ENGINEERING

Flood Risk Assessment & Sustainable Drainage Strategy for the Proposed Development of Land between Haverhill Road and Hinton Way, Stapleford, South Cambridgeshire

Contents

Appendices

2433 – FRA & DS Rev B – Mar 2020

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Flood Risk Assessment & Sustainable Drainage Strategy
for the Proposed Development of Land between
Haverhill Road and Hinton Way, Stapleford, South Cambridgeshire

1 Introduction

1.1 MTC Engineering (Cambridge) Limited has been asked to provide a Flood Risk Assessment and Sustainable Drainage Strategy for the development of land between Haverhill Road and Hinton Way, Stapleford for a retirement care village in Use Class C2 comprising housing with care, communal health, wellbeing and leisure facilities, public open space, landscaping, car parking, access and associated development and the provision of land for use as a countryside park for public access. The application is made on behalf of Axis Land Partnerships.

1.2 This Flood Risk Assessment and SuDS Strategy is based on the following information:-

1.2.1 Site inspection by MTC Engineering (Cambridge) Limited;

1.2.2 Site Survey by Parish Land Surveys;

1.2.3 Outline site layout provided by Axis Land Partnerships Limited;

1.2.4 Environment Agency Flood Data;

1.2.5 South Cambridgeshire District Council Strategic Flood Risk Assessment (SFRA);

1.2.6 Cambridgeshire County Council Surface Water Guidance for Developers, Nov 2019;

1.2.7 Greater Cambridgeshire Sustainable Design and Construction Supplementary Planning Document (January 2020)

1.2.8 Cambridgeshire Flood & Water Supplementary Planning Document, July 2016;

1.2.9 Infiltration Test Results by James & Milton Drilling Limited;

1.2.10 British Geological Survey Mapping.

1.3 All the comments and opinions contained in this report including any conclusions are based on the information available to MTC Engineering (Cambridge) Ltd. during our investigations. The conclusions drawn could therefore differ if the information is found to be inaccurate, incomplete or misleading. MTC Engineering (Cambridge) Ltd. accept no liability should this prove to be the case, nor if additional information exists or becomes available with respect to this site.

1.4 MTC Engineering (Cambridge) Ltd. makes no representation whatsoever concerning the legal significance of its findings or any other matters referred to in the following report. Except as otherwise requested by the client, MTC Engineering (Cambridge) Ltd. are not obliged and disclaim any obligation to update the report for events taking place after the Assessment was undertaken.

1.5 This report is a Flood Risk Assessment and Drainage Strategy of flooding and drainage related issues associated with the proposed development. The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. This report provides no guarantee against flooding of the study site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities quoted.

2 Site Description and Existing Drainage

2.1 The site involves the development of a 24.37Ha site currently in arable use, lying between Haverhill Road and Hinton Way, in Stapleford, South Cambridgeshire. A site location plan is provided in Appendix 1.

2.2 To the northeast of the site lies some sparse/low density residential development and agricultural buildings, along with open agricultural land.

2.3 To the southeast the site is bound by Haverhill Road, past which lies open agricultural land.

2.4 To the southwest the site is bound primarily by open agricultural land, along with some residential development off Hinton Way and Gog Magog Way.

2.5 To the northwest the site is bound by Hinton Way and some residential development along Hinton Way, past which lies open agricultural land.

2.6 The site itself is currently entirely in agricultural use with the exception of a very small copse of trees. The highest part of the site is midway along the central part of the northeastern boundary about 100 metres southwest of the boundary itself where there is a crest with a maximum level of about 56.64m above Ordnance Datum (AOD).

2.7 From this crest there is a shallow fall in a northwesterly direction to levels of just over 44m AOD along the northern boundary (land then rises again to the northwest), but steeper falls in all other directions to less than 30m AOD in the eastern area, and about 20m AOD in the southern area of the site.

2.8 The section of the site in which the care home and apartments/dwellings will be located is the southern part of the site just northwest of Gog Magog Way. Levels at the northwestern part of this area of the site are about 25m AOD, falling to a low point of just below 20m AOD in the western corner of this area of the site.

2.9 There is a small bund with a swale on the southwestern side of this running around the southeastern boundary of the section of the site with the new dwellings developed off Chalk Hill, believed to fall within/be the 5m tree/landscaping buffer that was required as part of that planning application. The bund and swale likely to serve two purposes, being firstly ensuring that the new dwellings are protected against any potential surface water flow coming south across the site towards these dwellings, and secondly taking surface water drainage from the development.

2.10 A copy of the site survey is provide in Appendix 2, with photographs of the southern part of the site in which the built development is proposed provided in Appendix 3, which also show the swale and bund noted above.

2.11 There are no significant surface water features in the vicinity of the site.

2.12 British Geological Survey Mapping indicates that the bedrock geology underlying the site is the zig zag chalk formation, with no superficial geology present across the site. Chalk is in most cases a highly permeable geology (aside from chalk putty/chalk marl). Infiltration testing in line with BRE 365 has therefore been carried out at the site at five locations in the southern area of the site in which the built development will take place (as this is the only area in which impermeable area will be created), with three tests carried out at each location.

2.13 A copy of the location of the tests, along with results and logs is provided in Appendix 4. This showed a layer of brown clay with angular to rounded medium sand and fine to course flint extended from ground level to a depth of between 0.4m and 1.1m across the site, with white granular chalk encountered beneath this.

2.14 Pits SA1 (at the low point in the southwest corner), SA2 (the northern area) and SA4 (the southwestern area) all drained extremely quickly, with the lowest infiltration rates obtained in the three tests at each location being 0.9374m/hr, 0.5414m/hr, and 0.7538m/hr respectively. Pit SA3 (the northeastern area) had a slightly lower rate of 0.2629 m/hr for the slowest test.

2.15 Pit SA5 (in the central area) had the slowest infiltration rate by some distance, with the final one of the three tests having to be extrapolated (it was also checked the following morning and was dry), with lowest test result obtained at this pit being 0.0089m/hr and thus the lowest rate at the site. This is however still significantly above the minimum rate of 10^{-6}m/s or 0.0036m/hr at which a site is generally considered suitable for infiltration.

2.16 Overall testing indicates that infiltration rates across the site tend to be very high and that infiltration will therefore provide a suitable means of drainage for the proposed development.

2.17 A 3m deep trial pit was also excavated during the ground investigations as a check for groundwater depth, and no groundwater encountered. As such it is not considered that groundwater levels will prevent infiltration being used.

3 Sources of Potential Flood Risk

3.1 In accordance with The National Planning Policy Framework all forms of flood risk need to be considered in relation to any development.

3.2 The first form of flood risk to be considered in respect of The National Planning Policy Framework is fluvial flooding.

3.3 The site is shown as being entirely in Flood Zone 1 on the Environment Agency Flood Map (Appendix 5), with no land classified as at a higher risk of flooding in the vicinity of the site. The SFRA also does not indicate that the site is at any significant risk of fluvial flooding.

3.4 There are no significant surface water features in the vicinity of the site considered to pose any significant risk of fluvial flooding to the site and the risk of fluvial flooding is considered to be low.

3.5 The second form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from the sea.

3.6 The site is well inland and with ground levels of about 20m AOD or higher it is considered that the risk of flooding from the sea is low.

3.7 The third form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from land.

3.8 Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can quickly run off land and result in local flooding. In developed areas, this flood water can be polluted with domestic sewage with foul sewer surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro level can influence or exacerbate this. Overland flow paths need to be taken into account in development to minimise the risk of flooding from overland flow.

3.9 With the site being situated on a shallow hill with a continuous fall across the site and no significant development at a higher level than the site to the north, there is a limited potential for overland flows to come onto the site or cause any significant build up on the site itself.

3.10 Environment Agency mapping shows (Appendix 6) that virtually all of the site is considered to be at a very low risk of flooding. None of the site is indicated as being at a high risk of flooding.

3.11 A very small area of ponding may potentially occurring the low point in the southern part of the site just north of Chalk Hill as shown by the medium risk/1 in 100 year mapping provided. Even in a 1 in 1000 year surface water event very little of the site is indicated as at risk with a small area of ponding occurring in the low point southwestern area of the site just north of Chalk Hill only.

3.12 There are no significant surface water issues at the site that will give rise to significant problems in development of the site, with the minor risks being easily possible to design against by ensuring that development remains outside of the low point in which minor ponding occurs or a minor redesign of sight levels/contouring occurs, that flow routes remain possible around buildings, and that finished floor levels are set relative to external levels in order to ensure that ponding does not occur in the vicinity of access points or enter buildings under any circumstances.

3.13 The provision of a drainage system in the developed area of the site will also pick up flows/surface water in this area, whilst swales provided in the country park at a higher level can pick up any flows coming south towards the developed area and allow these to infiltrate rather than continuing southwards.

3.14 These are detailed design issues that will be considered further at the detailed design stage as a detailed layout is developed, however with the current proposal being outline only no further consideration is required at present and the overall risk of surface water flooding to the site is considered to be low.

3.15 To ensure that the proposed development itself does not have an adverse impact upon the potential off site risk of surface water flooding a Drainage Strategy has been considered from an early stage, as detailed in Section 5.

3.16 The fourth form of flood risk to be considered in accordance with the National Planning Policy Framework is flooding from rising groundwater.

3.17 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands and river gravels in valley bottoms underlain by less permeable rocks. Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land.

3.18 The underlying chalk geology is a permeable geology, thus groundwater may be present, however the site lies near the crest of a hill, whilst the chalk geology extends to significantly lower levels, thus it is unlikely that ground water levels would reach surface levels under any circumstances. The ground investigation also included a 3m deep trial hole in which no groundwater was encountered.

3.19 The overall risk of groundwater flooding occurring in the vicinity of the site is therefore considered to be low.

3.20 The fifth flood risk be considered in respect of the National Planning Policy Framework is flooding from blocked or overloaded sewers and water mains.

3.21 A copy of Anglian Water mapping for the area is provided in Appendix 7. There are no sewers running across the site considered to give rise to any significant risk of flooding to the site.

3.22 Should the foul sewers or any watermain cause flooding on any of the surrounding roads both Haverhill Road and Hinton Road fall in a southerly direction and would likely channel water along the road southwards rather than resulting in water coming onto the site itself.

3.23 Gog Magog Way and the adjacent development to the south is lower than the site and land falls in a southerly direction away from the site thus sewers or watermains in this area are not considered to pose any significant risk to the site.

3.24 There are no other sewers and water mains considered to give rise to any significant risk of flooding to the site.

3.25 The last form of flood risk to be considered in respect of the National Planning Policy Framework is flooding from reservoirs canals and other artificial sources.

3.26 There are no reservoirs or other artificial sources of water in the vicinity of the site that are considered to provide any significant flood risk to the site.

4 The Proposed Development

4.1 The proposal involves an outline application for the development of a retirement care village in Use Class C2 comprising housing with care, communal health, wellbeing and leisure facilities, public open space, landscaping, car parking, access and associated development (all matters reserved apart from access), along with a 19.1ha countryside park, as shown on the illustrative masterplans provided in Appendix 8.

4.2 A CAM route may run through the site in a southwesterly direction as shown on the indicative masterplan, with a stop also potentially to be provided at the site. This is shown for completeness of the illustrative masterplan only, and would be subject to separate Planning Approvals/Applications relating to the wider regional CAM route if this is provided. This would include separate drainage and flood risk information required as necessary to support proposals should they be progressed and as such no further consideration of the potential CAM route and stop is provided within this Flood Risk Assessment and SuDS Strategy.

4.3 As detailed in Section 3, it is not considered that the site is not at any significant risk of flooding from fluvial sources, with the only risk of flooding being a low risk associated with potential surface water flows in a southerly direction across the site in an extreme surface water event, which could cause ponding in the low spot in the southwestern area of the site to be developed with the care home and dwellings.

4.4 The minor risks associated with surface water flooding/flows at this site can be dealt with by ensuring general good practice is followed during the detailed design phase when the final layout is developed, by ensuring that flow paths are provided around/between buildings, that these are kept out of low spots (or ground is remodeled in an appropriate way) and setting finished floor levels sufficiently above adjacent ground levels in order that water will not pond in the vicinity of access points and enter buildings under any circumstances during any extreme event in which drainage systems become blocked or over capacity.

4.5 The provision of a drainage system in the developed area of the site will also pick up flows/surface water in this area, whilst swales can be provided in the country park at a higher level than the developed area to pick up any flows coming south towards the developed area of the site and allow these to infiltrate rather than continuing to run southwards.

4.6 As the only layout available at present is an illustrative masterplan with a low level of detail only provided, surface water flows and flooding will be considered as a detailed layout is worked up and the development progresses, however as noted above there are a number of design methods for ensuring that the proposed development is adequately protected against flooding from overland flows.

4.7 No alteration to the existing swale/bund that runs around the northeastern side of the residential development at Chalk Hill will occur as a result of the proposed development.

4.8 The only significant remaining flood risk associated with the proposed development is therefore the potential impact upon off site flows that could result from the increased developed area at the site. A Surface Water Drainage Strategy has therefore been developed at an early stage in compliance with all current relevant local and national guidance, as detailed in Section 5.

4.9 Due to the early stage of proposals at present, being an outline planning application with illustrative masterplan only available as a site layout, full detailed design of the surface water system at the site will only be completed in line with this strategy and submitted for approval at the detailed design phase once planning permission is granted, and can be secured to any planning approval granted by the imposition of an appropriate condition.

5 Sustainable Drainage Strategy

5.1 Point of Discharge

5.1.1 In line with the Drainage Hierarchy, surface water should be discharged to the ground via infiltration systems where feasible.

5.1.2 As detailed in Section 2 and Appendix 4, infiltration testing undertaken in line with BRE365 shows infiltration rates across the site are generally very high and significantly above the minimum rate at which infiltration provides an acceptable means of discharge.

5.1.3 All drainage from the proposed development will therefore be to infiltration systems and thus in line with the drainage hierarchy, with no positive off site discharge required.

5.2 SuDS Systems Proposed at the Development and Attenuation Volumes

5.2.1 Living/green roof systems are a preferred SuDS systems, given that they are a flood reduction measure, reduce pollution through filtration, and provide a landscape and wildlife benefit.

5.2.2 At present as the Planning Application is outline only, with an illustrative masterplan only being available, it is unknown whether there will be any constraints to the use of green roofs such as buildings having pitched roofs or lightweight roof structures.

5.2.3 In line with Paragraph 3.7.4 of the Greater Cambridgeshire Sustainable Design and Construction Supplementary Planning Document all flat roofs at the development will be designed as green or brown roofs.

5.2.4 Further consideration will therefore be given to the use of green roof structures at the detailed design phase, however it should be noted that green roofs are not required to deal with discharge from the development in this instance which can all be comfortably dealt with by other measures as demonstrated below.

5.2.5 Basins and ponds are considered a preferred SuDS feature as they are both a flood and pollution reduction measure and also provide a landscape and wildlife benefit.

5.2.6 Given the minor risk of surface water flooding in the southern area of the site in which the built development will be located, and high infiltration rates present at the site, swales can be created in the country park area of the proposed development running along contours at a higher level than the developed area of the site.

5.2.7 Such features would pick up any flows coming southwards towards the site during an extreme rainfall event and hold these back whilst infiltration into the highly permeable chalk below takes place. Indicative locations for such features are shown on the drainage layout provided in Appendix 9.

5.2.8 Swales may also be used alongside impermeable road areas to take drainage from these prior to infiltration or to take roof drainage from buildings however the locations of these features will depend upon the detailed layout, and further details of swales will therefore be provided at the detailed design phase.

5.2.9 Permeable paving is a SuDS technique that is appropriate at most developments including the proposed development, and provides both a flood reduction benefit due to the attenuation provided in the base and a pollution reduction benefit due to the filtration of water as it passes through the permeable surfacing. In line with Paragraph 3.7.4 of the Greater Cambridgeshire Sustainable Design and Construction Supplementary Planning Document all hard surfaces are required to be permeable where practicable.

5.2.10 Based upon the illustrative layout, as shown on the drawing provided in Appendix 9 the roof area of buildings at the development is likely to be approximately 1.163Ha, whilst the internal roads and parking area is estimated at about 0.686Ha. Given that this will be a private/managed care development it is unlikely that any road areas will be adopted, whilst vehicles should be light and thus a permeable paving solution should be suitable to use across the 0.686Ha access and parking area.

5.2.11 The first set of calculations provided in Appendix 10 are based upon the second worst test rate achieved of 0.2629 m/hr (at pit SA3), which is the minimum rate likely to be achieved across the majority of the site. Based upon this rate, the permeably paved areas would need a crushed stone base thickness of just 194mm with a void ratio of 30% to successfully drain both the permeable paving and roof areas through the base.

5.2.12 This is a shallower base thickness than would tend to be required for structural reasons, and as such it is not considered that there are any issues with draining the developed area of the site by infiltration.

5.2.13 As a final check, a second set of calculations has been carried out using the absolute minimum rate achieved at any test location of 0.0089m/hr at pit SA5 for the entire base of the permeable paving. In this situation, a 1 in 100 year plus 40% climate change rainfall event would require a 553mm thick base layer (or use of cellular systems such as aquacell beneath some areas of the base which have 95% void space), but would still drain by infiltration with a half drain time of 1123 minutes thus within acceptable limits.

5.2.14 As an outline application with an indicative masterplan only available at present it is considered that the above demonstrates that the entire development can be drained by infiltration during a 1 in 100 year plus 40% climate change rainfall event.

5.2.15 When a detailed layout is designed, additional infiltration testing in line with BRE 365 will be undertaken at the location of the specific infiltration systems proposed and at the correct invert levels of such systems, with a full set of calculations provided as part of the detailed design information.

5.2.16 External pedestrian pathways etc. will also be of a permeable design.

5.2.17 Water re-use systems such as rainwater harvesting and water butts that would allow rainwater to be reused for purposes such as irrigation may also be provided at the development, however will be considered as part of the detailed design phase once outline planning permission be granted.

5.2.18 Should such system be provided any storage volume provided in such system (which would overflow to the main surface water drainage network or base of permeable paving) will not be counted towards that required to accommodate the design rainfall event as such systems may be full at the time the rainfall event occurs.

5.2.19 Large diameter pipe, tank and storm cells systems are considered to be the least sustainable/preferable SuDS system given that they solely provide a flood reduction system without providing either pollution reduction or landscape and wildlife benefit and will therefore only be used when necessary such as for conveyance beneath access areas.

5.3 SuDS Treatment Stages

5.3.1 All surface water will receive an appropriate level of treatment in line with requirements prior to discharge to either the ground or the surface water sewer network.

5.3.2 Drainage from all parking areas and access areas, which are considered to be lightly trafficked areas will initially be though the surfacing of the permeable paving which provides a filtration system, removing pollutants such as hydrocarbons.

5.3.3 A second treatment stage will be then be provided by filtration through the membrane (such as Terram) in which the base of the permeably paved areas will be wrapped, removing further pollutants from discharge and ensuring that surface water from these areas is suitably treated in line with requirements prior to discharge.

5.3.4 Roof drainage requires a single treatment stage only, which will be provided by filtration through the membrane such as terram in which the base of the permeable paving will be wrapped.

5.3.5 All surface water will therefore receive the required number of treatment stages prior to discharge.

5.4 **Maintenance of SuDS Systems**

5.4.1 As a residential care home and care/retirement development site will be managed and the manager/owner will be responsible for the maintenance of all sustainable drainage systems located at the development.

5.4.2 Further details relating to the maintenance responsibilities along with the provision of a full maintenance plan for the various SuDS systems will be provided at the detailed design phase once conditional planning approval has been granted to ensure that the site owner is aware of their responsibilities and the type and frequency of maintenance works required.

5.5 Full detailed design of the surface water drainage system will only take place once conditional planning approval has been granted. This will be based upon this outline Sustainable Drainage Strategy, which clearly demonstrates that the proposed development can be drained in accordance with all national and local requirements and will ensure that the proposed development does not have an adverse impact upon the off-site risk of flooding during all rainfall events upto and including a 1 in 100 year plus 40% climate change event.

5.6 Should the CAM route across the site and stop come forwards in due course, this would form part of a separate planning and design process covering the wider regional CAM route. This would include consideration of drainage and provision of all necessary information to demonstrate that this can be drained acceptably and no drainage consideration of the potential CAM link is required at the current stage.

6 Conclusion

6.1 The proposed development involves the provision of a retirement care village in Use Class C2 comprising housing with care, communal health, wellbeing and leisure facilities, public open space, landscaping, car parking, access and associated development (all matters reserved apart from access), along with a 19.1ha countryside park, and potentially a section of the CAM route and stop should this go ahead, as shown on the illustrative masterplan provided in Appendix 8.

6.2 The proposed site lies in Flood Zone 1, and in line with the National Planning Policy Framework the proposed development is appropriate in this flood zone without needing to apply the Exception Test, whilst the Sequential Test is automatically passed.

6.3 All the sources of flood risk have been considered in Section 3 of this report, and it is not considered that there are any significant risks of flooding to the site.

6.4 There is a low risk of surface water flooding in small areas of the site, however this can be easily dealt with as detailed in Paragraphs 4.3 to 4.5 and does not give rise to any significant flooding concerns.

6.5 No specific flood resistant or resilient construction methods are required, however during the detailed design phase flow paths will be maintained across the site in a southerly direction to mimic the existing situation with external levels and finished floor levels designed to ensure that water will not pool in the vicinity of access points or enter buildings under any circumstances.

6.6 The site is underlain by a chalk geology which is highly permeable as demonstrated by on site testing which has taken place in accordance with BRE365. Calculations provided in Appendix 10 demonstrate that the proposed development can be entirely drained by infiltration in line with the drainage hierarchy preference, and will not have an adverse impact upon the off-site risk of flooding during a 1 in 100 year plus 40% climate change event.

6.7 Adequate treatment will be provided to all surface water prior to discharge by the SuDS systems proposed at the site, as detailed in Section 5.3.

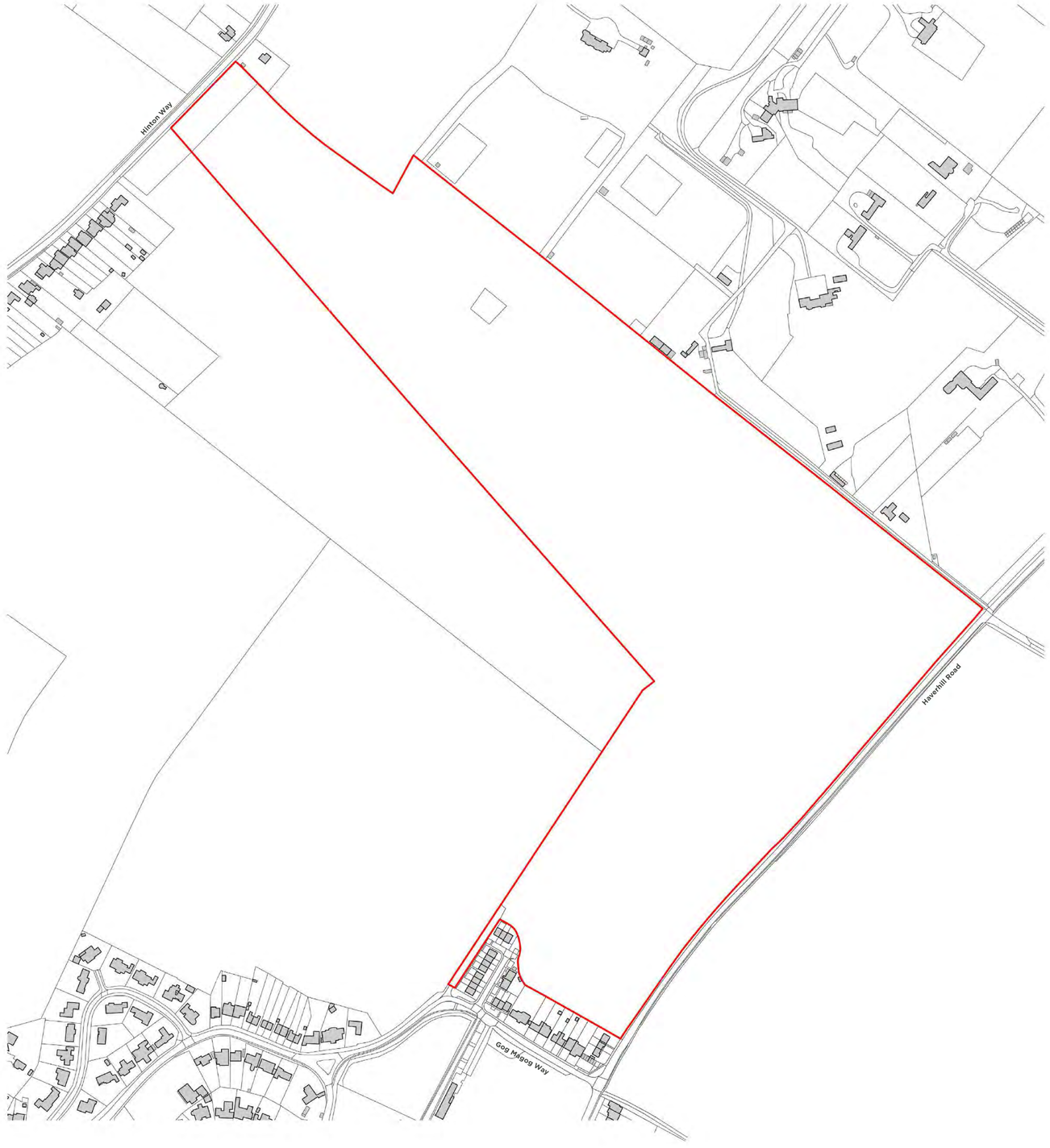
6.8 The owner/manager of the care home and care/retirement dwellings will be responsible for the maintenance of all drainage systems at the proposed development.

6.9 Full detailed drainage design will be submitted once conditional planning approval has been granted based upon this strategy and can be secured by planning condition.

6.10 This Flood Risk Assessment and Sustainable Drainage Strategy is fully in line with current Local and National Policy and there are no flood risk or drainage related grounds on which to object to the proposed development of a retirement care village in Use Class C2 comprising housing with care, communal health, wellbeing and leisure facilities, public open space, landscaping, car parking, access and associated development and a countryside park on land between Haverhill Road and Hinton Road, Stapleford.

APPENDIX 1

SITE LOCATION PLAN



0 100m

LEGEND

Site boundary (24.32 Ha)

Carter Jonas

PROJECT TITLE

LAND BETWEEN HAVERHILL ROAD AND HINTON WAY, STAPLEFORD

DRAWING TITLE

J0027450_011
SITE LOCATION PLAN

ISSUED BY	London	T: 020 7016 0720	
DATE	12.03.2020	**DRAWN**	NM
SCALE@A1	1:2500	**CHECKED**	JC
STATUS	Draft	**APPROVED**	JC

No dimensions are to be scaled from this drawing.
All dimensions are to be checked on site.
Area measurements for indicative purposes only.

Source: Ordnance Survey

APPENDIX 2

TOPOGRAPHIC SURVEY

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC
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TITLE
LAND AT STAPLEFORD,
HAVERHILL ROAD
AND HINTON WAY.
TOPO SURVEY (1 OF 5)

ORIG M.R.F	DATE JANUARY 2020
CHKD	SCALE 1:500 @ A1
APPR	DRAWING NO 2453-01 REV -

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC ENGINEERING

MTC Engineering (Cambridge) Ltd.
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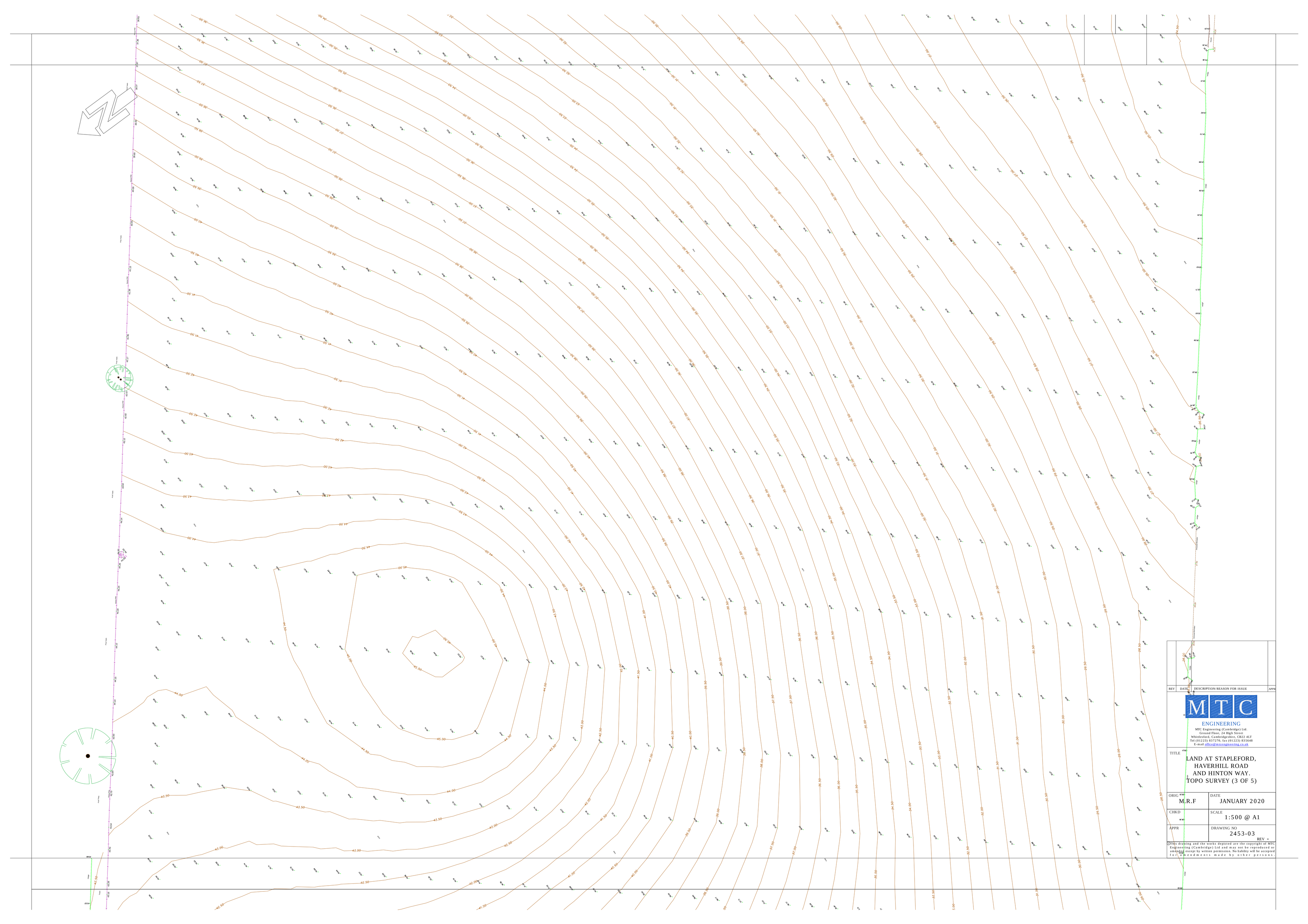
TITLE

LAND AT STAPLEFORD,
HAVERHILL ROAD
AND HINTON WAY.
TOPO SURVEY (2 OF 5)

ORIG	DATE
M.R.F	JANUARY 2020
CHKD	SCALE
	1:500 @ A1
APPR	DRAWING NO
	2453-02
	REV -


REV
DATE
DESCRIPTION/REASON FOR ISSUE
APPR
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TITLE
LAND AT STAPLEFORD,
HAVERHILL ROAD
AND HINTON WAY.
TOPO SURVEY (3 OF 5)
ORIG
M.R.F
DATE
JANUARY 2020
CHKD
SCALE
1:500 @ A1
APPR
DRAWING NO
2453-03
REV -
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REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

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TITLE

LAND AT STAPLEFORD, HAVERHILL ROAD AND HINTON WAY. TOPO SURVEY (4 OF 5)

ORIG	DATE
M.R.F	JANUARY 2020
CHKD	SCALE 1:500 @ A1
APPR	DRAWING NO 2453-04 REV -

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC

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TITLE

LAND AT STAPLEFORD, HAVERHILL ROAD AND HINTON WAY. TOPO SURVEY (5 OF 5)

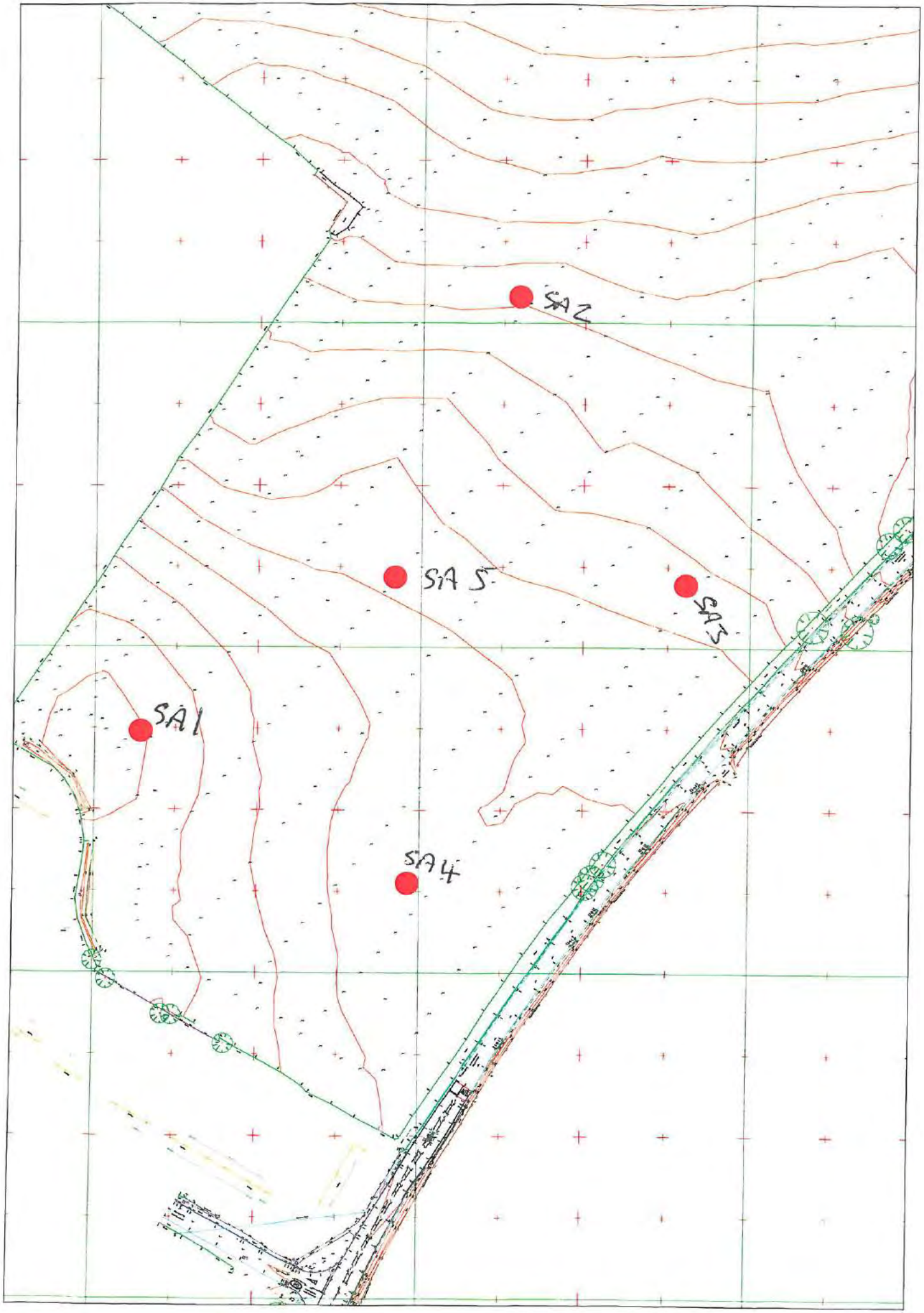
ORIG	DATE
M.R.F	JANUARY 2020
CHKD	SCALE 1:500 @ A1
APPR	DRAWING NO 2453-05 REV -

APPENDIX 3

PHOTOGRAPHS OF SOUTHERN AREA OF THE SITE

APPENDIX 4

INFILTRATION TEST RESULTS AND LOCATIONS


SA 2
SA 5
SA 3
SA 1
SA 4

JAMES and MILTON DRILLING Ltd.

Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Norfolk. NR21 7AW

BH No. SA1

Sheet No. 1 of 1

Job No		Site	Chalk Hill Stapleford	Date	13-1-20
Bore depth, start		Casing Depth, start of day		Water level, start of day	

Strata Details

Depth from	Depth to	Description
GL	0.80	Brown slightly gravelly sandy CLAY fine to coarse flint angular to rounded medium sand.
0.80	2.26	White granular CHALK fine to coarse chalk gravels.

Sample Details

SPT Details

Samp. No.	Type	Start Depth	End Depth	Casing Depth	Water level	0-75mm	75-150mm	0-75mm	75-150mm	150-225mm	225-300mm

Water Observations

				Casing	From	To
Water entry	DRY			150mm		
Rate				200mm		
Level after 20mins				250mm		
Casing Depth						
Depth sealed						

Chiselling

From			
To			
Time taken			
Material			

Notes

Hole depth, end	2.26	Casing Depth, end of day		Water level, end of day	

Crew Employed

Driller	Nick	Second Man		Others	

JAMES and MILTON DRILLING Ltd.

Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Norfolk. NR21 7AW

BH No. SA 2

Sheet No. 1 of 1

Job No		Site	Chalk Hill Stapleford.	Date	13-1-20
Bore depth, start		Casing Depth, start of day		Water level, start of day	

Strata Details

Depth from	Depth to	Description
GL	1.10	Brown slightly gravelly sandy CLAY fine to coarse flint angular to rounded medium sand.
1.10	2.20	White granular CHALK fine to coarse chalk gravel

Sample Details

SPT Details

Samp. No	Type	Start Depth	End Depth	Casing Depth	Water level	0-75mm	75-150mm	0-75mm	75-150mm	150-225mm	225-300mm

Water Observations

				Casing	From	To
Water entry	DRY			150mm		
Rate				200mm		
Level after 20mins				250mm		
Casing Depth						
Depth sealed						

Chiselling

From			
To			
Time taken			
Material			

Notes

Hole depth, end	2.20	Casing Depth, end of day		Water level, end of day	

Crew Employed

Driller	Nod	Second Man		Others	

JAMES and MILTON DRILLING Ltd.

Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Norfolk. NR21 7AW

BH No.	SA 3	Sheet No.	1 of 1

Job No		Site	Chalk A11 Stapleford.	Date	13-1-20
Bore depth, start		Casing Depth, start of day		Water level, start of day	

Strata Details

Depth from	Depth to	Description
GL	0.80	Brown slightly gravelly sandy CLAY fine to coarse flint angular to Rounded medium sand.
0.80	2.40	White granular CHALK fine to coarse flint gravelly

Sample Details

SPT Details

Samp. No.	Type	Start Depth	End Depth	Casing Depth	Water level	0-75mm	75-150mm	0-75mm	75-150mm	150-225mm	225-300mm

Water Observations

Water entry	Dry		
Rate			
Level after 20mins			
Casing Depth			
Depth sealed			

Casing	From	To
150mm		
200mm		
250mm		

Chiselling

From				
To				
Time taken				
Material				

Notes

Hole depth, end	2.40	Casing Depth, end of day		Water level, end of day	

Crew Employed

Driller	Nod	Second Man		Others	

JAMES and MILTON DRILLING Ltd.

Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Norfolk NR21 7AW

BH No. SA 4

Sheet No. 1 of 1

Job No		Site	Chalk Hill Stapleford	Date	13-1-20
Bore depth, start		Casing Depth, start of day		Water level, start of day	

Strata Details

Depth from	Depth to	Description
GL	0.40	Brown slightly gravelly, sandy CLAY fine to coarse flint angular to rounded medium sand.
0.40	2.40	White granular CHALK fine to coarse chalk gravels

Sample Details

SPT Details

Samp. No.	Type	Start Depth	End Depth	Casing Depth	Water level	0-75mm	75-150mm	0-75mm	75-150mm	150-225mm	225-300mm

Water Observations

Water entry	DRY		
Rate			
Level after 20mins			
Casing Depth			
Depth sealed			

Casing	From	To
150mm		
200mm		
250mm		

Chiselling

From			
To			
Time taken			
Material			

Notes

Hole depth, end	2.40	Casing Depth, end of day		Water level, end of day	

Crew Employed

Driller	Mad	Second Man		Others	

JAMES and MILTON DRILLING Ltd.

Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Norfolk. NR21 7AW

BH No: SA 5

Sheet No: 1 of 1

Job No		Site	Chalk Hill Stapleford	Date	13-1-20
Bore depth, start		Casing Depth, start of day		Water level, start of day	

Strata Details

Depth from	Depth to	Description
GL	1.10	Brown slightly gravelly sandy CLAY fine to coarse flint angular to rounded medium sand.
1.10	2.30	White granular CHALK fine to coarse chalk gravels medium to coarse chalk sands.

Sample Details

SPT Details

Samp. No.	Type	Start Depth	End Depth	Casing Depth	Water level	0-75mm	75-150mm	0-75mm	75-150mm	150-225mm	225-300mm

Water Observations

Water entry	ORF		
Rate			
Level after 20mins			
Casing Depth			
Depth sealed			

Casing	From	To
150mm		
200mm		
250mm		

Chiselling

From			
To			
Time taken			
Material			

Notes

Hole depth, end	2.30	Casing Depth, end of day		Water level, end of day	

Crew Employed

Driller	Nod	Second Man		Others	

Trial Pit Permeability Testing

James & Milton DRILLING Ltd.
Site Investigation Specialists

Address : Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Fakenham, Norfolk, NR21 7AW
Telephone: (01328) 829767 Mobile: 07958 785545

Client	MTC	**Date**	13-1-20
Contract	Chalk Hill Stapleford	**Job Number**	

Trial Pit No.	SA1	Water Level Prior to Test	DRY		
Trial Pit Depth	2.26m	Trial Pit Topped up to	1.26		
Trial Pit Length.	2.20m	Approx. Quantity of Water Added	300m		
Trial Pit Width	0.50m	Gravel Pack Installed From	1.26	To	2.26

Time (min/sec)	Water Level	Time (min/sec)	Water Level	Time (min/sec)	Water Level
0	1.26	0	1.26	0	1.26
1	1.61	1	1.63	1	1.62
2	1.97	2	1.79	2	1.76
3	2.06	3	1.97	3	1.94
4	2.15	4	2.01	4	1.99
5	2.18	5	2.08	5	2.06
6	2.20	6	2.17	6	2.13
7	2.22	7	2.24	7	2.20
8	2.24	8	2.2[illegible]	8	2.22
9	2.25	9	225[illegible]	9	2.24
10	DRY	10	2.25	10	2.25
		11	DRY	11	DRY

Trial Pit Permeability Testing

James & Milton
DRILLING Ltd.
Site Investigation Specialists

Address : Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Fakenham, Norfolk, NR21 7AW
Telephone: (01328) 829767 Mobile: 07958 785545

Client	MTC	Date	14-1-19
Contract	Chalk Hill Stapleford	Job Number	

Trial Pit No.	SA2	Water Level Prior to Test	DRY		
Trial Pit Depth	2.20m	Trial Pit Topped up to	1.20		
Trial Pit Length.	2.20m	Approx. Quantity of Water Added	800lts		
Trial Pit Width	0.50m	Gravel Pack Installed From	120	To	220

TEST 1		TEST 2		TEST 3	
Time (min/~~sec~~)	Water Level	Time (min/~~sec~~)	Water Level	Time (min/~~sec~~)	Water Level
0	1.20	0	1.20	0	1.20
1	1.44	1	1.41	1	1.39
2	1.63	2	160	2	1.57
3	1.81	3	1.78	3	1.65
4	1.89	4	1.86	4	1.74
5	DRY	5	1.94	5	1.82
6		6	DRY	6	1.87
7		7		7	1.92
8		8		8	1.96
9		9		9	1.99
10		10		10	DRY

Trial Pit Permeability Testing

James & Milton DRILLING Ltd.
Site Investigation Specialists

Address : Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Fakenham, Norfolk, NR21 7AW
Telephone: (01328) 829767 Mobile: 07958 785545

Client	MTC	Date	15-1-20
Contract	Chalk Hill Stapleford.	Job Number	

Trial Pit No.	SA3	Water Level Prior to Test	DRY		
Trial Pit Depth	2.20m	Trial Pit Topped up to	1.40m		
Trial Pit Length.	2.40m	Approx. Quantity of Water Added	300Ltrs		
Trial Pit Width	0.50m	Gravel Pack Installed From	1.40	To	2.40

TEST 1		TEST 2		TEST 3	
Time (min/~~see~~)	Water Level	Time (min/~~see~~)	Water Level	Time (min/~~sec~~)	Water Level
0	1.40	0	1.40	0	1.40
1	1.63	1	1.63	1	1.62
2	1.70	2	1.69	2	1.68
3	1.74	3	1.73	3	1.71
4	1.78	4	1.77	4	1.75
5	1.81	5	1.80	5	1.78
6	1.84	6	1.83	6	1.81
7	1.87	7	1.85	7	1.84
8	1.89	8	1.87	8	1.86
9	1.91	9	1.89	9	1.88
10	1.93	10	1.91	10	1.90
15	2.00	15	1.98	15	1.96
20	2.06	20	2.03	20	2.01
25	2.11	25	2.07	25	2.06
30	2.15	30	2.10	30	2.10
45	2.26	45	2.19	45	2.17
60	2.34	60	2.26	60	2.22
90	DRY	90	2.33	90	2.30
120		120	DRY	120	2.37
				150	DRY

Trial Pit Permeability Testing

James & Milton DRILLING Ltd.
Site Investigation Specialists

Address : Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Fakenham, Norfolk, NR21 7AW
Telephone: (01328) 829767 Mobile: 07958 785545

Client	MTC	Date	15-1-19
Contract	Chalk Hill Stapleford	Job Number	

Trial Pit No.	SA4	Water Level Prior to Test	DRY
Trial Pit Depth	2.20m	Trial Pit Topped up to	1.20
Trial Pit Length.	2.30m	Approx. Quantity of Water Added	800lts
Trial Pit Width	0.50m	Gravel Pack Installed From 1.20	To 2.20

TEST 1		TEST 2		TEST 3	
Time (min/sec)	Water Level	Time (min/sec)	Water Level	Time (min/sec)	Water Level
0	1.20	0	1.20	0	1.20
1	1.45	1	1.42	1	1.41
2	1.70	2	1.68	2	1.57
3	1.95	3	1.85	3	1.71
4	2.10	4	1.99	4	1.80
5	2.15	5	2.10	5	1.89
6	DRY	6	2.14	6	1.96
7		7	2.18	7	2.04
8		8	DRY	8	2.10
9		9		9	2.15
10		10		10	2.18
				15	DRY

Trial Pit Permeability Testing

James & Milton
DRILLING Ltd.
Site Investigation Specialists

Address : Ryburgh House Farm, 63 Fakenham Road, Great Ryburgh, Fakenham, Norfolk, NR21 7AW
Telephone: (01328) 829767 Mobile: 07958 785545

Client	MTC	Date	15-1-20
Contract	Chalk Hill Stapleford	Job Number	16-1-20

Trial Pit No.	SA5	Water Level Prior to Test	DRY		
Trial Pit Depth	2.10m	Trial Pit Topped up to	1.00		
Trial Pit Length.	2.50m	Approx. Quantity of Water Added	3.00lts		
Trial Pit Width	0.50m	Gravel Pack Installed From	1.00	To	2.00

TEST 1		TEST 2		TEST 3	
Time (min/~~sec~~)	Water Level	Time (min/~~sec~~)	Water Level	Time (min/sec)	Water Level
0	1.00	0	1.00	0	1.00
1	1.16	1	1.15	1	1.16
2	1.18	2	1.17	2	1.17
3	1.20	3	1.18	3	1.18
4	1.22	4	1.19	4	1.19
5	1.23	5	1.20	5	1.21
6	1.24	6	1.21	6	1.21
7	1.24	7	1.21	7	1.22
8	1.24	8	1.21	8	1.23
9	1.25	9	1.21	9	1.23
10	1.26	10	1.22	10	1.24
15	1.28	15	1.24	15	1.26
20	1.30	20	1.26	20	1.28
25	1.31	25	1.28	25	1.30
30	1.32	30	1.30	30	1.32
45	1.36	45	1.34		
60	1.40	60	1.37		
120	1.53	120	1.41	16hr	DRY
180	1.61	180	1.53		
240	1.68	240	1.60		
300	1.74	300	1.66		
360	1.83	360	1.71		
410	1.89	410	1.80		
470	1.96	470	1.87		
530	DRY	530	1.91		
		590	1.95		
		650	DRY		

Michael Brindley

From: andy@jamesandmiltondrilling.co.uk
Sent: 20 January 2020 17:21
To: Michael Brindley
Subject: RE: Fee proposal request - Land at Stapleford [CJ-WORKSITE.FID541380]

HI Mike,

Yes, he did one near the centre of the site to 3.0m and it was dry.

Kind regards

Andy James
Director
+44 (0)1328 829767
+44 (0)7958 785545
http://www.jamesandmiltondrilling.co.uk

James & Milton
DRILLING Ltd.
Site Investigation Specialists

From: Michael Brindley [mailto:mbrindley@mtcengineering.co.uk]
Sent: 20 January 2020 15:48
To: andy@jamesandmiltondrilling.co.uk
Subject: RE: Fee proposal request - Land at Stapleford [CJ-WORKSITE.FID541380]

Hi Andy,

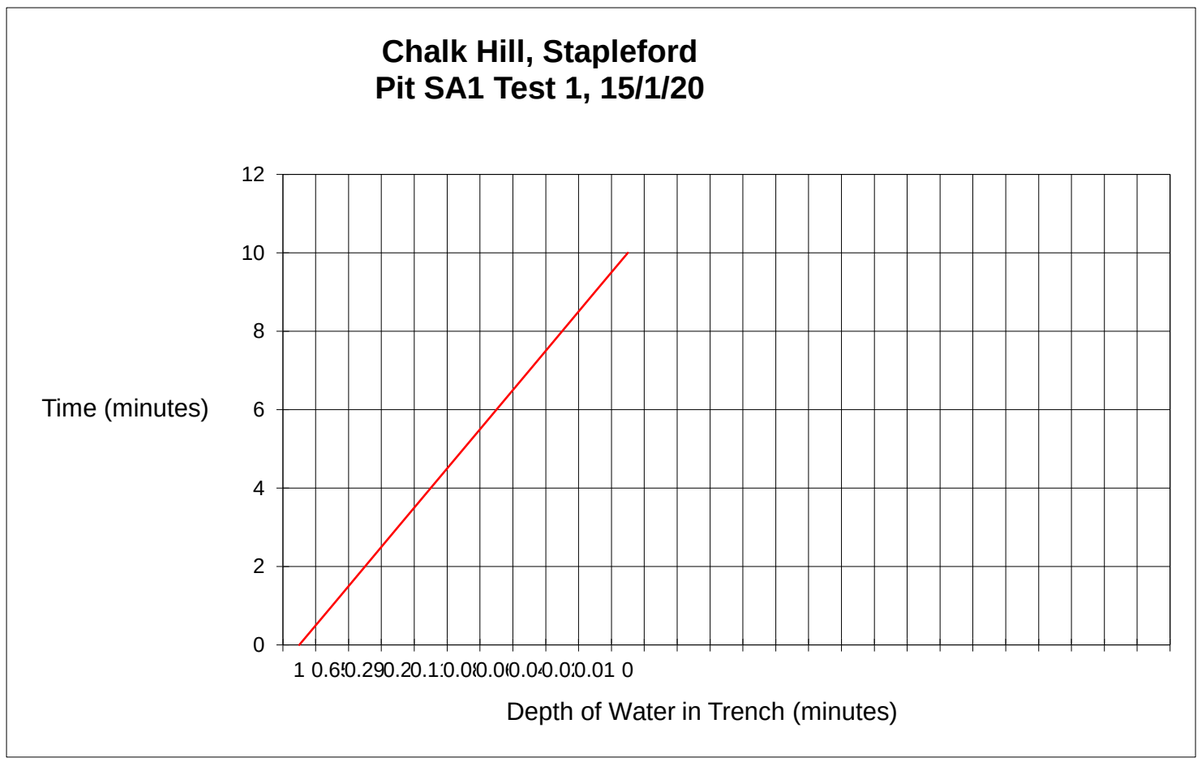
Thanks for this, certainly seems infiltration will work at the site. Did you also do a couple of deeper pits to 3m to check groundwater levels as per the attached request?

Kind regards

Mike Brindley
For and on behalf of
MTC Engineering (Cambridge) Ltd.

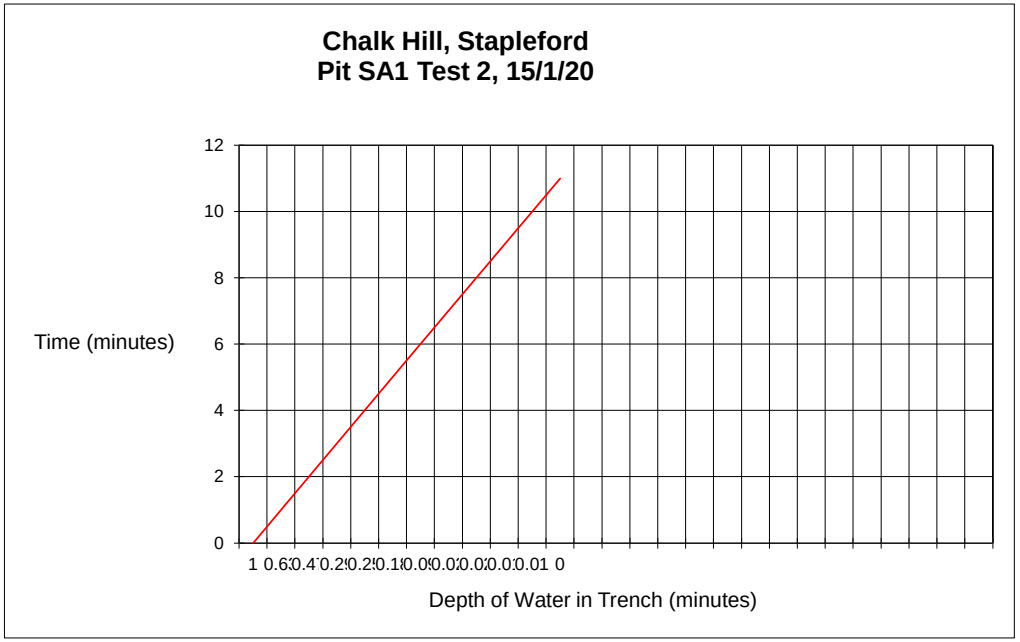
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.26	1
1	1.61	0.65
2	1.97	0.29
3	2.06	0.2
4	2.15	0.11
5	2.18	0.08
6	2.2	0.06
7	2.22	0.04
8	2.24	0.02
9	2.25	0.01
10	2.26	0

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.26
Pipe Length	2.26
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	0.7143
T25	2.4444
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	103.8095
q (m/sec)	5.58E-04
q (mm/hour)	2007.7257
q (m/hour)	2.0077
q (mm/sec)	5.58E-01



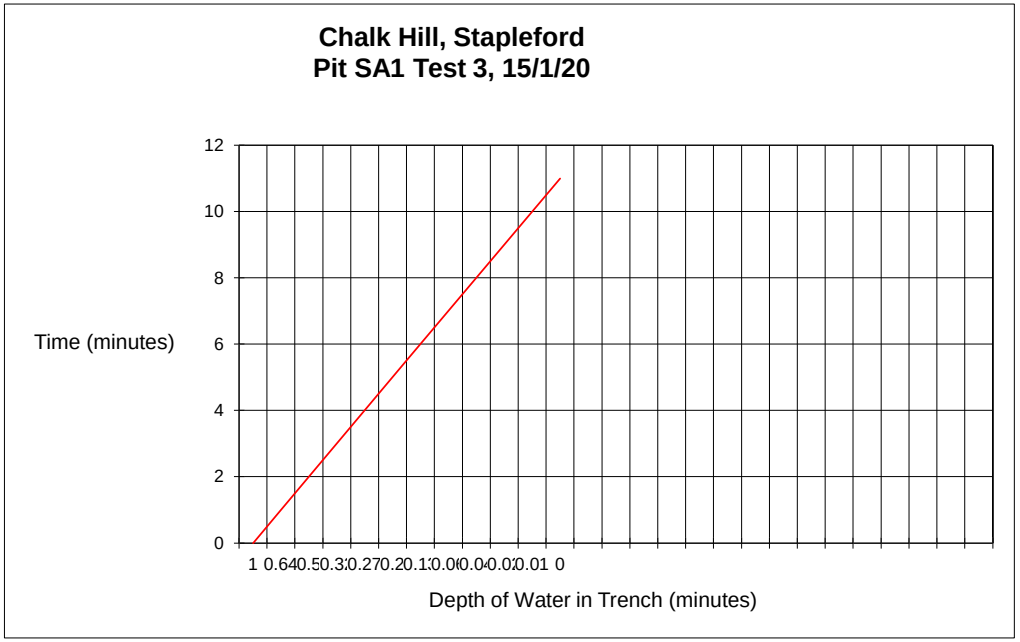
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.26	1
1	1.63	0.63
2	1.79	0.47
3	1.97	0.29
4	2.01	0.25
5	2.08	0.18
6	2.17	0.09
7	2.24	0.02
8	2.24	0.02
9	2.25	0.01
10	2.25	0.01
11	2.26	0

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.26
Pipe Length	2.26
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	0.6757
T25	4.0000
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	199.4595
q (m/sec)	2.90E-04
q (mm/hour)	1044.9294
q (m/hour)	1.0449
q (mm/sec)	2.90E-01



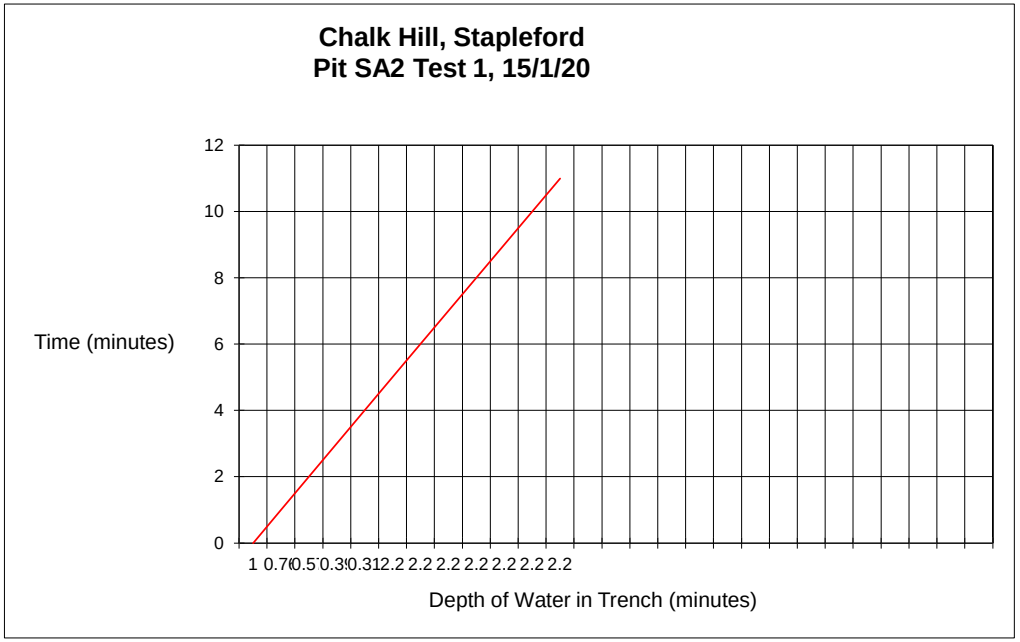
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.26	1
1	1.62	0.64
2	1.76	0.5
3	1.94	0.32
4	1.99	0.27
5	2.06	0.2
6	2.13	0.13
7	2.2	0.06
8	2.22	0.04
9	2.24	0.02
10	2.25	0.01
11	2.26	0

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.26
Pipe Length	2.26
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	0.6944
T25	4.4000
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	222.3333
q (m/sec)	2.60E-04
q (mm/hour)	937.4260
q (m/hour)	0.9374
q (mm/sec)	2.60E-01



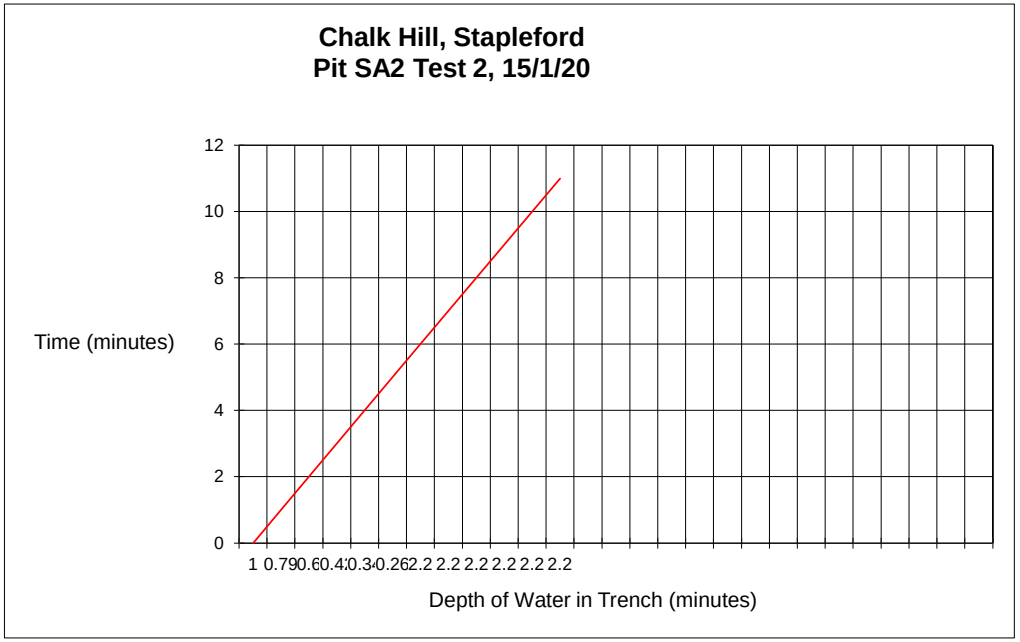
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.2	1
1	1.44	0.76
2	1.63	0.57
3	1.81	0.39
4	1.89	0.31
5	0	2.2
6		2.2
7		2.2
8		2.2
9		2.2
10		2.2
11		2.2

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.2
Pipe Length	2.2
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.0526
T25	3.9683
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	174.9373
q (m/sec)	3.31E-04
q (mm/hour)	1191.4040
q (m/hour)	1.1914
q (mm/sec)	3.31E-01



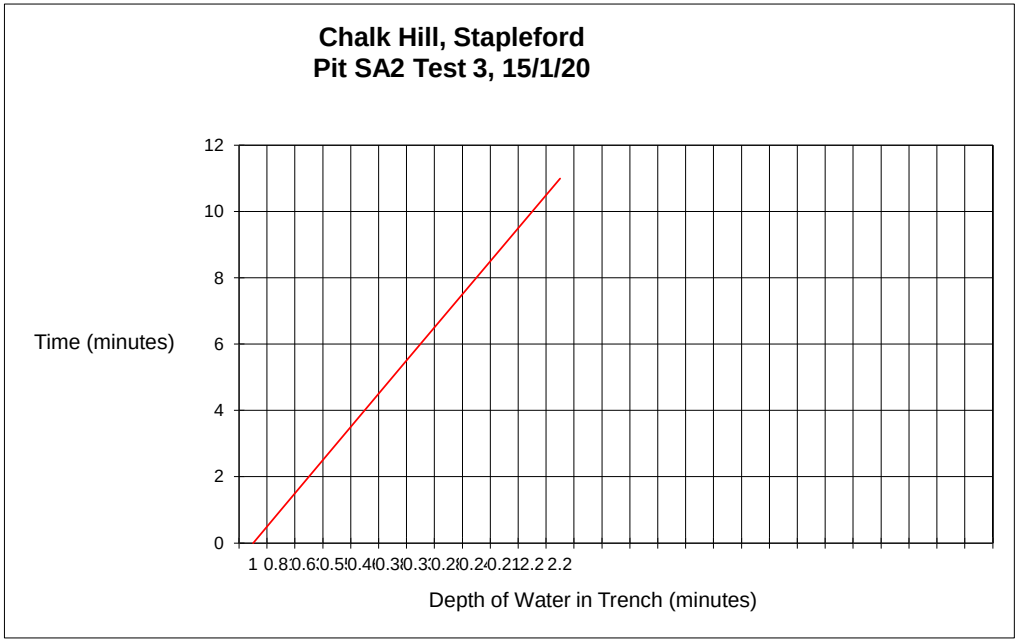
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.2	1
1	1.41	0.79
2	1.6	0.6
3	1.78	0.42
4	1.86	0.34
5	1.94	0.26
6	0	2.2
7		2.2
8		2.2
9		2.2
10		2.2
11		2.2

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.2
Pipe Length	2.2
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.2105
T25	4.9948
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	227.0591
q (m/sec)	2.55E-04
q (mm/hour)	917.9153
q (m/hour)	0.9179
q (mm/sec)	2.55E-01



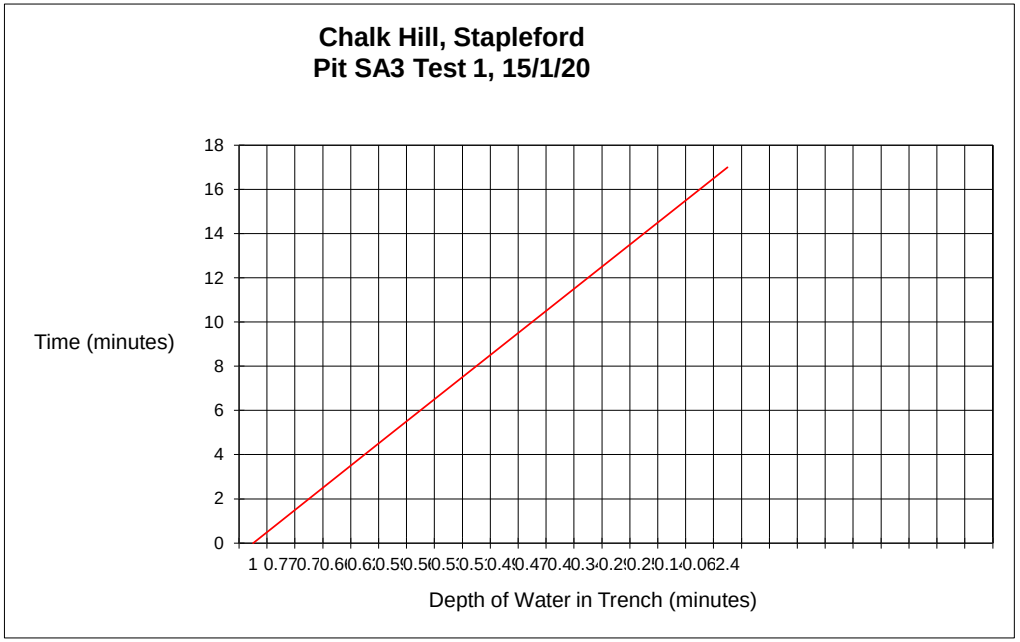
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.2	1
1	1.39	0.81
2	1.57	0.63
3	1.65	0.55
4	1.74	0.46
5	1.82	0.38
6	1.87	0.33
7	1.92	0.28
8	1.96	0.24
9	1.99	0.21
10	0	2.2
11		2.2

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.2
Pipe Length	2.2
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.3333
T25	7.7500
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	385.0000
q (m/sec)	1.50E-04
q (mm/hour)	541.3534
q (m/hour)	0.5414
q (mm/sec)	1.50E-01



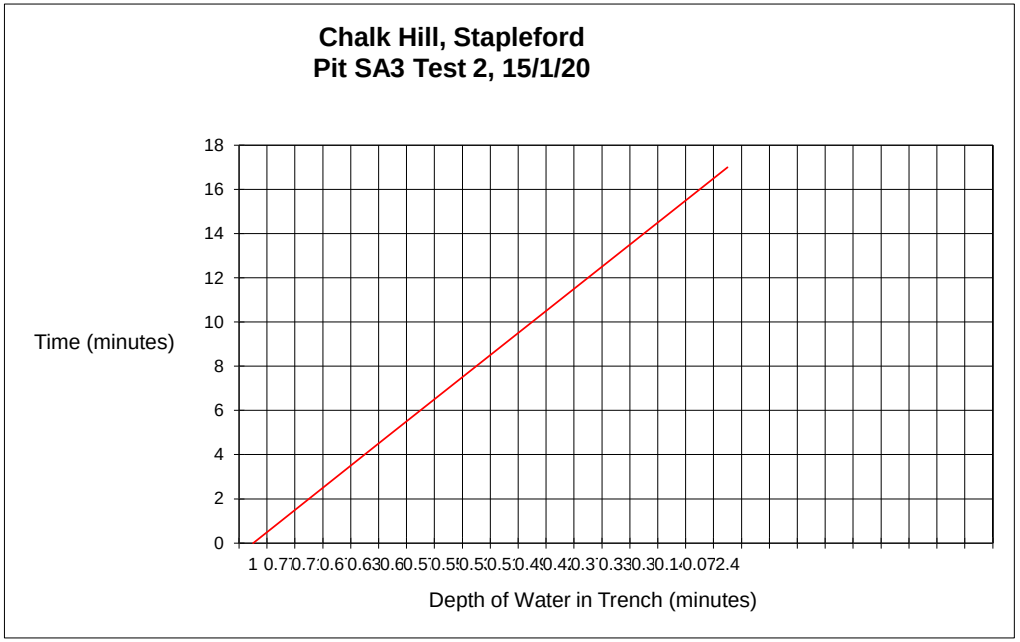
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.4	1
1	1.63	0.77
2	1.7	0.7
3	1.74	0.66
4	1.78	0.62
5	1.81	0.59
6	1.84	0.56
7	1.87	0.53
8	1.89	0.51
9	1.91	0.49
10	1.93	0.47
11	2	0.4
12	2.06	0.34
13	2.11	0.29
14	2.15	0.25
15	2.26	0.14
16	2.34	0.06
17	0	2.4

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.4
Pipe Length	2.2
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.2857
T25	14.0000
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	762.8571
q (m/sec)	7.59E-05
q (mm/hour)	273.2111
q (m/hour)	0.2732
q (mm/sec)	7.59E-02



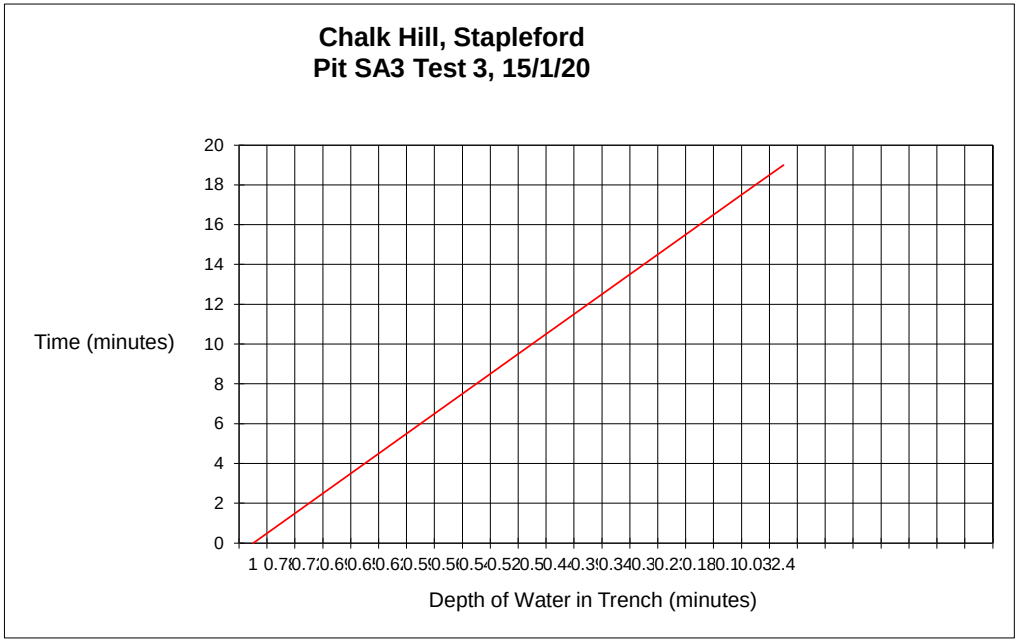
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.4	1
1	1.63	0.77
2	1.69	0.71
3	1.73	0.67
4	1.77	0.63
5	1.8	0.6
6	1.83	0.57
7	1.85	0.55
8	1.87	0.53
9	1.89	0.51
10	1.91	0.49
11	1.98	0.42
12	2.03	0.37
13	2.07	0.33
14	2.1	0.3
15	2.26	0.14
16	2.33	0.07
17	0	2.4

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.4
Pipe Length	2.2
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.3333
T25	14.3125
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	778.7500
q (m/sec)	7.43E-05
q (mm/hour)	267.6354
q (m/hour)	0.2676
q (mm/sec)	7.43E-02



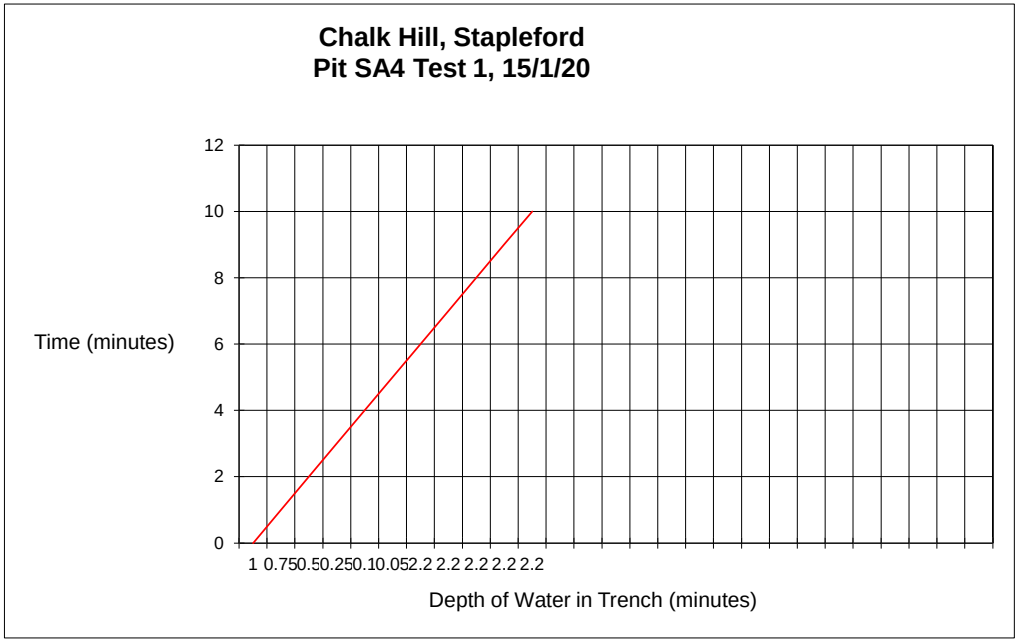
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.4	1
1	1.62	0.78
2	1.68	0.72
3	1.71	0.69
4	1.75	0.65
5	1.78	0.62
6	1.81	0.59
7	1.84	0.56
8	1.86	0.54
9	1.88	0.52
10	1.9	0.5
11	1.96	0.44
12	2.01	0.39
13	2.06	0.34
14	2.1	0.3
15	2.17	0.23
16	2.22	0.18
17	2.3	0.1
18	2.37	0.03
19	0	2.4

Pit Dimensions (m)	
Pit Length	2.2
Pit Width	0.5
Pit Depth	2.4
Pipe Length	2.2
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.5000
T25	14.7143
Volumes, Areas and Times	
Vp75-25	0.2200
Ap50	3.8
Tp75-25	792.8571
q (m/sec)	7.30E-05
q (mm/hour)	262.8734
q (m/hour)	0.2629
q (mm/sec)	7.30E-02



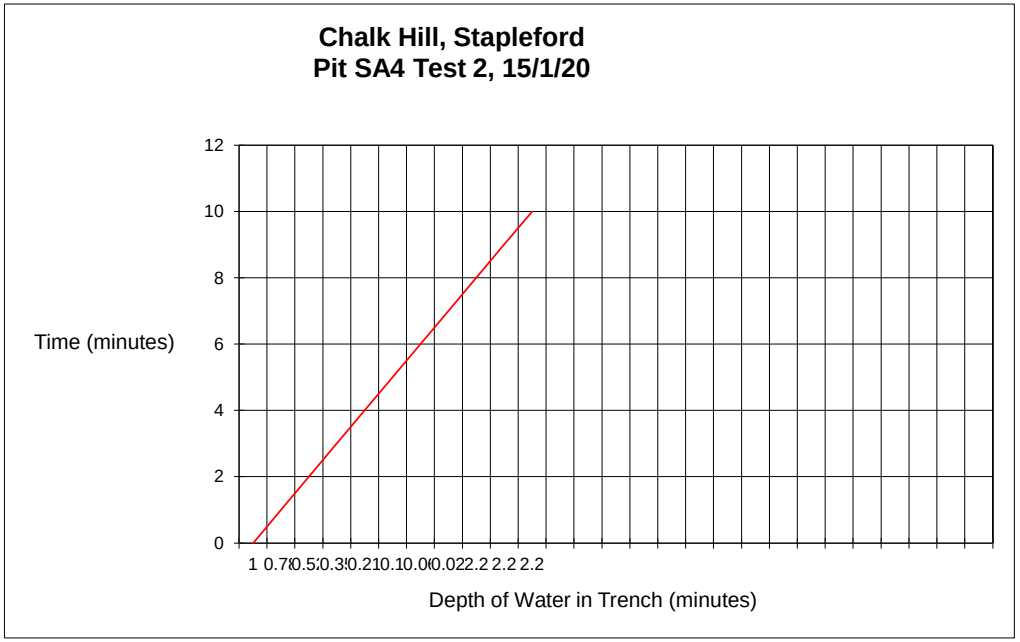
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.2	1
1	1.45	0.75
2	1.7	0.5
3	1.95	0.25
4	2.1	0.1
5	2.15	0.05
6	0	2.2
7		2.2
8		2.2
9		2.2
10		2.2

Pit Dimensions (m)	
Pit Length	2.3
Pit Width	0.5
Pit Depth	2.2
Pipe Length	2.3
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.0000
T25	3.0000
Volumes, Areas and Times	
Vp75-25	0.2300
Ap50	3.95
Tp75-25	120.0000
q (m/sec)	4.85E-04
q (mm/hour)	1746.8354
q (m/hour)	1.7468
q (mm/sec)	4.85E-01



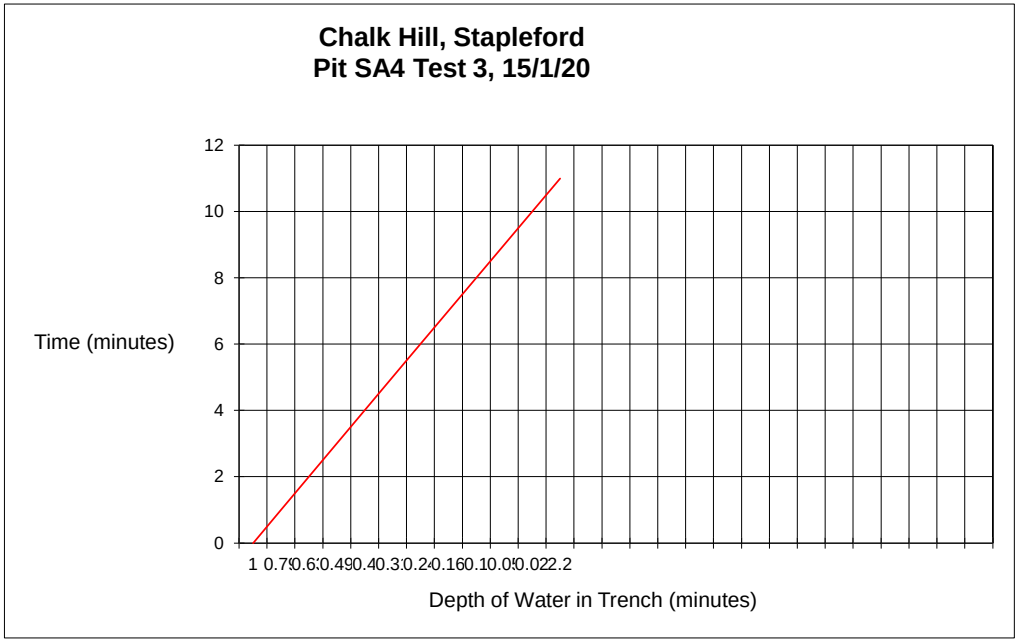
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.2	1
1	1.42	0.78
2	1.68	0.52
3	1.85	0.35
4	1.99	0.21
5	2.1	0.1
6	2.14	0.06
7	2.18	0.02
8	0	2.2
9		2.2
10		2.2

Pit Dimensions (m)	
Pit Length	2.3
Pit Width	0.5
Pit Depth	2.2
Pipe Length	2.3
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.1154
T25	3.7143
Volumes, Areas and Times	
Vp75-25	0.2300
Ap50	3.95
Tp75-25	155.9341
q (m/sec)	3.73E-04
q (mm/hour)	1344.2877
q (m/hour)	1.3443
q (mm/sec)	3.73E-01



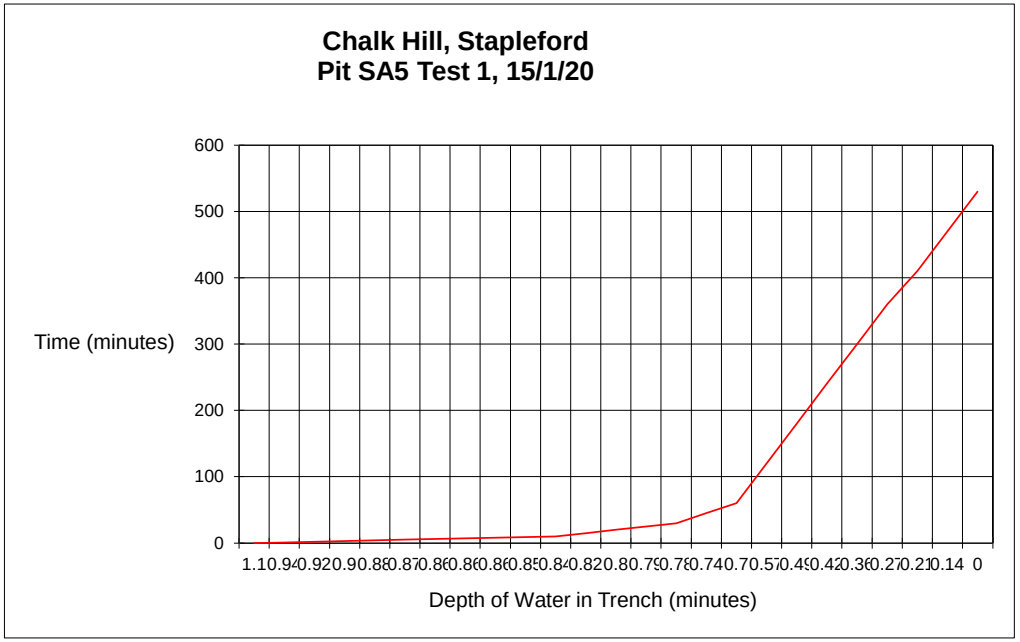
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1.2	1
1	1.41	0.79
2	1.57	0.63
3	1.71	0.49
4	1.8	0.4
5	1.89	0.31
6	1.96	0.24
7	2.04	0.16
8	2.1	0.1
9	2.15	0.05
10	2.18	0.02
11	0	2.2

Pit Dimensions (m)	
Pit Length	2.3
Pit Width	0.5
Pit Depth	2.2
Pipe Length	2.3
Void Space	40%
Depths (m)	
D75	0.75
D25	0.25
D50	0.5
Times (minutes)	
T75	1.2500
T25	5.8571
Volumes, Areas and Times	
Vp75-25	0.2300
Ap50	3.95
Tp75-25	276.4286
q (m/sec)	2.11E-04
q (mm/hour)	758.3162
q (m/hour)	0.7583
q (mm/sec)	2.11E-01



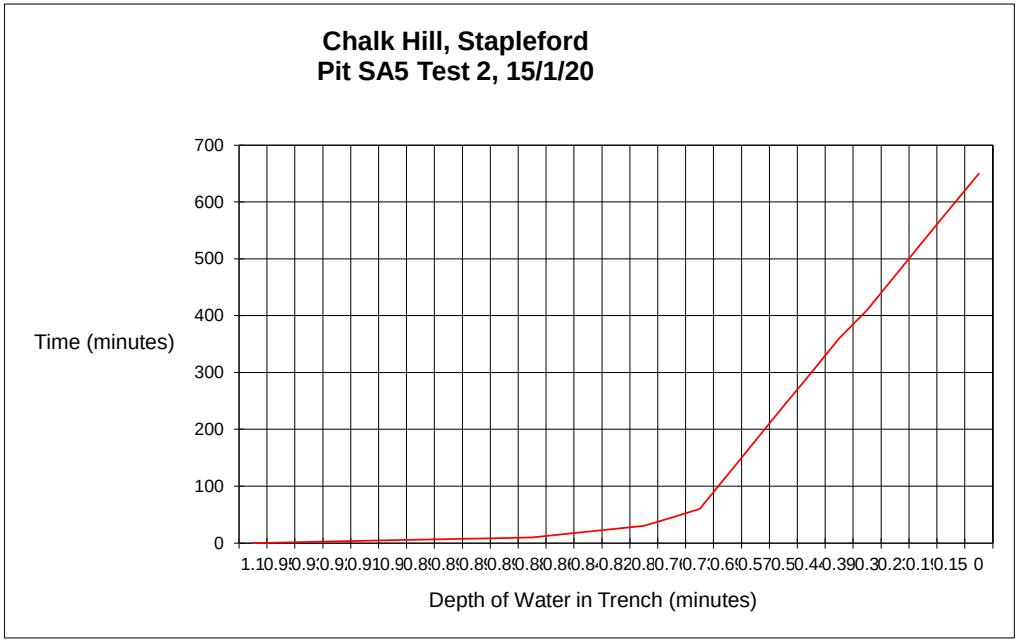
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1	1.1
1	1.16	0.94
2	1.18	0.92
3	1.2	0.9
4	1.22	0.88
5	1.23	0.87
6	1.24	0.86
7	1.24	0.86
8	1.24	0.86
9	1.25	0.85
10	1.26	0.84
15	1.28	0.82
20	1.3	0.8
25	1.31	0.79
30	1.32	0.78
45	1.36	0.74
60	1.4	0.7
120	1.53	0.57
180	1.61	0.49
240	1.68	0.42
300	1.74	0.36
360	1.83	0.27
410	1.89	0.21
470	1.96	0.14
530	2.1	0

Pit Dimensions (m)	
Pit Length	2.5
Pit Width	0.5
Pit Depth	2.1
Pipe Length	2.1
Void Space	40%
Depths (m)	
D75	0.825
D25	0.275
D50	0.55
Times (minutes)	
T75	13.1250
T25	355.8333
Volumes, Areas and Times	
Vp75-25	0.2750
Ap50	4.55
Tp75-25	20562.5000
q (m/sec)	2.94E-06
q (mm/hour)	10.5815
q (m/hour)	0.0106
q (mm/sec)	2.94E-03



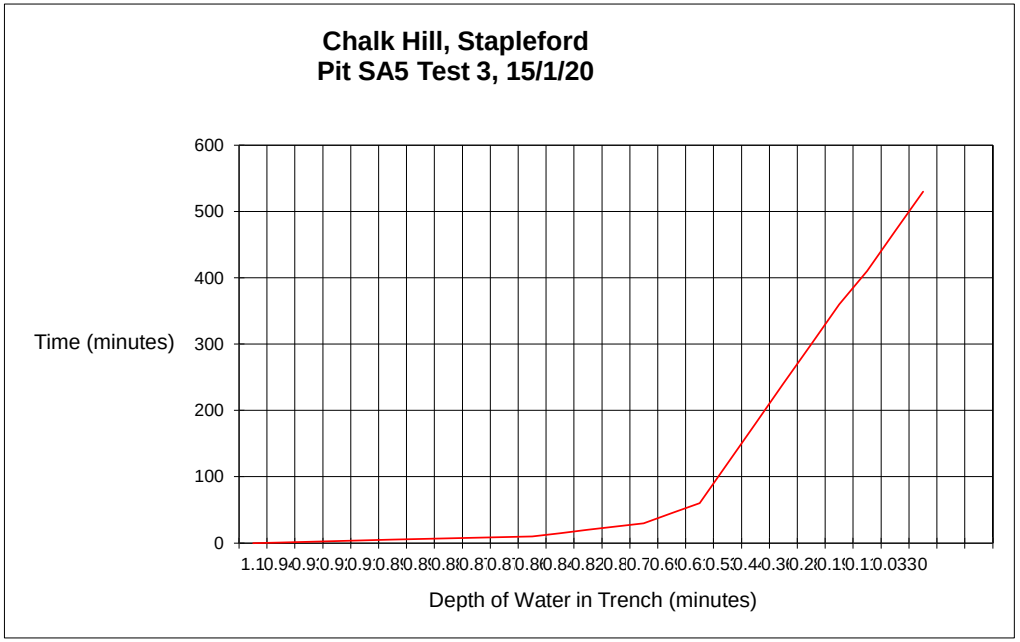
Time (min)	Depth to Water (m)	Depth of Water (m)
0	1	1.1
1	1.15	0.95
2	1.17	0.93
3	1.18	0.92
4	1.19	0.91
5	1.2	0.9
6	1.21	0.89
7	1.21	0.89
8	1.21	0.89
9	1.21	0.89
10	1.22	0.88
15	1.24	0.86
20	1.26	0.84
25	1.28	0.82
30	1.3	0.8
45	1.34	0.76
60	1.37	0.73
120	1.41	0.69
180	1.53	0.57
240	1.6	0.5
300	1.66	0.44
360	1.71	0.39
410	1.8	0.3
470	1.87	0.23
530	1.91	0.19
590	1.95	0.15
650	2.1	0

Pit Dimensions (m)	
Pit Length	2.5
Pit Width	0.5
Pit Depth	2.1
Pipe Length	2.1
Void Space	40%
Depths (m)	
D75	0.825
D25	0.275
D50	0.55
Times (minutes)	
T75	23.7500
T25	431.4286
Volumes, Areas and Times	
Vp75-25	0.2750
Ap50	4.55
Tp75-25	24460.7143
q (m/sec)	2.47E-06
q (mm/hour)	8.8952
q (m/hour)	0.0089
q (mm/sec)	2.47E-03



Time (min)	Depth to Water (m)	Depth of Water (m)
0	1	1.1
1	1.16	0.94
2	1.17	0.93
3	1.18	0.92
4	1.19	0.91
5	1.21	0.89
6	1.21	0.89
7	1.22	0.88
8	1.23	0.87
9	1.23	0.87
10	1.24	0.86
15	1.26	0.84
20	1.28	0.82
25	1.3	0.8
30	1.32	0.78
45	1.403	0.697
60	1.486	0.614
120	1.569	0.531
180	1.652	0.448
240	1.735	0.365
300	1.818	0.282
360	1.901	0.199
410	1.984	0.116
470	2.067	0.033
530	2.1	0

Pit Dimensions (m)	
Pit Length	2.5
Pit Width	0.5
Pit Depth	2.1
Pipe Length	2.1
Void Space	40%
Depths (m)	
D75	0.825
D25	0.275
D50	0.55
Times (minutes)	
T75	21.8675
T25	305.0602
Volumes, Areas and Times	
Vp75-25	0.2750
Ap50	4.55
Tp75-25	16991.5663
q (m/sec)	3.56E-06
q (mm/hour)	12.8053
q (m/hour)	0.0128
q (mm/sec)	3.56E-03



APPENDIX 5

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Flood map for planning

Your reference	Location (easting/northing)	Created
2453	**547665/252753**	**27 Jan 2020 14:38**

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

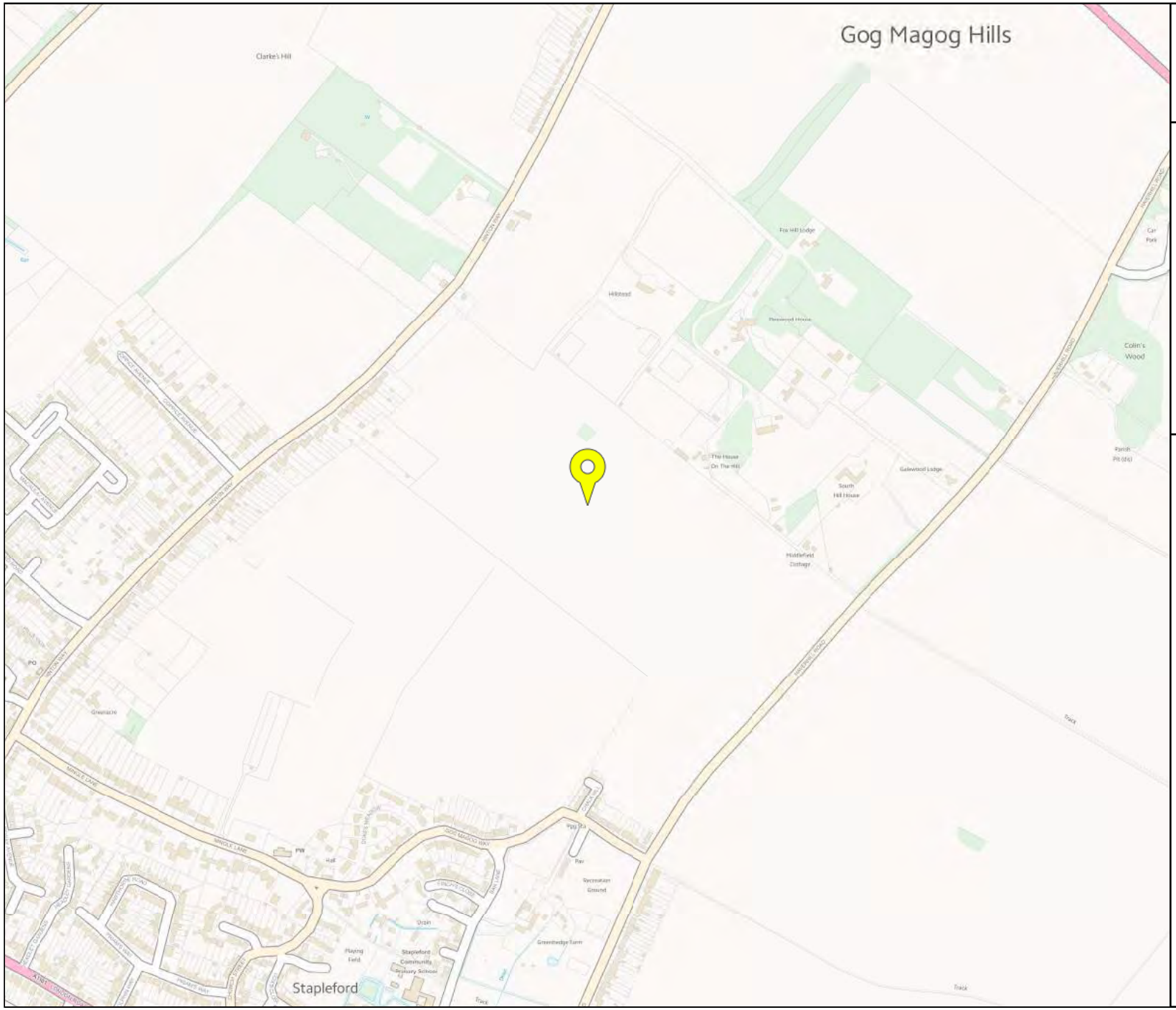
This means:

- 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.



Environment Agency

Flood map for planning

Your reference
2453

Location (easting/northing)
547665/252753

Scale
1:10000

Created
27 Jan 2020 14:38

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

0 100 200 300m

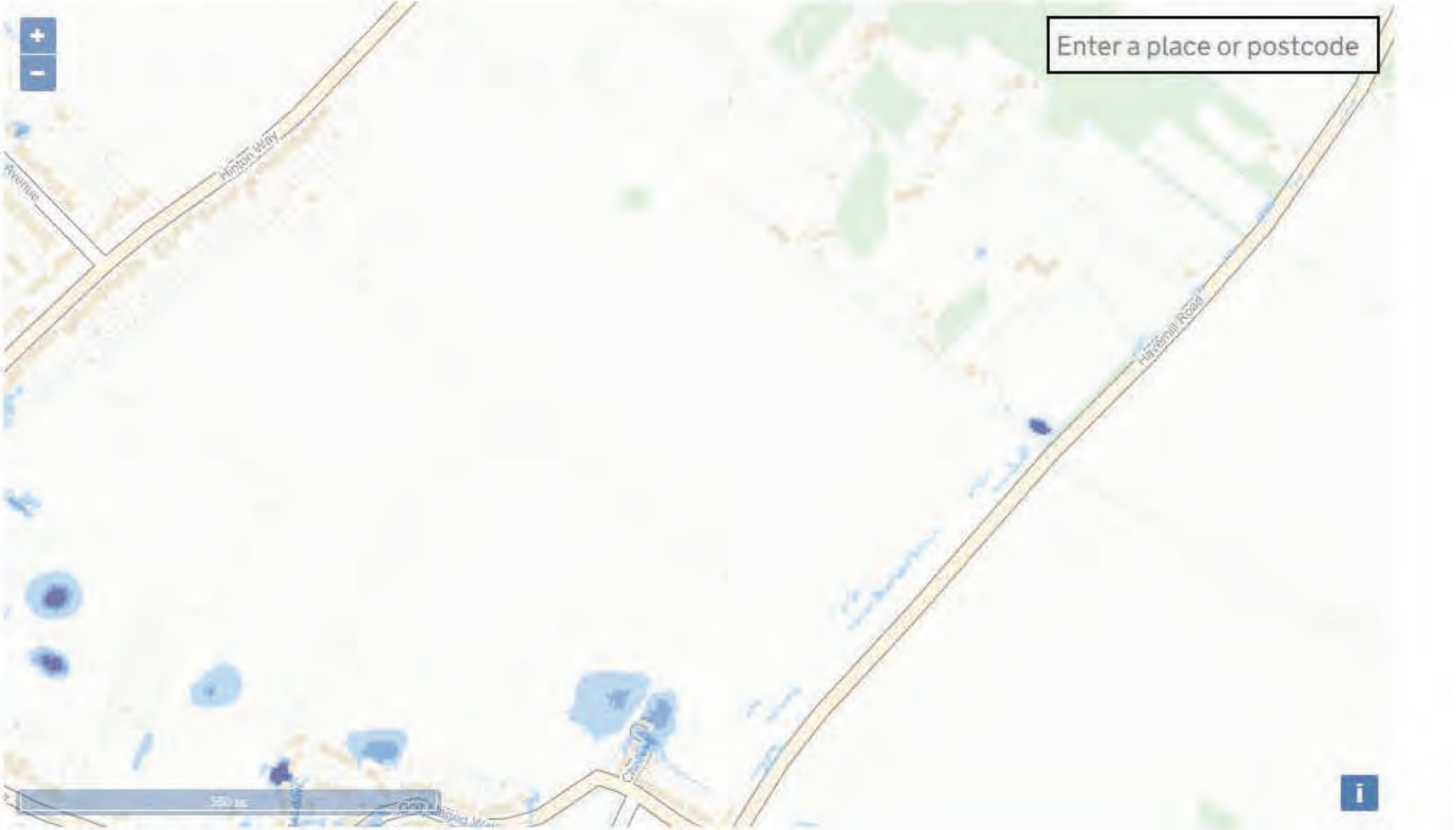
APPENDIX 6

SURFACE WATER FLOOD RISK MAPPING

Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

Extent of flooding



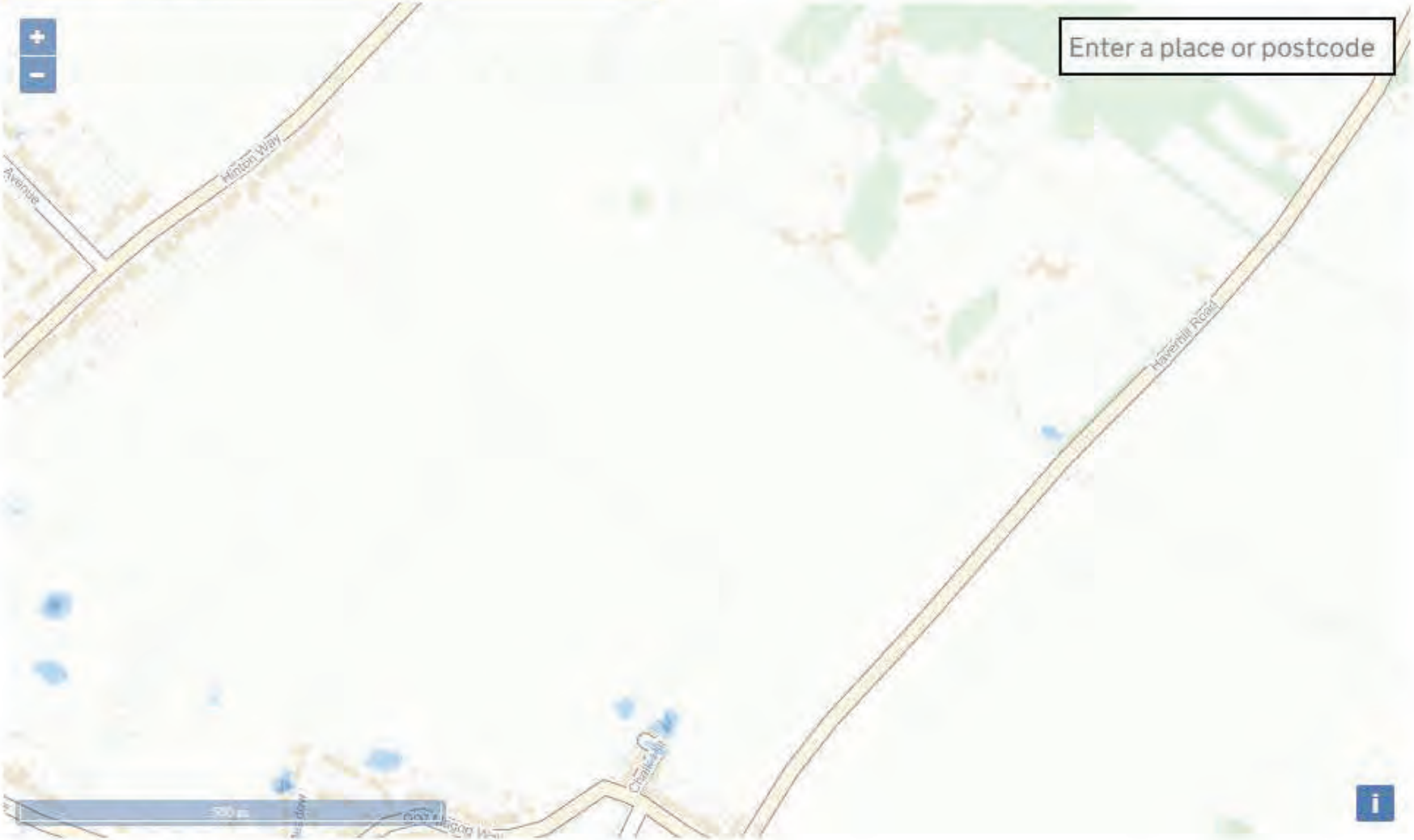
Extent of flooding from surface water

High Medium Low Very low

Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

Medium risk: depth



Surface water flood risk: water depth in a medium risk scenario

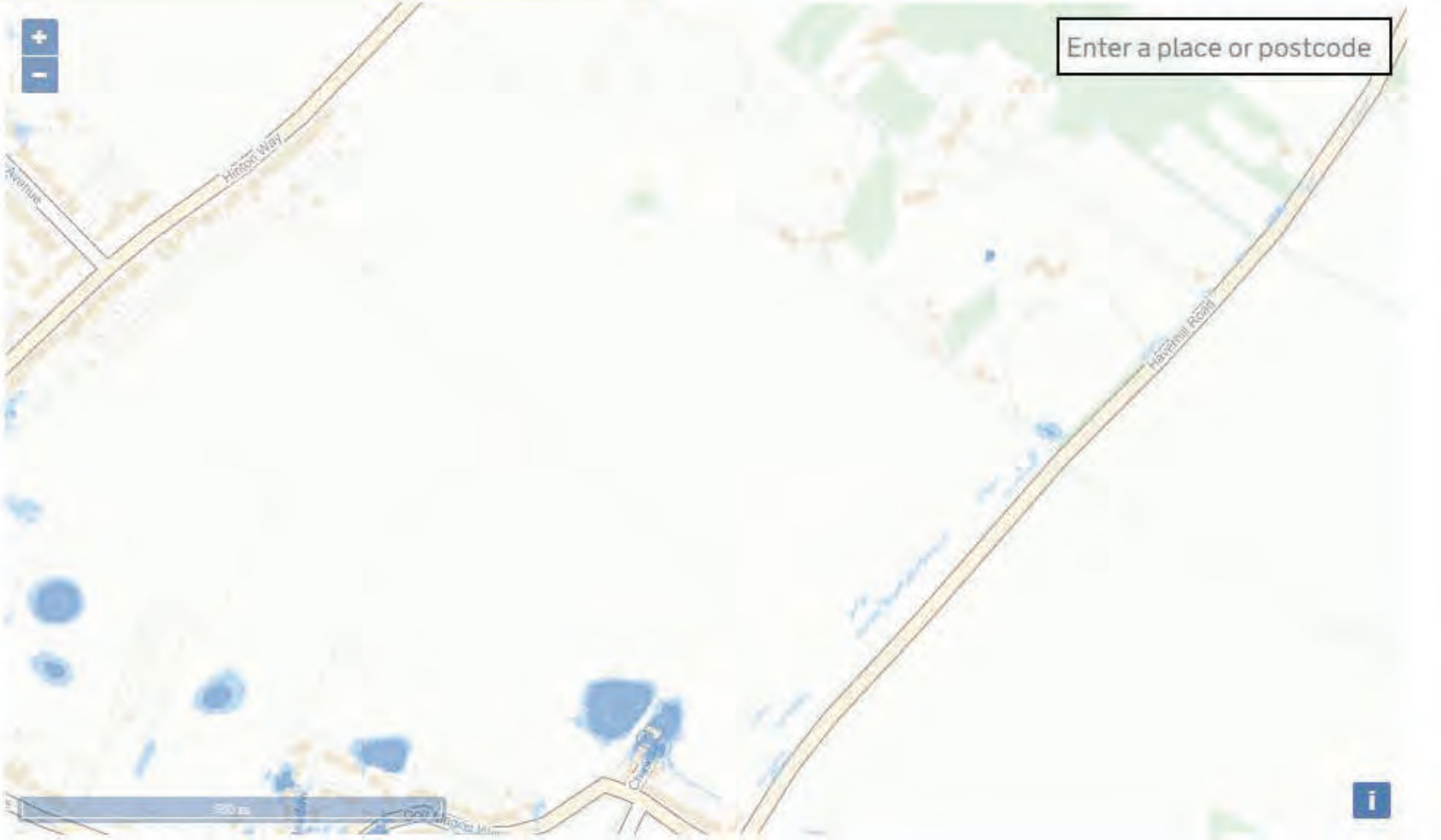
Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

Low risk: depth



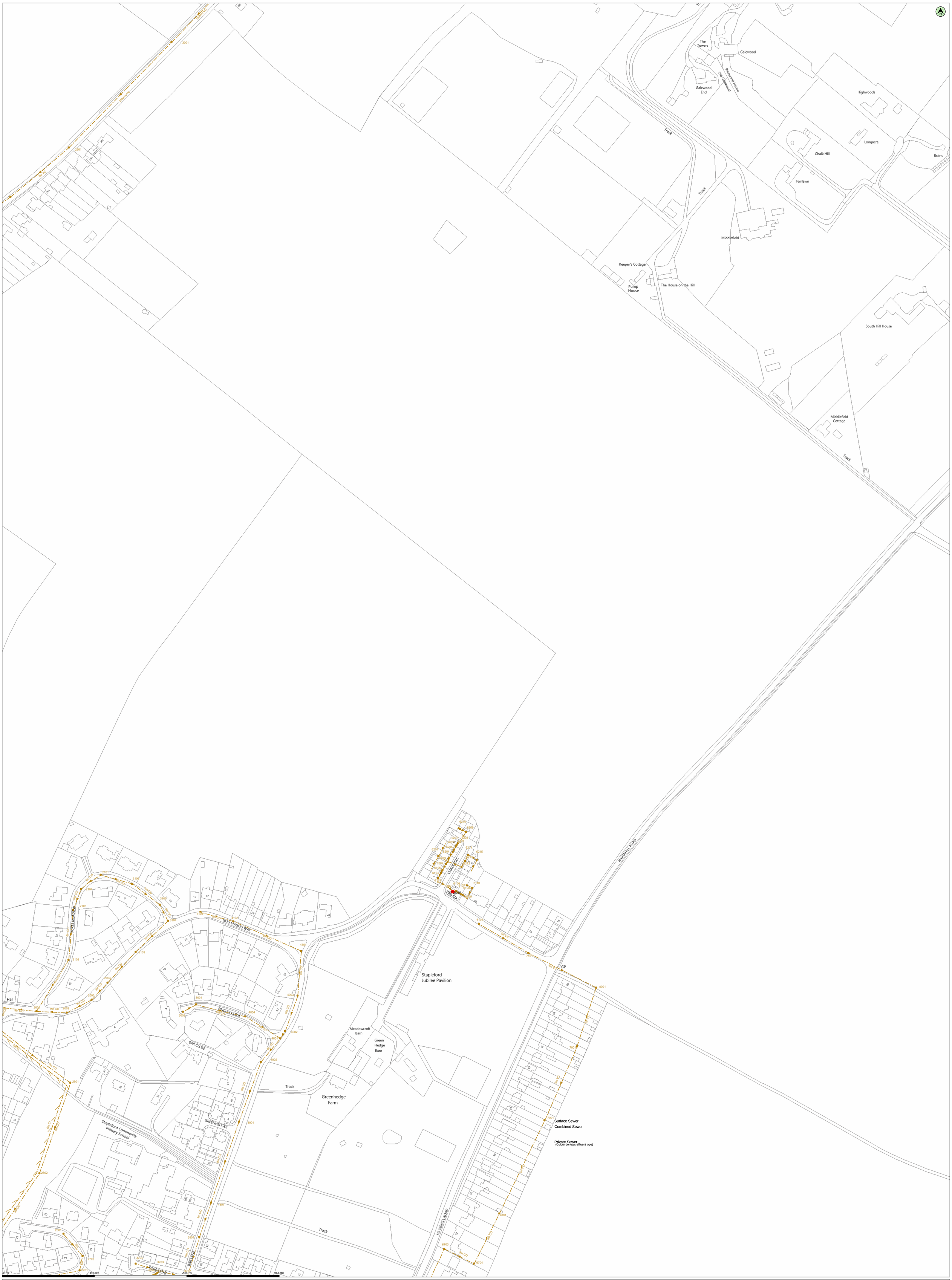
Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm

APPENDIX 7

ANGLIAN WATER MAPPING



Data updated: 02/12/19

Scale: 1:1250 | Date: 27/01/20 | Wastewater Plan A0
Map Centre: 547691,252451 | Our Ref: 365217 - 1 | Powered by digdat

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent Sewer
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

office@mtcengineering.co.uk
2453

love every drop anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
1002	547181	252053	F	17.059	15.109	1.95
1901	547187	252931	F	26.536	25.256	1.28
2001	547215	252049	F	16.878	15.158	1.72
2002	547248	252048	F	17.184	15.264	1.92
2003	547275	252062	F	17.254	15.344	1.91
2004	547292	252080	F	17.262	15.362	1.9
2101	547285	252197	F	18.672	17.142	1.53
2102	547250	252105	F	18.11	15.88	2.23
2103	547255	252159	F	18.189	16.459	1.73
2104	547263	252182	F	18.503	16.773	1.73
2701	547262	251768	F	-	-	-
2702	547265	251784	F	-	15.731	-
2801	547244	251808	F	-	16.02	-
2802	547218	251874	F	17.276	14.368	2.908
2901	547252	251972	F	17.447	14.661	2.786
2901	547250	252984	F	27.866	26.786	1.08
3001	547388	252056	F	17.349	16.13	1.219
3001	547361	253098	F	29.68	27.75	1.93
3002	547374	252049	F	17.105	16.191	0.914
3101	547393	252156	F	17.96	16.34	1.62
3103	547322	252113	F	17.219	15.569	1.65
3104	547357	252147	F	17.314	15.584	1.73
3105	547349	252164	F	17.977	16.057	1.92
3106	547319	252187	F	18.583	16.673	1.91
3703	547349	251768	F	-	-	-
3704	547323	251776	F	-	-	-
3705	547344	251764	F	-	-	-
3706	547341	251763	F	-	-	-
3801	547392	251805	F	17.419	15.049	2.37
4001	547479	252020	F	-	-	-
4002	547484	252027	F	17.255	15.715	1.54
4003	547498	252066	F	17.46	15.84	1.62
4004	547441	252043	F	17.459	15.935	1.524
4101	547502	252114	F	17.483	15.953	1.53
4102	547428	252146	F	17.854	16.164	1.69
4801	547404	251842	F	17.419	15.149	2.27
4901	547434	251929	F	17.239	15.359	1.88
4902	547458	251994	F	17.108	15.598	1.51
6101	547694	252144	F	20.582	19.102	1.48
6102	547661	252184	F	-	-	-
6103	547650	252190	F	-	-	-
6104	547650	252193	F	-	-	-
6105	547653	252199	F	-	-	-
6106	547669	252179	F	-	-	-
6107	547672	252178	F	-	-	-
6108	547677	252175	F	-	-	-
6109	547681	252172	F	-	-	-
6110	547687	252183	F	-	-	-
6200	547661	252211	F	-	-	-
6201	547650	252217	F	-	-	-
6202	547655	252202	F	-	-	-
6203	547658	252209	F	-	-	-
6204	547661	252215	F	-	-	-
6205	547666	252221	F	-	-	-
6206	547667	252224	F	-	-	-
6207	547670	252229	F	-	-	-
6208	547674	252232	F	-	-	-
6209	547680	252243	F	-	-	-
6210	547674	252246	F	-	-	-
6211	547672	252231	F	-	-	-
6212	547675	252205	F	-	-	-
6213	547679	252212	F	-	-	-
6214	547683	252218	F	-	-	-
6215	547692	252213	F	-	-	-
6703	547657	251792	F	17.62	15.975	1.645
6704	547689	251776	F	17.364	16.118	1.246
7001	547800	252011	F	19.67	17.63	2.04
7101	547748	252112	F	20.926	18.706	2.22
7801	547716	251830	F	18.492	16.383	2.109
7901	547765	251931	F	19.026	17.133	1.893
8001	547821	252075	F	20.462	18.102	2.36

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX 8

ILLUSTRATIVE SITE MASTERPLAN

Carter Jonas

PROJECT TITLE

LAND BETWEEN HAVERHILL ROAD & HINTON WAY, STAPLEFORD

DRAWING TITLE

ILLUSTRATIVE MASTERPLAN

ISSUED BY	London	T: 020 7016 0720	
DATE	12.02.20	**DRAWN**	NM
SCALE@A3	1:1250	**CHECKED**	GR
STATUS	DRAFT	**APPROVED**	JC

No dimensions are to be scaled from this drawing.
All dimensions are to be checked on site.
Area measurements for indicative purposes only.

DWG. NO. J0027450_002

1 Main vehicular access from Haverhill Road

2 Main village centre, potentially including care suites and facilities, administration, dining areas, hairdressers, swimming pool, salon and wellness facilities, activity spaces and shuttle bus service stop

3 Enhanced boundary planting to protect existing residential amenity of properties on Gog Magog Way and Chalk Hill

4 Pedestrian and cycle access to Stapleford and Great Shelford

5 Extensive countryside park area, creating a chalk grassland area, with new tree and wildflower planting and pedestrian routes for leisure, open to all

6 New block planting to mitigate the development's impact on long views from the north east at Magog Down

7 Potential location of viewpoint in countryside park

8 Potential access to Countryside Park from Hinton Way

9 Potential access to Countryside Park from Haverhill Road

Carter Jonas

PROJECT TITLE

LAND BETWEEN HAVERHILL ROAD & HINTON WAY, STAPLEFORD

DRAWING TITLE

ILLUSTRATIVE MASTERPLAN WITH COUNTRYSIDE PARK

ISSUED BY	London	T: 020 7016 0720	
DATE	12.03.2020	**DRAWN**	NM
SCALE@A3	NTS	**CHECKED**	GR
STATUS	Draft	**APPROVED**	GR

DWG. NO. J0027450_005

No dimensions are to be scaled from this drawing.
All dimensions are to be checked on site.
Area measurements for indicative purposes only.

APPENDIX 9

OUTLINE DRAINAGE PLAN

EXISTING LOW SPOT SHOWN AS FREE FROM BUILT DEVELOPMENT

ESTIMATED ROOF AREA 1.163Ha

ESTIMATED ACCESS AREA 0.686Ha

SWALE OR SIMILAR FEATURE TO PICK UP/ARREST RUN OFF FROM COUNTRY PARK IN EXTREME EVENTS

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR
A	17/03/20	LAYOUT UPDATED	MJB

MTC ENGINEERING

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TITLE

HAVERHILL ROAD, STAPLEFORD INDICATIVE DRAINAGE PLAN

ORIG M.B	DATE 28-01-20
CHKD	SCALE 1:50
APPR	DRAWING NO 2453-06 REV A

APPENDIX 10

MICRO DRAINAGE INFILTRATION CALCULATIONS

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 14 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	24.154	0.154	250.5	317.9	O K
30 min Summer	24.170	0.170	250.5	350.5	O K
60 min Summer	24.156	0.156	250.5	321.5	O K
120 min Summer	24.110	0.110	250.5	226.0	O K
180 min Summer	24.073	0.073	250.5	151.0	O K
240 min Summer	24.052	0.052	250.5	107.1	O K
360 min Summer	24.039	0.039	194.1	80.1	O K
480 min Summer	24.032	0.032	159.1	64.9	O K
600 min Summer	24.027	0.027	134.0	55.3	O K
720 min Summer	24.023	0.023	116.5	48.0	O K
960 min Summer	24.019	0.019	93.9	38.3	O K
1440 min Summer	24.013	0.013	66.4	27.7	O K
2160 min Summer	24.010	0.010	48.8	19.8	O K
2880 min Summer	24.008	0.008	38.8	15.6	O K
4320 min Summer	24.006	0.006	28.8	11.5	O K
5760 min Summer	24.004	0.004	21.3	9.0	O K
7200 min Summer	24.004	0.004	18.8	7.5	O K
8640 min Summer	24.003	0.003	16.3	6.5	O K
10080 min Summer	24.003	0.003	13.8	5.7	O K
15 min Winter	24.179	0.179	250.5	368.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	143.954	0.0	14
30 min Summer	92.629	0.0	23
60 min Summer	56.713	0.0	40
120 min Summer	33.583	0.0	72
180 min Summer	24.424	0.0	100
240 min Summer	19.389	0.0	128
360 min Summer	13.924	0.0	186
480 min Summer	11.018	0.0	248
600 min Summer	9.182	0.0	308
720 min Summer	7.908	0.0	368
960 min Summer	6.245	0.0	488
1440 min Summer	4.471	0.0	734
2160 min Summer	3.197	0.0	1092
2880 min Summer	2.518	0.0	1444
4320 min Summer	1.796	0.0	2172
5760 min Summer	1.413	0.0	2920
7200 min Summer	1.172	0.0	3544
8640 min Summer	1.006	0.0	4296
10080 min Summer	0.884	0.0	4984
15 min Winter	143.954	0.0	15

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	24.194	0.194	250.5	398.4	O K
60 min Winter	24.168	0.168	250.5	344.8	O K
120 min Winter	24.095	0.095	250.5	195.8	O K
180 min Winter	24.051	0.051	250.5	104.2	O K
240 min Winter	24.041	0.041	204.1	84.0	O K
360 min Winter	24.030	0.030	149.0	61.5	O K
480 min Winter	24.024	0.024	119.0	48.6	O K
600 min Winter	24.020	0.020	98.9	40.6	O K
720 min Winter	24.017	0.017	86.4	35.1	O K
960 min Winter	24.014	0.014	68.9	27.9	O K
1440 min Winter	24.010	0.010	48.8	19.7	O K
2160 min Winter	24.007	0.007	36.3	14.5	O K
2880 min Winter	24.006	0.006	28.8	11.4	O K
4320 min Winter	24.004	0.004	21.3	8.4	O K
5760 min Winter	24.003	0.003	16.3	6.5	O K
7200 min Winter	24.003	0.003	13.8	5.4	O K
8640 min Winter	24.002	0.002	11.3	4.7	O K
10080 min Winter	24.002	0.002	11.3	4.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	92.629	0.0	25
60 min Winter	56.713	0.0	44
120 min Winter	33.583	0.0	76
180 min Winter	24.424	0.0	98
240 min Winter	19.389	0.0	128
360 min Winter	13.924	0.0	188
480 min Winter	11.018	0.0	248
600 min Winter	9.182	0.0	308
720 min Winter	7.908	0.0	362
960 min Winter	6.245	0.0	482
1440 min Winter	4.471	0.0	714
2160 min Winter	3.197	0.0	1072
2880 min Winter	2.518	0.0	1416
4320 min Winter	1.796	0.0	2220
5760 min Winter	1.413	0.0	3064
7200 min Winter	1.172	0.0	3888
8640 min Winter	1.006	0.0	4304
10080 min Winter	0.884	0.0	5280

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.450	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.849

Time (mins) From:	To:	Area (ha)
0	4	1.849

Model Details

Storage is Online Cover Level (m) 25.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.26290	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	686.0
Max Percolation (l/s)	1905.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	24.000	Membrane Depth (m)	0

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1123 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	24.223	0.223	8.5	458.2	O K
30 min Summer	24.289	0.289	8.5	595.7	O K
60 min Summer	24.354	0.354	8.5	727.7	O K
120 min Summer	24.412	0.412	8.5	847.6	O K
180 min Summer	24.441	0.441	8.5	907.0	O K
240 min Summer	24.457	0.457	8.5	941.1	O K
360 min Summer	24.473	0.473	8.5	973.2	O K
480 min Summer	24.479	0.479	8.5	985.8	O K
600 min Summer	24.479	0.479	8.5	985.9	O K
720 min Summer	24.475	0.475	8.5	977.9	O K
960 min Summer	24.461	0.461	8.5	949.5	O K
1440 min Summer	24.434	0.434	8.5	893.7	O K
2160 min Summer	24.396	0.396	8.5	815.9	O K
2880 min Summer	24.361	0.361	8.5	743.5	O K
4320 min Summer	24.298	0.298	8.5	612.9	O K
5760 min Summer	24.242	0.242	8.5	498.6	O K
7200 min Summer	24.194	0.194	8.5	399.2	O K
8640 min Summer	24.153	0.153	8.5	315.2	O K
10080 min Summer	24.120	0.120	8.5	246.7	O K
15 min Winter	24.252	0.252	8.5	517.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	143.954	0.0	19
30 min Summer	92.629	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	33.583	0.0	124
180 min Summer	24.424	0.0	182
240 min Summer	19.389	0.0	242
360 min Summer	13.924	0.0	362
480 min Summer	11.018	0.0	482
600 min Summer	9.182	0.0	600
720 min Summer	7.908	0.0	720
960 min Summer	6.245	0.0	876
1440 min Summer	4.471	0.0	1110
2160 min Summer	3.197	0.0	1492
2880 min Summer	2.518	0.0	1900
4320 min Summer	1.796	0.0	2684
5760 min Summer	1.413	0.0	3464
7200 min Summer	1.172	0.0	4184
8640 min Summer	1.006	0.0	4920
10080 min Summer	0.884	0.0	5552
15 min Winter	143.954	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	24.327	0.327	8.5	672.4	O K
60 min Winter	24.399	0.399	8.5	821.3	O K
120 min Winter	24.466	0.466	8.5	958.8	O K
180 min Winter	24.500	0.500	8.5	1028.2	O K
240 min Winter	24.519	0.519	8.5	1069.1	O K
360 min Winter	24.540	0.540	8.5	1111.0	O K
480 min Winter	24.550	0.550	8.5	1131.2	O K
600 min Winter	24.553	0.553	8.5	1137.4	O K
720 min Winter	24.551	0.551	8.5	1134.9	O K
960 min Winter	24.541	0.541	8.5	1113.4	O K
1440 min Winter	24.505	0.505	8.5	1040.1	O K
2160 min Winter	24.456	0.456	8.5	939.2	O K
2880 min Winter	24.406	0.406	8.5	836.2	O K
4320 min Winter	24.312	0.312	8.5	641.5	O K
5760 min Winter	24.229	0.229	8.5	470.5	O K
7200 min Winter	24.159	0.159	8.5	326.6	O K
8640 min Winter	24.103	0.103	8.5	212.8	O K
10080 min Winter	24.065	0.065	8.5	133.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	92.629	0.0	33
60 min Winter	56.713	0.0	62
120 min Winter	33.583	0.0	122
180 min Winter	24.424	0.0	180
240 min Winter	19.389	0.0	240
360 min Winter	13.924	0.0	356
480 min Winter	11.018	0.0	472
600 min Winter	9.182	0.0	586
720 min Winter	7.908	0.0	700
960 min Winter	6.245	0.0	916
1440 min Winter	4.471	0.0	1186
2160 min Winter	3.197	0.0	1620
2880 min Winter	2.518	0.0	2072
4320 min Winter	1.796	0.0	2900
5760 min Winter	1.413	0.0	3688
7200 min Winter	1.172	0.0	4400
8640 min Winter	1.006	0.0	5016
10080 min Winter	0.884	0.0	5544

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.450	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.849

Time (mins) From:	To:	Area (ha)
0	4	1.849

Model Details

Storage is Online Cover Level (m) 25.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00890	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	686.0
Max Percolation (l/s)	1905.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	24.000	Membrane Depth (m)	0