Lower Broadbridge Farm, Broadbridge Heath

PEREGA

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Suitability Code	Revision/ Version	Date	Written by	Checked by	Description
S2	P1	11/03/2026	Robert Masson	Greory Schmidt	Issued for information
S2	P2	24/03/2026	Robert Masson	Gregory Schmidt	Updated appendices only
S2	P3	30/03/2026	Robert Masson	Gregory Schmidt	Updated to comments provided
S2	P4	14/08/2026	Dion Randall	Robert Masson	Updates to reflect changes to site layout and drainage strategy to suit.
S2	P5	17/08/2026	Dion Randall	Gregory Schmidt	Updates to reflect changes to site layout and drainage strategy to suit.

1 INTRODUCTION

1.1 This Drainage Strategy Report has been prepared by Perega Ltd on behalf of Taylor Wimpey South Thames to support the Reserved Matters planning application for the development at Lower Broadbridge Farm, Horsham. This follows the Section 73 application which includes Flood risk Assessment and Drainage Strategy Reports.

1.2 The application boundary covers an area of approximately 7 hectares (ha) and is a greenfield site.

1.3 This Drainage Strategy presented in accordance with the requirements set out in the National Planning Policy Framework (NPPF) 2024 and the associated Technical Guidance.

1.4 The key site details are presented in Table 1, below.

Table 1 - Site Summary

Item	Description
Site Name	Lower Broadbridge Farm
Location	Broadbridge Heath, Horsham, RH12 3TL
Grid Reference	TQ 14175 31175
Development Site Area	7 hectares (ha)
Development Type	Residential Development
Flood Zone	Flood Zone 1 (Low Probability Risk), some Flood Zone 2.
Surface Water Flood Risk	Very Low Probability Risk (Areas of zone 2/3 adjacent to site, aligned with existing watercourses and ponds)
Local Water Authority	Southern Water
Local Planning Authority	Horsham District Council
Lead Local Flood Authority	West Sussex County Council

1.5 The development area is located in Flood Zone 1, and based on available information, it is not at risk of flooding from surface water or other flood sources. There are areas of Flood zone 2 and 3 adjacent aligning with existing watercourses and ponds with some Flood Zone 2 shown within the site which does not affect the infrastructure or dwellings on the layout. The modelling has confirmed the flood risk level to remain above. Therefore, in line with standing advice, an independent FRA is not required under the guidance of the National Planning Policy Framework (NPPF). There are existing reports by Odessey published.

1.6 This report has been prepared solely as a Drainage Strategy Report. It therefore only addresses any environmental issues to the extent they are impacted by drainage strategy. The findings are based on information evaluated at the time of preparation.

1.7 The report is the property of Perega and is produced for the exclusive use of our client and is confidential to that client. The contents may not be made use of by any third party without the express written consent of Perega. Any liability to any third party is expressly excluded.

1.8 This report is made on behalf of Perega. By receiving this report and acting on it, the client, or any third party relying on it, accepts that no individual is personally liable in contract, tort, or breach of statutory duty (including negligence).

2 METHODOLOGY

2.1 This is a desk-based study that utilises existing, publicly held information in the form of mapping and previously undertaken work. Conclusions made about flooding have been made using our expert judgement and knowledge of similar events.

2.2 In preparing this report, information has been gathered and referenced from several sources. These are as follows:

i. The Environment Agency's Flood Map for Planning.
ii. The Long-Term Flood Risk Map for England.
iii. The National Planning Policy Framework , and.
iv. The Planning Practice Guidance.
v. As-Built topographical survey information for the property

3 SITE DETAILS

3.1 Site Setting

3.1.1 The site is roughly triangular, irregular shape and includes a ditchcourse. The northern, eastern and western boundaries all connect to adjacent agricultural or undeveloped land. The southern and south-eastern boundary is adjacent to a carriageway and the site is to be accessed via a new arm on a new roundabout to the south.

3.1.2 A site location plan is included in **Appendix A** of this report.

3.2 Topography

3.2.1 The site displays a moderate difference in ground levels, generally falling from south to north. The levels range from approximately 30.75m AOD along parts of the southern boundary corner to around 29.50m AOD in the north-east and 27.5m AOD in the north-west.

3.2.2 The Topographic survey can be seen in **Appendix B**.

3.3 Surface Water Features

3.3.1 There is an unnamed surface water features on site running south to north through the western third of the site.

3.4 Geology & Hydrogeology

3.4.1 A ground investigation report has been undertaken by CDS Group in April 2022. The report body, without appendix, can be seen in **Appendix G.**

3.4.2 The borehole logs from the investigation indicated a layer of made ground is present over the site, ranging between 0.3-0.5m in depth. The logs suggest that clay underlays the site beneath the made ground, with occasional mudstone and stiff clay lenses. Overall the site is clay.

3.4.3 BGS Geology Viewer indicates that site is situated on the Weald Clay Formation of Mudstone, with superficial deposits of Grinstead Clay Member. These are layers of clay and mudstone.

3.4.4 Defra's Magic Maps show that the site is in an unproductive area for groundwater and records no vulnerability. This tallies with the site being located atop clay formations.

3.4.5 Although groundwater has been noted in the information provided by CDS Group within their monitoring wells they report this is likely seepage into the well from the surface and not representative of the groundwater on site.

3.5 Existing Drainage

3.5.1 The incumbent sewage undertaker is Southern Water.

3.5.2 Asset records from Southern Water show that there are existing foul water (FW) and surface water (SW) sewers in or adjacent to the A281 along the south-east boundary of the site. The SW is noted at ø750 increasing to ø900 before discharging into a nearby watercourse located south west of the development site. The FW is noted as ø450 but the shape is unknown and may be irregular.

3.5.3 There is an existing SW culvert which discharges into the existing watercourse on site, at the location of the new roundabout arm into the site. This is proposed to be extended into the site as part of the separate highway works, to accommodate the new roundabout design. It is not envisaged that these works will affect the proposed development.

3.5.4 No drainage is shown for existing properties adjacent to the site boundary and in the vicinity, this includes Arun House and the development to the north. It is likely that they are served with private drainage not recorded on public utilities records.

3.5.5 Asset records are shown in **Appendix C** of this report.

3.6 Existing Discharge Rate

3.6.1 The development site is entirely greenfield.

3.6.2 The HR Wallingford tool has been used to calculate the following Greenfield discharge rate per hectare for the site which can be seen in **Appendix E**. This is summarised in Table 2.

Table 2 - Greenfield Runoff rate per ha

Storm Event	Greenfield Rate (l/s)
QBar	38.1
1-year	32.4
30-year	87.6
100-year	121.4

4 THE PROPOSED DEVELOPMENT

4.1 The proposed development consists of 133 new homes, each with associated car parking, external hardstanding and soft landscaping.

4.2 The proposed development layout can be seen in **Appendix A.**

4.3 The impermeable and permeable areas for the site are summarised in Table 3.

Table 3 - Impermeable and Permeable Areas

Description	Impermeable Area (m^2)	Permeable Area (m^2)
Total Area	**23,080m²**	**46,920m²**

4.1 Peak Rainfall Intensity

4.1.1 With climate change it is becoming more common to see rainfall events of higher intensity. Increased rainfall intensity affects river levels and drainage systems, with the result being an increase in surface water flooding and sewerage surcharge.

4.1.2 The NPPF states that for flood risk assessments for developments with a lifetime beyond 2100, the upper end allowances should be used. Table 4 and Table 5 summarises the data attributed the *Arun and Western Streams Management Catchment.*

Table 4: Catchment Peak Rainfall Flow Allowances - 3.3% annual exceedance rainfall event

Epoch	Central Allowance	Upper End Allowance
2050s	20%	35%
2070s	20%	35%

Table 5:Catchment Peak Rainfall Flow Allowances - 1% annual exceedance rainfall event

Epoch	Central Allowance	Upper End Allowance
2050s	20%	45%
2070s	25%	45%

4.1.3 The emerging surface water strategy for the proposed development has been designed to accommodate and discharge peak rainfall flows up to the 1 in 100-year event, including a 40% increase in rainfall for climate change, as identified by the Arun and Western Streams Management Catchment Peak Rainfall allowance for the 1% AEP. Similarly, the 3.3% AEP shall be designed using an increased rainfall uplift of 45%

4.2 Hierarchy of Surface Water Discharge

4.2.1 The Hierarchy for the discharge of surface water looks at the most sustainable ways to discharge surface water from most preferred to least preferred options.

4.2.2 The most preferred option is to discharge to ground, then discharge to surface water body, then discharge to surface water sewer, then discharge to combined sewers.

4.2.3 The ground investigation undertaken by CSD Group notes that the site is underlain by clay therefore soakaways and infiltration is not viable. There is a surface water body within the site boundary, therefore all surface water discharges should be made to this unnamed ditchcourse within the site.

4.2.4 It should be noted that asset records from Southern Water identified offsite and onsite surface water sewers along the southern boundary east of the site, which discharge to an existing watercourse on the western boundary of the site. However, this would not be supported by topography without pumping but may serve as an alternative for some parts of the site if necessary.

4.3 Proposed Discharge Rate

4.3.1 Based on the impermeable site area of 23,080m², the following discharge rates would be required to match greenfield runoff rate.

Table 6 - Greenfield Runoff rate per ha

Storm Event	Greenfield Rate (l/s)
QBar	12.5
1-year	10.6
30-year	28.8
100-year	39.9

5 PROPOSED DRAINAGE STRATEGY

5.1 Based on the above assumptions and constraints, a proposed drainage strategy has been developed which can be seen in **Appendix D.** Drainage calculations can be seen in **Appendix F**.

5.1 Surface Water

5.1.1 Following from the drainage hierarchy, the preferred method of surface water discharge is via connection to the unnamed ditchcourse within the site. There will be four separate discharges to suit topography across the site and to keep storage efficient. The total rate of discharge of 11.8 l/s has been pro-rata'd between the 4No. discharge locations.

5.1.2 The rainfall runoff from the housing roof's are proposed to be collected via rainwater pipes and discharge into a below ground surface water system. Hardstanding areas such as driveways are proposed to be drained via linear drainage channels and gullies where necessary. Highway areas are proposed to be drained via highway gullies in the carriageway which discharge directly to the main drainage or to a highway drain. Drainage Kerbs are also an option in areas with adjacent ponds which can be assessed at detailed design.

5.1.3 The site will utilise above-ground storage in the form of detention basins, three are proposed. In addition, in one location to the south-west, porous paving will be used due to topography, to store surface water below ground.

5.1.4 The discharge rates will be achieved for the surface water discharges from site using a proprietary flow control vortex device. For the porous paving area, an orifice plate will likely be used within a PPIC to control the restricted discharge of surface water. All discharge rates are for the peak flow in all storm events up to and including the 1-in-100 year event range with a 45% allowance for climate change. This is subject to approval from Southern Water.

Table 7 - Summary of Storage Volumes and Discharge Rates

Network Name	Approximate Plot No.	Impermeable Area m²	Storage Volume m³	Discharge Rate l/s
Basin 1 SW	1-5, 16-21	3,070m²	198m³	2.8 l/s
Basin 2 SE	33-37, 99-108, 119-133	4,390m²	356m³	3.1 l/s
Basin 3	21-32, 38-98, 109-118	14,460m³	1,640m³	2.4 l/s
Porous Paving 1	6-15	1,160m²	93m³	3.5 l/s
Total	**133**	**23,080m²**	**2,287m³**	**11.8 l/s**

5.1.5 Different areas of hardstanding pose different risks of pollution. Table 8 is replicated from CIRIA's C753: The SuDS Manual, and details the various pollution risk indices for the different runoff surfaces.

Table 8: Pollution hazard indices for different land use classifications - reproduced from CIRIA C753: The SuDS Manual

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Notes

1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009)

2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

5.1.6 Based on Table 8, the site is classified as Low pollution hazard level due to the presence of only residential traffic and driveways – although the number of traffic movements from the 133 properties will need to be assessed against the Low pollution hazard index criteria.

5.1.7 Some roads are proposed as block paving and may utilise permeable paving as required to reduce the pollution index, if required, prior to discharge to the watercourse.

5.2 Foul Water

5.2.1 It is proposed that the foul drainage from the development will be directed to a pumping station in the north-east corner of the site. This adoptable pumping station will pump via a rising main to the public

foul water sewer, located to the south-east corner of the site and connect via the first efficient chamber.

5.2.2 This is subject to connection and adoptable approval from Southern Water or other authority.

6 CONCLUSION

6.1 This Drainage Strategy Report has been prepared by Perega Ltd on behalf of Taylor Wimpey South Thames to support the Reserved Matters planning application for development at Broadbridge Heath, Horsham, RH12 3TL. The site comprises a new development of 133 new homes with associated parking, hardstanding areas and soft landscaping.

6.2 The existing site is greenfield and the northern, eastern and western boundaries all connect to adjacent agricultural or undeveloped land. The southern and south-eastern boundary is adjacent to a carriageway and the site is to be accessed via a new arm on a roundabout to the south.

6.3 The development area is located in Flood Zone 1, and based on available information, it is not at risk of flooding from surface water or other flood sources. There are areas of Flood zone 2 and 3 adjacent aligning with existing watercourses and ponds with some Flood Zone 2 shown within the site which does not affect the infrastructure or dwellings on the layout.

6.4 Ground investigations carried out at the site confirm the site has a layer of made ground underlain by clay rendering soakaways and infiltration SUDs infeasible.

6.5 The surface water is proposed to be attenuated and stored on site within ponds and permeable paving. The runoff from the roofs, car parks/driveways, and other hardstanding areas is proposed to be collected via a combination of rainwater pipes, permeable paving, gullies and linear drainage channels.

6.6 The surface water is to be discharged at controlled rate via a proprietary vortex flow control devices, to the existing unnamed watercourse within the site for all storms up to and including a 1-in-100 year event range with a 45% allowance for climate change.

6.7 The total discharge rate is 11.8 l/s total from four separate locations to suit topography.

6.8 An existing foul sewer located at the edge of the site, to the south, is at a level that cannot be reached by gravity. An adoptable pumping station is required to discharge foul water to this public sewer.

6.9 This drainage strategy is in-line with Condition 12 of the Section 73 for the development.

Appendix A
Proposed Site Plan

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

N

Mill House

Pond

Lower Broadbridge Farm

The Bungal

Cattle Grid

Cattle Grid

Millmead

The Paddocks

Ecological Enhancement Area

Arun House

L.E.A.P.

FW Pump Station

Attenuation Basin

Attenuation Basin

Attenuation Basin

Pond

High Pressure Gas Main with 6m easement either side

Sub Station

5.0m SHARED SURFACE

5.5m MAIN ACCESS

4.1m PRIVATE DRIVE

5.0m SECONDARY STREET

Acoustic fence with landscaping

Acoustic fence with landscaping

Sewer with 3m easement either side

Sewer with 6m easement either side (not traced)

3m High brick wall

Roundabout / Junction redesigned to facilitate access (as approved drawing)

NEWBRIDGE CLOSE

EDWARDS CLOSE

LANGRIDGE LANE

FARLEY CLOSE

FIVE OAKS ROAD

A 264

A 281

Balancing Pond

Drain

Rev	Date	Revision Details	Dr	Ch
M	17.08.26	Plot 1 Amended	MC	KE
L	14.08.26	Colour Amended and trees amended	MC	KE
K	13.08.26	Attenuation basins, housetypes, landscape and layout amended	MC	KE
J	05.08.26	Layout and Mix Updated, Colour Amended	MC	KE
I	10.07.26	Layout updated to Conservation Officer comments	KE	AK
H	03.06.26	Substation Relocated	MC	KE
G	01.04.26	Landscape Updated	MC	KE
F	31.03.26	House type notations amended	MC	KE
E	27.03.26	Red Line Amended	MC	KE
D	27.03.26	Landscape Updated	MC	KE
C	17.03.26	95 rotated and parking for 86-94 amended	KE	AK
B	16.03.26	Site Layout Updated	KE	AK
A	06.03.26	Colour Updated to Layout Changes	MC	AK

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Client's Name
Taylor Wimpey South Thames

Job Title
Lower Broadbridge Farm, Broadbridge Heath

Drawing Title
Proposed Site Layout

Scale
1:500 @ A0 / 1:1000 @ A2

metres 10 20 30 40 50

Drawn	Checked	Date
KE	AK	20.02.26

Job No	Drawing No	Rev
7564	PL-03	M

Status
APPROVAL

CAD Plot date: 17/08/2026 - 09:53:03 7564 - site.dwg

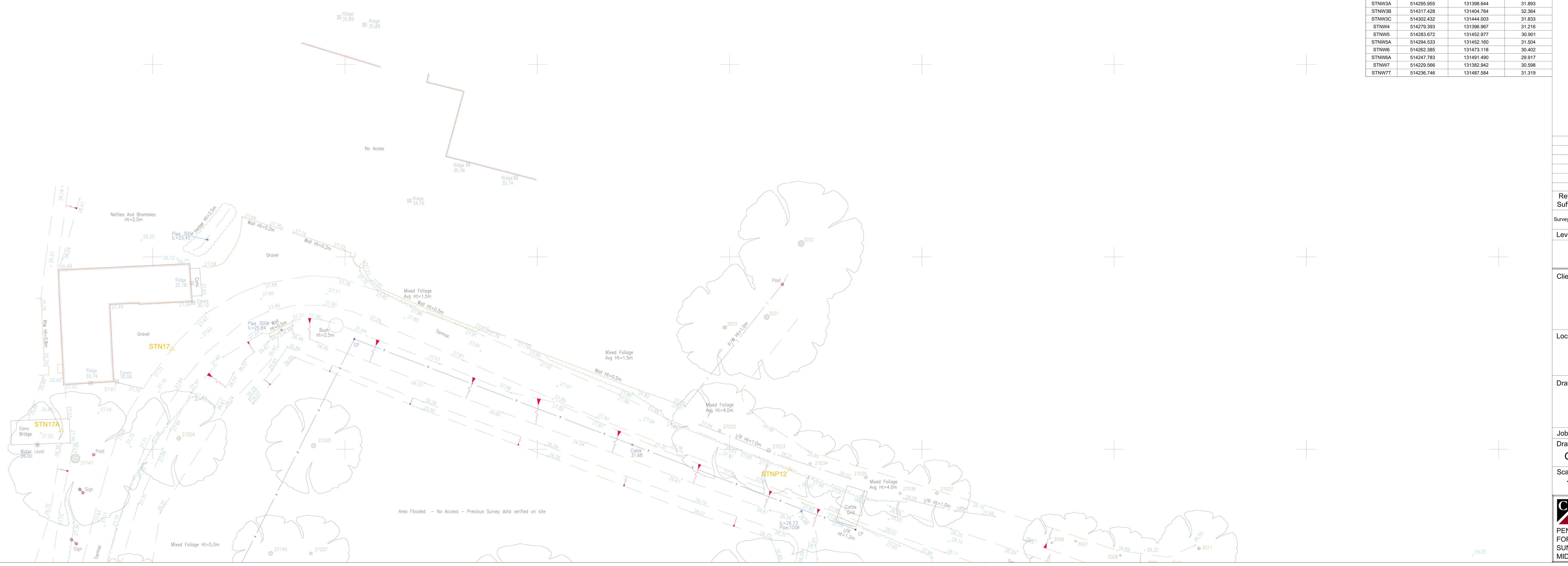
Appendix B
Topographical Survey

Tree Schedule

Pt No	Spread	Bole	Height	Species
480	6.0	0.80	13.0	TREE UNKNOWN
481	6.0	0.75	13.0	TREE UNKNOWN
482	5.0	0.40	11.0	TREE UNKNOWN
483	7.0	0.55	14.0	TREE UNKNOWN
484	8.0	1.10	14.0	TREE UNKNOWN
485	5.0	0.35	10.0	TREE UNKNOWN
486	6.0	0.65	14.0	TREE UNKNOWN
487	6.0	0.55	14.0	TREE UNKNOWN
488	5.0	0.35	11.0	TREE UNKNOWN
489	6.0	0.55	11.0	TREE UNKNOWN
490	6.0	0.90	11.0	TREE UNKNOWN
491	5.0	0.45	13.0	TREE UNKNOWN
492	5.0	0.45	13.0	TREE UNKNOWN
493	6.0	0.55	13.0	TREE UNKNOWN
494	5.0	0.35	13.0	TREE UNKNOWN
495	4.0	0.45	9.0	TREE UNKNOWN
496	6.0	0.65	14.0	TREE UNKNOWN
497	6.0	0.55	14.0	TREE UNKNOWN
499	8.0	1.20	14.0	TREE UNKNOWN
500	6.0	0.75	14.0	TREE UNKNOWN
501	6.0	0.35	12.0	TREE UNKNOWN
502	7.0	1.40	14.0	TREE UNKNOWN
503	7.0	0.75	14.0	TREE UNKNOWN
504	7.0	0.60	14.0	TREE UNKNOWN
505	6.0	0.50	13.0	TREE UNKNOWN
509	5.0	0.55	13.0	TREE UNKNOWN
510	5.0	0.55	13.0	TREE UNKNOWN
511	6.0	0.55	14.0	TREE UNKNOWN
512	7.0	0.80	14.0	TREE UNKNOWN
513	7.0	0.75	14.0	TREE UNKNOWN
514	7.0	0.75	14.0	TREE UNKNOWN
518	8.0	1.60	15.0	TREE UNKNOWN
1094	12.0	0.50	10.0	ASH
1097	8.0	0.40	7.0	ALDER
1098	8.0	0.35	8.0	MAPLE
1099	8.0	0.35	8.0	MAPLE
1100	8.0	0.30	8.0	MAPLE
1101	6.0	0.15	6.0	ASH
1378	7.0	0.20	6.0	FRUIT
1528	8.0	0.40	8.0	ALDER
1529	8.0	0.30	8.0	ALDER
1530	6.0	0.20	6.0	ALDER
1531	8.0	0.40	8.0	ALDER
1532	5.0	0.25	6.0	HORNBEAM
2874	7.0	0.30	7.0	HORSECHESTNUT
2875	8.0	0.50	8.0	HORSECHESTNUT
2876	7.0	0.30	7.0	HORSECHESTNUT
2877	7.0	0.40	7.0	HORSECHESTNUT
2878	6.0	0.30	6.0	HORSECHESTNUT
2879	8.0	0.40	8.0	HORSECHESTNUT
2880	6.0	0.30	6.0	HORSECHESTNUT
2881	6.0	0.30	6.0	HORSECHESTNUT
2882	6.0	0.30	6.0	HORSECHESTNUT
2883	8.0	0.40	8.0	HORSECHESTNUT
2896	8.0	0.40	8.0	HORSECHESTNUT
3006	6.0	0.20	8.0	OAK
3007	6.0	0.20	7.0	ALDER
3008	6.0	0.20	7.0	ALDER
3009	6.0	0.30	7.0	ALDER
3010	6.0	0.30	7.0	ASH
3011	8.0	0.30	8.0	ALDER
3201	13.0	0.50	16.0	ASH
3202	13.0	0.60	14.0	HORSECHESTNUT
3203	10.0	0.30	9.0	MAPLE
3749	20.0	1.10	18.0	OAK
3750	7.0	0.30	10.0	SPRUCE
3751	12.0	0.50	16.0	ALDER
3753	15.0	0.60	12.0	WILLOW
3768	7.0	0.30	10.0	SPRUCE
3769	13.0	0.50	17.0	ASH
3770	15.0	0.60	17.0	ASH
3785	15.0	1.00	20.0	ASH
3880	18.0	0.90	20.0	ASH
3892	14.0	0.30	18.0	ASH
3896	13.0	0.80	16.0	ALDER
3897	13.0	0.60	16.0	ALDER
3898	13.0	0.80	18.0	ALDER
3899	13.0	0.80	18.0	ALDER
3900	13.0	0.80	18.0	ALDER
3901	13.0	0.80	18.0	ALDER
3902	10.0	0.50	18.0	ALDER
3903	10.0	0.50	18.0	ALDER
3904	10.0	0.60	18.0	ALDER
3905	10.0	0.40	15.0	ALDER
3912	10.0	0.50	15.0	ALDER
3916	13.0	0.50	15.0	ALDER
3917	13.0	0.50	15.0	ALDER
3929	13.0	0.60	16.0	ALDER
3932	13.0	0.40	14.0	ALDER
3934	13.0	0.50	14.0	ALDER
3935	10.0	0.30	10.0	WILLOW
3936	10.0	0.30	10.0	WILLOW
3937	13.0	0.50	15.0	ALDER
3938	10.0	0.30	12.0	ALDER
3959	12.0	0.50	15.0	ALDER
4017	13.0	0.60	16.0	ALDER
4045	12.0	0.70	16.0	ALDER
4268	8.0	0.30	8.0	MAPLE
4300	16.0	0.70	16.0	ALDER
4301	14.0	0.60	16.0	ALDER
4304	14.0	0.50	16.0	ASH
4319	10.0	0.30	8.0	WILLOW
4320	7.0	0.30	9.0	ALDER
4321	7.0	0.30	9.0	ALDER
4322	7.0	0.30	9.0	ALDER
4340	12.0	0.40	11.0	ALDER
4341	12.0	0.40	11.0	ALDER
4346	16.0	0.50	13.0	ASH
4356	13.0	0.50	9.0	WILLOW
4364	14.0	0.70	14.0	OAK
4372	16.0	0.70	18.0	ASH
4377	18.0	1.00	18.0	ASH
4380	15.0	0.50	14.0	WILLOW
4394	13.0	0.30	9.0	WILLOW
4396	13.0	0.30	9.0	WILLOW
4397	13.0	0.30	9.0	WILLOW
4398	10.0	0.30	9.0	WILLOW
4399	10.0	0.30	9.0	WILLOW
4400	10.0	0.30	9.0	WILLOW
4439	12.0	0.60	8.0	ALDER
18049	11.0	0.55	13.0	ASH
18164	10.0	0.36	7.0	OAK
18165	20.0	1.40	16.0	OAK
18231	7.0	0.26	9.0	ASH
18388	7.5	0.26	6.5	OAK
18389	3.0	0.16	6.0	ASH
18390	6.0	0.21	6.0	OAK
18391	6.0	0.30	5.0	TREE UNKNOWN
18392	8.0	0.28	7.0	OAK
18393	9.0	0.31	7.0	OAK
18394	9.0	0.36	6.5	TREE UNKNOWN
18406	3.5	0.17	4.5	OAK
18407	9.5	0.33	10.0	OAK
18408	3.0	0.30	7.0	CYPRESS
18409	3.0	0.20	8.0	CYPRESS
18410	3.0	0.25	10.0	CYPRESS
18411	8.0	0.42	12.0	CYPRESS
18412	3.0	0.25	12.0	CYPRESS
18413	4.0	0.32	12.0	CYPRESS
18414	4.0	0.40	12.0	CYPRESS
18415	4.5	0.38	12.0	CYPRESS
18441	4.0	0.32	12.0	CYPRESS
18442	4.0	0.28	12.0	CYPRESS
18443	4.0	0.32	12.0	CYPRESS
18444	4.0	0.34	12.0	CYPRESS
18445	3.5	0.20	10.0	CYPRESS
18459	8.0	0.31	7.5	TREE UNKNOWN
18461	3.5	0.30	12.0	CYPRESS
18462	2.5	0.20	12.0	CYPRESS
18463	3.5	0.28	12.0	CYPRESS
18464	3.5	0.32	12.0	CYPRESS
18465	3.0	0.25	10.0	CYPRESS
18466	3.0	0.27	11.0	CYPRESS
18467	3.5	0.16	7.0	CYPRESS
18525	3.5	0.40	12.0	CYPRESS
18526	3.0	0.25	12.0	CYPRESS
18527	3.0	0.31	12.0	CYPRESS
18528	3.0	0.27	12.0	CYPRESS
18529	3.0	0.22	12.0	CYPRESS
18530	3.5	0.27	12.0	CYPRESS
18531	3.5	0.30	12.0	CYPRESS
18532	3.5	0.28	12.0	CYPRESS
18533	3.0	0.22	13.0	SILVER BIRCH
18534	10.0	0.28	12.0	HORSECHESTNUT
18535	10.0	0.31	14.0	BEECH
19652	12.0	0.55	17.0	OAK
19653	10.0	0.84	14.0	OAK
19841	11.0	0.60	10.0	OAK
19870	6.0	0.35	13.0	CYPRESS
19871	6.0	0.24	13.0	CYPRESS
19872	6.0	0.29	13.0	CYPRESS
19873	6.0	0.20	13.0	CYPRESS
19874	6.0	0.50	13.0	CYPRESS
19875	6.0	0.22	13.0	CYPRESS
19876	6.0	0.23	13.0	CYPRESS
19877	6.0	0.26	13.0	CYPRESS
27032	10.0	0.25	9.0	TREE UNKNOWN
27033	9.0	0.40	12.0	TREE UNKNOWN
27034	7.0	0.25	14.0	TREE UNKNOWN
27035	8.0	0.30	12.0	TREE UNKNOWN
27036	5.0	0.25	6.0	TREE UNKNOWN
27037	7.0	0.30	10.0	TREE UNKNOWN
27145	8.0	0.40	13.0	TREE UNKNOWN
27146	6.0	0.20	8.0	TREE UNKNOWN

Tree Schedule

Pt No	Spread	Bole	Height	Species
27147	14.0	0.90	15.0	OAK
27204	10.0	0.40	13.0	OAK
27205	10.0	0.45	6.0	TREE UNKNOWN
27207	8.0	0.30	10.0	TREE UNKNOWN
27325	7.0	0.25	10.0	TREE UNKNOWN
27326	8.0	0.40	13.0	OAK
27327	4.0	0.25	6.0	TREE UNKNOWN
27328	8.0	0.20	9.0	TREE UNKNOWN
27329	8.0	0.20	9.0	TREE UNKNOWN
27330	11.0	0.60	16.0	OAK
27331	7.0	0.25	10.0	TREE UNKNOWN
27347	9.0	0.20	10.0	OAK
27348	10.0	0.35	11.0	OAK
27349	1.0	0.25	9.0	
27410	7.0	0.25	9.0	OAK
27411	7.0	0.25	10.0	OAK
27412	7.0	0.30	11.0	OAK
27413	6.0	0.15	9.0	OAK
27414	6.0	0.15	9.0	OAK
27415	7.0	0.20	9.0	OAK
27416	7.0	0.15	9.0	OAK
27417	8.0	0.30	10.0	HOLLY
27418	9.0	0.40	12.0	OAK
27419	4.0	0.15	8.0	TREE UNKNOWN
27436	9.0	0.40	12.0	TREE UNKNOWN
27437	6.0	0.20	12.0	TREE UNKNOWN
27438	7.0	0.20	9.0	TREE UNKNOWN
27439	8.0	0.30	14.0	PINE
27440	8.0	0.25	14.0	PINE
27441	7.0	0.30	14.0	PINE
27442	7.0	0.25	13.0	PINE
27443	8.0	0.35	14.0	PINE
27444	6.0	0.20	8.0	TREE UNKNOWN
27510	8.0	0.30	12.0	OAK
27511	5.0	0.15	8.0	TREE UNKNOWN
27512	4.0	0.15	6.0	TREE UNKNOWN
27513	4.0	0.15	6.0	TREE UNKNOWN
27514	4.0	0.25	7.0	TREE UNKNOWN
27515	14.0	1.20	16.0	OAK
27516	10.0	0.30	12.0	OAK
27517	10.0	0.30	12.0	OAK
27518	10.0	0.35	13.0	OAK
27519	9.0	0.25	12.0	OAK
27520	9.0	0.30	12.0	OAK
27521	9.0	0.30	13.0	OAK
27522	8.0	0.30	11.0	OAK
27523	8.0	0.30	12.0	OAK
27524	8.0	0.55	12.0	OAK
27525	9.0	0.25	12.0	TREE UNKNOWN
27526	8.0	0.30	10.0	TREE UNKNOWN
27527	8.0	0.20	10.0	TREE UNKNOWN
27646	9.0	0.30	13.0	OAK
27647	11.0	0.45	13.0	OAK
27648	14.0	1.40	18.0	PINE
27649	10.0	0.50	12.0	PINE
27650	12.0	0.50	14.0	OAK
27651	6.0	0.25	8.0	TREE UNKNOWN
27652	6.0	0.25	8.0	TREE UNKNOWN
27669	8.0	0.35	12.0	YEW
27670	9.0	0.40	12.0	YEW
27671	7.0	0.40	16.0	PINE
27672	7.0	0.35	16.0	PINE
27673	8.0	0.35	14.0	TREE UNKNOWN
27674	8.0	0.30	13.0	TREE UNKNOWN
27675	8.0	0.40	15.0	TREE UNKNOWN
27676	6.0	0.25	10.0	TREE UNKNOWN
27677	6.0	0.20	10.0	TREE UNKNOWN
27678	4.0	0.30	9.0	TREE UNKNOWN
27679	15.0	0.80	18.0	OAK
27692	6.0	0.30	10.0	OAK
27712	8.0	0.30	10.0	TREE UNKNOWN
27713	8.0	0.25	12.0	TREE UNKNOWN
27714	8.0	0.25	10.0	TREE UNKNOWN
27715	8.0	0.35	12.0	OAK
27716	12.0	0.50	15.0	TREE UNKNOWN
27719	12.0	0.50	15.0	OAK
27720	14.0	0.50	16.0	OAK
27721	14.0	0.40	16.0	OAK
27722	13.0	0.45	16.0	OAK
27723	8.0	0.25	12.0	TREE UNKNOWN
27724	9.0	0.25	13.0	TREE UNKNOWN
27725	13.0	0.50	15.0	OAK
27730	12.0	0.50	14.0	TREE UNKNOWN
27731	12.0	0.45	14.0	OAK
27732	8.0	0.30	10.0	TREE UNKNOWN
27733	8.0	0.25	10.0	TREE UNKNOWN
30168	7.0	0.30	7.0	HAWTHORN
30231	8.0	0.30	8.0	ASH
30232	8.0	0.30	8.0	TREE UNKNOWN
30233	8.0	0.30	8.0	TREE UNKNOWN
30234	7.0	0.30	10.0	ASH
30235	7.0	0.30	10.0	ASH
30236	7.0	0.30	10.0	ASH
30237	9.0	0.60	9.0	ALDER
30238	7.0	0.40	8.0	ALDER
40000	9.0	0.40	15.0	TREE UNKNOWN
40001	6.0	0.30	13.0	PINE
40002	6.0	0.30	13.0	PINE
40003	6.0	0.30	13.0	PINE
40004	6.0	0.30	11.0	PINE
40005	6.0	0.30	11.0	PINE
40006	4.0	0.20	10.0	TREE UNKNOWN
40018	6.0	0.30	11.0	PINE
40019	6.0	0.45	11.0	PINE
40020	6.0	0.30	10.0	PINE
40021	6.0	0.30	10.0	PINE
40022	6.0	0.35	11.0	PINE
40023	6.0	0.50	11.0	PINE
40024	6.0	0.35	12.0	PINE
40025	6.0	0.20	12.0	PINE
40026	6.0	0.20	12.0	PINE
40027	6.0	0.20	11.0	PINE
40028	6.0	0.20	11.0	PINE
40029	10.0	0.35	13.0	TREE UNKNOWN
40030	6.0	0.40	12.0	PINE
40031	5.0	0.25	10.0	PINE
40032	5.0	0.40	10.0	PINE
40049	8.0	0.60	13.0	TREE UNKNOWN
40050	8.0	0.60	13.0	TREE UNKNOWN
40051	9.0	0.60	14.0	TREE UNKNOWN
40052	10.0	0.80	14.0	TREE UNKNOWN
40053	6.0	1.00	16.0	TREE UNKNOWN
40054	11.0	0.80	16.0	OAK
40055	10.0	0.75	16.0	OAK
40056	9.0	0.60	15.0	OAK
40057	12.0	0.80	15.0	OAK
40058	5.0	0.40	10.0	TREE UNKNOWN
40059	5.0	0.30	13.0	TREE UNKNOWN
40060	6.0	0.40	11.0	TREE UNKNOWN
40061	6.0	0.35	9.0	TREE UNKNOWN
40062	8.0	0.65	14.0	TREE UNKNOWN
40065	6.0	0.40	12.0	TREE UNKNOWN
50044	14.0	1.10	20.0	TREE UNKNOWN
50045	6.0	0.15	9.0	TREE UNKNOWN
50046	6.0	0.15	9.0	TREE UNKNOWN
50054	9.0	0.40	13.0	TREE UNKNOWN
50055	13.0	0.70	14.0	TREE UNKNOWN
50056	9.0	0.35	12.0	TREE UNKNOWN
50061	5.0	0.15	8.0	HAWTHORN
50081	7.0	0.20	8.0	HAWTHORN
50082	7.0	0.20	8.0	HAWTHORN
50083	14.0	0.70	16.0	TREE UNKNOWN
50084	13.0	1.05	17.0	TREE UNKNOWN
50085	11.0	0.80	16.0	TREE UNKNOWN
50086	12.0	0.60	16.0	TREE UNKNOWN
50087	15.0	1.05	15.0	TREE UNKNOWN
50088	6.0	0.20	9.0	TREE UNKNOWN
50090	6.0	0.30	8.0	TREE UNKNOWN
50092	9.0	0.30	13.0	TREE UNKNOWN
50093	13.0	1.05	20.0	TREE UNKNOWN
50094	16.0	1.20	20.0	TREE UNKNOWN
50095	14.0	0.90	18.0	TREE UNKNOWN
50124	20.0	1.30	20.0	TREE UNKNOWN
50125	16.0	1.20	20.0	TREE UNKNOWN
50126	15.0	1.00	20.0	TREE UNKNOWN
50129	6.0	0.20	6.0	HAWTHORN
50130	7.0	0.35	9.0	HAWTHORN
50131	14.0	1.00	20.0	TREE UNKNOWN
50162	18.0	1.20	19.0	TREE UNKNOWN
50163	15.0	0.70	19.0	TREE UNKNOWN
50231	17.0	0.90	19.0	TREE UNKNOWN
50243	10.0	0.45	12.0	TREE UNKNOWN
50244	8.0	0.30	9.0	TREE UNKNOWN
50245	16.0	1.00	18.0	TREE UNKNOWN
50246	9.0	0.25	14.0	TREE UNKNOWN
50247	11.0	0.60	15.0	TREE UNKNOWN
50275	7.0	0.20	11.0	TREE UNKNOWN
50307	8.0	0.35	10.0	TREE UNKNOWN
50308	9.0	0.60	15.0	TREE UNKNOWN
50309	9.0	0.50	12.0	TREE UNKNOWN



Coordinate Table

Stn	Easting	Northing	Level
STN1	514481.302	131770.777	30.324
STN10	514028.984	130937.728	28.692
STN100	514093.861	131273.698	27.924
STN101	514122.372	131361.519	28.498
STN10G	514029.020	130937.758	28.685
STN11	514006.992	130998.475	28.298
STN12	513992.650	131080.751	28.268
STN12G	513992.689	131080.753	28.263
STN13	513984.722	131187.746	28.869
STN13G	513984.693	131187.760	28.849
STN14	513984.178	131227.788	28.834
STN14G	513984.216	131227.771	28.834
STN15	513998.803	131261.181	29.285
STN16	514007.030	131344.701	27.879
STN16G	514007.051	131344.655	27.889
STN16G	514007.051	131344.656	27.887
STN17	514021.991	131390.418	27.714
STN17A	514010.479	131381.967	27.590
STN17G	514022.003	131390.361	27.720
STN18	514144.589	131355.482	28.788
STN18A	514212.370	131272.968	30.374
STN19	514155.072	131436.550	29.067
STN2	514389.551	131564.589	31.277
STN20	514122.642	131481.347	28.806
STN21	514020.133	131476.924	27.336
STN22	513996.581	131536.986	27.923
STN23	513924.953	131668.180	27.201
STN24	514004.591	131706.861	27.799
STN25	514128.172	131732.518	28.281
STN26	514237.685	131713.026	30.541
STN27	514363.759	131706.541	30.719
STN3	514352.730	131399.271	32.338
STN4	514287.463	131223.989	33.144
STN4G	514287.437	131223.968	33.126
STN5	514304.628	131163.052	32.937
STN5A	514356.130	131157.471	33.670
STN6	514199.191	130994.619	31.151
STN6G	514199.186	130994.659	31.161
STN6G6	514199.182	130994.656	31.160
STN8	514168.666	130955.879	30.761
STN8A	514199.402	130958.678	31.155
STN8G	514168.678	130955.926	30.741
STN9	514099.727	130931.983	30.977
STN96	514007.477	130996.705	28.306
STN97	514055.054	131043.412	30.441
STN98	514114.497	131068.124	29.774
STN99	514091.855	131165.420	28.672
STN9G	514099.747	130932.030	30.977
STNAG	513946.244	130924.721	29.992
STNE1	514000.340	131271.248	29.315
STNE2	514026.455	131242.041	29.704
STNE3	513988.424	131140.215	28.630
STNE4	514035.571	131120.226	30.014
STNG4G	514287.436	131223.997	33.162
STNGR1	514024.240	130950.697	29.593
STNGR2	513999.710	131031.239	29.808
STNGR3	513998.552	131038.264	29.829
STNGR4	513996.982	131049.719	29.816
STNL1	514227.848	131046.263	31.851
STNL10	514317.286	131391.191	33.731
STNL11	514313.797	131382.133	32.817
STNL12	514303.763	131378.689	32.416
STNL13	514347.394	131485.575	33.545
STNL13A	514338.604	131485.456	32.313
STNL14	514344.561	131460.541	34.073
STNL15	514339.745	131441.620	34.664
STNL16	514016.594	130973.340	28.182
STNL17	514051.425	130975.037	30.236
STNL18	514096.974	131074.296	29.285
STNL19	513978.579	131070.446	28.254
STNL1G	514227.847	131046.290	31.858
STNMR1	514058.789	130941.960	29.869
STNP1	514455.460	131762.391	30.924
STNP10	514026.242	131463.105	27.376
STNP11	514191.878	131441.886	32.769
STNP12	514086.271	131377.911	27.971
STNP12G	514086.281	131377.834	27.957
STNP14	514009.524	131406.958	26.268
STNP15	514071.570	131349.455	26.929
STNP16	514078.242	131316.855	27.024
STNP16A	514046.609	131309.166	26.633
STNP17	514068.017	131286.937	26.575
STNP18	514031.714	131346.741	27.148
STNP19	514042.133	131319.850	27.685
STNP2	514446.381	131821.561	29.592
STNP20	514050.703	131279.251	27.807
STNP21	514067.971	131257.608	26.572
STNP22	514072.064	131225.181	26.609
STNP23	514076.155	131254.682	26.637
STNP24	514071.635	131194.907	27.039
STNP25	514076.308	131164.858	27.648
STNP26	514080.254	131123.263	28.528
STNP26A	514028.894	131116.491	30.161
STNP27	514020.926	131211.124	29.888
STNP28	513977.342	131041.709	28.916
STNP29	513976.141	131027.381	29.208
STNP3	514444.266	131793.511	29.944
STNP4	514366.493	131603.267	32.063
STNP5	514250.630	131580.370	31.142
STNP6	514287.549	131502.729	33.969
STNP7	513957.747	131635.601	27.942
STNP8	513901.468	131624.491	26.750
STNP9	513919.474	131589.714	27.393
STNRM2	513952.810	130926.409	29.808
STNT1	514193.106	131686.997	32.578
STNT10	514135.002	131459.281	30.243
STNT11	514143.854	131400.104	29.384
STNT12	514094.165	131375.109	29.554
STNT13	514147.322	131201.912	31.565
STNT2	514121.769	131679.196	31.736
STNT3	514057.614	131672.179	31.260
STNT5	513974.868	131684.844	29.639
STNT6	514063.526	131551.478	30.465
STNT7	513994.018	131561.336	29.612
STNT8	514098.762	131551.079	31.146
STNT9	514239.309	131255.607	32.808
STNW1	514228.577	131366.942	30.462
STNW1A	514209.114	131300.468	31.466
STNW1B	514269.499	131265.510	34.246
STNW1B1	514282.710	131275.254	34.218
STNW1C	514271.859	131275.421	32.423
STNW1D	514285.621	131288.659	32.188
STNW1E	514268.334	131316.596	31.516
STNW1F	514265.406	131339.704	31.711
STNW2	514269.140	131370.842	31.240
STNW3	514284.284	131345.293	31.716
STNW3A	514295.955	131398.644	31.893
STNW3B	514317.428	131404.784	32.364
STNW3C	514302.432	131444.003	31.833
STNW4	514279.393	131396.967	31.216
STNW5	514283.672	131452.977	30.901
STNW5A	514294.533	131452.160	31.504
STNW6	514262.385	131473.118	30.402
STNW6A	514247.783	131491.490	29.917
STNW7	514229.566	131382.942	30.598
STNW7T	514236.746	131487.584	31.319

Notes:

Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.

All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction.

Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

N
INDICATIVE

Legend:

Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:	
Barbed Wire Fence	B/W
Corrugated Iron Fence	C/I
Closed Board Fence	C/B
Chestnut Paling Fence	C/P
Iron Railing Fence	I/R
Post and Chain Fence	P/C
Post and Rail Fence	P/R
Post Wire Fence	P/W
Interwoven	I/W
Chain Link Fence	C/L
Larch Lap Fence	L/L
Wire Mesh Fence	W/M

Abbreviations:

BOLLARD	BO	MARKER	MK
BRITISH TELECOM IC	BT	PARKING METER	PM
CONCRETE PAVING SLABS	CPS	ROAD NAME PLATE	RNP
COVER LEVEL	CL	ROAD SIGN	RS
DROP KERB	DK	RODDING EYE	RE
ELECTRICITY POLE	EP	RETAINING WALL	Rtw
FIRE HYDRANT	FH	RAINWATER PIPE	RPW
FLOWER BED	F/B	SOIL VENT PIPE	SVP
FOOTPATH	FP	STOP VALVE	SV
GAS VALVE	GV	TELEGRAPH POLE	TP
GULLY	GY	TRAFFIC LIGHT	TL
INSPECTION COVER	IC	UNABLE TO LIFT	UTL
PIPE INVERT LEVEL	IL	VENT PIPE	VP
KERB OUTLET	KO	WATER METER	WM
MAN HOLE	MH		

Sheet Layout

1	2
3	4
5	6
7	8

Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client
gleeson land

Location
Lower Broadbridge Farm
Broadbridge

Drawing Title
Topographical Survey Sheet 1 of 8

Job No. 2402059 | Old Job No. 1905017

Drawing Number GH/2402059/1 | Revision Suffix

Scale 1:200m (A0) | Date April 2024

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Notes:

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Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:

Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:	
Barbed Wire Fence	B/W
Corrugated Iron Fence	C/I
Closed Board Fence	C/B
Chestnut Paling Fence	C/P
Iron Railing Fence	I/R
Post and Chain Fence	P/C
Post and Rail Fence	P/R
Post Wire Fence	P/W
Interwoven	I/W
Chain Link Fence	C/L
Larch Lap Fence	L/L
Wire Mesh Fence	W/M

Abbreviations:

BOLLARD	BO	MARKER	MK
BRITISH TELECOM IC	BT	PARKING METER	PM
CONCRETE PAVING SLABS	CPS	ROAD NAME PLATE	RNP
COVER LEVEL	CL	ROAD SIGN	RS
DROP KERB	DK	RODDING EYE	RE
ELECTRICITY POLE	EP	RETAINING WALL	Rtw
FIRE HYDRANT	FH	RAINWATER PIPE	RPW
FLOWER BED	F/B	SOIL VENT PIPE	SVP
FOOTPATH	FP	STOP VALVE	SV
GAS VALVE	GV	TELEGRAPH POLE	TP
GULLY	GY	TRAFFIC LIGHT	TL
INSPECTION COVER	IC	UNABLE TO LIFT	UTL
PIPE INVERT LEVEL	IL	VENT PIPE	VP
KERB OUTLET	KO	WATER METER	WM
MAN HOLE	MH		

Sheet Layout

1	2
3	4
5	6
7	8

Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Lower Broadbridge Farm
Broadbridge

Drawing Title

Topographical Survey
Sheet 2 of 8

Job No. 2402059 Old Job No. 1905017

Drawing Number GH/2402059/2 Revision Suffix

Scale 1:200m (A0) Date April 2024

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Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:

Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:
Barbed Wire Fence BW
Chestnut Paling Fence CP
Closed Board Fence CB
Chestnut Paling Fence CP
Post and Rail Fence P/R
Post and Chain Fence P/C
Post and Rail Fence P/R
Stock Fence SF
Wire Fence W
Chain Link Fence CL
Post and Wire Fence P/W
Wire Mesh Fence W/M

Abbreviations:
BOLLARD BD
BRITISH TELECOM PC BT
CONCRETE PANEL SLABS CPS
COVER LEVEL CL
DROP KERB DK
ELECTRICITY POLE EP
FIRE HYDRANT FH
FLOWER BED FB
GAS VALVE GV
KERB KB
INSPECTION COVER IC
INVERT LEVEL IL
KERB SLOPED FULL KD
MAN HOLE MH
MARKER MK
PARKING METER PM
PAVING SLABS PS
ROAD SIGN RS
WOODNIZ TREE WT
TELEGRAPH POLE TP
TRAFFIC LIGHT TL
TOOL POST PIPE TP
TRIAL HOLE TH
SUPPORTED CABLE SC
TRIAL PIT TP
UNABLE TO LIFT UTL
VALVE CHAMBER VC
WATER METER WM

Sheet Layout

1 2
3 4
5 6
7 8

Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Lower Broadbridge Farm
Broadbridge

Drawing Title

Topographical Survey
Sheet 3 of 8

Job No.	2402059	Old Job No.	1905017
Drawing Number	GH/2402059/3	Revision Suffix	
Scale	1:200m (A0)	Date	April 2024

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Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:

Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:
Barbed Wire Fence BWF
Chestnut Paling Fence CPF
Closed Board Fence CBF
Chestnut Pailing Fence CPF
Post and Rail Fence PRF
Post and Rail Fence PRF
Post and Wire Fence PWF
Stakenet Fence SF
Close Board Fence CBF
Cleft Log Fence CLF
Wire Mesh Fence WMF

Abbreviations:
BOLLARD BD
CONCRETE BLOCK IC
CONCRETE PAVING SLABS CPS
EDGE STONE ES
FENCE POST FP
ELECTRICITY POLE EP
FLAG STONE FS
GRATED INLET GI
HOTSPACE HS
KERB KERB
OIL STAND OS
INSPECTION COVER IC
MANHOLE COVER MC
KERB OUTLET KO
MAN HOLE MH
MARKER MK
PARKING METER PM
ROAD NAME PLATE RNP
SIGN SIGN
ROOFING TILE RT
RETAINING WALL RW
TELEPHONE BOX TB
TRAFFIC LIGHT TL
STOP VALVE SV
TELEPHONE POLE TP
UNABLE TO LIFT UTO
WATER VALVE WV
WATER METER WM

Sheet Layout

1	2	
3	4	
5	6	
7	8	

Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson plan

Location

Lower Broadbridge Farm
Broadbridge

Drawing Title

Topographical Survey
Sheet 4 of 8

Job No.	2402059	Old Job No.	1905017
Drawing Number	GH/2402059/4	Revision Suffix	
Scale	1:200m (A0)	Date	April 2024

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Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:

Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:
Barbed Wire Fence BWF
Chain Link Fence CLF
Closed Board Fence CBF
Chestnut Paling Fence CPF
Post and Rail Fence P/R
Post and Trellis Fence P/T
Post and Rail Fence P/RF
Stock Fence STF
Stakenet SN
Concrete Post Fence CPF
Cleft Log Fence CLF
Wire Mesh Fence WMF

Abbreviations:

BOLLARD
BRICK PIER
CONCRETE PAVING SLABS
EDGE
EDGE KERB
ELECTRICITY POLE
FLAG STONE
FLOWER BED
HOTSPACE
KERB
KIOSK PILLAR
LAMP
INSPECTION COVER
MANHOLE COVER
KERB OUTLET
MAN HOLE

BD
BP
CPS
E
EK
EP
FS
FB
HS
K
LP
MC
MH

MARKER
PARKING METER
ROAD NAME PLATE
ROCKERY
ROOFING TILE
RETAINING WALL
SIGN POST / POLE
SOIL PIPE VENT
STEP
STOP VALVE
TELEPHONE POST
UNABLE TO LIFT
WALL MARK
WATER METER

MK
PM
RNP
RT
RW
SP
SV
TP
UTL
WM
WV

Sheet Layout

1 2
3 4
5 6
7 8

Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Lower Broadbridge Farm
Broadbridge

Drawing Title

Topographical Survey
Sheet 5 of 8

Job No.	2402059	Old Job No.	1905017
Drawing Number	GH/2402059/5	Revision Suffix	
Scale	1:200m (A0)	Date	April 2024

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INDICATIVE

Legend:

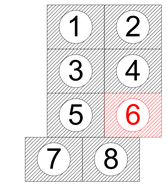
Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:
Barbed Wire Fence BW
Corrugated Iron Fence CI
Closed Board Fence CB
Open Board Fence OB
Wire Mesh Fence WM
Post and Rail Fence PR
Post and Chain Fence PC
Post and Wire Fence PW
Post and Twin Fence PT
Wire Low Fence WL
Otherwise LF
Chain Link Fence CL
Cattle Grid Fence CG
Wire Mesh Fence W/M

Abbreviations:

BOLLARD	BD	MARKER	MK
BOLLARD - ELECTRIC AC	BE	MANHOLE - METER	MH
CONCRETE PAVING SLABS	CPS	POST - NAME PLATE	NAME
COVER LEVEL	CL	ROAD SIGN	RS
DRAIN INLET	DI	TELEPHONE	TEL
ELECTRICITY POLE	EP	RETAINING WALL	RW
FIRE HYDRANT	FH	SUBMERGED PIPE	SUBPIPE
FLOOD LIGHT	FL	TRAFFIC LIGHT	TL
GUIDEPOST	GP	TOP OF SLOPE	TOS
KIOSK - BT	KIOSK	TRAFFIC LIGHT	TL
KIOSK - ELECTRIC	KIOSK	TRIANGULATION STATION	TS
MANHOLE COVER	MH	UNABLE TO LIFT	UTL
MANHOLE COVER - STEEL	MH	VALVE	V
NEWS OUTLET	NO	WATER METER	WM
WIRE POLE	WP		

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Lower Broadbridge Farm
Broadbridge

Drawing Title

Topographical Survey
Sheet 6 of 8

Job No. 2402059	Old Job No. 1905017
Drawing Number GH/2402059/6	Revision Suffix
Scale 1:200m (A0)	Date April 2024

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131040N
131020N
131000N
130980N
130960N
130940N
130920N
130900N
513900E
513920E
513940E
513960E
513980E
514000E
514020E
514040E
514060E
514080E

STNP28
STNP29
STNP32
STNP23
STNA6
STN96
STNL16
STNL17
STN10
STNMR1
Air Raid Shelter
Bldg Ht=2.0m
Unmade
Small Trees And Bushes Ht=8.0m
Mixed Foliage Ht=6.0m
Mixed Foliage Ht=4.0m
Mixed Foliage Ht=7.0m
Mixed Foliage Avg Ht=8.0m
Mixed Foliage Avg Ht=7.0m
Mixed Foliage Avg Ht=6.0m
Rough Grass
Grass
Tarmac
Pipe Bridge
B/B Ht=1.2m
Hedge Ht=1.5m
Tree Canopy Ht=10.0m
Mixed Foliage Ht=6.0m
Wall Ht=1.0m
Conc Setts
Conc
SLOW
Five Oaks Road
Bus Stop
Gate
Cable
RM
SV
DK
BT
RS
Sign
Gully
Manhole
Ditch
Culvert
Fence
Wall
Hedge
Tree
Overhead Electric
Overhead Phone
Building

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INDICATIVE

Legend:

Fences, Walls, Hedges, Trees, Buildings, Overhead Electric, Overhead Phone, Gate

Fences: Barbed Wire Fence (B/W), Post and Rail Fence (P/R), Closed Board Fence (CB), Chestnut Paling Fence (CP), Post and Wire Fence (P/W), Post and Chain Fence (P/C), Post Rail Fence (P/R), Chain Link Fence (C/L), Palisade Fence (P), Wire Mesh Fence (W/M)

Abbreviations:

BOLLARD	BO	MARKER	MK
BRITISH TELECOM PC	BT	PARKING METER	PM
CABLE TELEVISION CABIN	CAB	PLANTING PLATE	PP
COVER LEVEL	CL	POST SIGN	SP
DROP KERB	DK	RODDING EYE	RE
ELECTRICITY POLE	EP	SOIL VENT PIPE	SVP
FIRE HYDRANT	FH	STANDARD TREE	ST
FLOWER BED	FB	SIGN POST	SP
GULLY	G	TELEPHONE POLE	TP
GAS VALVE	GV	TELEPHONE POST	TP
INVERT	IN	TRAFFIC LIGHT	TL
INSPECTION COVER	IC	UNABLE TO LIFT	UTL
KERB LOWERED	KD	VALVE	V
KERB RAISED LEVEL	KR	WATER METER	WM
MAN HOLE	MH		

Sheet Layout

1 2 3 4 5 6 7 8

Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client: gleeson land

Location: Lower Broadbridge Farm, Broadbridge

Drawing Title: Topographical Survey Sheet 7 of 8

Job No.	2402059	Old Job No.	1905017
Drawing Number	GH/2402059/7	Revision Suffix	
Scale	1:200m (A0)	Date	April 2024

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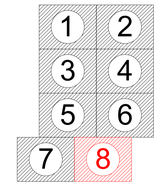
Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:



Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	GG	Verified By	GG	CAD Operator	TJH	Approved By	EG	Date	18.04.24

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson plc

Location

Lower Broadbridge Farm
Broadbridge

Drawing Title

Topographical Survey
Sheet 8 of 8

Job No.	2402059	Old Job No.	1905017
Drawing Number	GH/2402059/8	Revision Suffix	
Scale	1:200m (A0)	Date	April 2024

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Appendix C
Asset Records



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Date: 11/10/21

Scale: 1:1250

Map Centre: 514185,131372

Data updated: 20/09/21

Our Ref: 671212 - 3

Wastewater Plan A0

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2021 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer
Combined Gravity Sewer
Covered Water Course or Inland Rivers
Surface Water Gravity Sewer
Rising Main, Vacuum or Siphon
Combined Outfall
Foul Outfall
Surface Water Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Asset
Building Over Agreement Only
Foul Manhole
Combined Manhole
Surface Water Manhole
Dual Entry Manhole, Association Overlays Exactly Manhole or Surface Water Soakaway

shane@utilitasassociates.co.uk

BROADBRIDGE FARM

WATER for LIFE

from Southern Water

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0901	F	29.56	26.85	
1901	F	30.15	26.85	
1902	F	29.30	0.00	
2001	F	0.00	0.00	
2002	F	0.00	0.00	
2101	F	0.00	0.00	
2102	F	0.00	0.00	
2901	F	0.00	0.00	
2902	F	30.87	28.81	
2903	F	30.53	28.60	
2904	F	30.50	28.46	
2905	F	31.06	28.33	
2906	F	31.20	29.89	
2907	F	30.94	27.84	
2908	F	31.26	28.00	
2909	F	31.41	30.11	
3101	F	34.13	29.87	
3102	F	33.72	29.69	
3103	F	33.54	31.30	
3104	F	33.16	28.90	
3201	F	33.97	31.58	
3202	F	33.52	31.16	
3203	F	33.33	31.45	
3204	F	33.56	32.01	
3301	F	33.33	31.55	
3302	F	33.05	31.41	
3303	F	33.23	31.13	
3304	F	33.14	30.99	
3400	F	32.13	30.68	
3803	F	31.88	30.01	
3901	F	32.67	31.32	
3902	F	32.48	30.96	
3903	F	32.34	30.87	
3904	F	32.92	30.78	
3905	F	32.27	30.68	
3906	F	31.85	29.92	
3907	F	32.22	30.12	
3908	F	32.82	30.30	
4101	F	36.28	32.66	
4102	F	36.11	32.09	
4103	F	35.45	31.86	
4104	F	36.22	32.39	
4105	F	35.00	31.59	
4106	F	34.30	31.15	
4107	F	0.00	0.00	
4108	F	0.00	0.00	
4201	F	35.74	33.65	
4202	F	35.99	33.53	
4203	F	34.64	31.61	
4204	F	34.93	32.07	
4205	F	35.20	32.31	
4206	F	35.46	32.96	
4207	F	34.09	32.46	
4208	F	0.00	0.00	
4209	F	0.00	0.00	
4301	F	34.01	32.12	
4302	F	34.81	32.22	
4303	F	34.87	32.35	
4308	F	0.00	0.00	
4401	F	32.76	30.65	
4402	F	32.73	30.46	
4403	F	33.21	30.31	
4405	F	33.75	30.03	
4406	F	34.10	32.36	
4501	F	32.70	29.54	
4502	F	32.56	29.00	
4503	F	32.78	29.43	
4601	F	32.30	28.30	
4602	F	33.16	28.59	
4701	F	31.00	29.72	
4702	F	32.40	27.99	
4901	F	33.32	30.58	
4902	F	33.73	31.05	
4903	F	33.75	31.21	
4904	F	33.61	31.47	
4905	F	33.65	31.72	
5001	F	36.18	33.83	
5002	F	0.00	0.00	
5101	F	36.28	33.11	
5102	F	36.39	32.96	
5103	F	36.13	33.30	
5104	F	36.34	33.72	
5105	F	37.17	34.81	
5106	F	37.32	34.95	
5107	F	37.73	35.83	
5108	F	37.97	35.55	
5109	F	0.00	0.00	
5110	F	0.00	0.00	
5111	F	0.00	0.00	
5201	F	36.40	34.11	
5202	F	38.45	0.00	
5203	F	0.00	0.00	
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5205	F	0.00	0.00	
5206	F	0.00	0.00	
5207	F	0.00	0.00	
5208	F	0.00	0.00	
5209	F	0.00	0.00	
5210	F	0.00	0.00	
5401	F	36.38	33.24	
5402	F	35.58	0.00	
5403	F	35.11	0.00	
5404	F	35.70	32.76	
5405	F	0.00	0.00	
5408	F	0.00	0.00	
5409	F	0.00	0.00	
5411	F	0.00	0.00	
5701	F	0.00	0.00	
5702	F	32.22	31.06	
5703	F	0.00	0.00	
5704	F	31.92	30.03	
5705	F	30.99	29.81	
5706	F	31.89	30.55	
5707	F	31.89	30.58	
5708	F	31.80	30.77	
6001	F	37.65	35.69	
6002	F	0.00	0.00	
6101	F	37.83	35.21	
6102	F	38.15	35.38	
6103	F	39.01	36.43	
6104	F	38.81	36.76	
6105	F	39.23	37.09	
6106	F	0.00	0.00	
6201	F	0.00	0.00	
6202	F	0.00	0.00	
6203	F	0.00	0.00	
6204	F	0.00	0.00	
6301	F	39.45	0.00	
6302	F	0.00	0.00	
6303	F	0.00	0.00	
6401	F	39.51	35.01	
6402	F	0.00	0.00	
6403	F	37.17	33.54	
6404	F	37.70	33.97	
6405	F	36.60	0.00	
6406	F	38.52	34.24	
6501	F	37.03	35.03	
6502	F	36.09	33.12	
6601	F	34.27	33.71	
6602	F	34.39	32.71	
6603	F	32.48	31.33	
6604	F	33.04	32.04	
6605	F	35.32	0.00	
7101	F	40.59	38.44	
7102	F	41.05	38.21	
7103	F	41.10	38.09	
7104	F	40.14	37.64	
7105	F	41.07	38.19	
7201	F	0.00	0.00	
7202	F	0.00	0.00	
7203	F	0.00	0.00	
7204	F	0.00	0.00	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
7205	F	0.00	0.00	
7501	F	38.21	36.31	
7502	F	38.39	37.27	
7503	F	39.12	0.00	
7504	F	36.92	35.44	
7506	F	36.50	34.99	
7507	F	0.00	0.00	
7508	F	0.00	0.00	
7509	F	0.00	0.00	
7510	F	0.00	0.00	
7512	F	0.00	0.00	
7513	F	0.00	0.00	
7514	F	0.00	0.00	
7515	F	0.00	0.00	
7601	F	36.27	0.00	
7603	F	36.30	34.74	
7604	F	35.90	34.39	
7606	F	35.42	0.00	
8101	F	0.00	0.00	
8102	F	0.00	0.00	
8401	F	39.94	38.02	
8501	F	39.44	0.00	
8601	F	37.54	35.55	
9202	F	0.00	0.00	
0951	S	0.00	0.00	
1951	S	29.85	27.09	
2051	S	31.73	28.87	
2052	S	31.96	30.53	
2053	S	32.07	30.46	
2151	S	32.42	30.66	
2850	S	0.00	0.00	
2950	S	30.86	29.19	
2951	S	30.48	29.11	
2952	S	30.60	29.08	
2953	S	31.23	29.01	
2954	S	31.34	0.00	
2955	S	0.00	0.00	
3050	S	33.61	31.92	
3151	S	34.08	32.31	
3152	S	33.83	32.27	
3153	S	33.13	31.90	
3154	S	33.71	31.85	
3155	S	34.22	32.65	
3156	S	32.86	31.34	
3251	S	33.43	31.97	
3252	S	33.40	32.14	
3253	S	34.17	32.55	
3254	S	33.56	32.50	
3255	S	34.05	33.09	
3256	S	33.93	32.83	
3351	S	33.28	32.01	
3352	S	33.27	31.88	
3353	S	33.01	31.73	
3354	S	33.23	31.52	
3355	S	33.16	31.48	
3451	S	31.77	30.26	
3551	S	31.25	29.70	
3852	S	31.90	30.31	
3950	S	32.27	30.33	
3951	S	32.61	30.02	
3952	S	33.08	31.60	
3953	S	33.50	32.00	
3954	S	32.81	31.13	
3955	S	32.19	30.54	
3956	S	32.49	29.82	
3957	S	32.28	29.73	
3958	S	32.28	29.71	
3959	S	32.04	29.68	
4051	S	35.46	34.02	
4151	S	36.25	33.07	
4152	S	36.15	32.63	
4153	S	35.47	32.52	
4154	S	36.19	32.89	
4155	S	35.09	32.48	
4156	S	34.34	32.45	
4157	S	34.34	32.79	
4158	S	0.00	0.00	
4251	S	35.81	34.04	
4252	S	36.09	33.87	
4253	S	34.64	32.74	
4254	S	34.85	32.81	
4255	S	35.16	33.30	
4256	S	35.43	33.59	
4351	S	34.16	32.69	
4352	S	34.77	33.75	
4353	S	34.87	34.07	
4451	S	32.79	31.24	
4452	S	32.68	30.73	
4453	S	33.29	30.90	
4454	S	32.21	30.47	
4455	S	33.65	30.98	
4456	S	34.24	32.90	
4551	S	32.65	31.32	
4651	S	30.75	28.98	
4652	S	30.34	28.78	
4751	S	30.43	28.45	
4752	S	30.35	28.29	
4753	S	30.11	27.89	
4754	S	30.78	28.85	
4950	S	33.61	32.07	
4951	S	33.62	32.19	
4952	S	33.75	32.30	
4953	S	33.63	32.28	
4954	S	33.35	31.90	
5051	S	36.20	34.65	
5052	S	36.48	35.01	
5151	S	36.24	33.55	
5152	S	36.39	33.31	
5153	S	36.15	33.80	
5154	S	36.41	34.12	
5155	S	37.22	35.15	
5156	S	36.29	34.65	
5157	S	37.30	35.22	
5158	S	37.64	36.21	
5159	S	37.94	35.42	
5160	S	38.08	35.97	
5251	S	36.47	34.68	
5452	S	35.90	34.44	
5453	S	35.42	34.36	
5454	S	35.66	34.36	
5455	S	35.68	34.29	
5751	S	31.78	29.78	
5752	S	30.75	29.00	
6051	S	37.70	35.90	
6052	S	36.56	35.05	
6151	S	37.76	35.62	
6152	S	38.21	35.76	
6153	S	39.16	37.11	
6154	S	38.77	37.22	
6155	S	39.24	37.89	
6451	S	37.24	36.11	
6651	S	32.73	31.20	
6751	S	32.82	30.98	
7051	S	38.63	37.15	
7551	S	36.92	35.72	
7552	S	36.50	35.24	
7651	S	36.38	34.99	
7652	S	35.88	33.55	
7653	S	35.50	33.15	
8051	S	39.71	38.25	
9160	S	40.53	39.63	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix D
Proposed Drainage Strategy

W24149-PER-XX-XX-DR-C-02022

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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CONSTRUCTION

1. SAFE CONSTRUCTION METHOD OF SW & FW SEWER ADJACENT TO THE EXISTING GAS AND EXISTING SEWER UTILITIES ON SITE.

MAINTENANCE

1. ANY EXCAVATION WORKS NEAR THE HIGH PRESSURE GAS PIPELINE TO BE UNDERTAKEN UNDER PERMIT TO WORK AND NEED TO NOTIFY THE UTILITY COMPANY

DEMOLITION

1. CARE TO BE TAKEN DURING SITE CLEARANCE AND SITE STRIP WORKS AROUND EXISTING UTILITIES

ALL WORKS TO BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING (WHERE APPROPRIATE) TO AN APPROVED METHOD STATEMENT

THIS DRAWING SHOULD NOT BE USED FOR CONSTRUCTION UNLESS THE DRAWING STATUS IS "CONSTRUCTION"

GENERAL NOTES:

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2. ALL UNITS IN MILLIMETERS U.N.O. ON THE DRAWING.
3. DO NOT SCALE OFF THE DRAWING.
4. THE WORKS DESCRIBED AND SPECIFIED ON THIS DRAWING AND ASSOCIATED DRGS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ALL CURRENT HEALTH AND SAFETY LEGISLATION AND THE PROJECT HEALTH & SAFETY PLAN, PREPARED BY THE PLANNING SUPERVISOR FOR THE PROJECT.
5. WHERE NOTES AND INFORMATION ON THIS DRG DIFFER FROM THE SPECIFICATION, CLARIFICATION SHOULD BE SOUGHT FROM THE ENGINEER.

LEGEND

- S104 SW SEWER
- S104 SW MANHOLE
- PERMEABLE PAVING
- S104 FW RISING MAIN
- S104 FW SEWER
  HIGH PRESSURE GAS MAIN
  (8m EASEMENT EITHER SIDE)
- S104 FW MANHOLE
- PROPOSED ACOUSTIC FENCE LAYOUT
- DEVELOPMENT SITE BOUNDARY
- NEW HIGHWAY GULLY
- EXISTING FW DRAINAGE EASEMENT (5m EITHER SIDE)
- EXISTING FW DRAINAGE EASEMENT (5m EITHER SIDE)
- TREE ROOT PROTECTION ZONES

AS PER THE FLOOD RISK ASSESSMENT UNDERTAKEN BY ODYSSEY, AND CONDITION 12 OF THE S73, ALL FFLs PROPOSED FOR SITE ARE 600mm HIGHER THAN THE EA PRODUCT 4 DATA FLOOD LEVEL OF 28.180m, GIVING A MINIMUM FFL LEVEL OF 28.780m AOD.

AS PER THE FLOOD RISK ASSESSMENT UNDERTAKEN BY ODYSSEY, AND CONDITION 12 OF THE S73, ALL FFLs PROPOSED FOR SITE ARE 600mm HIGHER THAN THE EA PRODUCT 4 DATA FLOOD LEVEL OF 28.180. GIVING A MINIMUM FFL LEVEL OF 28.780 AOD.

NEW S104 FW & SW SEWERS PASS BENEATH GAS MAIN. ACCEPTABILITY TO PASS BENEATH WITHIN EASEMENT AND SAFE CONSTRUCTION METHOD TO BE ESTABLISHED AT DETAIL DESIGN

INDICATIVE GAS MAIN CROSSING
GAS MAIN IL: CIRCA 28.988
FW SOFFIT LEVEL: CIRCA : 28.847
SW SOFFIT LEVEL: CIRCA : 28.500

PLOTS 99-108 TO DISCHARGE FW INTO FS27

FW RISING MAIN TO BREAK (BRAKE) CHAMBER AND DISCHARGE BY GRAVITY INTO EXISTING Ø450 VIA NEW CHAMBER BUILT ON-LINE.

PLOTS 126-132 TO DISCHARGE FW INTO FS24

NEW HEADWALL. DISCHARGE RATE 2.8 l/s CONNECTION TO DITCHCOURSE. TO BE EXEMPT FROM ORDINARY WATERCOURSE CONSENT HEADWALL TO BE CONSTRUCTED SO THAT NO PART OF THE STRUCTURE PROTRUDES BEYOND PROFILE OF BANK.

PLOTS 6-11 TO DISCHARGE FW INTO FS01 & SW INTO S103

NEW HEADWALL. DISCHARGE RATE 3.1 l/s CONNECTION TO DITCHCOURSE. TO BE EXEMPT FROM ORDINARY WATERCOURSE CONSENT HEADWALL TO BE CONSTRUCTED SO THAT NO PART OF THE STRUCTURE PROTRUDES BEYOND PROFILE OF BANK.

NEW HEADWALL. DISCHARGE RATE 3.5 l/s CONNECTION TO DITCHCOURSE. TO BE EXEMPT FROM ORDINARY WATERCOURSE CONSENT HEADWALL TO BE CONSTRUCTED SO THAT NO PART OF THE STRUCTURE PROTRUDES BEYOND PROFILE OF BANK.

LOCATION OF NEW HEADWALL SUBJECT TO UPDATED CULVERT ALIGNMENT AND LAYOUT, WHICH IS BEING AMENDED AS PART OF S278 WORKS ROUNDABOUT DESIGN BY OTHERS.

NEW HEADWALL TO ACCOMMODATE ROUNDABOUT CONSTRUCTION (BY OTHERS)

BOTTOM OF PROPOSED EMBANKMENT.

PLOTS 12-15 TO DISCHARGE FW INTO FS01 & SW INTO S103

NEW PRIVATE SW SEWER WITHIN EASEMENT TO BE CONFIRMED AS ACCEPTABLE BY SEWER UNDERTAKER

FIVE OAKS ROAD

A281/A264

SCALE BAR 1:500

Rev	Description	By	Date	Chkd
P7	UPDATED TO LATEST SITE LAYOUT	DR	17/08/2026	GS
P6	PLANNING ISSUE	DR	14/08/2026	ACN
P5	UPDATED TO SUIT LLFA COMMENTS PERTAINING TO PONDS AND EXISTING WATERCOURSE	ACN	08/07/2026	GS
P4	UPDATED DRAINAGE TO SUIT TO LATEST SITE PLAN PROVIDED. ADDED FOOTPATH PLOT 8, ADDED NOTE REGARDING FFLs.	RGM	30/03/2026	GS
P3	UPDATED DRAINAGE TO SUIT TO LATEST SITE PLAN PROVIDED	RGM	24/03/2026	GS
P2	UPDATED DRAINAGE/PONDS TO LATEST SITE PLAN PROVIDED	RGM	10/03/2026	GS
P1	ISSUED FOR INFORMATION	RGM	24/02/2026	GS

PEREGA
Quarry Court, Lime Quarry Mews, Guildford, GU1 2RD 01483 565 886

Client: Taylor Wimpey

Project: BROADBRIDGE FARM
HORSHAM

Title: DRAINAGE STRATEGY
SHEET 1 OF 2

Perega Project No.	Checked	Passed	Size	Scale
W24149	GS	-	A1	1:500

Project Code	Originator	Zone	Level	Type	Role	Drawing No.
W24149	PER	XX	XX	DR	C	02021

Suitability Code	Status	Revision
S2	PRELIMINARY	P7

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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CONSTRUCTION

1. SAFE CONSTRUCTION METHOD OF SW & FW SEWER ADJACENT TO THE EXISTING GAS AND EXISTING SEWER UTILITIES ON SITE.

MAINTENANCE

1. ANY EXCAVATION WORKS NEAR THE HIGH PRESSURE GAS PIPELINE TO BE UNDERTAKEN UNDER PERMIT TO WORK AND NEED TO NOTIFY THE UTILITY COMPANY

DEMOLITION

1. CARE TO BE TAKEN DURING SITE CLEARANCE AND SITE STRIP WORKS AROUND EXISTING UTILITIES

ALL WORKS TO BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING (WHERE APPROPRIATE) TO AN APPROVED METHOD STATEMENT

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5. WHERE NOTES AND INFORMATION ON THIS DRG DIFFER FROM THE SPECIFICATION, CLARIFICATION SHOULD BE SOUGHT FROM THE ENGINEER.

LEGEND

- S104 SW SEWER
- S104 SW MANHOLE
- PERMEABLE PAVING
- S104 FW RISING MAIN
- S104 FW SEWER
- HIGH PRESSURE GAS MAIN (6m EASEMENT EITHER SIDE)
- S104 FW MANHOLE
- PROPOSED ACOUSTIC FENCE LAYOUT
- DEVELOPMENT SITE BOUNDARY
- NEW HIGHWAY GULLY
- EXISTING FW DRAINAGE EASEMENT (5m EITHER SIDE)
- EXISTING FW DRAINAGE EASEMENT (5m EITHER SIDE)
- TREE ROOT PROTECTION ZONES

AS PER THE FLOOD RISK ASSESSMENT UNDERTAKEN BY ODYSSEY, AND CONDITION 12 OF THE S73, ALL FFLs PROPOSED FOR SITE ARE 600mm HIGHER THAN THE EA PRODUCT 4 DATA FLOOD LEVEL OF 28.180m, GIVING A MINIMUM FFL LEVEL OF 28.780m AOD.

Rev	Description	By	Date	Chkd
P7	UPDATED TO LATEST SITE LAYOUT	DR	17/08/2026	GS
P6	PLANNING ISSUE	DR	14/08/2026	ACN
P5	UPDATED TO SUIT LLFA COMMENTS PERTAINING TO PONDS AND EXISTING WATERCOURSE	ACN	08/07/2026	GS
P4	UPDATED DRAINAGE TO SUIT TO LATEST SITE PLAN PROVIDED. ADDED FOOTPATH PLOT 8, ADDED NOTE REGARDING FFLs.	RGM	30/03/2026	GS
P3	UPDATED DRAINAGE TO SUIT TO LATEST SITE PLAN PROVIDED	RGM	24/03/2026	GS
P2	UPDATED DRAINAGE/PONDS TO LATEST SITE PLAN PROVIDED	RGM	10/03/2026	GS
P1	ISSUED FOR INFORMATION	RGM	24/02/2026	GS

PEREGA
Quarry Court, Lime Quarry Mews, Guildford, GU1 2RD 01483 565 886

Client: Taylor Wimpey

Project: BROADBRIDGE FARM
HORSHAM

Title: DRAINAGE STRATEGY
SHEET 2 OF 2

Perega Project No.			Checked	Passed	Size	Scale
W24149			GS	-	A1	1:500
Project Code	**Originator**	**Zone**	**Level**	**Type**	**Role**	**Drawing No.**
W24149	PER	XX	XX	DR	C	02022

Suitability Code: S2 — Status: PRELIMINARY — Revision: P7

W24149-PER-XX-XX-DR-C-02021

SCALE BAR 1:500 (0, 10, 20, 30, 40, 50)

NEW HEADWALL, DISCHARGE RATE 2.4 l/s CONNECTION TO DITCHCOURSE. TO BE EXEMPT FROM ORDINARY WATERCOURSE CONSENT HEADWALL TO BE CONSTRUCTED SO THAT NO PART OF THE STRUCTURE PROTRUDES BEYOND PROFILE OF BANK. EXACT LOCATION TO BE CONFIRMED IN DISCUSSIONS WITH ARBICULTURALIST AND ECOLOGIST ON-SITE.

FW RISING MAIN FROM ADOPTABLE PUMPING STATION SOUTHWARDS ADJACENT TO GAS MAIN AT SUITABLE OFFSET DISTANCE. IF SUITABLE DISTANCE NOT ACHIEVABLE THEN RUN TO BE EXTENDED.

NEW S104 FW & SW SEWERS PASS BENEATH GAS MAIN. ACCEPTABILITY TO PASS BENEATH WITHIN EASEMENT AND SAFE CONSTRUCTION METHOD TO BE ESTABLISHED AT DETAIL DESIGN
INDICATIVE GAS MAIN CROSSING GAS MAIN IL: CIRCA 28.176
FW SOFFIT LEVEL: CIRCA : 27.741
SW IL: CIRCA : 29.180

NEW S104 FW & SW SEWERS PASS BENEATH GAS MAIN. ACCEPTABILITY TO PASS BENEATH WITHIN EASEMENT AND SAFE CONSTRUCTION METHOD TO BE ESTABLISHED AT DETAIL DESIGN
INDICATIVE GAS MAIN CROSSING GAS MAIN IL: CIRCA 28.988
FW SOFFIT LEVEL: CIRCA : 28.847
SW SOFFIT LEVEL: CIRCA : 28.500

PLOTS 99-108 TO DISCHARGE FW INTO FS27

FW RISING MAIN TO BREAK (BRAKE) CHAMBER AND DISCHARGE BY GRAVITY INTO EXISTING Ø450 VIA NEW CHAMBER BUILT ON-LINE.

W24149-PER-XX-XX-DR-C-02012

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION

1. EXISTING HIGH PRESSURE GAS MAIN RUNS THROUGH THE SITE REQUIRES A BUFFER OF 6m
2. IN CLOSE PROXIMITY TO ROOT PROTECTION ZONES.
3. EXISITNG LIVE SERVICES RUNNING THROUGH THE SITE.

MAINTENANCE

1. ANY EXCAVATION WORKS NEAR THE HIGH PRESSURE GAS PIPELINE TO BE UNDERTAKEN UNDER PERMIT TO WORK AND NEED TO NOTIFY THE UTILITY COMPANY

DEMOLITION

1. CARE TO BE TAKEN DURING SITE CLEARANCE AND SITE STRIP WORKS AROUND EXISTING UTILITIES

ALL WORKS TO BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING (WHERE APPROPRIATE) TO AN APPROVED METHOD STATEMENT

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5. WHERE NOTES AND INFORMATION ON THIS DRG DIFFER FROM THE SPECIFICATION, CLARIFICATION SHOULD BE SOUGHT FROM THE ENGINEER.

LEGEND

- DEVELOPMENT SITE BOUNDARY
- LOG RETAINING WALL IN GARDENS
- MAJOR CONTOURS @ 250mm
- MINOR CONTOURS @ 50mm
- RETAINING FEATURE - HEIGHT AS STATED
- PROPOSED ACOUSTIC FENCE LAYOUT
- TREE ROOT PROTECTION ZONES

AS PER THE FLOOD RISK ASSESSMENT UNDERTAKEN BY ODYSSEY, AND CONDITION 12 OF THE S73, ALL FFLs PROPOSED FOR SITE ARE 600mm HIGHER THAN THE EA PRODUCT 4 DATA FLOOD LEVEL OF 28.180m, GIVING A MINIMUM FFL LEVEL OF 28.780m AOD.

DESIGN TIES IN WITH MOTION S278 DESIGN. REFER TO DRG 2602010-0310 FOR S278 CONTOUR DESIGN.

FIVE OAKS ROAD

A281/A264

SCALE BAR 1:500

Rev	Description	By	Date	Chkd
P6	PLOT 1 UPDATED. LOG RETAINING WALL ADDED	DR	17/08/2026	GS
P5	PLANNING ISSUE	DR	14/08/2026	ACN
P4	UPDATED DRAINAGE TO SUIT TO LATEST SITE PLAN PROVIDED. ADDED FOOTPATH PLOT 8. ADDED NOTE REGARDING FFLs.	RGM	30/03/2026	GS
P3	UPDATED LEVELS STRATEGY TO LATEST SITE PLAN PROVIDED	RGM	24/03/2026	GS
P2	UPDATED LEVELS STRATEGY TO LATEST SITE PLAN PROVIDED	RGM	10/03/2026	GS
P1	ISSUED FOR INFORMATION	RGM	24/02/2026	GS

PEREGA
Quarry Court, Lime Quarry Mews, Guildford, GU1 2RD 01483 565 886

Client: Taylor Wimpey

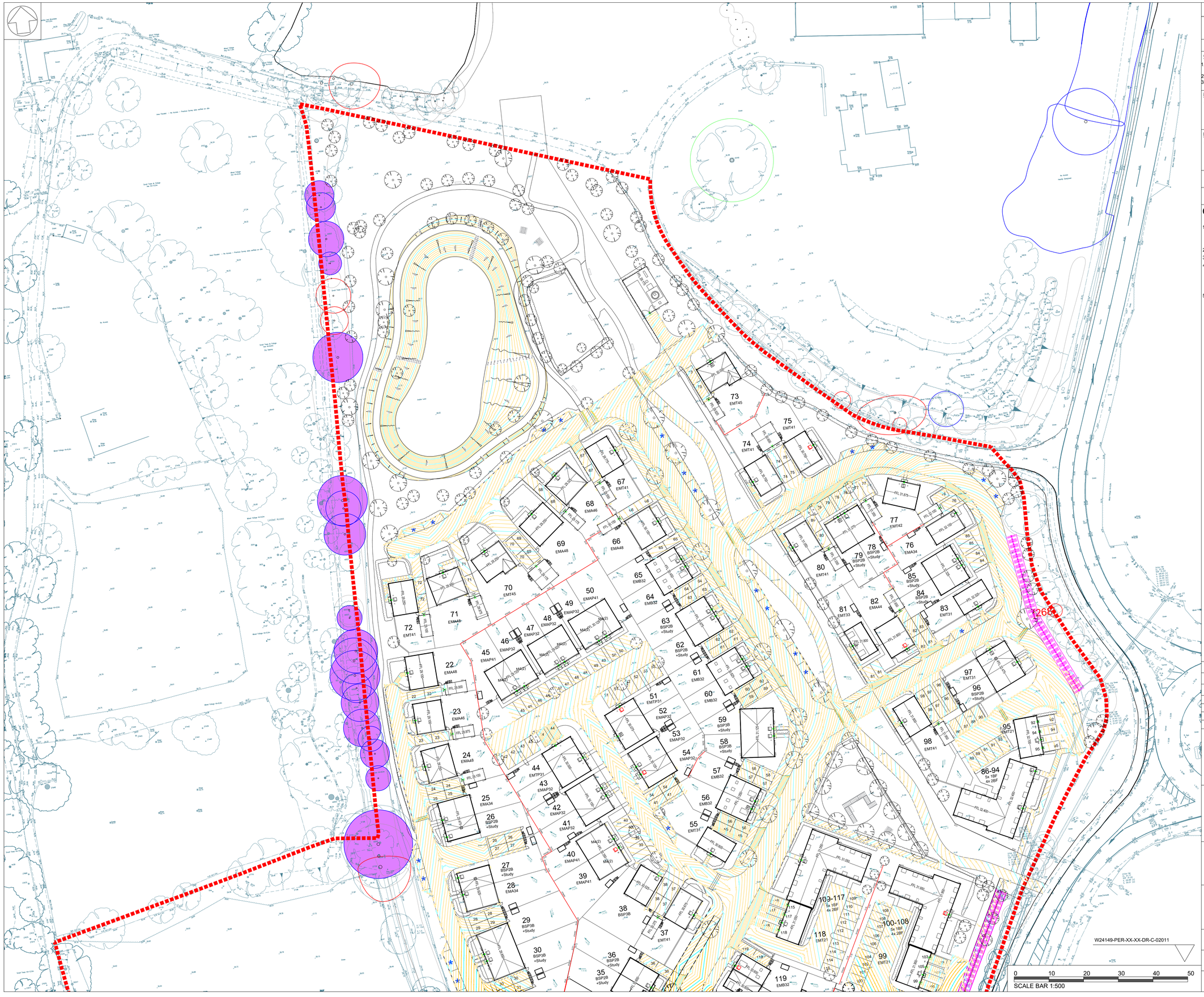
Project: BROADBRIDGE FARM
HORSHAM

Title: LEVELS STRATEGY
SHEET 1 OF 2

Perega Project No.	Checked	Passed	Size	Scale
W24149	GS	-	A1	1:500

Project Code	Originator	Zone	Level	Type	Role	Drawing No.
W24149	PER	XX	XX	DR	C	02011

Suitability Code	Status	Revision
S2	PRELIMINARY	P6



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CONSTRUCTION

1. EXISTING HIGH PRESSURE GAS MAIN RUNS THROUGH THE SITE REQUIRES A BUFFER OF 6m
2. IN CLOSE PROXIMITY TO ROOT PROTECTION ZONES.
3. EXISITNG LIVE SERVICES RUNNING THROUGH THE SITE.

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LEGEND

- DEVELOPMENT SITE BOUNDARY
- MAJOR CONTOURS @ 250mm
- MINOR CONTOURS @ 50mm
- RETAINING FEATURE - HEIGHT AS STATED
- PROPOSED ACOUSTIC FENCE LAYOUT
- TREE ROOT PROTECTION ZONES

AS PER THE FLOOD RISK ASSESSMENT UNDERTAKEN BY ODYSSEY. AND CONDITION 12 OF THE S73, ALL FFLs PROPOSED FOR SITE ARE 600mm HIGHER THAN THE EA PRODUCT 4 DATA FLOOD LEVEL OF 28.180m, GIVING A MINIMUM FFL LEVEL OF 28.780m AOD.

Rev	Description	By	Date	Chkd
P6	UPDATED TO LATEST SITE LAYOUT	DR	17/08/2026	GS
P5	PLANNING ISSUE	DR	14/08/2026	ACN
P4	UPDATED DRAINAGE TO SUIT TO LATEST SITE PLAN PROVIDED. ADDED FOOTPATH PLOT #, ADDED NOTE REGARDING FFLs	RGM	30/03/2026	GS
P3	UPDATED LEVELS STRATEGY TO LATEST SITE PLAN PROVIDED	RGM	24/03/2026	GS
P2	UPDATED LEVELS STRATEGY TO LATEST SITE PLAN PROVIDED	RGM	10/03/2026	GS
P1	ISSUED FOR INFORMATION	RGM	24/02/2026	GS

PEREGA
Quarry Court, Lime Quarry Mews, Guildford, GU1 2RD 01483 565 886

Client

Taylor Wimpey

Project

BROADBRIDGE FARM
HORSHAM

Title

LEVELS STRATEGY
SHEET 2 OF 2

Perega Project No.			Checked	Passed	Size	Scale
W24149			GS	-	A1	1:500
Project Code	**Originator**	**Zone**	**Level**	**Type**	**Role**	**Drawing No.**
W24149	PER	XX	XX	DR	C	02012
Suitability Code			**Status**			**Revision**
S2			PRELIMINARY			P6

Appendix E
Greenfield Runoff Rate Calculations

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

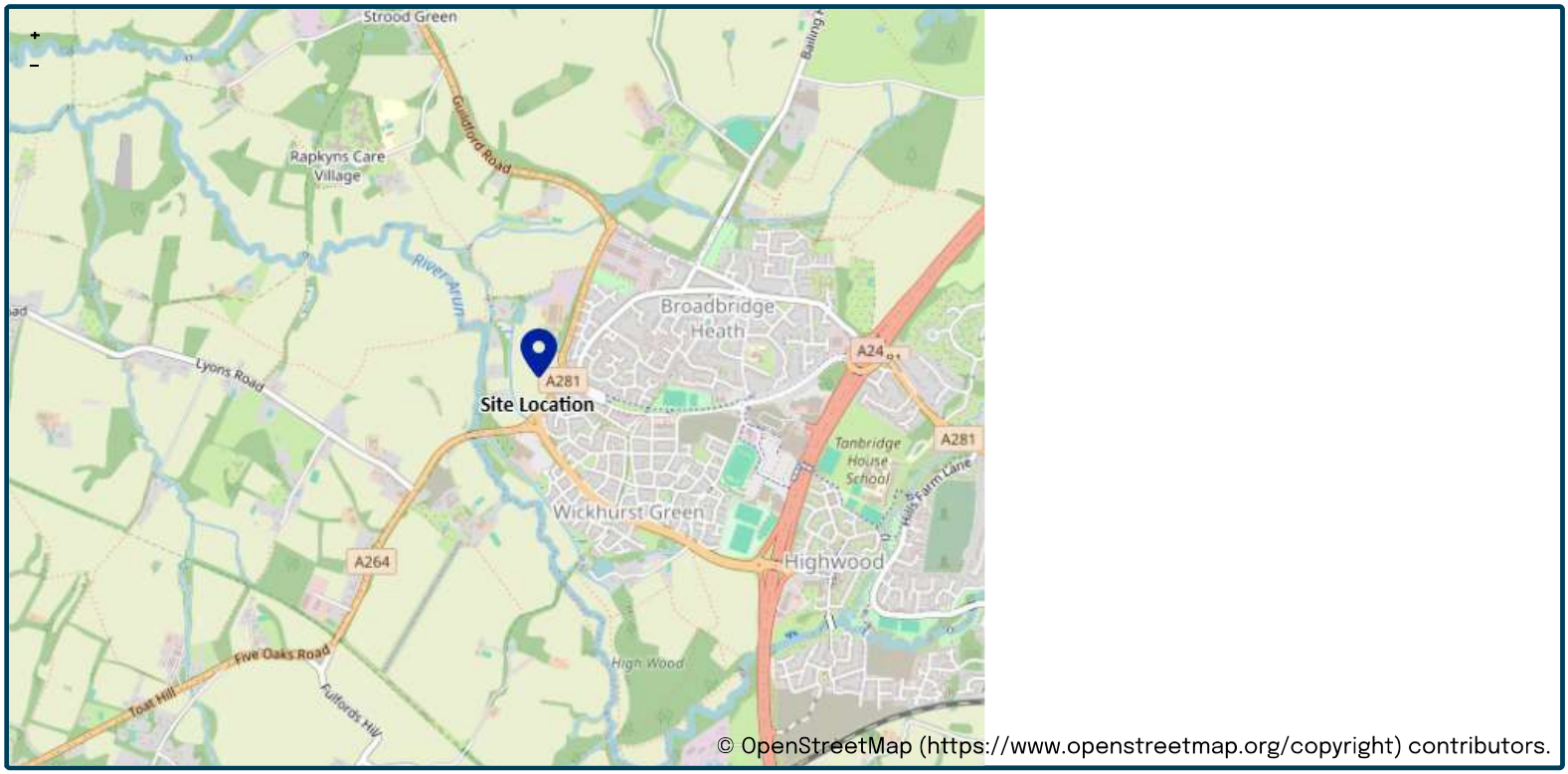
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	23/02/2026
Calculated by	RGM
Reference	W24149
Model version	2.2.3

Location

Site name	Lower Broadbridge Farm
Site location	Horsham



Site easting (British National Grid)	514206
Site northing (British National Grid)	131070

Site details

Total site area (ha)	7 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	775 mm		775
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	38.1 l/s		

Growth curve factors

	My value		Map value
Hydrological region	7		7
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	IH124	
Flow rate 1 year (l/s)	32.4	l/s
Flow rate 2 year (l/s)	33.5	l/s
Flow rate 10 years (l/s)	61.7	l/s
Flow rate 30 years (l/s)	87.6	l/s
Flow rate 100 years (l/s)	121.4	l/s
Flow rate 200 years (l/s)	142.4	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix F
Drainage Calculations

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

30	60	120	240	360	480	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0	100	45	0	0
100	0	0	0				

Node S109 FCC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	28.225	Product Number	CTL-SHE-0077-2800-1200-2800
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.8	Min Node Diameter (mm)	1200

Node S108 Basin 1 SW Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	28.250	Main Channel Slope (1:X)	250.0
Safety Factor	1.0	Time to half empty (mins)	720	Main Channel n	0.025

Inlets

S107 Headwall

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	92.0	0.0	0.300	137.3	0.0	0.600	191.7	0.0	0.900	255.1	0.0	1.200	327.6	0.0	1.500	409.1	0.0
0.100	106.1	0.0	0.400	154.4	0.0	0.700	211.8	0.0	1.000	278.3	0.0	1.300	353.8	0.0			
0.200	121.2	0.0	0.500	172.6	0.0	0.800	233.0	0.0	1.100	302.4	0.0	1.400	380.9	0.0			

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Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S103	18	29.049	0.149	37.9	0.1682	0.0000	OK
240 minute winter	S126	236	28.904	0.179	8.8	0.2025	0.0000	OK
240 minute winter	S104	236	28.904	0.254	9.7	0.2874	0.0000	OK
30 minute summer	S121	18	29.073	0.073	17.3	0.1048	0.0000	OK
240 minute winter	S105	236	28.904	0.379	17.1	0.4287	0.0000	SURCHARGED
240 minute winter	S122	236	28.904	0.304	4.2	0.4352	0.0000	SURCHARGED
240 minute winter	S106	236	28.904	0.554	22.0	0.7930	0.0000	SURCHARGED
240 minute winter	S107 Headwall	236	28.904	0.614	20.9	0.0000	0.0000	OK
240 minute winter	S108 Basin 1 SW	236	28.904	0.654	12.0	0.0000	0.0000	SURCHARGED
240 minute winter	S109 FCC	236	28.904	0.679	2.9	1.2000	0.0000	SURCHARGED
30 minute winter	S110 Headwall	20	28.168	0.043	2.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S103	1.000	S126	38.0	0.978	0.467	1.2596	
240 minute winter	S126	1.001	S104	8.8	0.708	0.100	0.6436	
240 minute winter	S104	1.002	S105	9.7	0.778	0.113	0.5634	
30 minute summer	S121	2.000	S105	17.3	1.614	0.205	0.1326	
240 minute winter	S105	1.003	S106	16.4	0.620	0.105	3.1488	
240 minute winter	S122	3.000	S106	4.1	0.593	0.041	1.5608	
240 minute winter	S106	1.004	S107 Headwall	20.9	0.581	0.154	1.1859	
240 minute winter	S107 Headwall	Flow through Pond	S108 Basin 1 SW	12.0	0.035	0.000	90.1123	
240 minute winter	S108 Basin 1 SW	1.006	S109 FCC	2.9	0.304	0.041	0.4418	
240 minute winter	S109 FCC	1.007	S110 Headwall	2.7	0.643	0.178	0.0578	131.9

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S103	18	29.073	0.173	48.2	0.1961	0.0000	OK
240 minute winter	S126	236	29.046	0.321	11.0	0.3629	0.0000	SURCHARGED
240 minute winter	S104	236	29.046	0.396	12.3	0.4477	0.0000	SURCHARGED
30 minute summer	S121	17	29.081	0.081	22.0	0.1159	0.0000	OK
240 minute winter	S105	236	29.046	0.521	21.0	0.5891	0.0000	SURCHARGED
240 minute winter	S122	236	29.046	0.446	5.2	0.6381	0.0000	SURCHARGED
240 minute winter	S106	236	29.046	0.696	26.7	0.9959	0.0000	SURCHARGED
240 minute winter	S107 Headwall	236	29.046	0.756	26.0	0.0000	0.0000	OK
240 minute winter	S108 Basin 1 SW	236	29.046	0.796	14.6	0.0000	0.0000	SURCHARGED
240 minute winter	S109 FCC	236	29.046	0.821	2.9	1.4505	0.0000	SURCHARGED
120 minute winter	S110 Headwall	56	28.168	0.043	2.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S103	1.000	S126	48.3	1.021	0.593	1.5373	
240 minute winter	S126	1.001	S104	11.1	0.735	0.126	0.8434	
240 minute winter	S104	1.002	S105	11.8	0.802	0.138	0.5919	
30 minute summer	S121	2.000	S105	22.0	1.648	0.260	0.2082	
240 minute winter	S105	1.003	S106	19.9	0.609	0.127	3.1490	
240 minute winter	S122	3.000	S106	4.7	0.587	0.047	1.5608	
240 minute winter	S106	1.004	S107 Headwall	26.0	0.598	0.191	1.1859	
240 minute winter	S107 Headwall	Flow through Pond	S108 Basin 1 SW	14.6	0.035	0.000	120.3582	
240 minute winter	S108 Basin 1 SW	1.006	S109 FCC	2.9	0.318	0.042	0.4418	
240 minute winter	S109 FCC	1.007	S110 Headwall	2.7	0.643	0.178	0.0578	165.0

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S103	19	29.429	0.529	69.9	0.5980	0.0000	SURCHARGED
480 minute winter	S126	464	29.323	0.598	9.2	0.6767	0.0000	SURCHARGED
480 minute winter	S104	464	29.323	0.673	9.5	0.7615	0.0000	SURCHARGED
480 minute winter	S121	464	29.323	0.323	3.6	0.4627	0.0000	SURCHARGED
480 minute winter	S105	464	29.323	0.798	17.2	0.9029	0.0000	SURCHARGED
480 minute winter	S122	464	29.323	0.723	4.3	1.0350	0.0000	SURCHARGED
480 minute winter	S106	464	29.323	0.973	23.0	1.3928	0.0000	SURCHARGED
480 minute winter	S107 Headwall	464	29.323	1.033	22.8	0.0000	0.0000	OK
480 minute winter	S108 Basin 1 SW	464	29.323	1.073	12.7	0.0000	0.0000	SURCHARGED
480 minute winter	S109 FCC	464	29.323	1.098	2.8	1.9406	0.0000	SURCHARGED
30 minute winter	S110 Headwall	16	28.168	0.043	2.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S103	1.000	S126	67.2	1.061	0.826	2.2864	
480 minute winter	S126	1.001	S104	8.5	0.665	0.097	0.8434	
480 minute winter	S104	1.002	S105	9.4	0.713	0.110	0.5919	
480 minute winter	S121	2.000	S105	3.6	0.961	0.043	0.4920	
480 minute winter	S105	1.003	S106	17.0	0.504	0.109	3.1490	
480 minute winter	S122	3.000	S106	4.2	0.490	0.042	1.5608	
480 minute winter	S106	1.004	S107 Headwall	22.8	0.561	0.168	1.1859	
480 minute winter	S107 Headwall	Flow through Pond	S108 Basin 1 SW	12.7	0.022	0.000	192.1819	
480 minute winter	S108 Basin 1 SW	1.006	S109 FCC	2.8	0.204	0.040	0.4418	
480 minute winter	S109 FCC	1.007	S110 Headwall	2.7	0.643	0.178	0.0578	273.2

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Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

30	60	120	240	360	480	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0	100	45	0	0
100	0	0	0				

Node S50 FCC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	28.650	Product Number	CTL-SHE-0081-3100-1200-3100
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.1	Min Node Diameter (mm)	1200

Node S49 Basin 2 SE Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	28.650	Main Channel Slope (1:X)	250.0
Safety Factor	1.0	Time to half empty (mins)	1170	Main Channel n	0.040

Inlets

S45 Headwall	S63 Headwall	S40 Headwall

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	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	0.250	239.4	0.0	0.500	282.3	0.0	0.750	328.7	0.0	1.000	378.7	52.7	1.300	443.3	120.8
0.050	207.6	0.0	0.300	247.7	0.0	0.550	291.3	0.0	0.800	338.4	10.2	1.050	389.1	63.7	1.350	454.6	132.7
0.100	215.3	0.0	0.350	256.1	0.0	0.600	300.4	0.0	0.850	348.3	20.7	1.100	399.6	74.7	1.400	466.0	144.7
0.150	223.2	0.0	0.400	264.7	0.0	0.650	309.7	0.0	0.900	358.3	31.2	1.150	410.4	86.1	1.450	477.5	156.9
0.200	231.2	0.0	0.450	273.4	0.0	0.700	319.1	0.0	0.950	368.4	41.8	1.250	432.2	109.1	1.500	489.2	169.2

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S41	17	30.223	0.123	29.1	0.1766	0.0000	OK
30 minute summer	S130	18	30.106	0.206	43.0	0.2330	0.0000	OK
30 minute summer	S42	18	29.945	0.195	51.9	0.2209	0.0000	OK
30 minute summer	S127	18	29.883	0.083	14.7	0.1185	0.0000	OK
30 minute summer	S128	18	29.741	0.191	68.9	0.2160	0.0000	OK
30 minute summer	S43	18	29.548	0.198	76.6	0.2244	0.0000	OK
360 minute winter	S44	352	29.338	0.238	11.2	0.3405	0.0000	OK
360 minute winter	S45 Headwall	360	29.339	0.649	11.1	0.0000	0.0000	OK
30 minute summer	S31	18	29.580	0.080	15.9	0.1147	0.0000	OK
30 minute summer	S32	17	29.433	0.173	51.0	0.2480	0.0000	OK
30 minute summer	S33	19	29.384	0.314	55.0	0.4486	0.0000	SURCHARGED
30 minute summer	S34	19	29.347	0.347	71.1	0.4972	0.0000	SURCHARGED
360 minute winter	S35	352	29.336	0.386	10.9	0.5519	0.0000	SURCHARGED
360 minute winter	S36	352	29.336	0.436	12.3	0.6233	0.0000	SURCHARGED
360 minute winter	S40 Headwall	352	29.337	0.647	11.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S41	1.000	S130	29.1	0.959	0.587	0.6623	
30 minute summer	S130	1.001	S42	42.7	1.144	0.986	0.8027	
30 minute summer	S42	1.002	S128	51.7	1.512	0.912	0.3581	
30 minute summer	S127	2.000	S128	14.7	0.835	0.293	0.4226	
30 minute summer	S128	1.003	S43	68.6	1.419	0.631	1.0088	
30 minute summer	S43	1.004	S44	76.1	1.528	0.683	1.2413	
360 minute winter	S44	1.005	S45 Headwall	11.1	0.933	0.110	1.1732	
360 minute winter	S45 Headwall	Flow through Pond	S49 Basin 2 SE	19.8	0.024	0.000	169.2417	
30 minute summer	S31	3.000	S32	15.9	0.563	0.159	0.8463	
30 minute summer	S32	3.001	S33	51.8	1.004	0.636	1.9461	
30 minute summer	S33	3.002	S34	49.7	0.766	0.592	0.8576	
30 minute summer	S34	3.003	S35	70.1	0.995	0.771	0.5236	
360 minute winter	S35	3.004	S36	10.6	0.593	0.155	0.9212	
360 minute winter	S36	3.005	S40 Headwall	11.8	0.673	0.190	1.1199	
360 minute winter	S40 Headwall	Flow through Pond	S49 Basin 2 SE	19.8	0.024	0.000	169.2417	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S60	352	29.336	0.236	2.1	0.3372	0.0000	SURCHARGED
360 minute winter	S61	352	29.336	0.361	4.0	0.5160	0.0000	SURCHARGED
360 minute winter	S62	352	29.336	0.426	3.9	0.6091	0.0000	SURCHARGED
360 minute winter	S63 Headwall	352	29.336	0.646	3.6	0.0000	0.0000	OK
360 minute winter	S49 Basin 2 SE	352	29.335	0.685	19.8	0.0000	0.0000	SURCHARGED
360 minute winter	S50 FCC	352	29.335	0.785	14.4	3.5527	0.0000	SURCHARGED
60 minute summer	S51 Outfall	35	28.383	0.033	3.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S60	4.000	S61	2.1	0.498	0.038	0.4304	
360 minute winter	S61	4.001	S62	3.9	0.649	0.084	0.3259	
360 minute winter	S62	4.002	S63 Headwall	3.6	0.596	0.085	0.4946	
360 minute winter	S63 Headwall	Flow through Pond	S49 Basin 2 SE	19.8	0.024	0.000	169.2417	
360 minute winter	S49 Basin 2 SE	1.007	S50 FCC	14.4	0.499	0.105	0.4630	
360 minute winter	S50 FCC	1.008	S51 Outfall	3.1	0.716	0.026	0.0759	234.9

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S41	19	30.440	0.340	37.0	0.4869	0.0000	SURCHARGED
30 minute summer	S130	19	30.317	0.417	52.6	0.4716	0.0000	SURCHARGED
30 minute summer	S42	19	30.050	0.300	63.1	0.3390	0.0000	SURCHARGED
30 minute summer	S127	18	29.894	0.094	18.7	0.1351	0.0000	OK
30 minute summer	S128	19	29.774	0.224	84.3	0.2535	0.0000	OK
30 minute summer	S43	19	29.586	0.236	93.4	0.2671	0.0000	OK
480 minute summer	S44	472	29.498	0.398	16.6	0.5696	0.0000	SURCHARGED
480 minute winter	S45 Headwall	472	29.501	0.811	11.0	0.0000	0.0000	OK
30 minute summer	S31	20	29.705	0.205	20.2	0.2937	0.0000	OK
30 minute summer	S32	20	29.697	0.437	64.3	0.6259	0.0000	SURCHARGED
30 minute summer	S33	20	29.607	0.537	57.9	0.7687	0.0000	SURCHARGED
30 minute summer	S34	20	29.561	0.561	81.9	0.8023	0.0000	SURCHARGED
480 minute winter	S35	472	29.497	0.547	10.1	0.7831	0.0000	SURCHARGED
480 minute winter	S36	472	29.497	0.597	11.4	0.8549	0.0000	SURCHARGED
480 minute winter	S40 Headwall	472	29.498	0.808	11.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S41	1.000	S130	35.1	0.975	0.708	0.8742	
30 minute summer	S130	1.001	S42	52.0	1.308	1.200	0.8543	
30 minute summer	S42	1.002	S128	63.1	1.587	1.112	0.4074	
30 minute summer	S127	2.000	S128	18.7	0.833	0.373	0.5212	
30 minute summer	S128	1.003	S43	84.2	1.452	0.774	1.2089	
30 minute summer	S43	1.004	S44	94.1	1.570	0.846	1.4945	
480 minute summer	S44	1.005	S45 Headwall	16.6	0.968	0.164	1.2675	
480 minute winter	S45 Headwall	Flow through Pond	S49 Basin 2 SE	20.0	0.026	0.000	222.4496	
30 minute summer	S31	3.000	S32	19.8	0.567	0.198	1.8028	
30 minute summer	S32	3.001	S33	53.8	1.014	0.661	2.4774	
30 minute summer	S33	3.002	S34	55.2	0.784	0.657	0.8576	
30 minute summer	S34	3.003	S35	78.2	1.111	0.860	0.5236	
480 minute winter	S35	3.004	S36	9.8	0.577	0.143	0.9212	
480 minute winter	S36	3.005	S40 Headwall	11.0	0.633	0.178	1.1199	
480 minute winter	S40 Headwall	Flow through Pond	S49 Basin 2 SE	20.0	0.026	0.000	222.4496	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S60	472	29.497	0.397	2.1	0.5687	0.0000	SURCHARGED
480 minute winter	S61	472	29.497	0.522	3.8	0.7476	0.0000	SURCHARGED
480 minute winter	S62	472	29.498	0.588	3.5	0.8409	0.0000	SURCHARGED
480 minute winter	S63 Headwall	472	29.499	0.809	4.7	0.0000	0.0000	OK
480 minute winter	S49 Basin 2 SE	472	29.497	0.847	20.0	0.0000	0.0000	SURCHARGED
480 minute winter	S50 FCC	472	29.497	0.947	14.2	4.2861	0.0000	SURCHARGED
120 minute winter	S51 Outfall	58	28.383	0.033	3.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	S60	4.000	S61	2.0	0.464	0.036	0.4304	
480 minute winter	S61	4.001	S62	3.5	0.625	0.076	0.3259	
480 minute winter	S62	4.002	S63 Headwall	3.4	0.542	0.079	0.4946	
480 minute winter	S63 Headwall	Flow through Pond	S49 Basin 2 SE	20.0	0.026	0.000	222.4496	
480 minute winter	S49 Basin 2 SE	1.007	S50 FCC	14.2	0.481	0.103	0.4630	
480 minute winter	S50 FCC	1.008	S51 Outfall	3.1	0.716	0.026	0.0759	306.1

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S41	19	31.332	1.232	53.6	1.7624	0.0000	FLOOD RISK
30 minute summer	S130	19	31.098	1.198	73.7	1.3555	0.0000	SURCHARGED
30 minute summer	S42	19	30.603	0.853	86.3	0.9653	0.0000	SURCHARGED
30 minute summer	S127	19	30.247	0.447	27.2	0.6402	0.0000	SURCHARGED
30 minute summer	S128	19	30.191	0.641	113.3	0.7245	0.0000	SURCHARGED
30 minute summer	S43	19	29.901	0.551	126.1	0.6227	0.0000	SURCHARGED
720 minute winter	S44	705	29.833	0.733	11.6	1.0486	0.0000	SURCHARGED
720 minute winter	S45 Headwall	705	29.834	1.144	11.3	0.0000	0.0000	OK
30 minute summer	S31	18	30.443	0.943	29.3	1.3497	0.0000	SURCHARGED
30 minute summer	S32	18	30.407	1.147	87.3	1.6414	1.9174	FLOOD
30 minute summer	S33	19	30.263	1.193	84.7	1.7067	0.0000	SURCHARGED
30 minute summer	S34	19	30.187	1.187	118.6	1.6990	0.0000	FLOOD RISK
30 minute summer	S35	19	30.059	1.109	112.1	1.5869	0.0000	SURCHARGED
30 minute summer	S36	19	29.878	0.978	128.2	1.3988	0.0000	SURCHARGED
720 minute winter	S40 Headwall	690	29.830	1.140	11.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S41	1.000	S130	48.1	1.210	0.971	0.8742	
30 minute summer	S130	1.001	S42	70.6	1.774	1.627	0.8543	
30 minute summer	S42	1.002	S128	85.2	2.141	1.501	0.4180	
30 minute summer	S127	2.000	S128	23.9	0.834	0.477	0.8531	
30 minute summer	S128	1.003	S43	112.6	1.600	1.035	1.4684	
30 minute summer	S43	1.004	S44	125.6	1.783	1.128	1.7554	
720 minute winter	S44	1.005	S45 Headwall	11.3	0.816	0.112	1.2675	
720 minute winter	S45 Headwall	Flow through Pond	S49 Basin 2 SE	16.9	0.030	0.000	347.8219	
30 minute summer	S31	3.000	S32	27.1	0.585	0.271	2.0848	
30 minute summer	S32	3.001	S33	78.7	1.118	0.967	2.4774	
30 minute summer	S33	3.002	S34	79.0	1.122	0.940	0.8576	
30 minute summer	S34	3.003	S35	112.1	1.593	1.233	0.5236	
30 minute summer	S35	3.004	S36	106.2	1.509	1.554	0.9212	
30 minute summer	S36	3.005	S40 Headwall	125.7	1.786	2.031	1.1199	
720 minute winter	S40 Headwall	Flow through Pond	S49 Basin 2 SE	16.9	0.030	0.000	347.8219	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	S60	705	29.830	0.730	2.2	1.0441	0.0000	SURCHARGED
720 minute winter	S61	705	29.830	0.855	4.0	1.2228	0.0000	SURCHARGED
720 minute winter	S62	705	29.830	0.920	3.9	1.3158	0.0000	SURCHARGED
720 minute winter	S63 Headwall	705	29.831	1.141	3.8	0.0000	0.0000	OK
720 minute winter	S49 Basin 2 SE	705	29.830	1.180	16.9	0.0000	0.0000	SURCHARGED
720 minute winter	S50 FCC	705	29.829	1.279	16.2	5.7878	0.0000	SURCHARGED
720 minute winter	S51 Outfall	705	28.383	0.033	3.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	S60	4.000	S61	2.1	0.432	0.037	0.4304	
720 minute winter	S61	4.001	S62	3.9	0.568	0.084	0.3259	
720 minute winter	S62	4.002	S63 Headwall	3.8	0.484	0.088	0.4946	
720 minute winter	S63 Headwall	Flow through Pond	S49 Basin 2 SE	16.9	0.030	0.000	347.8219	
720 minute winter	S49 Basin 2 SE	1.007	S50 FCC	16.2	0.401	0.118	0.4630	
720 minute winter	S50 FCC	1.008	S51 Outfall	3.1	0.717	0.026	0.0763	351.5

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Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

30	60	120	240	360	480	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0	100	45	0	0
100	0	0	0				

Node S539 FCC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	26.650	Product Number	CTL-SHE-0071-2400-1200-2400
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.4	Min Node Diameter (mm)	1200

Node S538 Basin 3 N Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.750	Main Channel Slope (1:X)	500.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.015

Inlets

S528 Headwall	S537 Headwall

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1125.0	0.0	0.300	1234.6	0.0	0.600	1349.2	0.0	0.900	1468.9	0.0	1.200	1593.8	0.0	1.500	1723.7	0.0
0.100	1161.0	0.0	0.400	1272.2	0.0	0.700	1388.5	0.0	1.000	1510.0	0.0	1.300	1636.5	0.0			
0.200	1197.5	0.0	0.500	1310.4	0.0	0.800	1428.5	0.0	1.100	1551.6	0.0	1.400	1679.8	0.0			

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S503	18	30.604	0.074	19.8	0.1066	0.0000	OK
30 minute summer	S540	18	29.604	0.080	19.8	0.0901	0.0000	OK
30 minute summer	S541	18	29.036	0.077	19.8	0.0867	0.0000	OK
30 minute summer	S501	18	30.365	0.115	27.5	0.1304	0.0000	OK
30 minute summer	S502	18	30.047	0.097	40.7	0.1092	0.0000	OK
30 minute summer	S504	19	29.014	0.214	92.3	0.2423	0.0000	OK
30 minute summer	S508	19	28.797	0.497	113.5	0.5616	0.0000	SURCHARGED
30 minute summer	S509	19	28.605	0.555	107.0	0.6281	0.0000	SURCHARGED
30 minute summer	S510	1	29.150	0.000	0.0	0.0000	0.0000	OK
30 minute summer	S511	18	28.945	0.145	56.5	0.2069	0.0000	OK
30 minute summer	S512	20	28.625	0.275	67.7	0.3111	0.0000	OK
30 minute summer	S513	20	28.558	0.458	80.4	0.5185	0.0000	SURCHARGED
30 minute summer	S514	19	28.492	0.642	199.1	0.9186	0.0000	SURCHARGED
30 minute summer	S515	18	29.001	0.051	7.1	0.0580	0.0000	OK
30 minute summer	S516	17	28.904	0.129	55.6	0.1852	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S503	2.000	S540	19.8	1.650	0.235	0.4614	
30 minute summer	S540	1.000	S541	19.8	1.620	0.253	0.3054	
30 minute summer	S541	1.001	S504	19.8	0.785	0.252	0.1776	
30 minute summer	S501	15.000	S502	27.5	1.400	0.473	0.3900	
30 minute summer	S502	15.001	S504	40.7	2.162	0.386	0.5437	
30 minute summer	S504	1.002	S508	94.2	1.603	0.763	2.5170	
30 minute summer	S508	1.003	S509	101.7	1.485	0.744	1.1666	
30 minute summer	S509	1.004	S514	106.5	1.525	1.053	0.4247	
30 minute summer	S510	3.000	S511	0.0	0.000	0.000	0.1239	
30 minute summer	S511	3.001	S512	56.4	1.500	0.451	1.6782	
30 minute summer	S512	3.002	S513	64.9	1.301	0.510	1.3182	
30 minute summer	S513	3.003	S514	80.2	1.448	0.822	0.9114	
30 minute summer	S514	1.005	S521	193.4	1.425	0.758	5.0632	
30 minute summer	S515	4.000	S516	7.1	0.902	0.058	0.0685	
30 minute summer	S516	4.001	S519	55.9	1.650	0.248	1.9586	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S517	18	28.477	0.077	17.4	0.1103	0.0000	OK
30 minute summer	S519	20	28.399	0.274	108.7	0.3925	0.0000	OK
30 minute summer	S520	20	28.392	0.442	107.1	0.5001	0.0000	OK
30 minute summer	S521	19	28.349	0.774	322.9	1.1074	0.0000	SURCHARGED
30 minute summer	S522	18	30.190	0.090	19.2	0.1283	0.0000	OK
30 minute summer	S523	18	29.847	0.097	25.5	0.1389	0.0000	OK
30 minute summer	S524	18	29.529	0.104	61.1	0.1490	0.0000	OK
30 minute summer	S525	19	28.229	0.804	393.0	1.1508	0.0000	SURCHARGED
30 minute summer	S526	19	27.837	0.687	400.1	0.9831	0.0000	SURCHARGED
30 minute summer	S527	19	27.614	0.614	408.4	0.8788	0.0000	SURCHARGED
1440 minute winter	S528 Headwall	1440	27.429	0.659	39.1	0.0000	0.0000	OK
30 minute summer	S529	19	28.242	0.142	4.7	0.1608	0.0000	OK
30 minute summer	S530	19	28.241	0.211	43.4	0.2389	0.0000	OK
30 minute summer	S531	18	27.846	0.221	69.6	0.2498	0.0000	OK
30 minute summer	S532	18	27.563	0.213	82.8	0.3047	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S517	5.000	S519	17.4	0.823	0.095	0.8675	
30 minute summer	S519	4.002	S520	107.1	1.630	0.365	2.7483	
30 minute summer	S520	4.003	S521	110.1	1.048	0.372	5.6465	
30 minute summer	S521	1.006	S525	304.6	1.410	0.803	5.2736	
30 minute summer	S522	6.000	S523	19.2	1.234	0.323	0.4182	
30 minute summer	S523	6.001	S524	25.5	1.649	0.333	0.1793	
30 minute summer	S524	6.002	S525	61.1	2.215	0.263	1.8827	
30 minute summer	S525	1.007	S526	385.9	1.787	1.067	10.6321	
30 minute summer	S526	1.008	S527	400.2	1.853	0.949	4.2731	
30 minute summer	S527	1.009	S528 Headwall	408.3	1.890	1.318	5.2070	
1440 minute winter	S528 Headwall	Flow through Pond	S538 Basin 3 N	27.4	0.005	0.000	831.3940	
30 minute summer	S529	8.000	S530	4.5	0.189	0.107	0.3404	
30 minute summer	S530	8.001	S531	41.4	1.166	1.051	2.0291	
30 minute summer	S531	8.002	S532	68.7	1.291	0.827	1.8973	
30 minute summer	S532	8.003	S533	82.5	1.349	0.551	1.3583	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S533	1440	27.428	0.278	4.8	0.3978	0.0000	OK
1440 minute winter	S534	1410	27.428	0.503	4.8	0.7198	0.0000	SURCHARGED
30 minute summer	S535	18	27.493	0.143	32.9	0.2050	0.0000	OK
1440 minute winter	S536	1440	27.427	0.327	2.2	0.4675	0.0000	SURCHARGED
1440 minute winter	S537 Headwall	1410	27.433	0.663	8.6	0.0000	0.0000	OK
1440 minute winter	S538 Basin 3 N	1410	27.426	0.676	27.4	0.0000	0.0000	SURCHARGED
1440 minute winter	S539 FCC	1410	27.426	0.776	11.0	3.5098	0.0000	SURCHARGED
30 minute winter	S540 Outfall	907	26.593	0.033	2.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S533	8.004	S534	4.8	0.484	0.020	5.4729	
1440 minute winter	S534	8.005	S537 Headwall	4.4	0.410	0.027	4.5226	
30 minute summer	S535	9.000	S536	33.0	1.079	0.711	0.9571	
1440 minute winter	S536	9.001	S537 Headwall	2.2	0.556	0.046	0.8286	
1440 minute winter	S537 Headwall	Flow through Pond	S538 Basin 3 N	27.4	0.005	0.000	831.3940	
1440 minute winter	S538 Basin 3 N	1.011	S539 FCC	11.0	-0.295	0.098	0.6922	
1440 minute winter	S539 FCC	1.012	S540 Outfall	2.2	0.749	0.106	0.0193	318.6

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.18%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S503	18	30.616	0.086	25.2	0.1224	0.0000	OK
30 minute summer	S540	20	29.768	0.244	25.2	0.2762	0.0000	SURCHARGED
30 minute summer	S541	20	29.715	0.756	26.3	0.8549	0.0000	SURCHARGED
30 minute summer	S501	18	30.385	0.135	35.0	0.1522	0.0000	OK
30 minute summer	S502	19	30.079	0.129	51.7	0.1455	0.0000	OK
30 minute summer	S504	20	29.694	0.894	101.8	1.0115	0.0000	SURCHARGED
30 minute summer	S508	19	29.375	1.075	117.8	1.2153	0.0000	SURCHARGED
30 minute summer	S509	19	29.154	1.104	115.8	1.2483	0.0000	SURCHARGED
30 minute summer	S510	20	29.341	0.191	9.9	0.2736	0.0000	OK
30 minute summer	S511	20	29.325	0.525	71.8	0.7520	0.0000	SURCHARGED
30 minute summer	S512	20	29.207	0.857	88.6	0.9697	0.0000	SURCHARGED
30 minute summer	S513	19	29.118	1.018	89.1	1.1513	0.0000	SURCHARGED
30 minute summer	S514	19	29.030	1.180	209.9	1.6892	0.0000	SURCHARGED
30 minute summer	S515	18	29.008	0.058	9.1	0.0660	0.0000	OK
30 minute summer	S516	20	28.984	0.209	70.8	0.2992	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S503	2.000	S540	25.2	1.798	0.299	0.9772	
30 minute summer	S540	1.000	S541	26.3	1.644	0.335	0.9926	
30 minute summer	S541	1.001	S504	34.6	0.871	0.441	0.2788	
30 minute summer	S501	15.000	S502	35.0	1.478	0.602	0.4701	
30 minute summer	S502	15.001	S504	50.5	2.167	0.479	0.8338	
30 minute summer	S504	1.002	S508	95.6	1.592	0.774	2.8532	
30 minute summer	S508	1.003	S509	109.1	1.549	0.798	1.1666	
30 minute summer	S509	1.004	S514	115.2	1.636	1.140	0.4247	
30 minute summer	S510	3.000	S511	10.0	-0.386	0.178	0.8999	
30 minute summer	S511	3.001	S512	74.3	1.511	0.594	2.5096	
30 minute summer	S512	3.002	S513	71.2	1.327	0.560	1.3446	
30 minute summer	S513	3.003	S514	83.3	1.456	0.854	0.9114	
30 minute summer	S514	1.005	S521	208.0	1.431	0.815	5.0632	
30 minute summer	S515	4.000	S516	9.1	0.881	0.074	0.1550	
30 minute summer	S516	4.001	S519	70.8	1.662	0.314	3.9394	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.18%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S517	20	28.896	0.496	63.9	0.7091	0.0000	SURCHARGED
30 minute summer	S519	19	28.964	0.839	136.2	1.2002	0.0000	SURCHARGED
30 minute summer	S520	19	28.936	0.986	116.5	1.1154	0.0000	SURCHARGED
30 minute summer	S521	19	28.872	1.297	346.6	1.8566	0.0000	SURCHARGED
30 minute summer	S522	18	30.203	0.103	24.4	0.1474	0.0000	OK
30 minute summer	S523	18	29.862	0.112	32.4	0.1607	0.0000	OK
30 minute summer	S524	18	29.543	0.118	77.7	0.1695	0.0000	OK
30 minute summer	S525	19	28.675	1.250	465.4	1.7891	0.0000	SURCHARGED
30 minute summer	S526	19	28.129	0.979	469.3	1.4010	0.0000	SURCHARGED
30 minute summer	S527	19	27.823	0.823	478.3	1.1776	0.0000	SURCHARGED
1440 minute winter	S528 Headwall	1410	27.616	0.846	28.5	0.0000	0.0000	OK
30 minute summer	S529	19	28.476	0.376	5.9	0.4253	0.0000	SURCHARGED
30 minute summer	S530	19	28.472	0.442	53.5	0.4998	0.0000	SURCHARGED
30 minute summer	S531	19	27.901	0.276	87.2	0.3124	0.0000	OK
1440 minute winter	S532	1440	27.606	0.256	5.2	0.3670	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S517	5.000	S519	-41.8	0.798	-0.228	2.6221	
30 minute summer	S519	4.002	S520	116.5	1.668	0.397	3.3630	
30 minute summer	S520	4.003	S521	124.0	1.044	0.419	5.6577	
30 minute summer	S521	1.006	S525	349.9	1.620	0.922	5.2736	
30 minute summer	S522	6.000	S523	24.4	1.302	0.411	0.5039	
30 minute summer	S523	6.001	S524	32.4	1.745	0.423	0.2153	
30 minute summer	S524	6.002	S525	77.7	2.249	0.334	1.9671	
30 minute summer	S525	1.007	S526	451.3	2.089	1.248	10.6321	
30 minute summer	S526	1.008	S527	467.8	2.166	1.109	4.2731	
30 minute summer	S527	1.009	S528 Headwall	477.8	2.212	1.542	5.2591	
1440 minute winter	S528 Headwall	Flow through Pond	S538 Basin 3 N	24.1	0.005	0.000	1084.0201	
30 minute summer	S529	8.000	S530	7.2	0.200	0.170	0.4155	
30 minute summer	S530	8.001	S531	51.7	1.301	1.313	2.2071	
30 minute summer	S531	8.002	S532	85.7	1.357	1.031	2.2311	
1440 minute winter	S532	8.003	S533	5.2	0.638	0.035	2.1172	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.18%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S533	1410	27.605	0.455	5.9	0.6515	0.0000	SURCHARGED
1440 minute winter	S534	1440	27.605	0.680	5.9	0.9738	0.0000	SURCHARGED
30 minute summer	S535	19	27.634	0.284	41.8	0.4062	0.0000	SURCHARGED
1440 minute winter	S536	1440	27.606	0.506	2.8	0.7247	0.0000	SURCHARGED
1440 minute winter	S537 Headwall	1410	27.610	0.840	12.6	0.0000	0.0000	OK
1440 minute winter	S538 Basin 3 N	1440	27.605	0.855	24.1	0.0000	0.0000	SURCHARGED
1440 minute winter	S539 FCC	1440	27.605	0.955	11.9	4.3196	0.0000	SURCHARGED
960 minute winter	S540 Outfall	390	26.593	0.033	2.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S533	8.004	S534	5.9	0.484	0.025	6.6387	
1440 minute winter	S534	8.005	S537 Headwall	5.5	0.401	0.033	4.5226	
30 minute summer	S535	9.000	S536	41.0	1.109	0.884	1.2442	
1440 minute winter	S536	9.001	S537 Headwall	2.6	0.557	0.055	0.8286	
1440 minute winter	S537 Headwall	Flow through Pond	S538 Basin 3 N	24.1	0.005	0.000	1084.0201	
1440 minute winter	S538 Basin 3 N	1.011	S539 FCC	11.9	0.353	0.107	0.6922	
1440 minute winter	S539 FCC	1.012	S540 Outfall	2.2	0.749	0.106	0.0193	342.8

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.18%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S503	20	31.366	0.836	36.6	1.1963	0.4663	FLOOD
30 minute summer	S540	20	31.308	1.784	38.4	2.0176	0.0000	SURCHARGED
30 minute summer	S541	20	31.263	2.304	40.9	2.6054	0.0000	SURCHARGED
30 minute summer	S501	20	31.763	1.513	50.7	1.7107	0.0000	SURCHARGED
30 minute summer	S502	20	31.628	1.678	65.8	1.8975	0.0000	SURCHARGED
30 minute summer	S504	20	31.242	2.442	120.6	2.7619	0.0000	SURCHARGED
30 minute summer	S508	20	30.650	2.350	148.3	2.6576	0.0000	SURCHARGED
30 minute summer	S509	19	30.224	2.174	157.5	2.4587	0.0000	SURCHARGED
30 minute summer	S510	20	30.470	1.320	34.6	1.8892	0.0000	FLOOD RISK
30 minute summer	S511	19	30.487	1.687	104.1	2.4141	1.3918	FLOOD
30 minute summer	S512	19	30.343	1.993	91.7	2.2543	0.0000	SURCHARGED
30 minute summer	S513	19	30.196	2.096	109.8	2.3708	0.0000	SURCHARGED
30 minute summer	S514	19	30.006	2.156	287.9	3.0853	0.0000	SURCHARGED
30 minute summer	S515	18	29.831	0.881	57.5	0.9964	0.0000	SURCHARGED
30 minute summer	S516	19	29.829	1.054	112.5	1.5082	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S503	2.000	S540	36.1	1.924	0.428	1.5287	
30 minute summer	S540	1.000	S541	40.9	1.694	0.521	0.9926	
30 minute summer	S541	1.001	S504	53.7	1.350	0.684	0.2788	
30 minute summer	S501	15.000	S502	43.8	1.531	0.752	0.7895	
30 minute summer	S502	15.001	S504	59.6	2.160	0.565	1.0490	
30 minute summer	S504	1.002	S508	122.8	1.745	0.994	2.8532	
30 minute summer	S508	1.003	S509	150.4	2.136	1.100	1.1666	
30 minute summer	S509	1.004	S514	159.6	2.267	1.579	0.4247	
30 minute summer	S510	3.000	S511	-34.6	-0.870	-0.618	0.9450	
30 minute summer	S511	3.001	S512	70.9	1.550	0.568	2.5096	
30 minute summer	S512	3.002	S513	87.7	1.341	0.689	1.3446	
30 minute summer	S513	3.003	S514	108.9	1.547	1.117	0.9114	
30 minute summer	S514	1.005	S521	290.4	1.833	1.137	5.0632	
30 minute summer	S515	4.000	S516	-44.4	0.873	-0.362	0.5800	
30 minute summer	S516	4.001	S519	108.4	1.665	0.481	5.0110	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.18%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S517	18	29.585	1.185	144.7	1.6957	24.3261	FLOOD
30 minute summer	S519	19	29.699	1.574	173.6	2.2530	0.0000	FLOOD RISK
30 minute summer	S520	18	29.689	1.739	127.1	1.9667	0.0000	SURCHARGED
30 minute summer	S521	19	29.680	2.105	395.2	3.0129	0.0000	SURCHARGED
30 minute summer	S522	18	30.230	0.130	35.4	0.1861	0.0000	OK
30 minute summer	S523	19	29.990	0.240	47.1	0.3435	0.0000	SURCHARGED
30 minute summer	S524	19	29.882	0.457	111.9	0.6543	0.0000	SURCHARGED
30 minute summer	S525	19	29.469	2.044	547.3	2.9244	0.0000	SURCHARGED
30 minute summer	S526	19	28.677	1.527	574.4	2.1852	0.0000	SURCHARGED
30 minute summer	S527	19	28.221	1.221	589.2	1.7475	0.0000	SURCHARGED
1440 minute winter	S528 Headwall	1470	27.967	1.197	40.8	0.0000	0.0000	OK
30 minute summer	S529	19	29.530	1.430	11.2	1.6172	0.0000	SURCHARGED
30 minute summer	S530	19	29.525	1.495	76.0	1.6904	0.0000	SURCHARGED
30 minute summer	S531	19	28.192	0.567	124.8	0.6411	0.0000	SURCHARGED
1440 minute winter	S532	1410	27.964	0.614	7.5	0.8789	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S517	5.000	S519	-115.4	-1.047	-0.629	2.6221	
30 minute summer	S519	4.002	S520	127.1	1.705	0.433	3.3630	
30 minute summer	S520	4.003	S521	124.1	1.043	0.419	5.6577	
30 minute summer	S521	1.006	S525	401.0	1.857	1.057	5.2736	
30 minute summer	S522	6.000	S523	35.4	1.397	0.596	0.8192	
30 minute summer	S523	6.001	S524	47.4	1.872	0.619	0.4607	
30 minute summer	S524	6.002	S525	103.3	2.248	0.444	2.8782	
30 minute summer	S525	1.007	S526	547.0	2.532	1.512	10.6321	
30 minute summer	S526	1.008	S527	574.0	2.657	1.361	4.2731	
30 minute summer	S527	1.009	S528 Headwall	590.5	2.733	1.906	5.2591	
1440 minute winter	S528 Headwall	Flow through Pond	S538 Basin 3 N	27.1	0.012	0.000	1623.7991	
30 minute summer	S529	8.000	S530	14.4	0.361	0.338	0.4155	
30 minute summer	S530	8.001	S531	74.8	1.882	1.900	2.2726	
30 minute summer	S531	8.002	S532	124.0	1.763	1.493	2.4322	
1440 minute winter	S532	8.003	S533	7.5	0.689	0.050	2.4501	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.18%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S533	1440	27.962	0.812	8.6	1.1624	0.0000	SURCHARGED
1440 minute winter	S534	1440	27.962	1.037	8.1	1.4839	0.0000	SURCHARGED
30 minute summer	S535	18	28.287	0.937	60.5	1.3411	0.0000	SURCHARGED
1440 minute winter	S536	1410	27.961	0.861	3.9	1.2317	0.0000	SURCHARGED
1440 minute winter	S537 Headwall	1410	27.967	1.197	20.3	0.0000	0.0000	OK
1440 minute winter	S538 Basin 3 N	1440	27.960	1.210	27.1	0.0000	0.0000	FLOOD RISK
1440 minute winter	S539 FCC	1440	27.960	1.310	8.7	5.9265	0.0000	FLOOD RISK
1440 minute winter	S540 Outfall	1440	26.595	0.035	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S533	8.004	S534	8.1	0.476	0.034	6.6388	
1440 minute winter	S534	8.005	S537 Headwall	7.9	0.389	0.048	4.5226	
30 minute summer	S535	9.000	S536	57.7	1.451	1.243	1.2442	
1440 minute winter	S536	9.001	S537 Headwall	3.8	0.545	0.079	0.8286	
1440 minute winter	S537 Headwall	Flow through Pond	S538 Basin 3 N	27.1	0.012	0.000	1623.7991	
1440 minute winter	S538 Basin 3 N	1.011	S539 FCC	8.7	0.356	0.078	0.6922	
1440 minute winter	S539 FCC	1.012	S540 Outfall	2.5	0.771	0.118	0.0209	386.9

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Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

30	60	120	240	360	480	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0	100	45	0	0

Node S905 FCC Online Orifice Control

Flap Valve	x	Invert Level (m)	28.500	Design Flow (l/s)	2.5	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Depth (m)	1.100	Diameter (m)	0.033		

Node S901 FCC Online Orifice Control

Flap Valve	x	Invert Level (m)	28.950	Design Flow (l/s)	1.0	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Depth (m)	0.676	Diameter (m)	0.024		

Node S900 Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.050	Length (m)	22.500	Inf Depth (m)	
Safety Factor	1.0	Time to half empty (mins)	352	Slope (1:X)	96.0		

Node S908 Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.150	Length (m)	17.500	Inf Depth (m)	
Safety Factor	1.0	Time to half empty (mins)	240	Slope (1:X)	50.0		

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Node S904 Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	28.720	Length (m)	40.000	Inf Depth (m)	
Safety Factor	1.0	Time to half empty (mins)	132	Slope (1:X)	50.0		

Node S904 Paving Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	28.720
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	42

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	20.0	0.200	20.0	23.2	0.201	0.0	23.2	0.919	0.0	23.2

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Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S900 Paving	118	29.447	0.397	3.8	9.4626	0.0000	FLOOD RISK
120 minute winter	S908 Paving	118	29.447	0.297	3.7	5.3224	0.0000	SURCHARGED
120 minute winter	S901 FCC	118	29.447	0.497	1.6	0.1407	0.0000	SURCHARGED
120 minute winter	S902	120	28.750	0.025	0.8	0.0279	0.0000	OK
120 minute winter	S903	120	28.472	0.022	0.8	0.0036	0.0000	OK
120 minute winter	S904 Paving	100	29.324	0.604	10.4	18.8878	0.0000	SURCHARGED
120 minute winter	S905 FCC	100	29.323	0.823	2.7	0.2328	0.0000	SURCHARGED
120 minute winter	S906	112	28.391	0.041	2.8	0.0065	0.0000	OK
120 minute winter	S907 Headwall	112	28.241	0.041	2.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	S900 Paving	1.000	S901 FCC	-1.2	0.302	-0.057	0.1275	
120 minute winter	S908 Paving	2.000	S901 FCC	1.6	0.677	0.029	0.0376	
120 minute winter	S901 FCC	1.001	S902	0.8	0.429	0.061	0.0743	
120 minute winter	S902	1.002	S903	0.8	0.470	0.057	0.0714	
120 minute winter	S903	1.003	S906	0.8	0.465	0.048	0.0295	
120 minute winter	S904 Paving	3.000	S905 FCC	2.7	0.525	0.073	0.0874	
120 minute winter	S905 FCC	3.001	S906	2.0	0.627	0.092	0.0317	
120 minute winter	S906	1.004	S907 Headwall	2.8	0.734	0.161	0.0585	50.2

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S900 Paving	232	29.661	0.611	3.4	16.6807	0.0000	FLOOD RISK
240 minute winter	S908 Paving	232	29.661	0.511	4.0	14.1410	0.0000	FLOOD RISK
240 minute winter	S901 FCC	232	29.661	0.711	2.3	0.2012	0.0000	FLOOD RISK
240 minute winter	S902	232	28.752	0.027	1.0	0.0306	0.0000	OK
240 minute winter	S903	232	28.474	0.024	1.0	0.0039	0.0000	OK
120 minute winter	S904 Paving	88	29.639	0.919	19.1	38.1199	2.8900	FLOOD
60 minute summer	S905 FCC	57	29.638	1.138	3.4	0.3219	0.0000	FLOOD RISK
240 minute winter	S906	196	28.395	0.045	3.4	0.0071	0.0000	OK
120 minute winter	S907 Headwall	120	28.244	0.044	3.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	S900 Paving	1.000	S901 FCC	0.5	0.114	0.026	0.1275	
240 minute winter	S908 Paving	2.000	S901 FCC	2.0	0.158	0.036	0.0376	
240 minute winter	S901 FCC	1.001	S902	1.0	0.453	0.074	0.0847	
240 minute winter	S902	1.002	S903	1.0	0.496	0.068	0.0814	
240 minute winter	S903	1.003	S906	1.0	0.488	0.058	0.0334	
120 minute winter	S904 Paving	3.000	S905 FCC	2.8	0.572	0.075	0.0874	
60 minute summer	S905 FCC	3.001	S906	2.4	0.658	0.108	0.0356	
240 minute winter	S906	1.004	S907 Headwall	3.4	0.770	0.191	0.0662	105.9

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Appendix G
Site Investigation

C
D
S

Discover what's beneath

A Phase II Geoenvironmental and Geotechnical Report for Gleeson Land.

Address: Lower Broadbridge Heath Farm, Broadbridge Heath, West Sussex, RH13 0QN.

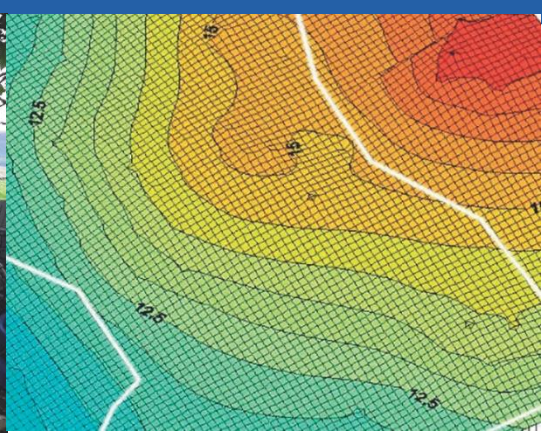
Date: 13th April 2022

Reference: ES0007 Rev1

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Executive Summary

The site comprises a series of agricultural fields to the west, north and south of Lower Broadbridge Heath Farm, which is now occupied by the Horsham Stone Reclamation Yard and Bury Hill Landscaping Supplies. The total site area is approximately 22ha, the majority of which comprises open arable fields.

The buildings, which formerly comprised Lower Broadbridge Heath Farm, were found to be metal and concrete framed barns, with asbestos cement cladding, downpipes and guttering. The barns had a solid concrete floor and were found to be used for storing soils, bark and a range of equipment. Two small above ground plastic bunded fuel tanks were observed in the Bury Hill Landscaping Yard, each of which were in good condition and were situated on concrete slabs.

It is proposed to redevelop the site with a mixture of residential properties and mixed commercial properties with areas of landscaping.

Geological records indicate the site to be underlain by the Weald Clay (Unproductive Aquifer), with pockets of Horsham Stone off site in the surrounding area. Along the far western boundary Alluvium (Secondary A aquifer) deposits are mapped, which run along the route of the River Arun. The site is not situated within a groundwater source protection zone.

Historical records show that the site had in essence remained unaltered up to the present day, with the area of fields remaining unaltered from the 1880 maps. The buildings around Lower Broadbridge Heath Farm have been redeveloped on several occasions, which could lead to the presence of reworked made ground soils beneath the footprint of the existing buildings.

Potential sources of onsite contamination that have been identified comprise made ground soils around the farmyard, the presence of asbestos containing materials on the existing buildings and the presence of both historical and present above ground fuel tanks.

During the site investigation works, the soils encountered comprised TOPSOIL (-0.20/0.50m) or MADE GROUND (-0.20/0.40m) over gravelly CLAY (-0.50/2.70m) over MUDSTONE (-3.30m+).

On the basis of the investigations carried out to date, and subject to final layout, traditional strip or trench fill foundations are recommended for this site. All loadings should be transferred beneath any topsoil and softer subsoil and be placed within the underlying firm becoming firm to stiff clay.

For reinforced foundations placed into the CLAY, to a minimum depth of 1.0m, an allowable bearing capacity of 100kPa is applicable, and NHBC high Volume Change Potential precautions will apply. Should foundation deepening expose the underlying MUDSTONE, and an appropriate toe depth is achieved, any further deepening can be ceased. It is recommended that foundations are inspected by a suitably qualified engineer. Piled foundations may be required subject to engineers review.

Suspended floor slabs, incorporating land gas protection measures, are applicable for all buildings.

Concrete Design Sulphate Class of DS-2 should be assumed, on the basis of the test results, with ACEC site classification of AC-2.

There is a limited Made Ground encountered within the farm yard buildings, and the samples analysed of this were generally free from significant contamination, however, some BaP exceedances were recorded, along with some isolated asbestos fibres. Some basic remediation is necessary. CS2 Gas protection measures are also proposed.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

1 Introduction and Site Location

The CDS Group have been requested by Kirsty Miller of Gleeson Land to undertake a Phase I Desk Study Assessment/Walkover Survey of the proposed development site to ascertain the historical nature of the site and any potential geotechnical and/or geoenvironmental issues which could impact on the development of the site.

The proposed development area, which comprises land to the east of Lower Broadbridge Heath Farm, Broadbridge Heath, West Sussex, RH13 0QN, has been assessed on a 1km area of influence: grid reference 514129, 131484 and the nearest postcode is RH13 0QN. The site is calculated as being approximately 22 ha.



Figure 1. OS map of the site (boundary indicated in red)



Figure 2. Aerial Image of the site (boundary indicated in red)

2 Development Proposals

The site is currently at master planning stage and as such definitive development proposals have not been put forward. However, the details shown on the illustrative master plan drawing provided to us shows that the proposal at the time of writing comprises 8.4ha of residential properties and 13.9ha of open public space.

The residential development areas are predominantly situated in the southern part of the site and the north-eastern/eastern part of the site. The western/north-western areas of the site a proposed to be public open space. Therefore, in accordance with published guidance (CLEA Model 2009/C4SL Report 2014), the developable areas of the site would be classified as Residential with homegrown produce.

CIRIA Guidance C665 classifies the residential development area as High gas sensitivity.

3 Geological Assessment

The report utilises third party information from providers such as Envirocheck, British Geological Survey and Cranfield University, whilst the information is deemed to be professionally reliable, CDS do not guarantee the accuracy of third party information.

The full reports of the referenced documents are attached in Appendix F.

3.1 Geology

The following headings cover the aspects of geology of the immediate area of the proposed development.

3.1.1 Artificial Ground

This is ground at or near the surface that has been modified by man. It includes ground that has been deposited (Made Ground), landscaped, disturbed, excavated (Worked Ground) or some combination of these.

As can be seen in Figure 3 below, there are no mapped artificial ground deposits beneath the site or within the immediate vicinity.

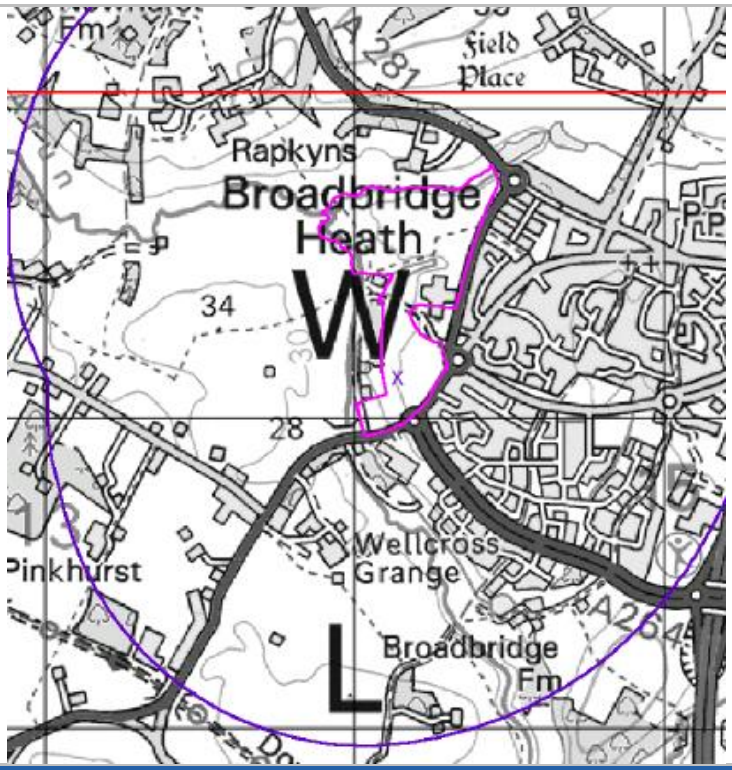


Figure 3. Artificial deposits within the vicinity of the site.

3.1.2 Superficial Deposits

These are relatively young geological deposits formerly known as 'Drift', which lie on the bedrock in many areas. They include deposits such as unconsolidated sands and gravels formed by rivers and clayey tills formed by glacial action. They may be overlain by landslide deposits, by artificial deposits or both.

As can be seen in Figure 4 below, there are no mapped superficial deposits across the majority of the site. Along the far western boundary, where the River Arun is situated, there are Alluvial deposits, however these soils are only mapped along the far site boundary and are therefore not expected to be encountered during the redevelopment of the site based on the current development plans.

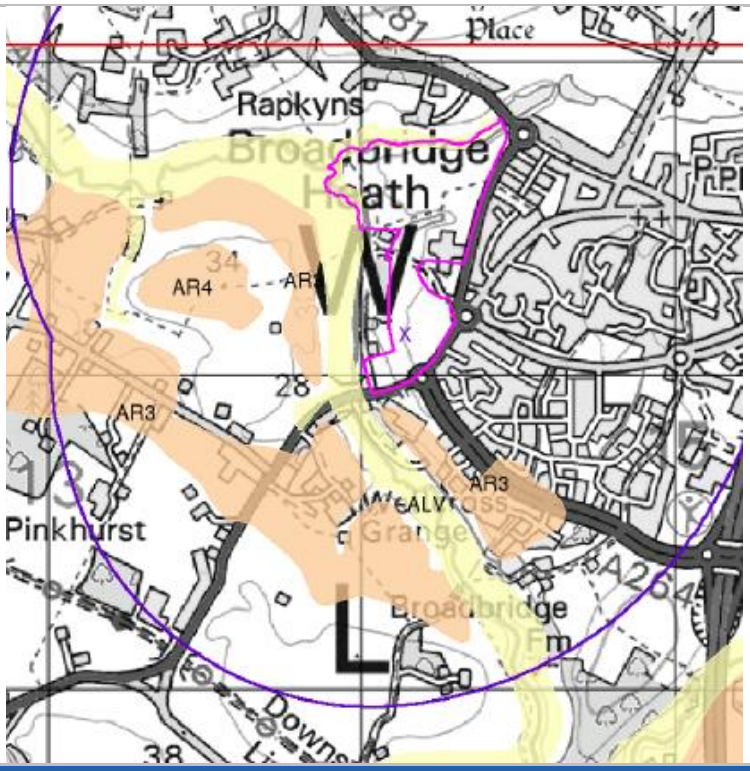


Figure 4. Superficial deposits within the vicinity of the site.

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	AR3	Arun Terrace Deposits, 3 Member	Sand and Gravel	Not Supplied - Wolstonian
	AR4	Arun Terrace Deposits, 4 Member	Sand and Gravel	Not Supplied - Anglian
	AR3T4	Arun River Terrace Deposits, 3 Member And Arun River Terrace Deposits, 4 Member, Undifferentiated	Sand and Gravel	Not Supplied - Quaternary

3.1.3 Bedrock Geology

Bedrock forms the ground underlying the whole of an area, commonly overlain by superficial deposits, landslide deposits or artificial deposits, in any combination.

As can be seen in Figure 5 below, the site is underlain in its entirety by the Weald Clay Formation, which generally comprises dark grey shales, mudstones and subordinate bands of siltstone, sandstone shelly limestones and clay ironstones. At the surface the Weald Clay weathers to a plastic Clay with variable mudstone lithorelic content and bands of red clay can also be encountered where the Horsham Stone is situated. Weald Clay is also known to contain pyrite, which can have implications with regards to the grade of concrete used.

Pockets of Horsham Stone are shown off site to the west and therefore there is potential that outliers of Horsham Stone could be encountered on the subject site.

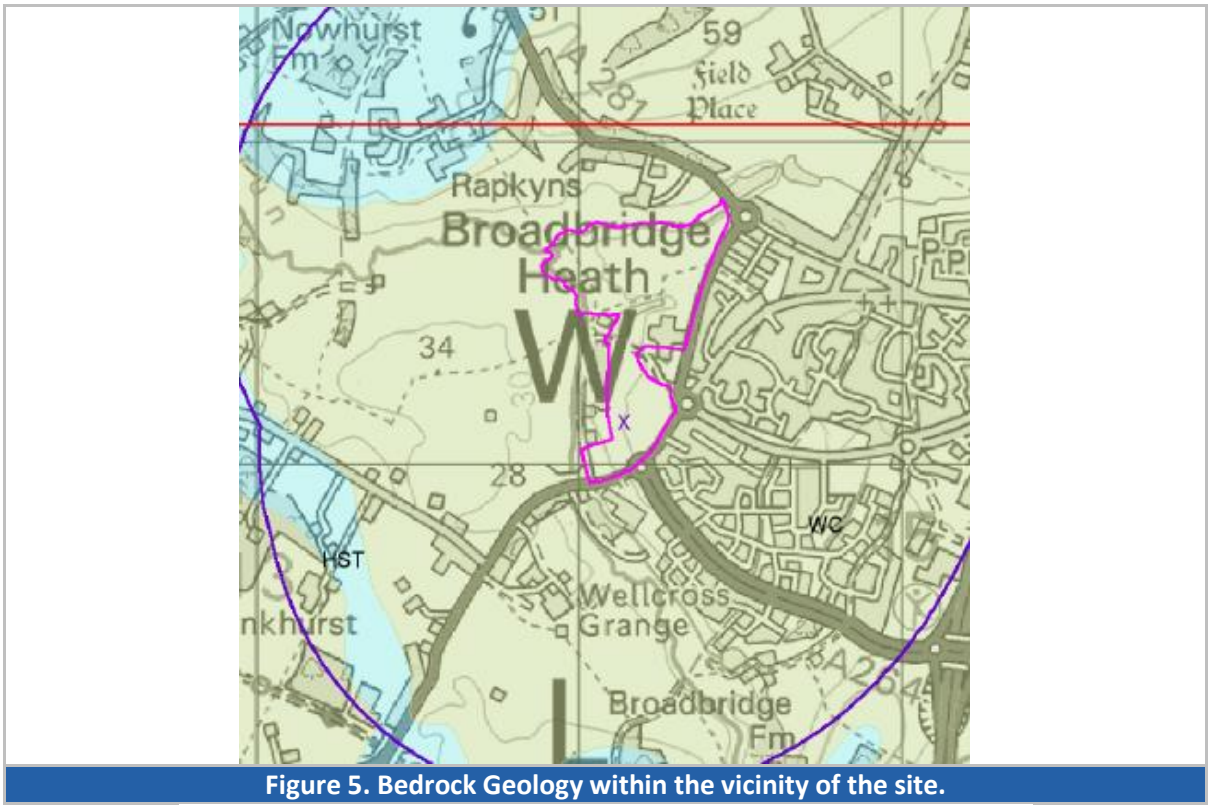


Figure 5. Bedrock Geology within the vicinity of the site.

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WC	Weald Clay Formation	Mudstone	Not Supplied - Hauterivian
	HST	Horsham Stone Member	Sandstone	Not Supplied - Hauterivian
	UTW	UPPER TUNBRIDGE WELLS SAND	Sandstone and Siltstone, Interbedded	Not Supplied - Valanginian
	UTW	UPPER TUNBRIDGE WELLS SAND	Sandstone and Mudstone	Not Supplied - Valanginian

3.2 Agricultural Land Classification

As the proposed parcel of land comprises agricultural land, a detailed Agricultural Land Classification Report will be required to support any future planning application in line with government requirements (https://www.gov.uk/government/publications/agricultural-land-assess-proposals-for-development/guide-to-assessing-development-proposals-on-agricultural-land). A review of the published 1:250,000 scale maps, as shown below in Figure 6 below, indicates that the site appears to fall into either Grade III (Good to Moderate) or Grade IV (Poor land). It should be noted that these maps do not show the subdivisions of the Grade III land into 3a and 3b, this would need to be defined during a detailed assessment of the site.

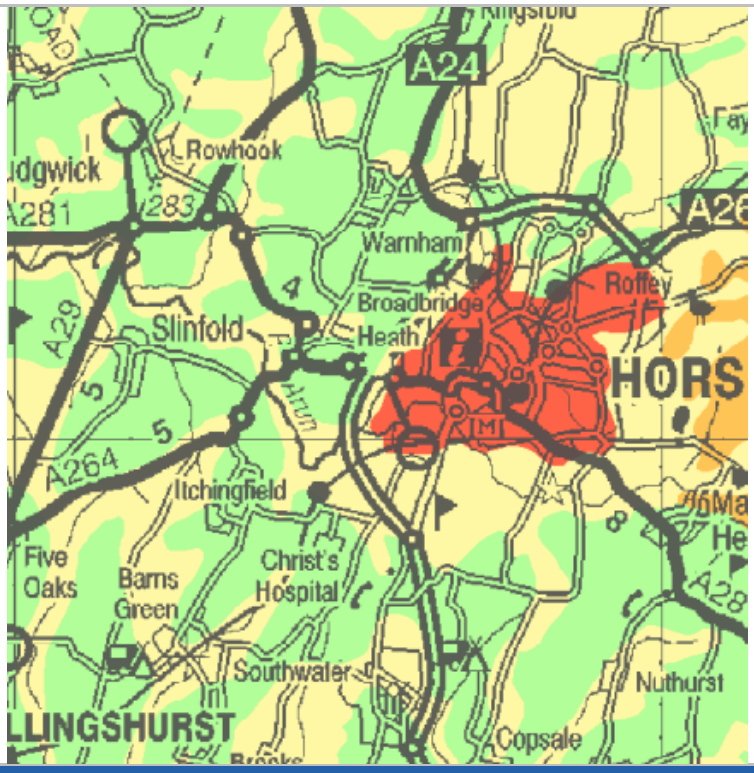


Figure 6. Agricultural Land Classification

3.3 Additional Geological Considerations

A summary of the potential geological hazards which could be found on site are explained in Table 1 below. This data is obtained from the BGS and the Envirocheck Report and should not be considered site specific.

Table 1. Onsite Geological Hazards

Geological hazard	May be significant within site area (Yes/No)?	Comments
Potential Natural Ground Stability Hazards		
Shrink-Swell	Yes	The mapped geology on the site predominantly comprises the Weald Clay. Whilst the unweathered Weald Clay is not considered to be plastic, the upper weathered profile is and

Geological hazard	May be significant within site area (Yes/No)?	Comments
		swelling and shrinkage, especially in close proximity to mature trees, is considered to be a risk on this site.
Landslides (slope instability)	No	The site is generally flat and level and as such there is no significant risk associated with landslides.
Soluble Rocks (dissolution)	No	The site is not situated on a geology which is susceptible to dissolution and as such there is very low risk.
Compressible Ground	No	The site is not situated on a geology which is susceptible to compression and as such there is no risk. If Alluvial soils were however encountered on site then these soils would be considered a moderate to high risk.
Collapsible Deposits	No	The site is not situated on a geology which is susceptible to collapse and as such there is very low risk.
Running Sand	No	Based on the mapped geology of Weald Clay the site is not considered to be at risk from encountering running sands.
Other Potential Hazards		
Mining	No	The site is not in an area at high risk of mining. No historical evidence of mining was observed on site or on the historical maps, however small scale/piecemeal excavations in the Weald Clay are often encountered and a careful watch for any infilled features should be made during investigation works and subsequent development. There was some limited evidence of quarrying off site to the northeast of the site on the early maps, which could potentially be a stone quarry for the excavation of Horsham Stone.
Flooding*	Yes	The majority of the site is classed as Flood Zone 1 and is at low risk of flooding from rivers or sea and as such is suitable for use as a residential development The majority of the site is at a very low risk of pluvial (surface) flooding, however there are areas associated with the ponds and ditch lines that are mapped as high risk areas and therefore development should allow for a suitable buffer between these features. ** This section is for information only, this report does not constitute a formal flood risk assessment and specialist advice should be sought in relation to potential flooding issues.*
Natural Land Gas		There are a number of small scale historical pits in the immediate vicinity of the site, however these appear to have been left as

Geological hazard	May be significant within site area (Yes/No)?	Comments
	No	open excavations and subsequently filled with water, therefore the risk is negligible. There are also some limited alluvial deposits mapped to the west of the site, which could act as a potential source of land gas generation.
Radon	No	The site is situated in a lower probability radon area (less than 1% of homes estimated to be at or above the action level). On this basis, no radon protective measures are required in the construction of new dwellings or properties.

4 Hydrogeological Assessment

In lowland areas of the UK with little topographic variation, groundwater is likely to be found at shallow depths of only a few metres. Water table fluctuations will be small as they will be constrained by the ground surface and the base level of the local perennial streams and rivers. In upland areas, precipitation is usually high and the dominantly metamorphic and igneous rocks often have relatively shallow groundwater levels.

This is due to preferential groundwater storage in near-surface weathered and fractured zones with limited drainage into the underlying un-weathered lower permeability rock. Exceptions can occur where higher permeability rocks, such as sandstone or limestone, allow faster throughflow of groundwater towards the nearest stream or other discharge point.

Perched water tables occur where a less permeable horizon (e.g. a clay layer) in an otherwise permeable sequence retains a body of groundwater above the level of the regional water table. They usually occur at shallow depths in alluvial and glacial sediments and can be difficult to identify or to delimit.

An aquifer becomes confined when it is overlain by a less permeable horizon that restricts the upward movement of groundwater. When this less permeable horizon is penetrated (e.g. by drilling), the groundwater level rises above where struck to a level controlled by the hydrostatic pressure. If this is above ground level, overflowing artesian conditions will be encountered. Confined conditions should be anticipated, where possible, in order to plan for the problems they can generate.

Individual sites will always require more detailed assessments to determine the specific impact on groundwater resources. The maps represent conditions only at the ground surface. Where the soil and/or underlying formations have been disturbed or removed the vulnerability class may have been changed and site-specific data will be required. Sites in urban areas and restored or current mineral workings are classified as having high (urban) soil leaching potential until proved otherwise.

Table 2. Hydrogeology summary

Geological unit	Groundwater potential	Water level and strikes	Groundwater vulnerability classification
Alluvium	Mixed permeability of moderate to high due to the presence of organic silty clays and potentially bands of sand and gravel.	Likely to be close to the water level in the River Arun to the west of the site, therefore we would expect to encounter water strikes within 1-3m bgl depending on the time of year.	Secondary A Superficial aquifer with moderate vulnerability.
Weald Clay	Negligible permeability through the clay soils, with some potential fissure flow. Where bands of rock are encountered then the potential to encounter perched water is considered to be moderate.	Nearby borehole records to the east indicate multiple water strikes within the underlying Tunbridge Wells Sand which were artesian in nature. No records of shallow water strikes within the Weald Clay were observed.	Unproductive Aquifer

4.1 Groundwater Vulnerability

This section reviews all components of hydrology, geology and topsoil surface water drainage to assess risk notably to groundwater.

4.1.1 Source Protection Zones

The position of the site relevant to current groundwater protection zones is shown in Figure 7. The proposed development site lies outside of any groundwater source protection zones.

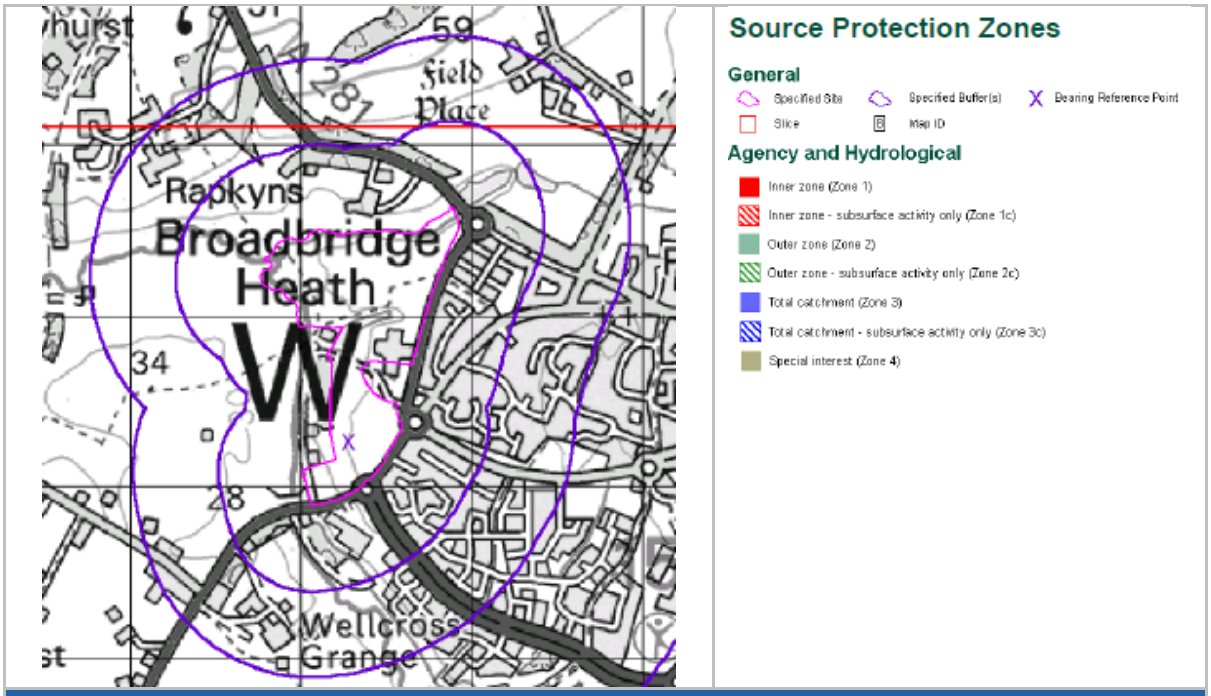


Figure 7. Groundwater Source Protection Zones associated with the site.

Source Protection Zones (SPZs) provide an indication of the risk to groundwater supplies that may result from potentially polluting activities and accidental releases of pollutants. Generally, the closer the activity or release is to a groundwater source the greater the risk. Three zones (an inner, outer and total catchment) are usually defined although a fourth zone (zone of special interest) is occasionally defined.

The Agency has subdivided groundwater source catchments into four zones. Two of these are determined by the travel time of potential pollutants, the third by the source catchment area itself and the fourth is a "Zone of Special Interest". This fourth zone highlights areas where known local conditions mean that potentially polluting activities could impact on a groundwater source even though the area is outside the normal catchment of that source.

- *Zone I (Inner Protection Zone)* **-** This zone is defined by a travel time of 50-days or less from any point within the zone at, or below, the water table. Additionally, the zone has, as a minimum, a 50-meter radius. It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water-borne disease.
- *Zone II (Outer Protection Zone)* **-** This zone is defined by the 400-day travel time, or 25% of the source catchment area, whichever is larger. The travel time is derived from consideration of the minimum time required to provide delay, dilution and attenuation of slowly degrading pollutants.
- *Zone III (Total catchment)* **-** This zone is defined as the total area needed to support the abstraction or discharge from the protected groundwater source.
- *Zone of Special Interest* **-** For some groundwater sources an additional Zone of Special Interest may be defined. These zones highlight areas (mainly on non-aquifers) where known local conditions mean that potentially polluting activities could impact on a groundwater source even though the area is outside the normal catchment of that source.

The discharge of clean roof water to ground is acceptable within an SPZ1, provided that all roof water down-pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminants already in the ground. No environmental permit is required, if the above criteria can be met.

4.1.2 Aquifer Vulnerability

The Groundwater Vulnerability maps are produced at a 1:100,000 scale. They show, by means of colour coding, those areas of the country where water-bearing rocks (aquifers) are present. They also show the vulnerability of groundwater to pollution. The aquifers are classified into Principal, Secondary and unproductive aquifers according to their physical properties and their consequent value as a resource.

The classification of the land surface reflects the ability of contaminants to leach through the covering soils and pose a potential risk to groundwater at depth. The maps also indicate areas where the presence of low permeability drift may provide additional groundwater protection.

These maps can therefore be used for an initial screening assessment of the vulnerability of groundwater to contaminants applied to the surface of the ground. They do not provide all information relevant to the determination of vulnerability, such as the depth to water table or nature of the drift deposits. Site-specific information would always be needed for a detailed assessment of vulnerability at a given location. The original groundwater vulnerability maps were produced some time ago.

Groundwater Vulnerability Maps provide information on how significant the ground waters are likely to be and if they are vulnerable to pollution occurring at the land surface. The maps have descriptions on them to explain the different aquifer and soil types.

Areas shown as principal aquifers have strategic significance for water resource; they often support large abstractions for the public water supply.

Secondary aquifers have a more localised significance to domestic, agricultural and industrial users (although they may still be used for drinking water). Unproductive aquifers do not store significant amounts of groundwater. However, in some areas they can support local supplies: e.g. small springs feeding individual properties.

4.1.3 Superficial Aquifer

As shown in Figure 8 below, the majority of the site is not situated on a designated superficial aquifer due to the absence of superficial geology onsite. Along the western site boundary, where the Alluvial soils are mapped, a Secondary A aquifer is mapped.

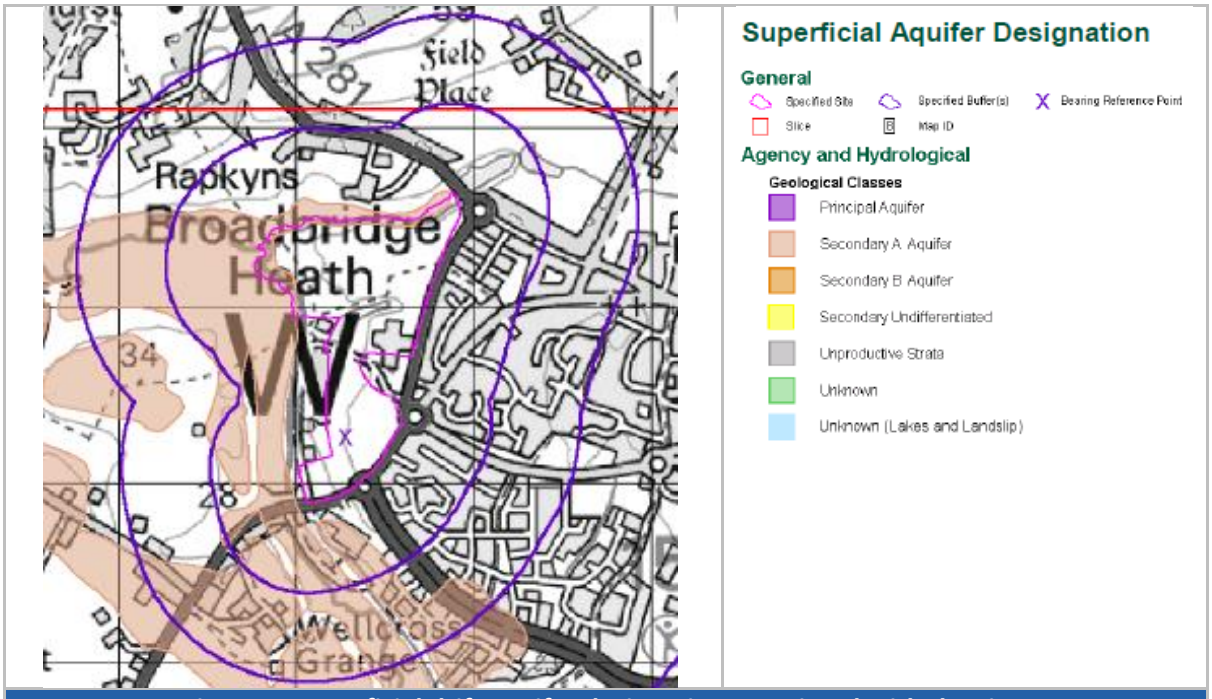


Figure 8. Superficial drift aquifer designation associated with the site.

4.1.4 Bedrock Aquifer

As shown in Figure 9 below, the site is situated on an unproductive bedrock aquifer.

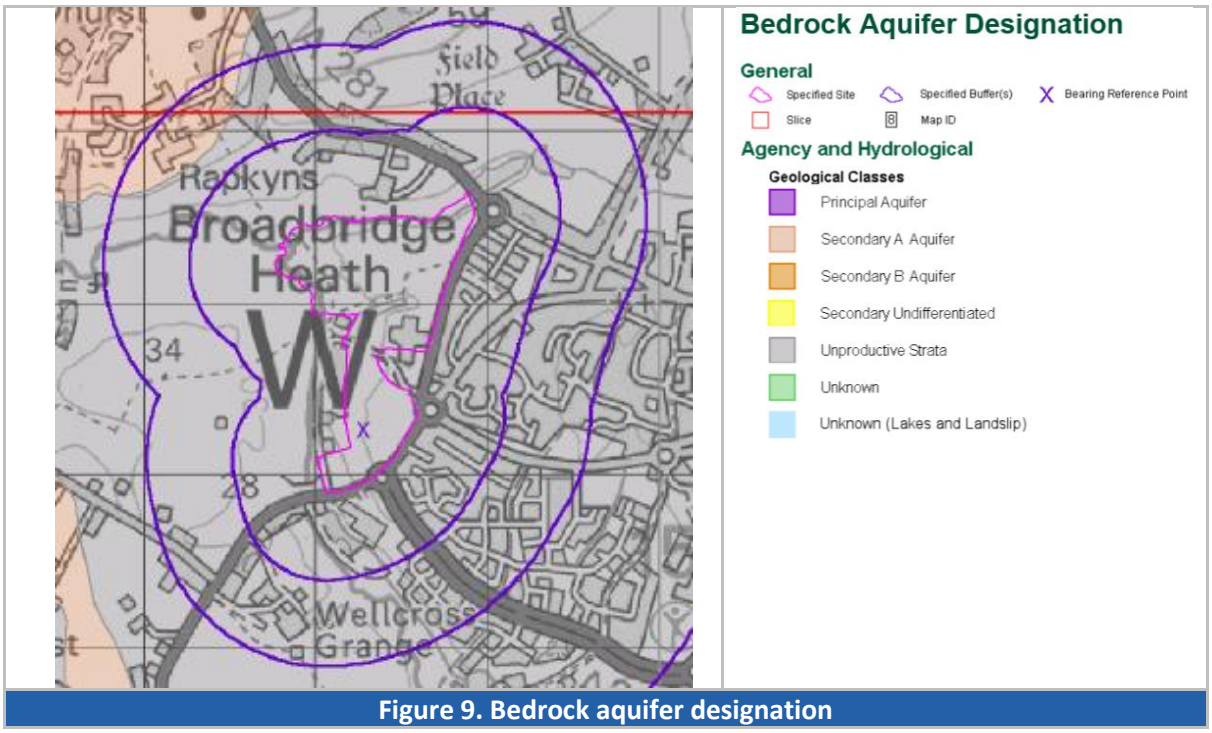


Figure 9. Bedrock aquifer designation

4.1.5 Groundwater Vulnerability Classification

As shown in Figure 10 below, the site is situated on an unproductive aquifer.

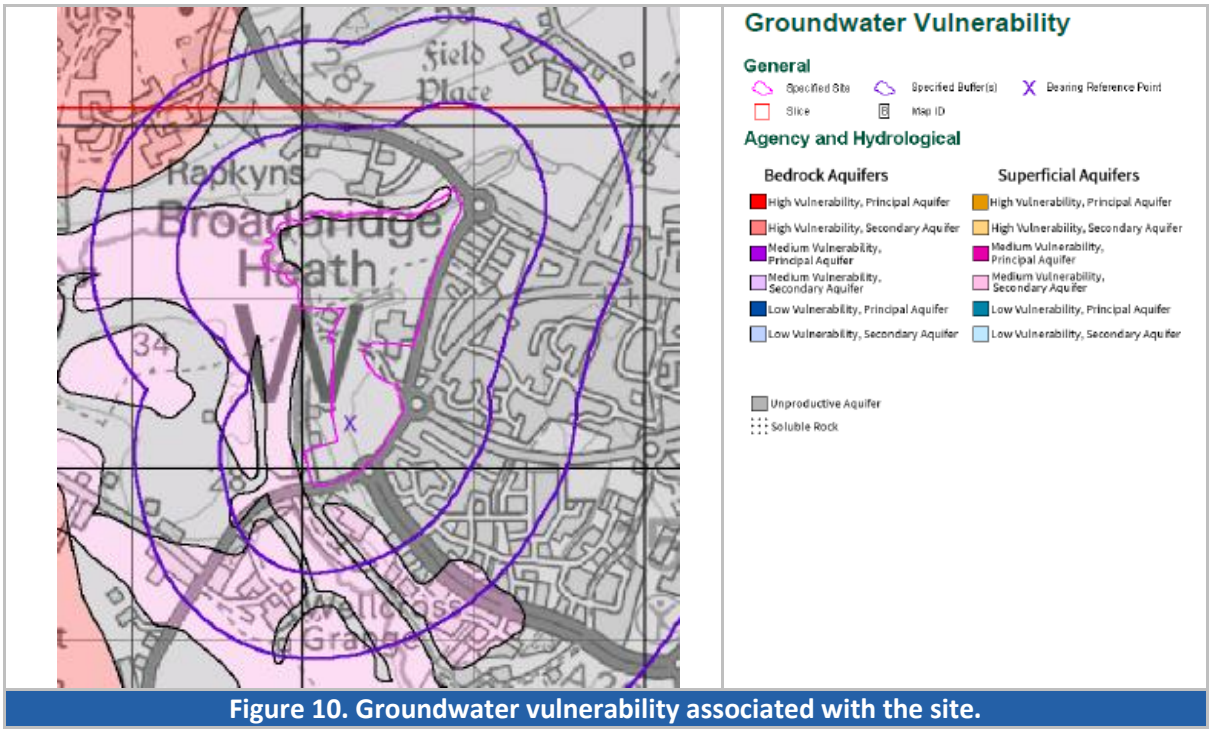


Figure 10. Groundwater vulnerability associated with the site.

4.1.6 Flood Risk

The majority of the site is within Flood Zone 1 land which is at low risk- less than 1 in 1,000 in any given year (Figure 11). From this respect, the land is suitable for residential development. Along the far western boundary, adjacent to the ditches and the River Arun, both Flood Zone II and Zone III land is mapped. However these areas are not due to be developed and therefore these flood zones will not have a significant impact on the proposed site redevelopment.

If areas of impermeable surfaces such as buildings, roads etc. are constructed on a greenfield site, a surface water management system designed in accordance with the principles of Sustainable Urban Drainage Schemes (SUDS) will be required.

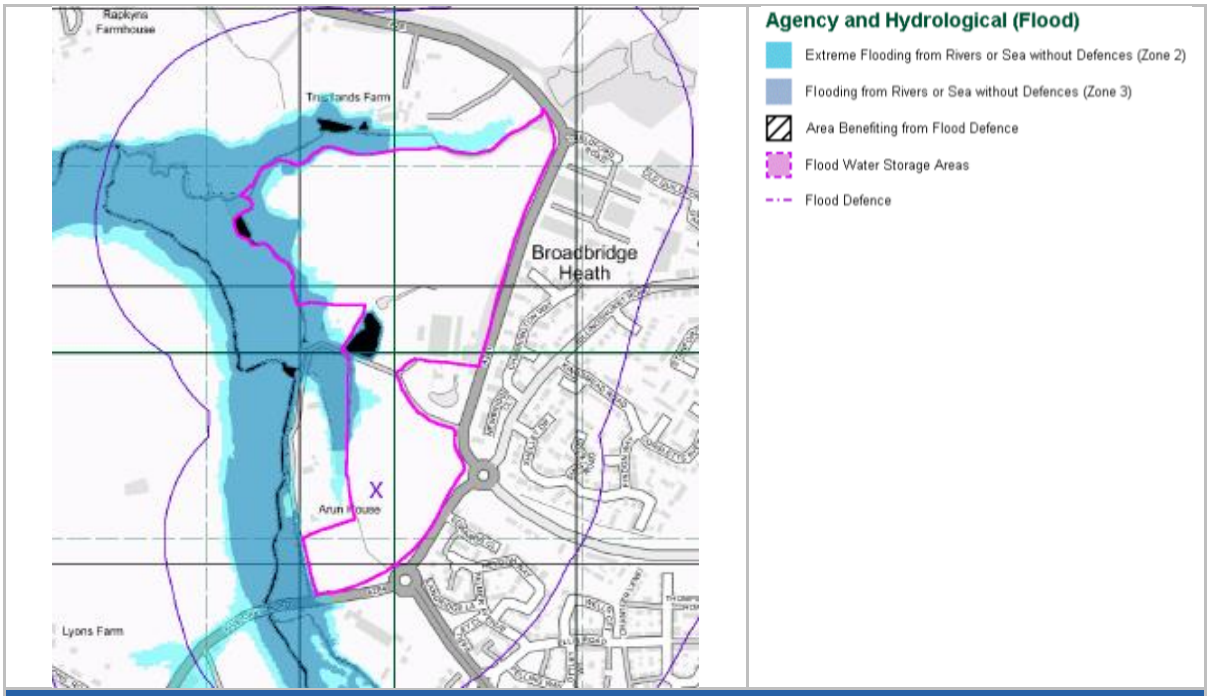


Figure 11. Map of Flood Risk Zones

4.1.7 Wells in the vicinity of the site

As can be seen in Figure 12 below, there are two groundwater abstractions mapped within 250m of the site. The first is mapped off site to the southwest and the second is mapped off site to the northwest.

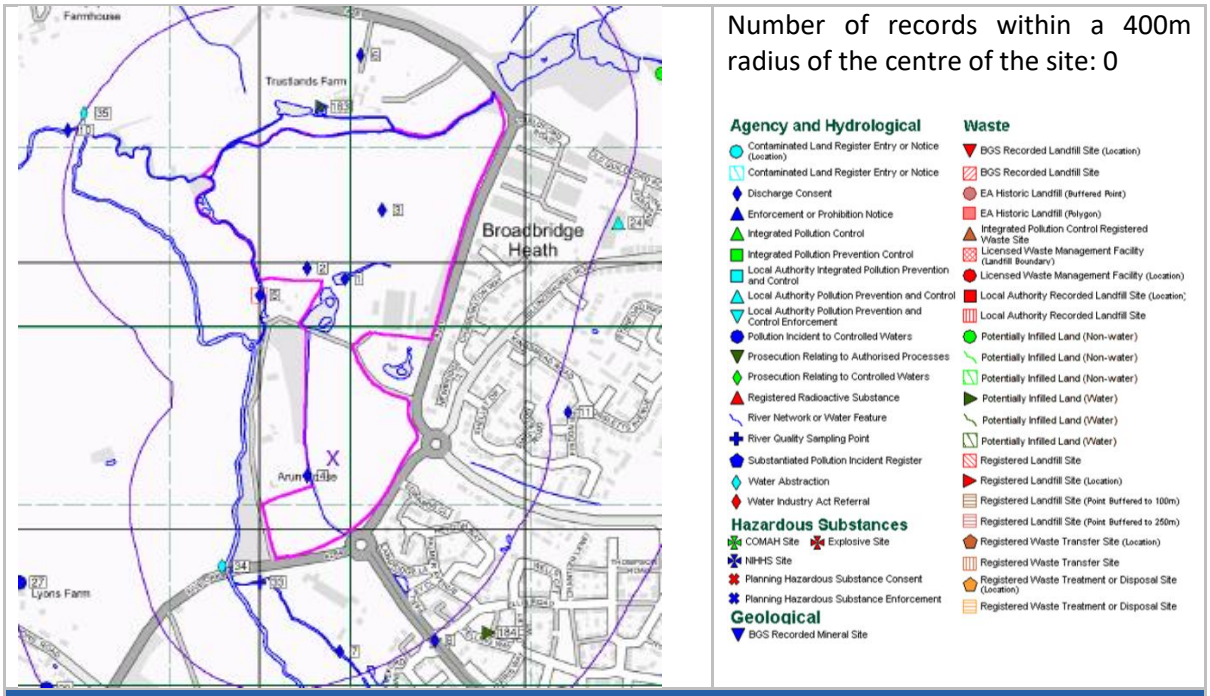


Figure 12. Well records

4.2 Surface Water Issues

The western boundary of the site is shown to be at low to high risk of surface water flooding. This is associated with a ditch line and overgrown boggy/wetland area which is fed from the pond overflow to the north. This ditch line is in places culverted under entrances across fields and these should be inspected and potentially upgraded to reduce the risk of surface water flooding exceedances. If any of the proposed redevelopment works increase the risk of downstream flooding or onsite flooding, these risks would need to be assessed and mitigated against using a suitable SUDS compliant approach.

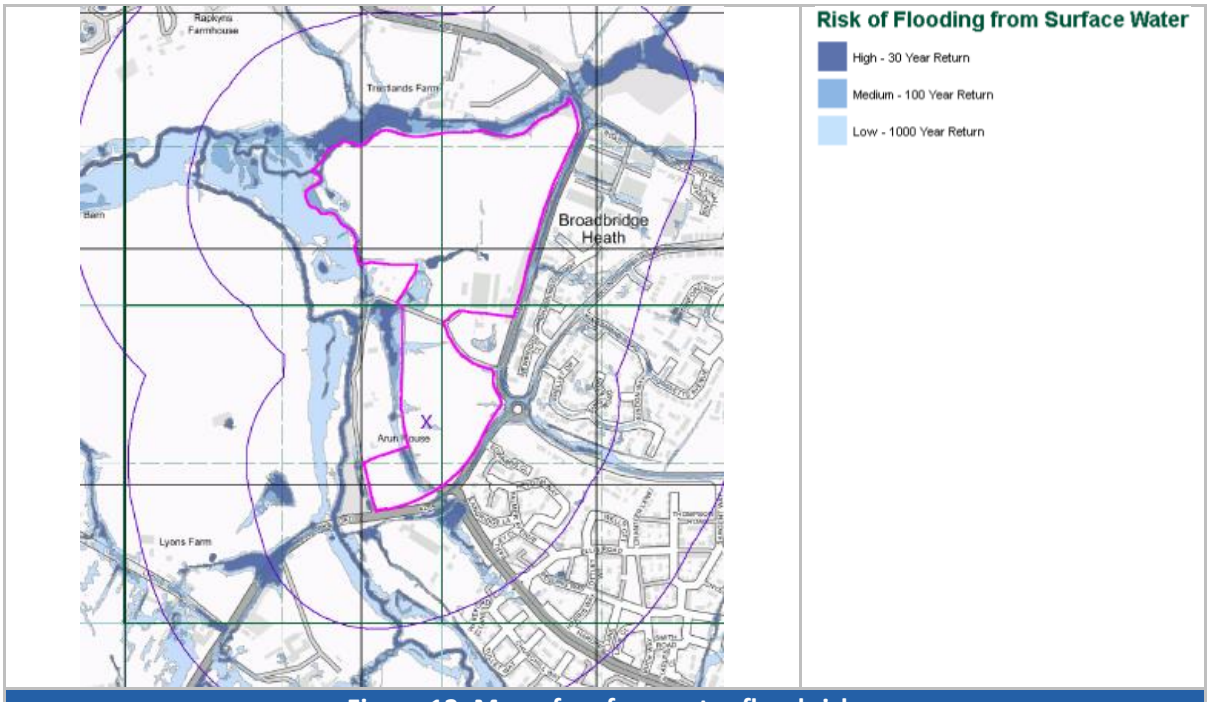


Figure 13. Map of surface water flood risk.

5 Desk Study and Walkover Assessment

5.1 Introduction

Due to the size of site and the different uses of the current land within the site itself, the description of the site and the historical map assessment of the site has been broken down into six distinct areas. These areas comprise:

- The Northern Fields (pale green)
- Bury Hill Landscape Supplies (pale brown)
- Horsham Stone Reclamation Yard (pale yellow)
- Southern Fields (pale blue)
- Wetland/Marsh Area (pale red)
- Pond Area (pale orange)

These areas are generally indicated on Figure 14 below for reference and photograph locations and view directions are highlighted on the drawing in Appendix A.

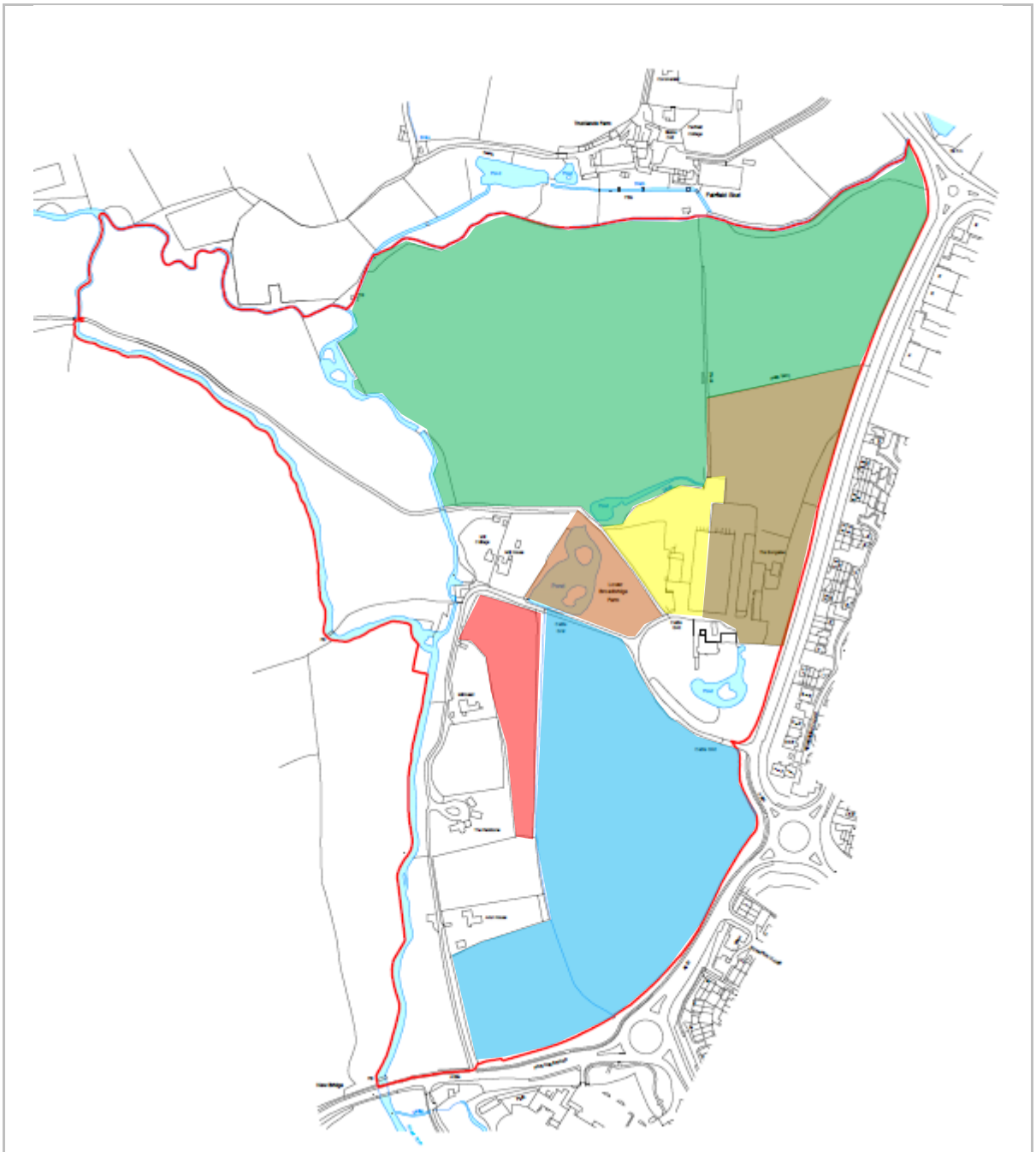


Figure 14. Site Description Zoning Map – General Boundaries

5.2 General Site Description

5.2.1 Northern Fields (Walkover Images 35-50 in Appendix B)

The northern fields comprise two parcels of agricultural land, which are subdivided by discontinuous hedgerows and mature oak trees into four parcels of land and also has a concrete access road which splits the fields to a small eastern field and a large western field. The land at the time of our walkover survey had been recently cultivated ready for seeding of the winter crop (corn/winter wheat) in the coming weeks. The site generally fell broadly towards to the north and to the west at a gentle slope.

The northern fields are bounded to the east by the A281, to the north and to the west by a ditch/stream, which flows initially to the west and then to the south and is situated approximately 1-2m below the general level of the site (deeper in the north-eastern corner and becoming more progressively shallow to the west). The southern boundary of the northern fields comprises a mixed boundary, to the east the boundary is with the Bury Hill Landscaping Supplies and comprises a mixed hedgerow with mature oak trees and recently formed shallow soil bunds. The central part of the boundary is against a ditch line which drains water from the Horsham Stone Yard and Farm Buildings away to the pond to the south. The western most part of the southern boundary is against gardens of the two residential properties Mill Cottage and Mill House.

Other than a few pieces of abandoned farm machinery along the concrete access road and a small soil bund in the far north-eastern corner, no obvious signs of potential on site contamination was identified.

5.2.2 Bury Hill Landscape Supplies (Walkover Images 51-68 in Appendix B)

The Bury Hill Landscape Supplies business is a recent addition to the site and appears to have opened between 2018-2020, with a further extension into the fields taking place in 2021. The owner of the business and the current landowner informed us that the topsoil and subsoil of the former field area was scrapped back and forms the mound, which runs along the eastern boundary of this part of the site. The land was then partially covered in crushed concrete/compacted hardcore to form a stable base for machinery and vehicular movement.

At the time of our walkover survey, the northern half of this part of the site comprised a series of soil mounds, comprising sand, organics, topsoil, nutrient depleted sand and reject material which is being used to form a bund along the northern boundary under license (images 51-54).

The central part of the site (images 55-61) comprised a more open working area, with a crushed concrete/hardcore base. This area contained modular concrete storage yards/bins for segregated materials and two small, modern plastic bunded fuel/oil tanks (images 59 and 61).

The southern part of the site (images 62-68) comprises a series of former agricultural barns which were formally used to house livestock. The buildings comprised a solid concrete floor and are a mixture of concrete and steel frames with half height concrete walls. The buildings are clad on the upper portion and roofed with asbestos cement sheeting and evidence of asbestos cement guttering and downpipes were also observed. At the time of our walkover survey, the barns were being used for the storage of graded soils, bark and other landscaping products as well as storage of equipment and maintenance products such as fuel/oils etc.

Given the presence of asbestos sheeting on the existing buildings, it is recommended that an Asbestos Survey is undertaken and that all materials are carefully removed from site by a licensed contractor.

5.2.3 Horsham Stone Reclamation Yard (Walkover Images 69-79 in Appendix B)

The Horsham Stone Reclamation yard appears to have developed on site around 2001 and slowly extended its operations to the north towards the boundary with a ditch by the 2005 map, with potential land raising/levelling having taken place.

At the time of our walkover survey the Horsham Stone Reclamation yard comprised a small single storey building with asbestos cement sheeting on the roof, small portacabin style buildings and the western half of the barns as described in the Bury Hill Landscape walkover description.

In the northern part of this area, stockpiles of stone and brick were observed along with a soil mound to the west which comprises the subsoil/topsoil which was stripped as part of the extension of the yard. Along the northern boundary and the eastern boundary stockpiles of what appears to be inert waste (rubble, wood and reject stone) were observed which contained some plastic and metal. The ditch along the northern boundary receives uncontrolled drainage from the yard, with no flow controls or pollution control measures in place.

The northern part of this parcel of land appears to have been built up by between 0.5m to 1.0m of made ground, as observed in image 77. As such, these made ground soils will require investigation for potential contamination and will likely require removal from site during the redevelopment works.

Given the presence of asbestos sheeting on the existing buildings, it is recommended that an Asbestos Survey is undertaken and that all materials are carefully removed from site by a licensed contractor.

5.2.4 Southern Fields (Walkover Images 8-24 in Appendix B)

The southern fields comprise two parcels of agricultural land, which are divided by a ditch line and mature hedgerow. The access point from the larger eastern field to the smaller western field (image 18) comprises a field entrance which crosses the ditch line which runs along the western field boundary. The ditch is culverted under the crossing by a ~150mm twin-walled plastic pipe, and was partially obstructed with silt and vegetation (image 19).

The land at the time of our walkover survey had been recently cultivated ready for seeding of the winter crop (corn/winter wheat) in the coming weeks. The site generally fell broadly towards to the south and to the west at a gentle slope. An overhead power cable cuts across the larger field from the A281 to the residential properties to the west and two gas marker posts were observed along the southwestern field boundary (images 14 and 15).

The fields are bounded by the site entrance route to the north, by the A281 to the east, by the A264 to the south and by an access road to the west which provided access to a series of residential properties along the western boundary. Also along the far western boundary the River Arun is mapped which flows to the north before turning west and used to have an old corn mill at the location of the location of Mill Cottage.

No obvious signs of potential on site contamination was identified in this part of the site.

5.2.5 Wetland/Marsh Area

Access into this area was not possible during our walkover survey as it was wet underfoot and heavily overgrown. This area, known as the Withey, takes the overflow from the pond to the north through a culvert pipe under the access track and eventually joins the ditch line to the south where the water flows down to join the River Arun.

5.2.6 Pond Area (Walkover Images 1, 2, 6 and 7 in Appendix B)

The pond area comprises a small section of open land laid to grass at the time of our walkover survey. The pond comprises a large feature with a small island in the centre, and has a high level overflow on the southern boundary which discharges into the wetland area to the south.

The pond is bounded by existing residential properties to the west and by fields to the north and south.

5.3 Historical Map Assessment

Historical maps are attached in Appendix F for reference. Due to the scale of the site, the historical assessment below has been undertaken using the 1:10000 scale maps, however more detailed 1:2500 maps are also included.

5.3.1 Onsite Features

The site is first shown on the 1880 map to comprise predominantly open agricultural land. Lower Broadbridge Heath Farm is mapped in the centre of the site along the eastern boundary and comprises a farmhouse and series of external buildings assumed to be the farmyard. Directly west of the farm is a small section of orchards, beyond which a pond is mapped.

By the 1898 map, the only change of note onsite comprises the construction of additional buildings in and around the Lower Broadbridge Heath farmyard. Further redevelopment of the farmyard was also shown by the 1912-1913 map, which also includes the mapping of a well to the west of the farm buildings.

The site has remained essentially unchanged up to the 1981-1983 map when the buildings associated with Lower Broadbridge Heath Farm appear to have been redeveloped in their entirety with the exception of the original farmhouse. The buildings now appear to comprise one large barn, one narrow barn and a smaller outbuilding.

The site has remained essentially unchanged up to the latest map dated 2021. The map however does not show the development of the Horsham Stone yard or the Bury Hill Landscape Supplies yard which were described in detail as part of the walkover survey above.

5.3.2 Off Site Features

The 1880 map shows that the surrounding area is predominantly open rural land, with numerous farmsteads mapped in the surrounding area. Directly off site to the west, Sleafold Flour Mill is mapped on the River Arun along with a small residential property. Along the western site boundary an area of marshland is also mapped. Off site to the northeast, a series of fishponds are mapped which appear to be situated in former quarries as the maps clearly show quarry boundaries.

By the 1912-1913 map, Sleafold Mill to the west has now been mapped as disused and off site to the east the village of Broadbridge Heath has started to develop, with new houses constructed, St Johns Church built along with schools, smithies, and recreation grounds. By the 1932-1933 map, Broadbridge Heath to the east has continued to expand, and to the south of the site a water treatment works including filter beds has been developed along Mill Stream, which joins into the River Arun.

On the 1938 map, two residential properties have been developed along the western site boundary and by the 1961 map, an additional property was constructed along the western boundary.

By the 1981-1983 map, the village of Broadbridge Heath to the east has continued to grow, with many new roads, residential estates and sports centres developed, which are adjacent to the A24 which was constructed at some point between the 1960's and the 1980's. Directly south of the southern most part of the site, Newbridge Nurseries is now also mapped.

At some point between the 1981-1983 map and the 1999-2000 map, the village of Broadbridge Heath to the east has undergone significant development. Housing and industrial units now directly bound the subject site to the east. The final map dated 2021 shows further significant development, with the village of Broadbridge Heath expanding to the south and almost doubling in size. As part of the extensive development a new bypass has been developed for the A264, so that traffic goes around Broadbridge Heath to the A24 rather than directly through it. Newbridge nurseries which was situated to the south of the site has been redeveloped into Greenacres Nurseries.

5.4 Environmental Database Assessment

The Envirocheck Report, which is included in full in Appendix F, summarises a range of historical and current land uses in close proximity to the site, as well as a range of other important information.

The following table provides a review of the features and entries listed within 500m of the boundary of the site.

Table 3. Environmental Database Summary

Environmental Database	Distance (m) and Direction	Significant Hazard to/from the site (Yes/No)?	Notes
Contemporary Trade Directories	27m NE 28m NE 47m NE 47m NE 50m NE 63m E 70m NE	No No No No No No No	Bury Hill Builders Merchants – Active Antique Stone Company – Inactive Ax Distribution Services – Inactive Aerco – Electronic Manufacturers – Inactive Charlie'S Products – Animal By products – Inactive K D Autos – Garage Services - Inactive Preco – Radio Communication Equipment – Inactive A further 34 entries are listed within 250m of the site, however none are considered to pose a significant risk.
Fuel Sites	270m NE 783m E	No No	Evans Halshaw – Obsolete. Tesco's Horsham - Active
Pollution Incidents	-	No	None listed within 450m of the site. The nearest is listed as 496m southwest of the site and related to a spillage of oil into groundwater – Category 3 Minor Incident.
Water Abstractions	102m SW 243m NW	No No	Abstraction for spray irrigation. Abstraction for spray irrigation.
Discharge Consents	0m E 0m W 0m W	No No No	Sewage Discharge – Treated Domestic to watercourse. Sewage Discharge – Treated Domestic to watercourse. Sewage Discharge – Treated Domestic to watercourse.

Environmental Database	Distance (m) and Direction	Significant Hazard to/from the site (Yes/No)?	Notes
	6m W	No	Sewage Discharge – Treated Domestic to watercourse. Multiple other domestic treated sewage discharges are listed within 150m of the site. However, none of these licensed discharge are considered to pose a risk to the redevelopment of the site.
Infilled Land (Non-Water)	-	-	None listed on site. The nearest listed feature is mapped 308m to the northeast of the site from the 1981 map.
Infilled Land (Water)	-	-	None listed on site. The nearest listed feature is mapped 57m to the north of the site from the 1961 map.
Historical Landfills	-	-	None listed within 500m of the site.
Recorded Landfill Sites	-	-	None listed within 500m of the site.

6 Conceptual Model

6.1 On site Sources of Contamination

6.1.1 Pesticides/Herbicides

The majority of the site has been used as arable land since the earliest historical maps. The only potential source of onsite contamination associated with this land use would be the build up of pesticides/herbicides in the topsoil, coupled with potential heavy metal build up associated with the compounds used.

As such we would recommend some initial pesticide screening tests to be undertaken to assess the level of risk posed.

6.1.2 Demolition / Construction Materials

The continuous redevelopment of the Lower Broadbridge Heath Farm buildings poses the greatest onsite risk due to the potential to encounter variable made ground soils. There also remains a risk that residual contamination associated with the former buildings may remain on site if redevelopment works excluded the removal of any below ground substructures.

In addition, evidence of imported made ground was observed in both the Horsham Stone Yard and the Bury Hill Landscape Yard, which could potentially contain variable contamination sources.

As such, the following contaminants may be encountered in this area of the site and should therefore form part of the contamination assessment in the Phase II investigation:

- Heavy Metals, PAH's, Asbestos, Hydrocarbons.

6.1.3 Fuel Tanks

Two small, bunded plastic fuel tanks were observed during our walkover survey within the Bury Hill Landscape yard. These tanks appeared in good condition and were situated on solid concrete bases and as such the risk of contamination is considered to be low.

Historical tanks associated with the former buildings may have been situated on site, however the locations of these is now unknown. Therefore there remains a risk that residual pockets of hydrocarbons may be encountered across the former farmyard area. Given the soils low permeability these are likely to be isolated hotspots rather than widespread contamination and would be more easily remediated as hotspots during the demolition of the existing farm buildings.

As such, the following contaminants maybe encountered in this area of the site:

- Hydrocarbons.

6.2 Off site Sources of Contamination

No significant sources of offsite contamination have been identified which would have an impact on the proposed redevelopment of the site.

6.3 Pollutant Linkage Model

The identified pollutant linkages based on the desk study assessment have been summarised below in the Site Specific Pollutant Linkage table:

Table 4. Site Specific Pollutant Linkages

Source	Pathway	Receptor	Assessment (Calculated Risk)
Onsite contamination arising from current of historical land use	Direct ingestion, direct contact & inhalation of dust/ vapours.	Future Site users.	The calculated risk is deemed to be low in the areas of the site which are currently arable land. The area of the site where the former farmyard was situated and where the existing buildings and commercial operations are based to the current day is considered to be a moderate risk. Remedial works based on the identified contamination would be required to reduce/remove the risk to future end users in line with the sites end use (residential with plant uptake).

Source	Pathway	Receptor	Assessment (Calculated Risk)
		Construction workers.	The calculated risk is deemed to be low in the areas of the site which are currently arable land. The area of the site where the former farmyard was situated and where the existing buildings and commercial operations are based to the current day is considered to be a moderate risk. The provision of suitable PPE/RPE during the demolition/construction phase along with detailed method statements and risk assessments would be required to reduce/remove the risk to construction workers to appropriate levels.
	Leaching and vertical & lateral migration	Controlled waters	The calculated risk is deemed to be low in general across the site given the limited number of potential contamination sources and the negligible permeability of the underlying geology which restrict vertical and lateral migration.
	Direct infiltration in water supply pipes.	Service conduits.	The calculated risk is deemed to be low in the areas of the site which are currently arable land. The area of the site where the former farmyard was situated and where the existing buildings and commercial operations are based to the current day is considered to be a moderate risk. Services and incoming pipework will need to be designed in accordance with the suppliers specifications based on the level of identified contamination on site.
	Plant uptake.	Vegetation within landscaped areas.	The calculated risk is deemed to be low in the areas of the site which are currently arable land. The area of the site where the former farmyard was situated and where the existing buildings and commercial operations are based to the current day is considered to be a moderate risk.
	Lateral migration through groundwater	Off-Site neighbouring properties.	The calculated risk is deemed to be low in general across the site given the limited number of potential contamination sources and the negligible permeability of the underlying geology which restrict vertical and lateral migration.

Source	Pathway	Receptor	Assessment (Calculated Risk)
Potentially contaminated groundwater (onsite or offsite)	Direct ingestion, direct contact & inhalation of dust/ vapours.	Future Site users.	The calculated risk is deemed to be low in general across the site given the limited number of potential contamination sources and the negligible permeability of the underlying geology which restrict vertical and lateral migration. Remedial works based on the identified contamination would be required to reduce/remove the risk to offsite receptors subject to consent and approval.
	Leaching and vertical & lateral migration	Controlled waters (watercourses)	The calculated risk is deemed to be low in general across the site given the limited number of potential contamination sources and the negligible permeability of the underlying geology which restrict vertical and lateral migration. Remedial works based on the identified contamination would be required to reduce/remove the risk to offsite receptors subject to consent and approval.
Potential for ground gas	Vertical and lateral migration	Human Health and buildings	The calculated risk is deemed to be low in general across the site given the limited number of potential contamination sources. Furthermore, the clay based geology encountered across the site would restrict the lateral migration of land gases away from the source.

7 Site Investigation

7.1 Site Topography

The site appears to be generally flat at approximately 30m AOD, whilst the surrounding area appears to gently slope to the west.

7.2 Site Investigation

Given the size of the site and in order to keep the impact to the recent sown winter crop, our intrusive site investigation was split into two separate phases.

The first phase was undertaken between the 3rd and 4th November 2021 and comprised a total of thirteen windowless sampler boreholes across the site, to a maximum depth of 3.30m bgl (refusal on underlying weak mudstone). The aim of the investigation was to allow for the construction of a series of groundwater / gas monitoring wells across the site, and to allow for initial investigation to be undertaken within the commercial working area whilst minimising disturbance.

The second phase of the investigation was undertaken between the 30th November and the 3rd December 2021 and comprised a total of twenty-five mechanically excavated trial pits using a 8T tracked machine. The pits were dug to a maximum depth of 3.20m bgl. In addition to the trial pits 3 No. BRE365 soakage tests were undertaken at the proposed location of the attenuation basins to assess on site soakage potential. The trial pits were all located, at the behest of the landowner, near field boundaries and along tram lines to minimise crop damage. A fourth soakage test had been planned but given the requirement to keep wheeled traffic off the fields, this test had to be cancelled.

The trial pits and windowless sampler boreholes were sunk at the approximate locations shown below in Figure 3. The locations were distributed across the entire site to assess soil variability and depth to groundwater, and were positioned due to access restrictions by way of under / above ground services, structures and obstacles onsite.

Some of the originally proposed locations had to be moved due to the requests of the land owner.

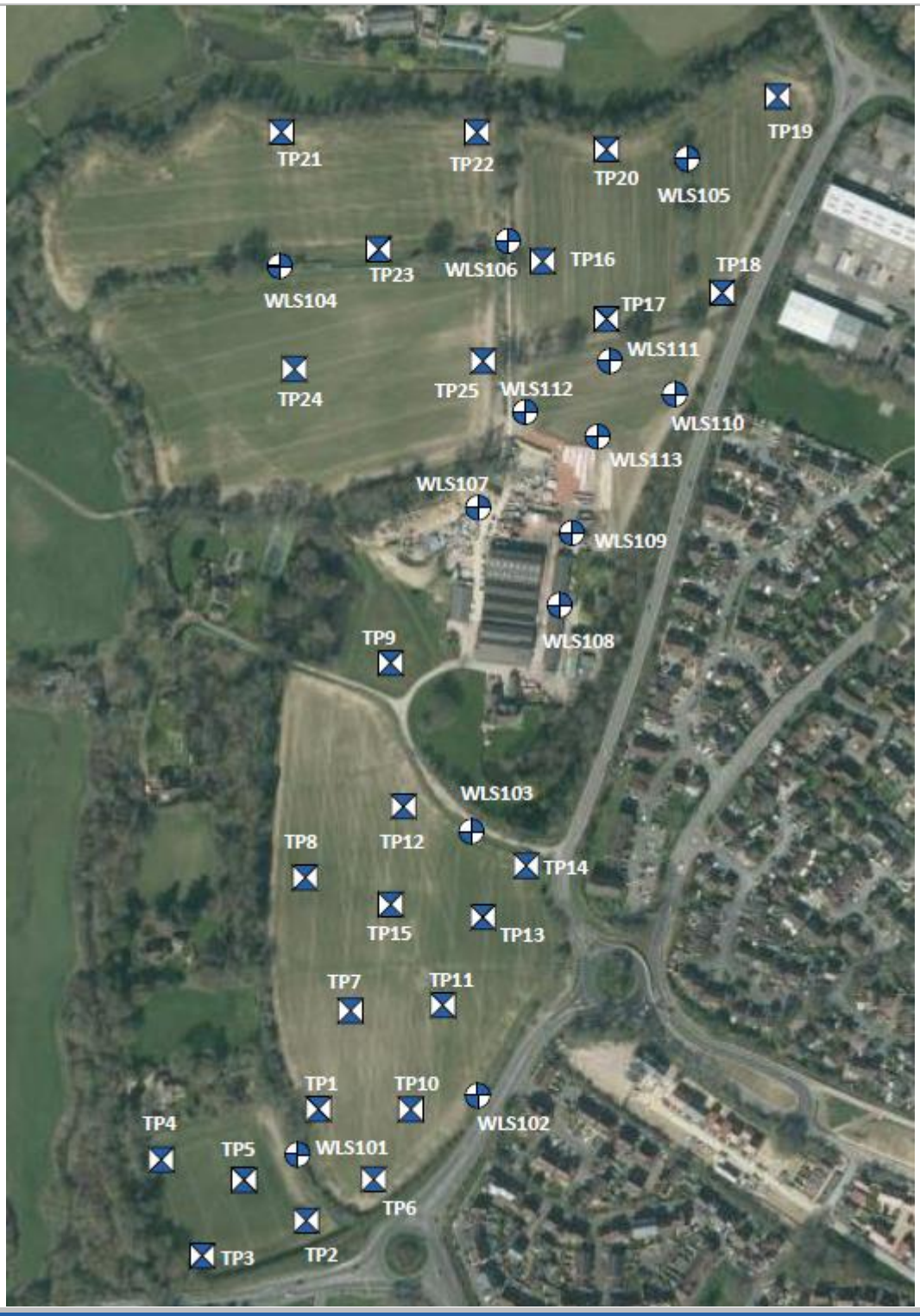


Figure 15. Trial Pit Location plan

7.3 Soils as Found

The soils encountered are described in detail on the attached exploratory hole logs in Appendix A, but in general comprised a covering of TOPSOIL over gravelly CLAY, which transitioned into MUDSTONE at depth. A limited thickness of MADE GROUND was encountered within the stone reclamation yard and topsoil processing centre. The following table provides a general summary of the soils as found on site.

Table 5. Soils as Found

Depth m bgl (Top to Base)	Soil Type	Description
G.L to 0.20m/0.50m	Topsoil	Brown silty clayey TOPSOIL with rootlets.
G.L to 0.20m/0.40m	Made Ground	Concrete over flint sub-base / crushed brick and concrete Over Dirty brown very gravelly SAND with abundant brick, concrete, glass and blacktop fragments. Whole bricks Or Dark brown sandy gravelly CLAY with brick and concrete fragments [only encountered in WLS107 to 113]
-0.50m/2.70m	Gravelly CLAY	Firm grey/orange-brown silty CLAY with black flecks and rae fine rootlets. Over Stiff becoming hard, orange-brown mottled grey silty CLAY with abundant fine to coarse randomly orientated, becoming subhorizontally oriented mudstone lithorelics. [some layers absent between locations]
-3.30m +	MUDSTONE	Very weak to weak orange-brown/grey friable MUDSTONE with some laminated structure and ironstone staining. Occasional very stiff clay lenses.

7.4 Groundwater

A limited number of groundwater strikes were encountered within particular sandy lenses encountered, details of which are included within the logs attached (Appendix A).

Groundwater monitoring has been undertaken as part of the fortnightly gas monitoring visits and are reported in the table below. It is likely that the reported values represents build up of water seepages and potential surface water ingress within the monitoring wells rather than representing the true depth to groundwater. Additional monthly groundwater monitoring visits are scheduled until April 2022.

Table 6. Groundwater Monitoring

Groundwater Levels m bgl									
	09.11.21	23.11.21	15.12.21	21.12.21	06.01.22	20.01.22	16.02.22	17.03.22	12.04.22
BH101	0.52	0.56	0.34	0.40	0.39	0.36	0.31	0.42	0.32
BH102	1.78	1.93	1.93	1.91	1.96	1.59	1.85	1.80	0.82
BH103	0.84	1.19	0.74	0.60	0.41	0.32	1.54	0.93	0.80
BH104	0.65	0.84	0.75	0.80	0.71	0.85	1.35	0.84	0.82
BH105	0.94	1.10	0.72	0.80	0.43	0.52	0.52	0.78	0.75
BH106	DRY	1.68	1.22	1.18	1.08	1.95	1.84	1.01	0.78
BH107	1.48	1.81	1.42	1.72	1.15	1.16	1.84	N/a*	N/a*
BH109	1.91	1.81	1.62	1.73	1.46	1.38	1.69	1.12	1.09

*BH107 had been destroyed and the well could not be accessed.

7.5 Trench Stability

It was observed during our intrusive works, that the underlying cohesive soils tended to be generally stable in the short term, with no evidence of any significant trench stability observed.

As with any excavations where personnel are required to enter, some form of close lateral support and allowances for dewatering is always recommended.

8 Geotechnical Assessment

8.1 Laboratory Results

During our first phase of investigation, eleven Atterberg Limit tests were undertaken, with Plasticity Index's recorded in these samples ranged from 13% - 53%.

An additional eighteen Atterberg Limit tests were undertaken during the second phase of our investigation, with Plasticity Index's recorded in these samples ranged from 4.5% - 57%, following percentage passing modification.

Based on the results of both phases of testing, the cohesive substrates in general should therefore be considered to be shrinkable, and of HIGH volume change potential with respect to NHBC Chapter 4.2 Building Near Trees, for the design of new foundations/floor slabs.

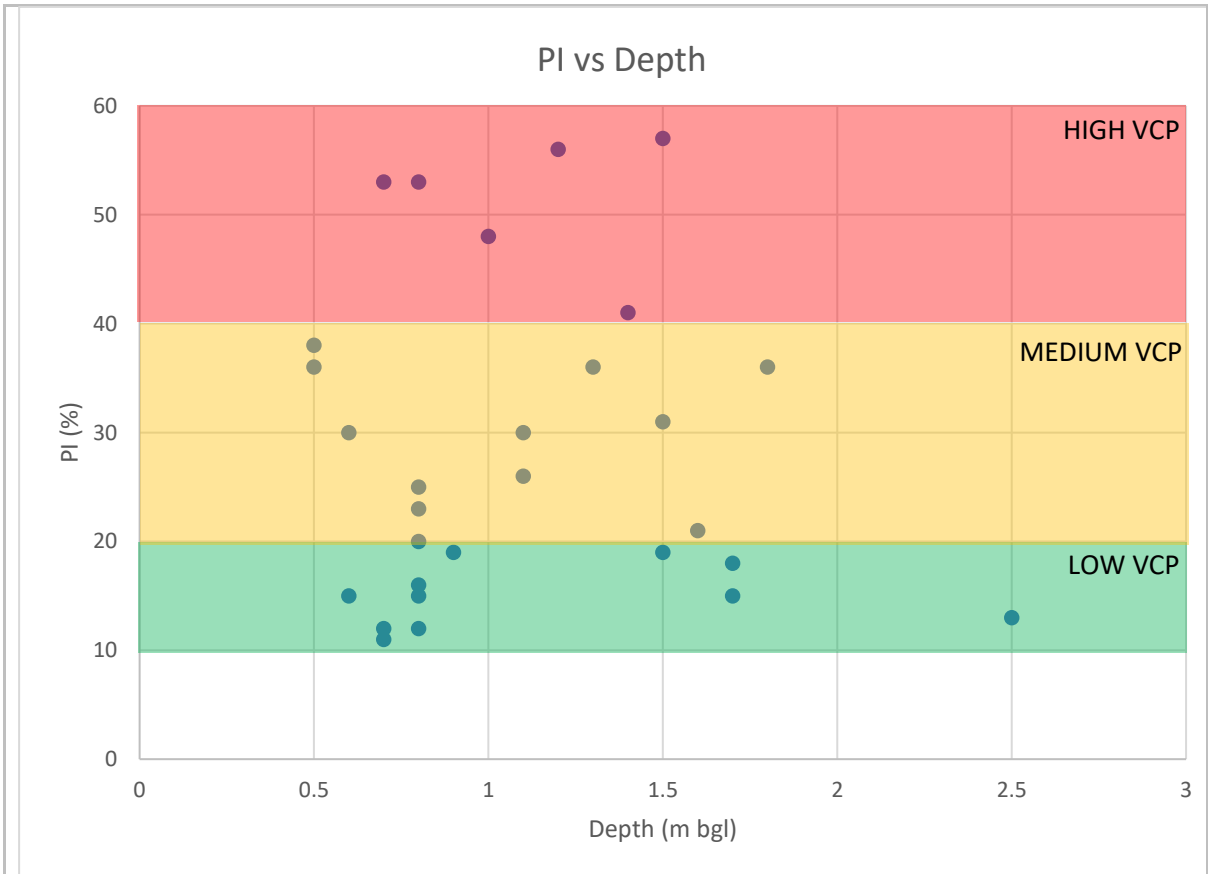


Figure 16. Plasticity Index vs Depth (m bgl)

There does not appear to be any evidence of zoning, either by area or substrate. Therefore, the worst-case situation should be assumed – HIGH VCP. The underlying mudstone should however be regarded as non-shrinkable.

8.2 Groundwater Levels

Scattered and limited water strikes were observed within particularly sandy lenses encountered during our intrusive investigation. In addition, shallow water levels were also recorded within the installed boreholes. However, given the cohesive nature of the soils encountered, and the limited number of water strikes recorded during both the boreholes and pitting exercises, the groundwater recorded within the monitoring wells is not thought to represent a true groundwater level across the site, but perched groundwater entering the boreholes, from the boundaries between the topsoil / made ground and clay subgrades.

Water ingress and trench instability did not appear to have obvious zoning across the site.

Groundwater levels may vary from season to season and year to year with levels potentially rising near surface in wet or winter periods. Groundworks should make allowances for encountering the localised groundwater pockets and dewatering from sumps within the main excavations should be allowed for at this stage.

8.3 Soakaways

A total of three BRE 365 soakage tests were undertaken in close proximity to the proposed attenuation ponds. The fourth planned location was not undertaken, due to access restrictions imposed by the landowner.

The results of the soakage tests were negligible, with the water levels not dropping significantly over a four hour period.

Table 7. Soakage Results

Location	Depth	Soakage Rate	
	m bgl	Litre/m^2/min	m/sec
TP1	2.24m	0.026	4.31 x 10^{-7}
TP9	2.00m	N/a	N/a
TP16	2.40m	0.0048	8.07 x 10^{-8}
Mean Value of All Calculated Soakage Rates		**0.015**	**2.56 x 10^{-8}**

Where three fillings have not been carried out, a reduction factor should be applied to the result to provide a design infiltration rate.

Typically, a minimum soakage rate of 0.1 l/m2/min is required for conventional soakaways to meet the BRE365 requirement of a soakaway half empty time of less than 24 hours. Based upon the results obtained, conventional chamber soakaways would not prove feasible for this site.

Discharge to sewers where possible or to the ditches/rivers along the site boundaries at greenfield run off should generally be pursued for the site. Attenuation basins should be assumed to be impermeable and should be design in accordance with a 1:100 year storm +30% for climate change.

8.4 Sulphates and Acidity

Twenty two BRE SD1 suites were undertaken across the two site investigations. The oxidisable sulphates did exceed 0.3% in two of the samples, inferring that pyrite is present.

The samples tested recorded pH values in the range of 5.6 – 10.7, which are slight acidic through to slightly alkaline in reaction. The elevated pH in some of the samples could be attributed to the crushed concrete encountered in the farmyard area.

Given the potential for the presence of pyrite, the Total Potential Sulphate has been used to classify the concrete design. Based upon these a concrete classification of **DS-2, and mobile groundwater AC-2** should be assumed for the site.

The result from WLS107 @ 0.2m did indicate a classification of DS-3, but given that this was within the crushed concrete made ground recovered the result has been ignored.

8.5 Foundation Design

8.5.1 Shallow Foundations

On the basis of the investigations carried out to date, and subject to final layout, traditional strip or trench fill foundations are recommended for this site. All loadings should be transferred beneath any topsoil and softer subsoil and be placed within the underlying firm becoming firm to stiff clay.

For reinforced foundations placed into the CLAY, to a minimum depth of 1.0m, an allowable bearing capacity of 100kPa is applicable, and NHBC HIGH Volume Change Potential precautions will apply. Should foundation deepening expose the underlying MUDSTONE, and an appropriate toe depth is achieved, any further deepening can be ceased. It is recommended that foundations, especially where under the influence of trees are inspected by a suitably qualified engineer.

The designer should be aware that precautions regarding swelling and shrinkage are applicable and, in this respect, NHBC precautions provide a helpful guide with respect to minimum foundation depths and deepening, particularly within the zone of influence of trees hedgerows or shrubs; existing, proposed or removed.

Subject to the Engineers final design, excessive foundation deepening may be required where plots are in close proximity to mature trees. Based on NHBC guidance, foundations below 2.5m must be designed individually by an engineer on an individual property basis taking into account soil desiccation, heave, lateral pressure, trench stability and workmanship. At depths in excess of 2.5m, a piled foundation is usually the most appropriate foundation option. However, as stated above, if the foundations are toed into non plastic Mudstone at depths shallower than 2.5m bgl, foundation deepening should not be required.

Allowance should be made for nominal mesh reinforcement in all foundations to cater for differential movement where they span differing materials.

Provisional allowances (extra-dig, over-break etc) are always recommended, and abnormal foundations cannot be ruled out entirely should deepening for existing service runs (water pipes and gas pipes) that traverse the site be required; such disturbed ground should be ‘bottomed out’.

8.5.2 Piled Foundations

Given anticipated tree influence along the site boundaries and in some area of the site and HIGH shrinkable clays, there is the potential for foundation deepening to exceed 2.5m in certain locations, therefore a piled foundation solution would prove a potential option. Deeper boreholes would be required to progress with this option.

However, as stated above, if the foundations are toed into non plastic Mudstone at depths shallower than 2.5m bgl, foundation deepening should not be required.

8.6 Floor Slabs

Given the immediate sub-grades are locally clayey and may be prone to influence from existing and proposed vegetation, we would recommend allowance be made for a fully suspended block and beam type floor slabs throughout.

8.7 Settlement

For foundations constructed as discussed above, and assuming site levels are to remain approximately as per existing, then settlements are anticipated to be within standard construction tolerances (<25mm).

8.8 Excavations and trenching

Statutory support will be required in all excavations where personnel must work.

The clay materials will be prone to instability in open excavations during wet weather, or where seepages are encountered, and will soften rapidly if exposed to moisture or the elements. The sand lenses will run and be highly unstable in excavations or boring operations below the water table.

Where excavation is proposed in close proximity to existing structures, care will need to be taken to avoid undermining existing foundations.

Hard ground may be encountered, such as mudstone, and, where necessary, allowance should be made for breaking these using hydraulic hammers or the like mounted on the excavation plant, to facilitate excavation.

Seepage of groundwater into excavations should be anticipated, especially from the superficial soils. However, these should be managed with simple pumping methods from within the main excavation.

An allowance should be made for breaking out and re-routing sub-surface obstructions such as buried services and potentially larger concrete and brickwork obstructions.

8.9 Road Construction

It is anticipated that proposed pavement areas will be formed in the firm CLAY. The results of in-situ DCP CBR testing generally indicated CBR values in the range of 1.7% to 2.9% from 0.3m to 1.0m bgl.

The results of Atterberg Limit tests form the initial phase of work on the clay materials indicate plasticity indices in the range of 13% to 53 %, with an average value of 24%.

For preliminary design purposes, a CBR value of 2.5% can be assumed for pavement design. However, given that the soils are likely to be disturbed by heavy plant during demolition and construction, it may be prudent to reassess the CBR value as construction progresses.

The most important element of any road construction is drainage and attention must be given not only to the drainage of the subsoil, but to the various layers of construction. To this end, the formation should be shaped to a camber or crossfall to allow water movement out of the sub-base. Silty soils soften extremely quickly if allowed to become wet, or if they are excavated below the water table, and this softening can give rise to a very substantial increase in costs.

Sub-base and coarse capping materials tend to segregate during placing operations, particularly when end-tipped. On soft clay sub-grades this can lead to punching and softening of the formation. The use of a layer of sand or geo-fabric will minimise the problem.

The formation should be proof rolled and any soft spots found should be excavated and replaced with compacted granular material. The surface of the formation should then be compacted, prior to laying the road sub-base.

Construction traffic should be kept off formations and it is often advisable to leave a protective layer of soil above formation level until the last moment before placing the sub-base.

The formation should be considered potentially frost-susceptible.

9 Preliminary Environmental Assessment

9.1 Analytical Assessment Criteria

CDS have undertaken the contamination assessment based on the Source – Pathway – Receptor risk assessment methodology.

Soil screening values have been utilised where possible from the CLEA model (Updated Technical Background to the CLEA Model, 2009), which utilises toxicological data to calculate a Soil Guidance Value or SGV, which can be used as a screening value based on the proposed end use of the site (i.e residential/commercial/industrial).

Where an SGV is not available for a given substance, a screening value is derived based on guidance including the LQM/CIEH S4UL's for Human Health Risk Assessment (2014) and The EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment (2009).

Screening values for the identified contaminants are valid at the time of writing and any assessment of on site contamination is made against these published figures at the time of writing. Any changes to the proposed end use or published changes to screening values dated after the issue of this report would invalidate any assessment and recommendations made here within.

9.2 Environmental Sampling

The aim of this investigation and subsequent sampling was to provide general high level coverage across the site.

9.3 Environmental Testing

Our preliminary conceptual model identified that the majority of site has had an agricultural history, with the area around the main farm buildings being more industrial/commercial in nature.

Potential sources of onsite contamination in the form of unknown made ground soil was identified which could contain a wide range of contaminants including Asbestos, Heavy Metals, Hydrocarbons and PAHS. Additionally herbicide / pesticide contamination was considered within the larger fields.

The following tests were undertaken on made ground soils to assess the potential presence of onsite contamination.

- Heavy Metal Screen - (40 topsoil / made ground / natural samples)
- PAH's -USEPA 16 - (10 topsoil / made ground / natural samples)
- Asbestos Screen- (10 topsoil / made ground / natural samples)
- Hydrocarbon Testing TPH CWG - (10 topsoil / made ground / natural soil samples)
- WAC analysis – (9 made ground / natural samples)
- Herbicide/Pesticide Screens – (10 topsoil / natural samples)

9.4 Environmental Test Result Analysis – Heavy Metals, PAH's and Asbestos

9.4.1 Soil Type – Made Ground

A total of five samples of made ground from around the existing stone reclamation and topsoil processing centre were sampled and screened for the range of contaminants identified above. The full results are included in Appendix D and are summarised in the table below:

Table 8. Made Ground – Contamination Results

Determinand	Unit	Number of Samples	Mean	Range	Screening Values (Residential with veg)
Heavy Metals					
Arsenic	mg/kg	5	10	<1.0-16	37
Cadmium	mg/kg	5	0.31	<0.10-0.39	11
Chromium III	mg/kg	5	15	12-17	910
Chromium VI	mg/kg	5	<0.50	<0.50	6
Copper	mg/kg	5	58	29-110	200
Lead	mg/kg	5	25	8.3-51	200
Mercury	mg/kg	5	<0.10	<0.10	7.6
Nickel	mg/kg	5	11	9.5-13	110
Selenium	mg/kg	5	0.23	<0.20-0.23	250
Zinc	mg/kg	5	52	32-94	300
Naphthalene	mg/kg	5	0.86	<0.10-0.86	2.3
Benzo[a]pyrene	mg/kg	5	11.7	<0.10-33 WLS109 @ 0.20 – 33mg/kg WLS110 @ 0.20 – 1.3mg/kg	1.7
Total PAH's	mg/kg	5	201	<2.0-570	//
Asbestos Screen	-	5	-	WLS109 @ 0.20m – Chrysotile Fibres / clumps	-

The majority of the results from the contamination testing of the made ground have identified no elevated concentrations of heavy metals, PAH's or asbestos above the site specific screening values for Residential with homegrown produce. However, there were two exceedances for Benzo[a]pyrene, along with some isolated asbestos encountered (discussed more in section 9.5).

As such, based on the results from the soils tested to date, there will be a requirement for remedial measures as part of the redevelopment of the site, which would include importation of clean cover, combined with reduced dig and removal. This would be required within the proposed rear gardens and soft landscaping areas to mitigate any risk to the end users; the contractors will need to review this report for their own health and safety assessment although, on the basis of the results to date, the use to use standard PPE and good site practices should be sufficient to mitigate any risk to the work force.

Given the operational nature of the site, additional investigation once the site has been vacated would be prudent to confirm the contamination risk and to identify and further potential sources.

9.4.2 Soil Type – Topsoil

A total of twenty-one samples of topsoil from around the proposed development area were sampled and screened for the range of contaminants identified above. The full results are included in Appendix D and are summarised in the table below:

Table 9. Topsoil – Contamination Results

Determinand	Unit	Number of Samples	Mean	Range	Screening Values (Residential with veg)
Heavy Metals					
Arsenic	mg/kg	21	10.1	5.5-18	37
Cadmium	mg/kg	21	0.27	<0.10-0.71	11
Chromium III	mg/kg	21	22	13-40	910
Chromium VI	mg/kg	21	<0.50	<0.50	6
Copper	mg/kg	21	41	9.1-140	200
Lead	mg/kg	21	38	14-61	200
Mercury	mg/kg	21	<0.10	<0.10	7.6
Nickel	mg/kg	21	15	7.9-25	110
Selenium	mg/kg	21	0.28	<0.20-0.45	250
Zinc	mg/kg	21	60	25-94	300
Naphthalene	mg/kg	1	<0.10	<0.10	2.3
Benzo[a]pyrene	mg/kg	1	<0.10	<0.10	1.7
Total PAH's	mg/kg	1	<2.0	<2.0	//
Asbestos Screen	-	1	-	None detected (ND)	-

The results from the contamination testing of the topsoil have identified no elevated concentrations of heavy metals, PAH's or asbestos above the site specific screening values for Residential with homegrown produce. Therefore as long as the topsoil is stripped and stored correctly, it should prove suitable for re-use.

9.4.3 Soil Type – Natural

A total of sixteen samples of natural soils from around the proposed development area were sampled and screened for the range of contaminants identified above. The full results are included in Appendix D and are summarised in the table below:

Table 10. Natural – Contamination Results

Determinand	Unit	Number of Samples	Mean	Range	Screening Values (Residential with veg)
Heavy Metals					
Arsenic	mg/kg	16	10	1.8-37	37
Cadmium	mg/kg	16	0.34	<0.10-1.1	11
Chromium III	mg/kg	16	24	8.5-60	910
Chromium IV	mg/kg	16	<0.50	<0.50	6
Copper	mg/kg	16	51	9.6-200	200
Lead	mg/kg	16	22	6.2-74	200
Mercury	mg/kg	16	0.10	<0.10-0.10	7.6
Nickel	mg/kg	16	13	4.0-30	110
Selenium	mg/kg	16	0.31	<0.20-0.55	250
Zinc	mg/kg	16	48	16-120	300
PAH's					
Naphthalene	mg/kg	6	0.34	<0.10-0.34	2.3
Benzo[a]pyrene	mg/kg	6	0.38	<0.10-0.38	1.7
Total PAH's	mg/kg	6	6.6	<2.0-6.6	//
Other					
Asbestos Screen	-	6	-	None detected (ND)	-

The results of the contamination testing have identified no elevated concentrations of heavy metals, PAH's or asbestos above the site-specific screening values for Residential with homegrown produce. Therefore, the natural samples analysed appeared to be free from significant levels of contamination. This concurs with the visual and olfactory evidence on site.

9.5 Asbestos Containing Materials

Only one single asbestos result was recorded at WLS109 @ 0.20m (further quantification recorded <0.001%). However, it should be noted that some potential ACM boarding was noted during the site walkover, mainly on the existing structures as noted in our walkover survey. There is always the potential for pockets of asbestos or for asbestos containing materials to be present, which have not been detected in the sampling. This is particularly true on old commercial sites, such as this, where fill has been encountered.

It is also our experience that asbestos containing materials are quite often encountered in buried pockets and beneath slabs (sometimes adhering to the concrete) on older sites. A watching brief should be put in place should any unforeseen pockets of asbestos be encountered.

9.6 Environmental Test Result Analysis – Hydrocarbons

Relatively low levels of longer chain aromatic and aliphatic compounds were recorded for most of the samples analysed, but these were well below the LQM/CIEH S4UL's guideline level for the corresponding hydrocarbon band, in terms of Residential with homegrown produce. The concentrations of BTEX compounds were also recorded below the laboratory detection limits. This concurs with the visual and olfactory evidence on site.

9.7 Pesticides / Herbicides

Due to the majority of the site comprising fields' which are associated with long term agricultural use over a prolonged period, a range of pesticides and herbicides were screened for as a precaution in selected samples of topsoil. Organo Nitrate, Organo Phosphate and Organochlorine pesticides and Acid Herbicides were all screened for in selected samples, and no residual impact was detected within the samples analysed.

No further assessment is considered necessary in this regard.

10 Land Gas Monitoring

10.1 Gas Monitoring

The sensitivity of the proposed development is rated high (residential), however, with the exception of the made ground soils round the farmyard, the generation potential is considered to be low.

An initial six gas readings over a period of three-month period have been proposed to assess the risk of land gas generation.

The results of the land gas monitoring to date are given in full in Appendix E and are summarised in the table below.

Table 11. Gas Monitoring Results

Borehole Gas Monitoring Results						
Location	**BH101**	**BH102**	**BH103**	**BH104**	**BH105**	**BH106**
Evidence of contamination	None	None	None	None	None	None
No. of Monitoring Events	6	6	6	6	6	6
Methane range CH4 (%)	0.0-0.1	0.0-0.1	0.0	0.0-0.1	0.0-0.3	0.0-0.1
Carbon dioxide range CO2 (%)	1.4-3.1	1.7-**5.1**	2.2-**6.0**	0.7-**7.1**	1.7-**5.1**	1.8-4.2
Oxygen range O2 (%)	19.8-22.3	7.4-20.9	16.0-19.0	19.6-21.9	13.8-20.7	10.9-16.4

Borehole Gas Monitoring Results						
Location	**BH101**	**BH102**	**BH103**	**BH104**	**BH105**	**BH106**
Flow rate range l/hr	-3.0-0.0	-0.1-0.5 steady 4.5 peak recorded	-3.9-0.4 steady 8.5 peak recorded	0.1-0.0	-0.2-0.0	-0.1-0.2 steady 3.6 peak recorded
Water level (m bgl)	0.34-0.56	1.59-1.96	0.32-1.19	0.65-0.85	0.43-1.1	1.08-DRY
Atmospheric pressure during monitoring (mb)	1018-1030	1017-1031	1017-1032	1017-1034	1016-1033	1016-1032

Borehole Gas Monitoring Results		
Location	**BH107**	**BH109**
Evidence of contamination	Shallow Made Ground	Shallow Made Ground
No. of Monitoring Events	6	6
Methane range CH4 (%)	0.0-0.1	0.0-0.1
Carbon dioxide range CO2 (%)	0.7-**15.0**	1.2-**10.1**
Oxygen range O2 (%)	14.6-21.3	6.5-21.2
Flow rate range l/hr	-0.2-0.0 steady 3.9 peak recorded	-3.1-0.0
Water level (m bgl)	1.15-1.81	1.15-1.91
Atmospheric pressure during monitoring (mb)	1014-1032	1014-1031

The monitoring visits to date were undertaken at times of generally high atmospheric pressure (1014-1032mb). It should be noted that a visit during falling or low pressure (>1000mb) was not achieved during the three month monitoring period.

The levels of carbon dioxide measured at a number of locations were generally around and above the 5% threshold, whilst the results recorded for methane generally where generally below 0.1%. Some isolated flow was also recorded, albeit larger peak values were recorded, which reduced to <0.1l/hr after a five-minute period. The increased flow could potentially be attributed to changing water levels within the boreholes rather than land gas generation given the lack of an identifiable source either on site or in the surrounding area.

At the location of WLS107 and WLS109, within the made ground soil there is evidence of significant gas generation in the form of elevation Carbon Dioxide concentrations, with a maximum concentration of 15% recorded. It would be prudent as part of the future development to remove the made ground soils from this part of the site and hence the source of the land gas generation would be also removed.

10.1.1 Identified Gas Regime

A worse case flow rate of 0.5l/hr (steady flow used rather than peak) has been assumed, along with the maximum CO2 reading of 15%. This yields a gas screening value (GSV) of 0.075 for the site. This corresponds to Characteristic Situation 2 (CS2) of the modified Wilson and Card classification.

It should be noted however that this is an overall site classification, parcel specific monitoring is recommended to finalise any ground gas protection requirements. Subject to the parcel specific investigation, a reduced characteristic situation (CS1) may be achievable in some parts of the site.

We would recommend that at least one further land gas monitoring visits is undertaken to coincide with a low pressure event in order to collect the 'worst case' levels.

10.2 Summary of Results

On the basis of the investigation to date, some elevated concentrations of Benzo (a)pyrene & asbestos and PAH's were identified within the made ground samples analysed within the farmyard buildings. This poses a risk to the contractors, end users and the service pipes and may impact the waste classification of arisings.

In addition, some ground gas protection measures will be required due to the recorded elevated carbon dioxide concentrations. Further monitoring and installation of additional ground gas monitoring wells may enable the site to be zoned subject to further analysis and agreement from the regulatory bodies.

11 Revised Conceptual Model

Based on the results of the investigation and subsequent contamination testing the initial site conceptual model, undertake by others, has been reviewed and revised to reflect the findings of the investigation.

Table 12. Revised Conceptual Model

Source	Pathway	Receptor	Calculated Risk
Onsite/Offsite contamination arising from current and historical land use	Direct ingestion, direct contact & inhalation of dust/ vapours.	Future Site users.	The calculated risk is deemed to be MODERATE within the farmyard buildings, whilst LOW across the rest of the site based on the onsite contamination to be encountered. Some remedial action will be required.
		Construction workers.	The calculated risk is deemed to be MODERATE within the farmyard buildings, whilst LOW across the rest of the site based on the potential for onsite contamination to be encountered especially during any excavation. The provision of suitable PPE/RPE during the demolition/construction phase along with detailed method statements and risk assessments would be required to reduce/remove the risk to construction workers to appropriate levels. A discovery strategy should be put in place should any currently un-discovered contamination be encountered. Phase III works are recommended below the existing buildings.
	Leaching and vertical & lateral migration	Controlled waters	The calculated risk is deemed to be LOW based on the potential for onsite contamination to be encountered.
	Direct infiltration in water supply pipes.	Service conduits	The calculated risk is deemed to be MODERATE based on the potential for onsite contamination to be encountered. Services and incoming pipework will need to be designed in accordance with the suppliers specifications based on the level of identified contamination on site.
	Plant uptake.	Vegetation within landscaped areas.	The calculated risk is deemed to be LOW to MODERATE based on the potential for onsite contamination to be encountered. Some remedial action will be required.
	Lateral migration through groundwater	Off-Site neighbouring properties.	The calculated risk is deemed to be LOW based on the potential for onsite contamination to be encountered.

Potential for ground gas	Vertical and lateral migration	Human Health and buildings	The calculated risk is MODERATE given the elevated CO2 encountered. Some basic gas protection will be required based on the results of the preliminary testing to date.

11.1 Revised Relevant Pollutant Linkages

A number of Relevant Pollutant Linkages, some of which are possible, for which remedial action will be required have been identified in the revised conceptual model, as follows.

Table 13. Pollutant linkages

Contaminant / Source	Pathways	Receptor
PAH's and Asbestos in Made Ground	Ingestion/inhalation/dermal contact Direct Contact	End Users and construction Workers Structures
Land Gas	Inhalation	End Users

12 Discussions and Conclusions

Phase III investigations are recommended within the farmyard buildings, stone reclamation and topsoil manufacturing centre once these have been vacated and ideally demolished along with the removal of the floor slabs. Parcel specific gas monitoring is recommended to potentially reduce the characteristic gas situation in areas of the site.

Appropriate health and safety measures should be adopted during all ground works in respect of the presence of PAHs and asbestos identified in the made ground, with precautions taken to minimise the potential for dust release and inhalation. It would be sensible to wear dusk masks that have a P3 filter when digging through the made ground, and to ensure that exposed soils are damped down during dry weather, to prevent dust generation. This would also afford some protection should more significant quantities be present in place.

For the majority of the site, any new areas of gardens/soft landscaping, it would be prudent to allow for a minimum of 150mm of site-won certified clean topsoil to allow for a growing medium. The landscape gardener contractor, may request a more significant depth of topsoil, depending on the planting requirements. This should be confirmed.

Where the proposed residential gardens coincide with Made Ground, some removal will be necessary (unless levels are raised significantly) and replacement with 600mm of certified clean subsoil and topsoil. As the depth of fill often exceeded 600mm an 'alert membrane' should be placed at the base of 600mm of clean cover to act as a physical barrier to any remaining made ground present which is impacted with PAHs and asbestos. This could be reduced to 300mm within less sensitive communal soft landscaping areas. This is subject to the comment and approval of the regulators.

If any topsoil needs to be imported for new soft landscaped/garden areas, this material should be from a reliable source and certified clean; in addition, depending upon the source and local authority requirements, testing may also be required following importation. The existing topsoil onsite, could also be re-used, depending on the quantities required. This should be stripped and stockpiled at an early part of the works to protect this resource. The material should also be managed properly.

Any new pipes for drinking water may need to be upgraded to Protecta Line or similar. This should be checked with the suppliers.

Based upon the preliminary land gas monitoring results to date the site falls within CS2. This corresponds to a gas protection score of 3.5, assuming a residential building classification, and appropriate protection systems will need to allow for this.

As with any site, areas of contamination not identified during site investigation works may come to light in the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

13 Waste Disposal

If arisings from earthworks are intended for disposal, then there is a requirement to determine prior to disposal whether these would classify as:

- Hazardous or;
- Non hazardous

13.1 Waste Classification and Waste Acceptance Criteria (WAC)

The current relevant waste legislation and technical guidance (WM3 1st edition version 1.1, 2018) on the assessment and classification of hazardous waste, sets out the requirement for classification and provides the basis for the methodology employed to ensure compliance with the regulations. This report sets out to fulfil the requirements of basic characterisation.

Waste classification indicates whether the material is hazardous or non-hazardous. If material is classified as non-hazardous, there is a choice of sending the material to a non-hazardous or an inert landfill (subject to meeting inert waste acceptance levels based on WAC analysis). Where the waste is classified as hazardous, WAC analysis will be required to demonstrate that the concentrations meet the acceptance levels for hazardous landfill or stable non-reactive hazardous (SNRH) landfill.

The List of Wastes (England) Regulations 2005 shows those wastes that are absolute entries (i.e. hazardous waste regardless of their concentration) and mirror entries (hazardous waste only if hazardous substances are present above the specified threshold concentrations).

Section 17 of the List of Wastes relates to Construction and Demolition Wastes (including Excavated Soil from Contaminated Sites, stones and dredging spoil). Contaminated soil is a “mirror entry” and is not automatically assigned a hazardous or non-hazardous nature. Instead, an assessment of the composition of the soil is undertaken to determine the concentrations of hazardous substances, and the waste classified accordingly. The assessment of contaminated soil to determine whether it is hazardous waste is dependent on the presence of “hazardous substances” exceeding particular thresholds.

13.2 Waste Classification Assessment

The waste classification assessment has been undertaken using the results of the chemical analyses on the samples analysed, including some analysis of the samples recovered during the previous site investigation. The classification of the materials was conducted using the concentrations of each identified substance attributed to its 'worst-case' compound (where relevant), as per Environment Agency (EA) document WM3 (2018) and The Classification, Labelling and Packaging of Substances and Mixtures Regulation 1272/2008 (CLP). The assessment was carried out using the HazWaste Online Toolkit together with Tables 3.1 and 3.2 of CLP Regulation. The details of the waste classification are presented in Appendix D.

A summary of the assessment results is presented in the table below:

Table 14. Waste Classification Assessment

Sample ID	Strata	Classification	EWC	Hazardous Substance	Hazardous Properties
TP1 @ 0.90m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP2 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP3 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP3 @ 1.40m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP4 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP5 @ 2.10m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP6 @ 0.20m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP6 @ 0.60m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP8@ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP8 @ 0.40m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP9@ 0.20m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP11 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP11 @ 0.40m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP13 @ 0.20m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP13 @ 1.30m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP14 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP16 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP17 @ 0.40m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP18 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP20 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP23 @ 1.00m	Natural	Non-Hazardous	17 05 04	n/a	n/a
TP24 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP25 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
TP25 @ 1.30m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS101 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
WLS101 @ 0.40m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS102 @ 0.20m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
WLS102 @ 0.90m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS103 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
WLS103 @ 1.20m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS104 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
WLS104 @ 0.30m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS105 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a

Sample ID	Strata	Classification	EWC	Hazardous Substance	Hazardous Properties
WLS106 @ 0.10m	Topsoil	Non-Hazardous	17 05 04	n/a	n/a
WLS107 @ 0.20m	Made Ground	Non-Hazardous	17 05 04	n/a	n/a
WLS107 @ 0.50m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS109 @ 0.20m	Made Ground	Non-Hazardous	17 05 04	n/a	n/a
WLS110 @ 0.20m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS111 @ 0.30m	Natural	Non-Hazardous	17 05 04	n/a	n/a
WLS113 @ 0.30m	Made Ground	Non-Hazardous	17 05 04	n/a	n/a

The TPH (C6 to C40) petroleum group results indicated that the samples could be potentially Hazardous, however, these can be discounted as this material is a solid waste, and does not have a free draining liquid phase. In addition, during the sampling exercise no vapour or liquid element was noted within the exploratory logs or samples. The asbestos encountered in WLS109 @ 0.20m was recorded as <0.001%, below the 0.1% hazardous threshold.

Based upon the results of the chemical analysis, the topsoil, made ground and natural soils could be classified as Non-Hazardous with EWC Code 17 05 04.

13.3 Waste Acceptance Criteria (WAC) Analysis

WAC analysis was only undertaken on three samples (1 x Made Ground, 8 x Natural) collected during both phases of site investigation.

Topsoil

No WAC testing was undertaken on the topsoil recovered, however, by default, topsoil is not considered to be inert due to presence of generally high organic matter. The recovered topsoil materials have been described as containing organic matter (roots). On the basis of the above, any surplus topsoil from the site cannot be disposed of as inert. It can however, be accepted into NON-HAZARDOUS landfill.

Made Ground (WLS107 @ 0.20m)

The results from the WAC testing indicate for the majority of the determinands that the made ground material could be disposed of as INERT. However, the inert threshold is exceeded for sulphates, but given the high volume of crushed concrete encountered in the made ground, this is not thought to pose a risk to the waste classification. The inclusion of asbestos fibres in the crushed demolition materials means that the made ground material would need to be disposed of as NON-HAZARDOUS. The results should be forwarded to the receiving facility of their final approval.

Natural (WLS102 @ 0.90m, WLS107 @ 0.50m, WLS110 @ 0.20m, TP1 @ 0.90m, TP13 @ 1.30m, TP17 @ 0.40m, TP23 @ 1.00m and TP25 @ 1.30m)

As long as the materials can be kept separate, the underlying natural soils can be disposed of as INERT.

13.4 Recommendations

The chemical analyses undertaken in the course of this investigation have been used to carry out a preliminary waste classification of the materials on site. This report should be forwarded to waste receiving sites for their final decision. Additional testing and Waste Acceptance Criteria (WAC) testing may be needed for confirmation of the material's classification.

If more significant contamination is encountered during the construction works, this may affect the waste classification.

14 Reporting Details

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