FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

Proposed Leisure Centre and Residential Development

Land West of Egley Road
Woking
GU22 0NJ

Prepared for:
Woking Football Club

22nd November 2019

Project Number:
RMA-C1947

RMA ENVIRONMENTAL

environmental planning consultancy

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Prepared by: Kieran Renton/Melissa Seymour

Checked by: Rob Murdock

Approved by: Rob Murdock

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6	22nd November 2019	Final Issue

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FIGURES

APPENDICES

1 INTRODUCTION

Background

1.1 RMA Environmental Limited has been commissioned by Woking Football Club to prepare a Flood Risk Assessment (FRA) to support a full planning application for a proposed leisure centre and residential development on land at to the west of Egley Road in Woking, GU22 0NJ.

1.2 This FRA has been prepared in accordance with the National Planning Policy Framework (NPPF), associated Planning Practice Guidance (PPG) and Environment Agency (EA) standing advice on flood risk for new development.

Site Location and Land Use

1.3 The site is largely undeveloped land although, a small warehouse and parking area/access track are located in the north-eastern part of the site. The site extends to an area of approximately 4.1 hectares (ha) and is located at National Grid Reference SU 99410 56401 (refer to Figure 1.1).

1.4 The site is bordered by the following land uses:

- Hoe Valley School which comprises of an athletics club and car park form the northern boundary of the site;
- a railway forms the western site boundary;
- a wooded area is located along the south-eastern boundary of the site and beyond this is further residential development and Hook Hill Lane;
- a garden centre and industrial yard are located directly east of the site; and
- the surrounding area is mostly urbanised with a mixture of commercial and residential buildings, with some areas of greenfield land.

1.5 Access to the site is currently via Egley Road to the east of the site. Further details on site topography, geology and hydrology are set out in Section 2.

Proposed Development

1.6 The Proposed Development includes the redevelopment of the site, following the demolition of the existing building, to provide a health club building (Class D2) incorporating an external swimming pool and tennis/sports courts, the provision of 36 dwelling houses (Class C3) up to a maximum of 3 storeys in height, associated landscaping and car parking and new vehicular access from an existing road serving Hoe Valley School (refer to the proposed development layout at Appendix A).

Requirements for a Flood Risk Assessment

1.7 The requirements for FRA are provided in the NPPF and associated PPG. Paragraph 163 of the NPPF (2018) requires that a site-specific FRA should be submitted with planning applications for all sites greater than 1 ha in Flood Zone 1; for sites of any size within Flood Zones 2 or 3; in an area within Flood Zone 1 which has critical drainage problems; in an area within Flood Zone 1 which is identified in a strategic flood risk assessment as being at increased flood risk in the future; or an area within Flood Zone 1 that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

1.8 Flood Zone 1 is defined as land with little or no flood risk (an annual exceedance probability [AEP] of flooding of less than 0.1%); Flood Zone 2 is defined as having a medium flood risk (an AEP of between 0.1% and 0.5% for tidal areas or 0.1% and 1.0% for rivers); and Flood Zone 3 is defined as high risk (with an AEP of greater than 0.5% for tidal areas or greater than 1.0% for rivers).

1.9 FRAs should describe and assess all flood risks (from rivers, the sea, surface water, reservoirs, sewers and groundwater) to and from the development and demonstrate how they will be managed, including an evaluation of climate change effects.

Consultation

1.10 Consultation has been undertaken with the following consultees and further details of these consultations are included within Section 3 and 4 of this FRA:

- direct consultation in the form of a meeting and email correspondence has been undertaken with Katherine Waters at Woking Borough Council (who are acting at the Lead Local Flood Authority) to the scope of the surface water drainage strategy; and
- a pre-development enquiry has been undertaken with Thames Water to determine the location of sewers within the site and surrounding are and if there is sufficient capacity within the local foul sewerage system to supply the development.

2 BASELINE ENVIRONMENTAL CONDITIONS

Topography

2.1 A topographical survey is included within Appendix B of this report. This identifies that the site slopes in an easterly direction; the highest level is approximately 32.96 metres Above Ordnance Datum (mAOD) in the north-western corner of the site, falling to approximately 27.94 mAOD in the north-eastern corner of the site.

Hydrology

2.2 There is one 'main river'[1] within a 500 m radius of the site. This is the Hoe Stream which is located approximately 250 m east of the site and flows in a north-easterly direction.

2.3 A further stream is located approximately 110 m north of the site along Egley Road. It was identified during the site visit that this stream is culverted beneath Egley Road and into the Hoe Stream to the north-east of the site.

2.4 There are no other significant watercourses or water bodies within the surrounding area.

Geology and Hydrogeology

2.5 As reported on the British Geological Survey (BGS) online Geology of Britain Viewer, the site is not underlain by any superficial geology; however, it is underlain by the bedrock geology of the Bagshot formation, comprising sand.

2.6 The EA classify the bedrock geology as a Secondary A Aquifer; these are defined as "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*."

2.7 The site is not located within a groundwater Source Protection Zone (SPZ).

2.8 A Geo-Environmental and Geotechnical Assessment (Ground Investigation) Report has been prepared for the site and is submitted as a separate report for this application. This states that during return monitoring, groundwater was reported at depths of between 1.78 m and 3.94 m below ground level (bgl).

[1] Main Rivers described by the EA as the following "usually larger rivers and streams"

3 EXTERNAL FLOOD RISK

Flooding Mechanisms

3.1 The EA's flood map for planning (refer to Figure 3.1) indicates that the site lies entirely within Flood Zone 1 (low risk). Land within Flood Zone 2 (medium risk) is located approximately 110 m east of the site at an elevation approximately 1.9 m lower than the site. Land within Flood Zone 3 (high risk) is located approximately 190 m east of the site at an elevation approximately 3 m lower than the site. It is therefore concluded that the site will remain within Flood Zone 1 for its operational lifetime, with the added effects of climate change.

3.2 The EA's surface water flood risk map identifies that the majority of the site has a very low risk of surface water flooding (each year, this area has a chance of flooding of less than 1 in 1000 (0.1%)). There is a small area of low surface water flood risk located within the north of the site and an area of medium and high surface water flood risk located within the south-western part of the site. This is discussed further below.

3.3 When reviewing the Woking Borough Council Strategic Flood Risk Assessment (SFRA) Volume 2 Technical Report (Nov 2015), it identifies that the site is located within an area of "*limited potential for groundwater flooding to occur*". It is therefore considered that the site has a low risk of groundwater flooding and this is considered a risk to the proposed development.

3.4 Woking Borough Council's SFRA identifies that the site lies within a postcode area with six records of sewer flooding. No further details are given on the location of these records and, given the size and location of the site, it is not considered to be at significant risk of flooding from this source.

3.5 A review of the SFRA and EA flood maps, has identified that there are no other significant sources of flooding at the site, i.e. from reservoirs.

Historic Flooding

3.6 The Woking Borough Council SFRA has been reviewed to establish any records of flooding at or in close proximity to the application site. No records of flooding were found for the site or the immediate surrounding area.

3.7 The EA's historic flood map identifies no records of flooding for the site or its surroundings.

Surface Water Flooding

3.8 The EA's risk of flooding from surface water map shows that the majority of the site has a very low risk of surface water flooding. Very low surface water flood risk is defined where *"each year, this area has a chance of flooding of less than 1 in 1000 (0.1%)*".

3.9 There is an area of medium and high surface water flood risk in the south-western part of the site (refer to Figure 3.2). Medium surface water flood risk is defined where *"each year, this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)".* High surface water flood risk is defined where "*each year, this area has a chance of flooding of greater than 1 in 30 (3.3%)*".

3.10 During the medium risk scenario, a small isolated area of surface water flooding is located in the south-west of the site which has an estimated depth of 150 to 600 mm.

3.11 During the high risk scenario, a very small isolated area of surface water flooding is located in the south-west of the site which has an estimated depth of 150 to 600 mm.

3.12 The EA's flood mapping indicates that this area of medium to high surface water flood risk in the south-western part of the site is limited in size and does not form part of any surface water flow paths (i.e. it originates within the site boundary). The extents of medium/high surface water flood risk are located in an existing topographical depression on the site and is therefore ponded water. Post development, it is considered that any ponding of surface water in extreme events will be re-distributed to the new low points within the site (i.e. areas of open space and roads) and managed within the surface water drainage strategy.

3.13 The EA's surface water flood risk mapping shows what "*happens when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead."* It is noted that this type of flooding is difficult to predict and was based on the best information available to the EA regarding ground levels and drainage.

3.14 The risk of surface water flooding originating within the site would be reduced (or eliminated) through the implementation of the proposed drainage strategy. Therefore, it is considered unlikely that surface water flooding would adversely affect the site.

Safe Access/Egress

3.15 Access/egress to the site would not be affected by fluvial or tidal flooding; the site is located entirely within Flood Zone 1 (low risk) and safe access/egress via Egley Road along the north-eastern boundary of the site is readily achievable.

3.16 There are small areas of low surface water flood risk along Egley Road adjacent to the site; however, during a low risk (0.1% AEP) surface water event, the flood depth is estimated to be less than 300 mm. When the estimated flood depths are less than 300 mm, it is considered that safe access/egress from the site would still be possible. Should surface water flood depths exceed this level and it is not possible to exit the property safely, occupants would be advised to stay within the property and wait for surface water to recede.

Land Use Vulnerability

3.17 Table 2 of the NPPF PPG sets out a schedule of land uses based on their vulnerability or sensitivity to flooding. As set out in Table 2, the proposed residential development is classified as 'more vulnerable' and the leisure centre development is classified as a land use that is 'less vulnerable' to flooding. Referring to Table 3 of the PPG, all land uses are considered appropriate within Flood Zone 1.

3.18 Therefore, on the basis of land use vulnerability, the development should be deemed appropriate in planning policy terms of its proposed location.

4 DRAINAGE ASSESSMENT

Introduction

4.1 This drainage strategy has been prepared in accordance with Defra's *"Non-statutory technical standards for sustainable drainage systems"* (March 2015) to ensure that the proposed development does not increase flood risk to the site or elsewhere and, where practicable, reduces flood risk over the lifetime of the development.

4.2 Peak rainfall intensity is expected to increase as a result of climate change and, as such, storage calculations have included a 40% increase in rainfall depths in accordance with current climate change guidance.

Summary

4.3 The site comprises of mostly green open space, a small warehouse is located in the north-eastern part of the site. There is limited information on the drainage arrangements for the existing site, however, the topographical survey (refer to Appendix B) shows a number of surface water sewers within the site and indicated that these are likely to be connected to the exiting public surface water sewer in the adjacent access road to Hoe Valley School.

4.4 BRE365 compliant infiltration testing has been undertaken at the site and the results are included as Appendix C of this report. This testing confirmed that there is low potential for infiltration across most of the site. Therefore, it is proposed to maintain the existing connections and discharge to the public surface water sewer to the north of the site.

4.5 Table 4.1 provides an overview of the feasibility of a range of SuDS techniques which are considered in accordance with the SuDS hierarchy in order to identify the most appropriate for the proposed development.

Table 4.1: Type and Feasibility of SuDS

Technique	Comments	Feasibility		Utilised
Green roofs	Requires flat or minimal slope roofs. Limited value for runoff attenuation in comparison with other techniques.	Feasible	x	Not proposed due to commercial reasons.
Soakaways and infiltration trenches	Require infiltration rates of 1 x 10^{-6} m/s or greater. Shallow soakaways or infiltration trenches would be required where groundwater is shallow (i.e. less than 2.0 mbgl).	Not Feasible	x	Soakaway tests have been completed and infiltration rates and groundwater depth are not suitable for soakaways.
Infiltration basins / swales	Are widely applicable for attenuation and treatment of surface runoff by infiltration into the ground. Require slope of no more than 4-10% and can act as a substitute for soakaways where groundwater is shallow.	Not Feasible	x	Soakaway tests have been completed and infiltration rates and groundwater depth are not suitable for soakaways.

Technique	Comments	Feasibility		Utilised
Bio-retention – landscaped infiltration areas	Primarily used to remove pollutants from runoff and due to their shallow nature are not as effective at runoff attenuation as other SUDS techniques.	Feasible	✓	Runoff from surfaces will be diverted to tree pits and rain gardens with excess runoff being diverted to the positive drainage system (where possible).
Permeable pavement	Ideally requires a level site and favourable underlying ground conditions. May be suitable in areas of relatively flat topography. Can be linked with geocellular storage or a porous sub-base.	Feasible	✓	Lined permeable paving will be used for non-adopted areas, with geocellular storage beneath, where necessary.
Non-infiltration swales	Used in the same way as carrier ditches or storage bunds. Shallow swales can be used for conveyance and/or storage.	Not Feasible	x	Insufficient space is available within the layout as a result of economic constraints (refer to Para 4.6)
Filter drains	These are normally used adjacent to areas of car parking or roads and convey runoff via flow through an engineered substrate.	Feasible	x	Not proposed.
Balancing ponds or attenuation basins	These are permanent ponds or basins that provide storage. These are appropriate for most sites but require suitable space.	Not Feasible	x	Insufficient space is available within the layout as a result of economic constraints (refer to Para 4.6)
Geo-cellular storage	Geo-cellular storage or similar sub-base medium beneath car parking areas and/or other areas of hardstanding and/or other forms of underground attenuation.	Feasible	✓	Geocellular storage is to be provided under car parking and roads.

4.6 The site at Egley Road has been designed to enable the relocation of the David Lloyd Leisure Centre from Kingfield Road. In order to enable the relocation of the leisure centre and make it financially sustainable, the site must incorporate a certain quantum of residential development. Given the economic and technical constraints on this site (approximately 25% of the site comprises of protected trees), insufficient space is available within the layout for above ground SuDS features, such as swales and ponds. Soakaway tests have been completed and infiltration rates and groundwater depths are not suitable for soakaways, however, lined permeable paving will be used for non-adopted areas.

4.7 The rate of discharge to the public sewer will be controlled by a hydro-brake. Refer to drawings SK100/A and SK101/A within Appendix C of this report.

4.8 The drainage arrangement for the proposed development will limit runoff for all events up to and including the 100 year plus 40% climate change to Qbar. This is likely to be a betterment on existing rates and a betterment on equivalent greenfield rates for the site.

4.9 Full details of the proposed surface water drainage strategy are provided in Appendix C.

Designing for Exceedance Events

4.10 If the proposed drainage system were to become blocked or an event above the design event occur, then exceedance flows would be routed along the road network towards the north-eastern corner of the site and onto Egley Road and ultimately into the watercourse to the north of the site (refer to Figure 4.1). This would mimic what would occur on the site in its existing condition and would ensure that the proposed developments is safe during an exceedance event.

Long Term Maintenance of SuDS

4.11 Where SuDS features serve more than one property, it would be the responsibility of the developer to either maintain the SuDS features themselves or to negotiate with and secure the agreement of a third party to maintain the sustainable drainage system.

4.12 The maintenance requirements of the proposed SuDS features for use in the drainage strategy are detailed in the SuDS Manual and would be carried out accordingly.

Foul Drainage

4.13 Consultation with Thames Water (refer to Appendix D) identifies the location of sewers in the vicinity of the Site. This has identified that there are foul sewers along Egley Road and Egley Drive to the east and Chiltern Close and Hook Hill Lane to the south.

4.14 Consultation with Thames Water was undertaken to determine if there is sufficient capacity within the local foul sewerage system (refer to Appendix D). This states that the foul sewerage network does not currently have enough capacity to serve the development. Therefore, Thames Water are required to carry out detailed modelling work and potential off-site reinforcement to ensure the necessary improvement are in place prior to the development going ahead.

4.15 It should be noted that since the publication of the new connections and development charging rules in April 2018, drainage authorities in England are obligated to provide a point of connection and undertake any mitigation or improvement works and network reinforcements, where necessary. These will be programmed once planning consents are granted. Therefore, it is recommended that Thames Water should be consulted following planning consent so this detailed network modelling can be undertaken.

5 CONCLUSIONS

5.1 The requirements for Flood Risk Assessment are provided in the National Planning Policy Framework and its associated Planning Practice Guidance, together with the Environment Agency's Guidance Notes. This policy and associated guidance have been followed in the preparation of this FRA.

5.2 The EA's flood map for planning identifies that the entire site lies within Flood Zone 1 and, therefore, flood risk from rivers and the sea is considered to be low. The EA's surface water flood risk map identifies that the majority of the site has a very low risk of surface water flooding. There is a small area of medium to high surface water flood risk located in the south-western extent of the site. However, the EA's flood mapping indicates that this is limited in size and does not form part of surface water flow path (i.e. it is ultimately ponded water).

5.3 The SFRA indicates the site lies within a postcode area with six records of sewer flooding in the past ten years therefore the site has a low risk of sewer flooding.

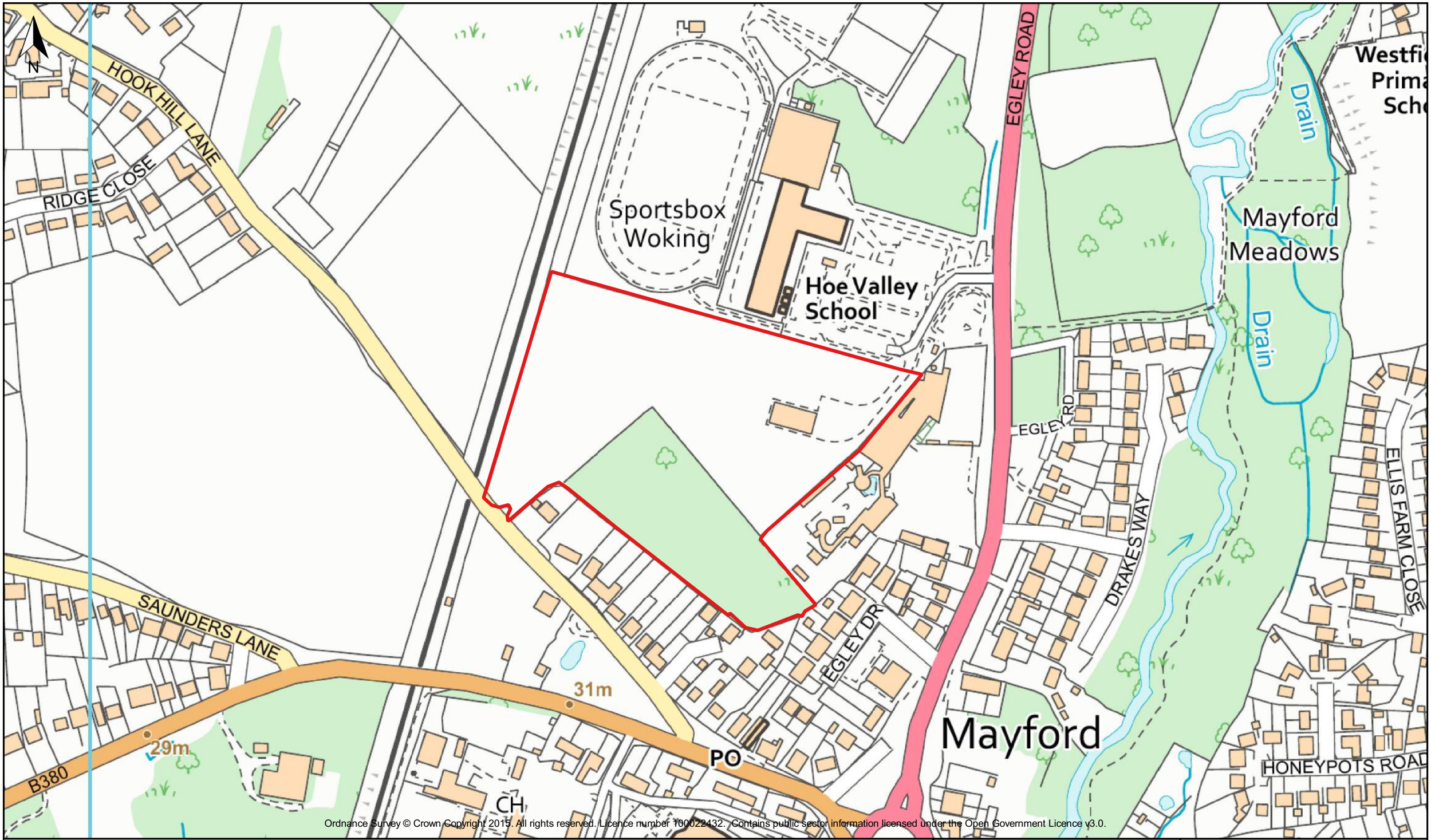
5.4 A review of further EA maps and the SFRA have identified that there are no other significant sources of flooding at the site, i.e. from groundwater or reservoirs. The SFRA and the EA's historic flood map indicate that there are no historic flood records for the site or the surrounding area.

5.5 The site is located entirely within Flood Zone 1 (low risk) and therefore safe access/egress via Egley Road would not be affected by fluvial or tidal flooding. There are small areas of low surface water flood risk along Egley Road; however, the flood depth is estimated to be less than 300 mm and therefore safe access/egress from the site would still be possible.

5.6 The proposed drainage strategy comprises of lined permeable paving and geo-cellular storage and would ensure that surface water runoff rates for the proposed development would be limited to Qbar which is a betterment on both the existing drainage arrangement and greenfield runoff rates. Surface water runoff would discharge into the public sewer to the north of the site. Attenuation would be provided for all return periods up to and including the 1 in 100 year event inclusive of a 40% allowance for climate change.

5.7 This FRA has therefore demonstrated that the proposed development will be safe and that it would not increase flood risk elsewhere. The proposed land use is classified as 'more vulnerable' for the residential element and 'less vulnerable' for the leisure centre and is considered appropriate in relation to the flood risk vulnerability classifications set out in Table 3 of the NPPF. The development should therefore be considered acceptable in planning policy terms.

Figures



Key

Red Line Boundary

Figure 1.1: **Site Location Plan**

Client: **Woking Football Club**

Project: **Egley Road Woking**

Project No.: **C1947**

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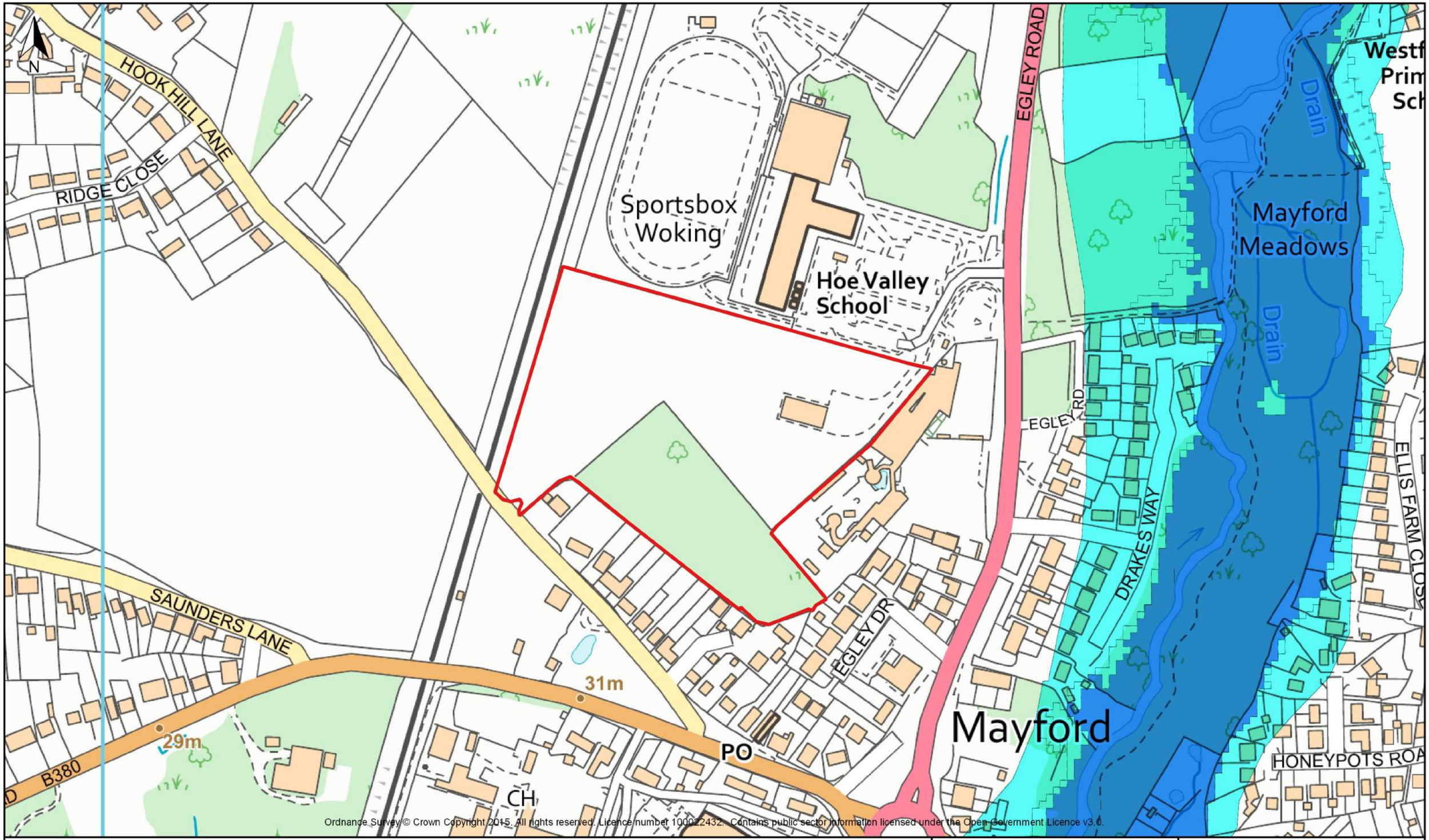

Key

- Red Line Boundary
- EA Flood Zone 2
- EA Flood Zone 3

Figure 3.1: **EA Flood Map for Planning**

Client: **Woking Football Club**

Project: **Egley Road Woking**

Project No.: **C1942**

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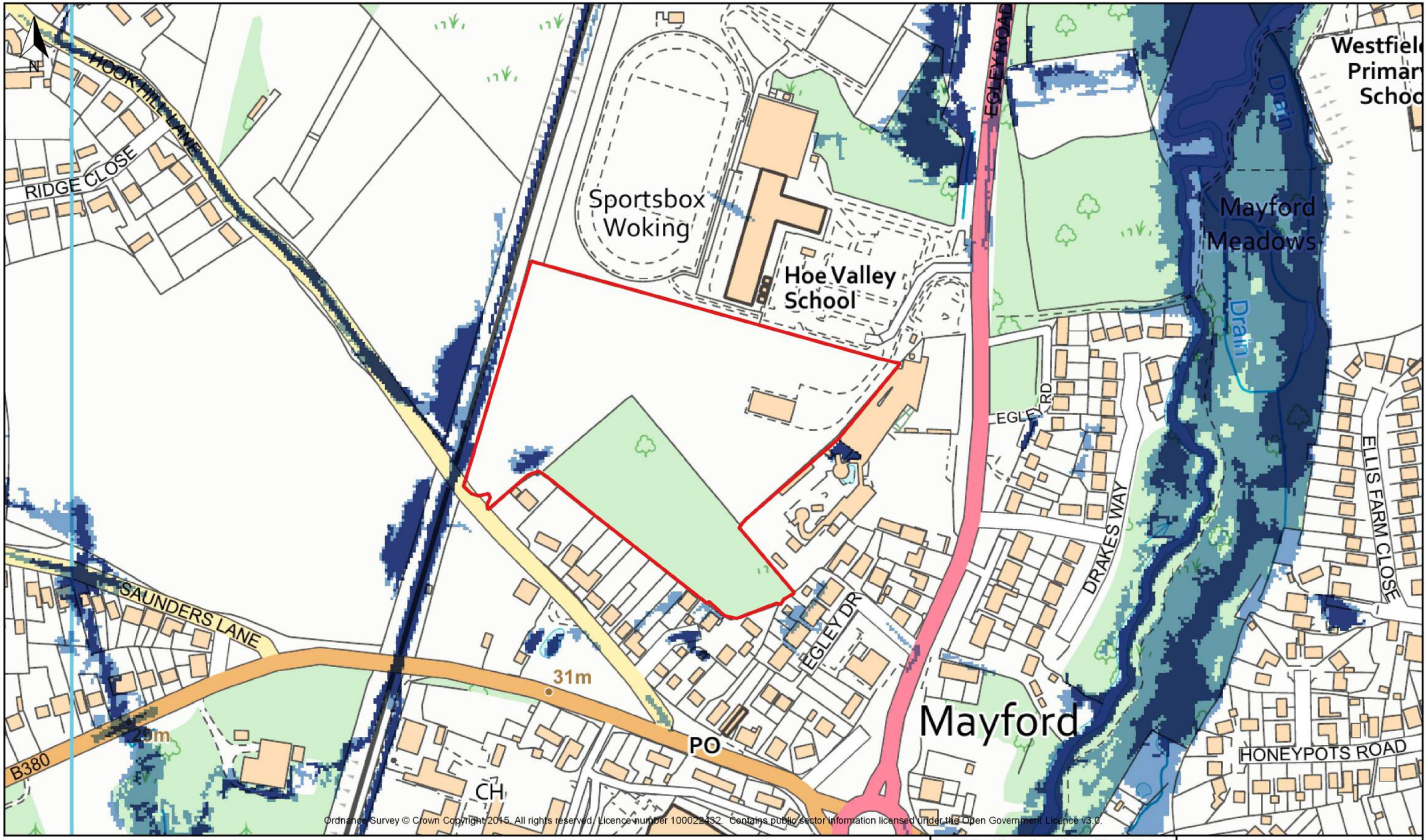

Key

- Red Line Boundary
- EA Medium Surface Water Flood Risk
- EA High Surface Water Flood Risk

Figure 3.2: **EA Surface Water Flood Risk**

Client: **Woking Football Club**

Project: **Egley Road Woking**

Project No.: **C1947**

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N

Hoe Valley School

David Lloyd Site

RESIDENTIAL SITE

RETAINED WOODLAND

TENNIS COURTS 1/3

TENNIS COURTS 4/6

TENNIS COURTS 7-8

BATTLE BOX

SPA GARDEN

MAIN AREA

TERRACE

DAVID LLOYD SITE ENTRANCE

CAR PARK 281 spaces

Key

- Red Line Boundary
- Surface Water Flow Route

Figure 4.1: **Surface Water Flow Paths in an Exceedance Event**

Client: **Woking Football Club**

Project: **Egley Road Woking**

Project No.: **C1947**

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Appendix A: Proposed Development Layout

LEGEND

SITE BOUNDARY

(Leisure Site Area: 22,303sqm)

(Residential Site Area: 9,161sqm)

RESIDENTIAL:

0.91 hectares

36no. houses

- 05 x House Type 1
- 13 x House Type 2
- 16 x House Type 3
- 02 x House Type 4

Gross density:

39 dwellings/ha

58,366 sqft saleable area

90 parking spaces provided

House Type 1
2/3 BEDROOM (4 PEOPLE)
TOWNHOUSE
(123.2sqm /1326sqft)

House Type 2
3 BEDROOM (6 PEOPLE)
TOWNHOUSE
(145sqm /1560sqft)

House Type 3
4 BEDROOM (8 PEOPLE)
TOWNHOUSE
(162.3sqm /1747sqft)

House Type 4
5 BEDROOM (9 PEOPLE)
TOWNHOUSE
(162.3sqm /1747sqft)

0 10 20m 40m

SCALE @ 1:500

LeachRhodesWalker Architects
Ground Floor West 50 Dearmans Place Manchester M3 5LH t 0161 833 0211 e info@lrw.co.uk www.lrw.co.uk

7884 EGLEY ROAD, WOKING : PROPOSED SITE / GROUND FLOOR PLAN

Scale: **1:500@A1** Auth By: **CJG** Drawn By: **IS** Date: **05.11.19** Dwg No: **7884-L(00)103N**

Appendix B: Topographical Survey

KEY

- Bottom of slope / batter
- Building
- Ditch bottom
- Dropped Kerb
- Edge of change in surface
- Eaves and Ridge 2D
- Fence
- Foliage (Outline)
- Hedge
- Kerb
- Pipe String
- Road Centre Line
- Road Line
- Hedge Rootline
- Road Markings
- Road Sign board
- String ground level
- Top of slope / batter
- Track
- Track Centre
- Telegraph pole
- Verge
- Wall
- Wall Centre
- Bush
- Gate
- Road Markings (Max Speed)
- Tree
- Bollard
- Telephone cover
- Box
- Fire Hydrant
- Gate post point
- Gulley Square
- Gulley Round
- Inspection cover
- Manhole
- Marker post (unidentified)
- Manhole (circle)
- Water meter
- Road sign
- Vent pipe
- FWS
- SWS

SURVEY STATIONS : NATIONAL GPS GRID SF=1.000			
Name	Easting	Northing	Height
STNA	499599.100	156471.211	28.021
STNB	499578.391	156439.281	28.196
STND	499487.348	156354.616	32.141
STNE	499337.262	156496.810	32.544
STNF	499497.349	156288.970	29.487
STNG	499484.918	156257.078	29.217
STNH	499463.647	156276.498	29.901
STNJ	499431.717	156282.863	30.369
STNK	499401.337	156320.391	31.097
STNL	499328.808	156362.191	31.500
STNN	499284.122	156339.547	36.074
STNP	499276.793	156347.795	36.921
STNQ	499264.024	156364.952	36.448

0m 2m 4m 8m 12m 20m

1:200

Notes

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Revision	Desciption	Drawn	Checked	Date
A	UPDATED SURVEY FOLLOWING MINOR AMENDMENTS.	NC	SGB	15-10-2018

Preliminary · Information · Tender · Construction · As Built

Woods Hardwick
Architects, Engineers and Development Consultants

15-17 Goldington Road
Bedford
MK40 3NH
United Kingdom
T. +44 (0)1234 268862
F. +44 (0)1234 353034
mail@woodshardwick.com
www.woodshardwick.com

Title: EGLEY ROAD WOKING

Details: TOPOGRAPHIC SURVEY SHEET 1 of 4

Scale: 1-200 @ A0 · Date: 05-10-2018 · Drawn: NC · Chk: SGB

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KEY

- Bottom of slope / batter
- Building
- Ditch bottom
- Dropped Kerb
- Edge of change in surface
- Eaves and Ridge 2D
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- Vent pipe
- FWS
- SWS

SURVEY STATIONS : NATIONAL GPS GRID SF=1.000

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STNG	499484.918	156257.078	29.217
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STNJ	499431.717	156282.863	30.369
STNK	499401.337	156320.391	31.097
STNL	499328.808	156362.191	31.500
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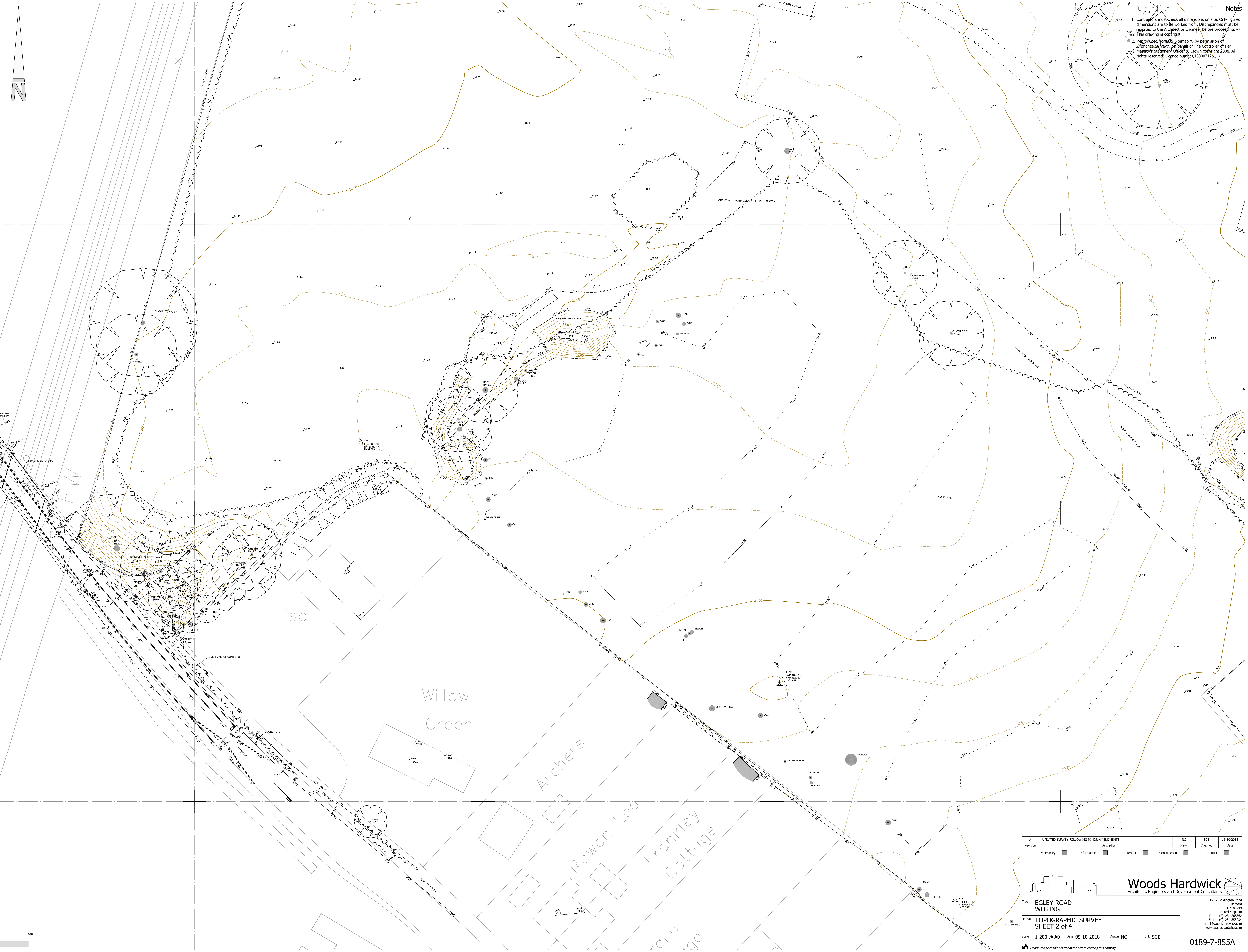

0m 2m 4m 8m 12m 20m

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A	UPDATED SURVEY FOLLOWING MINOR AMENDMENTS.	NC	SGB	15-10-2018

Preliminary Information Tender Construction As Built

Woods Hardwick
Architects, Engineers and Development Consultants

15-17 Goldington Road
Bedford
MK40 3NH
United Kingdom
T. +44 (0)1234 268862
F. +44 (0)1234 353034
mail@woodshardwick.com
www.woodshardwick.com

Title: EGLEY ROAD WOKING

Details: TOPOGRAPHIC SURVEY SHEET 2 of 4

Scale 1-200 @ A0 Date 05-10-2018 Drawn NC Chk SGB

0189-7-855A

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Notes

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KEY

- Bottom of slope / batter
- Building
- Ditch bottom
- Dropped Kerb
- Edge of change in surface
- Eaves and Ridge 2D
- Fence
- Foliage (Outline)
- Hedge
- Kerb
- Pipe String (PIPE "W"Ø)
- Road Centre Line
- Road Line
- Hedge Rootline
- Road Markings
- Road Sign board (RS)
- String ground level
- Top of slope / batter
- Track
- Track Centre
- Telegraph pole (TP)
- Verge
- Wall
- Wall Centre
- Bush
- Gate
- Road Markings (Max Speed)
- Tree ("TREE "H"")
- Bollard (Bol)
- Telephone cover (TEL)
- Box
- Fire Hydrant (FH)
- Gate post point (GP)
- Gulley Square
- Gulley Round (G)
- Inspection cover
- Manhole (MH CL=)
- Marker post (unidentified) (Mkr)
- Manhole (circle) (MH CL=)
- Water meter
- Road sign (RS)
- Vent pipe (VP)
- FWS
- SWS

SURVEY STATIONS : NATIONAL GPS GRID SF=1.000

Name	Easting	Northing	Height
STNA	499599.100	156471.211	28.021
STNB	499578.391	156439.281	28.196
STND	499487.348	156354.616	32.141
STNE	499337.262	156496.810	32.544
STNF	499497.349	156268.970	29.487
STNG	499484.918	156257.078	29.217
STNH	499463.647	156276.498	29.901
STNJ	499431.717	156282.863	30.369
STNK	499401.337	156320.391	31.097
STNL	499328.808	156362.191	31.500
STNM	499284.122	156339.547	36.074
STNP	499276.793	156347.795	36.921
STNQ	499264.024	156364.952	36.448

1:200

0m 2m 4m 8m 12m 20m

Revision	Description	Drawn	Checked	Date
A	UPDATED SURVEY FOLLOWING MINOR AMENDMENTS.	NC	SGB	15-10-2018

Preliminary ■ Information ■ Tender ■ Construction ■ As Built ■

Woods Hardwick
Architects, Engineers and Development Consultants

15-17 Goldington Road
Bedford
MK40 3NH
United Kingdom
T. +44 (0)1234 268862
F. +44 (0)1234 353034
mail@woodshardwick.com
www.woodshardwick.com

Title: EGLEY ROAD
WOKING

Details: TOPOGRAPHIC SURVEY
SHEET 3 of 4

Scale: 1-200 @ A0 Date: 05-10-2018 Drawn: NC Chk: SGB

0189-7-856A

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KEY

- Bottom of slope / batter
- Building
- Ditch bottom
- Dropped Kerb
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- Water meter
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SURVEY STATIONS : NATIONAL GPS GRID SF=1.000			
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STNQ	499264.024	156364.952	36.448

Notes

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Revision	Description	Drawn	Checked	Date
A	UPDATED SURVEY FOLLOWING MINOR AMENDMENTS.	NC	SGB	15-10-2018

Preliminary ☐ Information ☐ Tender ☐ Construction ☐ As Built ☐

1:200 (0m 2m 4m 8m 12m 20m)

Woods Hardwick
Architects, Engineers and Development Consultants

15-17 Goldington Road
Bedford
MK40 3NH
United Kingdom
T. +44 (0)1234 268862
F. +44 (0)1234 353034
mail@woodshardwick.com
www.woodshardwick.com

Title: EGLEY ROAD WOKING

Details: TOPOGRAPHIC SURVEY SHEET 4 of 4

Scale: 1-200 @ A0 Date: 05-10-2018 Drawn: NC Chk: SGB

0189-7-857A

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Appendix C: Drainage Strategy

PURPOSE

The purpose of this Design Statement is to describe how the surface water drainage strategy for the proposed redevelopment of the Egley Road site will manage runoff in a manner that will mitigate the risk of flooding and pollution to the environment.

SCOPE

This design addresses runoff from areas within the red line boundary for the planning application.

DESIGN CONSTRAINTS

A ground investigation has been carried out. A combination of high groundwater levels and low percolation rates indicates that infiltration will not be feasible. Refer to the main body of the report for a description of the ground investigations carried out at the site.

There is limited information on the drainage arrangements for the existing site. However, the topographic survey shows a number of surface water sewers within the site and indicates that these are likely to be connected to the existing public surface water sewer in the adjacent access road to Hoe Valley School.

In pre-application discussions with the Lead Local Flood Authority it has been stipulated that runoff from the site should be limited as close as practicable to greenfield conditions.

The proposed site will have two distinct functions; the main area of the site will be developed with a new health club, while the remainder is to be used for residential development. It is a requirement that the drainage system for the heath club be separate from that of the residential development.

DESIGN STANDARDS

The proposed surface water drainage system is to be designed to ensure that all runoff from the 100year rainfall event plus a 40% increase in rainfall intensity is managed in accordance with DEFRA's Technical Standards for Sustainable Drainage Systems.

DESIGN - STRATEGY

It is proposed to attenuate runoff prior to discharge to the public surface water sewer. Attenuation will be provided in:

- the granular material beneath permeable paving;
- lined geocellular tanks.

The rate of discharge from the site will be controlled by means of a Hydro-Brake.

The proposed drainage layout is shown on drawing SK100 in Appendix B.

DESIGN - DETAIL

Volumetric Control

The MicroDrainage software suite has been used to model the performance of the proposed drainage system. The model and simulation results are included in Appendix A.

Treatment Design

The pollution treatment requirements for the site have been established using the Simple Index Approach set out in Table 26.1 of the SUDS Manual.

Pollution hazard levels have been derived From Table 26.2 and are shown in the following table.

Land Use	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydro-Carbons**
Roads with more than 300 vehicle movements/day	Medium	0.7	0.6	0.7
Residential roofs	Very low	0.2	0.2	0.05

Table 1 – Pollution Hazard Indices

The following table shows how runoff from the above areas will be treated. The figure in brackets is the target level of treatment.

Land Use	**Treatment**	**Total Suspended Solids (TSS)**	**Metals**	**Hydro-Carbons**
Roads with more than 300 vehicle movements/day	Permeable paving	0.7 (0.7) OK	0.6 (0.6) OK	0.7 (0.7) OK
Residential roofs	Bioretention areas (i.e. rain gardens and tree pits)	0.2 (0.8) OK	0.2 (0.8) OK	0.05 (0.8) OK

Table 2 – Proposed SuDS Mitigation Indices

Comparing the pollution hazard indices in Table 1 with the mitigation indices in Table 2 indicates that the proposed treatment measures are appropriate for the site use.

Compliance with Technical Standards for Sustainable Drainage Systems

The following sections describe how the proposed surface water drainage system meets the requirements of the DEFRA document Non-Statutory Technical Standards for Sustainable Drainage Systems.

S1 *Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (**S2** and **S3** below) and volume control technical standards (**S4** and **S6** below) need not apply*

There are no water bodies in the vicinity of the proposed development that are capable of accommodating uncontrolled runoff without increasing flood risk.

S2 *For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.*

Not applicable – brownfield site.

S3 *For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.*

Greenfield runoff rates for the existing site area have been estimated using the MicroDrainage software suite (see Appendix A) and are shown in the following table.

Return Period (years)	Runoff (l/s)
Qbar	9.92
1	8.43
30	22.47
100	31.63

Table 3 – Greenfield Runoff Rates for Entire Site

At present almost the entire site comprises a permeable stone surface, the only exception being a single building with a footprint of 465m^2. The runoff from the building appears to discharge to the public surface water sewer. Rates of runoff have been calculated using a simple MicroDrainage model and are summarised in the following table. Model printouts are included in Appendix A.

Return Period (years)	Runoff (l/s)
Qbar	-
1	8.0
30	19.7
100	24.8
100+40%	31.1

Table 4 – Estimate of Discharge Rates to the Public Sewer

In view of the fact that runoff characteristics for the site almost replicate the greenfield condition it is proposed to limit discharge rates to greenfield rates.

S4 *Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.*

Not applicable – brownfield site.

S5 *Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6-hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.*

Not practicable due to significant increase in impermeable areas, and ground conditions are not conducive to the use of concentrated infiltration techniques.

S6 *Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with* ***S4*** *or* ***S5*** *above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.*

From the calculation in Appendix A it can be seen that the increase in the volume of runoff for the 100year, 6-hour rainfall event is approximately 724m^3. To mitigate flood risk arising from the increase in volume it is proposed to limit the rate of discharge from the site to Qbar.

S7 *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.*

The drainage system has been designed such that runoff from all events up to the 100year +40% will be stored below ground level. Refer to the MicroDrainage outputs in Appendix A.

S8 *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.*

See S7 above.

S9 *The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100year rainfall event are managed in exceedance routes that minimise the risks to people and property.*

Refer to Section 4.10 in the main body of the report.

S10 *Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.*

Where practicable the drainage system will be located beyond the zone of influence of adjacent foundations. Where this is not practicable, foundations will be designed to allow for the replacement of the drainage system without the need for special support.

S11 *The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.*

The surface water system will be designed in accordance with the SuDS Manual. The design will allow for replacement of component parts without long-term detriment to the performance of the system.

S12 *Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.*

Runoff will generally be disposed of by means of gravity.

S13 *The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.*

Connections to the existing drainage system will be made only by appropriately qualified and licensed contractors.

S14 *Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.*

See S13 above.

APPENDIX A

CALCULATIONS

1. Greenfield runoff rates
2. MicroDrainage printout for proposed drainage system - 100year +40% rainfall event
3. MicroDrainage printout for proposed drainage system – 100yr-6hr
4. MicroDrainage printout for existing drainage system - 100year +40% rainfall event

1. Greenfield Runoff Rates

Pitman Associates Ltd		Page 1
South Lodge Exminster Devon EX6 8AT		Micro Drainage
Date 01/09/2019 16:27 File	Designed by Karl Checked by	
XP Solutions	Source Control 2019.1	

IH 124 Mean Annual Flood

Input

Return Period (years)	1	Soil	0.400
Area (ha)	50.000	Urban	0.000
SAAR (mm)	700	Region Number	Region 6

Results	l/s
QBAR Rural	170.1
QBAR Urban	170.1
Q1 year	144.6
Q1 year	144.6
Q2 years	149.9
Q5 years	217.7
Q10 years	275.6
Q20 years	340.8
Q25 years	365.4
Q30 years	385.5
Q50 years	445.7
Q100 years	542.7
Q200 years	637.9
Q250 years	668.6
Q1000 years	877.8

Pro-rata for health club site area (2.221ha):

Qbar = 7.56l/s

1yr = 6.42l/s

30yr = 17.12l/s

100yr = 24.10l/s

Pro-rata for residential site area (0.694ha):

Qbar = 2.36l/s

1yr = 2.01l/s

30yr = 5.35l/s

100yr = 7.53l/s

2. MicroDrainage printout for proposed drainage system 100year +40% rainfall event

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	45.000	0.750	60.0	0.217	4.00	0.0	0.600		o	450	Pipe/Conduit	
S1.001	50.000	0.750	66.7	0.298	0.00	0.0	0.600		o	450	Pipe/Conduit	
S2.000	10.000	2.150	4.7	0.280	12.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	25.000	0.100	250.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S1.003	45.000	0.500	90.0	0.104	0.00	0.0	0.600		o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	75.00	4.29	30.700	0.217	0.0	0.0	0.0	2.63	418.0	44.1
S1.001	75.00	4.62	29.950	0.515	0.0	0.0	0.0	2.49	396.5	104.6
S2.000	75.00	12.04	31.650	0.280	0.0	0.0	0.0	4.71	83.2	56.9
S1.002	75.00	12.36	29.200	0.795	0.0	0.0	0.0	1.28	203.8	161.5
S1.003	75.00	12.71	29.100	0.899	0.0	0.0	0.0	2.14	341.0	182.6

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	65.000	1.600	40.6	0.466	4.00	0.0	0.600		o	450	Pipe/Conduit	
S3.001	33.000	0.400	82.5	0.086	0.00	0.0	0.600		o	450	Pipe/Conduit	
S3.002	6.000	0.100	60.0	0.126	0.00	0.0	0.600		o	450	Pipe/Conduit	
S4.000	8.000	0.200	40.0	0.250	12.00	0.0	0.600		o	225	Pipe/Conduit	
S5.000	8.000	1.000	8.0	0.090	12.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	75.00	4.34	31.000	0.466	0.0	0.0	0.0	3.20	508.5	94.7
S3.001	75.00	4.58	29.400	0.552	0.0	0.0	0.0	2.24	356.2	112.1
S3.002	75.00	4.62	29.000	0.678	0.0	0.0	0.0	2.63	418.0	137.7
S4.000	75.00	12.06	30.700	0.250	0.0	0.0	0.0	2.07	82.5	50.8
S5.000	75.00	12.04	31.650	0.090	0.0	0.0	0.0	3.58	63.3	18.3

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	6.000	0.700	8.6	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S6.000	8.000	1.800	4.4	0.157	12.00	0.0	0.600		o	225	Pipe/Conduit	
S1.005	5.000	0.510	9.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S7.000	30.000	0.610	49.2	0.050	4.00	0.0	0.600		o	225	Pipe/Conduit	
S8.000	8.000	1.390	5.8	0.097	12.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	75.00	12.74	28.600	1.917	0.0	0.0	0.0	3.46	61.2«	389.4
S6.000	75.00	12.02	29.700	0.157	0.0	0.0	0.0	6.25	248.5	31.9
S1.005	75.00	12.77	27.900	2.074	0.0	0.0	0.0	3.24	57.2«	421.3
S7.000	75.00	4.27	28.000	0.050	0.0	0.0	0.0	1.87	74.3	10.2
S8.000	75.00	12.03	28.780	0.097	0.0	0.0	0.0	4.23	74.7	19.7

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	37.000	0.100	370.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.007	31.000	0.090	344.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.008	17.000	0.050	340.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S9.000	45.000	0.200	225.0	0.115	4.00	0.0		0.020	→[↓]		Cellular Storage	
S10.000	10.000	1.325	7.5	0.051	4.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	75.00	13.68	27.390	2.221	0.0	0.0	0.0	0.67	26.8«	451.1
S1.007	75.00	14.42	27.290	2.221	0.0	0.0	0.0	0.70	27.8«	451.1
S1.008	75.00	14.82	27.200	2.221	0.0	0.0	0.0	0.70	28.0«	451.1
S9.000	75.00	4.47	28.100	0.115	0.0	0.0	0.0	1.58	6025.6	23.4
S10.000	75.00	4.03	29.800	0.051	0.0	0.0	0.0	4.79	190.6	10.4

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.000	10.000	1.325	7.5	0.059	4.00	0.0	0.600		o	225	Pipe/Conduit	
S12.000	10.000	1.125	8.9	0.051	4.00	0.0	0.600		o	225	Pipe/Conduit	
S13.000	10.000	1.125	8.9	0.052	4.00	0.0	0.600		o	225	Pipe/Conduit	
S9.001	60.000	0.200	300.0	0.048	0.00	0.0		0.020	→[↓]		Cellular Storage	
S14.000	10.000	1.125	8.9	0.053	4.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S11.000	75.00	4.03	29.800	0.059	0.0	0.0	0.0	4.79	190.6	12.0
S12.000	75.00	4.04	29.600	0.051	0.0	0.0	0.0	4.42	175.6	10.4
S13.000	75.00	4.04	29.600	0.052	0.0	0.0	0.0	4.42	175.6	10.6
S9.001	75.00	5.20	27.900	0.376	0.0	0.0	0.0	1.37	5218.3	76.4
S14.000	75.00	4.04	28.900	0.053	0.0	0.0	0.0	4.42	175.6	10.8

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S15.000	10.000	1.125	8.9	0.055	4.00	0.0	0.600		o	225	Pipe/Conduit	
S16.000	10.000	0.625	16.0	0.045	4.00	0.0	0.600		o	225	Pipe/Conduit	
S17.000	10.000	0.625	16.0	0.050	4.00	0.0	0.600		o	225	Pipe/Conduit	
S9.002	60.000	0.300	200.0	0.024	0.00	0.0		0.020	→[↓]		Cellular Storage	
S9.003	16.000	0.150	106.7	0.054	0.00	0.0		0.050	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S15.000	75.00	4.04	28.900	0.055	0.0	0.0	0.0	4.42	175.6	11.2
S16.000	75.00	4.05	28.400	0.045	0.0	0.0	0.0	3.29	130.7	9.1
S17.000	75.00	4.05	28.400	0.050	0.0	0.0	0.0	3.29	130.7	10.2
S9.002	75.00	6.28	27.700	0.603	0.0	0.0	0.0	0.93	1325.8	122.5
S9.003	75.00	7.22	27.400	0.657	0.0	0.0	0.0	0.28	11.3«	133.4

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.000	10.000	0.600	16.7	0.037	4.00	0.0	0.600		o	225	Pipe/Conduit	
S9.004	19.000	0.100	190.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S18.000	75.00	4.05	27.850	0.037	0.0	0.0	0.0	3.22	128.1	7.5
S9.004	75.00	7.55	27.250	0.694	0.0	0.0	0.0	0.95	37.6«	141.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	32.250	1.550	Open Manhole	1350	S1.000	30.700	450				
S2	32.250	2.300	Open Manhole	1350	S1.001	29.950	450	S1.000	29.950	450	
S2	31.950	0.300	Open Manhole	1200	S2.000	31.650	150				
S2	31.950	2.750	Open Manhole	1350	S1.002	29.200	450	S1.001	29.200	450	
								S2.000	29.500	150	
S3	31.950	2.850	Open Manhole	1350	S1.003	29.100	450	S1.002	29.100	450	
S3	32.250	1.250	Open Manhole	1350	S3.000	31.000	450				
S3	31.950	2.550	Open Manhole	1350	S3.001	29.400	450	S3.000	29.400	450	
S4	31.950	2.950	Open Manhole	1350	S3.002	29.000	450	S3.001	29.000	450	
S9	31.000	0.300	Open Manhole	1200	S4.000	30.700	225				
S10	31.950	0.300	Open Manhole	1200	S5.000	31.650	150				
S7	31.000	2.400	Open Manhole	1350	S1.004	28.600	150	S1.003	28.600	450	
								S3.002	28.900	450	600
								S4.000	30.500	225	1975
								S5.000	30.650	150	2050
S12	30.000	0.300	Open Manhole	1200	S6.000	29.700	225				
S8	30.000	2.100	Open Manhole	1200	S1.005	27.900	150	S1.004	27.900	150	
								S6.000	27.900	225	
S11	29.080	1.080	Open Manhole	1200	S7.000	28.000	225				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S15	29.080	0.300	Open Manhole	1200	S8.000	28.780	150				
S9	29.080	1.690	Open Manhole	1200	S1.006	27.390	225	S1.005	27.390	150	
								S7.000	27.390	225	
								S8.000	27.390	150	
S17	28.700	1.410	Open Manhole	1200	S1.007	27.290	225	S1.006	27.290	225	
S18	28.200	1.000	Open Manhole	1200	S1.008	27.200	225	S1.007	27.200	225	
S	28.000	0.850	Open Manhole	0		OUTFALL		S1.008	27.150	225	
S1	31.000	2.900	Open Manhole	3000	S9.000	28.100					
S3	30.400	0.600	Open Manhole	1200	S10.000	29.800	225				
S5	30.400	0.600	Open Manhole	1200	S11.000	29.800	225				
S8	30.200	0.600	Open Manhole	1200	S12.000	29.600	225				
S9	30.200	0.600	Open Manhole	1200	S13.000	29.600	225				
S10	30.640	2.740	Open Manhole	3000	S9.001	27.900		S9.000	27.900		
								S10.000	28.475	225	
								S11.000	28.475	225	
								S12.000	28.475	225	
								S13.000	28.475	225	
S13	29.500	0.600	Open Manhole	1200	S14.000	28.900	225				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S12	29.500	0.600	Open Manhole	1200	S15.000	28.900	225				
S14	29.000	0.600	Open Manhole	1200	S16.000	28.400	225				
S15	29.000	0.600	Open Manhole	1200	S17.000	28.400	225				
S19	30.000	2.300	Open Manhole	3000	S9.002	27.700		S9.001	27.700		
								S14.000	27.775	225	
								S15.000	27.775	225	
								S16.000	27.775	225	
								S17.000	27.775	225	
S38	28.450	1.050	Open Manhole	3000	S9.003	27.400	225	S9.002	27.400		
S17	28.450	0.600	Open Manhole	1200	S18.000	27.850	225				
S40	28.200	0.950	Open Manhole	1200	S9.004	27.250	225	S9.003	27.250	225	
								S18.000	27.250	225	
S	28.000	0.850	Open Manhole	0		OUTFALL		S9.004	27.150	225	

No coordinates have been specified, layout information cannot be produced.

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o		S1	32.250	30.700	1.100	Open Manhole	1350
S1.001	o	450	S2	32.250	29.950	1.850	Open Manhole	1350
S2.000	o	150	S2	31.950	31.650	0.150	Open Manhole	1200
S1.002	o	450	S2	31.950	29.200	2.300	Open Manhole	1350
S1.003	o	450	S3	31.950	29.100	2.400	Open Manhole	1350
S3.000	o	450	S3	32.250	31.000	0.800	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	45.000	60.0	S2	32.250	29.950	1.850	Open Manhole	1350
S1.001	50.000	66.7	S2	31.950	29.200	2.300	Open Manhole	1350
S2.000	10.000	4.7	S2	31.950	29.500	2.300	Open Manhole	1350
S1.002	25.000	250.0	S3	31.950	29.100	2.400	Open Manhole	1350
S1.003	45.000	90.0	S7	31.000	28.600	1.950	Open Manhole	1350
S3.000	65.000	40.6	S3	31.950	29.400	2.100	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.001	o	450	S3	31.950	29.400	2.100	Open Manhole	1350
S3.002	o	450	S4	31.950	29.000	2.500	Open Manhole	1350
S4.000	o	225	S9	31.000	30.700	0.075	Open Manhole	1200
S5.000	o	150	S10	31.950	31.650	0.150	Open Manhole	1200
S1.004	o	150	S7	31.000	28.600	2.250	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.001	33.000	82.5	S4	31.950	29.000	2.500	Open Manhole	1350
S3.002	6.000	60.0	S7	31.000	28.900	1.650	Open Manhole	1350
S4.000	8.000	40.0	S7	31.000	30.500	0.275	Open Manhole	1350
S5.000	8.000	8.0	S7	31.000	30.650	0.200	Open Manhole	1350
S1.004	6.000	8.6	S8	30.000	27.900	1.950	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	o	225	S12	30.000	29.700	0.075	Open Manhole	1200
S1.005	o	150	S8	30.000	27.900	1.950	Open Manhole	1200
S7.000	o	225	S11	29.080	28.000	0.855	Open Manhole	1200
S8.000	o	150	S15	29.080	28.780	0.150	Open Manhole	1200
S1.006	o	225	S9	29.080	27.390	1.465	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	8.000	4.4	S8	30.000	27.900	1.875	Open Manhole	1200
S1.005	5.000	9.8	S9	29.080	27.390	1.540	Open Manhole	1200
S7.000	30.000	49.2	S9	29.080	27.390	1.465	Open Manhole	1200
S8.000	8.000	5.8	S9	29.080	27.390	1.540	Open Manhole	1200
S1.006	37.000	370.0	S17	28.700	27.290	1.185	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.007	o	225	S17	28.700	27.290	1.185	Open Manhole	1200
S1.008	o	225	S18	28.200	27.200	0.775	Open Manhole	1200
S9.000	→[↓]		S1	31.000	28.100	2.099	Open Manhole	3000
S10.000	o	225	S3	30.400	29.800	0.375	Open Manhole	1200
S11.000	o	225	S5	30.400	29.800	0.375	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.007	31.000	344.4	S18	28.200	27.200	0.775	Open Manhole	1200
S1.008	17.000	340.0	S	28.000	27.150	0.625	Open Manhole	0
S9.000	45.000	225.0	S10	30.640	27.900	1.939	Open Manhole	3000
S10.000	10.000	7.5	S10	30.640	28.475	1.940	Open Manhole	3000
S11.000	10.000	7.5	S10	30.640	28.475	1.940	Open Manhole	3000

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.000	o	225	S8	30.200	29.600	0.375	Open Manhole	1200
S13.000	o	225	S9	30.200	29.600	0.375	Open Manhole	1200
S9.001	→[↓]		S10	30.640	27.900	1.939	Open Manhole	3000
S14.000	o	225	S13	29.500	28.900	0.375	Open Manhole	1200
S15.000	o	225	S12	29.500	28.900	0.375	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.000	10.000	8.9	S10	30.640	28.475	1.940	Open Manhole	3000
S13.000	10.000	8.9	S10	30.640	28.475	1.940	Open Manhole	3000
S9.001	60.000	300.0	S19	30.000	27.700	1.499	Open Manhole	3000
S14.000	10.000	8.9	S19	30.000	27.775	2.000	Open Manhole	3000
S15.000	10.000	8.9	S19	30.000	27.775	2.000	Open Manhole	3000

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.000	o	225	S14	29.000	28.400	0.375	Open Manhole	1200
S17.000	o	225	S15	29.000	28.400	0.375	Open Manhole	1200
S9.002	→[↓]		S19	30.000	27.700	1.999	Open Manhole	3000
S9.003	o	225	S38	28.450	27.400	0.825	Open Manhole	3000
S18.000	o	225	S17	28.450	27.850	0.375	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.000	10.000	16.0	S19	30.000	27.775	2.000	Open Manhole	3000
S17.000	10.000	16.0	S19	30.000	27.775	2.000	Open Manhole	3000
S9.002	60.000	200.0	S38	28.450	27.400	0.749	Open Manhole	3000
S9.003	16.000	106.7	S40	28.200	27.250	0.725	Open Manhole	1200
S18.000	10.000	16.7	S40	28.200	27.250	0.725	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S9.004	o	225	S40	28.200	27.250	0.725	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S9.004	19.000	190.0	S	28.000	27.150	0.625	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.008	S	28.000	27.150	0.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S9.004	S	28.000	27.150	0.000	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S7, DS/PN: S1.004, Volume (m³): 11.5

Unit Reference	MD-SHE-0103-5000-1200-5000	Sump Available	Yes
Design Head (m)	1.200	Diameter (mm)	103
Design Flow (l/s)	5.0	Invert Level (m)	28.600
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0	Kick-Flo®	0.745	4.0
Flush-Flo™	0.354	5.0	Mean Flow over Head Range	-	4.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	0.600	4.7	1.600	5.7	2.600	7.2	5.000	9.8	7.500	11.8
0.200	4.7	0.800	4.1	1.800	6.0	3.000	7.7	5.500	10.2	8.000	12.2
0.300	5.0	1.000	4.6	2.000	6.3	3.500	8.3	6.000	10.7	8.500	12.6
0.400	5.0	1.200	5.0	2.200	6.6	4.000	8.8	6.500	11.1	9.000	12.9
0.500	4.9	1.400	5.4	2.400	6.9	4.500	9.3	7.000	11.5	9.500	13.3

Hydro-Brake® Optimum Manhole: S8, DS/PN: S1.005, Volume (m³): 2.7

Unit Reference	MD-SHE-0114-5000-0400-5000	Sump Available	Yes
Design Head (m)	0.400	Diameter (mm)	114
Design Flow (l/s)	5.0	Invert Level (m)	27.900
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	5.0	Kick-Flo®	0.312	4.5
Flush-Flo™	0.169	5.0	Mean Flow over Head Range	-	4.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.0	0.600	6.0	1.600	9.6	2.600	12.0	5.000	16.4	7.500	20.2
0.200	5.0	0.800	6.9	1.800	10.1	3.000	12.9	5.500	17.3	8.000	20.9
0.300	4.6	1.000	7.7	2.000	10.6	3.500	13.9	6.000	18.0	8.500	21.5
0.400	5.0	1.200	8.3	2.200	11.1	4.000	14.8	6.500	18.8	9.000	22.1
0.500	5.5	1.400	9.0	2.400	11.6	4.500	15.6	7.000	19.5	9.500	22.7

Hydro-Brake® Optimum Manhole: S9, DS/PN: S1.006, Volume (m³): 3.2

Unit Reference	MD-SHE-0135-7500-0400-7500	Objective	Minimise upstream storage
Design Head (m)	0.400	Application	Surface
Design Flow (l/s)	7.5	Sump Available	Yes
Flush-Flo™	Calculated	Diameter (mm)	135

Hydro-Brake® Optimum Manhole: S9, DS/PN: S1.006, Volume (m³): 3.2

Invert Level (m) 27.390 Suggested Manhole Diameter (mm) 1200
Minimum Outlet Pipe Diameter (mm) 150

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	7.5	Kick-Flo®	0.327	6.8
Flush-Flo™	0.197	7.5	Mean Flow over Head Range	-	5.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.9	0.600	9.1	1.600	14.4	2.600	18.2	5.000	24.8	7.500	30.5
0.200	7.5	0.800	10.4	1.800	15.3	3.000	19.5	5.500	26.1	8.000	31.5
0.300	7.1	1.000	11.5	2.000	16.0	3.500	21.0	6.000	27.2	8.500	32.5
0.400	7.5	1.200	12.6	2.200	16.8	4.000	22.4	6.500	28.4	9.000	33.4
0.500	8.3	1.400	13.5	2.400	17.5	4.500	23.5	7.000	29.4	9.500	34.3

Hydro-Brake® Optimum Manhole: S19, DS/PN: S9.002, Volume (m³): 234.2

Unit Reference	MD-SHE-0060-2000-1600-2000	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	60
Design Flow (l/s)	2.0	Invert Level (m)	27.700
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Hydro-Brake® Optimum Manhole: S19, DS/PN: S9.002, Volume (m³): 234.2

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	2.0	Kick-Flo®	0.536	1.2
Flush-Flo™	0.263	1.5	Mean Flow over Head Range	-	1.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	0.600	1.3	1.600	2.0	2.600	2.5	5.000	3.4	7.500	4.1
0.200	1.5	0.800	1.5	1.800	2.1	3.000	2.7	5.500	3.5	8.000	4.2
0.300	1.5	1.000	1.6	2.000	2.2	3.500	2.9	6.000	3.7	8.500	4.3
0.400	1.5	1.200	1.8	2.200	2.3	4.000	3.0	6.500	3.8	9.000	4.4
0.500	1.3	1.400	1.9	2.400	2.4	4.500	3.2	7.000	4.0	9.500	4.6

Hydro-Brake® Optimum Manhole: S40, DS/PN: S9.004, Volume (m³): 2.0

Unit Reference	MD-SHE-0070-2000-0800-2000	Sump Available	Yes
Design Head (m)	0.800	Diameter (mm)	70
Design Flow (l/s)	2.0	Invert Level (m)	27.250
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	2.0	Kick-Flo®	0.504	1.6
Flush-Flo™	0.240	2.0	Mean Flow over Head Range	-	1.7

Hydro-Brake® Optimum Manhole: S40, DS/PN: S9.004, Volume (m³): 2.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	0.600	1.8	1.600	2.7	2.600	3.4	5.000	4.7	7.500	5.6
0.200	2.0	0.800	2.0	1.800	2.9	3.000	3.7	5.500	4.9	8.000	5.8
0.300	2.0	1.000	2.2	2.000	3.0	3.500	3.9	6.000	5.1	8.500	6.0
0.400	1.9	1.200	2.4	2.200	3.2	4.000	4.2	6.500	5.3	9.000	6.2
0.500	1.6	1.400	2.6	2.400	3.3	4.500	4.4	7.000	5.5	9.500	6.3

Storage Structures for Storm

Porous Car Park Manhole: S2, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	31.650	Depression Storage (mm)	1
Max Percolation (l/s)	568.3	Width (m)	31.0	Evaporation (mm/day)	1
Safety Factor	2.0	Length (m)	66.0	Membrane Depth (mm)	100

Porous Car Park Manhole: S9, DS/PN: S4.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	30.700	Depression Storage (mm)	1
Max Percolation (l/s)	555.6	Width (m)	80.0	Evaporation (mm/day)	1
Safety Factor	2.0	Length (m)	25.0	Membrane Depth (mm)	100

Porous Car Park Manhole: S10, DS/PN: S5.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	31.650	Depression Storage (mm)	1
Max Percolation (l/s)	245.6	Width (m)	52.0	Evaporation (mm/day)	1
Safety Factor	2.0	Length (m)	17.0	Membrane Depth (mm)	100

Cellular Storage Manhole: S7, DS/PN: S1.004

Invert Level (m)	28.600	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000			Safety Factor	2.0

Cellular Storage Manhole: S7, DS/PN: S1.004

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1300.0	0.0	1.200	1300.0	0.0	1.201	0.0	0.0

Cellular Storage Manhole: S8, DS/PN: S1.005

Invert Level (m)	27.900	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000			Safety Factor	2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	500.0	0.0	0.400	500.0	0.0	0.401	0.0	0.0

Porous Car Park Manhole: S15, DS/PN: S8.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	28.780	Depression Storage (mm)	1
Max Percolation (l/s)	250.0	Width (m)	20.0	Evaporation (mm/day)	1
Safety Factor	2.0	Length (m)	45.0	Membrane Depth (mm)	100

Cellular Storage Manhole: S9, DS/PN: S1.006

Invert Level (m)	27.390	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000			Safety Factor	2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	200.0	0.0	0.400	200.0	0.0	0.401	0.0	0.0

Cellular Storage Pipe: S9.000

Manning's N 0.020 Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0
Invert Level (m) 28.100 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	225.0	0.0	0.800	225.0	0.0	0.801	0.0	0.0

Cellular Storage Pipe: S9.001

Manning's N 0.020 Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0
Invert Level (m) 27.900 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	300.0	0.0	0.800	300.0	0.0	0.801	0.0	0.0

Cellular Storage Pipe: S9.002

Manning's N 0.020 Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0
Invert Level (m) 27.700 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	300.0	0.0	0.300	300.0	0.0	0.301	0.0	0.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000		
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 10 Number of Real Time Controls 0

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.000	S1	15 Summer	100	+40%					30.905	-0.245	0.000	0.43		161.3
S1.001	S2	15 Summer	100	+40%	100/15 Summer				30.771	0.371	0.000	0.91		328.9
S2.000	S2	60 Summer	100	+40%					31.752	-0.048	0.000	0.79		58.7
S1.002	S2	15 Summer	100	+40%	100/15 Summer				30.195	0.545	0.000	1.94		330.7
S1.003	S3	1440 Summer	100	+40%	100/15 Summer				29.858	0.308	0.000	0.12		37.5

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
S1.000	S1	OK	
S1.001	S2	SURCHARGED	
S2.000	S2	FLOOD RISK	
S1.002	S2	SURCHARGED	
S1.003	S3	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S3.000	S3	15 Summer	100	+40%					31.392	-0.058	0.000	0.71		333.9
S3.001	S3	15 Summer	100	+40%	100/15 Summer				30.627	0.777	0.000	1.23		381.2
S3.002	S4	15 Summer	100	+40%	100/15 Summer				30.025	0.575	0.000	2.59		461.7
S4.000	S9	60 Summer	100	+40%					30.819	-0.106	0.000	0.55		34.7
S5.000	S10	30 Summer	100	+40%					31.717	-0.083	0.000	0.41		22.4
S1.004	S7	1440 Summer	100	+40%	1/120 Summer				29.800	1.050	0.000	0.10		5.2
S6.000	S12	30 Summer	100	+40%					29.788	-0.137	0.000	0.33		61.5
S1.005	S8	2880 Summer	100	+40%	100/60 Summer				28.297	0.247	0.000	0.11		5.0
S7.000	S11	15 Summer	100	+40%					28.117	-0.108	0.000	0.54		37.2
S8.000	S15	30 Summer	100	+40%					28.846	-0.084	0.000	0.40		26.1
S1.006	S9	480 Summer	100	+40%	100/30 Summer				27.775	0.160	0.000	0.29		7.4
S1.007	S17	60 Winter	100	+40%					27.371	-0.144	0.000	0.28		7.4
S1.008	S18	360 Summer	100	+40%					27.283	-0.142	0.000	0.30		7.4
S9.000	S1	7200 Summer	100	+40%					28.376	-0.525	0.000	0.00		11.8
S10.000	S3	15 Summer	100	+40%					29.874	-0.151	0.000	0.24		38.0
S11.000	S5	15 Summer	100	+40%					29.880	-0.145	0.000	0.28		43.9
S12.000	S8	15 Summer	100	+40%					29.678	-0.147	0.000	0.26		38.0
S13.000	S9	15 Summer	100	+40%					29.678	-0.147	0.000	0.26		38.7
S9.001	S10	7200 Summer	100	+40%					28.376	-0.325	0.000	0.00		6.4
S14.000	S13	15 Summer	100	+40%					28.979	-0.146	0.000	0.27		39.5
S15.000	S12	15 Summer	100	+40%					28.981	-0.144	0.000	0.28		40.9
S16.000	S14	15 Summer	100	+40%					28.485	-0.140	0.000	0.31		33.5
S17.000	S15	15 Summer	100	+40%					28.491	-0.134	0.000	0.34		37.2
S9.002	S19	7200 Summer	100	+40%	100/15 Summer				28.376	0.375	0.000	0.00		2.1
S9.003	S38	600 Summer	100	+40%					27.563	-0.062	0.000	0.19		2.2

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
S3.000	S3	OK	
S3.001	S3	SURCHARGED	
S3.002	S4	SURCHARGED	
S4.000	S9	FLOOD RISK	
S5.000	S10	FLOOD RISK	
S1.004	S7	SURCHARGED	
S6.000	S12	FLOOD RISK	
S1.005	S8	SURCHARGED	
S7.000	S11	OK	
S8.000	S15	FLOOD RISK	
S1.006	S9	SURCHARGED	
S1.007	S17	OK	
S1.008	S18	OK	
S9.000	S1	OK	
S10.000	S3	OK	
S11.000	S5	OK	
S12.000	S8	OK	
S13.000	S9	OK	
S9.001	S10	OK	
S14.000	S13	OK	
S15.000	S12	OK	
S16.000	S14	OK	
S17.000	S15	OK	
S9.002	S19	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
S9.003	S38	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S18.000	S17	15 Summer	100	+40%	100/15 Summer				28.170	0.095	0.000	0.22		23.5
S9.004	S40	15 Summer	100	+40%	1/15 Summer				28.138	0.663	0.000	0.06		2.1

PN	US/MH Name	Status	Level Exceeded
S18.000	S17	FLOOD RISK	
S9.004	S40	FLOOD RISK	

Discharge Wizard Results for Storm

Summary

Discharge Rates Check - Pass

Discharge Volumes Check - Fail

Minimal Discharge Check - Not Run

Discharge Rates Check

PN	RP(yrs)/ CC(%)	Pre-development Discharge Rate (l/s)	Post-development Discharge Rate (l/s)	Pass/Fail
1.008	1yr +0%	6.4	5.5	Pass
1.008	100yr +40%	7.5	7.4	Pass
9.004	1yr +0%	2.0	2.0	Pass
9.004	100yr +40%	2.3	2.1	Pass

Discharge Volumes Check

PN	Volume Calculation Method	Pre-development Volume (m^3)	Post-development Volume (m^3)	Pass/Fail
1.008	Greenfield	499.494	836.464	Fail
9.004	Greenfield	156.078	277.743	Fail

(Pre-development runoff volume (except those marked with '*') for the 100 year, 360 minutes, Winter storm)

(Post-development runoff volume for the 100 year, 360 minutes, Winter storm with 0% climate change)

Discharge Wizard Results for Storm

Warning - The network was still discharging at the end of the discharge volume test and so it is unlikely the system has fully drained down. It is advisable you rerun the simulation using a longer analysis time to allow the system to fully drain down.

3. MicroDrainage printout for proposed drainage system – 100yr-6hr

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	35.000	1.630	21.5	0.046	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	35.000	0.650	53.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	75.00	4.27	29.430	0.046	0.0	0.0	0.0	2.18	38.6	9.3
S1.001	75.00	4.69	27.800	0.046	0.0	0.0	0.0	1.37	24.3	9.3

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	29.850	0.420	Open Manhole	1200	S1.000	29.430	150				
S2	28.500	0.700	Open Manhole	1200	S1.001	27.800	150	S1.000	27.800	150	
S	27.980	0.830	Open Manhole	0		OUTFALL		S1.001	27.150	150	

No coordinates have been specified, layout information cannot be produced.

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	29.850	29.430	0.270	Open Manhole	1200
S1.001	o	150	S2	28.500	27.800	0.550	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	35.000	21.5	S2	28.500	27.800	0.550	Open Manhole	1200
S1.001	35.000	53.8	S	27.980	27.150	0.680	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.001	S	27.980	27.150	0.000	0	0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	1	+0%	100/15 Summer				29.478
S1.001	S2	15 Summer	1	+0%	99/15 Summer				27.861

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.102	0.000	0.22		8.2	OK	
S1.001	S2	-0.089	0.000	0.34		8.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+0%	100/15 Summer				29.509
S1.001	S2	15 Summer	30	+0%	99/15 Summer				27.908

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.071	0.000	0.54		20.2	OK	
S1.001	S2	-0.042	0.000	0.84		19.7	OK	

99 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	99	+0%	100/15 Summer				29.523
S1.001	S2	15 Summer	99	+0%	99/15 Summer				28.032

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.057	0.000	0.70		26.1	OK	
S1.001	S2	0.082	0.000	1.06		24.8	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+40%	100/15 Summer				29.635
S1.001	S2	15 Summer	100	+40%	99/15 Summer				28.447

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.055	0.000	0.89		33.0	FLOOD RISK	
S1.001	S2	0.497	0.000	1.33		31.1	FLOOD RISK	

Discharge Wizard Results for Storm

Summary

Discharge Rates Check - Fail

Discharge Volumes Check - Not Run

Minimal Discharge Check - Not Run

Discharge Rates Check

PN	RP(yrs)/ CC(%)	Pre-development Discharge Rate (l/s)	Post-development Discharge Rate (l/s)	Pass/Fail
1.001	1yr +0%	1.0	8.0	Fail
1.001	30yr +0%	1.0	19.7	Fail
1.001	99yr +0%	1.0	24.8	Fail
1.001	100yr +40%	1.0	31.1	Fail

4. MicroDrainage printout for existing drainage system - 100year +40% rainfall event

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	35.000	1.630	21.5	0.046	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	35.000	0.650	53.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	75.00	4.27	29.430	0.046	0.0	0.0	0.0	2.18	38.6	9.3
S1.001	75.00	4.69	27.800	0.046	0.0	0.0	0.0	1.37	24.3	9.3

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	29.850	0.420	Open Manhole	1200	S1.000	29.430	150				
S2	28.500	0.700	Open Manhole	1200	S1.001	27.800	150	S1.000	27.800	150	
S	27.980	0.830	Open Manhole	0		OUTFALL		S1.001	27.150	150	

No coordinates have been specified, layout information cannot be produced.

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	29.850	29.430	0.270	Open Manhole	1200
S1.001	o	150	S2	28.500	27.800	0.550	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	35.000	21.5	S2	28.500	27.800	0.550	Open Manhole	1200
S1.001	35.000	53.8	S	27.980	27.150	0.680	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.001	S	27.980	27.150	0.000	0	0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	1	+0%	100/15 Summer				29.478
S1.001	S2	15 Summer	1	+0%	99/15 Summer				27.861

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.102	0.000	0.22		8.2	OK	
S1.001	S2	-0.089	0.000	0.34		8.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+0%	100/15 Summer				29.509
S1.001	S2	15 Summer	30	+0%	99/15 Summer				27.908

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.071	0.000	0.54		20.2	OK	
S1.001	S2	-0.042	0.000	0.84		19.7	OK	

99 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	99	+0%	100/15 Summer				29.523
S1.001	S2	15 Summer	99	+0%	99/15 Summer				28.032

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.057	0.000	0.70		26.1	OK	
S1.001	S2	0.082	0.000	1.06		24.8	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 99, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+40%	100/15 Summer				29.635
S1.001	S2	15 Summer	100	+40%	99/15 Summer				28.447

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.055	0.000	0.89		33.0	FLOOD RISK	
S1.001	S2	0.497	0.000	1.33		31.1	FLOOD RISK	

Discharge Wizard Results for Storm

Summary

Discharge Rates Check - Fail

Discharge Volumes Check - Not Run

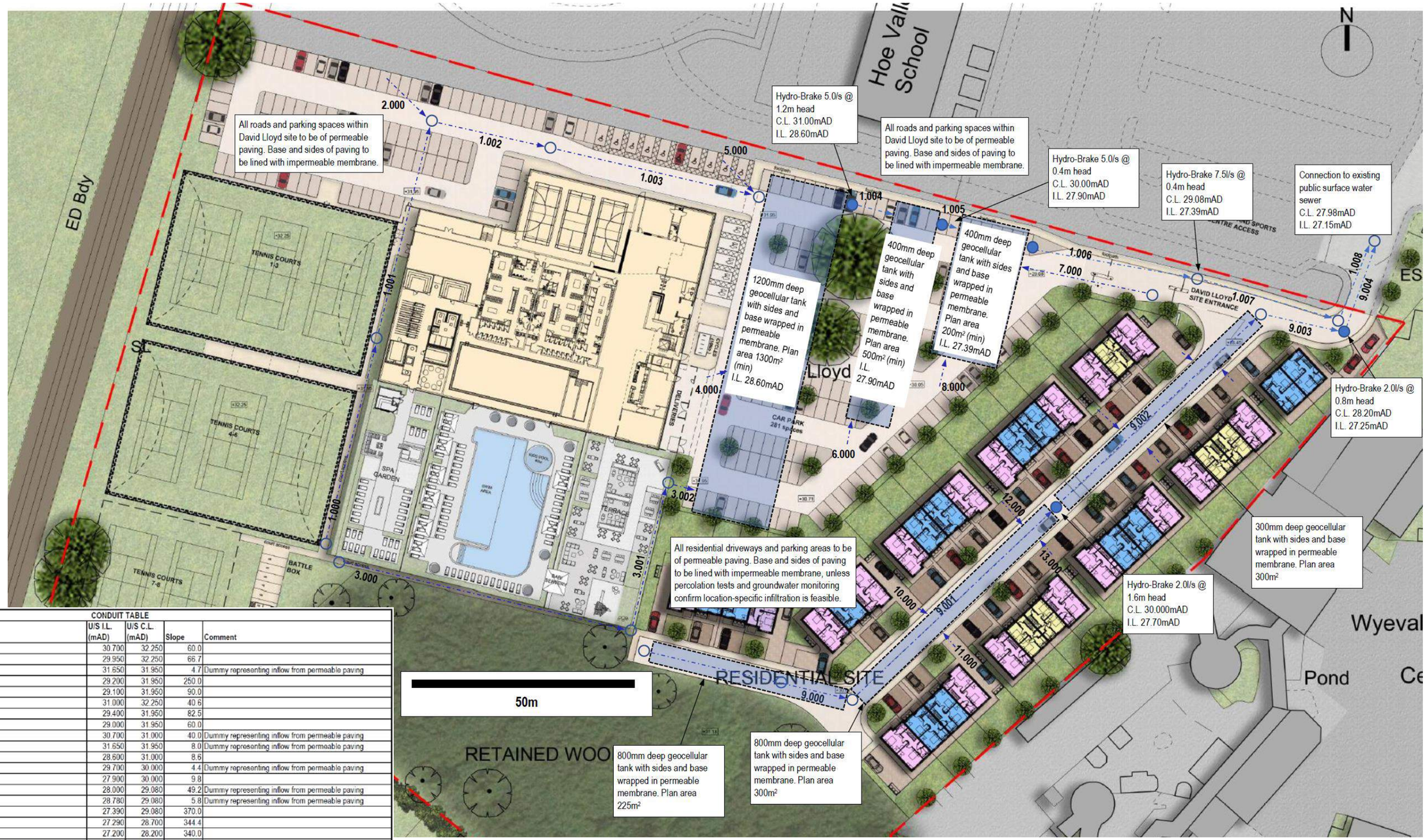
Minimal Discharge Check - Not Run

Discharge Rates Check

PN	RP(yrs)/ CC(%)	Pre-development Discharge Rate (l/s)	Post-development Discharge Rate (l/s)	Pass/Fail
1.001	1yr +0%	1.0	8.0	Fail
1.001	30yr +0%	1.0	19.7	Fail
1.001	99yr +0%	1.0	24.8	Fail
1.001	100yr +40%	1.0	31.1	Fail

APPENDIX B
DRAWINGS

SK100 Surface Water Layout
SK101 Surface Water – Area Take-Off



CONDUIT TABLE

Ref	Length (m)	Form	U/S I.L. (mAD)	U/S C.L. (mAD)	Slope	Comment
1.000	45.0	450mm dia. pipe	30.700	32.250	60.0	
1.001	50.0	450mm dia. pipe	29.950	32.250	66.7	
2.000	10.0	150mm dia. pipe	31.650	31.950	4.7	Dummy representing inflow from permeable paving
1.002	25.0	450mm dia. pipe	29.200	31.950	250.0	
1.003	45.0	450mm dia. pipe	29.100	31.950	90.0	
3.000	65.0	450mm dia. pipe	31.000	32.250	40.6	
3.001	33.0	450mm dia. pipe	29.400	31.950	82.5	
3.002	6.0	450mm dia. pipe	29.000	31.950	60.0	
4.000	8.0	225mm dia. pipe	30.700	31.000	40.0	Dummy representing inflow from permeable paving
5.000	8.0	150mm dia. pipe	31.650	31.950	8.0	Dummy representing inflow from permeable paving
1.004	6.0	150mm dia. pipe	28.600	31.000	8.6	
6.000	8.0	225mm dia. pipe	29.700	30.000	4.4	Dummy representing inflow from permeable paving
1.005	5.0	150mm dia. pipe	27.900	30.000	9.8	
7.000	30.0	225mm dia. pipe	28.000	29.080	49.2	Dummy representing inflow from permeable paving
8.000	8.0	150mm dia. pipe	28.780	29.080	5.8	Dummy representing inflow from permeable paving
1.006	37.0	225mm dia. pipe	27.390	29.080	370.0	
1.007	31.0	225mm dia. pipe	27.290	28.700	344.4	
1.008	17.0	225mm dia. pipe	27.200	28.200	340.0	
9.000	45.0	800mm high x 5000mm wide geocellular conduit	28.100	31.000	225.0	
10.000	10.0	225mm dia. pipe	29.800	30.400	7.5	
11.000	10.0	225mm dia. pipe	29.800	30.400	7.5	
12.000	10.0	225mm dia. pipe	29.600	30.200	8.9	
13.000	10.0	225mm dia. pipe	29.600	30.200	8.9	
9.001	60.0	800mm high x 5000mm wide geocellular conduit	27.900	30.640	300.0	
14.000	10.0	225mm dia. pipe	28.900	29.500	8.9	
15.000	10.0	225mm dia. pipe	28.900	29.500	8.9	
16.000	10.0	225mm dia. pipe	28.400	29.000	16.0	
17.000	10.0	225mm dia. pipe	28.400	29.000	16.0	
9.002	60.0	300mm high x 5000mm wide geocellular conduit	27.700	30.000	200.0	
9.003	16.0	225mm dia. pipe	27.400	28.450	106.7	
18.000	10.0	225mm dia. pipe	27.850	28.450	16.7	
9.004	19.0	225mm dia. pipe	27.250	28.200	190.0	

All geocellular conduits to have granular reinstatement with 30% void content. Tank and granular material to have sides and invert wrapped in impermeable membrane.

Revisions
A 07.09.2019 – Initial Issue

Project Nr 0394

Drg Nr/Rev SK100/A

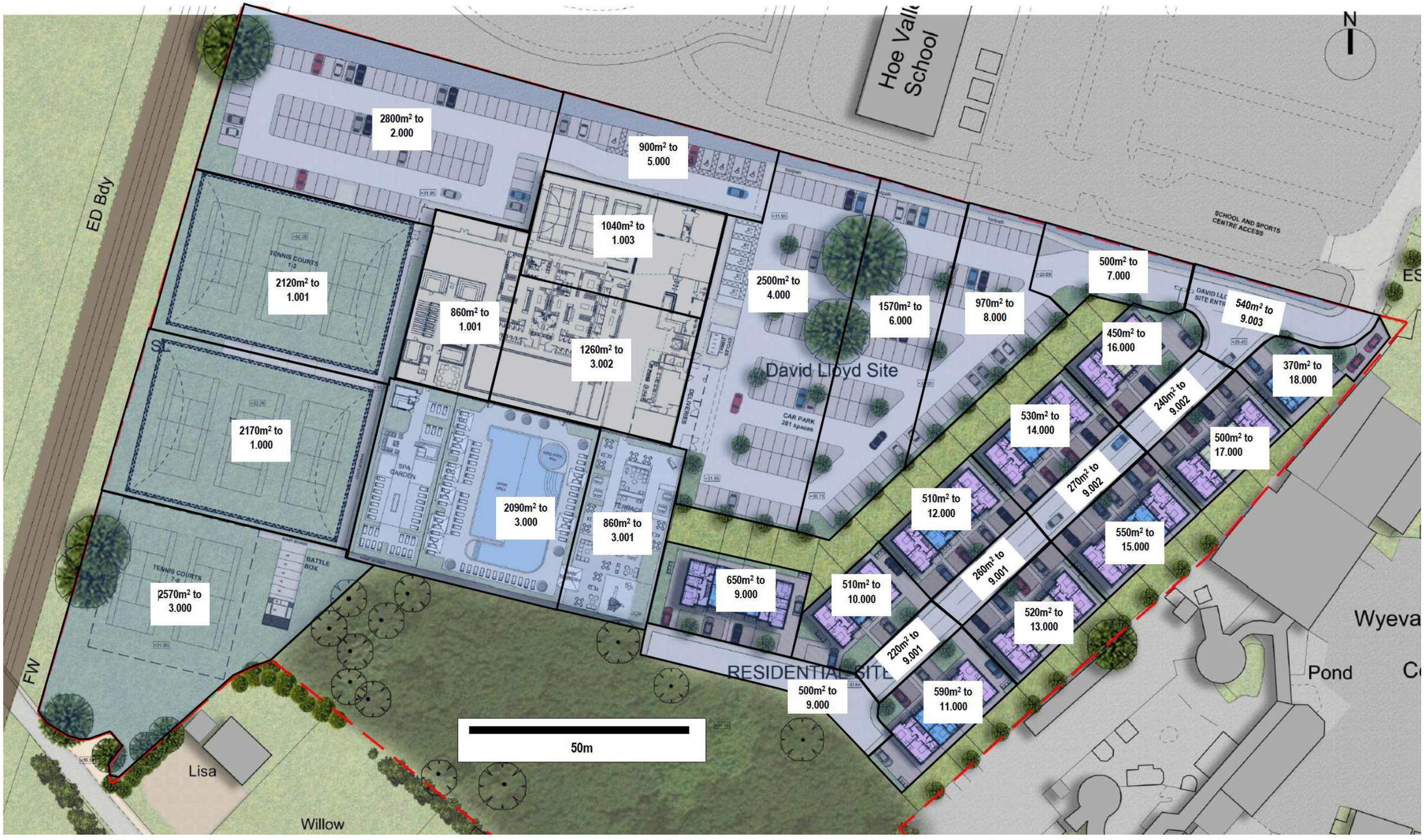
Status Planning Issue

CLIENT Goldev
PROJECT Egley Road, Woking
DRG TITLE **Surface Water Drainage Layout**
SCALE As shown

SOUTH LODGE
OLD DAWLISH ROAD
EXMINSTER DEVON EX6 8AT

Telephone: +44(0)1392 824616
Email: admin@pitmanassociates.com
pitmanassociates.com

pitman associates



Revisions A 07.09.2019 – Initial Issue	Project Nr	0394	CLIENT	Goldev	SOUTH LODGE OLD DAWLISH ROAD EXMINSTER DEVON EX6 8AT Telephone: +44(0)1392 824616 Email: admin@pitmanassociates.com pitmanassociates.com
	Drg Nr/Rev	SK101/A	PROJECT	Egley Road, Woking	
	Status	Planning Issue	DRG TITLE	**Surface Water Drainage – Area Take-Off**	
			SCALE	As shown	

Wayne Gold
Goldev Woking Ltd

JOMAS ASSOCIATES LTD
6-9 The Square
Stockley Park
Uxbridge
UB11 1FW

Tel: 0843-289-2187
Fax: 0872-115-4505

www.jomasassociates.com
info@jomasassociates.com

P1381J1459/AJH

27/06/2019

Dear Wayne,

EGLEY ROAD, WOKING, GU22 0AF: SOIL INFILTRATION TESTING

Jomas attended the above-mentioned site under instruction by Goldev Woking Ltd on 24th, 25th and 26th June 2019 to carry out soil infiltration testing in general accordance with BRE 365.

A full list of previous reports undertaken for the site by Jomas are detailed in Table 1 below:

Table 1: Previous Reports - Jomas

Title	Author	Reference	Date
Desk Study / Preliminary Risk Assessment Report For Land Adjacent To Egley Road Woking GU22 0NJ	Jomas Associates Ltd	P1381J1459/TE Final V1.0	August 2018
Geo-environmental & Geotechnical Assessment Ground Investigation Report for Egley Road, Woking, GU22 0AF	Jomas Associates Ltd	P1381J1549/AMM Final V1.0	11 April 2019
Supplementary Geo-environmental Assessment Ground Investigation Report for Egley Road, Woking, GU22 0AF	Jomas Associates Ltd	P1381J1549/AMM Final V1.0	25 June 2019

During the previous work the predominant soil type encountered at site was reported as sand considered to represent the Bagshot Formation. However these were locally noted to be clays and is considered likely to either represent clay bands/pockets within the Bagshot Formation, or were recovered as such due to the percussive nature of the drilling equipment further disturbing the samples.

7No. pits (STP1 – STP7) were excavated using a mechanical excavator (positions shown on the exploratory hole location plan in Appendix 1). STP1, STP2, STP3, STP4, STP5, STP6 and STP7 were excavated to depths of 1.0mbgl, 1.0mbgl, 1.0mbgl, 2.4mbgl, 2.4mbgl, 2.4mbgl and 2.4mbgl respectively.

An additional pit was excavated (TP8) to aid in determining ground conditions and specifically to observe groundwater levels. (position shown on the exploratory hole location plan in Appendix 1). Slight dampness was noted at 3.70mbgl. The pit was left open for 35 minutes, no water ingress was noted before backfilling.

The pits were then filled with water and allowed to drain over time, with the water level measured at intervals. As prescribed by BRE 365 the water in the pit should be allowed to drain until the water falls to at least 25%.However due to time constraints this was not always possible, where significant drainage had occurred the time required to drain to 25% was extrapolated, however in a number of cases the drainage was noted to be insignificant even after being left to drain over night.

Some general instability was noted in STP5 due to ascribed dimensions within the granular substrate. Subsequent hole collapse occurred during the test.

All locations and pit dimensions were specified to the clients requirements.

Ground Conditions

Full logs of the ground conditions observed in each of the pits are included in Appendix 2, however, a summary of the ground conditions is provided below:

Table 2: Ground Conditions Encountered

Stratum and Description	Encountered from (m bgl)	Base of strata (m bgl)	Thickness range (m)
Grass over mid-brown sandy slightly gravelly CLAY with rootlets/cobble content. Sand is fine. Gravel consists of medium to coarse, rounded to well-rounded flint. Cobble consist of rounded flint/angular brick. (MADE GROUND / TOPSOIL).	0.0	0.35-0.50	0.35-0.50
Grey heavily mottled orange brown very silty / slightly gravelly/ SAND with occasional roots and rootlets down to 1.25mbgl. Sand is medium to coarse. Gravel consists of fine to coarse, rounded to well rounded flint. (BAGSHOT FORMATION).	0.35-0.50	>1.00 – >3.40	>0.65-3.40

Infiltration Testing Results

1No. test was conducted for STP1, STP3, STP5 and STP7 , however each of these were deemed to be failed tests as “insufficient drainage” was noted in each of these locations, even though in an number of locations the tests ran over night.

1No. test carried out in each of STP4 and STP6 which reported infiltration rates of between

6.15×10^{-7} m/s and 6.28×10^{-7} m/s respectively, which is indicative of “poor drainage” with “low permeability”.

3No. tests were able to be completed in STP2 within the identified silty Sand stratum encountered from 0.35mbgl. The infiltration rates calculated from these tests in ranged between 5.66 x 10^{-6} m/s to 1.16 x 10^{-5} m/s

it is considered that the silty Sand in this area of the site has with “medium” to “poor” permeability with “good” to “poor” drainage conditions.

Although the material that the tests were undertaken in were described by the BGS and by the various phases of investigation by Jomas as a Sand, it is worth noting that the BGS classifies the Bagshot Formation as a “Solid deposit”. It is therefore possible that the lower than would normally be expected infiltration results recorded could potentially be due to the sand grains being cemented together and as such reducing both the porosity and permeability of these materials.

The reduction in infiltration rate is likely due to the soil pore spaces reaching saturation point after the first test. Subsequent tests would indicate that water is unable to effectively permeate away from the soakage pit as soils become water logged.

We trust that this is satisfactory for your current needs, however please do not hesitate to contact the udnersigned if we can be of further assistance on either this or any other project.

Yours sincerely,

approved by

Adam Hines BSc (Hons) MSc

Geo-Environmental Engineer

Peter Swettenham BSc (Hons) MSc PgCert CEnv MIEnvSc

Principal Geotechnical Engineer

Enc.

Appendix 1 – Figures

Appendix 2 – Exploratory Hole Logs

Appendix 3 – Infiltration Rates – Results and Calculations

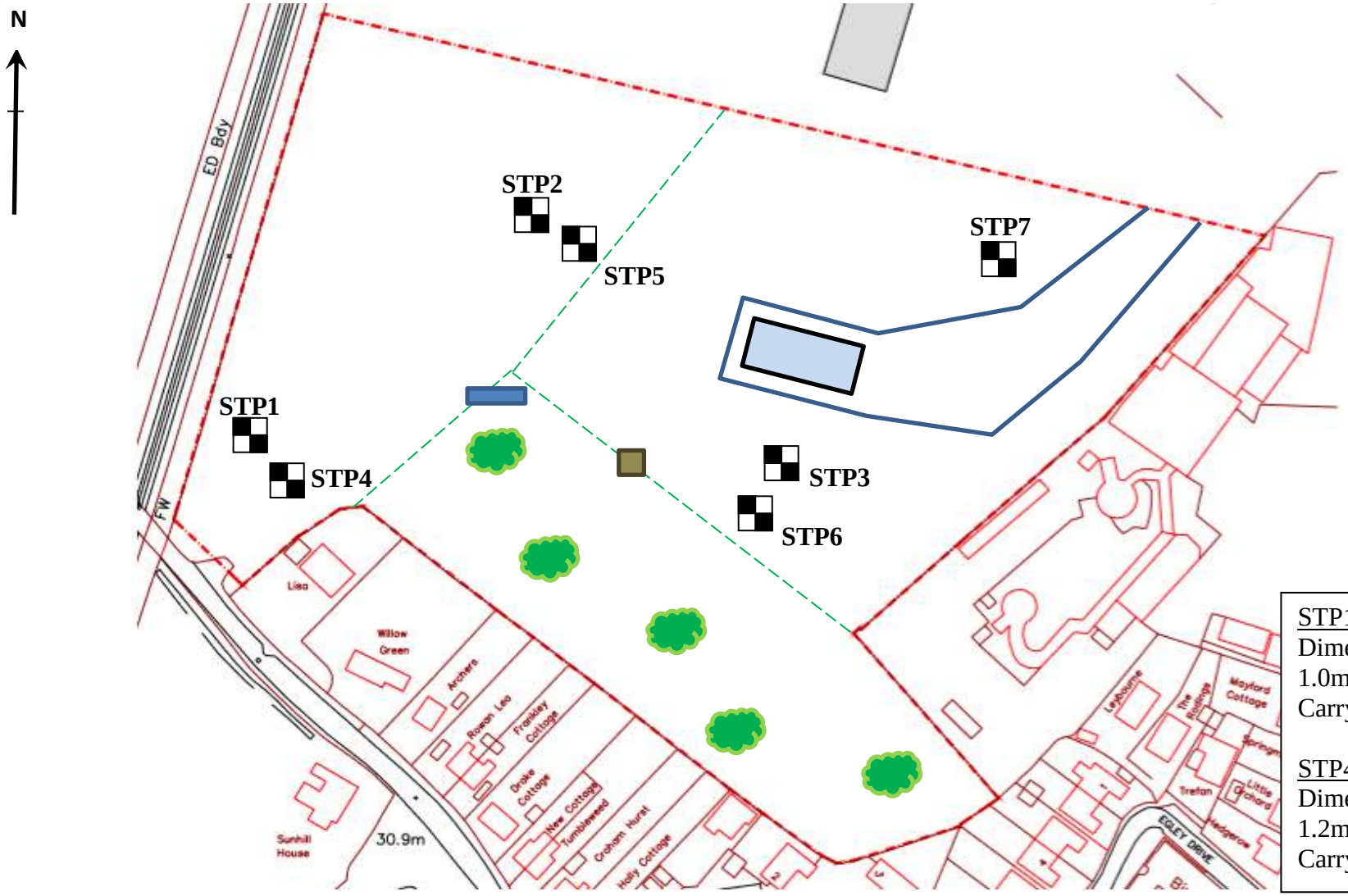
APPENDIX 1 – FIGURES

JOMAS ASSOCIATES LTD
T: 0843 289 2187

Project Name	Egley Road, Woking	**Client**	Goldev Woking Ltd
Project No.	P1381J1459	**Date**	15/08/2018
Title	Site Location Plan	**Figure No**	1

JOMAS ASSOCIATES LTD
T: 0843 289 2187

Project Name	Egley Road, Woking	**Client**	Goldev Woking Ltd
Project No.	P1381J1459	**Date**	June 2019
Title	Provisional Infiltration Testing Plan	**Prepared By**	AM



STP1 – STP3:
Dimensions:
1.0m L x 1.0m W x 1.0m D
Carry out tests from 0.4m bgl

STP4 – STP7:
Dimensions:
1.2m L x 0.30m W x 2.4m D
Carry out tests from 1.0m bgl

APPENDIX 2 – EXPLORATORY HOLE LOGS

TRIAL PIT RECORD

Exploratory Hole No:	STP1		
Site Address:	Egley Road, Woking, GU22 0AF	Project No:	P1381J1459
Client:	Goldev Woking Ltd	Ground Level:	
Logged By:	JLW	Date Commenced:	24/06/2019
Checked By:	PSw	Date Completed:	24/06/2019
Type and diameter of equipment:	JCB 3CX Eco	Sheet No:	1 Of 1

Pit Dimension:	Length:	1.80	Width:	0.95	Depth:	1.00

Remarks

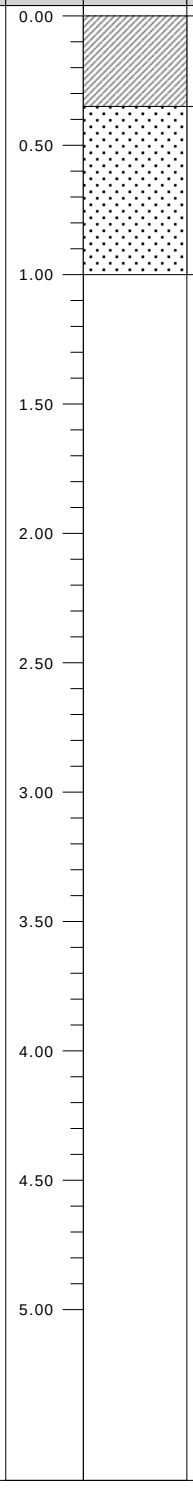
1: No water reported.

2: Infiltration test carried out in general accorancce with BRE 365.

3:

4:

Sample or Tests			Strata			
Type	Depth (mbgl)	Result	Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
				0.35		Grass over mid-brown very sandy gravelly CLAY with low cobble content. Sand is fine. Gravel consists of fine to coarse, rounded to well rounded flint. Cobble consist of rounded flint. (TOPSOIL).
				1.00		Grey heavily mottled orange brown very silty slightly gravelly SAND. Sand is medium to coarse. Gravel consists of fine to coarse, rounded to well rounded flint. (BAGSHOT FORMATION).



Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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TRIAL PIT RECORD

Exploratory Hole No:	STP2		
Site Address:	Egley Road, Woking, GU22 0AF	Project No:	P1381J1459
Client:	Goldev Woking Ltd	Ground Level:	
Logged By:	JLW	Date Commenced:	24/06/2019
Checked By:	PSw	Date Completed:	24/06/2019
Type and diameter of equipment:	JCB 3CX Eco	Sheet No:	1 Of 1

Pit Dimension:	Length:	1.70	Width:	1.00	Depth:	1.10

Remarks

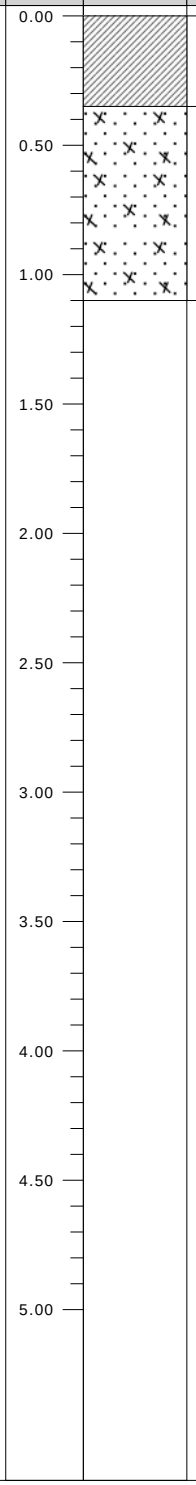
1: No water reported.

2: Infiltration tests carried out in general accorancce with BRE 365.

3:

4:

Sample or Tests			Strata			
Type	Depth (mbgl)	Result	Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
				0.35		Grass over mid-brown very sandy slightly gravelly CLAY with frequent rootlets. Sand is fine. Gravel consists of fine to coarse, rounded to well rounded flint. (TOPSOIL).
				1.10		Grey mottled orange brown very silty SAND with occasional pockets of sand. Sand is medium to coarse. (BAGSHOT FORMATION).



Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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TRIAL PIT RECORD

				Exploratory Hole No:	STP3		
Site Address:	Egley Road, Woking, GU22 0AF			Project No:	P1381J1459		
Client:	Goldev Woking Ltd			Ground Level:			
Logged By:	JLW			Date Commenced:	25/06/2019		
Checked By:	PSw			Date Completed:	25/06/2019		
Type and diameter of equipment:	JCB 3CX Eco			Sheet No:	1 Of 1		
Pit Dimension:	Length:	1.80	Width:	0.95	Depth:	1.00	

Remarks

1: No water reported.

2: Infiltration test carried out in general accorancce with BRE 365.

3:

4:

Sample or Tests				Strata			
Type	Depth (mbgl)	Result		Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
			0.00				Grass over mid-brown sandy gravelly clay with low cobble content and occasional rootlets. Sand is fine. Gravel consists of fine to coarse, angular to rounded flint and brick. Cobbles consist of angular brick. (MADE GROUND - Topsoil).
					0.50		
			0.50				Light brown to grey mottled orange brown silty SAND with occasional rootlets, wood fragments and slight organic odour. Sand is mediu mto coarse. (BAGSHOT FORMATION).
					1.00		
			1.00				
			1.50				
			2.00				
			2.50				
			3.00				
			3.50				
			4.00				
			4.50				
			5.00				

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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TRIAL PIT RECORD

				Exploratory Hole No:		STP4	
Site Address:	Egley Road, Woking, GU22 0AF			Project No:		P1381J1459	
Client:	Goldev Woking Ltd			Ground Level:			
Logged By:	JLW			Date Commenced:		24/06/2019	
Checked By:	PSw			Date Completed:		24/06/2019	
Type and diameter of equipment:	JCB 3CX Eco			Sheet No:		1 Of 1	
Pit Dimension:	Length:	1.60	Width:	0.35	Depth:	2.40	

Remarks

1: No water reported.

2: Infiltration test carried out in general accorancce with BRE 365.

3:

4:

Sample or Tests				Strata			
Type	Depth (mbgl)	Result		Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
			0.00		0.35		Grass over mid-brown sandy slightly gravelly CLAY with frequent rootlets. Sand is fine. Gravel consists of rounded flint. (TOPSOIL).
			0.50				Grey mottled orange brown very silty SAND. Sand is medium to coarse. (BAGSHOT FORMATION).
			1.00				
			1.50				
			2.00		2.40		
			2.50				
			3.00				
			3.50				
			4.00				
			4.50				
			5.00				

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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TRIAL PIT RECORD

Exploratory Hole No:	STP5		
Site Address:	Egley Road, Woking, GU22 0AF	Project No:	P1381J1459
Client:	Goldev Woking Ltd	Ground Level:	
Logged By:	JLW	Date Commenced:	24/06/2019
Checked By:	PSw	Date Completed:	24/06/2019
Type and diameter of equipment:	JCB 3CX Eco	Sheet No:	1 Of 1

Pit Dimension:	Length:	1.70	Width:	0.32	Depth:	2.40

Remarks

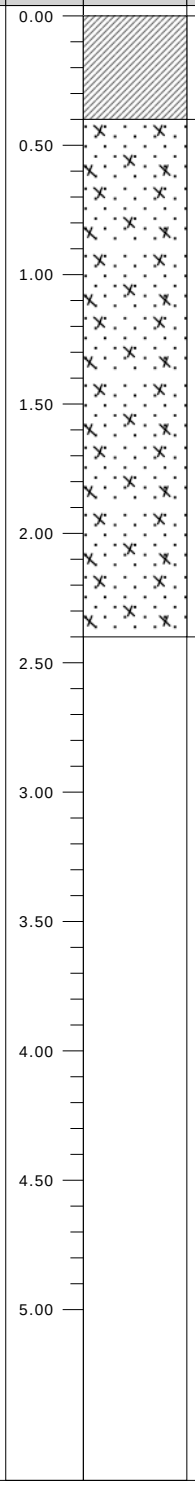
1: No water reported.

2: Infiltration test carried out in general accorancce with BRE 365.

3:

4:

Sample or Tests			Strata			
Type	Depth (mbgl)	Result	Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
				0.40		Grass over mid-brown sandy slightly gravelly CLAY with frequent rootlets. Sand is fine. Gravel consists of medium to coarse, rounded to well rounded flint. (TOPSOIL).
				2.40		Grey mottled becoming slightly mottled orange brown very silty becoming slightly silty SAND. Sand is medium to coarse. (BAGSHOT FORMATION).



Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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TRIAL PIT RECORD

				Exploratory Hole No:		STP6	
Site Address:	Egley Road, Woking, GU22 0AF			Project No:		P1381J1459	
Client:	Goldev Woking Ltd			Ground Level:			
Logged By:	JLW			Date Commenced:		25/06/2019	
Checked By:	PSw			Date Completed:		25/06/2019	
Type and diameter of equipment:	JCB 3CX Eco			Sheet No:		1 Of 1	
Pit Dimension:	Length:	1.80	Width:	0.35	Depth:	2.43	

Remarks

1: No water reported.

2: Infiltration test carried out in general accorancce with BRE 365.

3:

4:

Sample or Tests				Strata			
Type	Depth (mbgl)	Result		Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
			0.00		0.45		Grass over mid-brown very sandy slightly gravelly clay with frequent rootlets and occasional roots. Sand is fine. Gravel consists of fine to coarse, rounded flint with occasional angular brick. (MADE GROUND - Topsoil).
			0.50		2.45		Light brown to grey mottled orange brown very silty becoming slightly silty SAND with occasional roots and rootlets down to 1.25mbgl. Sand is medium to coarse. (BAGSHOT FORMATION).
			1.00				
			1.50				
			2.00				
			2.50				
			3.00				
			3.50				
			4.00				
			4.50				
			5.00				

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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TRIAL PIT RECORD

Exploratory Hole No:	STP7		
Site Address:	Egley Road, Woking, GU22 0AF	Project No:	P1381J1459
Client:	Goldev Woking Ltd	Ground Level:	
Logged By:	JLW	Date Commenced:	25/06/2019
Checked By:		Date Completed:	25/06/2019
Type and diameter of equipment:	JCB 3CX Eco	Sheet No:	1 Of 1

Pit Dimension:	Length:	1.60	Width:	0.35	Depth:	2.40

Remarks

1: No water reported.

2: Infiltration test carried out in general accorancce with BRE 365.

3:

4:

Sample or Tests				Strata			
Type	Depth (mbgl)	Result		Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
			0.00				Grass over mid-brown very sandy gravelly clay with rootlets. Sand is fine. Gravel consists of fine to coarse, angular to rounded flint and brick. (MADE GROUND - Topsoil).
					0.50		
			0.50				Light brown mottled becoming slightly mottled orange brown very silty becoming slightly silty SAND. Sand is medium to coarse. (BAGSHOT FORMATION).
			1.00				
			1.50				
			2.00				
					2.40		
			2.50				
			3.00				
			3.50				
			4.00				
			4.50				
			5.00				

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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TRIAL PIT RECORD

Exploratory Hole No:	TP8 - OBS		
Site Address:	Egley Road, Woking, GU22 0AF	Project No:	P1381J1459
Client:	Goldev Woking Ltd	Ground Level:	
Logged By:	JLW	Date Commenced:	24/06/2019
Checked By:		Date Completed:	24/06/2019
Type and diameter of equipment:	JCB 3CX Eco	Sheet No:	1 Of 1

Pit Dimension:	Length:	2.00	Width:	1.00	Depth:	3.90

Remarks

1: Material reported to be slightly damp from ~3.70mbgl.

2: Pit left open for 35mins and no water seepage was noted. Monitoring well nearby recorded water at ~4.20mbgl.

3:

4:

Sample or Tests			Strata			
Type	Depth (mbgl)	Result	Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description
				0.50		Grass over mid-brown very sandy slightly gravelly CLAY with frequent rootlets. Sand is fine. Gravel consists of fine to coarse, rounded flint. (TOPSOIL).
				3.00		Light brown to grey mottled orange brown very silty SAND. Sand is medium to coarse. (BAGSHOT FORMATION).
				3.90		Light brown to grey slightly mottled orange brown SAND. Sand is medium to coarse. (BAGSHOT FORMATION).

0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample

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APPENDIX 3 – INFILTRATION RATES – RESULTS AND CALCULATIONS

BRE 365 INFILTRATION TESTS

JOMAS JOB NAME: Egley Road

JOMAS JOB NO.: P1381J1459
TEST LOCATION: STP1
DATE OF TEST: 24 June 2019

Pit Details

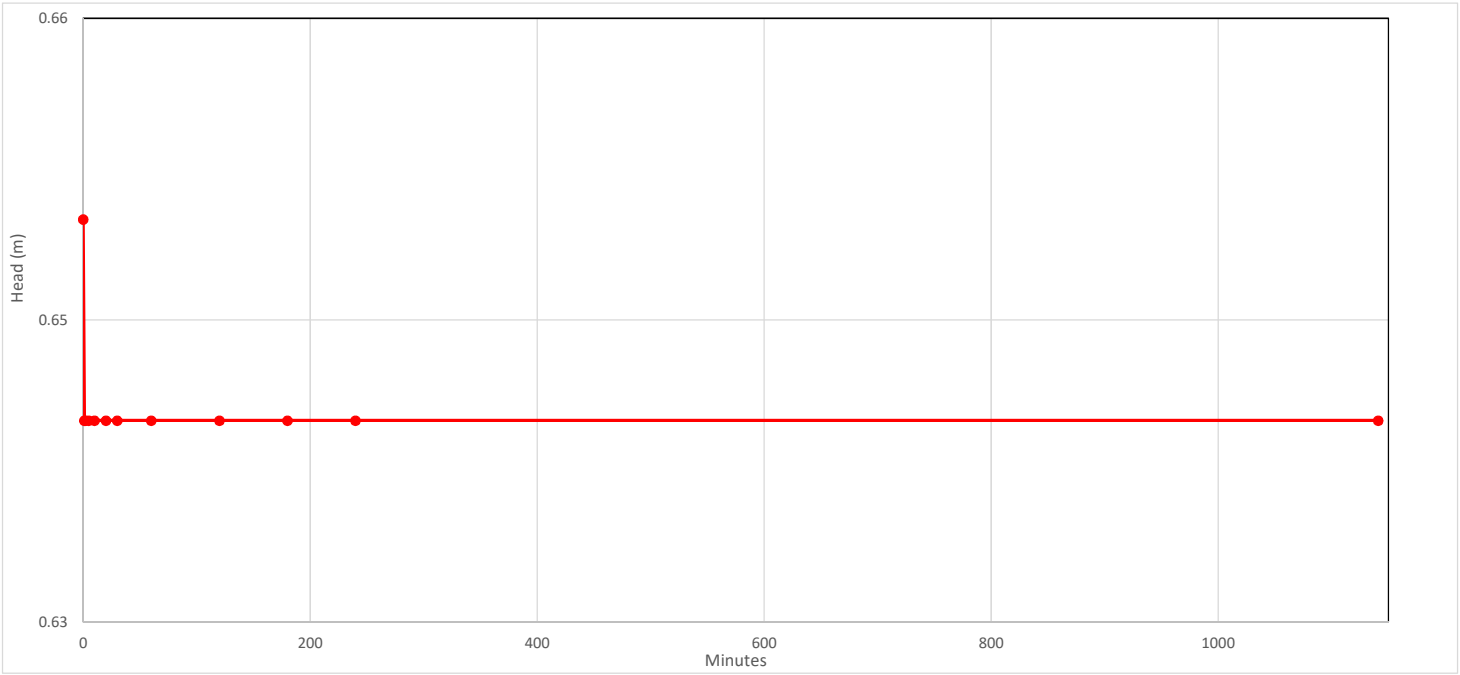
Length	1.2 m
Breadth	0.95 m
Depth	1.0 m
Groundwater?	N
Filled With Gravel?	N

CALCULATING ENGINEER: AJH **DATE:** 26 June 2019
APPROVED BY: PS **DATE:** 27 June 2019

	STP1 - Test 1	STP1 - Test 2	STP1 - Test 3
Dg 75% (m)	0.49		
Tp 75%			
Dg 25%	0.16		
Tp 25%			
Vp75% - Vp25% (m^3)	0.37		
ap50% (m^2)	2.54		
Tp75-Tp25 (min)			
Soil infiltration rate (m/sec)	Insuff. Drain		
Permeability Description			
Drainage Condtions			

Notes:

Dw = depth to water
Dg = head of water in the pit



STP1 - Test 1			STP1 - Test 2			STP1 - Test 3		
Min	Dw	Dg	Min	Dw	Dg	Min	Dw	Dg
0	0.36	0.65						
1	0.37	0.64						
2	0.37	0.64						
5	0.37	0.64						
10	0.37	0.64						
20	0.37	0.64						
30	0.37	0.64						
60	0.37	0.64						
120	0.37	0.64						
180	0.37	0.64						
240	0.37	0.64						
1141	0.37	0.64						

	Min	Dg		Min	Dg		Min	Dg
	Insuff. Drain							
75%		0.488	75%			75%		
	Insuff. Drain							
25%		0.163	25%			25%		

BRE 365 INFILTRATION TESTS

JOMAS JOB NAME: Egley Road

JOMAS JOB NO.: P1381J1459
TEST LOCATION: STP2
DATE OF TEST: 25 June 2019

Pit Details

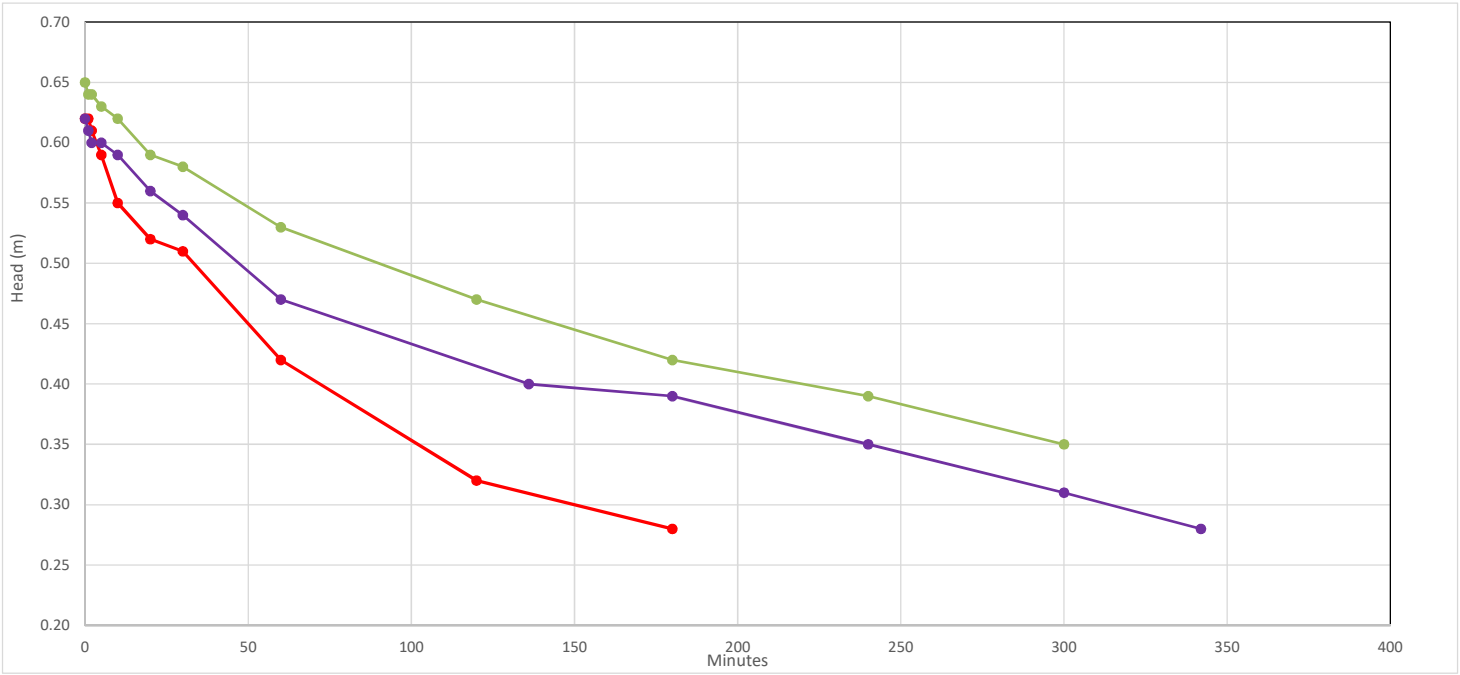
Length	1.7 m
Breadth	1 m
Depth	1.0 m
Groundwater?	N
Filled With Gravel?	N

CALCULATING ENGINEER: AJH **DATE:** 26 June 2019
APPROVED BY: PS **DATE:** 27 June 2019

	STP2 - Test 1	STP2 - Test 2	STP2 - Test 3
Dg 75% (m)	0.47	0.47	0.49
Tp 75%	45.00	65.43	102.50
Dg 25%	0.16	0.16	0.16
Tp 25%	269.42	525.08	621.69
Vp75% - Vp25% (m^3)	0.53	0.53	0.22
ap50% (m^2)	3.37	3.37	3.46
Tp75-Tp25 (min)	224.42	459.65	519.19
Soil infiltration rate (m/sec)	1.16E-05	5.66E-06	2.05E-06
Permeability Description	Medium	Low	Poor
Drainage Condtions	Good	Poor	Poor

Notes:

Dw = depth to water
Dg = head of water in the pit



STP2 - Test 1			STP2 - Test 2			STP2 - Test 3		
Min	Dw	Dg	Min	Dw	Dg	Min	Dw	Dg
0	0.39	0.62	0	0.39	0.62	0	0.36	0.65
1	0.39	0.62	1	0.40	0.61	1	0.37	0.64
2	0.40	0.61	2	0.41	0.60	2	0.37	0.64
5	0.42	0.59	5	0.41	0.60	5	0.38	0.63
10	0.46	0.55	10	0.42	0.59	10	0.39	0.62
20	0.49	0.52	20	0.45	0.56	20	0.42	0.59
30	0.50	0.51	30	0.47	0.54	30	0.43	0.58
60	0.59	0.42	60	0.54	0.47	60	0.48	0.53
120	0.69	0.32	136	0.61	0.40	120	0.54	0.47
180	0.73	0.28	180	0.62	0.39	180	0.59	0.42
			240	0.66	0.35	240	0.62	0.39
			300	0.70	0.31	300	0.66	0.35
			342	0.73	0.28			

	Min	Dg		Min	Dg		Min	Dg
	Interpolated			Interpolated			Interpolated	
75%	45	0.465	75%	65.43	0.465	75%	102.5	0.488
	Extrapolated			Extrapolated			Extrapolated	
25%	269.4	0.155	25%	525	0.155	25%	621.7	0.163

BRE 365 INFILTRATION TESTS

JOMAS JOB NAME: Egley Road

JOMAS JOB NO.: P2052J1651
TEST LOCATION: STP3
DATE OF TEST: 25 June 2019

Pit Details

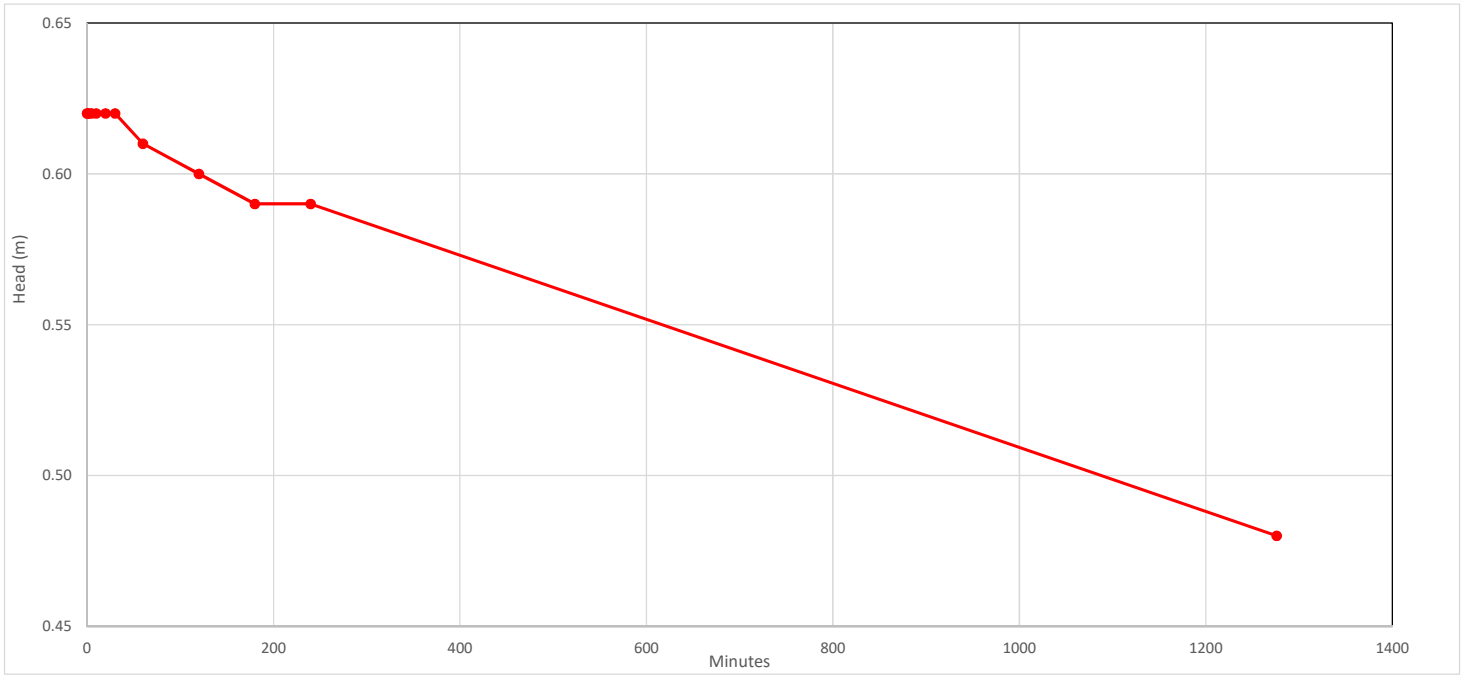
Length	1.8 m
Breadth	0.95 m
Depth	1.0 m
Groundwater?	N
Filled With Gravel?	N

CALCULATING ENGINEER: AJH **DATE:** 26 June 2019
APPROVED BY: PS **DATE:** 27 June 2019

	STP3 - Test 1	STP3 - Test 2	STP3 - Test 3
Dg 75% (m)	0.47		
Tp 75%			
Dg 25%	0.16		
Tp 25%			
Vp75% - Vp25% (m^3)	0.53		
ap50% (m^2)	3.42		
Tp75-Tp25 (min)			
Soil infiltration rate (m/sec)	Insuff. Drain		
Permeability Description			
Drainage Condtions			

Notes:

Dw = depth to water
Dg = head of water in the pit



STP3 - Test 1			STP3 - Test 2			STP3 - Test 3		
Min	Dw	Dg	Min	Dw	Dg	Min	Dw	Dg
0	0.39	0.62						
1	0.39	0.62						
2	0.39	0.62						
5	0.39	0.62						
10	0.39	0.62						
20	0.39	0.62						
30	0.39	0.62						
60	0.40	0.61						
120	0.41	0.60						
180	0.42	0.59						
240	0.42	0.59						
1276	0.53	0.48						

	Min	Dg		Min	Dg		Min	Dg
	Insuff. Drain							
75%		0.465	75%			75%		
	Insuff. Drain							
25%		0.155	25%			25%		

BRE 365 INFILTRATION TESTS

JOMAS JOB NAME: Egley Road

JOMAS JOB NO.: P2052J1651
TEST LOCATION: STP4
DATE OF TEST: 24 June 2019

Pit Details

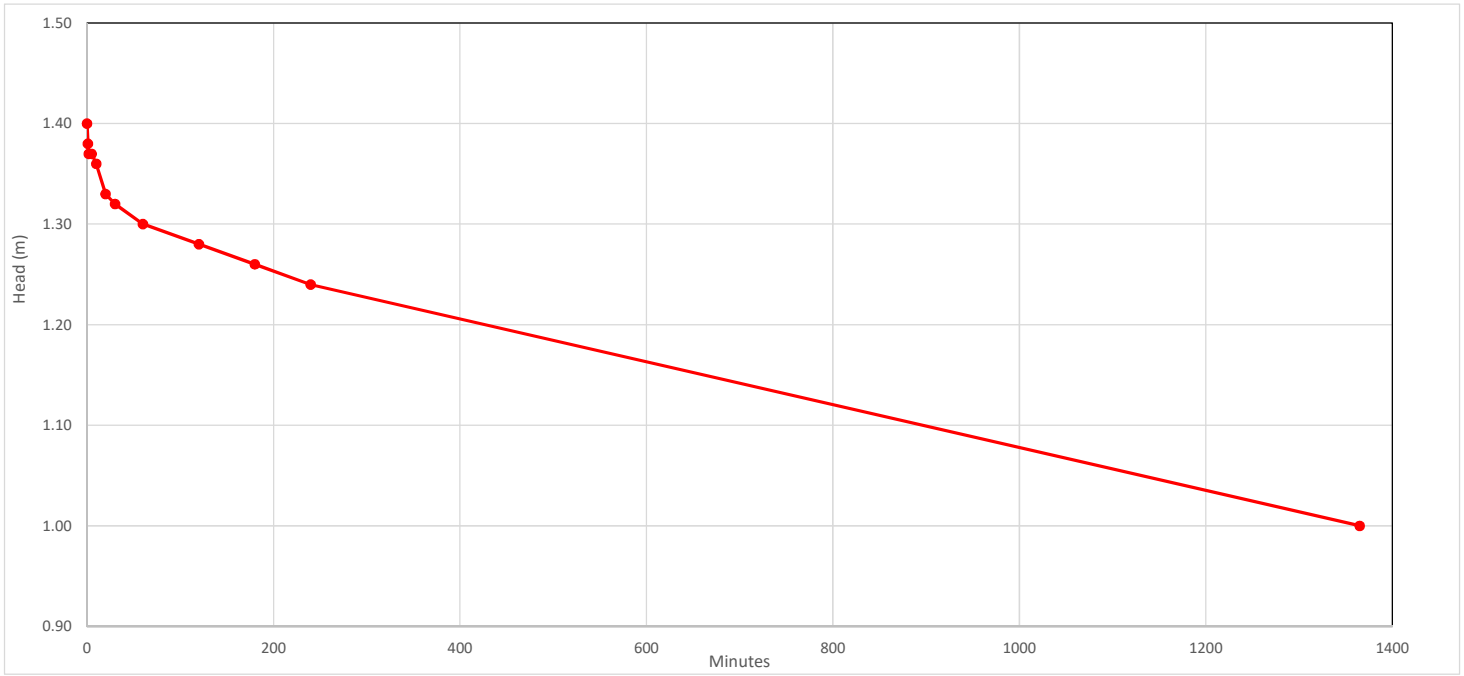
Length	1.6 m
Breadth	0.35 m
Depth	2.4 m
Groundwater?	N
Filled With Gravel?	N

CALCULATING ENGINEER: AJH **DATE:** 26 June 2019
APPROVED BY: PS **DATE:** 27 June 2019

	STP4 - Test 1	STP4 - Test 2	STP4 - Test 3
Dg 75% (m)	1.05		
Tp 75%	1130.63		
Dg 25%	0.35		
Tp 25%	4361.68		
Vp75% - Vp25% (m^3)	0.39		
ap50% (m^2)	3.29		
Tp75-Tp25 (min)	3231.05		
Soil infiltration rate (m/sec)	6.15E-07		
Permeability Description	Low		
Drainage Condtions	Poor		

Notes:

Dw = depth to water
Dg = head of water in the pit



STP4 - Test 1			STP4 - Test 2			STP4 - Test 3		
Min	Dw	Dg	Min	Dw	Dg	Min	Dw	Dg
0	1.00	1.40						
1	1.02	1.38						
2	1.03	1.37						
5	1.03	1.37						
10	1.04	1.36						
20	1.07	1.33						
30	1.08	1.32						
60	1.10	1.30						
120	1.12	1.28						
180	1.14	1.26						
240	1.16	1.24						
1365	1.40	1.00						

	Min	Dg		Min	Dg		Min	Dg
	Interpolated							
75%	1131	1.05	75%			75%		
	Extrapolated							
25%	4362	0.35	25%			25%		

BRE 365 INFILTRATION TESTS

JOMAS JOB NAME: Egley Road

JOMAS JOB NO.: P2052J1651
TEST LOCATION: STP5
DATE OF TEST: 24 June 2019

Pit Details

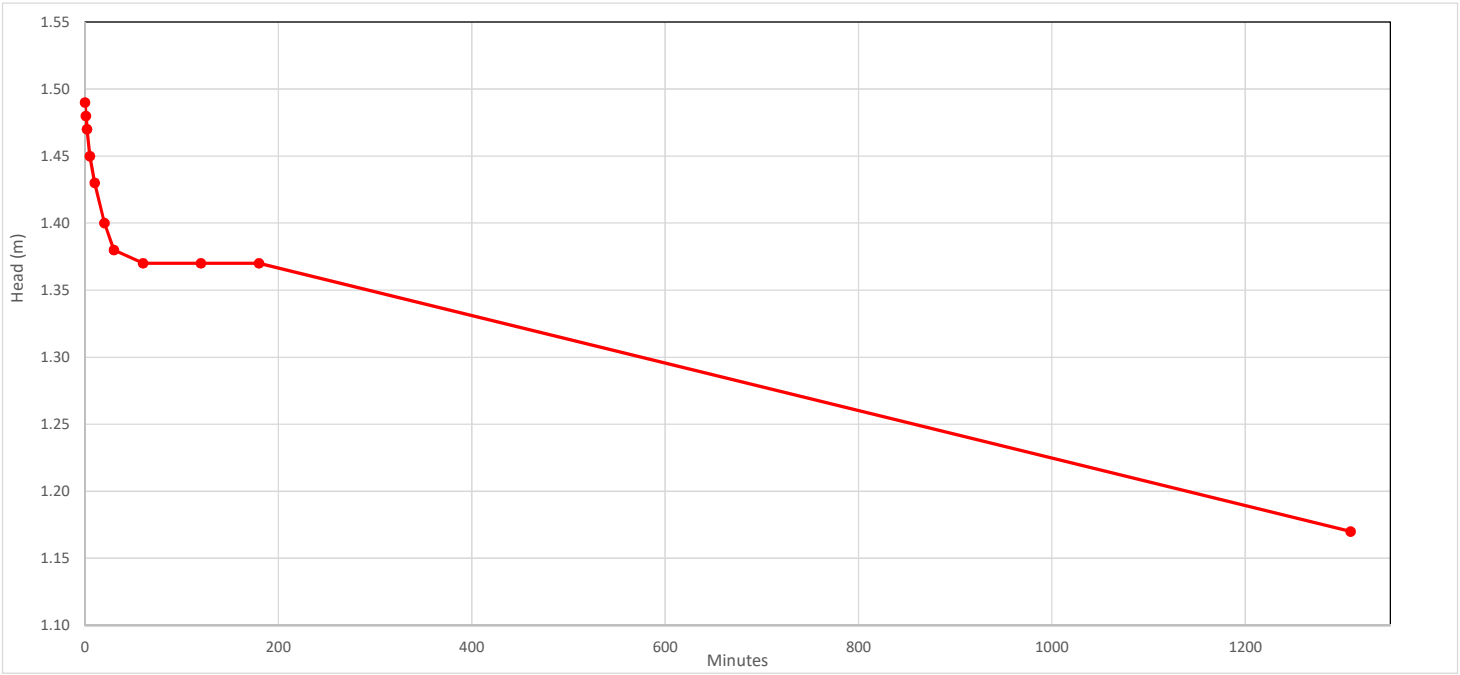
Length	1.7 m
Breadth	0.32 m
Depth	2.4 m
Groundwater?	N
Filled With Gravel?	N

CALCULATING ENGINEER: AJH **DATE:** 26 June 2019
APPROVED BY: PS **DATE:** 27 June 2019

	STP5 - Test 1	STP5 - Test 2	STP5 - Test 3
Dg 75% (m)	1.12		
Tp 75%			
Dg 25%	0.37		
Tp 25%			
Vp75% - Vp25% (m^3)	0.41		
ap50% (m^2)	3.55		
Tp75-Tp25 (min)			
Soil infiltration rate (m/sec)	Insuff. Drain		
Permeability Description			
Drainage Condtions			

Notes:

Dw = depth to water
Dg = head of water in the pit



STP5 - Test 1			STP5 - Test 2			STP5 - Test 3		
Min	Dw	Dg	Min	Dw	Dg	Min	Dw	Dg
0	0.91	1.49						
1	0.92	1.48						
2	0.93	1.47						
5	0.95	1.45						
10	0.97	1.43						
20	1.00	1.40						
30	1.02	1.38						
60	1.03	1.37						
120	1.03	1.37						
180	1.03	1.37						
1309	1.23	1.17						

	Min	Dg		Min	Dg		Min	Dg
	Insuff. Drain							
75%		1.118	75%			75%		
	Insuff. Drain							
25%		0.373	25%			25%		

BRE 365 INFILTRATION TESTS

JOMAS JOB NAME: Egley Road

JOMAS JOB NO.: P2052J1651
TEST LOCATION: STP6
DATE OF TEST: 25 June 2019

Pit Details

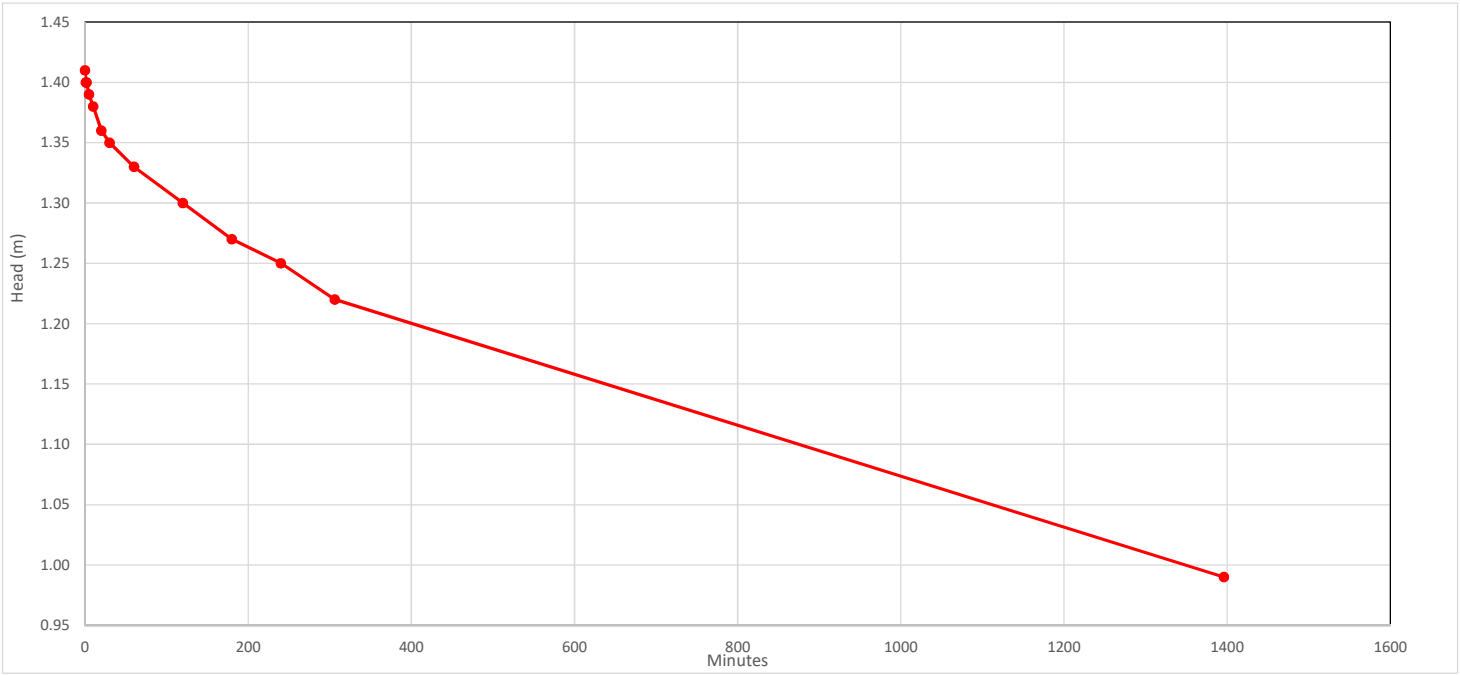
Length	1.8 m
Breadth	0.35 m
Depth	2.4 m
Groundwater?	N
Filled With Gravel?	N

CALCULATING ENGINEER: AJH **DATE:** 26 June 2019
APPROVED BY: PS **DATE:** 27 June 2019

	STP6 - Test 1	STP6 - Test 2	STP6 - Test 3
Dg 75% (m)	1.06		
Tp 75%	1076.11		
Dg 25%	0.35		
Tp 25%	4296.86		
Vp75% - Vp25% (m^3)	0.44		
ap50% (m^2)	3.66		
Tp75-Tp25 (min)	3220.76		
Soil infiltration rate (m/sec)	6.28E-07		
Permeability Description	Low		
Drainage Condtions	Poor		

Notes:

Dw = depth to water
Dg = head of water in the pit



STP6 - Test 1			STP6 - Test 2			STP6 - Test 3		
Min	Dw	Dg	Min	Dw	Dg	Min	Dw	Dg
0	1.02	1.41						
1	1.03	1.40						
2	1.03	1.40						
5	1.04	1.39						
10	1.05	1.38						
20	1.07	1.36						
30	1.08	1.35						
60	1.10	1.33						
120	1.13	1.30						
180	1.16	1.27						
240	1.18	1.25						
306	1.21	1.22						
1396	1.44	0.99						

	Min	Dg		Min	Dg		Min	Dg
	Interpolated							
75%	1076	1.058	75%			75%		
	Extrapolated							
25%	4297	0.353	25%			25%		

BRE 365 INFILTRATION TESTS

JOMAS JOB NAME: Hundreds Farm

JOMAS JOB NO.: P2052J1651
TEST LOCATION: STP7
DATE OF TEST: 25 June 2019

Pit Details

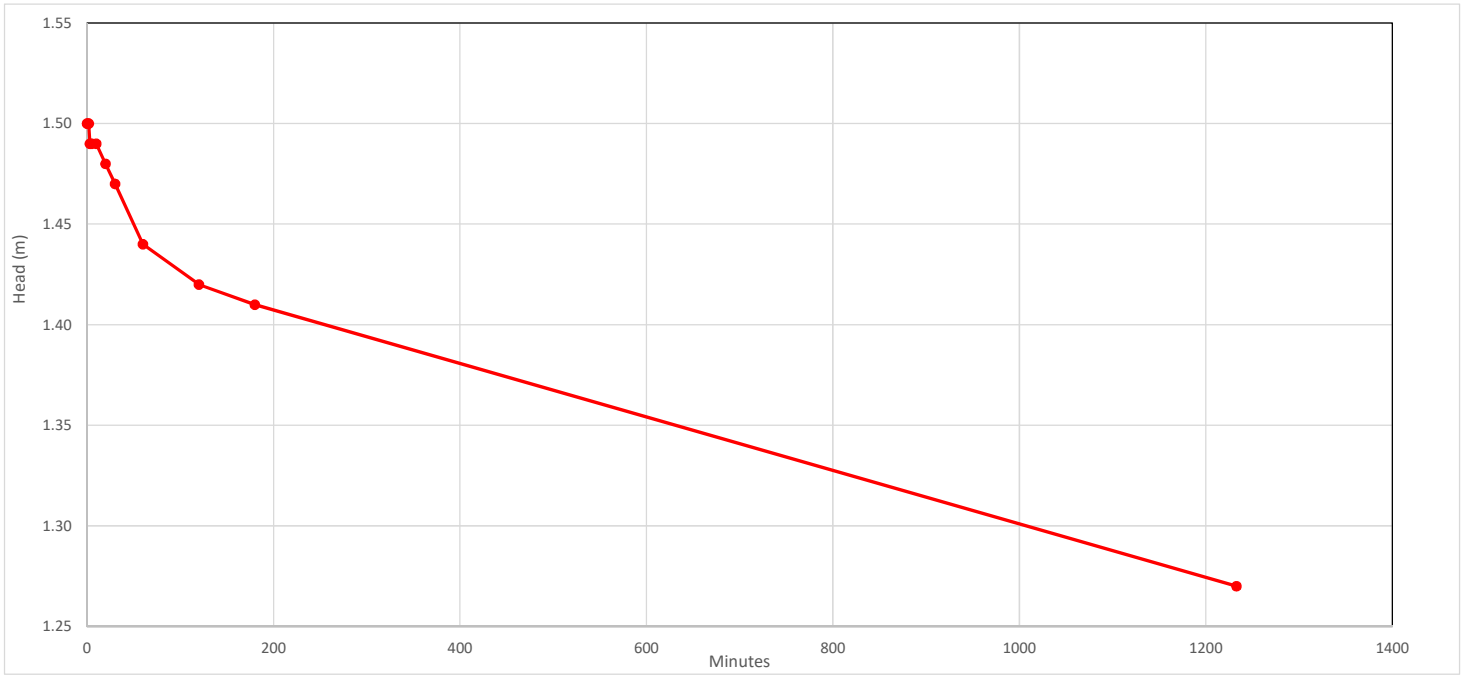
Length	1.6 m
Breadth	0.35 m
Depth	2.4 m
Groundwater?	N
Filled With Gravel?	N

CALCULATING ENGINEER: AJH **DATE:** 26 June 2019
APPROVED BY: PS **DATE:** 27 June 2019

	STP7 - Test 1	STP7 - Test 2	STP7 - Test 3
Dg 75% (m)	1.13		
Tp 75%			
Dg 25%	0.38		
Tp 25%			
Vp75% - Vp25% (m^3)	0.42		
ap50% (m^2)	3.49		
Tp75-Tp25 (min)			
Soil infiltration rate (m/sec)	Insuff. Drain		
Permeability Description			
Drainage Condtions			

Notes:

Dw = depth to water
Dg = head of water in the pit



STP7 - Test 1			STP7 - Test 2			STP7 - Test 3		
Min	Dw	Dg	Min	Dw	Dg	Min	Dw	Dg
0	0.90	1.50						
1	0.90	1.50						
2	0.90	1.50						
3	0.91	1.49						
5	0.91	1.49						
10	0.91	1.49						
20	0.92	1.48						
30	0.93	1.47						
60	0.96	1.44						
120	0.98	1.42						
180	0.99	1.41						
1233	1.13	1.27						

	Min	Dg		Min	Dg		Min	Dg
	Insuff. Drain							
75%		1.125	75%			75%		
	Insuff. Drain							
25%		0.375	25%			25%		

Appendix D:
Thames Water Sewer Records

Asset location search

Property Searches

Groundwise Searches Ltd
Suite 8 Chichester House
45Chichester Road
SOUTHEND ON SEA
SS1 2JU

Search address supplied Land At Egley Road
Woking
GU22 0PL

Your reference 23398DM

Our reference ALS/ALS Standard/2019_3949964

Search date 8 February 2019

Keeping you up-to-date

Notification of Price Changes

From 1 September 2018 Thames Water Property Searches will be increasing the price of its Asset Location Search in line with RPI at 3.23%.

For further details on the price increase please visit our website: www.thameswater-propertysearches.co.uk
Please note that any orders received with a higher payment prior to the 1 September 2018 will be non-refundable.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

searchcode

Asset location search

Property Searches

Search address supplied: Land At Egley Road, Woking, GU22 0PL

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset location search

Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

Affinity Water Ltd
Tamblin Way
Hatfield
AL10 9EZ
Tel: 0845 7823333

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

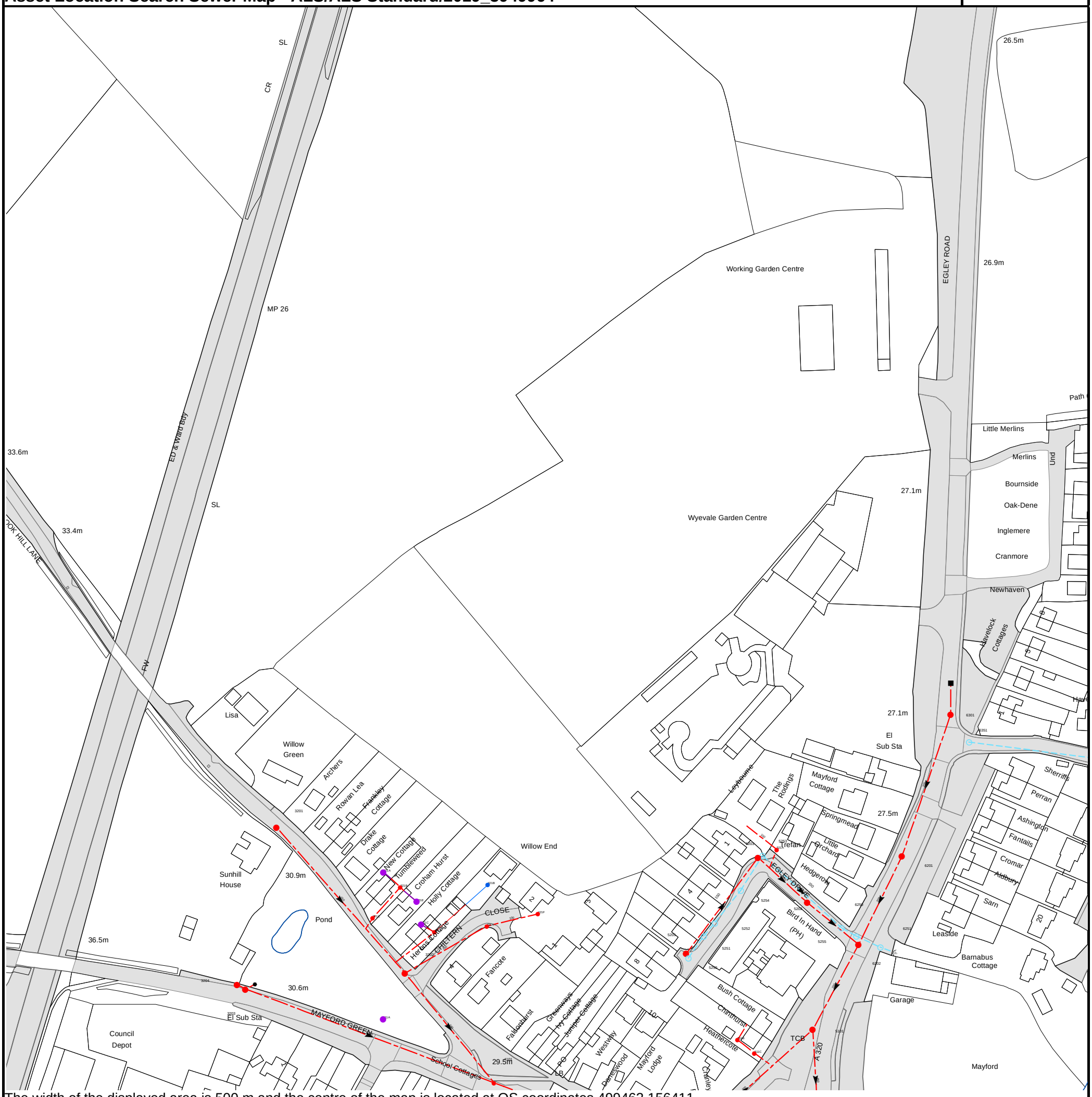
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2019_3949964



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 499462,156411

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4101	29.34	26.93
5101	27.38	24.54
311A	n/a	n/a
3203	31.42	28.5
3204	31.45	n/a
3202	29.74	28.14
5250	28.4	27.81
5201	28.39	27.69
6251	26.97	26.03
6202	27.24	n/a
6250	27.15	26.43
5251	28.43	27.62
421D	n/a	n/a
5255	27.3	26.5
421A	n/a	n/a
421C	n/a	n/a
5252	28.34	27.53
321C	n/a	n/a
421F	n/a	n/a
5202	27.6	26.31
421E	n/a	n/a
5254	28.09	27.25
321B	n/a	n/a
421B	n/a	n/a
321A	n/a	n/a
5203	28.11	26.84
6201	27.47	24.83
5253	28.07	27.06
521A	n/a	n/a
3201	31.7	29.31
6351	n/a	n/a
6301	27.17	24.98

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Ms Melissa Seymour

RMA Environmental Ltd,
Suite 4, Swallow Court,
Devonshire Gate,
Tiverton,
Devon,
EX16 7EJ

Wastewater pre-planning
Our ref **DS6062019**

24 July 2019

Pre-planning enquiry: Insufficient Capacity

Dear Melissa,

Thank you for providing information on your development.

Site: Land West of Egley Road, Woking, Surrey - GU22 0PS

Existing site: Greenfield.
Proposed site: Houses (36 units) + Sports Hall (1,500 visitors/day).
Proposed foul water discharge by gravity into manhole SU99565203.
Proposed surface water discharge to nearby watercourse and not to Thames Water sewer.

We have completed the assessment of the foul water flows based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

We've assessed your **foul water** proposals and concluded that our sewerage network will not have enough capacity for your development at this time.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve the remainder of your development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.

Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: 8 months
Design: 6 months
Construction: 6 months
Total: 20 months

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

What do you need to tell us before we start modelling?

We're responsible for funding any modelling and reinforcement work. We need, though, to spend our customers' money wisely, so we'll only carry out modelling once we're confident that your development will proceed.

In order to have this confidence, we'll need to know that you **own the land and have either outline or full planning permission**. Please email this information to us as soon as you have it.

If you'd like us to start modelling work ahead of this point, we can do this if you agree to underwrite the cost of modelling and design. That means we'll fund the work – but you agree to pay the cost if you don't achieve first occupancy within five years..

If the modelling shows we need to carry out reinforcement work, then before we start construction we'll need you to supply us with notification that you've confirmed your F10 – Notification of construction project - submission to the Health and Safety Executive.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable.

The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

Only when it can be proven that soakage into the ground or a connection into an adjacent watercourse is not possible we would then consider a restricted discharge into the public surface water/combined sewer network. As a guide a discharge rate of 5 litres/second/Hectare will be use, in most instances, however more onerous constraints may be imposed to fit local circumstances. The system shall not show signs of flooding above ground for the worst 1 in 30-year storm and shall be tested for exceedance in a 1 in 100-year storm to demonstrate any flooding that may occur will not flood properties.

Thames Water Planning team would ask to see why it is not practicable on the site to restrict to Greenfield run-off rates if they are consulted as part of any planning application.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What do I need to do next?

If you are satisfied with the points above, then you should compare your own timeline with the typical timescales we have suggested for our activities. If the time you're likely to take from planning and construction through to first occupancy is **more** than the total time we're likely to take, we'll be able to carry out the necessary upgrades in time for your development.

If it's **less** than this, you might want to ask us to start modelling earlier – in which case we'll require you to underwrite the cost, as noted above.

If you've any further questions, please contact me on 020 3577 7608

Yours sincerely

Zaid Kazi

Development Engineer
Developer Services – Sewer Adoptions Team
Thames Water