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 1.80m arisings, 1.80m to 2.80m gravel.
2. Pit orientation: 122°.
3. Pit corner coordinates: A: 613610.93mE, 315087.49mN; B: 613610.56mE, 315086.90mN; C: 613608.27mE, 315088.33mN; D: 613608.64mE, 315088.92mN.

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Trial Pit Record

TP210 | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613534.50	N: 315112.32
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 23/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			17.39	Type	Depth	Results / Remarks	
TOPSOIL. Brown slightly gravelly very clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.				D1	0.10		
				ES1	0.20		
				LB1	0.20 - 0.25		
		0.30	17.09	PID01	0.20	1.3ppm	
Brown to orangish brown slightly gravelly clayey fine to coarse SAND. Gravel is angular to sub-angular fine to coarse flint.				D2	0.50		
				ES2	0.50		
				PID02	0.50	1.2ppm	
				LB2	0.60 - 0.70		
From 0.80m: Rare pockets of orangish brown clayey fine to coarse sand.							
From 0.90m: Rare pockets of yellow slightly clayey fine to coarse sand.				D3	1.00		
				ES3	1.00		
From 1.20m: Low cobble content. Cobbles are flint.				PID03	1.00	1.3ppm	
				LB3	1.30 - 1.40		
Trial pit terminated at 1.40m: Target depth		1.40	15.99				

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 2.30m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.40m arisings, 0.40m to 1.40m gravel.
2. Pit orientation: 290°.
3. Pit corner coordinates: A: 613533.71mE, 315111.91mN; B: 613533.64mE, 315112.50mN; C: 613535.77mE, 315111.99mN; D: 613535.84mE, 315111.39mN.

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Trial Pit Record

TP222 | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612464.28	N: 315166.41
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 10/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			24.15	Type	Depth	Results / Remarks	
TOPSOIL. Brown very gravelly slightly clayey fine to coarse SAND with low cobble content. Gravel is angular to rounded fine to coarse flint. Cobbles are sub-rounded flint.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
				PID01	0.10	0.0ppm	
Brown slightly clayey fine to coarse SAND and angular to rounded fine to coarse GRAVEL with medium cobble content. Gravel is flint. Cobbles are sub-angular to sub-rounded flint. *From 0.40m to 0.50m: Rare boulders of flint.* *From 0.70m: Pockets of soft greyish brown sandy clay.* *From 0.80m: Grading to gravelly clayey fine to coarse sand.*		0.40	23.75	D2	0.50		
				ES2	0.50		
				LB2	0.50 - 0.80		
				PID02	0.50	0.2ppm	
				D3	0.70		
Firm greyish brown mottled brown and grey slightly gravelly sandy CLAY with pockets of clayey fine to coarse sand. Gravel is sub-angular to rounded fine and medium flint. *From 1.30m: Becoming very stiff.* *From 1.50m: Pockets <50mm of yellowish brown sandy clay.* *From 1.80m: Frequent gravel of sub-rounded fine and medium chalk.*		0.90	23.25	D4	1.00		
				ES3	1.00		
				HV01	1.00	62 kPa	
				PID03	1.00	0.1ppm	
				PP01	1.00	98 kPa	
				LB3	1.30 - 1.50		
				HV02	1.30	190 kPa	
				PP02	1.30	130 kPa	
				D5	1.50		
				HV03	1.60	200 kPa	
				PP03	1.60	150 kPa	
				HV04	1.90	190 kPa	
				PP04	1.90	150 kPa	
Trial pit terminated at 2.15m: Target depth		2.15	22.00				

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 2.80m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks

Remarks

1. Backfill: GL to 1.15m arisings, 1.15m to 2.15m gravel.
2. Pit orientation: 116°.
3. Pit corner coordinates: A: 612465.39mE, 315166.53mN; B: 612465.21mE, 315166.04mN; C: 612462.04mE, 315167.40mN; D: 612462.31mE, 315168.21mN.

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Trial Pit Record

TP223

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613559.25	N: 315071.79
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 23/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			18.56	Type	Depth	Results / Remarks	
TOPSOIL. Brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint.				D1 ES1 LB1	0.10 0.20 0.20 - 0.30		
		0.35	18.21	PID01	0.20	1.2ppm	
Brown and orangish brown slightly gravelly slightly clayey fine to coarse SAND with low cobble content and occasional pockets of clayey fine to coarse sand. Gravel is angular to sub-rounded fine to coarse flint. Cobbles are flint.				D2 ES2 PID02 LB2	0.50 0.50 0.50 0.60 - 0.70	 1.0ppm 	
From 1.00m: Pockets becoming very clayey fine to coarse sand.				D3 ES3 PID03	1.00 1.00 1.00	 0.9ppm	
From 1.20m: Becoming clayey with rare pockets of yellow slightly clayey fine to coarse sand.				LB3	1.30 - 1.40		
Trial pit terminated at 1.40m: Target depth		1.40	17.16				

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 2.65m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.40m arisings, 0.40m to 1.40m gravel.
2. Pit orientation: 30°.
3. Pit corner coordinates: A: 613560.68mE, 315073.21mN; B: 613560.10mE, 315073.77mN; C: 613559.27mE, 315070.90mN; D: 613558.82mE, 315071.38mN.

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Trial Pit Record

TP224

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613599.66	N: 315066.63
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 22/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			18.69	Type	Depth	Results / Remarks	
TOPSOIL. Brown slightly gravelly slightly clayey fine to coarse SAND. Locally gravelly. Gravel is angular to sub-rounded fine to coarse flint with rare chalk.				LB1	0.15 - 0.25		
				D1	0.20		
				ES1	0.20		
				PID01	0.20	0.2ppm	
Orangish brown slightly gravelly slightly clayey fine to coarse SAND with frequent clayey pockets. Gravel is sub-angular to sub-rounded fine to coarse flint with rare chalk.		0.30	18.39	D2	0.50		
				ES2	0.50		
				PID02	0.50	0.1ppm	
From 0.70m: Pockets becoming very clayey.				LB2	0.60 - 0.70		
				D3	1.00		
From 1.00m: Rare pockets of soft orangish brown mottled light grey sandy clay.				ES3	1.00		
				PID03	1.00	0.1ppm	
				LB3	1.30 - 1.40		
Trial pit terminated at 1.40m: Target depth		1.40	17.29				

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.00m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.40m arisings, 0.40m to 1.40m gravel.
2. Pit orientation: 30°.
3. Pit corner coordinates: A: 613599.67mE, 315068.53mN; B: 613600.33mE, 315068.54mN; C: 613600.45mE, 315065.69mN; D: 613599.79mE, 315065.63mN.

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Trial Pit Record

TP224A | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613563.08	N: 315076.57
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 11/07/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			18.55	Type	Depth	Results / Remarks	
TOPSOIL. Brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint.				LB1	0.10 - 0.20		
				D1	0.20		
				ES1	0.20		
		0.30	18.25	PID01	0.20	0.1ppm	
Orangish brown slightly gravelly slightly clayey fine to coarse SAND with rare pockets of clayey fine to coarse sand. Gravel is sub-angular to sub-rounded fine to coarse flint.				LB2	0.40 - 0.50		
				D2	0.50		
				ES2	0.50		
				PID02	0.50	0.3ppm	
From 0.80m: Frequent pockets of cream to light brown slightly gravelly sandy silt. Gravel is chalk.							
From 0.90m: Low cobble content. Cobbles are sub-rounded flint.				ES3	1.00		
				LB3	1.00 - 1.10		
				PID03	1.00	0.8ppm	
				D3	1.50		
		1.60	16.95				
Structureless CHALK composed of cream slightly sandy slightly gravelly SILT. Gravel is weak, low density, white sub-angular to sub-rounded fine to coarse chalk with rare angular fine to coarse flint. (Grade Dm)				B1	1.70 - 1.80		
From 1.80m: Low cobble and boulder content. Cobbles and boulders are flint.				D4	2.00		
				ES4	2.00		
From 2.10m: Frequent yellow staining.				PID04	2.00	0.1ppm	
				LB4	2.60 - 2.70		
		2.70	15.85				
Trial pit terminated at 2.70m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 2.70m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 1.70m arisings, 1.70m to 2.70m gravel.
2. Pit orientation: 220°.
3. Pit corner coordinates: A: 613563.72mE, 315077.79mN; B: 613564.18mE, 315077.41mN; C: 613562.44mE, 315075.34mN; D: 613561.98mE, 315075.73mN.

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Trial Pit Record

TP224B

Sheet 1 of 1

Project ID:	**NCCT41793**	Client:	Ferrovial Construction (UK) Limited	E: 613599.66	N: 315066.63
Location:	Norwich Western Link	Consultant:	Ramboll		
		Plant used:	JCB 3CX	Date:	25/07/2022

Geology Description	Legend	Depth	Elevation (maOD) 18.69	Sample / In-Situ Test Information Type	Depth	Results / Remarks	Installation & Backfill
TOPSOIL. Brown slightly gravelly slightly clayey fine to coarse SAND. Locally gravelly. Gravel is angular to sub-rounded fine to coarse flint with rare chalk.		0.30	18.39				
Orangish brown slightly gravelly slightly clayey fine to coarse SAND with frequent clayey pockets. Gravel is sub-angular to sub-rounded fine to coarse flint with rare chalk.		1.40	17.29				
Orangish brown slightly gravelly slightly clayey fine to coarse SAND with rare pockets of soft orangish brown mottled light grey sandy clay. Gravel is sub-angular to sub-rounded fine to coarse flint with rare chalk.		1.70	16.99				
Orangish brown slightly gravelly clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.				D4 ES4 LB4 PID01	1.80 2.00 2.00 - 2.30 2.00	 0.4ppm	
Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint. Gravel noted with discoloured/stained or possibly burnt dark brown. Rare reddish brown possible oxidised sand on flint gravel.		2.60 2.70	16.09 15.99	B1 D5 ES5 PID02	2.60 - 2.70 2.60 2.60 2.60	 0.6ppm	
Trial pit terminated at 2.70m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.00m x W: 0.50m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. UXO crew scanned material encountered at 2.60m. No metal or residue detected.
2. TP224 extended from 1.40m to undertake soakaway test at deeper depth, as requested by Ramboll. Sample numbering continued from TP224.
3. Backfill: GL to 1.70m arisings, 1.70m to 2.70m gravel.
4. Pit orientation: 30°.
5. Pit corner coordinates: A: 613599.67mE, 315068.53mN; B: 613600.33mE, 315068.54mN; C: 613600.45mE, 315065.69mN; D: 613599.79mE, 315065.63mN.

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Trial Pit Record

TP225

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612759.05	N: 315048.63
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 16/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			23.41	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
		0.33	23.08	PID01	0.10	0.0ppm	
Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint.				D2	0.50		
				ES2	0.50		
				LB2	0.50 - 0.70		
				PID02	0.50	0.0ppm	
From 0.80m: Low cobble content. Cobbles are sub-rounded flint.							
From 0.98: Frequent pockets of grey slightly gravelly clayey fine and medium sand.				D3	1.00		
				ES3	1.00		
				LB3	1.00 - 1.20		
				PID03	1.00	0.0ppm	
		1.40	22.01				
Orangish brown mottled grey slightly gravelly very clayey fine and medium SAND with frequent pockets 100-200mm of grey occasionally mottled orangish brown sandy clay. Gravel is sub-angular to sub-rounded fine to coarse flint.				D4	1.50		
				LB4	1.90 - 2.00		
				D5	2.00		
				ES4	2.00		
				PID04	2.00	0.0ppm	
		2.40	21.01	D6	2.40		
Trial pit terminated at 2.40m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.90m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 1.40m arisings, 1.40m to 2.40m gravel.
2. Pit orientation: 138°.
3. Pit corner coordinates: A: 612757.97mE, 315050.28mN; B: 612757.52mE, 315049.88mN; C: 612760.13mE, 315046.98mN; D: 612760.58mE, 315047.38mN.

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Trial Pit Record

TP226

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612716.95	N: 315048.65
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 16/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			22.10	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
Reddish brown gravelly silty fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint and sub-rounded fine chalk.		0.32	21.78	PID01	0.10	0.0ppm	
				D2	0.40		
		0.52	21.58	LB2	0.40 - 0.50		
Brownish cream gravelly SILT. Gravel is angular to sub-rounded fine to coarse flint and sub-rounded fine chalk. Rare cobbles of sub-angular flint.				ES2	0.50		
				PID02	0.50	0.0ppm	
				D3	0.70		
				LB3	0.70 - 1.00		
				D4	1.00		
				ES3	1.00		
				PID03	1.00	0.0ppm	
At 1.60m: Soft grey mottled brown slightly gravelly sandy clay. Gravel is sub-rounded fine chalk. Possible new stratum.		1.60	20.50	D5	1.60		
Trial pit terminated at 1.60m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.40m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.60m arisings, 0.60m to 1.60m gravel.
2. Pit orientation: 340°.
3. Pit corner coordinates: A: 612717.81mE, 315047.16mN; B: 612717.25mE, 315046.95mN; C: 612716.09mE, 315050.14mN; D: 612716.65mE, 315050.35mN.

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Trial Pit Record

TP227

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612688.78	N: 315051.77
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 16/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			22.24	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint. Rare cobbles of sub-angular flint.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
				PID01	0.10	0.4ppm	
Reddish brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.		0.35	21.89	D2	0.40		
				LB2	0.40 - 0.60		
				ES2	0.50		
				PID02	0.50	0.1ppm	
Stiff brown slightly gravelly sandy CLAY with frequent pockets of very clayey fine to coarse sand. Gravel is sub-rounded fine flint.		0.70	21.54	LB3	0.70 - 0.90		
				D3	0.80		
From 0.75m to 0.95m: Brownish cream gravelly silt with rare cobble of sub-angular flint in northeast side of pit.		0.95	21.29	HV01	0.80	140 kPa	
				PP01	0.80	160 kPa	
Trial pit terminated at 0.95m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.00m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.45m arisings, 0.45m to 0.95m gravel.
2. Pit orientation: 262°.
3. Pit corner coordinates: A: 612690.22mE, 315052.28mN; B: 612690.31mE, 315051.68mN; C: 612687.34mE, 315051.26mN; D: 612687.25mE, 315051.86mN.

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Trial Pit Record

TP228

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612661.50	N: 315082.35
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 16/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			22.33	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint.				D1 ES1 LB1	0.10 0.10 0.10 - 0.20		
		0.30	22.03	PID01	0.10	0.0ppm	
Brown very gravelly fine to coarse SAND with medium cobble content. Gravel is angular to rounded fine to coarse flint. Cobbles are sub-rounded flint. Stratum extends to 1.30m in northeast side of pit with occasional pockets of brownish cream gravelly silt. Gravel is sub-angular to sub-rounded fine to coarse flint with sub-rounded fine chalk.				LB2 D2 ES2 PID02 LB3	0.40 - 0.50 0.50 0.50 0.50 0.80 - 1.00	 0.1ppm 	
		0.60	21.73				
Brownish cream gravelly SILT with low cobble content. Gravel is sub-angular to sub-rounded fine to coarse flint and sub-rounded fine chalk. Cobbles are sub-rounded flint.				D3 ES3 PID03	1.00 1.00 1.00	 0.0ppm	
		1.30	21.03				
Trial pit terminated at 1.30m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Slight instability from 0.30m to 0.60m
Shoring Used:	
Pit Dimensions:	L: 3.00m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.80m arisings, 0.80m to 1.30m gravel.
2. Pit orientation: 208°.
3. Pit corner coordinates: A: 612661.94mE, 31083.82mN; B: 612662.47mE, 315083.53mN; C: 612661.06mE, 315080.88mN; D: 612660.53mE, 315081.17mN.

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Trial Pit Record

TP229

Sheet 1 of 1

Project ID:	**NCCT41793**	Client:	Ferrovial Construction (UK) Limited	E: 612523.33	N: 315187.90
Location:	Norwich Western Link	Consultant:	Ramboll		
		Plant used:	JCB 3CX	Date:	10/06/2022

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			24.16	Type	Depth	Results / Remarks	
MADE GROUND. Brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint with rare sub-rounded fine to coarse brick.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
				PID01	0.10	0.1ppm	
		0.43	23.73				
Brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint.				D2	0.50		
		0.60	23.56	ES2	0.50		
Brown very gravelly slightly clayey fine to coarse SAND with medium cobble content. Gravel is angular to rounded fine to coarse flint. Cobbles are sub-rounded to rounded flint.				LB2	0.50 - 0.60		
				PID02	0.50	0.2ppm	
				LB3	0.90 - 1.10		
				D3	1.00		
				ES3	1.00		
		1.20	22.96	PID03	1.00	0.0ppm	
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is sub-rounded to rounded fine and medium flint. Rare roots <6mm.				D4	1.30		
				LB4	1.30 - 1.50		
				HV01	1.30	92 kPa	
				PP01	1.50	130 kPa	
		1.60	22.56	LB5	1.60 - 1.70		
Cream to brown slightly sandy gravelly SILT. Gravel is angular to sub-rounded fine to coarse flint.		1.70	22.46	D5	1.65		
Trial pit terminated at 1.70m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.40m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks

Remarks

1. Backfill: GL to 0.70m arisings, 0.70m to 1.70m gravel.
2. Pit orientation: 118°.
3. Pit corner coordinates: A: 612525.53mE, 315187.11mN; B: 612525.28mE, 315186.60mN; C: 612522.72mE, 315187.77mN; D: 612523.01mE, 315188.64mN.

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Trial Pit Record

TP230

Sheet 1 of 1

Project ID:	**NCCT41793**	Client:	Ferrovial Construction (UK) Limited	E: 612489.27	N: 315175.40
Location:	Norwich Western Link	Consultant:	Ramboll		
		Plant used:	JCB 3CX	Date:	15/06/2022

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			24.18	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint.				D1	0.10		
				ES1	0.10		
		0.24	23.94	LB1	0.10 - 0.20		
Reddish brown gravelly silty fine to coarse SAND. Gravel is angular to rounded fine to coarse flint with rare sub-rounded fine to coarse chalk. Rare cobbles of sub-rounded flint.				PID01	0.10	0.1ppm	
		0.45	23.73	D2	0.30		
				LB2	0.30 - 0.40		
Cream to brown gravelly SILT with medium cobble content. Gravel is sub-rounded fine chalk and angular to sub-rounded fine to coarse flint. Cobbles are sub-angular to sub-rounded flint.				D3	0.50		
				ES2	0.50		
				LB3	0.50 - 0.90		
				PID02	0.50	0.1ppm	
From 0.90m to 1.40m: Pockets of greyish brown sandy clay.				D4	1.00		
From 0.90m to 1.70m: Yellowish brown silty fine and medium sand in south-west side of pit.				ES3	1.00		
				PID03	1.00	0.0ppm	
At 1.00m: Pockets 100-200mm of yellowish brown silty fine and medium sand.				LB4	1.10 - 1.40		
		1.40	22.78	LB5	1.40 - 1.70		
Cream to brown very silty angular to sub-rounded fine to coarse GRAVEL with medium cobble content. Gravel is flint. Cobbles are angular to sub-rounded flint.				B1	1.50		
		1.70	22.48				
Trial pit terminated at 1.70m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.90m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 0.70m arisings, 0.70m to 1.70m gravel.
2. Pit orientation: 136°.
3. Pit corner coordinates: A: 612490.84mE, 315174.21mN; B: 612490.41mE, 315173.79mN; C: 612487.70mE, 315176.59mN; D: 612488.13mE, 315177.01mN.

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Trial Pit Record

TP235 | Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613744.66	N: 315113.23
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 15/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			14.77	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
		0.30	14.47	PID01	0.10	0.2ppm	
Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to rounded fine to coarse flint.				D2	0.40		
				LB2	0.40 - 0.50		
				ES2	0.50		
				PID02	0.50	0.2ppm	
From 0.90m: Frequent pockets of brown and grey very clayey fine and medium sand and occasional pockets of grey very sandy clay.				LB3	0.90 - 1.10		
				D3	1.00		
				ES3	1.00		
From 1.00m: Gravel becoming sub-angular to sub-rounded fine and medium flint.				PID03	1.00	0.0ppm	
				D4	1.50		
From 1.60m: Occasional pockets of reddish brown fine to coarse sand.		1.65	13.12				
Trial pit terminated at 1.65m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.00m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered, but damp from 1.60m

Remarks

1. Backfill: GL to 0.65m arisings, 0.65m to 1.65m gravel.
2. Pit orientation: 120°.
3. Pit corner coordinates: A: 613745.37mE, 315112.01mN; B: 613745.67mE, 315112.77mN; C: 613743.81mE, 315113.82mN; D: 613743.41mE, 315113.16mN.

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Trial Pit Record

TP236

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613727.25	N: 315128.97
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 15/06/2022	

Geology Description	Legend	Depth	Elevation (maOD) 14.54	Sample / In-Situ Test Information			Installation & Backfill
				Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is sub-angular to rounded fine to coarse flint.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
		0.32	14.22	PID01	0.10	0.0ppm	
Orangish brown gravelly silty fine to coarse SAND. Gravel is angular to rounded fine to coarse flint. Rare cobbles of sub-rounded flint.				D2	0.40		
				LB2	0.40 - 0.60		
				ES2	0.50		
				PID02	0.50	0.0ppm	
				LB3	0.90 - 1.10		
				D3	1.00		
				ES3	1.00		
From 1.10m: Frequent pockets of grey clayey fine and medium sand. *From 1.20m: Pockets of yellowish brown silty fine and medium sand.*				PID03	1.00	0.1ppm	
				D4	1.50		
		1.60	12.94				
Yellowish brown slightly gravelly silty fine and medium SAND. Gravel is sub-angular to sub-rounded fine flint.				LB4	1.80 - 2.00		
				D5	2.00		
				ES4	2.00		
				PID04	2.00	1.0ppm	
Trial pit terminated at 2.35m: Target depth		2.35	12.19				

Weather:	Sunny and dry
Pit Stability:	Unstable. Pit collapsed from 2.20m to 2.35m.
Shoring Used:	
Pit Dimensions:	L: 3.60m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 1.20m arisings, 1.20m to 2.20m gravel, 2.20m to 2.35m arisings.
2. Pit orientation: 82°.
3. Pit corner coordinates: A: 613726.05mE, 315127.41mN; B: 613726.08mE, 315128.06mN; C: 613722.45mE, 315127.51mN; D: 613722.44mE, 315126.94mN.

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Logged by: W. Atkins / J. Camp | Checked by: R. Leech | **Fm-Hn-R-3069-Rev E**

Trial Pit Record

TP237

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613703.49	N: 315099.42
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 14/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			15.95	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint. Occasional straw pieces.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
		0.35	15.60	PID01	0.10	0.1ppm	
Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint. Rare cobbles of sub-rounded flint.				D2	0.50		
				ES2	0.50		
				LB2	0.50 - 0.70		
				PID02	0.50	0.1ppm	
From 0.80m: Frequent pockets of grey fine and medium sand.				LB3	0.80 - 1.00		
From 0.90m: Frequent pockets of reddish brown fine and medium sand.				D3	1.00		
				ES3	1.00		
				PID03	1.00	0.0ppm	
				D4	1.50		
From 1.90m: Becoming clayey.				D5	2.00		
				ES4	2.00		
				LB4	2.00 - 2.10		
				PID04	2.00	0.1ppm	
				D6	2.50		
At 2.80m: Pockets of greyish brown very clayey fine and medium sand.		2.90	13.05	D7	2.90		
Trial pit terminated at 2.90m: Target depth							

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.40m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 1.90m arisings, 1.90m to 2.90m gravel.
2. Pit orientation: 171°.
3. Pit corner coordinates: A: 613703.52mE, 315101.78mN; B: 613704.22mE, 315101.88mN; C: 613704.88mE, 315098.42mN; D: 613704.00mE, 315098.13mN.

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Logged by: W. Atkins / J. Camp | Checked by: R. Leech | **Fm-Hn-R-3069-Rev E**

Trial Pit Record

TP238

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613682.78	N: 315113.66
Location: Norwich Western Link	Consultant: Ramboll		
	Plant used: JCB 3CX	Date: 14/06/2022	

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			15.87	Type	Depth	Results / Remarks	
TOPSOIL. Dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint.				D1	0.10		
				ES1	0.10		
				LB1	0.10 - 0.30		
		0.33	15.54	PID01	0.10	0.1ppm	
Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is angular to rounded fine to coarse flint.				D2	0.40		
				ES2	0.50		
				LB2	0.50 - 0.70		
				PID02	0.50	0.0ppm	
				ES3	1.00		
				PID03	1.00	0.1ppm	
From 1.10m to 1.60m: Frequent pockets of grey very clayey fine and medium sand.				D3	1.10		
				LB3	1.10 - 1.30		
				D4	1.50		
From 1.60m: Frequent pockets of brownish grey very clayey fine and medium sand.							
				D5	2.00		
				ES4	2.00		
From 2.10m: Medium cobble content. Cobbles are sub-rounded flint.				PID04	2.00	0.0ppm	
				LB4	2.10 - 2.40		
Trial pit terminated at 2.40m: Target depth		2.40	13.47				

Weather:	Sunny and dry
Pit Stability:	Stable
Shoring Used:	
Pit Dimensions:	L: 3.30m x W: 0.60m

Water Strike

Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
				No groundwater encountered

Remarks

1. Backfill: GL to 1.40m arisings, 1.40m to 2.40m gravel.
2. Pit orientation: 95°.
3. Pit corner coordinates: A: 613684.62mE, 315112.91mN; B: 613684.73mE, 315113.31mN; C: 613680.76mE, 315113.07mN; D: 613681.02mE, 315112.45mN.

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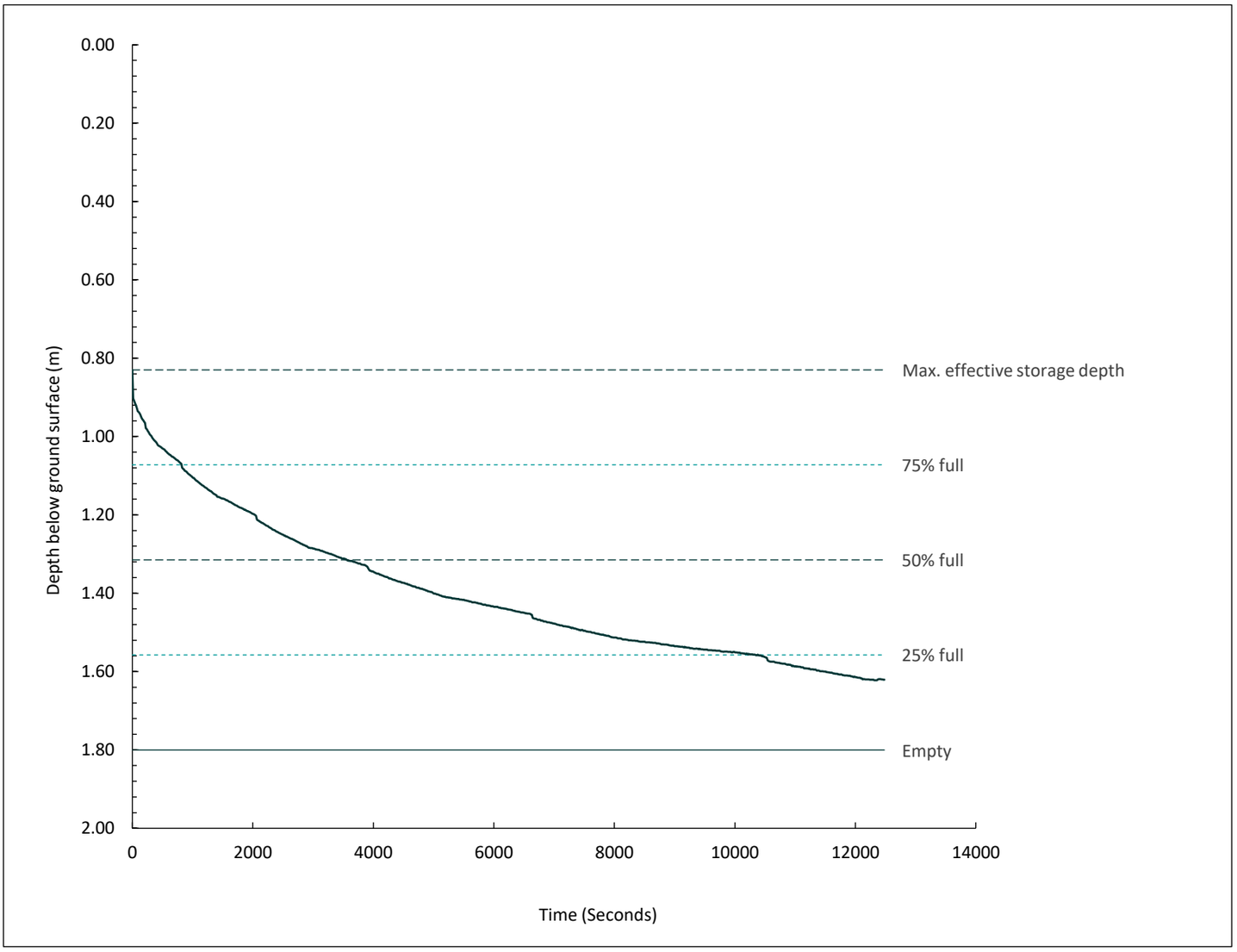
APPENDIX C

IN-SITU TESTING

SPT N60 Plot vs Reduced Level	
In-situ TRL DCP Test Results	
Infiltration Testing Results	
Cambridge In-Situ –Pressuremeter Testing Report	CIR1535_Volume_1.2 CIR1535_Volume_2 CIR1535_Volume_3 CIR1535_Volume_4
Lankelma - Cone Penetration Testing (CPT)	Report Ref: P-108063_03, dated 01/09/2022
CPT Graphical Summaries	CPT201 – CPT203
In Situ Plate Load Test Results	
Light Weight Deflectometer Results	

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP205

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614036.03	N: 315774.61
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	15.99 maOD
	Infilling 1	Test Date:	31/05/2022



Soil Infiltration Rate: 5.08E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	0.60	1.80	1.80

Fill Porosity: 30%	Test Duration (hh:mm): 03:28	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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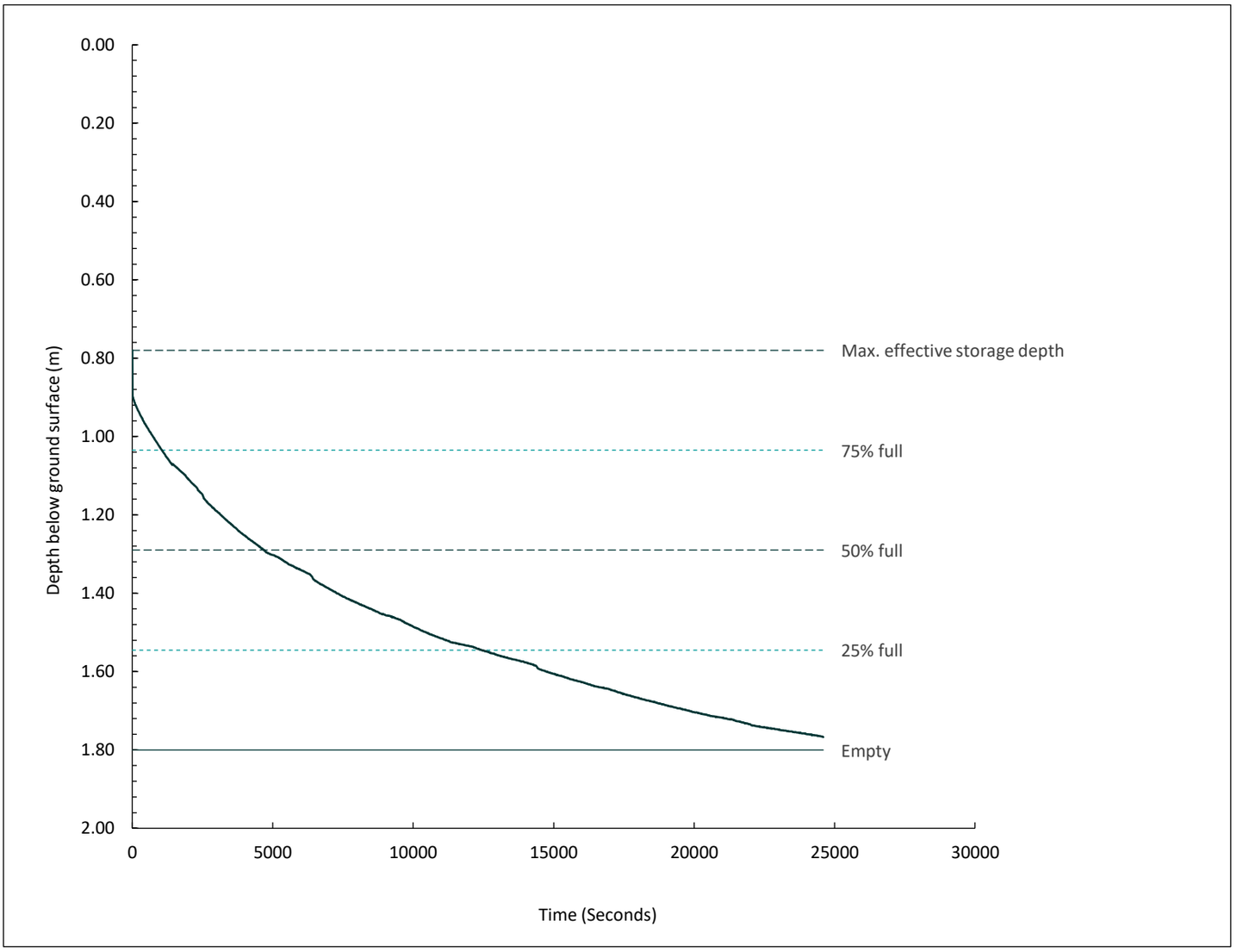
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP205

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614036.03	N: 315774.61
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	15.99 maOD
	Infilling 2	Test Date:	31/05/2022



Soil Infiltration Rate: 4.32E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	0.60	1.80	1.80

Fill Porosity: 30%	Test Duration (hh:mm): 06:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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Water measuring device: Level Logger

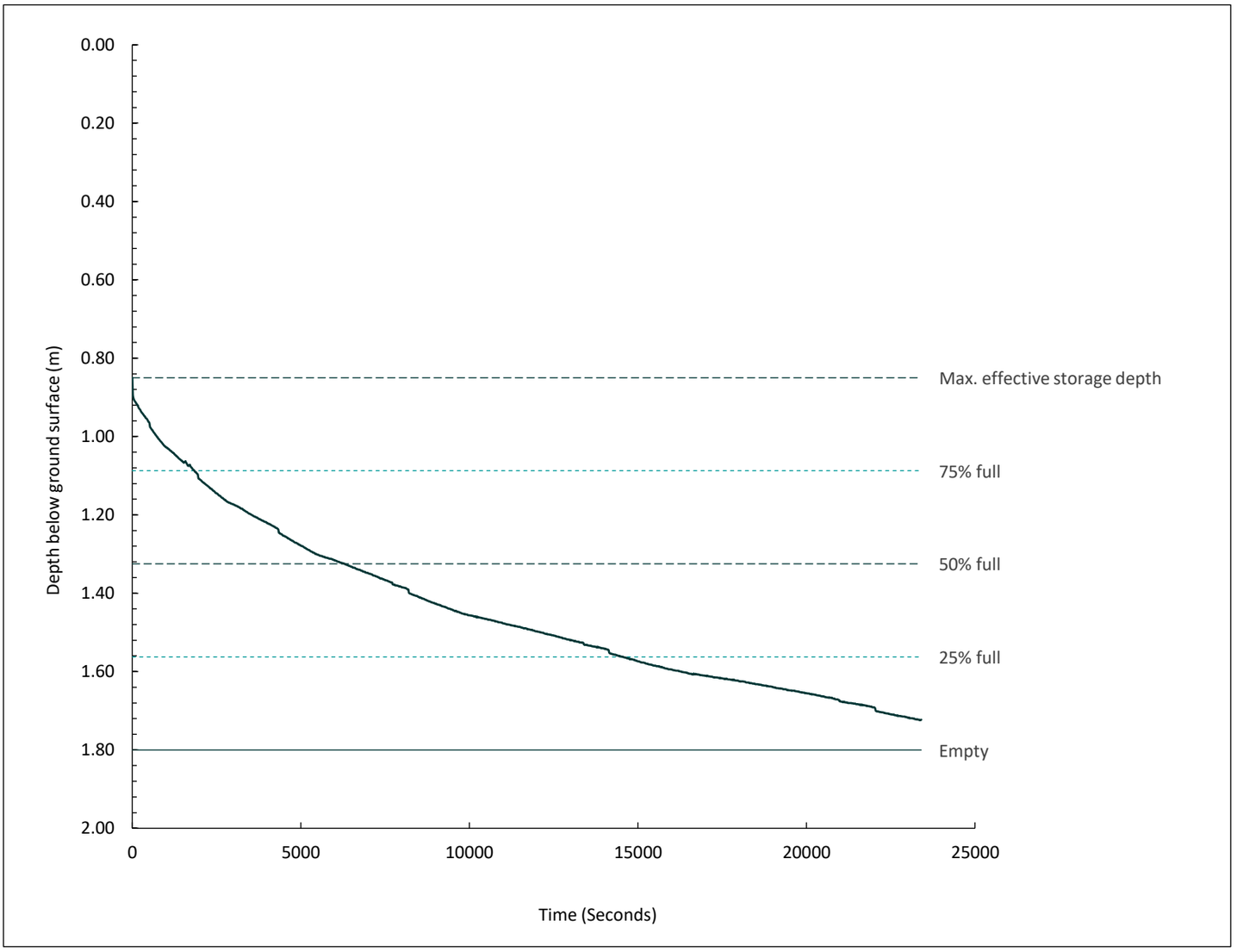
Weather conditions: Cloudy and dry

Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP205
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614036.03 N: 315774.61
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 15.99maOD
	Infilling 3	Test Date: 01/06/2022



Soil Infiltration Rate: 3.78E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.50	0.60	1.80	1.80

Fill Porosity: 30%	Test Duration (hh:mm): 06:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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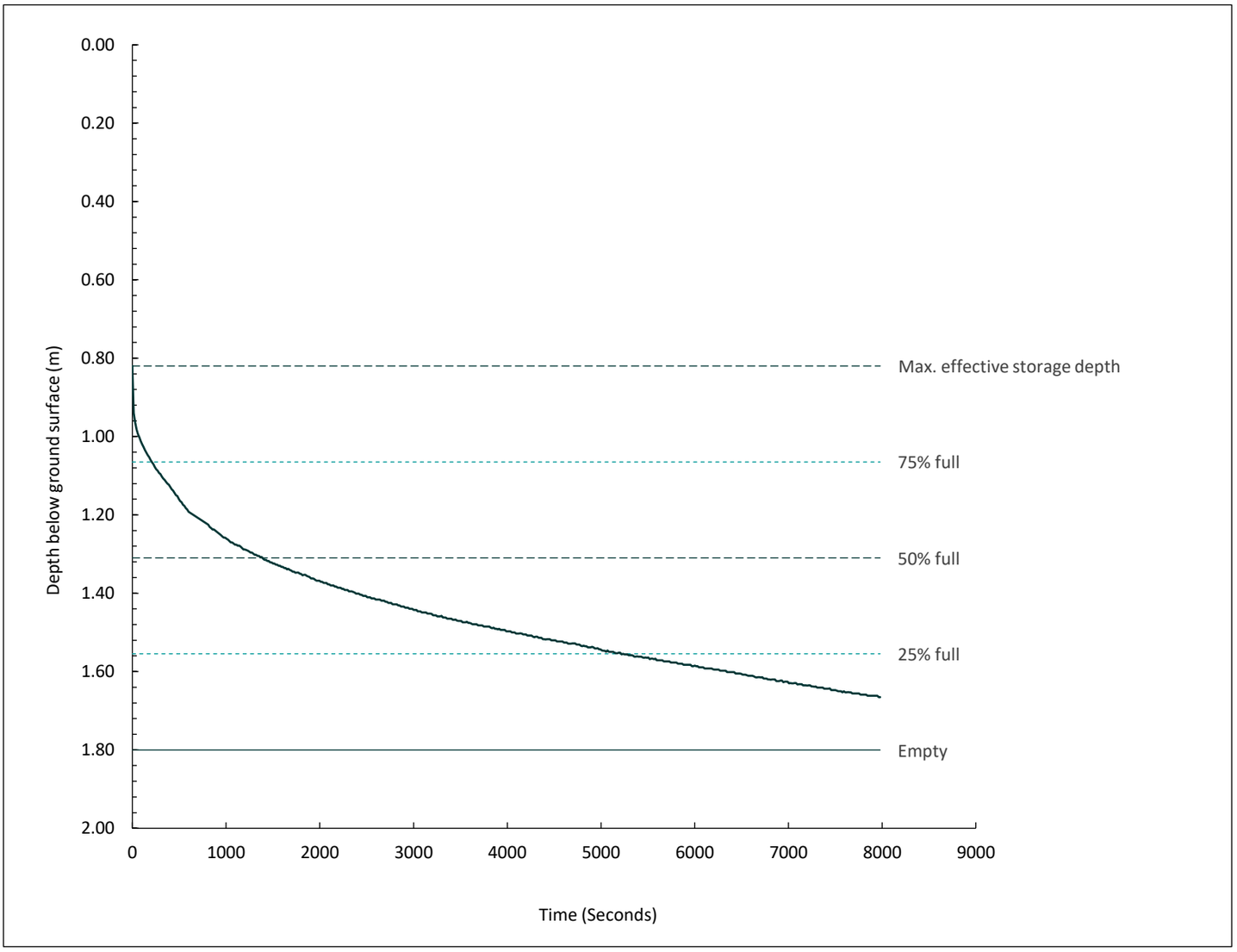
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP206

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614020.41	N: 315785.09
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	15.94 maOD
	Infilling 1	Test Date:	31/05/2022



Soil Infiltration Rate: 9.53E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.20	0.60	1.80	1.80

Fill Porosity: 30%	Test Duration (hh:mm): 02:13	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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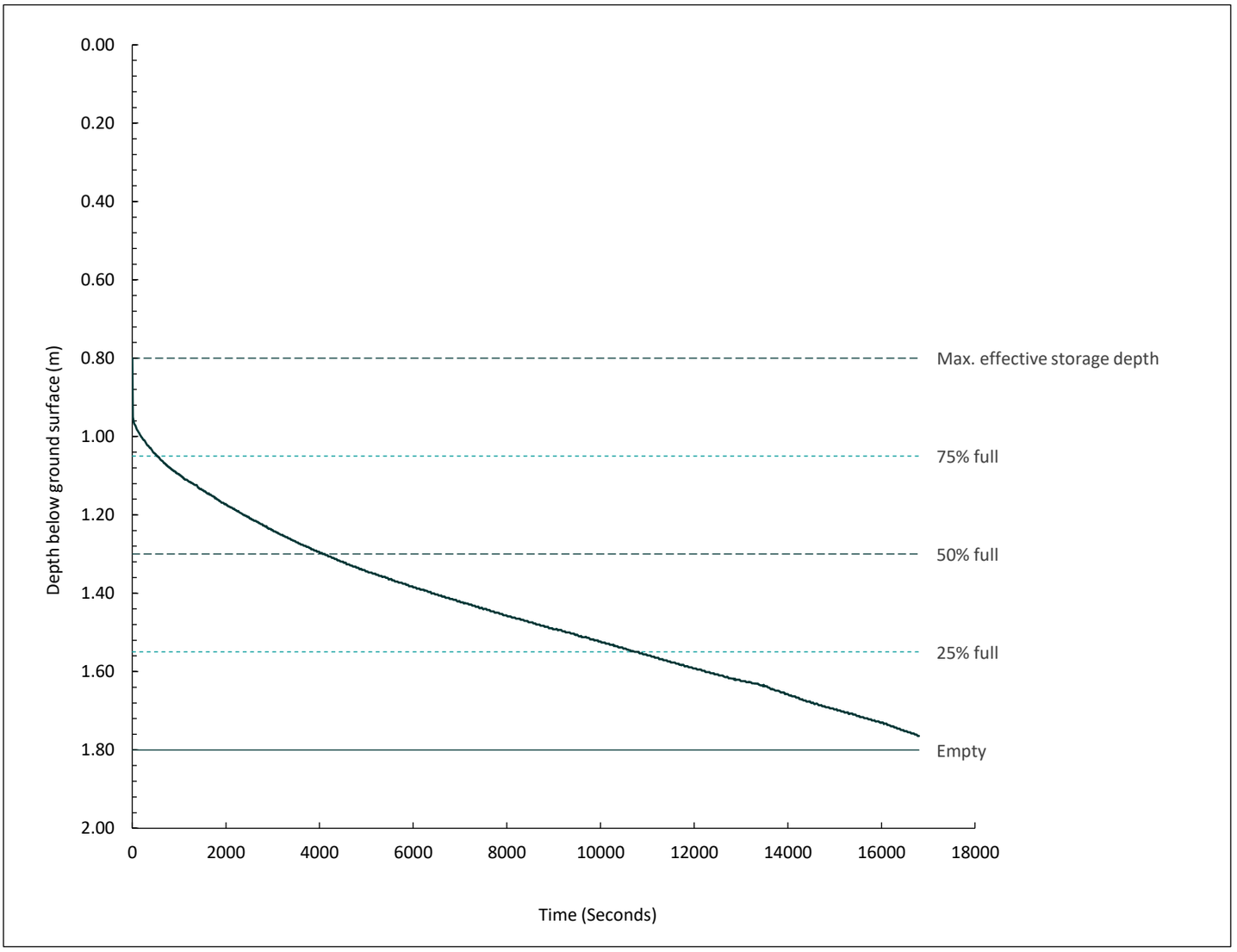
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP206
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614020.41 N: 315785.09
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 15.94 maOD
	Infilling 2	Test Date: 31/05/2022



Soil Infiltration Rate: 4.72E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.20	0.60	1.80	1.80

Fill Porosity: 30%	Test Duration (hh:mm): 04:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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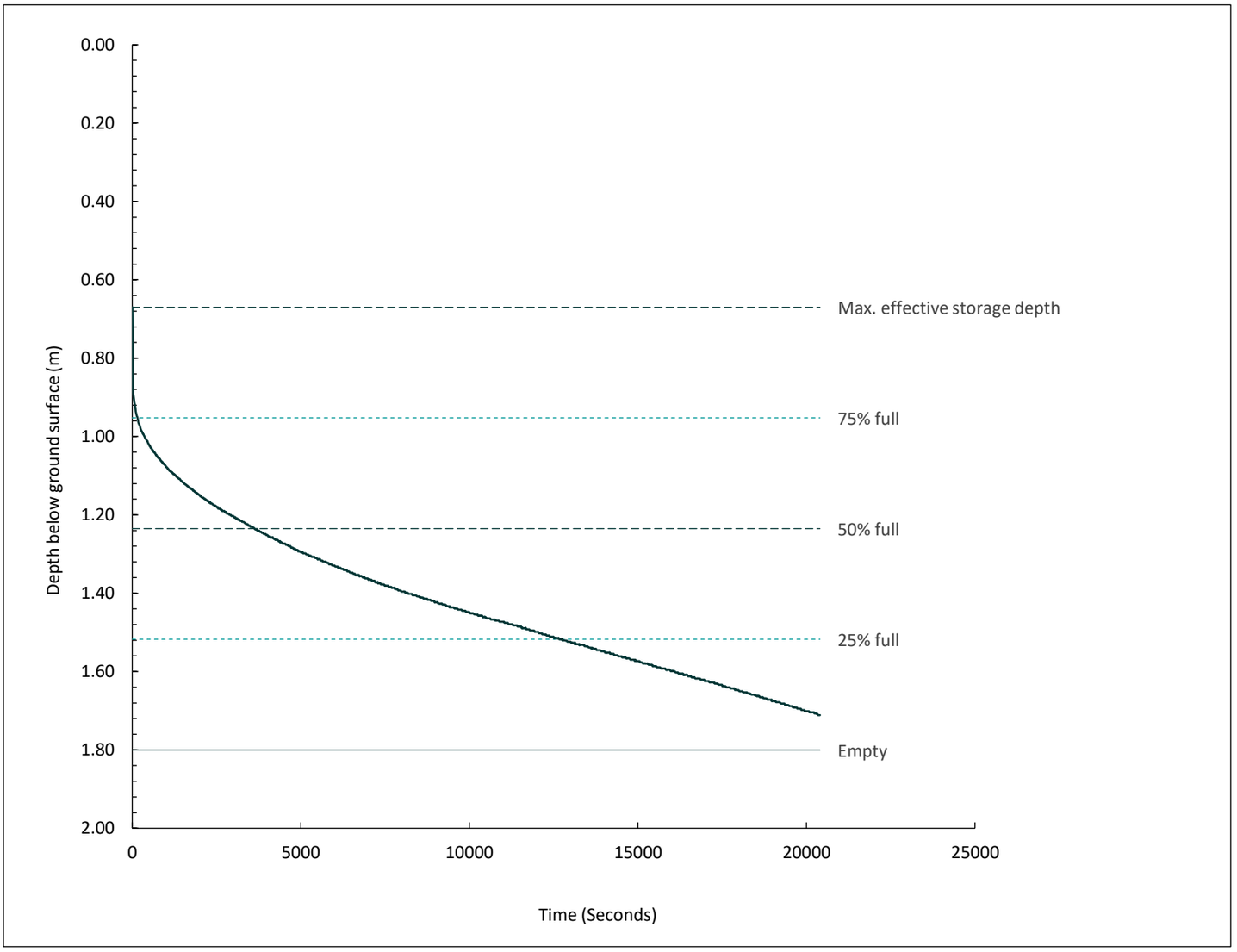
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP206
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614020.41 N: 315785.09
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 15.94maOD
	Infilling 3	Test Date: 01/06/2022



Soil Infiltration Rate: 3.99E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.20	0.60	1.80	1.80

Fill Porosity: 30%	Test Duration (hh:mm): 05:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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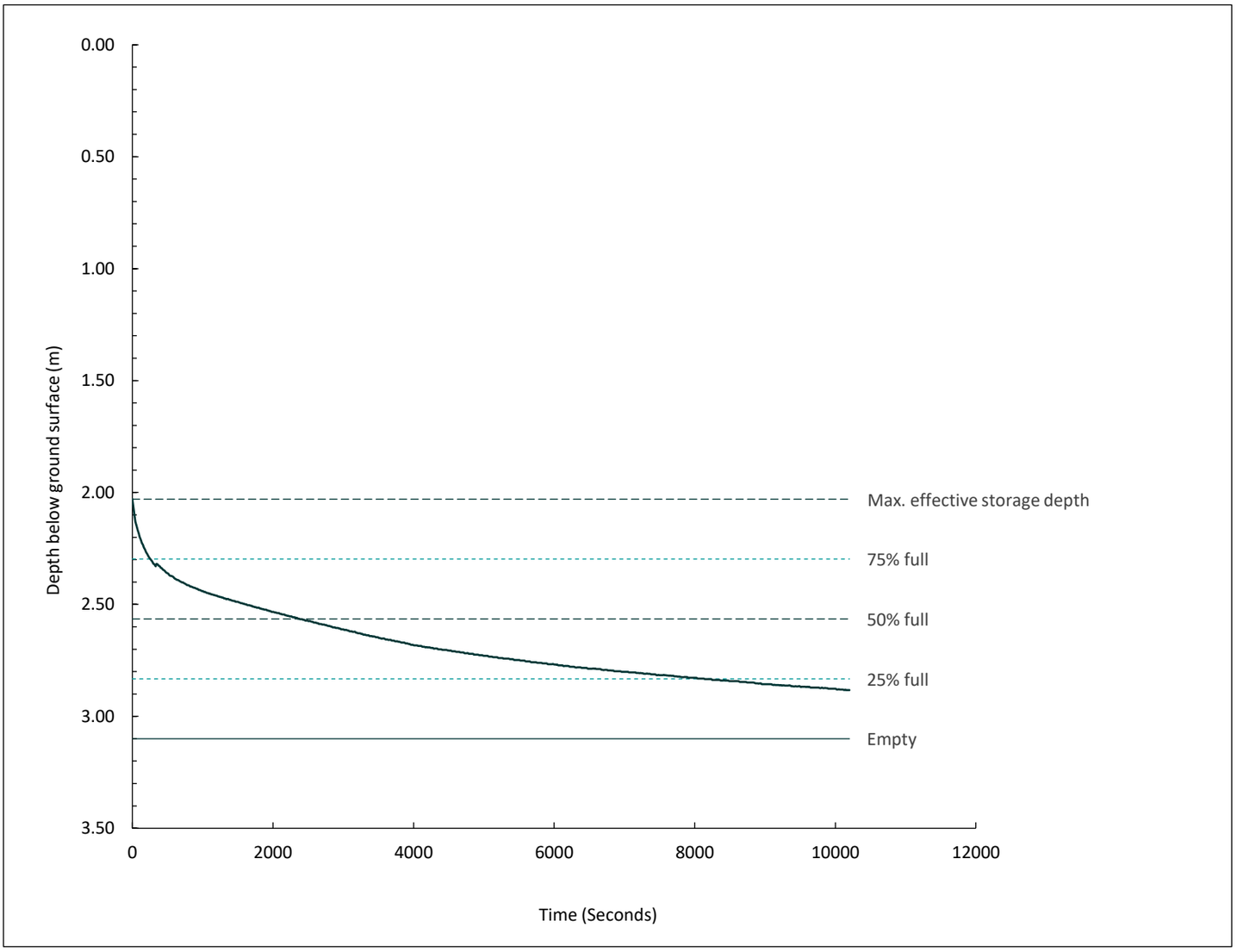
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP207

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 614060.23	N: 315774.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.75 maOD
	Infilling 1	Test Date:	31/05/2022



Soil Infiltration Rate: 6.53E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.60	3.10	3.10

Fill Porosity: 30%	Test Duration (hh:mm): 02:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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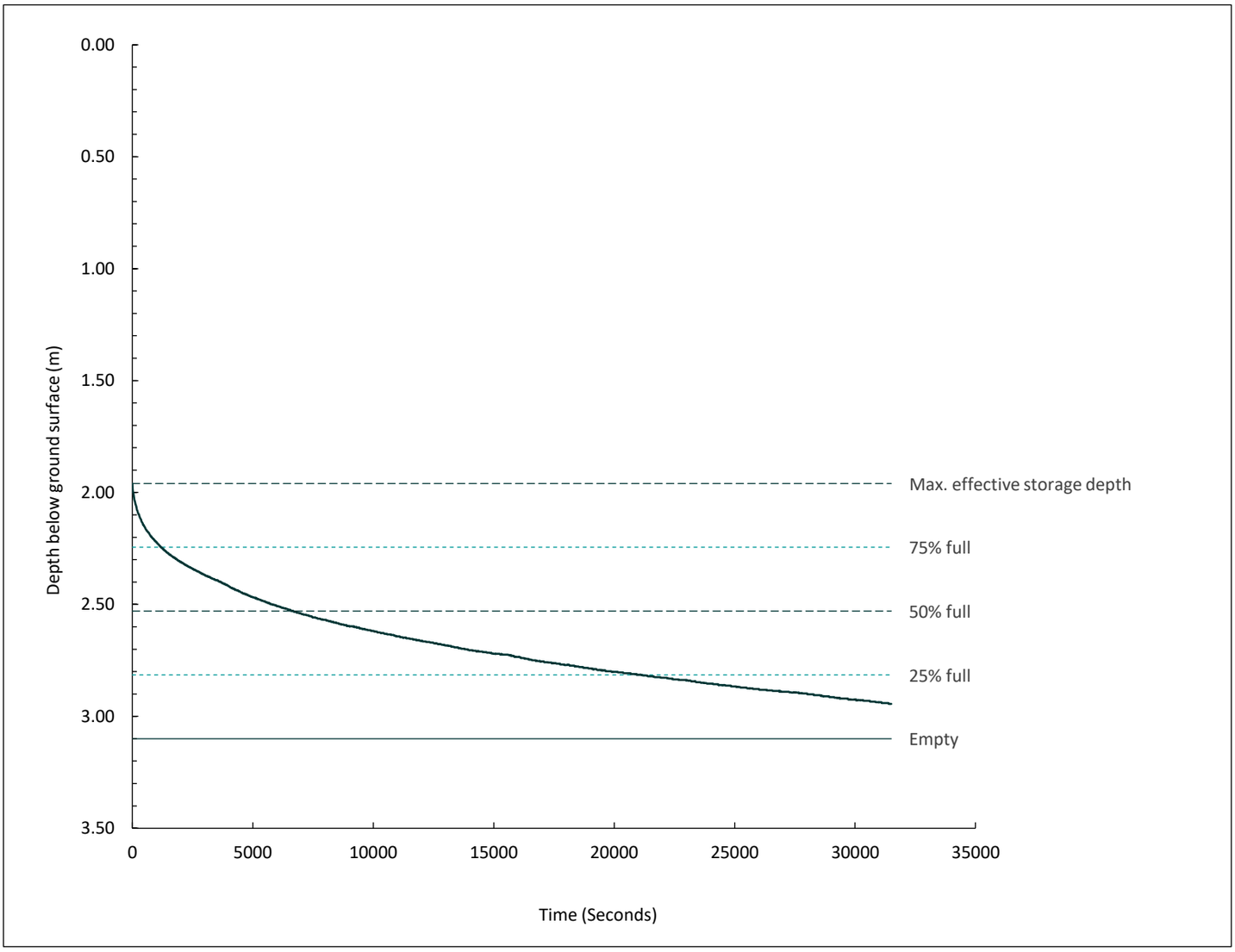
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	**Soakaway Test**	Location ID - Test Number **TP207**
Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 614060.23 N: 315774.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 16.75 maOD
	Infilling 2	Test Date: 31/05/2022



Soil Infiltration Rate: 2.66E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.60	3.10	3.10

Fill Porosity: 30%	Test Duration (hh:mm): 08:45	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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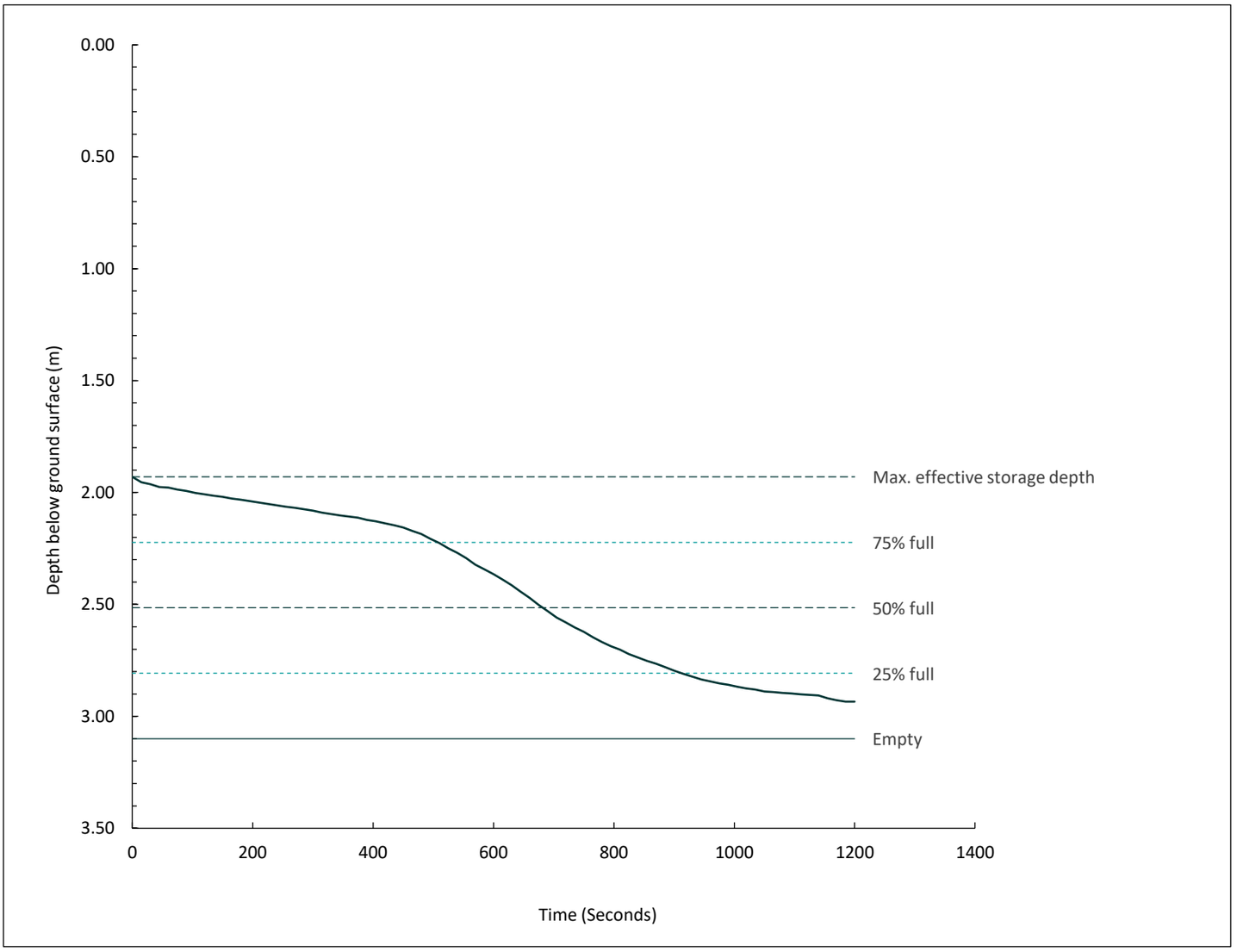
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP207

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614060.23	N: 315774.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.75maOD
	Infilling 3	Test Date:	01/06/2022



Soil Infiltration Rate: 1.31E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.60	3.10	3.10

Fill Porosity: 30%	Test Duration (hh:mm): 00:20	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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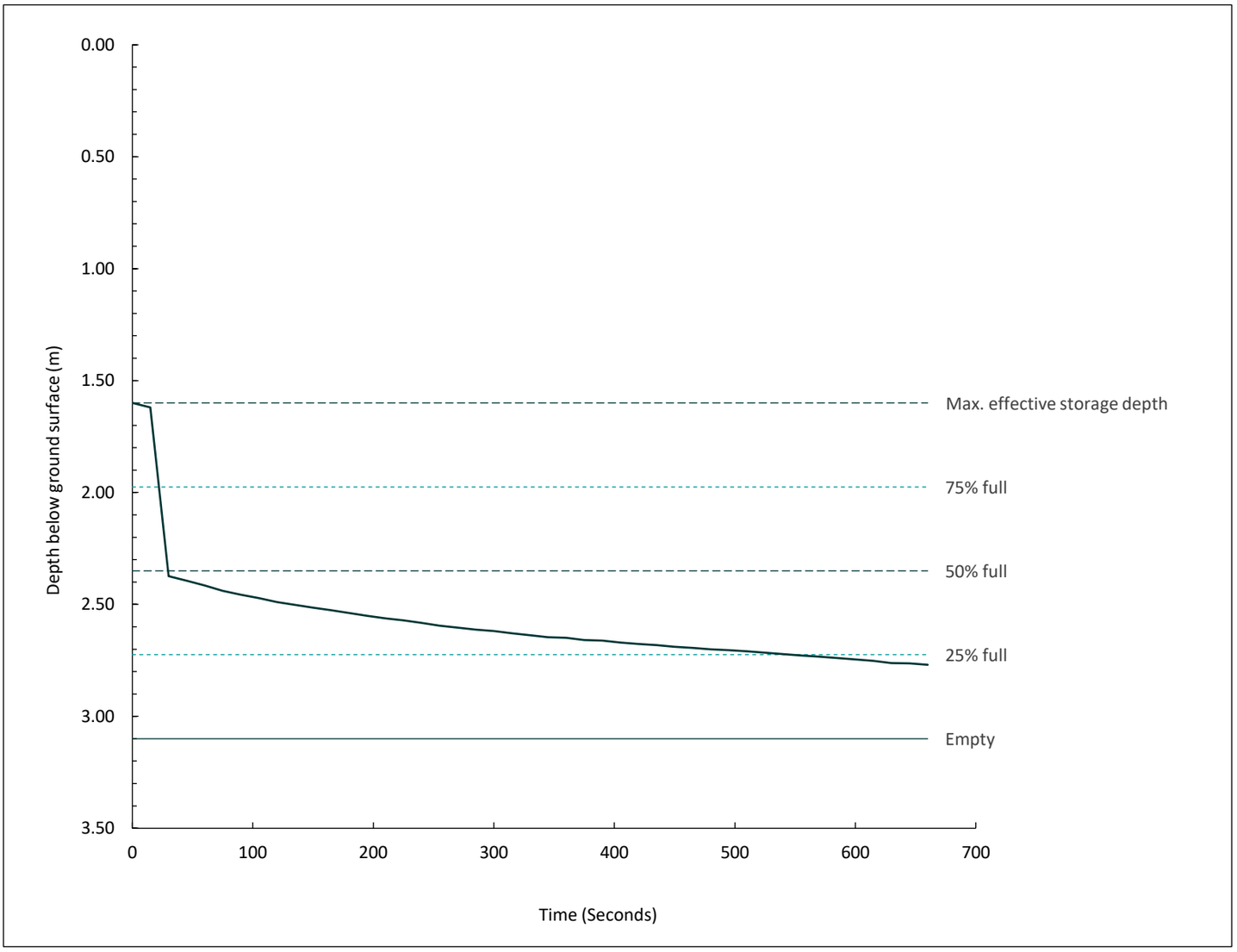
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP207

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614060.23	N: 315774.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.75 maOD
	Infilling 4	Test Date:	01/06/2022



Soil Infiltration Rate: 1.08E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.60	3.10	3.10

Fill Porosity: 30%	Test Duration (hh:mm): 00:11	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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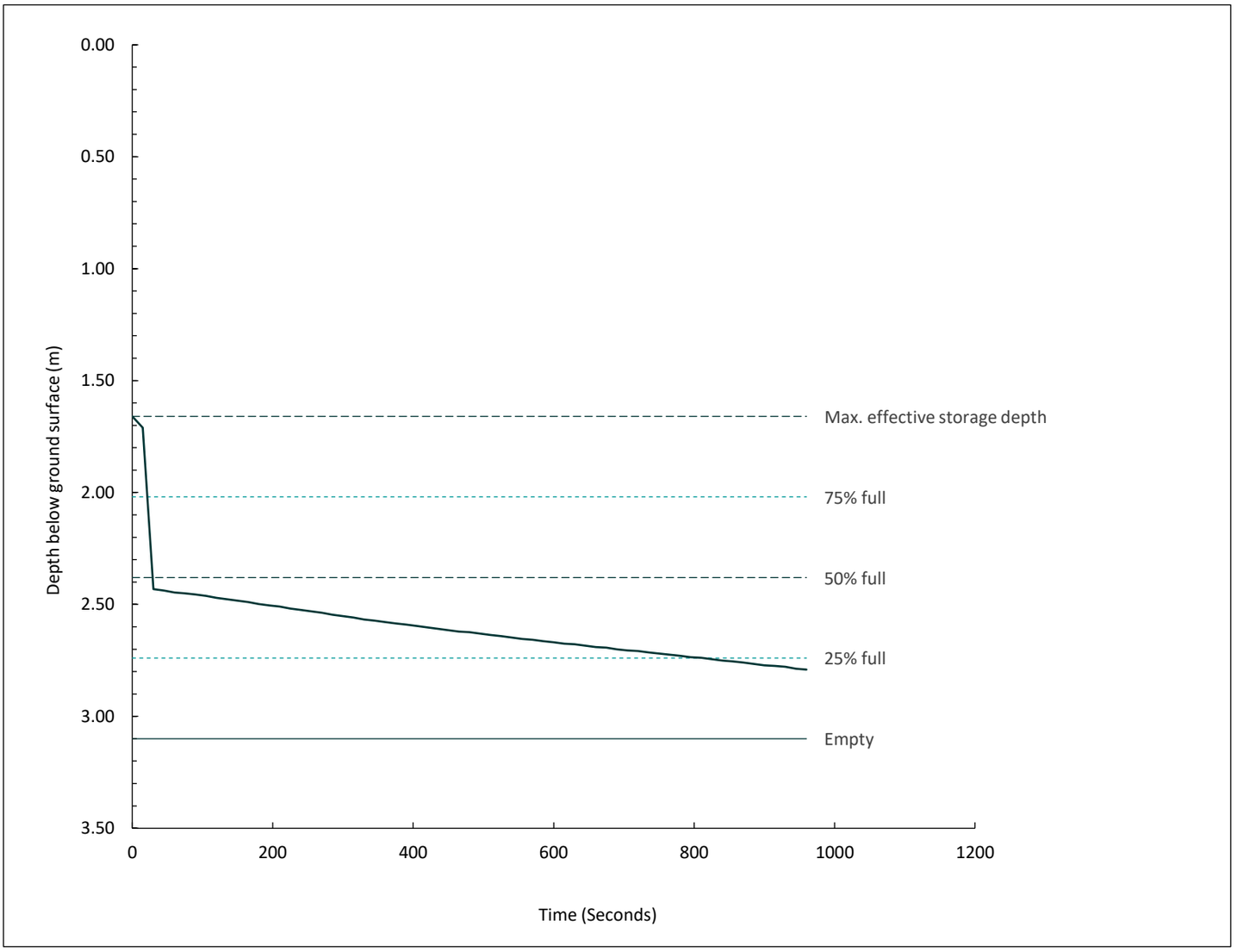
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Additional infilling due to unusual infiltration speed observed in infilling 3.

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP207

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614060.23	N: 315774.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.75 maOD
	Infilling 5	Test Date:	01/06/2022



Soil Infiltration Rate: 7.08E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.60	3.10	3.10

Fill Porosity: 30%	Test Duration (hh:mm): 00:16	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

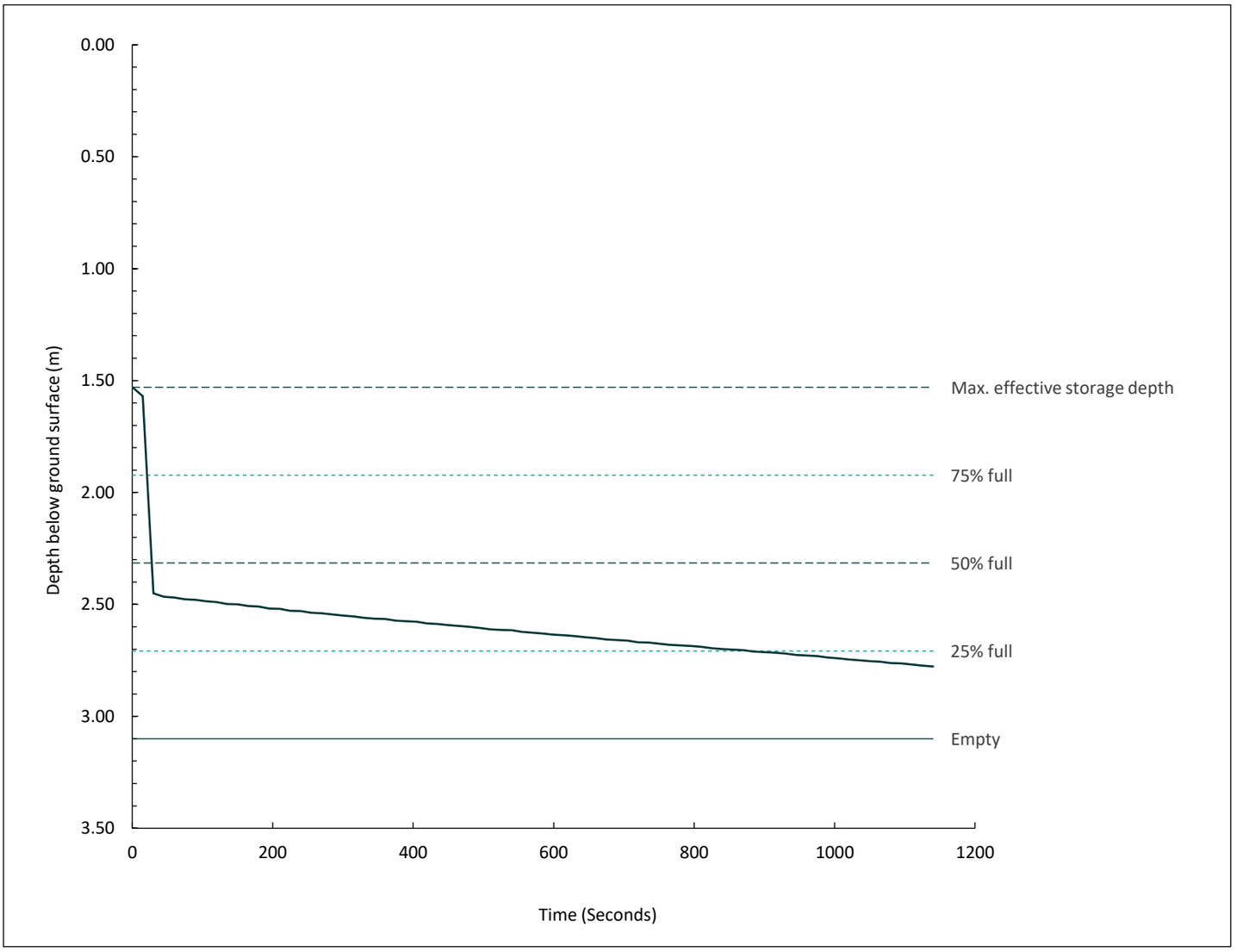
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Additional infilling due to unusual infiltration speed observed in infilling 3.

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP207

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614060.23	N: 315774.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.75maOD
	Infilling 6	Test Date:	01/06/2022



Soil Infiltration Rate: 6.69E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.20	0.60	3.10	3.10

Fill Porosity: 30%	Test Duration (hh:mm): 00:19	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

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Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

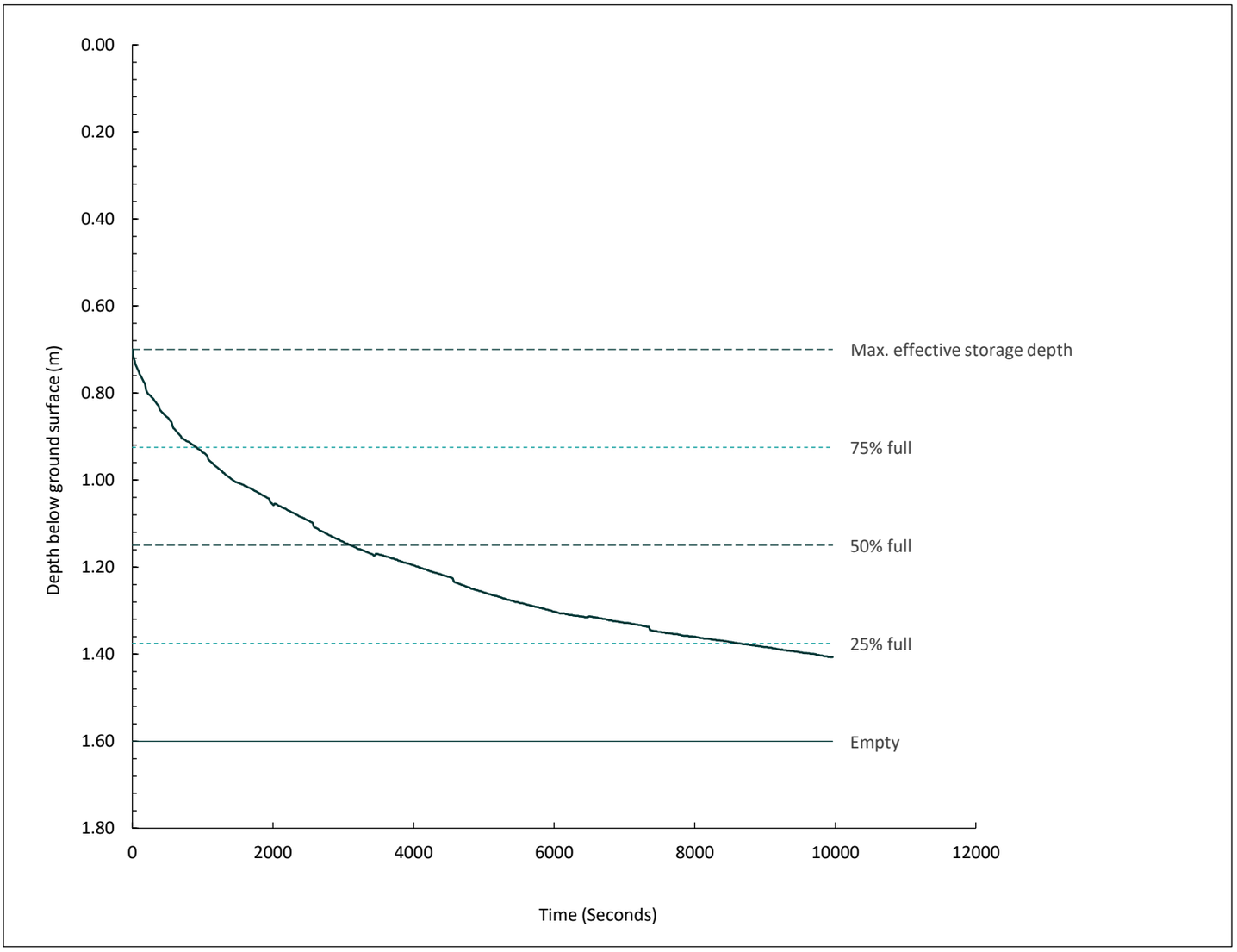
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Additional infilling due to unusual infiltration speed observed in infilling 3.

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP208

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614035.43	N: 315792.28
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.29 maOD
	Infilling 1	Test Date:	31/05/2022



Soil Infiltration Rate: 6.08E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.40	0.60	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 02:46	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

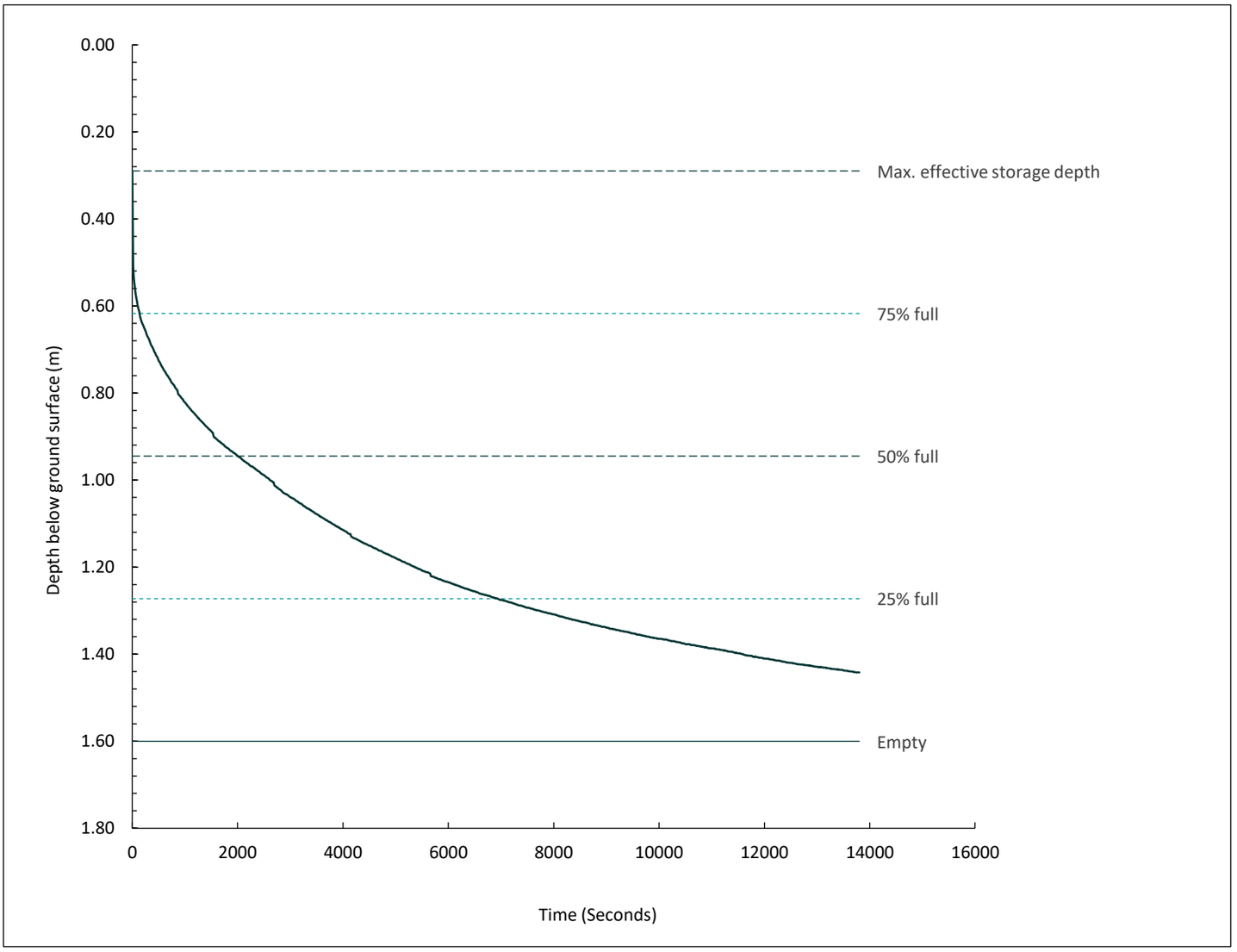
AGS

Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP208
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614035.43 N: 315792.28
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 16.29 maOD
	Infilling 2	Test Date: 31/05/2022



Soil Infiltration Rate: 7.76E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.40	0.60	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 03:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

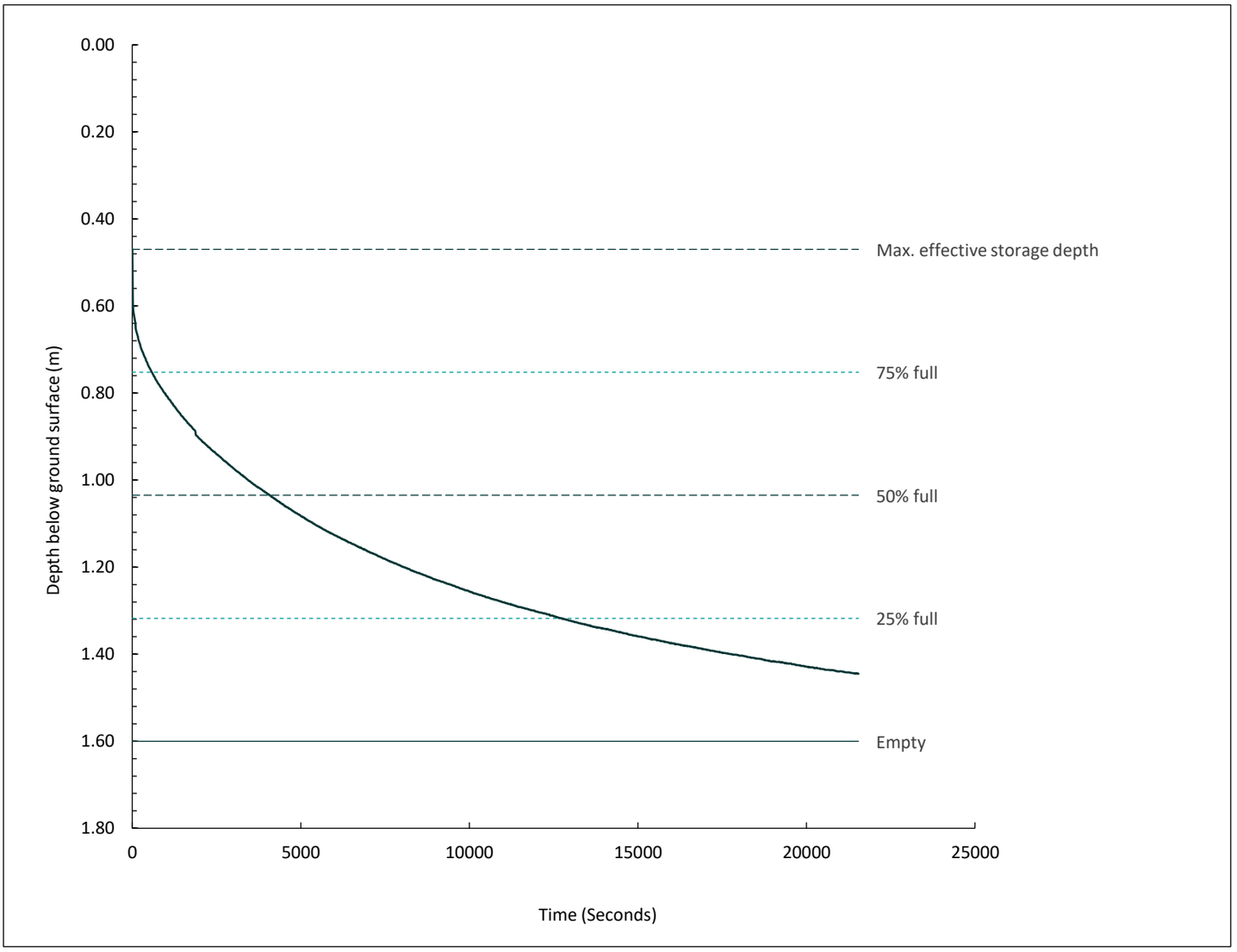
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP208

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614035.43	N: 315792.28
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	16.29maOD
	Infilling 3	Test Date:	01/06/2022



Soil Infiltration Rate: 4.16E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.40	0.60	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 05:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

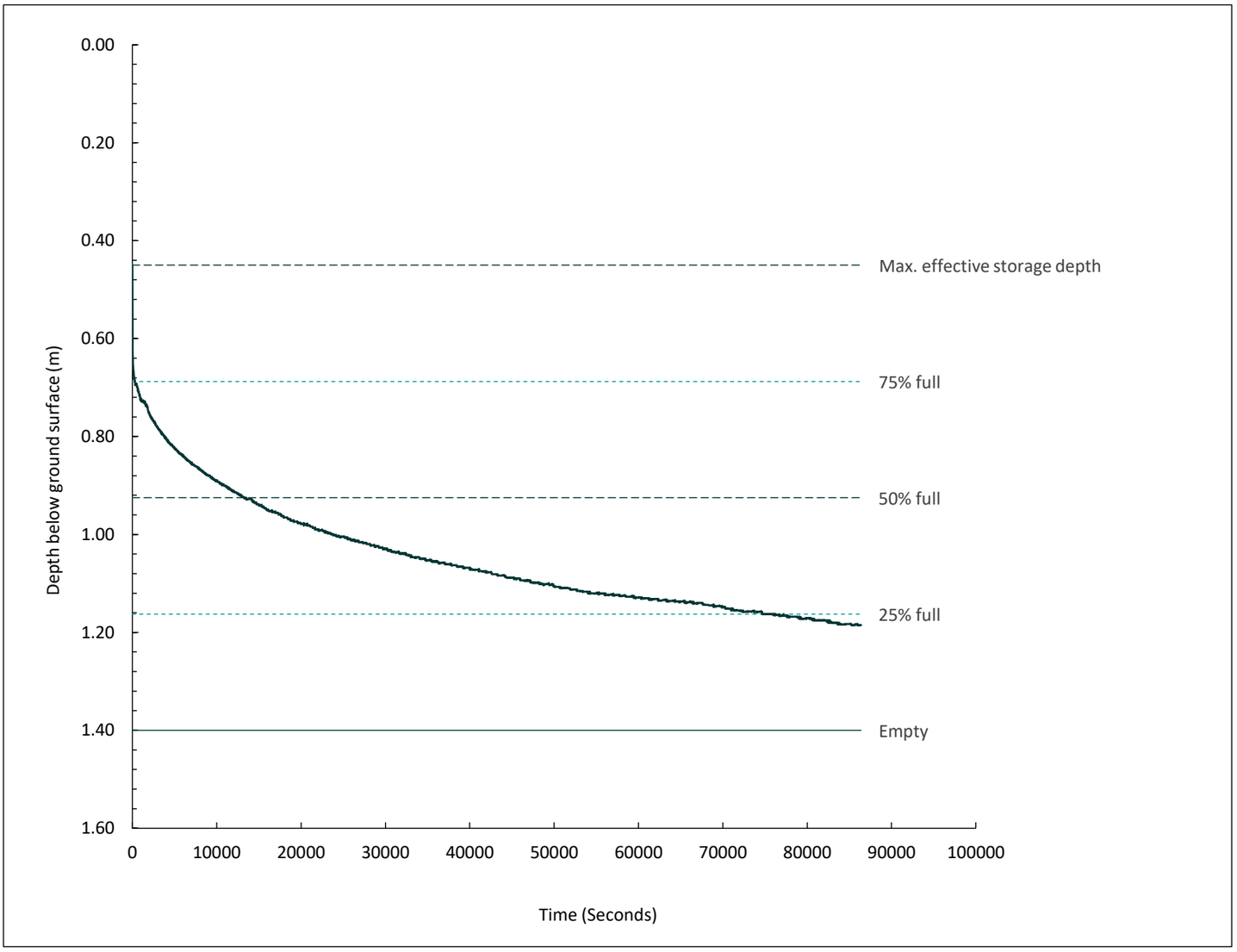
AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP209
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613609.60 N: 315087.91
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 18.31 maOD
	Infilling 1	Test Date: 23/06/2022



Soil Infiltration Rate: 6.61E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 23:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

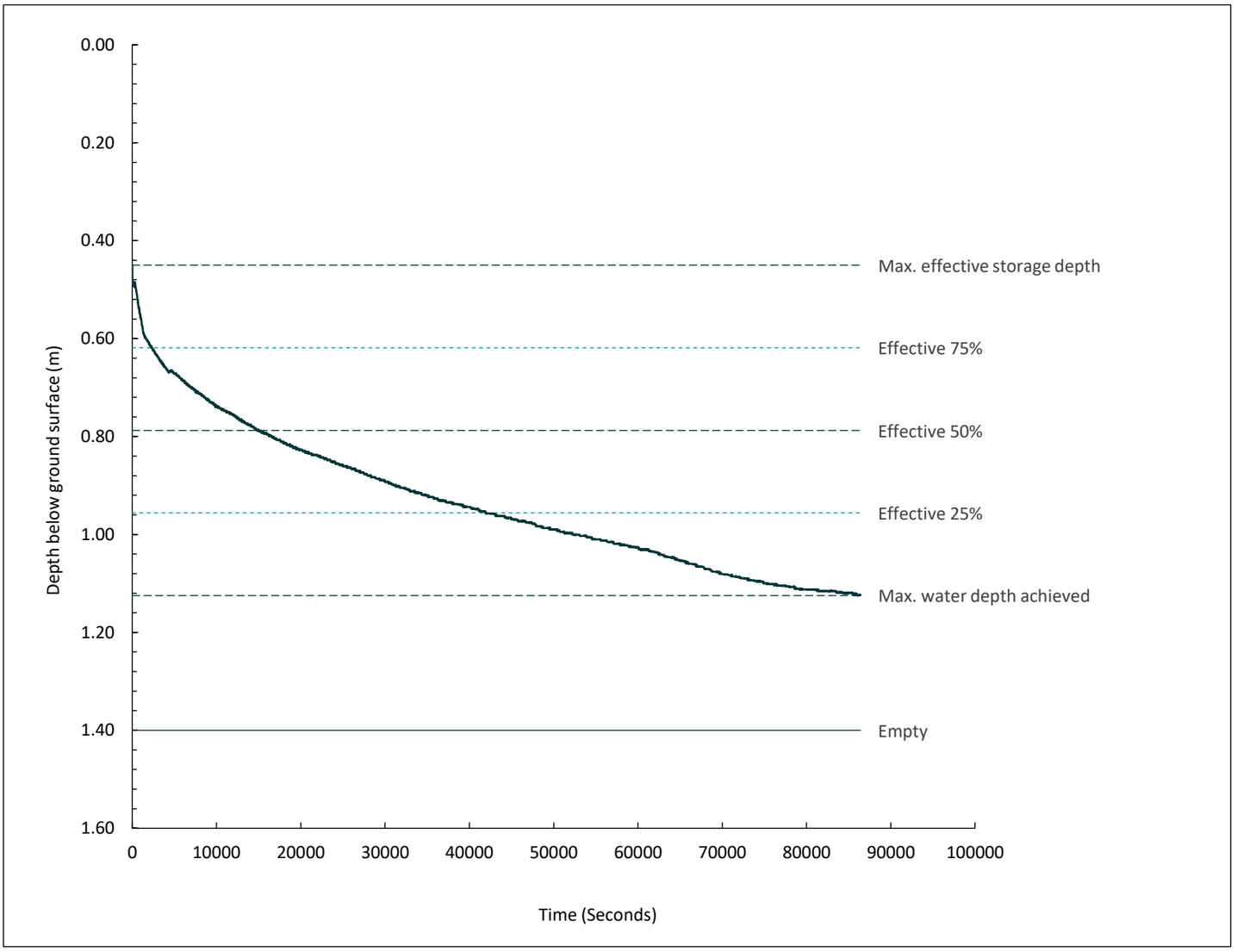
AGS

Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP209
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613609.60 N: 315087.91
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 18.31 maOD
	Infilling 2	Test Date: 24/06/2022



Soil Infiltration Rate: 1.09E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 23:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

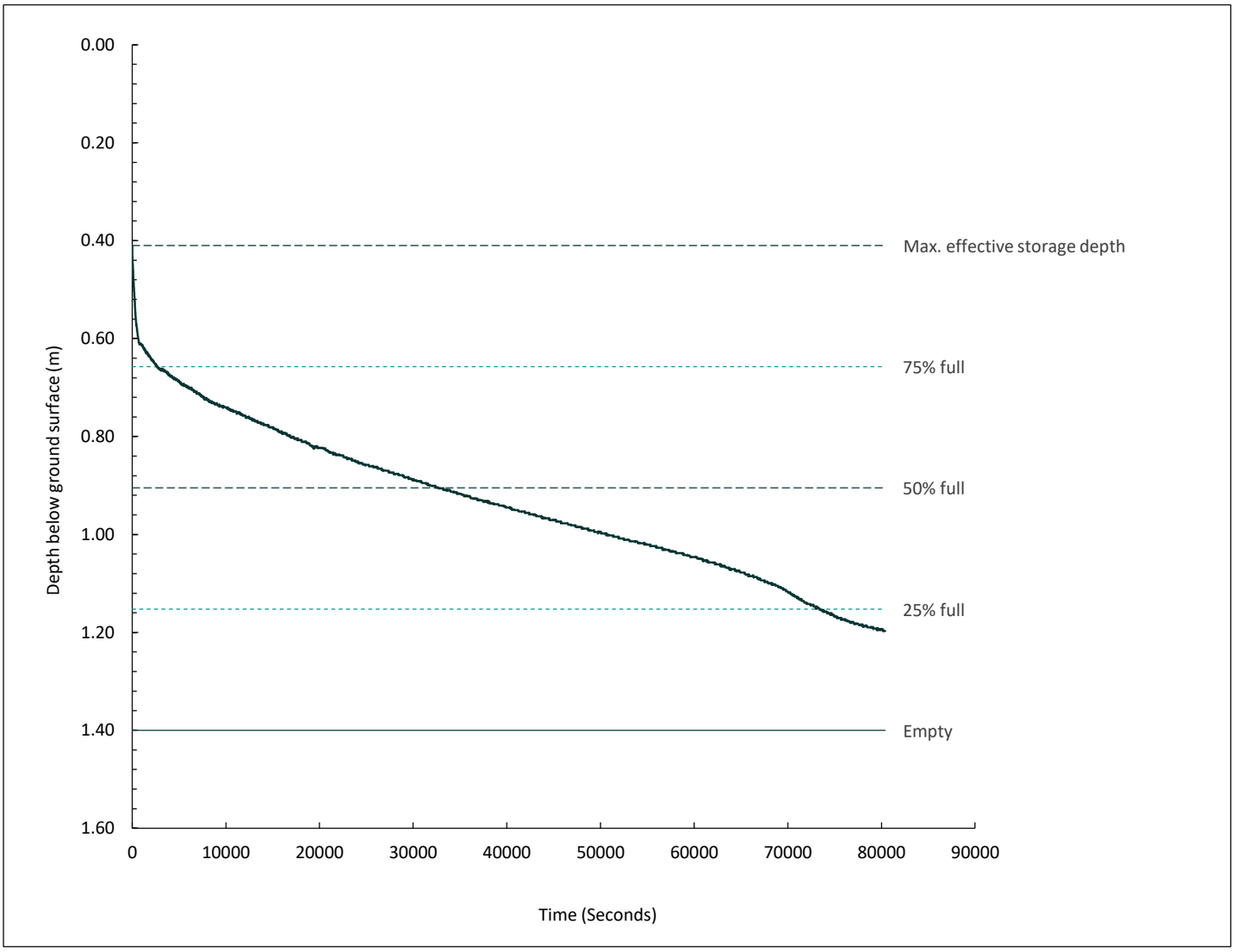
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Effective rate calculation based on maximum water depth achieved.

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP209

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613609.60	N: 315087.91
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.31maOD
	Infilling 3	Test Date:	27/06/2022



Soil Infiltration Rate: 7.05E-7 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 22:20	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

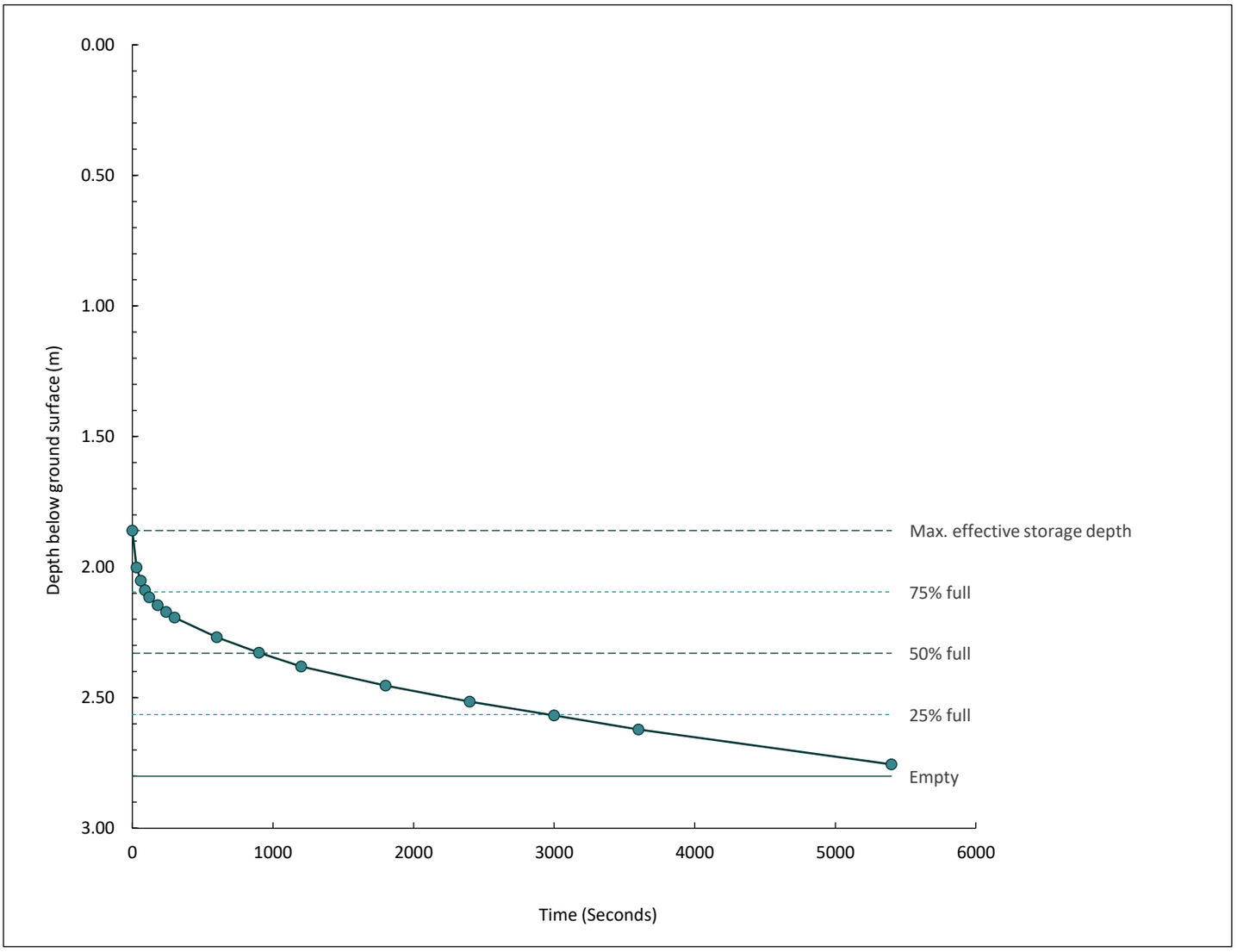
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP209A

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613605.02	N: 315090.83
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.36 maOD
	Infilling 1	Test Date:	12/07/2022



Soil Infiltration Rate: 1.83E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.70	0.70	2.80	2.80

Fill Porosity: 30%	Test Duration (hh:mm): 01:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

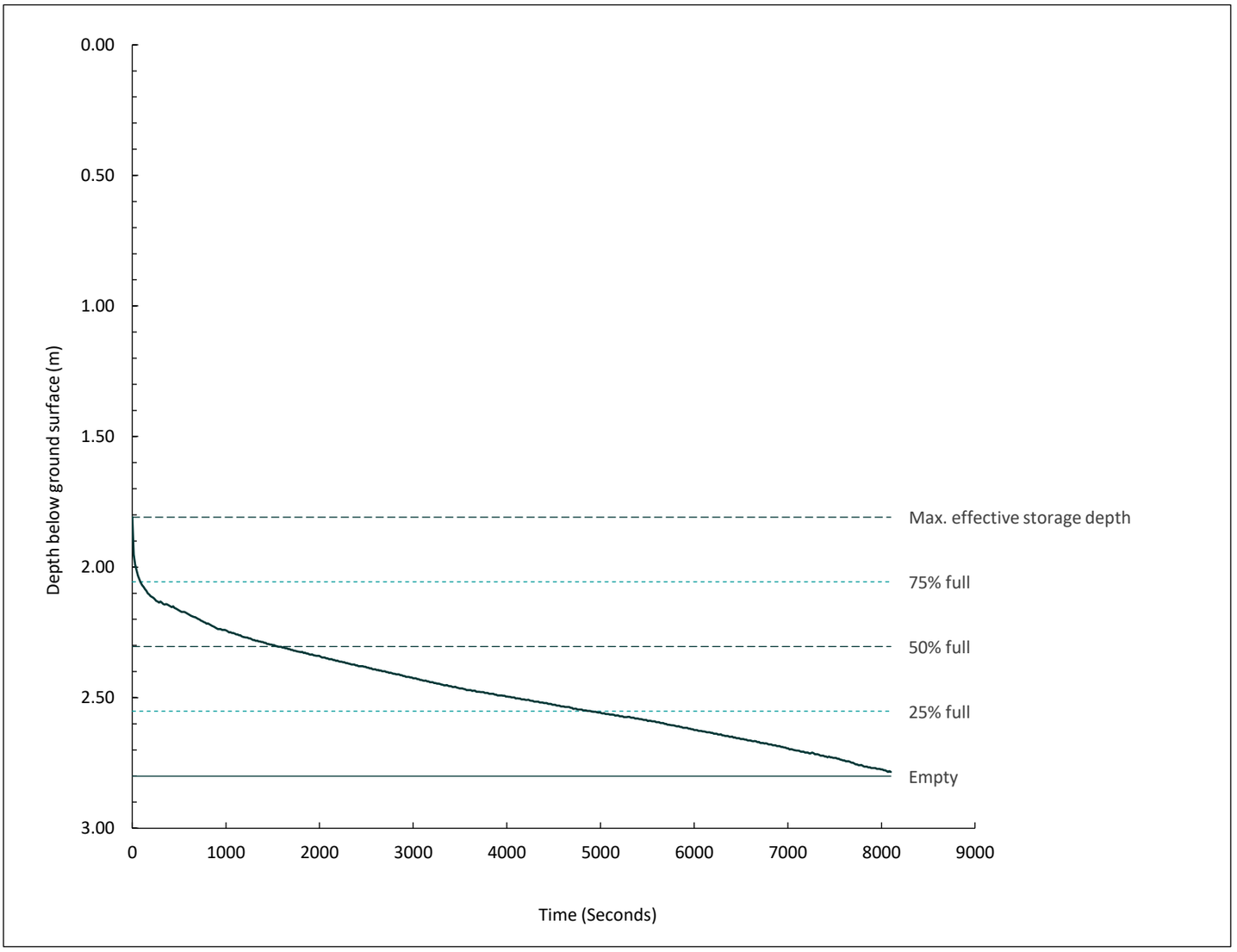
Water measuring device: Dip Meter
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Levellogger not used. Dip meter readings only.

Operator: C. Ogunniyi / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP209A

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613605.02	N: 315090.83
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.36 maOD
	Infilling 2	Test Date:	12/07/2022



Soil Infiltration Rate: 1.11E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.70	0.70	2.80	2.80

Fill Porosity: 30%	Test Duration (hh:mm): 02:15	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

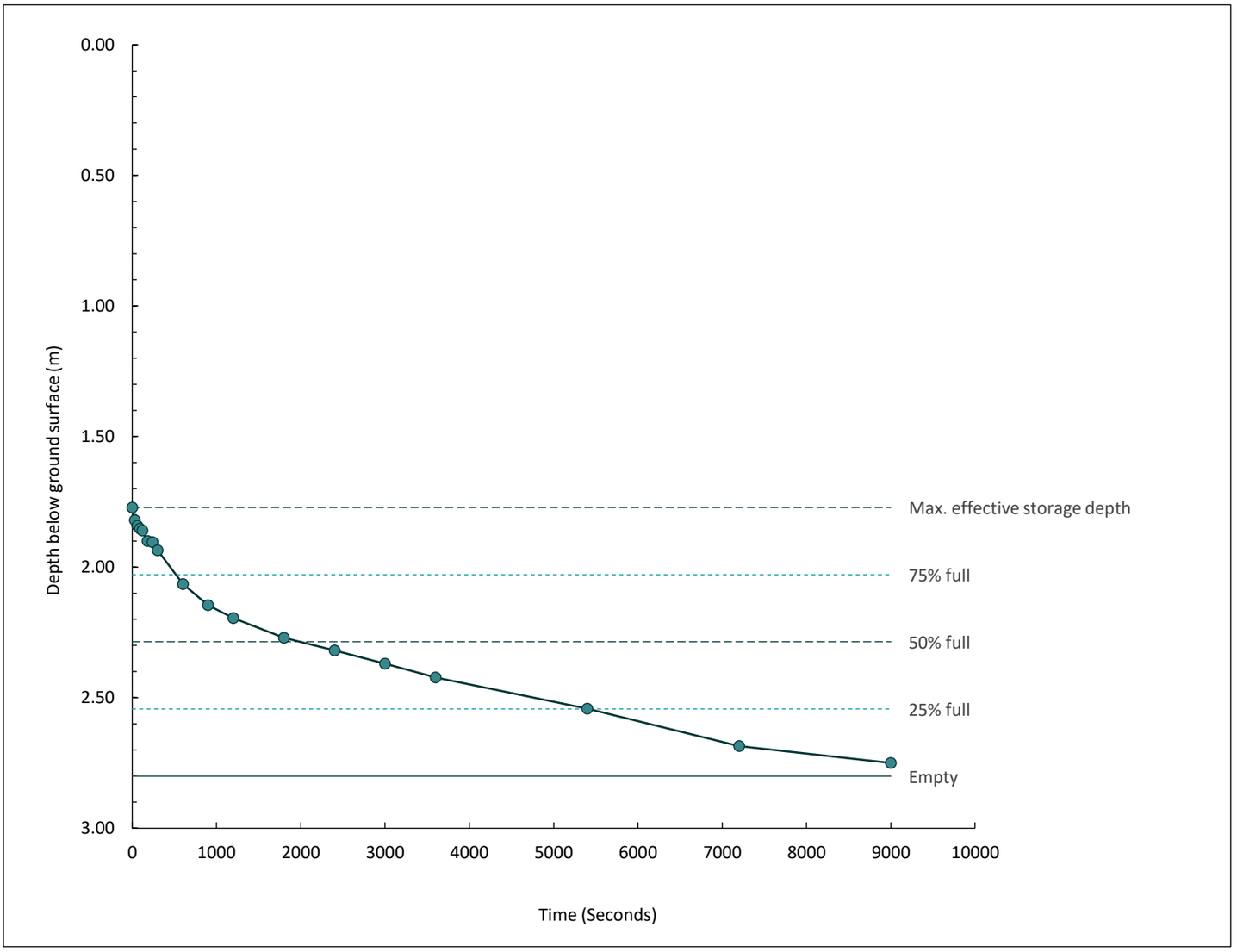
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: C. Ogunniyi / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP209A

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613605.02	N: 315090.83
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.36maOD
	Infilling 3	Test Date:	13/07/2022



Soil Infiltration Rate: 1.11E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.70	0.70	2.80	2.80

Fill Porosity: 30%	Test Duration (hh:mm): 02:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

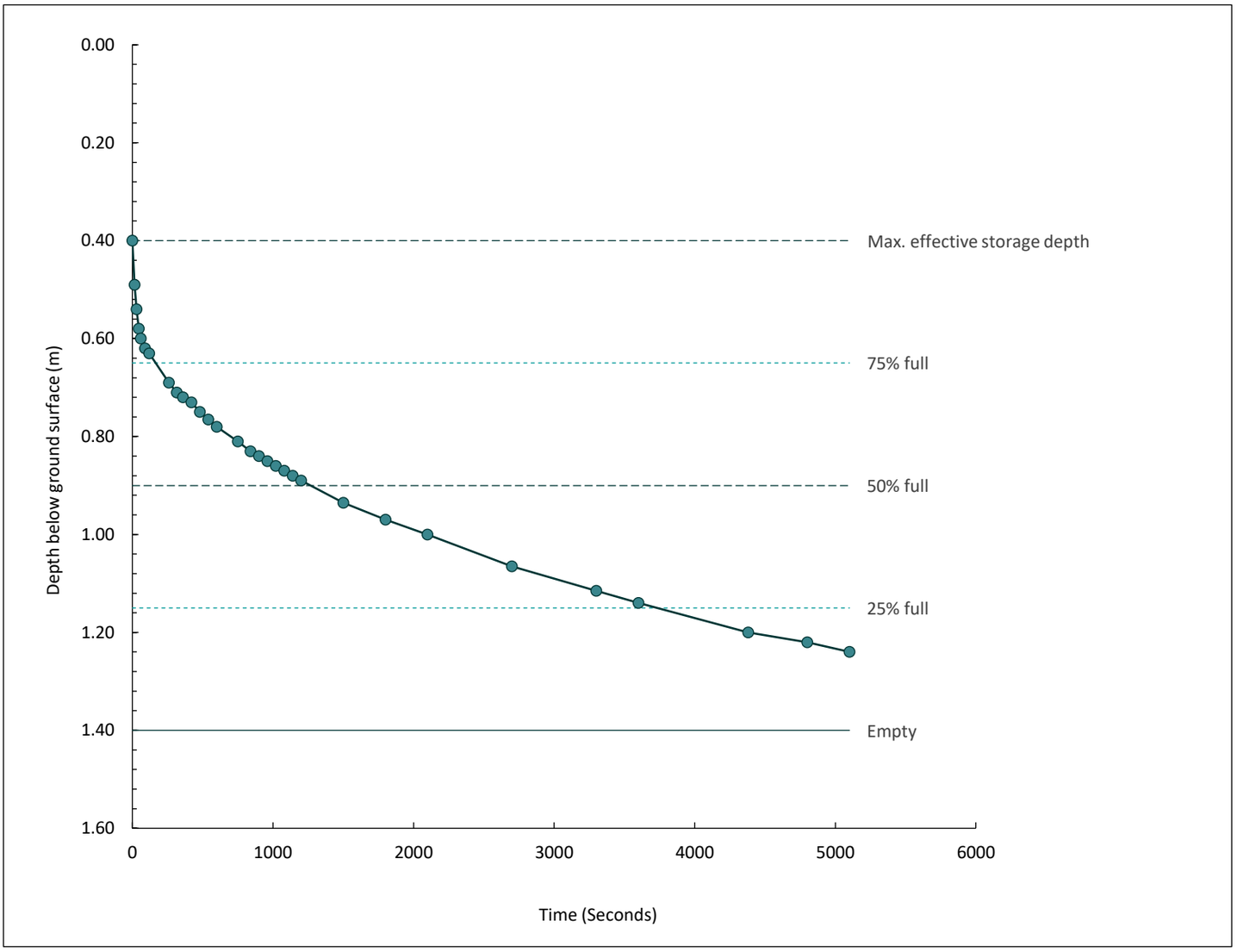
Water measuring device: Dip Meter
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Levellogger malfunction. Dip meter readings only.

Operator: C. Ogunniyi / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP210

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613534.50	N: 315112.32
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	17.39 maOD
	Infilling 1	Test Date:	23/06/2022



Soil Infiltration Rate: 1.36E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.30	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 01:25	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

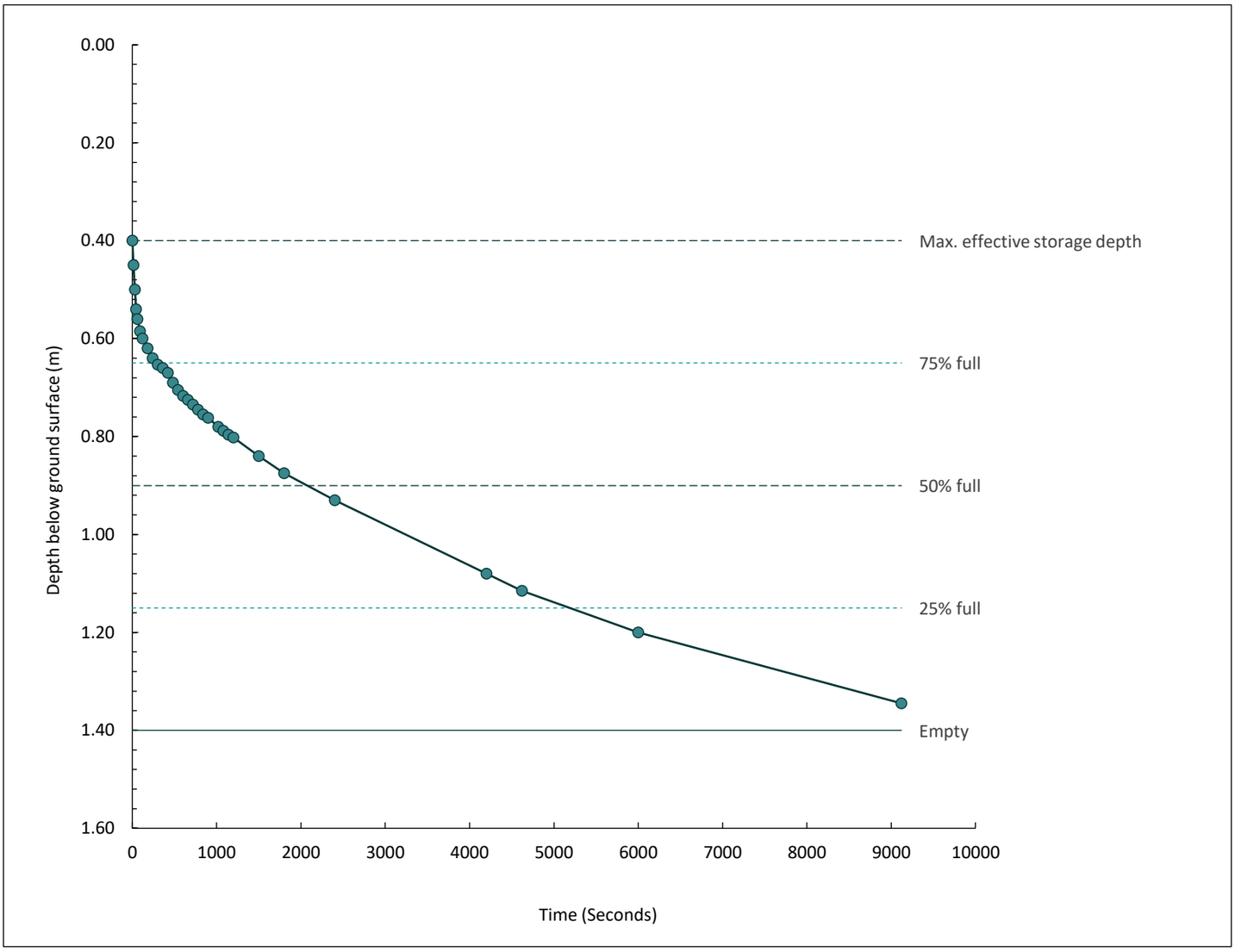
AGS

Water measuring device: Dip Meter
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP210
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613534.50 N: 315112.32
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 17.39 maOD
	Infilling 2	Test Date: 24/06/2022



Soil Infiltration Rate: 9.87E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.30	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 02:32	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

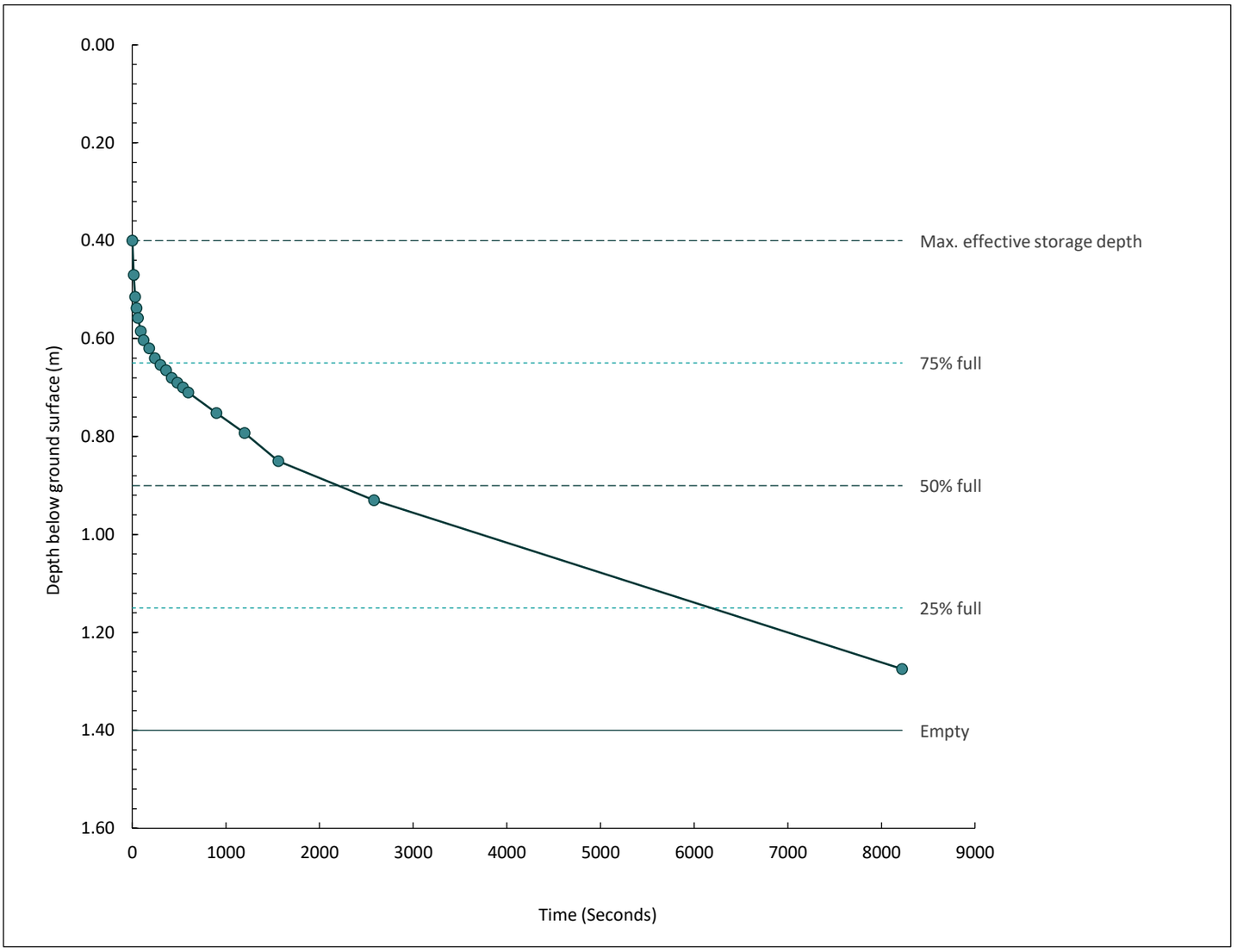
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP210

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613534.50	N: 315112.32
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	17.39maOD
	Infilling 3	Test Date:	24/06/2022



Soil Infiltration Rate: 8.21E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.30	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 02:17	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

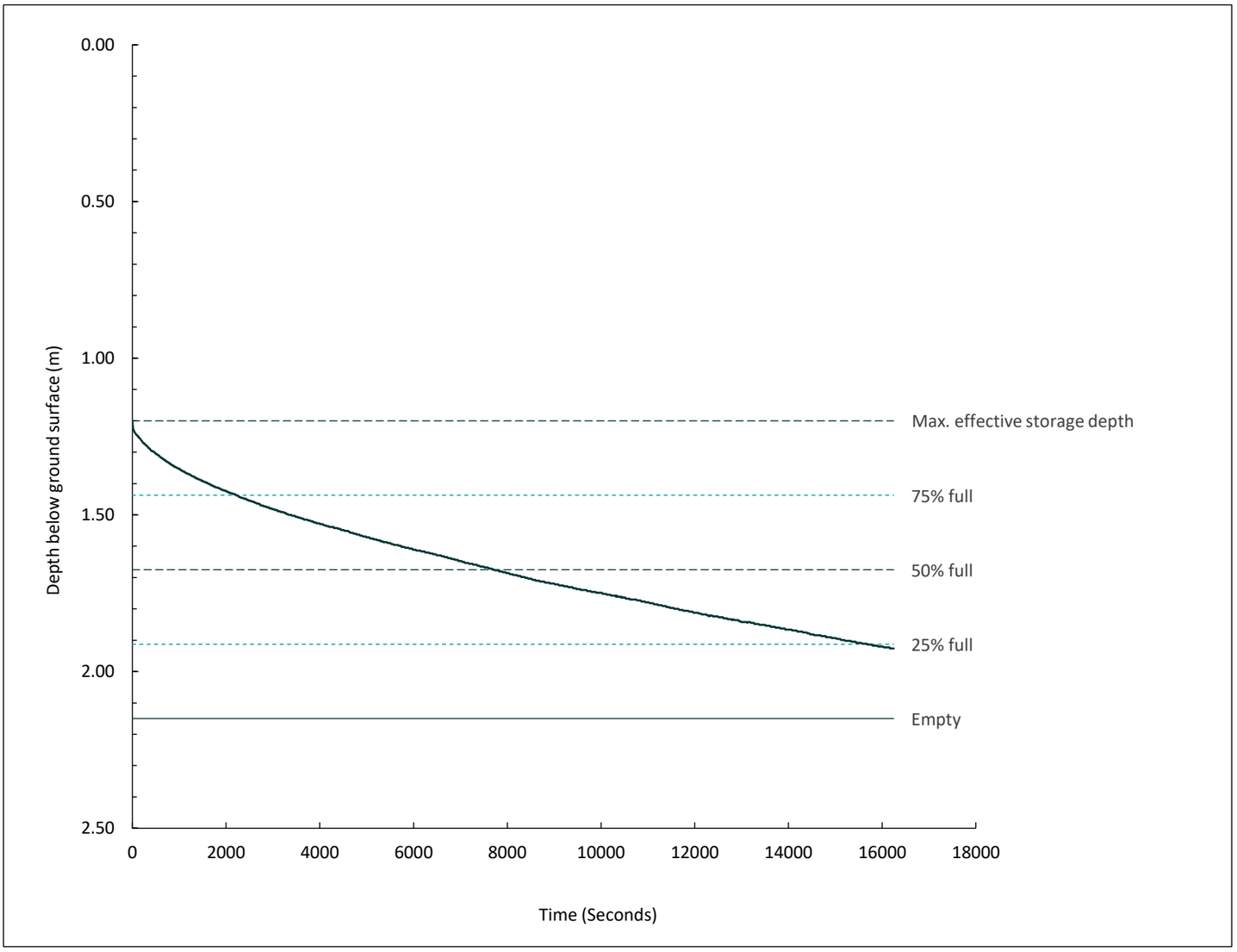
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP222

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612464.28	N: 315166.41
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.15 maOD
	Infilling 1	Test Date:	16/06/2022



Soil Infiltration Rate: 3.63E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.60	2.15	2.15

Fill Porosity: 30%	Test Duration (hh:mm): 04:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

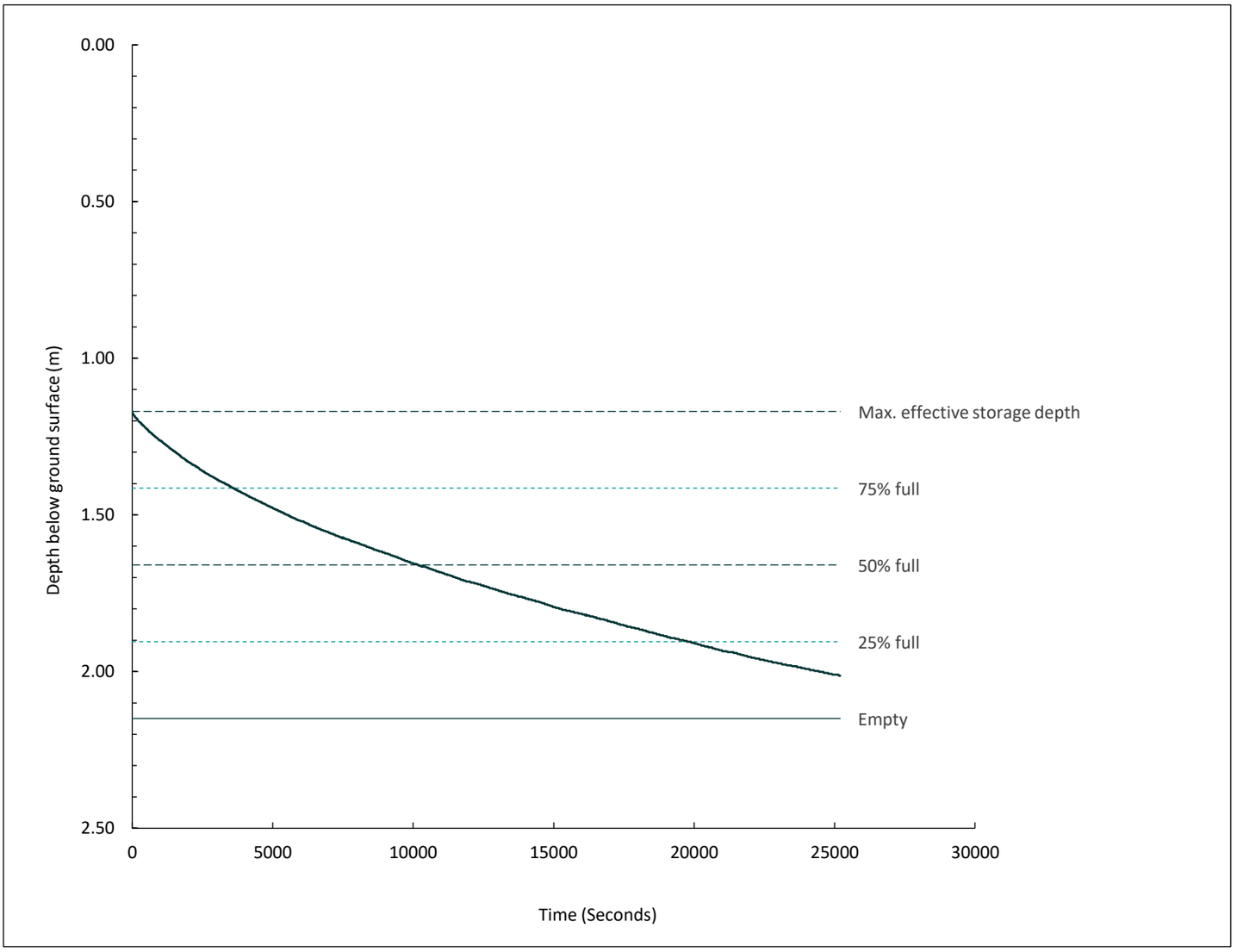
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP222

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612464.28	N: 315166.41
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.15 maOD
	Infilling 2	Test Date:	16/06/2022



Soil Infiltration Rate: 3.05E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.60	2.15	2.15

Fill Porosity: 30%	Test Duration (hh:mm): 07:00	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

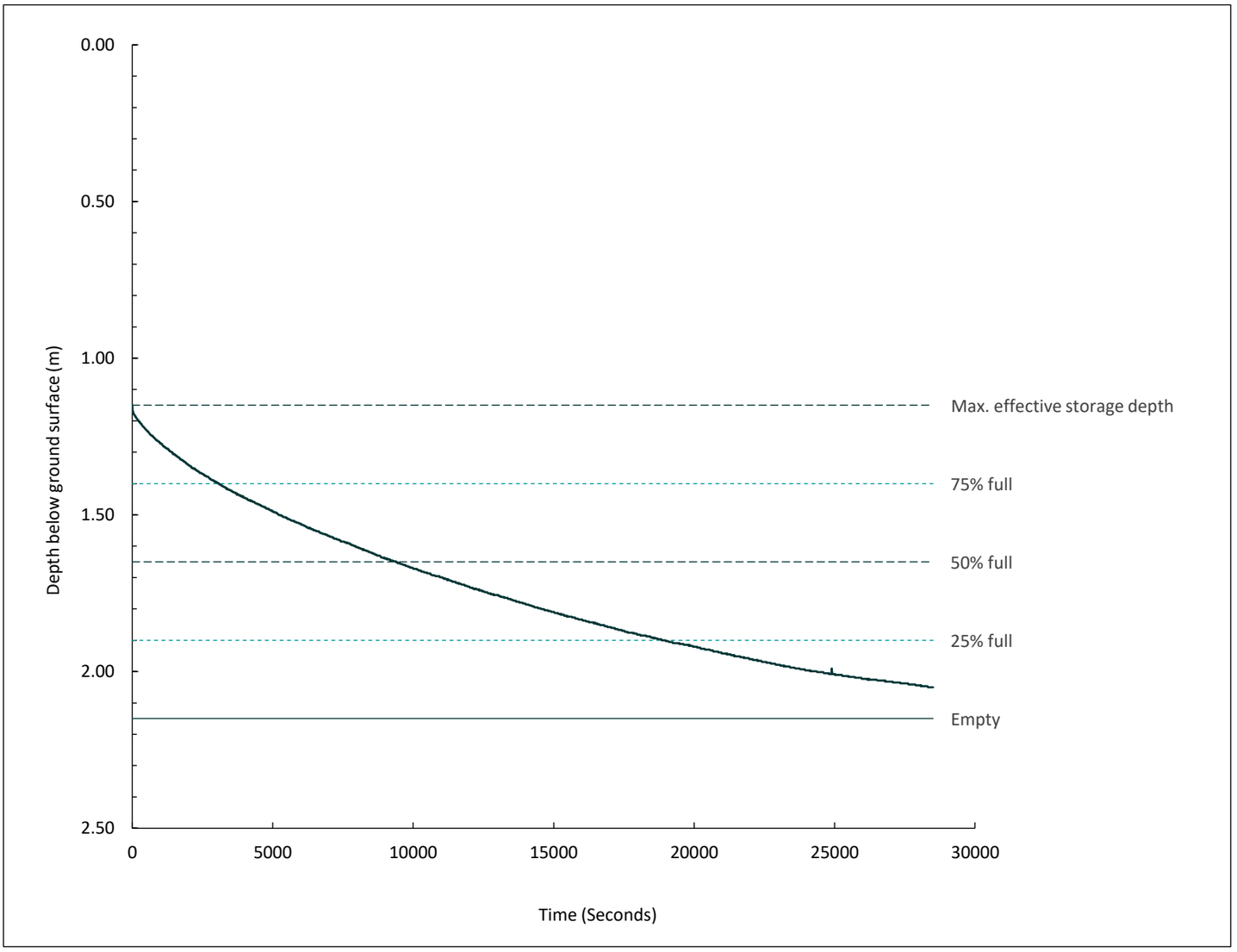
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP222

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612464.28	N: 315166.41
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.15maOD
	Infilling 3	Test Date:	17/06/2022



Soil Infiltration Rate: 3.15E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.80	0.60	2.15	2.15

Fill Porosity: 30%	Test Duration (hh:mm): 07:55	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

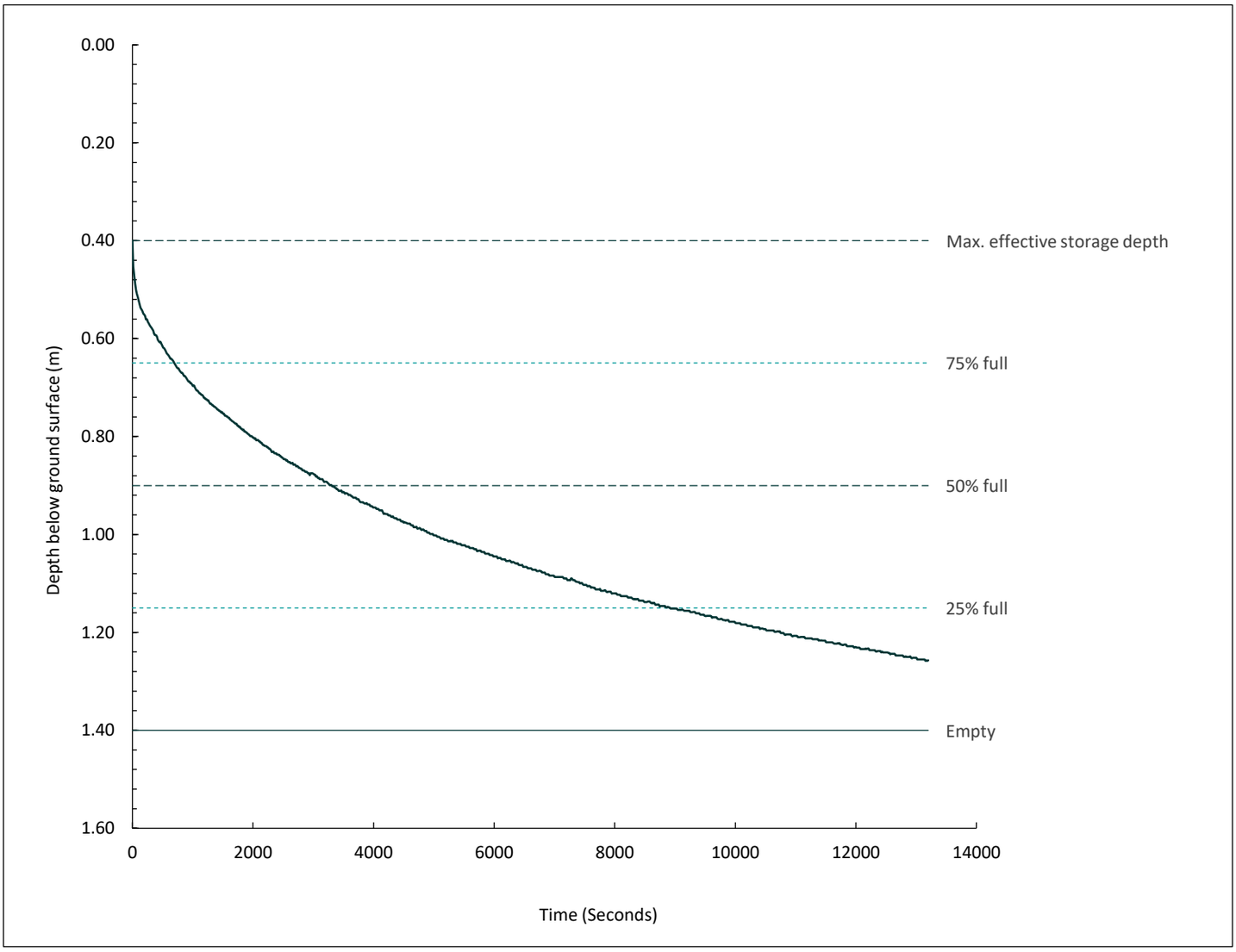
AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP223
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613559.25 N: 315071.79
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 18.56 maOD
	Infilling 1	Test Date: 23/06/2022



Soil Infiltration Rate: 5.99E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.65	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 03:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

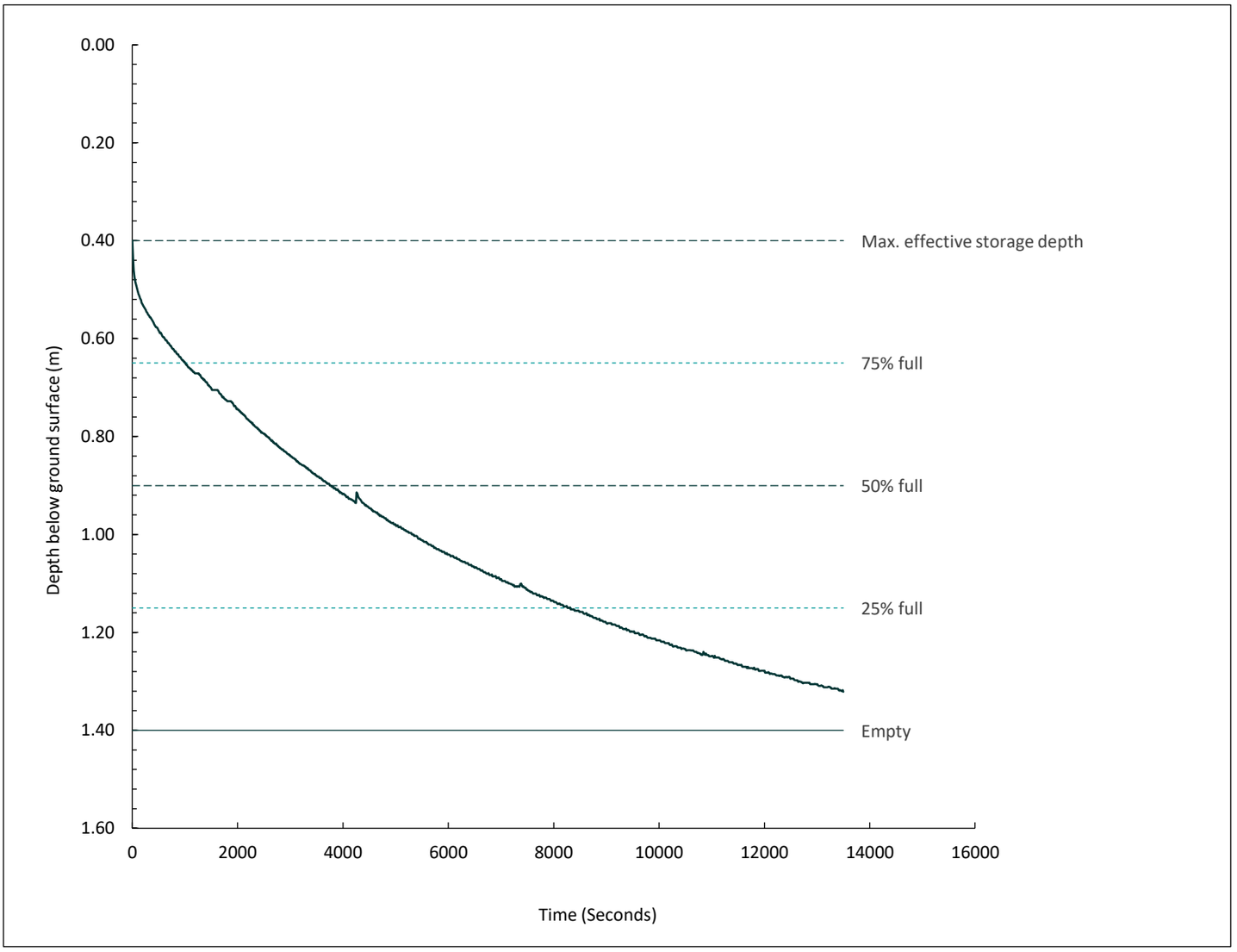
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP223

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613559.25	N: 315071.79
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.56 maOD
	Infilling 2	Test Date:	24/06/2022



Soil Infiltration Rate: 6.79E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.65	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 03:45	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

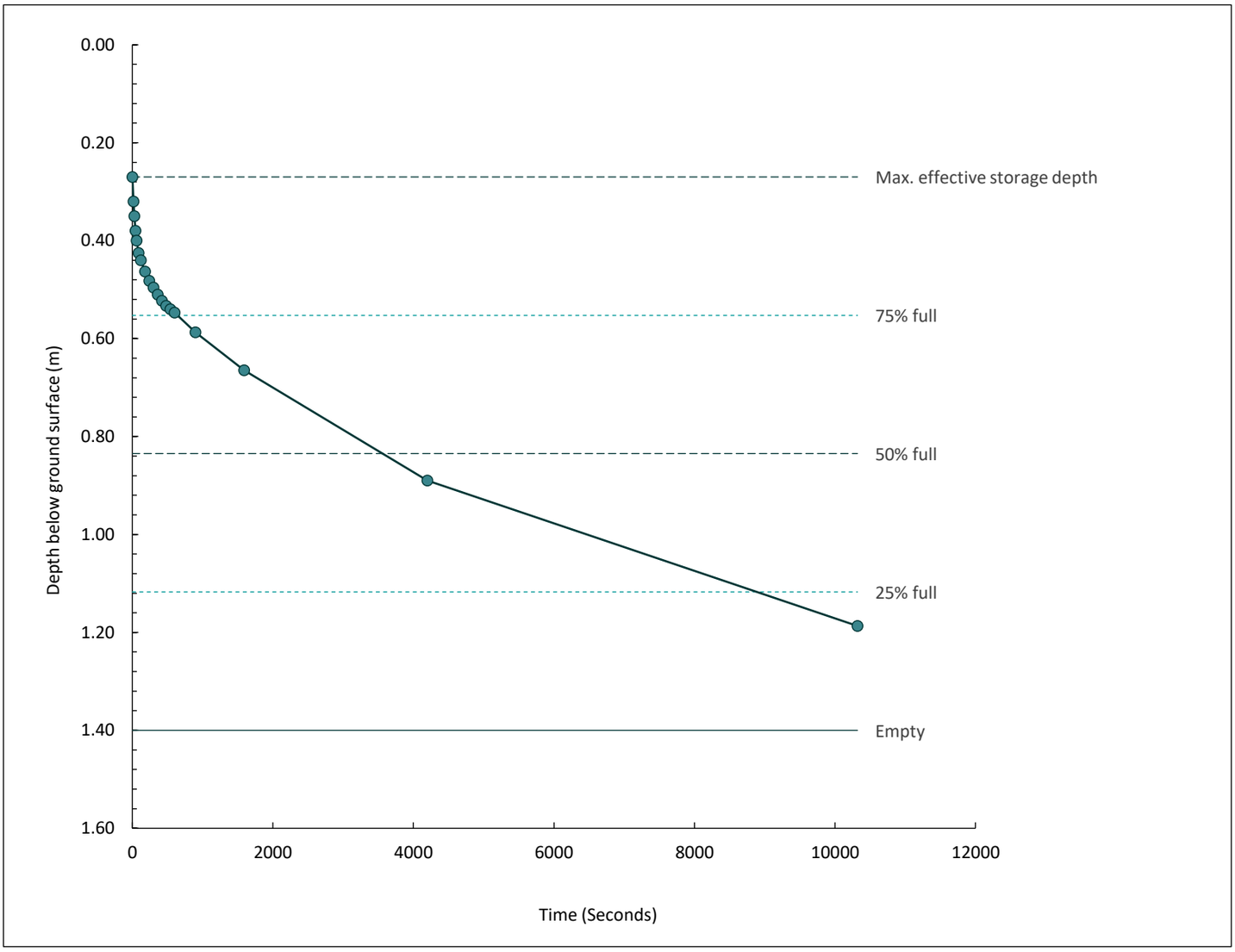
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP223

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613559.25	N: 315071.79
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.56maOD
	Infilling 3	Test Date:	24/06/2022



Soil Infiltration Rate: 6.21E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.65	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 02:52	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

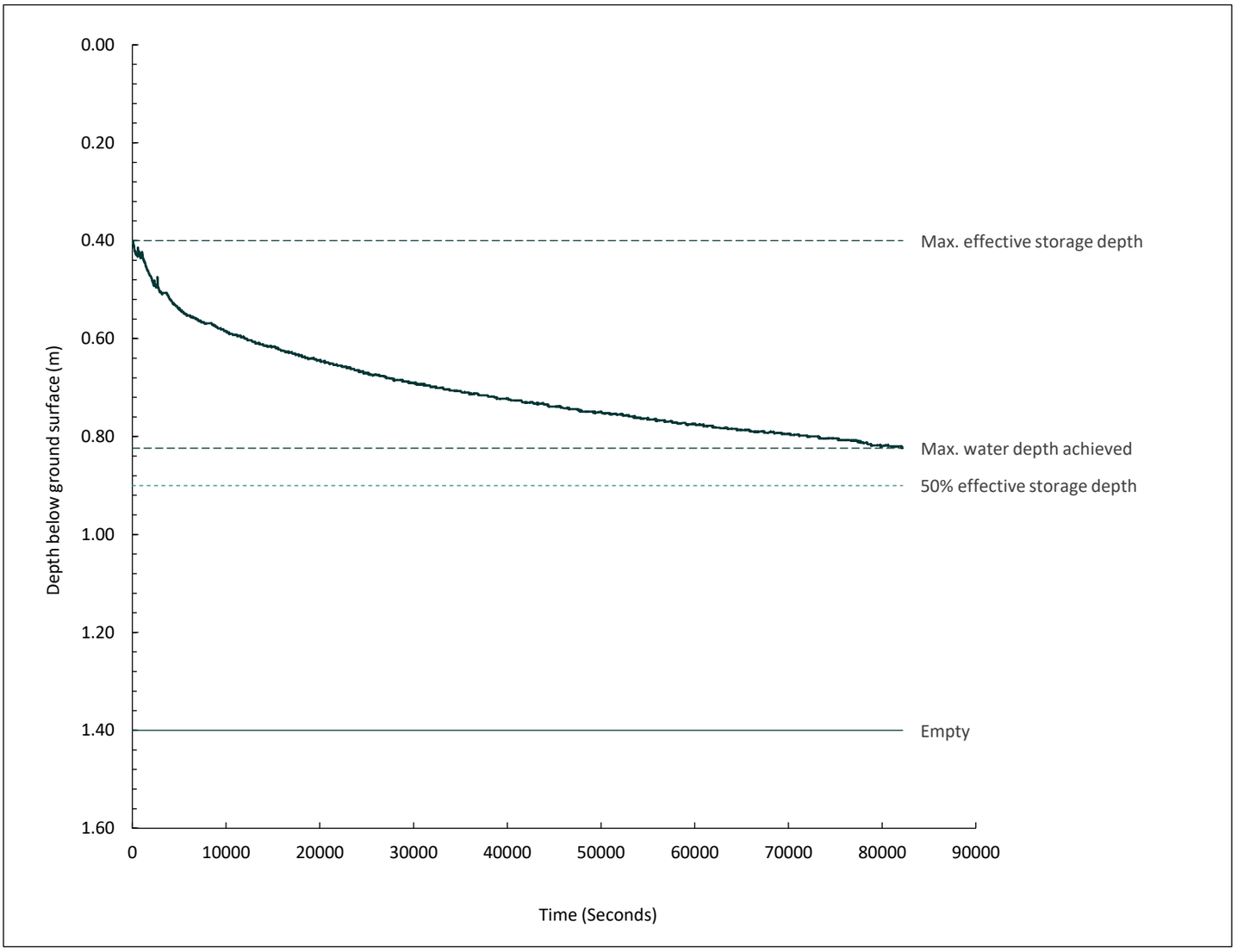
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Levellogger malfunction. Dip meter readings only.

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP224

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613599.66	N: 315066.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.69 maOD
	Infilling 1	Test Date:	23/06/2022



Soil Infiltration Rate: N/A

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 22:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

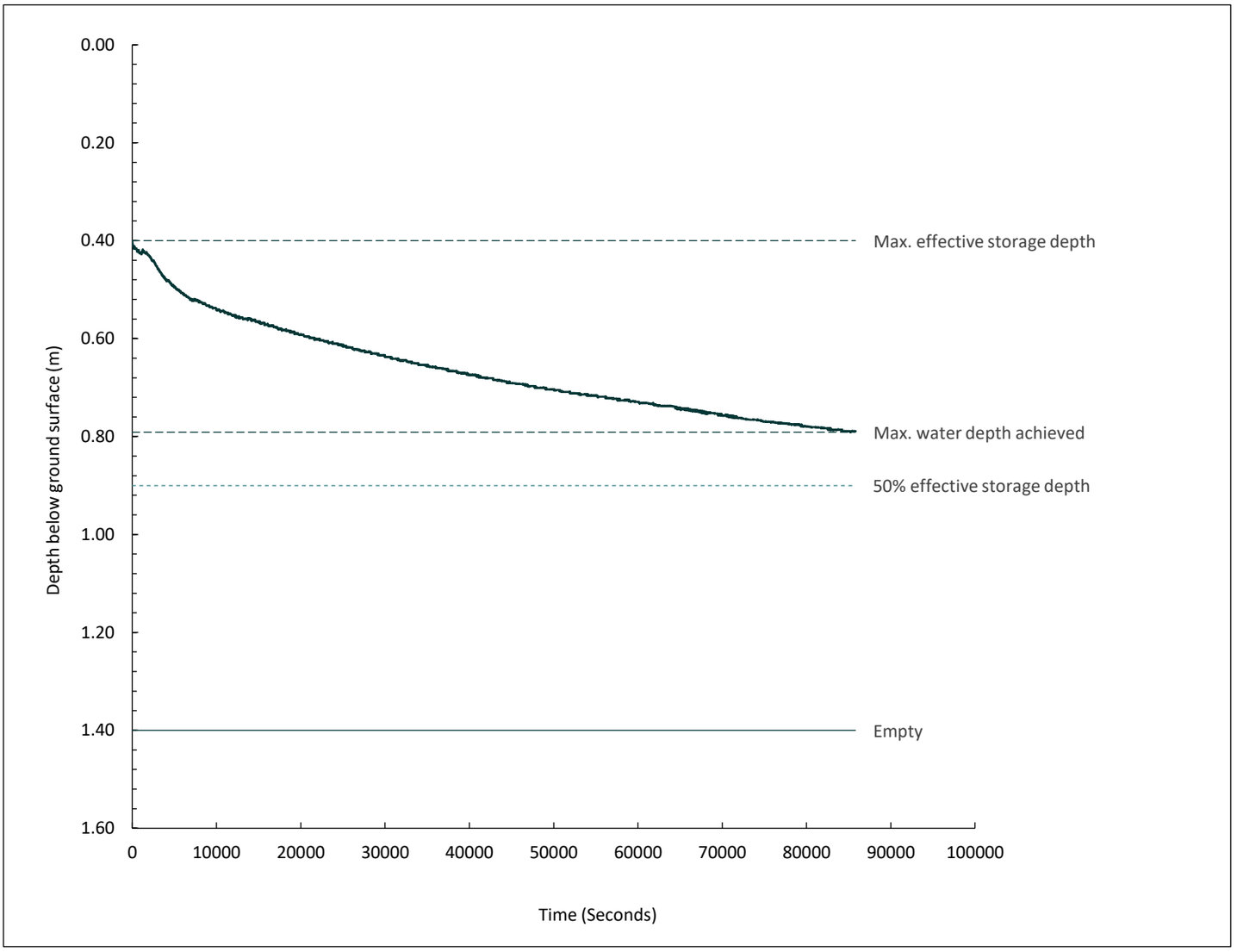
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Water level did not reach 50% effective storage depth within test period. Rate not calculated.

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP224

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613599.66	N: 315066.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.69 maOD
	Infilling 2	Test Date:	24/06/2022



Soil Infiltration Rate: N/A

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 23:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

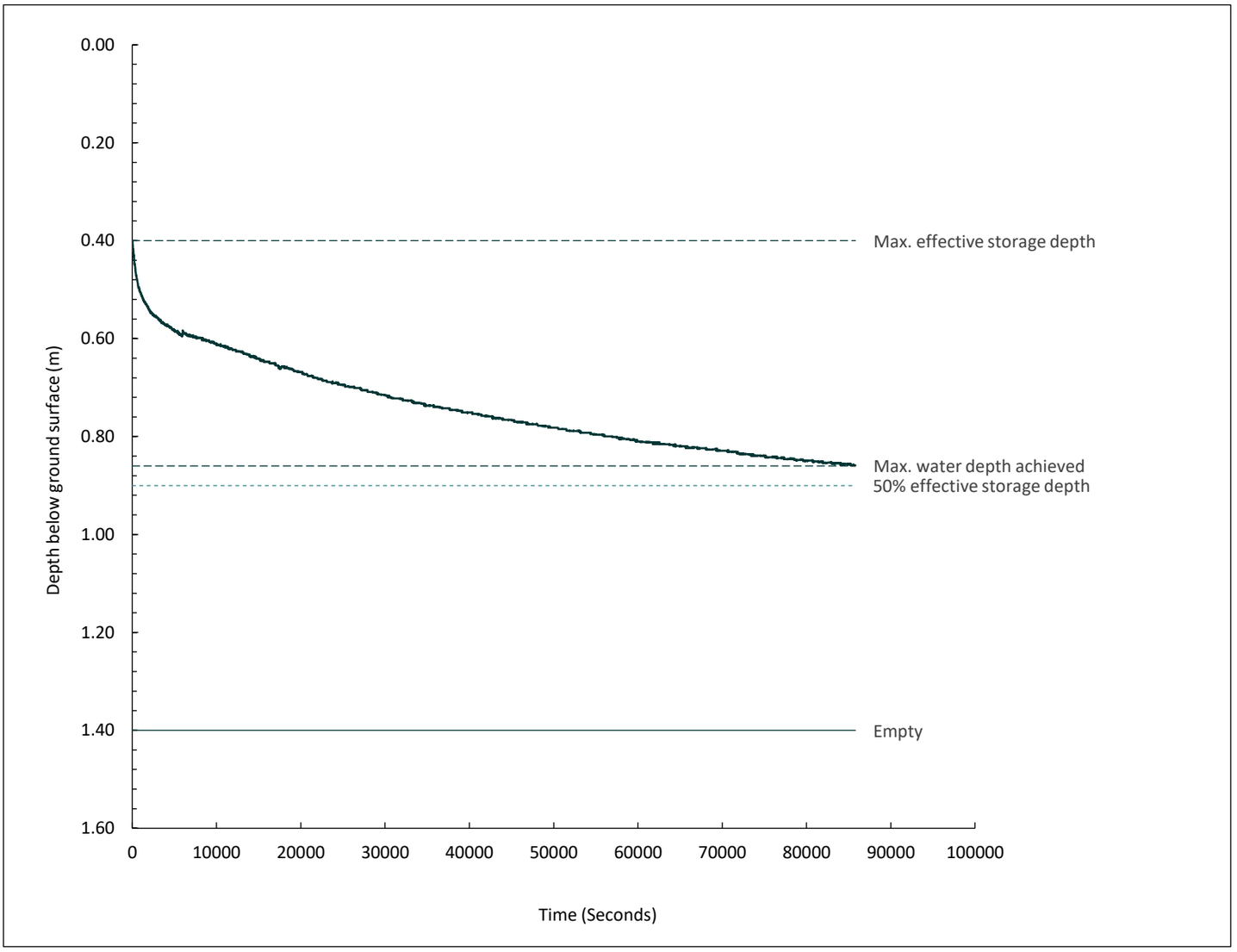
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Water level did not reach 50% effective storage depth within test period. Rate not calculated.

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP224

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613599.66	N: 315066.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.69maOD
	Infilling 3	Test Date:	27/06/2022



Soil Infiltration Rate: N/A

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.40	1.40

Fill Porosity: 30%	Test Duration (hh:mm): 23:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

Water measuring device: Level Logger

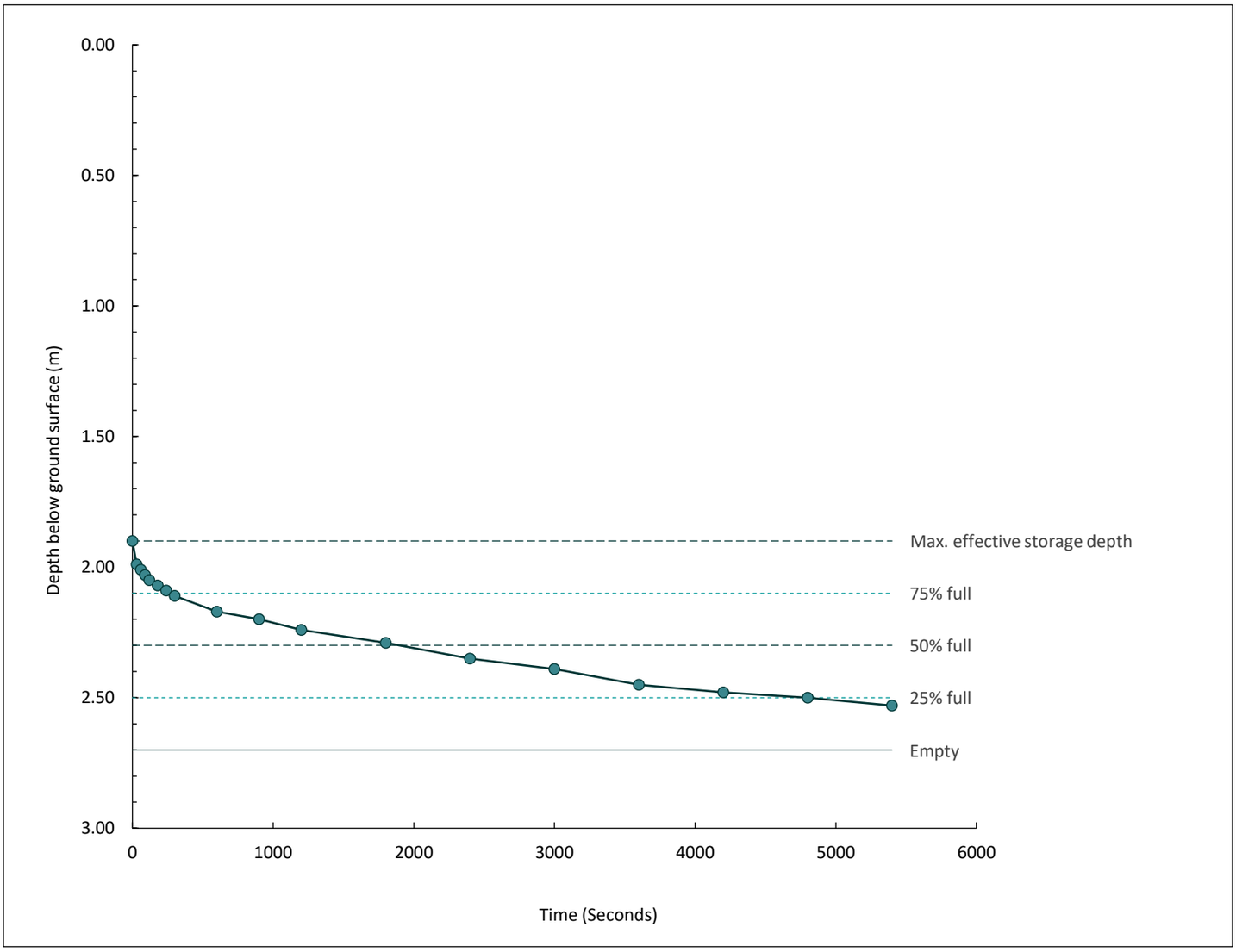
Weather conditions: Cloudy and dry

Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Water level did not reach 50% effective storage depth within test period. Rate not calculated.

Operator: L. Jeffery / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP224B
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613599.66 N: 315066.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 18.69 maOD
	Infilling 1	Test Date: 25/07/2022



Soil Infiltration Rate: 9.24E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.50	2.70	2.70

Fill Porosity: 30%	Test Duration (hh:mm): 01:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

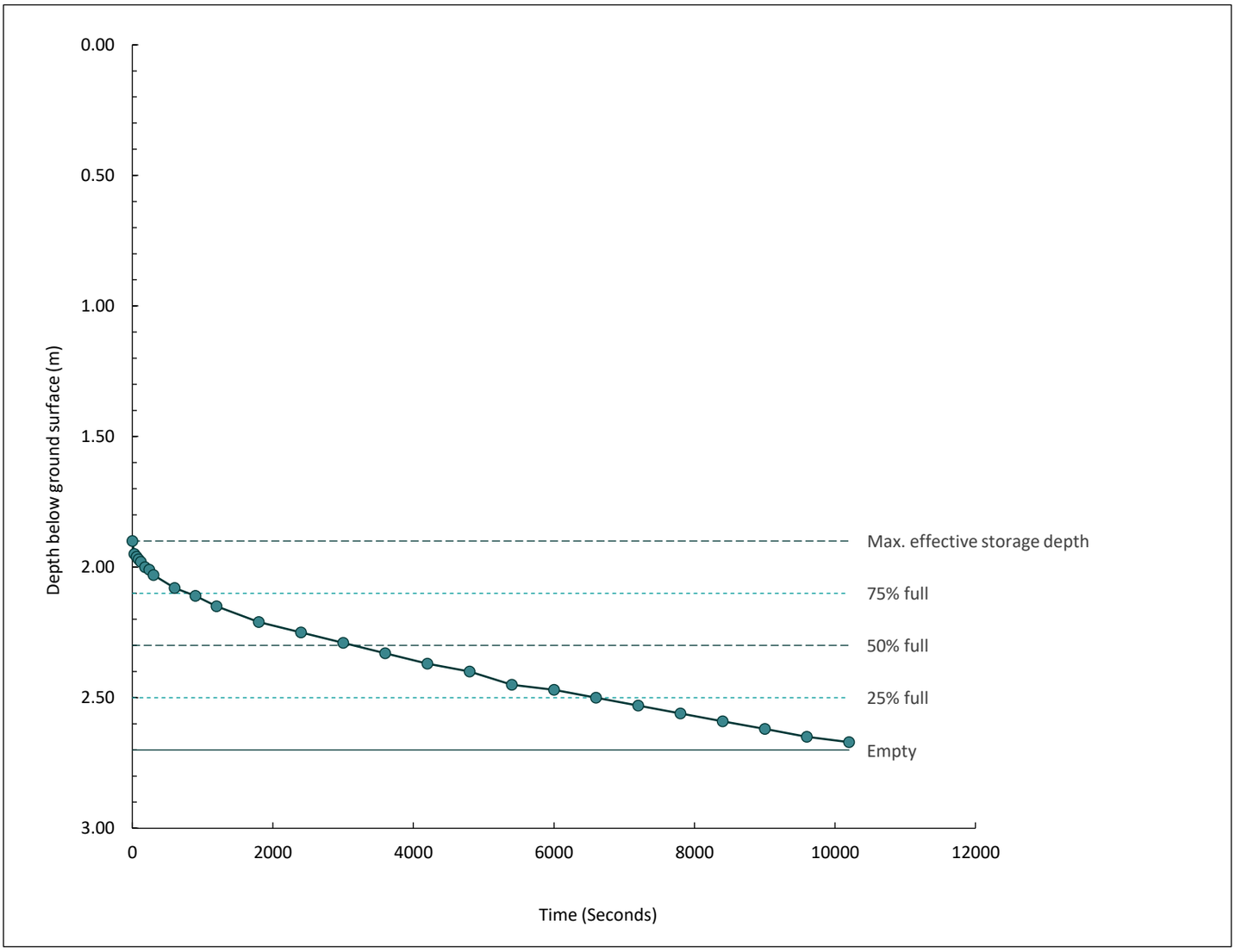
Water measuring device: Dip Meter
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: T. Leather-Younghusband / G.	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP224B

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613599.66	N: 315066.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.69 maOD
	Infilling 2	Test Date:	25/07/2022



Soil Infiltration Rate: 7.22E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.50	2.70	2.70

Fill Porosity: 30%	Test Duration (hh:mm): 02:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

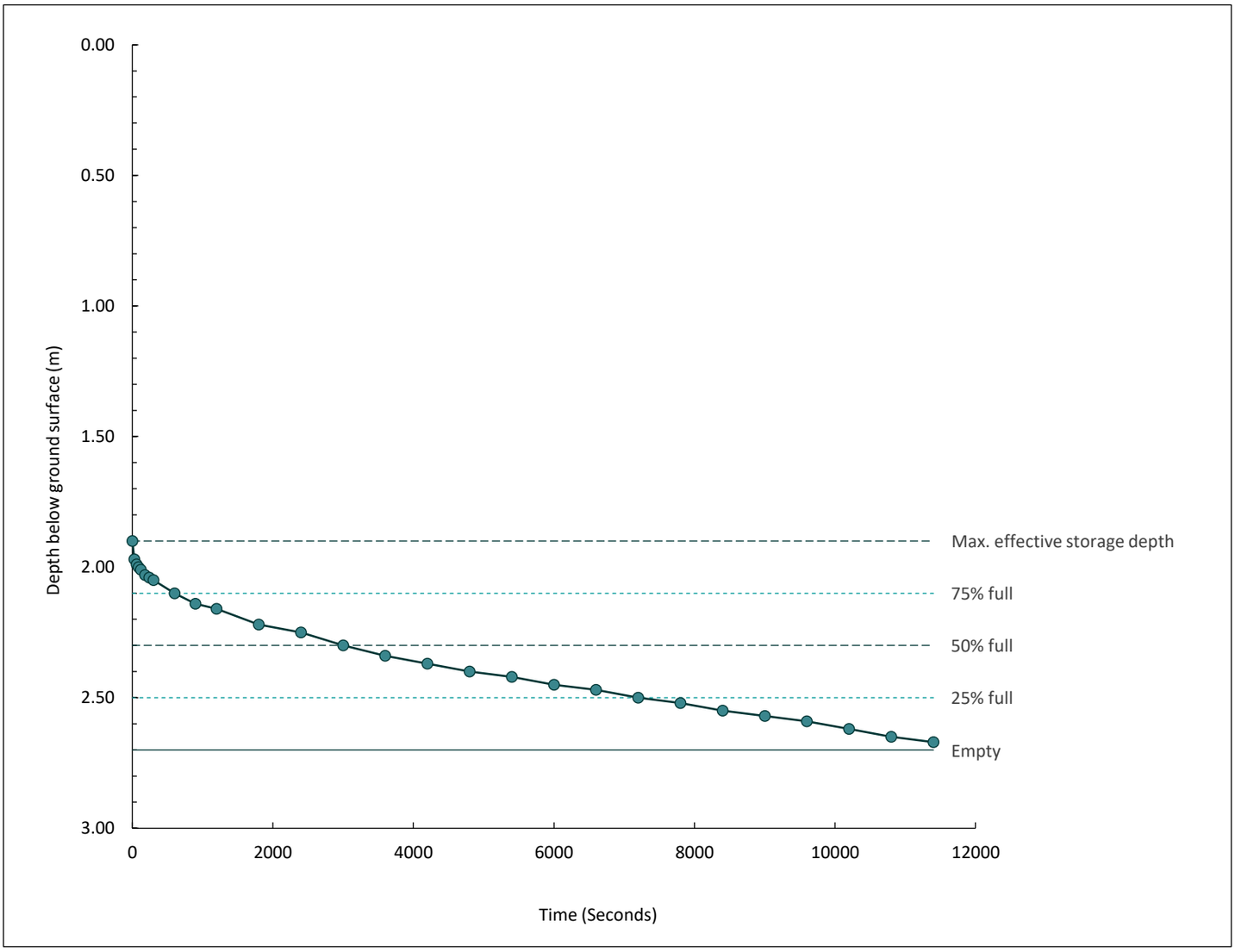
Water measuring device: Dip Meter
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: T. Leather-Younghusband / G.	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP224B

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613599.66	N: 315066.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	18.69maOD
	Infilling 3	Test Date:	26/07/2022



Soil Infiltration Rate: 6.34E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.50	2.70	2.70

Fill Porosity: 30%	Test Duration (hh:mm): 03:10	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

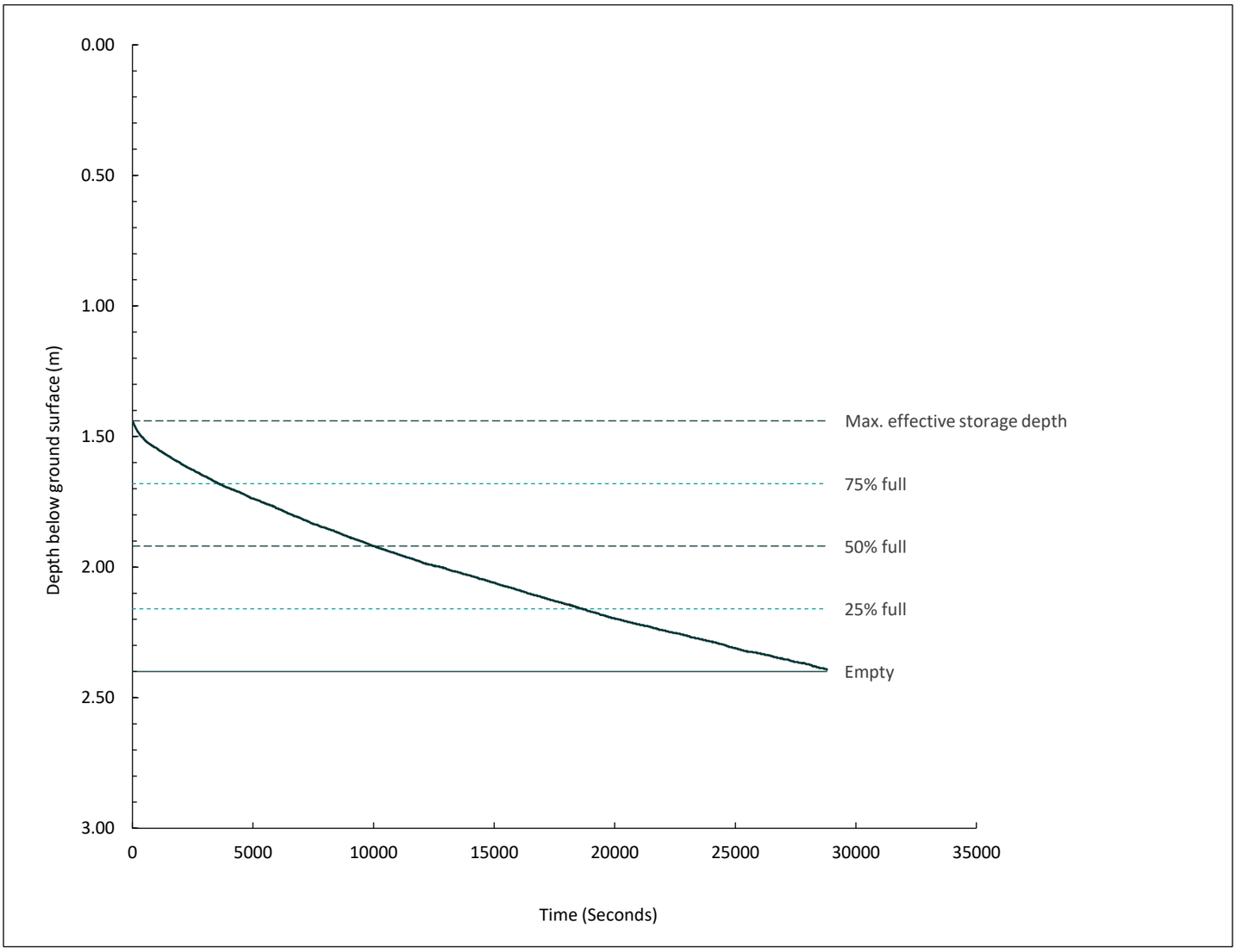
AGS

Water measuring device: Dip Meter
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: T. Leather-Younghusband / G.	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP225
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612759.05 N: 315048.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 23.41 maOD
	Infilling 1	Test Date: 16/06/2022



Soil Infiltration Rate: 3.35E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.90	0.60	2.40	2.40

Fill Porosity: 30%	Test Duration (hh:mm): 08:00	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

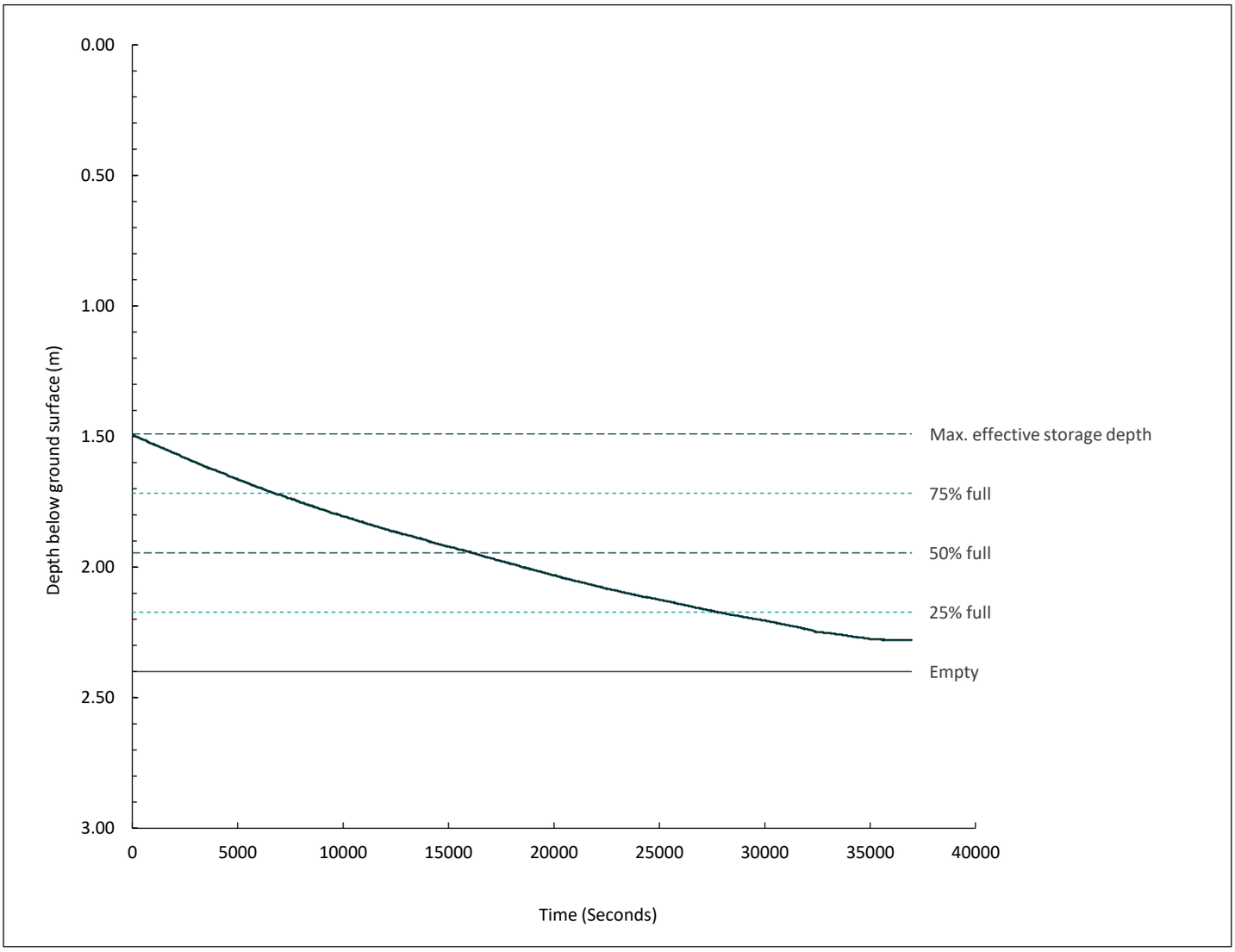
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP225

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612759.05	N: 315048.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	23.41 maOD
	Infilling 2	Test Date:	17/06/2022



Soil Infiltration Rate: 2.36E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.90	0.60	2.40	2.40

Fill Porosity: 30%	Test Duration (hh:mm): 10:16	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

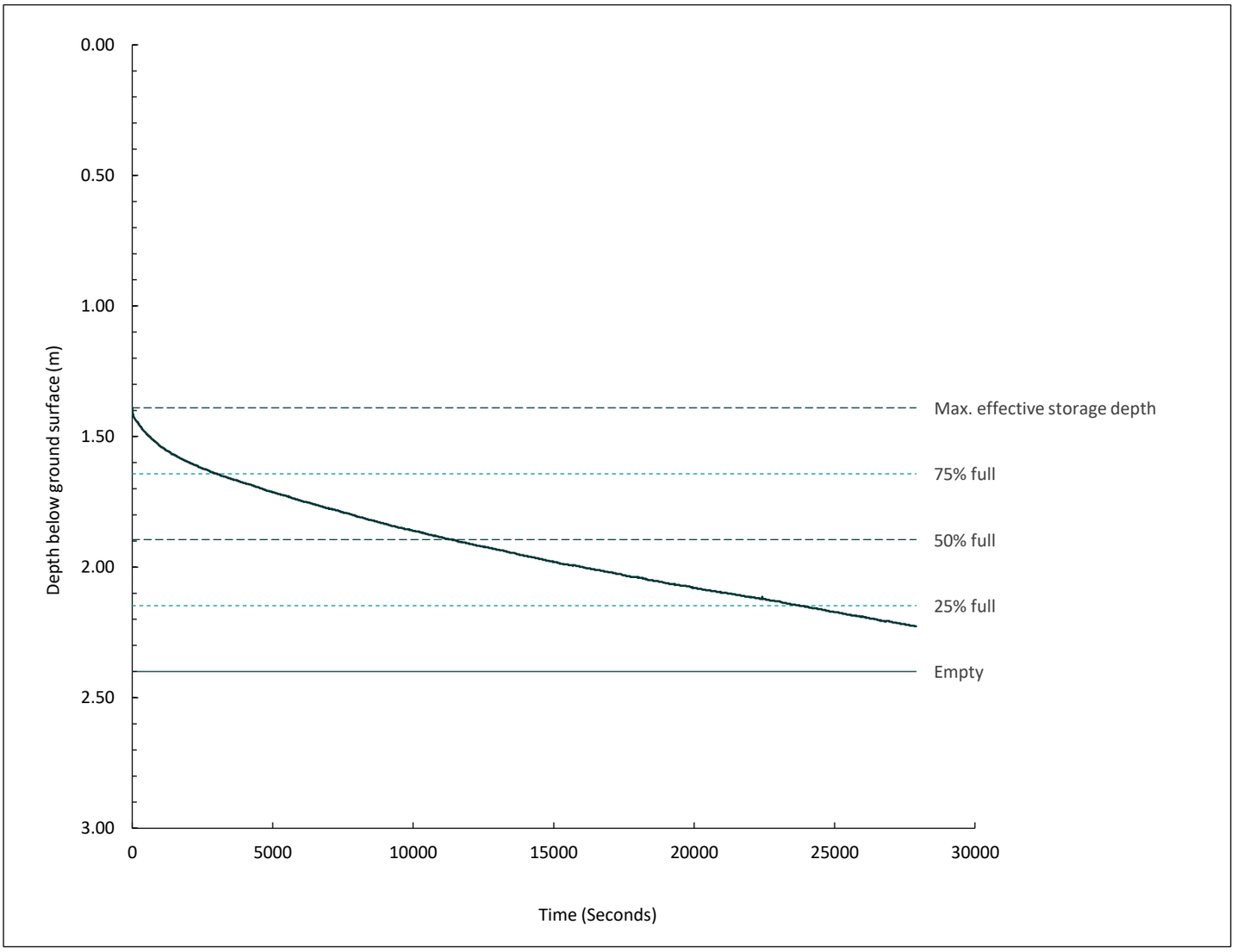
AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	**Soakaway Test**	Location ID - Test Number **TP225**
Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612759.05 N: 315048.63
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 23.41maOD
	Infilling 3	Test Date: 20/06/2022



Soil Infiltration Rate: 2.48E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.90	0.60	2.40	2.40

Fill Porosity: 30%	Test Duration (hh:mm): 07:45	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

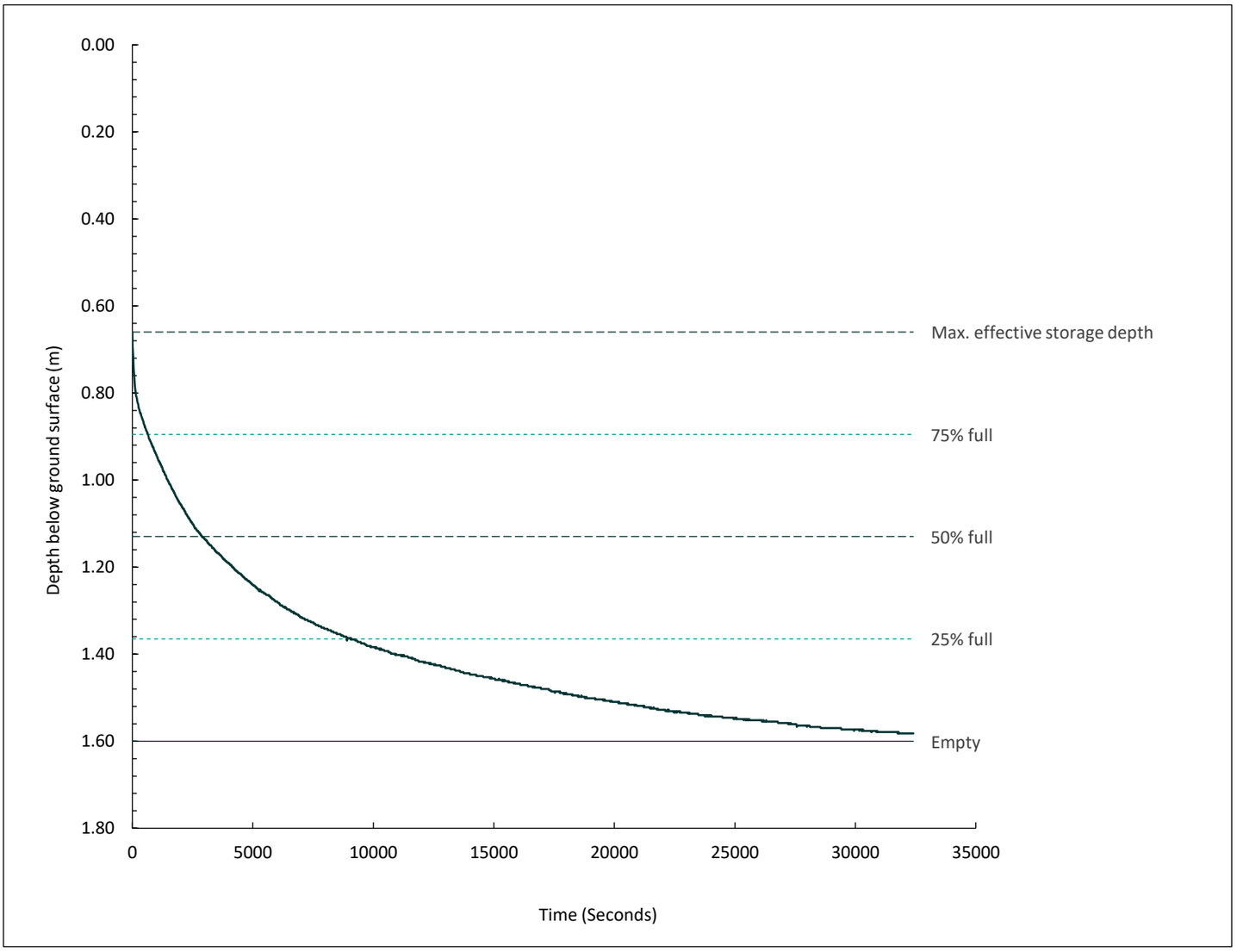
AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP226
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612716.95 N: 315048.65
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 22.10 maOD
	Infilling 1	Test Date: 17/06/2022



Soil Infiltration Rate: 6.01E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.40	0.60	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 09:00	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

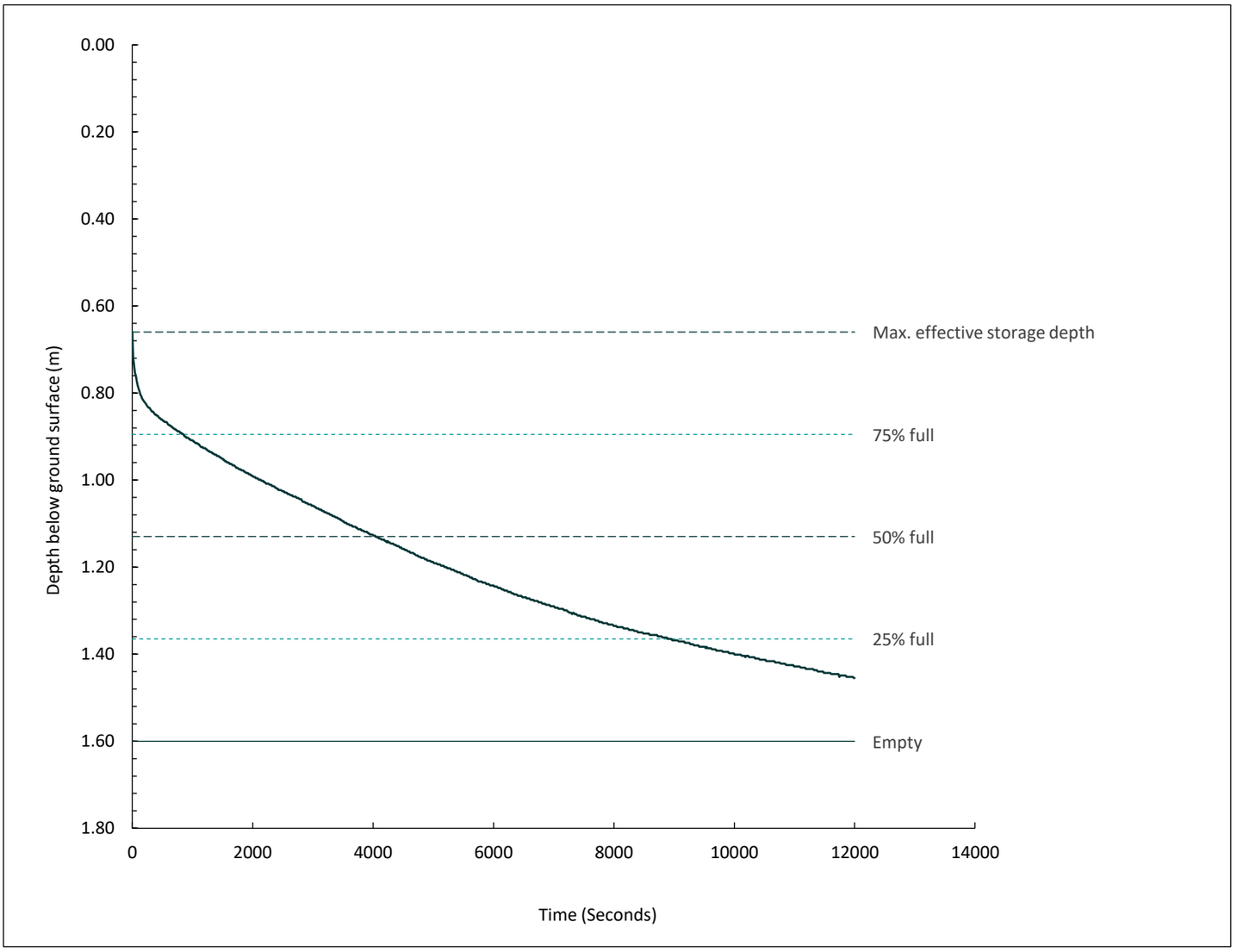
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP226

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612716.95	N: 315048.65
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.10 maOD
	Infilling 2	Test Date:	20/06/2022



Soil Infiltration Rate: 6.16E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.40	0.60	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 03:20	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

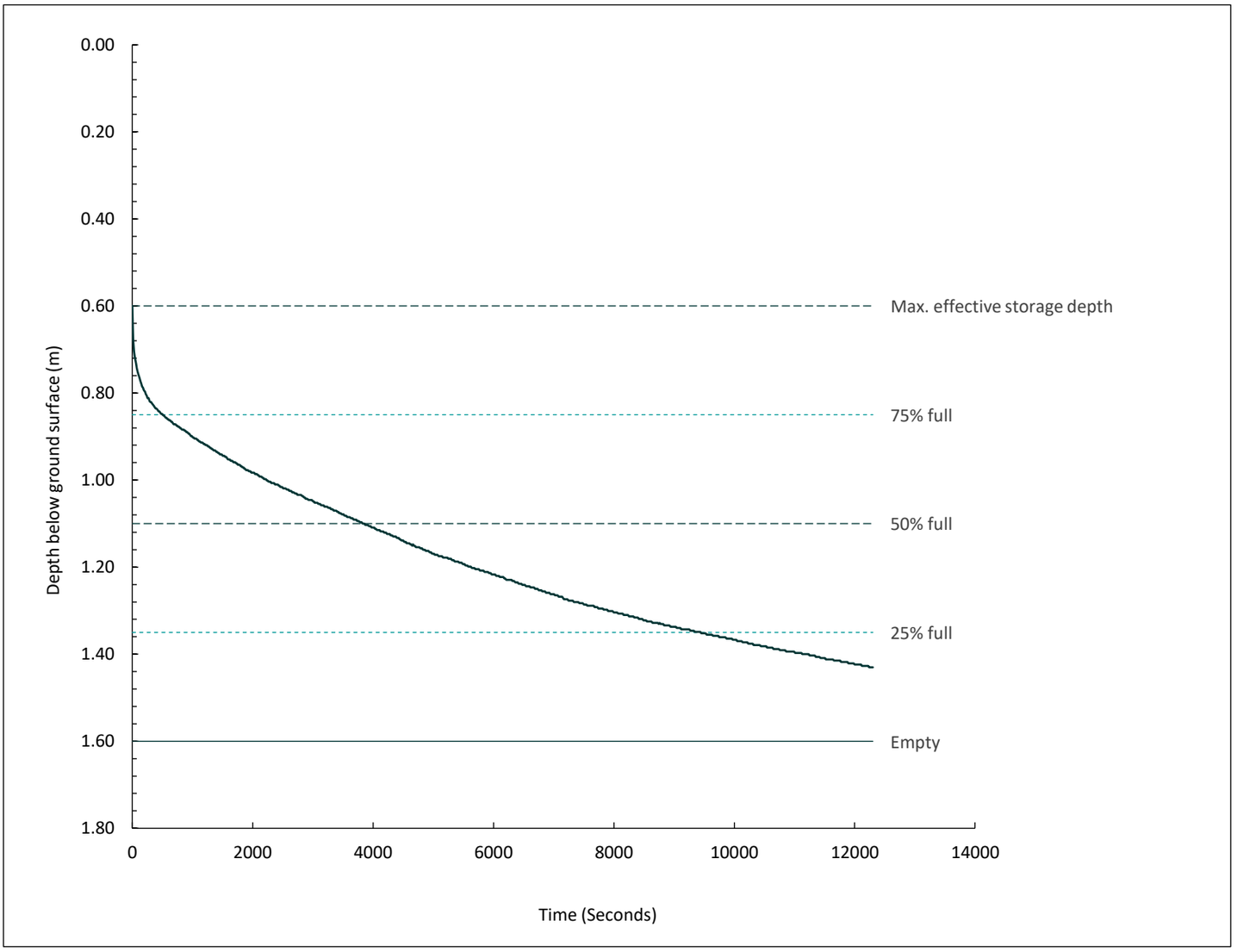
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP226

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612716.95	N: 315048.65
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.10maOD
	Infilling 3	Test Date:	20/06/2022



Soil Infiltration Rate: 5.67E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.40	0.60	1.60	1.60

Fill Porosity: 30%	Test Duration (hh:mm): 03:25	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

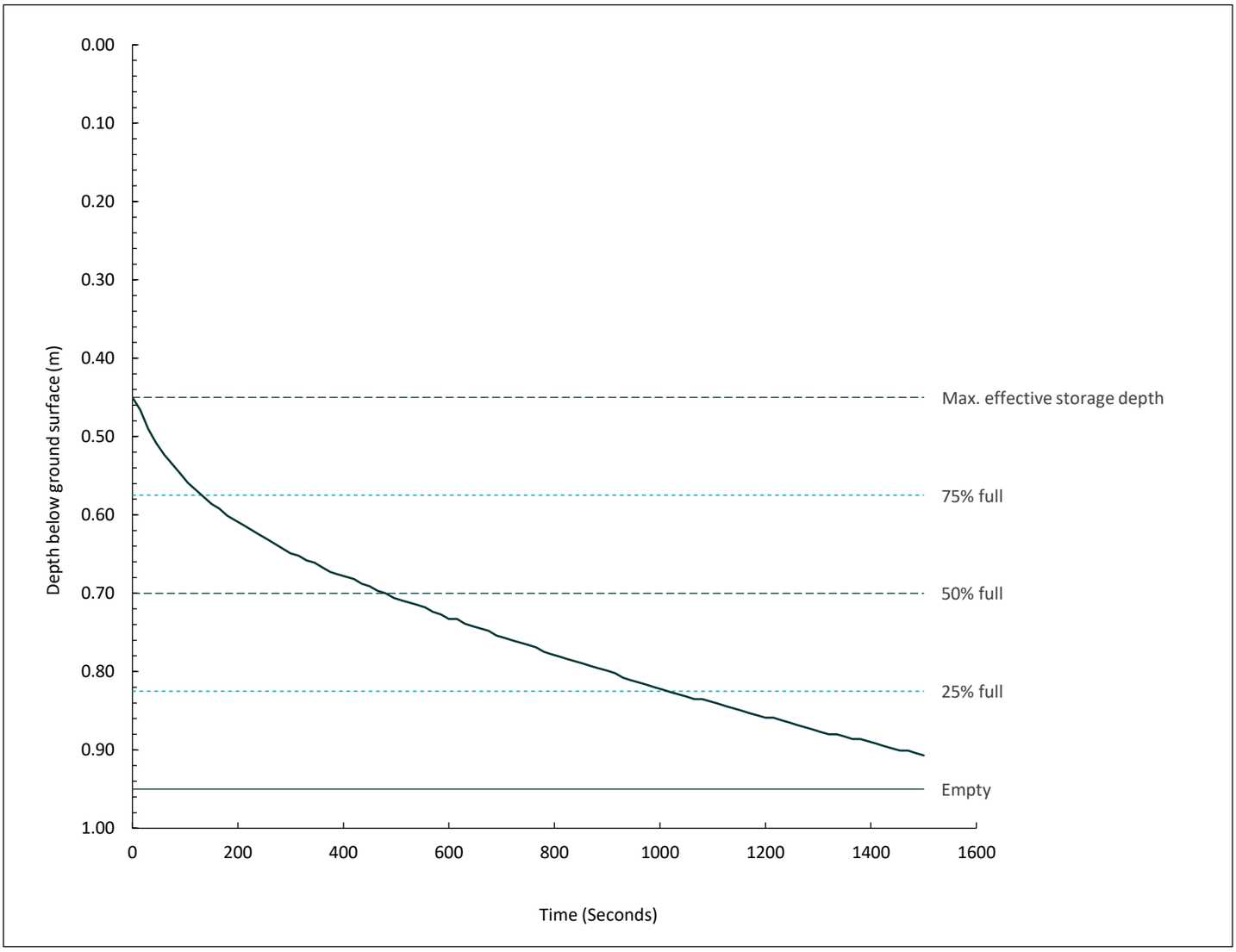
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP227

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612688.78	N: 315051.77
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.24 maOD
	Infilling 1	Test Date:	17/06/2022



Soil Infiltration Rate: 4.25E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	0.95	0.95

Fill Porosity: 30%	Test Duration (hh:mm): 00:25	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

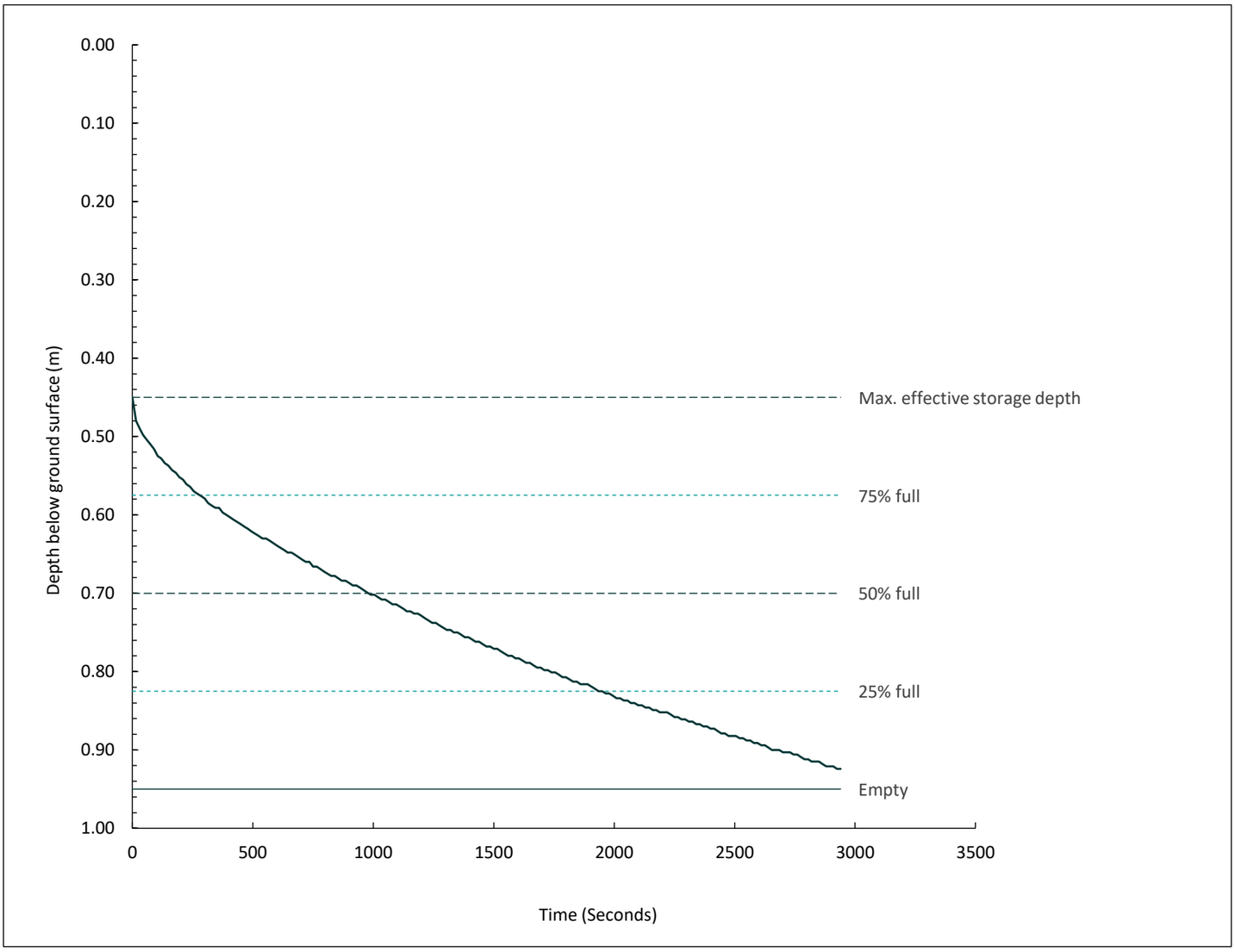
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP227

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612688.78	N: 315051.77
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.24 maOD
	Infilling 2	Test Date:	17/06/2022



Soil Infiltration Rate: 2.27E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	0.95	0.95

Fill Porosity: 30%	Test Duration (hh:mm): 00:49	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

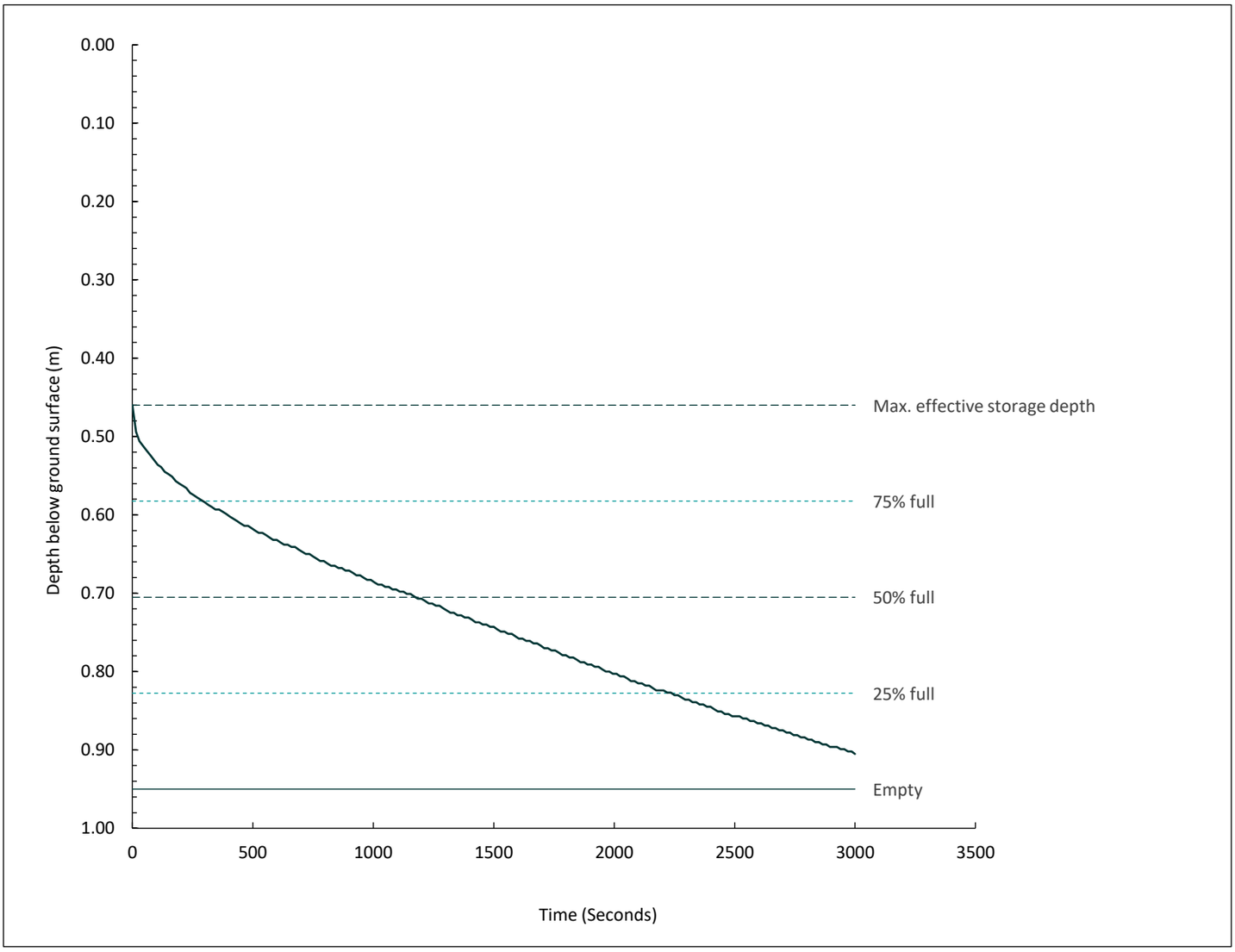
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP227

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612688.78	N: 315051.77
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.24maOD
	Infilling 3	Test Date:	20/06/2022



Soil Infiltration Rate: 1.91E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	0.95	0.95

Fill Porosity: 30%	Test Duration (hh:mm): 00:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

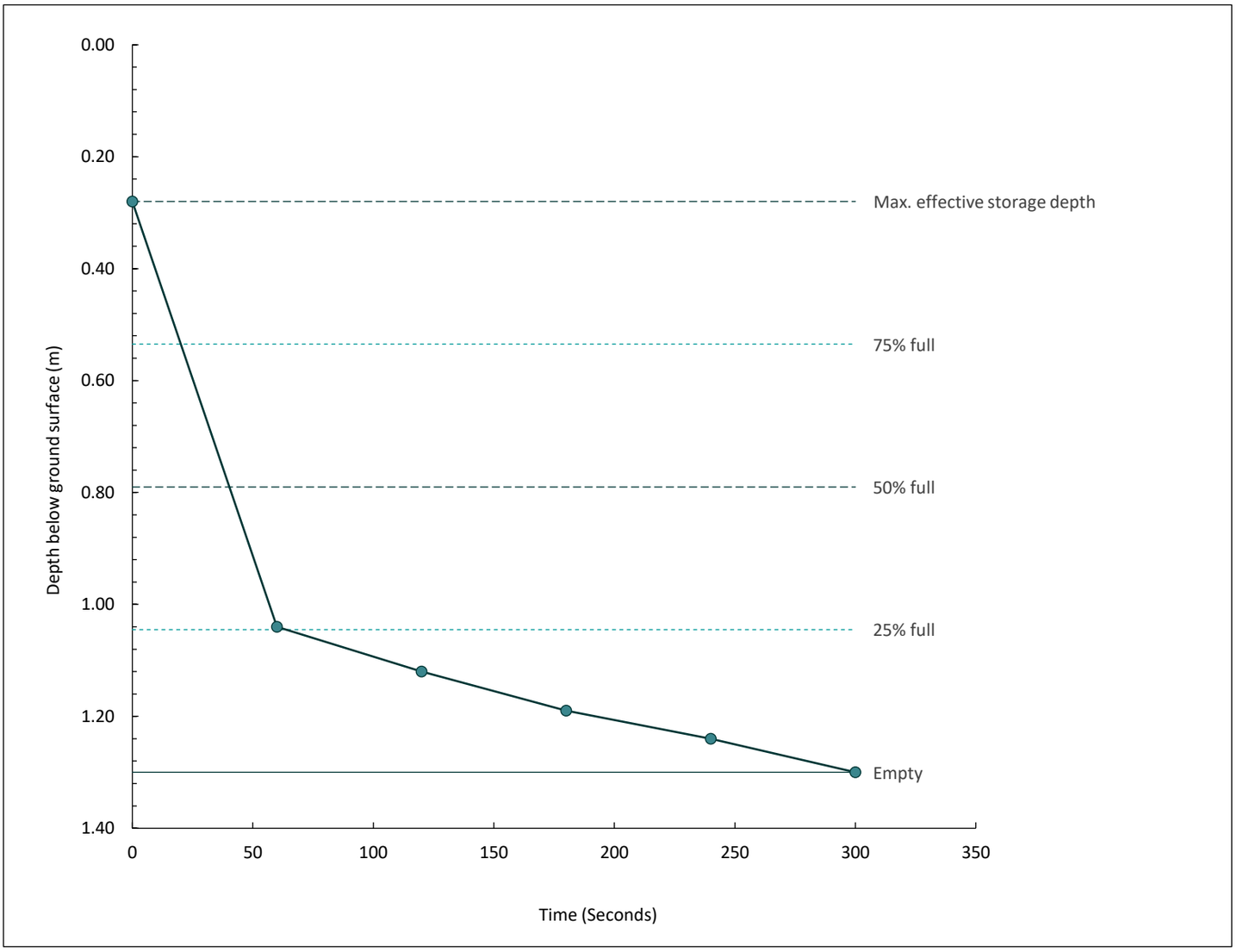
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP228

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612661.50	N: 315082.35
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.33 maOD
	Infilling 1	Test Date:	17/06/2022



Soil Infiltration Rate: 1.15E-3 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.30	1.30

Fill Porosity: 30%	Test Duration (hh:mm): 00:05	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

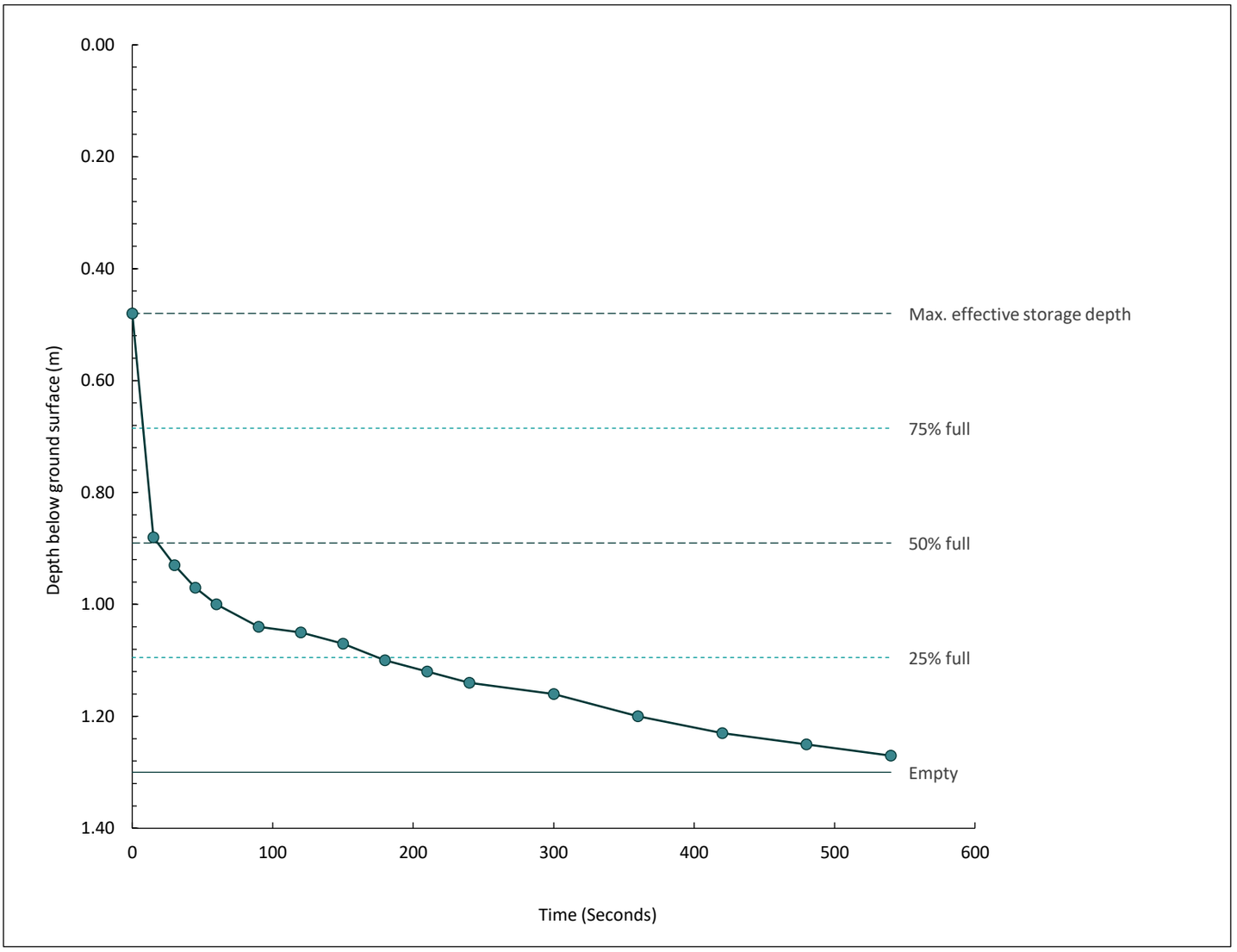
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP228

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612661.50	N: 315082.35
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.33 maOD
	Infilling 2	Test Date:	20/06/2022



Soil Infiltration Rate: 2.78E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.30	1.30

Fill Porosity: 30%	Test Duration (hh:mm): 00:09	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

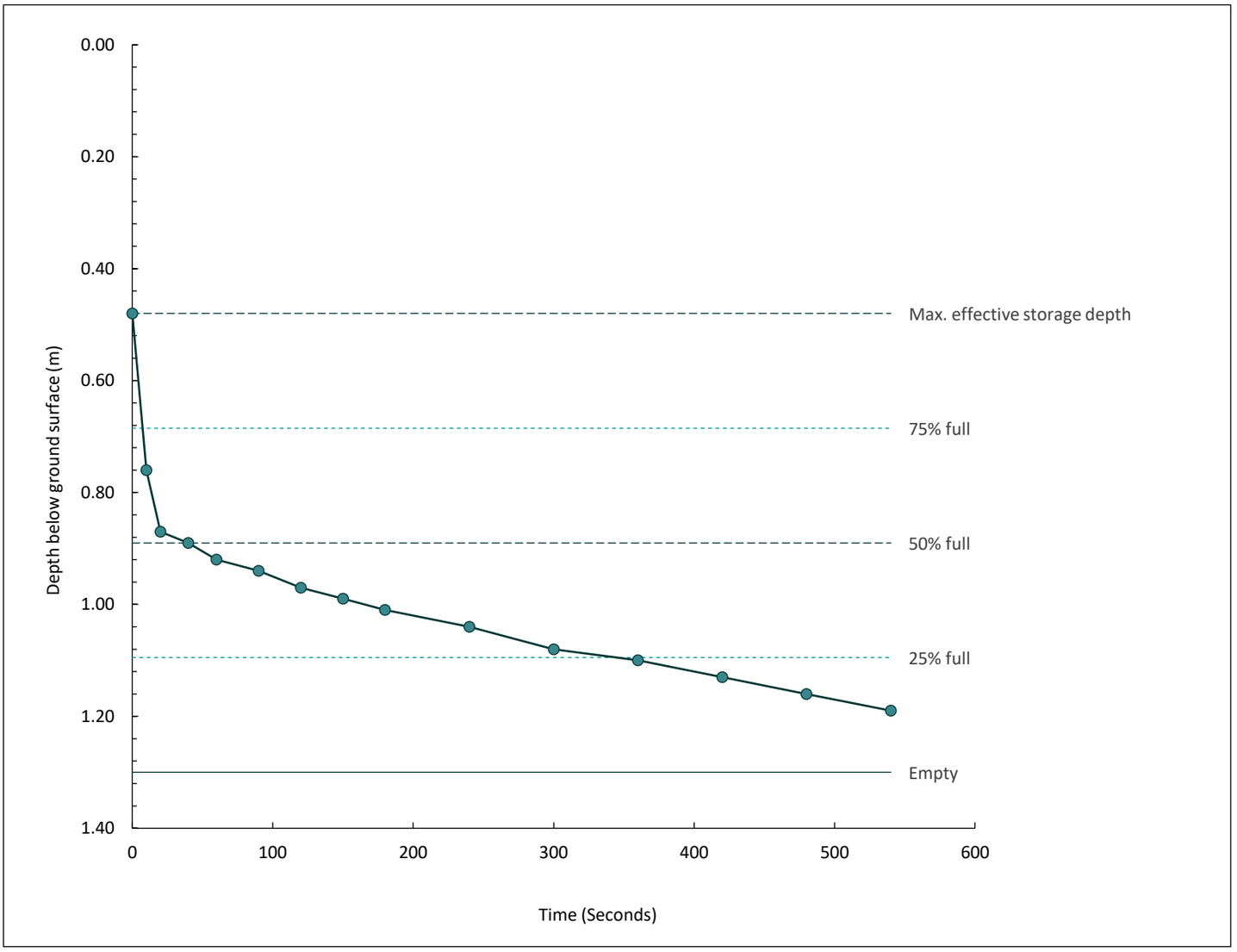
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP228

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 612661.50	N: 315082.35
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.33maOD
	Infilling 3	Test Date:	20/06/2022



Soil Infiltration Rate: 1.38E-4 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.30	1.30

Fill Porosity: 30%	Test Duration (hh:mm): 00:09	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

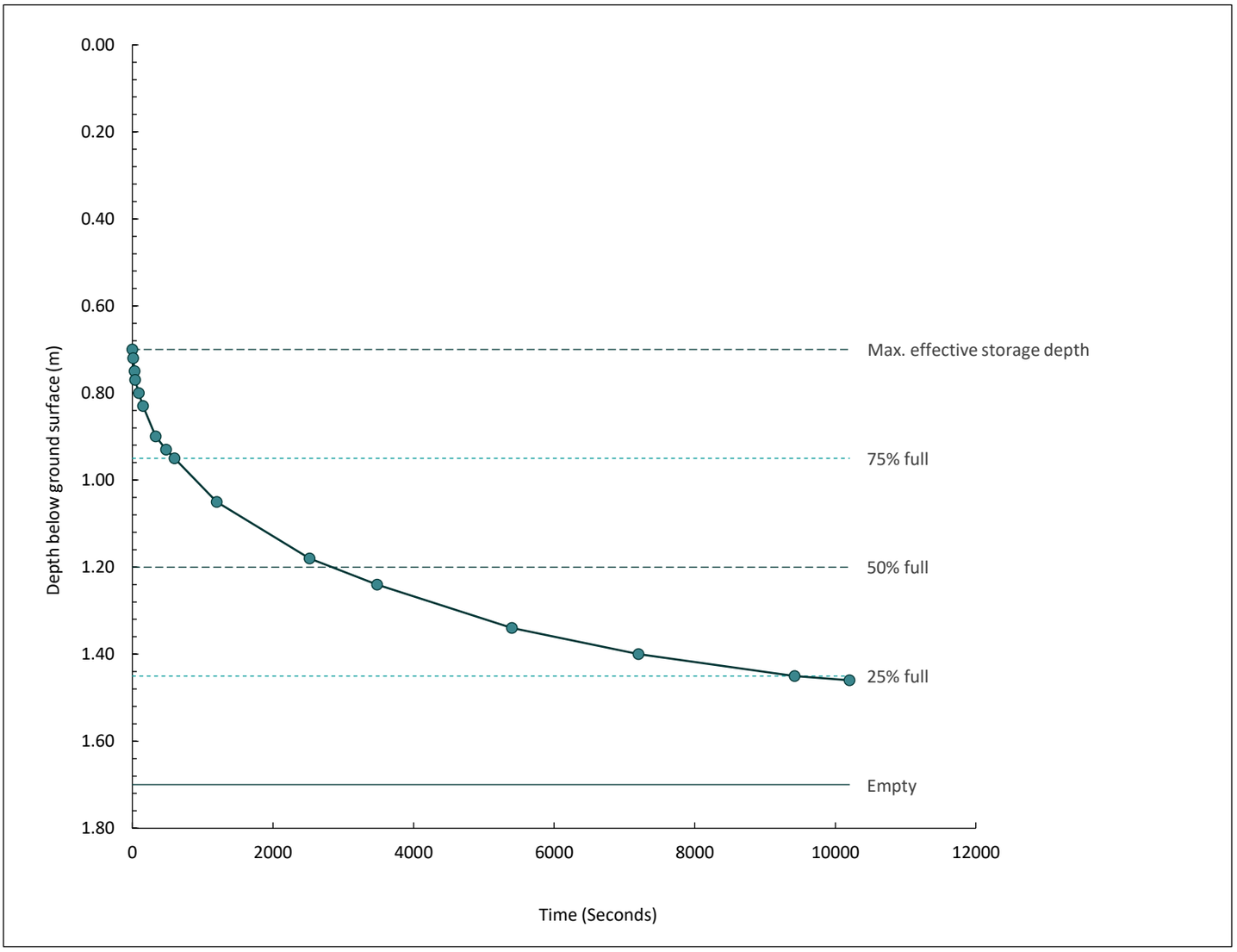
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP229

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612523.33	N: 315187.90
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.16 maOD
	Infilling 1	Test Date:	16/06/2022



Soil Infiltration Rate: 5.74E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.40	0.60	1.70	1.70

Fill Porosity: 30%	Test Duration (hh:mm): 02:50	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

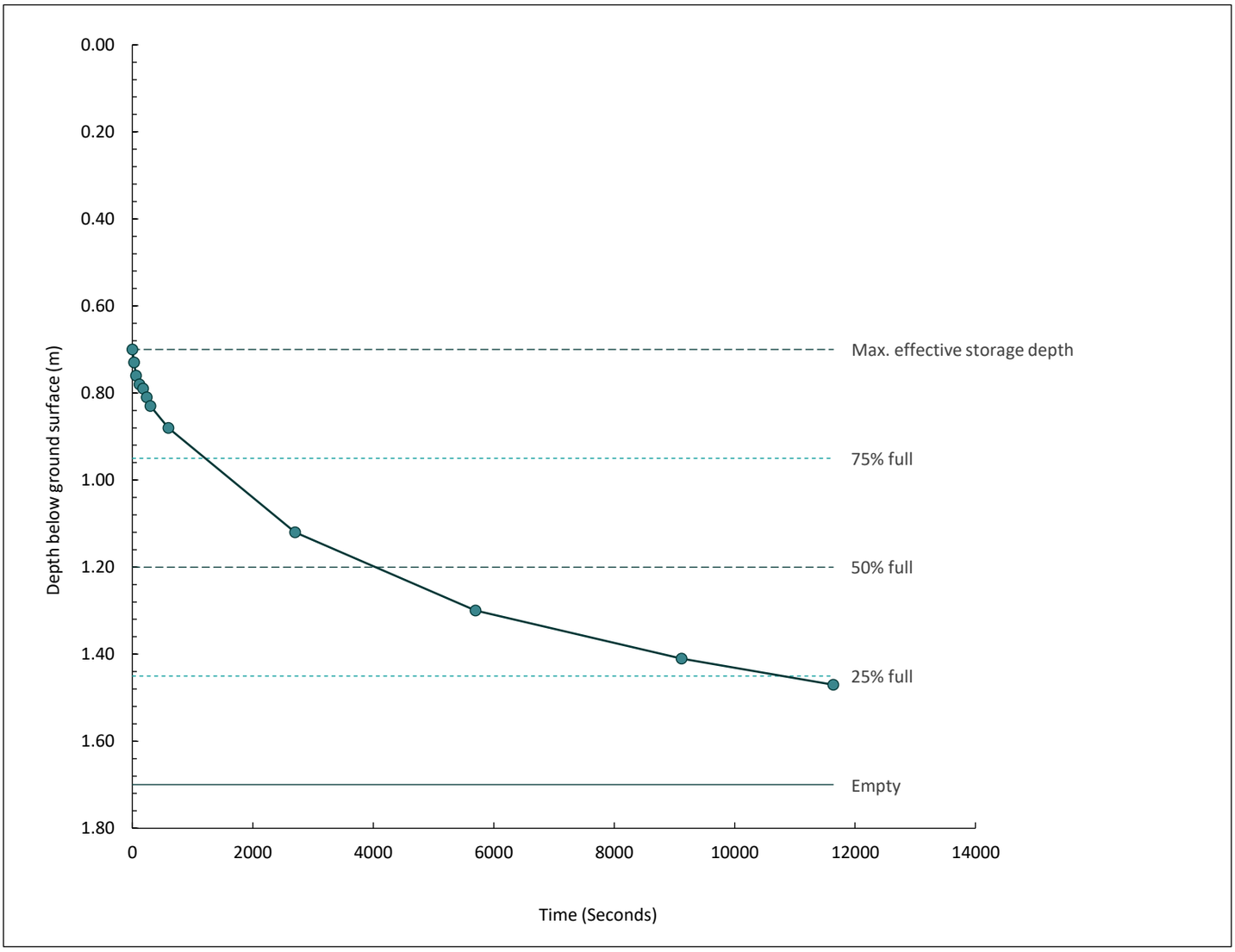
AGS

Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP229
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612523.33 N: 315187.90
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 24.16 maOD
	Infilling 2	Test Date: 16/06/2022



Soil Infiltration Rate: 5.28E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.40	0.60	1.70	1.70

Fill Porosity: 30%	Test Duration (hh:mm): 03:14	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

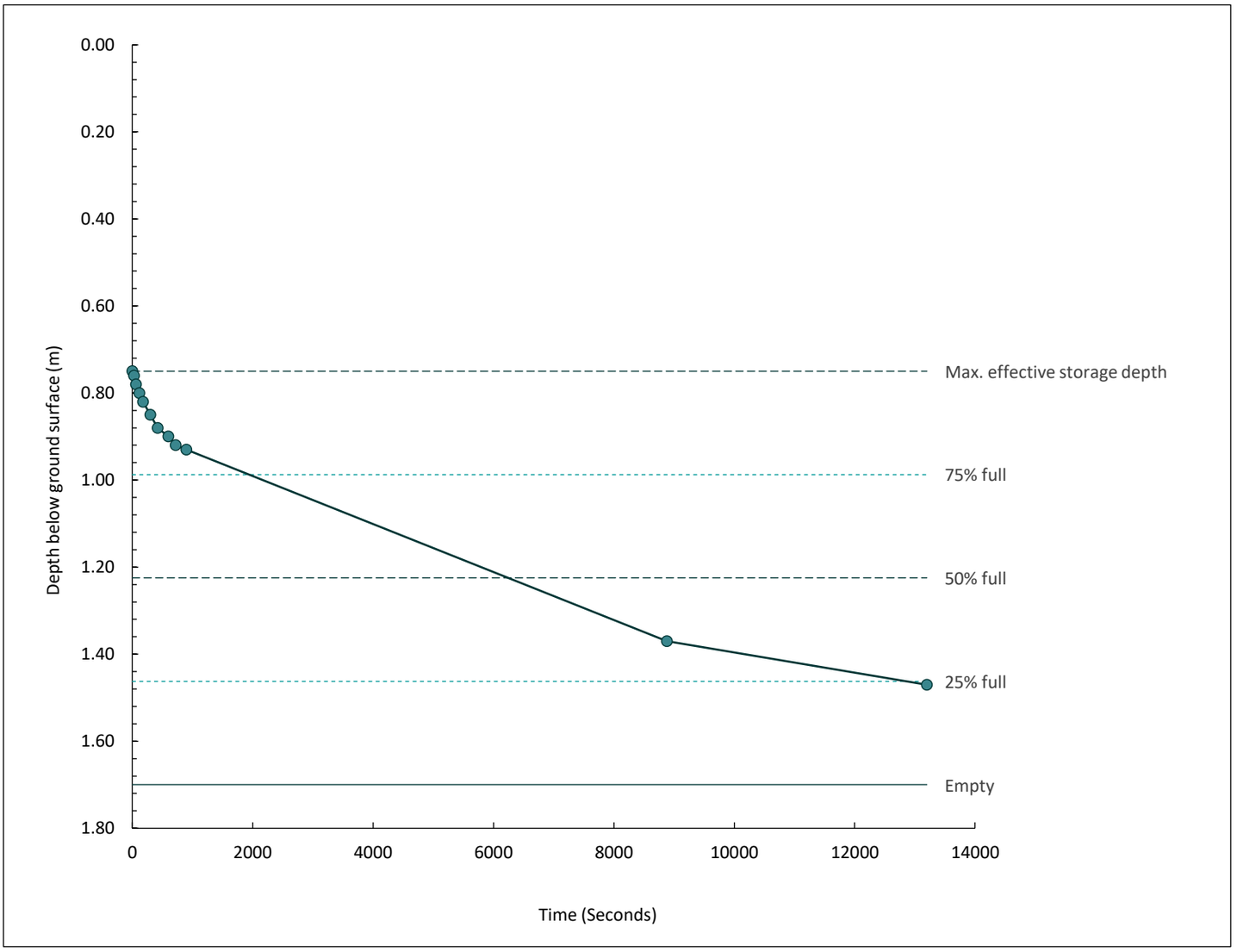
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP229

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612523.33	N: 315187.90
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.16maOD
	Infilling 3	Test Date:	17/06/2022



Soil Infiltration Rate: 4.55E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.40	0.60	1.70	1.70

Fill Porosity: 30%	Test Duration (hh:mm): 03:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

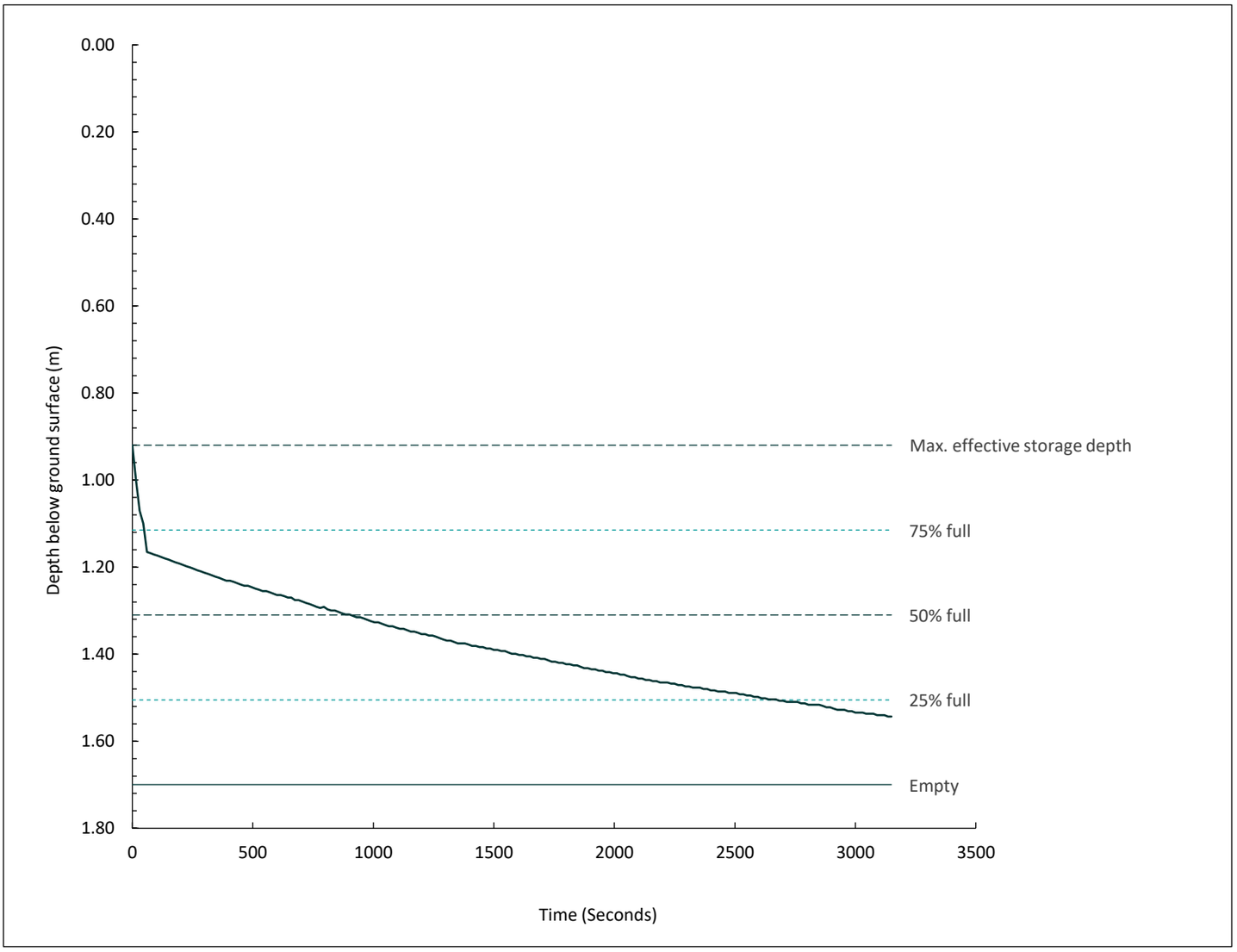
Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Croker	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP230

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612489.27	N: 315175.40
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.18 maOD
	Infilling 1	Test Date:	16/06/2022



Soil Infiltration Rate: 1.78E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.90	0.60	1.70	1.70

Fill Porosity: 30%	Test Duration (hh:mm): 00:52	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

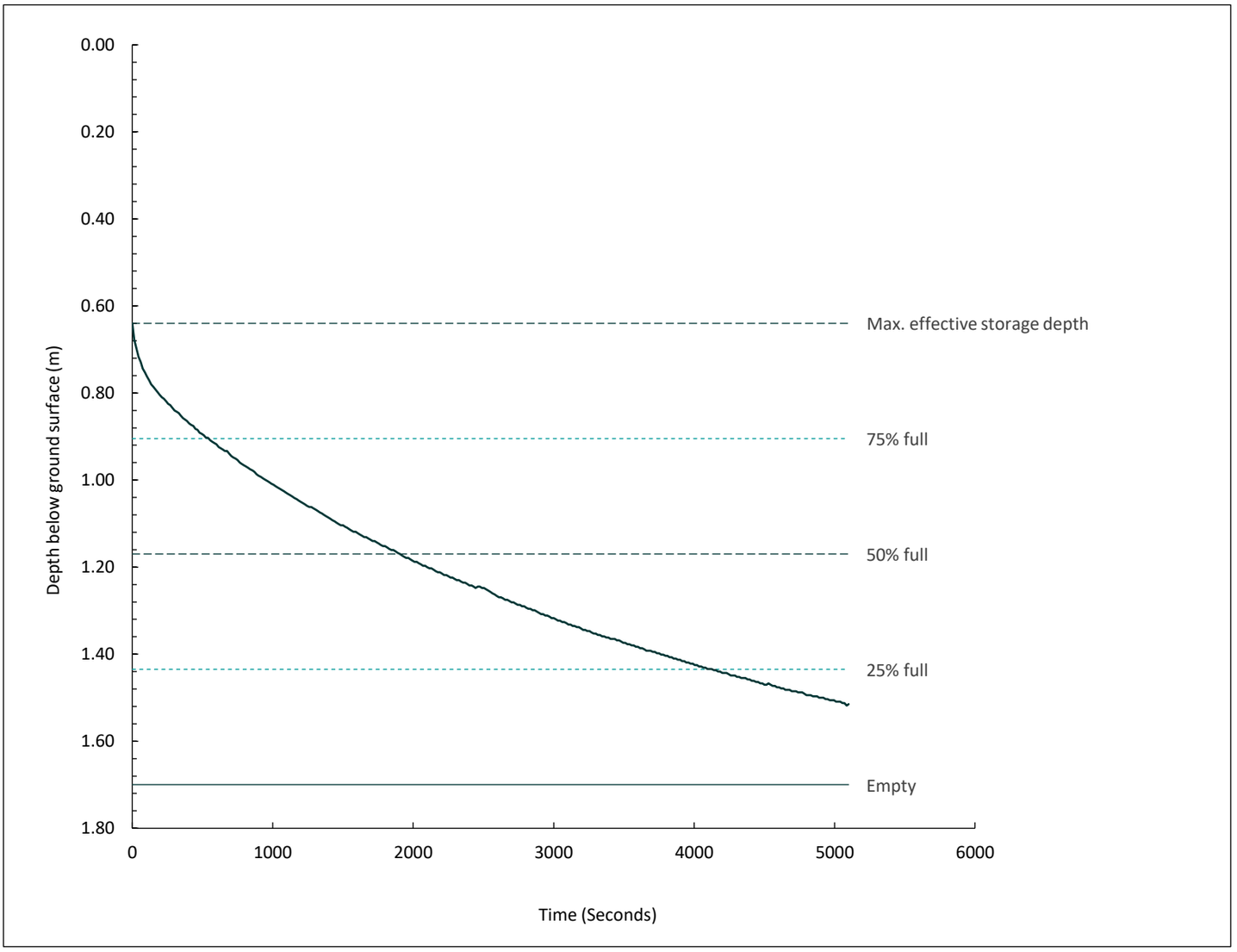
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Pit collapsing during infilling. Unable to fill to required start depth.

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP230

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612489.27	N: 315175.40
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.18 maOD
	Infilling 2	Test Date:	16/06/2022



Soil Infiltration Rate: 1.46E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.90	0.60	1.70	1.70

Fill Porosity: 30%	Test Duration (hh:mm): 01:25	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

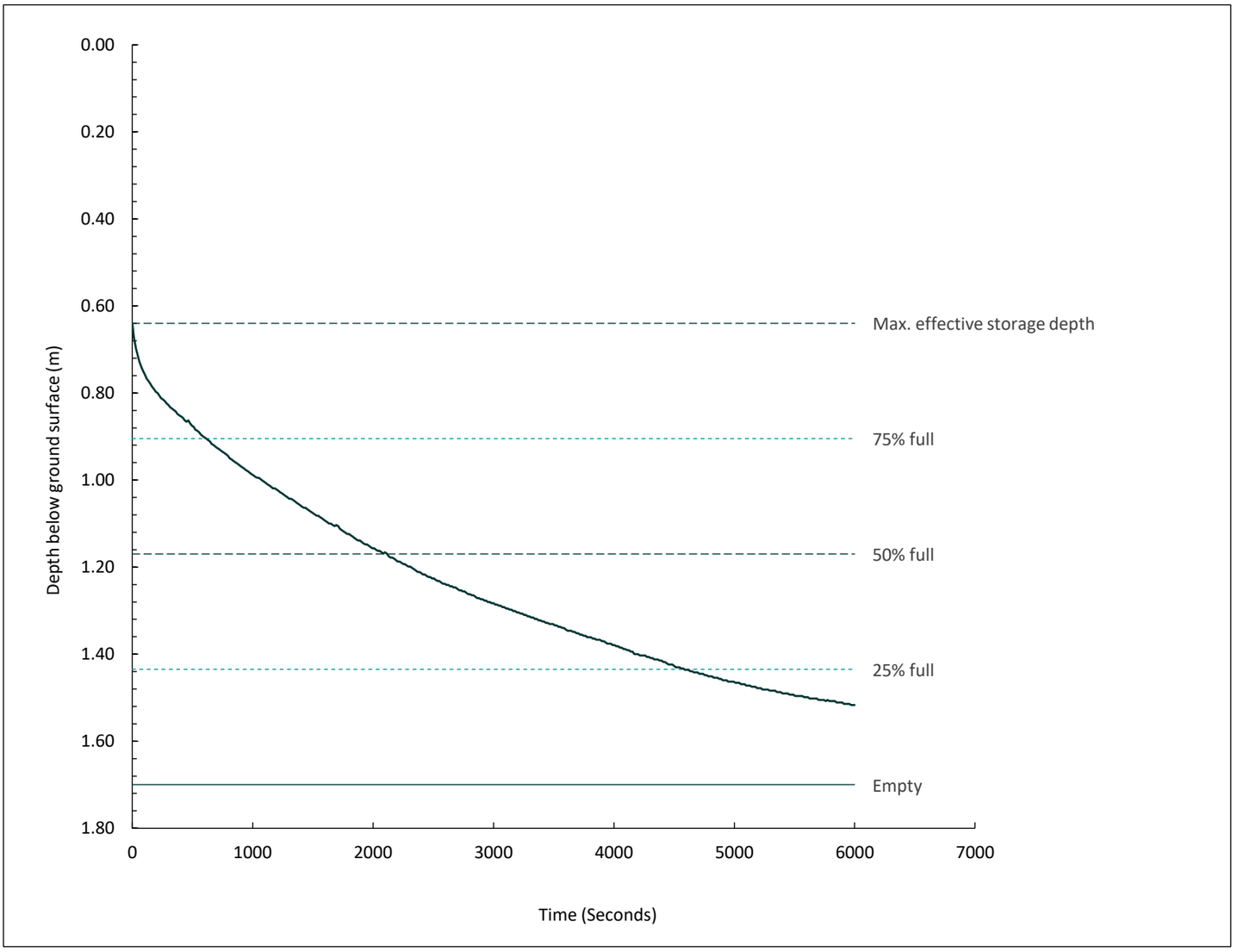
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP230

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 612489.27	N: 315175.40
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	24.18maOD
	Infilling 3	Test Date:	16/06/2022



Soil Infiltration Rate: 1.32E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.90	0.60	1.70	1.70

Fill Porosity: 30%	Test Duration (hh:mm): 01:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

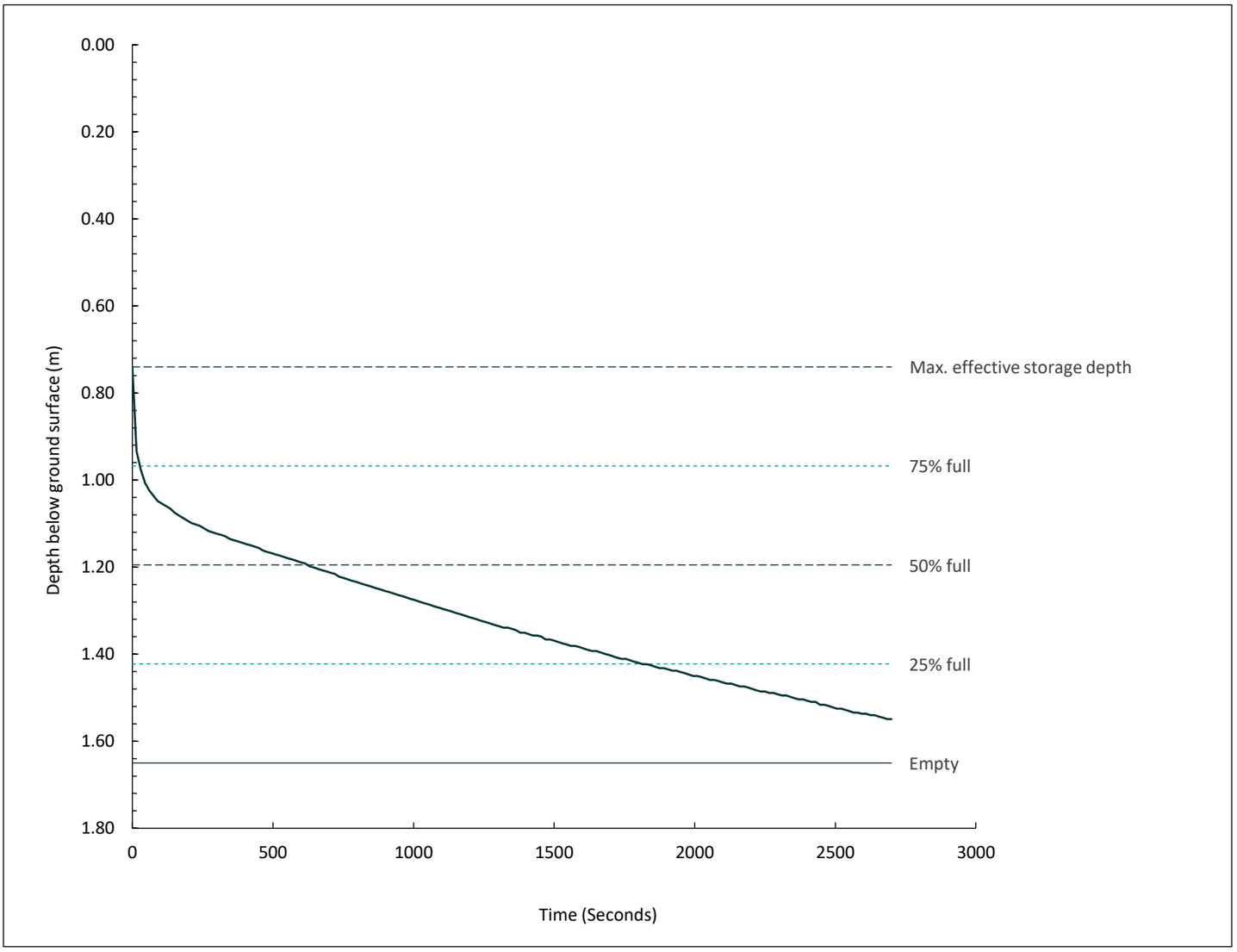
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP235

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613744.66	N: 315113.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	14.77 maOD
	Infilling 1	Test Date:	15/06/2022



Soil Infiltration Rate: 2.71E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.65	1.65

Fill Porosity: 30%	Test Duration (hh:mm): 00:45	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

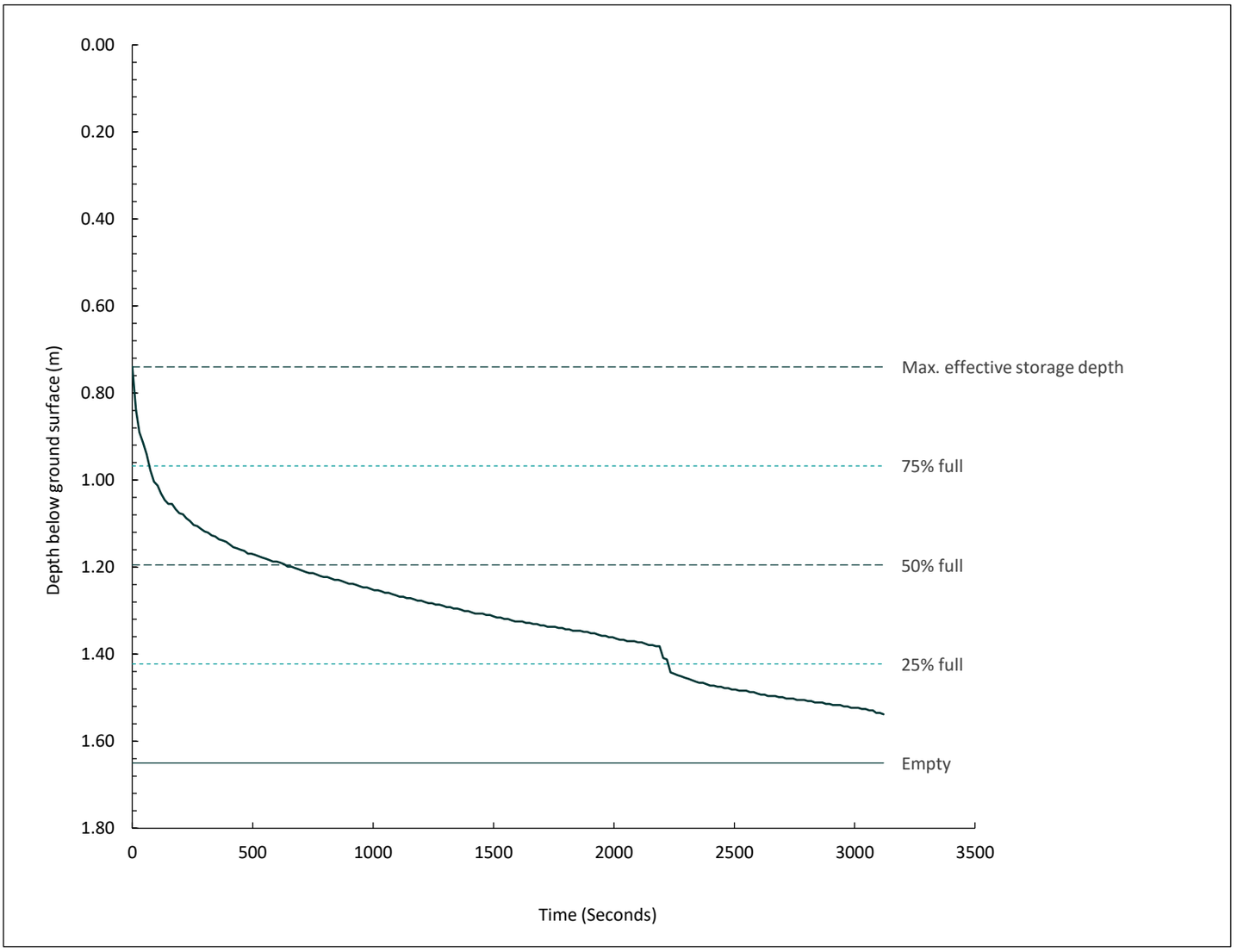
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP235

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613744.66	N: 315113.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	14.77 maOD
	Infilling 2	Test Date:	15/06/2022



Soil Infiltration Rate: 2.25E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.65	1.65

Fill Porosity: 30%	Test Duration (hh:mm): 00:52	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

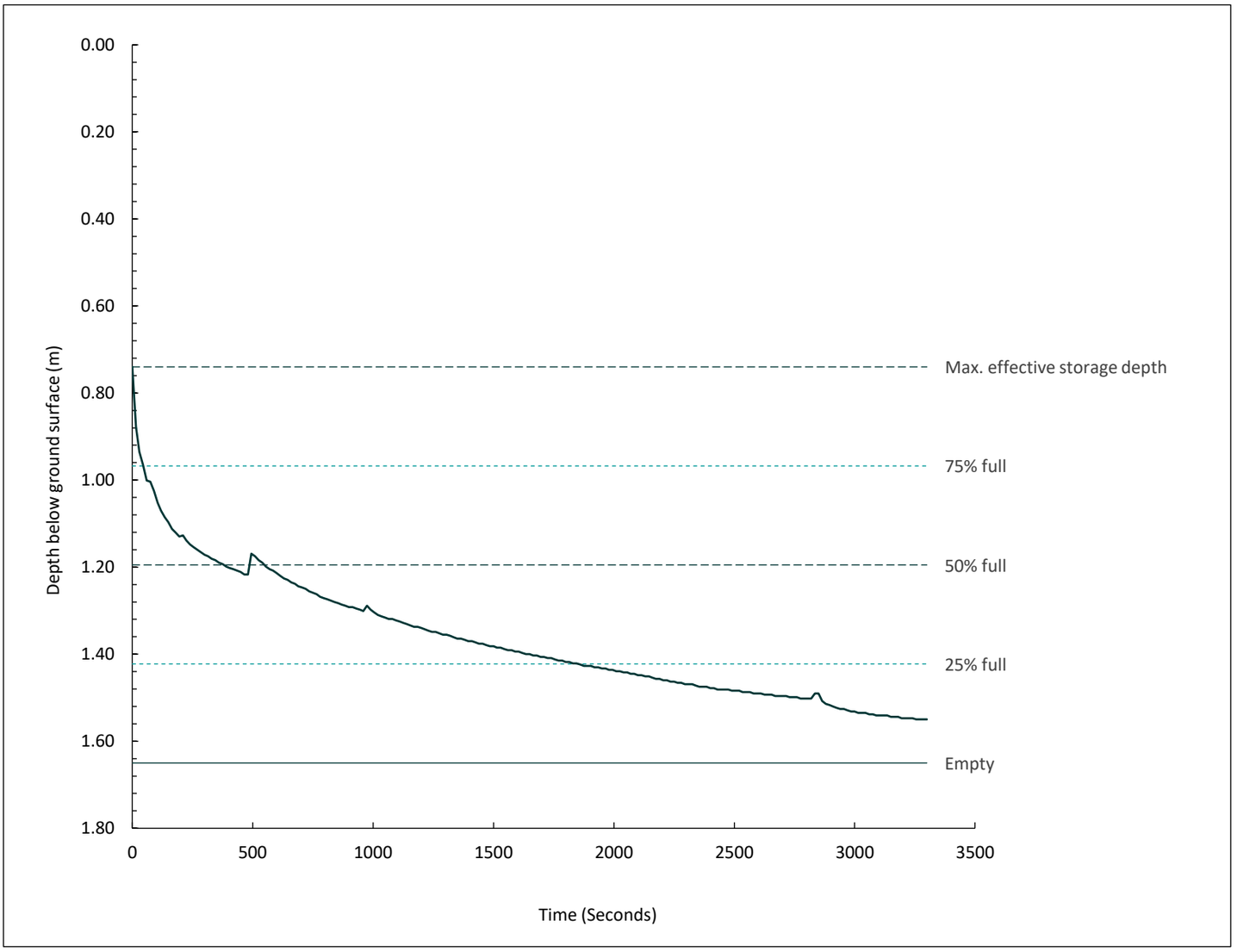
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP235

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 613744.66	N: 315113.23
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	14.77maOD
	Infilling 3	Test Date:	15/06/2022



Soil Infiltration Rate: 2.68E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.00	0.60	1.65	1.65

Fill Porosity: 30%	Test Duration (hh:mm): 00:55	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

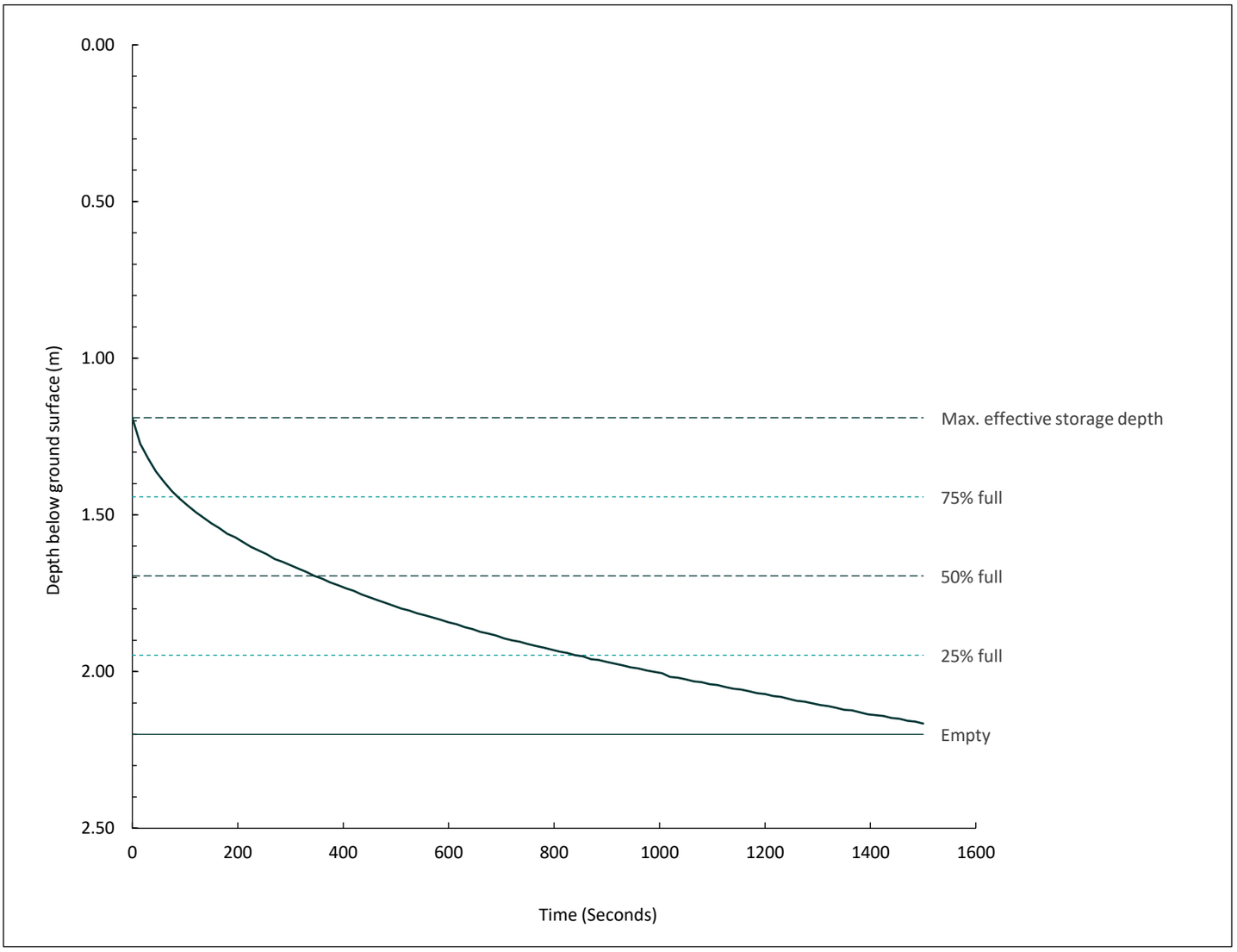
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP236

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613727.25	N: 315128.97
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	14.54 maOD
	Infilling 1	Test Date:	15/06/2022



Soil Infiltration Rate: 6.79E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.60	0.60	2.20	2.20

Fill Porosity: 30%	Test Duration (hh:mm): 00:25	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

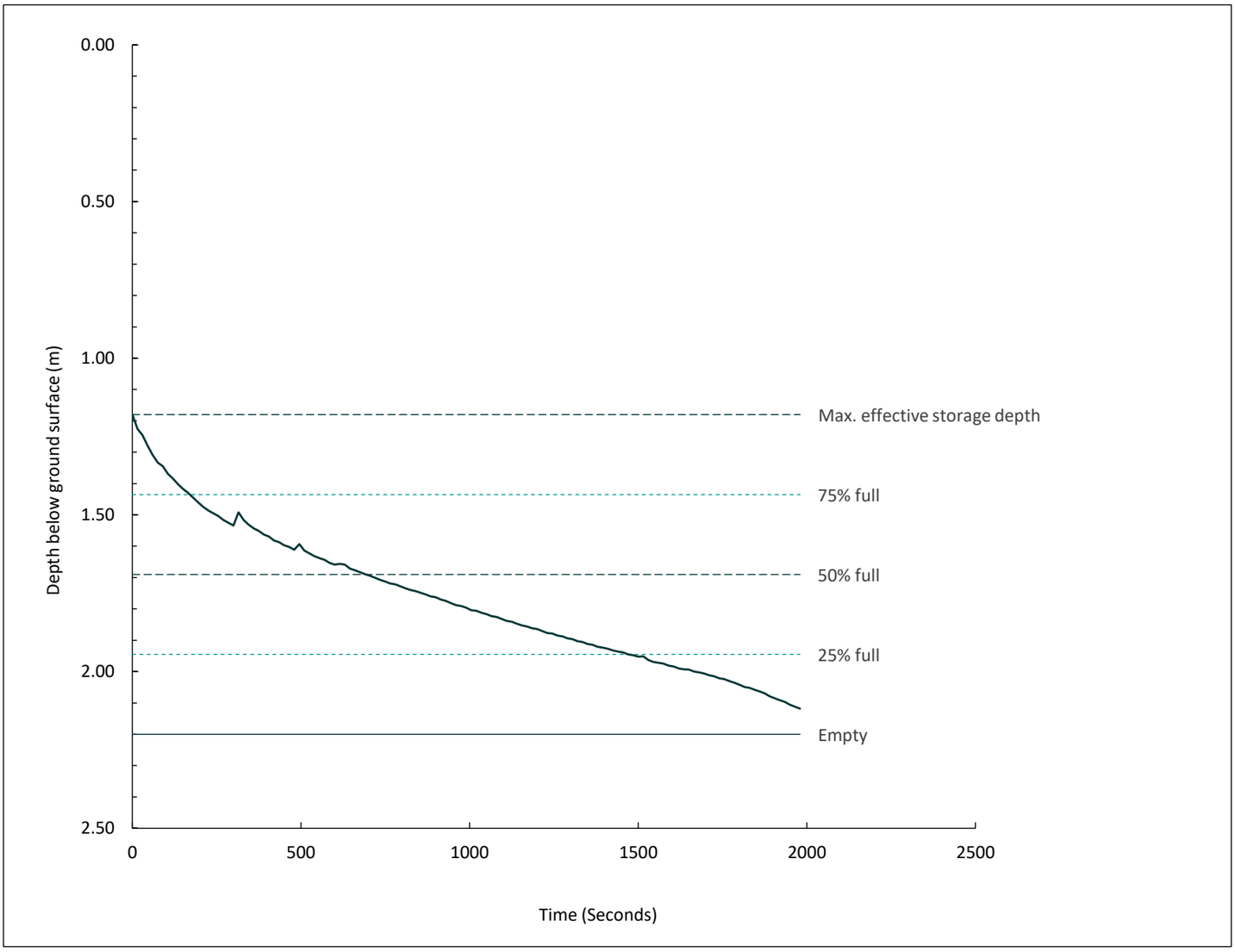
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP236

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613727.25	N: 315128.97
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	14.54 maOD
	Infilling 2	Test Date:	15/06/2022



Soil Infiltration Rate: 3.95E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.60	0.60	2.20	2.20

Fill Porosity: 30%	Test Duration (hh:mm): 00:33	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

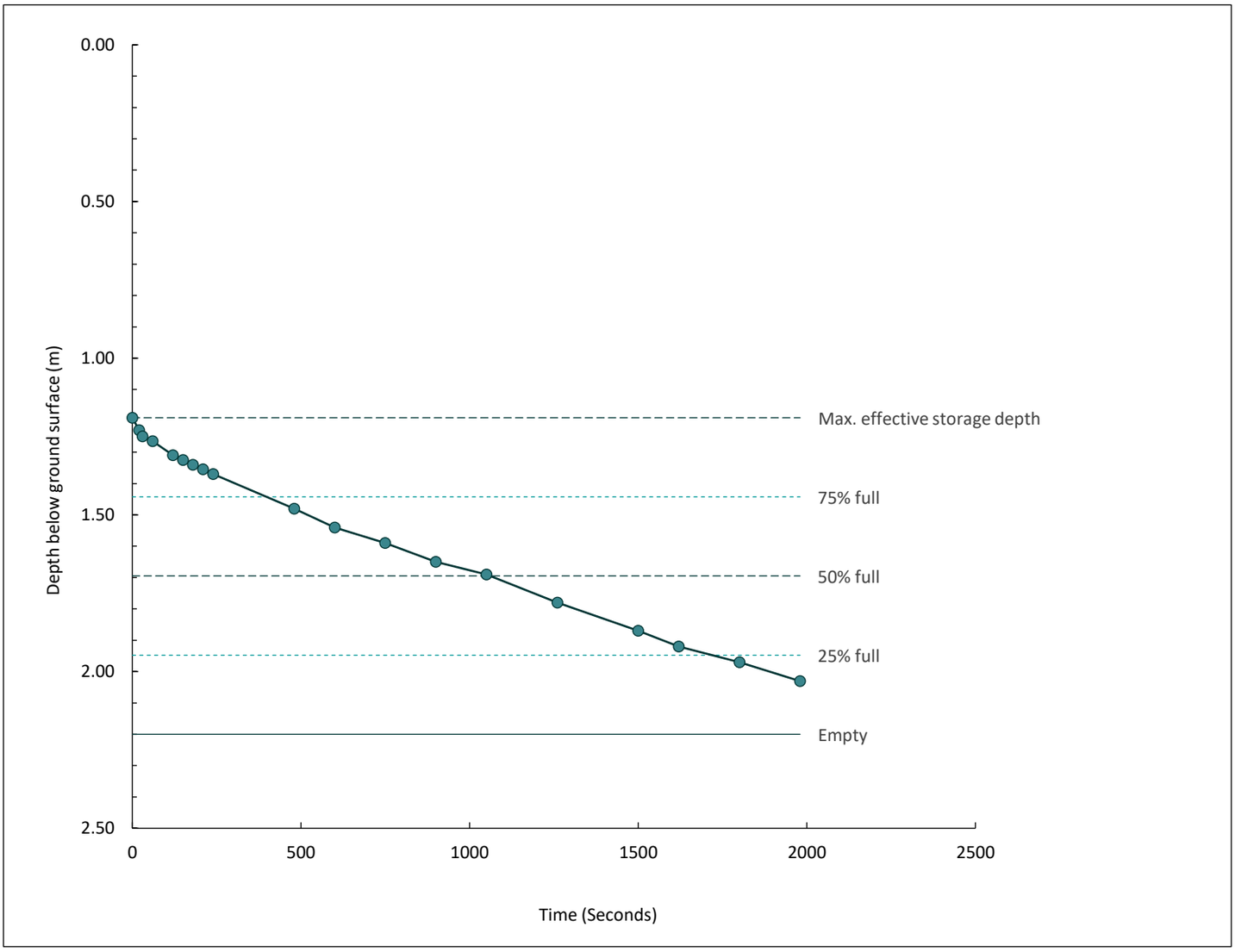
AGS

Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP236
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613727.25 N: 315128.97
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 14.54maOD
	Infilling 3	Test Date: 15/06/2022



Soil Infiltration Rate: 3.87E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.60	0.60	2.20	2.20

Fill Porosity: 30%	Test Duration (hh:mm): 00:33	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

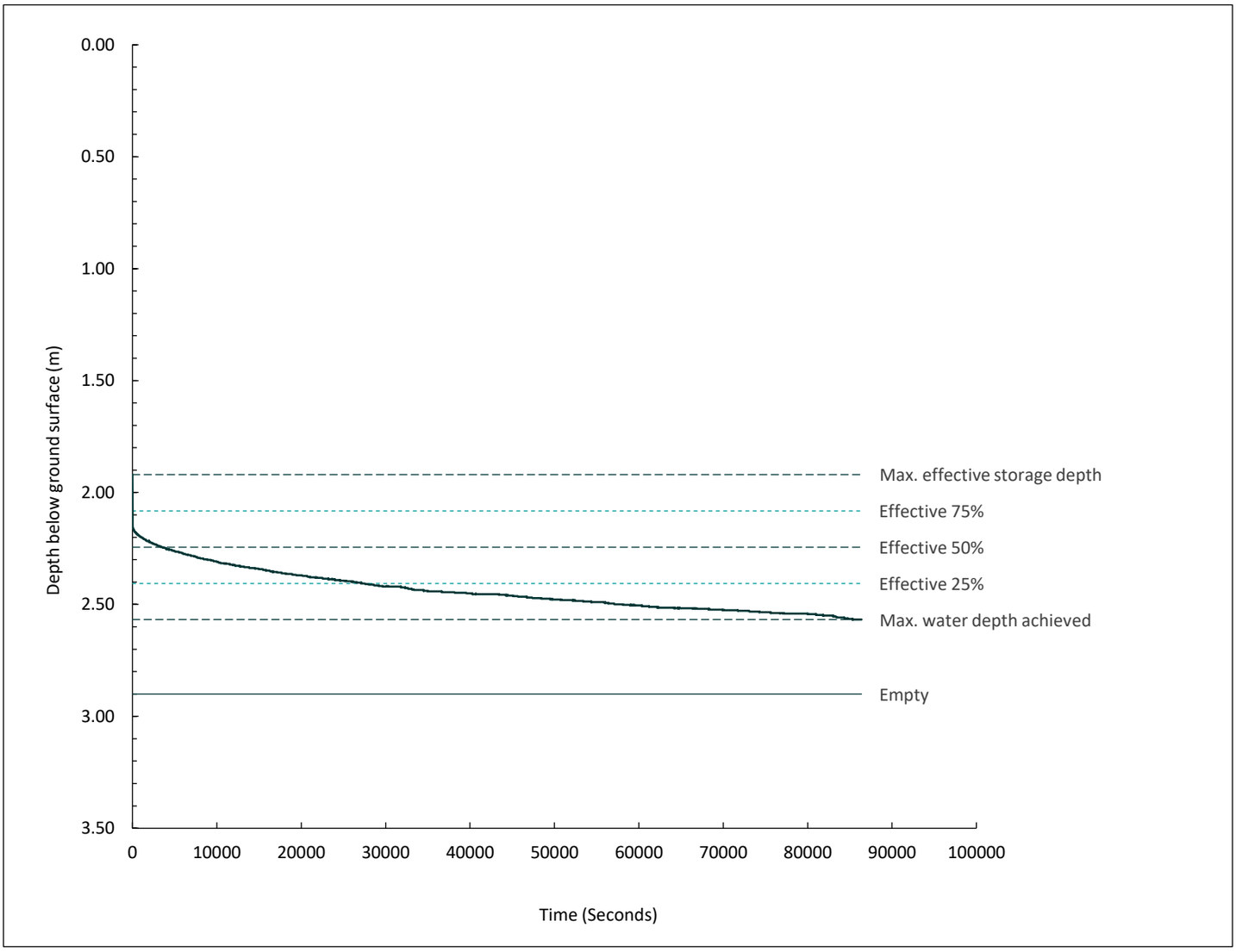
AGS

Water measuring device: Dip Meter
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Levellogger malfunction. Dip meter readings only.

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP237
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613703.49 N: 315099.42
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 15.95 maOD
	Infilling 1	Test Date: 15/06/2022



Soil Infiltration Rate: 1.58E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.40	0.60	2.90	2.90

Fill Porosity: 30%	Test Duration (hh:mm): 23:59	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

Water measuring device: Level Logger

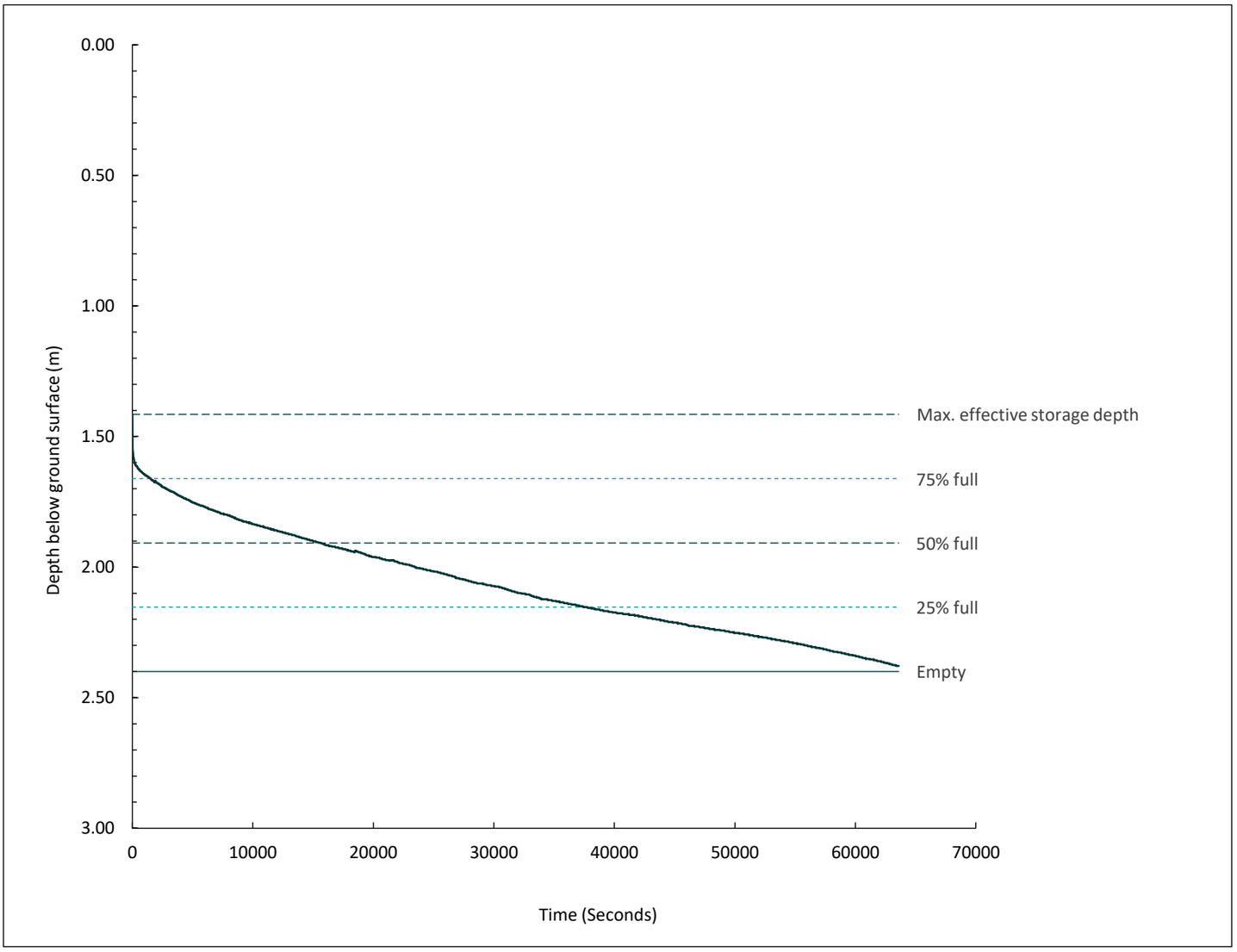
Weather conditions: Sunny and dry

Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Effective rate calculation based on maximum water depth achieved
2. Testing terminated early as water failed to drain past 25% storage depth within 24hrs.

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP238
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613682.78 N: 315113.66
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 15.87 maOD
	Infilling 1	Test Date: 15/06/2022



Soil Infiltration Rate: 1.39E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.30	0.60	2.40	2.40

Fill Porosity: 30%	Test Duration (hh:mm): 17:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

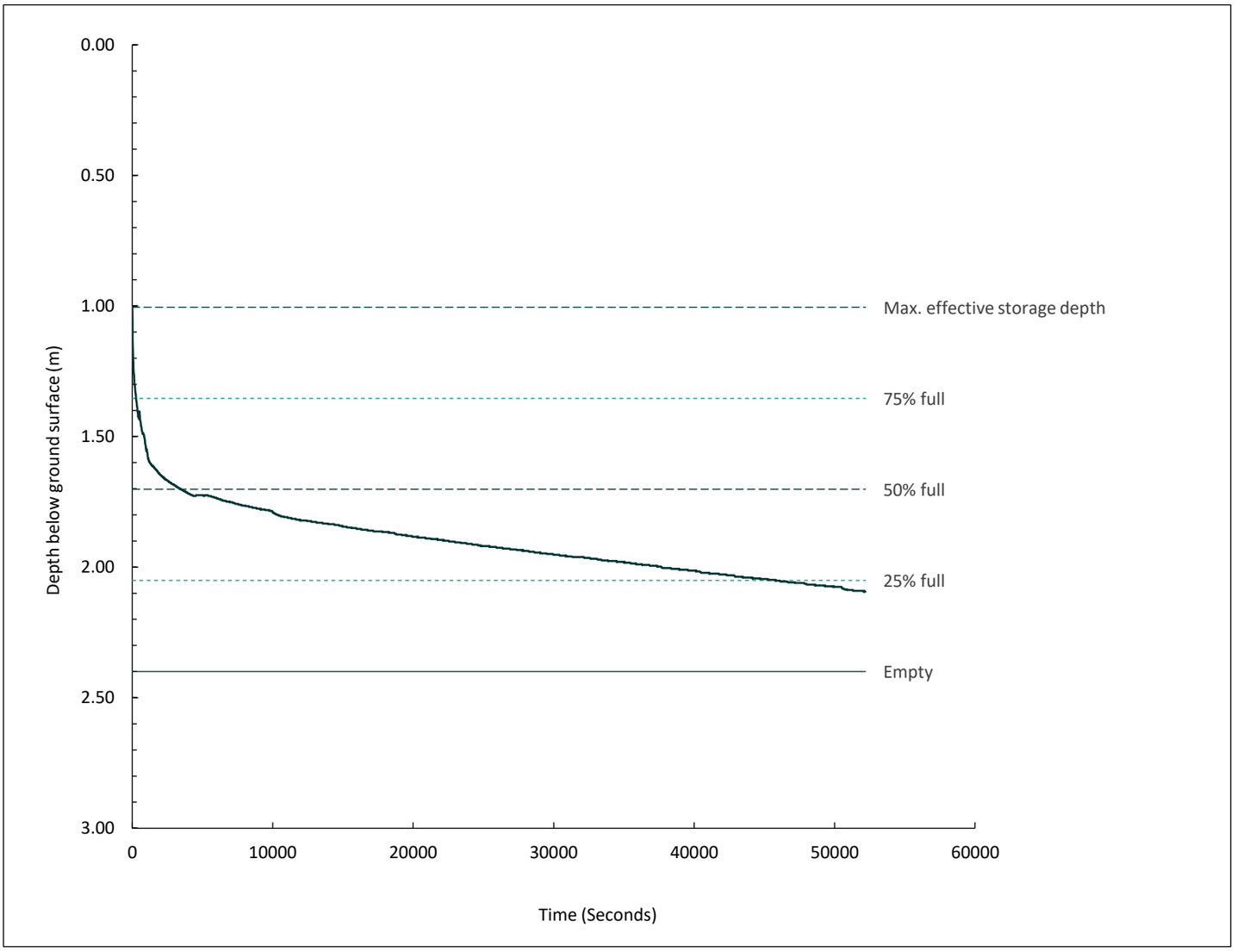
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP238

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613682.78	N: 315113.66
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	15.87 maOD
	Infilling 2	Test Date:	16/06/2022



Soil Infiltration Rate: 1.23E-6 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.30	0.60	2.40	2.40

Fill Porosity: 30%	Test Duration (hh:mm): 14:30	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

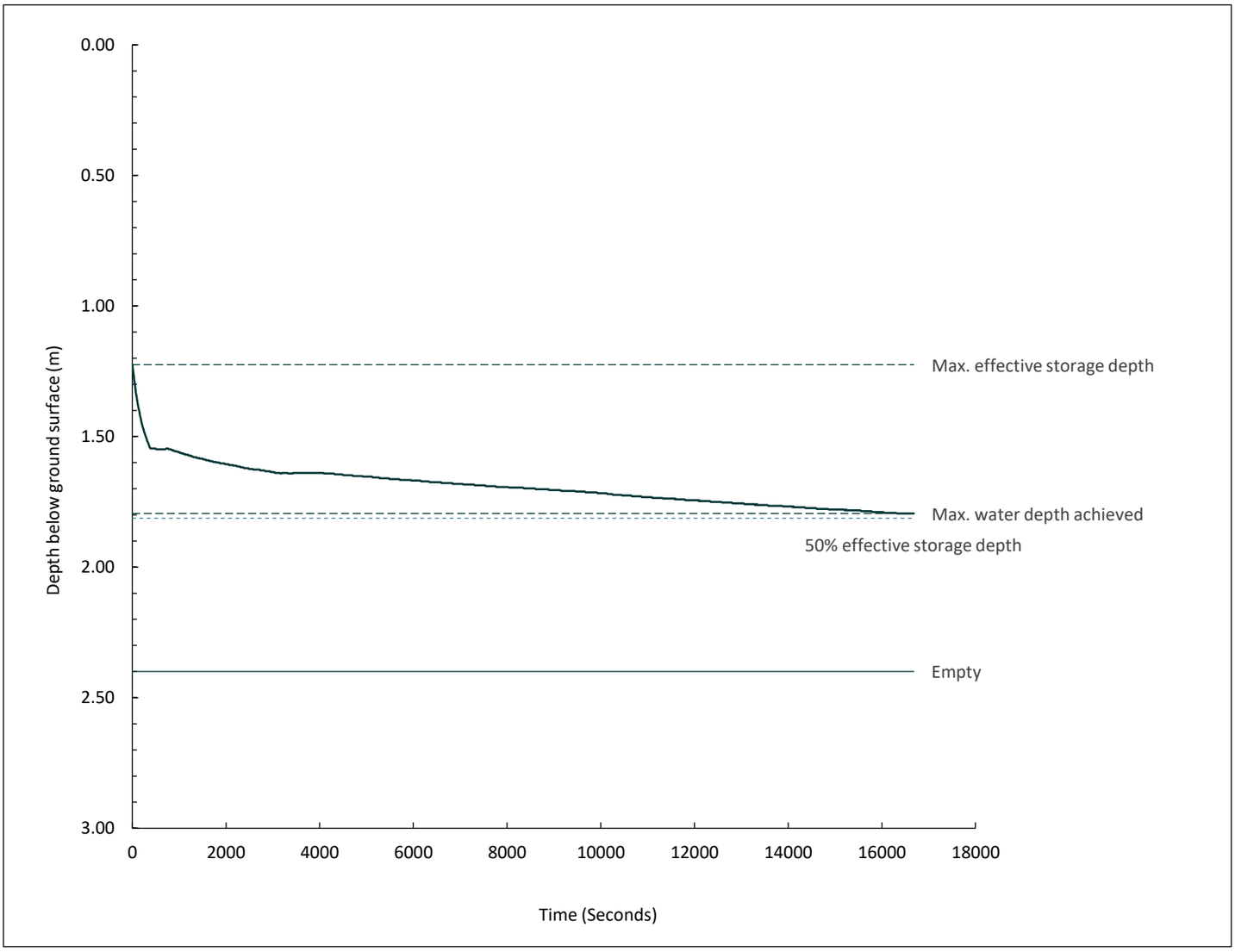
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP238

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 613682.78	N: 315113.66
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	15.87maOD
	Infilling 3	Test Date:	17/06/2022



Soil Infiltration Rate: N/A

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
3.30	0.60	2.40	2.40

Fill Porosity: 30%	Test Duration (hh:mm): 04:38	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

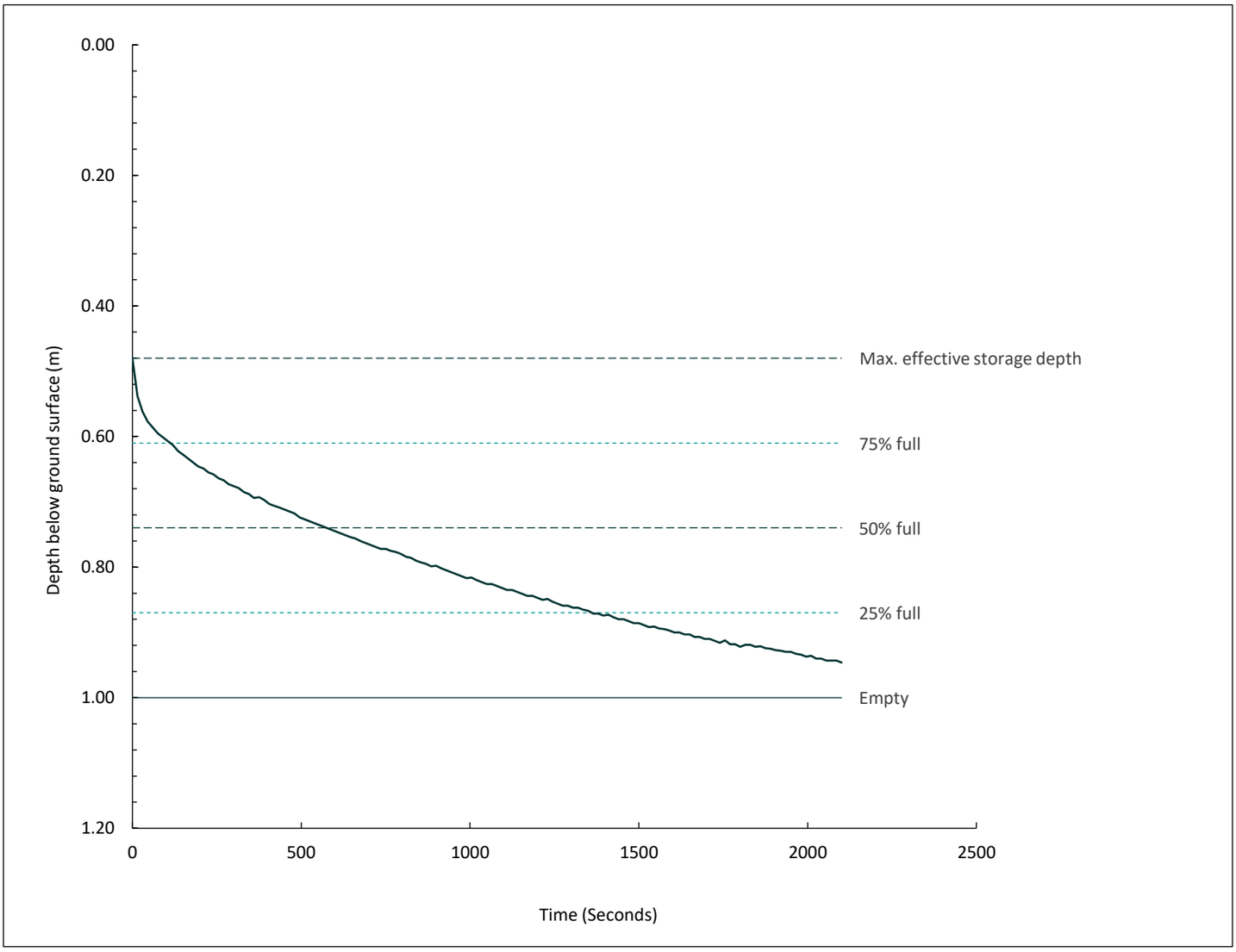
Water measuring device: Level Logger
Weather conditions: Sunny and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:
1. Test terminated early due to access constraints.

Operator: W. Atkins / J. Camp	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP239

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614308.83	N: 315627.97
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.46 maOD
	Infilling 1	Test Date:	31/05/2022



Soil Infiltration Rate: 2.94E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.00	0.60	1.00	1.00

Fill Porosity: 30%	Test Duration (hh:mm): 00:35	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

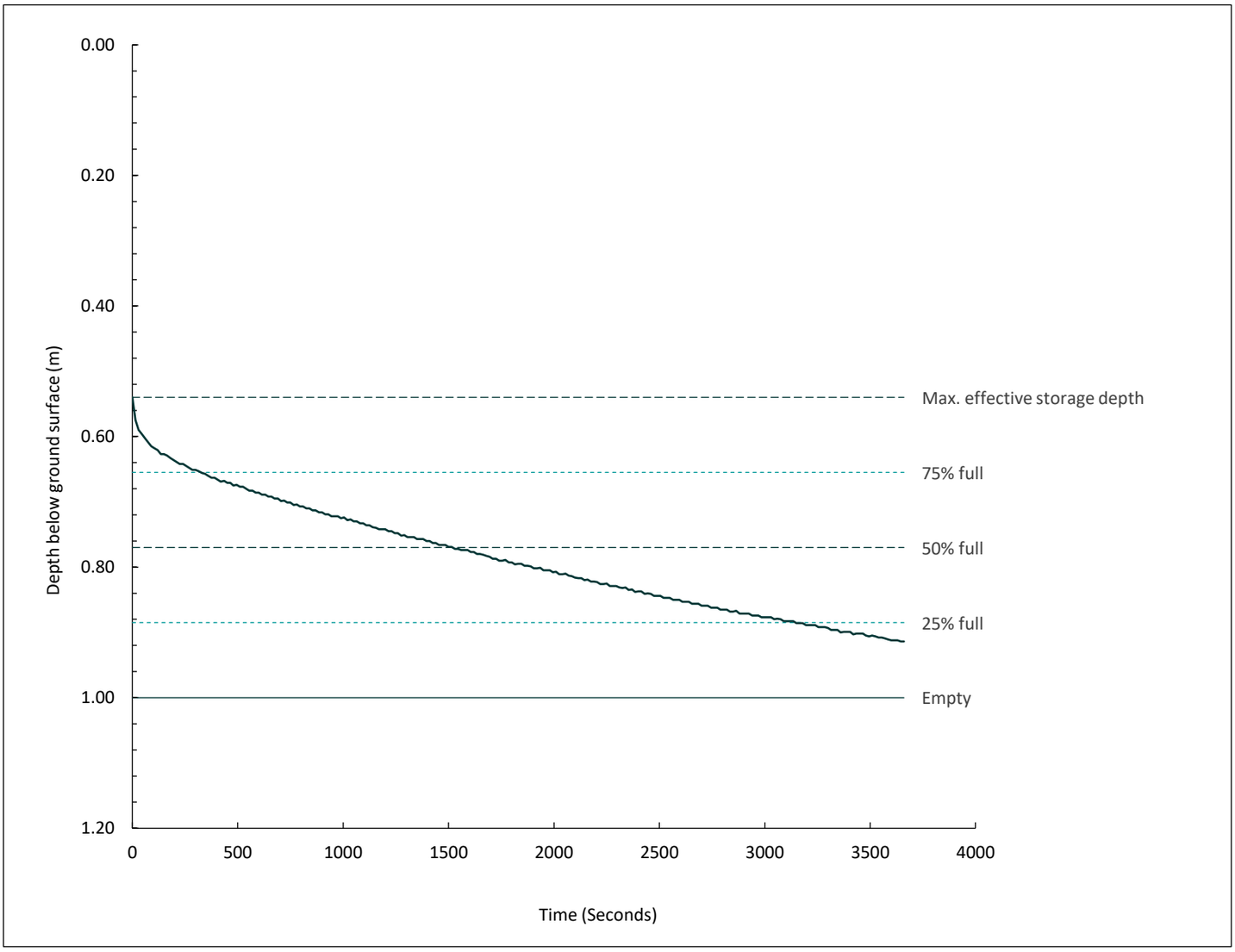
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP239

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614308.83	N: 315627.97
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	22.46 maOD
	Infilling 2	Test Date:	31/05/2022



Soil Infiltration Rate: 1.23E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.00	0.60	1.00	1.00

Fill Porosity: 30%	Test Duration (hh:mm): 01:01	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

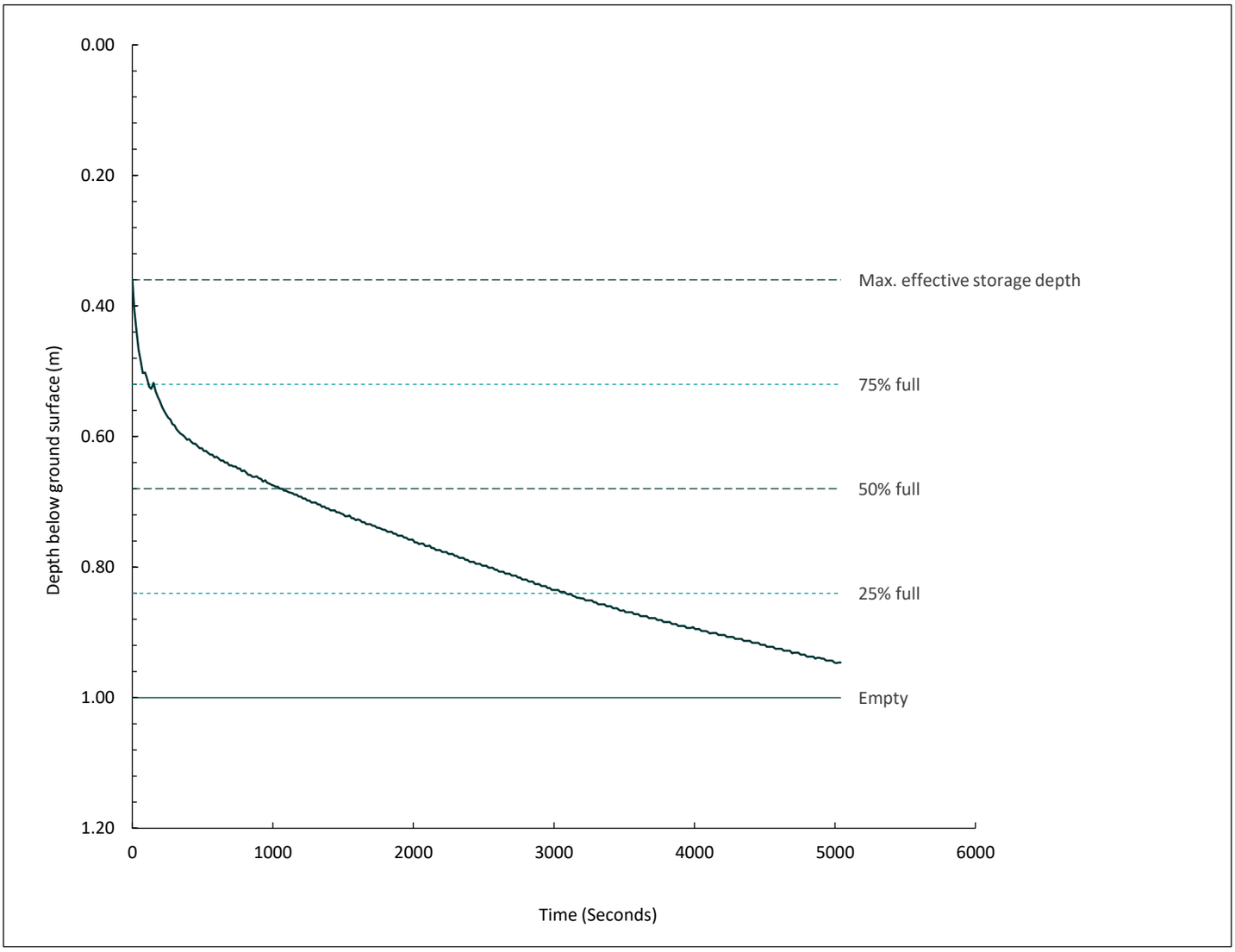
AGS

Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP239
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614308.83 N: 315627.97
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 22.46maOD
	Infilling 3	Test Date: 31/05/2022



Soil Infiltration Rate: 1.37E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
2.00	0.60	1.00	1.00

Fill Porosity: 30%	Test Duration (hh:mm): 01:24	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

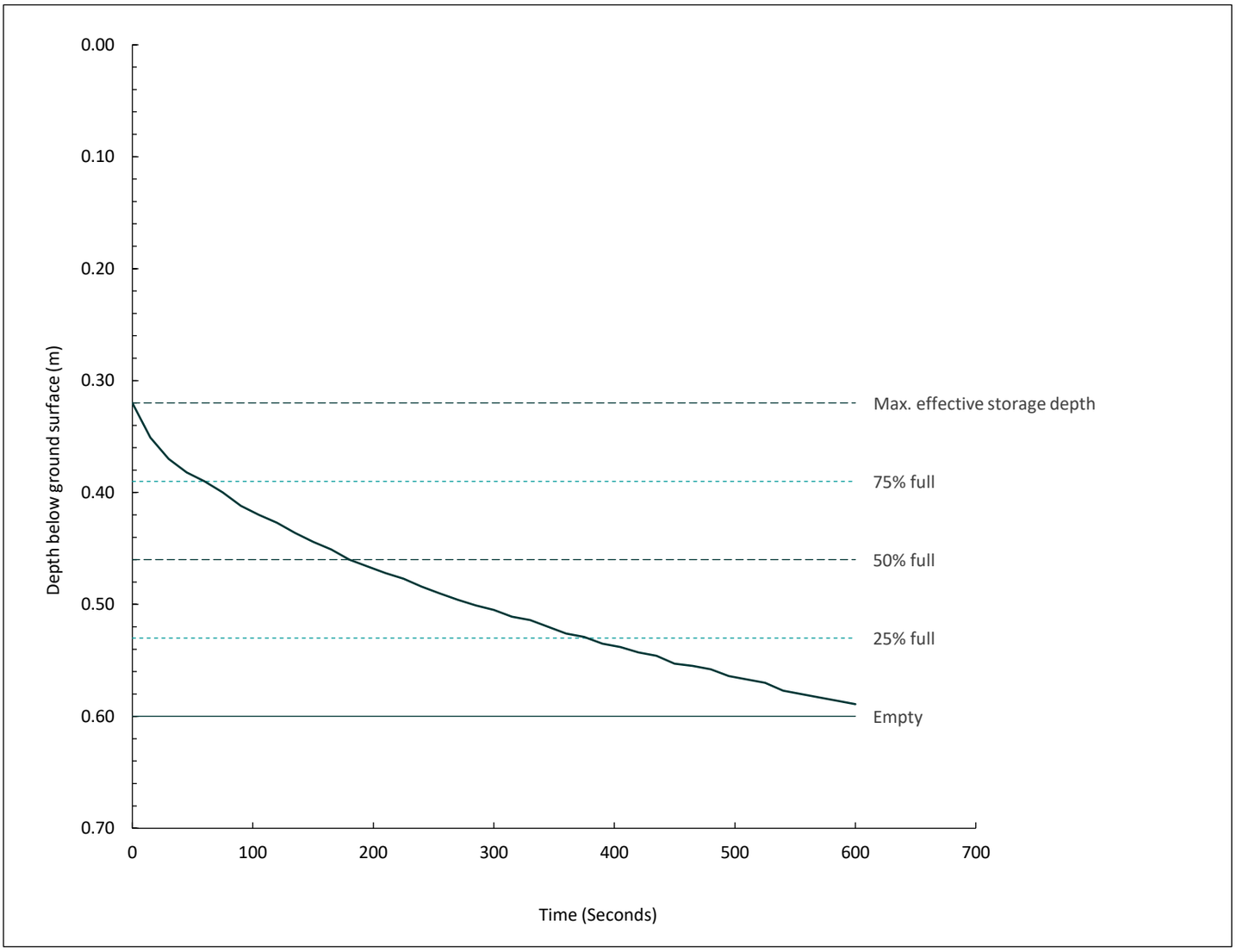
Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP240

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614281.90	N: 315628.83
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.93 maOD
	Infilling 1	Test Date:	31/05/2022



Soil Infiltration Rate: 8.06E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
1.60	0.60	0.60	0.60

Fill Porosity: 30%	Test Duration (hh:mm): 00:10	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

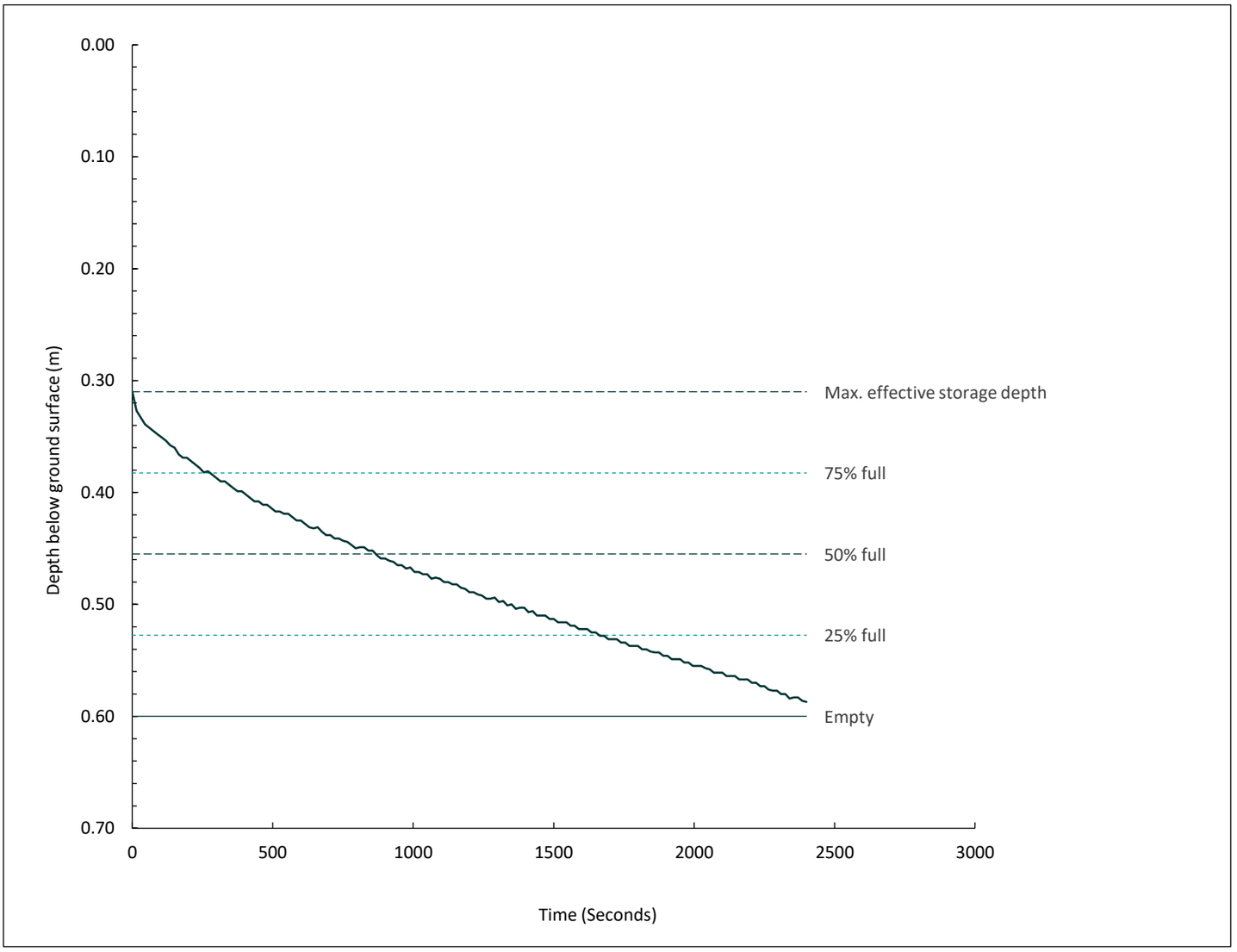
AGS

Water measuring device: Level Logger
Weather conditions: Cloudy and dry
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP240
Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614281.90 N: 315628.83
Location: Norwich Western Link	Consultant: Ramboll	Ground Level: 20.93 maOD
	Infilling 2	Test Date: 31/05/2022



Soil Infiltration Rate: 1.89E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
1.60	0.60	0.60	0.60

Fill Porosity: 30%	Test Duration (hh:mm): 00:40	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

Water measuring device: Level Logger

Weather conditions: Cloudy and dry

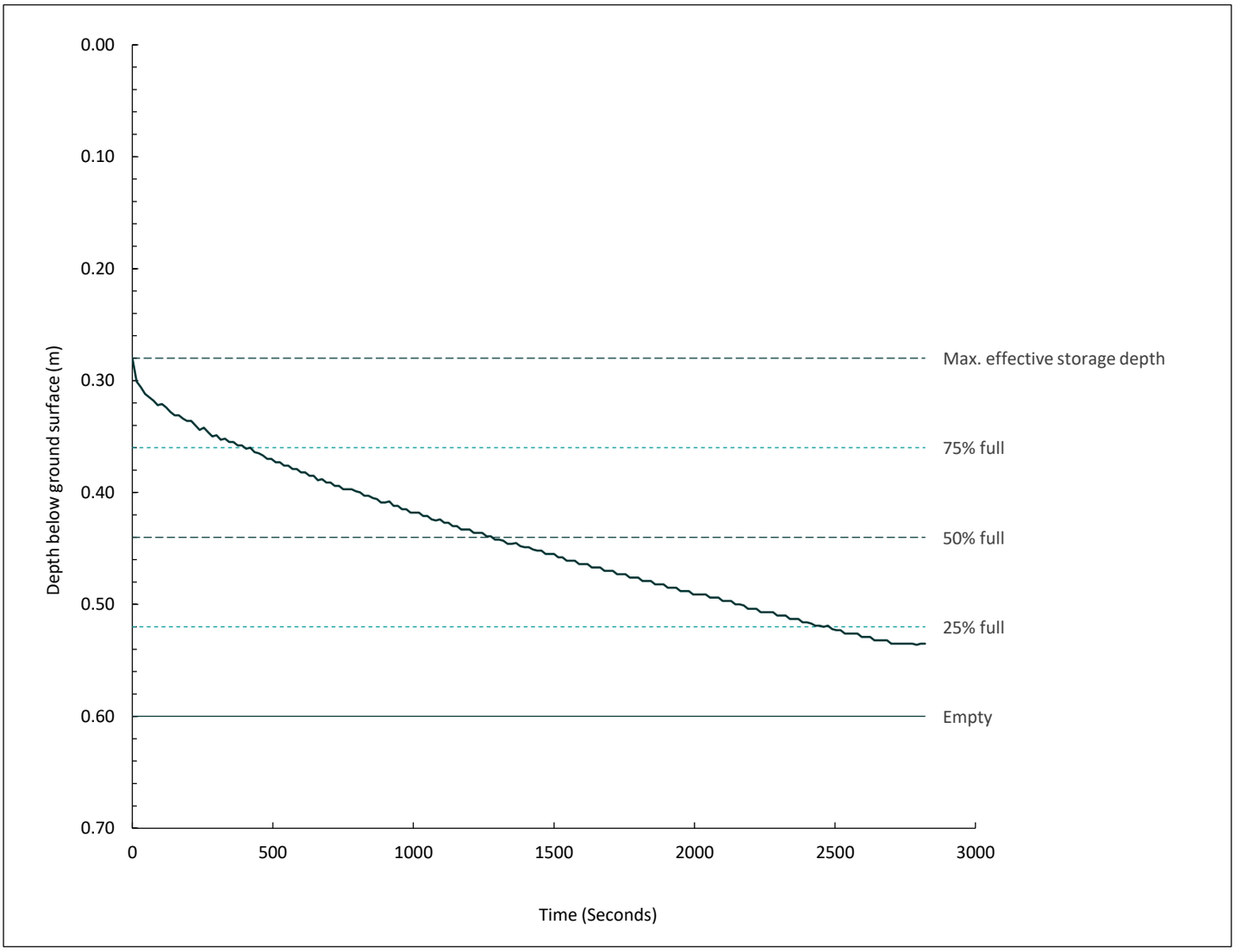
Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

harrisongroup ENVIRONMENTAL	Soakaway Test	Location ID - Test Number
		TP240

Project ID: NCCT41793	Client: Ferrovial Construction (UK) Limited	E: 614281.90	N: 315628.83
Location: Norwich Western Link	Consultant: Ramboll	Ground Level:	20.93maOD
	Infilling 3	Test Date:	31/05/2022



Soil Infiltration Rate: 1.36E-5 m/second

Pit Dimensions			
Length (m)	Width (m)	Depth at Start of Test (m)	Depth at End of Test (m)
1.60	0.60	0.60	0.60

Fill Porosity: 30%	Test Duration (hh:mm): 00:47	Soakaway Construction: Vertical sides trimmed square with granular fill and observation tube

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Colchester Office: 01206 986675
Testing Services: 01603 416333
E-mail: info@harrisongroupuk.com
Website: www.harrisongroupuk.com

AGS

Water measuring device: Level Logger

Weather conditions: Cloudy and dry

Test in accordance with BRE DG 365 Revised 2016

Remarks:

Operator: W. Atkins / L. Jeffery	Checked by: R. Leech	Approved by: R. Leech	Fm-Hn-R-3064-Rev C

ferrovial construction

RAMBOLL

Norfolk County Council

NORWICH WESTERN LINK

DOCUMENT TITLE*:

Factual Ground Investigation Report
' Woodland Campaign'

DOCUMENT NUMBER*	NCCT41973-HAG-VGT-FSC-RP-GI-0003

STATUS*	S5 - Suitable for Review and Acceptance (appointing party)	Date*:	30/11/2022
		Revision*:	P02
ASITE Task ID:			

Prepared by*	Checked by*	Approved by*
		
Rachael Leech Senior Geotechnical Engineer	David Ruiz Site Agent	Francisco Quesada Engineering Manager

*Details correct at time of upload to ASITE. Check ASITE for current document status, and Workflows Approval
*Note that Asite 'Purpose of Issue' Attribute is the same as the ISO19650 'STATUS'

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1. Issue and Revision Control

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Revision History			
Rev No	Date	Summary of Changes	Section or Page Number
P01	17/11/2022	First Issue - Draft	Not Applicable
P02	30/11/2022	Second Issue	Not Applicable

Document:	Factual Ground Investigation Report
Project:	Norwich Western Link – Alignment Refinement – Woodland Campaign
Reference No.:	NCCT41793_GI-AR-WC
Date:	November 2022
Prepared for:	Ferrovial Construction (UK) Limited
Investigation Supervisor:	Ramboll UK Limited

harrisongeotechnical
ENGINEERING

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HARRISON GROUP ENVIRONMENTAL LIMITED

Document: **Factual Ground Investigation Report**

Project: **Norwich Western Link – Alignment Refinement – Woodland Campaign**

Reference No.: **NCCT41793_GI-AR-WC**

Date: **November 2022**

Prepared For: **Ferrovial Construction (UK) Limited**

Investigation Supervisor: **Ramboll UK Limited**

REPORT STATUS:

Revision	Comments	Prepared By	Approved By	Issued By	Audited By
0	First Draft	INIT RL SIGN COMMENTS DATE 17/11/22	INIT SW SIGN COMMENTS DATE 17/11/22	INIT RL SIGN COMMENTS DATE 17/11/22	INIT SW SIGN COMMENTS DATE 17/11/22
1	Second Issue	INIT RL SIGN COMMENTS DATE 29/11/22	INIT SW SIGN COMMENTS DATE 30/11/2022	INIT RL SIGN COMMENTS DATE 30/11/2022	INIT SW SIGN COMMENTS DATE 30/11/2022
		INIT SIGN COMMENTS DATE	INIT SIGN COMMENTS DATE	INIT SIGN COMMENTS DATE	INIT SIGN COMMENTS DATE
		INIT SIGN COMMENTS DATE	INIT SIGN COMMENTS DATE	INIT SIGN COMMENTS DATE	INIT SIGN COMMENTS DATE

Sheringham Cliffs Formation

Deposits considered representative of the *Sheringham Cliffs Formation* were frequently encountered across the entire site and were recorded at a majority of the exploratory locations. Deposits comprised both granular and cohesive horizons although the granular horizons were observed to be the most prominent soil type of this formation with the cohesive horizons observed to be more localised and at depth.

Where granular soils were recorded, these were categorised as the *Sheringham Cliffs Formation – Granular* unit. These granular deposits typically comprised silty gravelly fine to coarse sand with local variation in the content of fines but also included limited horizons of sandy gravel. Gravel components were mainly noted to comprise flint and chalk however during previous phases of investigation records of sandstone, cemented ironstone and quartz were also occasionally noted throughout. A low to medium flint cobble content has also been frequently encountered within these granular soils, however cobbles were only noted during the excavation of TP255 during this phase of works. Localised pockets and lenses of sandy clay were also sporadically recorded throughout the granular strata at varying depths and thicknesses. Overall, deposits of the *Sheringham Cliffs Formation – Granular* were recorded to a maximum depth of 6.70m in BH232 however were observed to variable thicknesses throughout the site area as part of previous investigations.

Where cohesive deposits considered representative of the *Sheringham Cliffs Formation – Cohesive* unit were encountered, these were typically described as firm to very stiff slightly gravelly sandy clay with local variation in the content of fines and gravel. Gravel constituents typically comprised flint. Localised pockets and lenses of sand were also occasionally observed throughout the cohesive strata. Overall, horizons of the *Sheringham Cliffs Formation - Cohesive* were encountered to a maximum depth of 4.80m recorded in BHR259, however were observed to variable thicknesses throughout the site during previous phases of investigation.

Glacial Deposits

Deposits referred to as *Glacial Sand and Gravel* or *Glacial Silts and Clays* have been categorised where it has been difficult to discern the distinct geological formation to which these deposits belong but are otherwise considered to be a product of glacial activities. These glacial deposits were encountered across the entire site area to varying extents and were found amid other formations more easily distinguished. As part of this phase of investigation no soils considered representative of *Glacial Silts and Clays* were encountered but these soil types have been encountered during other phases of works.

Where granular deposits have been encountered, these have generally been described as slightly gravelly silty or slightly clayey fine to coarse sand with variation in the fines and gravel content with gravel typically comprising flint. The content of fines and density of these deposits varied locally however they were typically found to be medium dense to dense. The colour of these granular deposits was frequently recorded as yellowish brown but deposits encountered within the far south west of the site underlying the Lowestoft Till were described typically as orangish brown. Overall, *Glacial Sand and Gravel* deposits were recorded to a maximum depth of 10.45m within BH264 however were observed to variable thicknesses and extents throughout the site during previous phases of investigation.

Chalk

Chalk encountered during the investigation was predominantly described as structureless due to the disturbance caused to the soils by the cable percussive drilling technique used during this phase of investigation. Structured chalk has previously been encountered across the site where rotary drilling techniques have previously been employed to recover chalk core therefore retaining structure for suitable grading in accordance with CIRIA C574.

Chalk stratum was encountered to the maximum depth of the investigation at 60m depth with the surface of the deposits variably encountered between 3.7 – 6.7m depth, as summarised in table 3.3.1 below. The structureless chalk deposits were described as either grade Dm deposits composed of silt or grade Dc deposits composed of gravel. Gravel clasts comprised chalk of varying density however flint gravel and cobbles were also commonly encountered.

Possible structure was inferred within BH260 between 15.5 – 18.5m where it was considered that the chalk stratum may have comprised structured chalk in-situ however due to disturbance by drilling it was not possible to apply a grading to the material. Undisturbed samples (UT100) were taken throughout the drilling process which were subsequently extruded, split and described as scheduled by the Investigation

Supervisor. These samples were predominantly described to comprise structureless chalk deposits however where structure was observed, gradings were applied in accordance with CIRIA C574 to classify the chalk strata by the discontinuity apertures observed, with subdivisions applied to the gradings dependent on the discontinuity spacing present. Chalk grades B – C were recorded over the variable depths the UT100 samples were obtained from with variation in the discontinuity spacings also observed. Detail of the UT100 samples extruded, split and described can be found on the split and describe records presented within Appendix D. Overall, the density of the chalk was described as variably low to high with the corresponding strength recorded as very weak to moderately strong. Overall, the density of the chalk was generally observed to increase with depth.

Geology	Depth Below Ground Level (m) Encountered		Thickness (Min / Max) (m)	Thickness (Average) (m)	Site Level Range (maOD) Encountered	
	Upper Boundary	Lower Boundary			Upper Boundary	Lower Boundary
Topsoil	Ground Level	0.20 - 0.70	0.20 - 0.70	0.40	24.14 - 50.27	23.69 - 49.90
Lowestoft (Till)	0.30 - 0.40	2.00 - 5.70	1.65 - 5.40	4.19	49.41 - 49.90	44.50 - 48.18
Sheringham Cliffs Formation - Granular	0.20 - 0.70	0.50 - 6.70	0.10 - 6.40	2.08	23.76 - 32.54	20.30 - 32.03
Sheringham Cliffs Formation - Cohesive	0.45 - 3.50	1.20 - 4.80	0.75 - 3.60	1.69	22.13 - 24.78	20.93 - 22.94
Glacial Sand and Gravel	4.10 - 5.70	5.50 - 10.45	1.40 - 4.90	3.68	21.78 - 44.71	20.38 - 39.81
Chalk Dm	3.70 - 6.70	15.50 - 60.00	11.80 - 54.50	37.83	20.30 - 21.14	-34.12 - 9.13
Chalk Dc	17.50 - 38.00	53.50 - 60.00	22.00 - 41.50	35.13	-12.06 - 8.38	-35.37 - -27.62
Structured Chalk	15.50	18.50	3.00	3.00	9.13	6.13

Table 3.3.1: Summary of Stratum Ranges encountered

3.3.2 Groundwater

Groundwater was encountered in some exploratory holes during the ground investigation as summarised in table 3.3.2 below. At some borehole locations it was not possible to capture the groundwater strike due to the use of casing and adding of water to the position to aid in the drilling process. Boreholes where no groundwater was either encountered or the strike not captured are not included in table 3.3.2 below.

Exp Hole	Water Strikes			
	Struck		Rose to	
	mbgl	maOD	mbgl	maOD
BH232	20.00	7	18.27	8.73
BH248	18.60	7.28	18.01	7.87
BH259	21.40	4.54	21.15	4.79

Table 3.3.2: Summary of Groundwater Levels captured during drilling and excavation

3.4 In-Situ Testing Results

In-situ testing was undertaken for geotechnical purposes and is summarised below in table 3.4 with subsequent sections providing details regarding the test results.

Test Type and Reference	Stratum	Number of Results	Results (Range)	Comments / Limitations
Standard penetration test (BS EN ISO 22476-3:2005+A1:2011)	Sheringham Cliffs Formation - Granular	14	N = 4 - 46 N_{60} = 3 - 35	Representative of very loose to dense granular soils.
	Sheringham Cliffs Formation - Cohesive	5	N = 17 – 50 N_{60} = 15 – 45	N value range considered representative of stiff to very stiff cohesive soils. 2no. values with an N value of 50 terminated due to refusal.
	Glacial Sand and Gravel	8	N = 25 – 50 N_{60} = 22 - 47	Representative of medium dense to very dense granular soils.
	Structureless Chalk Dm	38	N = 4 - 47 N_{60} = 3 - 42	A degree of higher N values observed within each chalk stratum are likely due to contact

Cable Percussive Borehole Record

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Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609816.59	N: 312541.64
Location: Norwich Western Link	Consultant: Ramboll	Date: 14/09/2022 - 15/09/2022	
	Plant used: Dando 2000 Cable Percussive Rig	SPT Hammer Serial No:	

Geology Description	Legend	Depth (m)	Elevation (maOD) 49.97	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
TOPSOIL. Brown slightly gravelly clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint. *From 0.20m: Occasional pockets of slightly gravelly sandy clay.*		0.40	49.57	B1	0.10 - 0.30			
				D1	0.20			
				ES1	0.20			
				PID01	0.20	0.0ppm		
				HV01	0.40	71 kPa		
				PP01	0.40	170 kPa		
Firm to stiff brown slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint. *From 0.55m: Becoming gravelly. Gravel is sub-angular to sub-rounded fine to coarse flint and sub-angular to sub-rounded fine and medium chalk.* *From 0.90m: Pockets of orangish brown clayey fine to coarse sand.*		1.00	48.97	D2	0.50			
		1.20	48.77	ES2	0.50			
				ES3	0.50			
				PID02	0.50	0.1ppm		
				B2	0.60 - 0.80			
				HV02	0.70	73 kPa		
				PP02	0.70	130 kPa		
Firm to stiff brown slightly gravelly sandy CLAY with low cobble content and pockets of orangish brown clayey fine to coarse sand. Gravel is sub-angular to sub-rounded fine to coarse flint and sub-angular to sub-rounded fine and medium chalk. Cobbles are flint.				B3	1.00 - 1.20			
				D3	1.00			
				ES4	1.00			
				HV03	1.00	Material unsuitable for testing		
				PID03	1.00	0.1ppm		
				PP03	1.00	Material unsuitable for testing		
Firm to stiff greyish brown slightly sandy gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint and chalk. *From 1.40m: Becoming brownish grey.*		3.30	46.67				14/09/2022 - 1.20 - (Dry)	
							15/09/2022 - 1.20 - (Dry)	
Stiff grey slightly sandy gravelly CLAY with rare pockets of orangish brown fine to coarse sand. Gravel is angular to sub-rounded fine to coarse chalk.				D4	1.30 - 1.40			
				UT1	1.50 - 1.95	Blows = 48. 100% recovered.		
				D5	1.95 - 2.00			
				ES5	2.00			
				PID04	2.00	0.2ppm		
				B4	2.30 - 2.50			
				D6	2.30 - 2.40			
				UT2	2.50 - 2.95	Blows = 38. 100% recovered.		
Borehole terminated at 5.00m: Target depth		5.00	44.97	D7	2.95 - 3.00			
				ES6	3.00			
				PID05	3.00	0.3ppm		
				D8	3.30 - 3.40			
				B5	3.40 - 3.50			
				UT3	3.50 - 3.95	Blows = 52. 100% recovered.		
				D9	3.95 - 4.00			
				D10	4.30 - 4.40			
				B6	4.40 - 4.50			
				UT4	4.50 - 4.95	Blows = 38. 100% recovered.		
				D11	4.95 - 5.00			
							15/09/2022 - 5.00 1.50 (Dry)	

Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
										No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
5.00	150	1.50	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 50mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted with geosock, fitted with cap and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 1.00m bentonite pellets, 1.00m to 5.00m gravel.

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Drilled by: A. Elshof | Logged by: C. Cooper | Checked by:

Cable Percussive Borehole Record

BH262 | Sheet 1 of 1

harrisongroup ENVIRONMENTAL

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609812.36	N: 312533.95
Location: Norwich Western Link	Consultant: Ramboll	Date: 13/09/2022 - 22/09/2022	
	Plant used: Dando 2000 Cable Percussive Rig	SPT Hammer Serial No: AR3538 (ER: 56%)	

Geology Description	Depth (m)	Elevation (maOD) 49.81	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)
TOPSOIL. Dark orangish brown gravelly clayey fine to coarse SAND with occasional pockets of sandy gravelly clay. Gravel is sub-angular to sub-rounded fine to coarse flint.			D1	0.10		
			ES1	0.10		
	0.40	49.41	PID01	0.10	0.0ppm	
Firm to stiff dark orangish brown slightly sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint.			B1	0.20 - 0.30		
			D2	0.50		
From 0.60m: Occasional chalk gravel.			ES2	0.50		
From 0.75m: Becoming sandy clay.	0.95	48.86	HV01	0.50	85 kPa	
			PID02	0.50	0.0ppm	
Firm to stiff orangish brown slightly sandy gravelly CLAY. Gravel is sub-rounded fine to coarse flint and chalk.	1.35	48.46	PP01	0.50	160 kPa	
			B2	0.60 - 0.90		
From 1.05m to 1.20m: Band of orange slightly gravelly clayey fine to coarse SAND. Gravel is sub-rounded fine to coarse chalk and flint.			HV02	0.80	74 kPa	
			PP02	0.80	130 kPa	
From 1.20m: Becoming slightly gravelly very sandy. Gravel becoming sub-angular to sub-rounded.			B3	1.10 - 1.20		
			D3	1.10		
			ES3	1.10		
			PID03	1.10	0.0ppm	
Stiff greyish brown slightly sandy gravelly CLAY with low cobble content. Gravel is sub-angular to sub-rounded fine to coarse chalk and flint. Cobbles are flint.			D4	1.20 - 1.30		
						13/09/2022 - 1.20 - (Damp)
						22/09/2022 - 1.20 - (Dry)
			D5	1.40 - 1.50		
			UT1	1.50 - 1.95	Blows = 80. 100% recovered.	
			D6	1.95 - 2.00		
			B4	2.00 - 2.30		
			ES4	2.00		
			PID04	2.00	0.1ppm	
			D7	2.40 - 2.50		
			UT2	2.50 - 2.95	Blows = 80. 100% recovered.	
			D8	2.95 - 3.00		
			B5	3.00 - 3.30		
	5.10	44.71	ES5	3.00		
Initially medium dense becoming very dense orangish brown slightly gravelly slightly clayey medium to coarse SAND. Gravel is sub-rounded fine and medium flint.			PID05	3.00	0.0ppm	
			D9	3.30 - 3.40		
From 5.50m: Becoming clayey.			UT3	3.50 - 3.95	Blows = 74. 100% recovered.	
			D10	3.95 - 4.00		
			B6	4.00 - 4.30		
			D11	4.40 - 4.50		
			UT4	4.50 - 4.95	Blows = 62. 100% recovered.	
			D12	4.95 - 5.00		
			D13	5.10 - 5.20		
			B7	5.20 - 5.50		
			SPT(S)	5.50	N=28 (3,4/6,7,7,8)	1.50 (Dry)
			B8	5.50 - 6.00		
			D14	5.50 - 5.95		
			D15	6.50 - 6.60		
			SPT(S)	7.00	50 (3,5/24,26,0 for 0mm)	7.00 (6.80)
			B9	7.00 - 7.50		
			D16	7.00 - 7.30		
			D17	8.00 - 8.10		
			SPT(C)	8.50	50 (3,6/11,13,17,9 for 0mm)	8.50 (Dry)
			B10	8.50 - 9.00		
			D18	9.50 - 9.60		
Borehole terminated at 10.00m: Target depth	10.00	39.81	SPT(C)	10.00	50 (5,9/24,26,0 for 0mm)	10.00 (Dry) 22/09/2022 - 10.00 10.00 (Dry)

Installation & Backfill

Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
		6.40 - 10.00	640							No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
10.00	150	10.00	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 50mm standpipe GL to 1.50m plain, 1.50m to 2.50m slotted with geosock, fitted with cap and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 1.50m bentonite/cement pellets, 1.50m to 2.50m gravel, 2.50m to 10.00m bentonite/cement pellets.

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Drilled by: A. Elshof | Logged by: T. Leather-Younghusband | Checked by:

Cable Percussive Borehole Record

BH263

Sheet 1 of 1

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609803.57	N: 312548.96
Location: Norwich Western Link	Consultant: Ramboll	Date: 15/09/2022 - 20/09/2022	
	Plant used: Dando 2000 Cable Percussive Rig	SPT Hammer Serial No:	

Geology Description	Legend	Depth (m)	Elevation (maOD) 50.27	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
TOPSOIL. Dark brown gravelly clayey fine to coarse SAND with occasional pockets of sandy gravelly clay. Gravel is sub-angular to sub-rounded fine to coarse flint.				B1	0.10 - 0.30			
				D1	0.10			
		0.40	49.87	ES1	0.10			
				PID01	0.10	0.5ppm		
Firm to stiff orangish brown slightly sandy gravelly CLAY with rare pockets of gravelly clayey fine to coarse sand. Gravel is sub-angular to sub-rounded fine to coarse flint.				B2	0.50 - 0.70			
From 0.80m: Occasional black specks.		0.95	49.32	D2	0.50			
From 0.90m: Occasional gravel of sub-rounded fine to coarse chalk.				ES2	0.50			
				HV01	0.50	Material unsuitable for testing		
				PID02	0.50	0.4ppm		
		1.50	48.77	PP01	0.50	Material unsuitable for testing		
Firm to stiff greyish brown slightly sandy gravelly CLAY with low cobble content. Gravel is sub-angular to sub-rounded fine to coarse flint and chalk. Cobbles are flint.				HV02	0.80	Material unsuitable for testing		
				PP02	0.80	Material unsuitable for testing		
				B3	1.00 - 1.20			
Firm to stiff brownish grey slightly sandy gravelly CLAY with occasional pockets of gravelly clayey fine to coarse sand. Gravel is sub-rounded fine to coarse chalk and flint.				D3	1.00			
				ES3	1.00			
				HV03	1.00	Material unsuitable for testing		
				PID03	1.00	0.4ppm		
				PP03	1.00	Material unsuitable for testing		
From 3.00m: Sand pockets no longer present.				D4	1.20 - 1.30		15/09/2022 - 1.20 - (Dry) 20/09/2022 - 1.20 - (Dry)	
Stiff dark grey slightly sandy gravelly CLAY. Gravel is sub-rounded fine to coarse chalk with occasional flint.		3.60	46.67	UT1	1.50 - 1.95	Blows = 80. 100% recovered.		
				D5	1.95 - 2.00			
				B4	2.00 - 2.30			
				ES4	2.00			
				PID04	2.00	0.0ppm		
				D6	2.40 - 2.50			
				UT2	2.50 - 2.95	Blows = 76. 100% recovered.		
				D7	2.95 - 3.00			
Borehole terminated at 5.00m: Target depth		5.00	45.27	B5	3.00 - 3.30			
				ES5	3.00			
				PID05	3.00	0.0ppm		
				D8	3.40 - 3.50			
				UT3	3.50 - 3.95	Blows = 78. 100% recovered.		
				D9	3.95 - 4.00			
				B6	4.00 - 4.30			
				D10	4.40 - 4.50			
				UT4	4.50 - 4.95	Blows = 64. 100% recovered.		
				D11	4.95 - 5.00			
							20/09/2022 - 5.00 1.50 (Dry)	

Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
										No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
5.00	150	1.50	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 50mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted with geosock, fitted with cap and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 1.00m bentonite pellets, 1.00m to 5.00m gravel.

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Cable Percussive Borehole Record

BH264

Sheet 1 of 2

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609798.87	N: 312540.59
Location: Norwich Western Link	Consultant: Ramboll	Date: 14/09/2022 - 21/09/2022	
	Plant used: Dando 2000 Cable Percussive Rig	SPT Hammer Serial No: AR3538 (ER: 56%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 50.20	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
TOPSOIL. Brown gravelly clayey fine and medium SAND. Gravel is angular to sub-rounded fine to coarse flint.		0.30	49.90	B1	0.10 - 0.25			
				D1	0.10			
Firm brown slightly sandy slightly gravelly CLAY with pockets and partings of orangish brown silt and fine sand. Gravel is sub-angular to sub-rounded fine to coarse flint. Rare black staining.				ES1	0.10			
				PID01	0.10	0.3ppm		
				B2	0.40 - 0.65			
				D2	0.40			
		1.05	49.15	ES2	0.40			
Soft to firm orangish brown slightly gravelly very sandy CLAY. Gravel is sub-angular to sub-rounded fine and medium occasionally coarse flint and chalk.				HV01	0.40	64 kPa		
				PID02	0.40	0.5ppm		
				HV02	0.70	83 kPa		
				D3	0.90			
				ES3	0.90			
				PID03	0.90	0.6ppm		
				HV03	1.00	61 kPa		
		2.30	47.90	B3	1.10 - 1.20			
Stiff brownish grey slightly sandy gravelly CLAY. Gravel is sub-rounded fine to coarse chalk with occasional flint.				D4	1.10			
				ES4	1.10			
				PID04	1.10	0.3ppm		
							14/09/2022 - 1.20 - (Dry)	
							20/09/2022 - 1.20 - (Dry)	
From 3.50m to 5.20m: Becoming greyish brown.				D5	1.30 - 1.40			
				UT1	1.50 - 1.95	Blows = 80. 100% recovered.		
				D6	1.95 - 2.00			
				B4	2.00 - 2.30			
				ES5	2.00			
				PID05	2.00	0.0ppm		
				D7	2.40 - 2.50			
				UT2	2.50 - 2.95	Blows = 47. 100% recovered.		
				D8	2.95 - 3.00			
				ES6	3.00			
From 5.20m: Becoming firm to stiff and orangish brown.				PID06	3.00	0.1ppm		
		5.40	44.80	D9	3.10 - 3.20			
Firm to stiff orangish brown very sandy CLAY.				B5	3.20 - 3.50			
		5.70	44.50	UT3	3.50 - 3.95	Blows = 80. 44% recovered.		
Brownish orange slightly clayey medium and coarse SAND.				B6	3.75 - 4.25			
				D10	3.95 - 4.00			
		6.10	44.10	D11	4.40 - 4.50			
Medium dense becoming dense brownish orange slightly gravelly slightly clayey medium and coarse SAND. Gravel is sub-rounded fine to coarse flint.				UT4	4.50 - 4.95	Blows = 60. 100% recovered.		
From 6.60m: Becoming gravelly.				D12	4.95 - 5.00			
				B7	5.00 - 5.20			
				D13	5.40 - 5.50			
				UT5	5.50 - 5.95	Blows = 60. 100% recovered.		
				B8	6.00 - 6.50			
				D14	6.10 - 6.20			
							20/09/2022 - 6.50 1.50 (Dry)	
							21/09/2022 - 6.50 1.50 (Dry)	
				SPT(S)	7.00	N=25 (9,5/6,5,6,8)	7.00 (0.00)	
				B9	7.00 - 7.50			
				D15	7.00 - 7.45			
				B10	8.00 - 8.50			
				D16	8.00 - 8.10			
				SPT(S)	8.50	N=38 (3,6/7,8,11,12)	8.50 (0.00)	
				D17	8.50 - 8.95			
				D18	9.50 - 9.60			
				SPT(S)	10.00	N=47 (4,7/7,10,14,16)	10.00 (Dry)	
				D19	10.00 - 10.45			

Chiselling Details		Water Added Records	
Depths (m)	Duration (hh:mm)	Depths (m)	Litres
		6.50 - 9.00	1000
		9.00 - 10.00	120

Water Strike						
Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
						No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
10.00	150	10.00	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation 50mm standpipe GL to 6.00m plain, 6.00m to 8.00m slotted with geosock, fitted with cap and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 6.00m bentonite/cement pellets, 6.00m to 8.00m gravel, 8.00m to 10.45m bentonite/cement pellets.

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Cable Percussive Borehole Record

BH264

Sheet 2 of 2

Project ID: **NCCT41793**	Client: Ferrovial Construction (UK) Limited	E: 609798.87	N: 312540.59
Location: Norwich Western Link	Consultant: Ramboll	Date: 14/09/2022 - 21/09/2022	
	Plant used: Dando 2000 Cable Percussive Rig	SPT Hammer Serial No: AR3538 (ER: 56%)	

Geology Description	Legend	Depth (m)	Elevation (maOD) 50.20	Sample / In-Situ Test Information: Type	Depth	Results / Remarks	Date - Depth (m) Casing (Water)	Installation & Backfill
Medium dense becoming dense brownish orange slightly gravelly slightly clayey medium and coarse SAND. Gravel is sub-rounded fine to coarse flint.		10.45	39.75				21/09/2022 - 10.45 10.00 (Dry)	
Borehole terminated at 10.45m: Target depth								

Chiselling Details		Water Added Records		Water Strike						
Depths (m)	Duration (hh:mm)	Depths (m)	Litres	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
		6.50 - 9.00 9.00 - 10.00	1000 120							No groundwater encountered

Hole Diameter by Depth		Casing Diameter by Depth	
Depth (m)	Diameter (mm)	Depth (m)	Diameter (mm)
10.00	150	10.00	150

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation 50mm standpipe GL to 6.00m plain, 6.00m to 8.00m slotted with geosock, fitted with cap and tophat cover.
3. Backfill: GL to 0.50m concrete, 0.50m to 6.00m bentonite/cement pellets, 6.00m to 8.00m gravel, 8.00m to 10.45m bentonite/cement pellets.

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Drilled by: A. Elshof | Logged by: T. Leather-Younghusband | Checked by:

ferrovial construction

RAMBOLL

Norfolk County Council

Norwich Western Link

DOCUMENT TITLE*:
Ground Investigation Report

DOCUMENT NUMBER*	NCCT41793-RAM-HGT-FSC-RP-GI-0002

STATUS*	S5 - Suitable for Review and Acceptance (appointing party)	Date*:	03/02/2023
		Revision*:	P04
ASITE Task ID:			

Prepared by*	Checked by*	Approved by*
Jack So/Colin Millard/Andy Rose Engineer/Principal Engineer/Technical Director (RAM)	José María Aniceto Barranco Geotechnical Lead (FER)	Francisco J Quesada Engineering Manager (FER)

*Details correct at time of upload to ASITE. Check ASITE for current document status, and Workflows Approval
*Note that Asite 'Purpose of Issue' Attribute is the same as the ISO19650 'STATUS'

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Revision History			
Rev No	Date	Summary of Changes	Section or Page Number
P01	14/04/2022	First issue	-
P02	28/04/2022	Second issue - Drawing NCCT41793-RAM-HGT-MLE-DR-GI-2603 attached.	Appendix 1
P03	10/06/2022	Third issue incorporating Ferrovial comments	Section 5 and Section 7. Risk Register.
P04	03/02/2023	Fourth issue – Incorporating NCC comments on P03 and data from the 2022 Alignment Refinement Ground Investigation. Report updated to cover the entire scheme.	Full report

2. Contents

3. Executive Summary

Ramboll UK Limited has been commissioned by Ferrovial Construction (UK) Limited to carry out the detailed design of the Norwich Western Link (NWL) road scheme. This Ground Investigation Report (GIR) combines and builds on existing geotechnical reports (including Technical Notes produced by Ramboll and the preliminary sources study reports prepared by WSP) and data from all ground investigations carried out specifically for the scheme.

This report has been prepared following the requirements of CD 622 - Managing Geotechnical Risks (DMRB, 2020). The main objective is to present a design ground model and geotechnical risk register for the scheme and establish site-wide characteristic values of geotechnical parameters. The information presented will be used as the basis for the detailed design of each element of the scheme. In addition, the geotechnical risk register will be continuously reviewed during the design process and updated where necessary.

The mainline road alignment has been refined between the A1067 Fakenham Road and CH2400. Therefore, the previous versions of this GIR are considered suitable for informing the design between CH2400 to CH5635 only.

This GIR has been updated to incorporate data obtained along the entire road alignment and the 2022 Alignment Refinement Ground Investigation. Section 5 presents a review of all existing geotechnical information available and remains relevant to the scheme following the refinement process. The geotechnical assessment and interpretation presented in Section 7 have been revised accordingly.

along the scheme. These aerial photographs give a current and historical overview of the area's layout and help identify features that would influence the design.

An assessment of the historical aerial photography is presented in the Interpretative Environmental Desk Study Report (ref. NCCT41793-04-B-06-02). Photographs of the site can also be found in the Photo Location Plan and Photos (ref. NCCT41793-04-B-17-01).

5.5. Hydrology and Hydrogeology

The entire NWL scheme is located within a Groundwater Source Protection Zone (SPZ) Total Catchment Zone 3. The purpose of SPZs is to provide additional protection to safeguard drinking water quality by constraining the proximity of an activity that may impact drinking water. Zones are defined by groundwater travel times to an abstraction. SPZ Total Catchment Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source and defined by a 400-day travel time to the source.

There are no groundwater abstraction locations along the scheme. However, two lie within 250m of the mainline. The closest abstraction is located 16m east of the mainline (south of the A1067) for general farming and domestic use and is abstracted from the chalk aquifer.

Maps and further information on water and hydrology can be found within the Envirocheck Reports provided in the Interpretative Environmental Desk Study Report (ref. NCCT41793-04-B-06-02).

5.5.1. Surface Water Features

The River Wensum and associated floodplains are located in the northern section of the NWL mainline. There are also multiple small unnamed inland river water features along the scheme. The River Tud runs approximately 400m south of the mainline with an orientation of east to west.

The River Wensum is the only main river crossed by the NWL. It is a low gradient groundwater (chalk aquifer) dominated river that flows south-easterly for approximately 78 km through the county of Norfolk, from its source (at an altitude of 75m) on Colkirk Heath near South Raynham and Whissonsett to its confluence with the River Yare in Norwich. The river typology for the entire study area is classified as a 'Group A: lowland river with shallow gradients and rich geology; Type III Chalk river and other base-rich rivers with stable flows'. (JNCC, 2019)

The floodplain of the River Wensum mainly comprises managed grassland with areas of fen, wet grassland, woodland and wet woodland. Historically, the floodplain has been drained for agricultural purposes and managed by the Norfolk Rivers Internal Drainage Board (IDB). The drains run parallel to the river and join the main channel below each impoundment.

Flooding from the River Wensum in the vicinity of the NWL scheme is confined mainly to the surrounding wet grassland and open green space. Furthermore, flooding was noted during the 2019/2020 Preliminary and 2021 Supplementary Stage 1 GI. Figure 5-2 and Figure 5-3 are photos of the floodplain taken during the 2021 GI, where the water level rose circa. 0.20 to 0.25m above ground level following two days of rain.

The River Tud, a main river and tributary of the River Wensum, is located approximately 300m south of the scheme's southern extent. The River Tud rises from its source on East Dereham and flows in an easterly direction for approximately 27 km to its confluence with the River Wensum below Hellesdon Mill, approximately 14.8 km downstream of the NWL.

Figure 5-2 River Wensum floodplain – Photos were taken on 14/10/2021

Figure 5-3 River Wensum floodplain - Photos were taken on 22/10/2021

5.5.2. Bedrock Aquifers and Groundwater Bodies

The Envirocheck report classifies the Chalk formation as a Principal Aquifer. The Environment Agency describes these as 'layers of rock or drift deposits that have a high level of water storage'. Although the formation is highly porous and allows water to flow within the strata (greater than 30%), the groundwater flow occurs predominantly through fissures in the rock.

The Lowestoft Formation, Alluvium and River Terrace Deposits are classified as Secondary A Aquifers by the Environment Agency. Secondary A Aquifers are permeable strata capable of supporting water supplies at a local rather than strategic scale and, in some cases, forming an important source of baseflow to rivers. The Head Deposits are classified as Secondary B Aquifers. These are defined as having low permeability layers that may store and yield limited amounts of groundwater but may support local water supplies. The Sheringham Cliffs Formation is classified as both a Secondary A and Secondary Undifferentiated Aquifers by the Environment Agency. Secondary Undifferentiated Aquifers are geologies that have historically been classed as either Secondary A or B Aquifers.

5.6. Land use and Soil Survey Information

The site comprises individual parcels of agricultural farmland, with sections of woodland and the Wensum Valley floodplain. The land predominantly comprised stubble fields or lightly cultivated agricultural land, with areas of the floodplain comprising rough grassland used for grazing cattle.

The surrounding area is predominantly agricultural or wooded land with occasional residential properties and farm buildings. Multiple villages are also present within the vicinity of the Site: Attlebridge to the north, Ringland to the east, Honingham to the south, and Weston Green and Weston Longville to the west.

5.7. Archaeological and Historical Investigations

WSP undertook a Historic Environment Walkover Survey in November 2019 to assess the heritage assets potentially affected by the NWL scheme. Findings from the survey and recommendations for future work are presented in the Historic Environment Walkover Survey report (ref. NCCT41793-04-B-06-20).

The Environmental Impact Assessment Scoping Report (ref. NCCT41793-04-B-06-07) and EIA reports prepared for the scheme should be referred to for further information.

5.8. Existing Ground Investigations

Three ground investigations have been completed, and they are referred to as the following in this report:

- 2019/2020 Preliminary GI;
- 2021 Supplementary Stage 1 GI; and
- 2022 Alignment Refinement GI.

The preliminary ground investigation was carried out by Norfolk Partnership Laboratory, part of Norse (Eastern) and formerly part of Norfolk County Council, under the supervision of WSP between August 2019 and September 2020. The results from this GI are presented in the following:

- WSP (2020) Norwich Western Link Factual Report (ref. NCCT41793-04-B-02-04); and
- WSP (2020) Norwich Western Link Ground Investigation Report (ref. NCCT41793-04-B-12-03).

Ramboll has reviewed data from the 2019/2020 Preliminary GI during the tender stage. The findings and discussions of the results are presented in the following technical note: Derivation of Preliminary Values of Geotechnical Parameters for Tender Design (ref. NCCT41973-02-B-02).

The supplementary ground investigation commenced in September 2021 and was carried out by Harrison Group Environmental Limited. The intrusive investigation was stopped early on the instruction from the Norfolk County Council in December 2021. Subsequently, six groundwater and ground gas monitoring rounds were completed in the following months. The objective of the investigation was to target areas along the proposed route where data gaps have been highlighted during the tender to progress the detailed design. Findings and test results can be found in the Factual Ground Investigation Report (ref. NCCT41793-HAG-VGT-FSC-RP-GI-0001).

In previous versions of this GIR, the data obtained between mainline CH2400 to 5635 were reviewed and presented. It was noted that in contrast to the 2021 Supplementary Stage 1 GI findings, a minimal quantity of cohesive soils was encountered during the 2019/2020 Preliminary GI towards the southern end of the scheme.

Following the alignment refinement process, Harrison Group Environmental Limited was instructed in 2022 to conduct an additional phase of ground investigation targeting the realigned mainline. Fieldwork commenced in May and concluded in August 2022. However, several planned exploratory holes were not completed due to access restrictions within the woodland parcels. As a result, site work was remobilised between September and October 2022 to complete the remaining investigation. This involved work in the woodland parcels and additional investigation at the GB5 Nursery Woodland Green Bridge and the A47 tie-in. At the time of writing, groundwater and ground gas monitoring is ongoing and will comprise six rounds. The findings of the summer and autumn phases of GI are presented in the factual reports NCCT41793-HAG-VGT-FSC-RP-GI-0002 and NCCT41793-HAG-VGT-FSC-RP-GI-0003, respectively.

Exploratory hole locations along the scheme and the refined alignment are presented in the geological long sections in Appendix 1. An overview of the ground conditions across the site, considering all available data, is presented in Section 7.

5.9. Consultation with Statutory Bodies and Agencies

During the preliminary sources study phase of the scheme, statutory and non-statutory authorities were contacted to obtain geological, environmental, and public register information for the preliminary sources studies. Specific consultations are outlined within the reports listed in Section 4.4.

5.10. Flood Records

WSP prepared a Flood Risk Appraisal (ref. NCCT41793-00-A-05) in May 2020, which summarises flooding issues that may affect and be affected by the NWL. It also recommends measures and further analysis to be considered during detailed design.

A review of the Environment Agency Flood Map for Planning, which depicts flood risk from main rivers and the sea, indicates that the scheme is located predominantly in the low-risk Flood Zone 1, where the annual probability of flooding is less than 1 in 1000 (0.1%). However, the scheme intersects the floodplain of the River Wensum located in the medium risk Flood Zone 2 and high-risk Flood Zone 3. Flood Zone 2 is defined as land with an annual probability of fluvial flood risk of between 1 in 100 (1%) and 1 in 1000 (0.1%), and Flood Zone 3 is defined as land with an annual probability of fluvial flood risk of greater than 1 in 100 (1%).

Between the A47 and River Wensum floodplain, the scheme intersects an unnamed ordinary watercourse and other minor watercourses (i.e. streams and drainage ditches). Flood risk from these watercourses was not assessed in the preliminary FRA, and other flood risk assessments prepared for the scheme should be referred.

5.11. Potentially Contaminated Land

A review of publicly available historical maps and site plans to identify former land uses and potential contaminative activities on and surrounding the site is presented in the Interpretative Environmental Desk Study Report (ref. NCCT41793-04-B-06-02). The report suggests that the risks of contamination are medium to low.

Broadland District Council was contacted as part of the desk study in November 2019 regarding environmentally pertinent information relating to the site. The council has not declared any sites as contaminated within the NWL boundary as defined under the regulations.

Detailed contamination assessment is provided separately in the Ground Contamination Interpretive Report (ref. NCCT41793-RAM-EGT-FSC-RP-NZ-0003) prepared by Ramboll. The following is a summary of the key findings from the assessment:

- There are very few exceedances of the client specified soil assessment criteria. The majority of exceedances are of PAHs within the Pavement cores, likely related to tar within bound surfacing;
- The majority of the soil samples have tested as non-hazardous, except for the pavement cores that are hazardous for the PAH concentrations;
- Only a limited number of groundwater monitoring wells produce enough water for samples to be taken. However, of the samples collected, most of the results are within the client specified assessment criteria / EQS; and
- At the time of writing, two rounds of monitoring have been carried out. Gas monitoring information appears to be variable, with some high levels of carbon monoxide in some wells. Further analyses will be carried out following subsequent monitoring visits.

5.12. Records of Mines and Mineral Deposits

An overview of the BGS recorded mineral sites and their proximity to the mainline is presented in the Geotechnical Desk Study (ref. NCCT41793-04-B-02-01). The report indicated thirteen recorded pits along the NWL, and Table 5-1 highlights the mineral sites within 100m of the mainline.

The desk study also summarised the mining and ground stability hazard from the Envirocheck reports. The potential of ground stability hazards is generally very low to low. However, there is moderate potential for compressible ground stability hazards at the southern end of the scheme. In addition, there is a high potential for ground dissolutions stability hazards near River Wensum and the floodplain.

Table 5-1 Opencast and ceased mineral sites near the NWL mainline

Location Ref *	Name	Commodity	Proximity to the mainline
28 & 29	Attlebridge Hall Marl Peat	Chalk	42.0m from the A1067 Fakenham Road single-carriageway near CH120
20	Mousewood Farm Clay Pit	Common clay and shale	43.0m from Basin 5
18	Old Covert Marl Pit	Common clay and shale	33.0m from the mainline near CH5130
5	Honingham Pit	Common clay and shale	44.0m from the mainline near CH5550
* Location reference as per Table 3-3 of the Geotechnical Desk Study (ref. NCCT41793-04-B-02-01)			

The presence of multiple historic mines and pits within the site boundary presents a hazard for the scheme, though they are not near the proposed structures. Limited information about the pit construction or the filling works undertaken is known. Some locations are also identified as unfilled and remain as ponds, with no details on the depth. All material extraction sites identified are recorded as being opencast mines.

One location of ground depression was observed during the preliminary GI, which was not recorded in the Envirocheck database. The depression is located 80m from the Breck Road/The Broadway junction and 280m from the mainline alignment. Further details on this feature can be found in the preliminary Ground Investigation Report (ref. NCCT41793-04-B-12-03). No historic mines and pits were noted during the 2021 Supplementary Stage 1 GI and 2022 Alignment Refinement GI. Unrecorded opencast mines should be considered a potential health and safety hazard during construction.

6. Field and Laboratory studies

For details of the 2019/2020 Preliminary GI and the 2021 Supplementary Stage 1 GI, references should be made to:

- WSP (2020) Norwich Western Link Factual Report (ref. NCCT41793-04-B-02-04); and
- Harrison Group Environmental Limited (2022) Norwich Western Link Factual Ground Investigation Report (ref. NCCT41793-HAG-VGT-FSC-RP-GI-0001).

The following sections present information relevant to the 2022 Alignment Refinement GI only.

6.1. Geomorphological/Geological Mapping and Topographic Survey

Geomorphological/geological mapping has not been carried out.

A topographic survey was carried out for the scheme by Survey Solutions. This is presented in NCCT41793-SSL-VTO-FSC-DP-GG-0010 and NCCT41793-SSL-VTO-FSC-DP-GG-0011.

6.2. Ground Investigations

Following the alignment refinement process, Harrison Group Environmental Limited was instructed in 2022 to conduct a ground investigation targeting the realigned mainline. Fieldwork commenced in May and concluded in August 2022. However, several planned exploratory holes were not completed due to access restrictions within the woodland parcels.

Site work was remobilised between September and October 2022 to complete the remaining investigation. Besides the remaining work in the woodland parcels, additional investigation at the GB5 Nursery Woodland Green Bridge and the A47 tie-in was carried out. The objective was to obtain information for the detailed design of the structure and provide monitoring installations near exploratory hole WS33 to verify the high groundwater levels recorded.

At the time of writing, groundwater and ground gas monitoring is ongoing and will comprise six rounds until Spring 2023.

The findings of the summer and autumn phases of GI are presented in the factual reports NCCT41793-HAG-VGT-FSC-RP-GI-0002 and NCCT41793-HAG-VGT-FSC-RP-GI-0003, respectively.

6.3. Description of Fieldwork

The scope of the Alignment Refinement GI was provided by Ramboll and detailed in the following documents:

- Ramboll (2022) Norwich Western Link Alignment Refinement Ground Investigation Scope Report (ref. NCCT41793-RAM-GEN-FSC-SO-GI-0091);
- Ramboll (2022) Norwich Western Link Supplementary Stage 1 + Alignment Refinement Ground Investigation Specification (ref. NCCT41793-RAM-GEN-FSC-SP-GI-0002 P04); and
- Ramboll (2022) Norwich Western Link Supplementary Stage 1 + Alignment Refinement + Additional Ground Investigation to the Alignment Refinement and Supplementary Ground Investigation Specification (ref. NCCT41793-RAM-GEN-FSC-SP-GI-0002 P06).

The following was undertaken during the summer phase of the Alignment Refinement GI:

- 22 no. cable percussive (CP) boreholes to a maximum depth of 30.0m;
- 32 no. cable percussive with rotary follow on (CP+RC) boreholes to a maximum depth of 60.6m;
- 2 no. rotary open boreholes to a maximum depth of 60.0m on the floodplain for monitoring installation;

- 12 no. dynamic continuous sampler (window sampler, WS) boreholes to a maximum depth of 10.5m. Eight of which terminated early due to refusal;
- 12 no. dynamic cone penetrometer (DCP) tests were completed to a maximum depth of 1.73m;
- 3 no. cone penetration tests (CPT) to a maximum depth of 24.6m;
- 61 no. machine excavated trial pits (TP) to a maximum depth of 5.00m;
- 5 no. machine excavated trial trenches to a maximum depth of 2.50m.;
- Hand excavated starter pits to a maximum depth of 1.20m;
- Sampling and soil logging;
- In-situ and laboratory testing; and
- Groundwater and ground gas monitoring.

Trial trenches TR201 – TR203 were completed at cut/fill transitions to investigate the ground conditions at subgrade level and inform the in-situ testing. TR202 was the first to be attempted as a continuous trench, and the ground conditions are recorded in logs TR202NW and TR202SE. However, due to side wall instability and collapse during excavation, thus forming a significant hazard, all trenches were subsequently completed as six individual trial pits. At each trench location, three pits were excavated end to end to the scheduled depth, and the remaining three were excavated adjacent to allow for in-situ testing. These are labelled as A-F in the trial trench logs.

TR204 and TR205 were additional trial trenches completed after potential waste-impacted soil from an existing backfilled pit was encountered during the archaeological investigation. The purpose was to identify the lateral extent of the backfilled pit and environmental sampling. They were undertaken as continuous trenches extending to a depth of 0.60m. Furthermore, one section of TR205 (TR205HP) was extended to 1.40m bgl to investigate the depth of the backfilled pit and obtain samples of the soil below.

The following was undertaken during the autumn phase of the Alignment Refinement GI:

- 8 no. cable percussive (CP) boreholes to a maximum depth of 60.0m;
- 3 no. dynamic continuous sampler (window sampler, WS) boreholes to a maximum depth of 3.45m;
- 3 no. dynamic cone penetrometer (DCP) tests were completed to a maximum depth of 1.73m;
- 3 no. machine excavated trial pits (TP) to a maximum depth of 2.40m;
- Hand excavated starter pits to a maximum depth of 1.20m;
- Sampling and soil logging;
- In-situ and laboratory testing; and
- Groundwater and ground gas monitoring.

6.4. In-situ Tests

The following in-situ tests were carried out during the Alignment Refinement GI:

- Standard penetration tests (SPT) were carried out generally at 1.0 to 1.5 meters intervals;
- Dynamic cone penetrometer (DCP) tests were carried out to measure in situ CBR values along the access track routes;
- Infiltration tests were carried out within several trial pits to measure infiltration rates at the drainage basin location;
- Falling head permeability tests were carried out in a shallow installation within Peat on the floodplain to inform the design of the temporary works platform and other elements of the scheme;
- Hand penetrometer and hand shear vane were used to measure the undrained shear strength of cohesive soils;
- Pressuremeter tests were undertaken by the specialist subcontractor, Cambridge In-Situ, using a reaming pressuremeter (RPM) and a high-pressure dilatometer (HPD). Tests were carried out in Chalk only on the River Wensum floodplain, though both the superficial soils and Chalk were tested at the RW1 Ancient Woodland Retaining Wall location. The test results can be found in Appendix C of the Factual Ground Investigation Report (ref. NCCT41793-HAG-VGT-FSC-RP-GI-0002);

- Plate loading, lightweight deflectometer and sand replacement density tests were carried out in several trial pit and trial trench locations to obtain in-situ CBR, modulus of subgrade reaction and in-situ dry density. Where cohesive soils or Peat deposits were encountered or where the ground was considered unsuitable for sand replacement density tests, a core cutter sample was taken instead to determine the bulk and dry density;
- Cone penetration tests (CPT) with measurement of pore water pressure were undertaken by Lankelma Limited. In addition, dissipation tests were also carried out, typically within cohesive soils.

6.5. Drainage Studies

In situ infiltration tests and groundwater monitoring at the drainage basins were carried out to inform the design. Refer to the Drainage Strategy report (ref. NCCT41793-RAM-HDG-MLE-SG-DZ-0001) and other relevant documents and drawings for further detail.

6.6. Geophysical Surveys

No geophysical survey was carried out in the past ground investigations for the scheme.

6.7. Pile Tests

No pile testing was carried out in the past ground investigations for the scheme.

6.8. Other Field Work

Monitoring standpipes of 19 and 50 mm were installed within a portion of the exploratory holes. At the time of writing, post-fieldwork monitoring is ongoing and comprises six rounds planned over six months until Spring 2023. Fieldwork during the return visits includes:

- Water level reading;
- Ground gas measurement; and
- Collect water samples.

6.9. Laboratory Investigation

Geotechnical and geo-environmental laboratory tests were scheduled by Ramboll on samples obtained from the exploratory holes. This is outlined in Section 6.9.1.

The laboratory testing also comprises a series of stabilisation tests to inform the capping and pavement design. These tests are ongoing at the time of writing. Therefore, the results are not presented in this report and will be reported separately.

6.9.1. Description of Tests

Table 6-1 outlines the geotechnical laboratory tests scheduled on selected samples from the 2022 Alignment Refinement GI.

7. Ground Summary

This section presents the interpretation of the available information discussed in Sections 5 and 6. It is supplemented by geological long sections of the mainline presented in Appendix 1 of this report. All geological strata encountered during the ground investigations along the entire scheme are discussed. For location-specific information, refer to the respective Geotechnical Design Report.

7.1. Geology

The geological formations encountered during the ground investigations are presented in this section.

The underlying bedrock along the NWL scheme is Chalk, which comprises the undifferentiated components of the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation. This is overlain by superficial deposits comprising localised Peat, Alluvium and River Terrace Deposits encountered across the Wensum floodplain. Granular glacial deposits and cohesive glacial till were encountered elsewhere across the site.

Made Ground was encountered at several exploratory hole locations typically adjacent to the existing roads.

7.1.1. Topsoil

The ground surface at the exploratory hole locations typically comprised stubble fields or lightly cultivated agricultural land, with areas of the floodplain comprising rough grassland.

Topsoil was encountered in most of the exploratory holes across the site. The stratum is typically 0.30 to 0.50m thick. However, there are isolated locations where Topsoil was encountered up to 0.80 to 1.00m deep. The material is predominantly granular and generally described as 'slightly gravelly clayey fine to medium SAND. Gravel is sub-angular to sub-rounded fine to coarse flint. Occasional fine rootlets.'

Cohesive Topsoil was occasionally encountered in exploratory holes on the River Wensum floodplain and between mainline CH5250 to CH5550. On the floodplain, it has been described as a slightly gravelly sandy CLAY. Towards the southern end of the scheme, it has been described as a sandy very gravelly CLAY.

7.1.2. Made Ground

Made Ground was typically encountered in exploratory holes adjacent to existing roads and earthworks. However, it was found occasionally on arable lands.

Asphalt and tarmac encountered at the pavement core locations have an average thickness of 0.16m. Concrete was also found at several locations below the pavement, typically 0.10 to 0.20m thick. The sub-base material along the A1067 Fakenham Road is generally described as 'Pink very sandy slightly silty angular to sub-angular fine to coarse GRAVEL of medium-grained igneous rock.' The sub-base was proven at WS35 (windowless sample follow-on at PC-002) and recorded as 0.29m thick.

Granular Made Ground was encountered adjacent to the A1067 Fakenham Road (TP04 and TP05), near the past alignment of Fakenham Road (WS02, WS03 and 122), and adjacent to access roads within a land parcel at TP10. Within the trial pits, the stratum has been typically described as 'Dark brown slightly gravelly slightly silty fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint. Occasional rootlets. The average thickness of the stratum encountered was 0.50m.

Granular Made Ground along the past alignment of Fakenham Road is highly variable, and reference should be made to the fieldwork records for detailed descriptions of the materials encountered on each occasion. The thickness of the stratum encountered was between 0.30 to 0.55m, with an average of 0.42m. Two descriptions of the stratum are identified as follows:

- Made ground comprising concrete, asphalt and flint gravel in a light brown matrix of clayey, fine to coarse sand.
- Dark brown slightly gravelly slightly silty fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse flint. Occasional rootlets.

Between CH780 to 900, CH1200 to 1400 and CH1690 to 1850, Made Ground was occasionally noted where the mainline crosses lightly cultivated land parcels. The Made Ground was limited to surficial soils, typically described as dark brown gravelly slightly clayey SAND with anthropogenic constituents noted to comprise occasional or rare brick fragments. The stratum encountered is generally 0.10 to 0.40m thick from the ground surface. The thickest layer of Made Ground was encountered in BH245 at CH1690, where a layer of granular Made Ground from GL to 1.70m bgl was underlain by cohesive Made Ground to 2.5m bgl. The material is considered to represent possible reworked material with occasional fine brick fragments noted throughout. It was described as the following in the exploratory hole log:

- Orangish brown very gravelly slightly silty fine to coarse SAND with low cobble content; and
- Soft to firm dark brown very sandy silty CLAY with occasional pockets of brown slightly gravelly clayey sand and occasional pockets of structureless Chalk.

Potentially waste-impacted soil was encountered near mainline CH1130 and the RW1 Ancient Woodland Retaining Wall during the archaeological investigation in 2022. Subsequently, additional intrusive investigations were completed as part of the Alignment Refinement GI to determine the extent and depth of the impacted soil. These are TR204 and TR205. Dark brown gravelly SAND was encountered with frequent pockets of black ash, burnt wood, charcoal, electrical cables, plastic and ropes. See Figure 7-1. The location is likely used as a waste pit and has been backfilled at the time of the investigation. The depth of the impacted soil was proven in TR205HP to be 1.10m deep. Additional photograph records at TR204 and TR205 are available in Appendix 5.

No granular Made Ground was encountered between CH2400 to CH5635 of the site.

Cohesive Made Ground was encountered at borehole 001 near an existing concrete paved area and WS28 adjacent to the existing road 'The Broadway'. At borehole 001, the stratum was found below the Topsoil at 0.45 metres depth and is 0.25m thick. At WS28, the cohesive Made Ground was encountered at the ground surface and extended to 0.40m depth. The material was described as follows:

- Dark brown slightly gravelly very sandy silty CLAY. Gravel is sub-angular to sub-rounded fine to coarse flint with rare brick. Occasional rootlets.
- Stiff light brown very sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-rounded fine to medium flint, Chalk and granite subbase.

Figure 7-1 Backfilled waste pit at TR204 and TR205

7.1.3. Peat

Peat was locally encountered in exploratory holes on the River Wensum valley floodplain, typically found at locations on either side of the river and parts of the floodplain extending south from the river. The Peat encountered is generally formed of accumulated dead vegetation in various decomposition stages. This accumulation was observed to be particularly significant near a water reservoir which promotes growth and preserves the plant remains, see Figure 7-2 and Figure 7-3.

Figure 7-2 Peat on the River Wensum floodplain noted during the 2021 Supplementary Stage 1 GI.

Figure 7-3 Peat encountered at TP247A during the 2022 Alignment Refinement GI

Based on the environment in which the Peat was encountered, the formation can be categorised as a Fen, predominantly fed by groundwater or flowing water sources. A review of the material descriptions shows pseudo-fibrous Peat is the dominant material type, and amorphous Peat was occasionally found. This suggests there is limited to no recognisable plant structure in the Peat and no strength of the apparent plant material. The condition is typically recorded as spongy, indicating it is very compressible with an open material structure.

The local presence of fibrous Peat was occasionally noted in separate locations: BH211, BH212, BH221 and TP246. The fibrous Peat is recorded to be 0.30 to 1.30m thick, and in BH211, it was found below a layer of pseudo-fibrous material.

In general, the stratum underlies the Topsoil, and the thickness varies across the floodplain. It has been recorded as 0.23 to 2.72m thick, with an average of 1.07m. Furthermore, layers thicker than 2.00m were noted in BH209, BH219 and BH221. The typical descriptions are as follows:

- Plastic dark brown to black clayey pseudo-fibrous PEAT. Occasional relic roots and wood. Strong organic odour.
- Spongy dark brown to black slightly sandy fibrous PEAT with occasional fine to coarse decayed wood fragments.

The presence of Peat is a hazard to construction and temporary works because of its high compressibility, creep behaviour, low bulk density and low undrained shear strength. The risks and control measures will be evaluated during detailed design and construction.

7.1.4. Alluvium

Alluvial deposits were generally encountered within the River Wensum valley floodplain below the Topsoil. The thickness of the stratum ranges from 0.17 to 2.10m, with an average of 0.79m. Both granular and cohesive deposits of alluvium were recorded, and the typical log descriptions are as follows:

- Orangey brown fine to coarse angular to sub-rounded flint GRAVEL and medium to coarse SAND.
- Greyish brown very gravelly fine to coarse SAND. Gravel is fine to medium sub-angular to sub-rounded flint.
- Very soft to soft dark brown sandy organic CLAY with rare gravel of sub-angular fine flint. Occasional fine rootlets.
- Dark brown to black slightly gravelly sandy organic SILT with frequent horizons of fibrous peat. Gravel is sub-angular to sub-rounded fine to medium flint.

Alluvium was not found in the exploratory holes south of the River Wensum valley.

Where organic materials and Peat were noted within the stratum, the sample descriptions were studied, and index properties representative of the stratum have been considered in the derivation of correlation factors presented in Section 7.3.2.

7.1.5. River Terrace Deposits

River Terrace Deposits (RTD) were typically encountered within exploratory holes north of the River Wensum valley floodplain. In addition, RTD was recorded at an isolated location adjacent to the past Fakenham Road alignment at borehole 021 during the 2019/2020 Preliminary GI.

The stratum typically consists of granular soils and has been described as 'loose to medium dense yellowish brown very gravelly slightly silty medium to coarse SAND with a low cobble content. Gravel is sub-angular to sub-rounded fine to coarse flint. Cobbles are sub-angular to sub-rounded flint.'

The stratum was typically encountered beneath the Topsoil between 1.60 to 9.20m thick, with an average of 5.55m. No RTD was found in the exploratory holes south of the River Wensum valley.

7.1.6. Head Deposits

Head Deposits were occasionally encountered during the 2019/2020 Preliminary GI and 2022 Alignment Refinement GI at borehole 001, windowless sample hole 114 and BH226. The stratum was described as follows:

- Stiff to very stiff light brown, slightly gravelly CLAY. Gravel is fine to medium angular to sub-angular chalk gravel.
- Medium dense to dense orangey brown fine to medium SAND.
- Loose brown gravelly slightly clayey fine to coarse SAND.

At borehole 001, the stratum was encountered beneath the Topsoil and Made Ground. A cohesive layer of material of 2.30m thick overlies a granular layer of 2.35m thick. At window sample 114, Head Deposits were encountered beneath the Topsoil, and the layer was recorded to be granular of 1.20m thick. Both exploratory holes are located towards the southern end of the scheme between CH5450 and 5635.

BH226 is located towards the northern end of the scheme where the Head Deposits were recorded between 0.30 to 2.50m bgl. The material is considered to be derived from the parent superficial soils, Sheringham Cliffs Formation, up-gradient to the south and the Head Deposits were formed from natural washout and migration of material down gradient.

7.1.7. Sheringham Cliffs Formation

The Sheringham Cliffs Formation was frequently encountered across the site and comprised granular and cohesive soils, though granular is the more prominent material type.

The granular material is typically described as gravelly fine to medium sand or silty gravelly fine to medium sand. The density of these deposits was usually loose to medium dense and increased with depth occasionally to very dense near the base of the stratum. The fines content of the material varies across the site. Furthermore, local pockets and lenses of sandy clay were also recorded.

The cohesive components of the Sheringham Cliffs Formation were typically found as pockets and lenses between the granular components. It was generally recorded as a firm to stiff sandy gravelly clay, though occasionally as soft at shallow depth. Gravel constituents typically comprised flint, with occasional accounts of Chalk also recorded. Deposits described as gravelly silt with gravel comprising Chalk and occasionally flint were recorded in several locations.

The Sheringham Cliffs Formation typically underlies the Topsoil and overlies the Lowestoft Formation and Chalk. Furthermore, the thickness of the granular layer reduces as the mainline approaches the A47. The geological long sections are presented in Appendix 1 and should be referred to for location-specific variations.

During the ground investigations, multiple trial pits collapsed at shallow depths and others recorded unstable pit walls within the stratum before reaching the target depths. A few trial pits were successfully reattempted at a nearby location or with a different plant. This provides a construction hazard for any excavations within these materials and is recorded in the risk register.

7.1.8. Lowestoft Formation

The Lowestoft Formation is typically encountered immediately overlying the Chalk stratum. Due to the similarities of the Till members encountered, specific cohesive components of the Sheringham Cliffs Formation (Cohesive) have been grouped under this stratum for analysis.

The Till is the prominent material type encountered and is typically described as a sandy gravelly or gravelly clay. The consistency varied from firm to stiff and was occasionally recorded as very stiff. The thickness and elevation of the stratum increase as the proposed mainline approaches the A47. Furthermore, between CH5000 to CH5635, Lowestoft Formation was encountered beneath the Topsoil.

Granular components of the Lowestoft Formation were typically recorded as medium dense clayey gravelly medium to coarse sand or silty gravelly medium to coarse sand. Lenses and pockets of the granular soils were encountered between the Till or immediately overlying the Chalk bedrock. The geological long sections presented in Appendix 1 should be referred to for location-specific variations.

7.1.9. Glacial Deposits

Material referred to as Glacial Deposits are categorised where it has been difficult to differentiate the geological formation from which the stratum encountered belongs. This formation encompasses the superficial deposits which are a product of glacial activities, as shown in Figure 5-1 of the BGS geology map.

Across the River Wensum Valley floodplain and the immediate surrounding area, the stratum is predominantly granular though thin bands of silts and clays were noted at separate locations. It is typically a gravelly to very gravelly sand, and at some locations, the principal soil type is recorded to comprise both sand and gravel. The constituent materials are different to the River Terrace Deposits, with Chalk gravels occasionally noted. The stratum also appears to be thicker than the River Terrace Deposits. It was encountered below the alluvium, and the thickness varies from 0.50 to 13.0m, with an average of 5.56m. The colour of the deposits is generally of a darker shade of greyish brown and brown.

Towards the south of the floodplain and across the site, granular and cohesive deposits were encountered within localised exploratory holes. Granular deposits are recorded to be medium dense to dense, typically described as 'yellowish brown silty fine to coarse SAND and sub-rounded to rounded fine to coarse GRAVEL of flint'. The thickness ranges between 0.70 to 6.60m, with an average of 2.93m. The principal soil type of the cohesive deposits comprises both silt and clay with varying secondary soil types. Between CH1050 to 1250, a band of cohesive deposits of 1.20 to 7.10m thick was noted. It is described as 'firm to stiff cream calcareous SILT with occasional pockets of brown silty sand.'.

7.1.10. Chalk

The Chalk bedrock was encountered across the site and is the stratum of which most of the deeper exploratory holes were terminated. The Chalk descriptions provided in the exploratory hole logs follow the CIRIA C574 grading system.

Structureless Chalk, Grade Dm and Dc, were typically encountered beneath the superficial soils. The Grade Dc Chalk encountered generally are composed of sandy silty gravel where the clasts are weak with low to medium density. The Grade Dm Chalk has been described as composed of cream sandy gravelly silt where the gravels are weak with low density.

The density of the structured Chalk was variably described as low to high, though generally observed to increase with depth. The corresponding strength was recorded as very weak to moderately strong. Furthermore, the material recovered is typically reported as Grade C1 to C3 and Grade B2 to B4. Grade A Chalk was recorded at several exploratory holes on the floodplain (i.e. BH208, BH211, BH212, BH225, BH226 and BHR21) and near CH4360 at BHR34. The exploratory hole records should be referred to for further detail on the discontinuity apertures and spacings.

In contrast to rotary coring, it should be noted that cable percussive drilling does not permit reliable identification of structureless and structured Chalk due to the method of advancement through the stratum. Therefore, the recovered material is typically recorded as structureless, which does not represent the in-situ conditions. Notwithstanding, it has been adopted where considered suitably acceptable to inform the design. The transition between structureless and intact material could be interpreted from the SPTs and ground conditions from the neighbouring rotary cored exploratory holes. Furthermore, laboratory 'Split and describe' on thin-walled tube samples were scheduled to assist with the identification.

The categorisation of structureless and structured Chalk presented in Appendix 1 are as recorded on the exploratory hole logs, albeit the exploratory hole types have been differentiated on the drawing.

7.1.10.1. Dissolution features

Dissolution features within the Chalk bedrock in Norwich are well known and recorded in literature such as CIRIA C574 (Lord, et al., 2002). The following summarises features noted during the ground investigations that are interpreted to be dissolution features based on the site location. Notwithstanding, other origins are possible, such as contemporaneous sand channels.

During the 2019/2020 Preliminary GI, a possible dissolution feature was inferred during drilling from the presence of infilled material at borehole 003 between 14.3 to 14.5m bgl. The material was described as grey medium sand. The borehole is located at CH4460 at the proposed structure CU2 Tud Tributary Culvert. The adjacent borehole BHR35 recorded a zone of no recovery of 1.50m thick within the structureless Chalk at a similar elevation. The thickness of the feature is thin, and there is limited evidence suggesting these features could potentially form a single more extensive feature. Hence, the risk to the shallow foundation and proposed earthwork at this location is low.

In the 2022 Alignment Refinement GI, a band of granular deposit of 0.20m thick was encountered at 10.0m bgl at BH235 near CH1070. It was described as 'Loose brown fine to coarse SAND'. In neighbouring boreholes, the top of the Chalk is generally 2.00m lower in elevation, and granular Glacial Deposits were encountered at similar elevations. The band of infill is thin, and the proposed earthwork in the area is generally expected to be above the Chalk stratum. Hence, the risk of this local feature is not significant.

Zones of poor recovery were recorded in the past GIs. An in-depth study of the log descriptions and drilling notes has been carried out to infer the cause of core loss and assess the influence on the design. Following the 2022 Alignment Refinement GI, a technical note was produced by Harrison Group Environmental Limited on the recovery of Chalk based on site observations (ref. NCCT41793-HAG-VGT-FSC-TN-GI-0001). In summary, poor recovery is not uncommon due to the presence of flint cobbles and boulders. It can be further induced by in-situ testing, resulting in a structural breakdown of the material and core loss. Such occurrences are particularly frequent within low and medium density Chalk. Although 'No Recovery' or 'Areas of Core Loss' were recorded in the exploratory hole logs, there is limited evidence of voids noted during the 2022 Alignment Refinement GI. Furthermore, representative cases of extensive voids or fractured horizons were not noted following a review of the past GI information.

7.1.10.1.1. River Wensum Valley Floodplain

During the 2021 Supplementary Stage 1 GI, localised sand deposits were encountered during advancement through the Chalk stratum within BHR13 and BHR14. These exploratory holes were drilled on the floodplain, and the occurrence of granular infill appeared to be random in their location and extent.

At BHR13, a layer of granular material described as greyish brown fine to medium sand was encountered between 20.0 and 20.9m bgl. Between 49.0 and 50.0m bgl, further granular material was encountered and was described as brownish grey slightly silty fine to medium sand. Other than disturbance from the SPTs, multiple zones of no recovery were recorded within the Chalk ranging from 0.30 to 3.00m thick. Furthermore, sub-artesian groundwater pressure was noted when the dissolution feature infill was encountered. The water head was recorded to be as high as eight metres. The borehole was terminated early at 55.0m depth due to 'blowing sands', thus suggesting the potential presence of another dissolution feature.

At BHR14, more substantial layers of granular material were encountered within the Chalk stratum. These dissolution feature infills were encountered at shallower depths between 10.5 to 11.3m bgl and 12.4 to 19.1m bgl. The granular material was described as brown and white slightly gravelly slightly silty fine to coarse sand. However, neither pressured groundwater nor 'blowing sands' were noted during drilling.

During the 2022 Alignment Refinement GI, the occurrence of local sand deposits within the Chalk stratum was not noted on the floodplain.

Figure 7-4 and Figure 7-5 are photos of dissolution features taken at BHR13 and BHR14. The factual report NCCT41793-HAG-VGT-FSC-RP-GI-0001 and the exploratory hole logs should be referred to for further detail. Although the holes are about 120m away from the realigned mainline, dissolution features remain a significant hazard on the River Wensum Valley floodplain. They present the risk of additional settlements and reduction in pile capacities. In addition, the risk of multiple nearby features forming a single larger one should be assessed during detailed design. The designer should be notified if a dissolution feature is encountered during construction.

Figure 7-4 Dissolution feature infill at BHR13 between 49.0 to 50.0 mbgl

Figure 7-5 Dissolution feature infill at BHR14 between 10.5 to 11.3 mbgl

7.1.11. Summary

Table 7-1 summarises the elevation, depth and thickness of the strata encountered across the site along the proposed mainline. The geological long sections presented in Appendix 1 will form the basis for selecting design ground models for each earthwork and structure for the scheme. These will be detailed in the Geotechnical Design Report.

Table 7-1: Summary of elevation, depth and thickness of geological formations

Stratum	Range of Stratum Top Elevation (Average) (m OD)	Range of Stratum Top Depth (Average) (m bgl)	Range of Thickness (Average) (m)
Topsoil	8.79 – 57.6 (30.6)	0.00	0.10 – 1.20 (0.40)
Made Ground (Granular)	12.2 – 40.4 (25.2)	0.00 – 0.10 (0.00)	0.10 – 1.70 (0.52)
Made Ground (Cohesive)	21.5 – 55.1 (41.4)	0.00 – 1.70 (0.72)	0.25 – 0.80 (0.48)
Peat	8.41 – 9.06 (8.76)	0.00 – 0.80 (0.26)	0.23 – 2.72 (1.07)
Alluvium (Granular)	7.68 – 21.0 (9.40)	0.20 – 1.15 (0.49)	0.25 – 2.10 (0.79)
Alluvium (Cohesive)	8.22 – 21.5 (11.2)	0.20 – 0.80 (0.46)	0.17 – 0.55 (0.37)
River Terrace Deposits	6.13 – 19.4 (10.0)	0.20 – 2.90 (1.26)	1.60 – 9.20 (5.55)
Head Deposits (Granular)	11.2 – 48.9 (35.0)	0.30 – 3.00 (1.23)	1.20 – 2.35 (1.92)
Head Deposits (Cohesive)	47.3	0.70	2.30
Sheringham Cliffs Formation (Granular)	-0.55 – 58.5 (31.2)	0.00 – 4.05 (0.43)	0.20 – 30.6 (4.64)
Sheringham Cliffs Formation (Cohesive)	-1.10 – 58.5 (30.8)	0.15 – 14.2 (2.36)	0.03 – 13.4 (2.92)
Lowestoft Formation (Till)	17.8 – 51.3 (37.6)	0.25 – 31.0 (7.00)	0.36 – 10.6 (4.03)
Lowestoft Formation (Granular)	20.9 – 49.6 (37.7)	0.30 – 32.5 (10.5)	0.30 – 21.2 (7.48)
Glacial Deposits (Granular)	4.53 – 36.9 (14.0)	0.15 – 16.4 (3.72)	0.10 – 12.5 (4.54)
Glacial Deposits (Cohesive)	7.11 – 35.1 (25.0)	0.45 – 15.4 (5.52)	0.60 – 9.05 (2.13)
Structureless Chalk	-3.37 – 26.5 (14.3)	0.20 – 34.6 (6.87)	1.04 – 56.3 (27.4)*

Stratum	Range of Stratum Top Elevation (Average) (m OD)	Range of Stratum Top Depth (Average) (m bgl)	Range of Thickness (Average) (m)
Structured Chalk	-11.5 – 25.4 (-0.13)	9.50 – 38.0 (19.7)	Strata not proven
* Thickness as recorded on the exploratory hole logs. Refer to Section 7.1.10 on the influence of drilling methods.			

7.2. Groundwater

Groundwater was encountered in some of the exploratory holes and subsequently monitored following the fieldwork at selected locations.

The normal drilling rate does not necessarily permit the recording of an equilibrium water level for any one water strike. In addition, groundwater levels are subject to seasonal variation or changes in local drainage conditions. Hence, water level readings from water strikes alongside long-term groundwater monitoring data shall be used to derive design groundwater levels.

7.2.1. Groundwater Strikes / Observation / Seepage

The groundwater strikes recorded in all exploratory holes completed for the scheme are summarised in Table 7-2. Groundwater was not encountered at the time of the investigation at those locations not included in the table.

Table 7-2: Summary of groundwater strikes recorded

Hole ID	Depth (mbgl)		Elevation (mOD)		Stratum	Remarks
	Strike at	Rose to	Strike at	Rose to		
003	1.50	1.25	35.0	35.2	Sheringham Cliffs Formation (Granular)	
005	20.2	-	35.9	-	Sheringham Cliffs Formation (Granular)	
008	18.0	13.3	22.9	27.6	Sheringham Cliffs Formation (Granular)	
010	14.5	11.9	10.2	12.7	Structureless Chalk	
014	3.90	2.40	4.94	6.44	Alluvium (Granular)	
019	1.60	-	8.32	-	Sheringham Cliffs Formation (Granular)	
021	9.10	8.70	10.6	11.0	River Terrace Deposits	
031	15.2	15.0	5.99	6.19	Structureless Chalk	
BH204	6.90	3.64	5.29	8.55	River Terrace Deposits	
BH205	10.2	7.81	5.48	7.87	Structureless Chalk	
BH206	3.50	3.00	9.27	9.77	River Terrace Deposits	
BH207	7.40	4.69	6.02	8.73	River Terrace Deposits	
BH208	1.30	1.00	8.12	8.42	Peat	
BH209	1.10	1.02	7.93	8.01	Peat	
BH211	1.10	0.85	7.92	8.17	River Terrace Deposits / Peat	

Hole ID	Depth (mbgl)		Elevation (mOD)		Stratum	Remarks
	Strike at	Rose to	Strike at	Rose to		
BH212	1.10	0.95	7.91	8.06	Peat	
BH213	0.80	-	8.31	-	Glacial Deposits (Granular)	
BH214	0.80	0.60	8.15	8.35	Alluvium (Granular)	
BH215	0.85	0.70	8.24	8.39	Alluvium (Granular)	
BH216	0.90	0.85	8.58	8.63	Alluvium (Granular)	
BH217	0.80	0.60	8.08	8.28	Alluvium (Granular) / Peat	
BH218	0.80	-	8.19	-	Peat	
BH219	1.15	0.97	7.76	7.94	Peat	
BH220	0.95	-	7.90	-	Peat	
BH221	2.50	0.40	6.39	8.49	Glacial Deposits (Granular) / Peat	
BH221	1.10	-	7.79	-	Peat	
BH222	1.15	-	7.74	-	Peat	
BH223	0.50	-	8.29	-	Glacial Deposits (Granular)	
BH223	0.80	0.65	7.99	8.14	Glacial Deposits (Granular)	
BH227	9.40	9.26	4.74	4.88	Structureless Chalk	
BH228	10.7	8.00	4.90	7.60	Structureless Chalk	
BH230	13.8	13.7	10.7	10.8	Structureless Chalk	
BH232	20.0	18.3	7.00	8.73	Structureless Chalk	

Hole ID	Depth (mbgl)		Elevation (mOD)		Stratum	Remarks
	Strike at	Rose to	Strike at	Rose to		
BH246	12.0	11.1	11.9	12.9	Structureless Chalk	
BH248	18.6	18.0	7.28	7.87	Structureless Chalk	
BH251	1.10	1.00	8.43	8.53	Glacial Deposits (Granular) / Alluvium (Granular)	
BH252	0.65	-	8.42	-	Alluvium (Granular)	
BH252	0.95	0.65	8.12	8.42	Glacial Deposits (Granular) / Alluvium (Granular)	
BH253	1.00	0.87	7.91	8.04	Peat	
BH254	1.20	-	8.08	-	Sheringham Cliffs Formation (Granular)	
BH255	1.20	-	7.96	-	River Terrace Deposits	
BH257	1.00	0.80	8.00	8.20	Alluvium (Granular)	
BH258	1.00	0.80	7.98	8.18	Peat	
BH259	21.4	21.2	4.54	4.79	Structureless Chalk	
BHR02	2.60	2.40	8.38	8.58	River Terrace Deposits	
BHR03	2.80	2.50	8.16	8.46	River Terrace Deposits	
BHR12	8.00	6.00	1.21	3.21	Glacial Deposits (Granular)	
BHR13	0.90	0.70	8.14	8.34	Glacial Deposits (Granular) / Alluvium (Cohesive)	
BHR14	0.90	0.60	8.37	8.67	Glacial Deposits (Granular)	

Hole ID	Depth (mbgl)		Elevation (mOD)		Stratum	Remarks
	Strike at	Rose to	Strike at	Rose to		
BHR15	1.50	0.85	7.45	8.10	Peat	
BHR16	0.00	-	8.91	-	Topsoil	Groundwater at the ground surface
BHR17	2.40	1.00	6.48	7.88	Glacial Deposits (Granular) / Alluvium (Cohesive)	
BHR18	1.00	0.50	7.88	8.38	Alluvium (Granular) / Alluvium (Cohesive)	
BHR19	0.00	-	8.76	-	Alluvium (Cohesive)	Groundwater at the ground surface
BHR20	1.10	-	7.60	-	Glacial Deposits (Granular)	
BHR21	1.00	0.50	7.97	8.47	Glacial Deposits (Granular) / Alluvium (Cohesive)	
BHR22	2.60	-	9.18	-	Sheringham Cliffs Formation (Granular)	
BHR29	4.30	-	19.2	-	Structureless Chalk	
BHR35	10.5	9.52	25.7	26.7	Lowestoft Formation (Till)	
BHR35	0.90	0.69	35.3	35.5	Sheringham Cliffs Formation (Granular)	
CP03	4.00	-	12.8	-	Structureless Chalk	
CPT05	1.00	0.90	35.5	35.6	Sheringham Cliffs Formation (Granular)	
TP06	-	-	-	-	-	No groundwater was encountered, but damp from 3.50m bgl

Hole ID	Depth (mbgl)		Elevation (mOD)		Stratum	Remarks
	Strike at	Rose to	Strike at	Rose to		
TP233	-	-	-	-	-	No groundwater was encountered, but damp from 2.70m bgl
TP235	-	-	-	-	-	No groundwater was encountered, but damp from 1.60m bgl
TP241	1.10	0.90	8.33	8.53	Alluvium (Granular) / Peat	
TP242	1.00	0.90	8.02	8.12	Peat	
TP243	0.88	0.81	8.07	8.14	Alluvium (Granular)	
TP244	1.15	1.10	8.44	8.49	Glacial Deposits (Granular)	
TP245	0.80	0.60	7.98	8.18	Peat	
TP246	0.85	0.75	8.10	8.20	Alluvium (Granular)	
TP247A	0.90	-	7.93	-	Peat	
TP248	0.88	0.78	7.93	8.03	Peat	
TP252	3.00	-	31.6	-	Sheringham Cliffs Formation (Granular)	
TP36	-	-	-	-	-	No groundwater was encountered, but damp from 1.50m bgl
TP38	-	-	-	-	-	No groundwater was encountered, but damp from 1.90m bgl
TR202B	-	-	-	-	-	No groundwater was encountered, but damp from 2.10m bgl
WS05	4.00	3.46	8.06	8.60	River Terrace Deposits	

Hole ID	Depth (mbgl)		Elevation (mOD)		Stratum	Remarks
	Strike at	Rose to	Strike at	Rose to		
WS06	5.00	4.40	8.05	8.65	Sheringham Cliffs Formation (Granular)	
WS07	2.00	1.10	8.16	9.06	Sheringham Cliffs Formation (Granular)	
WS10	1.00	0.10	8.09	8.99	Alluvium (Granular) / Topsoil	
WS11	1.00	0.00	7.85	8.85	Glacial Deposits (Granular) / Topsoil	
WS12	2.00	1.50	7.15	7.65	Structureless Chalk	
WS12	6.00	5.50	3.15	3.65	Structureless Chalk	
WS203	7.45	-	6.26	-	Structureless Chalk	
WS204	4.00	-	7.64	-	Sheringham Cliffs Formation (Granular)	
WS29	4.45	-	38.9	-	Sheringham Cliffs Formation (Cohesive)	
WS31	4.16	-	43.0	-	Sheringham Cliffs Formation (Granular)	

It should be noted that water was added to assist with drilling within the granular superficial soils, which has impacted the detection of groundwater strikes. The corresponding depths at which water was added are recorded within the exploratory hole logs.

Groundwater strikes on the River Wensum Valley floodplain are generally shallow, between 0.00 to 4.00m bgl (with an average of 1.13m bgl) within the Peat, Alluvium and River Terrace Deposits. Furthermore, groundwater was found at the ground surface of the floodplain during the 2021 Supplementary Stage 1 GI as the investigation was carried out during wetter months of the year. Where a rise in groundwater level was recorded, the water head ranged between 0.05 to 3.26m, with an average of 0.49m. At BH221, a water head of 2.10m was recorded. The strike was at the surface of the Glacial Deposits (Granular) and subsequently rose to the Peat stratum of lower permeability.

During the 2021 Supplementary Stage 1 GI, sub-artesian groundwater pressure was noted on the floodplain when a dissolution feature infill was encountered at BHR13. The water head was recorded to be as high as circa. 8.00m. Although the exploratory hole is 120m or more away from the realigned mainline, the risk to design and construction remains high.

Water head greater than two metres were recorded at several locations in the immediate surrounding area of the floodplain. However, the strikes are generally at a depth lower than the proposed construction.

Across the rest of the scheme, groundwater strikes were typically recorded within the Glacial Deposits, Sheringham Cliffs Formation and Structureless Chalk. The water head ranged from 0.05 to 1.00m with an average of 0.37m. The groundwater level at boreholes 003 and CPT05 are high as they are within 10 and 20m from the Tud Tributary, respectively.

The highest water head recorded is 4.71m at borehole 008. The strike was recorded at 0.20m above the Lowestoft Formation, and no lenses of cohesive materials were recorded within the granular Sheringham Cliffs Formation. No groundwater was encountered in the nearby boreholes at a similar depth. Hence, the pressured groundwater is likely to be a local feature.

A water head of 0.98m was recorded at BHR35 within the Lowestoft Formation (Till). The description of the material at which the strike and rise were observed is as follows: 'Stiff grey slightly sandy CLAY with frequent bands of clayey sand.' Therefore, the interlayers of sandy clay are likely acting as an aquitard resulting in pressured groundwater. No groundwater was encountered in nearby boreholes at a similar depth.

Pressured groundwater is a hazard, and the risk will be evaluated on a location-by-location basis during detailed design. However, caution should be exercised if encountered during construction. It could negatively impact the stability of excavations within the shallow granular deposits and increase the difficulty of deep foundation construction.

7.2.2. Groundwater Monitoring

The monitoring data from all the exploratory holes completed for the scheme are summarised in Table 7-3. In addition, the groundwater monitoring data between 19/07/2022 and 16/11/2022 from the 2022 Alignment Refinement GI has been included.

Table 7-3: Summary of groundwater monitoring data

Hole ID	Installation Type	Response Zone Details					Monitored Groundwater Level			
		Depth (mbgl)		Elevation (mOD)		Stratum	Depth (mbgl)		Elevation (mOD)	
		From	To	From	To		From	To	From	To
001	Not recorded	5.00	20.0	43.0	28.0	Head Deposits (Granular) / Lowestoft Formation (Granular)	10.8	11.3	36.7	37.2
003	50mm diameter standpipe	1.50	4.80	35.0	31.7	Sheringham Cliffs Formation (Granular)	0.31	0.90	35.6	36.2
005	Not recorded	12.5	17.5	43.6	38.6	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
005	Not recorded	23.5	29.5	32.6	26.6	Sheringham Cliffs Formation (Granular)	20.0	20.6	35.5	36.1
007	63mm diameter standpipe	21.0	29.5	22.8	14.3	Structureless Chalk	21.1	22.8	21.0	22.7
010	Not recorded	12.0	15.5	12.6	9.14	Structureless Chalk	10.5	13.3	11.3	14.1
012	50mm diameter standpipe	1.00	14.0	12.4	-0.62	Sheringham Cliffs Formation (Granular) / Structureless Chalk	0.41	4.12	9.26	13.0
013	Not recorded	Pipe details missing	-	-	-	-	0.85	-	8.82	-
013	Not recorded	Pipe details missing	-	-	-	-	-	-	-	-
014	50mm diameter standpipe	10.0	15.0	-1.16	-6.16	Structureless Chalk	-	-	-	-
014	Not recorded	0.50	2.00	8.34	6.84	Alluvium (Granular)	-	-	-	-
015	50mm diameter standpipe	15.0	20.0	-5.76	-10.8	Structured Chalk	0.23	-	9.01	-
015	Not recorded	2.00	5.00	7.24	4.24	Alluvium (Granular)	0.23	-	9.01	-
016	Not recorded	4.00	7.00	5.59	2.59	Alluvium (Granular)	0.61	-	8.98	-
016	Not recorded	17.0	20.0	-7.41	-10.4	Structured Chalk	0.69	-	8.90	-
019	50mm diameter standpipe	15.0	20.0	-5.08	-10.1	Structureless Chalk	0.60	-	9.32	-
019	50mm diameter standpipe	2.00	8.50	7.92	1.42	Sheringham Cliffs Formation (Granular) / Structureless Chalk	0.70	-	9.22	-
020	Not recorded	2.00	5.00	11.0	8.01	Glacial Deposits (Cohesive)	3.49	-	9.52	-
020	Not recorded	9.00	14.0	4.01	-0.99	Structured Chalk	3.50	-	9.51	-
021	Not recorded	Pipe details missing	-	-	-	-	Dry	-	-	-
021	Not recorded	Pipe details missing	-	-	-	-	10.2	-	9.51	-
030	63mm diameter standpipe	5.00	7.00	21.0	19.0	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
031	63mm diameter standpipe	2.00	4.20	19.2	17.0	Sheringham Cliffs Formation (Granular) / Structureless Chalk	Dry	-	-	-
101	50mm diameter standpipe	2.00	3.00	41.1	40.1	Sheringham Cliffs Formation (Cohesive)	Dry	-	-	-
102	50mm diameter standpipe	2.00	4.50	48.8	46.3	Lowestoft Formation (Till)	Dry	-	-	-
103	50mm diameter standpipe	2.00	4.30	37.8	35.5	Sheringham Cliffs Formation (Granular)	2.37	3.31	36.5	37.4
105	50mm diameter standpipe	2.00	4.50	54.6	52.1	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
106	50mm diameter standpipe	2.00	4.50	46.9	44.4	Sheringham Cliffs Formation (Granular)	Dry	-	-	-

Hole ID	Installation Type	Response Zone Details					Monitored Groundwater Level			
		Depth (mbgl)		Elevation (mOD)		Stratum	Depth (mbgl)		Elevation (mOD)	
		From	To	From	To		From	To	From	To
107	50mm diameter standpipe	2.00	4.50	35.9	33.4	Sheringham Cliffs Formation (Cohesive) / Sheringham Cliffs Formation (Granular)	Dry	-	-	-
108	50mm diameter standpipe	3.00	4.00	29.3	28.3	Sheringham Cliffs Formation (Granular) / Lowestoft Formation (Till)	Dry	-	-	-
109	50mm diameter standpipe	2.00	4.50	38.3	35.8	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
110	50mm diameter standpipe	2.00	5.00	21.0	18.0	Structureless Chalk	Dry	-	-	-
112	50mm diameter standpipe	2.00	4.50	19.8	17.3	Structureless Chalk	Dry	-	-	-
113	50mm diameter standpipe	2.00	4.50	18.0	15.5	Sheringham Cliffs Formation (Granular) / Structureless Chalk	Dry	-	-	-
114	50mm diameter standpipe	2.00	4.00	47.3	45.3	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BH201	19mm diameter standpipe	1.50	8.00	24.5	18.0	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BH203	50mm diameter standpipe	1.00	4.00	14.9	11.9	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BH206	50mm diameter standpipe	2.50	6.50	10.3	6.27	River Terrace Deposits	2.62	2.90	9.87	10.2
BH210	50mm diameter standpipe	50.0	55.0	-40.8	-45.8	Structureless Chalk	0.41	1.37	7.83	8.79
BH210	50mm diameter standpipe	1.00	2.00	8.20	7.20	Peat / River Terrace Deposits	0.60	0.86	8.34	8.60
BH221	50mm diameter standpipe	40.0	45.0	-31.1	-36.1	Structureless Chalk	0.45	2.02	6.87	8.44
BH226	50mm diameter standpipe	4.00	8.00	7.50	3.50	Structureless Chalk	2.99	3.46	8.04	8.51
BH228	50mm diameter standpipe	9.00	12.0	6.60	3.60	Structureless Chalk	Dry	-	-	-
BH229	50mm diameter standpipe	1.00	6.00	23.1	18.1	Sheringham Cliffs Formation (Granular) / Structureless Chalk	Dry	-	-	-
BH231	50mm diameter standpipe	5.00	25.0	20.1	0.08	Structureless Chalk / Structured Chalk	15.4	20.2	4.92	9.70
BH233	50mm diameter standpipe	9.00	24.5	20.7	5.17	Structureless Chalk / Structured Chalk	20.0	21.3	8.34	9.65
BH233	50mm diameter standpipe	1.00	4.00	28.7	25.7	Sheringham Cliffs Formation (Granular) / Glacial Deposits (Cohesive)	Dry	-	-	-
BH235	50mm diameter standpipe	15.0	16.0	16.4	15.4	Structureless Chalk	Dry	-	-	-
BH235	19mm diameter standpipe	3.00	7.50	28.4	23.9	Sheringham Cliffs Formation (Granular) / Sheringham Cliffs Formation (Cohesive)	Dry	-	-	-
BH236	19mm diameter standpipe	2.00	6.50	32.7	28.2	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BH237	50mm diameter standpipe	9.00	10.0	26.7	25.7	Sheringham Cliffs Formation (Cohesive)	Dry	-	-	-
BH241	50mm diameter standpipe	8.50	10.4	31.0	29.1	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BH243	50mm diameter standpipe	1.00	13.0	39.2	27.2	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BH245	19mm diameter standpipe	2.00	2.50	21.2	20.7	Made Ground (Cohesive) / Structureless Chalk	Dry	-	-	-
BH246	50mm diameter standpipe	1.50	3.00	22.4	20.9	Sheringham Cliffs Formation (Cohesive)	Dry	-	-	-
BH260	50mm diameter standpipe	14.5	19.5	10.1	5.13	Structureless Chalk	15.8	16.0	8.63	8.79
BH261	50mm diameter standpipe	1.00	5.00	49.0	45.0	Lowestoft Formation (Till)	4.39	4.40	45.6	45.6

Hole ID	Installation Type	Response Zone Details					Monitored Groundwater Level			
		Depth (mbgl)		Elevation (mOD)		Stratum	Depth (mbgl)		Elevation (mOD)	
		From	To	From	To		From	To	From	To
BH262	50mm diameter standpipe	1.50	2.50	48.3	47.3	Lowestoft Formation (Till)	0.88	-	48.9	-
BH263	50mm diameter standpipe	1.00	5.00	49.3	45.3	Lowestoft Formation (Till)	4.97	5.00	45.3	45.3
BH264	50mm diameter standpipe	6.00	8.00	44.2	42.2	Lowestoft Formation (Granular)	Damp	-	-	-
BHR29	50mm diameter standpipe	27.0	30.0	-3.52	-6.52	Structureless Chalk / Structured Chalk	10.3	11.4	12.1	13.2
BHR30	50mm diameter standpipe	4.50	8.00	32.6	29.1	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BHR31	19mm diameter standpipe	13.5	14.5	24.4	23.4	Sheringham Cliffs Formation (Cohesive) / Structureless Chalk	14.0	-	23.9	-
BHR32	50mm diameter standpipe	29.9	34.9	25.0	20.0	Lowestoft Formation (Till)	18.5	18.8	36.1	36.4
BHR33	50mm diameter standpipe	38.0	40.0	6.17	4.17	Structured Chalk	7.65	8.04	36.1	36.5
BHR34	50mm diameter standpipe	3.00	5.00	43.4	41.4	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
BHR35	50mm diameter standpipe	10.0	12.0	26.2	24.2	Lowestoft Formation (Till) / Structureless Chalk	-0.75	-0.53	36.7	36.9
CP01	19mm diameter standpipe	2.50	7.00	21.9	17.4	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP02	50mm diameter standpipe	2.50	5.50	23.2	20.2	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP03	50mm diameter standpipe	0.60	2.00	16.2	14.8	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP04	19mm diameter standpipe	2.00	3.00	20.9	19.9	Sheringham Cliffs Formation (Granular)	2.84	-	20.1	-
CP05	50mm diameter standpipe	2.00	4.00	16.5	14.5	Structureless Chalk	Dry	-	-	-
CP06	50mm diameter standpipe	5.00	7.00	34.6	32.6	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP07	50mm diameter standpipe	2.00	4.00	38.1	36.1	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP08	50mm diameter standpipe	5.00	10.0	50.7	45.7	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP09	19mm diameter standpipe	2.00	6.00	50.8	46.8	Sheringham Cliffs Formation (Cohesive) / Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP10	19mm diameter standpipe	2.00	6.00	47.4	43.4	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
CP11	50mm diameter standpipe	11.0	12.0	39.9	38.9	Lowestoft Formation (Granular)	Dry	-	-	-
CP12	50mm diameter standpipe	8.50	9.50	43.2	42.2	Lowestoft Formation (Granular)	9.21	9.41	42.3	42.5
CP13A	19mm diameter standpipe	3.00	6.00	47.6	44.6	Lowestoft Formation (Till)	Dry	-	-	-
WS01	50mm diameter standpipe	0.30	5.00	21.0	16.3	Sheringham Cliffs Formation (Granular) / Glacial Deposits (Granular)	Dry	-	-	-
WS02	19mm diameter standpipe	0.60	4.80	21.8	17.6	Sheringham Cliffs Formation (Cohesive) / Structureless Chalk	Dry	-	-	-
WS03	50mm diameter standpipe	2.50	4.00	17.1	15.6	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS04	50mm diameter standpipe	1.50	3.00	20.2	18.7	Sheringham Cliffs Formation (Cohesive) / Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS05	50mm diameter standpipe	0.50	3.40	11.6	8.66	River Terrace Deposits	3.00	3.16	8.90	9.06
WS06	50mm diameter standpipe	3.50	5.00	9.55	8.05	Sheringham Cliffs Formation (Granular)	3.66	4.09	8.96	9.39

Hole ID	Installation Type	Response Zone Details					Monitored Groundwater Level			
		Depth (mbgl)		Elevation (mOD)		Stratum	Depth (mbgl)		Elevation (mOD)	
		From	To	From	To		From	To	From	To
WS07	50mm diameter standpipe	0.50	2.00	9.66	8.16	Sheringham Cliffs Formation (Granular)	1.03	1.42	8.74	9.13
WS15	50mm diameter standpipe	1.00	4.00	26.3	23.3	Sheringham Cliffs Formation (Granular) / Sheringham Cliffs Formation (Cohesive)	Dry	-	-	-
WS16	50mm diameter standpipe	1.00	2.50	22.4	20.9	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS18	50mm diameter standpipe	1.50	2.50	33.4	32.4	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS19	50mm diameter standpipe	3.00	4.00	31.9	30.9	Sheringham Cliffs Formation (Cohesive) / Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS20	50mm diameter standpipe	2.00	3.00	34.7	33.7	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS21	50mm diameter standpipe	1.00	3.00	39.1	37.1	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS211	50mm diameter standpipe	2.50	3.00	21.5	21.0	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS212	50mm diameter standpipe	2.00	4.00	20.0	18.0	Sheringham Cliffs Formation (Cohesive) / Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS213	50mm diameter standpipe	1.00	5.00	14.4	10.4	Sheringham Cliffs Formation (Granular) / Structureless Chalk	Dry	-	-	-
WS215	50mm diameter standpipe	1.00	2.00	15.2	14.2	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS216	50mm diameter standpipe	1.00	2.00	20.6	19.6	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS22	50mm diameter standpipe	2.00	4.00	48.8	46.8	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS23	50mm diameter standpipe	2.00	4.00	54.2	52.2	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS24	50mm diameter standpipe	2.00	4.00	55.3	53.3	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS26	50mm diameter standpipe	1.00	4.00	55.1	52.1	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS28	50mm diameter standpipe	0.75	2.75	54.4	52.4	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS29	50mm diameter standpipe	3.50	4.50	39.9	38.9	Sheringham Cliffs Formation (Cohesive)	2.96	4.27	39.1	40.4
WS30	50mm diameter standpipe	1.00	5.00	47.0	43.0	Sheringham Cliffs Formation (Cohesive)	Dry	-	-	-
WS31	50mm diameter standpipe	3.30	4.30	43.8	42.8	Sheringham Cliffs Formation (Cohesive) / Sheringham Cliffs Formation (Granular)	2.96	4.28	42.8	44.2
WS33	50mm diameter standpipe	1.00	5.00	49.1	45.1	Lowestoft Formation (Till)	0.57	3.66	46.4	49.5
WS34	50mm diameter standpipe	1.00	2.00	20.1	19.1	Sheringham Cliffs Formation (Granular) / Structureless Chalk	Dry	-	-	-
WS40	50mm diameter standpipe	1.00	6.00	38.6	33.6	Sheringham Cliffs Formation (Granular)	Dry	-	-	-
WS41	50mm diameter standpipe	1.00	6.00	36.4	31.4	Sheringham Cliffs Formation (Granular)	Dry	-	-	-

It has been assumed that the groundwater is mobile, and the ground has been classed as not 'disturbed' following the BRE SD1 guidance. Tables A1 to A10 in Appendix 2 present the data considered for the assessment.

Table 7-104 Summary of BRE SD1 soil aggressivity assessment

Geological Formation	Characteristic Values - Soil		Characteristic Values - Groundwater		Design Sulphate Class	ACEC Class
	SO_4 (mg/l)	pH	SO_4 (mg/l)	pH		
Topsoil	300	6.40	-	-	DS-1	AC-1
Made Ground	267	6.80	-	-	DS-1	AC-1
Peat	4400	3.90	194	6.70	DS-4	AC-5
Alluvium	1750	3.00	100	6.60	DS-3	AC-4
River Terrace Deposits	51.0	7.30	62.0	7.40	DS-1	AC-1
Head Deposits	5.00	8.40	-	-	DS-1	AC-1
Sheringham Cliffs Formation	47.0	6.60	43.0	7.70	DS-1	AC-1
Lowestoft Formation	200	8.10	52.0	7.80	DS-1	AC-1
Glacial Deposits	74.0	7.10	-	-	DS-1	AC-1
Chalk	100	8.30	95.0	7.00	DS-1	AC-1

7.6. Contamination

Potentially waste-impacted soil was encountered near mainline CH1130 and the RW1 Ancient Woodland Retaining Wall during the archaeological investigation in 2022. Section 6.3 details the additional site work completed as part of the 2022 Alignment Refinement GI and Section 7.1.2 presents the site observations at TR204 and TR205. Additional photograph records are available in Appendix 5.

The Ground Contamination Interpretive Report (ref. NCCT41793-RAM-EGT-FSC-RP-NZ-0003) should be referred to for further information on the environmental contaminant testing results.

The design CBR for selected site-won granular material has been taken as 8%.

Further details on the results and derivation of the design CBRs will be presented in the Earthworks Geotechnical Design Report.

9.6. Drainage

The site observations made during the ground investigations and the results of the ongoing groundwater monitoring indicate that no special dewatering measures are likely to be required when excavating the cuttings or that permanent slope drainage measures are needed.

The groundwater is expected near ground level at the Tud Tributary Culvert (CU2). Therefore, dewatering will be required to construct the granular mattress supporting the base of the culvert.