LRM PLANNING LIMITED

SANDLEFORD PARK 20/01238/OUTMAJ

RESPONSE TO COMMENTS FOR CONSULTEES

September 2020

Report Control

Project: Sandleford Park

Client: Bloor Homes Limited and Sandleford Farm Partnership

Job Number: 16.159

File Origin: https://lmaplanninglimited.sharepoint.com/16/16.159 Sandleford Park, Newbury/9 Applications/Application 4 December 2019/200924 response to LPA .docx

Document checking

Primary author: Owen Jones	Initialled: OJ
Review by: Owen Jones	Initialled: OJ

Issue	Date	Status	Checked for issue
A	24/09/2020	Draft	OJ
B	25/09/2020	Draft	OJ

Contents

1 Introduction

1.1 Application 20/01238/OUTMAJ was submitted on the 28th May 2020 and registered by the Local Planning Authority on the 24th June 2020. The registration letter advises that the LPA has until the 14th October 2020 to determine the application, unless an extension to that period is sought.

1.2 A number on internal consultation responses were published on the Council's website very recently:

- Highways Development Control 8th September 2020
- Lead Local Flood Authority 14th September 2020
- Tree Officer 15th September 2020
- Landscape 15th September 2020
- Transport Policy 16th September 2020
- Ecology 16th September 2020
- Planning Policy 17th September 2020

1.3 These responses, in some instances, request the Applicants to either provide clarification as to the information it has submitted or request additional information. This response compiled with information provided by Barrell Tree Consultancy, Brookbanks, Cooper Landscape (formerly of SLR), Vectors, White Peak Planning and WYG has been prepared to address those requests in order to assist the determination of the application.

1.4 Previously the Applicants have submitted a response to Natural England's consultation response and Hampshire County Council on the 1st and 4th September 2020.

2 Highways Development Control

2.1 Discussions regarding highways and transportation have been on-going for a considerable period of time and culminated in the VISSIM modelling undertaken in 2019.

2.2 **Mitigation measures.** This list of mitigation measures included at para 76 corresponds with those identified following the VISSIM modelling and set out by the Highway Officer in correspondence in June and July 2019 and are referred to in the submitted Transport Assessment. The mitigation measures in red are those which are being attributed to the Bloor/SFP application. With reference to A339/Pinchington it is unclear how the cost of this junction improvement is being viewed by the Council. On the basis that the modelling shows that both the Bloor/SFP scheme and the Donnington New Homes Scheme creates additional traffic along the A339 that require mitigation (paras 37 – 41), these costs are assumed to be shared between the two development as per para 76 of the consultation response. The junction costs will need to be agreed during discussions regarding the Section 106 planning obligation.

2.3 **Bus Services.** The principle of delivering a viable bus service accessing and egressing at Monks Lane and looping at the Local Centre has been agreed with the Reading Buses and is acceptable until an extension of this service to Andover Road can be provided with development at New Warren Farm. Financial contributions towards bus subsidy need to be discussed in the context of the Section 106 planning obligation. Restricting development in DPC to 100 occupations will unnecessarily reduce the available patronage to the bus service.

2.4 **Valley Crossing.** An illustrative plan of a proposed valley crossing was submitted as part of the Transport Assessment, which showed two separate carriageways both consisting of a 3.65 metre wide carriageway, a 2.0 metre wide footway and a 1.5 metre wide cycleway. An assessment of this was included as part of the Environmental Statement. In response to previous comments the proposals sought to ensure that access could be maintained at all times if one carriageway was closed or obstructed the other could still be used as an emergency access.

2.5 It is suggested in the consultation response that two separate carriageways would need to be extended to level ground and the bridge would need to be two separate structures. We consider that both of these are achievable. In particular, the culvert over the stream could be split into 2 culverts.

2.6 There is also the comment about a passing place being required but this does not seem logical; as we are dealing with an emergency access here with good visibility so anyone approaching the crossing would be able to see an emergency vehicle approaching. Furthermore, the hard surfacing width on each carriageway is 7.15m (3m for vehicles, 1.5m for cycles and a 2m footway) so two vehicles can pass in any case.

2.7 It should be remembered that this plan is illustrative rather than a detailed element of the scheme. The LPA have previously acknowledged that this requires a number of considerations to be taken into account (highway, ecology, landscape, water resources) and that this can be addressed at a later stage as part of the detailed design. The LPA has not requested, pursuant to Article 5(2) of the Town and Country Planning (Development Management) Order 2015, additional information in respect of this.

2.8 **Public Right of Way.** A 3m wide emergency access is proposed to run adjacent to the Public Right of Way Footpath Greenham 9, which would connect the site to the A339. It has been stated that the emergency route would need to be a 3.75 metre bonded surface. A detailed design for this route, including its alignment and surface treatment, could be conditioned by the LPA or included with the Country Park Scheme which is to be designed in detail at a later stage. This detailed design would take account of the proximity of the existing Public Right of Way to Waterleaze Copse.

2.9 **Visibility Splays.** 2.4x43 metre visibility splays have been added to the two access drawings and these are included at *Appendix 1*.

3 Local Lead Flood Authority

3.1 In its response to Application 18/0764/OUTMAJ, the LLFA supported the principle of the surface water drainage scheme subject to detailed design being secured by way of planning condition. On this occasion, the response still supports the principle of the surface water drainage strategy but recommends a different planning condition.

3.2 It also requests further information in respect of the following:

3.3 **Pollution Control (Construction Phase).** The Draft CEMP at Appendix D1 of the Environmental Statement outlines the pollution control measures that will be taken in respect of Water Resources. With direct reference to items WR1 and WR2 contained within Table 6.1 "Site Specific Environmental Actions", the Principal Contractor will be obliged to install appropriate measures to contain and control spillages, contaminants and all other potential pollutants such that they will not affect the wider water quality. As is conventional, a detailed CEMP will be submitted by the Applicants for the approval of the LPA in the event planning permission is granted. At that stage, the LLFA have the right as a statutory body to review and approve the measures contained within the CEMP at the Reserved Matters stage prior to any construction work being carried out.

3.4 **Pollution Control (Occupied Phase).** All baseline information gathered to support the ES in relation to the existing conditions of the site, watercourses and Country Park has concluded that there is no evidence to suggest that there are existing sensitivities that detrimentally impact the hydrology of the site including the water courses contained within. The latest ES submission in both Chapters 6 (Ecology) and 11 (Water Resources) provided an assessment on the sensitivity of the watercourses and springs within their wider studies and concluded that in parts either a negligible or minor beneficial effect would occur at the Occupied Phase. The minor beneficial effect against water quality and pollution control is generated by the introduction of SUDS into the development. The site will employ SUDS features such as porous paving, swales and detention basins. These are widely accepted to be of high pollutant removal efficiency (CIRIA 609). This provides for one stage of treatment onsite. As the site currently has no mechanism of storm water treatment, the introduction of SUDS presents a 2-3 stage of treatment, providing an extensive system by which to effectively decrease pollutant load within stormwater run-off.

3.5 **Groundwater.** A Site Investigation was undertaken in 2014 (included at Appendix C of the Flood Risk Assessment) and did not identify any groundwater in any of the trail pits which were dug to a depth of between 1.25m below ground level (bgl) and 3.7m. The proposed SUDS features will not be to a depth deeper than 1.5m bgl.

3.6 **Basins.** The illustrative basins are shown at a slope of 1 in 3. It is agreed that the basins will be designed in detail at a later stage. Should the basins be designed with a 1 in 4 slope at the detailed design stage, this would generate an increased land take of 1.5m around the basin as opposed to a 1 in 3 slope. As the basins are all situated in the Country Park with extensive open space, this potential increase in basin size is considered negligible. Further, it should be noted that the Sustainable Drainage Systems Supplementary Planning Document December 2018 makes no explicit reference to a required slope gradient.

3.7 **Drainage features shown on the Illustrative Masterplan.** Such water features are shown

simply to signify SUDS features within the built up areas. These will be situated and designed as part of the detailed surface water drainage strategy.

3.8 **Combined Drainage Strategy.** Both planning applications 20/01238/OUTMAJ and 8/00828/OUTMAJ have illustrative drainage strategies associated with them. We understand DNH submitted revisions to their drainage strategy in response to comments made previously. We believe the LLFA has sufficient information before them to enable a view to be formed as to whether the measures proposes in respect of both development proposals are adequate.

3.9 **Flood Risk Assessment.** Various errors in the FRA are referred to and Brookbanks has corrected these in Appendix 2. None of those corrections are substantive.

4 Tree Officer

4.1 **Monks Lane.** The removal of trees and vegetation along Monks Lane is necessary to provide the points of access referred to Policy CS3 and the SPD. The Strategic Landscape and Green Infrastructure Plan illustrates where trees and vegetation is expected to be removed. This is shown indicatively on the Illustrative Masterplan and on page 45 of the Design and Access Statement. It is accepted that this affects more trees than shown in the Arboricultural Report.

4.2 However, trees along this boundary are of low quality and replacement planting can be addressed as part of the Landscape Ecological Management Plan proposed for that part of the development that is intended to be secured as a planning condition and the Reserved Matters application where approval of landscaping details is sought. This approach is consistent with Principle L2 in the SPD. The Design and Access Statement, consistent with the SPD, identifies "*the retention of the existing hedgerow and strategic planting*" amongst the Key Design Principles for the Monks Lane Character Area.

4.3 **Ancient Woodland.** See comments at paras 5.15 and 5.17.

4.4 **Veteran trees.** Several trees have been identified by the Woodland Trust as being registered on the Ancient Tree Inventory:

- T1 is shown to be removed as part of the Warren Road improvements. This is not part of this Application.
- T31 is shown to be retained, and at the detailed design stage the RPA for this tree will be modified in line with Natural England's standing advice.
- T33 is shown to be retained, and at the detailed design stage the RPA for this tree will be modified in line with Natural England's standing advice.
- T34 is shown to be removed for the Park House School expansion site.
- T127 is proposed for works for safety reasons. Any works to important trees will be subject to consultation with the LPA.
- T128 is unaffected by the outline proposals.
- T133 is unaffected by the outline proposals.

4.5 **Landscaping Details.** Landscaping is a reserved matter. The LPA has not requested the Applicants to provide such details under Article 5(2) of the Town and Country Planning (Development Management Order) 2015.

4.6 **The Arboricultural Impact Assessment.** Trees for removal noted in the tree officer's consultations comments:

- T199 and several other trees along Warren Road (T1, T178, T179, T184, T185, T186, T187, T188 and T196) are shown to be removed as part of the Warren Road improvements. This is not part of this Application.
- which is outside the red line of this outline application.
- T76 is required to be removed for the valley crossing.
- T34 is required to be removed for the Park House School expansion.

4.7 The impact of the loss of these trees has been properly considered and is set out in the Arboricultural Report at paragraphs 1.2 and 1.6.

5 Landscape (Liz Lake Associates)

5.1 The LPA previously employed Kirkham Landscape Planning to advise them on landscape and visual matters and a number of matters were agreed with Ms Kirkham regarding arrangement of land uses, green links, landscaping measures, the design approach to the Country Park and viewpoints. This dialogue culminated in a consultation response to application 18/0764/OUTMAJ.

5.2 During discussions regarding that Application, the LPA sought the deletion of playing fields then proposed and the provision of the additional Viewpoint adjacent to the GREE/9. These amendments have been incorporated into the current scheme. Other matters, including the design of the valley crossings, were considered matters that could be addressed at the reserved matters stage.

5.3 On this occasion, the LPA has appointed Liz Lake Associates (LLA) to advise them.

5.4 **Landscape Character Assessment.** It is acknowledged that the 2019 Landscape Character Assessment has not been used. The 2009 Landscape Sensitivity Study is still current. The Site is referenced 18D and was and remains sensitive because of its complex topography, the mosaic of arable, grassland and woodland, parkland related to the Priory, secluded valley, open views from higher ground and intrusion from the urban area. The characteristics were the same when landscape and visual matters were discussed with Kirkham Landscape Associates and remain today.

5.5 The new Landscape Character Assessment provides the same landscape and visual considerations and uses a consolidation of previous assessments. South Newbury is part of the woodland and heathland mosaic. The key characteristics provide very little information on South Newbury, either new or existing, and it relates mostly to Greenham Common. Sandleford Park is mentioned at P167 (3): '*Land west of the A339 remains rural in character and contains blocks of ancient woodland, some uncommon Pre 18C fields and the degraded remains of Sandleford Park*'.

5.6 'Detractors' are discussed at page 168 and refers to development pressure from Newbury, views from the plateau to the east, and views from Sandleford Priory.

5.7 The Landscape Strategy on page 169 provides little specific to South Newbury. The scheme does all the following: (2) aims to retain open views, (3) strengthens boundaries (4) promotes woodland management. (5) balances recreation, (6) integrates new development into the landscape, enhancing the urban-rural interface, and setting, with new woodland planting, and (7) protects the integrity of Sandleford Park.

5.8 The measures to achieve these principles were agreed with Kirkham Landscape Planning previously and remain valid at the present time.

5.9 The LLA response asserts that the Site is 'Valued Landscape' but there is no designation to this effect in the Development Plan.

5.10 **Land to the West.** The comments relate to the development proposals at New Warren Farm are not associated with this application.

5.11 **Education Land.** The Feasibility Study shows a potential arrangement for the playing field sought by Park House School. As is acknowledged, an alternative arrangement could be designed, which for example relocates the existing playing field and tennis courts. The final scheme for Park House School will need to be prepared by the Local Education Authority. To accommodate the enlargement of Park House School contiguous with its boundary, loss of vegetation (including T34) is unavoidable.

5.12 **Exclusion Zones.** The Exclusions Zones in the Arboricultural Appraisal and Method Statement need to be read in conjunction with the Strategic Landscape and Green Infrastructure Plan. In any event this will inform detailed reserved matters applications at that stage rather than the strategic nature of the parameter plans at this outline planning application stage. A draft condition has previously been suggested to require tree protection measures to be submitted by the Applicant.

5.13 **All modes connection.** The main access road connection between the Application Site and the DNH Site is shown on the respective parameter plans and corresponds to a location where the trees resource (G47) has been found to be Category C. Category C trees are not considered sufficiently important to be worthy of influencing any layout. They are not important in the overall planning context and their loss should not influence the determination of this application. This has been shown consistently and was not an issue raised by Kirkham Landscape Planning. This does not appear to be a point raised by the Council's Tree Officer.

5.14 **Link between Neighbourhoods A and B.** Approval is not sought at the present time for the design of the Valley Crossing and what is shown in the TA and considered as part of the ES is an illustrative design. The LPA have previously acknowledged that this requires a number of considerations to be taken into account (highway, ecology, landscape, water resources) and that this can be addressed at a later stage. The LPA has not requested, pursuant to Article 5(2) of the Town and Country Planning (Development Management) Order 2015, additional information in respect of this.

5.15 **Play Areas.** The location of play areas has previously been considered satisfactory. As is conventional, the detailed design will be undertaken at a subsequent stage.

5.16 **Ancient Woodland.** The Applicants' plans and documentation refer to a 15m buffer between built development and the Ancient Woodlands, consistent with the SPD. The intended design approach for the buffer is also shown in the Design and Access Statement, again reflecting the principles in the SPD.

5.17 A planning condition could be drafted to specify (1) that each buffer should be not less that 15m in width, (2) the measure for calculating this, and (3) the uses that would be permissible within the buffer zone. Such a planning condition would control the reserved matters applications and the various schemes which are proposed in relation to landscape and ecological management and the design of the Country Park.

5.18 **Landscape and Visual Assessment.** These are new comments additional to those provided initially by Kirkham Landscape Planning and which had been addressed. We disagree with the visual points raised by Liz Lake Associates. We also disagree that the 2017 photographs are not appropriate, no reason is given as why this is the case.

6 Transport Policy

6.1 The principal concern expressed in this response is that there is no single Travel Plan for the whole site and proposes that Travel Planning becomes the responsibility of the Local Authority. The Applicants have no objection to this approach if is satisfies the Council.

6.2 The financial contribution sought in respect of this would need to be discussed as part of negotiations regarding the Section 106 planning obligation.

7 Ecology

7.1 The LPA previously employed BSG to advise them on ecology matters. The consultation response prepared by BSG to Application 18/0786/OUTMAJ did not present an objection to the proposed development in respect of ecology.

7.2 That response identified that the illustrative masterplan generally delivers the ecology objectives of Policy CS3. The Country Park is referred to as "*provid[ing] a new destination for new and existing residents, helping to mitigate increased recreational pressure on other valued sites in the local area"*. It further identifies the need to consider improving connectively for the wildlife between woodlands, managing public access and protecting woodland edge but concludes that these are matters for detailed design and not a reason for objection.

7.3 The current application includes additional information in respect of hydrological impacts within the Environmental Statement and a biodiversity net gain calculation, which were specific comments made by BSG.

7.4 On this occasion, the Council 's ecologist has commented on the application. This response recommends that on ecological and environmental grounds the application be refused unless the concerns can be addressed.

7.5 **Ancient Woodland.** See para 5.16 and 5.17 for comments regarding the definition of the Buffer and how this would inform the reserved matters stage. Whilst the existing sports facilities at Park House School do have lighting, the Park House School Feasibility Study prepared by the Applicants does not include lighting of the new playing field and hence it was not considered in the lighting assessment (the earlier Park House School Study prepared by Corde on behalf of the Council did not specify lighting).

7.6 **Rush Pasture.** We do not understand this comment or the route which is referred to. This is not a European site and hence the reference to HRA derogation is unclear. The ES concludes a significant positive effect for marshy grassland habitat due to predicted 14% increase in area post-development.

7.7 **Ponds.** The detailed design of ponds within the Country Park will follow at a later stage and measures to prevent dogs entering the ponds can be specified at that time. The detailed design can also include ponds for use by dogs within the Country Park if this is deemed necessary.

7.8 **Riparian/Fluvial Habitat.** The Landscape and Green Infrastructure Design and Management Plan **(**Appendix G7 of the ES) refers to a single, managed access point being provided to the edge of the River Enborne; this would not be an access for the public. This is the location of an existing track as opposed to the creation of a new route and will be secured to prevent access for recreation. The specification for this would be part of the detailed design and LEMP for the Country Park, which will be secured by planning condition. The remainder of the river frontage will be safeguarded as a wildlife habitat**.** If access for management is not required, this track can be removed. We note also the comments of the Environment Agency in respect of the River Enborne and measures to protect it from disturbance.

7.9 **Secondary Woodland.** Recreational disturbance has been considered as part of the assessments. It is not possibly to quantify this in the manner suggested. Consistent with the

view of BSG, the detailed design will provide necessary measures in respect of paths, planting schemes to prevent access etc. to demonstrate how disturbance will be minimised. Principles are established within the EMMP and considered as part of the in-built mitigation within the ES.

7.10 **Hedgerows.** Section 6.4.2 of the Ecology Chapter is incorrect, the hedgerows considered likely to be Important under the Hedgerow Regulations are A and E. The total length to be removed is 521m as per the Ecology Chapter and Appendix F21.

7.11 **Wood Pasture.** No wood pasture has been identified on site.

7.12 **Bats.** Trees with bat roost potential and two trees supporting bat roots have been proposed to undergo tree works, but are not required to be removed to accommodate the proposed development. As the removal of these trees is not necessary to allow the development as submitted to proceed, the loss of these roosts has not been considered. Should works be required and identified during the detailed design stage, it has been recommended that up to date surveys are undertaken to inform a suitable mitigation strategy. This approach takes into account the potential for the roost status of trees on site to change (which has occurred during surveys to date as detailed in Appendix F8), and for arboricultural recommendations to change based on the condition of these trees.

7.13 **Reptiles.** The reptile population has been determined to be of low value, a view endorsed by BSG. Within the ES the population was not considered significant and was discussed only in relation to potential breaches of legislation. We disagree that there will be a significant negative impact from domestic pets, and this has not been raised previously. The development will result in a significant increase in suitable habitat for reptiles, including refuge from predators. The development will also result in the cessation of pheasant releasing on site which will remove existing predator pressure on the on-site reptile population.

7.14 **Skylark and lapwing.** No issues were raised by BSG in respect of birds. Air quality impacts within the site itself are discussed in the Air Quality of the ES and are not significant (Chapter 15). None of the Sites scoped into the cumulative assessment are suitable for ground-nesting birds. We have also proposed measures (including fencing and signage) to prevent disturbance of ground nesting bird mitigation areas (this is specified as part of Section 6.5.3 of the Ecology Chapter). We note that additional compensation measures are now sought either in the form of off-site provision, which could be provided on other land owned by SFP, or through design measures in the Country Park.

7.15 **Otter.** See paragraph 7.8 in regard to restricting access to the River Enborne.

7.16 **Dormice.** Although no dormice were recorded in 2017, they were still assessed within the ES due to the previous records. Furthermore, the ES confirms that dormice were present during surveys in 2019. The changes in dormouse surveying mentioned (relating to footprint surveys) in the comments are not yet published best practice and therefore it is not appropriate to request these are undertaken. This is also not necessary as dormouse presence has been confirmed and the ES considers impacts to dormice and includes mitigation.

7.17 **Badger.** The current application which includes details of the proposed valley crossing includes the provision of mammal shelves to make sure that access for badgers is not impeded. Furthermore, only a comparably small area of suitable foraging habitat for badgers is present to the north of the proposed crossing, with the vast majority to the south and east. This will be

enhanced through the proposed landscape design and the provision of the Country Park. The ES states that at the detailed design stage, recreational routes will be designed to avoid recreational disturbance of badger setts. Where necessary, this will include fencing to prevent public access.

7.18 **Barn Owl.** T34 is not a confirmed barn owl nest (See Appendix F5 of the ES). It has been identified as having suitability for barn owl but there has been no evidence of nesting. However, as noted within the submission documents, there is potential for barn owl to nest within trees with suitability prior to development commencing. As per the Ecological Mitigation Plan, update surveys are required prior to works commencing within 150m of the tree. These surveys are not required at this point. If nesting is confirmed then the further mitigation set out in the EMMP will be required. The EMMP also specifies that a barn owl nest box will be installed to the edge of each woodland parcel to provide alternative roosting sites.

7.19 **Air Quality.** On-site air quality is discussed within the Air Quality Chapter (Chapter 15) which predicts no significant impacts to on-site receptors. This is referenced within the Ecology Chapter in respect of Occupation Phase effects (Section 6.6.1).

7.20 **Invasive Species** Any invasive species on site will be eradicated as part of the legal obligation to prevent spread. However, there is no legal or policy requirement for a contribution to catchment-wide invasive species management.

7.21 **Water Quality.** We disagree that it should be assumed that there will be a reduction water quality given the current intensive agricultural use of much of the site. Indeed, the Water Resources Chapter (Chapter 11) concludes there will be a minor beneficial effect on water quality. This is referenced within the Ecology Chapter in respect of Occupation Phase effects.

7.22 **Net Gain.** We disagree that the biodiversity net gain assessment does not take account of proposed land uses. Measures have been proposed to protect and enhance retained habitats and it does not follow that they will automatically be degraded due to the proposed development or 'general intensification'. The net gain assessment uses the provided guidance to set target levels of condition for retained and created habitats based on specific characteristics. These measures would be covered by detailed management proposals which are to be the subject of a planning condition and it is reasonable to assume that these measures will be achieved and maintained and that the submitted figures are appropriate.

7.23 **Greenham Common.** A ranger for the Country Park is referred to at Section 5.1 of the Landscape and Green Infrastructure Design and Management Plan (Appendix G7 of the ES). As referenced in the Ecology Chapter, correspondence from Natural England during 2016/17 confirmed that provided the Country Park is operational upon first occupation, there would be no significant impact upon Greenham Common through recreation.

8 Planning Policy

8.1 This response covers a range of matters but concludes by citing a conflict with Policy CS3 in respect of affordable housing and renewables.

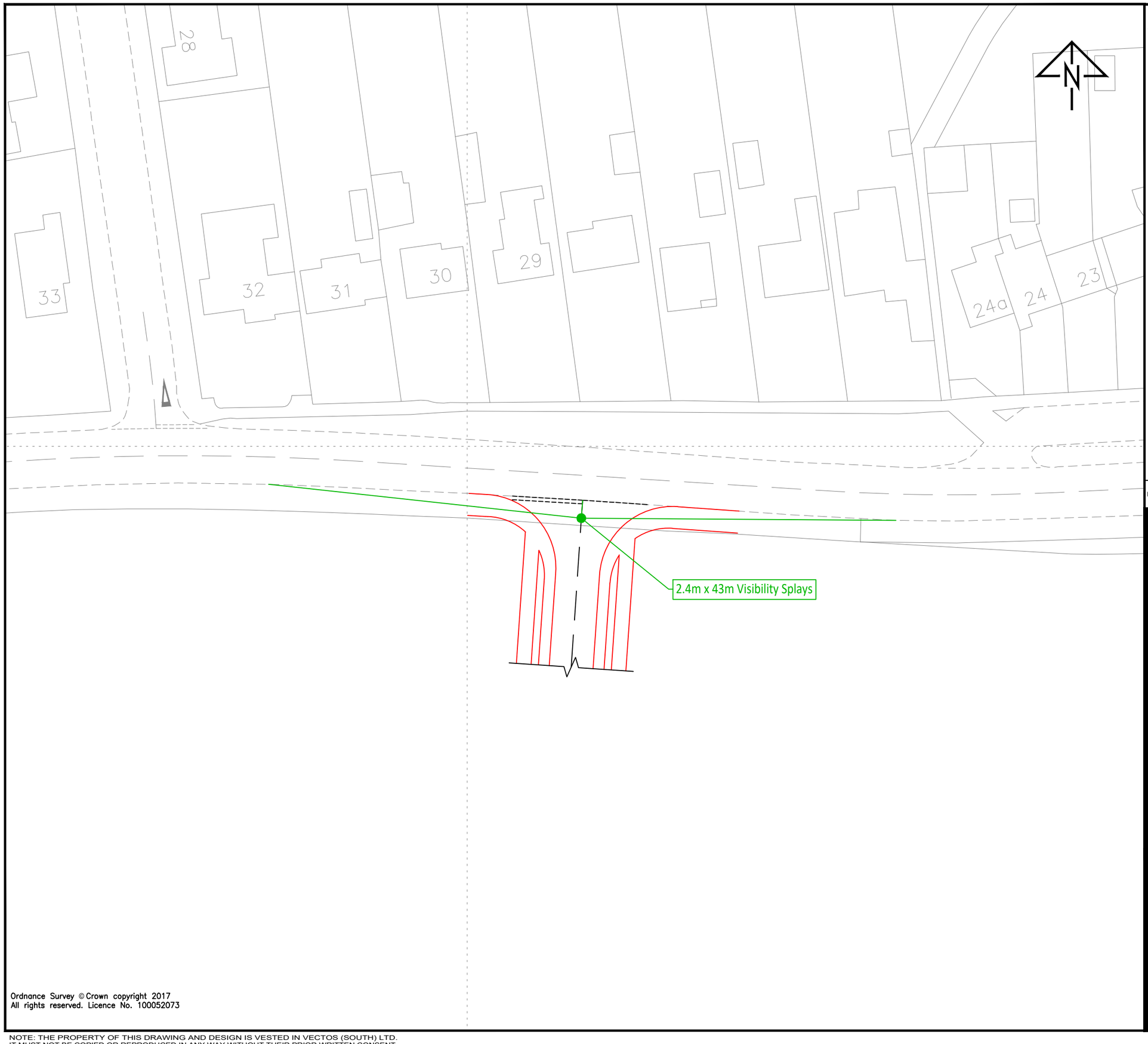
8.2 **Affordable Housing.** The Affordable Housing Statement and Draft Planning Obligation use the definition of affordable housing in the NPPF which refers to social and affordable rents (page 64). This can be addressed in the context of discussions associated with the planning obligation.

8.3 **Renewables.** The Council previously deemed that conflict with Policies CS3 and CS15 in terms of renewable energy provision was not a reason to refuse planning permission.

9 Other Matters

9.1 In addition to those consultation responses covered in preceding sections, the Applicants have also provided information in response to Natural England and Hampshire County Council. For completeness this information is at Appendices 3 and 4 respectively. Again, this is providing information which the consultees have specifically sought. In respect of Natural England this submission explains how 'in-combination effects' have been addressed and the HRA requirements.

Appendix 1: Visibility Splays



Notes:

1. Drawing is subject to Section 278 Agreement

REV.	DETAILS	DRAWN	CHECKED	DATE
A	Visibility splays added	CJM	TF	23.09.2020

CLIENT:

Bloor Homes

PROJECT:

Sandleford Park
Newbury

DRAWING TITLE:

Eastern Site Access

SCALES:

1:500 at A3

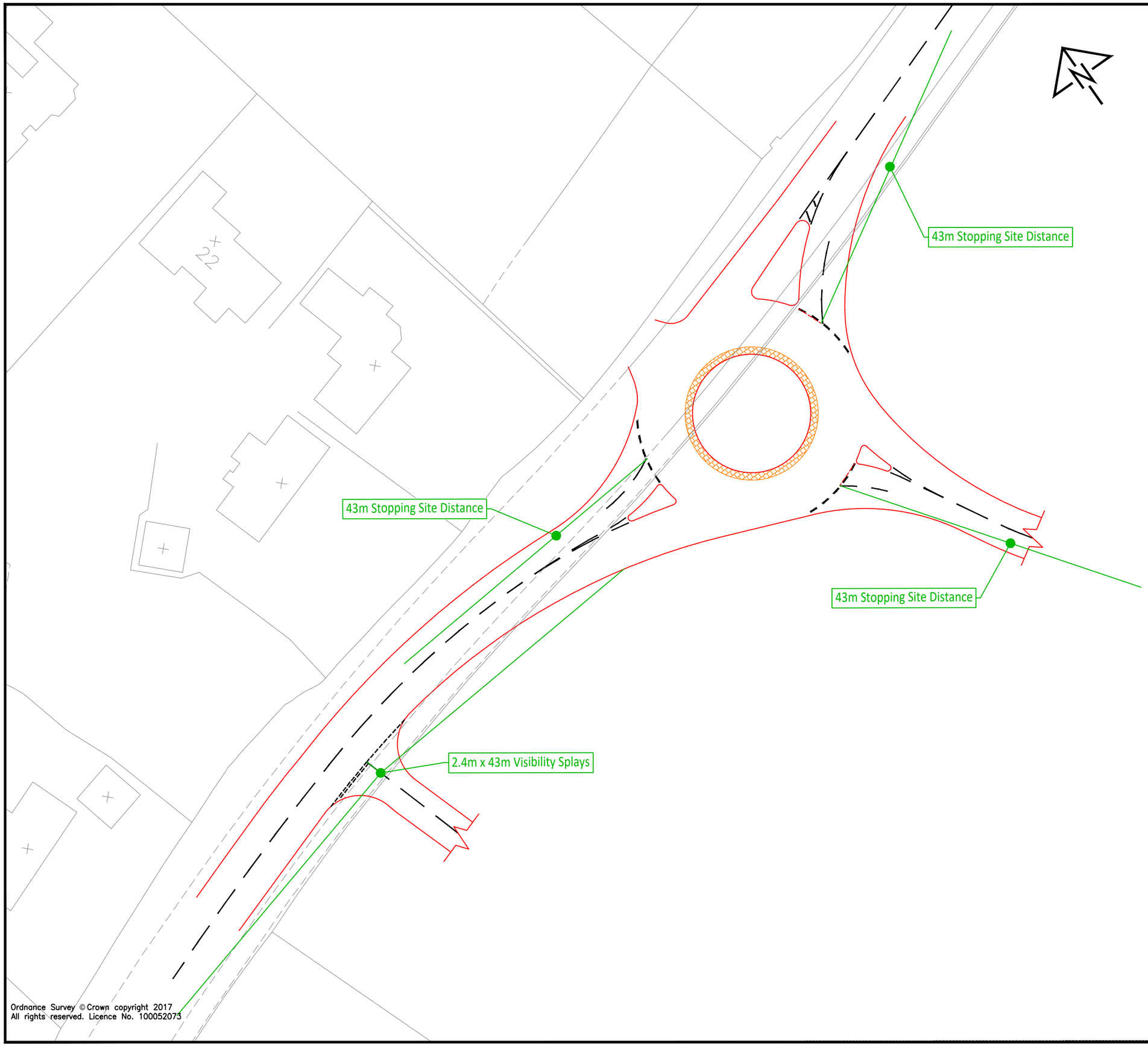
DRAWN:	CHECKED:	DATE:
TF	ES	13.03.2018

vectos

Network Building, 97 Tottenham Court Road, London W1T 4TP
t: 020 7580 7373 e: enquiries@vectos.co.uk

DRAWING NUMBER: 172985/A/07.1

REVISION: A



Notes:

1. Drawing is subject to Section 278 agreement

REV.	DETAILS	DRAWN	CHECKED	DATE
A	Visibility splays added	CJM	TF	23.09.2020

CLIENT:

Bloor Homes

PROJECT:

Sandleford Park
Newbury

DRAWING TITLE:

Western Junction Access

SCALES:

1:500 at A3

DRAWN:	CHECKED:	DATE:
SC	AW	19/03/2018

vectos

Network Building, 97 Tottenham Court Road, London W1T 4TP
t: 020 7580 7373 e: enquiries@vectos.co.uk

DRAWING NUMBER:	REVISION:
172985/A/08	A

Appendix 2: Flood Risk Assessment revised by Brookbanks.

BROOKBANKS

Land at Sandleford Park, Newbury

Flood Risk Assessment and Drainage Strategy

Bloor Homes Ltd & Sandleford Farm Partnership

Document Control Sheet

Document Title	Flood Risk Assessment and Drainage Strategy
Document Ref	10309 FRA04 Rv2
Project Name	Land at Sandleford Park, Newbury
Project Number	10309
Client	Bloor Homes Ltd & Sandleford Park Partnership

Document Status

Rev	Issue Status	Prepared / Date	Checked / Date	Approved / Date
0	Draft	KM 12.12.2018	AA 12.12.2018	LW 12.12.2018
1	Final	KM 18.12.2019	JK 18.12.2019	JK 18.12.2019
2	Final	KM 22.09.2020	LW 23.09.2020	LW 23.09.2020

Issue Record

Name / Date & Revision	14.12.2018	18.12.2019	23.09.2020			
Bloor Homes Ltd	0	1	2			
Sandleford Park Partnership	0	1	2			

Contents

Figures

Tables

Appendices

Appendix A - Conceptual Site Drainage Plan
Appendix B - IoH Greenfield runoff rates
WinDES Detention Routing Calculations
Appendix C - GEG Ltd Sandleford Park, Newbury Infiltration Report
Appendix D - Thames Water Sewer Impact Study

1 Introduction

1.1 Brookbanks is appointed by Bloor Homes Ltd and Sandleford Farm Partnership to complete a Flood Risk Assessment for a proposed residential development on Land at Sandleford Park in Newbury.

1.2 The objective of the study is to demonstrate the development proposals are acceptable from a flooding risk and drainage viewpoint.

1.3 This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Flooding risk
- Surface water drainage
- Foul water drainage

1.4 Plans showing the existing and proposed development are contained within the appendices.

2 Background Information

Location and Details

2.1 Sandleford Park is located south-west of Newbury and lies within the county of Berkshire. The Local Planning Authority is West Berkshire Council. The site is bounded to the north by Monks Lane with residential development beyond. Monks Lane connects the A339 Newtown Road in the east (from its junction with the access to Newbury Retail Park) with the A343 Andover Road in the west at Wash Common centre. Newbury College is located adjacent to the eastern corner of the site, with Newbury Retail Park located beyond (on the opposite side of the A339). Newbury Rugby Club and Park House School with their associated grounds are adjacent to the North-west of the site.

2.2 The site is currently undeveloped and is not thought to have been historically subject to any significant built development. The site comprises a mixture of agricultural land, grassed fields and woodland. An unnamed watercourse flows through the site, towards the River Enborne to the south of the site, and there are a number of ponds situated in the south and north east of the site. The site location and proposed development boundary is outlined in red on **Figure 2-1.**

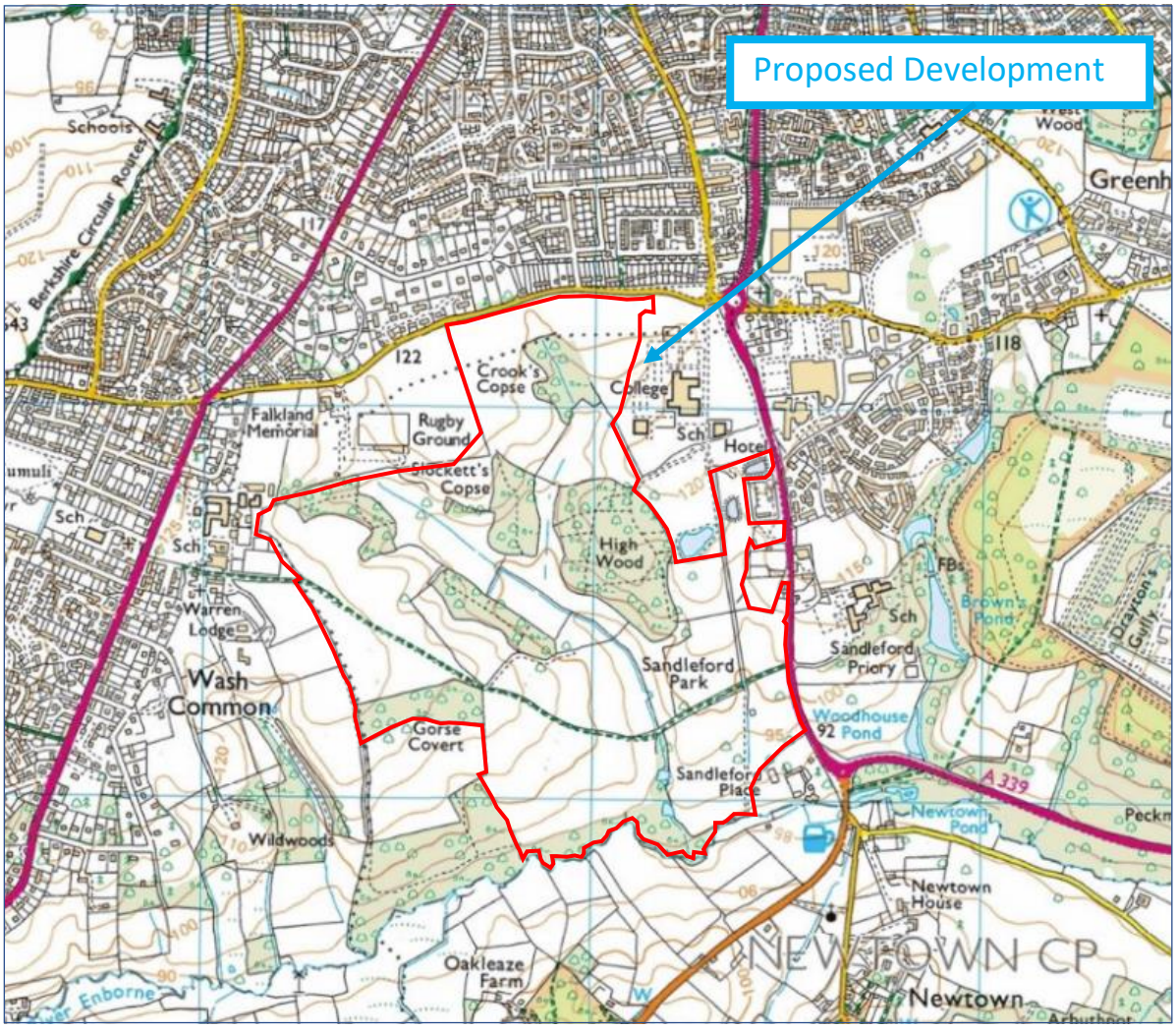


Figure 2-1: Site Location

Development Criteria

2.3 Sandleford Park is a Strategic Site Allocation in Policy CS3 of West Berkshire Core Strategy (2006-2026) identified for a sustainable and high-quality mixed-use development for up to 2,000 dwellings with associated infrastructure. The site has been allocated to contribute towards meeting West Berkshire's future housing requirements. The development will also provide education, community uses, public open space and new highways infrastructure. The development proposals have been conceived in the context of this Policy.

2.4 In this instance, the planning application therefore seeks outline permission with all matters reserved (except for access) for the following development, which forms the majority of the allocation:

'Outline planning permission for up to 1,000 new homes; an extra care facility as part of the C3 provision; a new 2 form entry primary school (D1); a local centre to comprise flexible commercial floorspace (A1-A5 up to 2,150 sq m, B1a up to 200 sq m) and D1 use (up to 500m); the formation of new means of access onto Monks Lane; new open space including the laying out of a new country park; drainage infrastructure; walking and cycling infrastructure and other associated infrastructure works.'

Sources of Information

2.5 The following bodies have been consulted while completing the study:

- Thames Water - Storm & foul water drainage
- Environment Agency - Flood risk and storm drainage
- West Berkshire Council - Flood risk, drainage and associated policy

2.6 The following additional information has been available while completing the study:

- Mastermap Data - Ordnance Survey
- Published Geology - British Geological Survey
- West Berks Council - Preliminary Flood Risk Assessment (June 2011)
- West Berks Council: Level 1 Strategic Flood Risk Assessment 2008, 2015 Update
- West Berks Council: Level 2 Strategic Flood Risk Assessment 2009

3 Baseline Conditions

Topography & Site Survey

3.1 The site is characterised by relatively shallow falls from the sides to an ordinary watercourse flowing from north to south through the centre of the site, and generally from north towards the River Enborne to the south of the site.

Geology

3.2 With reference to the published British Geological Survey (BGS) digital mapping, the entire site is shown to be underlain by the London Clay Formation, as shown on **Figure 3-1.** Most of the sedimentary bedrock comprises sand, however the southern and central areas of the site are shown to comprise clay, silt and sand.

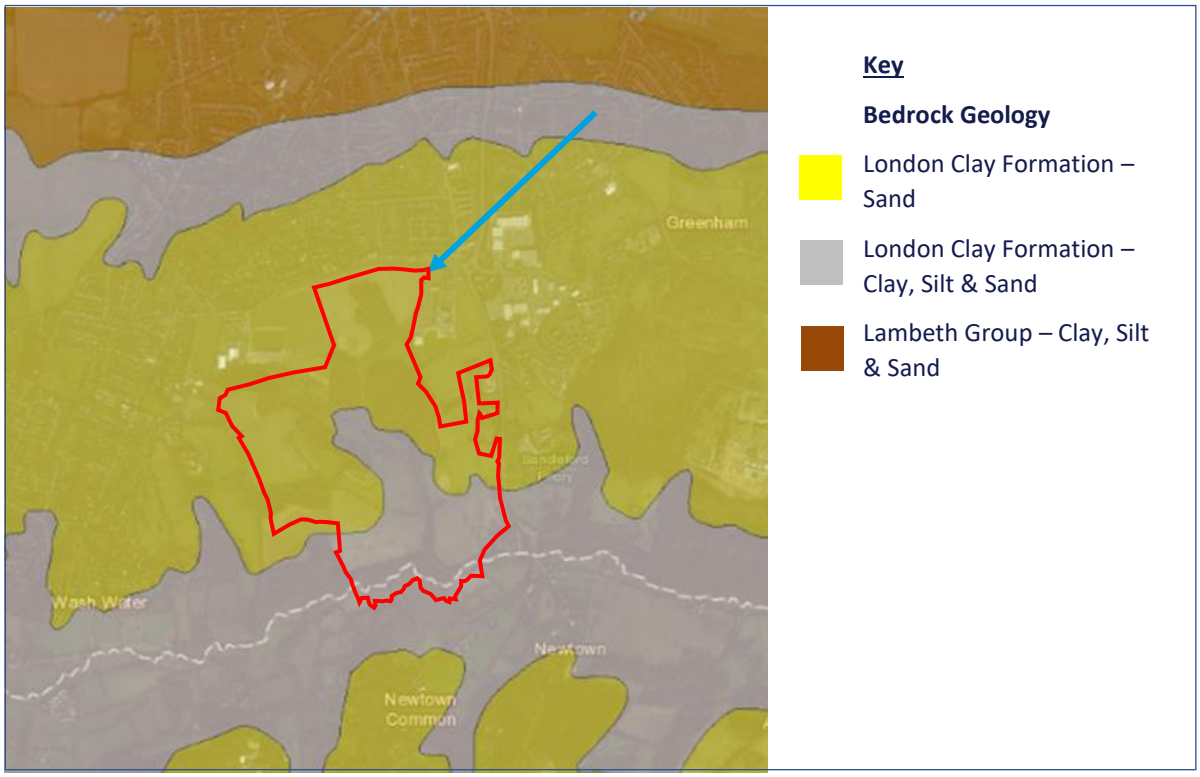


Figure 3-1: BGS Bedrock Published Geology

3.3 There are two bands of superficial deposits shown to cross the site, as shown in Figure 3-2. The north, north west and north east of the site is shown to comprise sand and gravel belonging to the Silchester Gravel Member whilst alluvium deposits comprising of clay, silt, sand and gravel are shown along the River Enborne in the south of the site.

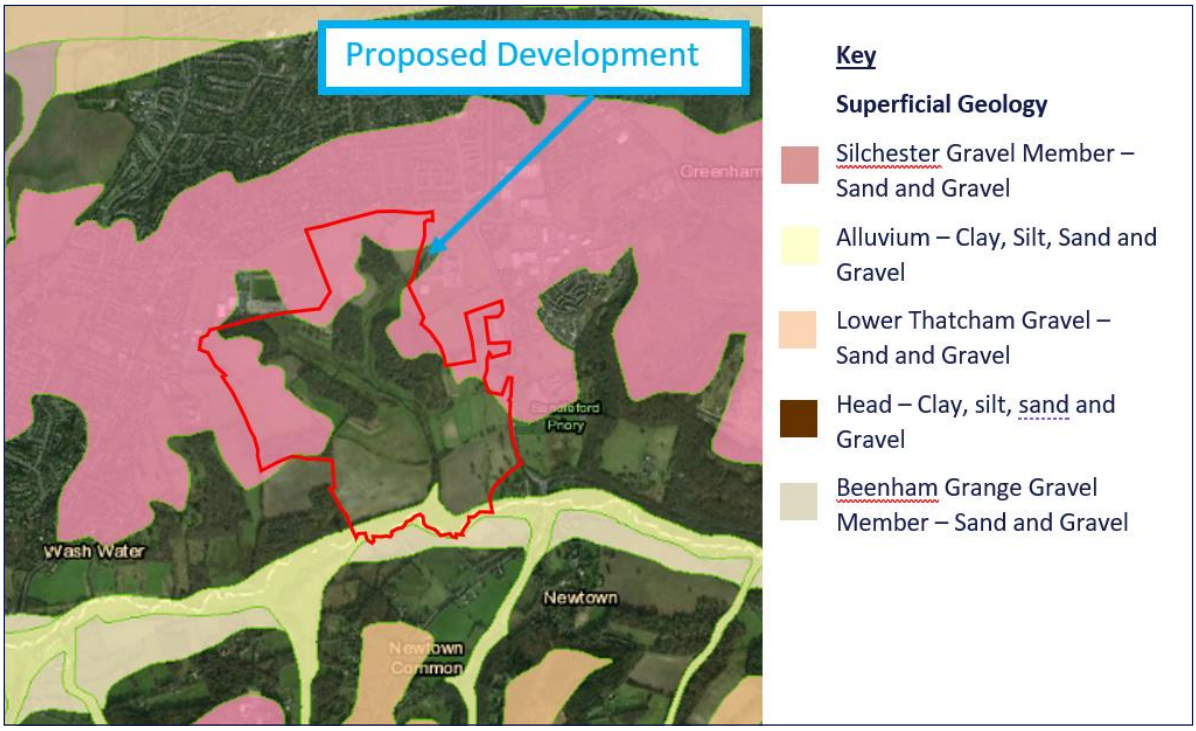


Figure 3-2: BGS Superficial Published Geology

Hydrogeology

3.4 With reference to Magic Maps the underlying London Clay sand bedrock in the northern half of the site is shown to form a Secondary A Aquifer and the superficial Silchester sand and gravel deposits (in the north, north west and north east of the site) and the alluvium in the south are shown to form a Secondary A Aquifer.

3.5 The EA provides the following definitions for Secondary Aquifers:

Secondary Aquifers *- These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage.*

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

Groundwater

3.6 The EA estimates that there are around 2000 groundwater sources such as wells, boreholes and springs that are used for public drinking water supply in England and Wales. The majority of these have been assigned with Source Protection Zones (SPZs), which illustrate the risk of contamination from any activities that may cause pollution in the area, with the closest 'Inner Zone' being at a higher risk from a polluting activity.

3.7 The site lies within Zone 3 (the Total Catchment) of a groundwater SPZ, which is defined by the EA as, "the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment area may extend for some distance from the source".

3.8 **Figure 3-3** is an extract of the EA's Simplified GVZ map, in which the indicative risks on site are shown to vary across the site from 'Unproductive/ Low/ Medium' in the southern half to 'High - Medium' in the east, west and northern half.

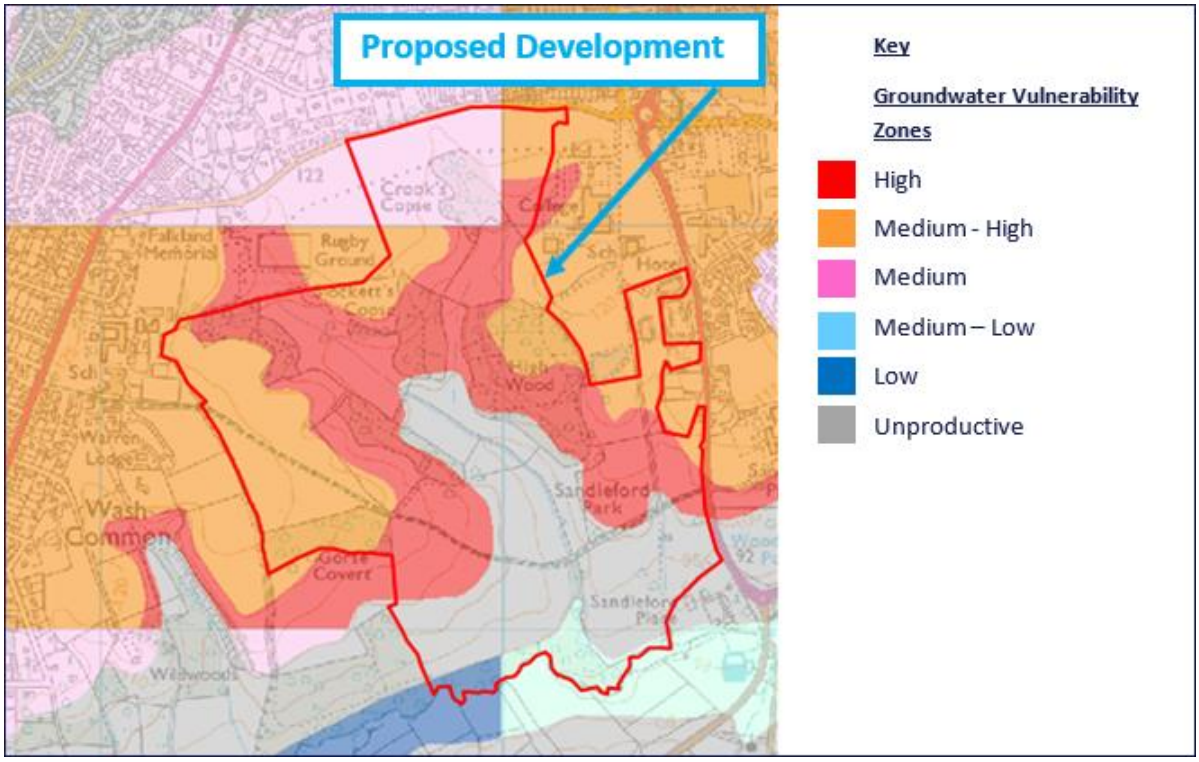


Figure 3-3: The EA's Simplified Groundwater Vulnerability Zones Map (September 2017)

3.9 The EA provides the following definition for the underlying GVZ:

High *– These are high priority groundwater resources that have very limited natural protection. This results in a high overall pollution risk to groundwater from surface activities. Operations or activities in these areas are likely to require additional measures over and above good practice pollution prevention requirements to ensure that groundwater is not impacted.*

Medium-high *– These are high priority groundwater resources that have limited natural protection. This results in a medium-high overall pollution risk to groundwater from surface activities. Activities in these areas may require additional measures over and above good practice to ensure they do not cause groundwater pollution.*

Medium *– these are medium priority groundwater resources that have some natural protection resulting in a moderate overall groundwater risk. Activities in these areas should as a minimum follow good practice to ensure they do not cause groundwater pollution.*

Medium-low *- these are lower priority groundwater resources that have some natural protection resulting in a moderate to low overall groundwater pollution risk. Activities in these areas should follow good practice to ensure they do not cause groundwater pollution.*

Low *– these are low priority groundwater resources that have a high degree of natural protection. This reduces their overall risk of pollution from surface activities. However, activities in these areas may be a risk to surface water due to increased run-off from lower permeability soils and near-surface deposits. Activities in these areas should be adequately managed.*

Watercourse Systems & Drainage

3.10 The site includes an unnamed ordinary watercourse, a tributary to the River Enborne, which runs in a southerly direction from the north west of the site through the centre. The River Enborne is designated as a 'Main River' by the EA and is situated along the southern boundary of the site.

3.11 There are two existing detention/balancing ponds situated in the north east of the site (adjacent to the rear of West Berkshire Recycling Centre) and one outside of the redline boundary (to the south of Newbury College). The position of these ponds are shown below on **Figure 3-4**.

3.12 The MAGIC map website indicates that the site includes an 'issues' in the north of the site which drains to the centre, where it traverses into the unnamed watercourse. There are also 2 'spreads' shown in the south of the site, these are shown on **Figure 3-4**.

3.13 The Ordnance Survey provides the following definitions for the above terms:

Issues: *"The start of a flowing watercourse which is a natural emission from an agricultural drain, or where the stream re-emerges from underground".*

Spreads: *"A place where a stream spreads into a marsh or onto a sand or shingle beach or an area of rough grass".*

3.14 With reference to the Flood Estimation Handbook (FEH) web service, the site is shown to comprise of 'rocks with essentially no groundwater'.

Figure 3-4: BGS Hydrogeology and Drainage Network (Source: FEH Web Service

3.15 With reference to the FEH dataset V3, the majority of the land is shown to lie within the catchment of an ordinary watercourse which forms a tributary of the River Enborne. With an URBEXT2000 value of 0.06 the catchment can be described as "moderately urban". The indicative FEH catchment for the site is shown in **Figure 3-5.**

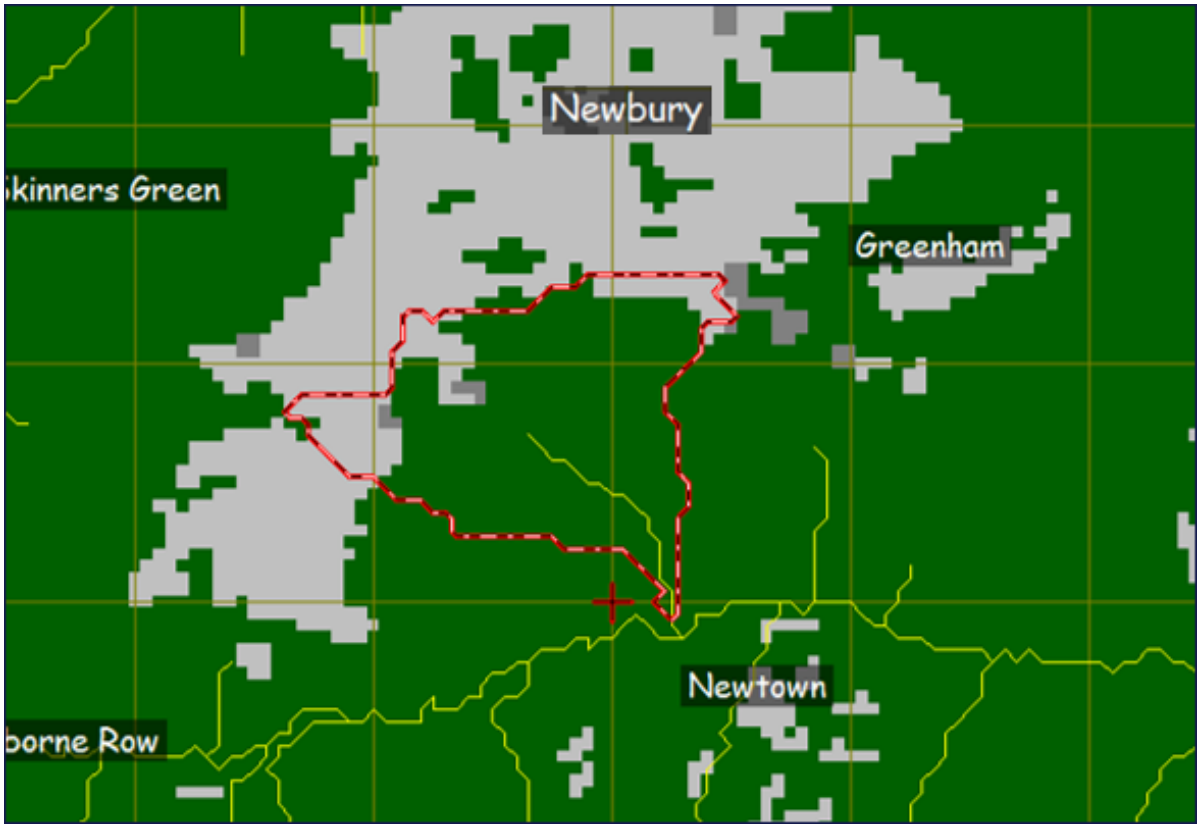


Figure 3-5: FEH Reported Catchment

3.16 With the exception of the watercourse feature outlined above, a site inspection shows the presence of only minor field ditches that follow the existing hedge lines and field boundaries.

4 Planning Policy

National Planning Policy

4.1 The National Planning Policy Framework (NPPF), updated in February 2019, sets out Governmental Policy on a range of matters, including Development and Flood Risk. The policies were largely carried over from the former PPS25: Development & Flood Risk, albeit with certain simplification. The allocation of development sites and local planning authorities' development control decisions must be considered against a risk-based search sequence, as provided by the document.

4.2 Allocation and planning of development must be considered against a risk-based search sequence, as provided by the NPPF guidance. In terms of fluvial flooding, the guidance categorises flood zones in three principal levels of risk, as follows in **Table 4-1.**

Flood Zone	Annual Probability of Flooding
Zone 1: Low probability	< 0.1 %
Zone 2: Medium probability	0.1 – 1.0 %
Zone 3a / 3b: High probability	> 1.0 %

Table 4-1: NPPF Flood Risk Parameters

4.3 The Guidance states that Planning Authorities should "apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change."

4.4 According to the NPPF guidance, residential development at the proposed site, being designated as "More Vulnerable" classifications, should lie outside the envelope of the predicted 1 in 100 year (1%) flood, with preference given to sites lying outside the 1 in 1,000 (0.1%) year events and within Flood Zone 1.

4.5 Sites with the potential to flood during a 1 in 100 (1%) year flood event (Flood Zone 3a) are not normally considered appropriate for proposed residential development unless on application of the "Sequential Test", the site is demonstrated to be the most appropriate for development and satisfactory flood mitigation can be provided. Additionally, proposed residential developments within Flood Zone 3a are required to pass the "Exception Test", the test being that:

- The development is to provide wider sustainability benefits
- The development will be safe, not increase flood risk and where possible reduce flood risk.

Regional & Local Policy

4.6 Newbury lies within West Berkshire, in which West Berkshire Council (WBC) is the Lead Local Flood Authority (LLFA). A **Preliminary Flood Risk Assessment** (PFRA) was produced in 2011 by WBC according to the guidance and information provided by DEFRA. The PFRA identifies flood risk from local flood sources and extreme events occurrence.

4.7 Indicative Flood Risk Areas consist of an area where flood risk is most concentrated, and over 30,000 people are predicted to be at risk of flooding. The PFRA reports that "*no areas in West Berkshire have been identified as national Indicative Flood Risk Areas".*

4.8 **Regional Flood Risk Assessment:** The South East Regional Assembly published their Regional Flood Risk Assessment (RFRA) in October 2008. The document is a high-level review of flood risk and strategy. In this document, concerns over the effects of flood risk and potential of climate change are identified across the wider West Midlands region

4.9 As with many RFRA's, this document outlines the broad understanding of flooding risk across areas of potential higher growth however makes no specific reference to the proposed site at Newbury.

4.10 **Strategic Flood Risk Assessment:** To support local planning policy, NPPF guidance recommends that local planning authorities produce a Strategic Flood Risk Assessment (SFRA). The SFRA should be used to help define the Local Development Framework and associated policies; considering potential development zones in the context of the sequential test defined in the guidance.

4.11 West Berkshire Council published a district-wide Level 1 Strategic Flood Risk Assessment (SFRA) in 2008 and a Level 2 SFRA for specific areas in 2009. These documents outline the results of a review of available flood risk related policy and data across the region and set out recommendations and guidance in terms of flood risk and drainage policy that generally underpin national guidance.

4.12 The SFRA document makes no specific reference to the proposed development site however the document assesses the risk of flooding of the wider Newbury area from the following sources which will be discussed further in this document:

- Surface Water Flooding
- Sewer Flooding
- Overland flooding
- Groundwater Flooding

4.13 The SFRA provides recommendations to developers with regards to Sustainable Urban Design Systems (SUDS) which will be investigated further in **Section 6**.

4.14 Core Strategy Policy CS16 as outlined with the **Local Plan,** relates directly to flooding in the area. The policy states:

"The sequential approach in accordance with the NPPF will be strictly applied across the District. Development within areas of flood risk from any source of flooding, including Critical Drainage Areas and areas with a history of groundwater or surface water flooding, will only be accepted if it is demonstrated that it is appropriate at that location, and that there are no suitable and available alternative sites at a lower flood risk.

When development has to be located in flood risk areas, it should be safe and not increase flood risk elsewhere, reducing the risk where possible and taking into account climate change.

Proposed development will require a Flood Risk Assessment for:

- *Sites of 1 ha or more in Flood Zone 1.*
- *Sites in Flood Zone 2 or 3.*
- *Critical Drainage Areas.*
- *Areas with historic records of groundwater and/or surface water flooding.*
- *Areas near ponds or the Kennet and Avon Canal, that may overtop.*
- *Sites where access would be affected during a flood.*
- *Areas behind flood defences.*

- *Sites with known flooding from sewers.*

Development will only be permitted if it can be demonstrated that:

- *Through the sequential test and exception test (where required), it is demonstrated that the benefits of the development to the community outweigh the risk of flooding.*
- *It would not have an impact on the capacity of an area to store floodwater.*
- *It would not have a detrimental impact on the flow of fluvial flood water, surface water or obstruct the run-off of water due to high levels of groundwater.*
- *Appropriate measures required to manage any flood risk can be implemented.*
- *Provision is made for the long-term maintenance and management of any flood protection and or mitigation measures.*
- *Safe access and exit from the site can be provided for routine and emergency access under both frequent and extreme flood conditions.*

On all development sites, surface water will be managed in a sustainable manner through the implementation of Sustainable Drainage Methods (SuDS) in accordance with best practice and the proposed national standards and to provide attenuation to greenfield run-off rates and volumes, for all new development and re-development and provide other benefits where possible such as water quality, biodiversity and amenity."

4.15 Local Policy will be taken not consideration when evaluating flood risk across the site and when designing the surface water drainage strategy for the development.

4.16 **Catchment Flood Management Plans:** A Catchment Flood Management Plan (CFMP) is a high-level strategic plan through which the Environment Agency seeks to work with other key-decision makers within a river catchment to identify and agree long-term policies for sustainable flood risk management.

4.17 The Thames Catchment Flood Management Plan (December 2009), outlines that the Thames River Basin District has been divided into 9 sub-catchments. The Site is shown to be covered by the following policy:

"Policy 6: Areas of low to moderate flood risk where we will take action with others to store water or manage run off in locations that provide overall flood risk reduction or environmental benefits.

This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists) but would only be implemented in specific locations within the area, after more detailed appraisal and consultation."

4.18 **Development Flood Risk Assessment:** At a local, site by site level the NPPF guidance and supporting documents advocate the preparation of a Flood Risk Assessment (FRA). NPPF requires that developments covering an area of greater than one hectare prepare an FRA in accordance with the guidance. The FRA is required to be proportionate to the risk and appropriate to the scale, nature and location of the development.

4.19 This document forms a Flood Risk Assessment (FRA), to accord with current guidance and addresses national, regional and local policy requirements in demonstrating that the proposed development lies within the acceptable flood risk parameters.

5 Flood Risk

Flood Mechanisms

5.1 Having completed a site hydrological desk study and walk over inspection, the possible flooding mechanisms at the site are identified as follows in **Table 5-1**.

Mechanisms	Potential	Comment
Fluvial	N	The EA flood map shows there to be no risk of flooding form the watercourse through the middle of the site, therefore situated within Flood Zone 1 (an area of low probability for fluvial flooding).
Coastal & Tidal	N	There is no risk of tidal flooding.
Overland Flow (Pluvial)	N	The site is protected from overland flow from the north by Monks Lane, the east by the A339 Newtown Road and the west by open fields.
Groundwater	N	Geology underlying the site is London Clay formation and thus considered relatively impermeable.
Sewers	N	There is no reported sewer network within the site boundary.
Reservoirs, Canals etc	N	No reservoirs or artificial sources lie within an influencing distance of the proposed development.

Table 5-1: Flooding Mechanisms

5.2 Where potential risks are identified in Table 3b, above, more detailed assessments have been completed and are outlined and discussed further within the following sections.

Fluvial Flooding

5.3 The Environment Agency's (EA) National Generalised Modelling (NGM) Flood Zones Plan indicates predicted flood envelopes of Main Rivers across the UK. In many circumstances, the NGM is based on basic catchment characteristic data and modelling techniques. Where appropriate, more accurate Section 105 / SFRM models are produced using more robust analysis techniques.

5.4 The mapping shows that apart from a narrow strip along the Enbourne, the proposed site lies within Flood Zone 1, an area of Low Probability of flooding, outside both the 1 in 100 (1% AEP) and 1 in 1,000 (0.1% AEP) year flood events. An extract of the EA Flood Zone plan is shown in **Figure 5-1.**

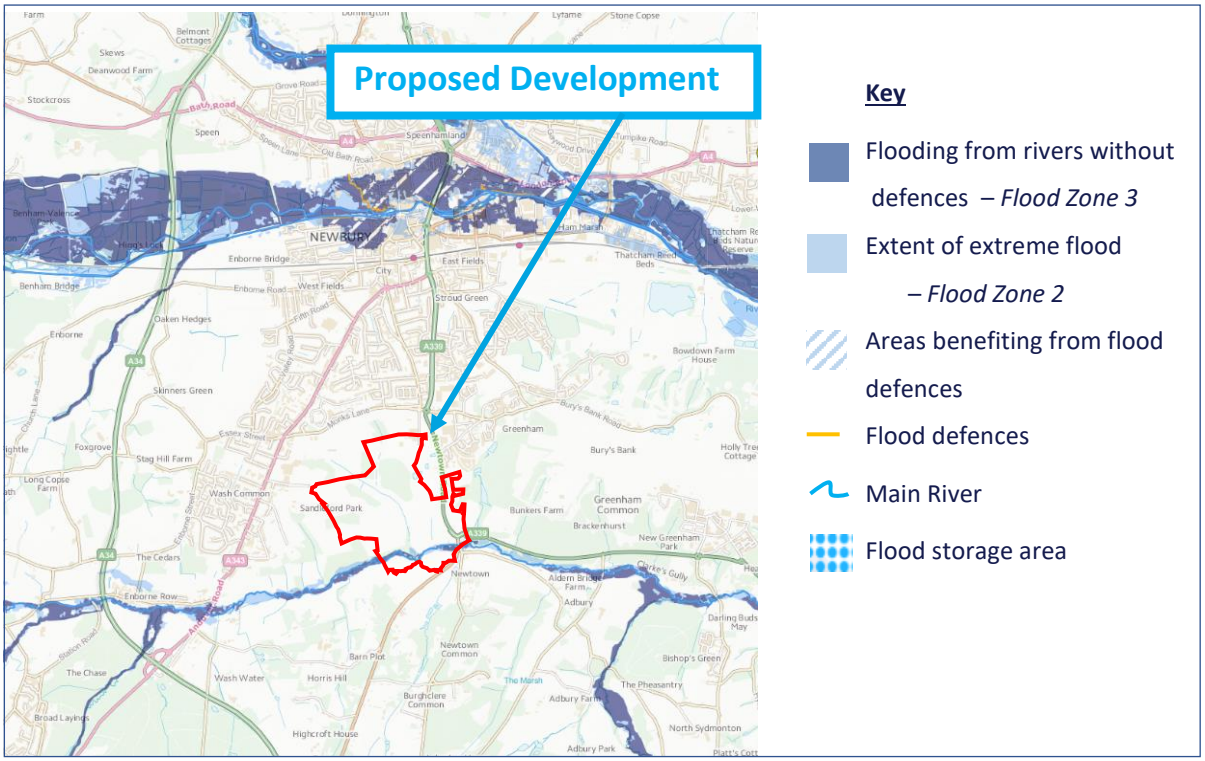


Figure 5-1: EA Flood Zone Plan showing 1 in 100 & 1 in 1,000 year floodplains

Coastal Flooding

5.5 The site lies a significant distance from the nearest tidal watercourse and the coast. As such there is no risk of tidal or coastal flooding at this location.

Overland Flow (Pluvial)

5.6 Overland flow mechanisms result from the inability of unpaved ground to infiltrate rainfall or due to inadequacies of drainage systems in paved areas to accommodate flow directed to gullies, drainage downpipes or similar. In minor cases, local ponding may occur. In more extreme events, flows accumulate and may be conveyed across land following the topography.

5.7 The Environment Agency, in partnership with lead local flood authorities, produced a series of surface water flood maps for many parts of the UK.

5.8 **Figure 5-2** illustrates areas of low to high risk from surface water flooding:

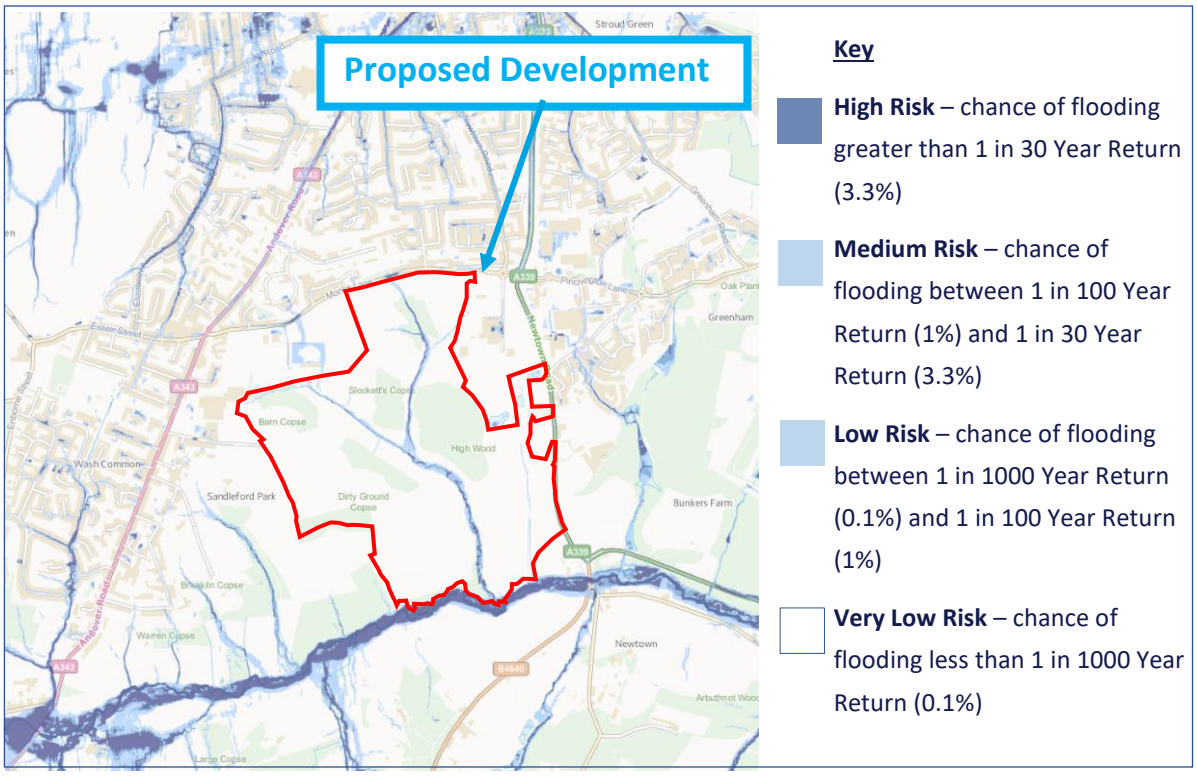


Figure 5-2: EA Long Term Flood Risk Maps – Flood risk from Surface Water (Gov.Uk website)

5.9 The mapping provided by the EA identifies potential risks of surface water flooding around the River Enborne to the south of the site, and along the ordinary watercourse that runs through the centre of the Site. However, most of the site is not shown to be at risk from surface water flooding. There is no risk of flooding shown within any of the proposed development parcels.

5.10 The findings of the Brookbanks and EA assessments have been considered as part of the master planning proposals for the site and accordingly it is proposed to ensure all built development remains outside identified significant surface water flooding areas.

5.11 Recognising the risk of overland flow mechanisms, published guidance in the form of the *Design and Construction Guidance for Foul and Surface Water Sewers* and the Environment Agency document *Improving the Flood Performance of New Buildings: Flood Resilient Construction et al* (June 2007) advocate the design of developments that implement infrastructure routes through the development that will safely convey flood waters resulting from sewer flooding or overland flows away from buildings and along defined corridors.

5.12 Further to protect the proposed development, current good practice measures defined by the guidance (such using materials with low permeability, raising finished floor levels above flood levels and raised thresholds), where appropriate will be incorporated at the proposed development.

5.13 Given the baseline site characteristics and further mitigating measures to be implemented residual flood risk from an overland flow mechanism is considered of a low probability.

Groundwater

5.14 Groundwater flooding is characterised by low-lying areas often associated with shallow unconsolidated sedimentary aquifers which overly non-aquifers. These aquifers are reported to be susceptible to flooding, especially during the winter months, due to limited storage capacity.

5.15 Groundwater related flooding is fortunately quite rare, although where flooding is present, persistent issues can arise that are problematic to resolve. Such mechanisms often develop due to construction activities that

may have an unforeseen effect on the local geology or hydrogeology.

5.16 flood risk from a ground water mechanism is considered to be of a low probability.

Sewerage Systems

5.17 No records of historical flooding have been located.

5.18 Positive drainage measures incorporated on site, coupled with sustainable drainage systems (SUDS) will ensure that no increase in surface water will result from the site. Flood risk associated with sewer flooding is therefore considered to be a low probability.

Artificial Water Bodies - Reservoirs & Canals

5.19 There are no reservoirs identified within an influencing distance of the site boundary.

5.20 Reservoir flooding is extremely unlikely to happen. However, in the unlikely event that a reservoir dam failed, a large volume of water would escape at once and flooding could happen with little or no warning. If living or working in an area that could be affected, it is recommended to plan in advance what to do in an emergency. It might be necessary to evacuate immediately.

5.21 It may therefore be concluded that there is a low risk of flooding associated with artificial water bodies at the proposed development. It is, however, important to make sure local emergency plans are followed.

Summary

5.22 In terms of fluvial and tidal flood risk, the site lies almost entirely within Flood Zone 1 and hence has a low probability of flooding from this mechanism. All built development will lie within Flood Zone 1.

5.23 Assessment of other potential flooding mechanisms show the land to have a low probability of flooding from overland flow, ground water and sewer flooding.

5.24 Accordingly, the proposed development land is in a preferable location for residential development when appraised in accordance with the NPPF Sequential Test and local policy. These findings are consistent with the West Berkshire Council Level 1 Strategic Flood Risk Assessment.

Objectives

5.25 The key development objectives that are recommended in relation to flooding are:

- Work collaboratively with the Environment Agency to identify potential flooding.
- Compliance with Design and Construction Guidance for Foul and Surface Water Sewers and EA guidance in relation to flood routing through the Proposed Development in the event of sewer blockages.

6 Storm Drainage

Background

6.1 The land is presently not serviced by a positive storm water drainage network. Storm water currently discharges to the existing ordinary watercourse and drainage ditches within the site boundary.

Drainage Options

6.2 The following paragraphs in this section outline the proposed drainage strategy to meet national and local design requirements and guidance.

6.3 Current guidance[1] requires that new developments implement means of storm water control, known as SUDS (Sustainable Drainage Systems), to maintain flow rates discharged to the surface water receptor at the pre-development 'baseline conditions' and improve the quality of water discharged from the land.

6.4 It is proposed to implement a SUDS scheme consistent with local and national policy at the proposed development.

6.5 When appraising suitable storm water discharge options for a development site, Part H of the Building Regulations 2002 (and associated guidance) provides the following search sequence for identification of the most appropriate drainage methodology.

"Rainwater from a system provided pursuant to sub-paragraphs (1) or (2) shall discharge to one of the following, listed in order of priority -

an adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,

a watercourse; or where that is not reasonably practicable,

a sewer. "

6.6 Dealing with the search order in sequence:

a) Source control systems treat water close to the point of collection, in features such as soakaways, porous pavements, infiltration trenches and basins. The use of same can have the benefit of discharging surface water back to ground rather than just temporarily attenuating peak flows before discharging it to a receiving watercourse or sewer.

As source control measures generally rely upon the infiltration of surface water to ground, it is a prerequisite that the ground conditions are appropriate for such.

The infiltration tests undertaken by GEG Ltd (Report GEG-14-352 included within the Appendix) indicate that the soils are of a relatively low permeability. In view of this, it is considered that the site is unsuitable for soakaway drainage. However, locally there is a possibility that limited soakaway drainage may be possible such as in the vicinity of TP07 in the north of the site, as shown on **Figure 6-1**. Therefore, further assessment may be prudent targeting the thicker granular areas once the detailed proposed residential layout is finalised. For the outline submission it has been assumed that infiltration is not a viable option.

[1] NPPF, CIRIA C522, C609, C753 et al.

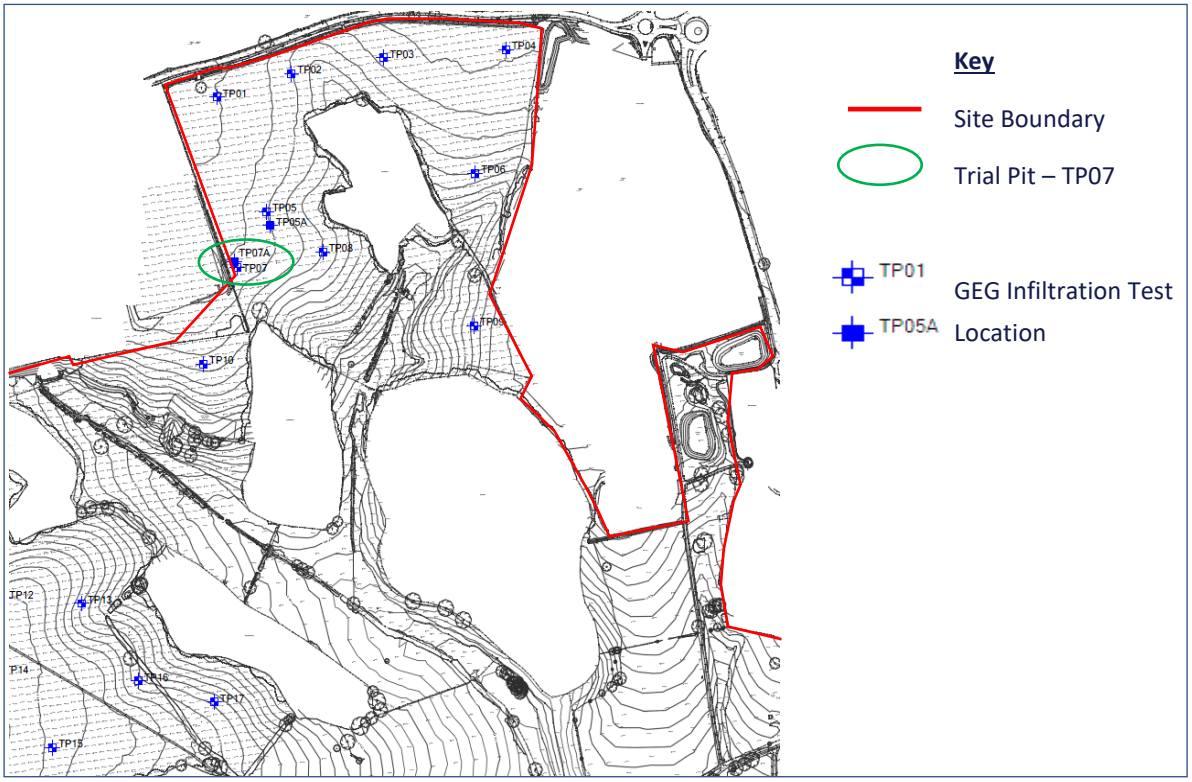


Figure 6-1: GEG Infiltration Trial Pit Location Plan extract (Report GEG-14-352)

b) Next in the search sequence, defined by Part H, is discharge to a watercourse or suitable receiving water body. Where coupled with appropriate upstream attenuation measures, this means of discharge can provide a sustainable drainage scheme that ensures that peak discharges and flood risk in the receiving water body are not increased.

The ordinary watercourse through the centre of the site currently receives stormwater from the existing land and as such, has the potential to receive flows from the proposed development once restricted to the pre-existing 'greenfield' rates of run-off.

c) Last in the search sequence is discharge to a sewer. In the context of SUDS this is the least preferable scheme as it relies on 'engineered' methods to convey large volumes of water from development areas, has a higher likelihood of flooding due to blockage and provides less intrinsic treatment to the water.

6.7 Therefore, the search sequence outlined above indicates that the existing watercourse network is the most appropriate receptor of storm water from the proposed development, having the potential to employ source control measures and on-line SUDS to control peak discharges to no greater than the baseline conditions.

6.8 Proposals have been developed to inform the strategic drainage network across the development. It is proposed that the drainage system for the site utilise a SUDS system as the primary storm water management scheme.

6.9 Accordingly, a plan showing the conceptual drainage masterplan for the site is contained in the Appendix as drawings 10309-DR-02 A.

6.10 Coupled with the storm water control benefits, the use of SUDS can also provide betterment on water quality. National guidance in the form of CIRIA 753 outlines that by implementing SUDS, storm water from the site can be polished to an improved standard thus ensuring the development proposals have no adverse effects on the wider hydrology.

6.11 The following paragraphs outline the potential SUDS features appropriate for use on-site.

Primary Drainage Systems (source control)

6.12 At the head of the drainage network, across the site, source control measures could be implemented to reduce the amount of run-off being conveyed directly to piped drainage systems.

6.13 The common aims of a Primary Drainage System are:

- Reduction in peak discharges to the agreed site wide run-off rate from the development areas.
- Provide water quality treatment where appropriate

6.14 Through consultations at outline planning stage, it has been agreed that nature of source control measures to be implemented will need to remain flexible, providing each house builder with a 'toolkit' of options to reach an agreed target for peak discharge reduction and water treatment. **Table 6-1** is an extract of Table 1.1 from the CIRIA SuDS Manual C753 which outlines a number of options available.

Componen	Description	Considered as part of the Development	
Rainwater Harvesting Systems	Rainwater is collected from the building roof or from other paved surfaces in an over-ground or underground tank for use on site. Depending on its intended use, the system may include treatment elements. The system should include specific storage provision if it is to be used to manage runoff to a design standard.	No	Not considered at outline stage. Developer to confirm suitability at Reserved Matters.
Green roofs	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation. Blue roofs store water at a roof level, without the use of vegetation.	No	Not considered at outline stage. Developer to confirm suitability at Reserved Matters.
Infiltration Systems	These systems collect and store runoff allowing it to infiltrate into the ground. Overlaying vegetation and underlying unsaturated soils can offer protection to groundwater from pollution risks.	No	Limitation for infiltration use due to underlying geology following initial infiltration testing. However further investigation may be carried out at Reserved Matters.
Proprietary treatment systems	These subsurface are surface structures are designed to provide treatment of water through the removal of contaminants.	Yes	Petrol interceptors will be provided for all estate roads as part of Section 278 approval/38 approval.
Filter strips /Ditches	Runoff from an impermeable area can flow across a grassed or otherwise densely planted area to promote sedimentation and filtration.	Yes	Suited to be implemented adjacent to large impervious areas. Easily integrated into landscaping and can be designed to provide aesthetic benefits.
Filter drains	Runoff is temporarily stored below the surface in a shallow trench willed with stone/gravel, providing attenuation, conveyance and treatment (via filtration).	Yes	Proposed inclusion of both swales and conventional pipe system. Filter drains considered a non-requirement for water conveyance.
Swales	A vegetated channel is used to convey and treat runoff (via filtration). These can be 'wet' where water is designed to remain permanently at the base of the swale or 'dry' where water is only present in the channel after rainfall events, It can be lined, or unlined to allow infiltration.	Yes	Easily integrated into landscaping and maintenance can be incorporated into general landscaping management. Pollution and blockages are visible and easily dealt with.

Bio retention systems	A shallow landscaped depression allows for runoff to pond temporarily on the surface, before filtering through the vegetation and underlying soils prior to collection or infiltration. In the simplest form it is often referred to as a rain garden. Engineered soils (gravel and sand layers) and enhanced vegetation can be used to improve treatment performance.	Yes	Land availability and suitable ground conditions allow for small bio retention systems within the proposed built development.
Trees	Trees can be planted within a range of infiltration SuDS components to improve their performance, as root growth and decomposition increase soil infiltration capacity. Alternatively they can be used as standalone features within soil-filled tree pits, tree planters or structural soils collecting and storing runoff and providing treatment.	Yes	As part of the proposed master planning trees will be incorporated into the built development and SUDS area. He details of which will be confirmed at the detailed design stage.
Pervious pavements	Runoff is allowed to soak through structural paving. This can be paving blocks with gaps between solid blocks, or porous paving where water filters through the block itself. Water can be stored in the sub-base and potentially allowed to infiltrate into the ground.	Yes	Can be used where infiltration is not desirable, or where soil integrity may be compromised. The use of pervious surfaces will allow for reduced peak flows to watercourses, reducing the risk of flooding downstream. In turn this reduces the effects of pollution in runoff on the environment. They can be used in high density developments with a range of surface finishes that accept surface waters over their area of use.
Attenuation storage tanks	Large, below ground voided spaces can be used to temporarily store runoff before infiltration, controlled release or use. The storage structure is often constructed using geocellular or other modular storage systems, concrete tanks or oversized pipes.	No	Due to the available space and ground conditions, these are not considered necessary. Therefore more viable SUDS have been selected.
Detention basins	During a rainfall event, runoff drains to a landscaped depression with an outlet that restricts flows, so that the basin fills and provides attenuation. Generally basins are dry, except during and immediately following the rainfall events. If vegetated, runoff will be treated as it is conveyed and filtered across the base of the basin.	Yes	These are able to cater for a wide range of rainfall events and if lined can also be used where groundwater is vulnerable
Ponds and wetlands	Features with a permanent pool of water can be used to provide both attenuation and treatment runoff. Where outflows are controlled and water levels are allowed to increase following rainfall. They can support emergent and submerged vegetation along their shoreline and in shallow, marshy zones, which enhances treatment processes and biodiversity.	Yes	Permanent wet features can be designed into the SuDS features and will be further outlined within the Reserved Matters.

Table 6-1: Table 1.1 Type of SuDS components

6.15 Taking into consideration the existing underlying ground conditions on site and infiltration limitation the following two potential options are considered to be the most practical. However further detailed ground investigations may be undertaken to confirm the suitability of other measures, once at the detailed design stage.

Filter Strips

6.16 Filter strips have been used in the drainage of highways alike for many years. The absence of traditional pipe work in such a system frees the drainage design to employ shallow gradients on both channels and drains, which in turn also act as a means of passive treatment to improve water quality.

6.17 The detailed design of highways could potentially include filter drains, subject to approval by the Highways Authority. Alternatively, filter strips can be used to collect flows from areas such a group of house. **Figure 6-2** shows an example of a filter strip in a road corridor.

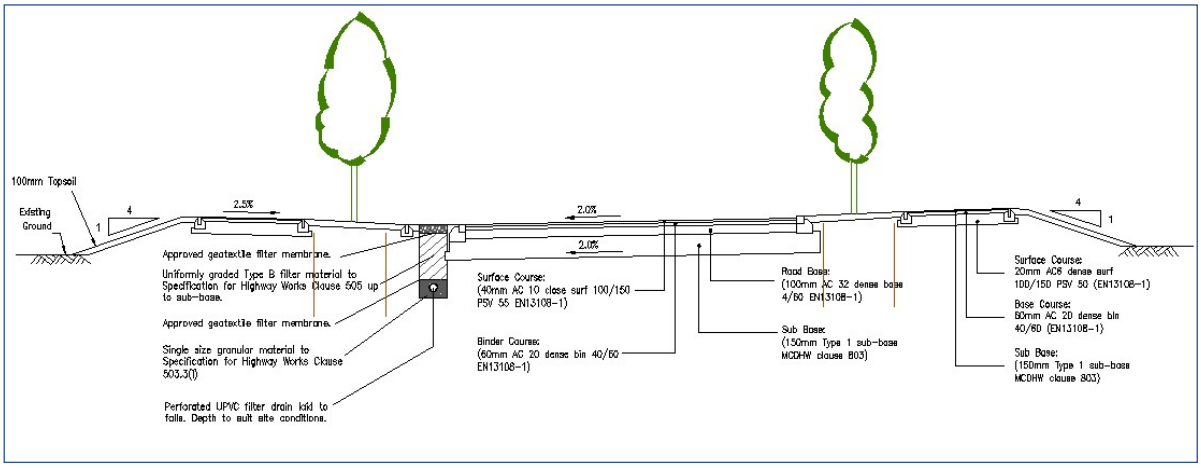


Figure 6-2: Filter Strips

Ditches

6.18 Ditches may be used along highways and in common areas to infiltrate, attenuate and convey flows from hard surfaces across the development before being discharged in to the secondary system. Linear features, such as ditches and filter strips provide an efficient means of improving water quality.

Swales

6.19 While swales implemented at development parcel level can be very land hungry, costly to maintain and provide difficulties with frontage access, the opportunity potentially exists to implement a swale on the eastern boundary of the site, through the development. Green space being incorporated along the highways could be designed to allow 'over the edge' flows to be directed into the swale for infiltration, attenuation and conveyance. A typical highway swale is show in **Figure 6-3**:

Figure 6-3: Swale along road corridor

Permeable Paving

6.20 Permeable Paving can act as a receptor for surface water run-off from nearby commercial buildings and house roofs. However, the system is perhaps best suited to manage parking areas and shared surfaces where block paving is typically used as the surface treatment and ongoing maintenance can be ensured by way of a management company or the like.

6.21 There is little need for underground pipes or gullies, and the attenuation afforded within the sub-base layer helps to reduce the volume of storage required elsewhere.

Figure 6-4: Filter Strip along highway

Attenuation Basins

6.22 Attenuation drainage systems collect partially treated excess water from the primary source control systems at a local level, thereafter providing both flow and water quality attenuation and flow conveyance through the Site towards the main outfall.

6.23 It is anticipated that two basins will be utilised and designed to primarily be dry with permanently wet low flow channels to convey run-off in periods of low rainfall, which will in turn provide the passive treatment benefits offered within the remainder of the surface water management network.

6.24 The primary aims of the basin will therefore be:

- Final flow and water quality conditioning
- Provide landscaping, amenity and ecological benefits

SuDS in the Built Development

6.25 A series of small linear basins (bio retention systems) are proposed within the build environment. These are very effective in removing urban pollutants and can reduce the volume and rate of runoff being conveyed to the overall site wide SUDS basin.

6.26 The SuDS for any given phase will be constructed prior to occupation of the same phase. This principal of SuDS delivery will be carried forward throughout all proposed development phases. The specific details of each phase will be managed through Reserved Matters applications and will be subject to the approval of the LLFA. The surety of appropriate delivery of drainage features per phase can be delivered through Planning Condition(s) linked to this Planning Application.

6.27 The following SuDS guidance is for West Berkshire is as followed:

"Developers and property owners deliver SuDS which

- Are appropriate to the local area and its hydrology;
- Deliver social, environmental and financial benefits;
- Aim to meet a range of sustainability and place-making objectives;
- Are clearly presented at planning stage, enabling an efficient review and approval process; and
- Have clear responsibilities for future maintenance and management."

6.28 It has been assumed that the functionality of the storm water management system would be ensured by ongoing maintenance, completed by West Berkshire Council, Thames Water, or a private maintenance company as appropriate. Through Reserved Matters, the Applicant shall determine the most sustainable and viable of these options.

Proposed Drainage Strategy

6.29 Surface water from the new development will be managed by appropriate use of SUDs techniques, as previously discussed, minimising the use of externally sourced water and promoting biodiversity. The existing network of streams and ponds will be retained within the development.

6.30 The SUDS system features, which will be present in the verges along the main road, have been designed as an integrated network within the Country Park and the development area. They will be developed through each

phase. The Conveyance features such as the swales will route stormwater to the detention basins for further attenuation and storage at the naturally occurring low areas of the site. In addition to this, open features may include water butts, grey water recycling and permeable paving in driveways, potential for green roofs in non-residential buildings.

Construction Phase – Water, Geology and Soil Management

6.31 The following outlines the high-level strategy that will be adopted for the construction process. It is noted that the formal, detailed strategy for the construction phase will be addressed by the Construction and Environmental Management Plan, which will follow from consent of this outline Planning Application.

Management Plan

6.32 All work is to be carried out mindful of NPPF and current guidance.

6.33 Two potential construction phase environmental effects have been identified relating to hydrogeology and hydrology. These mechanisms are as follows:

- Direct and indirect contamination of surface water due to mobilisation of soils, contamination and spillage of oils and the like from construction plant.
- Direct and indirect flooding and changes to baseline drainage hydrology due to disturbance of the ground during construction works.

6.34 The discharge of suspended solids to watercourses and ground waters will be avoided by prohibiting any temporary construction discharge without the prior approval of the Environment Agency. Discharges of waters resulting from construction activities will generally be directed to foul sewers, subject to approval of the drainage authority.

6.35 There is the potential for fuel oil spillage from stored materials supplying site plant, this potential impact will be controlled by storing such materials within bunded tanks located within the site compounds. The works will be completed in a manner that is consistent with the need to protect the surface and ground water quality environment.

6.36 All hazardous liquids and chemicals are to be stored and utilised in accordance with COSHH regulations.

6.37 It will be incumbent on the Main Contractor to assess working practice related risks and effects before implementation and control such by employing industry good practice techniques.

Emergency Environmental Procedures

6.38 The Main Contractor will be required to develop emergency spillage, flood, fire and contamination control procedures such that any inadvertent incidents are immediately controlled to minimise the potential impact. All works will be completed in accordance with the Environment Agency documents, PPG 6 Working at Construction and Demolition Sites and PPG21 Pollution Incident Response Planning together with current best practice measures for the management of construction activities.

Monitoring Proposals

6.39 The Main Contractor's Environmental Manager will carry out an assessment of the Project's environmental performance, based on reports from the environmental specialists and site inspections. This will be carried out at a frequency at no greater than monthly intervals but could be held more regularly depending on the nature of the construction activity. An assessment of the performance over the month would be made and quantified.

6.40 A monthly report detailing performance for the period will be provided to the Project Manager and will include a summary of environmental inspections completed, audits undertaken, complaints and incidents.

6.41 The Environmental Manager will as necessary provide details to the project delivery team, and also to the relevant statutory environmental agencies or local authorities if required.

6.42 Monitoring of agreed environmental determinants will be carried out in accordance with the specialist environmental procedures and environmental commitments made. The Environmental Manager will maintain a register of all environmental monitoring, which is to be retained on site for review.

6.43 The Environmental Manager will inform the Main Contractor of any work areas that are to be covered by environmental monitoring.

Site Investigation Works

6.44 Infiltration testing, to BRE365, was completed by GEG in November 2014 with seventeen trial pits completed across the site.

6.45 The infiltration tests undertaken recorded little or no infiltration.

6.46 The testing and reports reveal that "*groundwater was not encountered in any of the trial pits during the intrusive investigation.*"

6.47 The trial pits were dug between a depth of 1.25m bgl and 3.7m bgl across the site. The proposed SuDS features have not been designed to a depth deeper than 1.5m bg, therefore, any proposed SuDS will not impact groundwater across the site.

6.48 Any works completed on site supersedes indicative mapping produced by the council.

Drainage Design Criteria

6.49 Preliminary assessment of the requirements for storm drainage have been based on the criteria in **Table 6-2**.

Criteria	Measure/Rate/Factor
Application Site Area	114.00 ha
Developed Area	29.49 ha
Impermeability - Residential	0.55
Impermeability - Commercial	0.85
Impermeability - Education	0.45
Sewer design return period(2)	1 in 1 year
Sewer flood protection(2)	1 in 30 years
Fluvial / Development flood protection (1)	1 in 100 years
M5-60(3)	19.4mm
Ratio r (2)	0.350
Minimum cover to sewers (1)	1.2 m
Minimum velocity (1)	1.0 m/sec
Pipe ks value (1)	0.6 mm
Allowance for climate change (4)	40%

Table 6-2: Drainage Design Criteria

Detention Basins

6.50 National policy[1] requires that new developments control the peak discharge of storm water from a site to the baseline, undeveloped, site conditions. Over very large development areas, the baseline rate of run-off is normally estimated using the FEH methodologies. However, Paragraph 3.1.2 of the FEH guidance states:

6.51 "The frequency estimation procedures can be used on any catchment, gauged or ungauged, that drains an area of at least 0.5km^2. The flood estimation procedures can be applied on smaller catchments only where the catchment is gauged and offers simple flood peak or flood event data".

6.52 On undeveloped and ungauged catchments of less than 0.5km^2 in area, it is correct to complete baseline site discharge assessments using the nationally accepted IoH124 methodology for small rural catchments. Local policy is to employ IoH124 in a manner set out by CIRIA C697. This methodology requires that, for catchments of less than 50ha, the IoH assessment is completed for a 50ha area with the results linearly interpolated to determine the flow rate value based on the ratio of the development to 50ha.

6.53 The baseline IoH run-off rates are shown on **Table 6-3** below:

[2] Design and Construction Guidance for Foul and Surface Water Sewers
[3] Wallingford Report
[4] NPPF requirements for residential development

Event	IoH 124 (50ha)	IoH 124 Scaled to 1ha
1 in 1 year (l/s)	218.3	4.37
Qbar (l/s)	256.8	5.14
1 in 100 year (l/s)	819.2	16.38

Table 6-3: IoH124 baseline discharge rates

6.54 In order to determine the permitted rates of run-off from the development, the future impermeable catchment areas must be derived. This has been based on a BCL measured ratio from previous projects. Calculations below show these ratios and areas and how these correlate to the rates of discharge.

6.55 The calculations for this are shown in **Table 6-4** below:

Catchment	Land Use	Developable Area (ha)	Impermeable Area (ha)	Existing 100 Year Run-off (l/s)	Proposed 100 Year Run-off (l/s)
A	Residential /Commercial/ School	13.80	7.76	127.12	39.85
B	Residential / School	8.85	4.65	76.26	23.91
C	Residential	6.84	3.76	61.64	19.32
		29.49	16.17	259.02	83.08

Table 6-4: Run-off calculation

6.56 In accordance with the SFRA document and NPPF guidance, it is proposed to implement a drainage strategy that provides attenuation of peak storm water discharges from the developed land to the baseline rate determined using IoH124 methodology.

6.57 In order to mitigate for the increased volume of run-off associated with built development, peak flows in the 1 in 100-year event must be attenuated to the mean annual flow (Qbar).

6.58 Using these methods, development at the site will comply with the requirements set out in paragraph 9 of the Technical Guide to the National Planning Policy Framework (NPPF), with the discharge of surface water from the proposed developments not exceeding that of the existing greenfield sites, thus ensuring that there is no material increase in the flood risk to surrounding areas.

6.59 Assessments have thereafter been completed to determine the characteristics of proposed SUDS features to be situated within the development. Best practice methods have been employed by performing detention routing calculations for the 1 in 100-year inlet and outlet return periods using the WinDES Source Control module. The summary calculations are contained in the Appendix.

Catchment A

6.60 Calculations demonstrate that storm water detention storage of 6,001m^3 will be required to attenuate storm water discharges from the site during the critical 1 in 100-year event storm. This will limit the peak discharges to 39.85 l/s, being equivalent to the mean annual storm (Qbar), estimated by the IoH124 calculations above, representing 69% reduction on peak Greenfield rates. **Table 6-5** summarises the overall detention requirements. The summary calculations are contained within the Appendix.

Catchment Area (ha)	Impermeable Area (ha)	1 in 100 Year Run-off (l/s)	Detention Volume for 1 in 100 Year Event (m^3)	Detention Volume (m^3)	SuDS Type
13.80	7.76	127.12	39.85	6,0001	Detention Basin

Table 6-5: Summary run-off & detention assessment output

Catchment B

6.61 Calculations demonstrate that storm water detention storage of 3,582m^3 will be required to attenuate storm water discharges from the site during the critical 1 in 100-year event storm. This will limit the peak discharges to 23.91 l/s, being equivalent to the mean annual storm (Qbar), estimated by the IoH124 calculations above, representing 69% reduction on peak Greenfield rates. **Table 6-6** summarises the overall detention requirements. The summary calculations are contained within the Appendix.

Catchment Area (ha)	Impermeable Area (ha)	1 in 100 Year Run-off (l/s)	Detention Volume for 1 in 100 Year Event (m^3)	Detention Volume (m^3)	SuDS Type
8.85	4.65	76.26	23.91	3,582	Detention Basin

Table 6-6: Summary run-off & detention assessment output

Catchment C

6.62 Calculations demonstrate that storm water detention storage of 2,900m^3 will be required to attenuate storm water discharges from the site during the critical 1 in 100-year event storm. This will limit the peak discharges to 19.32 l/s, being equivalent to the mean annual storm (Qbar), estimated by the IoH124 calculations above, representing 69% reduction on peak Greenfield rates. **Table 6-7** summarises the overall detention requirements. The summary calculations are contained within the Appendix.

Catchment Area (ha)	Impermeable Area (ha)	1 in 100 Year Run-off (l/s)	Detention Volume for 1 in 100 Year Event (m^3)	Detention Volume (m^3)	SuDS Type
6.84	3.76	61.64	19.32	2,900	Detention Basin

Table 6-7: Summary run-off & detention assessment output.

6.63 An orifice will be provided on the detention features, at a level above the 1 in 100 year + 40% flood level to allow more extreme event flows to safely be conveyed away from properties, while at the same time not increasing flood risk to surrounding areas, in line with current good practice recommendations. The detailed

design stage will provide further detail into the positioning of overflows and direction of flow.

6.64 A conceptual layout for the drainage system has been developed to accord with the design requirements. While this FRA informs the general principles of the proposed drainage system, at detailed design stage, each device will be individually designed for the site characteristics developed for this application.

6.65 Furthermore, based on Brookbanks FRA work undertaken to support other, similar development applications, it is recognised and accepted that in addition to the developments strategic attenuation basins, the implementation of source control measures can achieve a minimum 50% betterment in peak run-off from each development parcel, thus should this be a viable option, a further betterment may be achieved.

6.66 The proposed strategic drainage master plan is shown illustratively on **drawing 10309-DR-02 A** contained in the Appendix.

Water Quality

6.67 Impermeable surfaces collect pollutants from a wide variety of sources including cleaning activities, wear from car tyres, vehicle oil and exhaust leaks and general atmospheric deposition (source: CIRIA C609). The implementation of SuDS in development drainage provides a significant benefit in removal of pollutant from development run-off.

6.68 The SuDS Manual C753 describes a 'Simple Index Approach' for assessing the pollution risk of surface run-off to the receiving environment using indices for likely pollution levels for different land uses and SuDS performance capabilities.

6.69 CIRIA document C753 Table 26.2, as shown in **Table 6-8** below, indicates the minimum treatment indices appropriate for contributing pollution hazards for different land use classifications. To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index.

Land Use	Pollution Hazard Level	Total suspended solids	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05

Table 6-8: CIRIA 753 Table 26.2 Pollution Hazard Indices

6.70 For a residential type development, roof water requires a very low treatment of 0.2 for total suspended solids, 0.2 for heavy metals and 0.05 for hydrocarbons, and run-off from low traffic roads such as cul-de-sacs and individual property driveways requires low treatment of 0.5 for total suspended solids, 0.4 for heavy metals and 0.4 for hydrocarbons.

6.71 To provide the correct level of treatment, an assessment needs to be made of the mitigation provided by each SuDS feature. Tables 26.3 and 26.4 of The SuDS Manual CIRIA document C753 shown as **Table 6-9** for discharges to surface waters and groundwater respectively indicate the treatment mitigation indices provided by each SuDS feature.

Type of SuDS component	Total suspended solids (TSS)	Metals	Hydro-carbons
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 6-9: CIRIA 753 Table 26.3 SuDS Mitigation Indices for discharges to surface waters.

6.72 Where more than one mitigation feature is to be used, CIRIA guidance states that the total mitigation index shall be calculated as follows:

Total SuDS mitigation index = Mitigation Index 1 + 0.5 x Mitigation Index 2

6.73 Due to the need to provide wider sustainability benefits and view the development at a strategic level, SuDS will be implemented to passively treat run off from the development so as to have a positive impact on the surrounding natural environment.

6.74 The site will employ SuDS features, such as porous paving, and detention basins. These are widely accepted to be of high pollutant removal efficiency (CIRIA 609). This provides for one stage of treatment onsite. Coupled with this however, the unknown watercourse should also be seen as an additional stage of treatment as the sedimentation process is not limited to artificial drainage systems but is taken from the natural processes observed within the water cycle. This gives 2-3 stages of treatment, providing an extensive system by which to effectively decrease pollutant load within stormwater run-off.

6.75 As the site is not presently served by any means of storm water treatment mechanisms, by providing the afore mentioned SuDS within the proposed development it will be possible to maintain present water quality in the area and thus the development can be seen to be having no significant environmental impact in relation to water.

Implementation Proposals

6.76 The conceptual drainage proposals have been developed in a manner that will allow the site wide system to be designed to encourage passive treatment of discharged flows and to improve the water quality by removing the low-level silts, oils which could be attributed to track/parking area run off of this nature. Final design will provide for appropriate geometry and planting to maximise this benefit.

6.77 The storm water management features will be constructed and operational prior to the first use of the site, derived on a phase-by-phase requirement.

6.78 It has previously been the case that the functionality of the storm water management system would be ensured by ongoing maintenance, completed by the Local Authority, Drainage Authority, or a private maintenance company as appropriate. It is proposed that the maintenance regime as shown in **Table 6-10** will be undertaken by a privately appointed company. It is usual for the following maintenance regime to be implemented:

Regular Maintenance		
1	Litter Management	
1.1	Pick up all litter in SUDS and Landscape areas and remove from	Monthly
2	Landscape Maintenance	
2.1	Mow all grass verges at 35-50mm with 75mm max and remove	As required or monthly
2.2	Mow all SUDS basins and margins to low flow channels at	4-8 visits as required
2.3	Weeding and invasive plant control.	As required or 1 visit
2.4	Tree and shrub maintenance.	As required or once every 2
2.5	Aquatic and shoreline vegetation management.	As required or 1 visit
3	Inlet and Outlet Structures	
3.1	Inspect monthly, remove silt from slab aprons and debris. Strim	Monthly and after every
Regular Maintenance		
4	Proprietary Systems	
4.1	Inspect and clean flow control.	
Occasional Maintenance		
5	Inspection	
5.1	Annual inspection, remove silt and check free flow.	1 visit annually
5.2	Inspection and removal of debris.	Post major storm events
6	Silt Management	
6.1	Inspect basin annually for silt accumulation.	1 visit annually
6.2	Excavate silt, stack and dry, spread, rake and over-seed.	As required
7	Vegetation Management	
7.1	Major vegetation maintenance and watercourse channel works.	Once every 15 - 20 years
Remedial Maintenance		
8	Inspection	
8.1	Structure rehabilitation/repair	As required after annual

Table 6-10: Framework maintenance of detention / retention system

6.79 The conceptual drainage masterplan proposals outlined in this report are indicative and will be subject to final drainage design and detailing. The storm water management system will be constructed before the start of any construction work and will be carried forward on a Phase by Phase basis. The specific details of each phase will be managed through Reserved Matters applications and will be subject to the approval of the LLFA. The surety of appropriate delivery of drainage features per phase can be delivered through Planning Condition(s) linked to this Planning Application.

Summary

6.80 A strategy for storm drainage at the site has been developed to meet both national and local policy. The above options outline the viability of the site to employ means of drainage to comply with NPPF guidance, together with the West Berkshire Council SFRA and other national and local guidance.

6.81 The development drainage system will manage storm water by way of a SUDS management train and ensure peak discharges from the developed land are reduced to circa 69% below the appraised baseline rates. The system will also provide improvements to the quality of water discharged from the development.

Objectives

6.82 The key objectives for the site drainage will be:

- Implementation of a sustainable drainage scheme in accordance with current national and local policy together with principles of good practice design.
- Control of peak discharges from the site to a rate commensurate with the baseline conditions.
- Development of storm water management proposals that maintain water quality and biodiversity of the site.
- Implementation of the storm water management system prior to first use of the site.

7 Hydrology Appraisal of Proposed Valley Crossing

7.1 The development team have designed a roadway and valley crossing which spans the Country Park open space situated to the west of the development. The valley crossing will span over an ordinary watercourse which serves as one of many existing and natural storm water conveyance systems within the development extents.

7.2 It is critical to note that the proposed valley crossing location is sited at a position of the ordinary watercourse upstream of any development outfall connection. Therefore, only the baseflow of storm water from the catchment upstream of the valley crossing needs to be assessed to determine if there is any impact on the valley crossing structure atop the watercourse.

7.3 In order to present a robust assessment, peak flows from the ordinary watercourse were determined for 1 in 100 year, 1 in 100 year + 40% climate change (cc) and 1 in 1000 year storm event using the REFH2 (Revitalised Flood Hydrograph) method with catchment data obtained from FEH online. The following results were generated:

- For the 1 in 100 year the catchment has a baseflow of BFO (m^3/s) of 0.04 with a peak flow of 1.49 m^3/s.
- For the 1 in 100 + 40% cc year the catchment has a baseflow of BFO (m^3/s) of 0.04 with a peak flow of 2.09 m^3/s.
- For the 1 in 1000 year the catchment has a baseflow of BFO (m^3/s) of 0.04 with a peak flow of 2.47 m^3/s.

7.4 The cross section of the watercourse at the location of the valley crossing has been assessed utilising survey data and OS digital mapping. The cross section of the watercourse can support a flow of 5.97 m^3/s before the existing banks would overtop.

7.5 Furthermore, the area of the proposed culvert beneath the valley crossing has been measured using accurate digital mapping tools, and the cross section proposed would be able to accommodate a flow of 11.60 m^3/s.

7.6 In addition, the proposed emergency access and cycleway route goes through Flood Zone 1; therefore, there is no drainage or flood risk issues associated with the emergency access and cycleway route.

7.7 Therefore, the culvert has a significantly robust factor of safety which can comfortably accommodate a 1 in 1000-year storm flow without overtopping the culvert.

Summary

7.8 The proposed roadway, valley crossing, and culvert can be supported from a hydraulic perspective.

7.9 Peak storm flow conditions were modelled, with all falling comfortably below the possible threshold of what can pass through the culvert without overtopping/flooding.

8 Foul Drainage

Background

8.1 A copy of the Thames Water sewerage network records has been obtained to confirm adopted foul sewers service the existing residential development areas to the east, north and west of the site.

Design Criteria / Network Requirements

8.2 Peak design discharges have been calculated based on the current development criteria as described in Section 2 of this report and for the following:

Domestic peak **=** ***4,000 litres / dwelling / day (peak)***

8.3 Assessed in accordance with the Design and Construction Guidance for Foul and Surface Water Sewers requirements, the development will have a design peak discharge of approximately 44.1/s.

Network Requirements / Options

8.4 Thames Water have completed a detailed Sewer Impact Study (copy provided within the Appendix) for the development, which at the time of consultation was based on a larger site quantum (2,000 new residential properties, 2,850m^2 of commercial space, two schools with a total of 1,108 pupils and an 80 bed care home). Thames water undertook the assessment using a pumped rate of 44.1l/s.

8.5 As outlined within Section 2, the Thames Water study represents a worst-case impact onto the existing sewer from the combined Sandleford Park development and the Sandleford Park West development.

8.6 The hydraulic model indicates that the existing foul network does not have available capacity downstream of the proposed development. As such, Thames Water have developed a solution to mitigate the predicted detriment following the connection of the proposed developments.

8.7 One indicative option has been developed by Thames Water to prevent the detrimental impact on the existing system. This option has been developed during a preliminary desktop investigation, using the hydraulic model only. The solution identified is intended to indicate the likely extent and magnitude and the network enhancement required to mitigate the predicted detriment. Following the latest publication of Ofwat's new charging rules in August 2017, the following changes will apply from April 2018: "all offsite network reinforcement costs will no longer be charged directly to a developer in their connection charges".

8.8 Following a change in legislation and OFWAT's guidance, which becomes enforceable from 1st April 2018, Thames Water will be responsible for all sewer upgrade works required to enable development works to take place. This means the previously developer funded upgrades on the adopting Water Authority's network is removed and is placed on the Water Authority itself.

8.9 Due to the size of the proposed development Thames Water require 2 permanent depth loggers to be installed to monitor the flows at the downstream point of the development site and at the proposed connection point.

8.10 Based on this Planning Application, plus the addition of Sandleford Park West, this Thames Water assessment provides a mitigation solution which is over and above that which will be required. Therefore, the Thames Water assessment is considered sufficiently robust for the purposes of Outline validation.

8.11 The onsite strategy for foul water comprises a series of new sewers which will service each phase of development and link to one another via strategic Trunk sewers. As the offsite connection point is proposed as being on London Road, which is higher in level than the site, a series of pumping stations will be required to convey foul water from the site to the connection point.

8.12 Sandleford Park West can be serviced in the same manner via new onsite foul sewers plus pumping regime. It is to be confirmed by Thames Water whether the connection point offsite for Sandleford Park West will be via:

a) a connection to Sandleford Park foul network (to the east of NWF), or

b) an independent connection out to a manhole in Warren Road (to the north of NWF) which will subsequently connect to Andover Road (to the west of NWF).

8.13 The Thames Water Sewer Impact Study, which considers a higher quantum than what is required for the Sandleford Park development alone, offers a solution which would therefore potentially accommodate the foul flows from the NWF development. However, the NWF development would be responsible for seeking approval from Thames Water for their choice of foul water drainage strategy.

8.14 Consultation with Thames Water is currently ongoing to establish and confirm the most feasible solution for Sandleford Park development.

Treatment Requirements

8.15 Discussions with Thames Water have confirmed that the proposed development will ultimately discharge to Newbury Sewerage Treatment Works.

8.16 Water companies have a statutory obligation through the Water Industry Act 1991, 2003 et al, to provide capital investment in strategic treatment infrastructure to meet development growth. This investment planning is managed and regulated by OFWAT through the Asset Management Plan (AMP) process. The five yearly cyclical process requires that water companies allocate finances to a range of strategic projects to meet their statutory obligations.

8.17 Where development programming requirements necessitate the reinforcement of facilities ahead of allocation in an AMP period, mechanisms are available to ensure the infrastructure can be delivered in a timely fashion, to meet the development programme.

Implementation Proposals

8.18 The proposed drainage network across the site will be designed to the current Design and Construction Guidance for Foul and Surface Water Sewers Standards, employing a point of connection agreed with Thames Water. The system will be offered for the adoption of Thames Water under S104 of the Water Industry Act 1991.

Summary

8.19 site drainage strategy with offsite connection has been developed that will meet with current regulatory requirements by discharging drainage to a sewerage network with improved capacity to accommodate the flows. This will be confirmed following conclusion of the consultation with Thames Water.

8.20 Once development is complete, the network conveying flows from the site will be adopted by Thames Water and be maintained as part of their statutory duties.

Objectives

8.21 The key development objectives required for the site drainage scheme are:

- Implementation of a drainage scheme to convey water to the local Thames Water network which is designed and maintained to an appropriate standard.

9 Summary

9.1 This FRA has identified no prohibitive engineering constraints in developing the proposed site for the proposed residential usage.

9.2 Assessment of fluvial flood risk shows the land, post development, to lie in Flood Zone 1 and hence be a preferable location for residential development when considered in the context of the NPPF Sequential Test. Assessment of other potential flooding mechanisms shows the land to have a low probability of flooding from overland flow, ground water and sewer flooding.

9.3 Means to discharge storm and foul water drainage have been established that comply with current guidance and requirements of the Water Authority.

9.4 Storm water discharged from development will be disposed of by way of SUDS measures to the existing watercourses within the site. Foul water will discharge to the existing network offsite, following improvement works established by Thames Water.

9.5 The site is fully able to comply with NPPF guidance together with associated local and national policy guidance.

10 Limitations

10.1 The conclusions and recommendations contained herein are limited to those given the general availability of background information and the planned usage of the site.

10.2 Third party information has been used in the preparation of this report, which Brookbanks, by necessity assumes is correct at the time of writing. While all reasonable checks have been made on data sources and the accuracy of data, Brookbanks accepts no liability for same.

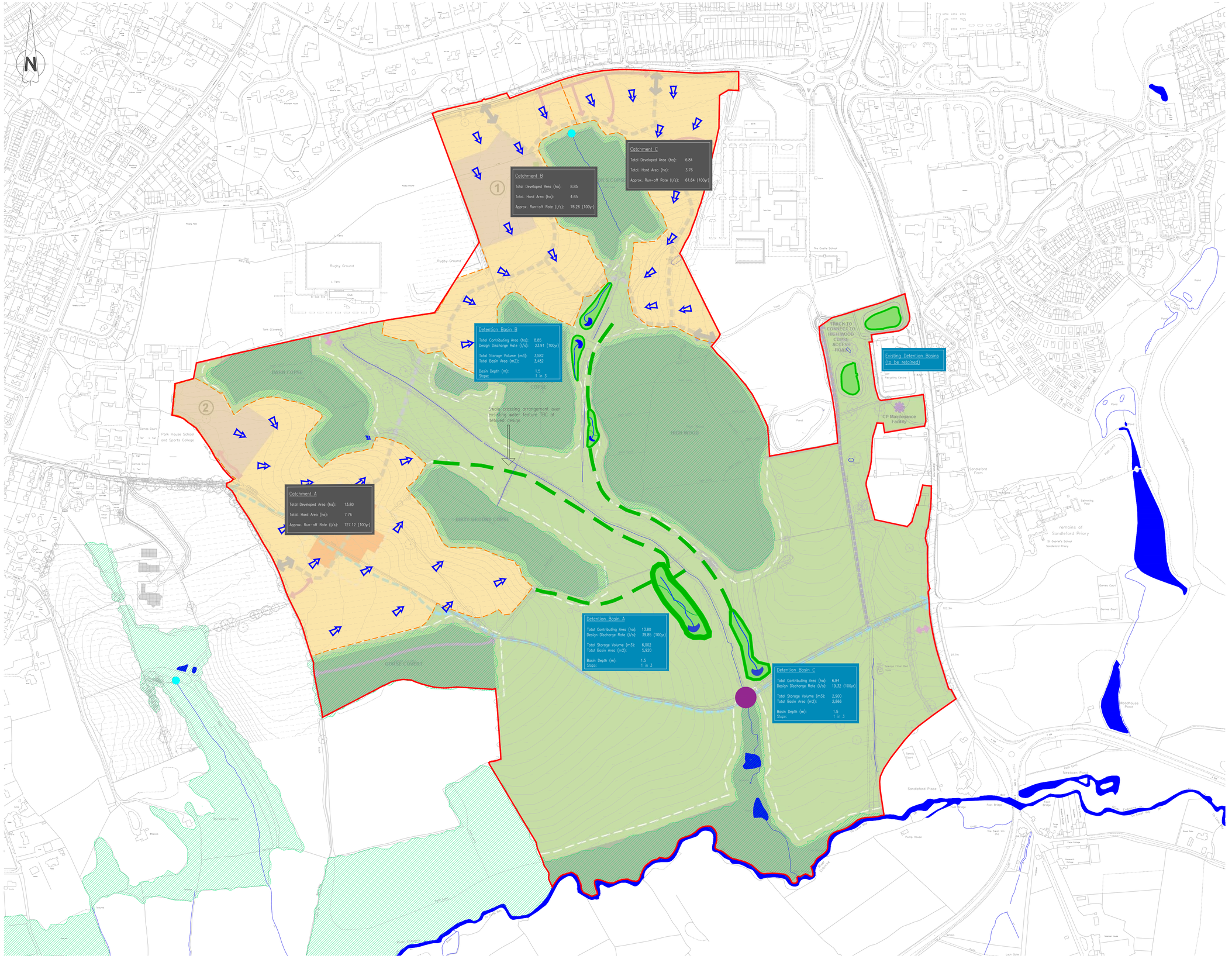
10.3 The benefits of this report are provided solely to Bloor Homes Ltd & Sandleford Farm Partnership for the proposed development land at Sandleford Park, Newbury only.

10.4 Brookbanks excludes third party rights for the information contained in the report.

Appendix A

Conceptual Site Drainage Plan

Original Drawing Size A1



Construction Design and Management (CDM) Key Residual Risks

Contractors entering the site should gain permission from the relevant land owners and/or principle contractor working on site at the time of entry. Contractors shall be responsible for carrying out their own risk assessments and for liaising with the relevant services companies and authorities. Listed below are Site Specific key risks associated with the project.

1) Overhead and underground services
2) Street Lighting Cables
3) Working adjacent to water courses and flood plain
4) Soft ground conditions
5) Working adjacent to live highways and railway line
6) Unchartered services
7) Existing buildings with potential asbestos hazards

NOTES:

1. **Do not scale from this drawing**
2. All dimensions are in metres unless otherwise stated.
3. Brookbanks Consulting Ltd has prepared this drawing for the sole use of the client. The drawing may not be relied upon by any other party without the express agreement of the client and Brookbanks Consulting Ltd. Where any data supplied by the client or from other sources has been used, it has been assumed that the information is correct. No responsibility can be accepted by Brookbanks Consulting Ltd for inaccuracies in the data supplied by any other party. The drawing has been produced based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.
4. No part of this drawing may be copied or duplicated without the express permission of Brookbanks Consulting.

KEY:

- Site Boundary
- Catchment Areas
- Illustrative SuDS Location
- Proposed Conveyance Channel
- Existing Surface Water Flow Direction (proposed drainage to be piped under the parcels and into the the proposed SuDS system in the open space)
- Existing Woodland
- Existing Watercourse
- Proposed outfall
- Spring

A	Additional Information Provided	KM LW	LW 23.09.20
-	First Issue	KM SO	LW 12.12.18

BROOKBANKS

6150 Knights Court, Solihull Parkway, Birmingham, B37 7WY
T +44 (0)121 329 4330 E mail@brookbanks.com
W brookbanks.com

Bloor Homes Ltd &
Sandleford Park Partnership

Land at Sandleford Park
Newbury

Illustrative Surface Water Drainage Strategy

Status		Status Date
Information		SEP 2020
Drawn	**Checked**	**Date**
KM	LW	12.12.18
Scale	**Number**	**Rev**
NTS	10309 DR-02	A

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR COMMENCE SITE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT HIS OWN RISK.

Appendix B

IoH Greenfield Runoff Rates
WinDES Detention Routing Calculations

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	50.000	Urban	0.000
SAAR (mm)	800	Region Number	Region 6

Results	**l/s**
QBAR Rural	256.8
QBAR Urban	256.8
Q100 years	819.2
Q1 year	218.3
Q2 years	226.2
Q5 years	328.7
Q10 years	416.0
Q20 years	514.4
Q25 years	551.6
Q30 years	582.0
Q50 years	672.8
Q100 years	819.2
Q200 years	963.0
Q250 years	1009.2
Q1000 years	1325.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.392	0.392	21.4	1837.3	O K
30 min Summer	0.520	0.520	25.2	2460.3	O K
60 min Summer	0.655	0.655	28.7	3131.3	O K
120 min Summer	0.791	0.791	31.9	3819.5	O K
180 min Summer	0.865	0.865	33.5	4200.3	O K
240 min Summer	0.911	0.911	34.4	4442.9	O K
360 min Summer	0.974	0.974	35.7	4769.5	O K
480 min Summer	1.013	1.013	36.4	4973.5	O K
600 min Summer	1.037	1.037	36.9	5104.4	O K
720 min Summer	1.053	1.053	37.2	5187.2	O K
960 min Summer	1.066	1.066	37.5	5259.3	O K
1440 min Summer	1.073	1.073	37.6	5293.1	O K
2160 min Summer	1.067	1.067	37.5	5261.9	O K
2880 min Summer	1.050	1.050	37.2	5171.2	O K
4320 min Summer	1.000	1.000	36.2	4908.9	O K
5760 min Summer	0.945	0.945	35.1	4616.5	O K
7200 min Summer	0.890	0.890	34.0	4334.2	O K
8640 min Summer	0.841	0.841	33.0	4077.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	127.517	0.0	1266.5	27
30 min Summer	85.701	0.0	1637.2	41
60 min Summer	54.957	0.0	2785.4	70
120 min Summer	34.010	0.0	3410.1	130
180 min Summer	25.295	0.0	3753.1	188
240 min Summer	20.351	0.0	3969.8	248
360 min Summer	14.971	0.0	4250.6	366
480 min Summer	12.028	0.0	4428.4	486
600 min Summer	10.141	0.0	4548.5	604
720 min Summer	8.817	0.0	4630.9	722
960 min Summer	7.063	0.0	4720.3	952
1440 min Summer	5.157	0.0	4716.3	1162
2160 min Summer	3.757	0.0	7434.3	1544
2880 min Summer	2.997	0.0	7757.1	1960
4320 min Summer	2.176	0.0	7775.7	2772
5760 min Summer	1.731	0.0	9541.7	3584
7200 min Summer	1.449	0.0	9961.4	4400
8640 min Summer	1.255	0.0	10305.3	5192

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.795	0.795	32.0	3840.4	O K
15 min Winter	0.437	0.437	22.8	2058.4	O K
30 min Winter	0.580	0.580	26.8	2757.6	O K
60 min Winter	0.730	0.730	30.5	3511.3	O K
120 min Winter	0.881	0.881	33.8	4286.6	O K
180 min Winter	0.964	0.964	35.5	4718.8	O K
240 min Winter	1.017	1.017	36.5	4995.7	O K
360 min Winter	1.088	1.088	37.9	5373.0	O K
480 min Winter	1.133	1.133	38.7	5613.6	O K
600 min Winter	1.162	1.162	39.2	5773.1	O K
720 min Winter	1.182	1.182	39.6	5879.6	O K
960 min Winter	1.203	1.203	39.9	5992.0	Flood Risk
1440 min Winter	1.205	1.205	40.0	6001.2	Flood Risk
2160 min Winter	1.191	1.191	39.7	5925.1	O K
2880 min Winter	1.162	1.162	39.2	5770.0	O K
4320 min Winter	1.085	1.085	37.8	5356.6	O K
5760 min Winter	1.002	1.002	36.2	4920.1	O K
7200 min Winter	0.924	0.924	34.7	4508.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.111	0.0	10550.8	5952
15 min Winter	127.517	0.0	1408.9	27
30 min Winter	85.701	0.0	1779.9	41
60 min Winter	54.957	0.0	3110.3	70
120 min Winter	34.010	0.0	3780.0	128
180 min Winter	25.295	0.0	4131.4	186
240 min Winter	20.351	0.0	4344.5	244
360 min Winter	14.971	0.0	4629.5	360
480 min Winter	12.028	0.0	4811.7	476
600 min Winter	10.141	0.0	4933.8	590
720 min Winter	8.817	0.0	5016.4	704
960 min Winter	7.063	0.0	5103.3	924
1440 min Winter	5.157	0.0	5087.8	1326
2160 min Winter	3.757	0.0	8278.2	1648
2880 min Winter	2.997	0.0	8578.4	2108
4320 min Winter	2.176	0.0	8500.0	2992
5760 min Winter	1.731	0.0	10693.1	3864
7200 min Winter	1.449	0.0	11162.2	4688

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.853	0.853	33.2	4141.7	O K
10080 min Winter	0.789	0.789	31.9	3811.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.255	0.0	11544.6	5528
10080 min Winter	1.111	0.0	11809.1	6272

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 7.760

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	2.587	4	8	2.587	8	12	2.587

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4552.4	0.400	4833.5	0.800	5123.1	1.200	5421.1
0.100	4621.9	0.500	4905.1	0.900	5196.8	1.300	5496.9
0.200	4691.9	0.600	4977.3	1.000	5271.0	1.400	5573.2
0.300	4762.4	0.700	5049.9	1.100	5345.8	1.500	5650.1

Orifice Outflow Control

Diameter (m) 0.134 Discharge Coefficient 0.600 Invert Level (m) 0.000

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.400	0.400	13.1	1100.3	O K
30 min Summer	0.529	0.529	15.3	1473.5	O K
60 min Summer	0.665	0.665	17.3	1875.0	O K
120 min Summer	0.800	0.800	19.2	2286.2	O K
180 min Summer	0.873	0.873	20.1	2513.3	O K
240 min Summer	0.919	0.919	20.6	2657.7	O K
360 min Summer	0.981	0.981	21.3	2851.6	O K
480 min Summer	1.019	1.019	21.8	2972.3	O K
600 min Summer	1.043	1.043	22.0	3049.3	O K
720 min Summer	1.058	1.058	22.2	3097.5	O K
960 min Summer	1.070	1.070	22.4	3138.3	O K
1440 min Summer	1.075	1.075	22.4	3152.9	O K
2160 min Summer	1.067	1.067	22.3	3127.1	O K
2880 min Summer	1.048	1.048	22.1	3067.3	O K
4320 min Summer	0.997	0.997	21.5	2902.1	O K
5760 min Summer	0.940	0.940	20.9	2722.0	O K
7200 min Summer	0.885	0.885	20.2	2550.5	O K
8640 min Summer	0.835	0.835	19.6	2395.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	127.517	0.0	799.4	27
30 min Summer	85.701	0.0	1002.9	41
60 min Summer	54.957	0.0	1717.7	70
120 min Summer	34.010	0.0	2090.6	130
180 min Summer	25.295	0.0	2288.7	188
240 min Summer	20.351	0.0	2409.7	248
360 min Summer	14.971	0.0	2572.0	366
480 min Summer	12.028	0.0	2676.3	486
600 min Summer	10.141	0.0	2746.7	604
720 min Summer	8.817	0.0	2794.8	722
960 min Summer	7.063	0.0	2846.8	954
1440 min Summer	5.157	0.0	2843.5	1168
2160 min Summer	3.757	0.0	4506.7	1544
2880 min Summer	2.997	0.0	4697.1	1964
4320 min Summer	2.176	0.0	4692.9	2772
5760 min Summer	1.731	0.0	5742.6	3584
7200 min Summer	1.449	0.0	5999.0	4400
8640 min Summer	1.255	0.0	6212.3	5192

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.789	0.789	19.0	2252.6	O K
15 min Winter	0.446	0.446	13.9	1232.9	O K
30 min Winter	0.590	0.590	16.2	1651.6	O K
60 min Winter	0.740	0.740	18.4	2102.8	O K
120 min Winter	0.890	0.890	20.3	2566.5	O K
180 min Winter	0.972	0.972	21.2	2824.6	O K
240 min Winter	1.024	1.024	21.8	2989.7	O K
360 min Winter	1.094	1.094	22.6	3214.3	O K
480 min Winter	1.138	1.138	23.1	3357.2	O K
600 min Winter	1.166	1.166	23.4	3451.6	O K
720 min Winter	1.185	1.185	23.6	3514.3	O K
960 min Winter	1.205	1.205	23.8	3579.8	Flood Risk
1440 min Winter	1.206	1.206	23.8	3581.7	Flood Risk
2160 min Winter	1.190	1.190	23.6	3529.1	O K
2880 min Winter	1.160	1.160	23.3	3431.7	O K
4320 min Winter	1.082	1.082	22.5	3177.1	O K
5760 min Winter	0.999	0.999	21.6	2911.0	O K
7200 min Winter	0.921	0.921	20.6	2661.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.111	0.0	6370.4	5952
15 min Winter	127.517	0.0	878.7	26
30 min Winter	85.701	0.0	1086.2	41
60 min Winter	54.957	0.0	1913.2	70
120 min Winter	34.010	0.0	2305.3	128
180 min Winter	25.295	0.0	2503.1	186
240 min Winter	20.351	0.0	2627.3	244
360 min Winter	14.971	0.0	2794.6	360
480 min Winter	12.028	0.0	2901.2	476
600 min Winter	10.141	0.0	2972.5	590
720 min Winter	8.817	0.0	3020.6	704
960 min Winter	7.063	0.0	3070.7	924
1440 min Winter	5.157	0.0	3060.1	1328
2160 min Winter	3.757	0.0	5010.6	1648
2880 min Winter	2.997	0.0	5174.0	2112
4320 min Winter	2.176	0.0	5120.5	3024
5760 min Winter	1.731	0.0	6433.9	3864
7200 min Winter	1.449	0.0	6720.5	4688

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.850	0.850	19.8	2440.1	O K
10080 min Winter	0.785	0.785	19.0	2241.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.255	0.0	6957.5	5536
10080 min Winter	1.111	0.0	7127.0	6352

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 4.650

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.550	4	8	1.550	8	12	1.550

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2644.8	0.400	2856.7	0.800	3076.8	1.200	3305.0
0.100	2697.0	0.500	2911.0	0.900	3133.1	1.300	3363.4
0.200	2749.7	0.600	2965.7	1.000	3189.9	1.400	3422.2
0.300	2803.0	0.700	3021.0	1.100	3247.2	1.500	3481.6

Orifice Outflow Control

Diameter (m) 0.103 Discharge Coefficient 0.600 Invert Level (m) 0.000

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.403	0.403	10.6	889.7	O K
30 min Summer	0.532	0.532	12.3	1191.4	O K
60 min Summer	0.667	0.667	13.9	1516.0	O K
120 min Summer	0.802	0.802	15.4	1848.6	O K
180 min Summer	0.874	0.874	16.1	2032.2	O K
240 min Summer	0.920	0.920	16.5	2149.1	O K
360 min Summer	0.981	0.981	17.1	2306.0	O K
480 min Summer	1.019	1.019	17.4	2403.9	O K
600 min Summer	1.043	1.043	17.6	2466.5	O K
720 min Summer	1.058	1.058	17.8	2505.9	O K
960 min Summer	1.070	1.070	17.9	2539.6	O K
1440 min Summer	1.074	1.074	17.9	2550.1	O K
2160 min Summer	1.066	1.066	17.8	2528.2	O K
2880 min Summer	1.048	1.048	17.7	2479.4	O K
4320 min Summer	0.996	0.996	17.2	2345.2	O K
5760 min Summer	0.940	0.940	16.7	2199.4	O K
7200 min Summer	0.886	0.886	16.2	2060.6	O K
8640 min Summer	0.836	0.836	15.7	1935.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	127.517	0.0	653.3	27
30 min Summer	85.701	0.0	811.7	41
60 min Summer	54.957	0.0	1399.7	70
120 min Summer	34.010	0.0	1697.4	130
180 min Summer	25.295	0.0	1851.7	188
240 min Summer	20.351	0.0	1946.9	248
360 min Summer	14.971	0.0	2075.5	366
480 min Summer	12.028	0.0	2158.0	486
600 min Summer	10.141	0.0	2213.6	604
720 min Summer	8.817	0.0	2251.4	722
960 min Summer	7.063	0.0	2291.9	958
1440 min Summer	5.157	0.0	2287.8	1174
2160 min Summer	3.757	0.0	3653.0	1556
2880 min Summer	2.997	0.0	3799.5	1964
4320 min Summer	2.176	0.0	3785.7	2776
5760 min Summer	1.731	0.0	4649.3	3592
7200 min Summer	1.449	0.0	4857.8	4400
8640 min Summer	1.255	0.0	5031.8	5192

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.790	0.790	15.2	1819.9	O K
15 min Winter	0.449	0.449	11.2	996.8	O K
30 min Winter	0.592	0.592	13.1	1335.5	O K
60 min Winter	0.742	0.742	14.7	1700.3	O K
120 min Winter	0.891	0.891	16.2	2075.3	O K
180 min Winter	0.973	0.973	17.0	2284.1	O K
240 min Winter	1.024	1.024	17.5	2417.7	O K
360 min Winter	1.093	1.093	18.1	2599.7	O K
480 min Winter	1.137	1.137	18.5	2715.7	O K
600 min Winter	1.165	1.165	18.7	2792.4	O K
720 min Winter	1.184	1.184	18.8	2843.6	O K
960 min Winter	1.204	1.204	19.0	2897.4	Flood Risk
1440 min Winter	1.205	1.205	19.0	2900.4	Flood Risk
2160 min Winter	1.189	1.189	18.9	2856.3	O K
2880 min Winter	1.160	1.160	18.6	2777.8	O K
4320 min Winter	1.083	1.083	18.0	2572.6	O K
5760 min Winter	1.001	1.001	17.3	2357.4	O K
7200 min Winter	0.923	0.923	16.5	2155.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.111	0.0	5161.7	5960
15 min Winter	127.517	0.0	713.7	26
30 min Winter	85.701	0.0	877.9	41
60 min Winter	54.957	0.0	1556.7	70
120 min Winter	34.010	0.0	1865.4	128
180 min Winter	25.295	0.0	2021.4	186
240 min Winter	20.351	0.0	2119.9	244
360 min Winter	14.971	0.0	2252.3	360
480 min Winter	12.028	0.0	2336.5	476
600 min Winter	10.141	0.0	2392.7	590
720 min Winter	8.817	0.0	2430.4	704
960 min Winter	7.063	0.0	2469.3	926
1440 min Winter	5.157	0.0	2459.2	1332
2160 min Winter	3.757	0.0	4055.6	1652
2880 min Winter	2.997	0.0	4176.7	2112
4320 min Winter	2.176	0.0	4126.2	3024
5760 min Winter	1.731	0.0	5208.6	3872
7200 min Winter	1.449	0.0	5441.5	4696

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.852	0.852	15.9	1976.6	O K
10080 min Winter	0.788	0.788	15.2	1815.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.255	0.0	5634.8	5536
10080 min Winter	1.111	0.0	5772.8	6352

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.760

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.253	4	8	1.253	8	12	1.253

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2115.7	0.400	2304.5	0.800	2501.5	1.200	2706.5
0.100	2162.1	0.500	2353.0	0.900	2552.0	1.300	2759.0
0.200	2209.1	0.600	2402.0	1.000	2603.0	1.400	2812.1
0.300	2256.6	0.700	2451.5	1.100	2654.5	1.500	2865.6

Orifice Outflow Control

Diameter (m) 0.092 Discharge Coefficient 0.600 Invert Level (m) 0.000

Appendix C

GEG Ltd Sandleford Park, Newbury Infiltration Report

GEG | Geo Environmental Group
Geotechnical, Environmental & Ecological Consultants

GEG House, 17 Graham Road, Malvern, WR14 2HR
Tel. 01684 212526 Fax 01684 576917 www.g-eg.co.uk

INFILTRATION TESTING REPORT

SANDLEFORD PARK
LAND SOUTH OF MONKS LANE
NEWBURY, BERKSHIRE
RG14 7FN

NOVEMBER 2014

Prepared for:

Brookbanks Consulting

BLOOR HOMES

Registered Company - GEG Ltd
Registered in England No 6469985
Registered Office: Granta Lodge, 71 Graham Rd, Malvern, WR14 2JS

REPORT TITLE: INFILTRATION TESTING REPORT

Site Address:

Sandleford Park
Monks Lane
Newbury
Berkshire
RG14 7FN

Performed By:
Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

On Behalf Of:
Bloor Homes Ltd
c/o Brookbanks Consulting
6150 Knights Court
Solihull Parkway
Birmingham
B37 7WY

Written by:

Matthew Perks
BSc(Hons) MSc FGS
Senior Engineer

Checked by:

Mark Rawlings
BSc(Hons) MSc FGS CGeol
Associate Director

Approved by:

Anthony Marriott
BSc(Hons) MRSC MIEnvSc FGS
Managing Director

Project Reference: GEG-14-352

Report Reference: GEG-14-352/IT

Issue Status: FINAL

Date: 4th November 2014

TABLE OF CONTENTS *PAGE*

Title *Appendix*

EXECUTIVE SUMMARY

Current Site Status

The site lies to the south of Monks Lane at Sandleford Park on the southern edge of Newbury, Berkshire, at the approximate National Grid Reference 446916E, 164799N.

The site which is approximately 100 Ha in area, comprises a mixture of agricultural arable land, grassed fields and woodland over several fields with internal site boundaries.

Geology and Water Infiltration Properties

The solid geology of the London Clay Formation which varies between predominantly 'sand' over the majority of the site with a tongue of 'clay, silt and sand' exposed along the valley sides in the southern section of the site. The solid geology is overlain by superficial deposits of the Silchester Gravel Member over the majority of the northern and eastern central sections of the site, conjectured as being absent towards the valley bases.

Intrusive Investigation

The intrusive investigation was undertaken on the 9th to 12th and 15th September 2014 and comprised the excavation of 18 No. infiltration test pits to depths ranging from 1.25m to 4.00m bgl targeting the most permeable strata present in each case.

Ground Conditions

Natural topsoil was encountered across the site to depths of 0.30m to 0.40m.

Underlying the topsoil, the Silchester Sand & Gravel Member was encountered across the site to depths of 0.60m to 2.80m. It typically comprised loose to medium dense clayey occasionally gravelly SAND, clayey SAND & GRAVEL or sandy GRAVEL with occasional cobbles and soft to stiff slightly sandy slightly gravelly to gravelly CLAY.

The anticipated sand and limited gravel of the London Clay Formation (Sand) was in general not specifically identified on site probably due to the difficulty in differentiation from the Silchester Sand & Gravel Member. However, medium dense orange brown SAND with occasional grey silt pockets was encountered at 3 No. locations from depths of 0.90m to 1.50m and may comprise this stratum.

Cohesive soils of the weathered London Clay Formation were encountered underlying the superficial deposits in 6 No. of the trial pits from depths of 0.60m to 2.80m.

Potentially naturally re-worked London Clay was found in 3 No. locations from depths of 0.70m to 2.30m.

Infiltration Tests

A total of 18 No. infiltration tests were undertaken in the 18 No. trial pits.

Soakaway Calculations

The infiltration tests undertaken recorded little or no infiltration. Consequently, infiltration rates could not be calculated over the majority of the site with the exception of TP07 which, using extrapolated data, resulted in an infiltration rate of 2.71×10^{-6}.

Recommendations

The infiltration tests undertaken indicated that the soils were of relatively low permeability.

Locally, an infiltration rate of 2.71 x 10^{-6} was obtained from TP07 within the Silchester Sand & Gravel Member based on extrapolated data.

In view of the above, at this stage it is considered that the site is unsuitable for soakaway drainage. However, locally there is a possibility that limited soakaway drainage may be possible such as in the vicinity of TP07. Therefore, further assessment may be prudent targeting the thicker granular areas once the detailed proposed residential layout is finalised.

This executive summary is intended to provide an outline of the site assessment in relation to ground infiltration rates. It does not provide a definitive analysis of the information obtained.

1. INTRODUCTION

1.1 General

Geo Environmental Group (GEG) were commissioned by Brookbanks Consulting Limited (Brookbanks) on behalf of Bloor Homes Ltd, to undertake infiltration testing at the site known as 'Sandleford Park, Newbury' for the purpose of determining infiltration rates of the strata and the suitability for soakaway drainage.

1.2 Available Information

The following drawing was supplied by Brookbanks:

- 'Site Investigation Location Plan' on behalf of Bloor Homes Ltd, Brookbanks Consulting Ltd, Drawing No. 10309-SI-01, dated 4th August 2014.
- Various utility company service drawings.

1.3 Proposed Site Usage

The site is currently being considered for residential development.

1.4 Scope

The works performed by GEG included:

- Trial pitting and infiltration testing.
- Recommendations for suitability of the site for soakaway drainage.
- Provision of a report documenting the above.

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

2. SITE SETTING

2.1 Site Location

The site lies to the south of Monks Lane at Sandleford Park on the southern edge of Newbury, Berkshire, at the approximate National Grid Reference 446916E, 164799N.

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

2.2 Site Description

The site which is approximately 100 Ha in area, comprises a mixture of agricultural arable land, grassed fields and woodland (including Crook's Copse, High Wood,

Slockett's Copse) over several fields with internal site boundaries. The eastern section of the site was not visited but contains two small ponds in the easternmost section adjacent to the A339. The site is intersected by two minor drains/watercourses, one of which flows southwards from Crook's Copse to converge with the second eastward flowing watercourse that traverses from the south of Slockett's Copse before turning southwards towards Sandleford Place south of the site. The topography is dictated by the watercourses which fall towards the base of two main valleys with slightly to moderately sloping sides.

3. GEOLOGY & HYDROGEOLOGY

3.1 Published Geology

British Geological Survey digital mapping indicates that the site is underlain by the solid geology of the London Clay Formation which varies between predominantly 'sand' over the majority of the site with a tongue of 'clay, silt and sand' exposed along the valley sides in the southern section of the site.

In the Newbury area the London Clay Formation includes relatively thick beds of sand and some gravels within the usual clays (described as blue grey or grey brown silty clay, clayey silt and sandy clay). The formation also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation.

The solid geology is overlain by superficial deposits of the Silchester Gravel Member over the majority of the northern and eastern central sections of the site, conjectured as being absent towards the valley bases. The Silchester Gravel Member is described as gravel which is variably clayey and sandy.

3.2 Hydrogeology

Environment Agency data indicates that the solid geology of the London Clay Formation consisting of sand is regarded as a Secondary A Aquifer and the London Clay Formation consisting of clay silt and sand as Unproductive Strata.

The superficial deposits are also characterised as Secondary A Aquifer.

Unproductive Strata - are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

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

3.3 Potential Water Infiltration Properties of the Strata

In terms of water infiltration, the strata of the Silchester Gravel Member are considered potentially relatively permeable. The extensive sand beds of the London Clay Formation, indicated over the majority of the site are potentially suitable for soakaway drainage subject to the depth of groundwater.

4. INTRUSIVE INVESTIGATION

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

4.1 Scope of Works

The intrusive investigation was undertaken on the 9th to 12th and 15th September 2014 and comprised the excavation of 18 No. infiltration test pits (TP01 to TP17, TP05A) at the locations determined by Brookbanks (as shown on Figure 2) to depths ranging from 1.25m to 4.00m bgl targeting the most permeable strata present in each case.

A further trial pit (TP07A) was undertaken in order to confirm the ground conditions in relation to TP07.

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

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

4.1.1 Limitations of Intrusive Investigation

There were no limitations to access across the site for the duration of the intrusive investigation. However, according to the Brookbanks Specification, only the northern and south western sections of the site were to be investigated.

4.2 Strata Encountered

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

4.2.1 Topsoil

Natural topsoil was encountered across the site to depths of 0.30m to 0.40m and typically comprised soft sandy slightly gravelly occasionally gravelly CLAY with occasional rootlets or locally loose slightly clayey gravelly SAND (TP03 and TP04).

4.2.2 Superficial Deposits

Underlying the topsoil, the Silchester Sand & Gravel Member was encountered across the site to depths of 0.60m to 2.80m. It typically comprised loose to medium dense clayey occasionally gravelly SAND, clayey SAND & GRAVEL or sandy GRAVEL with occasional cobbles and soft to stiff slightly sandy slightly gravelly to gravelly CLAY. The gravel was generally quartzite and chert.

4.2.3 *Solid Geology*

The anticipated sand and limited gravel of the London Clay Formation (Sand) was in general not specifically identified on site probably due to the difficulty in differentiation from the Silchester Sand & Gravel Member (although it was anticipated that a marked colour change would be present). However, the medium dense orange brown SAND with occasional grey silt pockets encountered in TP12, TP13 and TP14 from depths of 0.90m, 1.00m and 1.50m may comprise this stratum.

Cohesive soils of the weathered London Clay Formation were encountered underlying the superficial deposits in 6 No. of the trial pits from depths of 0.60m to 2.80m. The strata typically comprised firm occasionally stiff grey CLAY with occasional silty pockets.

Potentially naturally re-worked London Clay was found in TP06, TP07A and TP09 from depths of 2.30m, 1.80m and 0.70m respectively as firm orange brown CLAY with grey silt pockets.

4.2.4 *Groundwater*

Groundwater was not encountered in any of the trial pits during the intrusive investigation. It should be noted that groundwater levels may vary due to seasonal and other effects.

4.3 Infiltration Tests

A total of 18 No. infiltration tests were undertaken in the 18 No. trial pits (TP01-TP17, TP05A) which were excavated to depths ranging from 1.25m to 4.00m bgl. The tests were undertaken in accordance with BRE Digest 365.

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

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

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

4.4 Soakaway Calculations

The water level measurements from the infiltration tests are tabulated and graphically depicted on Figures D-1 to D-18 in Appendix D.

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

Table 1. Infiltration Test Results

Location	Test No.	Strata*	Effective Depth Reached (%)	Time (mins)	Infiltration Rate (m/s)
TP01	1	SGM	60	426	N/A
TP02	1	LC	103	282	N/A
TP03	1	SGM	76	392	N/A
TP04	1	SGM	85	353	N/A
TP05	1	LC	101	245	N/A
TP05A	1	SGM	74	423	N/A
TP06	1	LC	97	293	N/A
TP07*	1	SGM	25	800	2.71×10^{-6}
TP08	1	SGM	85	340	N/A
TP09	1	LC	86	384	N/A
TP10	1	SGM	87	347	N/A
TP11	1	SGM	89	383	N/A
TP12	1	SGM	86	381	N/A
TP13	1	SGM	63	381	N/A
TP14	1	SGM	89	395	N/A
TP15	1	SGM	97	243	N/A
TP16	1	SGM	68	420	N/A
TP17	1	SGM	95	304	N/A

*Based on extrapolated data.
SGM=Silchester Sand & Gravel Member; LC=London Clay

The infiltration tests undertaken recorded little or no infiltration. Consequently, infiltration rates could not be calculated over the majority of the site with the exception of TP07 which, using extrapolated data, resulted in an infiltration rate of 2.71×10^{-6}.

The results therefore indicated that the soils were typically of low permeability.

Recommendations for soakaways are presented in Section 5.1.

5. CONCLUSIONS & RECOMMENDATIONS

5.1 Soakaway Recommendations

The infiltration tests undertaken indicated that the soils were of relatively low permeability.

Locally, an infiltration rate of 2.71×10^{-6} was obtained from TP07 within the Silchester Sand & Gravel Member based on extrapolated data.

In view of the above, at this stage it is considered that the site is unsuitable for soakaway drainage. However, locally there is a possibility that limited soakaway drainage may be possible such as in the vicinity of TP07. Therefore, further assessment may be prudent targeting the thicker granular areas once the detailed proposed residential layout is finalised.

6. REFERENCES

1. British Standard Institute (1990) BS: 1377 Parts 1-9. Methods of Tests for Soils for Civil Engineering Purposes.

2. British Standard Institute (1999) BS: 5930 Code of Practice for Site Investigations. BSI, London.

3. BRE Digest 365 (September 1991) Soakaway Design.

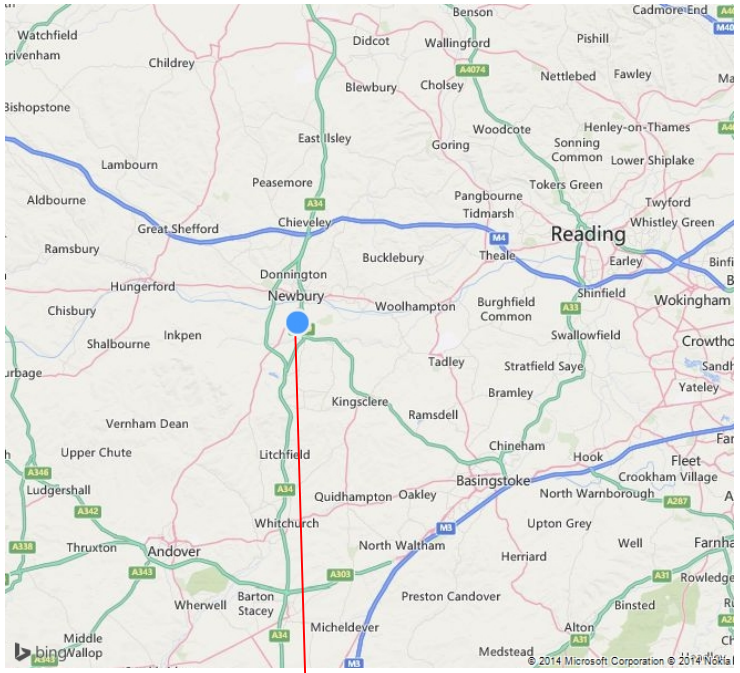
7. LIMITATIONS

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

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

APPENDIX A

FIGURES AND PLANS

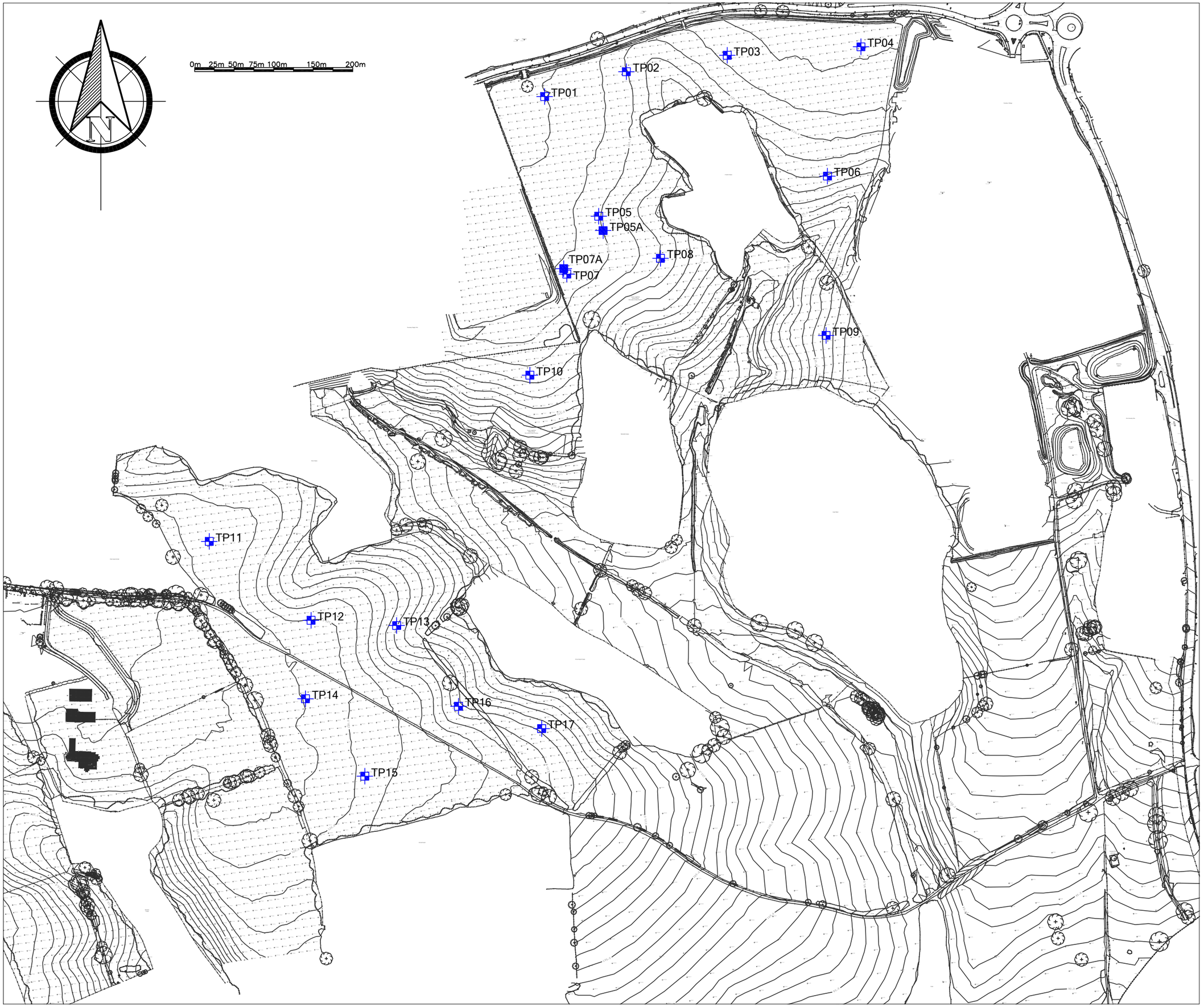


SITE LOCATION

TITLE: FIGURE 1 : SITE LOCATION PLAN	
SITE: SANDLEFORD PARK, NEWBURY	
CLIENT: BLOOR HOMES LTD/ BROOKBANKS CONSULTING LTD	
PROJECT No.: GEG-14-352	**DRAWN/CHECKED:** MP / MR
SCALE: NTS	**DATE:** 15/10/14

Geo Environmental Group

GEG House
17 Graham Road
Malvern, WR14 2HR
Tel. 01684 212526
Fax 01684 576917
admin@g-eg.co.uk
www.g-eg.co.uk



LEGEND

TP01	GEG INFILTRATION TEST LOCATION
TP05A	GEG TRIAL PIT LOCATION

NOTES:

1. BASE IMAGE PROVIDED BY BROOKBANKS CONSULTING.

2. DRAWING TO BE USED IN CONJUCTION WITH GEG REPORT GEG–14–352/IT

JOB NUMBER: GEG–14–352				Geo Environmental Group
PROJECT TITLE: SANDLEFORD PARK, NEWBURY				
DRAWING TITLE: FIGURE 2: EXPLORATORY HOLE LOCATION PLAN			DRAWING NO.: GEG–14–352_001	
CLIENT: BROOKBANKS CONSULTING	REVISION NO.: A	ORIGINAL SIZE: A3	DIMENSIONS: METRES	SCALE: AS SHOWN
DRAWN BY: FT	CHECKED BY: MP	APPROVED BY: MR	ISSUE: FINAL ISSUE	DATE: 10–11–14

APPENDIX B

PHOTOGRAPHIC RECORD

Photo 1: Excavation of trial pit TP01.

Photo 2: Arisings from trial pit TP01.

Photo 3: Excavation of trial pit TP02.

Photo 4: Arisings from trial pit TP02.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 5: Excavation of trial pit TP03.

Photo 6: Arisings from trial pit TP03.

Photo 7: Excavation of trial pit TP04.

Photo 8: Arisings from trial pit TP04.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 9: Excavation of trial pit TP05.

Photo 10: Arisings from trial pit TP05.

Photo 11: Excavation of trial pit TP05A.

Photo 12: Arisings from trial pit TP05A.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 13: Excavation of trial pit TP06.

Photo 14: Arisings from trial pit TP06.

Photo 15: Excavation of trial pit TP07.

Photo 16: Arisings from trial pit TP07.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 17: Excavation of trial pit TP07A.

Photo 18: Arisings from trial pit TP07A.

Photo 19: Excavation of trial pit TP08.

Photo 20: Arisings from trial pit TP08.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 21: Excavation of trial pit TP09.

Photo 22: Arisings from trial pit TP09.

Photo 23: Excavation of trial pit TP10.

Photo 24: Arisings from trial pit TP10.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 25: Excavation of trial pit TP11.

Photo 26: Arisings from trial pit TP11.

Photo 27: Excavation of trial pit TP12.

Photo 28: Arisings from trial pit TP12.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 29: Excavation of trial pit TP13.

Photo 30: Arisings from trial pit TP13.

Photo 31: Excavation of trial pit TP14.

Photo 32: Arisings from trial pit TP14.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

Photo 33: Excavation of trial pit TP15.

Photo 34: Arisings from trial pit TP15.

Photo 35: Excavation of trial pit TP16.

Photo 36: Arisings from trial pit TP16.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client:

Brookbanks Consulting Ltd / Bloor Homes Ltd

Project:

Sandleford Park, Newbury

Project No.:

GEG-14-352

		Geo Environmental Group Geotechnical, Environmental & Ecological Consultants **Geo Environmental Group** **GEG House** **17 Graham Road** **Malvern** **WR14 2HR** **Client:** **Brookbanks Consulting Ltd / Bloor Homes Ltd** **Project:** **Sandleford Park, Newbury** **Project No.:** **GEG-14-352**
Photo 37: Excavation of trial pit TP17.	**Photo 38:** Arisings from trial pit TP17.	

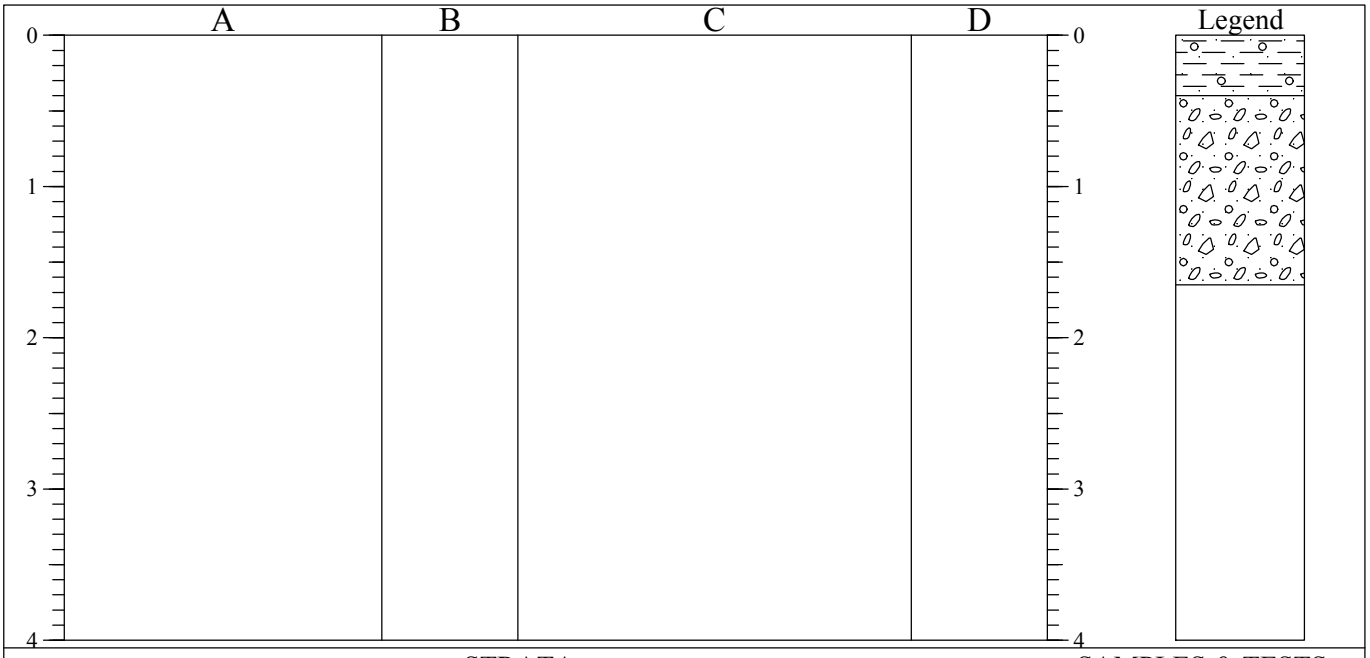
APPENDIX C

EXPLORATORY HOLE LOGS

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

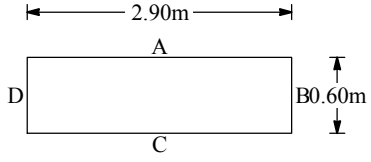
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP01**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	09-09-14		E 446,694.3 N 165,184.1	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.40		(Soft) dark brown sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert. (TOPSOIL)			
0.40-1.65		(Loose) yellow brown clayey SAND & GRAVEL of sub-angular chert with occasional silt pockets. (SILCHESTER SAND & GRAVEL MEMBER) 1.20 - 1.65 Becoming (medium dense) occasionally orange brown clay pockets 1.30 - 1.65 With occasional cobbles of sub-angular chert			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

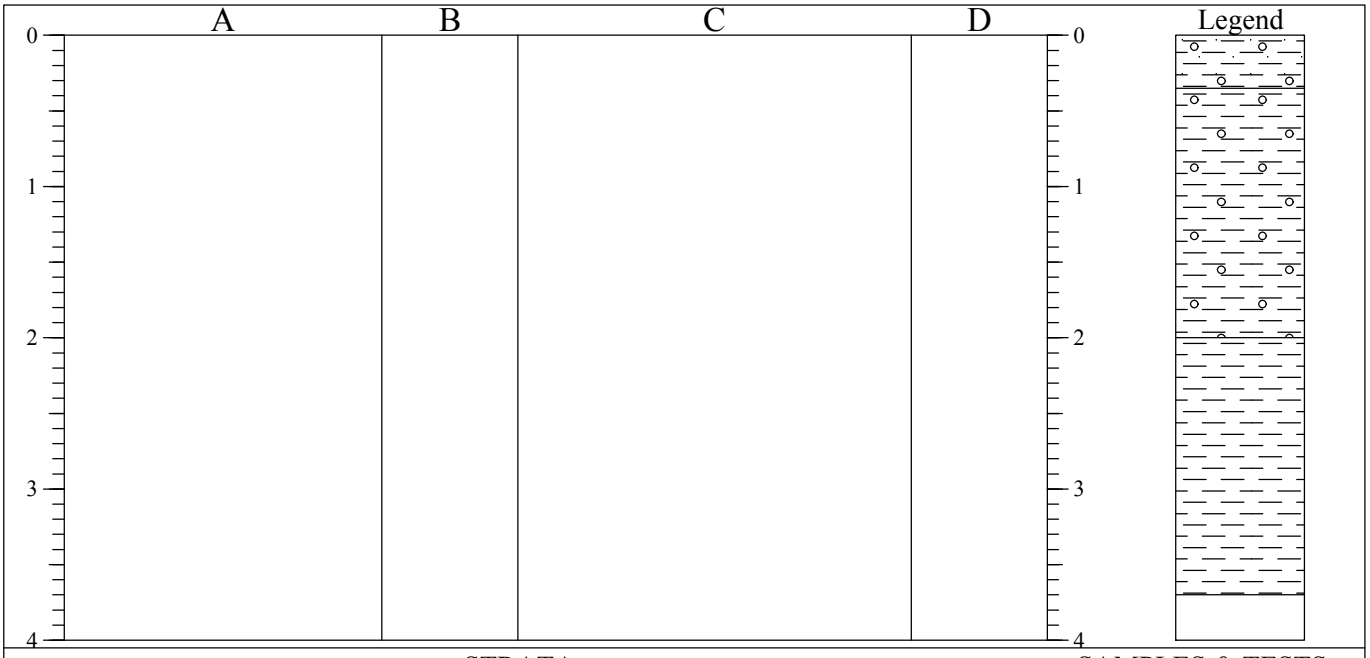
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

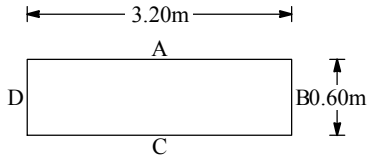
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP02**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	09-09-14		E 446,797.6 N 165,215.5	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.35		(Soft) dark brown sandy slightly gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert. (TOPSOIL)			
0.35-2.00		(Soft) orange brown slightly gravelly CLAY. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER) 0.70 - 2.00 Becoming (soft to firm) friable with occasional gravel-sized silty pockets 1.20 - 1.40 With occasional boulder-sized pockets of (medium dense) grey clayey slightly sandy GRAVEL pockets of sub-angular chert			
2.00-3.70		(Firm) grey CLAY with occasional gravel to cobble-sized grey silty pockets. (LONDON CLAY)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

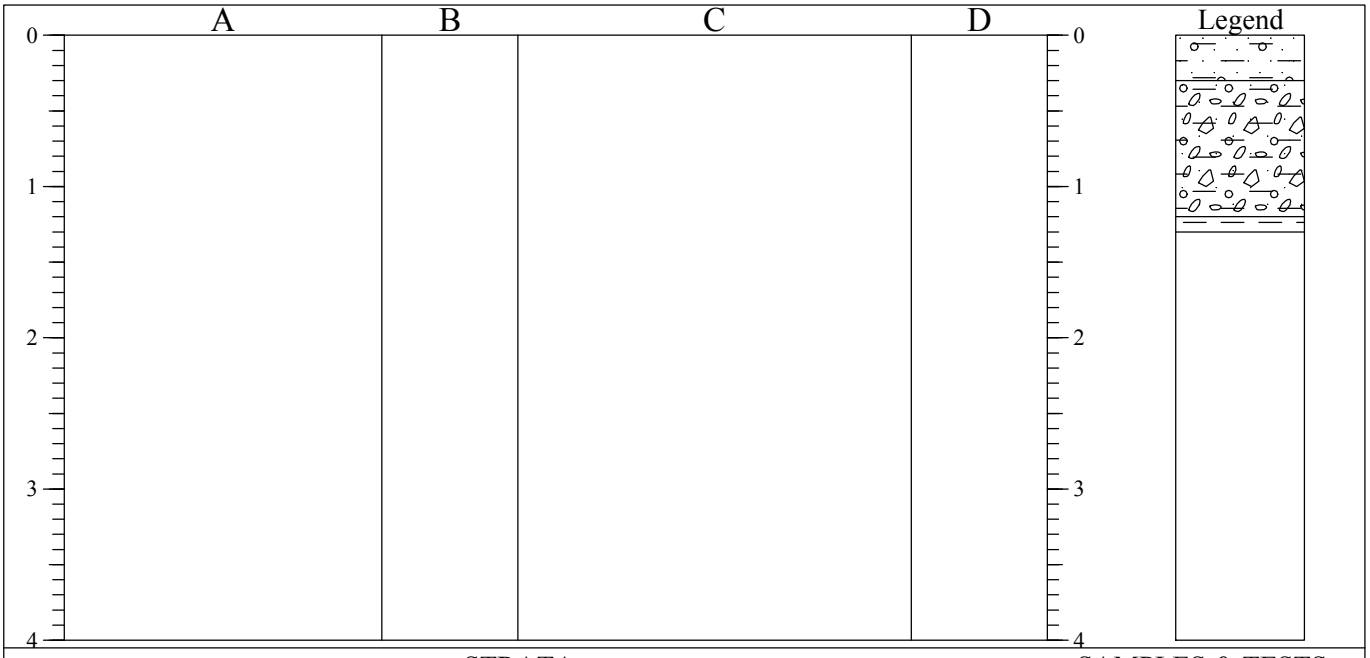
1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

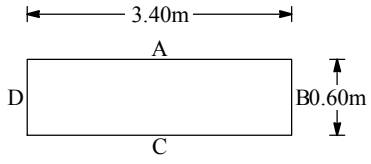
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP03**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	11-09-14		E 446,925.2 N 165,236.3	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Loose) dark brown slightly clayey gravelly SAND with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular flint.			
0.30-1.20		(TOPSOIL)			
		(Loose to medium dense) orange brown clayey fine sandy GRAVEL of sub-rounded chert with occasional pockets of orange brown gravel-sized pockets of clay. (SILCHESTER SAND & GRAVEL MEMBER) 0.70 - 1.30 Becoming (medium dense) 1.10 - 1.20 Becoming very clayey			
1.20-1.30		(Firm) grey CLAY. (LONDON CLAY)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

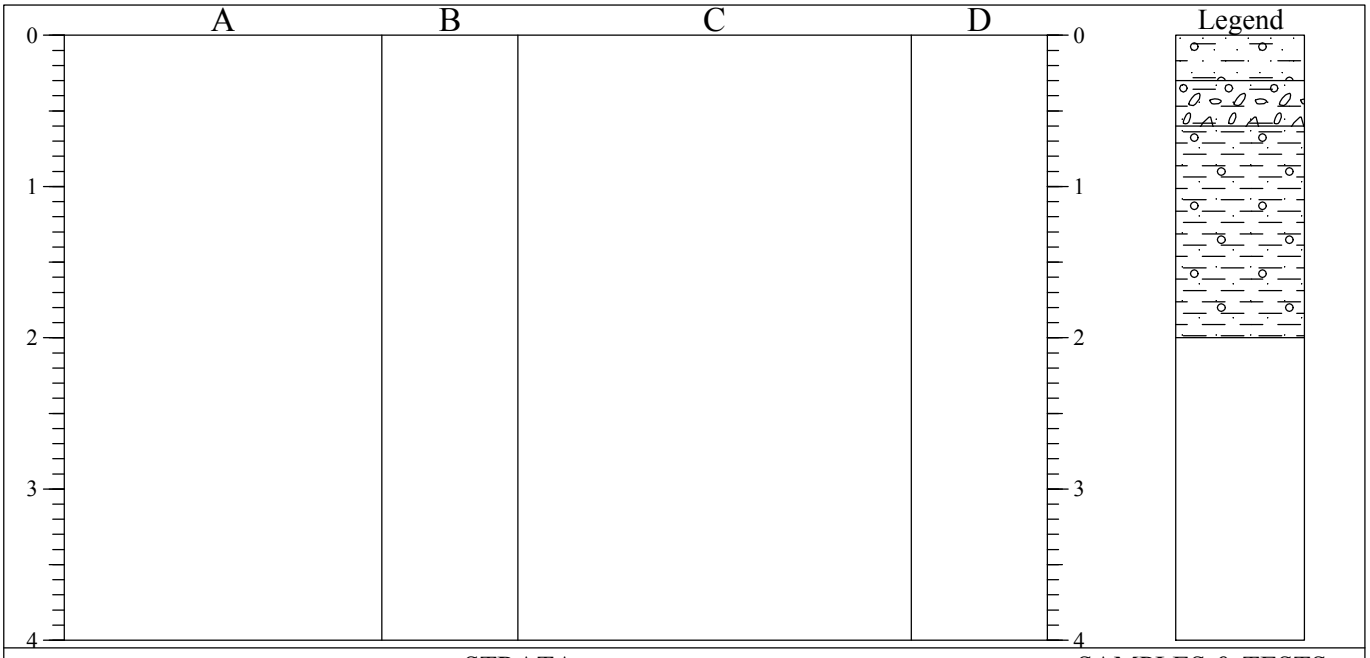
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

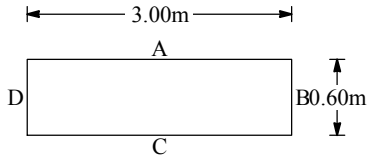
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP04**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	11-09-14		E 447,094.0 N 165,247.0	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Loose) dark brown slightly clayey slightly clayey gravelly SAND with occasional rootlets and boulders. Gravel is sub-rounded quartzite and sub-angular flint. Boulders are sub-angular flint.			
0.30-0.60		(TOPSOIL)			
0.60-2.00		(Loose) yellow brown clayey slightly fine sandy GRAVEL and occasional boulders of sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER) 0.55 - 0.60 Becoming orange brown			
		(Firm) friable orange brown slightly sandy gravelly CLAY. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER) 1.30 - 2.00 Becoming (firm to stiff) slightly gravelly with occasional grey pockets of silt 1.50 - 2.00 Becoming very friable			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

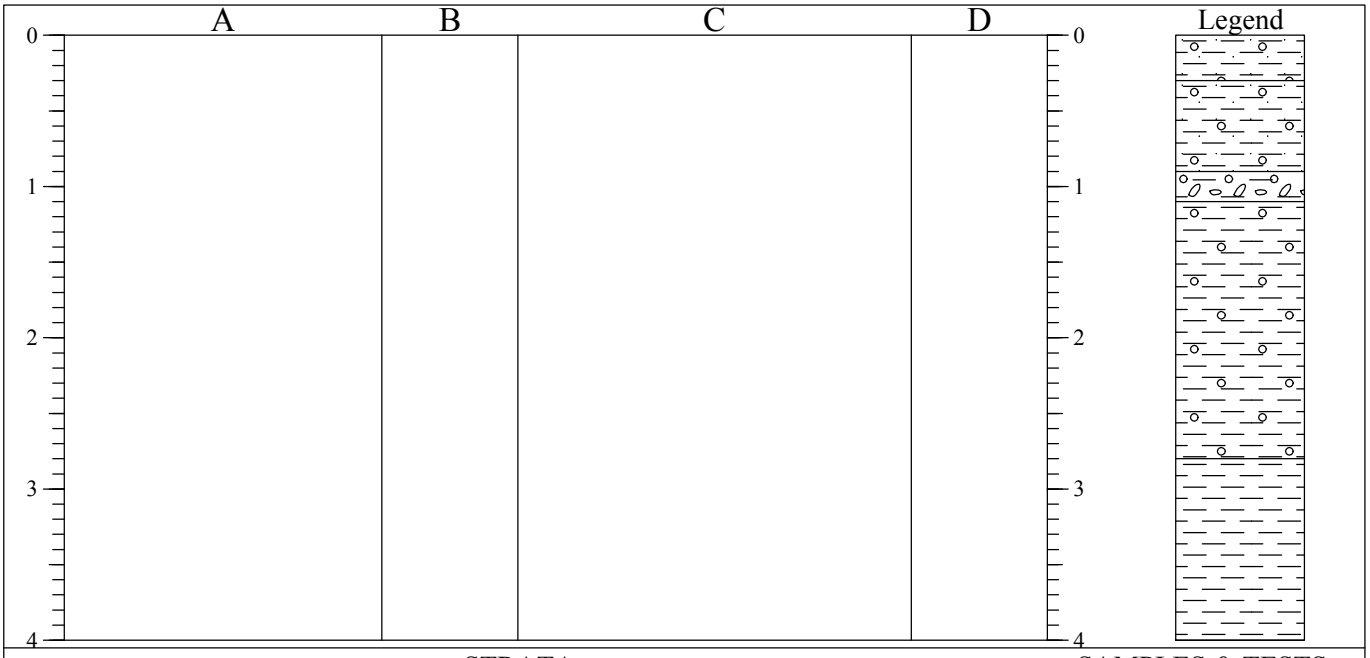
1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

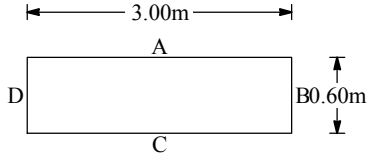
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP05**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	09-09-14		E 446,762.7 N 165,033.0	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) dark brown sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert.			
0.30-0.90		(TOPSOIL)			
		(Soft) friable yellow brown slightly sandy gravelly CLAY. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
0.90-1.10		(Loose to medium dense) yellow brown very clayey GRAVEL of sub-angular chert with occasional gravel to cobble-sized grey silt pockets.			
1.10-2.80		(SILCHESTER SAND & GRAVEL MEMBER)			
		(Firm) friable yellow brown very gravelly CLAY with occasional gravel to cobble-sized silt pockets. Gravel is sub-angular chert. (SILCESTER SAND & GRAVEL MEMBER)			
2.80-4.00		(Firm to stiff) grey CLAY with occasional gravel to cobble-sized grey silty pockets. (LONDON CLAY)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

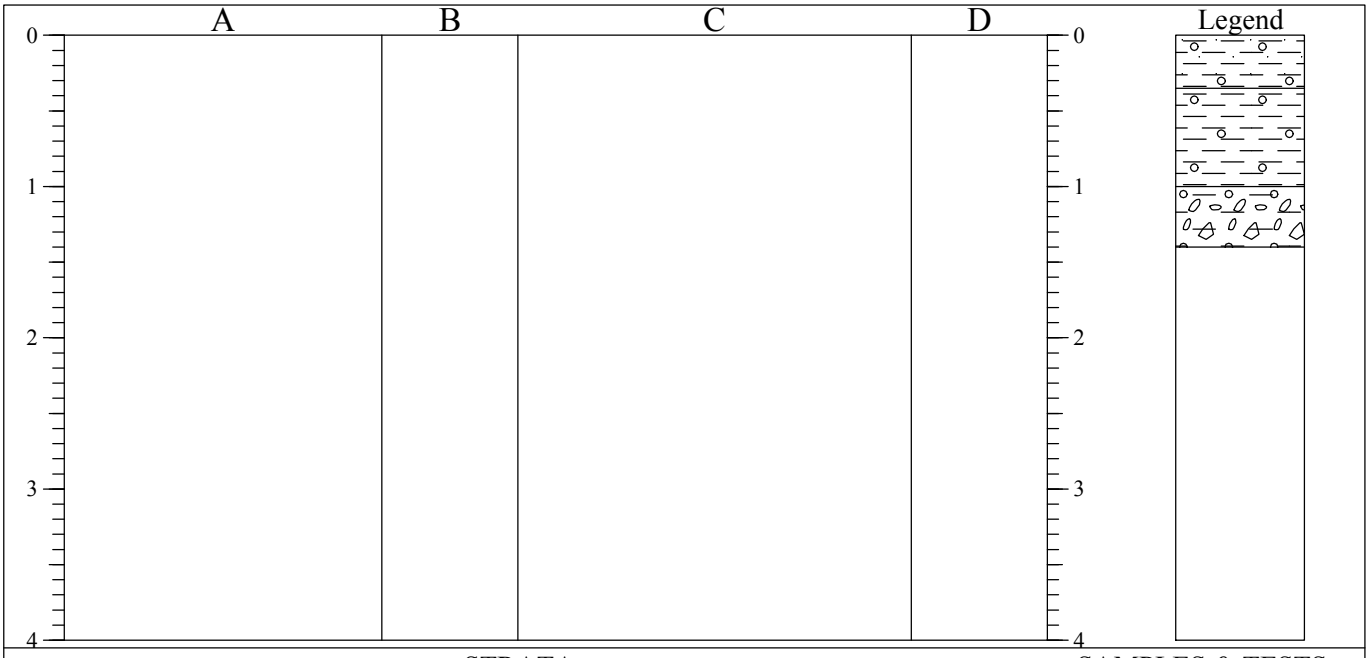
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

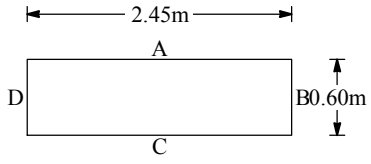
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP05A**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	10-09-14		E 446,768.2 N 165,014.8	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.35		(Soft) brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert. (TOPSOIL)			
0.35-1.00		(Soft to firm) orange brown gravelly CLAY with occasional gravel-sized pockets of silt. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
1.00-1.40		(Loose to medium dense) orange brown clayey GRAVEL of sub-angular chert with occasional gravel to cobble-sized orange brown clay and grey silt pockets. (SILCHESTER SAND & GRAVEL MEMBER)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

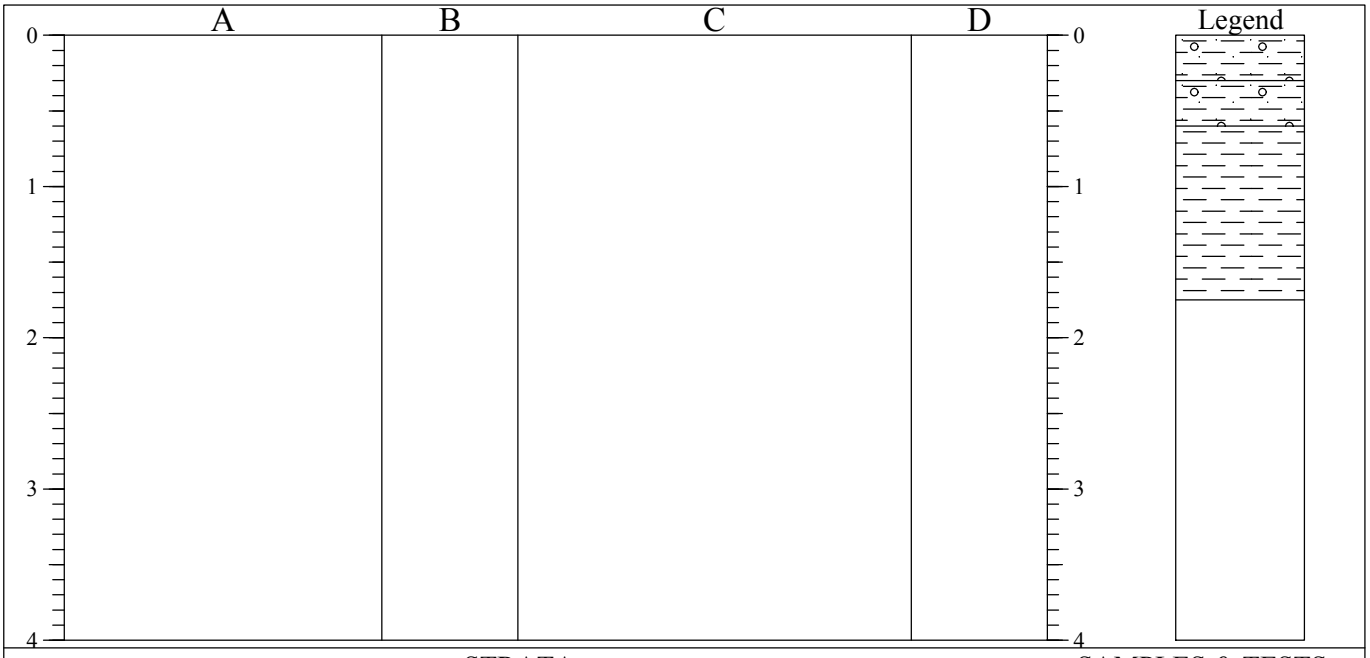
1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

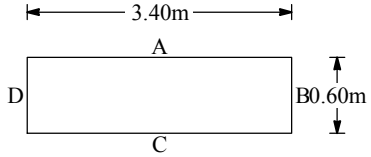
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP06**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	11-09-14		E 447,051.7 N 165,083.6	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) friable dark brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert.			
0.30-0.60		(TOPSOIL)			
0.60-1.75		(Soft to firm) friable orange brown slightly fine sandy slightly gravelly CLAY with occasional grey gravel-sized silt pockets. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
		(Firm) orange brown CLAY with some grey pockets of silt. (POSSIBLE REWORKED LONDON CLAY)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

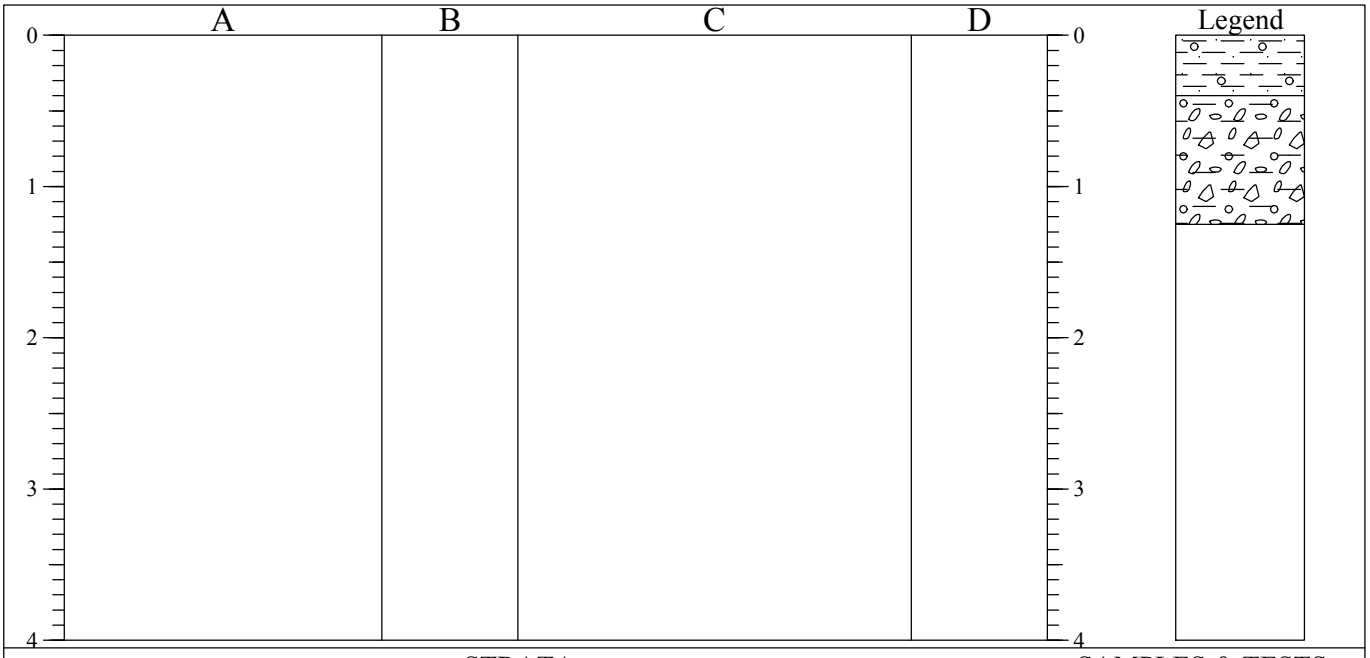
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

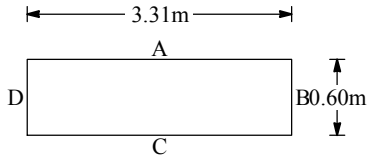
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP07**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	10-09-14		E 446,722.3 N 164,959.8	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.40		(Soft) brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert and sub-rounded quartzite. (TOPSOIL)			
0.40-1.25		(Loose to medium dense) brown slightly clayey fine sandy GRAVEL of sub-angular to sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER) 0.50 - 1.25 With occasional cobbles 1.10 - 1.25 Becoming (meduim dense) and sandy			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

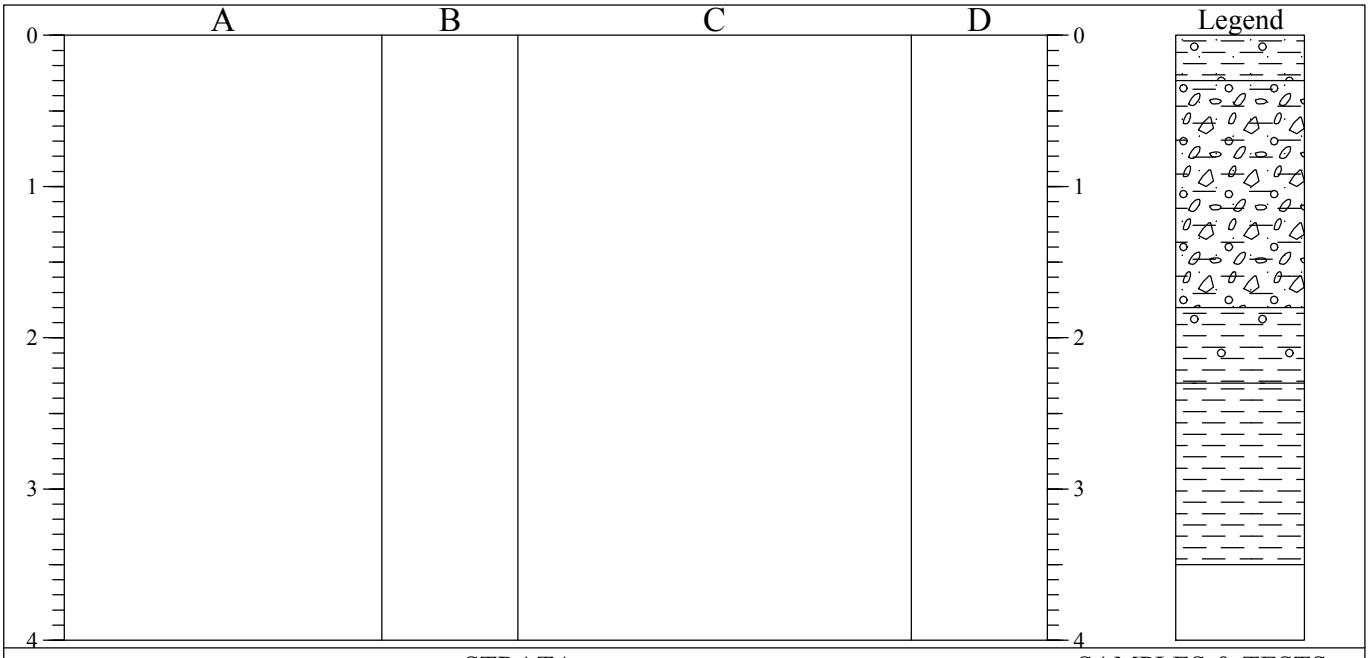
1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

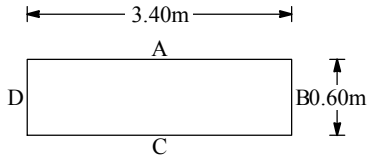
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP07A**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	10-09-14		E 446,718.5 N 164,966.7	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert and sub-rounded quartzite.			
0.30-1.80		(TOPSOIL)			
		(Loose to medium dense) orange brown clayey fine sandy GRAVEL of sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER)			
		0.70 - 1.80 Becoming (medium dense) slightly clayey sandy			
		1.50 - 1.80 With occasional gravel-sized grey silt pockets			
		1.70 - 1.80 With occasional orange brown gravel to cobble-sized clay pockets			
1.80-2.30		(Stiff) friable orange brown gravelly CLAY with some grey gravel to cobble-sized silt pockets. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
2.30-3.50		(Firm) light orange brown CLAY. (POSSIBLE REWORKED LONDON CLAY)			
		2.90 - 3.50 With many grey silt pockets			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

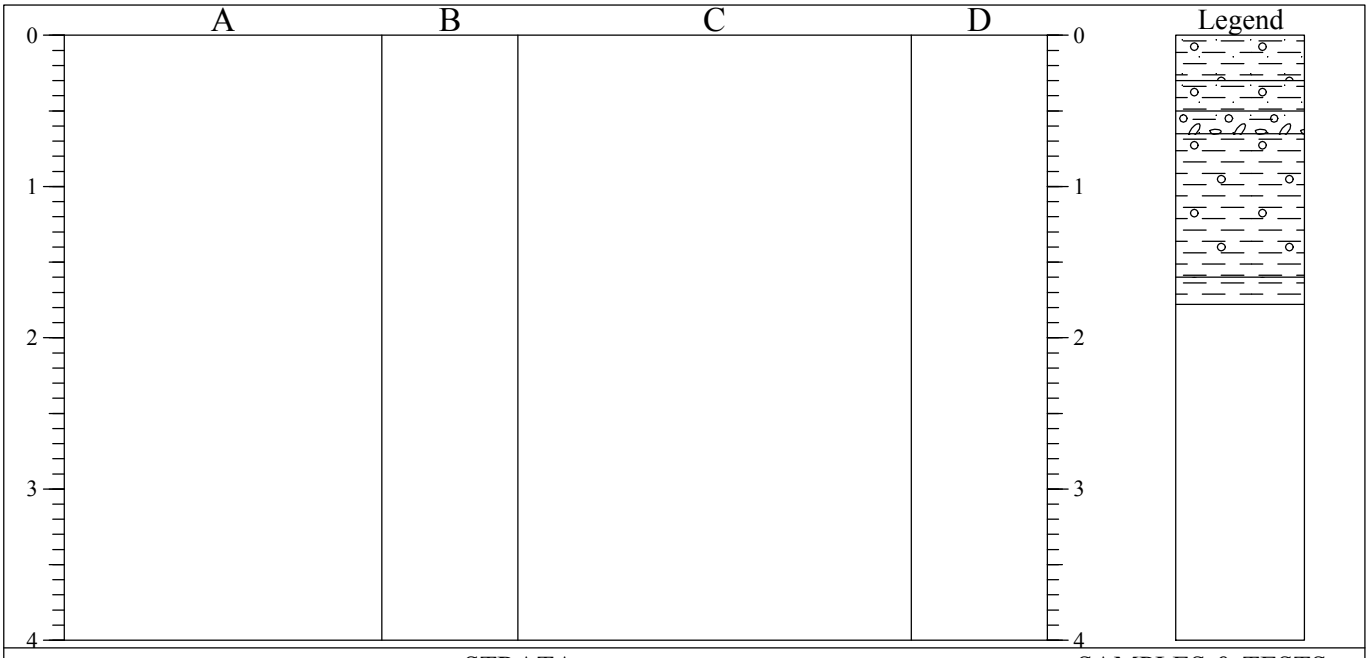
1. No groundwater encountered. 2. Upon completion, trial pit backfilled with arisings.

All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

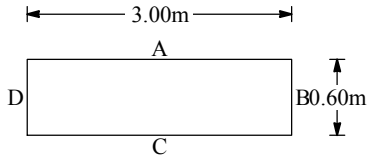
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP08**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	10-09-14		E 446,840.8 N 164,979.8	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert and sub-rounded quartzite.			
0.30-0.50		(TOPSOIL)			
0.50-0.65		(Firm) orange brown slightly fine sandy slightly gravelly CLAY. Gravel is sub-angular chert.			
0.65-1.60		(SILCHESTER SAND & GRAVEL MEMBER)			
		(Loose to medium dense) orange brown clayey slightly sandy GRAVEL of sub-angular to sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER)			
		(Firm) orange brown slightly gravelly CLAY with occasional grey silt pockets. Gravel is sub-angular chert.			
1.60-1.78		(SILCHESTER SAND & GRAVEL MEMBER)			
		(Firm) orange brown CLAY with occasional grey silt pockets. (POSSIBLE REWORKED LONDON CLAY)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

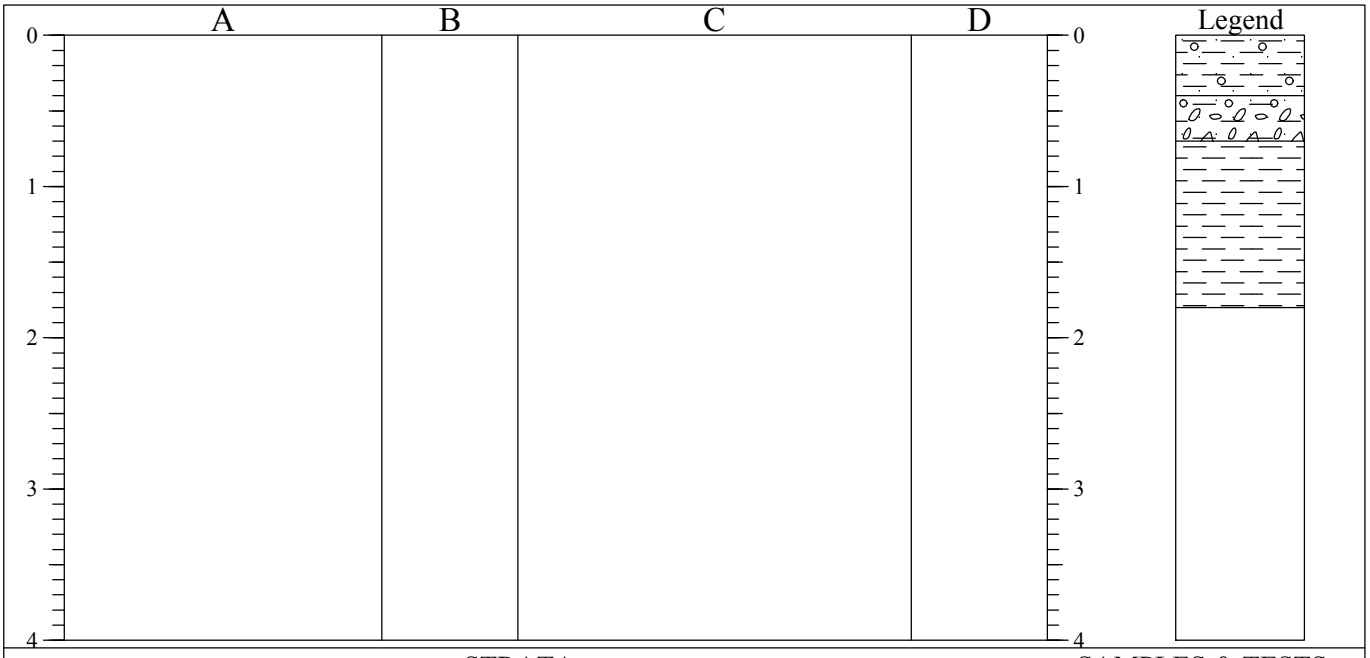
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

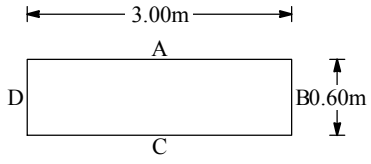
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP09**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	11-09-14		E 447,050.0 N 164,882.4	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.40		(Firm) friable red brown sandy slightly gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert. (TOPSOIL)			
0.40-0.70		(Loose) orange brown clayey slightly slightly fine sandy GRAVEL of sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
0.70-1.80		(Firm) friable orange brown CLAY with occasional grey pockets of silt. (POSSIBLE REWORKED LONDON CLAY)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

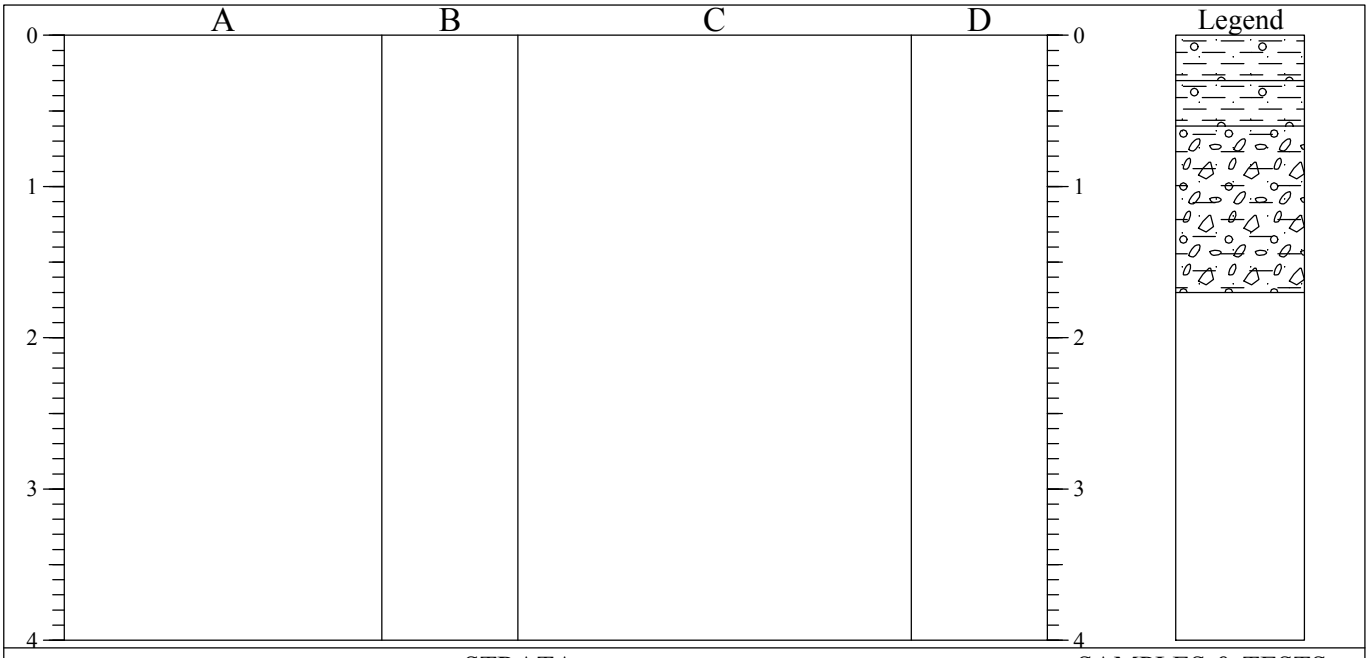
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

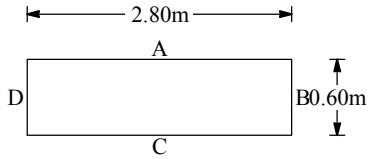
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP10**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	10-09-14		E 446,675.7 N 164,832.0	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert and sub-rounded quartzite.			
0.30-0.60		(TOPSOIL)			
0.60-1.70		(Firm) yellow brown slightly fine sandy gravelly CLAY. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
		(Loose to medium dense) yellow brown slightly clayey slightly fine sandy GRAVEL of sub-angular to sub-rounded chert with occasional cobble-sized pockets of orange brown clay. (SILCHESTER SAND & GRAVEL MEMBER) 1.20 - 1.70 With occasional boulder-sized pockets of orange brown clay			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

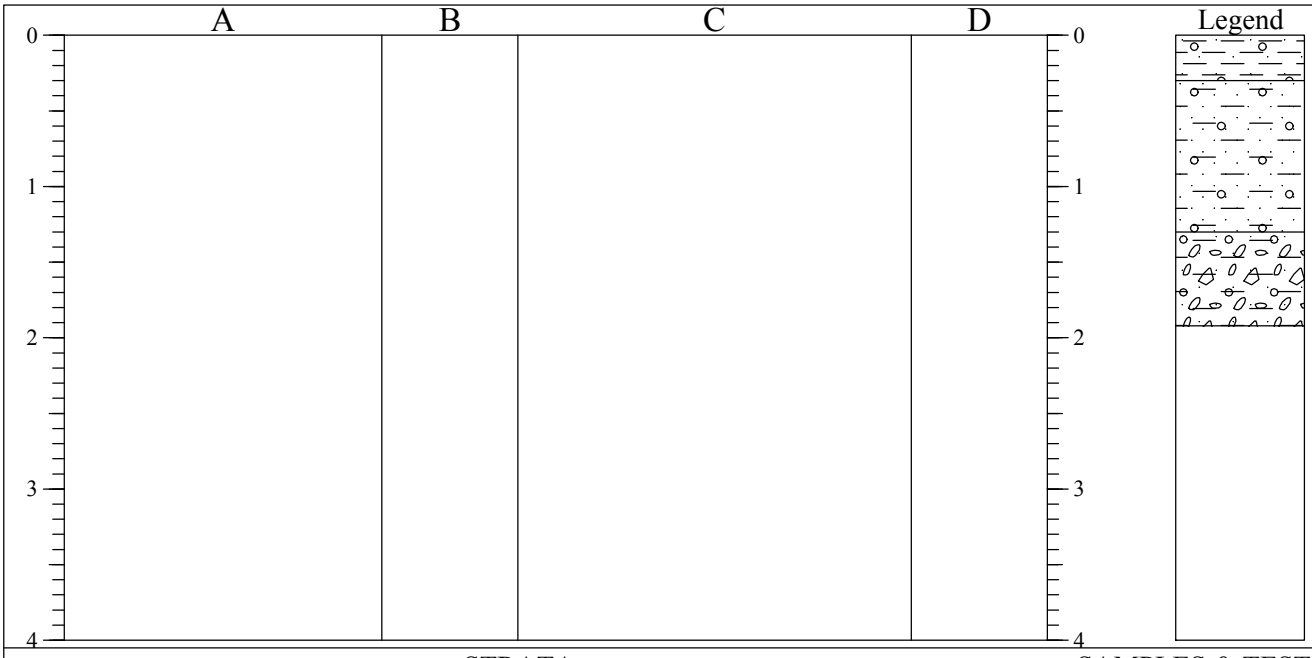
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

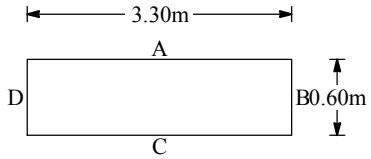
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP11**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	12-09-14		E 446,270.5 N 164,622.1	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) friable dark brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert.			
0.30-1.30		(TOPSOIL)			
		(Loose to medium dense) brown clayey gravelly SAND. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
		1.20 - 1.30 Becoming (medium dense)			
1.30-1.92		(Medium dense) brown slightly clayey slightly slightly sandy GRAVEL of sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

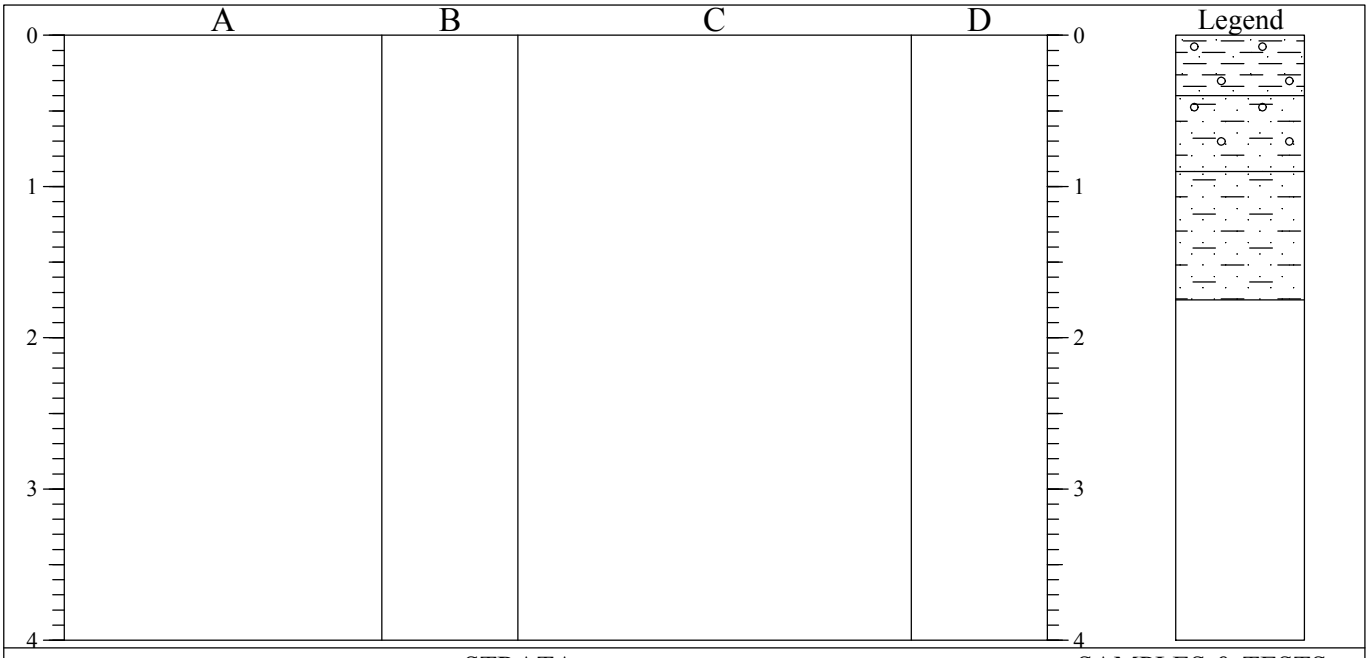
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

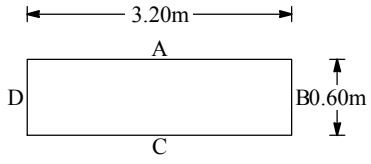
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP12**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	12-09-14		E 446,399.1 N 164,522.4	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.40		(Soft) friable dark brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert. (TOPSOIL)			
0.40-0.90		(Loose) orange brown slightly clayey gravelly fine SAND. Gravel is sub-angular to sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER)			
0.90-1.75		(Medium dense) orange brown clayey fine SAND with occasional grey silt pockets. (POSSIBLE SILCHESTER SAND & GRAVEL MEMBER/LONDON CLAY FORMATION)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

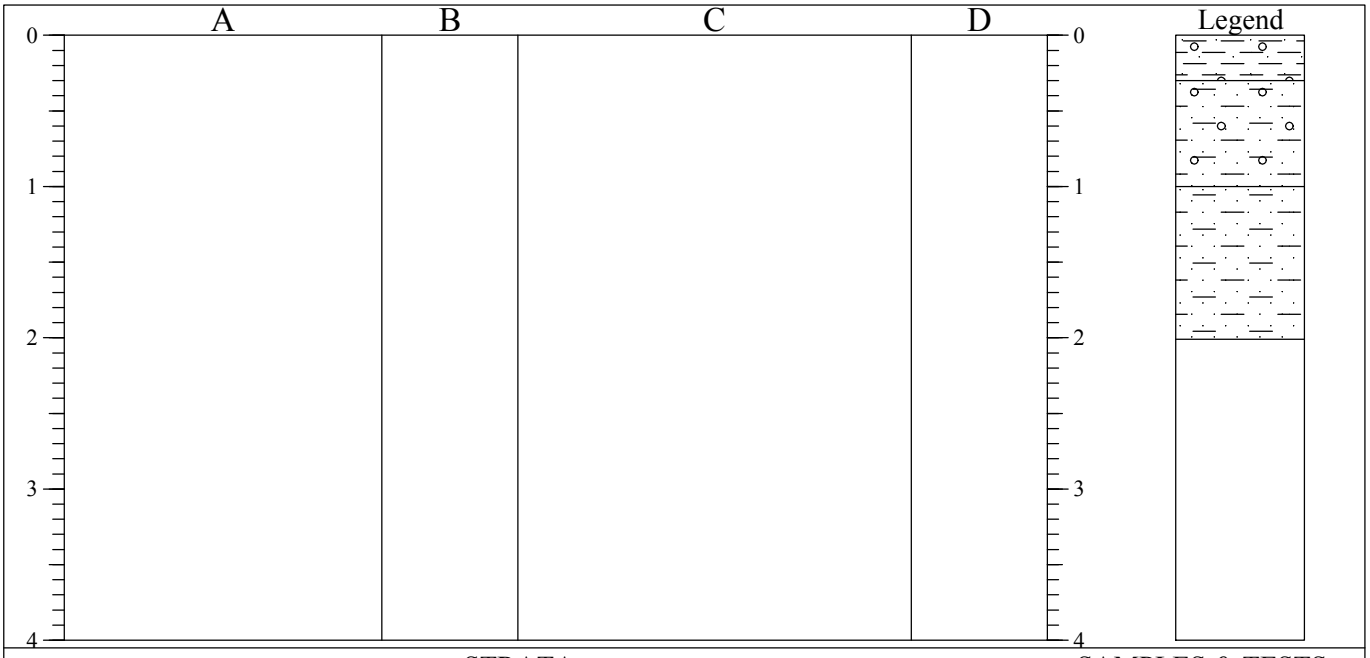
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

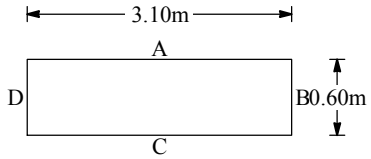
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				TP13
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	15-09-14		E 446,507.4 N 164,515.8	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) friable brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-angular to sub-rounded chert.			
0.30-1.00		(TOPSOIL)			
		(Loose) yellow brown clayey slightly gravelly medium SAND. Gravel is sub-angular to sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER)			
1.00-2.01		0.80 - 1.00 Becoming very gravelly			
		(Medium dense) orange brown clayey fine SAND with occasional grey gravel-sized silt pockets. (POSSIBLE SILCHESTER SAND & GRAVEL MEMBER/LONDON CLAY FORMATION)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

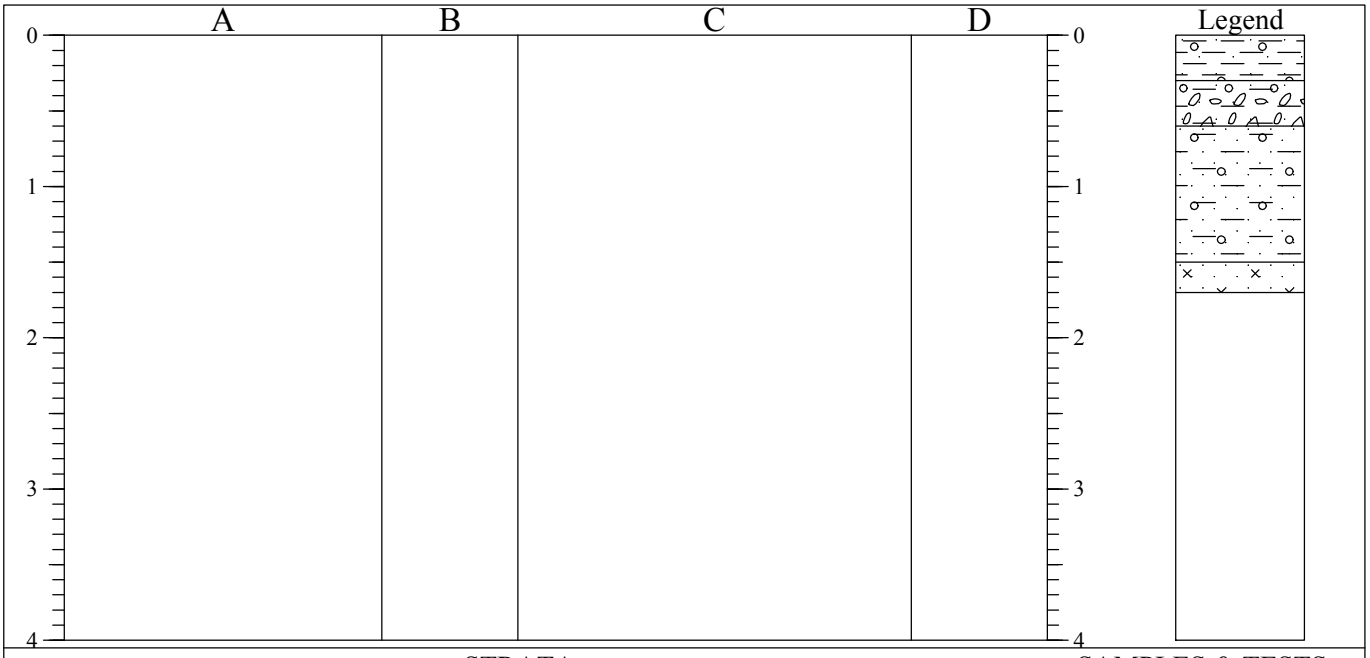
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

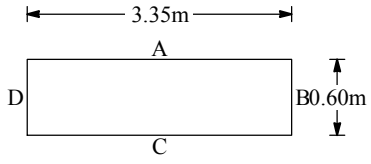
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP14**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	12-09-14		E 446,392.2 N 164,423.2	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) friable dark brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert.			
0.30-0.60		(TOPSOIL)			
0.60-1.50		(Loose) brown slightly clayey sandy GRAVEL of sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
		(Loose to medium dense) yellow brown slightly clayey slightly gravelly SAND with occasional grey silt pockets. (SILCHESTER SAND & GRAVEL MEMBER) 1.20 - 1.30 With grey silt boulder-sized pocket 1.20 - 1.50 Becoming (medium dense) gravelly			
1.50-1.70		(Medium dense) orange brown slightly silty fine to medium SAND with occasional grey silt pockets. (POSSIBLE SILCHESTER SAND & GRAVEL MEMBER/LONDON CLAY FORMATION)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

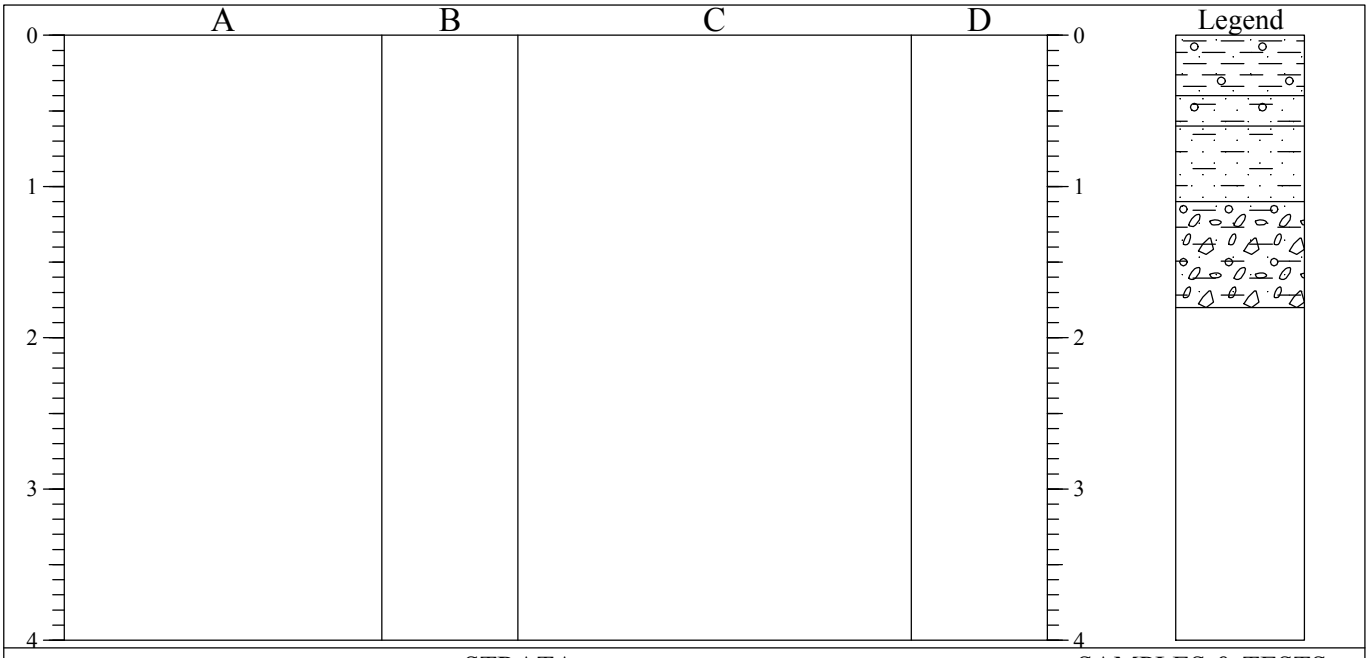
1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

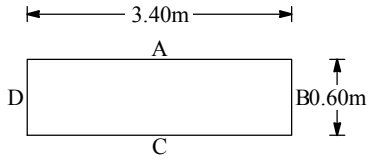
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP15**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	12-09-14		E 446,467.1 N 164,325.4	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.40		(Soft) friable dark brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-rounded quartzite and sub-angular chert. (TOPSOIL)			
0.40-0.60		(Loose) orange brown very clayey slightly gravelly fine SAND. Gravel is sub-angular chert. (SILCHESTER SAND & GRAVEL MEMBER)			
0.60-1.10		(Loose to medium dense) orange brown clayey fine to medium SAND with occasionl grey silt pockets. (SILCHESTER SAND & GRAVEL MEMBER) 0.90 - 1.00 With occasional boulder-sized grey silt pockets			
1.10-1.80		(Medium dense) orange brown slightly clayey sandy GRAVEL of sub-angular chert with occasional gravel-sized grey silt pockets. (SILCHESTER SAND & GRAVEL MEMBER) 1.40 - 1.80 Becoming clayey with occasional cobbles			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

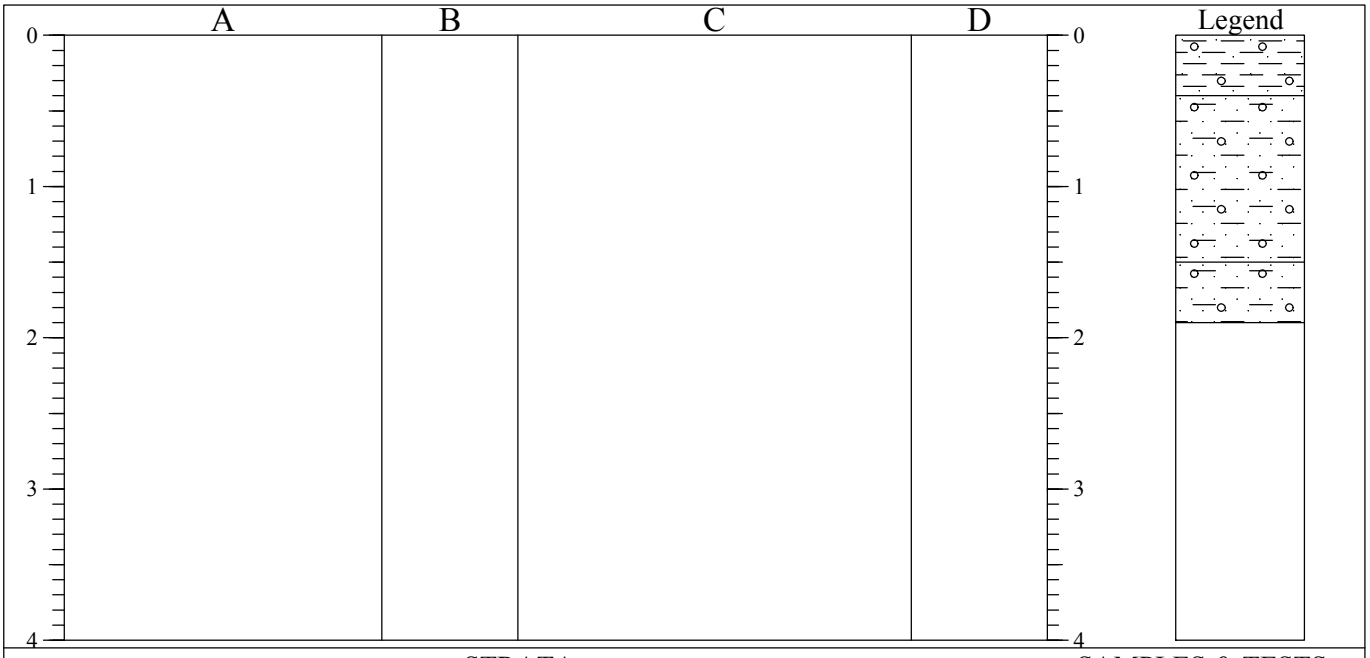
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

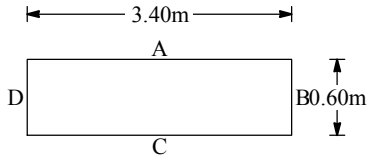
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				**TP16**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	15-09-14		E 446,585.4 N 164,413.7	
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.40		(Soft) friable brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-angular to sub-rounded chert and quartzite. (TOPSOIL)			
0.40-1.50		(Loose to medium dense) brown clayey slightly gravelly fine SAND. Gravel is sub-angular to sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER) 0.80 - 1.00 With occasional gravel-sized grey SILT pockets			
1.50-1.90		(Medium dense) orange brown very clayey gravelly fine to medium SAND with occasional to some grey gravel-sized silt pockets. Gravel is sub-angular to sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

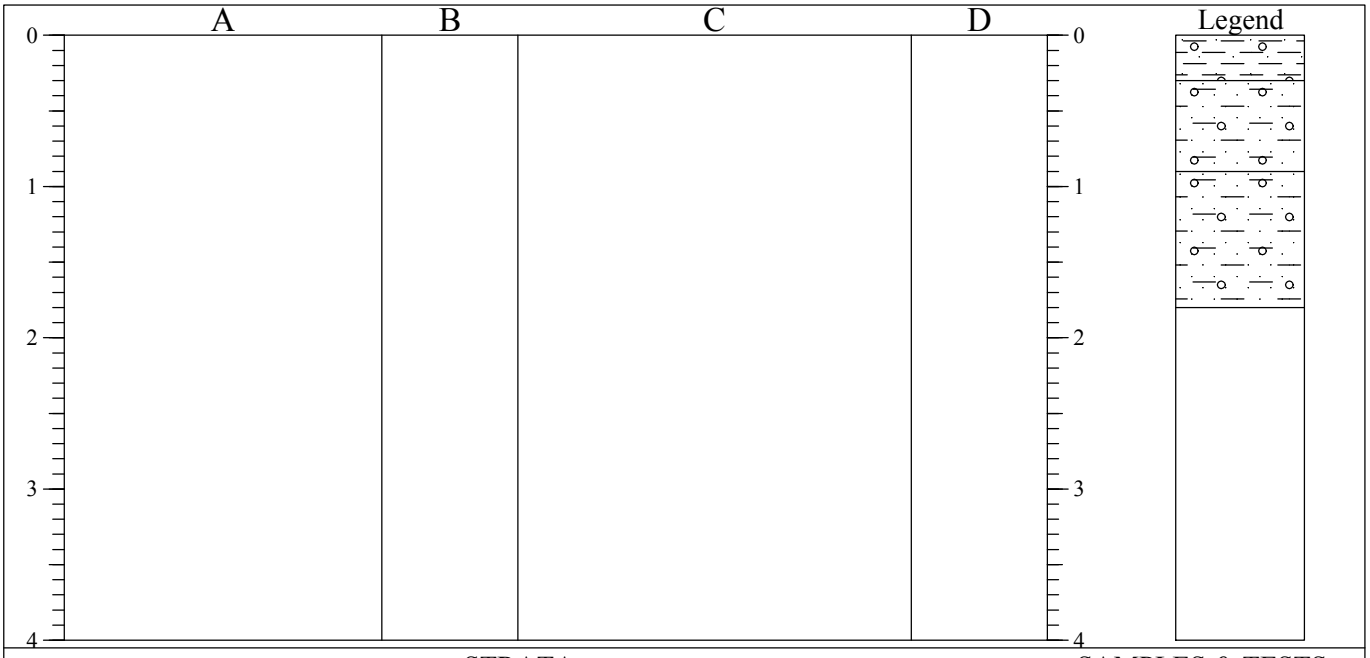
All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

Geo Environmental Group
GEG House, 17 Graham Road
Malvern, WR14 2HR
Telephone: 01684 212526
Fax: 01684 576917

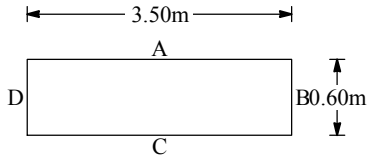
TRIAL PIT LOG

Project				TRIAL PIT No
Sandleford Park, Newbury				TP17
Job No	Date	Ground Level (m)	Co-Ordinates ()	
GEG-14-352	15-09-14		E 446,690.5 N 164,385.6	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		(Soft) friable brown slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-angular to sub-rounded chert.			
0.30-0.90		(TOPSOIL)			
		(Loose to medium dense) yellow brown clayey slightly gravelly fine to medium SAND with occasional gravel-sized grey SILT pockets. Gravel is sub-angular to sub-rounded chert. (SILCHESTER SAND & GRAVEL MEMBER)			
0.90-1.80		(Medium dense) orange brown slightly clayey fine SAND with some gravel-sized grey silt pockets. (POSSIBLE SILCHESTER SAND & GRAVEL MEMBER)			

Shoring/Support: None
Stability: Sides stable



GENERAL REMARKS

1. No groundwater encountered. 2. Infiltration test undertaken in trial pit. 3. Upon completion, trial pit backfilled with arisings.

All dimensions in metres Scale 1:50	Client Brookbands Consulting/Bloor Homes	Method/ Plant Used JCB-3CX	Logged By FT

AGS3 UK TP GEG-14-352 SANDLEFORD PK, NEWBURY.GPJ GINT STD AGS 3_1.GDT 10/11/14

APPENDIX D

INFILTRATION TEST DATA

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP01 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	65	100%
1	65	100%
2	66	99%
75	78	87%
93	80	85%
115	82	83%
136	83	82%
177	89	76%
201	91	74%
288	97	68%
323	100	65%
366	103	62%
406	105	60%
426	105	60%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP02 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	270	100%
1	269	101%
2	268	102%
43	268	102%
63	267	103%
106	267	103%
171	267	103%
219	267	103%
257	267	103%
282	267	103%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP03 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	30	100%
1	31	99%
2	31	99%
4	31	99%
77	39	91%
87	40	90%
137	43	87%
161	44	86%
220	47	83%
289	50	80%
331	52	78%
362	53	77%
392	54	76%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP04 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	98	100%
1	99	99%
2	99	99%
63	104	94%
79	105	93%
122	108	90%
148	108	90%
212	110	88%
280	113	85%
315	113	85%
337	113	85%
353	113	85%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP05 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	293	100%
1	292	101%
2	291	102%
17	292	101%
58	292	101%
126	292	101%
200	292	101%
245	292	101%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP05A Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	40	100%
1	41	99%
3	41	99%
29	44	96%
57	47	93%
79	49	91%
112	52	88%
161	54	86%
225	58	82%
282	62	78%
336	64	76%
361	65	75%
386	66	74%
423	66	74%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP06 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	71	100%
1	70	101%
3	70	101%
4	70	101%
42	72	99%
65	72	99%
99	73	98%
127	73	98%
201	74	97%
265	74	97%
293	74.5	97%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP07 Test 1*

Time (min)	Depth from Surface (cm)	% Effective Depth
0	25	100%
1	26	99%
3	28	97%
15	36	89%
46	46	79%
68	51	74%
100	58	67%
153	66	59%
216	72	53%
275	77	48%
326	80	45%
354	83	42%
375	84	41%
408	85	40%
428	86	39%
448	87	38%
700	93	32%
900	97	28%
1100	100	25%
End of Test		

*Last Data Point is Extrapolated

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP08 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	76	100%
1	76	100%
2	76	100%
22	77	99%
75	82	94%
113	84	92%
176	87	89%
232	89	87%
286	90	86%
312	91	85%
340	91	85%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP09 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	78	100%
1	78	100%
9	80	98%
44	82	96%
69	84	94%
85	84	94%
180	87	91%
243	89	89%
280	90	88%
318	91	87%
355	92	86%
384	92	86%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP10 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	68	100%
1	69	99%
2	69	99%
37	72	96%
62	73	95%
93	75	93%
145	77	91%
210	77	91%
267	80	88%
317	81	87%
347	81	87%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP11 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	92	100%
1	93	99%
2	94	98%
95	99	93%
123	99	93%
146	99	93%
208	101	91%
263	102	90%
333	103	89%
368	103	89%
383	103.5	89%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP12 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	77	100%
1	78	99%
2	78	99%
3	78	99%
71	84	93%
105	85	92%
122	86	91%
183	88	89%
243	89	88%
309	90	87%
331	90.5	87%
356	90.5	87%
381	91	86%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP13 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	99	100%
1	99	100%
3	101	98%
30	106	93%
63	109	90%
91	113	86%
135	121	78%
180	122	77%
219	126	74%
276	131	69%
326	136	64%
358	136.5	63%
381	136.5	63%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP14 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	69	100%
1	69	100%
2	70	99%
42	74	95%
81	76	93%
155	77	92%
220	78	91%
281	79	90%
370	80	89%
395	80	89%
End of Test		

Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP15 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	80	100%
1	80	100%
2	81	99%
51	82	98%
121	83	97%
191	83	97%
243	83	97%
End of Test		

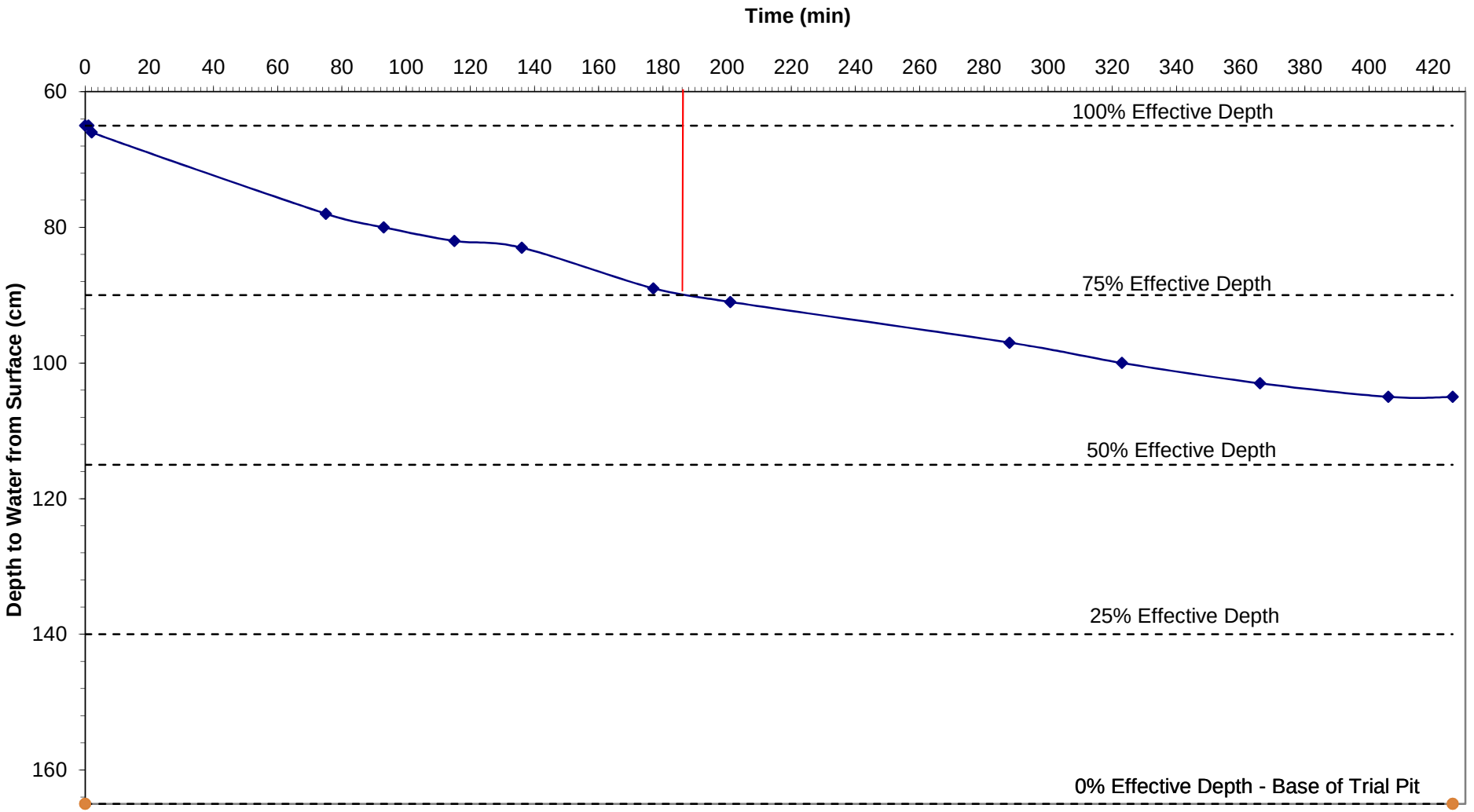
Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP16 Test 1

Time (min)	Depth from Surface (cm)	% Effective Depth
0	85	100%
1	86	99%
2	86	99%
4	87	98%
50	95	90%
77	97	88%
105	100	85%
149	103	83%
194	107	79%
233	109	77%
291	112	74%
345	115	71%
375	117	69%
420	118	68%
End of Test		

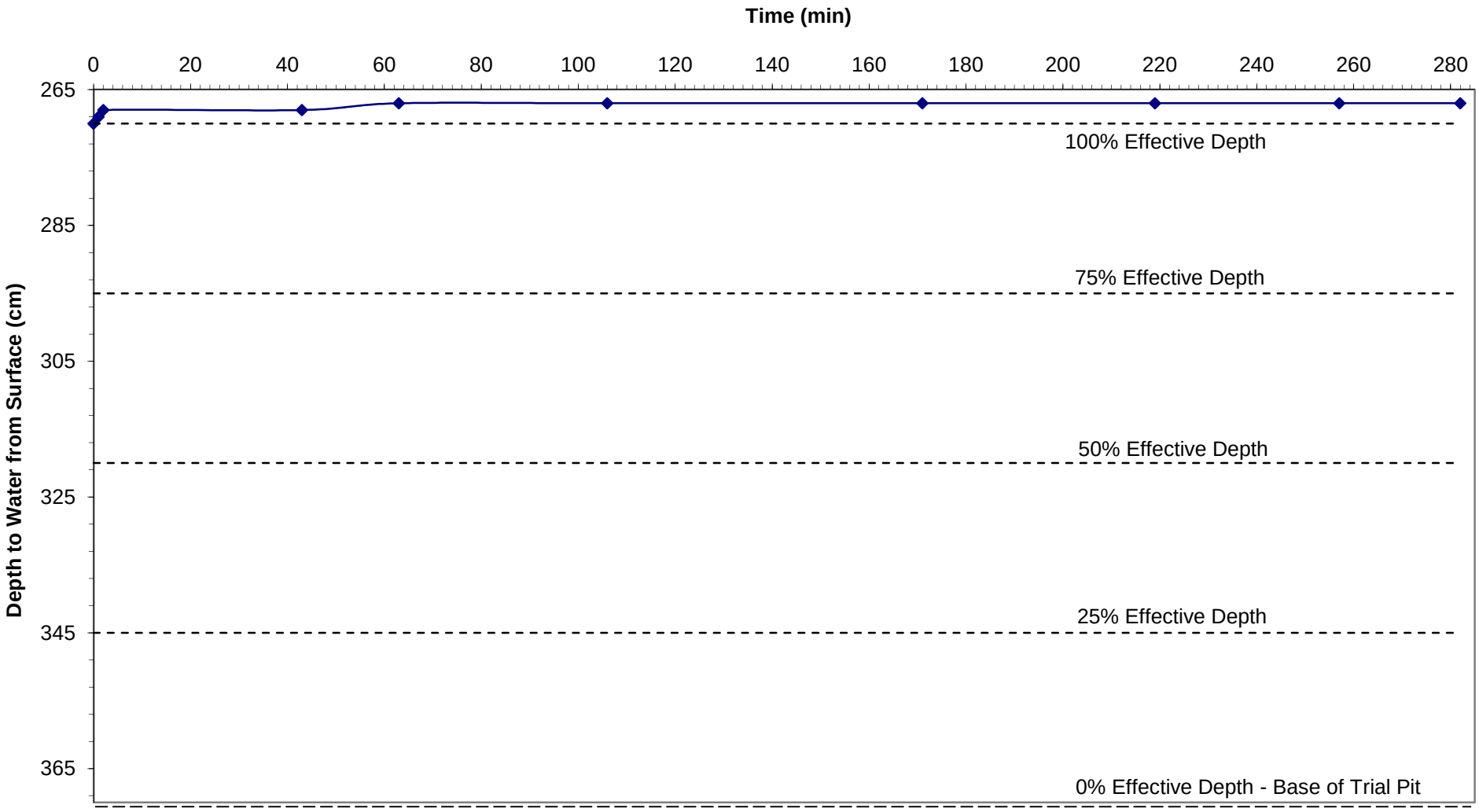
Appendix D
Infiltration Tests
Sandleford Park, Newbury
TP17 Test 1

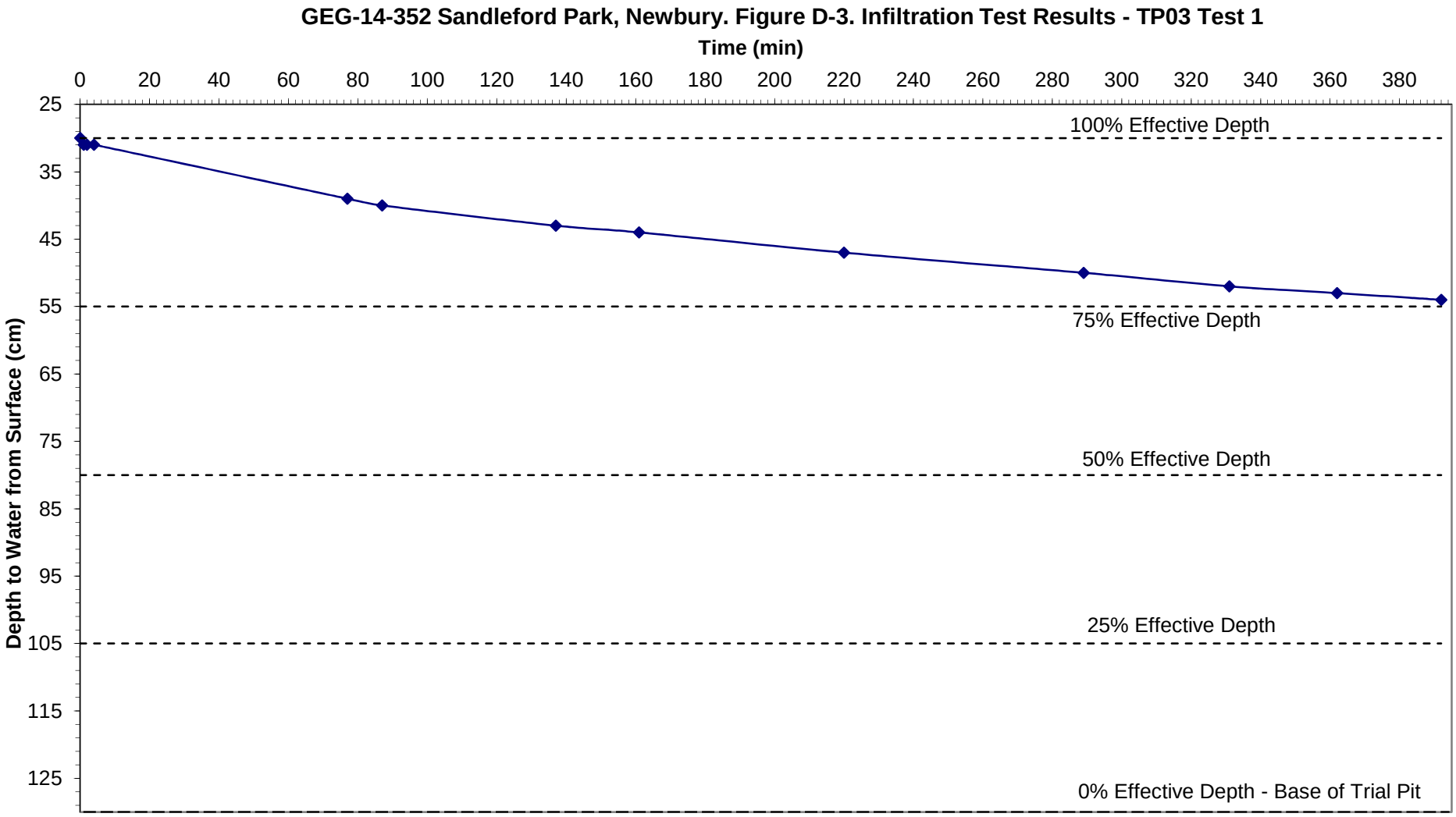
Time (min)	Depth from Surface (cm)	% Effective Depth
0	76	100%
2	76	100%
4	77	99%
9	77	99%
24	77	99%
41	78	98%
79	78	98%
105	79	97%
167	80	96%
194	81	95%
264	81	95%
304	81	95%
End of Test		

GEG-14-352 Sandleford Park, Newbury. Figure D-1. Infiltration Test Results - TP01 Test 1

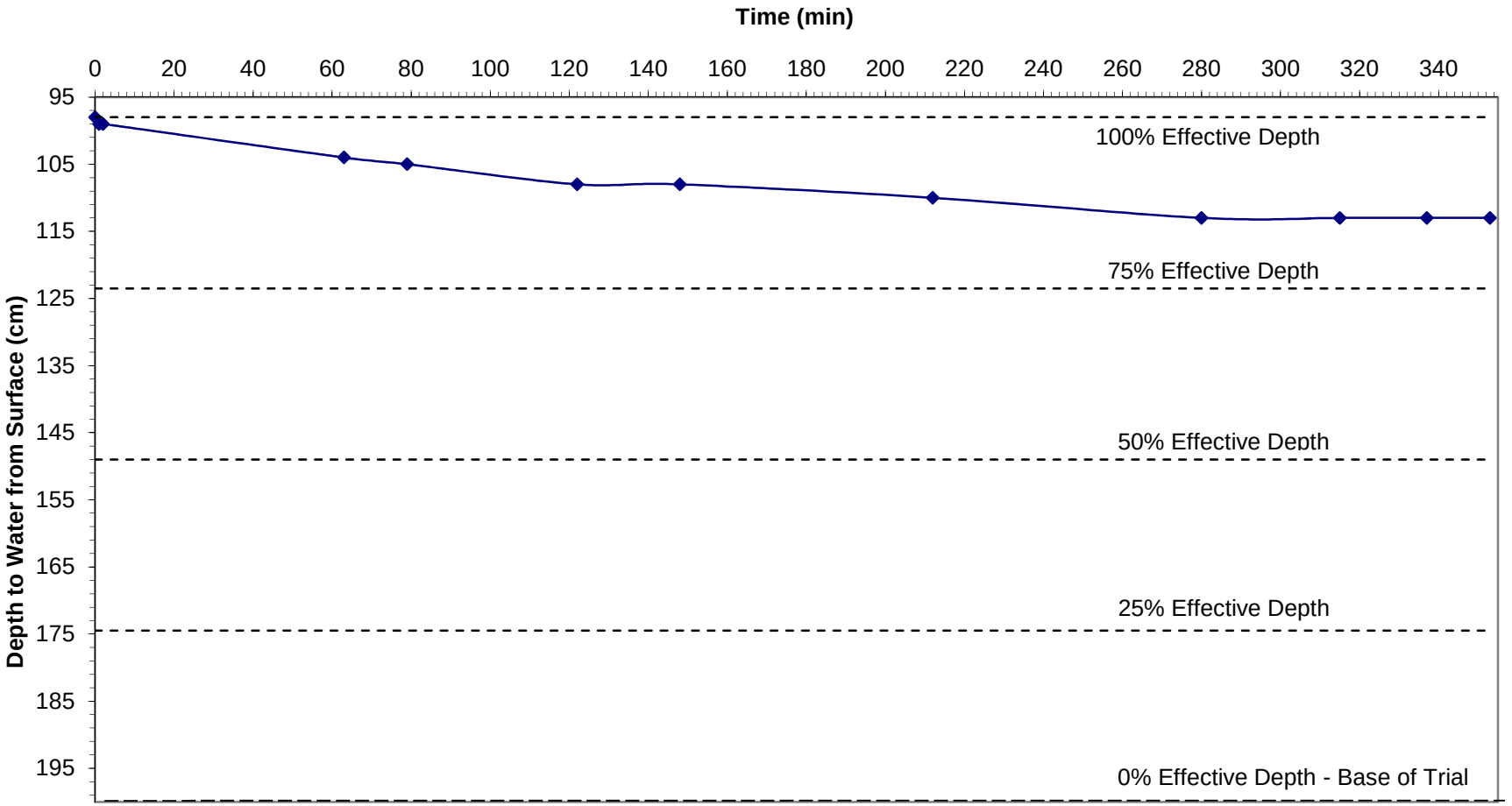


GEG-14-352 Sandleford Park, Newbury. Figure D-2. Infiltration Test Results - TP02 Test 1

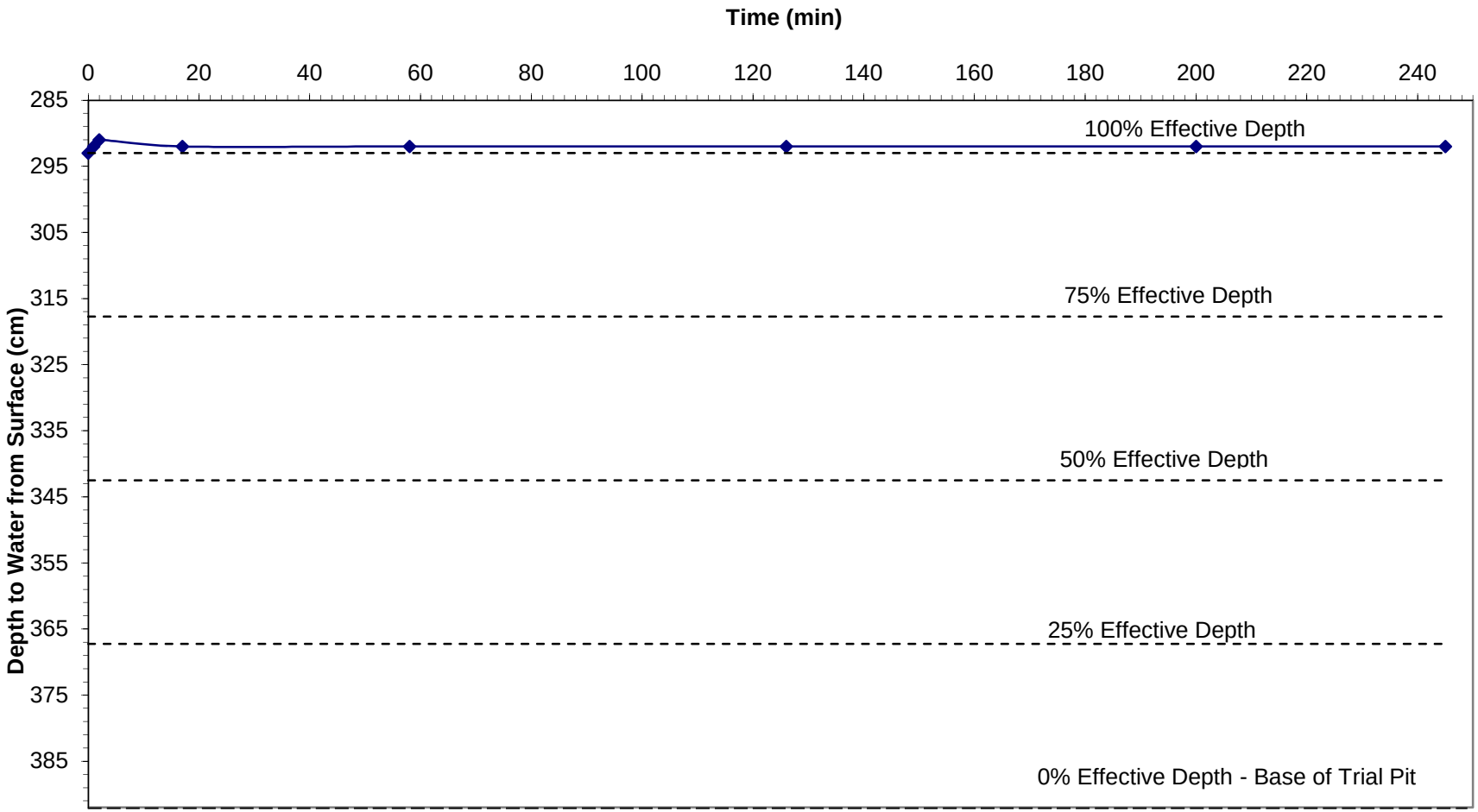



GEG-14-352 Sandleford Park, Newbury. Figure D-3. Infiltration Test Results - TP03 Test 1
Time (min)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
Depth to Water from Surface (cm)
25
35
45
55
65
75
85
95
105
115
125
100% Effective Depth
75% Effective Depth
50% Effective Depth
25% Effective Depth
0% Effective Depth - Base of Trial Pit

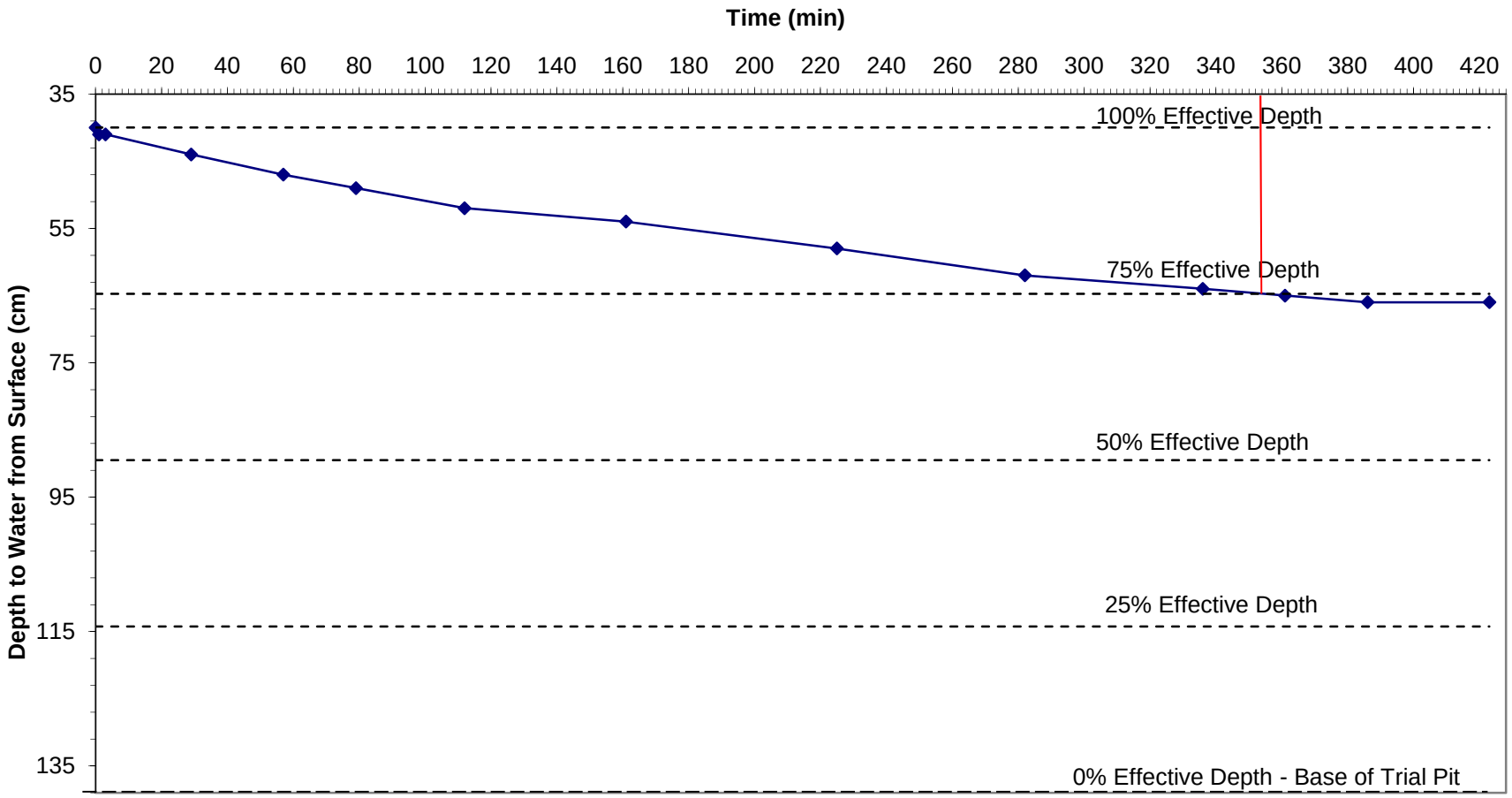
GEG-14-352 Sandleford Park, Newbury. Figure D-4. Infiltration Test Results - TP04 Test 1



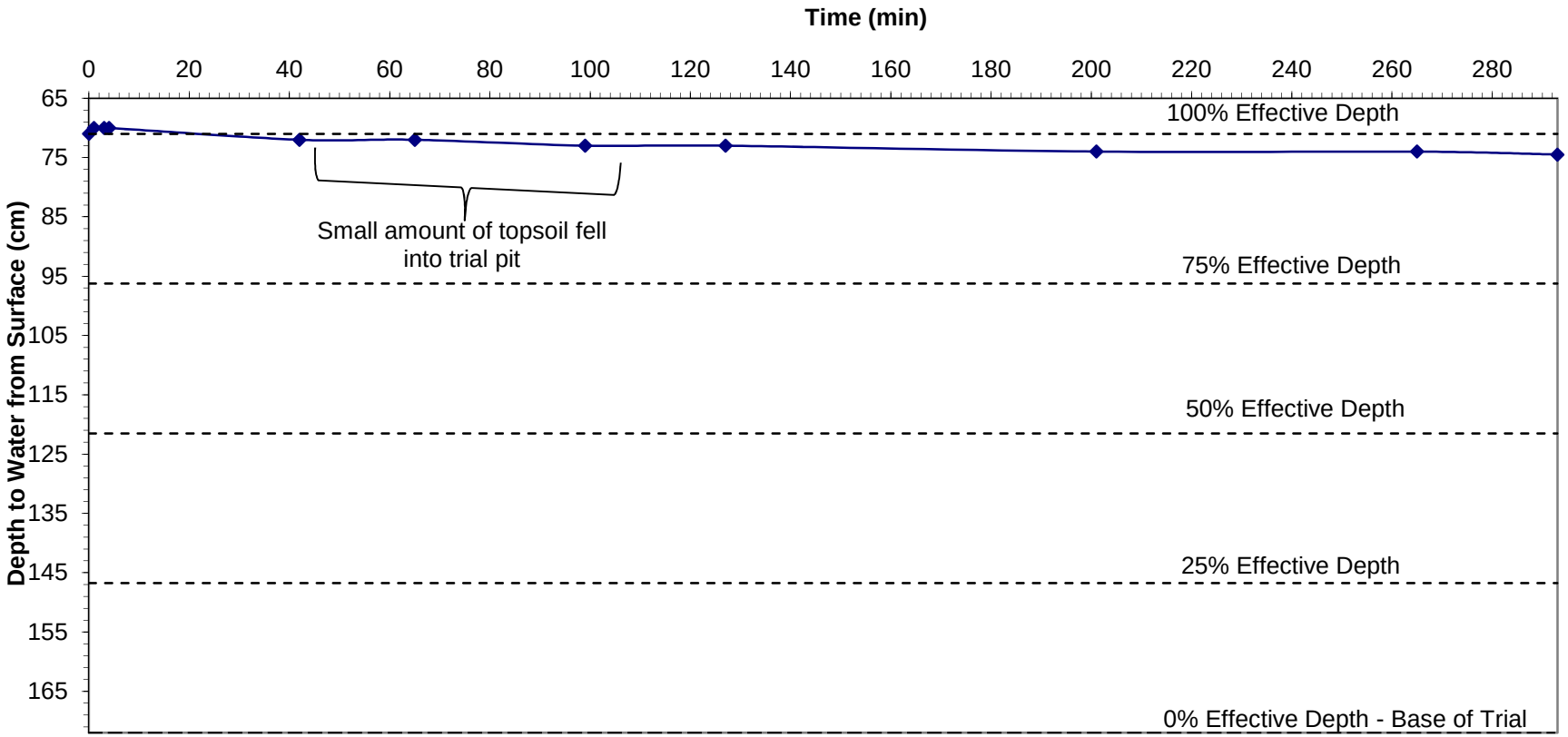
GEG-14-352 Sandleford Park, Newbury. Figure D-5. Infiltration Test Results - TP05 Test 1



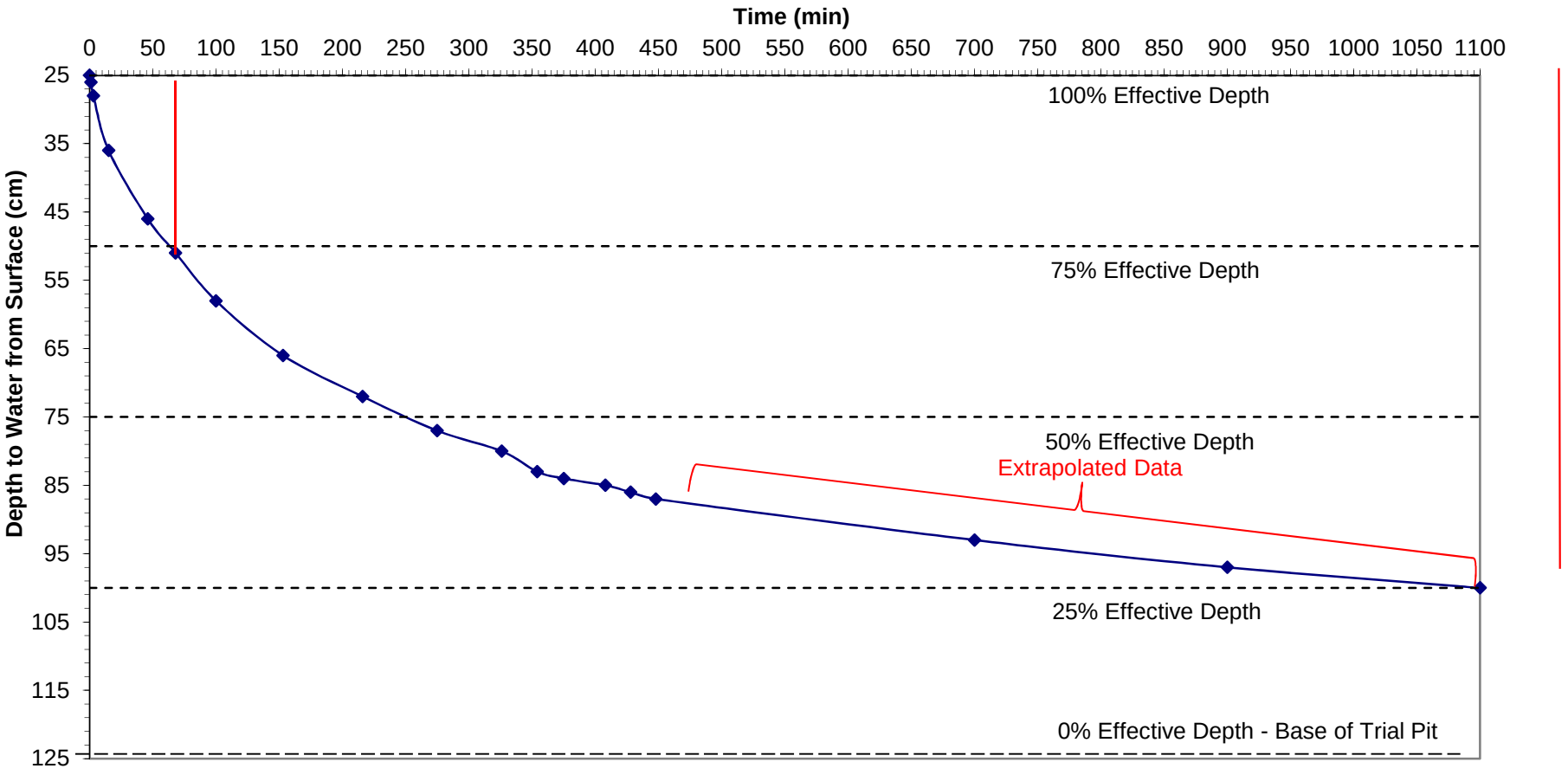
GEG-14-352 SandlefordPark, Newbury. Figure D-6. Infiltration Test Results - TP05A Test 1



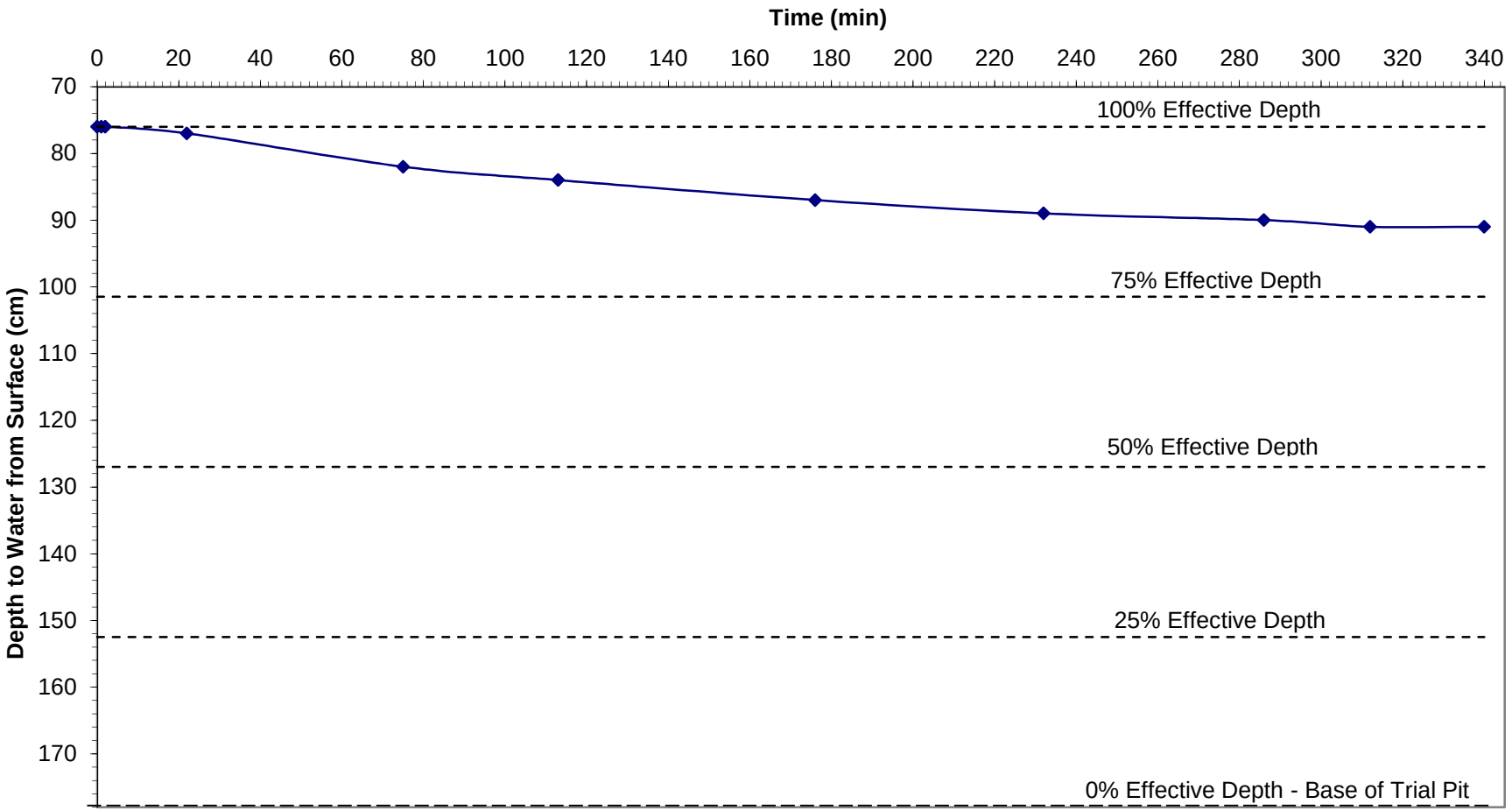
GEG-14-352 Sandleford Park, Newbury. Figure D-7. Infiltration Test Results - TP06 Test 1



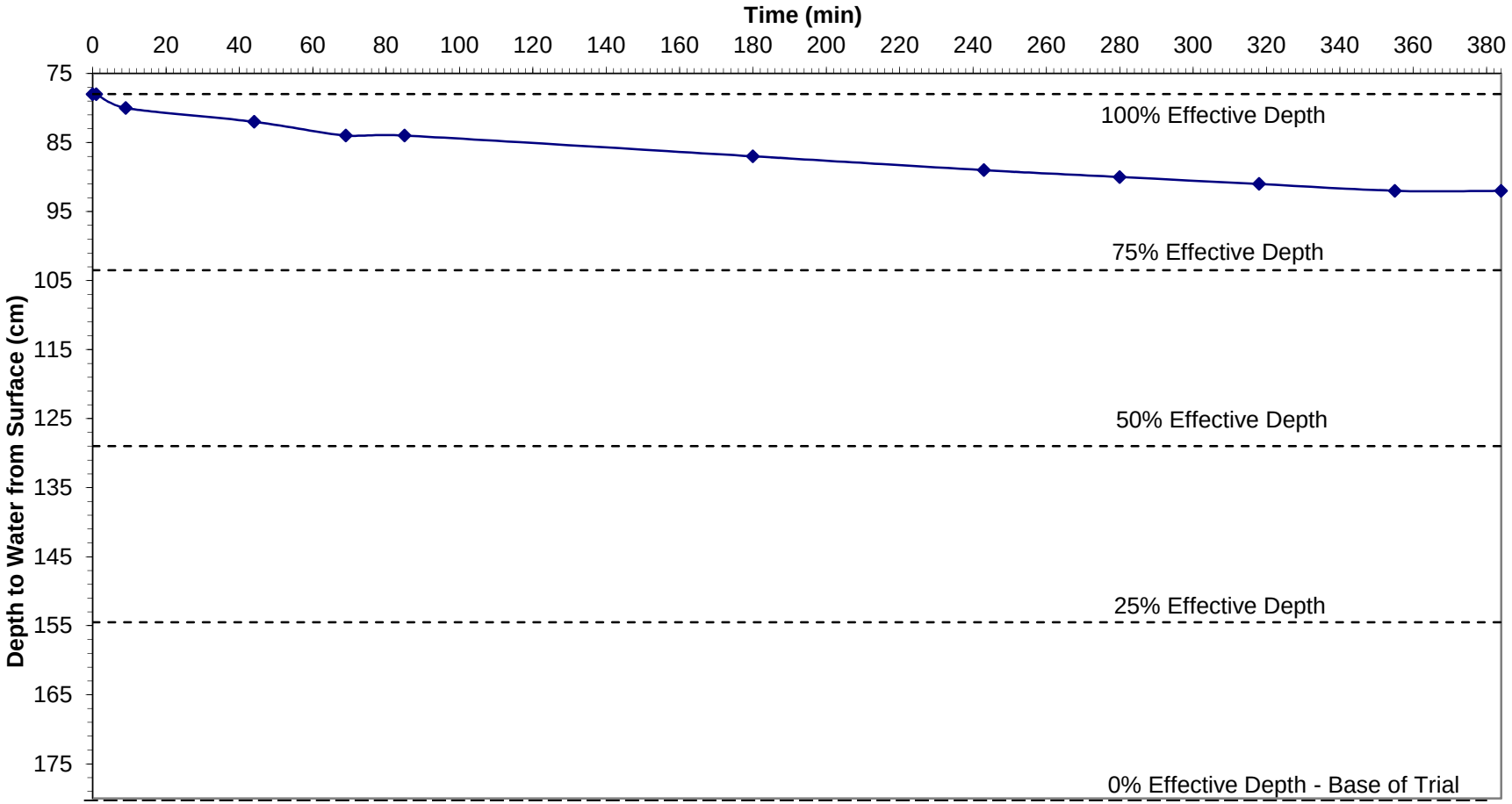
GEG-14-352 Sandleford Park, Newbury. Figure D-8. Infiltration Test Results - TP07 Test 1



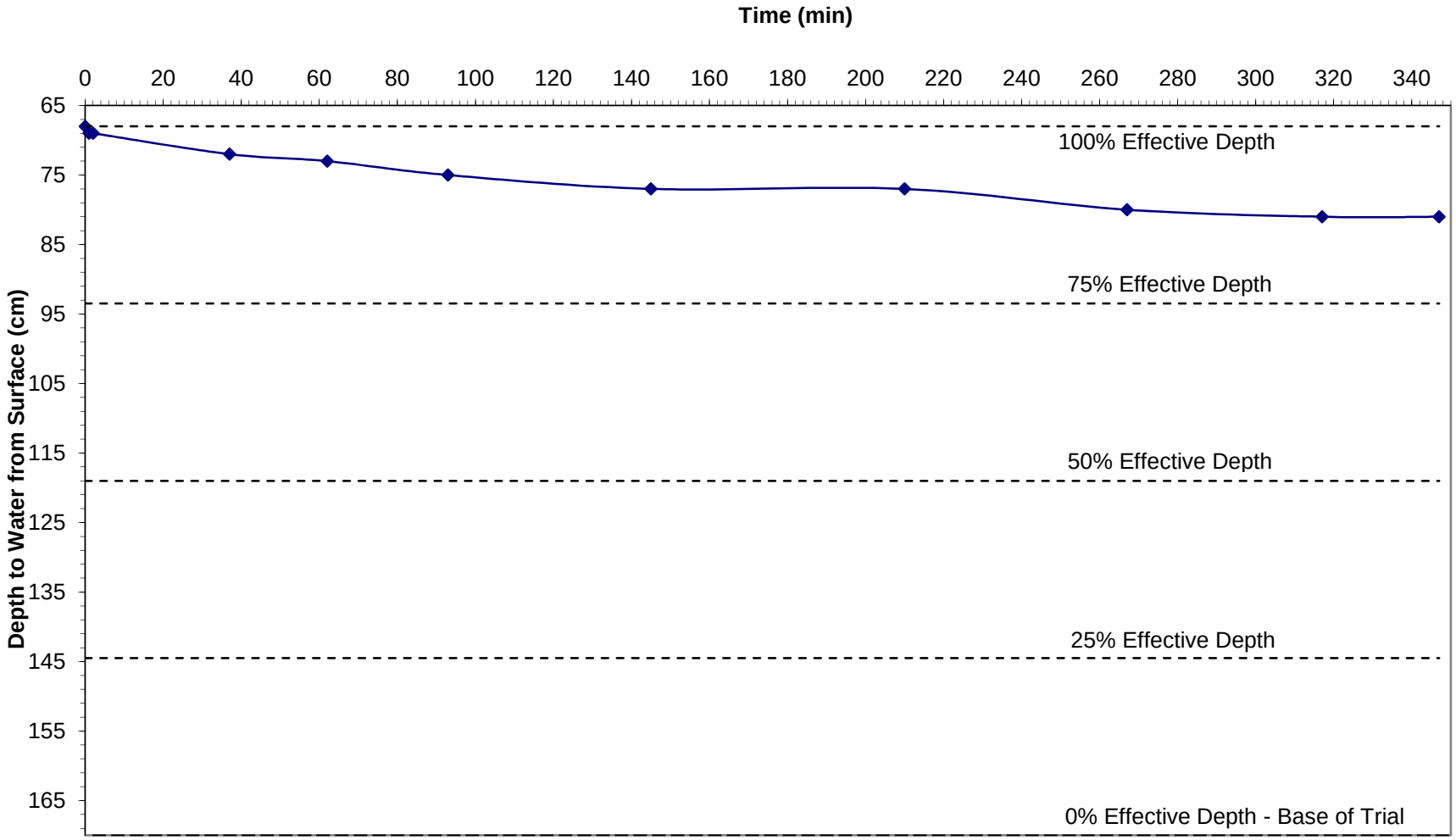
GEG-14-352 Sandleford Park, Newbury. Figure D-9. Infiltration Test Results - TP08 Test 1



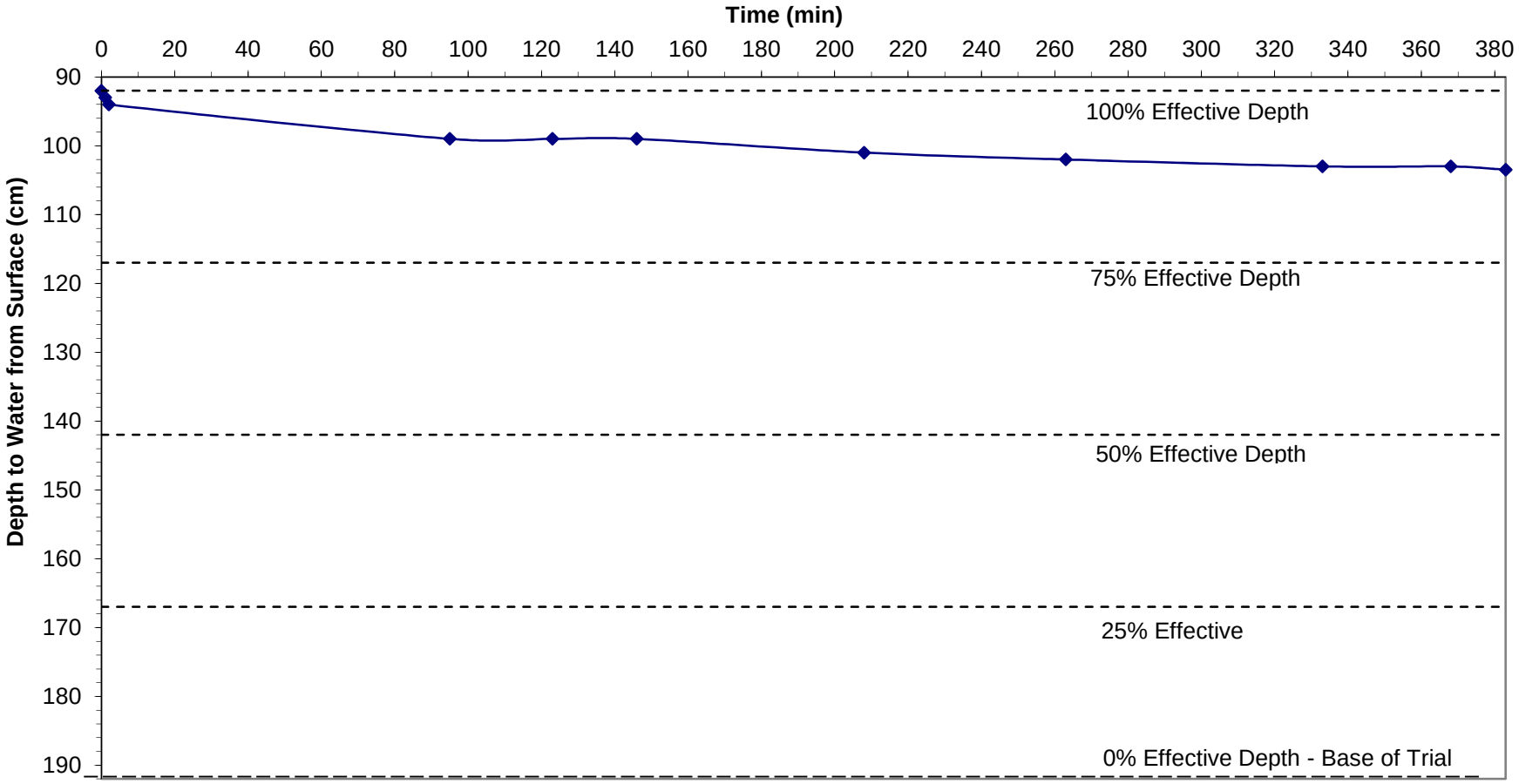
GEG-14-352 Sandleford Park, Newbury. Figure D-10. Infiltration Test Results - TP09 Test 1



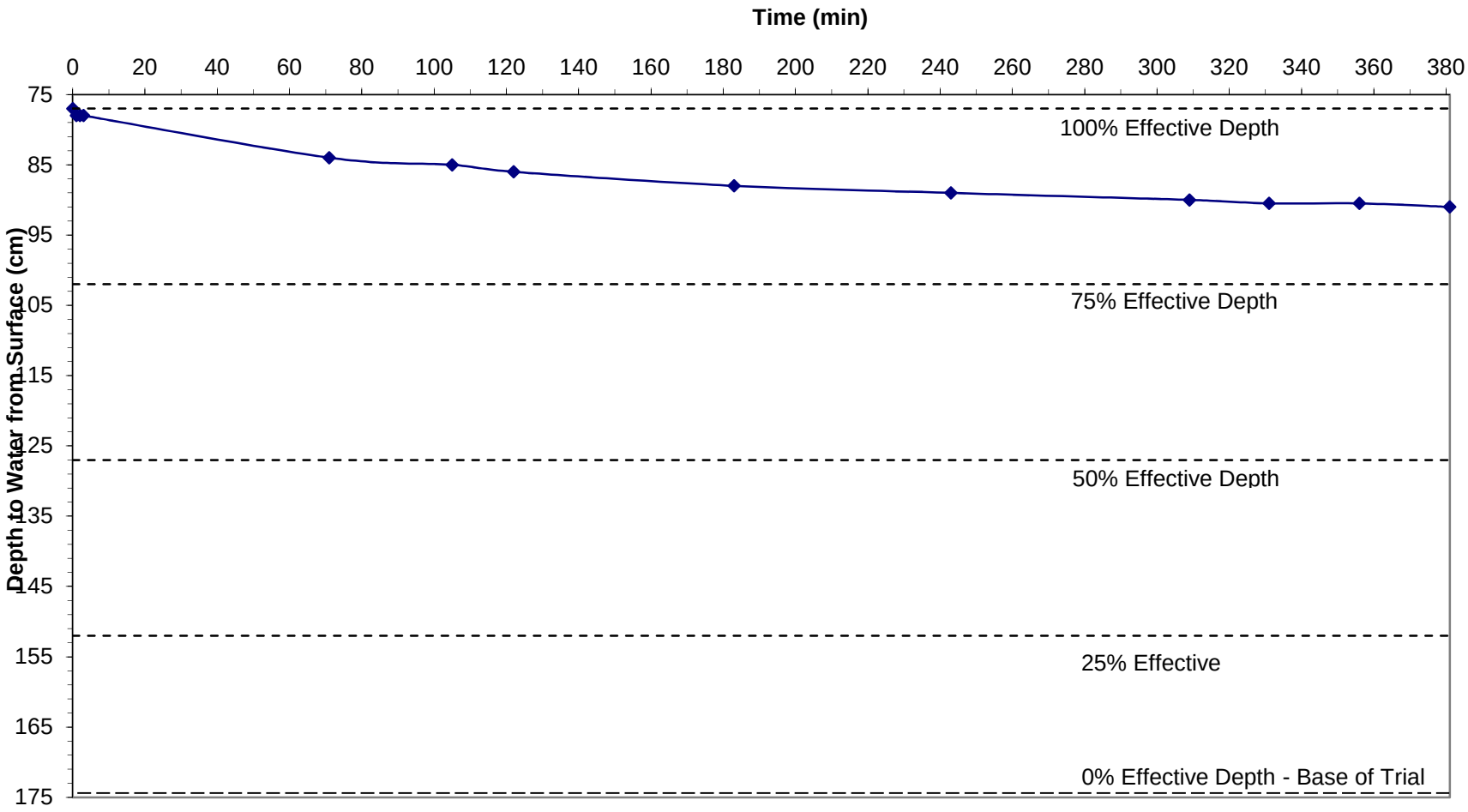
GEG-14-352 Sandleford Park, Newbury. Figure D-11. Infiltration Test Results - TP10 Test 1



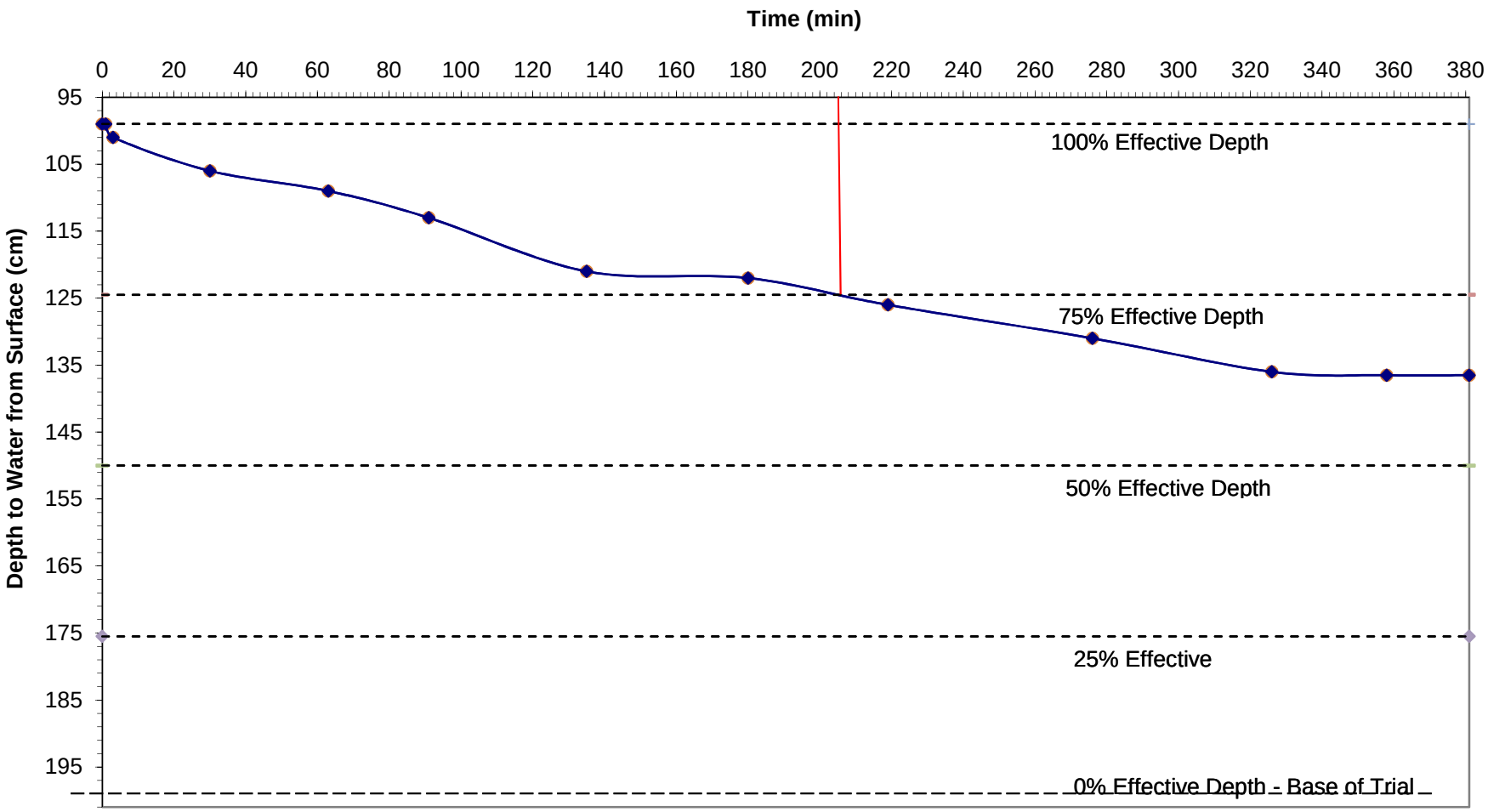
GEG-14-352 Sandleford Park, Newbury. Figure D-12. Infiltration Test Results - TP11 Test 1



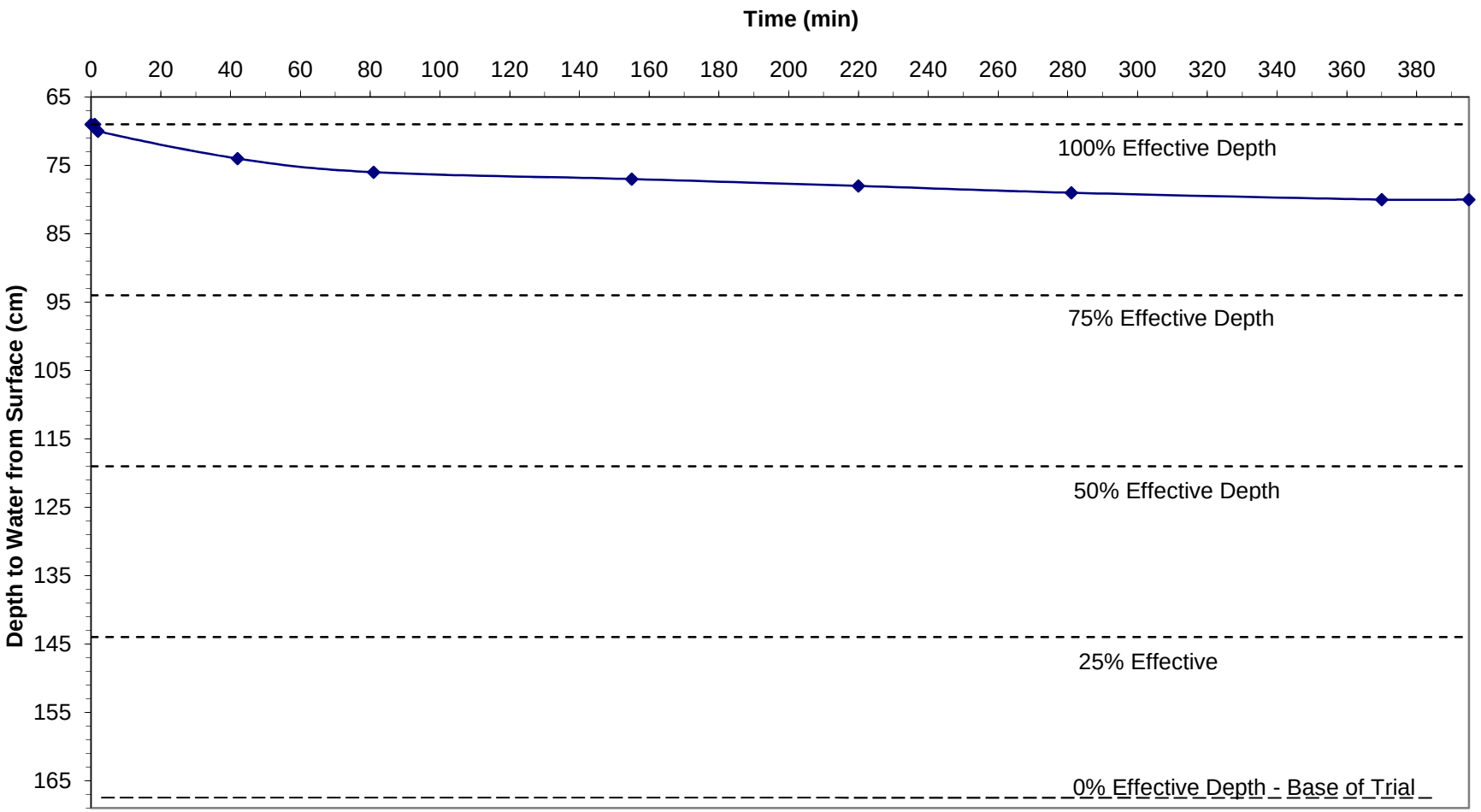
GEG-14-352 Sandleford Park, Newbury. Figure D-13. Infiltration Test Results - TP12 Test 1



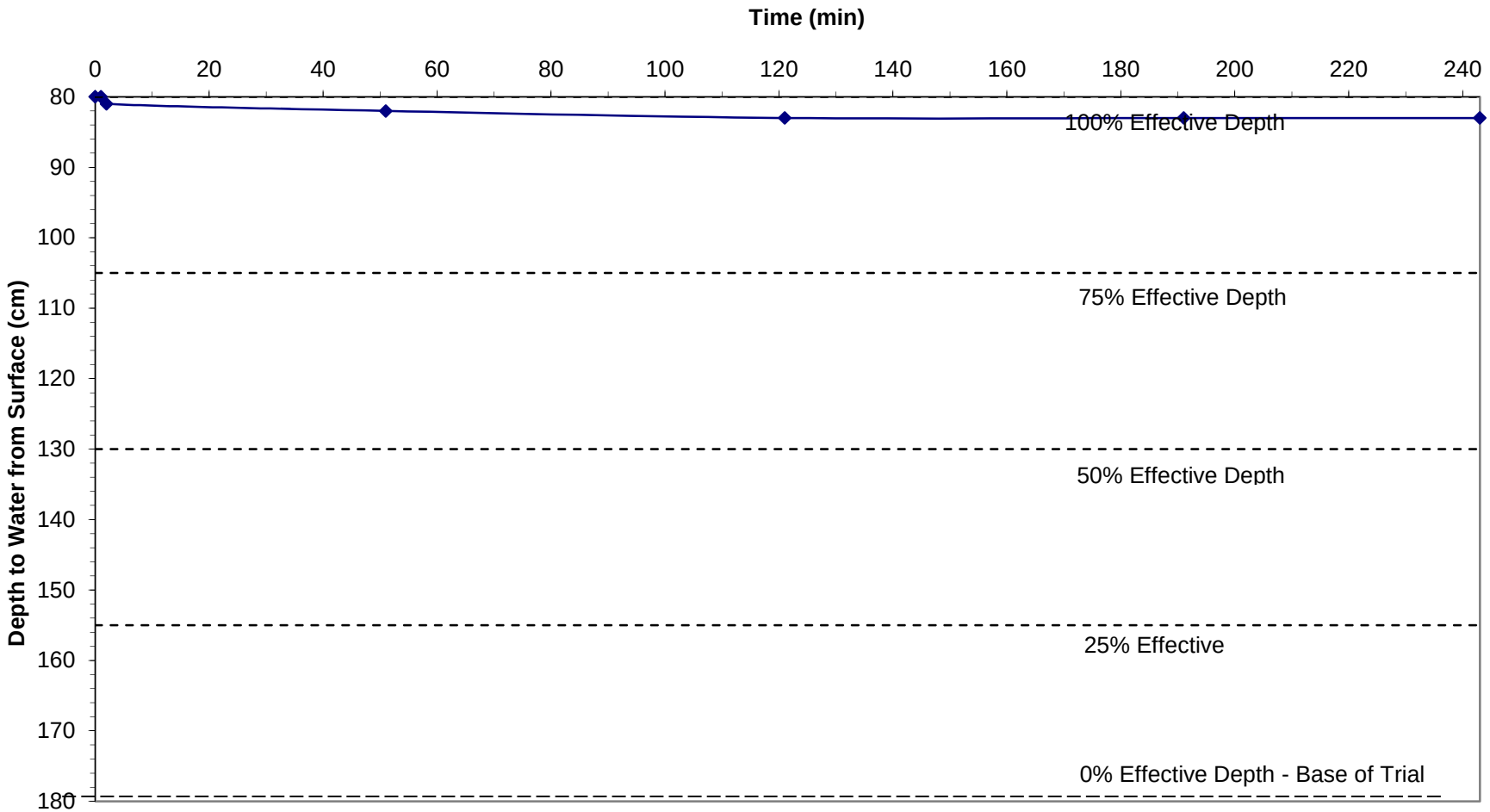
GEG-14-352 Sandleford Park, Newbury. Figure D-14. Infiltration Test Results - TP13 Test 1



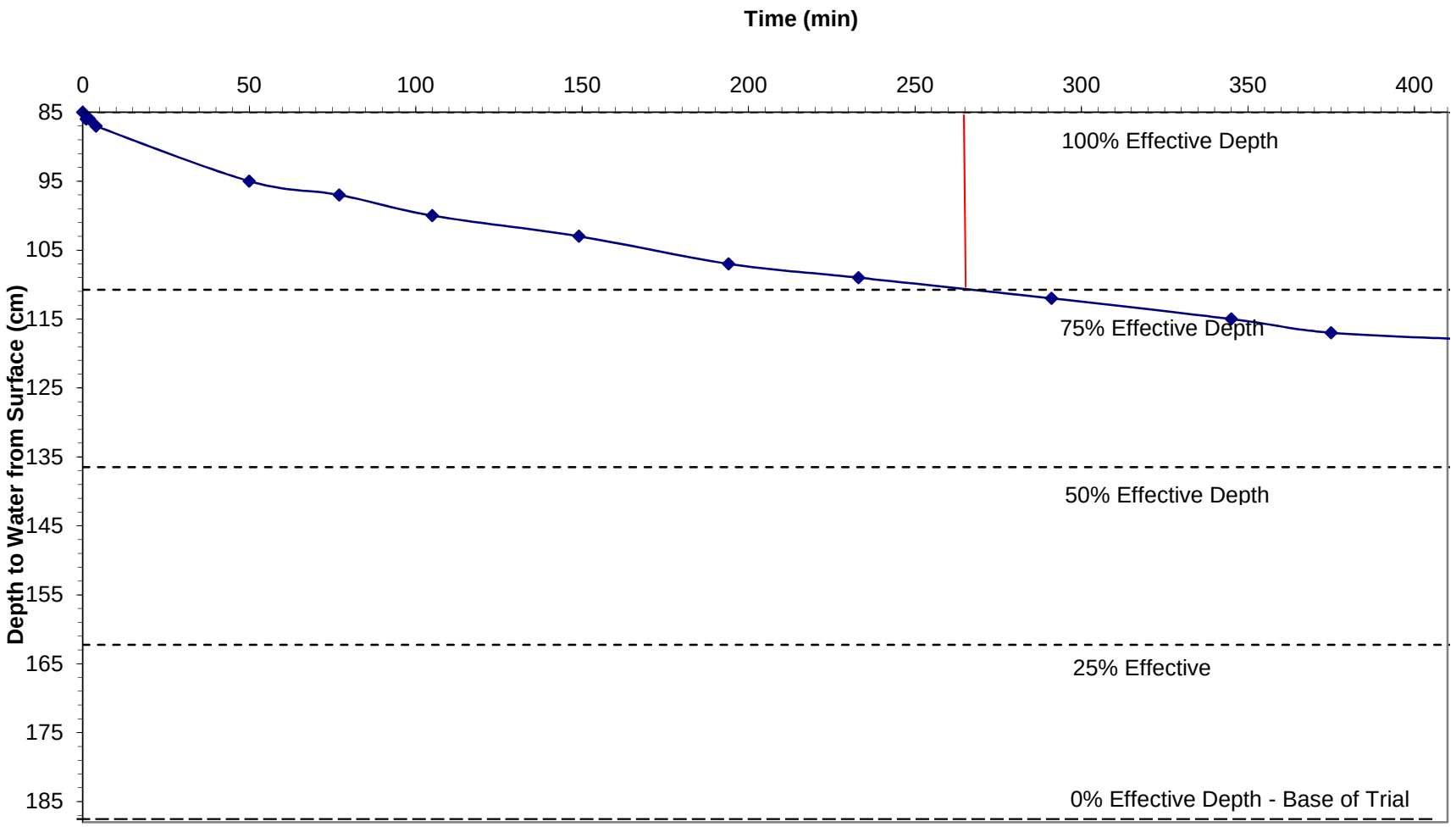
GEG-14-352 Sandleford Park, Newbury. Figure D-15. Infiltration Test Results - TP14 Test 1



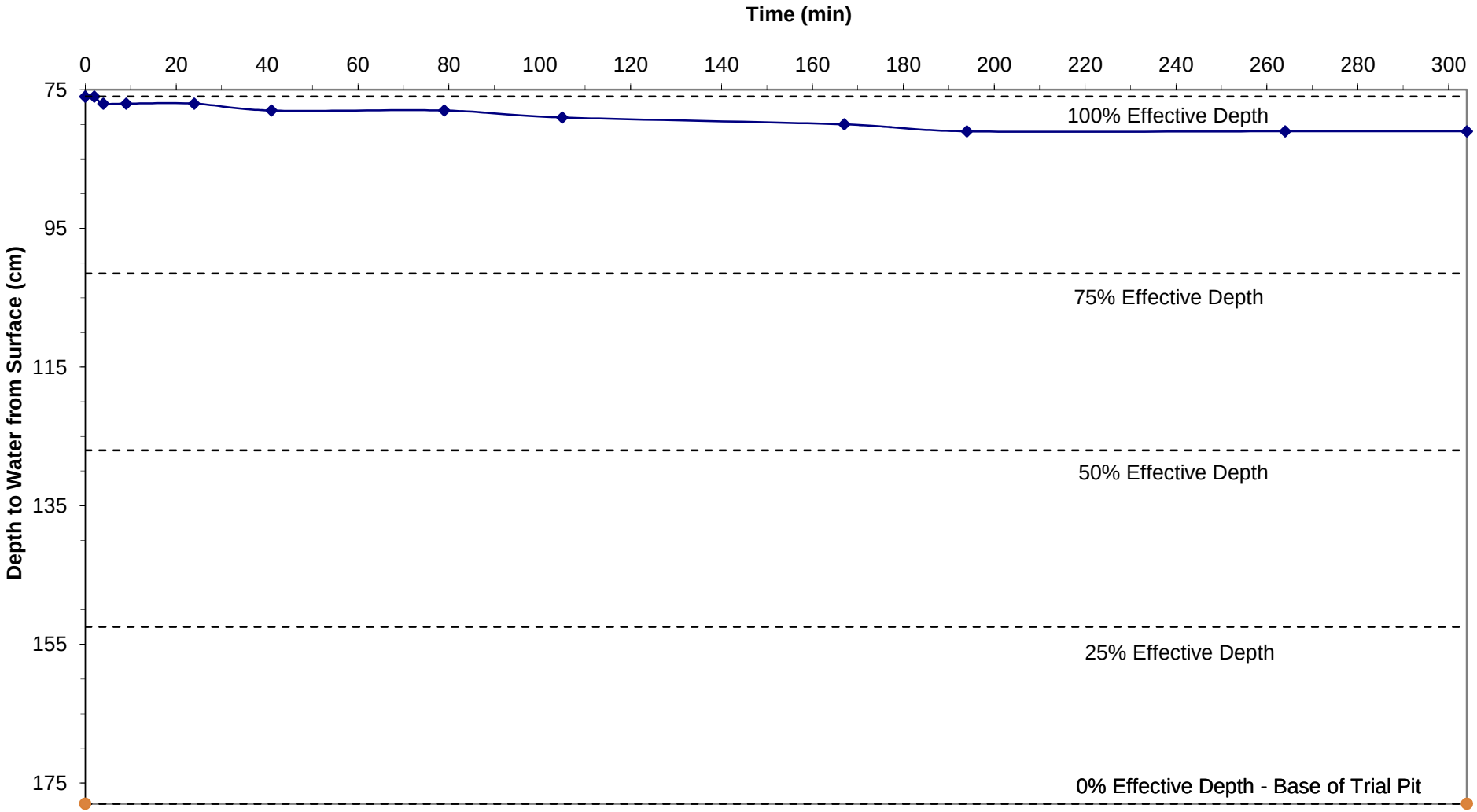
GEG-14-352 Sandleford Park, Newbury. Figure D-16. Infiltration Test Results - TP15 Test 1



GEG-14-352 Sandleford Park, Newbury. Figure D-17. Infiltration Test Results - TP16 Test 1



GEG-14-352 Sandleford Park, Newbury. Figure D-18. Infiltration Test Results - TP17 Test 1



Appendix D
Infiltration Rate Calculations
Sandleford Park, Newbury

Parameter	Symbol	Calculation	Units	TP01 Test 1	TP02 Test 1	TP03 Test 1	TP04 Test 1	TP05 Test 1	TP05A Test 1	TP06 Test 1	TP07 Test 1*	TP08 Test 1	TP09 Test 1
Effective Depth of Trial Pit	d_p		m	1.00	1.00	1.00	1.02	0.99	0.99	1.01	1.00	1.02	1.02
Width of Trial Pit	w		m	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.6
Length of Trial Pit	l		m	2.90	3.20	3.40	3.00	3.00	2.45	3.40	3.31	3.00	3
Volume of Trial Pit	V	$= d_p \times w \times l$	m^3	1.74	1.92	2.04	1.84	1.78	1.46	2.06	1.99	1.84	1.84
Volume of Trial Pit at 50% Effective Depth	$V_{50\%}$	$= V \times 0.5$	m^3	0.87	0.96	1.02	0.918	0.891	0.72765	1.0302	0.993	0.918	0.918
Internal Surface Area of Trial Pit to 50% Effective Depth (including base)	$a_{p50\%}$	$= l \times w + d_p \times (w + l)$	m^2	5.24	5.72	6.04	5.472	5.36	4.4895	6.08	5.896	5.47	5.47
Time to reach 75% Effective Depth	$T_{p75\%}$		min	184	-	-	-	-	353	-	64	-	-
Time to reach 25% Effective Depth	$T_{p25\%}$		min	-	-	-	-	-	-	-	1100	-	-
Time 75% - 25%	$T_{p75\%-25\%}$	$= T_{p25\%} - T_{p75\%}$	min	-	-	-	-	-	-	-	1036	-	-
Infiltration Rate	f	$= V_{50\%} / a_{p50\%} \times (T_{p75\%-25\%})$	m/s	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**2.71E-06**	**N/A**	**N/A**

*Based on extrapolated data

Parameter	Symbol	Calculation	Units	TP10 Test 1	TP11 Test 1	TP12 Test 1	TP13 Test 1	TP14 Test 1	TP15 Test 1	TP16 Test 1	TP17 Test 1
Effective Depth of Trial Pit	d_p		m	1.02	1.00	1.00	1.02	1.00	1.00	1.03	1.02
Width of Trial Pit	w		m	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Length of Trial Pit	l		m	2.80	3.30	3.20	3.10	3.35	3.40	3.40	3.50
Volume of Trial Pit	V	$= d_p \times w \times l$	m^3	1.71	1.98	1.92	1.90	2.01	2.04	2.10	2.14
Volume of Trial Pit at 50% Effective Depth	$V_{50\%}$	$= V \times 0.5$	m^3	0.8568	0.99	0.96	0.9486	1.005	1.02	1.0506	1.071
Internal Surface Area of Trial Pit to 50% Effective Depth (including base)	$a_{p50\%}$	$= l \times w + d_p \times (w + l)$	m^2	5.15	5.88	5.72	5.634	5.96	6.04	6.16	6.282
Time to reach 75% Effective Depth	$T_{p75\%}$		min	-	-	-	205	-	-	265	-
Time to reach 25% Effective Depth	$T_{p25\%}$		min	-	-	-	-	-	-	-	-
Time 75% - 25%	$T_{p75\%-25\%}$	$= T_{p25\%} - T_{p75\%}$	min	-	-	-	-	-	-	-	-
Infiltration Rate	f	$= V_{50\%} / a_{p50\%} \times (T_{p75\%-25\%})$	m/s	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Appendix D

Thames Water Sewer Impact Study

SEWER IMPACT STUDY

X4503 – 1162

SMG 841

PROPOSED CONNECTION AT
LAND SOUTH OF MONKS LANE, NEWBURY PHASE 2

FOUL SYSTEM

V1.0 August 2016

Prepared by:	Kishor Patil
Checked by:	Pugazh Thayumanavan
Reviewed by:	Graham Moralee
Amended and Approved by:	TWUTIL

Asset Modelling and Strategy Team
Wastewater SPA
Thames Water Utilities Ltd, Reading STW,
Island Road, Reading, Berks. RG2 ORP

Contents

Appendices

1.0 Introduction

The following report was commissioned by Thames Water's Developer Services to investigate the capacity within the existing foul network and to ascertain the impact of a proposed new connection on the foul network at Land South of Monks Lane, Sandleford Park, Newbury. A study was previously completed in 2010 and this study is to update the previous findings.

The scope of the study is to undertake a preliminary desktop study based upon an existing hydraulic model.

The scope of the study includes:

- Check the current performance of the existing network during both dry and wet weather events.
- Add development flows to the model and check the impact of additional flow to the sewer network during both dry and wet weather events.
- Suggest possible options to allow flows to be accepted into the existing network with no detriment to existing levels of service. It should be noted that these options are indicative and are likely to be subject to change based on site conditions, other utilities and requirements of third parties. However, the options indicate the feasibility of connecting the site to the sewerage system and the ability of the sewerage system to accept the development.

2.0 Background

The proposed new development is on a Greenfield site and the Developer proposes to accommodate 2,000 new residential properties, 2,850m^2 of commercial space, two schools with a total of 1,108 pupils and an 80 bed care home. The development area is situated in the town of Newbury, West Berkshire.

The development area is bounded by Monks Lane to the north, Newtown Road (A339) to the east and the River Enborne to the south.

The foul flow from the residential and non-residential properties in the development area has been calculated, using the latest Thames Water guidelines, as a pumped flow of 44.1l/s. The average inflow including peak infiltration from residential properties has been calculated as 12.2l/s with a peak inflow of 20.0l/s. The average inflow including peak infiltration from the non-residential properties has been calculated as 3.4l/s.

The preferred connection point was determined by the Developer as manhole SU47653301, located to the north-east of the development site.

A plan showing the location of the development and connection point is provided in Appendix A.

3.0 Existing Sewerage System and Treatment Works

The area in the vicinity of the development site is served by a separate foul and surface water sewer network.

From the development site, flows would be pumped to the connection manhole. From here, flows would gravitate in a northerly direction towards London Road (Newbury) Sewage Pumping Station (SPS).

Flows ultimately arrive at Newbury Sewage Treatment Works (STW), which is located approximately 5.6km to the north-east of the development site.

Flows would travel through sewers ranging from 225mm diameter to 525mm diameter from the development area towards Newbury STW.

The local foul sewers are shown in the plan provided in Appendix B.

4.0 Thames Water Drainage Requirements

It is necessary to provide separate foul and surface water drainage systems and to ensure that each system is connected to an appropriate drainage system.

This study considers the impact of foul flows discharging from the new development.

As the Developer proposes to connect only foul flows into the existing network, this report only covers the impact of the foul sewage flows from the proposed development on the existing foul sewer networks adjacent to and downstream of the proposed development. Surface water flows from the proposed development are not considered in this report and should not be connected to the foul sewer network.

The Developer is expected to follow the Local Authority's drainage hierarchy and be able to demonstrate how the proposed discharge rate of any surface water flows has been calculated.

Additional development flows should not cause new or additional flood risk to the existing system in either dry or wet weather.

5.0 Sewer Impact Assessment

Assessment of the hydraulic loading of the foul network was carried out by means of an existing hydraulic model.

The proposed new development area and connection point details were added to the model and the assessment completed to identify the impact of the proposed new development.

The analysis of the catchment indicates that the foul network is responsive to rainfall, with flooding being a risk in the catchment.

The impact of the proposed foul connection was assessed based on the design flows detailed in Section 2.0.

5.1 Foul Sewers

5.1.1 Assessment of Existing Catchment

The hydraulic model indicates that the existing foul network does not have available capacity in the network downstream of the proposed connection manhole. The hydraulic model has been used to assess wet weather scenarios of various durations. During these wet weather events, the hydraulic model predicts network surcharge and flooding to occur.

5.1.2 Assessment of Development Catchment

An analysis has been completed to assess the impact of connecting the flows from the development into the public sewer.

Table 1: Proposed Development Connection Details

Connection	Manhole	Diameter of Outgoing Sewer
Development Site	SU47653301	225mm

5.1.3 Foul System Improvement Works

The hydraulic model indicates that the foul network does not have available capacity in the network downstream of the proposed connection manhole to accept the proposed development flows. On inclusion of the additional flows from the development site, a decrease in the levels of service at multiple locations is predicted to occur.

One indicative option has been developed to prevent the detrimental impact on the existing system. This option has been developed during a preliminary desktop investigation, using the hydraulic model only. The solution identified is intended to indicate the likely extent and magnitude and the network enhancement required to mitigate the predicted detriment and thus inform negotiations between the Developer and Thames Water over the feasibility and likely cost of the connection. A detailed design is required to confirm the size, location and performance of the indicative option before proceeding with any construction. Detailed design may also indicate alternative options.

Option – Off-line Storage and local online upsizing (See Appendix C for Plan)

- Connect development flows to manhole SU47653301 at a pumped rate of 44.1l/s.
- Offline Storage at London Road SPS:
    - Provide approximately 1,671m^3 off-line storage in the green area adjacent to London Road (Newbury) SPS, located at Faraday Road. Flows would enter the storage via a low level weir constructed within manhole SU47676411, set at a spill level of 71.25m AOD. Flows would need to be pumped back to the existing sewer network at manhole SU47676411
- Local sewer upsize outside of the development at Newtown Road
    - Upsize foul sewer to a diameter of 375mm between manholes SU47653202 and SU47652301 for a length of 163m
- Local sewer upsize at Newbury Train Station at Station Road
    - Upsize foul sewer to a diameter of 375mm between manholes SU 47662601 and SU 47663707 for a length of 83m
    - Upsize foul sewer to a diameter of 300mm between manholes SU47661601 and SU47663708 for a length of 149m

Due to the size of the proposed development Thames Water require 2 permanent depth loggers to be installed to monitor the flows at the downstream point of the development site and also at the proposed connection point. The depth loggers need to feed into the Thames Water telemetry systems and need to fulfil Thames Water specifications.

[Note: As part of the optioneering process Thames Water have also considered alternative and linked up solutions which we wish to discuss further with the developer.]

6.0 Risks and Issues

The proposed development site is located within the Environment Agency's Risk of Flooding from Surface Water and Risk of Flooding from Rivers areas and the drainage of the site is therefore at risk of surface water ingress. The Developer should undertake necessary measures to ensure that the foul sewers are adequately protected against surface water ingress.

7.0 Pre-Construction Information

It should be noted that this is a hydraulic modelling desktop study. CDM Regulations do not apply at this high level design stage. The hydraulic modelling team has not undertaken site visits to identify H&S issues related to the proposed high level solution.

H&S issues to be considered in the outline and detailed design of the project as per the current CDM Regulations.

8.0 Conclusions

The desktop study has investigated and identified the implications of the proposed new development on a Greenfield site at Land South of Monks Lane, Sandleford Park, Newbury to the existing foul network.

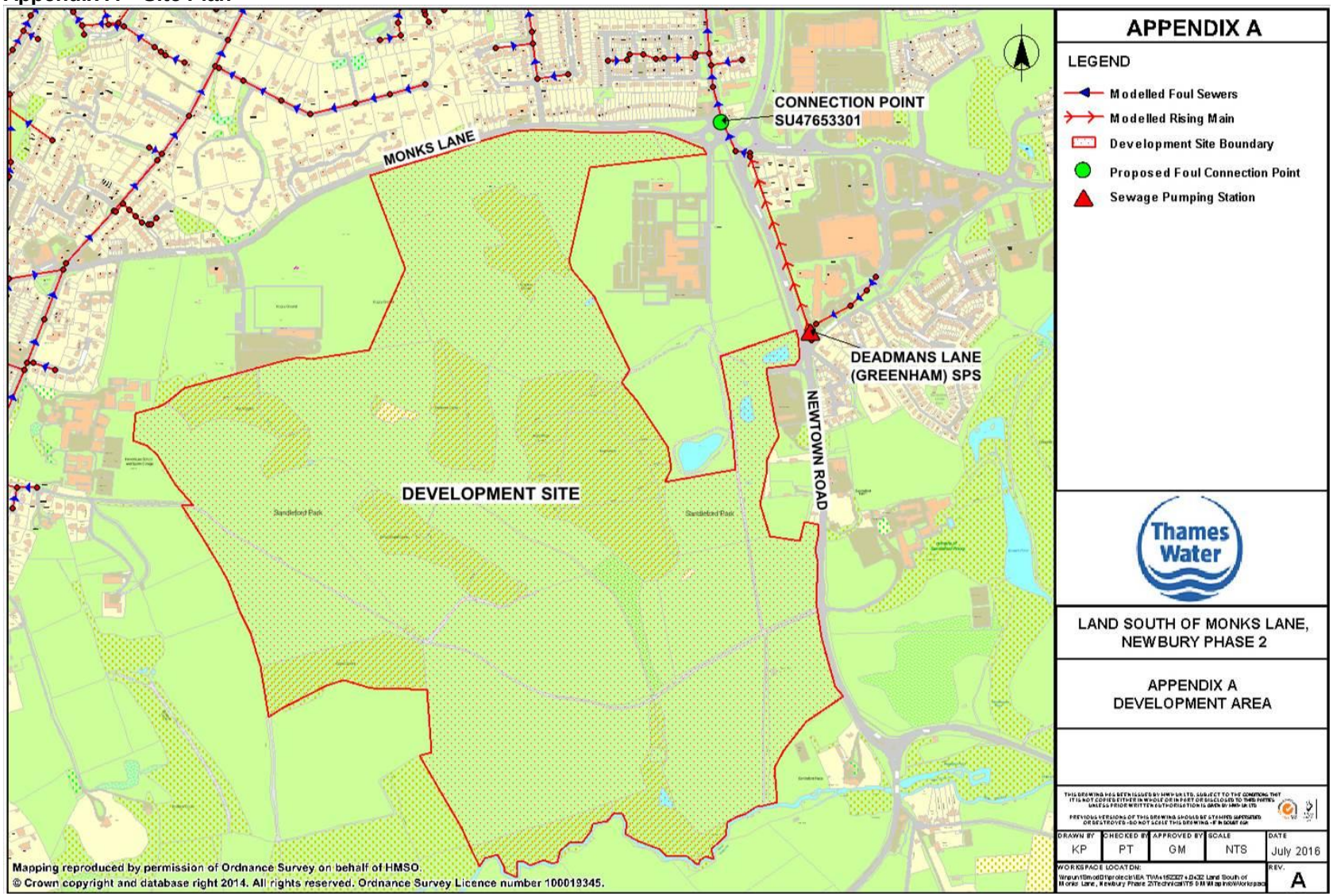
The hydraulic model indicates that the foul network does not have available capacity in the network downstream of the proposed connection manhole to accept the proposed development flows.

Improvements to the existing foul network are required to enable the proposed connection to the sewer network, without causing any detriment to the level of service provided. The proposed indicative option resolves the modelled increase in flooding and surcharge on the sewer network.

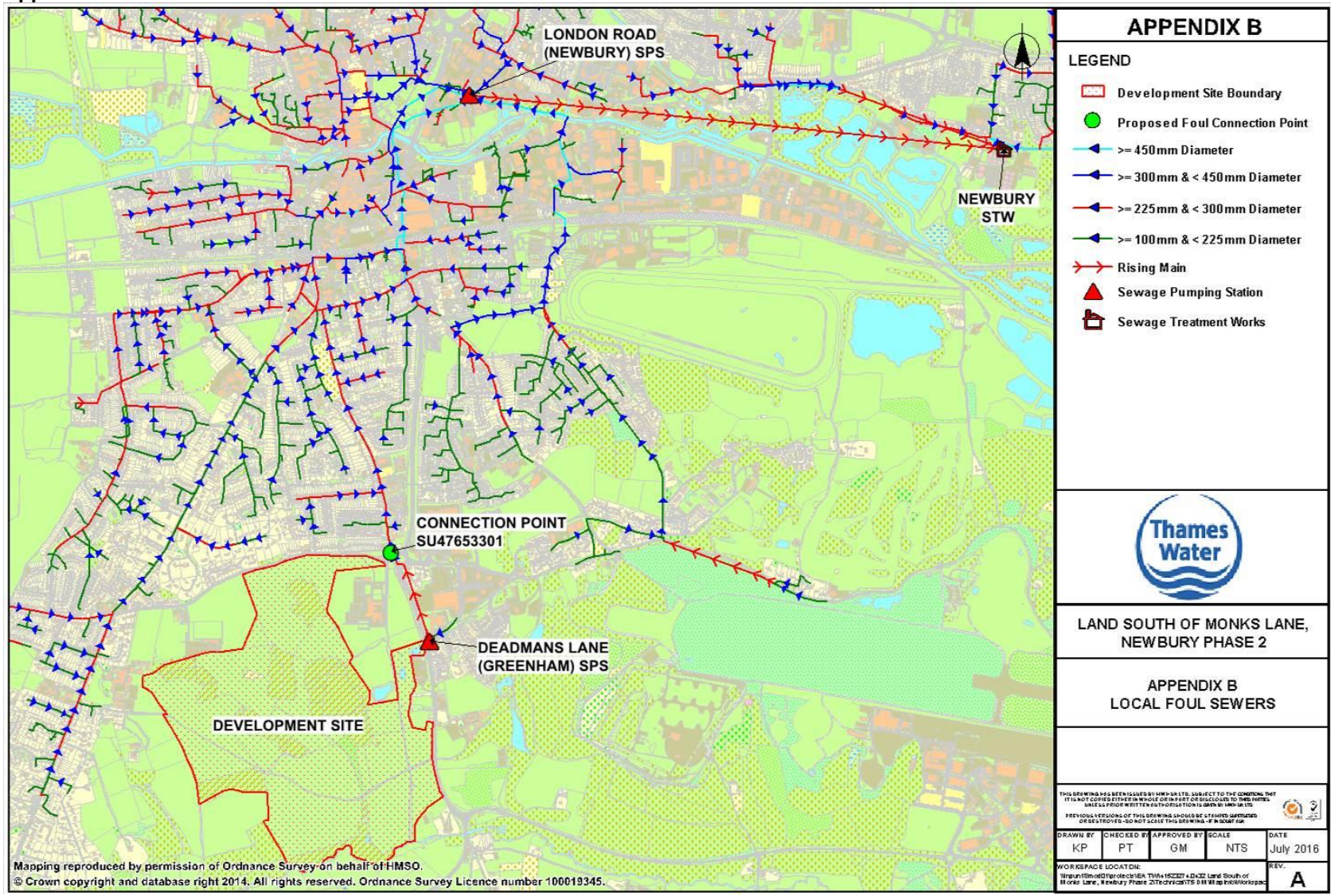
Due to the size of the proposed development Thames Water require 2 permanent depth loggers to be installed to monitor the flows at the downstream point of the development site and also at the proposed connection point. The depth loggers need to feed into the Thames Water telemetry systems and need to fulfil Thames Water specifications.

The issues highlighted and discussed throughout this report are recommendations to Thames Water Utilities and may be altered/added to based upon local operational knowledge of the system.

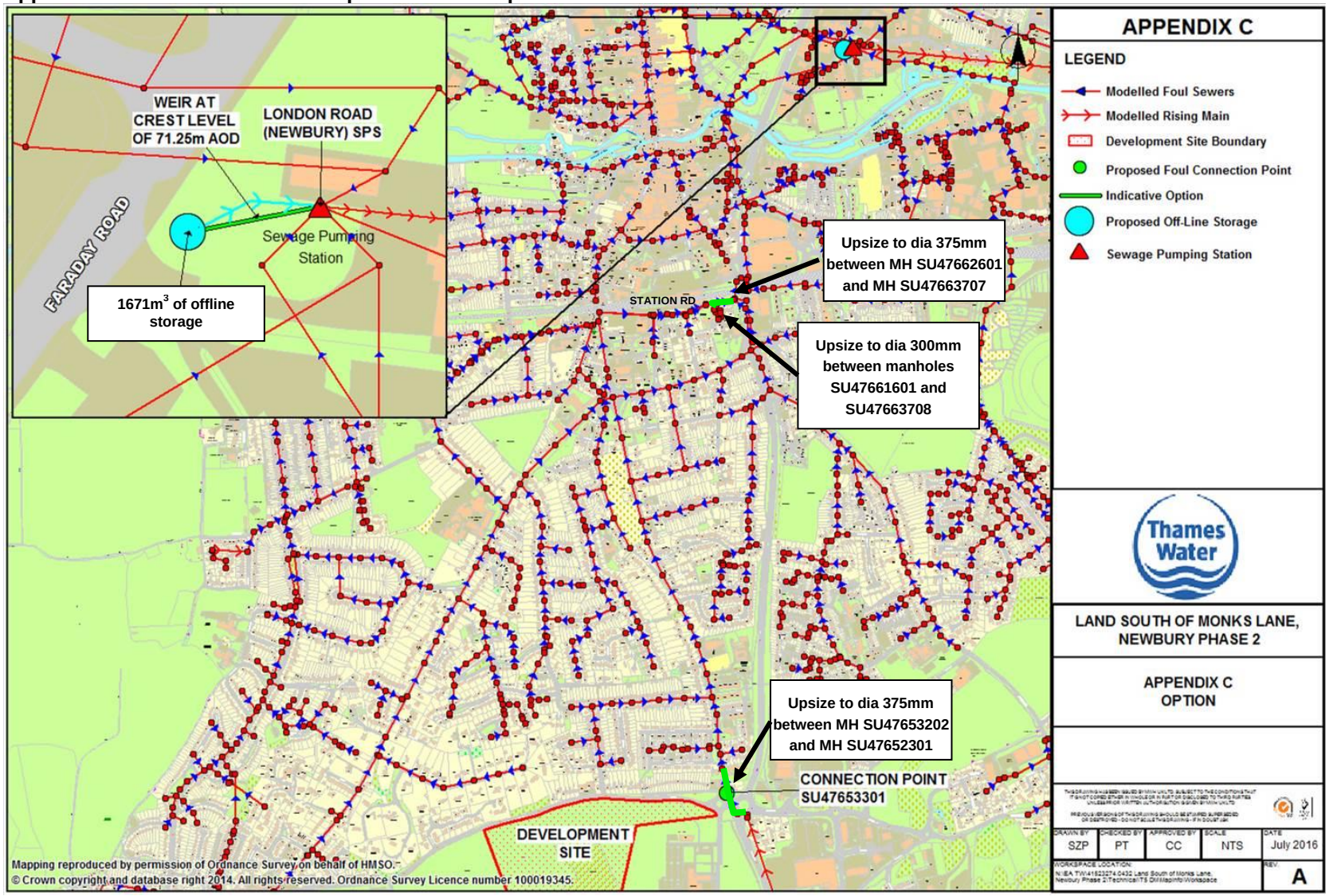
Appendix A – Site Plan



Appendix B – Local Sewers



Appendix C – Connections and Improvements – Option



Appendix D – Project Inputs Provided by the Developer

Head Office Address

6150 Knights Court,

Solihull Parkway,

Birmingham Business Park,

Birmingham.

B37 7WY

T +44(0)121 329 4330

mail@brookbanks.com

brookbanks.com

Appendix 3: Air Quality Assessment associated with Special Areas of Conservation requested by Natural England

Bloor Homes and the Sandleford Farm Partnership

Proposed Mixed Use Development Sandleford Park, Newbury, West Berkshire

Air Quality Technical Note

September 2020

Tel: 0116 234 8000

Email: nalo@wyg.com

Document control

Project:	Proposed Mixed Use Development, Sandleford Park, Newbury, West Berkshire
Client:	Bloor Homes and the Sandleford Farm Partnership
Job Number:	A106825-1
File Origin:	O:\Acoustics Air Quality and Noise\Active Projects

Document Checking:

Prepared by:	Donald Towler-Tinlin *Environmental Consultant*	Initialled:	DTT

Checked by:	Nathan Allan *Senior Environmental Consultant*	Initialled:	NA

Verified by:	Ashley Shepherd MIOA *Senior Consultant*	Initialled:	AS

Issue	Date	Status
1	14th August 2020	First Issue
2	18th September 2020	Second Issue – Updated Following Comments

Contents Page

Figures

Appendices

1. Introduction

1.1.1 WYG has been appointed by Bloor Homes Limited and the Sandleford Farm Partnership to provide air quality advice in relation to a planning application at Sandleford Park, Newbury, West Berkshire.

1.1.2 This Technical Note has been prepared in addition to the Air Quality Assessment, dated 15th January 2020, in relation to concerns raised by Natural England on the 29th July 2020 with the aim of demonstrating the air quality impacts of the proposed development on the following ecological sensitive sites:

- Kennet Valley Alderwoods SAC
- Kennet and Lambourn Floodplain SAC
- River Lambourn SAC

1.1 Scope of Technical Note

1.1.3 This Technical Note considers the air quality impacts that the development flows associated with the proposed development has on the additional ecological receptors requested by Natural England on the 29th July 2020. The assessment has been informed by *Natural England Approach to Advising Competent Authorities on the Assessment of Road Traffic Emissions under the Habitats Regulation, June 2018*.

1.2 Update History

1.2.1 Following comments received on behalf on Natural England this Technical Note has been updated. The comments dated 4th September 2020 state:

"Many thanks for sending us through the Air Quality technical note for the proposal at Sandleford Park. Whilst we appreciate the work that has gone into this note, we do not feel that the requirements outlined in our letter dated 20th July 2020 have been adequately addressed by the applicant. Primarily, we required a reassessment under the Habitats Regulations of the likely impacts on air quality on the mentioned European sites. The note includes no Habitats Regulations work. Secondly, we asked for the potential air quality impacts of the proposed development to be assessed in-combination with other plans and projects. This assessment has not been provided."

1.2.2 Following the aforementioned comments on behalf of Natural England, a Habitats Regulations Assessment has been undertaken.

1.2.3 The assessment of air quality impacts on the ecologically sensitive sites undertaken within this Technical Note is an in-combination assessment. As such, the 'Do Minimum' traffic accounts for future developments in the area and any additional local growth, as Air Quality Assessments for surrounding sites have been obtained to inform the assessment. Furthermore, traffic data for the scenario "Do Something 1" also includes traffic flows associated with 100 dwellings as part of the adjacent Sandleford Park West Scheme.

2. Traffic Data

2.1.1 WYG has undertaken an assessment to determine the impacts of additional air quality emissions associated with the increase in development traffic from the proposed development. Ecological receptors in accordance with the concerns raised by Natural England on the 29th July 2020 have been included within the assessment.

2.1.2 Baseline 2018 data has been obtained for the operational phase assessment in the form of Annual Average Daily Traffic figures (AADT).

2.1.3 Baseline 2017 data and projected 2031 'do minimum', 'do something (DS1)' and 'do something (DS2)' traffic data has been obtained for the operational phase assessment in the form of Annual Average Daily Traffic figures (AADT). Baseline 2017, 2031 'do minimum', 2031 'do something' scenarios AADT have been provided by Vectos Transport Consultants.

2.1.4 A TEMPro factor of 1.01 has been applied to the 2017 traffic data to provide 2018 baseline data, to coincide with the latest available monitoring and meteorological data. Additionally, traffic data (baseline 2018 and 'do minimum' and 'do something' 2031) from surrounding Air Quality Assessments have been obtained to include as part of the assessment. Due to the availability of traffic data, the "Do Something 1" traffic data also includes traffic flows associated with 100 dwellings as part of the adjacent Sandleford Park West Scheme.

2.1.5 Additional 2018 traffic flows have been obtained from the Department for Transport website. A TEMPro factor has been applied to the 2018 traffic data to provide 2031 'do minimum' traffic data. A TEMPro factor of 1.16 has been applied to the A34 2018 traffic data, and a factor of 1.15 has been applied to the A4 2018 traffic data to provide 2031 'do minimum' traffic data.

2.1.6 Emission factors for the 2018 baseline and 2031 projected 'do minimum' and 'do something' scenarios have been calculated using the Emission Factor Toolkit (EFT) Version 9.0 (May 2019). The EFT and Defra NOx-to-NO2 Calculator only calculate emissions up to the year 2030. With the operational year being 2031, it is thought that the emissions will be greater during 2030. Therefore, with the emissions being greater during 2030 this assessment will be higher than 2031 predictions would be and have been used in this assessment.

2.1.7 It is assumed the average vehicle speeds on the local road network in an opening year of 2031 will be broadly the same as the ones in 2018. Where unavailable, traffic speeds have been estimated based on site observations and national speed limits.

2.1.8 A 50m 20km/hr slow down phase is included on each link at every junction and roundabout within the assessment. All of the roads within the dispersion model are illustrated in Figure 1. Detailed traffic figures are provided in the Table 2.1.

Table 2.1 Traffic Data

Link	Speed	2018		2031					
		AADT	%HGV	Do Minimum		Do Something 1		Do Something 2	
				AADT	%HGV	AADT	%HGV	AADT	%HGV
SPW Site Access	48	1356	5.0	1521	4.0	5055	4.0	5055	4.0
Andover Road (South of Double Mini)	48	10750	0.4	13973	1.5	15135	1.4	14176	1.5
Monks Lane (West)	48	11370	0.3	11924	2.0	11622	1.9	11393	2.0
Andover Road (North of Double Mini)	48	17840	2.0	15025	2.0	17083	2.0	17083	2.0
Essex Street, Newbury	48	6980	0.2	7081	2.1	6969	2.0	7559	1.9
A343 Andover Road South (West of Newtown Road)	48	13024	0.1	17384	1.2	18649	1.2	18530	1.1
Bloor Western Site Access	48	0	0.0	0	0.0	2500	0.0	2500	0.0
Monks Lane (Central)	48	12473	5.0	16010	4.0	15346	4.0	15346	4.0
Bloor Eastern Site Access	48	0	0.0	0	0.0	798	0.0	798	0.0
Monks Lane (East)	48	10750	0.4	10125	2.0	7227	2.1	11457	1.7
Monks Lane East (Pinchington Junction Approach)	48	12482	5.0	16035	4.0	16279	4.0	16279	4.0
A339 South (South of Pinchington Lane)	80	24327	3.9	26028	3.4	26402	3.5	26242	3.5
A339 North (North of Pinchington Lane)	80	26071	8.0	32928	7.0	30755	7.0	30755	7.0
Pinchington Lane Newbury	48	997	2.1	10708	2.3	9928	2.3	10287	2.0
A343 St Johns Road	48	17840	2.0	15025	2.0	17083	2.0	17083	2.0
A339 Newbury (North of Retail Park)	65	23785	3.3	43726	2.9	44787	2.9	45115	2.8
Greenham Road, Newbury	48	5847	0.3	4712	1.3	4900	1.5	5225	1.6
A339 Newbury (South of Robin Hood)	65	39667	2.2	39245	3.0	40285	2.9	41048	2.8
B3421 Kings Road, Newbury	48	7295	0.5	10749	1.7	11074	1.6	10990	1.4
A339 East of Swan Roundabout	80	21873	3.9	27250	3.4	26458	3.5	29988	3.1
A343 South of A34	96	9864	0.4	10215	1.7	9831	1.8	13497	1.3
New A339 Access	48	0	0	596	0	3236	0	3236	0
A34	112	56137	12.3	64939	12.3	67193	11.9	66352	12.0
A4	96/48	12009	2.8	13778	2.8	14593	2.6	14300	2.7
Bath Road (A4) (East of B4000)	96	19647	2.5	22541	2.5	23356	2.4	23063	2.5
Bath Road (A4) (West of B4494)	64	17862	1.9	20493	1.9	21308	1.8	21015	1.8
Bath Road (A4) (East of B4494)	64	14361	2.1	16476	2.1	17291	2.0	16998	2.1
Eddington Hill	48	8357	4.1	9341	4.1	9613	3.9	9515	4.0

Link	Speed	2018		2031					
		AADT	%HGV	Do Minimum		Do Something 1		Do Something 2	
				AADT	%HGV	AADT	%HGV	AADT	%HGV
Charnham Street	48	10972	3.0	12265	3.0	12536	2.9	12439	3.0
Bridge Street	48	3310	2.8	3700	2.8	3972	2.6	3874	2.7

3. Ecological Receptors

3.1.1 Natural England have commented on the previous ecological receptors used in the Air Quality Assessment dated 15th January 2020, suggesting that it would be beneficial to include additional sites of ecological importance, such as Kennet Valley Alderwoods (SAC), Kennet and Lambourn Floodplain (SAC), and the River Lambourn (SAC) to identify how the proposed development trips would impact these sites.

3.1.2 The additional ecological receptor locations assessed as part of this Technical Note are summarised in Table 3.1 and the spatial locations of all of the receptors are illustrated in Figure 1.

Table 3.1 Construction Phase: Modelled Existing Sensitive Receptor Locations

Site ID	Site	Designation	UK NGR (m)		Distance from Site (km)	Distance from Nearest Affected Road (m)
			X	Y		
E21	Kennet Valley Alderwoods	SAC	444542	167060	2.8	430
E22	Kennet Valley Alderwoods	SAC	444543	166732	2.6	393
E23	Kennet Valley Alderwoods	SAC	439398	167724	7.4	760
E24	Kennet Valley Alderwoods	SAC	439679	167811	7.2	645
E25	Kennet Valley Alderwoods	SAC	439873	167868	7.1	567
E26	Kennet Valley Alderwoods	SAC	440026	167857	6.9	555
E27	Kennet Valley Alderwoods	SAC	440702	167565	6.2	812
E28	Kennet Valley Alderwoods	SAC	440702	167464	6.2	917
E29	Kennet Valley Alderwoods	SAC	439462	167272	7.2	1202
E30	Kennet and Lambourn Floodplain	SAC	434856	168613	12.0	84
E31	Kennet and Lambourn Floodplain	SAC	434669	168763	12.2	24
E32	Kennet and Lambourn Floodplain	SAC	434398	168892	12.5	27
E33	Kennet and Lambourn Floodplain	SAC	434277	168948	12.6	26
E34	Kennet and Lambourn Floodplain	SAC	434201	168992	12.7	13
E35	Kennet and Lambourn Floodplain	SAC	434229	168709	12.6	266
E36	Kennet and Lambourn Floodplain	SAC	434355	168619	12.5	290
E37	Kennet and Lambourn Floodplain	SAC	434645	168524	12.2	250
E38	Kennet and Lambourn Floodplain	SAC	434825	168505	12.0	195
E39	River Lambourn	SAC	445512	169081	4.0	16
E40	River Lambourn	SAC	445526	169123	4.1	17
E41	River Lambourn	SAC	445542	169170	4.1	18
E42	River Lambourn	SAC	445573	169152	4.1	16
E43	River Lambourn	SAC	445558	169114	4.1	16
E44	River Lambourn	SAC	445539	169070	4.0	15

3.1.3 It should be noted that the IAQM Guidance (A guide to the assessment of air quality impacts on designated nature conservation sites, May 2020) only requires the assessment of ecological receptors which are located within 200 m of the affected road network. For robustness, all ecological receptors above in Table 3.1 have been included within the air quality assessment.

3.1.4 Background concentrations at each of the ecologically sensitive sites are determined through a review of the NO_X pollutants published on the APIS website.

Table 1.2 APIS Ecological Receptor Background NOx Concentrations

Receptor ID	NO_x (µg/m^3)
E21	16.75
E22	16.75
E23	16.75
E24	16.75
E25	16.75
E26	16.75
E27	16.75
E28	16.75
E29	16.75
E30	15.93
E31	15.93
E32	15.93
E33	15.93
E34	15.93
E35	15.93
E36	15.93
E37	15.93
E38	15.93
E39	16.75
E40	16.75
E41	16.75
E42	16.75
E43	16.75
E44	16.75

3.1.5 The below assessment has been undertaken in accordance with A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites (IAQM, 2019).

3.1.6 These receptors have been included within the ADMS model to determine the NO_x contribution from traffic associated with the Proposed Development.

3.1 Scenario 1 ('Do Something 1') Assessment Results – With Bloor Homes Development – three accesses

Table 3.3 Modelled NOx Concentrations at Ecologically Sensitive Receptors

Receptor ID	Ecological Receptor	Predicted Maximum Annual Mean Concentration (µg/m³)		
		Do Minimum 2031 NO_X	Do Something 2031 NO_X	Process Contribution (PC)
E21	Kennet Valley Alderwoods	17.64	17.67	0.04
E22	Kennet Valley Alderwoods	17.69	17.73	0.04
E23	Kennet Valley Alderwoods	16.90	16.90	0.01
E24	Kennet Valley Alderwoods	16.91	16.92	0.01
E25	Kennet Valley Alderwoods	16.93	16.94	0.01
E26	Kennet Valley Alderwoods	16.93	16.94	0.01
E27	Kennet Valley Alderwoods	16.91	16.91	0.01
E28	Kennet Valley Alderwoods	16.90	16.90	0.01
E29	Kennet Valley Alderwoods	16.86	16.87	0.01
E30	Kennet and Lambourn Floodplain	16.66	16.71	0.04
E31	Kennet and Lambourn Floodplain	18.00	18.11	0.12
E32	Kennet and Lambourn Floodplain	18.06	18.17	0.11
E33	Kennet and Lambourn Floodplain	19.07	19.21	0.15
E34	Kennet and Lambourn Floodplain	21.78	22.05	0.27
E35	Kennet and Lambourn Floodplain	16.35	16.36	0.01
E36	Kennet and Lambourn Floodplain	16.24	16.26	0.01
E37	Kennet and Lambourn Floodplain	16.23	16.24	0.01
E38	Kennet and Lambourn Floodplain	16.28	16.30	0.02
E39	River Lambourn	23.96	24.23	0.27
E40	River Lambourn	24.08	24.36	0.27
E41	River Lambourn	24.28	24.56	0.28
E42	River Lambourn	28.24	28.66	0.43
E43	River Lambourn	27.43	27.82	0.40
E44	River Lambourn	26.33	26.68	0.36
Critical Level (CL)		**30**		

3.1.1 As indicated in Table 3.3, the maximum predicted increase in the annual average exposure to NO_X at any ecological receptor, due to changes in traffic movements associated with the development, is 0.43 µg/m³ at River Lambourn (E42).

3.1.2 All modelled ecological receptors outlined in Table 3.3 are below the Critical Level (CL) for NO_X. Therefore, there are not predicted to be any exceedance of the CL as a result of traffic from the proposed development.

3.1.3 Section 5.5.4.1 of *A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites*', IAQM 2019 states:

Where the assessment indicates that changes in annual mean NOx concentrations within a designated site cannot be dismissed as imperceptible (i.e. an increase of over 0.4 µg/m³) and the NOx critical level is exceeded, then changes in nutrient nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance.

3.1.4 As the NO_x contribution at E42 (River Lambourn, SAC) is above 0.43 µg/m^3, a full nitrogen deposition assessment has been undertaken below.

3.1.5 Ammonia (NH_3) and Sulphur Dioxide (SO_2) emissions from traffic are 0.001% and 0.4% of the road NO_x contribution respectively. There is not predicted to be a significant increase in either NH_3 or SO_2 as a result of the proposed development at any ecological receptor as a result of traffic movements from the proposed development.

Nitrogen Deposition

3.1.6 The dry deposition calculation has used the spreadsheet provided by the Air Quality Modelling and Assessment Unit (AQMAU). These calculations take the predicted maximum annual concentration (µg/m^3) and use an assumed deposition velocity to estimate deposition concentration in kgN/ha/year or keq/ha/year. The available deposition velocity is 0.14 for grasslands or similar habitats, in accordance with in LA 105 (published November 2019). The calculated total nitrogen depositions at the ecological receptors are presented in Table 3.4. The calculated nitrogen deposition was compared to the available critical load of nitrogen deposition.

Table 3.4 The Predicted Total PC Nitrogen Deposition

Ecological Receptor	Long-Term PC of NO_x (µg/m^3)	Dry PC Nitrogen Deposition (kgN/ha/year)	Background	Total PC Nitrogen Deposition (kgN/ha/year)	Critical load (CL) (kgN/ha/year)	PC as %age of CL
E42	0.43	0.06	17.22	17.28	10 - 15	0.4 - 0.6

Critical Load Function Tool

3.1.7 Calculating exceedance of an acidity critical load function, or the impact description of a contribution from a source is complex. Critical Load Function Tool has been used to calculate the exceedance (http://www.apis.ac.uk/critical-load-function-tool). It enables the comparison of acid deposition to the critical load function to help make a decision on the impact description of a process contribution.

River Lambourn (SAC)

3.1.8 The results of exceedance and deposition as a proportion of the critical level (CL) function for E42, are presented both in Figure 2 and in Table 3.5. The following data has been used in the calculations.

Background deposition: 1.2 (N: 1.23 |S: 0.17) (keg/ha/yr).

CLmax S: 4.18 CLminN: 0.223 CLMaxN: 4.403 (keq/ha/yr)

Nitrogen PC deposition: = 0.43*0.14 = 0.06 kqN/ha/yr

Table 3.5 Exceedance and deposition as a proportion of the CL Function at E42

Source	Exceedance (keq/ha/year)	% of CL function
Process Contribution (PC)	No exceedance of CL function	**1.4**
Background	No exceedance of CL function	**31.8**
Predicted Environmental Concentration (PEC)	No exceedance of CL function	**33.2**

3.1.9 The maximum predicted total acid deposition PC at receptor E42 is 0.06 keqN/ha/yr, which is "no exceedance of CL function" and 1.4 % of CL function. It can be concluded that the impact of nitrogen depositions from the road at E42 are negligible.

3.2 Scenario 2 ('Do Something 2') Assessment Results – Strategic Development – four accesses

Table 3.6 Modelled NOx Concentrations at Ecologically Sensitive Receptors

Receptor ID	Ecological Receptor	Predicted Maximum Annual Mean Concentration (µg/m³)		
		Do Minimum 2031 NO_X	Do Something 2031 NO_X	Process Contribution (PC)
E21	Kennet Valley Alderwoods	17.64	17.66	0.02
E22	Kennet Valley Alderwoods	17.69	17.71	0.02
E23	Kennet Valley Alderwoods	16.90	16.90	0.01
E24	Kennet Valley Alderwoods	16.91	16.92	0.01
E25	Kennet Valley Alderwoods	16.93	16.94	0.01
E26	Kennet Valley Alderwoods	16.93	16.94	0.01
E27	Kennet Valley Alderwoods	16.91	16.91	0.01
E28	Kennet Valley Alderwoods	16.90	16.90	0.00
E29	Kennet Valley Alderwoods	16.86	16.86	0.00
E30	Kennet and Lambourn Floodplain	16.66	16.69	0.03
E31	Kennet and Lambourn Floodplain	18.00	18.07	0.07
E32	Kennet and Lambourn Floodplain	18.06	18.13	0.07
E33	Kennet and Lambourn Floodplain	19.07	19.16	0.09
E34	Kennet and Lambourn Floodplain	21.78	21.95	0.17
E35	Kennet and Lambourn Floodplain	16.35	16.36	0.01
E36	Kennet and Lambourn Floodplain	16.24	16.25	0.01
E37	Kennet and Lambourn Floodplain	16.23	16.23	0.01
E38	Kennet and Lambourn Floodplain	16.28	16.29	0.01
E39	River Lambourn	23.96	24.13	0.17
E40	River Lambourn	24.08	24.26	0.17
E41	River Lambourn	24.28	24.46	0.18
E42	River Lambourn	28.24	28.50	0.27
E43	River Lambourn	27.43	27.67	0.25
E44	River Lambourn	26.33	26.55	0.22
Critical Level (CL)		**30**		

3.2.1 As indicated in Table 3.6, the maximum predicted increase in the annual average exposure to NO_X at any ecological receptor, due to changes in traffic movements associated with the development, is 0.27 µg/m³ at River Lambourn (E42).

3.2.2 Section 5.5.4.1 of *A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites*', IAQM 2019 states:

Where the assessment indicates that changes in annual mean NOx concentrations within a designated site cannot be dismissed as imperceptible (i.e. an increase of over 0.4 µg/m³) and

the NOx critical level is exceeded, then changes in nutrient nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance.

3.2.3 As maximum predicted increase in the annual average exposure to NO_X at E42 River Lambourn is below 0.4 µg/m³, a nitrogen deposition assessment has been scoped out of the assessment.

3.2.4 All modelled ecological receptors outlined in Table 3.4 are below the Critical Level for NO_x. Therefore, there are not predicted to be any exceedance of the CL as a result of traffic from the proposed development.

3.2.5 Ammonia (NH_3) and Sulphur Dioxide (SO_2) emissions from traffic are 0.001% and 0.4% of the road NO_x contribution respectively. There is not predicted to be a significant increase in either NH_3 or SO_2 as a result of the proposed development at any ecological receptor as a result of traffic movements from the proposed development.

4 Habitat Regulations Assessment

4.1 Overview

4.1.1 Natural England provides guidelines that advise on the assessment of the impacts of road traffic emissions of proposed developments (referred to as "plans and projects") on protected European habitat sites in its guidance *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (Version: June 2018)*.

4.1.2 The guidance primarily covers the screening stage that initially identifies the risk of the possibility of significant adverse effects on a European site which could undermine the achievement of its conservation objectives and which would therefore require further detailed examination through an "appropriate assessment". If risks which might undermine a site's conservation objectives can clearly be ruled out (based on the consideration of objective information), a proposal will have no likely significant effect and no appropriate assessment will be needed.

4.1.3 Advice on Screening

The advice on screening the need for an appropriate assessment is set out in 4 steps, as described below. If the proposal does not meet the criteria of one of the steps, there is no need to progress to the next step:

Step 1: Does the proposal give rise to emissions which are likely to reach a European Site?

- Any emissions from road traffic associated with a specific proposal and the proximity to European sites should be considered.

Step 2: Are the qualifying features of the sites within 200m of a road sensitive to air pollution?

- Distance-based criteria have been established for several sectors to identify consultations requiring consideration for potential effects from air pollution.
- With regard to potential risks from road traffic emissions, Natural England and Highways England are in agreement that protected sites falling within 200 meters of the edge of a road affected by a plan or project need to be considered further.

Step 3: Could the sensitive qualifying features of the site be exposed to emissions

- "Qualifying features" of a site can be identified by reference to Natural England's formal advice on their conservation objectives, which include a definitive list of legally qualifying features.
- There are several ways to establish whether qualifying feature is sensitive to the type of air emissions expected from a proposal, ranging from broad, internationally agreed

pollution benchmarks (critical loads and levels) to site specific information such as survey data.

Step 4: Application of screening thresholds: (a) alone; (b) in-combination with emissions from other road traffic plans and projects; and (c) in-combination with emissions from other non-road plans and projects.

- Established guideline thresholds that determine whether a change is likely to be significant are used and applied to the development.
- The parameters used as thresholds are a change in AADT of 1,000 or more (or 200 of more AADT HGV) or 1% of the critical load or critical level for emissions.
- These thresholds do not themselves imply any intrinsic environmental effects and are used solely as a trigger for further investigation.

4.2 Site Specific Screening (Steps 1-4a)

4.2.1 It has been identified that an assessment of the potential impact of road traffic emissions associated with the proposed development on Kennet Valley Alderwoods SAC, Kennet, Lambourn Floodplain SAC, and River Lambourn SAC is required. To facilitate this, a site-specific screening assessment has been carried out to determine whether an Appropriate Assessment is required. Tables 4.1, 4.2, and 4.3 summarise this screening assessment.

Table 4.1 Kennet Valley Alderwoods SAC Screening

Step	Outcome	Justification
Step 1: Does the proposal give rise to emissions which are likely to reach a European Site?	**Yes**	*The proposed development is expected to increase traffic flows along the A4, which passes alongside the Kennet Valley Alderwoods SAC.*
Step 2: Are the qualifying features of the sites within 200m of a road sensitive to air pollution?	**No**	*The qualifying features of the Kennet Valley Alderwoods SAC are no located within 200m of a road.*
Step 3: Could the sensitive qualifying features of the site be exposed to emissions?	**No**	*The distribution of the qualifying features within Kennet Valley Alderwoods are located further than 200m from an affected road source.*
Step 4a: Do the emissions from this proposal alone exceed screening thresholds?	**No**	*Scenario 1 is predicted to increase traffic on the A4 by 815 AADT, while Scenario 2 is predicted to increase traffic on the A4 by 522 AADT. This would not constitute a likely significant effect as it falls below the 1000 AADT threshold considered by Natural England to be suitably precautionary.*

Table 4.2 Kennet and Lambourn Floodplain SAC Screening

Step	Outcome	Justification
Step 1: Does the proposal give rise to emissions which are likely to reach a European Site?	**Yes**	*The proposed development is expected to increase traffic flows along the A4, which passes directly alongside the Kennet and Lambourn Floodplain SAC.*
Step 2: Are the qualifying features of the sites within 200m of a road sensitive to air pollution?	**No**	*The qualifying features of the Kennet and Lambourn Floodplain SAC are listed as being Desmoulin's whorl snail, Vertigo moulinsiana, which is not noted to be sensitive to NO_X.*
Step 3: Could the sensitive qualifying features of the site be exposed to emissions?	**Yes**	*The distribution of the qualifying features within River Avon cannot be determined, so it is assumed that they may be present at the closest section of the SAC within 200 metres of the A4.*
Step 4a: Do the emissions from this proposal alone exceed screening thresholds?	**No**	*Scenario 1 is predicted to increase traffic on the A4 by 815 AADT, while Scenario 2 is predicted to increase traffic on the A4 by 522 AADT. This would not constitute a likely significant effect as it falls below the 1000 AADT threshold considered by Natural England to be suitably precautionary.*

Table 4.3 River Lambourn SAC Screening

Step	Outcome	Justification
Step 1: Does the proposal give rise to emissions which are likely to reach a European Site?	**Yes**	*The proposed development is expected to increase traffic flows along the A34, which passes directly alongside the River Lamborn SAC.*
Step 2: Are the qualifying features of the sites within 200m of a road sensitive to air pollution?	**Yes**	*The qualifying features of the River Lamborn SAC are listed as being part of a broad habitat that is sensitive to NO_X.*
Step 3: Could the sensitive qualifying features of the site be exposed to emissions?	**Yes**	*The distribution of the qualifying features within River Lamborn cannot be determined, so it is assumed that they may be present at the section of the river that flows within 200 metres of the A34.*
Step 4a: Do the emissions from this proposal alone exceed screening thresholds?	**Yes**	*Scenario 1 is predicted to increase traffic on the A34 by 2254 AADT, while Scenario 2 is predicted to increase traffic on the A34 by 1413 AADT. This would constitute a likely significant effect as it is above the 1000 AADT threshold considered by Natural England to be suitably precautionary.*

4.3 In-Combination Effects (Steps 4b and 4c)

4.3.1 Steps 4b and 4c of the guidance are to apply the threshold value not only to the traffic flows generated by the site alone (as above, in step 4a), but also to those of the site in combination with those from other projects and proposals that have the potential to affect the site of interest. Step 4b gives guidance for the application of the threshold to emissions in combination with those from other road traffic plans and projects; while Step 4c gives guidance for the application of the thresholds to emissions in combination with those from other non-road plans and projects, for example ammonia emissions from a farm source.

4.3.2 These steps have been included in the updated guidance since June 2018 to reflect the requirements of the Habitats Regulations in response to recent clarification provided by the Wealden Judgement (February 2017). This ruled in favour of Wealden District Council that a neighbouring Local Authority had failed to take into account in-combination effects from developments in the protection of the Ashdown Forest Special Area of Conservation in the development of its Local Plan.

4.3.3 This Air Quality Technical Note includes an in-combination assessment where the 'Do Minimum' traffic utilised has accounted for developments in the area, as Air Quality Assessments from surrounding sites have been utilised as part of the assessment. Due to the availability of traffic data, the "Do Something 1" traffic data also includes traffic flows associated with 100 dwellings as part of the adjacent Sandleford Park West Scheme.

4.3.4 On this basis, adverse air quality effects on the integrity of any European site from the Sandleford Park scheme can be ruled out both alone and in combination.'

5 Summary and Conclusion

5.1.1 WYG has been appointed by Bloor Homes Limited and the Sandleford Farm Partnership to provide air quality advice in relation to a planning application at Sandleford Park, Newbury, West Berkshire.

5.1.2 This Technical Note has been prepared in addition to the Air Quality Assessment, dated 15th January 2020, in relation to concerns raised by Natural England om the 29th July 2020 with the aim of demonstrating the air quality impacts of the proposed development on the following ecological sensitive sites:

- Kennet Valley Alderwoods SAC
- Kennet and Lambourn Floodplain SAC
- River Lambourn SAC

5.1.3 The Technical note has assessed the additional ecological receptors for both:

- Scenario 1 ('Do Something 1') Assessment Results – With Bloor Homes Development – three accesses, and,
- Scenario 2 ('Do Something 2') Assessment Results – Strategic Development – four accesses

Scenario 1

5.1.4 The maximum predicted increase in the annual average exposure to NO_X at any ecological receptor, due to changes in traffic movements associated with the development, is 0.43 µg/m^3 at River Lambourn (E42).

5.1.5 As NO_x contribution at E42 (River Lambourn, SAC) is above 0.43 µg/m^3, a full nitrogen deposition assessment has been undertaken.

5.1.6 The Nitrogen Deposition assessment indicated that the maximum predicted total acid deposition PC at receptor E42 is 0.06 keqN/ha/yr, which is "no exceedance of CL function" and 1.4 % of CL function. It can be concluded that the impact of nitrogen depositions from the road at E42 are negligible.

Scenario 2

5.1.7 The maximum predicted increase in the annual average exposure to NO_X at any ecological receptor, due to changes in traffic movements associated with the development, is 0.27 µg/m^3 at River Lambourn (E42).

5.1.8 As maximum predicted increase in the annual average exposure to NO_X at E42 River Lambourn is below 0.4 µg/m³, a nitrogen deposition assessment has been scoped out of the assessment.

5.1.9 Overall the air quality assessment indicates that for both Scenarios, there is a negligible impact on the ecological receptors of concern.

Figures

Figure 1 Air Quality Assessment Study Area

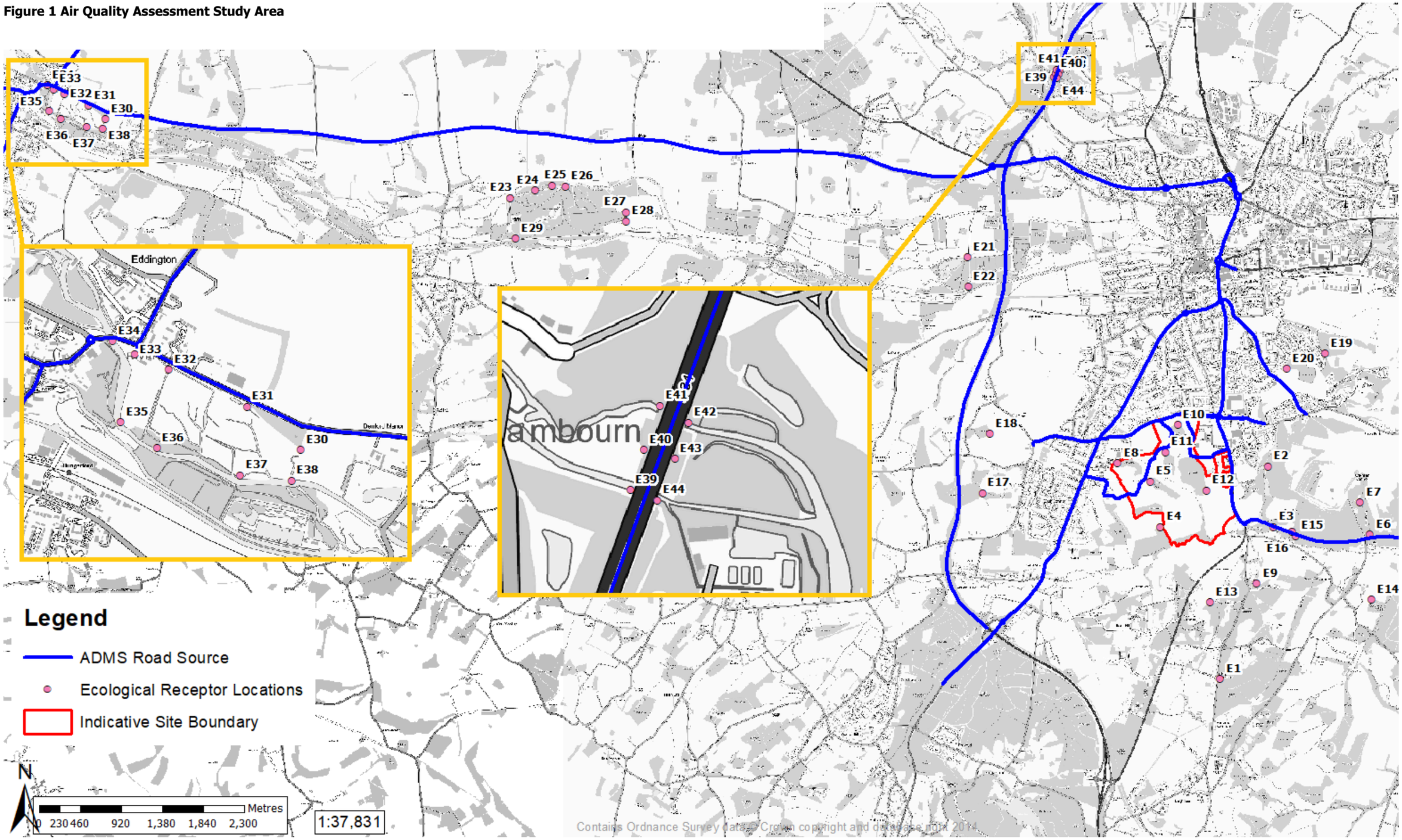
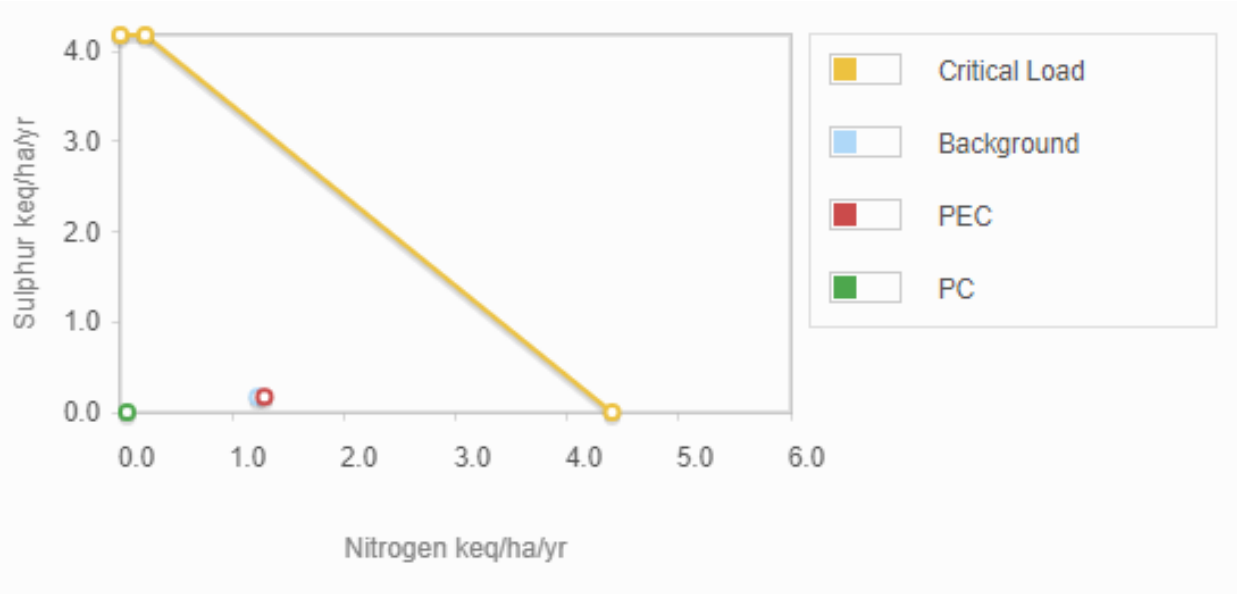


Figure 2 Critical Load Function Tool – E42 (Three Access Scenario Only)



Appendix A Report Terms & Conditions

This Report has been prepared using reasonable skill and care for the sole benefit of Bloor Homes Limited and Sandleford Farm Partnership ("the Client") for the proposed uses stated in the report by WYG Environment Planning Transport Limited ("WYG"). WYG exclude all liability for any other uses and to any other party. The report must not be relied on or reproduced in whole or in part by any other party without the copyright holder's permission.

No liability is accepted, or warranty given for; unconfirmed data, third party documents and information supplied to WYG or for the performance, reliability, standing etc of any products, services, organisations or companies referred to in this report. WYG does not purport to provide specialist legal, tax or accounting advice.

The report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections'. Environmental conditions can vary, and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times. No investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal and weather-related conditions. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions. The "shelf life" of the Report will be determined by a number of factors including; its original purpose, the Client's instructions, passage of time, advances in technology and techniques, changes in legislation etc. and therefore may require future re-assessment.

The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. WYG accept no liability for issues with performance arising from such factors.

Appendix 4: Response to questions from Hampshire County Council

Sandleford Park, Newbury

Transport Consultation Response

4th September 2020
172985/N29

Introduction

1. Vectos has been commissioned by Bloor Homes and the Sandleford Farm Partnership to provide traffic and transportation advice in relation to a proposed residential development at Sandleford Park, south of Monks Lane in Newbury.

2. The strategic location of the site is illustrated in **Figure 1**. The site currently comprises undeveloped land and is located to the south of Monks Lane, to the west of A339 and to the east of A343.

3. The planning application seeks outline permission with all matters reserved (except for access) for the following development:

   Up to 1,000 new homes; an 80 bed extra care facility (Use Class C3) as part of the affordable housing provision; a new 2 form entry primary school (D1); expansion land for Park House Academy School; a local centre to comprise flexible commercial floorspace (A1-A5 up to 2,150 sq m, B1a up to 200 sq m) and D1 use (up to 500sq m); the formation of new means of access onto Monks Lane; new open space including the laying out of a new country park; drainage infrastructure; walking and cycling infrastructure and other associated infrastructure works

4. An illustrative masterplan of the proposed development can be viewed at **Appendix A**.

5. Following submission of the planning application (Ref: 20/01238/OUTMAJ), Hampshire County Council (HCC), have raised the following concerns:

   - Junction modelling for the A34/B4640 junction
   - Mitigation options for the B4640 arm of the Swan Roundabout
   - Impact of the traffic growth on the A339 corridor to Basingstoke and associated safety concerns
   - A343 Penwood Crossroads assessment with regards additional traffic and mitigation of safety issues
   - Connecting the development to existing rights of way

- Details of bus service improvements and infrastructure improvements on Newtown Road.

6. A copy of HCC consultation response can be viewed at **Appendix B**. This Technical Note has been prepared to address the concerns raised by HCC.

7. As noted within HCC consultation response (**Appendix B**), HCC provided comments to a duplicate application (Ref: 18/00828/OUTMAJ) for the proposed development submitted in March 2018. To discuss the concerns raised by the relevant stakeholders regarding the March 2018 application, a meeting was held on the 12th October 2018, with HCC in attendance.

8. The concerns raised by HCC above were discussed at the meeting on the 12th October 2018. A summary of the meeting minutes is provided below:

    - All stakeholders agreed with the proposed trip rates and traffic distribution methodology.
    - HCC agreed that the proposed development would generate a minor number of trips at the A34/B4640 junction and accepted that no further analysis was required.
    - HCC acknowledged the highway proposals at the Swan roundabout and accepted that no further work was required.
    - HCC agreed that the proposed development would generate a minor number of trips at the Penwood crossroads and accepted that no further analysis was required.
    - HCC accepted that the existing rights of way in Hampshire were too distant to effectively link to from the site and accepted that no further work was required.

9. The minutes of the meeting can be viewed at **Appendix C**.

A34/B4640 Junction Modelling

10. The A34/B4640 junction was not considered within the VISSIM modelling undertaken as part the Transport Assessment submitted in support of the recent planning application (Ref: 20/01238/OUTMAJ). However, it is possible to derive the likely number of development trips using this junction during the peak periods based on the VISSIM traffic flow diagrams included at Appendix H of the submitted Transport Assessment (March 2020). For ease, these flow diagrams have been included at **Appendix D**.

11. It is noted that the proposed traffic distribution was agreed with HCC (**Appendix C**) at the meeting on the 12th October 2018.

12. The traffic flow diagrams indicate that the proposed development is likely to generate approximately 27 traffic movements at the A34/B4640 during both the AM and PM peak periods. Given the minor number of trips generated by the proposed development at this junction, it is considered that the proposals are unlikely to materially affect the operation of the junction. Furthermore, the anticipated development flows are within the daily variation in traffic flows at the junction.

Swan Roundabout Highways Mitigation

13. Highway improvements to the Swan roundabout are proposed as part of the development and were included at Appendix L of the submitted Transport Assessment (March 2020). For ease, a drawing of the proposed improvements is included at **Appendix E**.

14. The proposed highways works include amended white lining on the A339 (north), new signage and the installation of an uncontrolled pedestrian crossing on the A339 (north).

15. The proposed highway improvements were discussed with HCC at the meeting held on the 12th October 2018. It is noted that HCC raised no issue with the proposed highway improvements.

Impact of Traffic Growth on the A339

16. It is possible to derive the likely number of development trips using the A339 travelling towards Basingstoke during the peak periods based on the agreed VISSIM traffic flow diagrams included at Appendix H of the submitted Transport Assessment (March 2020). For ease, these flow diagrams have been included at **Appendix D**.

17. The traffic flow diagrams indicate that the proposed development is likely to generate 31 and 59 traffic movements on the A339 during both the AM and PM peak periods respectively.

18. Given the relatively minor number of trips generated by the proposed development on the A339 travelling towards Basingstoke, it is considered that the proposals are likely to have a negligible effect on highway safety or junction operation on the A339.

A343 Penwood Crossroads

19. The agreed traffic distribution indicates that approximately 2% of development traffic is likely to travel through the A343/Penwood crossroads. This results in approximately 11 vehicle movements during the AM and PM peak respectively. Given the minor number of

trips generated by the proposed development at this junction, it is considered that the proposals are unlikely to raise highway safety concerns.

20. The potential impact of the proposed development at the A343/Penwood crossroads was discussed at our meeting with HCC on the 12th October 2018. As noted above, it was indicated that the proposed development would result in a negligible increase in traffic at this junction and as such would result in an immaterial impact on highway safety. HCC accepted this point and agreed that no further work was required.

Connecting to Existing Rights of Way

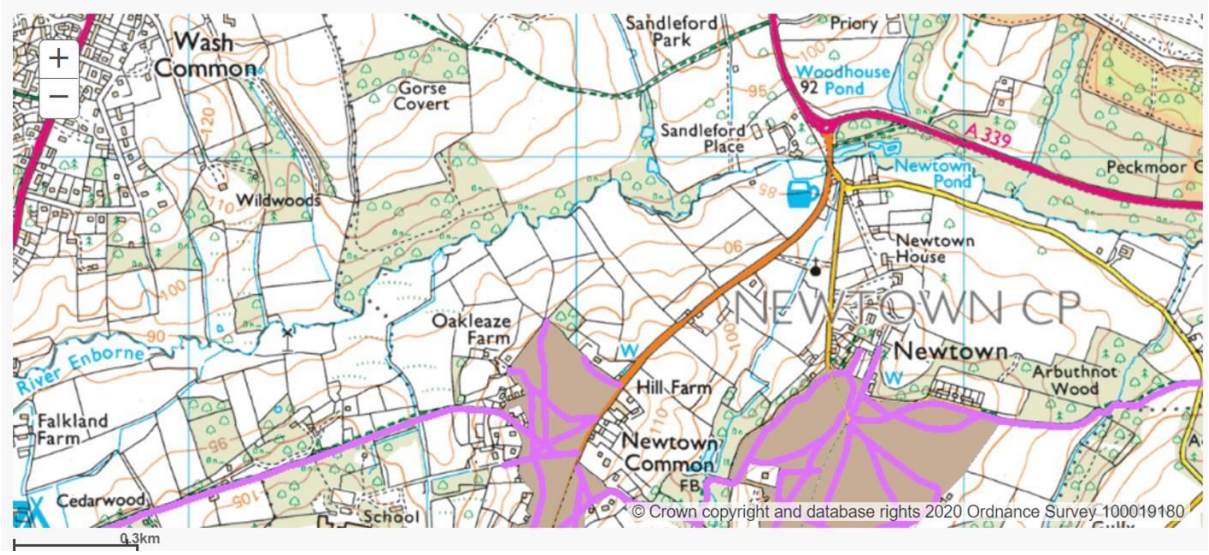
21. As set out within the submitted Transport Assessment (March 2020), the proposed development proposes improvements to the existing public right of way (GREE/9/1), which runs east to west through the site and provides a connection for pedestrians and cyclists from the A339 Newtown Road (opposite the access to the St Gabriel's School) in the east to the A343 Andover Road via Warren Road to the west.

22. It is proposed to improve the surface of the path, which is at present an unsurfaced track. It is also proposed to provide a cycle route adjacent to the PROW, which would extend through the site and link to the local centre.

23. It is also proposed to provide a new uncontrolled crossing on the A339 adjacent to the PROWs access onto the A339. The proposals will provide dedicated crossing facilities for pedestrians and cyclists wishing to access St Gabriel's School, Greenham Business Park and the walking routes on the eastern side of the A339.

24. **Figure 2** below shows the location of PROWs located in Hampshire. It is considered that residents of the proposed site are unlikely to use the PROWs located within Hampshire to the south of the River Enborne. These PROWs are very remote and not easily accessible from the proposed site given the severance caused by the river.

Figure 2: Hampshire Public Rights of Way



Bus improvements and infrastructure improvements on Newtown Road

25. As set out within the submitted Transport Assessment (March 2020), discussions with Reading Buses and WBC have been undertaken to assess the feasibility of several bus service options to link the proposed site to the centre of Newbury, consistent with the Core Strategy's Infrastructure Delivery Plan and the Sandleford Park SPD.

26. The proposals are:

- It is proposed that the initial phases of the development (development parcels north) would be served by existing bus services/stops on Monks Lane.
- As the central development parcel is built out, an option would be to divert the No103 bus service into the site, to form a loop at the local centre with access and egress on to Monks Lane.
- There is also the option to create a new bus service providing a fast and direct route between the site and Newbury bus station/train station via Newtown Road.
- The developers of both Sandleford Park and Sandleford Park West have undertaken to construct the main spine road to the boundary of their land within a prescribed time from when their respective developments commence (72 months). At that point, the main spine road will connect from Monks Lane to Andover Road and will enable a bus route to be created through the two developments. When the link road is provided, there is the potential to divert the No.2 service which currently runs along Andover Road and Monks Lane to enter the site via Warren Road and exit on Monks Lane.

27. There is an existing service operated by Stagecoach, which provides an hourly service between Newbury and Basingstoke. This service can be accessed from the A339 immediately adjacent to the Pinchington Lane/A339 roundabout.

28. It is anticipated that the vast majority of public transport users generated by the site will travel towards Newbury town centre and hence the infrastructure requirements in the Core Strategy. However, some residence who need to travel to Basingstoke will have the option to use the existing bus service.

Summary

29. Vectos has been commissioned by Bloor Homes and the Sandleford Farm Partnership to provide traffic and transportation advice in relation to a proposed residential development at Sandleford Park, south of Monks Lane in Newbury.

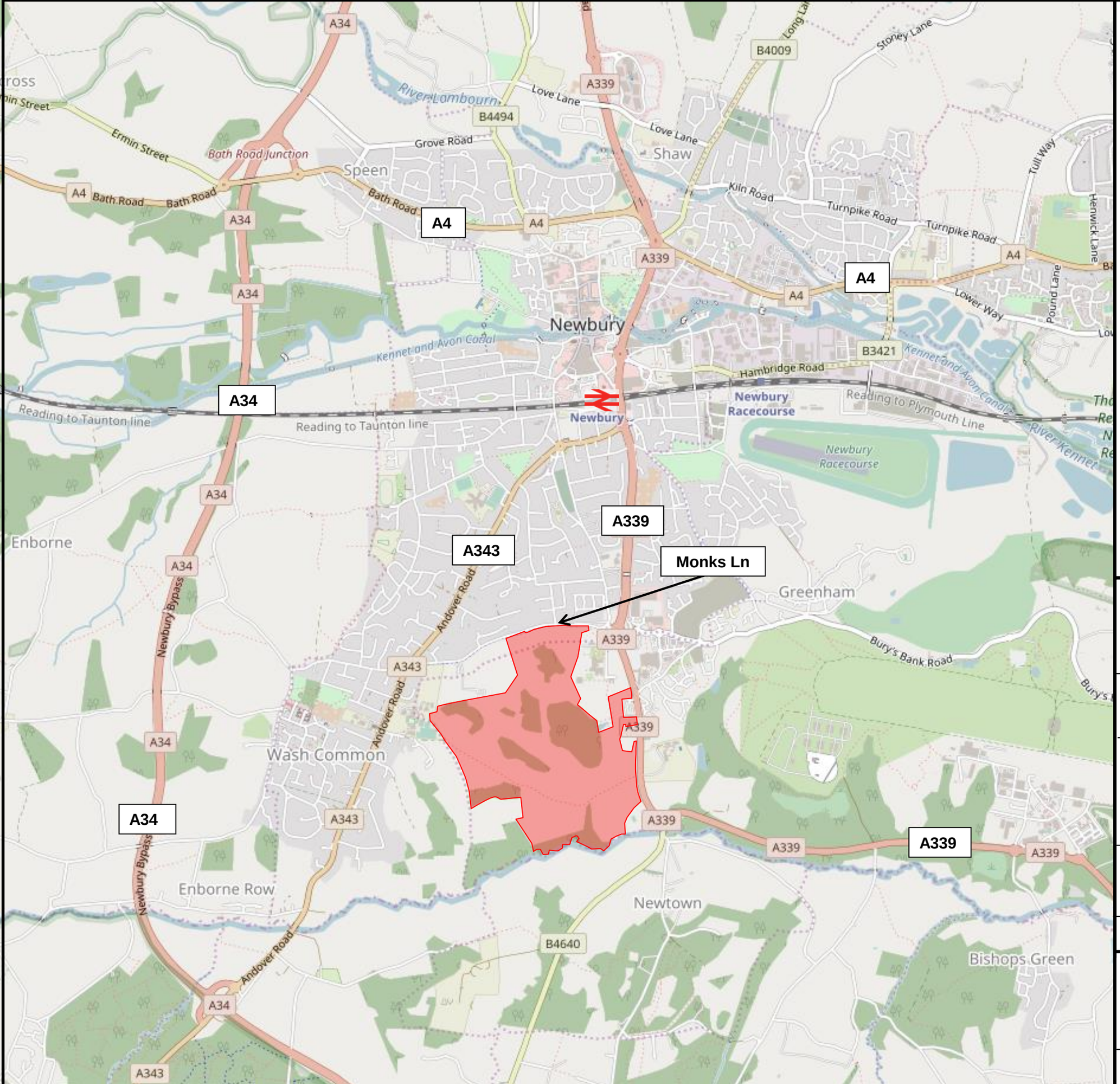
30. Following submission of the planning application (Ref: 20/01238/OUTMAJ), HCC have requested additional information. The evidence presented in this Technical Note demonstrates that the proposed development is unlikely to result in a severe impact on the A339 or at the A34/A4640 and A343/Penwood junctions.

31. Th development also proposes an extensive sustainable transport strategy, which will provide improvements to local PROWs and public transport. It is considered that PROWs in Hampshire are unlikely to be used by residence of the development due to the distance of these routes from the site.

Conclusion

32. It is therefore concluded that the site represents a suitable and sustainable location for residential development and there is no highways or transport reason why the planning application should not be granted consent.

FIGURES



Key

Site Location

Newbury Station

Bloor Homes South Midlands

Sandleford Park

Strategic Site Location Plan

SCALES:

NTS

DRAWN:	CHECKED:	DATE:	REVISION:
AV	AW	31/10/2017	FINAL

vectos transport planning specialists

Network Building, 97 Tottenham Court Road, London W1T 4TP
Tel: 020 7580 7373 Email: london@vectos.co.uk www.vectos.co.uk

DRAWING REFERENCE:

Figure 1

APPENDIX A

Rev	Date	Description	Drawn	Chkd
-	12/12/19	Combined masterplan	CR	AB

Client
Bloor Homes & Donnington New Homes

Boyer

Project
Sandleford Park
Newbury

Drawing Title
Illustrative Layout

Drawing No. 171 Job Ref. 14.273
Scale @A0 1:2000 Revision -
Scale Bar 0 20 40 60m
N

Boyer Planning Ltd, Crowthorne House, Nine Mile Ride, Wokingham, Berkshire, RG40 3GZ

APPENDIX B

Hampshire County Council

Economy, Transport and Environment Department
Elizabeth II Court West, The Castle
Winchester, Hampshire SO23 8UD

Tele: 0845 603 5638 (General Enquiries)
0845 603 5633 (Roads and Transport)
0845 603 5634 (Recycling Waste & Planning)
Textphone 0845 603 5625
Fax 01962 847055

www.hants.gov.uk

Head of Planning
West Berkshire Council
Council Offices
Market Street
Newbury
RG14 5LD

Enquiries to Mark Philcox

Direct Line 01962 832315

Date 31st July 2020

My reference 6/3/1/418

Your reference 20/01238/OUTMAJ

Email Mark.philcox@hants.gov.uk

Dear Sir / Madam,

Outline planning permission for up to 1,000 new homes; an 80 extra care housing units (Use Class C3) as part of the affordable housing provision; a new 2 form entry primary school (D1); expansion land for Park House Academy School; a local centre to compri se flexible commercial floorspace (A1-A5 up to 2,150 sq m, B1a up to 200 sq m) and D1 use (up to 500sq m); the formation of new means of access onto Monks Lane; new open space including the laying out of a new country park; drainage infrastructure; walking and cycling infrastructure and other associated infrastructure works. Matters to be considered: Access. Sandleford Park, Newtown Road, Newtown, Newbury, Berkshire.

Hampshire County Council as adjoining highway authority provided a response to application 16/03309/OUTMAJ, a previous planning application for up to 1000 dwellings on the Sandleford Park site and also to 18/00764/OUTMAJ - Outline planning permission for up to 1,000 new homes & 18/00828/OUTMAJ – Outline application for up to 500 new homes.

The remaining matters that still needed addressing identified within the 2018 submission were as follows:

- Junction modelling for the A34/B4640 junction
- Mitigation options for the B4640 arm of the Swan Roundabout
- Impact of the traffic growth on the A339 corridor to Basingstoke and associated safety concerns
- A343 Penwood Crossroads assessment with regards additional traffic and mitigation of safety issues
- Connecting the development to existing rights of way

Director of Economy, Transport and Environment

- Details of bus service improvements and infrastructure improvements on Newtown Road.

It is noted that the new submission is broadly similar to previous submissions and that updated modelling has been provided. The results of this modelling are broadly similar to previous results.

It would appear that the outstanding matters highlighted above as needing addressing have not been considered. Further to this more committed development has been agreed on the A339 further adding to the issue of the impact of traffic growth on the A339 corridor to Basingstoke and the associated safety concerns.

Recommendation

Having regard to the above, the highway authority would recommend a holding objection until the remaining information is submitted. HCC request that these revisions are provided in a Technical Note.

I trust that the above is clear but I would ask you not to hesitate to contact Mark Philcox should you wish to discuss anything further.

Yours faithfully

Gemma McCart
Team Leader- Highways Development Planning

APPENDIX C

Sandleford Park

Planning Applications Meeting

15th October 2018

172985/N10

Attendees

1. A meeting was held at Vectos' London office on the 12th October 2018 with the following attendees:

    - Andrew Ward – Vectos
    - Chris Long – WYG
    - Paul Goddard – West Berkshire Council
    - Patrick Blake – Highways England
    - Zoe Townsend – (WSP representing Highways England)
    - Barry Groves – Bloor Homes Southern
    - Mark Philcox – Hampshire County Council (dialled in)
    - Ben Jakes – Hampshire County Council (dialled in)

2. The purpose of the meeting was to discuss the post application responses to the Bloor Homes (North and Central) and Donnington New Homes (DNH) (West) issued by Highways England (HE), West Berkshire Council (WBC) and Hampshire County Council (HCC).

Traffic Generation

3. PG noted that the residential trip rates applied within the Transport Assessment were derived from surveys of existing residential developments. As such, PG confirmed that the trip rates used in the Transport Assessments for both developments are acceptable and provide a robust assessment of the proposed development.

4. PB and MP agreed that the trip rates applied within the Transport Assessments are acceptable.

Traffic Distribution

5. AW noted that HE has raised concerns regarding the volume of development traffic assumed to travel via the A34. AW commented that Vectos had prepared a Technical Note in response to HE concerns, which demonstrates that the traffic distribution applied within the Transport

Assessment assumes a robust volume of development traffic using the A34 junctions. AW also noted that junction modelling undertaken demonstrates that the A34 junctions operate within capacity with development traffic.

6. ZT noted that HE had no further comments regarding the Vectos Technical Note addressing traffic distribution at the A34 junctions.

7. MP stated that HCC have no concerns regarding the proposed traffic distribution.

8. All parties agreed that the traffic distribution applied within the Transport Assessment was acceptable.

A339

9. MP acknowledged that the consented development at Greenham Business Park, the proposed Manydowns and Sandleford Park developments will increase traffic on the A339 corridor. AW acknowledged that the proposed Sandleford Park development will result in a minor increase in vehicle trips on the A339 travelling into Hampshire.

10. MP stated that HCC have concerns regarding a number of existing accidents black spots and congestion on the A339 corridor, which will be sensitive to any increase in traffic.

11. MP noted that as part of the Manydowns application, the developer is currently in the process of preparing mitigation measures for a number of locations on the A339 to address congestion/highway safety concerns. MP was not aware of the current timescales for the delivery of these mitigation options; however, did note that the applicants are keen to reach planning committee as soon as possible.

12. AW requested that MP identify the locations of the accident blackspots and areas of congestion.

13. MP noted that HCC will be undertaking an A339 corridor study, which is anticipated to be concluded towards the middle of 2019. MP stated that it is unclear if the proposals being developed by the Manydowns application would form part of the corridor study.

14. MP stated that HCC are unlikely to raise an objection to the Sandleford Park application; however, HCC would be requesting a financial contribution from Sandleford Park for the identified improvements on the A339.

A34 Junctions

15. PB noted that the evidence base prepared to support WBC's Local Plan indicated that the A34/A343 priority junction would require highway improvements should the allocated sites come forward.

16. PG noted that the evidence base to support the Local Plan was based on WBC SATURN model, which provides high level analysis of the traffic impact of the Local Plan proposals. AW also noted that the Local Plan considered 2,000 units at the Sandleford Park site. The two planning applications are only considering up to 1,500 units.

17. AW also noted that the stand-alone traffic models undertaken as part of the submitted Transport Assessment provide an accurate representation of the junction's future operation with the proposed Sandleford Park development.

18. AW stated that the traffic modelling undertaken as part of the Transport Assessment demonstrated that the A34/A343 junctions operate within capacity with the inclusion of the proposed developments.

VISSIM Model

19. It had always been agreed that the proposals would be assessed by the updated VISSIM model. PG confirmed that the VISSIM model is ready to model the proposed Sandleford Park development.

20. PG confirmed that now the trip rates and traffic distribution were now agreed between all parties, the VISSIM modelling could commence.

21. It was agreed with PG, AW and CL that the previous modelling scenarios are still acceptable. PG requested that the intermediate assessment scenarios are reviewed again to ensure they are correct.

22. PB requested the HE is kept up-to-date with the VISSIM modelling as it is undertaken.

Hampshire County Council Comments

23. HCC have concerns that the Transport Assessment did not consider the impact of the proposals at the A34/B4640 junction. AW noted that the proposed development would result in a minor increase in traffic at the A34/B4640 junction, which is unlikely to result in a severe impact at the junction. BJ agreed with this point and accepted that no further analysis was required.

24. BJ also requested additional information regarding mitigation options for the B4640 arm of the Swan Roundabout. AW indicated that highway improvements at this junction have been proposed by WBC, which were included within the submitted Transport Assessment. BJ acknowledged these proposals and agreed that no further work was required.

25. HCC have also raised existing highway safety concerns at the A343 Penwood Crossroads. AW stated that the proposed development would result in a negligible increase in traffic at this junction and as such would result in an immaterial impact on highway safety. BJ accepted this point and agreed that no further work was required.

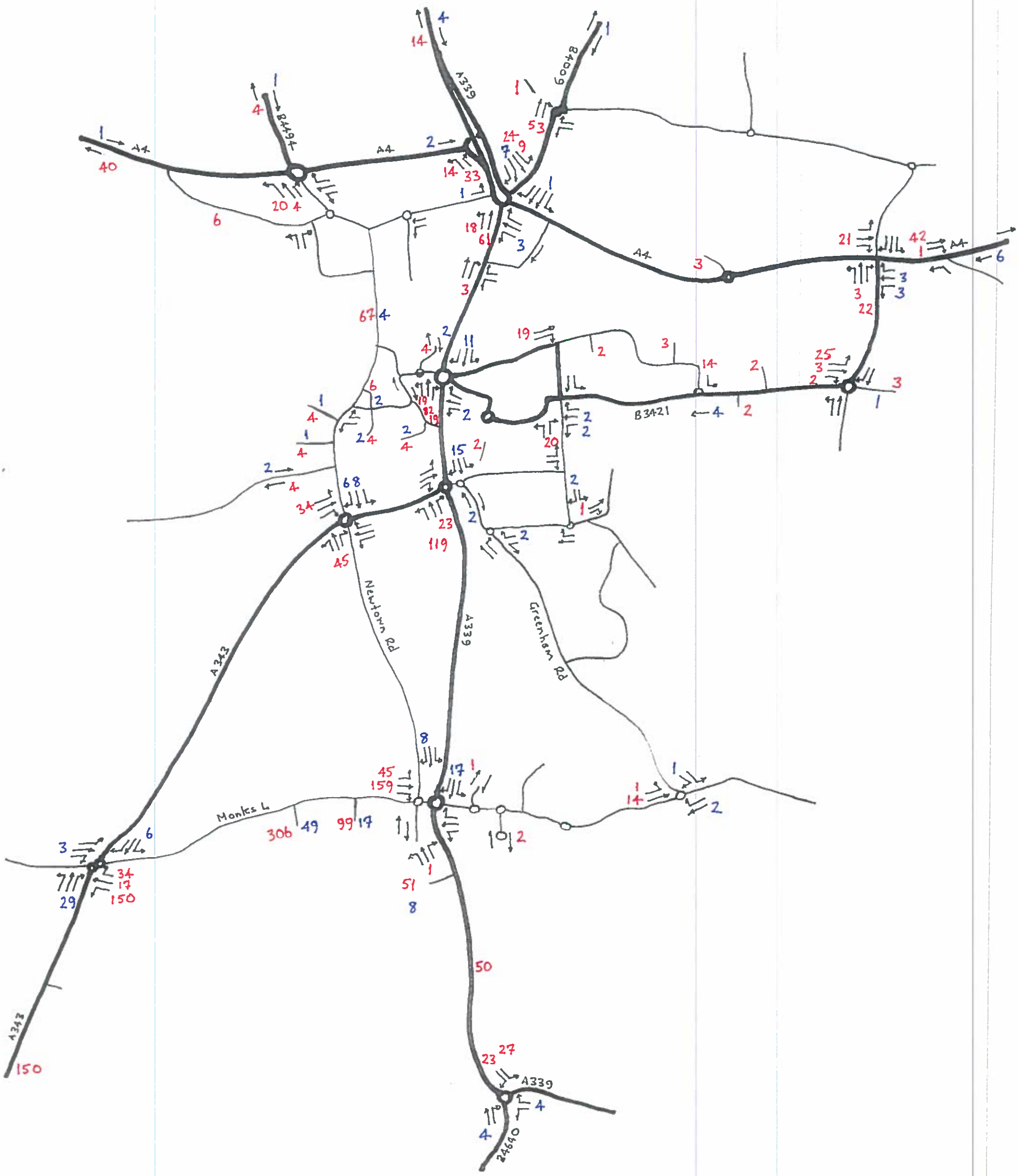
26. BJ has also requested further information of how the site was linking to existing Public Rights of Way (PROW) to the south of the site. AW indicated that the development will be improving an existing PROW, which runs through the site and providing a new pedestrian crossing on the A339 to connect to a wider network of PROWs to the east of the site. BJ accepted that the PROWs further to the south of the site with Hampshire were too distant to effectively link to from the site. As such, BJ accepted that no further work was required.

27. Finally, HCC requested further information regarding the proposed public transport strategy. AW stated that discussions are advancing with Reading buses reading the diversion of an existing route, which currently links Newbury town centre with Greenham Business Park to be diverted into the proposed development once the local centre has been built out. Before this, it is proposed that existing services on Monks Lane will serve the initial phases of the site.

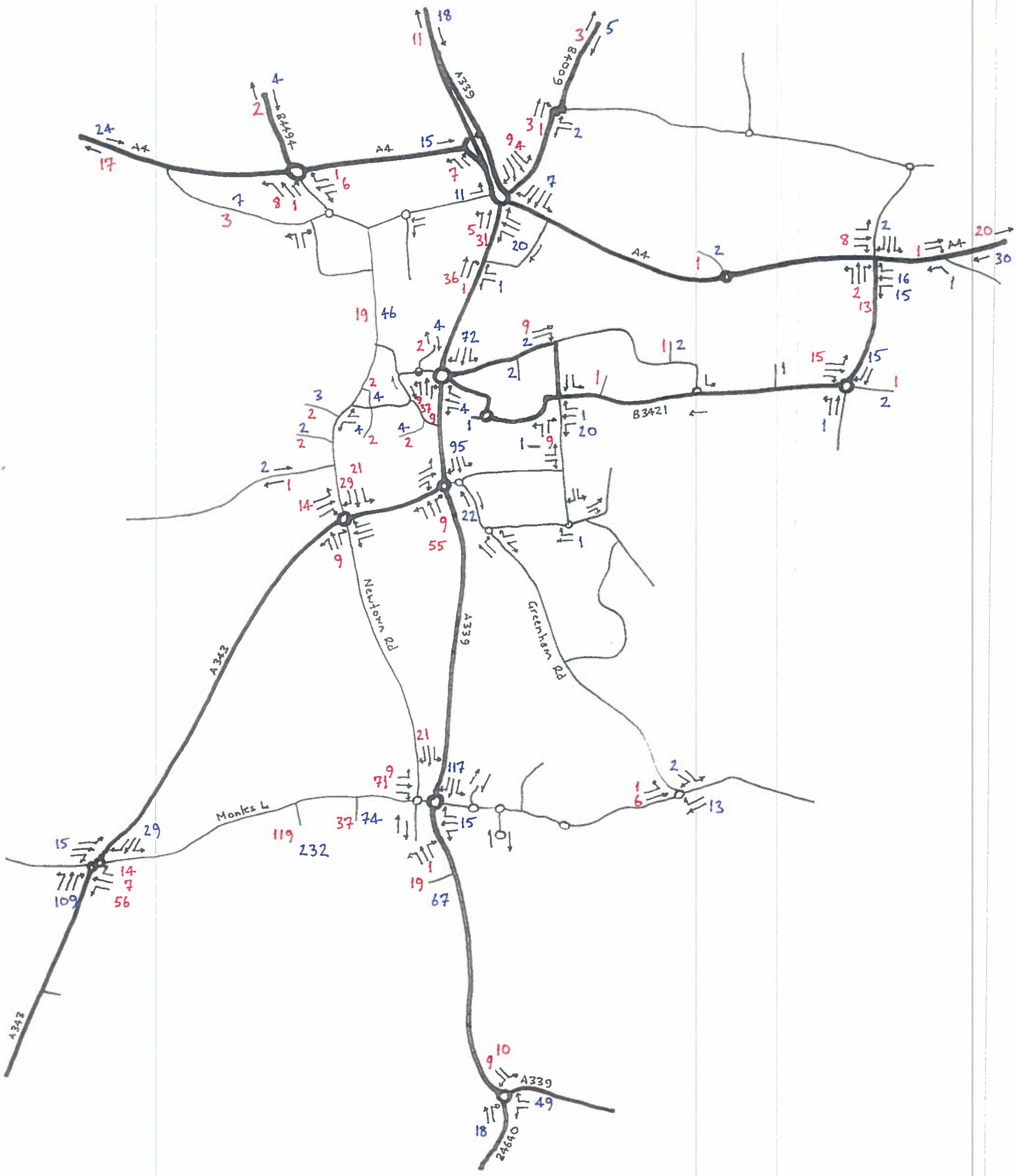
28. BJ requested that further consideration should be given regarding an existing Stagecoach service linking Basingstoke and Newbury and the feasibility of this service being diverted into the proposed site.

29. AW asked BJ if he could confirm if the Stagecoach service is currently subsidised. BJ confirmed he would investigate and confirm in due course.

APPENDIX D



Sandlejord Park 2031 AM
Bloor Homes only



Sandleford Park 2031 PM
Bloor Homes only

APPENDIX E

Footpath to Greenham from Sandleford Park

Sandleford Park

Turn right lane and ghost island to TD 42/95

2.50m wide footway / cycleway + refuge island

Continue single carriageway to 100m south of HWRC deceleration lane.

Speed limit reduced to 40mph subject to speed limit review

Widened Footway / cycleway to be provided on Eastern side by West Berkshire Council

Remains of Sandleford Priory

Sandleford Farm

Sandleford Lodge Park

Sandleford Place

Newtown Pond

Woodhouse Pond

River Enborne

Recycling Centre

Balancing Pond

Games Court

Swimming Pool

Path (um)

Track

Pond

Weir

Drain

Tennis Court

FB

GR

WB

0 10 20 30 40 50
metres

KEY

Road Markings

NOTES

1) All dimensions are shown in metres unless shown otherwise.

2) This drawing shows a proposed option and is subject to change following the location, depth and height of existing utility services.

3) WBC Standard Details must be adhered to at all times unless specified by a WBC Engineer.

4) Prior to any excavations the contractor will establish the location of existing utility services.

DRAFT

REV	DESCRIPTION	DR	AU	REV DATE
B				
A				

Status

West Berkshire Council

Transport & Countryside | Council Offices
Market Street | Newbury | RG14 5LD

Project Title

A339 Sandleford

Drawing Title

A339/B4640 Junction Road Marking

Date	Drawn By	Checked By	Paper Size	Drawing Scale
18/04/2016	AT	NS	A1	1:1250

Drawing Number

81311-041-108

Revision