

PROJECT TITLE: Land off Lovell Road, Oakley, Bedfordshire
PROJECT JOB NO: 18479
DATE: 11/08/20
Prepared by: JK/GBR

Land off Lovell Road, Oakley

Introduction

1. This Infrastructure Technical Note has been prepared by Woods Hardwick Infrastructure LLP in relation to a proposed residential development on land known as 'Land off Lovell Road, Oakley'. A Site Location Plan is included within Appendix A.
2. This Infrastructure Note is provided in support of a Call for Sites submission made on behalf of Red Eagle Securities and which seeks the allocation of land off Lovell Road, Oakley for development comprising the erection of up to 23 dwellings.
3. It is proposed that the site is developed to provide up to 23 residential dwellings with an adoptable vehicular access being taken off Lovell Road, which borders the south of the site. A Site Layout Plan is included in Appendix B.
4. The Note confirms that there is no known utility apparatus present which would create an insurmountable constraint to the proposed development and that based upon the utility apparatus in the surrounding area there will be sufficient capacity to serve the proposed development.
5. It is confirmed that based on the Environment Agency's Flood Mapping the site is not considered to be at risk of flooding from rivers or the sea during storm events with a probability of at least 1 in 1,000 years.
6. An assessment of the sustainability of the site in terms of accessibility to services and facilities and public transport has been undertaken and it has been concluded that the site lies in a sustainable location.
7. It can therefore be concluded that there are no known highways, drainage or utility constraints that would preclude the development of the site.
8. It should be noted that no objections to the proposals relating to the above elements of the development were raised by the various consultees in response to a recent planning application for a similar scale of development on the site.

Flood Risk

9. The nearest watercourse to the site is the River Great Ouse, which is located approximately 460m south of the site. OS maps indicate that the river lies at approximately 35mAOD. Considering that the surveyed ground levels of the existing site are between 37.11m and 35.41m AOD.
10. It is therefore considered that the site is not at risk of flooding from rivers and/or watercourses and this is confirmed by the EA Flood Map enclosed in Appendix C which shows that the proposed development land is situated in Flood Zone 1, which is land which has less than a 1 in 1,000 annual probability of river or sea flooding.
11. From the EA Surface Water Flood Map for the site, which is enclosed in Appendix C, the majority of the development site is considered to be at very low risk of surface water flooding. The EA website defines 'very low' risk as an area that has less than 0.1% annual probability of occurring.
12. A small part of the site, adjacent to the western site boundary is identified as being at low risk of flooding. This appears to be as a result of ponding occurring in a low spot.
13. Final external levels will be designed to ensure that surface water flows will be routed away from the more vulnerable areas and towards the proposed drainage network
14. A Ground Investigation (GI) for the site was carried out by Paddock Geo Engineering (PGE) in June 2019, which included groundwater monitoring in 6 trial pits which were excavated with depths varying from 1.50m to 3.50m below ground level (bgl). Groundwater was not encountered in any of the 6 trial pits during the fieldwork or the subsequent monitoring phase.
15. The application site is located within Groundwater Source Protection Zone (GSPZ) 2 (Outer Protection Zone). GSPZ 2 is defined by a 400 day travel time from a point below the water table.
16. A Level 1 Strategic Flood Risk Assessment (SFRA) for the area was prepared by URS on behalf of Bedford Borough Council in June 2015. The SFRA did not identify any historic groundwater flooding incidents in the vicinity of the site.
17. Based on the above information, it is anticipated that groundwater flooding should not be an issue to the proposed development.

18. The EA Reservoir Flood Map was acquired by Woods Hardwick Infrastructure LLP from the EA's website. A copy of this mapping is enclosed in Appendix C. No part of the site or any immediate neighbouring land is shown to be at risk of flooding from reservoirs.

Surface Water Drainage

19. In addition to ensuring that the development is not at risk of flooding from external sources, it is also important to ensure that the scheme itself does not exacerbate flood risk for others. It is therefore essential that the arrangements for storm and foul water disposal are fully assessed to guarantee that the effects are mitigated and that there will be no impact on the existing land drainage regime.
20. All of the recent guidance on the arrangements for storm water disposal from new developments has encouraged the application of a hierarchy for surface water disposal. This has now been formalised in the Building Regulations Part H. The hierarchy is also the basis of the advice on surface water disposal recommended by Bedford Borough Council, in their role as Lead Local Flood Authority (LLFA) in the BBC publication, 'Supplementary Planning Document for Sustainable Drainage Systems (February 2018).
21. The first choice for surface water disposal which should be pursued is via infiltration. Only where it has been determined that the ground conditions are not suitable should the second choice of disposal to a ditch and/ or watercourse be considered. If there is no alternative the third and last choice of disposal to the public sewer can be considered.
22. During PGE's ground investigations three sampling locations were excavated to depths between 0.90m to 1.50m bgl and used for infiltration testing. Copies of the corresponding trial pit logs and infiltration testing results taken from the PGE report are included in Appendix D.
23. The trial pit logs show that the sub-strata composition of the site at the infiltration testing locations typically consist of topsoil underlain by Stoke Goldington Member and Felmersham Member, which typically comprise medium dense becoming dense orange brown slightly clayey very gravelly sand.
24. As previously mentioned, infiltration rates were calculated to be between 1.03×10^{-5} and 7.93×10^{-6} . Therefore, the use of infiltration techniques is considered to be suitable as a means of surface water discharge at the proposed site.

25. A number of different options for discharge of surface water are available including traditional soakaways, crated soakaways, permeable paving and an infiltration basin. The current layout lends itself to a combination of these techniques and the most appropriate will be confirmed based upon the final site layout at such time as a planning application is submitted.
26. The final strategy will therefore adhere to the surface water drainage hierarchy in terms of the method of surface water disposal while also offering treatment of surface water at source.

Foul Water Drainage

27. The Anglian Water Asset Location Plan contained in Appendix E, identifies a 175mm diameter pipe within Lovell Road, running parallel to the southern site boundary.
28. The Anglian Water manhole record provides the invert level of manhole 7901, located downstream of the site as 33.497. Considering that the surveyed ground levels of the existing site are between 37.11m and 34.77m. Depending upon the final site layout it is likely that some of the proposed dwellings can be drained via gravity with the remainder requiring a pumped connection.
29. Discussions have been held with Anglian Water regarding the infrastructure required to pump foul water from the site and in consideration of the small number of dwellings Anglian Water have confirmed that a Type 2 kiosk style pumping station would be appropriate. The appended layout shows how this could be provided at the end of the proposed adoptable road.
30. Notwithstanding the above, in accordance with relevant drainage policy, Anglian Water are obliged to accept foul water flows from a proposed development subject to the site receiving planning consent. In anticipation that such a consent will be granted for the proposed residential scheme, it is expected that Anglian Water will make the necessary arrangements to ensure that the required provision within their public foul sewer network and treatment works will be available at the time that the Applicant wishes to connect the site's foul sewers to the designated outfall at Manhole 7401.

Potable Water

31. Potable Water in the area is provided by Anglian Water; their record plans for the site (included in Appendix E) confirm that no apparatus directly crosses the site. The nearest apparatus is an 8-inch watermain within Lovell Road along the site frontage. Anglian Water's Pre-Planning Assessment Report confirms that there is currently capacity in the network at this location to supply the proposed development.

Electricity

32. UK Power Network's (UKPN) Record Plans, included in Appendix F, indicate that no apparatus crosses the site; the nearest apparatus is located under the Lovell Road carriageway.
33. Given the extent of the electrical infrastructure within proximity to the site, it is not anticipated that providing a supply to the site would be problematic.

Gas

34. Cadent, on behalf of National Grid, were contacted with regard to the extent of their infrastructure in proximity to the site; a copy of their plans are included in Appendix G. The plans confirm that no apparatus crosses the site. The nearest apparatus is a medium pressure main located along Lovell Road.
35. It is anticipated that the proposed development can be served via this apparatus without the requirement for upgrades to the network. Care will need to be taken when constructing the access off Lovell Road.

Telecommunication

36. Record Plans have been obtained from BT Openreach; a full copy of the plans can be viewed in Appendix H. The plan shows that a cable runs along Lovell Road within the extent of the site frontage. Two boxes and three poles are also located within the immediate vicinity of the site. It is anticipated that from this apparatus a connection can be provided to the proposed development.

Highways and Transportation

37. The site is located well within the recommended walking distances of a range of educational and employment opportunities as well as other daily services and facilities such as local shops.
38. A summary of the services and facilities available within the village and the approximate walking distances are provided below:

Food / Drink

The Fox & Hounds - 800m
O for Coffee - 1.3km
Bedford Arms - 1.4km
Clapham Bar-BQ and Takeaway - 1.5km
Clapham Fish and Chip Shop - 1.5km
Zeera Tandoori Takeaway Clapham - 1.5km
Good Chef Chinese Takeaway - 1.5km
Caffe Piccolo - 1.6km
Mandarin House Takeaway - 1.6km
The Horse & Groom - 1.7km
Bellini's - 1.7km

Education

Lincroft Academy - 750m
Oakley Primary Academy - 850m
Clapham Pre-School - 1.5km
Oakley Pre-School - 1.6km
Ursula Taylor Church of England School - 1.7km
Puddleducks Bedford - 2km

Places of Worship

Saint Mary's Oakley - 850m
Oakley Methodist Church - 1.6km
Clapham Methodist Church - 1.7km

Convenience Stores

Tesco Express - 5.1km
One Stop Stores - 3.2km

Health and Beauty

Priory Medical Practice - 1km
Twinwoods Health Resource Centre - 1.5km
Anita's Beauty Salon - 1.2km
Hazel Kaye Hair, Beauty and Facial Aesthetics Salon - 1.5km
A Touch of Beauty - 1.4km

Leisure / Recreation

Oakley Sports and Social Club - 1.3km
Bedford and County Golf Club - 2.7km

Services

Oakley Post Office - 1.5km
Auto Tread Mobile Tyre Fitting - 1.3km
G A Henman & Sons Ltd (Garage) - 1.4km

39. Further educational, leisure and employment opportunities are available within the wider extents of Bedford Borough.
40. In addition to the facilities and opportunities noted above, the site is located within a 2-minute walk of the 'Lovell Memorial Homes East' bus stops, which are situated to the west of the site on Lovell Road. The services that operate from this bus stop facilitate access to key locations including Bedford, Rushden, Milton Keynes, Peterborough and Kettering. A summary of the timetable information relating to these services is presented in Table 1.1 below.

Table 1.1: Bus Service Information

Service	Operator	Route	Frequency	First	Last
25	Grant Palmer	Bedford - Harrold - Rushden (via Clapham, Oakley, Pavenham, or Stevington, Poddlington, or Sharnbrook)	Monday to Saturday - Hourly	08:00	19:02
50	Stagecoach	Bedford - Milton Ernest - Sharnbrook - Rushden - Rushden Lakes - Irthlingborough - Kettering	Monday to Friday - Hourly Saturdays - Hourly	06:05 06:10	21:59 21:59
VL6	The Villager	Clapham - Oakley - Stevington - Newton Blossomville - Milton Keynes	4 th Tuesday of each month	09:00	13:30
VL8	The Villager	Clapham - Oakley - Harrold - Sharnbrook - Peterborough	2 nd Friday of each month	09:00	15:45

41. The site also lies within 4.8km of Bedford Train Station, which equates to a 15-minute cycling journey. From Bedford Station, services can be taken to key locations including Wellingborough, Flitwick, London and Luton.

Anticipated Trip Generation

42. The methodology for calculating the anticipated trip generation for a proposed development is to use trip rate figures contained within the TRICS database. Trip rates are based on average traffic surveys conducted at similar sites throughout England (excluding Greater London, The Isle of Wight and The Isle of Man).
43. The trip rates outlined in Table 1.2 have been extracted from the 'Mixed Private / Affordable Housing' category of the TRICS database; a full copy of the TRICS Output can be viewed in Appendix I. The figures are based on the traditional AM and PM peak hours of 08:00-09:00 and 17:00-18:00 respectively.
44. The resultant trip generation based on the TRICS trip rates for the 23 proposed dwellings are presented in Table 1.3. The calculations show that the proposed development is expected to generate a total of 12 two-way trips during the AM Peak hour, and 15 two-way trips during the PM Peak hour.

Table 1.2: TRICS Trip Rates - Mixed Private / Affordable Housing

Peak Hour	Trip Rate (per dwelling)	
	Arrivals	Departures
AM (08:00-09:00)	0.160	0.321
PM (17:00-18:00)	0.315	0.272

Table 1.3: Proposed Trip Generation of X Dwellings using TRICS Trip Rates

Peak Hour	Trip Generation (23 dwellings)	
	Arrivals	Departures
AM (08:00-09:00)	4	8
PM (17:00-18:00)	8	7

45. Based upon the anticipated trip generation of the site, it is anticipated that the Local Highway Authority will not require capacity assessments to be undertaken at offsite junction locations.
46. The proposed vehicular access is to take the form of a priority T-junction off Lovell Road.
47. Lovell Road currently benefits from the provision of a footpath on the opposite side of the carriageway and street lighting on both sides of the carriageway. A tactile paving dropped kerb will be provided to allow connection into the existing infrastructure.
48. This form of access was agreed in principle by the Highway Authority in relation to a recently submitted planning application for a similar form of development on the site.

Summary and Conclusions

49. From the information presented above it can be concluded that no issues are anticipated in terms of capacity in the various utility networks to supply the site. It can also be concluded that there is no known utility apparatus that would serve as a constraint to the development proposals.
50. A very small area of the site is shown to be at risk from surface water flooding, however it is important to note that the area in question is located within an area of green space as opposed to built development. Therefore, the small area of potential flooding is not anticipated to serve as a constraint to development and equally the development will not impede any flood waters which may occur. Furthermore, this area would appear to be an anomaly with the flood mapping representing a localised low area on the site.

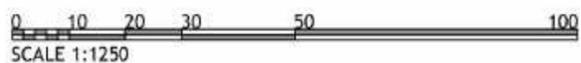
51. It has been demonstrated that an infiltration-based surface water drainage strategy can be implemented on the site which would accord with the hierarchy for surface water disposal set out within the Building Regulations as well as Bedford Borough Council's policies by providing surface water treatment close to the source.
52. Through discussions with Anglian Water it can be confirmed that a suitable strategy for the disposal of foul water is available.
53. It has been demonstrated that suitable vehicular access to the site can be provided off Lovell Road the principle of which has previously been deemed appropriate by the Highway Authority.
54. There are a number of services and facilities located in proximity to the site as well as a bus stop which provides sustainable access to the wider area. The site is therefore considered to lie in a sustainable location in terms of accessibility to services and facilities and the availability of sustainable modes of transport.
55. Upon consideration of the above, it can be concluded that the proposed development can be supported through the planning process in terms of highways, transportation, flood risk, drainage and utilities.
56. Indeed, it should be noted that no objections were raised in relation to utilities, flood risk, foul drainage, surface water drainage, highways or transportation in response to a recently submitted planning application for a similar scale of development on the site.

Appendix A

Site Location Plan

NOTES

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<input type="checkbox"/>	CONSTRUCTION	<input type="checkbox"/>	AS BUILT		
SCALE	1:1250 @ A3	DATE	Aug 2020		
DRAWN	JAB	CHK	MP		
DRAWING NO.	18412-1009	REV	-		
TITLE	Land off Lovell Road Oakley				
DETAILS	Site Location Plan				

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Appendix B

Site Layout Plan



NOTES

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<input type="checkbox"/>	CONSTRUCTION	<input type="checkbox"/>	AS BUILT		
SCALE	1:500 @ A2	DATE	July 2020		
DRAWN	JAB	CHK	MP		
DRAWING NO.	18412-1009	REV	-		
TITLE	Lovell Road Oakley				
DETAILS	Illustrative Sketch layout				

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Appendix C

EA Flood Maps

Flood map for planning

Your reference
18479

Location (easting/northing)
501786/253013

Created
11 Jun 2019 11:30

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

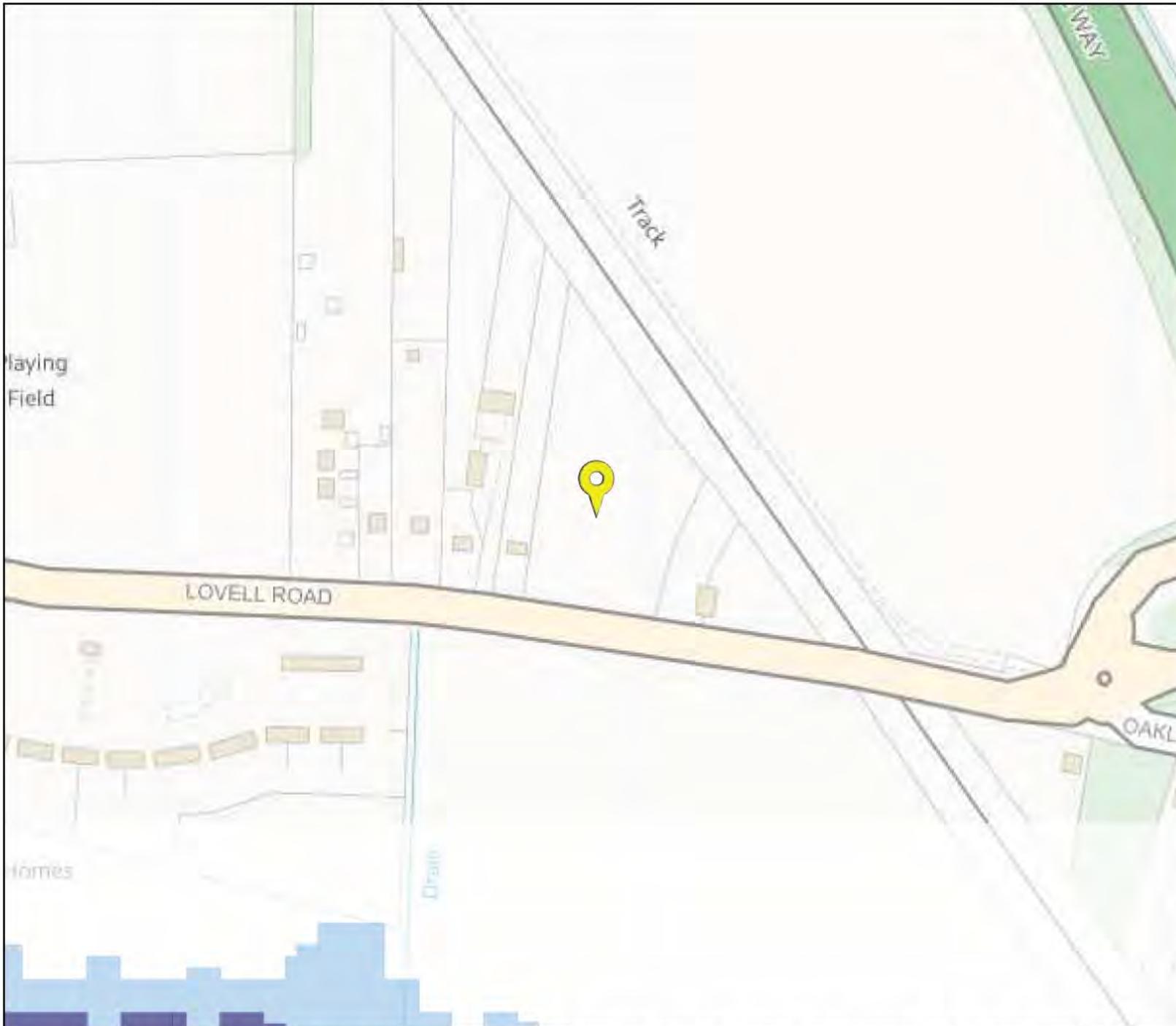
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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Flood map for planning

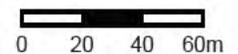
Your reference
18479

Location (easting/northing)
501786/253013

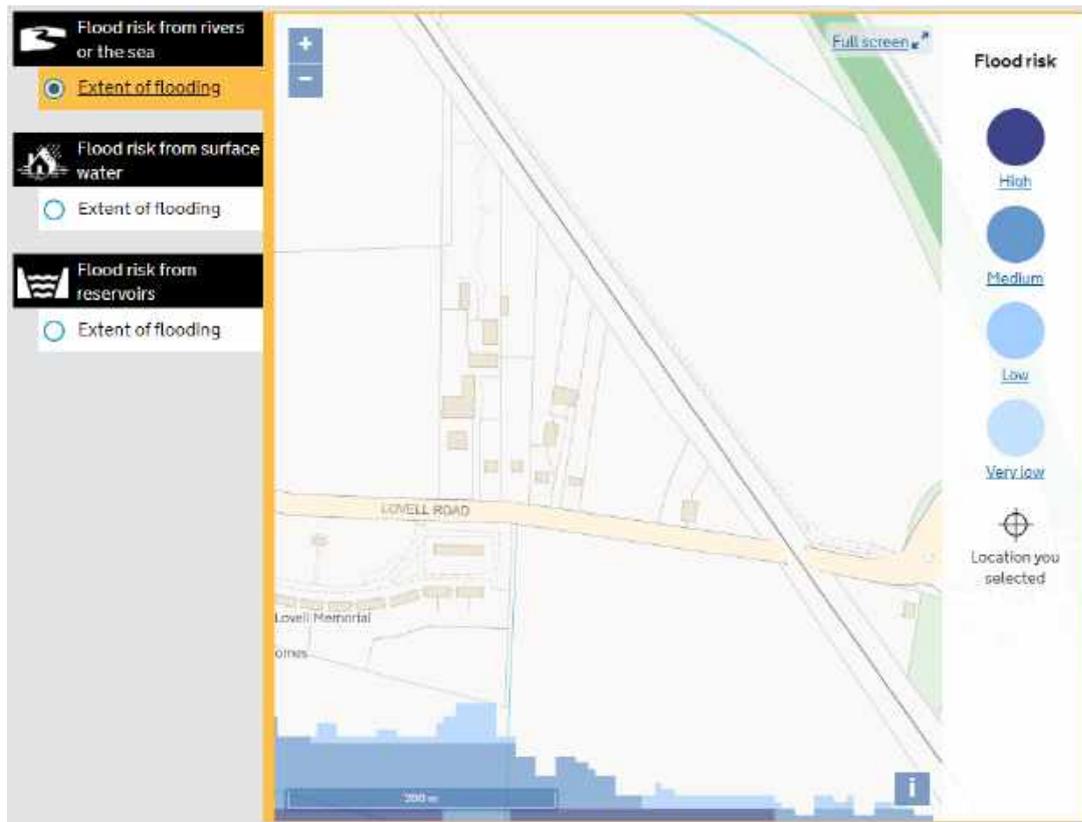
Scale
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Created
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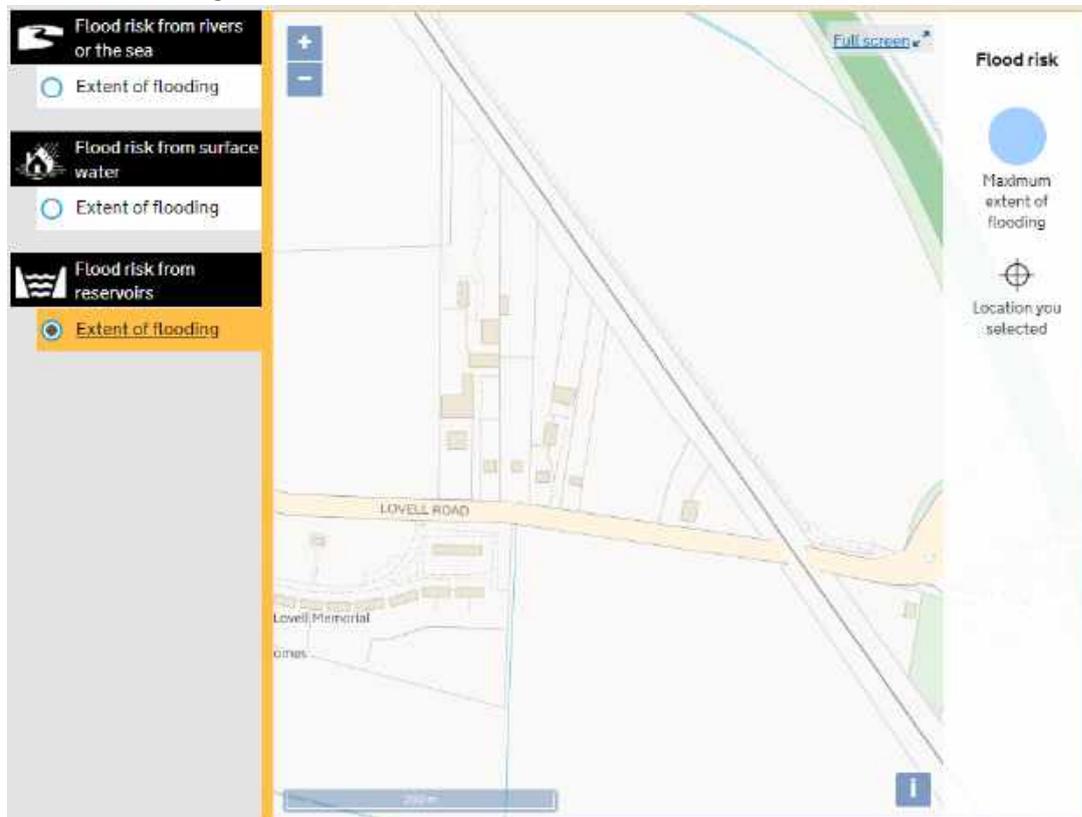
-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area



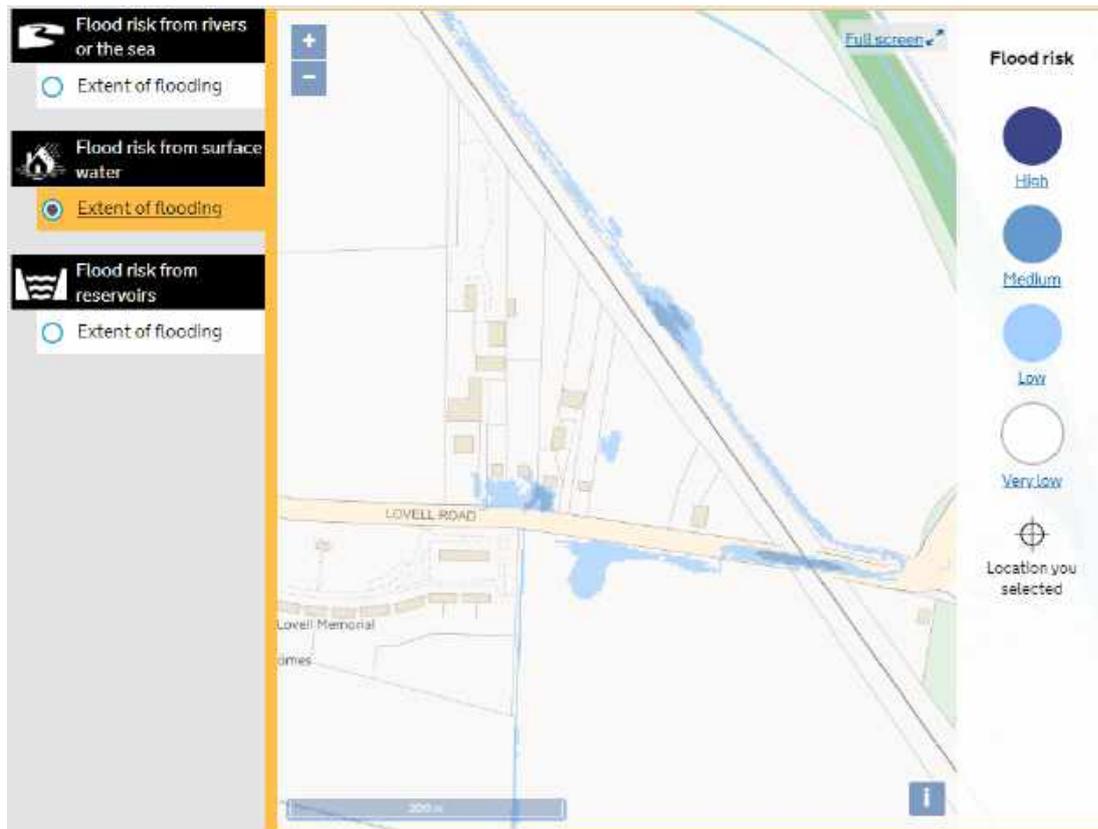
Extent of Flooding from Rivers or the Sea



Extent of Flooding from Reservoirs



Extent of Flooding from Surface Water





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Appendix D

PGE Report

PADDOCK

GEO ENGINEERING



**Land off Lovell Road, Oakley, Bedfordshire,
MK43 7RY**

GROUND INVESTIGATION – BRE365 INFILTRATION TESTING



Red Eagle Securities

June 2019

P19-077inf

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VAT Number: GB 166 8087 72



Issue:	Date	Written By:	Comment
1	03/06/19		-

For and on Behalf of Paddock Geo Engineering Limited

CONTENTS **Ground Investigation – Infiltration Testing**

APPENDICES

A **Site Location/Proposed Development Plan**

B **Trial Pit Location Plan**

C **Trial Pit Logs**

D **Infiltration Testing Results**

GROUND INVESTIGATION – BRE365 INFILTRATION TESTING

Land off Lovell Road, Oakley, Bedfordshire, MK43 7RY

Further to instructions received from Wood Hardwick LLP on behalf of Red Eagle Securities; the Client, infiltration testing have been carried out within trial pits at the above site in relation to assessing the infiltration properties of the underlying ground.

Objectives

This assessment has been carried out to a scope of works as detailed by the project Engineers. The assessment has been designed to assess the infiltration properties of the near surface strata.

Scope of Works

The works comprised the forming of 12no. trial pits with infiltration testing within five of the pits to the BRE365 methodology. The testing was carried out to assess the permeability of the Woburn Sands Formation at shallow depth beneath the site.

Terms of Reference

The assessment has been carried out generally in accordance with the following guidance.

- Code of Practice for Site Investigations, British Standards Institution BS5930: 2015
- BRE Digest 365 – Soakaway Design 2016

Sitework

The sitework comprised the forming of 12no. machine excavated trial pits to depth of between 1.50m and 3.90m below ground level (bgl) on 16th and 17th April 2019.

Trial pits TP1, TP4, TP5, TP6, TP9 and TP11 were progressed to the full achievable depth with the excavator used to assess the groundwater level and geology below anticipated infiltration level. Of these trial pits, TP1, TP5 and TP6 were installed with a temporary monitoring well to a depth of 3.00m bgl. The deeper trial pits were terminated on impenetrable Limestone.

The trial pit positions are indicated on the enclosed Trial Pit Plan presented in Appendix B.

The trial pit arisings were logged by a Geotechnical Engineer generally in accordance with BS5930:2015. Representative samples were recovered from the trial pits and are currently stored for any future requirements.

Trial Pits TP2, TP3, TP7, TP8 and TP10 had an infiltration test carried out to the BRE365 methodology to varying full depth.

The trial pits were reinstated upon completion of testing with compacted arisings.

Encountered Strata

A log of the Trial Pit and a Trial Pit Location Plan showing the positions investigated are presented in Appendix C and B respectively.

The strata encountered within the boreholes is summarised in the table below. These details are also included on the Trial Pit Logs presented in Appendix C.

Encountered Strata

Strata	Trial Pit and Basal Depth (m bgl)											
	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP9	TP10	TP11	TP12
Topsoil Grass over, dark brown clayey gravelly loamy SAND	0.50	0.50	0.90	0.40	0.40	0.50	0.65	0.35	0.65	0.40	0.40	0.35
Stoke Goldington Member and Felmersham Member (Undifferentiated) Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone	3.30	1.80	1.80	-	3.00	3.00	2.40	1.60	3.00	1.50	3.20	2.30
Great Oolite Group Firm light brown slightly gravelly silty sandy CLAY	-	-	-	1.80	-	3.30	-	-	-	-	-	-
Moderately strong grey LIMESTONE recovered as subangular to tabular gravel and cobble size fragments	3.50	-	-	3.00	-	3.50	2.60	-	3.20	-	-	-
Trial Pit Depth (m bgl)	3.50	1.80	1.80	3.00	3.00	3.50	2.60	1.60	3.20	1.50	3.20	2.30

Groundwater Details

Groundwater was not encountered within any of the trial pits during the fieldworks or in subsequent monitoring visits.

Laboratory Analysis

No lab analysis was carried out; however, samples were recovered from the trial pits and have been retained in case a future geotechnical appraisal is required.

Surface Water Soakaways

Infiltration testing was carried out within five of the trial pits across the site to the BRE365 methodology to allow an estimate of Infiltration Factor for the site. The test was repeated three times within all trial pits tested.

The testing was generally carried out within the near surface Stoke Goldington Member and Felmersham Member (Undifferentiated) granular soils.

The trial pits were formed to varying depths and filled to allow effective depth of water in the range 0.30m to 0.5m. This was done to limit the instability of the pit which had been noted within some of the trial pits within the granular soils. Therefore, for the infiltration calculations an invert incoming pipe level slightly above the filled water level was employed.

The results are presented in Appendix E and are summarised in the table below.

Infiltration Factors

Trial Pit	Soil Tested	Test Depth	Infiltration Factor (ms ⁻¹)		
			Cycle 1	Cycle 2	Cycle3
TP2	Stoke Goldington Member and Felmersham Member (Undifferentiated)	1.40-1.80m	1.64 x 10 ⁻⁵	1.17 x 10 ⁻⁵	6.58 x 10 ⁻⁶
TP3a		0.90-1.20m	4.13 x 10 ⁻⁵	1.18 x 10 ⁻⁵	7.93 x 10 ⁻⁶
TP8		1.00-1.60m	1.80 x 10 ⁻⁵	1.48 x 10 ⁻⁵	1.38 x 10 ⁻⁵
TP9a		0.90-1.20m	1.87 x 10 ⁻⁵	1.31 x 10 ⁻⁵	1.03 x 10 ⁻⁵
TP10*		1.00-1.50m	3.49 x 10 ⁻⁵	2.00 x 10 ⁻⁵	3.23 x 10 ⁻⁵

Note:

* Pit cleared of slumped material prior to final test.

The tests indicated moderate infiltration within all trial pits tested. This is considered commensurate with the granular soils encountered within the pits.

General Notes

This report is produced for the sole use of the Client, and no responsibility of any kind, whether for negligence or otherwise, can be accepted for any Third Party who may rely upon it.

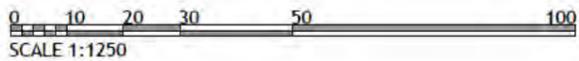
The conclusions and recommendations given in this report are based on our understanding of the future plans for the site and based on a scope of works agreed by the Client and afforded by the agreed budget. No responsibility is accepted for conditions not encountered, which are outside of the agreed scope of work.

The report has been prepared following the guidelines and principles established in the British Standards, BS 5930, CIRIA Guidance and NHBC Standards. It necessarily relies on the co-operation of other organisations and the free availability of information and total access. No responsibility can, therefore, be accepted for conditions arising from information that was inaccurate or not available to the investigating team as a result of information being withheld or access being denied.

This report may suggest an opinion on a possible configuration of strata or conditions between exploratory points and below the maximum depth of investigation. However, this is for guidance only and no liability can be accepted for its accuracy.

APPENDIX A

Site Location/Proposed Development Plan



NOTES

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SCALE 1:1250 @ A3 DATE March 2019

DRAWN MP CHK TF

DRAWING NO 18412-1000 REV -

TITLE Land off Lovell Road
Oakley

DETAILS Site Location Plan

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PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS DRAWING

APPENDIX B

Trial Pit Location Plan

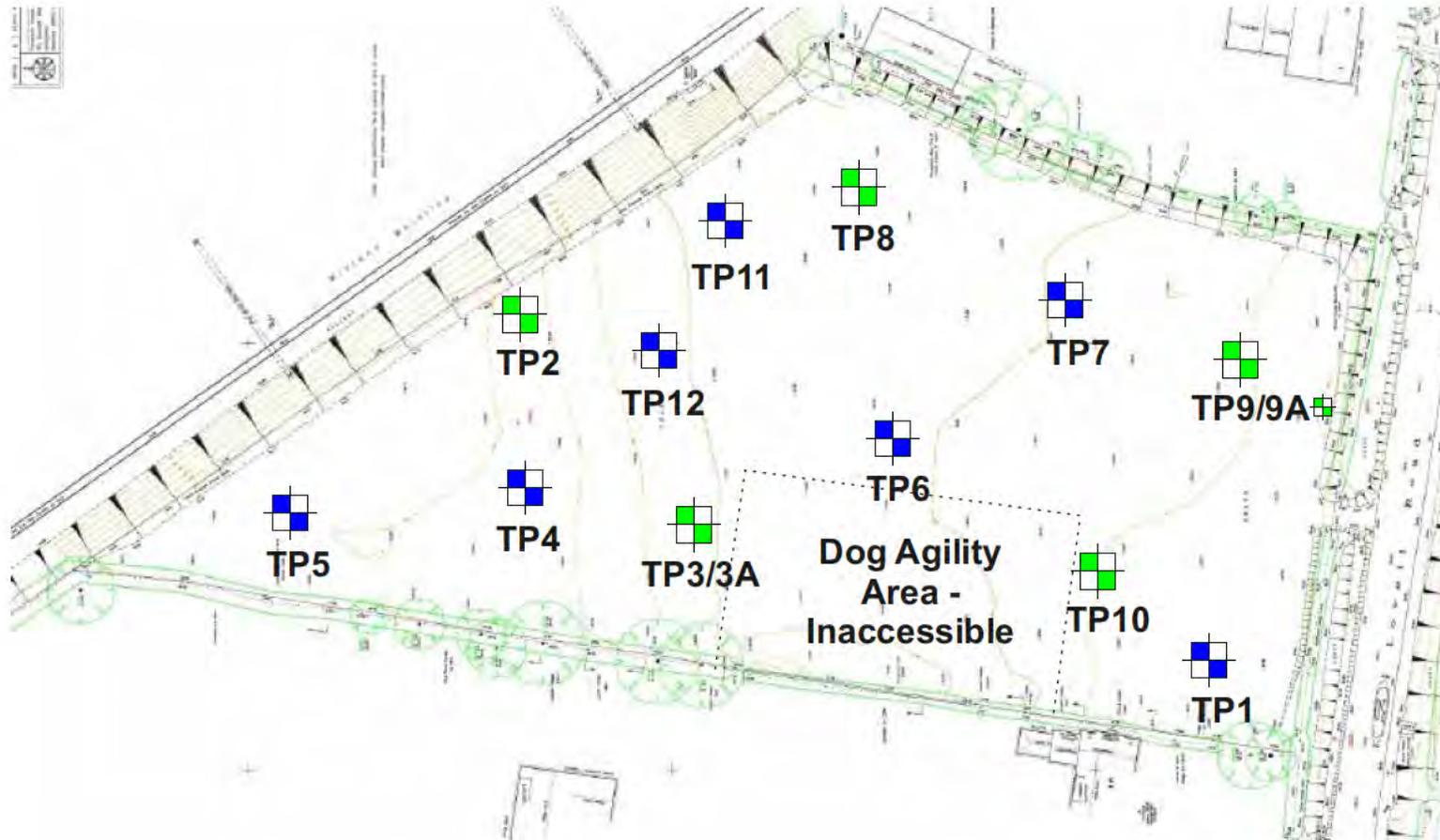
Trial Pit Location Plan

**Land off Lovell Road,
Oakley, Beds, MK43 7RY**

Red Eagle Securities

June 2019

NORTH ←



-  Trial Pit Location
-  Infiltration Testing Location

**Not to scale.
All positions are approximate.
Based on EP Architects
Plan 1708 P04**

APPENDIX C

Trial Pit Logs

					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP1		
Machine : JCB 3CX Method : Trial Pit		Dimensions 2.20m x 0.60m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 16/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.30 0.40	D D				(0.50)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
1.10	B				0.50	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated))			
2.50	B				(2.80)	occasional pockets to 5cm of light grey slightly gravelly sandy CLAY			
3.40	B				3.30 (0.20) 3.50	Moderately strong grey LIMESTONE recovered as subangular to tabular gravel and cobble size fragments (Great Oolite Group)			
						Complete at 3.50m			



Remarks

Backfilled with arisings
 Installed with 3.0m temporary monitoring well
 No groundwater encountered

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
-------------------------------	------------------------	----------------------------------

Machine : JCB 3CX Method : Trial Pit	Dimensions 2.20m x 0.45m	Ground Level (mOD)	Client Red Eagle Securities	Job Number P19-077
	Location	Dates 17/05/2019	Project Contractor PGE	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.40	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)		
					0.40	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated))		
					(2.80)	becoming light grey below 1.20m depth		
					3.20	Complete at 3.20m		



Remarks

No groundwater encountered
Backfilled with arisings

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
-------------------------------	------------------------	----------------------------------

					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP12		
Machine : JCB 3CX Method : Trial Pit		Dimensions 1.80m x 0.45m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 17/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
					0.35	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
					1.95	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated)) becoming light grey below 1.50m depth			
					2.30	Complete at 2.30m			



Remarks

Backfilled with arisings
 No groundwater encountered

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
-------------------------------	------------------------	----------------------------------

					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP2		
Machine : JCB 3CX Method : Trial Pit		Dimensions 1.80m x 0.45m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 16/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40	D				(0.50)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
0.80	D				0.50	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated))			
					(1.30)	becoming light grey below 0.90m			
1.40	D				1.80	Complete at 1.80m			



Remarks

Backfilled with arisings
 Infiltration testing carried out to BRE365 methodology
 No groundwater encountered

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
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					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP3		
Machine : JCB 3CX Method : Trial Pit		Dimensions 1.85m x 0.45m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 16/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40	D				(0.90)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
0.80	D				0.90	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated))			
1.00	D				(0.90)				
1.50	b				1.80	Complete at 1.80m			



Remarks

Backfilled with arisings
 Infiltration testing carried out to BRE365 methodology
 No groundwater encountered

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
-------------------------------	------------------------	----------------------------------

Machine : JCB 3CX Method : Trial Pit	Dimensions 2.20m x 0.45m	Ground Level (mOD)	Client Red Eagle Securities	Job Number P19-077
	Location	Dates 16/05/2019	Project Contractor PGE	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D				(0.40)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)		
0.70	D				0.40	Firm light brown slightly gravelly silty sandy CLAY (Great Oolite Group)		
1.40	D				(1.40)			
1.90	B				1.80	Moderately strong grey LIMESTONE recovered as subangular to tabular gravel and cobble size fragments in some brown silty CLAY matrix (Great Oolite Group)		
2.70	d				(1.20)			
					3.00	Complete at 3.00m		



Remarks

No groundwater encountered
Backfilled with arisings

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
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					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP5		
Machine : JCB 3CX Method : Trial Pit		Dimensions 2.30m x 0.45m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 16/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.30	D				(0.40)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
0.60	D				0.40	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated))			
1.30	B				(3.50)				
2.60	B				3.90	with cobbles of limestone from 3.0m depth			
						Complete at 3.90m			



Remarks

No groundwater encountered
Backfilled with arisings
Installed with 3.0m temporary monitoring well

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
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					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP6		
Machine : JCB 3CX Method : Trial Pit		Dimensions 2.20m x 0.60m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 16/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40	D				(0.50)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
0.80	D				0.50	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felpersham Member (Undifferentiated))			
1.50	B				(2.50)				
2.60	B								
3.10	D				3.00 (0.30)	Stiff light grey slightly limestone gravelly silty CLAY (Great Oolite Group)			
3.40	D				3.30 (0.20)	Moderately strong grey LIMESTONE recovered as subangular to tabular gravel and cobble size fragments in much light grey silty CLAY matrix (Great Oolite Group)			
					3.50	Complete at 3.50m			



Remarks

Backfilled with arisings
 No groundwater encountered
 Installed with 3.0m temporary monitoring well

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
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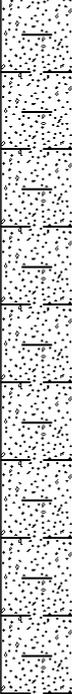
					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP7		
Machine : JCB 3CX Method : Trial Pit		Dimensions 2.10m x 0.60m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 17/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.50	D				(0.65)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
0.90	D				0.65	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated))			
1.80	D				(1.75)				
2.50	D				2.40 (0.20)	Moderately strong grey LIMESTONE recovered as subangular to tabular gravel and cobble size fragments in much light grey silty CLAY matrix (Great Oolite Group)			
					2.60	Complete at 2.60m			



Remarks

No groundwater encountered
Backfilled with arisings

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
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					Site Land at Lovell Road, Oakley, Bedfordshire, MK43 7RY		Trial Pit Number TP9		
Machine : JCB 3CX Method : Trial Pit		Dimensions 2.20m x 0.45m		Ground Level (mOD)		Client Red Eagle Securities		Job Number P19-077	
		Location		Dates 17/05/2019		Project Contractor PGE		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40	D				(0.65)	Grass over, dark brown clayey gravelly loamy SAND (TOPSOIL)			
0.90	D				0.65	Medium dense becoming dense orange brown slightly clayey very gravelly SAND. Gravel is fine to coarse subangular to rounded flint and occasional limestone (Stoke Goldington Member and Felmersham Member (Undifferentiated))			
2.00	D				(2.35)				
3.10	D				3.00 (0.20) 3.20	Moderately strong grey LIMESTONE recovered as subangular to tabular gravel and cobble size fragments (Great Oolite Group)			
						Complete at 3.20m			



Remarks

No groundwater encountered
 Backfilled with arisings
 Infiltration testing carried out to BRE365 methodology in adjacent pit TP9a to 1.20m depth due to collapse of TP9

Scale (approx) 1:25	Logged By MC	Figure No. P19-077.TP1
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APPENDIX D

Infiltration Testing Results

Infiltration Test to BRE365 - TP2 Test 1

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
10:20	0.0	0	1.40
10:30	10.0	600	1.40
10:42	22.0	1320	1.42
11:17	57.0	3420	1.49
11:44	84.0	5040	1.58
12:33	133.0	7980	1.68
12:40	140.0	8400	1.70
12:53	153.0	9180	1.73
13:28	188.0	11280	1.80

Location: TP2

TEST 1

Weather: Sunny

Engineer: MC

Date: 16/05/2019

Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

1.8m	TP2 - 1.8 m depth Assume invert level of incoming drain is 1.4m bgl. Effective depth = 0.4m	Pit Depths (m bgl)
		Length
		1.8
		Width
		0.45
		Depth
		1.8
		25% Effective Depth
	1.50	
	75% Effective Depth	
	1.70	
	Inlet Depth	
	1.4	
	0.45m	

Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{(ap_{50} \times tp_{75-25})}$$

Where:

$$V_{p75-25} = \text{effective storage volume between 75\% and 25\% effective depth}$$

$$1.8 \times 0.45 \times (1.7 - 1.5)$$

$$= 0.162$$

$$ap_{50} = \text{internal area of TP upto 50\% effective depth + base of TP}$$

$$2(1.8 \times 0.45) + 2(0.45 \times 0.45) + (1.8 \times 0.45)$$

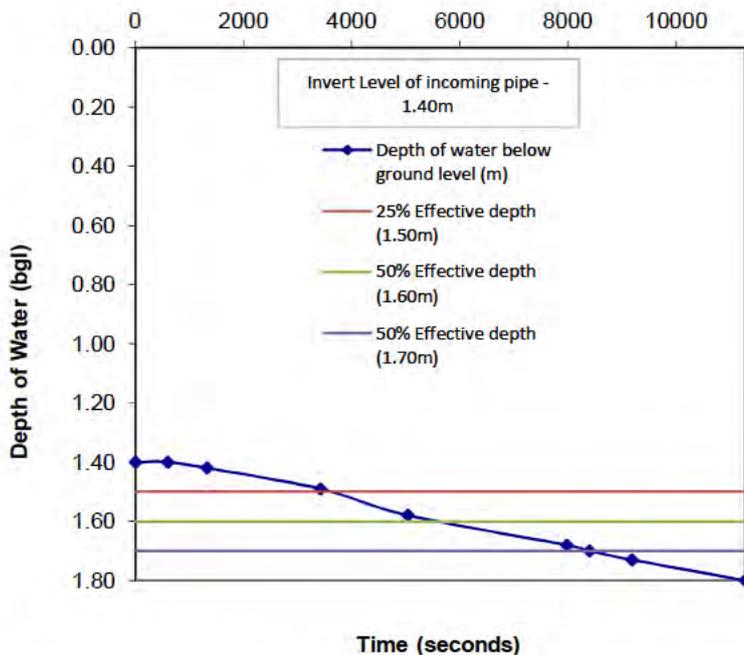
$$= 1.71$$

$$tp_{75-25} = \text{the time for water level to fall from 75\% - 25\% effective depth}$$

$$= 5760 \text{ secs}$$

$$f = 1.64E-05 \text{ m/s}$$

Comment



Infiltration Test to BRE365 - TP2 Test 2

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
13:30	0.0	0	1.40
14:03	33.0	1980	1.40
14:45	75.0	4500	1.50
15:19	109.0	6540	1.55
15:33	123.0	7380	1.60
15:57	147.0	8820	1.62
17:00	210.0	12600	1.70

Location: TP2

TEST 2

Weather: Sunny

Engineer: MC

Date: 16/05/2019

Stoke Goldington Member and Felmersham

Strata Tested Member (Undifferentiated)

1.8m	TP2 - 1.8 m depth	Pit Depths (m bgl)
	Assume invert level of incoming drain is 1.4m bgl. Effective depth = 0.4m	Length
		1.8
		Width
		0.45
		Depth
		1.8
		25% Effective Depth
	1.50	
	75% Effective Depth	
	1.70	
	Inlet Depth	
	1.4	
	0.45m	

Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{(ap_{50} \times tp_{75-25})}$$

Where:

V_{p75-25} = effective storage volume between 75% and 25% effective depth

$$1.8 \times 0.45 \times (1.7 - 1.5) = 0.162$$

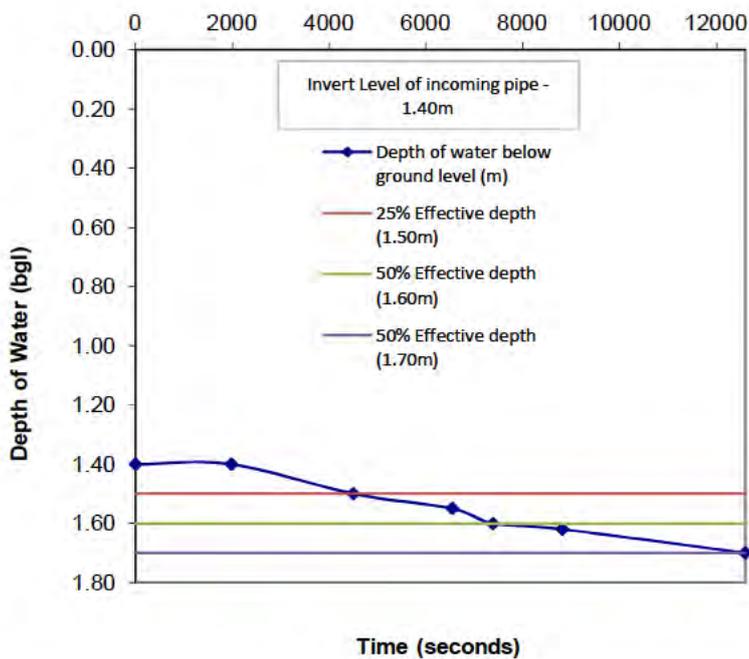
$$ap_{50} = \text{internal area of TP upto 50\% effective depth + base of TP} \\ 2(1.8 \times 0.45) + (1.8 \times 0.45) = 1.71$$

tp_{75-25} = the time for water level to fall from 75% - 25% effective depth

$$= 8100 \text{ secs}$$

$$f = 1.17E-05 \text{ m/s}$$

Comment



Infiltration Test to BRE365 - TP2 Test 3

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
17:02	0.0	0	1.40
17:15	13.0	780	1.41
17:40	38.0	2280	1.45
18:12	70.0	4200	1.50
19:12	310.0	18600	1.70

Location: TP2

TEST 3

Weather: Sunny

Engineer: MC

Date: 16/05/2019

Stoke Goldington Member and Felmersham

Strata Tested Member (Undifferentiated)

1.8m	TP2 - 1.8 m depth	Pit Depths (m bgl)
	Assume invert level of incoming drain is 1.4m bgl. Effective depth = 0.4m	Length
		1.8
		Width
		0.45
		Depth
		1.8
		25% Effective Depth
	1.50	
	75% Effective Depth	
	1.70	
	Inlet Depth	
	1.4	
	0.45m	

Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

Where:

$$V_{p75-25} = \text{effective storage volume between 75\% and 25\% effective depth}$$

$$1.8 \times 0.45 \times (1.7 - 1.5)$$

$$= 0.162$$

$$ap_{50} = \text{internal area of TP upto 50\% effective depth + base of TP}$$

$$2(1.8 \times 0.45) + (1.8 \times 0.45)$$

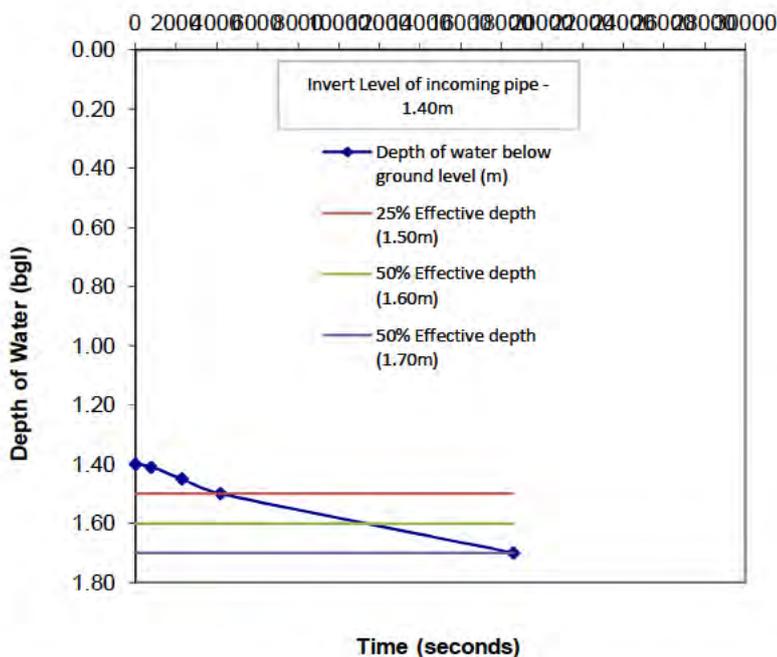
$$= 1.71$$

$$tp_{75-25} = \text{the time for water level to fall from 75\% - 25\% effective depth}$$

$$= 14400 \text{ secs}$$

$$f = 6.58E-06 \text{ m/s}$$

Comment



Infiltration Test to BRE365 - TP3a Test 1

Field Data

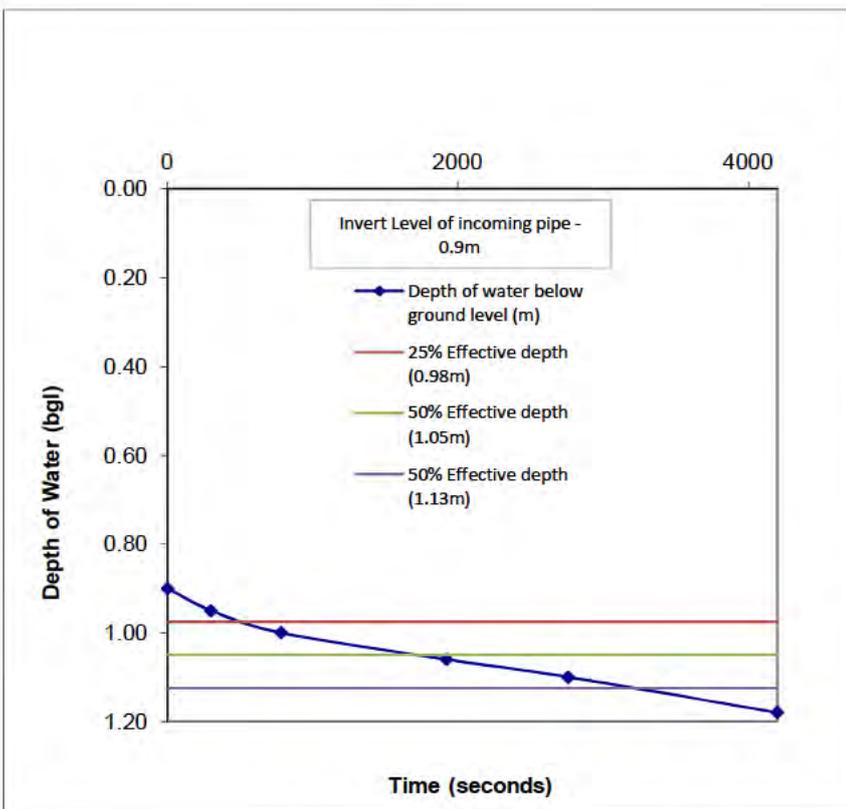
Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
11:10	0.0	0	0.90
11:15	5.0	300	0.95
11:23	13.0	780	1.00
11:42	32.0	1920	1.06
11:56	46.0	2760	1.10
12:20	70.0	4200	1.18

Location: TP3a
Weather: Sunny
Engineer: MC
Date: 16/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 1

1.8m	TP3a - 1.2 m depth Assume invert level of incoming drain is 0.9m bgl. Effective depth = 0.3m	Pit Depths (m bgl)
		Length
		1.8
		Width
		0.45
		Depth
		1.2
	25% Effective Depth	
	0.98	
	75% Effective Depth	
	1.13	
	Inlet Depth	
	0.9	
	0.45m	

Linear extrapolated values for calculation



CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

$$V_{p75-25} = \text{effective storage volume between 75\% and 25\% effective depth}$$

$$1.8 \times 0.45 \times (1.125 - 0.975)$$

$$= 0.1215$$

$$a_{p50} = \text{internal area of TP upto 50\% effective depth + base of TP}$$

$$2(1.8 \times 0.45) + 2(0.45 \times 0.45) + (1.8 \times 0.45)$$

$$= 1.485$$

$$t_{p75-25} = \text{the time for water level to fall from 75\% - 25\% effective depth}$$

$$= 1980 \text{ secs}$$

$$f = 4.13E-05 \text{ m/s}$$

Comment

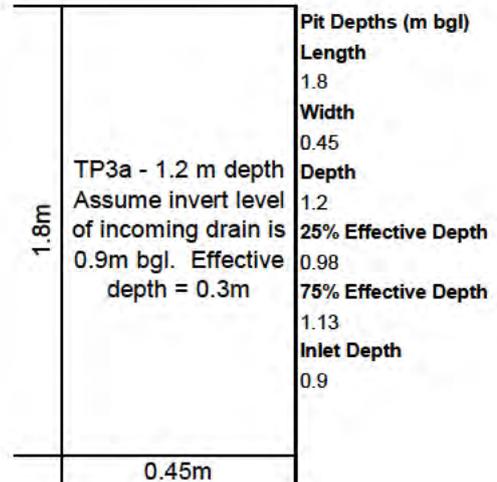
Infiltration Test to BRE365 - TP3a Test 2

Field Data

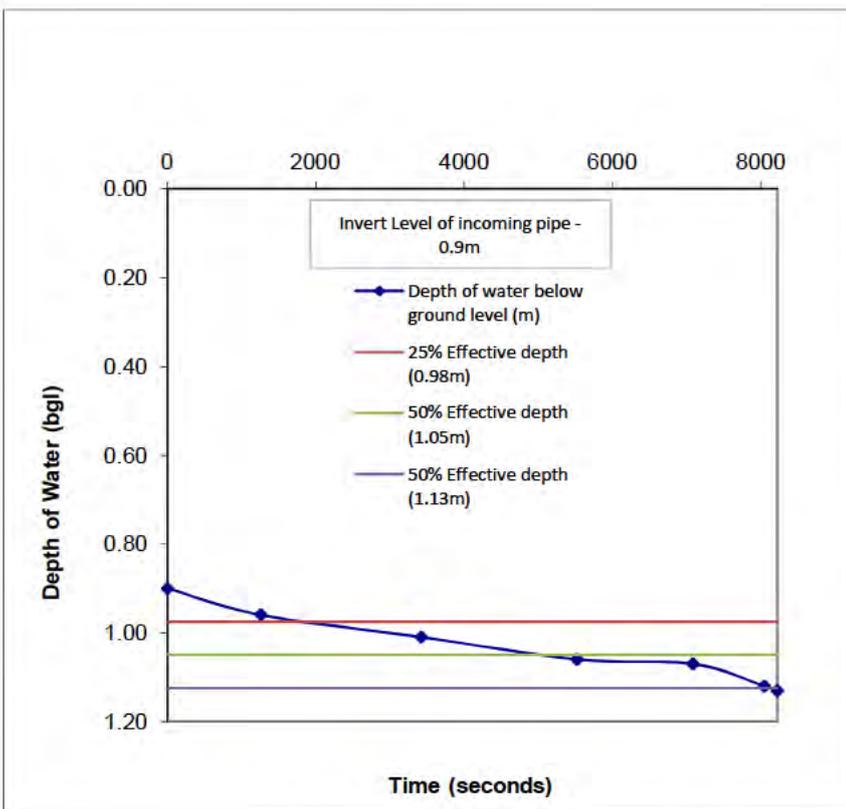
Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
12:30	0.0	0	0.90
12:51	21.0	1260	0.96
13:27	57.0	3420	1.01
14:02	92.0	5520	1.06
14:28	118.0	7080	1.07
14:44	134.0	8040	1.12
14:47	137.0	8220	1.13

Location: TP3a
Weather: Sunny
Engineer: MC
Date: 16/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 2



Linear extrapolated values for calculation



CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{(ap_{50} \times tp_{75-25})}$$

Where:

$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.125 - 0.975) \\
 &= 0.1215
 \end{aligned}$$

$$\begin{aligned}
 ap_{50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= 1.485
 \end{aligned}$$

$$\begin{aligned}
 tp_{75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= 6960 \text{ secs}
 \end{aligned}$$

$$f = 1.18E-05 \text{ m/s}$$

Comment

Infiltration Test to BRE365 - TP3a Test 3

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
14:49	0.0	0	0.90
15:18	29.0	1740	0.92
15:34	45.0	2700	0.94
15:55	66.0	3960	0.96
16:15	86.0	5160	0.98
17:41	172.0	10320	1.05
19:07	258.0	15480	1.13

Location: TP3a
Weather: Sunny
Engineer: MC
Date: 16/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 3

1.8m	TP3a - 1.2 m depth Assume invert level of incoming drain is 0.9m bgl. Effective depth = 0.3m	Pit Depths (m bgl)
		Length
		1.8
		Width
		0.45
		Depth
		1.2
		25% Effective Depth
	0.98	
	75% Effective Depth	
	1.13	
	Inlet Depth	
	0.9	
	0.45m	

Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{(ap_{50} \times tp_{75-25})}$$

Where:

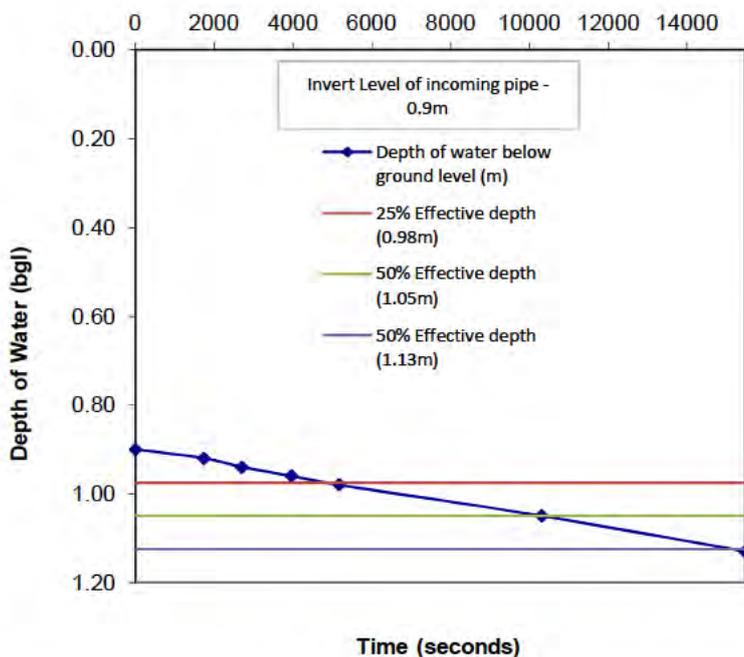
$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.125 - 0.975) \\
 &= 0.1215
 \end{aligned}$$

$$\begin{aligned}
 ap_{50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= 1.485
 \end{aligned}$$

$$\begin{aligned}
 tp_{75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= 10320 \text{ secs}
 \end{aligned}$$

$$f = 7.93E-06 \text{ m/s}$$

Comment



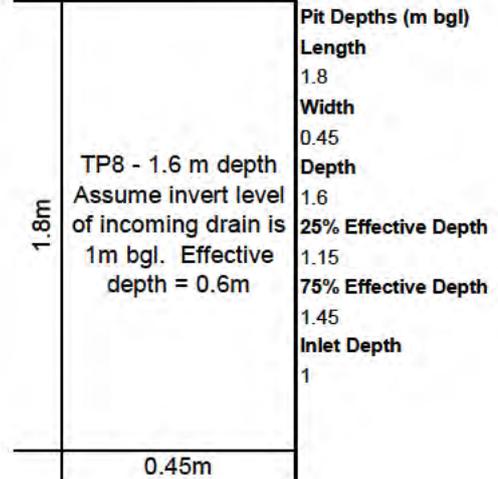
Infiltration Test to BRE365 - TP8 Test 1

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
08:35	0.0	0	1.00
08:38	3.0	180	1.06
08:45	10.0	600	1.12
08:51	16.0	960	1.15
09:14	39.0	2340	1.21
09:43	68.0	4080	1.30
10:05	90.0	5400	1.37
10:35	120.0	7200	1.45

Location: TP8
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 1



Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

Where:

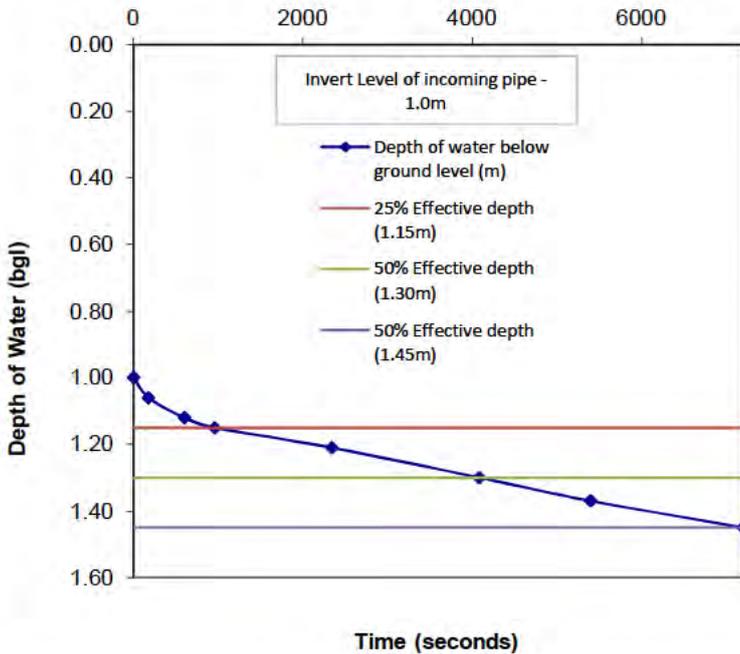
$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.45 - 1.15) \\
 &= \mathbf{0.243}
 \end{aligned}$$

$$\begin{aligned}
 ap_{50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= \mathbf{2.16}
 \end{aligned}$$

$$\begin{aligned}
 tp_{75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= \mathbf{6240} \text{ secs}
 \end{aligned}$$

$$f = \mathbf{1.80E-05} \text{ m/s}$$

Comment



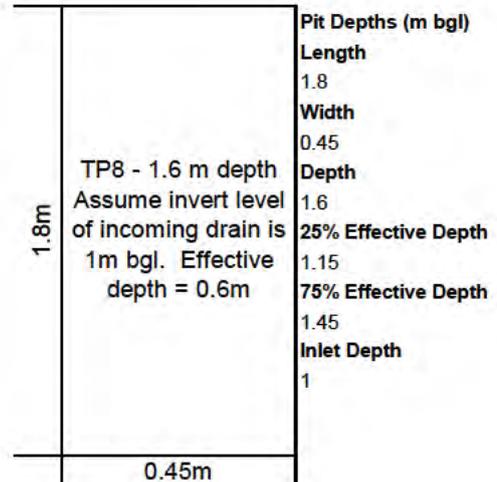
Infiltration Test to BRE365 - TP8 Test 2

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
10:08	0.0	0	1.00
10:45	37.0	2220	1.10
11:05	57.0	3420	1.15
11:27	79.0	4740	1.20
11:50	102.0	6120	1.25
12:27	139.0	8340	1.32
13:12	184.0	11040	1.45
13:26	198.0	11880	1.50

Location: TP8
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 2



Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

Where:

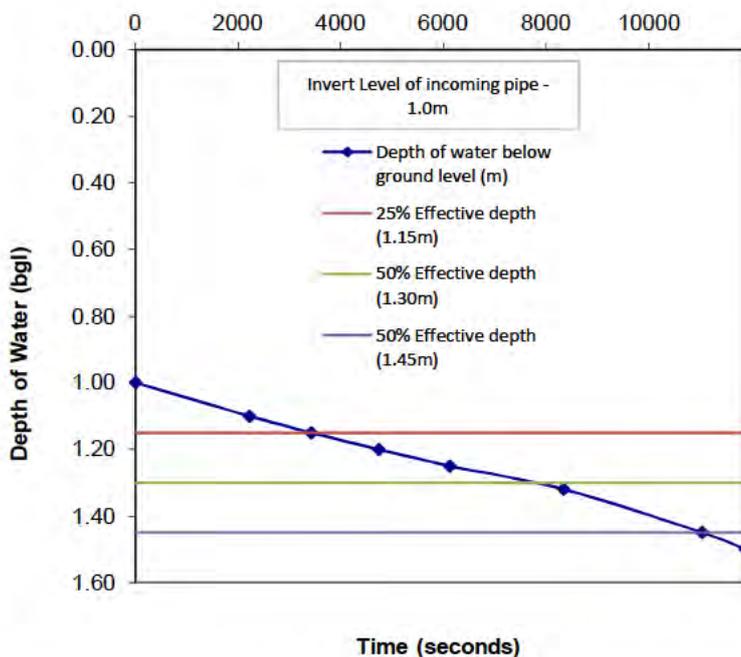
$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.45 - 1.15) \\
 &= \mathbf{0.243}
 \end{aligned}$$

$$\begin{aligned}
 ap_{50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= \mathbf{2.16}
 \end{aligned}$$

$$\begin{aligned}
 tp_{75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= \mathbf{7620 \text{ secs}}
 \end{aligned}$$

$$f = \mathbf{1.48E-05} \text{ m/s}$$

Comment

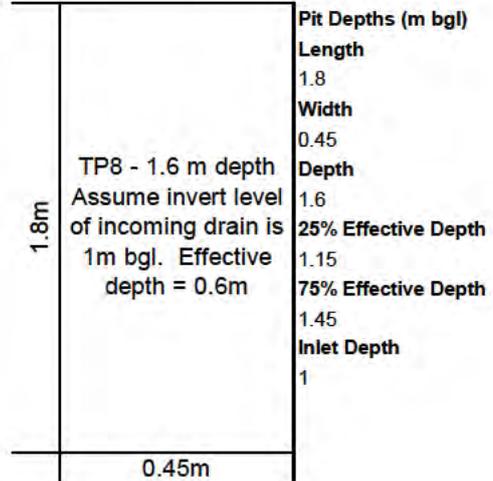


Infiltration Test to BRE365 - TP8 Test 3

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
13:29	0.0	0	1.00
13:48	19.0	1140	1.05
14:06	37.0	2220	1.11
14:37	68.0	4080	1.16
15:45	136.0	8160	1.30
16:53	204.0	12240	1.45

Location: TP8 **TEST 3**
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)



Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

Where:

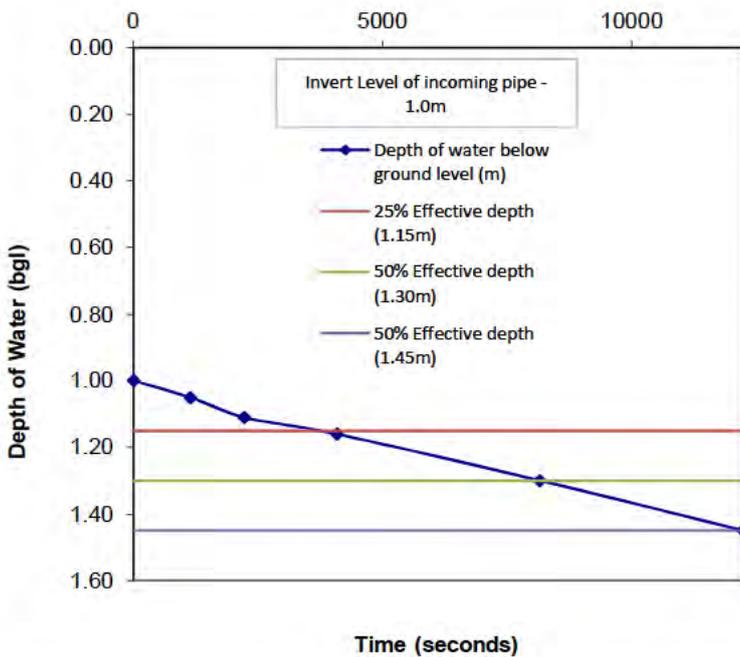
$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.45 - 1.15) \\
 &= \mathbf{0.243}
 \end{aligned}$$

$$\begin{aligned}
 ap_{50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= \mathbf{2.16}
 \end{aligned}$$

$$\begin{aligned}
 tp_{75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= \mathbf{8160 \text{ secs}}
 \end{aligned}$$

$$f = \mathbf{1.38E-05} \text{ m/s}$$

Comment



Infiltration Test to BRE365 - TP9a Test 1

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
09:18	0.0	0	0.90
09:21	3.0	180	0.91
09:27	9.0	540	0.92
09:44	26.0	1560	0.97
10:10	52.0	3120	1.02
10:24	66.0	3960	1.05
10:37	79.0	4740	1.08
11:29	131.0	7860	1.11
11:37	139.0	8340	1.15
11:45	147.0	8820	1.19
11:48	150.0	9000	1.20

Location: TP9a

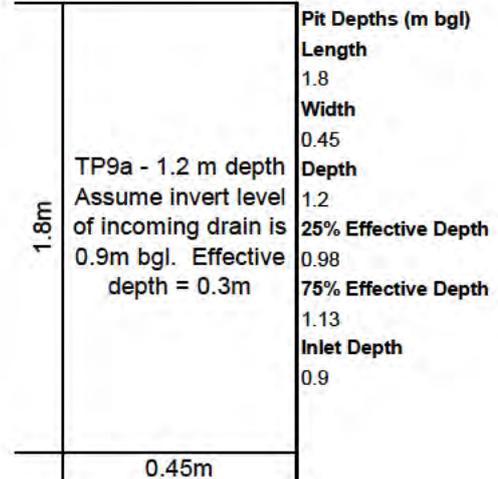
TEST 1

Weather: Sunny

Engineer: MC

Date: 17/05/2019

Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)



Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{(ap_{50} \times tp_{75-25})}$$

Where:

$$V_{p75-25} = \text{effective storage volume between 75\% and 25\% effective depth}$$

$$1.8 \times 0.45 \times (1.125 - 0.975)$$

$$= 0.1215$$

$$ap_{50} = \text{internal area of TP upto 50\% effective depth + base of TP}$$

$$2(1.8 \times 0.45) + (1.8 \times 0.45)$$

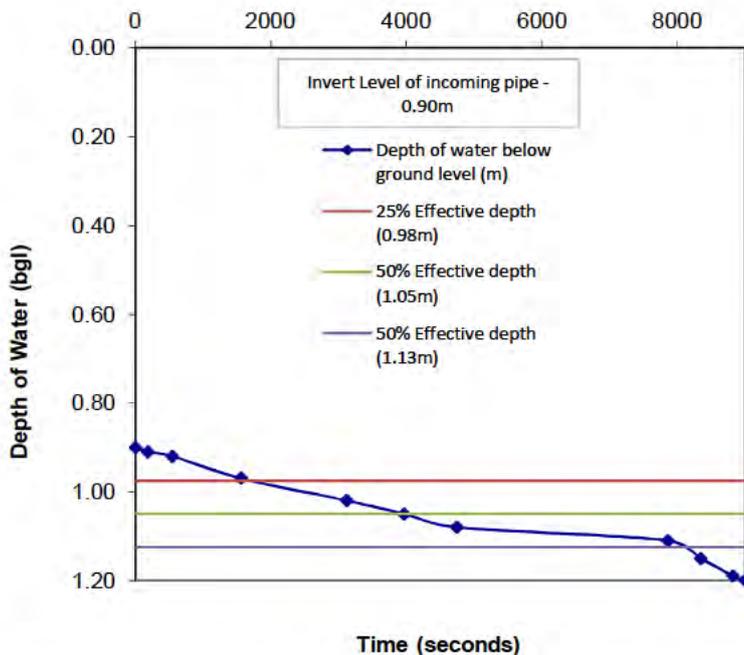
$$= 1.485$$

$$tp_{75-25} = \text{the time for water level to fall from 75\% - 25\% effective depth}$$

$$= 4380 \text{ secs}$$

$$f = 1.87E-05 \text{ m/s}$$

Comment



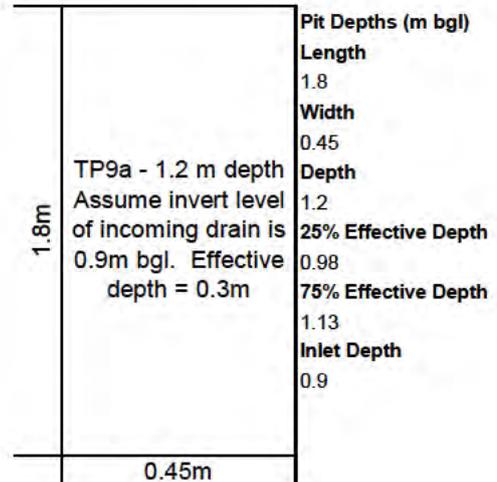
Infiltration Test to BRE365 - TP9a Test 2

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
11:49	0.0	0	0.90
12:32	43.0	2580	0.96
12:41	52.0	3120	0.98
13:33	104.0	6240	1.05
14:25	156.0	9360	1.13

Location: TP9a
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 2



Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{(a_{p50} \times t_{p75-25})}$$

Where:

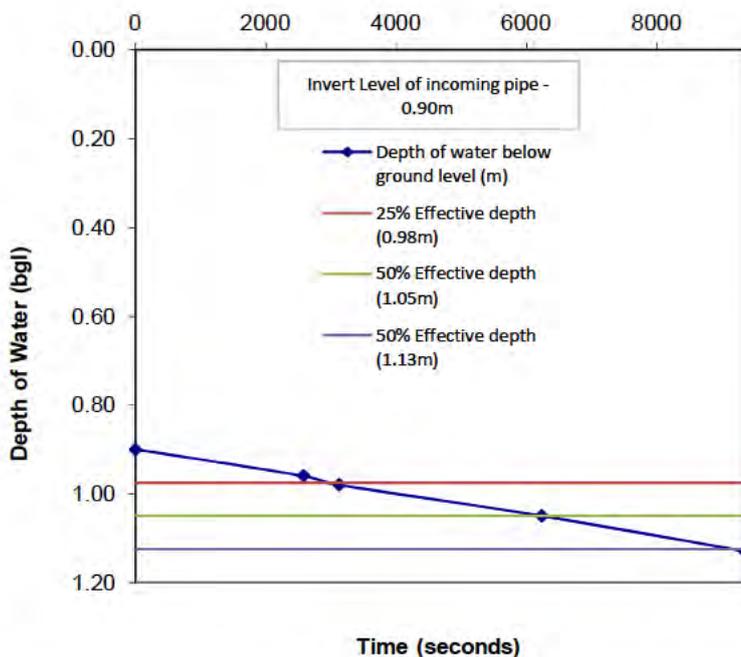
$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.125 - 0.975) \\
 &= 0.1215
 \end{aligned}$$

$$\begin{aligned}
 a_{p50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= 1.485
 \end{aligned}$$

$$\begin{aligned}
 t_{p75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= 6240 \text{ secs}
 \end{aligned}$$

$$f = 1.31E-05 \text{ m/s}$$

Comment



Infiltration Test to BRE365 - TP9a Test 3

Field Data

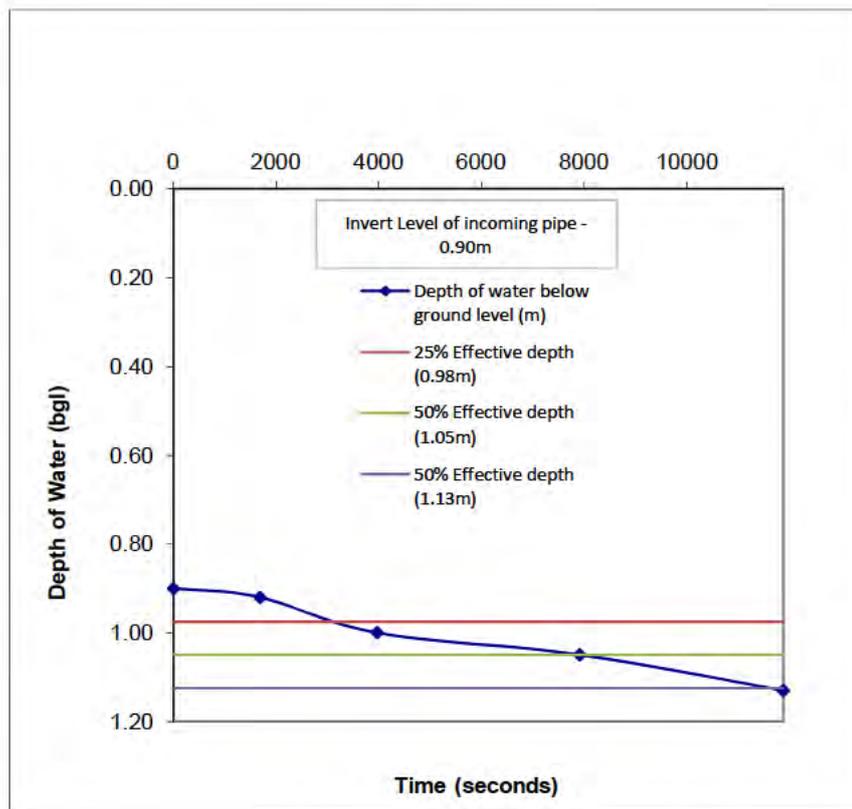
Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
13:36	0.0	0	0.90
14:04	28.0	1680	0.92
14:42	66.0	3960	1.00
15:48	132.0	7920	1.05
16:54	198.0	11880	1.13

Location: TP9a
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 3

1.8m	Pit Depths (m bgl)	1.8
	Length	0.45
	Width	0.45
	Depth	1.2
	25% Effective Depth	0.98
	75% Effective Depth	1.13
	Inlet Depth	0.9
		0.45m

Linear extrapolated values for calculation



CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

Where:

$$V_{p75-25} = \text{effective storage volume between 75\% and 25\% effective depth}$$

$$1.8 \times 0.45 \times (1.125 - 0.975)$$

$$= 0.1215$$

$$ap_{50} = \text{internal area of TP upto 50\% effective depth + base of TP}$$

$$2(1.8 \times 0.45) + 2(0.45 \times 0.45) + (1.8 \times 0.45)$$

$$= 1.485$$

$$tp_{75-25} = \text{the time for water level to fall from 75\% - 25\% effective depth}$$

$$= 7920 \text{ secs}$$

$$f = 1.03E-05 \text{ m/s}$$

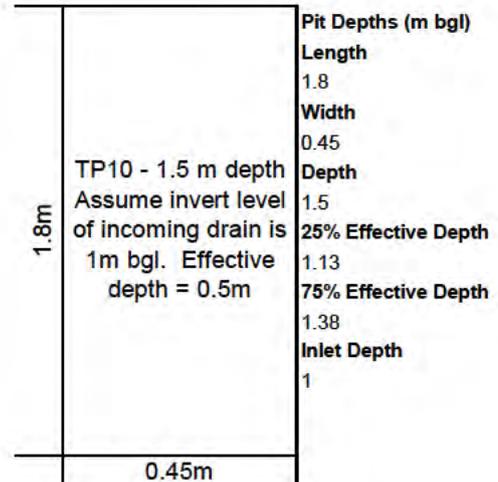
Comment

Infiltration Test to BRE365 - TP10 Test 1

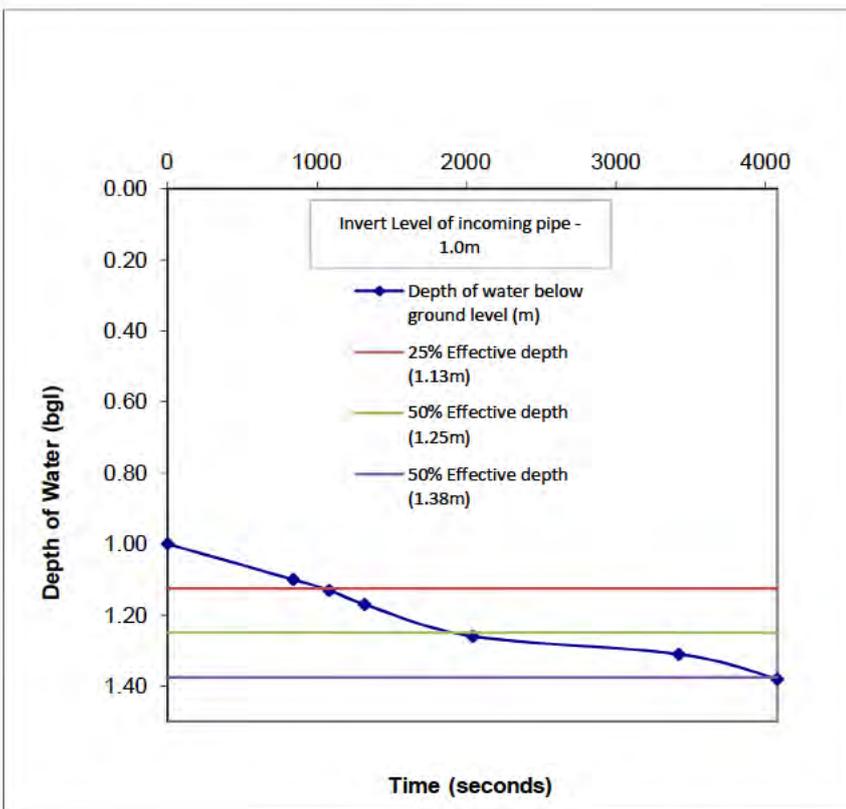
Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
09:41	0.0	0	1.00
09:55	14.0	840	1.10
09:59	18.0	1080	1.13
10:03	22.0	1320	1.17
10:15	34.0	2040	1.26
10:38	57.0	3420	1.31
10:49	68.0	4080	1.38

Location: TP10
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)



Linear extrapolated values for calculation



CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

Where:

$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.375 - 1.125) \\
 &= 0.2025
 \end{aligned}$$

$$\begin{aligned}
 ap_{50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= 1.935
 \end{aligned}$$

$$\begin{aligned}
 tp_{75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= 3000 \text{ secs}
 \end{aligned}$$

$$f = 3.49E-05 \text{ m/s}$$

Comment



Client: Woods Hardwick
Project No: P19-077
Project: Land off Lovell Road, Oakley
 Bedfordshire, MK43 7RZ

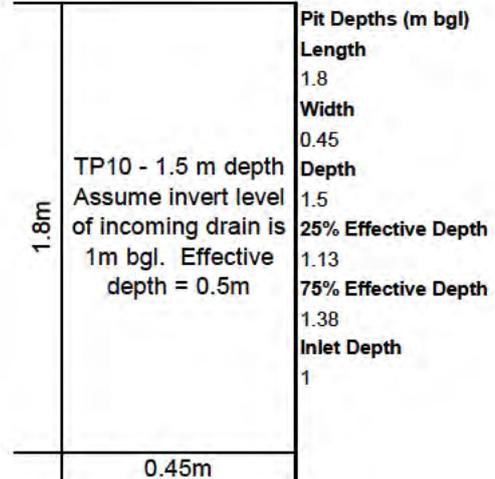
Infiltration Test to BRE365 - TP10 Test 2

Field Data

Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
10:42	0.0	0	1.00
11:01	19.0	1140	1.09
11:13	31.0	1860	1.13
11:24	42.0	2520	1.17
12:10	88.0	5280	1.28
12:30	108.0	6480	1.35
12:40	118.0	7080	1.38

Location: TP10
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 2



Linear extrapolated values for calculation

CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

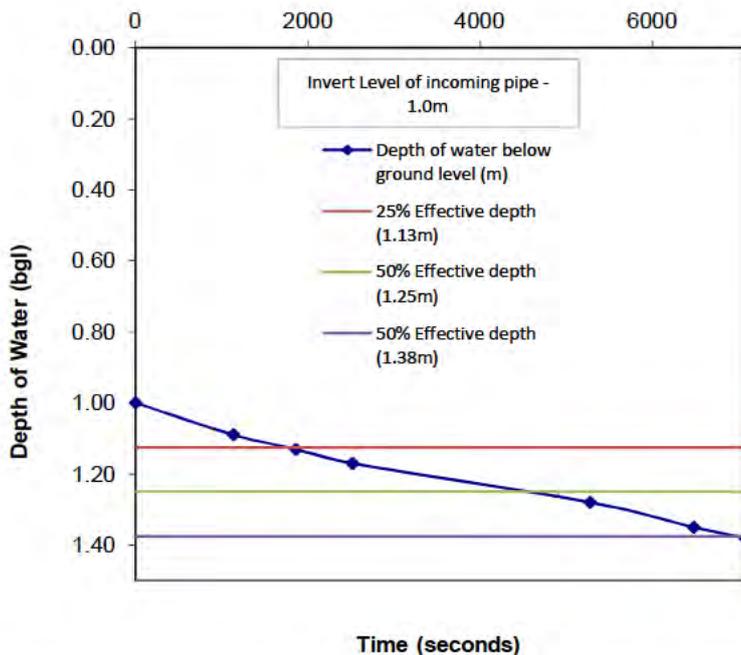
$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.375 - 1.125) \\
 &= 0.2025
 \end{aligned}$$

$$\begin{aligned}
 a_{p50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= 1.935
 \end{aligned}$$

$$\begin{aligned}
 t_{p75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= 5220 \text{ secs}
 \end{aligned}$$

$$f = 2.00E-05 \text{ m/s}$$

Comment



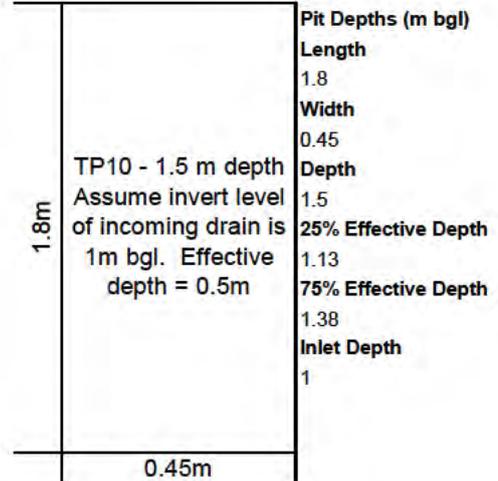
Infiltration Test to BRE365 - TP10 Test 3

Field Data

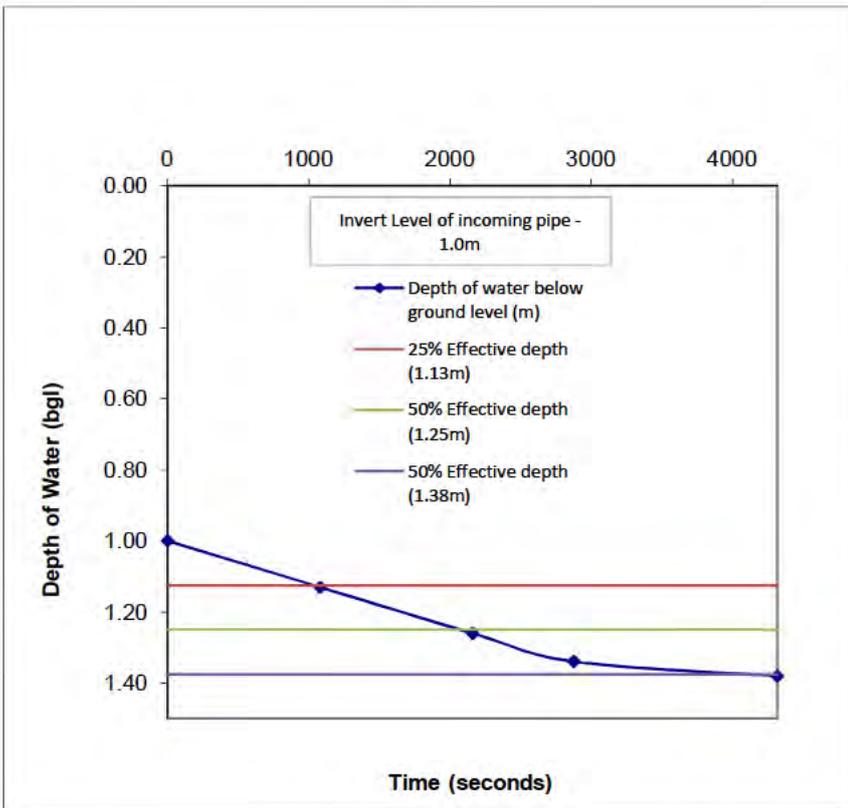
Time	Time Elapsed (min)	Time Elapsed (sec)	Depth of Water below GL (m)
12:34	0.0	0	1.00
12:52	18.0	1080	1.13
13:10	36.0	2160	1.26
13:22	48.0	2880	1.34
13:46	72.0	4320	1.38
Linear extrapolated values for calculation			

Location: TP10
Weather: Sunny
Engineer: MC
Date: 17/05/2019
 Stoke Goldington Member and Felmersham
Strata Tested Member (Undifferentiated)

TEST 3



Linear extrapolated values for calculation



CALCULATION:

$$\text{Soil Infiltration Rate}(f) = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

Where:

$$\begin{aligned}
 V_{p75-25} &= \text{effective storage volume between 75\% and 25\% effective depth} \\
 &= 1.8 \times 0.45 \times (1.375 - 1.125) \\
 &= 0.2025
 \end{aligned}$$

$$\begin{aligned}
 ap_{50} &= \text{internal area of TP upto 50\% effective depth + base of TP} \\
 &= 2(1.8 \times 0.45) + (1.8 \times 0.45) \\
 &= 1.935
 \end{aligned}$$

$$\begin{aligned}
 tp_{75-25} &= \text{the time for water level to fall from 75\% - 25\% effective depth} \\
 &= 3240 \text{ secs}
 \end{aligned}$$

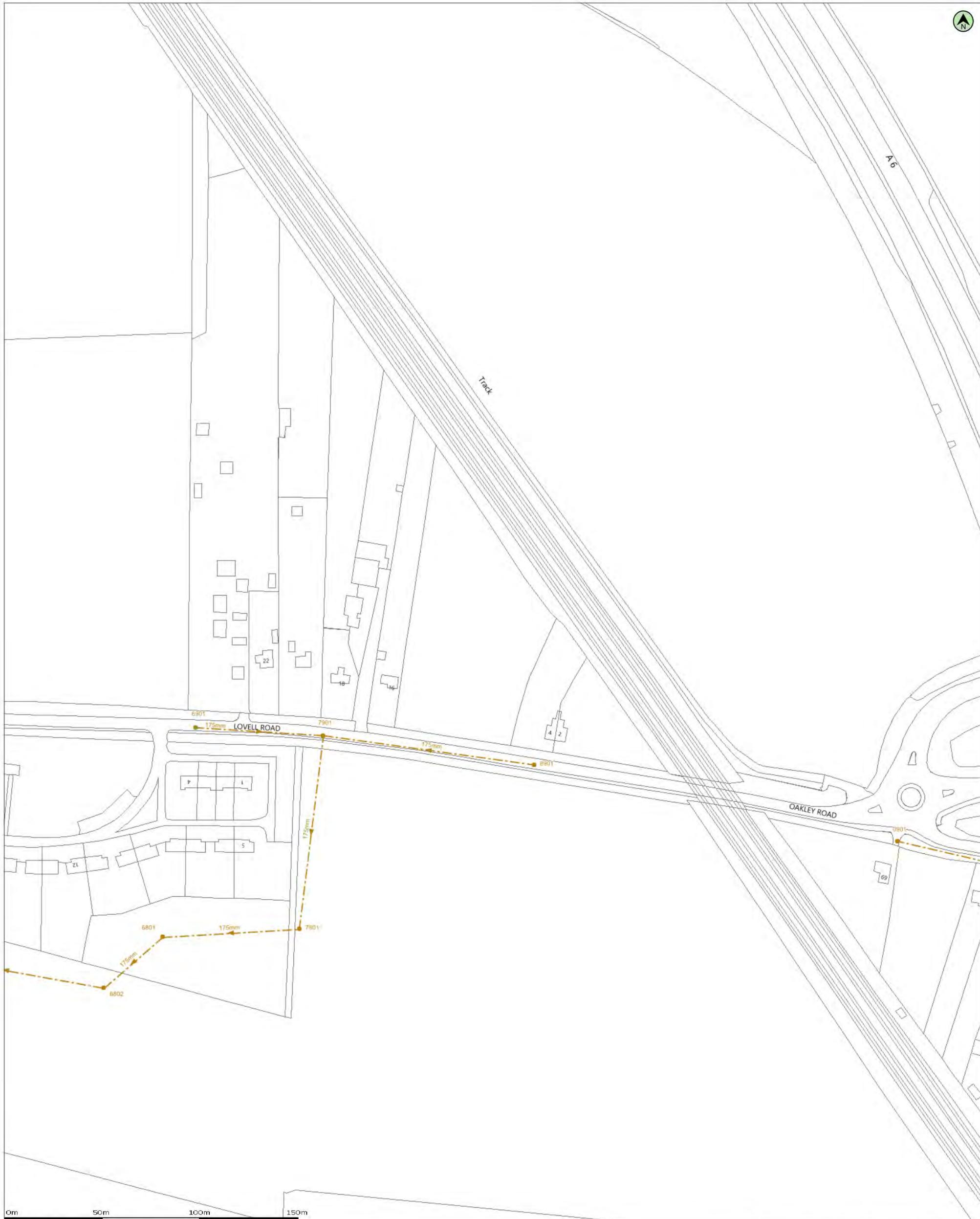
$$f = 3.23E-05 \text{ m/s}$$

Comment

Pit cleared out of slumped material prior to third test.

Appendix E

Anglian Water Record Plans



0m 50m 100m 150m

(c) Crown copyright and database rights 2019 Ordnance Survey 100019209 Date updated: 31/05/19 Scale: 1:1250 Map Centre: 501803.253034 Date: 26/06/19 Our Ref: 320516 - 1 Wastewater Plan A2 Powered by digdat

Foul Sewer		Outfall*		Sewage Treatment Works	
Surface Sewer		Inlet*		Public Pumping Station	
Combined Sewer		Manhole*		Decommissioned Pumping Station	
Final Effluent Sewer					
Rising Main*					
Private Sewer*					
Decommissioned Sewer*					

* (Colour denotes effluent type)

318210



This plan is provided by Anglian Water pursuant to its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2019 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.



(c) Crown copyright and database rights 2019 Ordnance Survey 100019209
 Date updated: 31/05/19
 Scale: 1:1250
 Map Centre: 501803.253034
 Date: 18/06/19
 Our Ref: 318210 - 1
 Clean Water Plan A2
 Powered by digdat

Potable Water		Fitting	
Raw Water		Hydrant	
Decommissioned Water			

Please note: Not all fittings are shown on the map

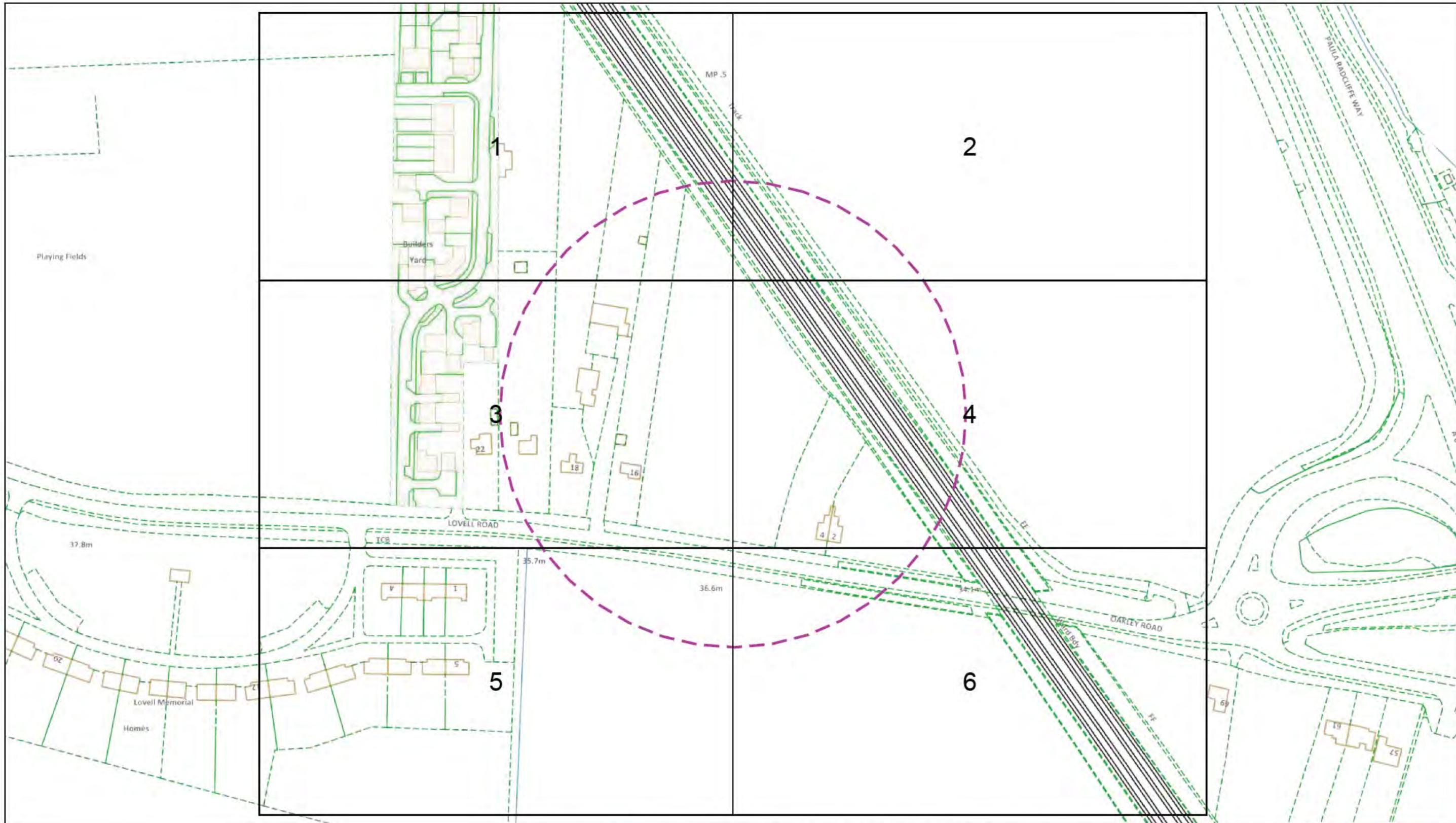
18479



This plan is provided by Anglian Water pursuant to its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2019 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Appendix F

UK Power Network Record Plans



Dig Sites Area: [Dashed Purple Line] Line: [Dashed Red Line]

The quality and accuracy of any print will depend on your printer, your computer and its print settings. Measurements scaled from this plan may not match measurements between the same points on the ground.

This plan must be used with the attached 'Symbols' document.
 Date Requested: 18/06/2019
 Job Reference: 15791338
 Site Location: 501597 252875
 Requested by:
 Your Scheme/Reference: 18479
 Scale: 1:1538 (When plotted at A3)

1. The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed.
2. The exact position of the apparatus should be verified - use approved cable avoidance tools prior to excavation using suitable hand tools.
3. It is essential that trial holes are carefully made avoiding the use of mechanical tools or picks until the exact location of all the cables have been determined.
4. It must be assumed that there is a service cable into each property, lamp column and street sign, etc.
5. All cables must be treated as being live unless proved otherwise by UK Power Networks.
6. The information proved must be given to all people working near UK Power Networks plant and equipment. Do not use plans more than 3 months after the issue date for excavation purposes.
7. Please be aware that electric cables/lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location.

1. UK Power Networks does not warrant that the information provided to you is correct. You rely upon it at your own risk.
2. UK Power Networks does not exclude or limit its liability if it causes the death of any persons or causes personal injury to a person.
3. Subject to paragraph 2 UK Power Networks has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise for any loss, damage, cost, claims, demands, or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever.
4. This plan has been provided to you on the basis of the terms of use set out in the covering letter that accompanies this plan. If you do not accept and/or do not understand the terms of use set out in the covering letter you must not use the plan and must return it to the sender of the letter.
5. You are responsible for the security of the information provided to you. It must not be given, sold or made available upon payment of a fee to a third party.

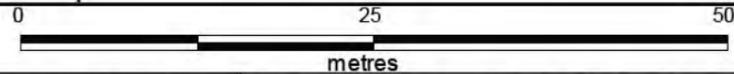
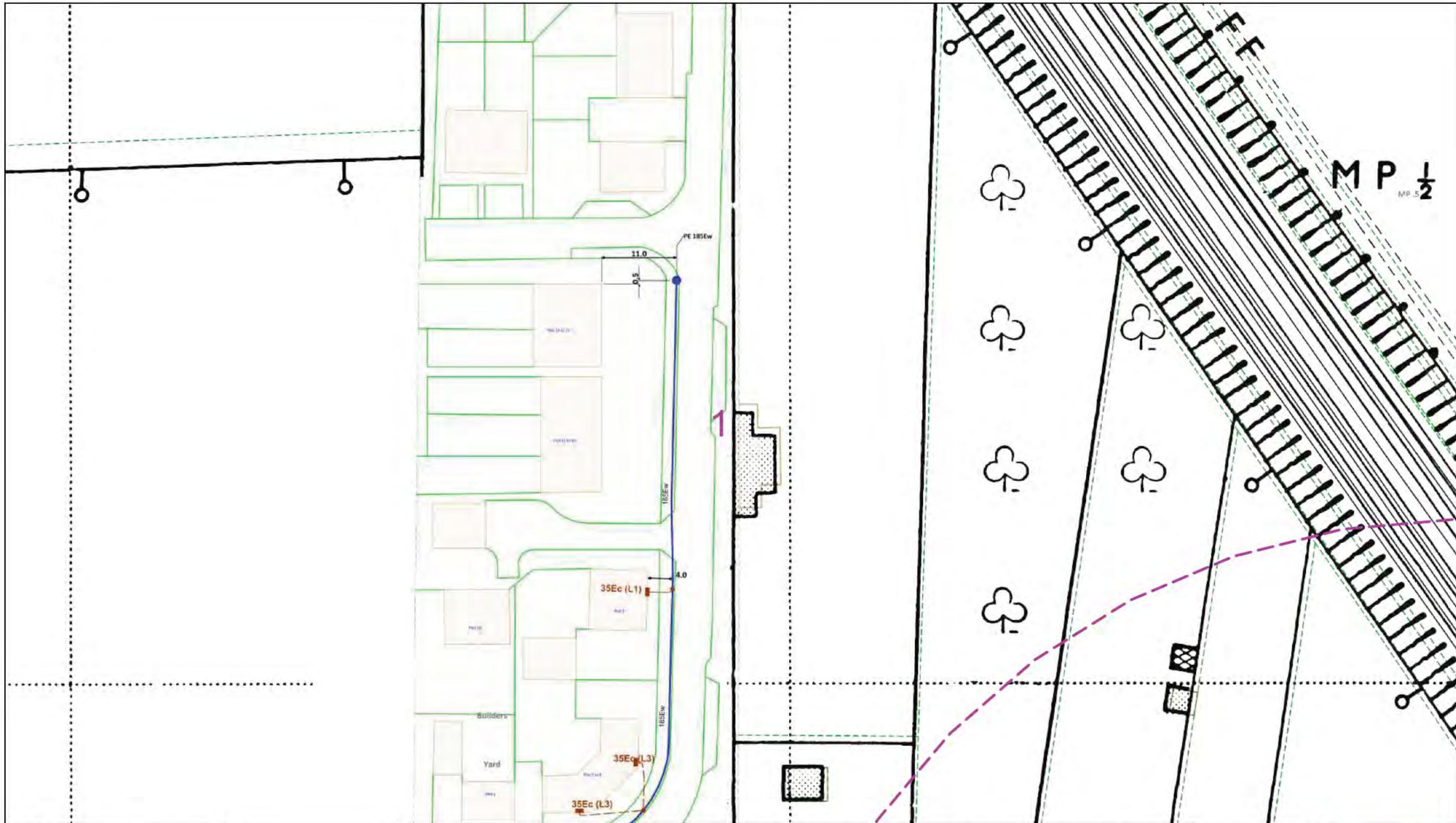


IF IN DOUBT - ASK!
 PHONE 0800 056 5866
 EMERGENCY - If you damage a cable or line
 Phone 0800 783 8838
 (24hrs) URGENTLY



ALWAYS LOOK UP BEFORE YOU START WORK
 Refer to HSE Guidance note G56

Maps produced at 1:2500 scale are Geo-Schematics which show LV mains cables and overhead lines (in some cases all voltages). Prior to carrying out excavations you must refer to the 1:500 records to determine the location of all known underground plant and equipment.



Dig Sites Area: Line:

The quality and accuracy of any print will depend on your printer, your computer and its print settings. Measurements scaled from this plan may not match measurements between the same points on the ground.

This plan must be used with the attached 'Symbols' document.

Date Requested: 18/06/2019
 Job Reference: 15791338
 Site Location: 501597 252875
 Requested by:

Your Scheme/Reference: 18479

Scale: 1:500 (When plotted at A3)

1. The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed.
2. The exact position of the apparatus should be verified - use approved cable avoidance tools prior to excavation using suitable hand tools.
3. It is essential that trial holes are carefully made avoiding the use of mechanical tools or picks until the exact location of all the cables have been determined.
4. It must be assumed that there is a service cable into each property, lamp column and street sign, etc.
5. All cables must be treated as being live unless proved otherwise by UK Power Networks.
6. The information proved must be given to all people working near UK Power Networks plant and equipment. Do not use plans more than 3 months after the issue date for excavation purposes.
7. Please be aware that electric cables/lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location.

1. UK Power Networks does not warrant that the information provided to you is correct. You rely upon it at your own risk.
2. UK Power Networks does not exclude or limit its liability if it causes the death of any persons or causes personal injury to a person.
3. Subject to paragraph 2 UK Power Networks has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise for any loss, damage, cost, claims, demands, or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever.
4. This plan has been provided to you on the basis of the terms of use set out in the covering letter that accompanies this plan. If you do not accept and/or do not understand the terms of use set out in the covering letter you must not use the plan and must return it to the sender of the letter.
5. You are responsible for the security of the information provided to you. It must not be given, sold or made available upon payment of a fee to a third party.

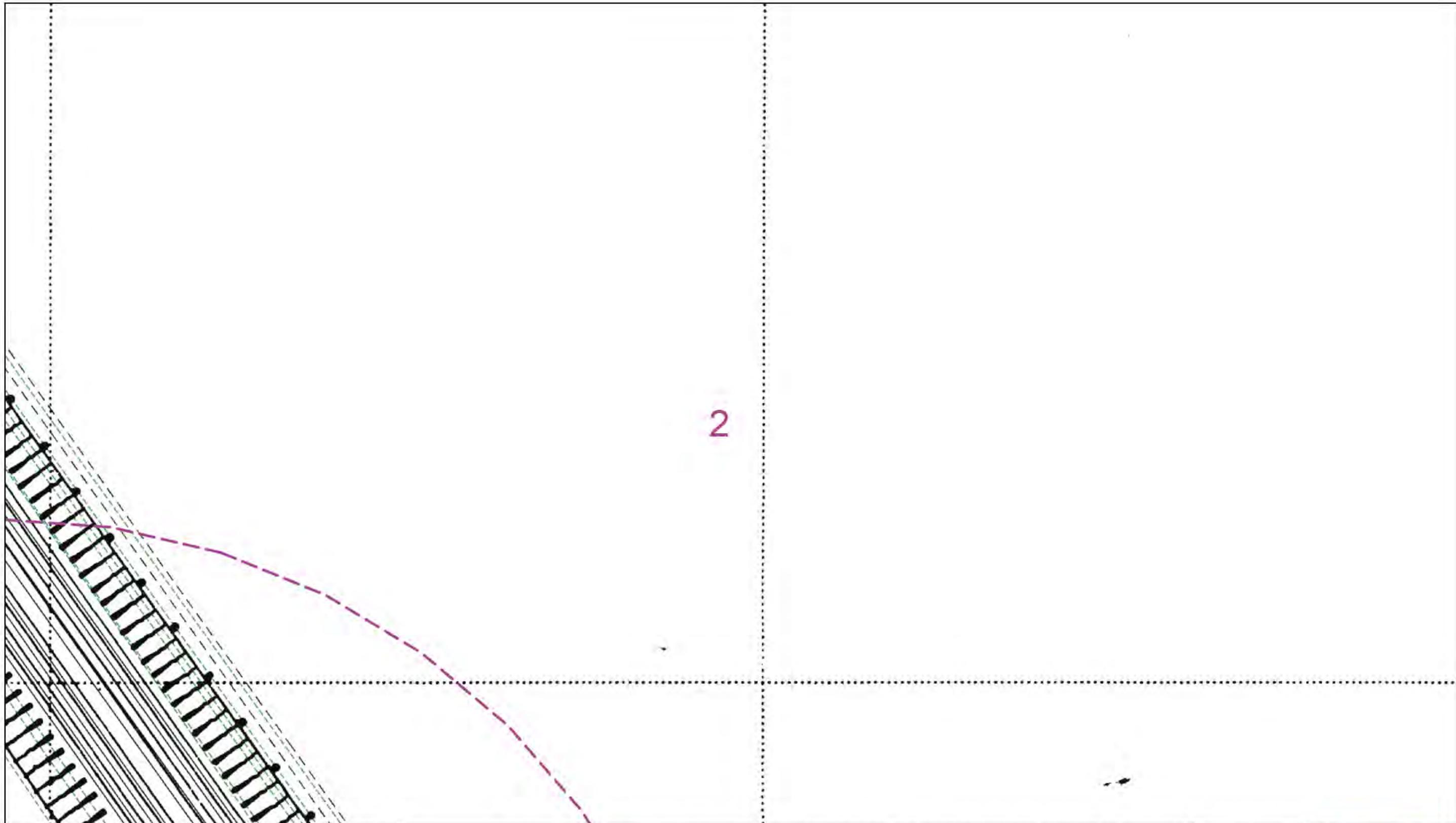


IF IN DOUBT - ASK!
 PHONE 0800 056 5866
 EMERGENCY - If you
 damage a cable or line
 Phone 0800 783 8838
 (24hrs) URGENTLY

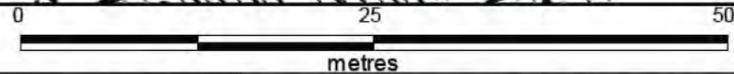


ALWAYS LOOK UP
 BEFORE
 YOU START WORK
 Refer to HSE
 Guidance note G56

Maps produced at 1:2500 scale are Geo-Schematics which show LV mains cables and overhead lines (in some cases all voltages). Prior to carrying out excavations you must refer to the 1:500 records to determine the location of all known underground plant and equipment.



2



Dig Sites Area: [dashed pink box] Line: [dashed pink line]

The quality and accuracy of any print will depend on your printer, your computer and its print settings. Measurements scaled from this plan may not match measurements between the same points on the ground.

This plan must be used with the attached 'Symbols' document.
 Date Requested: 18/06/2019
 Job Reference: 15791338
 Site Location: 501597 252875
 Requested by:
 Your Scheme/Reference: 18479
 Scale: 1:500 (When plotted at A3)

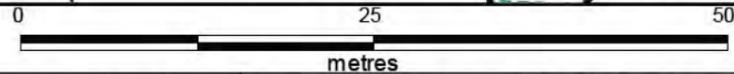
1. The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed.
2. The exact position of the apparatus should be verified - use approved cable avoidance tools prior to excavation using suitable hand tools.
3. It is essential that trial holes are carefully made avoiding the use of mechanical tools or picks until the exact location of all the cables have been determined.
4. It must be assumed that there is a service cable into each property, lamp column and street sign, etc.
5. All cables must be treated as being live unless proved otherwise by UK Power Networks.
6. The information proved must be given to all people working near UK Power Networks plant and equipment. Do not use plans more than 3 months after the issue date for excavation purposes.
7. Please be aware that electric cables/lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location.

1. UK Power Networks does not warrant that the information provided to you is correct. You rely upon it at your own risk.
2. UK Power Networks does not exclude or limit its liability if it causes the death of any persons or causes personal injury to a person.
3. Subject to paragraph 2 UK Power Networks has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise for any loss, damage, cost, claims, demands, or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever.
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Dig Sites Area: Line:

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 Site Location: 501597 252875
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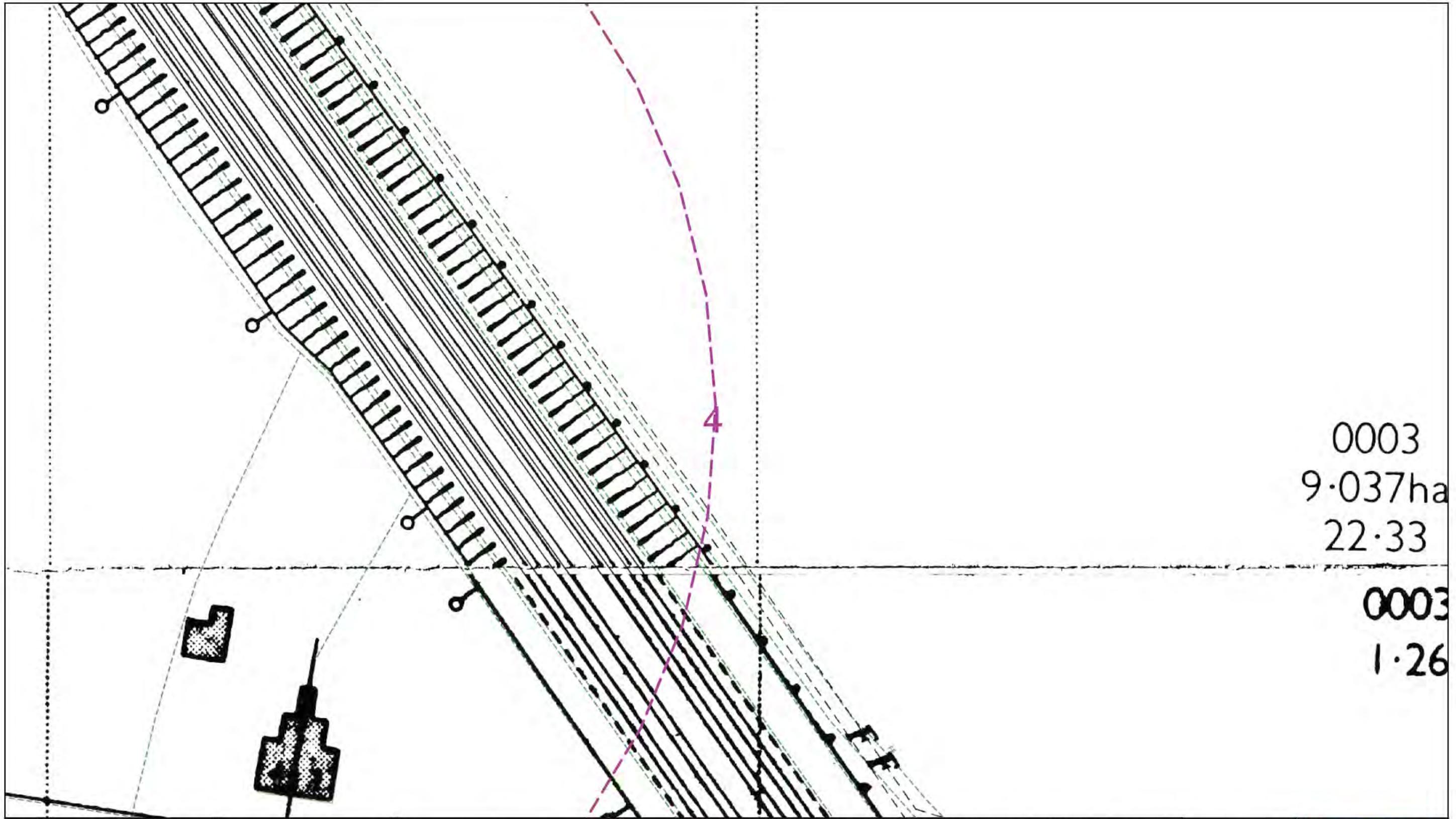


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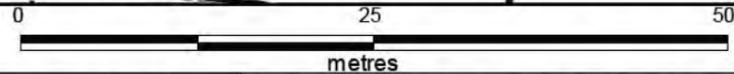


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0003
 9.037ha
 22.33
 0003
 1.26



Dig Sites Area: [dashed red line] Line: [dashed black line]

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 Job Reference: 15791338
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 Your Scheme/Reference: 18479
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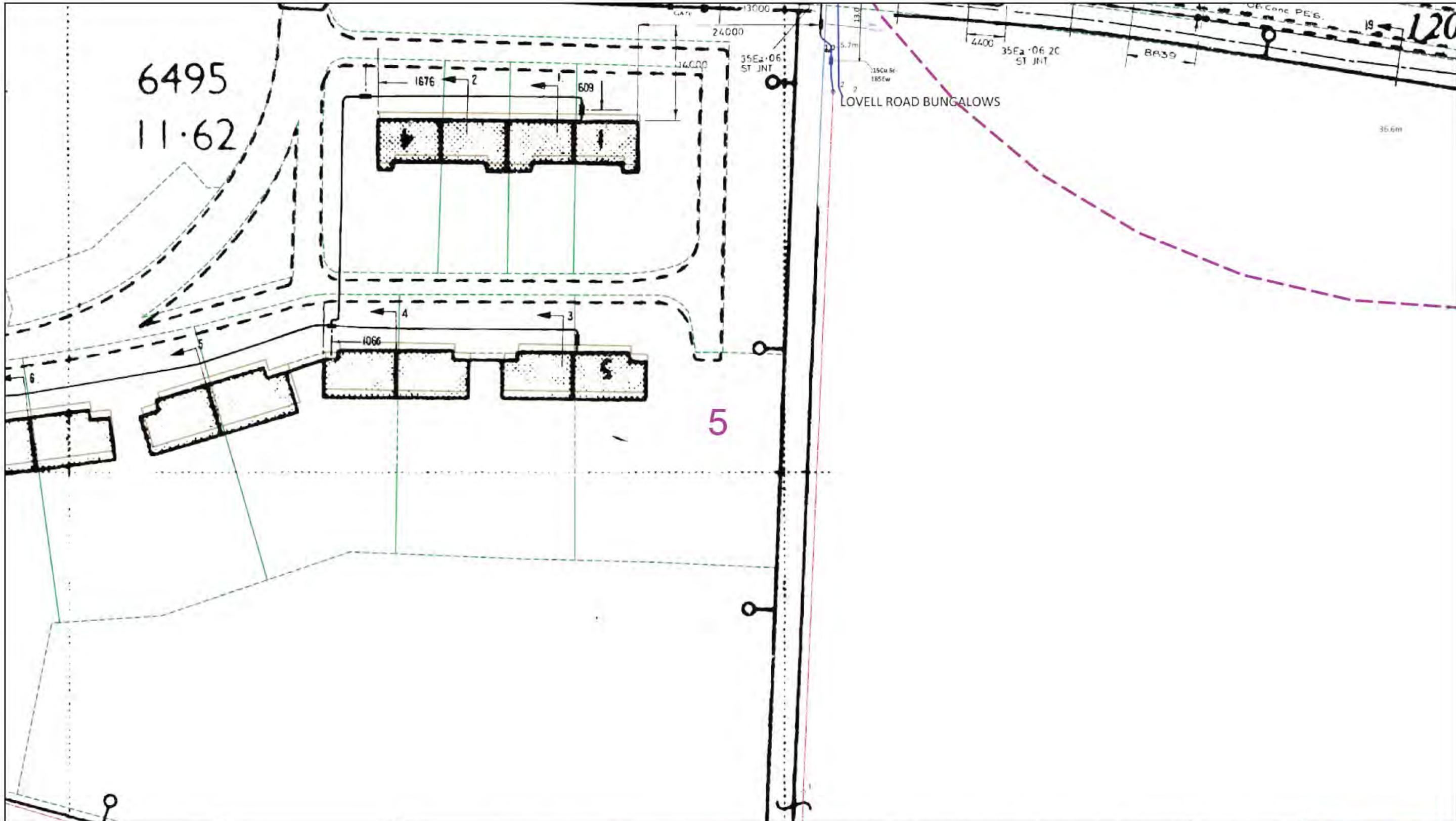


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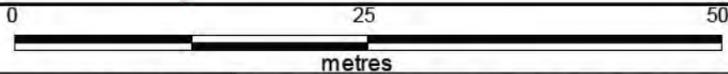
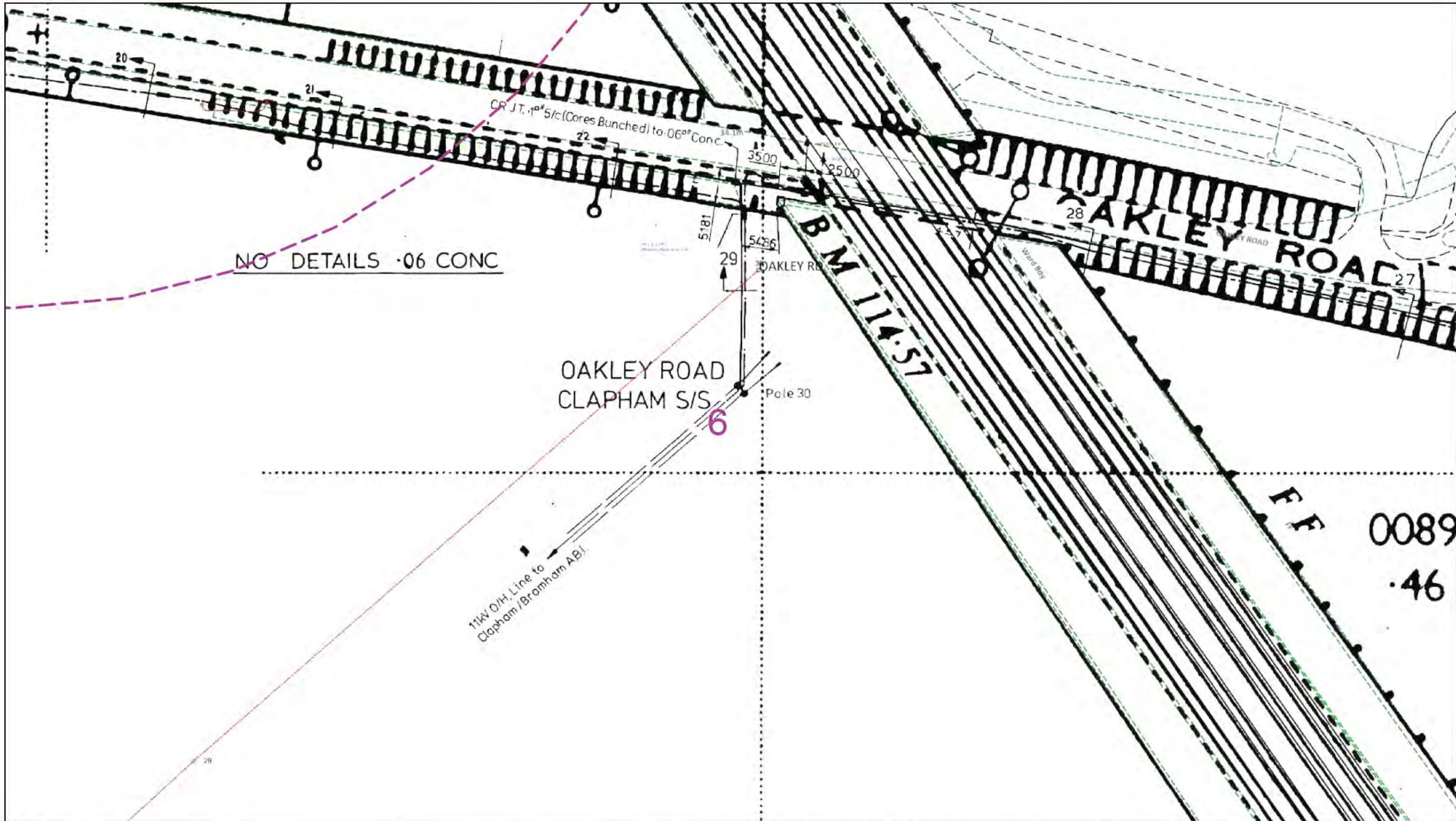


ALWAYS LOOK UP BEFORE YOU START WORK
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Maps produced at 1:2500 scale are Geo-Schematics which show LV mains cables and overhead lines (in some cases all voltages). Prior to carrying out excavations you must refer to the 1:500 records to determine the location of all known underground plant and equipment.



<p>0 25 50 metres</p>	<p>Dig Sites Area: [dashed red box] Line: [dashed black line]</p>	<p>The quality and accuracy of any print will depend on your printer, your computer and its print settings. Measurements scaled from this plan may not match measurements between the same points on the ground.</p>	
<p>This plan must be used with the attached 'Symbols' document.</p> <p>Date Requested: 18/06/2019 Job Reference: 15791338 Site Location: 501597 252875 Requested by:</p> <p>Your Scheme/Reference: 18479</p> <p>Scale: 1:500 (When plotted at A3)</p>	<ol style="list-style-type: none"> The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed. The exact position of the apparatus should be verified - use approved cable avoidance tools prior to excavation using suitable hand tools. It is essential that trial holes are carefully made avoiding the use of mechanical tools or picks until the exact location of all the cables have been determined. It must be assumed that there is a service cable into each property, lamp column and street sign, etc. All cables must be treated as being live unless proved otherwise by UK Power Networks. The information provided must be given to all people working near UK Power Networks plant and equipment. Do not use plans more than 3 months after the issue date for excavation purposes. Please be aware that electric cables/lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location. 	<ol style="list-style-type: none"> UK Power Networks does not warrant that the information provided to you is correct. You rely upon it at your own risk. UK Power Networks does not exclude or limit its liability if it causes the death of any persons or causes personal injury to a person. Subject to paragraph 2 UK Power Networks has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise for any loss, damage, cost, claims, demands, or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever. This plan has been provided to you on the basis of the terms of use set out in the covering letter that accompanies this plan. If you do not accept and/or do not understand the terms of use set out in the covering letter you must not use the plan and must return it to the sender of the letter. You are responsible for the security of the information provided to you. It must not be given, sold or made available upon payment of a fee to a third party. 	 <p>IF IN DOUBT - ASK! PHONE 0800 056 5866 EMERGENCY - If you damage a cable or line Phone 0800 783 8838 (24hrs) URGENTLY</p>  <p>ALWAYS LOOK UP BEFORE YOU START WORK Refer to HSE Guidance note G56</p> <p>Maps produced at 1:2500 scale are Geo-Schematics which show LV mains cables and overhead lines (in some cases all voltages). Prior to carrying out excavations you must refer to the 1:500 records to determine the location of all known underground plant and equipment.</p>



Dig Sites Area: [Red dashed box] Line: [Red dashed line]

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ALWAYS LOOK UP BEFORE YOU START WORK
 Refer to HSE Guidance note G56

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Appendix G

Cadent Record Plans

Woods Hardwick Infrastructure LLP
15-17 Goldington Road
Bedford
Bedfordshire
MK40 3NH

National Gas Emergency Number:
0800 111 999*

National Grid Electricity Emergency Number:
0800 40 40 90*

* Available 24 hours, 7 days/week.
Calls may be recorded and monitored.

www.cadentgas.com

Date: 30/06/2019

Our Ref: EA_GE3A_3SWP_562606

Your Ref: Lovell Road

RE: Proposed Works, Lovell Road, Oakley, Bedfordshire MK43 7RZ

Thank you for your enquiry which was received on 25/06/2019.
Please note this response and any attached map(s) are valid for 28 days.

An assessment has been carried out with respect to Cadent Gas Limited, National Grid Electricity Transmission plc's and National Grid Gas Transmission plc's apparatus. Please note it does not cover the items listed in the section "Your Responsibilities and Obligations", including gas service pipes and related apparatus.

For details of Network areas please see the Cadent website (<http://cadentgas.com/Digging-safely/Dial-before-you-dig>) or the enclosed documentation.

As your works are at a "proposed" stage, any maps and guidance provided are for information purposes only. This is not approval to commence work. You must submit a "Scheduled Works" enquiry at the earliest opportunity and failure to do this may lead to disruption to your plans and works. Plant Protection will endeavour to provide an initial assessment within 14 days of receipt of a Scheduled Works enquiry and dependent on the outcome of this, further consultation may be required.

In any event, for safety and legal reasons, works must not be carried out until a Scheduled Works enquiry has been completed and final response received.

Your Responsibilities and Obligations

The "Assessment" Section below outlines the detailed requirements that must be followed when planning or undertaking your scheduled activities at this location.

It is your responsibility to ensure that the information you have submitted is accurate and that all relevant documents including links are provided to all persons (either direct labour or contractors) working for you near Cadent and/or National Grid's apparatus, e.g. as contained within the Construction (Design and Management) Regulations.

This assessment solely relates to Cadent Gas Limited, National Grid Electricity Transmission plc (NGET) and National Grid Gas Transmission plc (NGGT) and apparatus. This assessment does **NOT** include:

- Cadent and/or National Grid's legal interest (easements or wayleaves) in the land which restricts activity in proximity to Cadent and/or National Grid's assets in private land. You must obtain details of any such restrictions from the landowner in the first instance and if in doubt contact Plant Protection.
- Gas service pipes and related apparatus
- Recently installed apparatus
- Apparatus owned by other organisations, e.g. other gas distribution operators, local electricity companies, other utilities, etc.

It is **YOUR** responsibility to take into account whether the items listed above may be present and if they could be affected by your proposed activities. Further "Essential Guidance" in respect of these items can be found on either the [National Grid](#) or [Cadent](#) website.

This communication does not constitute any formal agreement or consent for any proposed development work; either generally or with regard to Cadent and/or National Grid's easements or wayleaves nor any planning or building regulations applications.

Cadent Gas Limited, NGGT and NGET or their agents, servants or contractors do not accept any liability for any losses arising under or in connection with this information. This limit on liability applies to all and any claims in contract, tort (including negligence), misrepresentation (excluding fraudulent misrepresentation), breach of statutory duty or otherwise. This limit on liability does not exclude or restrict liability where prohibited by the law nor does it supersede the express terms of any related agreements.

If you require further assistance please contact the Plant Protection team via e-mail ([click here](#)) or via the contact details at the top of this response.

Yours faithfully

Plant Protection Team

ASSESSMENT

Affected Apparatus

The apparatus that has been identified as being in the vicinity of your proposed works is:

- Low or Medium pressure (below 2 bar) gas pipes and associated equipment. (As a result it is highly likely that there are gas services and associated apparatus in the vicinity)
- Above ground gas sites and equipment

Requirements

BEFORE carrying out any work you must:

- **Note the presence of an Above Ground Installation (AGI) in proximity to your site. You must ensure that you have been contacted by Cadent and/or National Grid prior to undertaking any works within 10m of this site.**
- Carefully read these requirements including the attached guidance documents and maps showing the location of apparatus.
- Contact the landowner and ensure any proposed works in private land do not infringe Cadent and/or National Grid's legal rights (i.e. easements or wayleaves). If the works are in the road or footpath the relevant local authority should be contacted.
- Ensure that all persons, including direct labour and contractors, working for you on or near Cadent and/or National Grid's apparatus follow the requirements of the HSE Guidance Notes HSG47 - 'Avoiding Danger from Underground Services' and GS6 – 'Avoidance of danger from overhead electric power lines'. This guidance can be downloaded free of charge at <http://www.hse.gov.uk>
- In line with the above guidance, verify and establish the actual position of mains, pipes, cables, services and other apparatus on site before any activities are undertaken.

GUIDANCE

Excavating Safely - Avoiding injury when working near gas pipes:

http://www.nationalgrid.com/NR/rdonlyres/2D2EEA97-B213-459C-9A26-18361C6E0B0D/25249/Digsafe_leaflet3e2finalamends061207.pdf

Standard Guidance

Essential Guidance document:

<http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=8589934982>

General Guidance document:

<http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=35103>

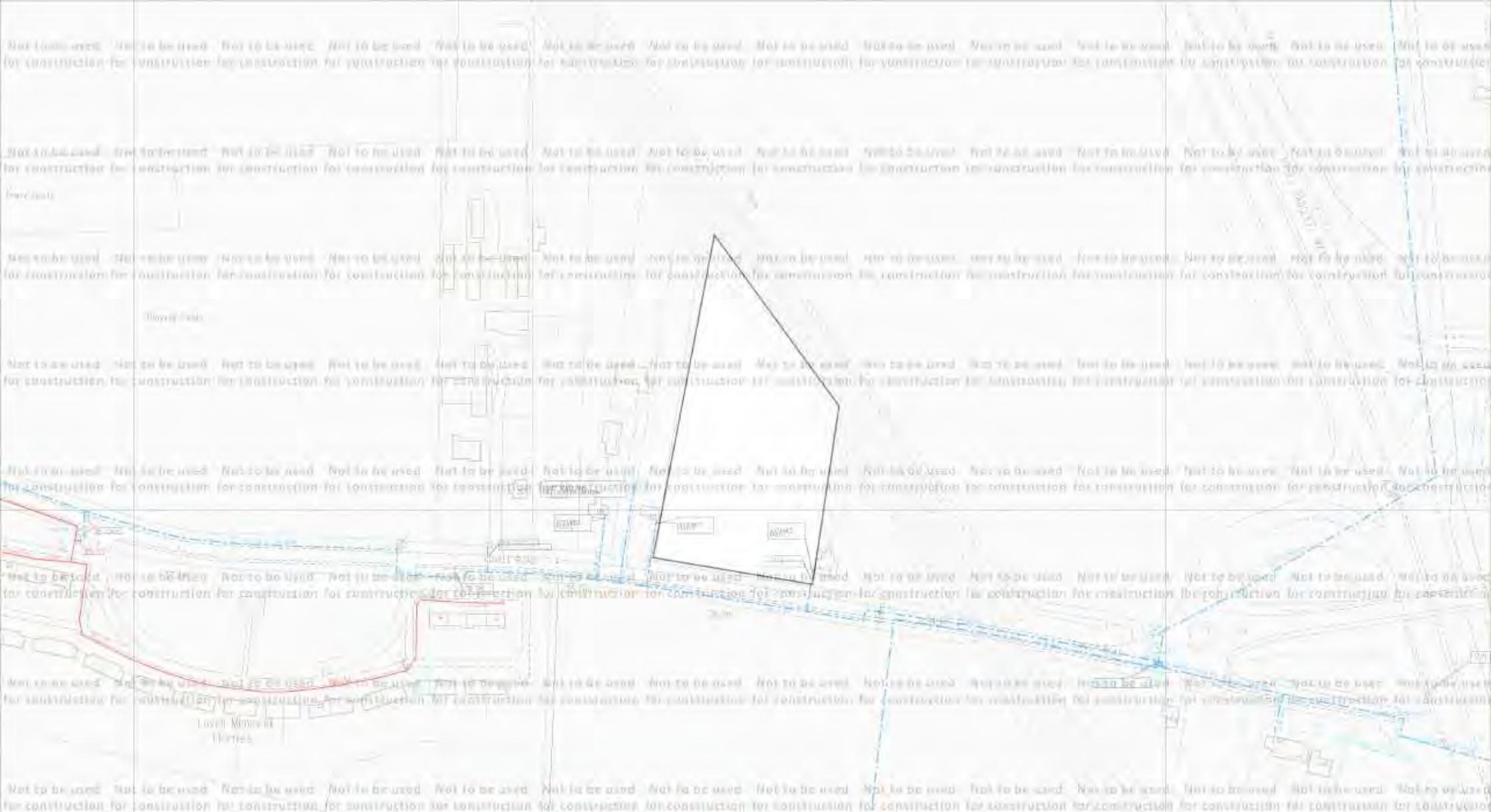
Excavating Safely in the vicinity of gas pipes guidance (Credit card):

<http://www.nationalgrid.com/NR/rdonlyres/A3D37677-6641-476C-9DDA-E89949052829/44257/ExcavatingSafelyCreditCard.pdf>

Excavating Safely in the vicinity of electricity cables guidance (Credit card):

<http://www.nationalgrid.com/NR/rdonlyres/35DDEC6D-D754-4BA5-AF3C-D607D05A25C2/44858/ExcavatingSafelyCreditCardelectricitycables.pdf>

Copies of all the Guidance Documents can also be downloaded from the [National Grid](#) and [Cadent](#) websites.



ID: EA_GE3A_3SWP_562606
 USER: natasha.hopka
 DATE: 30/06/2019
 DATA DATE: 29/06/2019
 REF: Lovell Road
 MAP REF: TL0153
 CENTRE: 501797, 253049

View extent: 723m, 393m

LP MAINS	
MP MAINS	
IP MAINS	
LHP MAINS	
NHP MAINS	

0m 50m
 Approximate scale 1:2500
 on A4 Colour Landscape

Map not to be used for construction

This plan shows those pipes owned by Cadent Gas Limited in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Limited or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Map 1 of 1 (GAS)

MAPS Plot Server Version 1.11.0

Cadent
 Your Gas Network

Requested by: Woods Hardwick Infrastructure LLP

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 Ordnance Survey Licence number 100024886



ENQUIRY SUMMARY

Received Date

25/06/2019

Your Reference

Lovell Road

Location

Centre Point: 501796, 253049

X Extent: 91

Y Extent: 169

Postcode: MK43 7RZ

Location Description: Lovell Road, Oakley, Bedfordshire MK43 7RZ

Map Options

Paper Size: A4

Orientation: LANDSCAPE

Requested Scale: 1250

Actual Scale: 1:2500 (GAS)

Real World Extents: 723m x 393m (GAS)

Recipients

pprsteam@cadentgas.com

Enquirer Details

Organisation Name: Woods Hardwick Infrastructure LLP

Contact Name:

Email Address:

Telephone: 01234 268862

Address: 15-17 Goldington Road, Bedford, Bedfordshire, MK40 3NH

Description of Works

plans only

Enquiry Type

Proposed Works

Activity Type

General Excavation

Work Types

Work Type: Plans Only



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Appendix H

BT Openreach Record Plans

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.



openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON-SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08:00 to 17:00)
www.openreach.co.uk/cbyd

Reproduced from the Ordnance Survey map by BT by permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office.
(C) Crown Copyright British Telecommunications plc 100029040

KEY TO BT SYMBOLS

	Planned	Live	Change Of State	+	Hatchings
DCP			Split Coupling		Built
Pole			Duct Tee		Planned
Box			Building		Infernal
Manhole			Kiosk		Duct
Cabinet					

Other proposed plant is shown using dashed lines. BT Symbols not listed above may be disregarded. Existing BT Plant may not be recorded. Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	In Place	Pending Remove	Not In Use
Power Cable				
Power Duct				N/A

BT Ref : MD203419U

Map Reference : (centre) TL0178352988

Easting/Northing : (centre) 501783,252988

Issued : 18/06/2019 15:41:54

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

Appendix I

TRICS Output

Woods Hardwick Ltd Goldington Road Bedford

Licence No: 140301

Filtering Summary

Land Use	03/M	RESIDENTIAL/MIXED PRIVATE/AFFORDABLE HOUSING
Selected Trip Rate Calculation Parameter Range	9-30 DWELLS	
Actual Trip Rate Calculation Parameter Range	9-27 DWELLS	
Date Range	Minimum: 01/01/12	Maximum: 17/05/17
Parking Spaces Range	All Surveys Included	
Parking Spaces Per Dwelling Range:	All Surveys Included	
Bedrooms Per Dwelling Range:	All Surveys Included	
Percentage of dwellings privately owned:	All Surveys Included	
Days of the week selected	Tuesday	2
	Wednesday	1
	Thursday	1
	Friday	4
Main Location Types selected	Suburban Area (PPS6 Out of Centre)	3
	Edge of Town	4
	Neighbourhood Centre (PPS6 Local Centre)	1
Population <1 Mile ranges selected	1,001 to 5,000	3
	20,001 to 25,000	1
	25,001 to 50,000	4
Population <5 Mile ranges selected	5,001 to 25,000	2
	25,001 to 50,000	1
	75,001 to 100,000	1
	125,001 to 250,000	2
	250,001 to 500,000	2
Car Ownership <5 Mile ranges selected	0.6 to 1.0	5
	1.1 to 1.5	3
PTAL Rating	No PTAL Present	8

Calculation Reference: AUDIT-140301-200810-0849

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
 Category : M - MIXED PRIVATE/AFFORDABLE HOUSING
 VEHICLES

Selected regions and areas:

02	SOUTH EAST	
	ES EAST SUSSEX	1 days
	WS WEST SUSSEX	1 days
05	EAST MIDLANDS	
	LE LEICESTERSHIRE	1 days
08	NORTH WEST	
	GM GREATER MANCHESTER	1 days
	MS MERSEYSIDE	2 days
09	NORTH	
	CB CUMBRIA	1 days
	TW TYNE & WEAR	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Dwellings
 Actual Range: 9 to 27 (units:)
 Range Selected by User: 9 to 30 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range: All Surveys Included

Bedrooms per Dwelling Range: All Surveys Included

Percentage of dwellings privately owned: All Surveys Included

Public Transport Provision:

Selection by: Include all surveys

Date Range: 01/01/12 to 17/05/17

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	2 days
Wednesday	1 days
Thursday	1 days
Friday	4 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	8 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaken using machines.

Selected Locations:

Suburban Area (PPS6 Out of Centre)	3
Edge of Town	4
Neighbourhood Centre (PPS6 Local Centre)	1

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	7
Village	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3 8 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 1 mile:

1,001 to 5,000 3 days
20,001 to 25,000 1 days
25,001 to 50,000 4 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000 2 days
25,001 to 50,000 1 days
75,001 to 100,000 1 days
125,001 to 250,000 2 days
250,001 to 500,000 2 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0 5 days
1.1 to 1.5 3 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No 8 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present 8 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

Site(1):	CB-03-M-04	Site area:	0.46 hect
Development Name:	SEMI-DETACHED & TERRACED	No of Dwellings:	20
Location:	CARLISLE	Housing density:	56
Postcode:	CA2 7BP	Total Bedrooms:	48
Main Location Type:	Suburban Area (PPS6 Out of Centre)	Survey Date:	24/06/16
Sub-Location Type:	Residential Zone	Survey Day:	Friday
PTAL:	n/a	Parking Spaces:	15
Site(2):	ES-03-M-09	Site area:	2.36 hect
Development Name:	DETACHED/SEMI-DETACHED	No of Dwellings:	16
Location:	NORTHAM	Housing density:	7
Postcode:	TN31 6QQ	Total Bedrooms:	53
Main Location Type:	Neighbourhood Centre (PPS6 Local Centre)	Survey Date:	17/05/17
Sub-Location Type:	Village	Survey Day:	Wednesday
PTAL:	n/a	Parking Spaces:	27
Site(3):	GM-03-M-01	Site area:	0.28 hect
Development Name:	TERRACED & FLATS	No of Dwellings:	9
Location:	ROCHDALE	Housing density:	47
Postcode:	OL12 9BX	Total Bedrooms:	14
Main Location Type:	Suburban Area (PPS6 Out of Centre)	Survey Date:	25/11/14
Sub-Location Type:	Residential Zone	Survey Day:	Tuesday
PTAL:	n/a	Parking Spaces:	16
Site(4):	LE-03-M-01	Site area:	0.49 hect
Development Name:	SEMI DETACHED	No of Dwellings:	16
Location:	LEICESTER	Housing density:	38
Postcode:	LE3 6UP	Total Bedrooms:	42
Main Location Type:	Edge of Town	Survey Date:	27/09/12
Sub-Location Type:	Residential Zone	Survey Day:	Thursday
PTAL:	n/a	Parking Spaces:	18
Site(5):	MS-03-M-02	Site area:	0.75 hect
Development Name:	TERRACED	No of Dwellings:	27
Location:	LIVERPOOL	Housing density:	54
Postcode:	L24 3UH	Total Bedrooms:	79
Main Location Type:	Edge of Town	Survey Date:	21/06/13
Sub-Location Type:	Residential Zone	Survey Day:	Friday
PTAL:	n/a	Parking Spaces:	48
Site(6):	MS-03-M-03	Site area:	0.75 hect
Development Name:	SEMI DETACHED/TERRACED	No of Dwellings:	24
Location:	LIVERPOOL	Housing density:	53
Postcode:	L24 0SX	Total Bedrooms:	72
Main Location Type:	Edge of Town	Survey Date:	21/06/13
Sub-Location Type:	Residential Zone	Survey Day:	Friday
PTAL:	n/a	Parking Spaces:	11
Site(7):	TW-03-M-01	Site area:	1.57 hect
Development Name:	DETACHED & BUNGALOWS	No of Dwellings:	27
Location:	NEWCASTLE	Housing density:	20
Postcode:	NE5 1AF	Total Bedrooms:	110
Main Location Type:	Edge of Town	Survey Date:	13/11/15
Sub-Location Type:	Residential Zone	Survey Day:	Friday
PTAL:	n/a	Parking Spaces:	99
Site(8):	WS-03-M-13	Site area:	0.64 hect
Development Name:	TERRACED & FLATS	No of Dwellings:	23
Location:	WORTHING	Housing density:	66
Postcode:	BN15 9NY	Total Bedrooms:	58
Main Location Type:	Suburban Area (PPS6 Out of Centre)	Survey Date:	21/06/16
Sub-Location Type:	Residential Zone	Survey Day:	Tuesday
PTAL:	n/a	Parking Spaces:	32

TRIP RATE for Land Use 03 - RESIDENTIAL/M - MIXED PRIVATE/AFFORDABLE HOUSING
VEHICLES

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	8	20	0.056	8	20	0.167	8	20	0.223
08:00 - 09:00	8	20	0.160	8	20	0.321	8	20	0.481
09:00 - 10:00	8	20	0.191	8	20	0.235	8	20	0.426
10:00 - 11:00	8	20	0.148	8	20	0.160	8	20	0.308
11:00 - 12:00	8	20	0.290	8	20	0.265	8	20	0.555
12:00 - 13:00	8	20	0.222	8	20	0.179	8	20	0.401
13:00 - 14:00	8	20	0.136	8	20	0.179	8	20	0.315
14:00 - 15:00	8	20	0.241	8	20	0.241	8	20	0.482
15:00 - 16:00	8	20	0.284	8	20	0.216	8	20	0.500
16:00 - 17:00	8	20	0.265	8	20	0.210	8	20	0.475
17:00 - 18:00	8	20	0.315	8	20	0.272	8	20	0.587
18:00 - 19:00	8	20	0.309	8	20	0.235	8	20	0.544
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.617			2.680			5.297

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: $COUNT/TRP*FACT$. Trip rates are then rounded to 3 decimal places.

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Parameter summary

Trip rate parameter range selected:	9 - 27 (units:)
Survey date range:	01/01/12 - 17/05/17
Number of weekdays (Monday-Friday):	8
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are shown. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.



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