

LAND SOUTH OF B2233 MAIN ROAD, YAPTON

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY
ON BEHALF OF
LANDLINK ESTATES LTD

Prepared by

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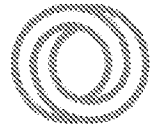
White Hart Lane

Basingstoke

RG21 4AF



November 2017

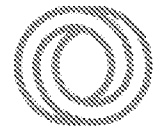


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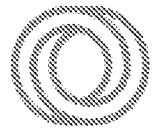


CONTENTS

1.0	Introduction	1
2.0	Development Proposals	2
3.0	Baseline Conditions	3
4.0	Flood Risk Legislation and Policy Review	7
5.0	The Sequential Test and the Exception Test	15
6.0	Flood Risk Methodology	16
7.0	Appraise Key Sources of Flood Risk	17
8.0	Flood Risk Mitigation Measures	19
9.0	Appraisal of Residual Flood Risk	21
10.0	Preliminary Surface Water Drainage Strategy	22
11.0	Preliminary Foul Drainage Strategy	25
12.0	Summary and Conclusions	26

APPENDICES

Appendix A	Site Location Plan
Appendix B	Proposed Site Layout
Appendix C	Topographical Survey
Appendix D	British Geological Survey (BGS) Data
Appendix E	Site Investigation and Infiltration Testing
Appendix F	Environment Agency (EA) Data
Appendix G	Southern Water Services Ltd (SWSL) Records
Appendix H	Proposed Surface Water and Foul Drainage Strategy & Micro Drainage Calculations
Appendix I	Strategic Flood Risk Assessment Extracts



1.0 INTRODUCTION

1.1 Odyssey has been commissioned by Landlink Estates Ltd to undertake a Flood Risk Assessment (FRA), incorporating a surface water and foul water drainage strategy to support a planning application for a proposed residential development in Yapton.

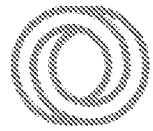
1.2 The land forms the western part of the allocated site SD7 for 500 dwellings in the Arun Local Plan 2017-2031.

1.3 The proposed development comprises: outline application with all matters reserved save access, for up to 300 dwellings, link road, surface drainage, open space and landscaping.

1.4 This report comprises the following elements:

- Review of existing legislation, policy and supporting documents in relation to flood risk, surface water and foul water;
- Review of all elements which may cause or increase the risk of flooding to the development and the local vicinity including fluvial, pluvial, groundwater, sewers and man-made infrastructure. The assessment also identifies and examines the residual flood risk to the proposed development and neighbouring property from these sources;
- Demonstration through the use of Sustainable Drainage Systems (SuDS) that the proposed development does not increase the potential for flooding through mitigation;
- A surface water and foul water drainage strategy, illustrating that the site can be drained effectively and in accordance with West Sussex County Council (WSCC), Arun District Council (ADC), Environment Agency (EA) and Southern Water Services Ltd (SWSL) requirements.

1.5 This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) (Communities and Local Government, March 2012), Planning Practice Guidance (PPG) (Department for Communities and Local Government, updated April 2015), EA guidance, The SuDS Manual (CIRIA C753), the Non-Statutory Technical Standards for Sustainable Drainage, and SWSL requirements.



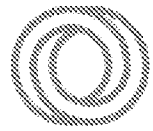
2.0 DEVELOPMENT PROPOSALS

2.1 The proposed development comprises: outline application with all matters reserved save access, for up to 300 dwellings, link road, surface drainage, open space and landscaping. The site is the western part of the allocated site SD7 allocated for at least 500 dwellings. An outline application for the remainder of the site is being drawn up alongside this application, using a jointly commissioned comprehensive masterplan for the site allocation.

2.2 A site location plan is shown in **Appendix A** and the indicative masterplan is presented in **Appendix B**.

2.3 Surface water runoff will be managed through the implementation of SuDS, in the form of permeable paving, cellular storage tanks and detention basins. The surface water drainage strategy is discussed in detail in **Section 10** of this report.

2.4 A foul water drainage system for the development will be designed in accordance with Sewers for Adoption 7th Edition (SfA), the Building Regulations Part H, and SWSL requirements. The proposed foul water drainage will connect to the existing SWSL public foul sewer, subject to a Section 106 agreement with SWSL.



3.0 BASELINE CONDITIONS

3.1 *Sources of Information*

3.1.1 The baseline conditions for this site have been established using the following sources and references:

- Topographical Survey, Digital Terrain Surveys, April 2017;
- British Geological Survey (BGS) online mapping (data obtained in November 2017);
- Phase 2 geo-environmental site investigation, BRD Environmental, October 2017;
- EA mapping;
- SWSL asset location plans (data obtained in August 2017).

3.2 *Site Description*

3.2.1 The 12.4ha site is located in Yapton, within the Arun District of West Sussex. The site is bounded by the B2233 Main Road to the north, residential development to the north east, agricultural fields to the east and south, and Drove Lane to the west. The fields to the east of the site form part of the wider Local Plan development site.

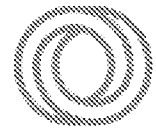
3.2.2 The approximate centre of the site is at Ordnance Survey (OS) Grid Reference 497363E, 103134N, and the nearest postcode is BN18 0EA.

3.2.3 The site currently consists of a field of undeveloped arable farmland.

3.3 *Topography*

3.3.1 The topographical survey for the site was undertaken by Digital Terrain Surveys in April 2017. A level study of the site's topography shows that the site falls gently from the east of the site to the west. There is a modest depression to the north of the site, as this land is located on the line of a former canal. The land to the very north of the site falls towards the B2233 Main Road. Levels at the site range from approximately 4.18m AOD to 7.10m AOD.

3.3.2 The topographical survey is provided in **Appendix C**.



3.4 **Geology**

3.4.1 BGS mapping indicates that the bedrock geology of the site consists of Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation - chalk.

3.4.2 The maps also show that there are superficial deposits at the site comprising river terrace deposits - sand, silt and clay.

3.4.3 BGS mapping is shown in **Appendix D**.

3.4.4 Intrusive ground investigations undertaken by BRD Environmental in September and October 2017 largely correspond with the BGS mapping. Made ground was encountered to the north east of the site, associated with the alignment of the former canal. Topsoil and superficial deposits consisting of river terrace deposits were found site-wide. Chalk was encountered beneath these strata.

3.4.5 The ground investigation logs are shown in **Appendix E**.

3.5 **Hydrology**

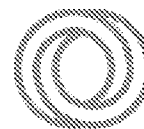
3.5.1 The nearest EA designated Main Rivers to the site are located approximately 200m to the north west, and just over 300m to the south east. The site borders a ditch to the south east, which forms a local network of ditches within the surrounding fields.

3.6 **Hydrogeology**

3.6.1 According to the BGS hydrogeological mapping, the site is located within the White Chalk Subgroup, which is described as a highly productive aquifer.

3.6.2 Groundwater mapping published by the EA indicates that the site is not situated within a groundwater Source Protection Zone. The bedrock at the site is designated as a 'Principal Aquifer'. The site is located within a 'Major Aquifer Intermediate' groundwater vulnerability zone. This information is shown within **Appendix F**.

3.6.3 Groundwater monitoring undertaken as part of the geo-environmental investigation between September and October 2017 found that the resting groundwater levels ranged from 2.48m below ground level (bgl) to 3.68m bgl, or dry down to the base of installations to a depth of 4.00m.



3.6.4 Soakage tests were also undertaken across the site, and the infiltration rates ranged from 5.54×10^{-5} m/s to 2.94×10^{-6} m/s. The groundwater monitoring and soakage test records are included within **Appendix E**.

3.7 **Existing Foul and Surface Water Drainage Regime**

3.7.1 According to maps provided SWSL, there are no public surface water sewers currently located within the site.

3.7.2 It is therefore anticipated that surface water runoff from the existing site currently infiltrates into the underlying strata, with any excess discharged towards the shallower points on site due to the topography.

3.7.3 The SWSL mapping shows that there is a public foul sewer located along the B2233 Main Road to the north of the site, which flows in a north-western direction. A copy of the SWSL sewer records is presented in **Appendix G**.

3.7.4 As the proposed development area is less than 50ha, the Institute of Hydrology (IoH) Report 124 Flood Estimation for Small Catchments (1994) method has been used to estimate the site greenfield peak flow rate, which is an approved methodology specified within the EA's Rainfall Runoff Management for Developments Report¹, using the parameters detailed in **Table 3.1** below.

Table 3.1: ICP SuDS Parameters

Parameter	Value	Unit
SAAR	750	mm
Soil Index	0.4	-
Region	7	-
Urban	0.000	-

3.7.5 **Table 3.2** summarises the estimated current greenfield discharge rates for the site. Calculations are provided in **Appendix H**.

¹ R Kellagher (2013) *Rainfall Runoff Management for Development Report SC030219*, Environment Agency, Bristol.

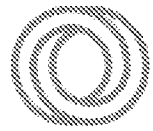
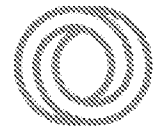


Table 3.2: Existing Surface Water Discharge Rates

Return Period	Existing Greenfield Discharge Rates (l/s)	Existing Greenfield Discharge Rates (l/s/ha)
Q_{BAR}	45.4	3.7
Q1	38.6	3.1
Q30	102.8	8.4
Q100	144.7	11.8



4.0 FLOOD RISK LEGISLATION AND POLICY REVIEW

Legislation

4.1 Flood and Water Management Act 2010

4.1.1 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The FWMA was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with the Government's response to Sir Michael Pitt's review of the summer 2007 floods.

4.1.2 Relevant to development sites, the FWMA is intended to encourage the uptake of SuDS by removing the automatic right to connect to sewers.

4.1.3 The development proposals will adhere to the FWMA through the provision of SuDS as a fundamental element of the surface water drainage system. Furthermore, Landlink Estates are committed to working with the relevant stakeholders, such as the EA and WSCC, in implementing the requirements of the FWMA where applicable.

4.2 Flood Directive – The Flood Risk Regulations 2009

4.2.1 The Flood Risk Regulations 2009 came into force on 10th December 2009, transposing the European Floods Directive into domestic law. In essence the Regulations require the EA to prepare FRAs, maps and plans for sea, main river and reservoir flood risk and will require lead local flood authorities (unitary and county councils) to do the same for all other forms of flooding.

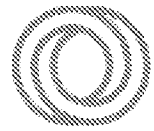
National Policy

4.3 National Planning Policy Framework 2012

4.3.1 The NPPF replaced all planning policy documents (including Planning Policy Statement 25: Development and Flood Risk) upon publication in March 2012.

4.3.2 The NPPF sets out the Government's planning policies for England and Wales, and how these policies should be applied. The technical guidance to the NPPF, the PPG, was published in March 2014 to accompany the NPPF. The PPG is an online document and provides additional guidance and links to relevant current detail documents.

4.3.3 Paragraph 100 of the NPPF states that "*inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.*"



4.3.4 As stated in Paragraph 103 of the NPPF, when determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider appropriate development in areas at risk of flooding where, following application of the Sequential Test (and if required, the Exception Test), it can be demonstrated that:

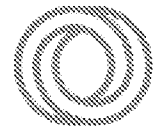
- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
- Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of SuDS.

4.3.5 All land in England and Wales is classified into three main Flood Zones which refer to the probability of river or sea flooding (ignoring the existence of defences). The PPG identifies and describes the EA Flood Zones as:

- Flood Zone 1: Low Probability, defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Flood Zone 2: Medium Probability, defined as land assessed as having between 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%), or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%);
- Flood Zone 3a: High Probability, defined as land assessed as having a 1 in 100 or greater annual probability of river flooding ($\geq 1\%$), or a 1 in 200 or greater annual probability of sea flooding ($\geq 0.5\%$);
- Flood Zone 3b: The Functional Floodplain, defined as land where water has to flow or be stored in times of flood (as identified by local planning authorities in their Strategic Flood Risk Assessments).

4.3.6 In accordance with the NPPF, a site specific FRA is required for:

- Proposals of 1 hectare or greater in Flood Zone 1,
- All proposals for development in Flood Zones 2 and 3,
- An area within Flood Zone 1 which has critical drainage problems,



- Development or change of use to a more vulnerable class that may be subject to other sources of flooding.

4.3.7 The site is entirely situated within Flood Zone 1, and due to the site being larger than 1 hectare, a site specific FRA is required in accordance to the NPPF.

4.3.8 Greenfield sites would rely on natural drainage to convey or absorb rainfall. In general, development can reduce the permeability of the site if not well designed, increasing the volume and rate of water running off the site and potentially increasing flood risk to downstream areas.

4.4 ***Non-Statutory Technical Standards for Sustainable Drainage Systems 2015***

4.4.1 The Non-Statutory Technical Standards for Sustainable Drainage Systems was published by the Department for Environment, Food and Rural Affairs (DEFRA) in March 2015.

4.4.2 The standards are to be used in order to manage surface runoff in accordance with Schedule 3 of the FWMA.

4.4.3 The standards state that runoff destination should be considered in the following order of preference:

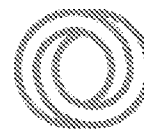
- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer;
- Discharge to a combined sewer.

4.4.4 The document provides guidance on runoff destination, peak flow rate, volume and control of water quality and function.

4.4.5 The local planning authority may set local requirements for planning permission that have the effect of more stringent requirements than that of the standards.

4.5 ***The Water Industry Act 1991***

4.5.1 The Water Industry Act 1991 (WIA) (HMSO, 1991) was introduced to consolidate previous water supply and wastewater services enactments in the UK. Section 94 sets out the principal duties and standards of performance to sewerage undertakers which include the duty '*to provide, improve and extend such a system of public sewers (whether inside its area or elsewhere) and so*



to cleanse and maintain those sewers so as to ensure that the area is and continues to be effectually drained.

4.5.2 Relevant to new developments, Section 104 and Section 106 of the WIA provides the framework for the adoption of private sewers, subject to an agreement with the sewerage undertaker, who in this case is SWSL.

4.5.3 Section 98 of the WIA provides the legal mechanism through which the appropriate infrastructure can be requested (by the developer) and provided to drain a specific location.

4.5.4 Section 106 allows the sewerage undertaker a 21 day notice period prior to the works being undertaken. During this time the application may be refused if the undertaker considers that the connection mode or condition of the connecting sewer does not satisfy the required standards. The undertaker cannot refuse the connection based on inadequate capacity.

4.6 ***Transfer of Private Sewers***

4.6.1 It should be noted that the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 has transferred private sewers into the ownership of the statutory sewerage companies in England since October 2011. The government are also taking steps to stem the proliferation of newly built sewers in order to prevent the recurrence of existing ownership/maintenance problems in the future.

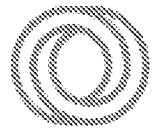
4.7 ***The Pitt Review***

4.7.1 In response to the severe flooding in the UK during the summer of 2007, the government commissioned an independent review on lessons to be learned. The Pitt Review was comprehensive and considered all stages of flooding – preparedness, response and recovery – as well as the coordination, responsibilities and legislation necessary to ensure the UK can advance in the area of flood risk management.

4.8 ***Sewers for Adoption 7th Edition***

4.8.1 The SfA places responsibility (in England and Wales) for existing and future private sewers and lateral drains that connect to the public sewer system to the water and sewerage companies.

4.8.2 The SfA will provide detailed guidance to support the Mandatory Build Standard whereby; it will be mandatory for new sewers and lateral drains (between the sewer and the serviced property boundary) to be adopted to public status by the sewerage undertaker.



4.8.3 The guidance for foul sewer design in SfA states; '*The design of flows for gravity sewers for residential developments should be 4,000 litres / unit dwelling / per 24 hours.*'

4.9 ***Building Regulations***

4.9.1 Where drainage within a development is not to be adopted by the sewerage undertakers, the so-called private sewers will be required to meet the standards as set out in the Building Regulations 2015, Part H 'Drainage and Waste Disposal' guidance on the design of private sewers.

4.9.2 Specific guidance can be found within the following sections of the Building Regulations 2015, Part H 'Drainage and Waste Disposal':

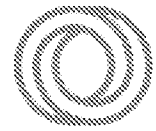
- H1 – Foul water drainage
- H2 – Wastewater treatment systems and cesspools
- H3 – Rainwater drainage
- H4 – Building over sewers
- H5 – Separate systems of drainage
- H6 – Solid waste storage.

Local Policy

4.10 ***Arun District Local Plan 2003 - saved policies***

4.10.1 The key aim of the plan is to apply the principles of sustainable development in assessing development proposals, addressing the balance between the need for development and the protection of resources.

4.10.2 Policy GEN 9 - Foul and Surface Water Drainage: planning permission for development which will materially increase foul and/or surface water discharges will be refused unless the Local Planning Authority is satisfied that either adequate drainage capacity exists or appropriate drainage capacity can be provided as part of the development. Consideration should also be given to the use of SuDS as alternatives to conventional drainage where appropriate.



4.11 ***Emerging Arun District Local Plan 2011-2031***

4.11.1 The plan will set out the strategic vision for the future of the District, and the objectives, policies and proposals for development to 2031 and beyond.

4.11.2 Policy W DM2 - Flood Risk: development in areas at risk from flooding, identified on the latest EA flood risk maps and the Council's Strategic Flood Risk Assessment, will only be permitted where all of the following criteria have been satisfied:

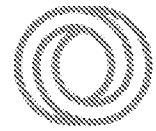
- a. The sequential test in accordance with the NPPF Technical Guidance has been met;
- b. A site specific FRA demonstrates that the development will be safe, including access and egress, without increasing flood risk elsewhere and reduce flood risk overall;
- c. The scheme identifies adaptation and mitigation measures;
- d. Appropriate flood warning and evacuation plans are in place; and
- e. New site drainage systems are designed to take account of events which exceed the normal design standard i.e. consideration of flood flow routing and utilising temporary storage areas.

The reports prepared as part of the criteria above must take into account contingency allowances, taking climate change into account as set out in the NPPF Technical Guidance.

In locations where strategic flood defence or resilient and resistant construction measures are necessary within the site itself, proposals will be required to demonstrate how measures have been incorporated as an intrinsic part of the scheme in a manner which is compatible with the Strategic Flood Risk Assessment.

All development proposals must take account of relevant Surface Water Management Plans, Catchment Flood Management Plans and related Flood Defence Plans and strategies such as the Lower Tidal River Arun Strategy. The council may require financial contributions from development on sites where measures to address flood risk or to improve the environmental quality of watercourses have been identified by these Plans and Strategies.

4.11.3 Policy W DM3 - Sustainable Urban Drainage Systems: to increase the levels of water capture and storage and improve water quality, all development must identify opportunities to



incorporate a range of SuDS, appropriate to the size of the development, at an early stage of the design process.

Proposals for both major and minor development proposals must incorporate SuDS within the private areas of the development in order to provide source control features to the overall SuDS design. These features include:

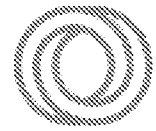
- Green roofs
- Permeable driveways and parking
- Soakaways
- Water harvesting and storage features including water butts.

Proposals for major development must also integrate SuDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SuDS must therefore be integrated into the overall design of a development and must:

- a. Contribute positively to the appearance of the area, integrating access to allow maintenance of existing watercourses and the system;
- b. Effectively manage water (including its quality);
- c. Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets;
- d. Provide amenity for local residents (ensuring a safe environment); and
- e. Retain the existing drainage network of the site and the wider area.

In order to ensure that SuDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- f. Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SuDS manual produced by CIRIA.
- g. Undertake up to six months groundwater monitoring within the winter period.
- h. Undertake winter percolation testing in accordance with BRE365.



- i. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.
- j. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas.

4.12 ***Yapton Neighbourhood Plan 2014-2029***

4.12.1 The Neighbourhood Plan establishes a vision for the future of Yapton parish, and sets out how that vision will be realised through planning and controlling land use and development change over the plan period 2014 to 2029.

4.12.2 Policy E11 - Minimising the impact of flooding from development: development proposals will be expected to:

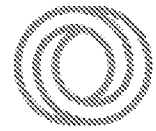
- Be designed and constructed to minimise the overall level of flood risk within the parish; and
- Provide appropriate surface water drainage; and
- Open existing culverts where practicable.

Development will not be permitted in flood attenuation areas where that development would reduce the ability of these areas to alleviate flooding.

Proposals that would create new culverts (unless essential to the provision of access to water systems) will not be permitted.

Proposals that would result in the loss of open watercourses will not be permitted.

Any new development must have adequate receiving surface water drainage, i.e. drains, culverts and definable water courses, under EA and Local Authority control.



5.0 THE SEQUENTIAL TEST AND THE EXCEPTION TEST

5.1 *The Sequential Test*

5.1.1 The EA Flood Zones are the starting point for the sequential approach promoted by the NPPF, and are shown on the EA flood mapping. The PPG identifies that the overall aim of the Sequential Test is to steer new development to Flood Zone 1 (NPPF, 2012).

5.1.2 As stated by the NPPF, development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with lower probability of flooding. The SFRA will provide the basis for applying this test (NPPF, 2012).

5.1.3 Following application of the Sequential Test, if it is not possible for the development to be located in zones with a lower probability of flooding (Flood Zone 1), proposed sites should take into account the flood risk vulnerability of land uses (Table 2, PPG) and consider reasonable sites in Flood Zone 2, and apply the Exception Test if required (Table 3, PPG). Only where there are no reasonably available sites in Flood Zones 1 and 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

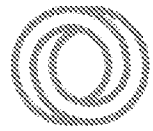
5.1.4 The development footprints are entirely situated within Flood Zone 1 and the site is suitable for the proposed residential development in accordance with the NPPF and PPG. The Sequential Test is therefore not required.

5.2 *The Exception Test*

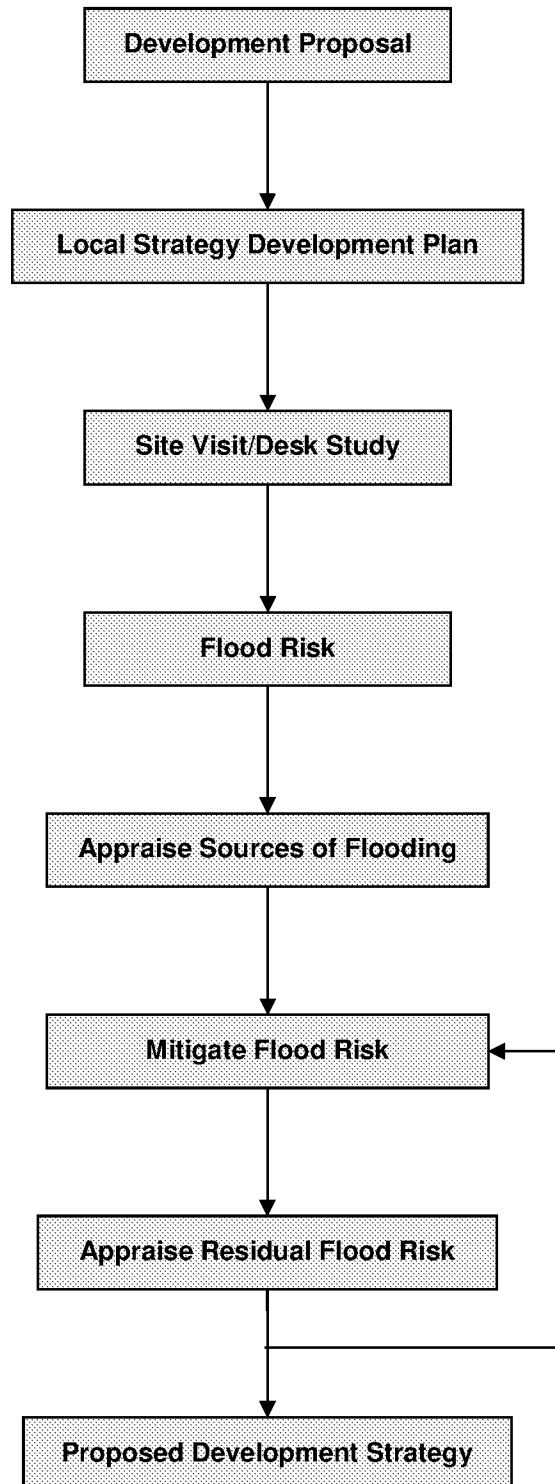
5.2.1 For the Exception Test to be passed, a development proposal:

- Must demonstrate that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA;
- The development should be on developable brownfield land or, if not, it must be demonstrated that there is no such alternative land available; and
- An FRA must demonstrate that the development will be safe for its lifetime, taking into account the vulnerability of its users, without increasing flood risk elsewhere, and where possible, reducing flood risk overall.

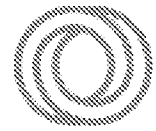
5.2.2 The development footprints are entirely situated within Flood Zone 1, and so the Exception Test is not required.



6.0 FLOOD RISK METHODOLOGY



6.1 The assessment methodology is based on the requirements of the NPPF.



7.0 APPRAISE KEY SOURCES OF FLOOD RISK

7.1 *Introduction*

7.1.1 In accordance with NPPF requirements, all forms of flooding must be considered within a site specific FRA. The following is a review of all types of flooding and an overview of their risks to the site, if any.

7.2 *Flooding from Rivers (Fluvial)*

7.2.1 Fluvial flooding is caused by high flows in rivers or streams exceeding the capacity of the river channel and spilling into the floodplain, or in some cases non-designated floodplain, which can occur after a period of heavy rainfall.

7.2.2 The EA's Flood Map for Planning (accessed November 2017) indicates that the entire site is located within Flood Zone 1: land having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) in any given year.

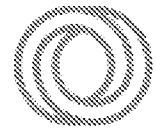
7.2.3 Appendix H of the ADC Strategic Flood Risk Assessment (SFRA) Update 2016 shows that the site is not located within the extents of any historic fluvial flooding incidents.

7.3 *Surface Water Flooding / Overland Flows (Pluvial)*

7.3.1 Surface water flooding is caused by rainfall levels exceeding the natural infiltration properties of the surrounding soils. It occurs where there is a lack of a formalised drainage system, as a result of poorly designed or maintained sewer systems, or due to no natural method of drainage such as watercourses or ditches, or where soil infiltration rates are low. It often results in ponding of water at low points or backing up behind obstructions.

7.3.2 The EA's updated Flood Map for Surface Water (uFMfSW) shows that the vast majority of the site lies within an area at 'very low risk' of surface water flooding. This is an area which has a less than 1 in 1,000 annual probability of surface water flooding (<0.1%).

7.3.3 The mapping shows that Drove Lane is susceptible to high surface water flood risk; however this appears to be restricted to within the highway. There is also a narrow strip of low and medium surface water flood risk to the north of the site, associated with the route of the former canal. There is a narrow strip of low surface water flood risk along the eastern boundary of the site. The uFMfSW is shown in **Appendix F**.



7.3.4 The SFRA map shown in **Appendix I** shows that there are no records of surface water flooding at the site.

7.4 ***Groundwater Flooding***

7.4.1 Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land. Periods of prolonged rainfall may also be a cause of groundwater flooding, with aquifers and soils becoming saturated.

7.4.2 According to the SFRA, the majority of the site is located in an area where the susceptibility to groundwater flooding is more than 25%, but less than 50%. To the south east of the site, the susceptibility is more than 50%, but less than 75%. The susceptibility to groundwater flooding map is shown within **Appendix I**.

7.5 ***Sewer Infrastructure Flooding***

7.5.1 Flooding can occur due to the failure of existing foul or surface water drainage infrastructure. If flows within the drainage system exceed the designed capacity or foreign matter causes blockages, overflow to the surface can occur, leading to flooding.

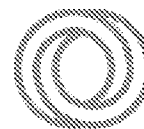
7.5.2 SWSL's records of historic flood incidents are included within the ADC SFRA. The database indicates that, as of February 2016, there have been 20 recorded sewer flood incidents within the BN18 0 postcode. However, as the data was provided at postcode area level, the exact location of these incidents cannot be determined from the information provided.

7.6 ***Flooding from Artificial Sources***

7.6.1 Flooding from artificial sources is that arising from the failure of man-made infrastructure, or human intervention that causes flooding.

7.6.2 The nearest reservoir is the Bilsham Farm Reservoir, located approximately 600m to the south west of the site. The site is not subject to flood risk from this reservoir.

7.6.3 The only canal within the Arun District SFRA area is the disused former Portsmouth to Arundel Canal, and therefore will not be a flood risk to the site.



8.0 FLOOD RISK MITIGATION MEASURES

8.1 *Mitigation against Flood Risk from the Proposed Development*

8.1.1 To mitigate against the risk from localised overland flooding from the proposed development, surface water runoff will be managed through the implementation of SuDS in the form of permeable paving, cellular storage tanks and detention basins.

8.1.2 The proposed development will alter the drainage regime of the site by increasing impermeable surface area and therefore increasing the rate, volume and potential contamination of surface runoff, it is necessary to provide mitigation measures to offset the potential impacts. It is proposed to manage the surface water runoff by utilising SuDS which will remove heavy metals, hydrocarbons, rubber dust, and silts prior to discharging into the ditch.

8.1.3 The proposed on-site drainage system will be designed to cater for the 1 in 30 year storm, providing attenuation to store flood waters on-site during flood events up to and including the 1 in 100 year plus 40% climate change rainfall event.

8.1.4 In order to manage the residual risk of blockage to all on-site drainage features, the developer, LLFA and/or adopting Sewerage Undertaker will ensure maintenance of their respective drainage system in line with the manufacturers' recommendations by the production of a Maintenance Management Plan. This will ensure that over the lifetime of the proposed development the drainage system will be maintained to ensure continuing functionality.

8.2 *Mitigation against Flood Risk to the Development*

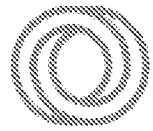
Surface Water Flooding

8.2.1 The site layout has been developed to avoid areas of surface water flooding; all built development will be located in areas at very low risk of surface water flooding.

8.2.2 As previously mentioned, a formalised surface water drainage system will be designed to accommodate storm water runoff for all events up to 1 in 100 year plus 40% climate change. Detailed information of the drainage strategy for the site is set out in **Section 10**.

Groundwater Flooding

8.2.3 Finished floor levels will usually be set 150mm above existing levels, and ground levels manipulated in order to ensure that in the unlikely event of groundwater flooding occurring, flood flows will be conveyed away from the houses and discharged into the surface water drainage system.

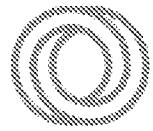


8.3 ***Contamination from Construction***

8.3.1 Contractors are to make reference to current legislation and EA guidelines in respect of construction pollution prevention. All procedures will be in effect to prevent pollution of the ground prior to, during, and post construction in order to maintain water quality.

8.3.2 All stocks of materials, oils and fuels are to be stored in a manner preventing spillage and seepage to the ground or drainage network. Wastewater will not be freely discharged to the ground or sewers. All hydrocarbons and chemical spillages will be thoroughly cleaned by excavation of the polluted ground and disposed of at a licensed waste depot.

8.3.3 The contractor would be required to report any pipework encountered during the construction works, trace the system to establish if it is live and maintain its operation whilst a diversion or protection to the system is established.



9.0 APPRAISAL OF RESIDUAL FLOOD RISK

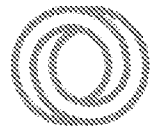
9.1 *Introduction*

9.1.1 When undertaking an FRA it is essential to put into perspective any theoretical analysis with the reality of the physical system in place. It is impossible (both practically and economically) to design a system which will never fail. However, good design, controlled construction and regular maintenance can reduce the likelihood of failure during its design life.

9.1.2 The assessment has shown that the site offers low flood risk to users of the proposed residential development based on the following:

- There are no historic flood events recorded within the site boundaries;
- The proposals are for a residential scheme with all built development to be located in Flood Zone 1, which is deemed appropriate as per the recommendations of the NPPF;
- The proposed development will utilise SuDS techniques to provide treatment of surface water runoff, up to and including that arising from the 1 in 100 year plus 40% climate change storm;
- The foul drainage system will be designed in accordance with best practice.

9.1.3 All flood advice given is based on literature, mapping and historic records produced by the EA, ADC and SWSL.



10.0 PRELIMINARY SURFACE WATER DRAINAGE STRATEGY

10.1 *Surface Water Management Strategy Requirements*

10.1.1 Any surface water drainage strategy must demonstrate that the proposed development can be drained in a sustainable manner, commensurate with local and national policy. The NPPF requires that flood risk to land and property is not increased as a result of new development.

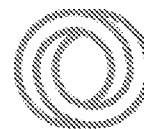
10.1.2 A fundamental principle of sustainable development in terms of flood defence is the reduction of surface water runoff from new developments. The Non-Statutory Technical Standards for Sustainable Drainage state that peak runoff rates should be limited to the greenfield runoff rates, and long term storage should be provided. Exceedance routes should be shown to not impact the safety of property.

10.1.3 The Non-Statutory Technical Standards for Sustainable Drainage and Part H of the Building Regulations: Drainage and Waste Disposal establish a hierarchy for surface water disposal, which also encourages a SuDS approach. This hierarchy stipulates that surface water runoff not collected for reuse must be discharged to one or more of the following in order of priority:

1. Discharge into the ground (infiltration); or, where not reasonably practicable;
2. Discharge to a surface water body; or, where not reasonably practicable;
3. Discharge to a surface water sewer, highway drain, or another drainage system; or, where not reasonably practicable;
4. Discharge to a combined sewer.

10.1.4 The peak runoff rates and volumes leaving the site must not be greater than those currently discharged during the following events:

- 1:1 year rainfall event;
- 1:30 year rainfall event;
- 1:100 year rainfall event; and
- 1:100 year plus climate change.



10.2 Proposed Surface Water Drainage Strategy

10.2.1 The proposed surface water management strategy described below is outlined in Drawing 14-111/102 in **Appendix H**.

10.2.2 Groundwater monitoring undertaken as part of the geo-environmental investigation between September and October 2017 found that the resting groundwater levels ranged from 2.48m below ground level (bgl) to 3.68m bgl, or dry down to the base of installations to a depth of 4.00m. Soakage tests were also undertaken across the site, and the infiltration rates ranged from 5.54×10^{-5} m/s to 2.94×10^{-6} m/s.

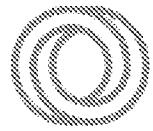
10.2.3 The use of infiltrating SuDS in some areas of the site may be practicable. However, most of the site is not suitable for infiltration. In accordance with the above drainage hierarchy, it is proposed that surface water runoff to the next best possible option which the watercourse to the south west of the site.

10.2.4 Storm water will therefore be attenuated on site and released gradually. The attenuation storage will be achieved by utilising tanked permeable paving, underground cellular storage tanks and detention basins prior to controlled discharge to the ditch south west of the site.

10.2.5 The SuDS features shown on the proposed drainage strategy have been sized to attenuate flows for all rainfall events up to the 1 in 100 year event plus climate change (+40%) whilst restricting discharge rates to Q_{BAR} , as shown in **Table 10.1**. This therefore negated the requirement to provide Long Term Storage for the site. The Micro Drainage Calculations are presented in **Appendix H**.

Table 10.1: Existing and Proposed Surface Water Discharge Rates

Return Period	Existing Greenfield Discharge Rates (l/s)	Proposed Discharge Rates (l/s/ha)
Q_{BAR}	45.4	45.4
Q1	38.6	38.6
Q30	102.8	45.4
Q100	144.7	45.4
Q100 + 40% CC	-	45.4

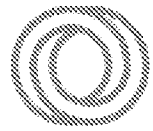


10.2.6 The proposed development is residential. The maximum pollution hazard index for the site as per the SuDS Manual (C753) is 0.5. The proposed permeable paving alone can treat runoff with pollution indices of up to 0.7, with the addition of the detention basin the water quality treatment provided is therefore far more than the recommended level

10.2.7 The onsite drainage system maintenance will be carried out by a private recognised management company through the implementation of an approved maintenance management plan, to minimise the residual risk of drainage system blockage. **Table 10.2** details the maintenance requirements for the SuDS features at the site.

Table 10.2: Maintenance of SuDS Features

SuDS Feature	Maintenance Requirement
Permeable paving	Brushing and vacuuming three times per year, removal of weeds, repair any broken blocks or damaged areas. Three-monthly inspection of poor operation; annual inspection of silt accumulation and inspection chambers.
Cellular storage tank	Monthly inspections for the first three months, then annually. Removal of sediment from pre-treatment structures and/or internal forebays annually or as required.
Attenuation basin	Monthly maintenance, including removal of litter and debris; cutting grass for spillways and access; managing other vegetation and removing nuisance plants; inspecting inlets, outlets and overflows for blockages and clear if required. Annual maintenance also includes tidying dead growth, removing sediments from inlets and outlets, checking mechanical devices, and repairing erosion or other damage by replanting.



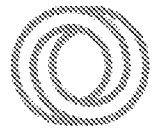
11.0 PRELIMINARY FOUL DRAINAGE STRATEGY

11.1 SWSL are the governing water authority for the area. Any proposed connections or changes to the existing discharge rates must be approved by SWSL prior to commencement of any construction works. A copy of the SWSL records is presented in **Appendix G**.

11.2 It is proposed to collect and discharge all the foul flows from the site by gravity to the southwestern corner of the site. Foul flows will then be pumped in a northern direction into the public foul sewer on Main Road. The new connection from the site must be approved by SWSL under a Section 106 agreement.

11.3 The hydraulic design for the discharge rate for the foul wastewater design has been calculated in accordance with Sewers for Adoption 7th Edition which states design flow rates for dwellings should be 4000l/day. The total foul discharge rate for the proposed development of up to 300 residential units, in accordance with SfA, equates to 13.9 l/s.

11.4 The results of the foul capacity check for the site have not yet been received; however discussions are ongoing with SWSL.



12.0 SUMMARY AND CONCLUSIONS

12.1 Odyssey has been commissioned by Landlink Estates to undertake an FRA, incorporating a surface water and foul water drainage strategy to support a planning application for proposed residential development in Yapton, West Sussex.

12.2 The EA flood mapping shows that the site lies entirely within Flood Zone 1, an area with a low probability of flooding. Residential (more vulnerable) development is appropriate within Flood Zone 1 and there are no records of historic flooding within the site boundaries.

12.3 The results of the soakage testing indicate that infiltrating SuDS features may not be suitable for the site. It is proposed that surface water will be discharged to the watercourse south west of the site, via non-infiltrating attenuation basins, permeable paving and cellular storage tanks.

12.4 The SuDS features shown on the proposed drainage strategy have been sized to attenuate flows for all rainfall events up to the 1 in 100 year event plus climate change (40%).

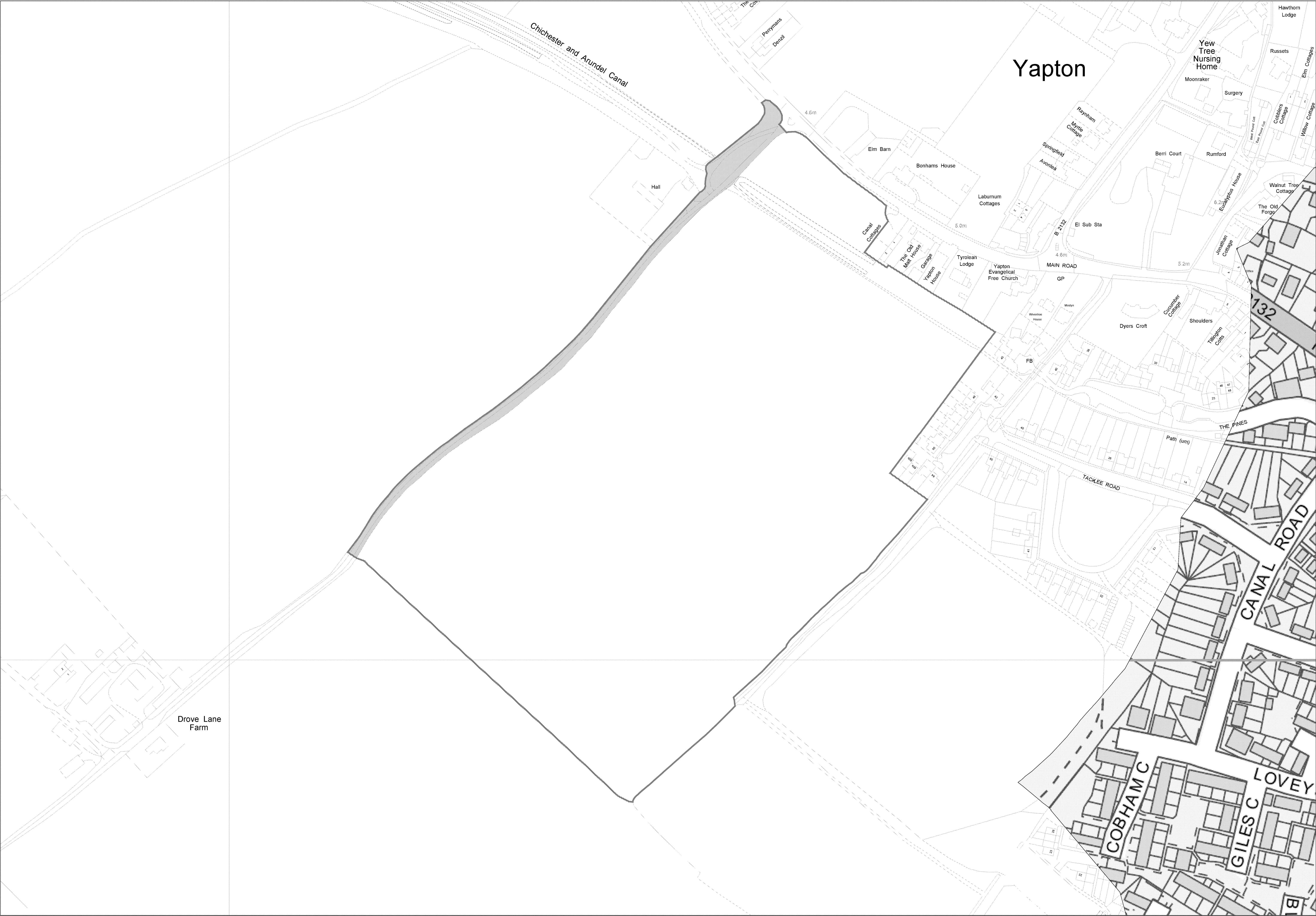
12.5 It is proposed to collect and discharge foul flows from the site by gravity to the southwestern corner of the site. Foul flows will then be pumped in a northern direction into the public foul sewer on Main Road. Section 106 applications will be made in accordance with the Water Industries Act with SWSL.

12.6 This FRA has demonstrated that the proposed development is fully compliant with the requirements of the NPPF. Issues relating to flood risk and drainage do not represent an obstruction to the development and therefore should not hinder an approval for planning permission of the proposed development.

APPENDIX A

Site Location Plan

Yapton



Drove Lane Farm

Chichester and Arundel Canal

CANAL ROAD

COBHAM C

GILES C

LOVEY

B

132

TACKLEE ROAD

Path (um)

THE PINES

Dyers Croft

Shoulders

Cuckoo Cottage

Wentlow House

Moody

FB

GP

MAIN ROAD

Yapton Evangelical Free Church

Tyrolean Lodge

Garage

The Old Mill House

Canal Cottages

S. G. 1911

S. G. 1911

S. G. 1911

S. G. 1911

S. G. 1911

S. G. 1911

S. G. 1911

S. G. 1911

S. G. 1911

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S. G. 1911

S. G. 1911

S. G. 1911

S. G. 1911

The Old Forge

Walnut Tree Cottage

Eucalyptus House

Rumford

Berri Court

El Sub Sta

Avonlea

Springfield

Myrtle Cottage

Raynham

Elm Barn

Bonhams House

Laburnum Cottages

Hall

4.6ft

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4.6ft

Hawthorn Lodge

Russets

Moonraker

Yew Tree Nursing Home

Surgery

Em Cottages

Willow Cottage

Cobblers Cottage

Em Cottages

Russets

Hawthorn Lodge

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Hawthorn Lodge

Em Cottages

Willow Cottage

APPENDIX B

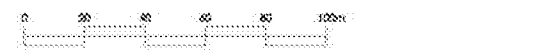
Proposed Site Layout



Site
LAND AT DROVE LANE,
YAPTON

Drawing
Illustrative masterplan

Date: 07.11.17 Scale: 1:2500@A2 Drawing ref: 1244L.03



- KEY**
- Site boundary
 - Existing trees retained
 - Existing hedgerows retained
 - Existing building
 - Proposed building
 - Key building
 - Residential street (5.5m)
 - Lane / Drive (4.8m)
 - Emergency access (3m)
 - Cycle route through site (on and off road)
 - Existing Public Right of Way retained
 - Park / Amenity greenspace / Childrens Play
 - Childrens Play Area
 - Allotments
 - Indicative amenity tree planting
 - Indicative structural tree planting
 - Location of SuDS feature
 - Potential location for pumping station + 1.5m offset

APPENDIX C

Topographical Survey

103480mN

103460mN

103440mN

103420mN

103400mN

103380mN

103360mN

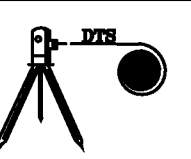
REVISION 2 - April 2017
This survey has been undertaken to extend the original survey to the North.

REVISION 1 - MAY 2016
The survey has been repositioned onto OSTN02 co-ordinates.

DRAINAGE
Invert levels, pipe sizes and pipe connections have been surveyed by visual inspection only and therefore the complete accuracy of this information cannot be guaranteed.

NORTHPOINT
The survey grid is related to OSTN02 and has been fixed by using GPS receivers.

LEVELS
Levels are related to a OSBM Value 7.08m situated on a Post box South-East side of Blitham Road.



Digital Terrain Surveys LLP
Lead Survey Partnership

Client: Gleeson Strategic Land

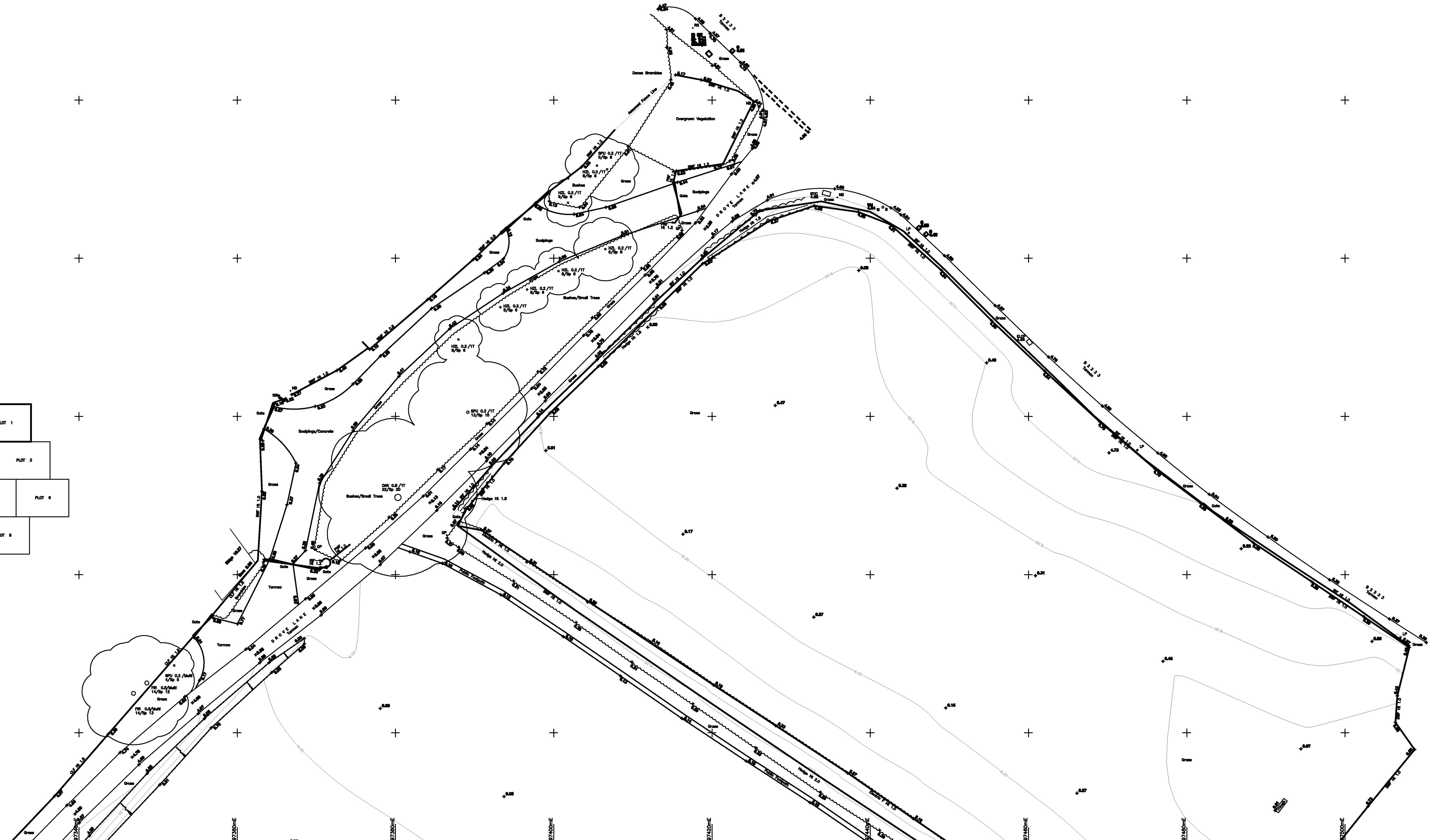
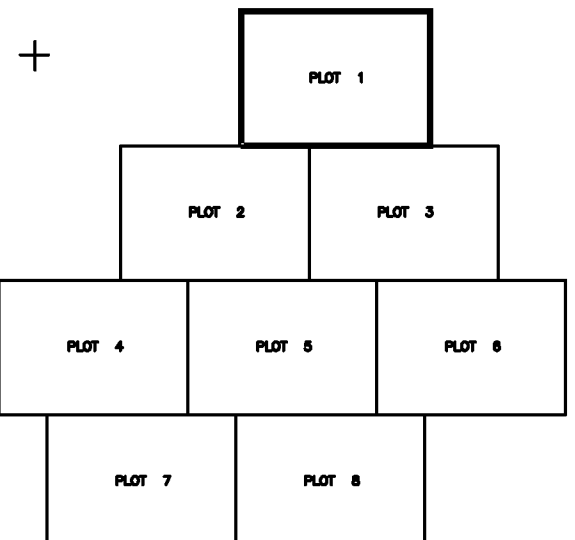
Location: Land at Drove Lane
Dapton
West Sussex

Type of Survey: Site Survey

Plotted Scale: 1:200 Date: April 2014

Ref No: DTS240417-7008 g & A Checked: RP/DH

Drawing: DTS240417-7008.1 of 8 Revision: 2



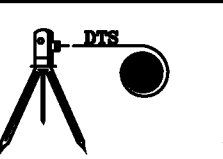
REVISION 2 - April 2017
This survey has been undertaken to extend the original survey to the North.

REVISION 1 - MAY 2016
The survey has been repositioned onto OSTN02 co-ordinates.

DRAWINGS
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NORTHPOINT
The survey grid is related to OSTN02 and has been fixed by using GPS receivers.

LEVELS
Levels are related to a OSM Value 7.05m situated on a Post box South-East side of Blenheim Road.



Digital Terrain Surveys LLP
Land Survey Partnership

Client
Gleeson Strategic Land

Location
Land of Drove Lane
Topham
West Sussex

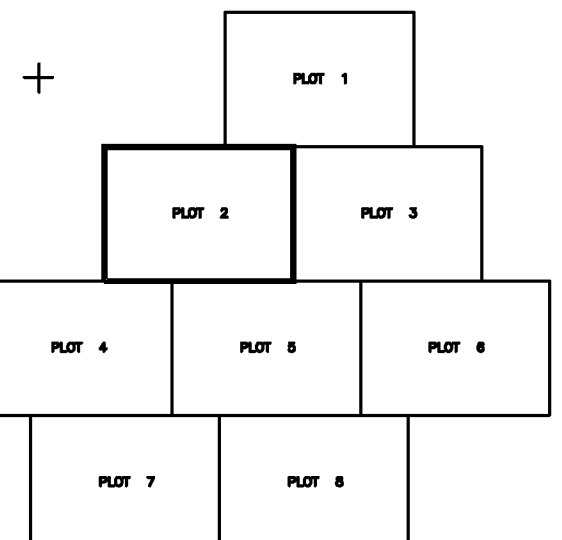
Type of Survey
Site Survey

Plotted Scale 1:200 **Date** April 2014

Ref No DTS240417-700B **Q & A Checked** RP/DH

Drawing Number 2 of 8 **Revision** 2

Thomas Clark
Surveying
Surveyor
2001-2007
Tel: 01793 816070
Fax: 01793 817000
E-Mail: info@dtssurveys.co.uk
Web Site: www.dtssurveys.co.uk



103280mN

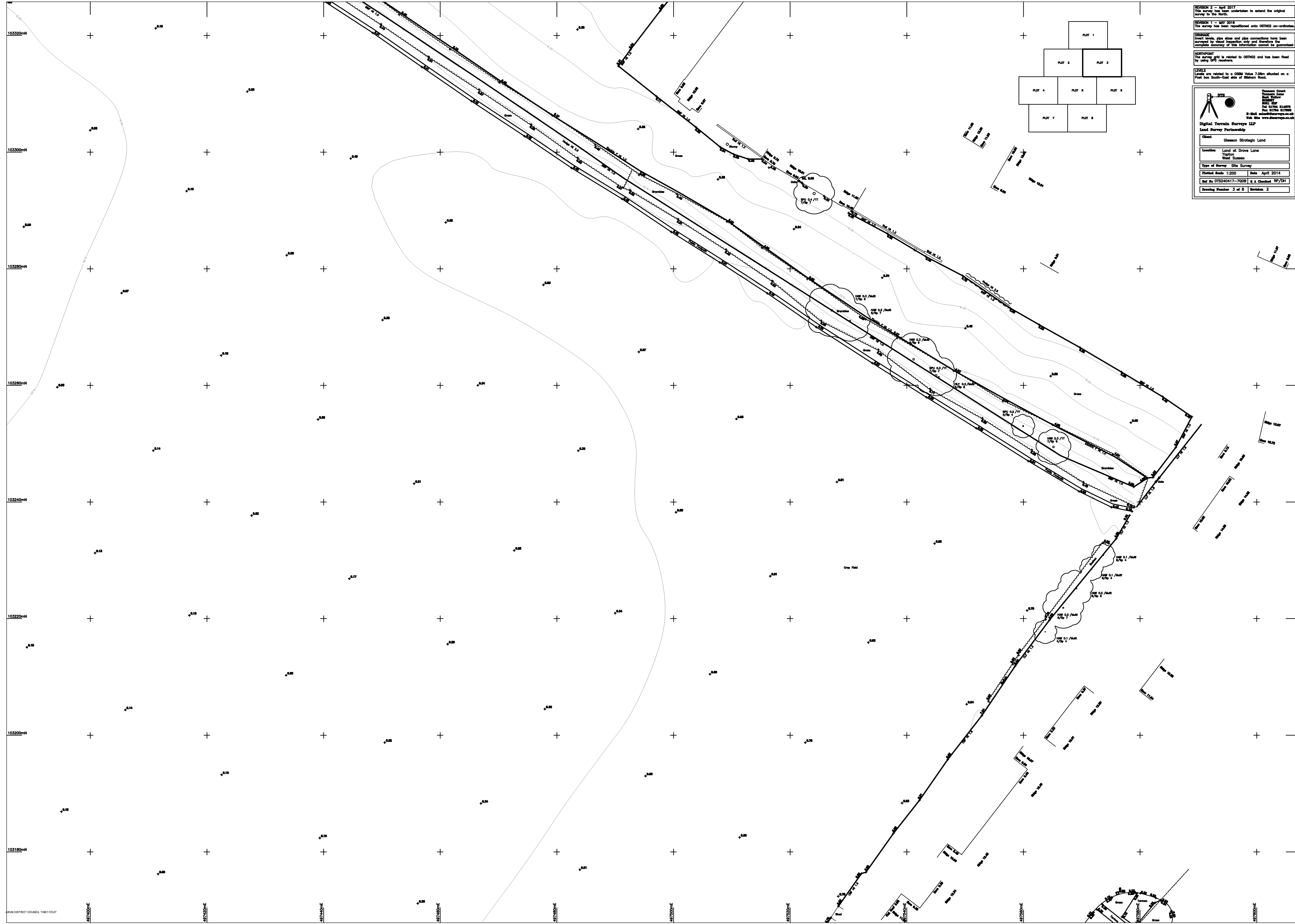
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103240mN

103220mN

103200mN

103180mN



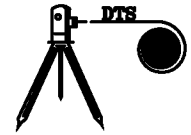
REVISION 2 - April 2017
This survey has been undertaken to extend the original survey to the North.

REVISION 1 - MAY 2016
The survey has been repositioned onto OSTN02 co-ordinates.

DRAWING
Invert levels, pipe sizes and pipe connections have been surveyed by direct inspection only and therefore the complete accuracy of this information cannot be guaranteed.

NORTHPOINT
The survey grid is related to OSTN02 and has been fixed by using GPS receivers.

LEVELS
Levels are related to a CGM Value 7.08m situated on a Post box South-East side of Blenheim Road.



Digital Terrain Surveys LLP
Land Survey Partnership

Client
Gleeson Strategic Land

Location
Land of Drove Lane
Vigorn
West Sussex

Type of Survey
Site Survey

Fielded Scale
1:200

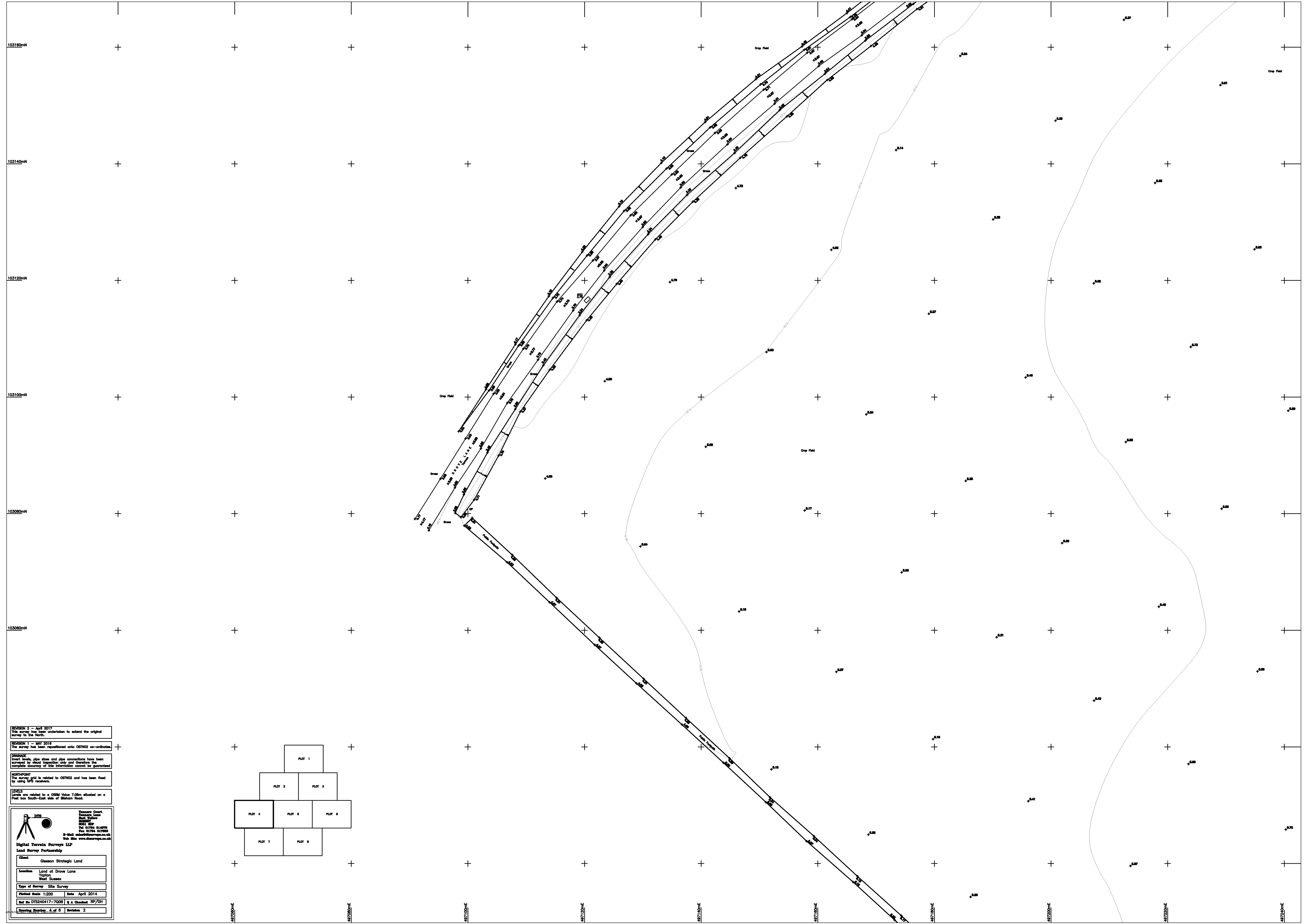
Date
April 2014

Ref No
DTS240417-7008

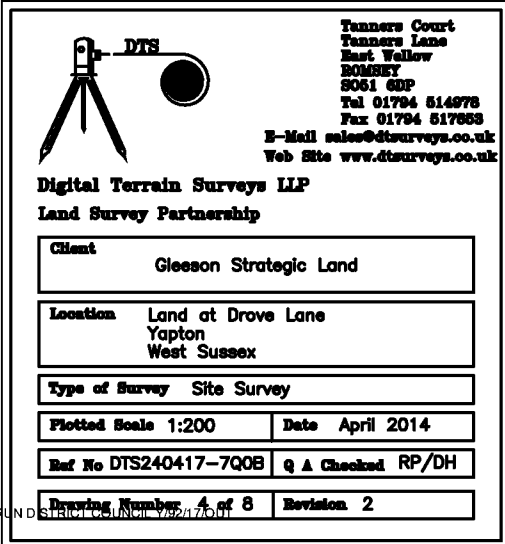
Scale
A & Checkbook RP/DH

Drawing Number
3 of 8

Revision
2



REVISION 2 – April 2017 This survey has been undertaken to extend the original survey to the North.
REVISION 1 – MAY 2016 The survey has been repositioned onto OSTN02 co-ordinates.
DRAINAGE Invert levels, pipe sizes and pipe connections have been surveyed by visual inspection only and therefore the complete accuracy of this information cannot be guaranteed
NORTHPOINT The survey and is related to OSTN02 and has been fixed by using GPS receivers.
LEVELS Levels are related to a OSBM Value 7.08m situated on a Post box South-East side of Blitham Road.



103180mN

103140mN

103120mN

103100mN

103080mN

103060mN

REVISION 2 - April 2017
This survey has been updated to extend the original survey to the North.

REVISION 1 - MAY 2016
The survey has been repositioned onto OSTN02 co-ordinates.

DISCLAIMER
Invert levels, pipe sizes and pipe connections have been surveyed by visual inspection only and therefore the complete accuracy of this information cannot be guaranteed.

NORTHPOINT
The survey grid is related to OSTN02 and has been fixed by using GPS receivers.

LEVELS
Levels are related to a CGM Value 7.00m situated on a Post box South-East side of Blenheim Road.

Digital Terrain Surveys LLP
Land Survey Partnership

Client Gleeson Strategic Land

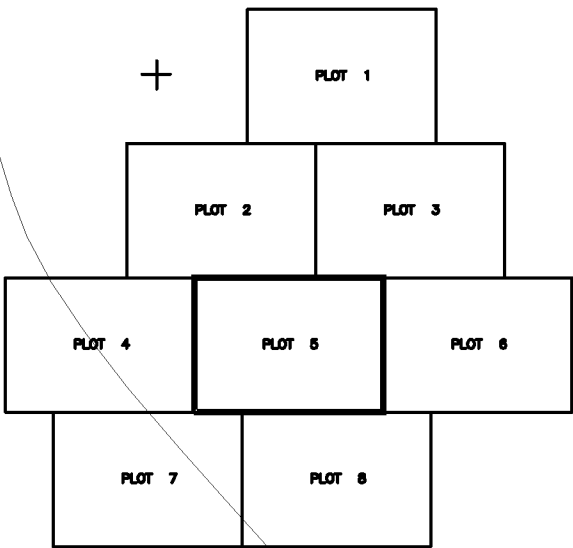
Location Land at Drove Lane
Yapton
West Sussex

Type of Survey Site Survey

Plotted Scale 1:200 **Date** April 2014

Ref No DTS240417-7008 **Q & Checked** RP/CH

Drawing Number S of 6 **Revision** 2



103180mN

103140mN

103120mN

103100mN

103080mN

103060mN

103040mN

103020mN

ARUN DISTRICT COUNCIL Y1001700T

497540mE

497550mE

497560mE

497570mE

497580mE

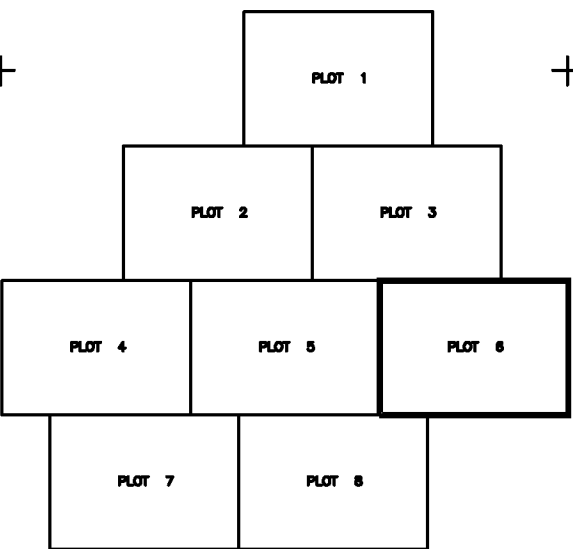
497590mE

497600mE

497610mE

497620mE

497630mE



REVISION 2 - April 2017
This survey has been undertaken to extend the original survey to the North.

REVISION 1 - MAY 2016
The survey has been repositioned onto OSTN02 co-ordinates.

SEWERAGE
Invert levels, pipe sizes and pipe connections have been surveyed by visual inspection only and therefore the complete accuracy of this information cannot be guaranteed.

NORTHPOINT
The survey grid is related to OSTN02 and has been fixed by using GPS receivers.

LEVELS
Levels are related to a OSM Value 7.05m situated on a Post box South-East side of Blaken Road.



Digital Terrain Surveys LLP
Land Survey Partnership

Thomas Court
Tunbury Lane
Buckley
BN1 1EP
Tel: 01796 644996
Fax: 01796 657862
E-mail: enquiries@dtssurveys.co.uk
Web Site: www.dtssurveys.co.uk

Client	Gloucester Strategic Land
Location	Land at Drove Lane Tunbury West Sussex
Type of Survey	Site Survey
Plotted Scale	1:200
Date	April 2014
Ref No	DTSS240417-700B g & A Checked RP/DH
Drawing Number	6 of 8
Revision	2

103000mN

102980mN

102960mN

102940mN

102920mN

102900mN

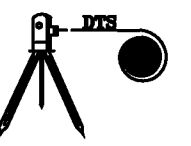
REVISION 2 - April 2017
This survey has been undertaken to extend the original survey to the North.

REVISION 1 - MAY 2016
The survey has been repositioned onto OSTW02 co-ordinates.

ORANGE
Invert levels, pipe sizes and pipe connections have been surveyed by visual inspection only and therefore the complete accuracy of this information cannot be guaranteed

NORTHPOINT
The survey grid is related to OSTW02 and has been fixed by using GPS receivers.

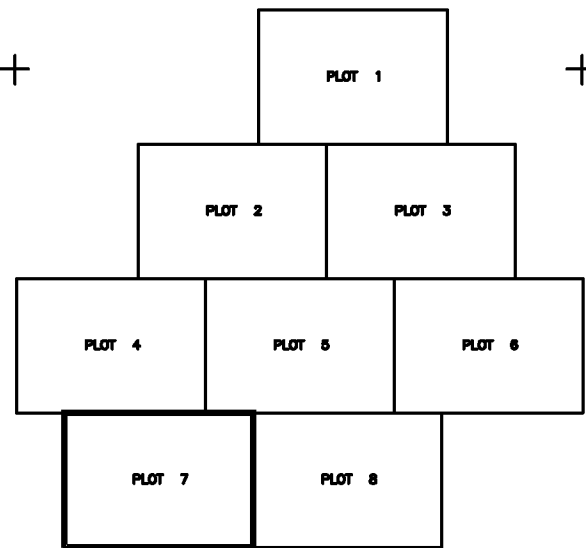
LEVELS
Levels are related to a OBM Value 7.08m situated on a Post box South-East side of Blahem Road.



Digital Terrain Surveys LLP
Lead Survey Partnership

Client	Gleeson Strategic Land		
Location	Land at Drove Lane Yapton West Sussex		
Type of Survey	Site Survey		
Plotted Scale	1:200	Date	April 2014
Ref No DTS240417-700B S A Checked RP/DH			
Drawn By	7 of 8	Revision	2

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Thames Valley
Bath, England
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E-mail sales@dtssurveys.co.uk
Web Site www.dtsurveys.co.uk



497100mE

497120mE

497140mE

497160mE

497180mE

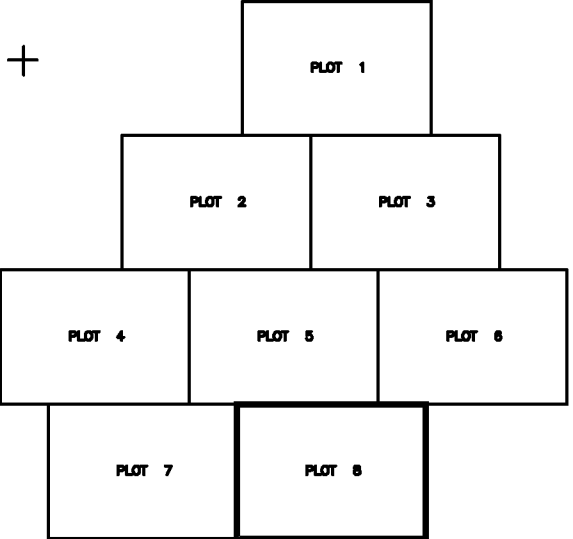
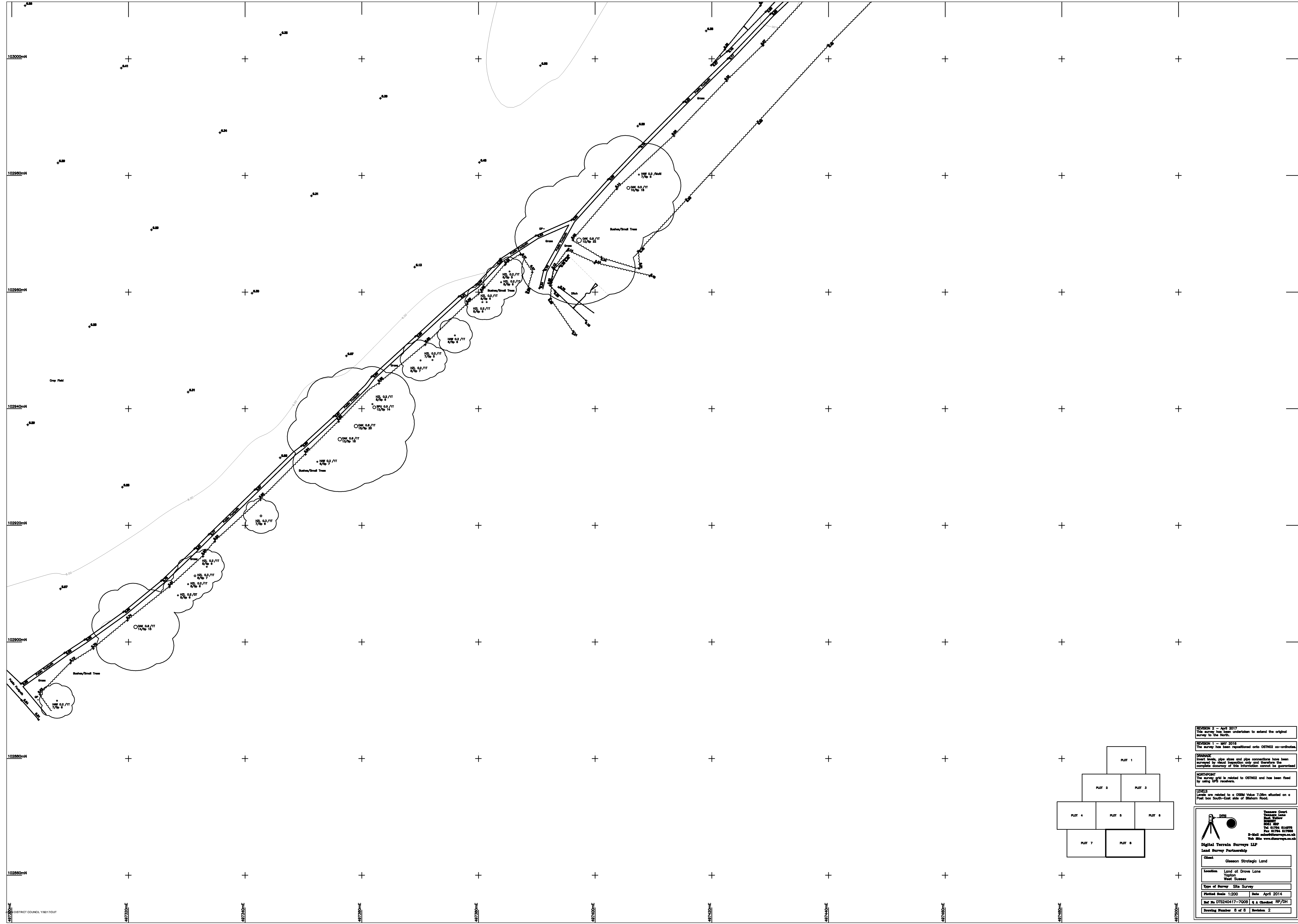
497200mE

497220mE

497240mE

497260mE

497280mE



REVISION 2 - April 2017
This survey has been undertaken to extend the original survey to the North.

REVISION 1 - MAY 2016
The survey has been repollinated onto OSTN02 co-ordinates.

DRAWINGS:
Invert levels, pipe sizes and pipe connections have been surveyed by hand inspection only and therefore the complete accuracy of this information cannot be guaranteed.

NORTHPOINT:
The survey grid is related to OSTN02 and has been fixed by using GPS receivers.

LEVELS:
Levels are related to a OSM Value 7.00m situated on a Post box South-East side of Blaken Road.

Thomas Over
Survey Lines
Post Office
BOSNITON
Tel 01794 616076
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Web Site www.dtsurveys.co.uk

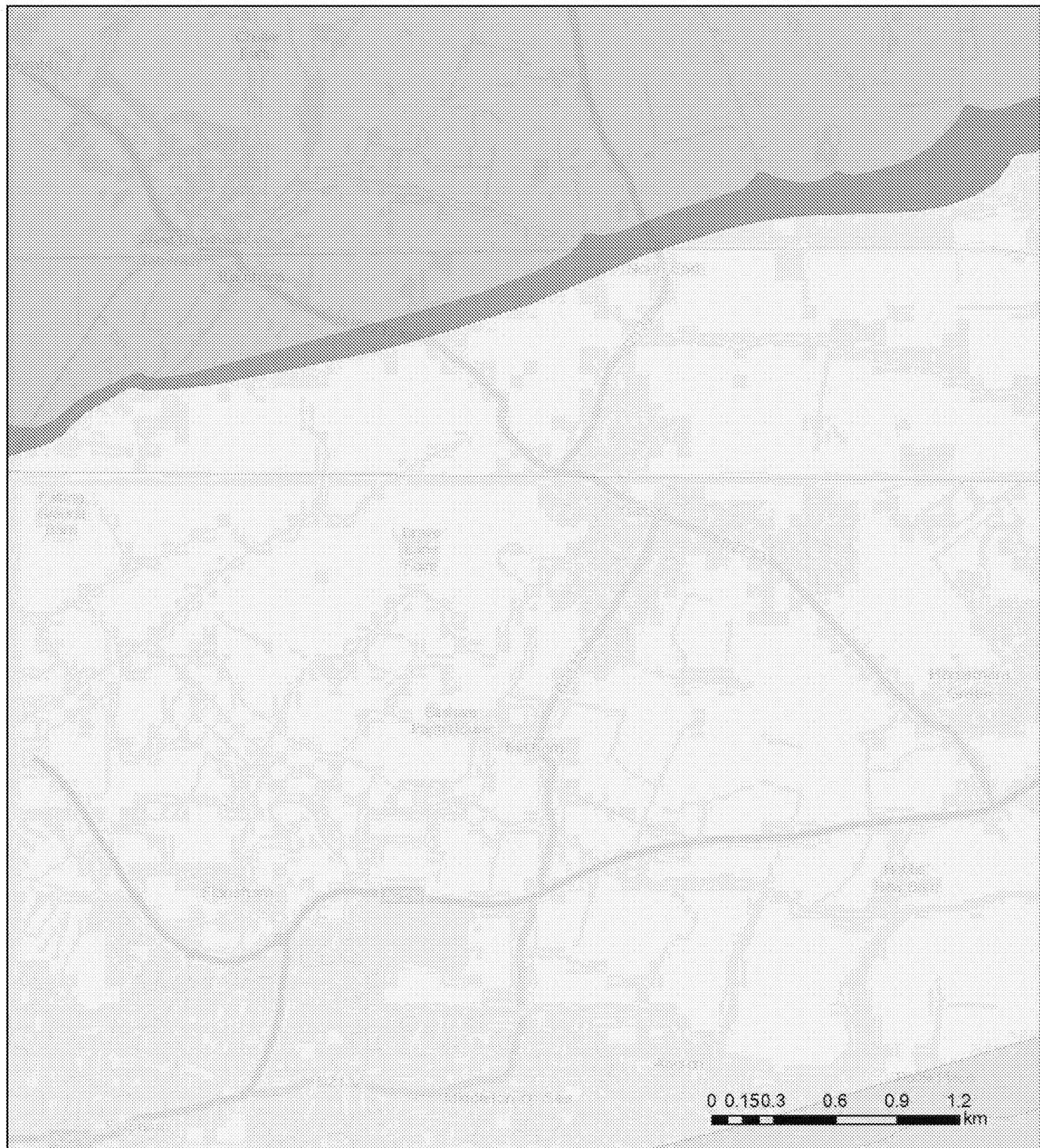
Digital Terrain Surveys LLP
Land Survey Partnership

Client	Gleason Strategic Land
Location	Land of Drove Lane Upton West Sussex
Type of Survey	Site Survey
Plotted Scale	1:200
Date	April 2014
Ref No	DTS240417-700B
Q & A Checked	RP/DH
Drawing Number	8 of 8
Revision	2

APPENDIX D

British Geological Survey (BGS) Data

Bedrock Geology



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Geotitles Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Bedrock geology 1:50,000 scale

LONDON CLAY FORMATION - CLAY, SILT AND SAND

SEAFORD CHALK FORMATION - CHALK

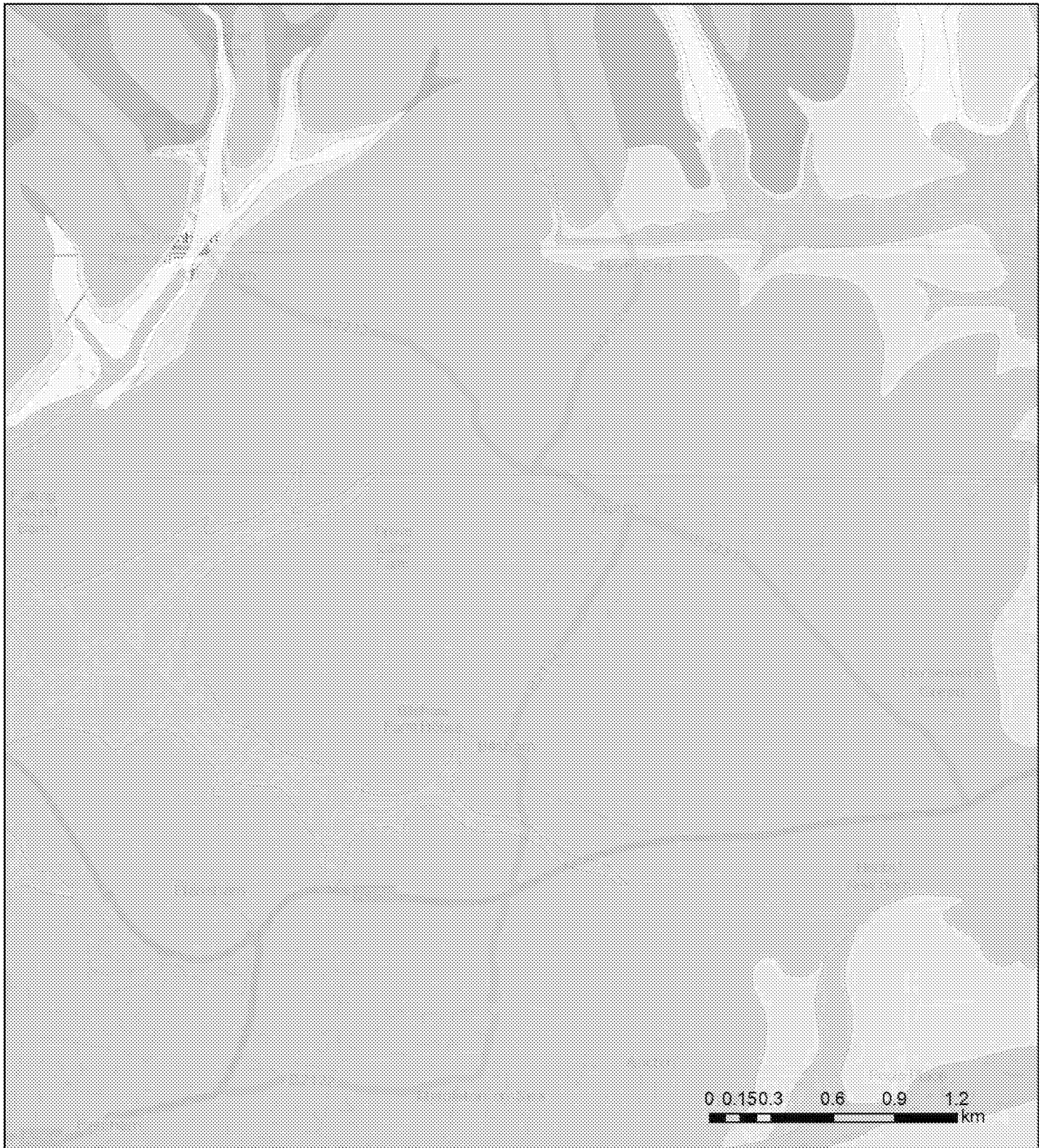
LEWES NODULAR CHALK FORMATION, SEAFORD CHALK FORMATION, NEWHAVEN CHALK FORMATION, CULVER CHALK FORMATION AND PORTSDOWN CHALK FORMATION (UNDIFFERENTIATED) - CHALK

NEW PIT CHALK FORMATION - CHALK

LAMBETH GROUP - CLAY, SILT AND SAND

NEWHAVEN CHALK FORMATION - CHALK

Superficial Deposits



Contains OS data © Crown Copyright and database right 2018

Geindex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Superficial deposits 1:50,000 scale

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

RAISED MARINE DEPOSITS - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND, SILT AND CLAY

RAISED BEACH DEPOSITS, 1 - SAND AND GRAVEL

BEACH AND TIDAL FLAT DEPOSITS (UNDIFFERENTIATED) - CLAY, SILT, SAND AND GRAVEL

BLOWN SAND - SAND

Hydrogeology

GEOINDEX
ONSHORE



Contains OS data © Crown Copyright and database right 2018

Geindex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Hydrogeology 1:625,000 scale

Aquifers with significant intergranular flow

Highly productive aquifer

Moderately productive aquifer

Low productivity aquifer

Aquifers in which flow is virtually all through fractures and other discontinuities

Highly productive aquifer

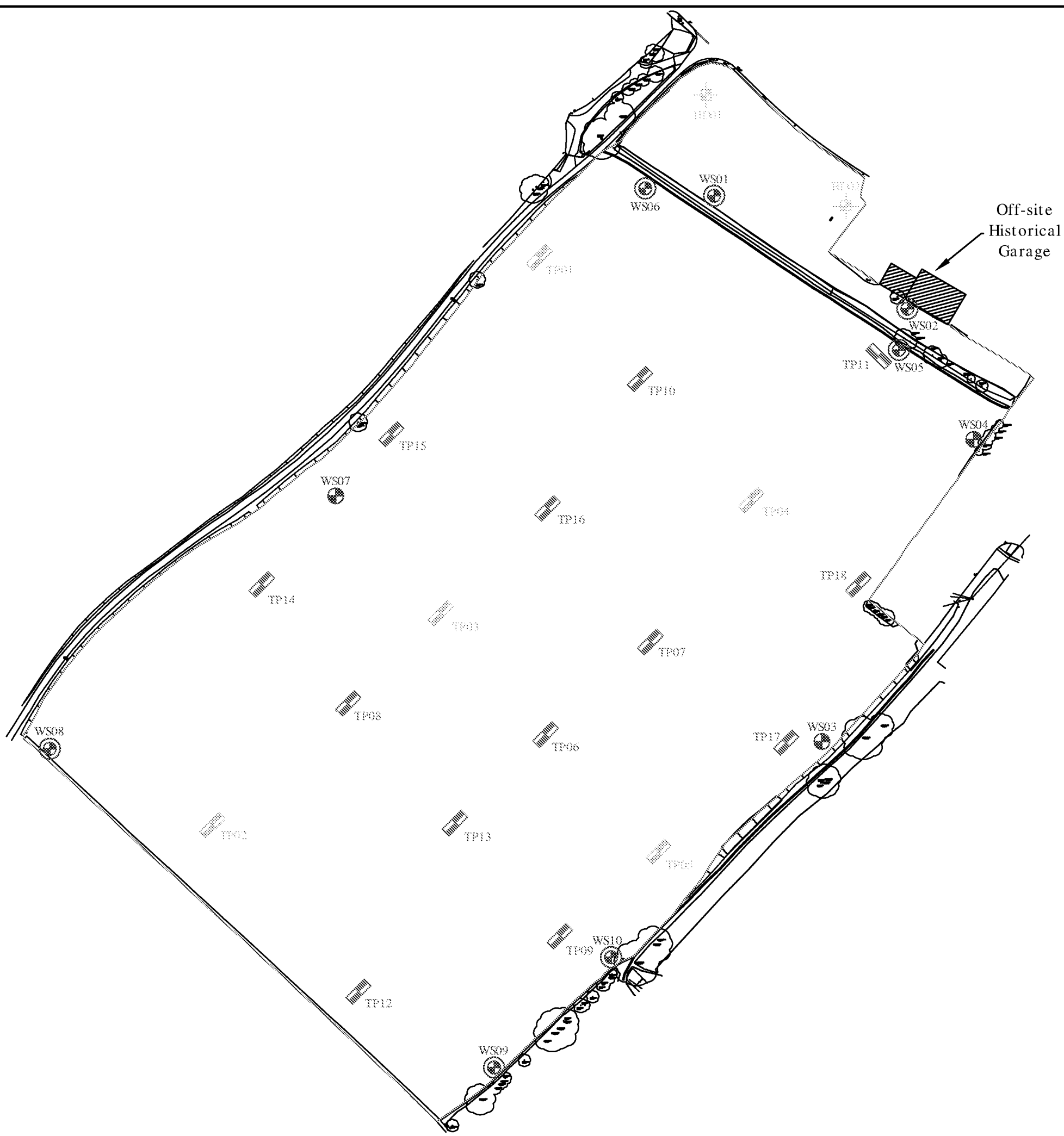
Moderately productive aquifer

Low productivity aquifer

Rocks with essentially no groundwater

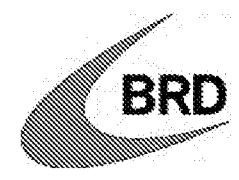
APPENDIX E

Site Investigation and Infiltration Testing



- Key:
- BRD Windowless Sample Borehole (GPS Location)
 - BRD Windowless Sample Borehole With Monitoring Well Installation (GPS Location)
 - BRD Trial Pit (GPS Location)
 - BRD Soakage Test Pit (GPS Location)
 - BRD Hand Dug Pit (GPS Location)
 - Site Boundary (Approximate Location)

Drawing reproduced from Digital Terrain Surveys LLP 'Site Survey - Land at Drove Lane, Yaptan', Ref No: DT5240417-7Q0B, Drawing No: 1 to 8, Dated: April 2014.

Revision	Date	Description	Drawn	Approved
Drawing title				
EXPLORATORY POINT PLAN				
Project title				
LAND AT DROVE LANE, YAPTON				
Client				
TRUSTEES OF THE LANGMEAD PENSION SCHEME				
Scale	Original drg. size/colour	Date		
1:2000	A3 / C	20/ 09/ 2017		
Drawn	Checked	Approved		
DB	AP	BD		
Drawing Number				Rev
BRD2934-OD1				A
 BRD Environmental Ltd				
01295 272244				
info@brduk.com				
www.brduk.com				

TRIAL PIT RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Completed: 11/09/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP01		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		Friable, brown, slightly humic silty TOPSOIL.	0.30 0	TS	
0.80 0.90	J2 SV D1	>140,>140,>140 kPa	Firm, stiff, friable, orange brown, slightly sandy silty CLAY. Sand is fine-sized.			
1.90	D2			2 2.00 0	RIVER TERRACE DEPOSITS	
				3 4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Trial pit terminated at 2.00 bgl.			
All dimensions in metres Log Scale 1:25					Telephone: 01295 272244 Email: info@brduk.com	

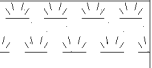
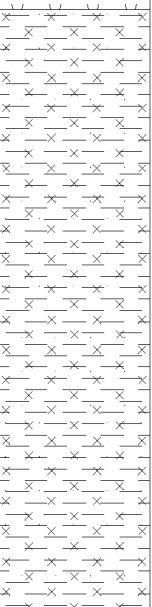
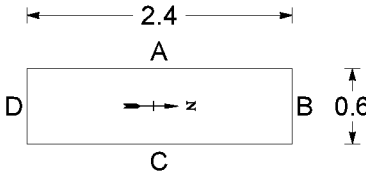
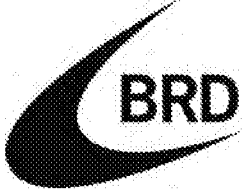
TRIAL PIT RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Completed: 11/09/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP02		
				Sheet 1 of 1		
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		Friable, brown, slightly humic silty TOPSOIL.	0.30 0	TS	
0.50	D1		Stiff, orange brown, slightly sandy silty CLAY. Sand is fine-sized.		RIVER TERRACE DEPOSITS	
1.00	J2			1		
1.10	SV	120,110,130 kPa				
1.50	D2		1.40 m: Becomes slightly gravelly.	1.80 0		
2.00	D3		Loose, orange brown, slightly gravelly, very sandy SILT. Gravel is fine sized, angular to subangular chalk and flint. Sand is fine-sized.	2 2.20 0		
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Trial pit terminated at 2.20 bgl.			
All dimensions in metres Log Scale 1:25						
Telephone: 01295 272244 Email: info@brduk.com						

TRIAL PIT RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Completed: 11/09/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP03		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		Friable, brown, slightly humic silty TOPSOIL.	0.25 0	TS	
0.60	SV	138,>140,>140 kPa	Stiff, friable, orange brown slightly sandy silty CLAY.			
1.00	SV B1 D1 J2	>140,>140,>140 kPa		1	RIVER TERRACE DEPOSITS	
			Stiff, orange brown, slightly gravelly, slightly sandy silty CLAY. Gravel is subangular flint and chalk.	1.90 0		
				2.50 0		
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Trial pit terminated at 2.50 bgl.			
All dimensions in metres Log Scale 1:25					 Telephone: 01295 272244 Email: info@brduk.com	

TRIAL PIT RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Completed: 11/09/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP04		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		Friable, brown, slightly humic silty TOPSOIL.	0.25 0	TS	
0.50	J2		Stiff, friable, orange brown, slightly gravelly, slightly sandy silty CLAY. Gravel is fine sized subangular flint.			
0.70	SV	110,100,100 kPa			RIVER TERRACE DEPOSITS	
1.00	SV D1	>140,>140,>140 kPa		1		
			1.25 m: Cobble of flint (250 x 180 x 100mm).			
			1.50 m: Becoming locally firm.			
			2.00 m: Gravel fraction becomes flint and chalk.	2		
				2.25 0		
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered				Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Trial pit terminated at 2.25 bgl.		All dimensions in metres Log Scale 1:25  Telephone: 01295 272244 Email: info@brduk.com	

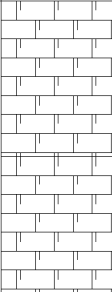
TRIAL PIT RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Completed: 11/09/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP05		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.50 0.70 1.00	J1 SV D1	130,>140,>140 kPa	Friable, brown, slightly humic, silty TOPSOIL.	0.30 0	TS	
			Stiff, friable, orange brown slightly sandy silty CLAY. Sand is fine-sized.			
			Stiff, locally firm, orange brown, slightly gravelly, slightly sandy silty CLAY. Gravel is fine to medium sized, angular and subangular flint and chalk.			
1.70	D2	>140,>140,>140 kPa		2.00 0		
				2.20 0		
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Trial pit terminated at 2.25 bgl.			
All dimensions in metres Log Scale 1:25					 Telephone: 01295 272244 Email: info@brduk.com	

PROBEHOLE RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Commenced: 14/09/2017 Date Completed: 14/09/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS05		
Sheet 1 of 2								
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation / Backfill
Depth	Type & No	Value						
0.10	J1			MADE GROUND: Friable, brown, slightly humic silty TOPSOIL.	0.15 (6.34)		MG	
0.30	J2			MADE GROUND: Stiff, friable, orange brown silty CLAY with occasional fine, angular gravel of brick to 0.50m.				
0.50	PEN 4.50 / J3	>4.50 / >4.50 kg/cm²		Stiff, friable, orange brown silty CLAY.	0.55 (5.94)		RIVER TERRACE DEPOSITS	
1.00	PEN 4.00 / SPT D1	4.00 / 4.00 / 4.00 kg/cm² 15 N		1.00 - 1.45 m: SPT: 4 for 150mm/3,4,4,4	1.0			
1.50	PEN 4.50 / D2	>4.50 / >4.50 kg/cm²		1.60 m: Cobble of flint (170 x >90 x >90 mm)				
2.00	SPT	13 N		2.00 - 2.45 m: SPT: 11 for 150mm/5,3,3,2	2.0			
2.80	PEN 1.00 / 1.00 / 1.50	1.00 / 1.00 / 1.50 kg/cm²		Firm, orange brown, slightly sandy, slightly gravelly silty CLAY. Gravel is fine and medium sized angular flint.	2.70 (3.79)			
3.00	SPT D3	3 N		Soft, light brown clayey SILT. 3.00 - 3.45 m: SPT: 1 for 150mm/0,1,1,1	3.0 (3.49)			
3.50	PEN 0.50 / 0.50 / 0.75	0.50 / 0.50 / 0.75 kg/cm²						
3.80	PEN 1.50 / 1.00 / 1.50	1.50 / 1.00 / 1.50 kg/cm²		Firm, brown, slightly gravelly silty CLAY. Gravel is fine to medium sized, subangular to subrounded flint and chalk.	3.70 (2.79)			
4.00	SPT	5 N		Off-white, locally light brown CHALK comprising of slightly clayey, gravelly SILT. Gravel is fine sized angular flint and subangular chalk. (CIRIA Chalk Grade Dm). 4.00 - 4.45 m: SPT: 2 for 150mm/1,2,1,1 4.00 - 5.45 m: Installation backfilled with chalk.	4.0 (2.49)			
					4.50			
General Remarks: Borehole terminated at 5.45m bgl. Water seepage at 4.80m bgl.					Surface Elevation Level: 6.49		 Telephone: 01295 272244 Email: info@brduk.com	
					All dimensions in metres Log Scale 1:25			

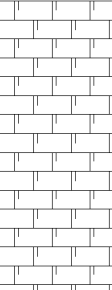
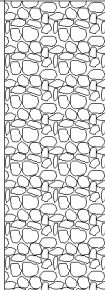
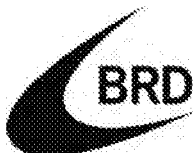
PROBEHOLE RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Commenced: 14/09/2017 Date Completed: 14/09/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS05		
						Sheet 2 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
5.00	SPT	15 N		Continued from 4.00m bgl: Off-white, locally light brown CHALK comprising of slightly clayey, gravelly SILT. Gravel is fine sized angular flint and subangular chalk. (CIRIA Chalk Grade Dm).	5.0 5.00 (1.49)		LCNF	
			CHALK as silty GRAVEL recovered as white, off-white gravelly silt (CIRIA Chalk Grade Dc). 5.00 - 5.45 m: SPT: 11 for 150mm/6,5,4,4	5.45 (1.04)				
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Borehole terminated at 5.45m bgl. Water seepage at 4.80m bgl.					Surface Elevation Level: 6.49		 Telephone: 01295 272244 Email: info@brduk.com	
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Commenced: 14/09/2017 Date Completed: 14/09/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS09		
						Sheet 1 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.20	J1			Friable, brown, slightly humic silty TOPSOIL.	0.30 (5.58)		TS	
0.60	J2			Stiff, friable, orange brown, slightly sandy silty CLAY.				
0.80	J3						RIVER TERRACE DEPOSITS	
1.00	PEN 4.50/4.50/4.50 SPT	kg/cm² 7 N		0.90 m: Coarse sized gravel. 1.00 - 1.45 m: SPT: 3 for 150mm/2,2,2,1	1.0			
1.50	PEN 1.50/1.00/2.00 D1	kg/cm²		1.50 m: Becoming firm, locally stiff.				
2.00	PEN 1.50/1.00/1.50 SPT	kg/cm² 10 N		Off-white, locally brown CHALK comprising of slightly clayey gravelly (25%) SILT. Gravel is medium sized, angular flint and fine to medium sized, subrounded very weak chalk (CIRIA Chalk Grade Dm). 2.00 - 2.45 m: SPT: 4 for 150mm/1,3,3,3	2.0 2.00 (3.88)		LEWES NODULAR CHALK FORMATION	
2.50	D2							
3.00	SPT	14 N		2.80 m: Wet soils. 3.00 - 3.45 m: SPT: 5 for 150mm/4,4,3,3	3.0			
4.00	SPT	18 N		CHALK of silty GRAVEL recovered as off-white, locally brown gravelly silt. 4.00 - 4.45 m: SPT: 7 for 150mm/5,4,4,5 4.00 - 5.45 m: Installation backfilled with chalk.	4.0 4.00 (1.88)			
					4.50			
General Remarks: Borehole terminated at 5.45m bgl. Slight water seepage at 2.80m bgl.					Surface Elevation Level: 5.88		 Telephone: 01295 272244 Email: info@brduk.com	
					All dimensions in metres Log Scale 1:25			

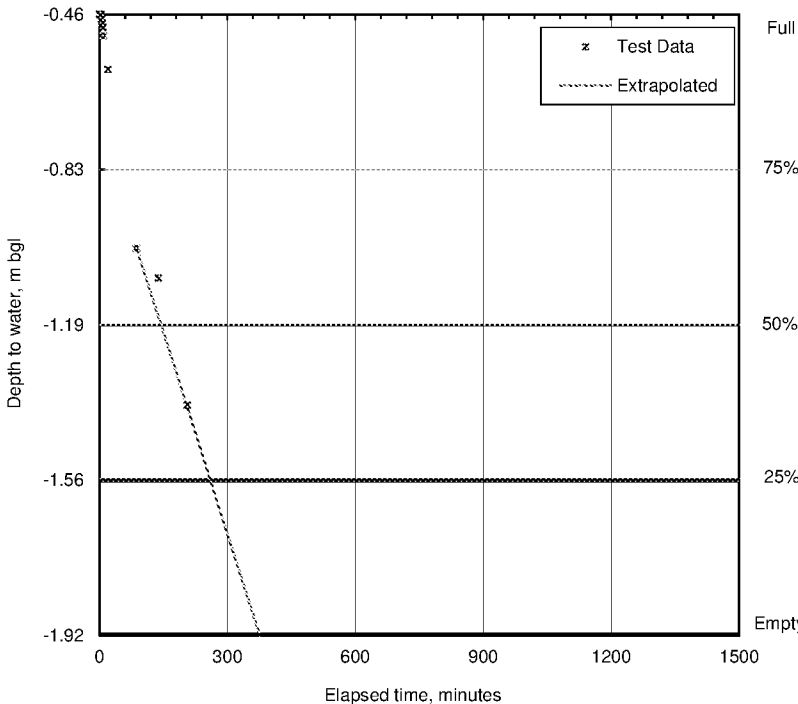
PROBEHOLE RECORD

Client: Trustees of the Langmead Pension Scheme Project Title: Drove Lane, Yapton Project No: BRD2934 Logged By: A Plant Date Commenced: 14/09/2017 Date Completed: 14/09/2017 Method Used: Windowless Percussive Sampling Rig							Borehole No. WS09 Sheet 2 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill	
Depth	Type & No	Value							
5.00	SPT	17 N		Continued from 4.00m bgl: CHALK of silty GRAVEL recovered as off-white, locally brown gravelly silt. 5.00 - 5.45 m: SPT: 4 for 150mm/3,3,5,6	5.0 5.45 (0.43) 6.0 7.0 8.0 9.0		LNCF		
General Remarks: Borehole terminated at 5.45m bgl. Slight water seepage at 2.80m bgl.					Surface Elevation Level: 5.88 All dimensions in metres Log Scale 1:25		 Telephone: 01295 272244 Email: info@brduk.com		

SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)																																
Client:	Trustees of the Langmead Pension Scheme																															
Project Title	Drove Lane, Yapton																															
Project No.	BRD2934																															
Test Details																																
Trial Pit Number	TP01																															
Test Number	1																															
Pit Depth	1.92	m																														
Pit Length	2.10	m																														
Pit Width	0.60	m																														
Depth to groundwater prior to test	Dry	m																														
Date of Test	12/09/2017																															
Logged by	Henrik K-Abbotts																															
Description of Soil under Test																																
Test Record																																
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time <table border="1" style="display: none;"> <caption>Test Data Points</caption> <thead> <tr> <th>Elapsed Time (min)</th> <th>Depth to Water (m)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0.43</td></tr> <tr><td>1</td><td>0.44</td></tr> <tr><td>3</td><td>0.46</td></tr> <tr><td>4</td><td>0.46</td></tr> <tr><td>5</td><td>0.47</td></tr> <tr><td>7</td><td>0.48</td></tr> <tr><td>8</td><td>0.49</td></tr> <tr><td>9</td><td>0.50</td></tr> <tr><td>10</td><td>0.51</td></tr> <tr><td>15</td><td>0.56</td></tr> <tr><td>20</td><td>0.58</td></tr> <tr><td>63</td><td>0.86</td></tr> <tr><td>114</td><td>1.09</td></tr> <tr><td>260</td><td>1.55</td></tr> </tbody> </table>	Elapsed Time (min)	Depth to Water (m)	0	0.43	1	0.44	3	0.46	4	0.46	5	0.47	7	0.48	8	0.49	9	0.50	10	0.51	15	0.56	20	0.58	63	0.86	114	1.09	260	1.55
Elapsed Time (min)	Depth to Water (m)																															
0	0.43																															
1	0.44																															
3	0.46																															
4	0.46																															
5	0.47																															
7	0.48																															
8	0.49																															
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Summary of Calculations and Result																																
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (54 mins) is the time for the water level to fall to 75% effective depth (0.80m bgl) and T_{25} (259 mins) is the time for the water level to fall to 25% effective depth (1.55m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 205$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.94 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.28 \text{ m}^2$ Soil Infiltration Rate $f = 1.44 \times 10^{-5} \text{ m/s}$																																
Comments																																

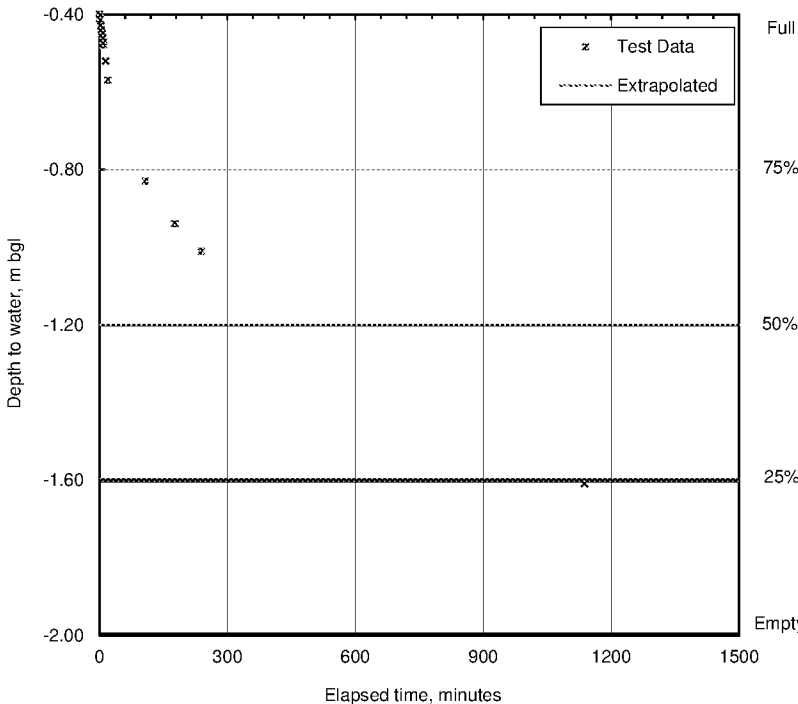
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP01	
Test Number	2	
Pit Depth	1.92	m
Pit Length	2.10	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	13/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.46	
2	0.46	
3	0.46	
4	0.46	
5	0.47	
6	0.47	
7	0.48	
8	0.49	
10	0.51	
20	0.59	
87	1.01	
138	1.08	
206	1.38	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (57 mins) is the time for the water level to fall to 75% effective depth (0.83m bgl) and T_{25} (260* mins) is the time for the water level to fall to 25% effective depth (1.56m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 202$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.92 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.20 \text{ m}^2$ Soil Infiltration Rate $f = 1.46 \times 10^{-5} \text{ m/s}$		
Comments	Calculation based on extrapolated results. Use as a guide only. Pit dry next day at 966 minutes.	

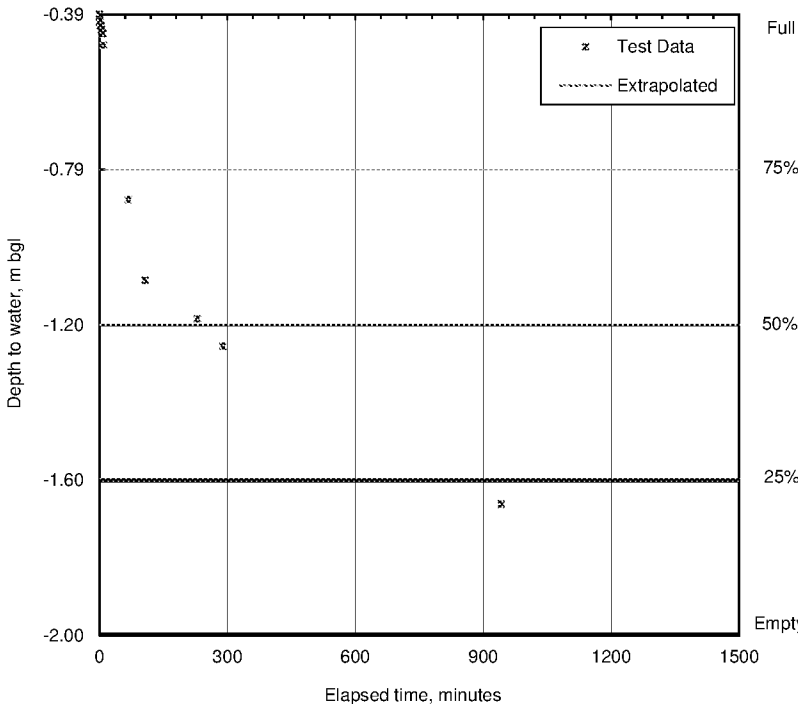
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)																																		
Client:	Trustees of the Langmead Pension Scheme																																	
Project Title	Drove Lane, Yapton																																	
Project No.	BRD2934																																	
Test Details																																		
Trial Pit Number	TP01																																	
Test Number	3																																	
Pit Depth	2.00	m																																
Pit Length	2.10	m																																
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Depth to groundwater prior to test	Dry	m																																
Date of Test	14/09/2017																																	
Logged by	Henrik K-Abbotts																																	
Description of Soil under Test																																		
Test Record																																		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time <table border="1" style="display: none;"> <caption>Test Data Points</caption> <thead> <tr> <th>Elapsed Time (min)</th> <th>Depth to Water (m bgl)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0.38</td></tr> <tr><td>1</td><td>0.39</td></tr> <tr><td>2</td><td>0.40</td></tr> <tr><td>3</td><td>0.40</td></tr> <tr><td>4</td><td>0.41</td></tr> <tr><td>5</td><td>0.41</td></tr> <tr><td>6</td><td>0.42</td></tr> <tr><td>7</td><td>0.43</td></tr> <tr><td>8</td><td>0.44</td></tr> <tr><td>9</td><td>0.44</td></tr> <tr><td>10</td><td>0.44</td></tr> <tr><td>65</td><td>0.71</td></tr> <tr><td>213</td><td>1.30</td></tr> <tr><td>298</td><td>1.45</td></tr> <tr><td>344</td><td>1.60</td></tr> </tbody> </table>	Elapsed Time (min)	Depth to Water (m bgl)	0	0.38	1	0.39	2	0.40	3	0.40	4	0.41	5	0.41	6	0.42	7	0.43	8	0.44	9	0.44	10	0.44	65	0.71	213	1.30	298	1.45	344	1.60
Elapsed Time (min)	Depth to Water (m bgl)																																	
0	0.38																																	
1	0.39																																	
2	0.40																																	
3	0.40																																	
4	0.41																																	
5	0.41																																	
6	0.42																																	
7	0.43																																	
8	0.44																																	
9	0.44																																	
10	0.44																																	
65	0.71																																	
213	1.30																																	
298	1.45																																	
344	1.60																																	
Summary of Calculations and Result																																		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (84 mins) is the time for the water level to fall to 75% effective depth (0.79m bgl) and T_{25} (342 mins) is the time for the water level to fall to 25% effective depth (1.60m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 259$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.02 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.63 \text{ m}^2$ Soil Infiltration Rate $f = 1.17 \times 10^{-5} \text{ m/s}$																																		
Comments																																		

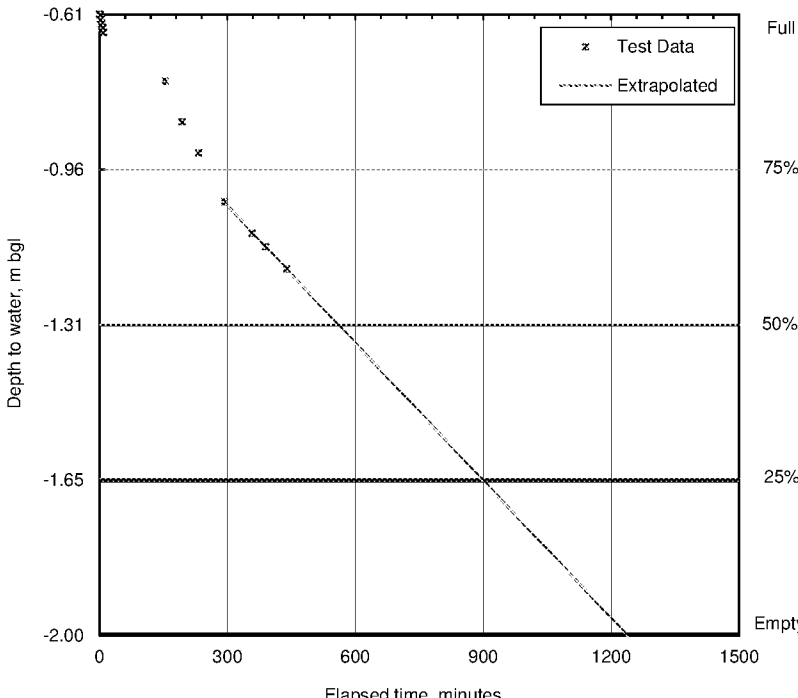
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP02	
Test Number	1	
Pit Depth	2.00	m
Pit Length	2.10	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	12/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.40	
1	0.41	
2	0.41	
4	0.43	
5	0.44	
6	0.45	
7	0.45	
8	0.46	
9	0.47	
10	0.48	
15	0.52	
20	0.57	
109	0.83	
177	0.94	
238	1.01	
1138	1.61	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (99 mins) is the time for the water level to fall to 75% effective depth (0.80m bgl) and T_{25} (1123 mins) is the time for the water level to fall to 25% effective depth (1.60m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 1024$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.01 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.58 \text{ m}^2$ Soil Infiltration Rate $f = 2.94 \times 10^{-6} \text{ m/s}$		
Comments		

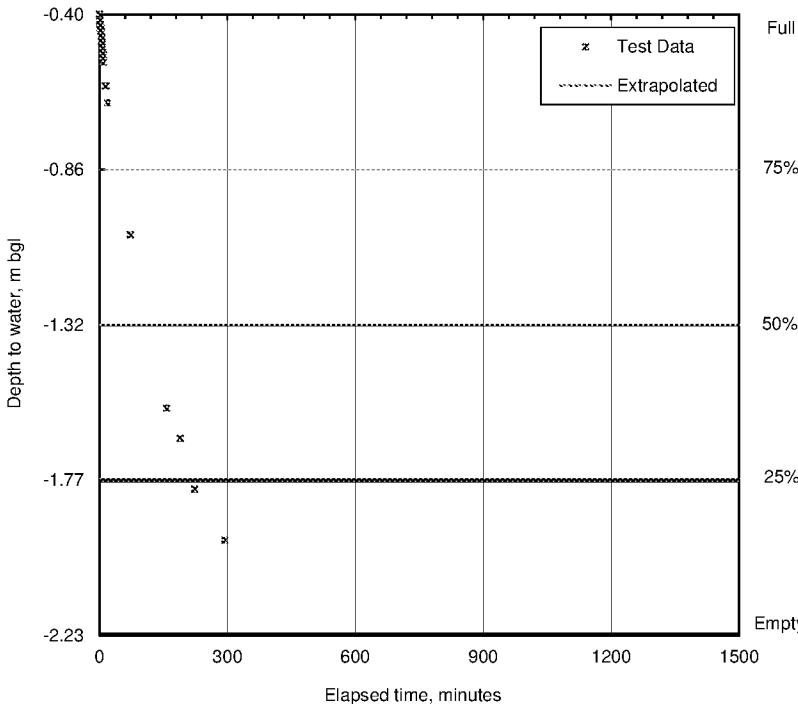
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP02	m m m
Test Number	2	
Pit Depth	2.00	
Pit Length	2.10	
Pit Width	0.60	
Depth to groundwater prior to test	1.60	
Date of Test	13/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.39	
1	0.41	
2	0.41	
3	0.42	
4	0.42	
5	0.43	
6	0.43	
7	0.44	
8	0.44	
10	0.47	
68	0.87	
107	1.08	
230	1.18	
290	1.25	
942	1.66	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (57 mins) is the time for the water level to fall to 75% effective depth (0.79m bgl) and T_{25} (843 mins) is the time for the water level to fall to 25% effective depth (1.60m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 786$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.01 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.61 \text{ m}^2$ Soil Infiltration Rate $f = 3.84 \times 10^{-6} \text{ m/s}$		
Comments		

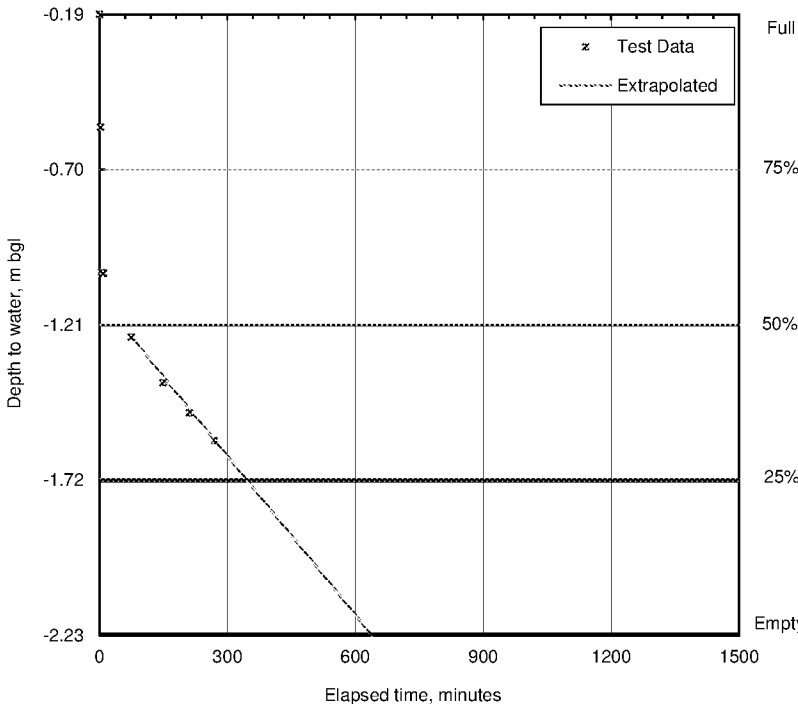
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP02	
Test Number	3	
Pit Depth	2.00	m
Pit Length	2.10	m
Pit Width	0.60	m
Depth to groundwater prior to test	1.66	m
Date of Test	14/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.61	
2	0.61	
3	0.62	
4	0.62	
5	0.63	
6	0.64	
7	0.64	
8	0.64	
9	0.65	
10	0.65	
154	0.76	
194	0.85	
234	0.92	
293	1.03	
359	1.10	
390	1.13	
439	1.18	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (254 mins) is the time for the water level to fall to 75% effective depth (0.96m bgl) and T_{25} (899* mins) is the time for the water level to fall to 25% effective depth (1.65m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 645$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.88 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.01 \text{ m}^2$ Soil Infiltration Rate $f = 4.51 \times 10^{-6} \text{ m/s}$		
Comments	Calculation based on extrapolated results. Use as a guide only.	

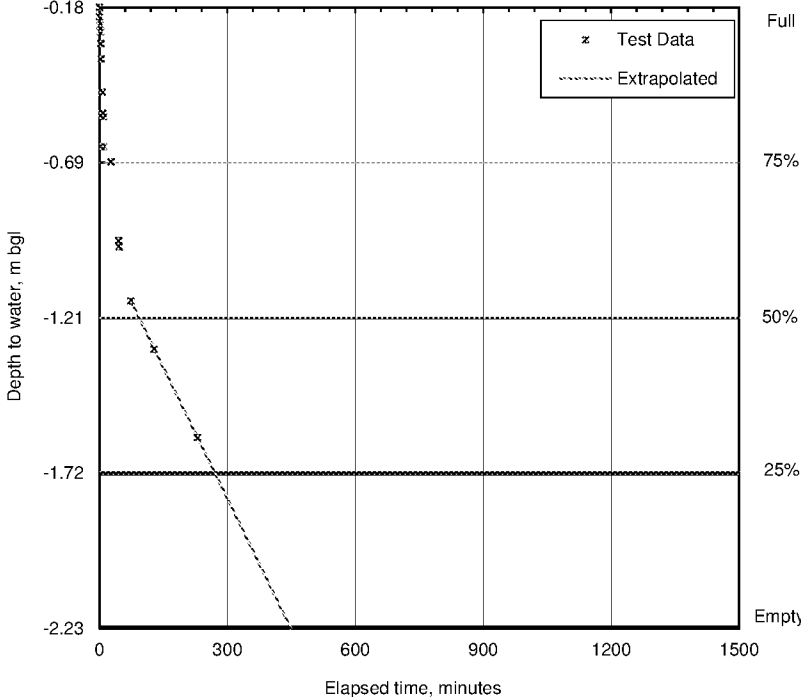
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP03	
Test Number	1	
Pit Depth	2.23	m
Pit Length	2.30	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	12/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.40	
1	0.42	
2	0.43	
3	0.44	
4	0.45	
5	0.47	
6	0.48	
7	0.49	
8	0.51	
9	0.52	
10	0.54	
15	0.61	
20	0.66	
72	1.05	
158	1.56	
190	1.65	
223	1.80	
293	1.95	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (46 mins) is the time for the water level to fall to 75% effective depth (0.86m bgl) and T_{25} (217 mins) is the time for the water level to fall to 25% effective depth (1.77m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 171$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.26 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 6.69 \text{ m}^2$ Soil Infiltration Rate $f = 1.84 \times 10^{-5} \text{ m/s}$		
Comments		

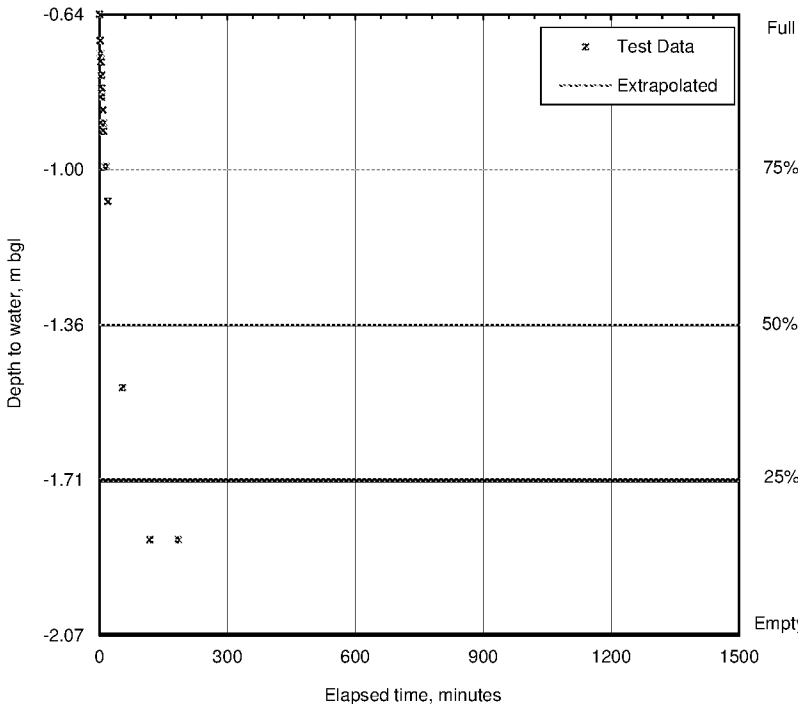
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP03	
Test Number	2	
Pit Depth	2.23	m
Pit Length	2.30	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	13/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.19	
3	0.56	
4	1.04	
5	1.04	
6	1.04	
8	1.04	
9	1.04	
10	1.04	
75	1.25	
150	1.40	
211	1.50	
271	1.59	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (3.3 mins) is the time for the water level to fall to 75% effective depth (0.70m bgl) and T_{25} (345* mins) is the time for the water level to fall to 25% effective depth (1.72m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 342$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.41 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 7.30 \text{ m}^2$ Soil Infiltration Rate $f = 9.40 \times 10^{-6} \text{ m/s}$		
Comments	Calculation based on extrapolated results. Use as a guide only. Pit was dry next day at 733 minutes.	

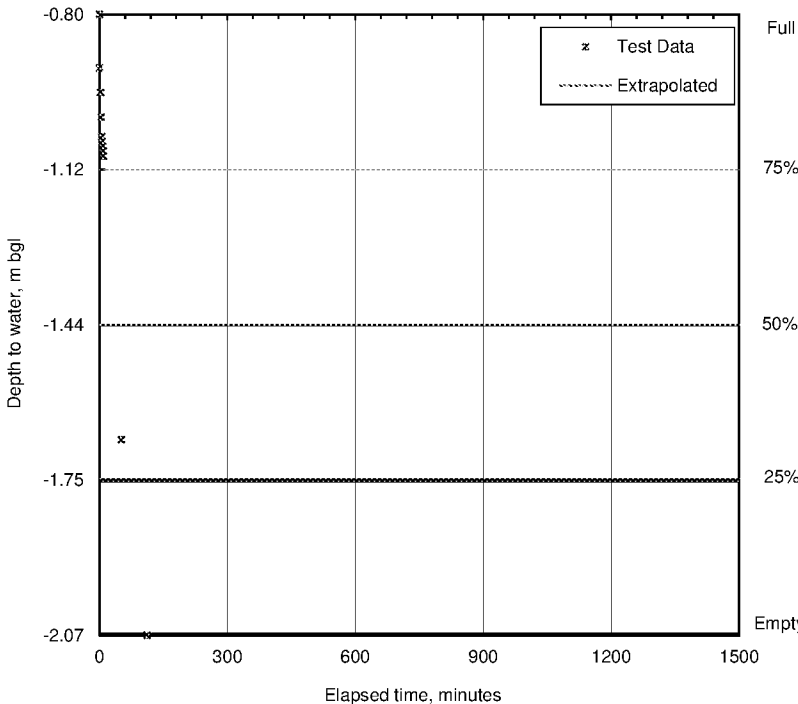
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP03	
Test Number	3	
Pit Depth	2.23	m
Pit Length	2.30	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	14/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.18	
1	0.21	
2	0.24	
3	0.26	
4	0.30	
5	0.35	
6	0.46	
7	0.53	
8	0.53	
9	0.54	
10	0.64	
28	0.69	
45	0.95	
47	0.97	
74	1.15	
128	1.31	
230	1.60	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (28 mins) is the time for the water level to fall to 75% effective depth (0.69m bgl) and T_{25} (271* mins) is the time for the water level to fall to 25% effective depth (1.72m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 243$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.41 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 7.33 \text{ m}^2$ Soil Infiltration Rate $f = 1.33 \times 10^{-5} \text{ m/s}$		
Comments	Calculation based on extrapolated results. Use as a guide only.	

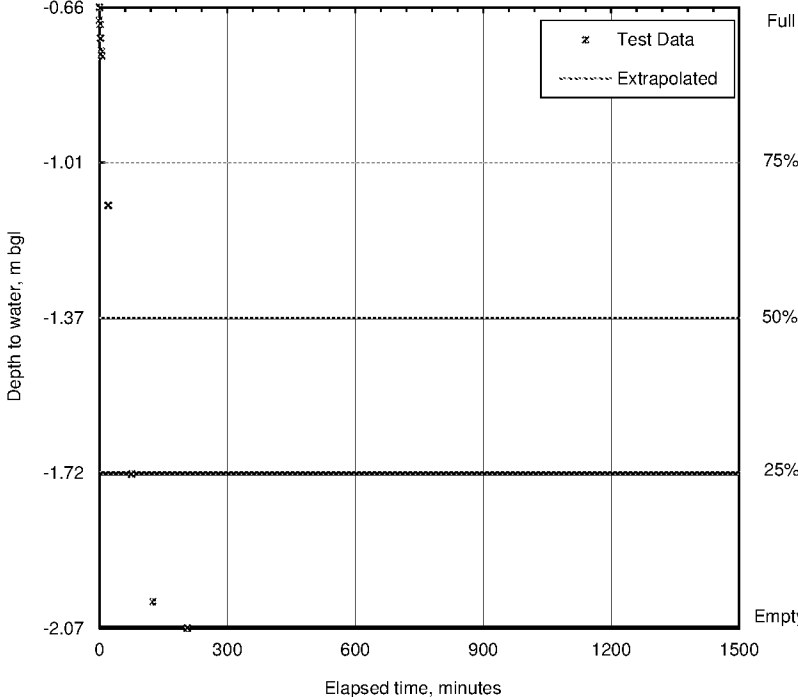
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP04	
Test Number	1	
Pit Depth	2.07	m
Pit Length	2.40	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	12/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.64	
2	0.70	
3	0.73	
4	0.75	
5	0.78	
6	0.81	
7	0.83	
8	0.86	
9	0.89	
10	0.91	
15	0.99	
20	1.07	
54	1.50	
119	1.85	
184	1.85	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (15 mins) is the time for the water level to fall to 75% effective depth (1.00m bgl) and T_{25} (93 mins) is the time for the water level to fall to 25% effective depth (1.71m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 78$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.03 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.73 \text{ m}^2$ Soil Infiltration Rate $f = 3.84 \times 10^{-5} \text{ m/s}$		
Comments		

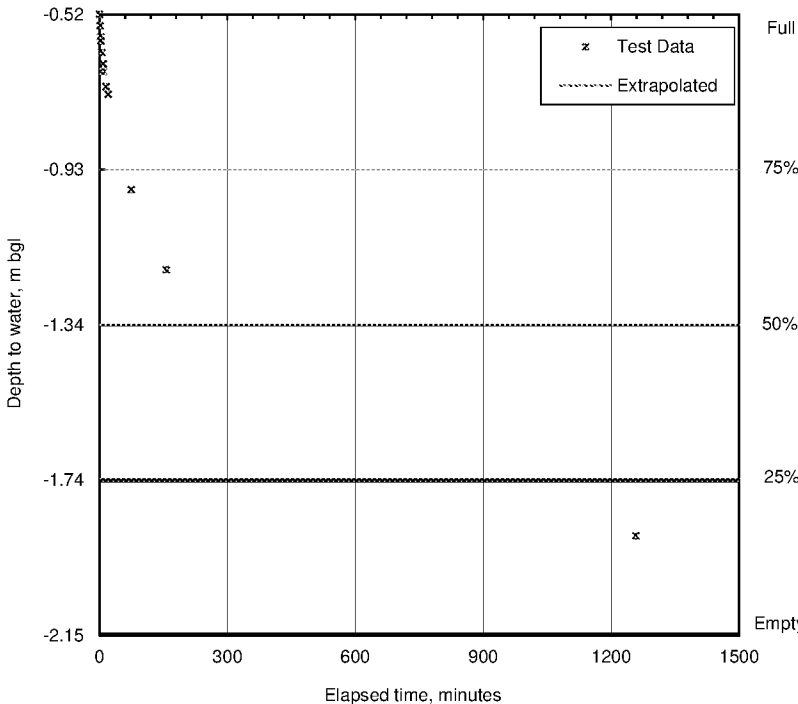
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP04	
Test Number	2	
Pit Depth	2.07	m
Pit Length	2.40	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	13/02/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.80	
1	0.91	
3	0.96	
5	1.01	
6	1.05	
7	1.06	
8	1.07	
9	1.08	
10	1.09	
52	1.67	
112	2.07	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (12 mins) is the time for the water level to fall to 75% effective depth (1.12m bgl) and T_{25} (64 mins) is the time for the water level to fall to 25% effective depth (1.75m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 52$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.91 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.25 \text{ m}^2$ Soil Infiltration Rate $f = 5.54 \times 10^{-5} \text{ m/s}$		
Comments		

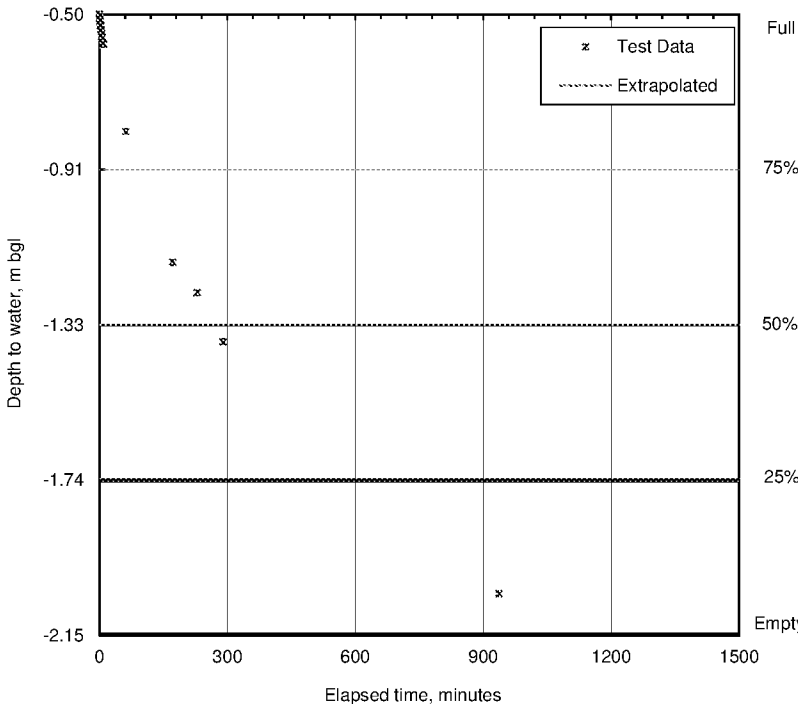
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP04	
Test Number	3	
Pit Depth	2.07	m
Pit Length	2.40	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	13/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.66	
1	0.69	
2	0.70	
3	0.73	
4	0.76	
5	0.77	
21	1.11	
76	1.72	
127	2.01	
206	2.07	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (16 mins) is the time for the water level to fall to 75% effective depth (1.01m bgl) and T_{25} (76 mins) is the time for the water level to fall to 25% effective depth (1.72m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 59$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.02 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.67 \text{ m}^2$ Soil Infiltration Rate $f = 5.03 \times 10^{-5} \text{ m/s}$		
Comments		

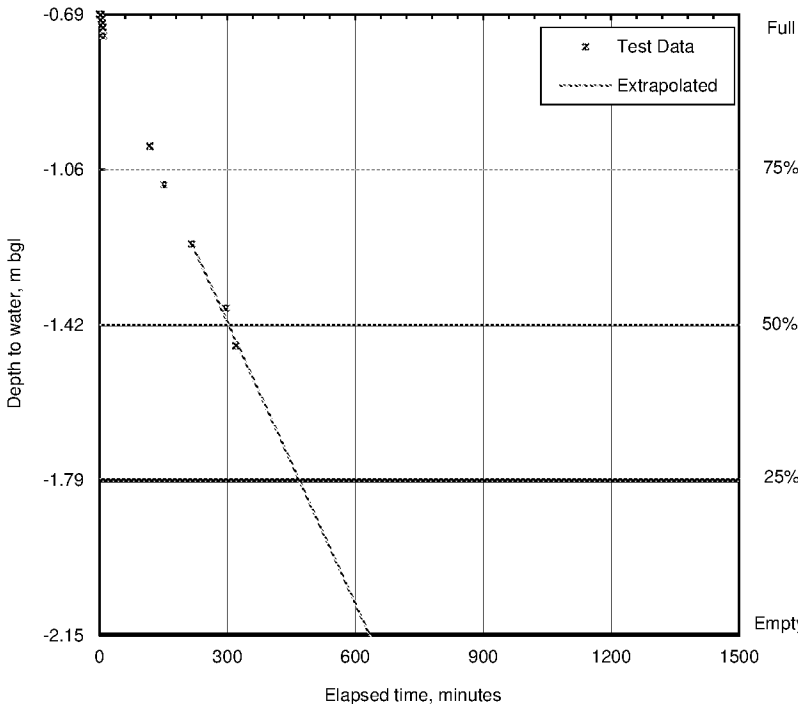
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP05	
Test Number	1	
Pit Depth	2.15	m
Pit Length	2.40	m
Pit Width	0.60	m
Depth to groundwater prior to test	Dry	m
Date of Test	12/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.52	Full 75% 50% 25% Empty
2	0.55	
3	0.58	
4	0.59	
6	0.62	
8	0.65	
9	0.65	
10	0.67	
16	0.71	
21	0.73	
75	0.98	
157	1.19	
1258	1.89	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T75 (64 mins) is the time for the water level to fall to 75% effective depth (0.93m bgl) and T25 (1026 mins) is the time for the water level to fall to 25% effective depth (1.74m bgl) thus, T75-T25 is the time for the water level to fall from 75% to 25% effective depth: T75-T25 = 962 mins V75-V25 is the effective storage volume in the trial pit between 75% and 25% effective depth: V75-V25 = 1.17 m³ and A50 is the internal surface area of the trial pit up to 50% effective depth and including the base area: A50 = 6.33 m² Soil Infiltration Rate $f = 3.21 \times 10^{-6}$ m/s		
Comments		

SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP05	
Test Number	2	
Pit Depth	2.15	m
Pit Length	2.40	m
Pit Width	0.60	m
Depth to groundwater prior to test	1.89	m
Date of Test	13/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.50	
1	0.51	
2	0.52	
3	0.53	
4	0.54	
5	0.55	
6	0.56	
7	0.56	
8	0.58	
10	0.58	
62	0.81	
172	1.16	
229	1.24	
290	1.37	
937	2.04	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (94 mins) is the time for the water level to fall to 75% effective depth (0.91m bgl) and T_{25} (645 mins) is the time for the water level to fall to 25% effective depth (1.74m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 551$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.19 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 6.39 \text{ m}^2$ Soil Infiltration Rate $f = 5.63 \times 10^{-6} \text{ m/s}$		
Comments		

SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client:	Trustees of the Langmead Pension Scheme	
Project Title	Drove Lane, Yapton	
Project No.	BRD2934	
Test Details		
Trial Pit Number	TP05	
Test Number	3	
Pit Depth	2.15	m
Pit Length	2.40	m
Pit Width	0.60	m
Depth to groundwater prior to test	2.04	m
Date of Test	14/09/2017	
Logged by	Henrik K-Abbotts	
Description of Soil under Test		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time 
0	0.69	
1	0.69	
2	0.69	
3	0.69	
4	0.69	
5	0.70	
6	0.70	
7	0.71	
8	0.72	
10	0.74	
119	1.00	
152	1.09	
217	1.23	
297	1.38	
320	1.47	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (139 mins) is the time for the water level to fall to 75% effective depth (1.06m bgl) and T_{25} (468* mins) is the time for the water level to fall to 25% effective depth (1.79m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 329$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.05 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.82 \text{ m}^2$ Soil Infiltration Rate $f = 9.14 \times 10^{-6} \text{ m/s}$		
Comments	Calculation based on extrapolated results. Use as a guide only.	

APPENDIX F

Environment Agency (EA) Data



Enter a postcode or place name:

Other topics for this area...

Groundwater



Map legend

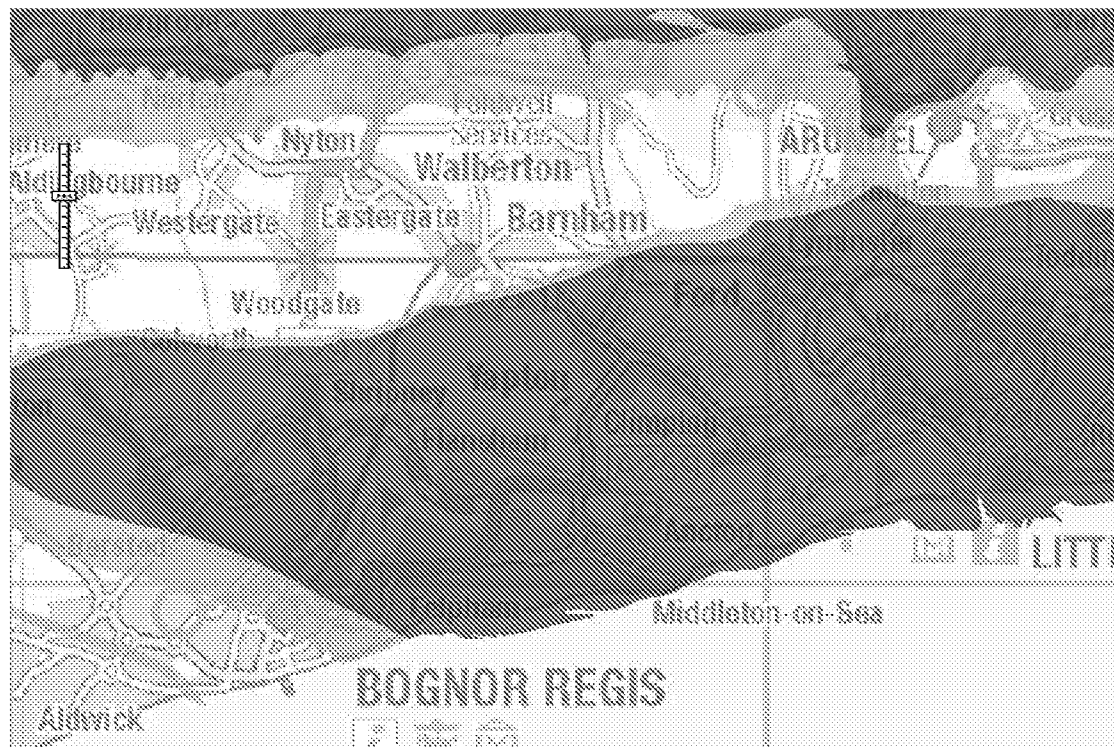
- ☐ Groundwater source protection zones
- ☐ BGS Aquifer Maps - Superficial Deposits Designation
- ☒ BGS Aquifer Maps - Bedrock Designation
- ☐ Groundwater Vulnerability Zones
- ☐ Other national environmental organisations

Principal

- Secondary A
- Secondary B
- Secondary (undifferentiated)

X: 497,320;Y: 102,716 at scale 1:75,000

Other maps ☐ Data search ☐ Text only version ☐



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More about Groundwater

Groundwater Source Protection Zones:

Groundwater provides a third of our drinking water. We ensure that your water is safe to drink defining Source Protection Zones. These zones help to monitor the risk of contamination from any activities that might cause pollution in the area.

The Source Protection Zones are not displayed at scales greater than 1:20,000 (Ordnance Survey 1:50,000 scale) as the data was only modelled to this level and is not accurate past this. They should not be compared against field boundaries.

[Understanding Groundwater Source Protection Zones maps](#)

British Geological Survey's Aquifer Maps:

From 1st April 2010 new aquifer designations replace the old system of classifying aquifers as Major, Minor and Non-Aquifer. This new system is in line with our Groundwater Protection Policy (GP3) and the Water Framework Directive (WFD) and is based on British Geological Survey mapping.

The Aquifer Extents are not displayed at scales greater than 1:75,000 (Ordnance Survey 1:250,000 scale) as the data was only modelled to this level and is not accurate past this.

[Understanding the British Geological Survey's Aquifer maps](#)

Groundwater Vulnerability Maps:

We are currently updating our groundwater vulnerability maps to reflect improvements in data mapping and understanding of the factors affecting vulnerability. The new maps will be released later in 2016.

The 'New groundwater vulnerability mapping methodology' report provides technical information about how the new maps have been created.

The user guide outlines the kinds of activities the new maps can be used for.

These reports have been published on GOV.UK in advance of the release of the new maps to give users time to understand the new approach and how this differs from the previous groundwater vulnerability maps.



Enter a postcode or place name:

Other topics for this area...

Groundwater



Map legend

Groundwater source protection zones

BGS Aquifer Maps - Superficial Deposits Designation

BGS Aquifer Maps - Bedrock Designation

Groundwater Vulnerability Zones

Major Aquifer High

Major Aquifer Intermediate

Major Aquifer Low

Minor Aquifer High

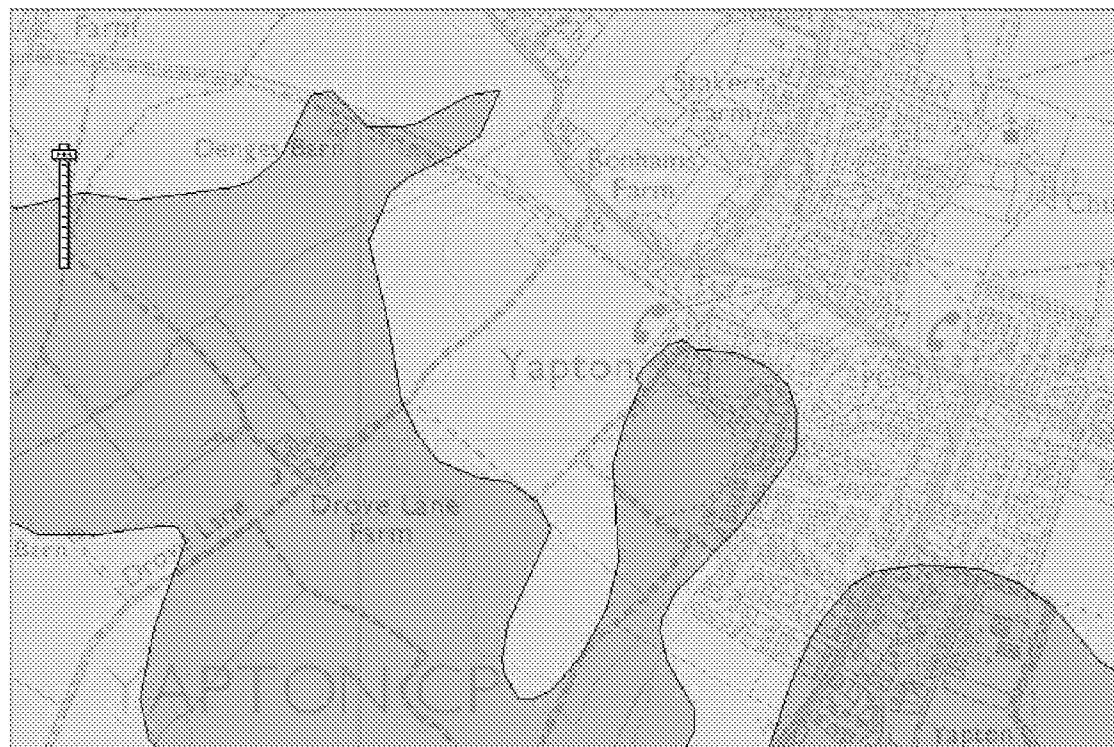
Minor Aquifer Intermediate

Minor Aquifer Low

Other national environmental organisations

X: 497,372;Y: 103,105 at scale 1:10,000

Other maps Data search Text only version



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More about Groundwater

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[Understanding the British Geological Survey's Aquifer maps](#)

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BETA

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From the list below, select the information you're interested in. The map view will then update.

Extent of flooding



Flood risk

 High  Medium  Low  Very low  Location of the postcode you entered

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[View the flood risk information for another location \(/long-term-flood-risk/\)](/long-term-flood-risk/)

[Go to the national flood information service \(https://flood-warning-information.service.gov.uk\)](https://flood-warning-information.service.gov.uk)

► [Other ways of getting this information](#)

11 April 2017

This information meets the requirements of the EU Floods Directive 2007/60/EC

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