advant ENGINEERS

LEEDS ROAD
HECKMONDWIKE
WEST YORKSHIRE
WF16 9DA

Flood Risk Assessment & Drainage Strategy

(Rev A)

28th May 2025

DOC No: 25014-DOC-001-A

Issue Sheet.

Prepared	Date		Checked	Date
MJM	28.05.25		MJM	28.05.25

Revisions	Comment	Date
A	Initial Issue	28.05.25

The report is based on the information that has been acquired and / or made available to Advant Engineers via the various searches and consultations undertaken as part of the Flood Risk Assessment. In some cases, anecdotal information has been relied upon, where documented evidence has been lacking.

The conclusions drawn in the following report are considered correct although any subsequent additional information may allow refinement of the conclusions.

All work carried out in preparing this report has utilised and is based upon Advant Engineers current professional knowledge and understanding of current UK standards and codes, technology, and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect.

This report has been prepared using information contained in maps and documents prepared by others. Advant Engineers can accept no responsibility for the accuracy of such information.

EXECUTIVE SUMMARY

Site Description

Site Area	13,253m² (1.33ha)
Existing Use	Greenfield
Proposed Use	51 unit residential development

Flood Risk

Flood Zone	1 (one)
Surface Water	None
Reservoirs	None
Sewers	None known.
Ground Water	Low Risk

Drainage Strategy

Existing Impermeable Area	-
Proposed Impermeable Area	6,070m² (0.607ha)
Proposed Discharge Rate	6.5 l/s
Proposed Outfall	Kirklees Highway drain
1 in 100 Year + CC Storage	385m³

Table of Contents

1 Introduction

1.1 Advant Engineers has been commissioned by Orion Homes, to undertake a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed new development located off on Leeds Road in Heckmondwike.

1.2 The site is currently a greenfield site, the proposal is for a 51 unit residential scheme with a new adopted highway off Leeds Road. (see Appendix A for layout).

1.3 This FRA has been produced to demonstrate how risk from all sources of flooding to the site itself and risk to others will be managed, in order to satisfy the requirements, set out in the NPPF – National Planning Policy Framework.

2 Site Description

2.1 The site is located to the rear of Nos 185-197 Leeds Road in Heckmondwike at the following co-ordinates 421465E, 424764N and the nearest postcode is WF16 9DA.

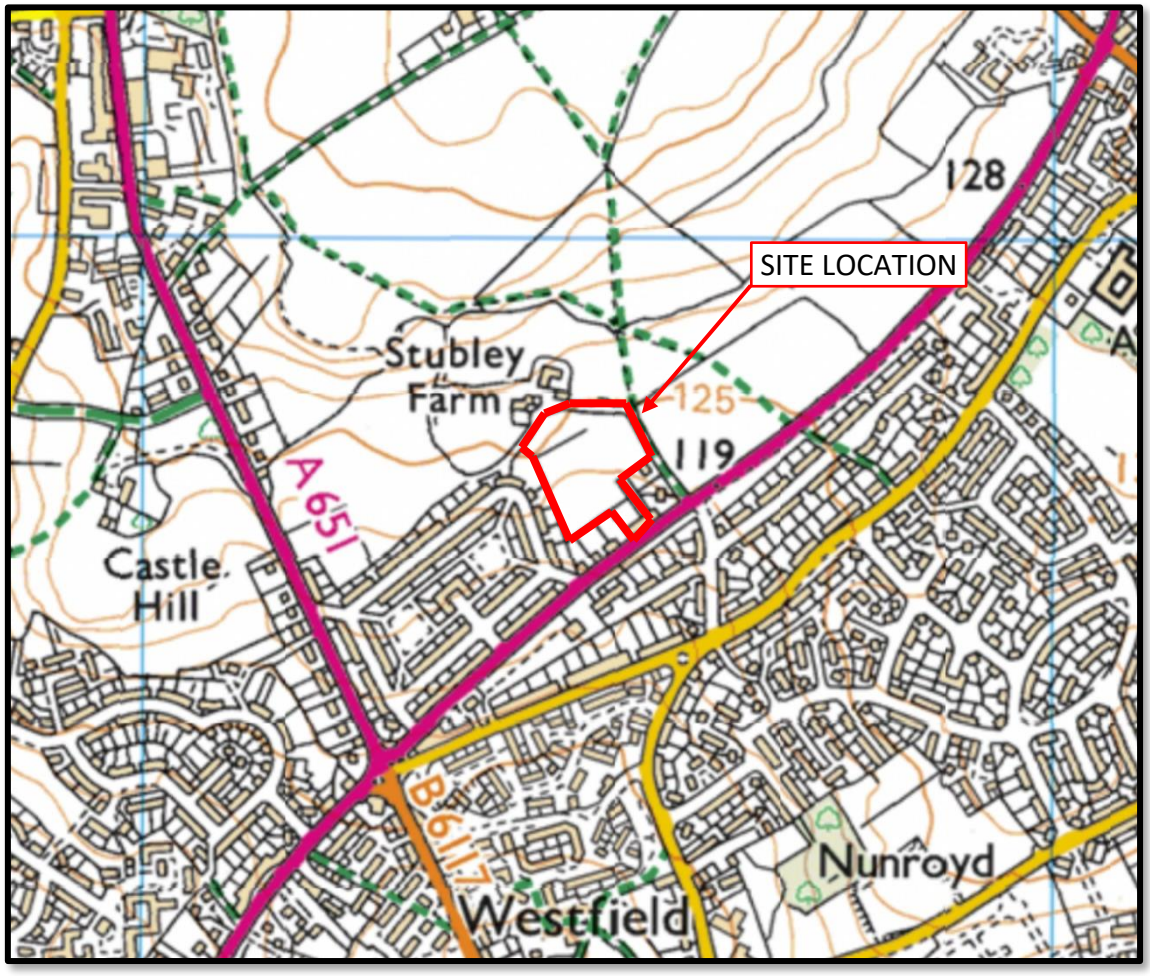
2.2 The site has existing residential dwellings along the western and southern boundaries, a farmhouse to the north and agricultural fields to the east of the site.

2.3 It is proposed that properties Nos 195-197 be demolished to provide access to the from through which a new adopted road will be constructed off Leeds Road.

3 Site Levels

3.1 The existing site levels predominantly fall from north to south, with a high point of circa 126.80m and a low point of 116.80m. (See Appendix B for survey).

4 Site Location



5 Aerial Photograph

6 Existing Flood Risk.

6.1 National Planning Policy Framework (NPPF) Paragraphs 155-165 refers to the risk based Sequential Test aiming to steer new development to areas at the lowest probability of flooding (Zone 1).

6.2 Paragraph's 158 & 159 of the NPPF states that

> *"158. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding."*

> *"159. If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance."*

7 Existing Geology / Hydrogeology

7.1 A Phase 1/2 site investigation has been undertaken by ARP Geotechnical Ltd (Report: ORH/25r1 – Dated Nov '24), (See Appendix C for extracts from SI report) from this report the ground conditions have been described as follows:

Geology	Undifferentiated strata (mudstones, siltstones and minor sandstones) of the Lower Coal Measures. No superficial deposits. A fault and a coal seam outcrop are shown to cross the site.

Ground Conditions	Made ground only found at one location, 0.4m thick. Sequence of gravelly clays onto clayey gravels onto mudstone, consistent with in situ weathering of Coal Measures mudstone. 0.7m thick weathered coal found in one borehole on the north of the site.

8 Environment Agency Consultation

8.1 At the time of writing this report we had not received any correspondence from the EA, but as the site is located in Flood Zone 1 then we do not anticipate that there will be any flood data available, and that the EA will object based on the information in this report.

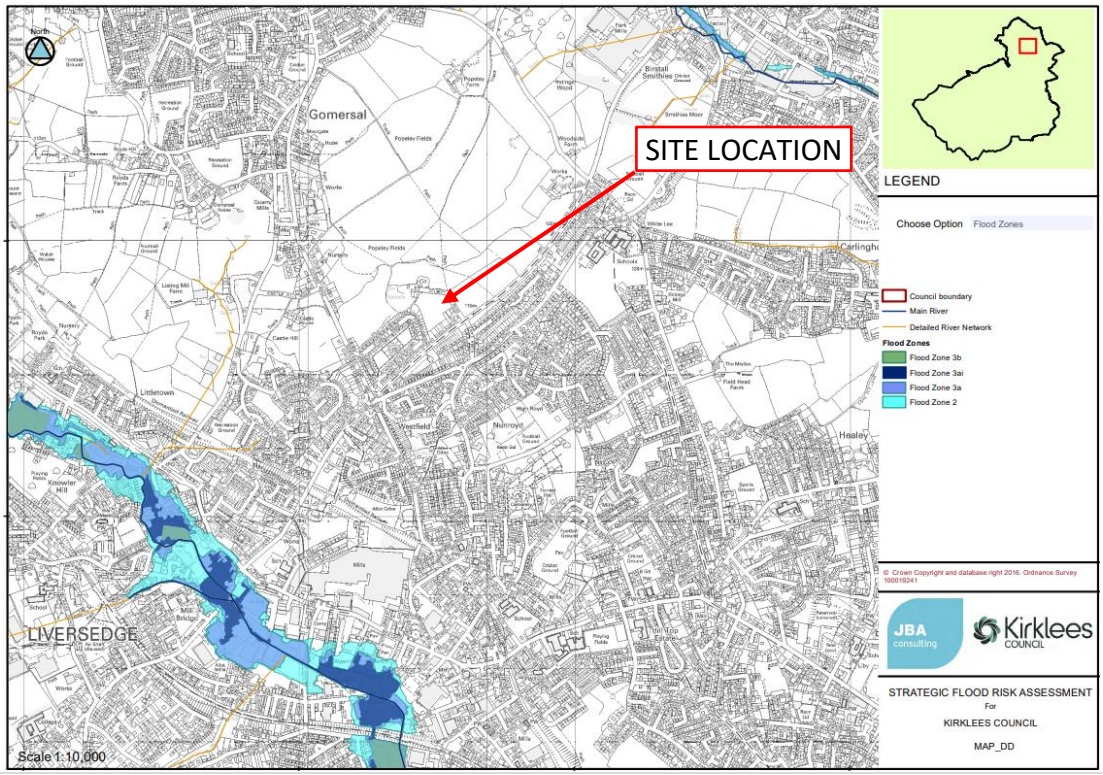
9 Sewerage Undertaker Consultation.

9.1 Yorkshire Water is the sewerage undertaker in this location, we have obtained the sewer records, and it shows that the pipework around the properties have been adopted, this will have occurred in October 2011 under the 'Transfer of private sewers regulations.

9.2 There is an adopted foul sewer that crosses the north-west corner of the site running north to south, and then there are a series of combined sewers located in Alma Lane which is the housing estate on the opposite side of Leeds Road. (See Appendix D for sewer records).

10 Kirklees SFRA.

10.1A Strategic Flood Risk Assessment has been undertaken by JBA Consulting to assess the Kirklees area on a high strategic level. Having reviewed this report, it hasn't identified any risks to this particular piece of land as shown on the extract below.

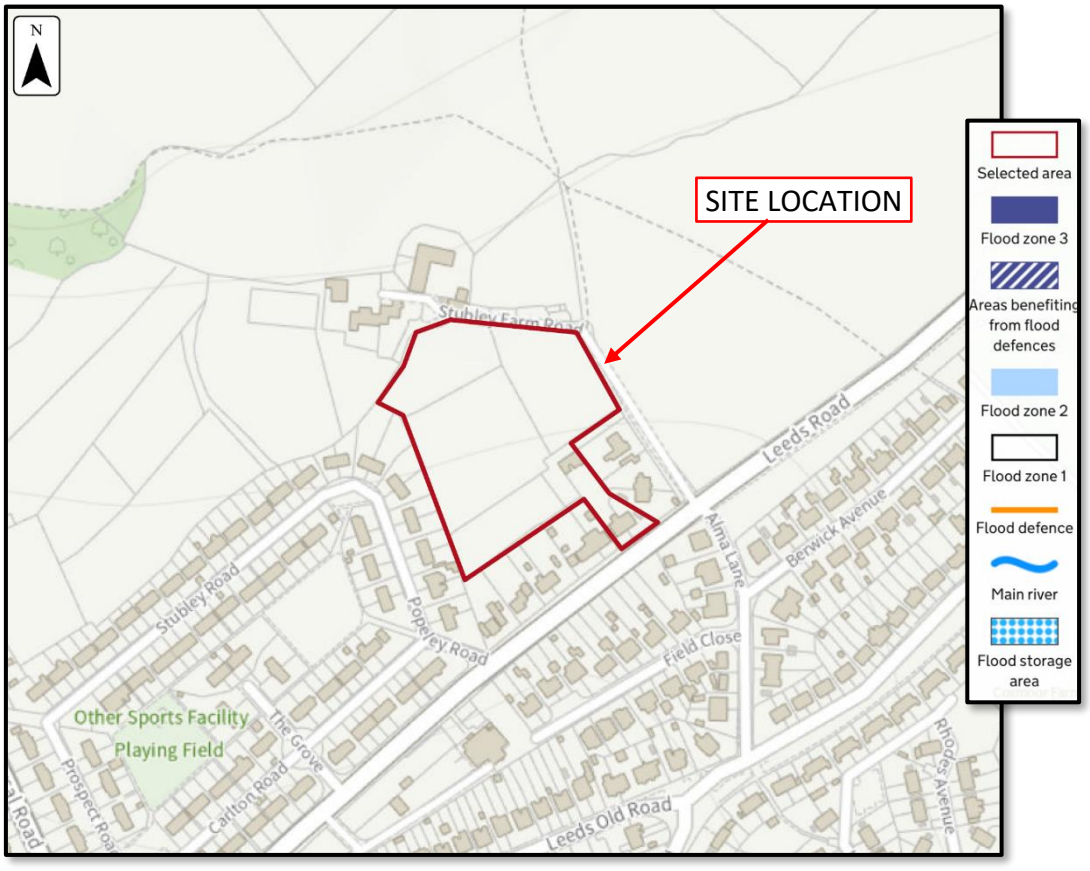


11 Flood Risk Assessment

11.1 The National Planning Policy Framework (NPPF) aims to avoid inappropriate development in areas at risk of flooding, directing development away from high-risk areas and avoiding increasing or reducing the risk of flooding elsewhere.

11.2 The flood risk assessment will use a sequential approach to assess the site to avoid development in flood risk areas and to manage the residual risks and take into account the effect of climate change. The 'Sequential Test' will start with consideration of the Flood Zones in the vicinity of the site. Where development is proposed within a flood zone an 'Exception Test' may also be necessary in accordance with the National Planning Policy Framework guidance.

11.3 As per the Environment Agency (EA) flood map below, the proposed developed area of the site is in **Flood Zone 1.**



11.4 These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood map for planning (River and Seas) available on the Environment Agency's website.

12 Sequential Test

12.1 This risk-based test has the aim of steering new development to area at the lowest probability of flooding, it is broken down into 3 tables, the first of which identifies the risk based on Flood zone as per below, of which this site is within **FLOOD ZONE 1**.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

12.2 The second table then identifies the vulnerability class of the site dependant on the sites proposed used, and within this table this site falls into the **MORE VULNERABLE DEVELOPMENT** classification as shown below:

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

12.3 Finally, Table 3 determines the need for the Exception test based upon the results from tables 1 and 2 previously identified, in this instance the development **IS** appropriate and there is **NO** need for an exception test.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

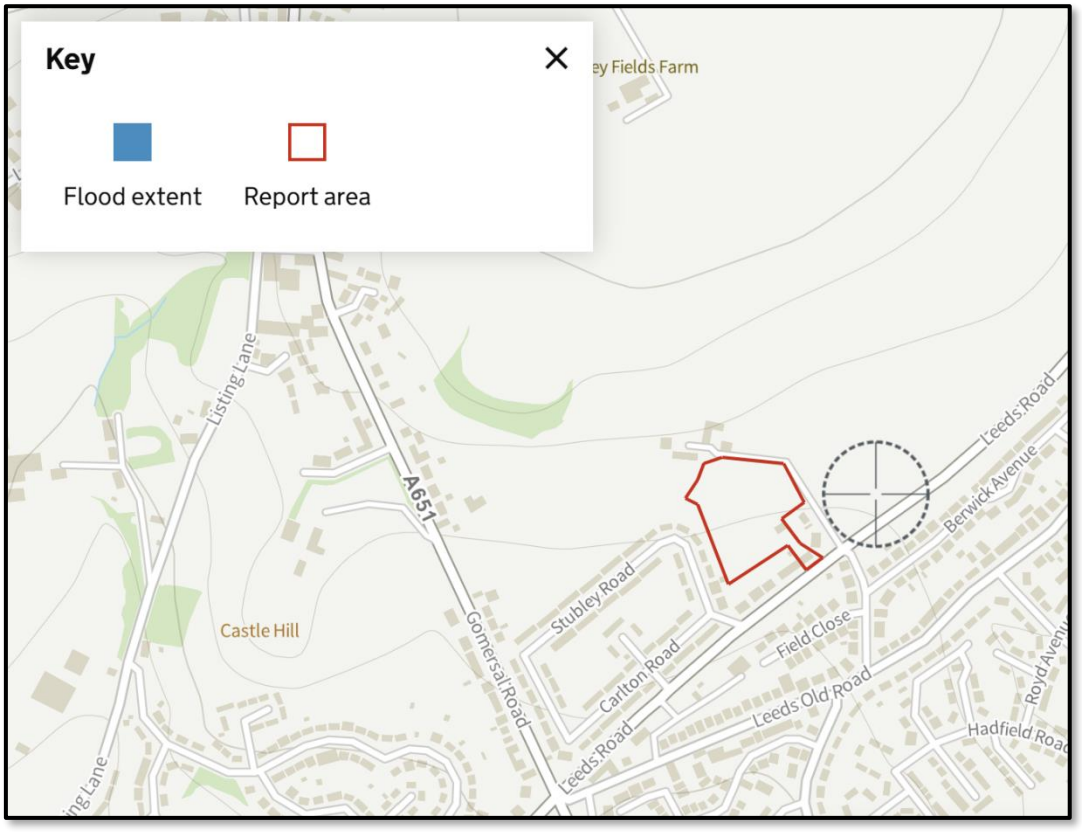
13 Exception Test

13.1 The sequential test has been passed and therefore the exception test is **not** required.

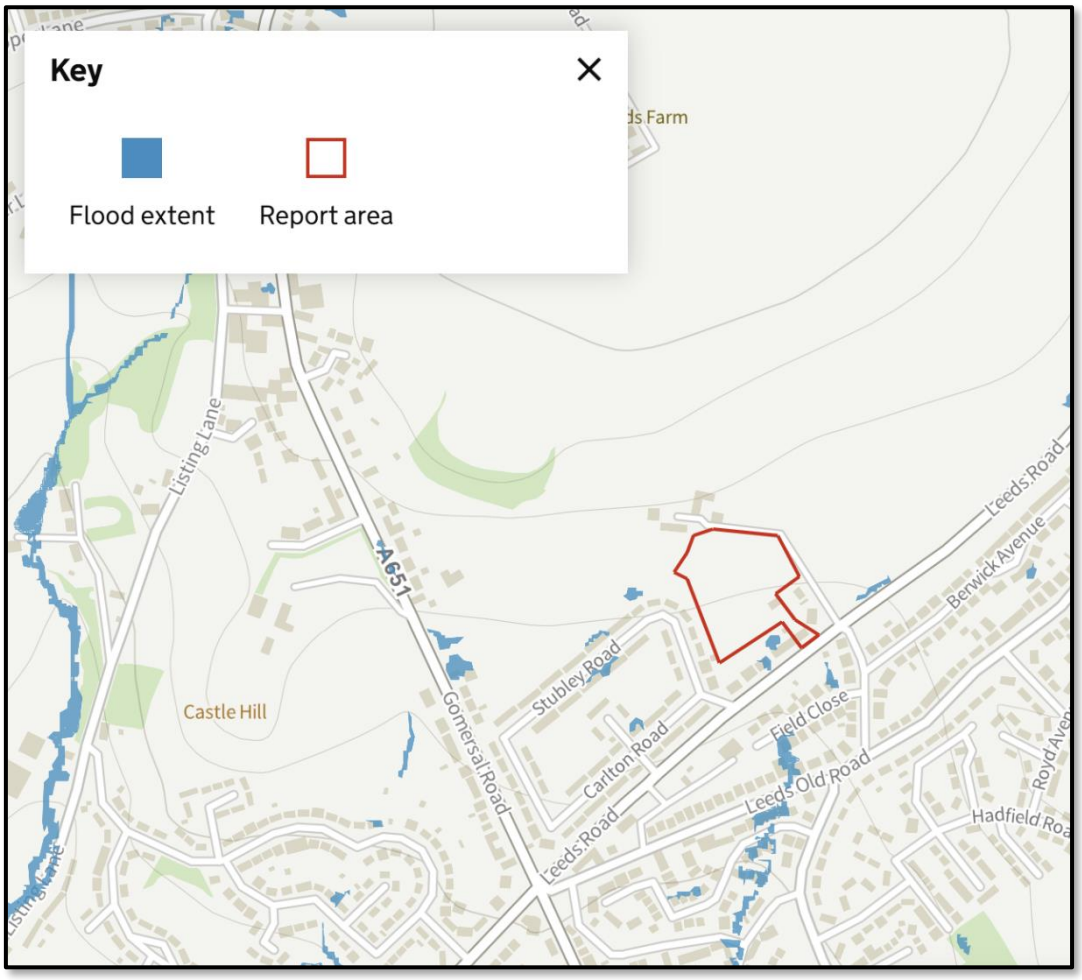
14 Sources of Potential Flooding

SOURCE OF FLOODING	POTENTIAL RISK				DESCRIPTION
	HIGH	MEDIUM	LOW	NONE	
Fluvial				X	See paragraph 14.1
Pluvial				X	See paragraph 14.2
Reservoirs				X	See paragraph 14.3
Sewers			X		We have not been made aware of any issues with the sewers flooding.
Groundwater			X		The SI doesn't indicate any ground water issues.
Proposed Development			X		See paragraph 14.4

14.1 The (EA) flood mapping service on their website identifies the areas at risk of flooding from rivers and seas, it can be seen from the below map that the site is at a **not at a risk of flooding** from rivers and seas.



14.2 The (EA) flood mapping service on their website identifies the areas at risk from surface water flooding, it can be seen from the below map that the site is **not at risk**, from surface water flooding.



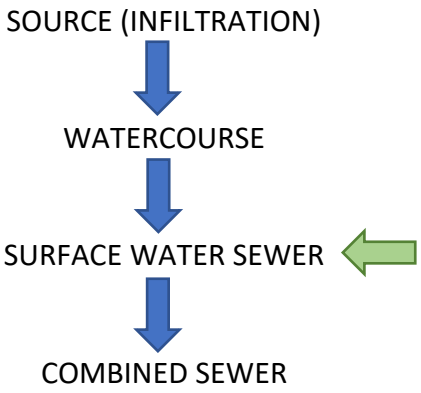
14.3 The (EA) flood mapping service on their website identifies the areas at risk from reservoirs flooding through failure to the reservoir or over topping, as per the map below the site would **NOT** be at risk of flooding should the reservoir breach.

14.4 The proposed development needs to be considered when looking at the risks of flooding both on site and the surrounding areas and downstream of the proposed outfall to ensure that the development does not create flooding elsewhere. Therefore, any risk of increase of flooding would be mitigated though a SUDS surface water drainage scheme.

15 Drainage Strategy

Surface Water

15.1 In accordance with the SUDS hierarchy we need to investigate the disposal of the surface water in the following declining order, only moving on to the next one if the previous one has been proven not to be viable.



15.2 A soakaway feasibility assessment was undertaken, and it was deemed that soakaways would not be feasible on this site. (See Appendix E for report).

15.3 Next in the hierarchy is to discharge to a watercourse, as there are no watercourses in the vicinity then this has also been discounted.

15.4 We would normally propose to discharge to the nearest public sewer, in this instance it would be the combined system in the opposite estate and would require pumping, we have however located a Kirklees Highway drain under the footpath that flows down the hill.

15.5 The discharge from the site should be restricted to the equivalent greenfield rater, which for this site is as follows (See Appendix F for calc):

QBAR = 6.7 l/s
1 YEAR = 5.8 l/s
30 YEAR = 11.8 l/s
100 YEAR = 14.0 l/s

15.6 The site is therefore proposed to discharge to the Kirklees highway drain located under the footpath via a new manhole at a restricted rate of **6.5 l/s** with attenuation provided on site to accommodate the 1 in 100 year + 45% climate change rainfall event. (See Appendix G for the drainage layout and Appendix H for drainage calcs).

Foul Sewer

15.7 The foul is proposed to connect into the public 225mm foul sewer that runs across the top north-west corner of the site, as this is at the top end of the site we will require a foul pumping station, this will be offered for adoption.

16 Operations and Maintenance Plan

16.1 The proposed drainage strategy consists of several SUDS elements which can have different responsibilities on the operation and maintenance and each one will require routine checks and repairs, these different SUDS elements and their require maintenance are as outlined in the table below.

ELEMENT	RESPONSIBILITY		
	PUBLIC	PRIVATE	MAINTENANCE COMPANY
FLOW CONTROL	✓	✓	
ATTENUATION TANK	✓	✓	

16.2 FLOW CONTROL DEVICE MAINTENANCE

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

16.3 ATTENUATION TANK

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

17 Flood Exceedance Event

17.1 Although the drainage has been designed to accommodate the 1 in 100 year + 40%cc rainfall event consideration has to be given to the exceedance event to the drainage, this is the event where the surface water system is pushed to such a point that it is forced to flood so that the resultant flow paths can be identified on a plan. (See Appendix I for plan)**.**

18 Conclusion

18.1 Advant Engineers has been commissioned by Orion Homes, to undertake a Flood Risk Assessment (FRA) and Drainage Strategy for a proposed 51 unit residential development located off Leeds Road in Heckmondwike.

18.2 The proposed developed part of the site is located in **Flood Zone 1** and is at a **Low** risk of flooding from rivers and watercourses and is **not at risk** of flooding from surface water or reservoirs.

18.3 The sequential test was undertaken, and the site was deemed **appropriate,** and that the exception test would **not** be required.

18.4 The surface water from the plots is to discharge to Kirklees highway drain at a controlled rate of **6.5l/s** with attenuation on site for the 1 in 100 year + 54% climate change rainfall event.

18.5 The foul drainage from the site is to discharge to the public foul sewer located in the north-west of the site via a foul pumping station.

18.6 This Flood Risk Assessment and Drainage Strategy has confirmed that subject to the details in this report, the proposed development is appropriate and sustainable in the terms as set out in NPPF.

19 References

- https://flood-map-for-planning.service.gov.uk/

Appendix A
Proposed Layout Plans

SCHEDULE OF ACCOMMODATION

PROJECT: Leeds Road, Heckmondwike
DWG REF: 2403-002-001

Name	No	Beds	Storey	Type	Parking	Sq ft	Total Sq Ft	% Mix
Linton	8	2	3	Quarter	Space	700	5,600	16
Cranwell	9	3	2	Semi/ Mews	Space	972	8,748	18
Bamburgh	9	3	2	Semi	Space	1046	9,414	18
Leadbury	4	3	2.5	Semi	Attached	1196	4,784	8
Arundel	6	4	2.5	Semi	Integral	1388	8,328	12
Wharfedale	6	4	2.5	Semi	Det or Space	1431	8,586	12
PRIVATE TOTAL	**42**						**45,460**	**82**
Edinburgh	3	2	2	Mews	Space	781	2,343	6
Paignton	6	3	2	Mews	Space	912	5,472	12
APH TOTAL	**9**						**7,815**	**18**
SITE TOTAL	**51**						**53,275**	**100**

	Ac.	Ha.
Gross Area	3.27	1.33
Nett Area	3.01	1.23
Sq.Ft/Acre	17699	

Private Mix	No.	%
2 Bedroom	8	19
3 Bedroom	22	52
4 Bedroom	12	29
	42	**100**

Affordable Mix	No.	%
2 Bedroom	3	33
3 Bedroom	6	67
	9	**100**

Overall Mix	No.	%
2 Bedroom	17	33
3 Bedroom	22	43
4 Bedroom	12	24
	51	**100**

KEY:

- INDICATES AFFORDABLE HOUSING UNIT
- INDICATES CYCLE STORE
- INDICATES BIN STORE
- INDICATES BIN COLLECTION POINT
- INDICATES PLOT PARKING DEMARCATION
- INDICATES VISITOR PARKING
- INDICATES EXISTING TREES TO BE RETAINED
- INDICATES EXISTING TREE RPA
- INDICATES INDICATIVE TREE PLANTING
- INDICATES DRAINAGE EASEMENT

N

Revision notes:

Rev:	Date:	Notes:	By:
-	29.04.2025	FIRST ISSUE	CC

Revision notes:

Rev:	Date:	Notes:
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Revision notes:

Rev:	Date:	Notes:
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Date: 29.04.2025

Project: Leeds Road, Heckmondwike

Scale @ A1: 1:500

Drawing Number: 2403-02-001

Revision: -

Drawn By: CC

Drawing Title: SITE PLAN

OrionHomes
SO GOOD TO COME HOME TO
Unit 5, Benton Office Park, Bennett Avenue,
Horbury, Wakefield, WF4 5RA, Tel: 01924 831030

Appendix B
Topographical Survey

Appendix C
Extracts from Site Investigation

Notes

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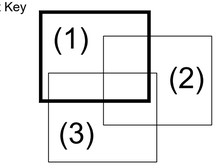
Grid : OS National Grid.
Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on R1

Datum : OS Level Datum.
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

Layout Key



Station Listing

Station	Easting	Northing	Level
R1	421598.500	424716.039	118.180
R2	421542.579	424661.124	115.550

KEY

AIR VALVE	AV	JUNCTION BOX	JB
BENCH MARK	BM	KERB OUTLET	KO
BIN	BIN	LAMP POST	LP
BOLLARD	BOL	MANHOLE (CIRCULAR)	MH
BORE HOLE	BH	MANHOLE (RECTANGULAR)	MH
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MH
BUS STOP	BUS	MARKER POST	MKR
CABLE TV COVER	CATV	GULLY	GU
CABLE TV SUPPLY	CA	RODDING EYE	RE
COLUMN	COL	SIGN POST	SIGN
DROPPED KERB	DK	TELECOM COVER	TEL
EARTHING POINT	ER	TELEGRAPH POLE	TP
ELECTRICITY COVER	ELEC	THRESHOLD LEVEL	THL
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TL
FIRE HYDRANT	FH	TRIAL PIT	PIT
GAS VALVE	GAS	WASH OUT	WO
GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	SC
INSPECTION COVER (RECTANGULAR)	IC	WATER STOP VALVE	SV
TOP OF WALL LEVEL	TOW	TOP OF FENCE LEVEL	TOF
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
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Site
LEEDS ROAD
HECKMONDWIKE

Title
TOPOGRAPHICAL
SURVEY

Surveyed	BH & SB	Drawn	SB
Check	DA	Date	14/11/2024
Scale 1:250	Job No P24-00903	Sheet Size A1	Rev 01

DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P24-00903	MET	EXT	XX	TOP	M2	G	001

Notes

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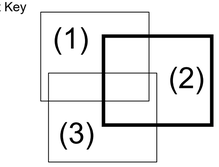

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GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	SC
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HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
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Client
ORION HOMES LIMITED
HORBURY

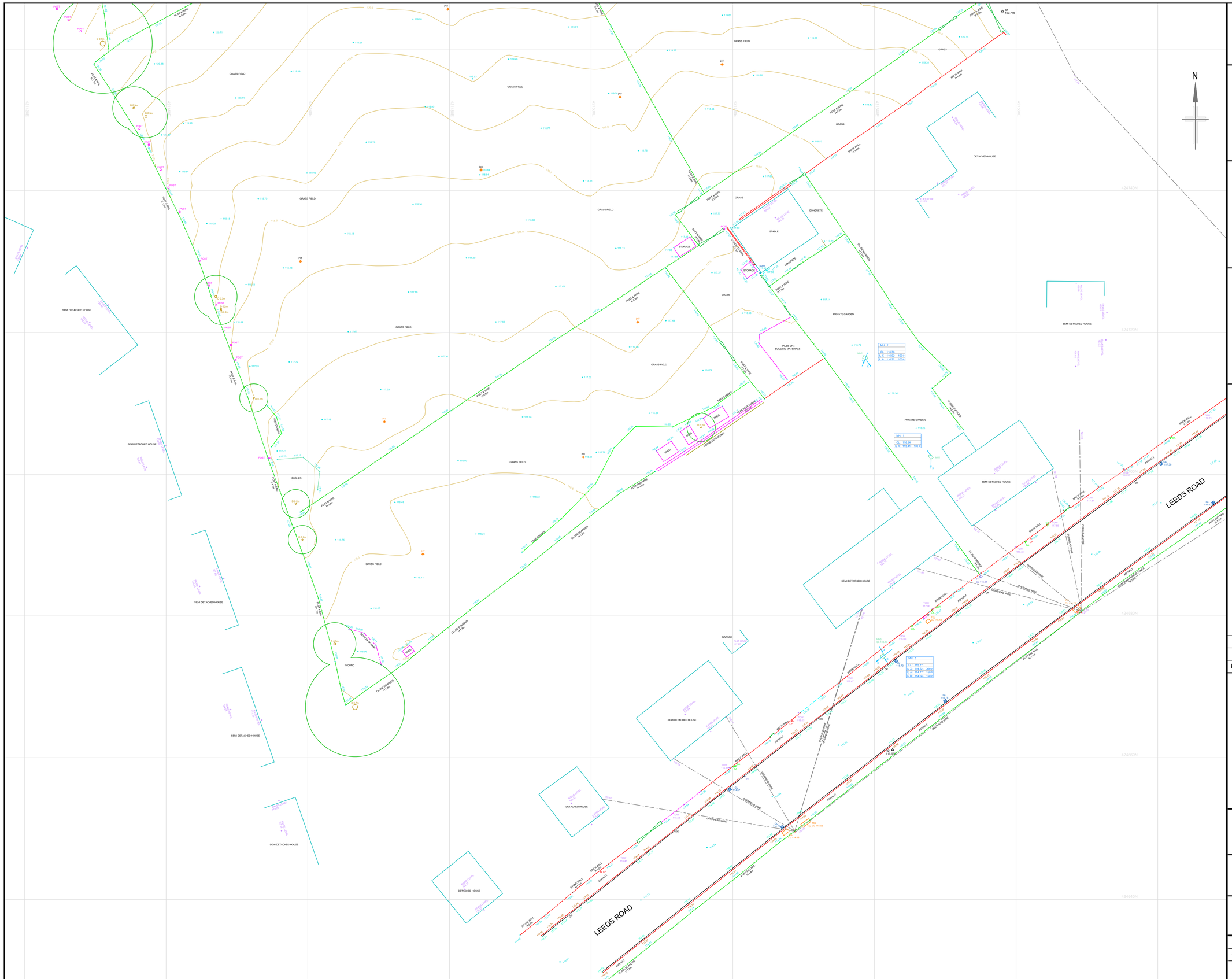
Site
LEEDS ROAD
HECKMONDWIKE

Title
TOPOGRAPHICAL
SURVEY

Surveyed	BH & SB	Drawn	SB
Check	DA	Date	14/11/2024
Scale 1:250	Job No P24-00903	Sheet Size A1	Rev 01

DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P24-00903	MET	EXT	XX	TOP	M2	G	002



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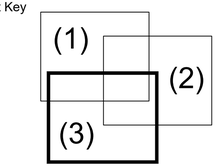

Station Listing

Station	Easting	Northing	Level
R1	421598.500	424716.039	118.180
R2	421542.579	424661.124	115.550

KEY

AIR VALVE	AV	JUNCTION BOX	JB
BENCH MARK	BM	KERB OUTLET	KO
BIN	BIN	LAMP POST	LP
BOLLARD	BOL	MANHOLE (CIRCULAR)	MH
BORE HOLE	BH	MANHOLE (RECTANGULAR)	MH
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MH
BUS STOP	BUS	MARKER POST	MKR
CABLE TV COVER	CATV	GULLY	GU
CABLE TV SUPPLY	CA	RODDING EYE	RE
COLUMN	COL	SIGN POST	SIGN
DROPPED KERB	DK	TELECOM COVER	TEL
EARTHING POINT	ER	TELEGRAPH POLE	TP
ELECTRICITY COVER	ELEC	THRESHOLD LEVEL	THL
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TL
FIRE HYDRANT	FH	TRIAL PIT	PIT
GAS VALVE	GAS	WASH OUT	WO
GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	SC
INSPECTION COVER (RECTANGULAR)	IC	WATER STOP VALVE	SV
TOP OF WALL LEVEL	TOW	TOP OF FENCE LEVEL	TOF
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

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W: www.metgeoenvironmental.com

Client
ORION HOMES LIMITED
HORBURY

Site
LEEDS ROAD
HECKMONDWIKE

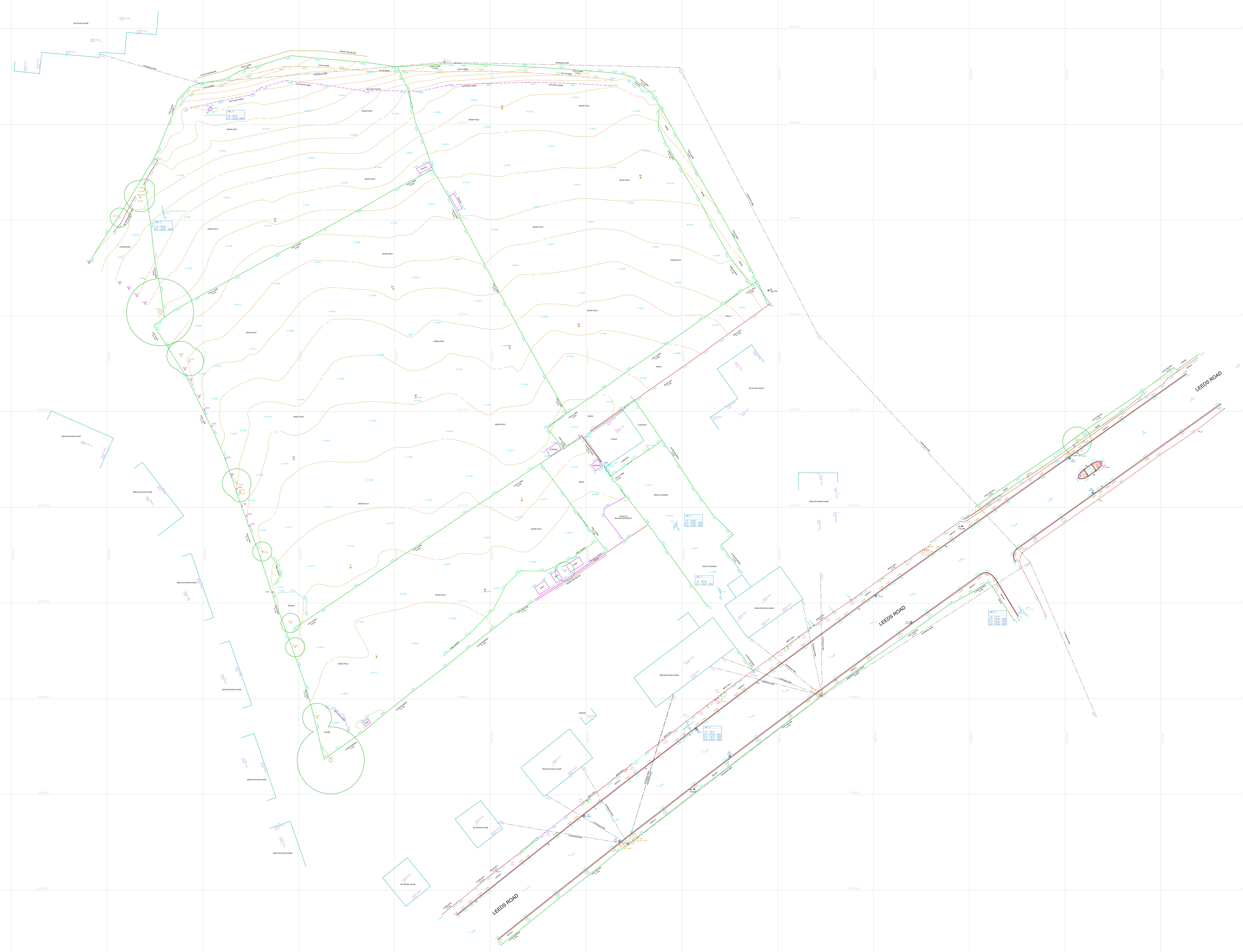
Title
TOPOGRAPHICAL SURVEY

Surveyed	BH & SB	Drawn	SB
Check	DA	Date	14/11/2024

Scale	Job No	Sheet Size	Rev
1:250	P24-00903	A1	01

DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P24-00903	MET	EXT	XX	TOP	M2	G	003



Grid : OS National Grid.
Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on R1

Datum : OS Level Datum.
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

Station Listing

Station	Easting	Northing	Level
R1	421598.500	424716.039	118.180
R2	421542.579	424661.124	115.550

KEY

AIR VALVE	AV	JUNCTION BOX	JB
BENCH MARK	BM	KERB OUTLET	KO
BIN	BIN	LAMP POST	LP
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BORE HOLE	BH	MANHOLE (RECTANGULAR)	MH
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MH
BUS STOP	BUS	MARKER POST	MKR
CABLE TV COVER	CATV	GULLY	GU
CABLE TV SUPPLY	CA	RODDING EYE	RE
COLUMN	COL	SIGN POST	SIGN
DROPPED KERB	DK	TELECOM COVER	TEL
EARTHING POINT	ER	TELEGRAPH POLE	TP
ELECTRICITY COVER	ELEC	THRESHOLD LEVEL	THL
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TL
FIRE HYDRANT	FH	TRIAL PIT	PIT
GAS VALVE	GAS	WASH OUT	WO
GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	SC
INSPECTION COVER (RECTANGULAR)	IC	WATER STOP VALVE	SV
TOP OF WALL LEVEL	TOW	TOP OF FENCE LEVEL	TOF
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

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W: www.metgeoenvironmental.com

Client
ORION HOMES LIMITED
HORBURY

Site
LEEDS ROAD
HECKMONDWIKE

Title
TOPOGRAPHICAL
SURVEY

Surveyed	BH & SB	Drawn	SB
Check	DA	Date	14/11/2024

Scale	Job No	Sheet Size	Rev
1:250	P24-00903	A0	01

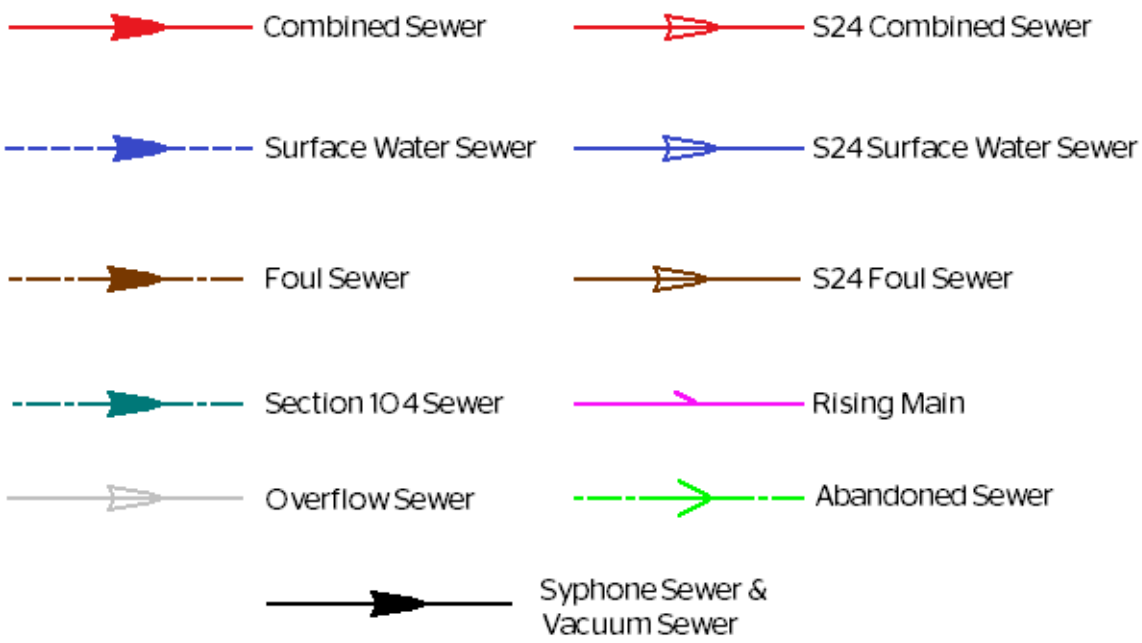
DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P24-00903	MET	EXT	XX	TOP	M2	G	004

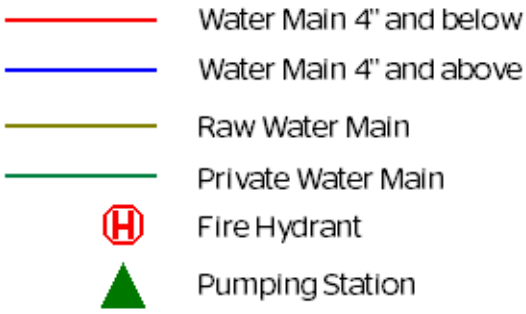
Appendix D
Sewer Records

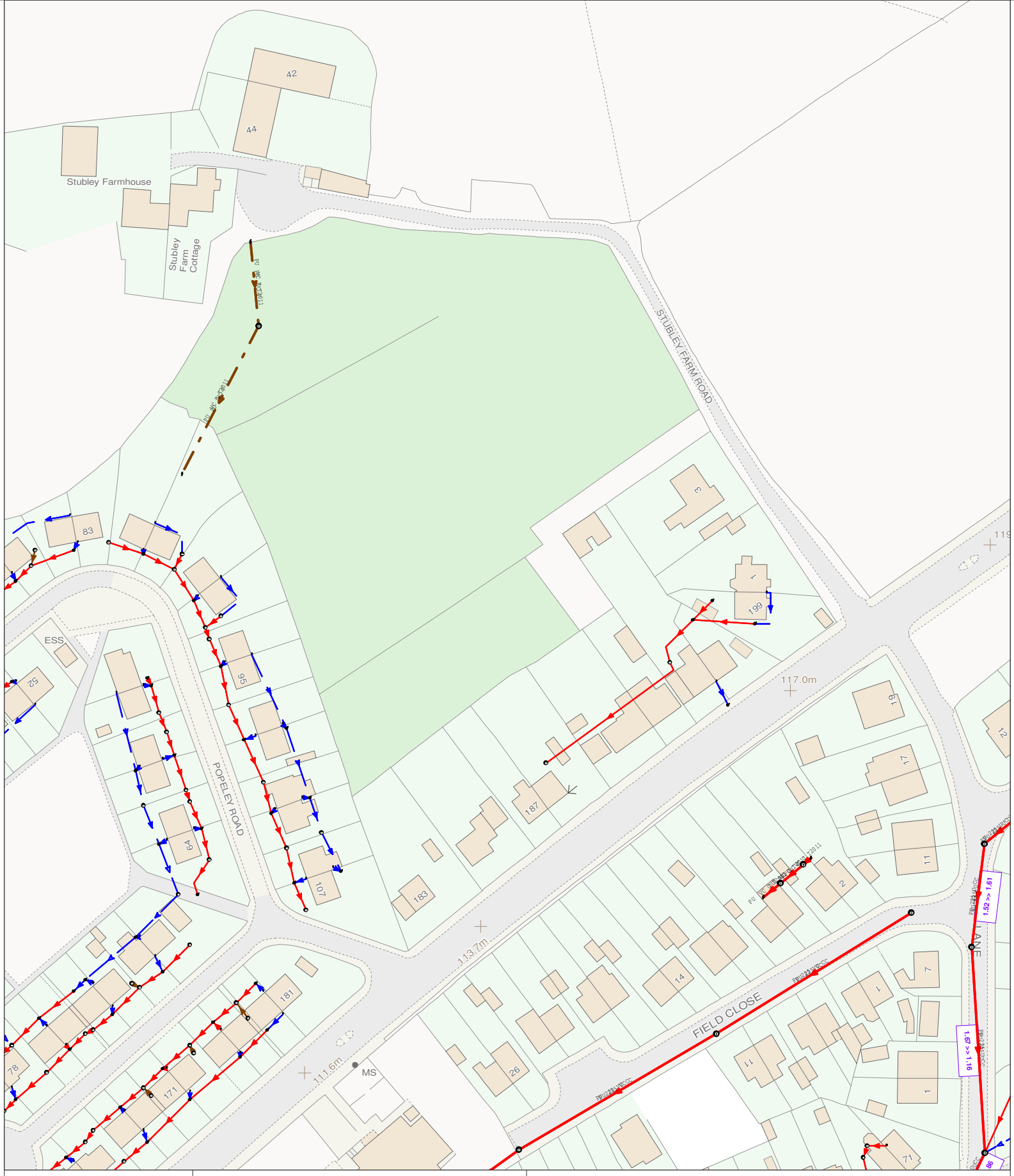
Property Identfier

Sewer Legend



Water Legend





421386 : 424583	Map Name : SE2124NW	Title

YorkshireWater

Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
Search Advisor H BROOK
Contact Tel : 75 4487

Notes

Partial Key

Foul Sewer = F

Combined Sewer = C

Surface Water Sewer = SW

Trade Sewer = TD

Partially Separate = PS

This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.

Date Req :	02/04/2019, 11:49:33	Date Gen :	02/04/2019, 11:49:35
Source :	Sewer Network Enquiry		

SafeMove
A part of YorkshireWater

UPN: Undefined Originator: H BROOK, Safe-Move, 75 4487

Appendix E
Soakaway Results

Chartered Consulting Engineers

ARP Geotechnical Ltd 5 & 6 Northwest Business Park, Servia Hill, Leeds, LS6 2QH
☎ 0113 245 8498 ✉ leeds@arpgeotechnical.co.uk 🌐 www.arpconsultingengineers.co.uk

Mr I Halliday
Orion Homes Ltd
5 Benton Office Park
Bennett Avenue
Benton Hill
Horbury
Wakefield WF4 5RA

BY EMAIL

Our Ref: ORH/25/JRjcl2

07th November 2024

Dear Ian

195 Leeds Road, Heckmondwike
Soakaway Feasibility Assessment

In accordance with our commission, we have undertaken a geological and geotechnical assessment of the above site with respect to consideration for the use of infiltration drainage methods, namely the feasibility of traditional soakaways. On occasion, it becomes evident that, regardless of infiltration rates on a site, mitigating factors such as underlying lithology, sensitive aquifers, and the location of a fault, can preclude infiltration as a viable drainage solution. This assessment is providing detail on such factors.

The Site

The site, which is centred on Ordnance Survey Grid Reference 421500, 424740 , is located off Leeds Road, on the northern edge of Heckmondwike, in West Yorkshire. A site location plan and aerial photograph are attached. The site has overall dimensions of approximately 115m (northwest – southeast) by 115m (northeast – southwest). An indicative site layout is attached. The site comprises mainly undeveloped fields, with some residential buildings in the southeastern corner.

The site and surrounding area slope down to the south, at a gradient of around 1 in 20, although a steeper slope is present off-site to the north, of around 1 in 7.

Ordnance Survey Archive maps were obtained as part of a combined Stage 1/Stage 2 Geo-environmental Report which was in preparation at the time of this letter. The maps are not reproduced here but the contents are summarised below:

- The 1854 map shows coal pits 20m and 30m to the southeast. A farm or dwelling called "Stubley" is adjacent to the north/northwest. The remaining adjacent areas are undeveloped. The coal pits are not shown on the following 1894 map.
- By 1932, residential properties are adjacent to the southwest and south/southeast.
- No significant further changes are evident on later maps.

Geology and Environmental Factors

Geological maps show the site to be underlain by undifferentiated strata (mudstones, siltstones and minor sandstones) of the Pennine Lower Coal Measures of the Carboniferous Period. No superficial deposits are indicated on or near the site. Site investigation has been undertaken by ARP on site but has not yet been reported. Ground conditions recorded on site comprised topsoil over a soft slightly gravelly, sandy clay underlain by a firm to stiff, slightly gravelly, sandy, silty clay to a maximum depth of 1.9m bgl. This was underlain by a weathered mudstone to a maximum recorded depth of 2.7m bgl.

A significant fault is conjectured to cross the western section of the site, trending northwest – southeast, between 10m and 35m inside the southwestern boundary. A further fault is indicated 10m to 20m outside the eastern boundary. A coal seam (the Flockton Thick) is conjectured to outcrop on the site, with the outcrop crossing approximately east-west on the northern quarter. An oblique view of the geological setting is attached to this letter.

A CON29M Coal Mining Report was obtained and a separate Coal Mining Risk Assessment undertaken for the site by ARP, reported separately (letter ORH/25/JRjcl1), it was concluded that that an intrusive coal mining investigation is required to be undertaken, due to the potential presence of shallow unrecorded coal mine workings, which could adversely affect ground stability on the site.

The Envirocheck Report, obtained for the ARP Combined Stage 1/ Stage 2 Geo-environmental Report, states the bedrock aquifer designation is 'Secondary A'. These aquifers comprise "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers".

The site is not in an area at risk from river flooding. There are no watercourses shown within 500m downslope of the site, although archive maps show a small stream or open drain approximately 100m west of the site. Development to the south and southwest of the site is likely to have picked up minor drainage features.

The Envirocheck Report states that BGS data show the site has limited potential for groundwater flooding. However, 68m to the south, there is potential for groundwater flooding of property situated below ground level (e.g. basements).

Infiltration Assessment

The following conditions need to be met for soakaway viability:

1. Sufficient infiltration rates.
2. Base of the soakaway to be at least 1m above the groundwater table.
3. Soakaway to be 5m away from the foundation of any pertinent structure.
4. Soakaway not to be within 20m of a fault that affects development on and off the site.
5. Soakaway not to adversely impact historical underground coal workings.
6. Soakaway not to be located where water from the soakaway could flood nearby basements or other below ground structures.
7. Infiltrated water from the soakaway should not have the potential to re-emerge downslope due to geological effects (e.g. low permeability horizons) or topography.
8. Infiltrated water should not have the potential to enter filled ground (either on site or off-site), e.g. backfilled quarries, landfills.

The above requirements are assessed, in turn, below.

1. Sufficient infiltration rates: The underlying geology comprises mudstones, siltstones and minor sandstones of the Pennine Lower Coal Measures, with no superficial deposits shown to be present. Ground conditions recorded on site comprised topsoil over a soft slightly gravelly, sandy clay underlain by a firm to stiff, slightly gravelly, sandy, silty clay to a maximum depth of 1.9m bgl. This was underlain by a weathered mudstone to a maximum recorded depth of 2.7m bgl. Both the solid strata and overlying clays are likely to be of low permeability. **Condition not satisfied.**

2. Soakaway to be at least 1m above groundwater table: The site is not within an area at risk of river or groundwater flooding and, therefore, groundwater is not anticipated to be present at shallow depths beneath the site. It is unlikely that a soakaway would reach within 1m of the water table. **Condition satisfied.**

3. Distance from structures: The soakaways can be designed to ensure that they are at least 5m away from any pertinent structure. **Condition satisfied.**

4. Distance from faults: There is a significant fault crossing the site, and another close to the east of the site. **Condition not satisfied.**

5. Potential adverse impact on old underground coal workings: The Coal Mining Risk Assessment indicated shallow recorded underground coal workings on the south of the site and suspected shallow underground coal workings on the north of the site, with additional seams worked at greater depth. These workings are also intersected by a significant fault. An intrusive borehole coal mining investigation was recommended, to assess this further. If discharged water from soakaways flows to the workings, this can exacerbate instability. Where any workings were to be treated by grout injection, then this area would have a reduced infiltration rate/capacity and the grout treatment could adversely affect the effectiveness of the soakaways. **Condition not satisfied.**

6. Potential to flood nearby basements/structures: There is development, mainly residential, adjacent and downslope of the site. It is possible that these could have basements or areas sunken/terraced into the natural slope. **Condition not satisfied.**

7. Potential to re-emerge downslope: There are no spring lines recorded on archive maps downslope from the site. Except where there may be any areas downslope where the natural slope may have been cut into, the risk of surface re-emergence is considered negligible. **Condition satisfied.**

8. Potential to enter filled ground: There are no known landfills or infilled ground recorded within 400m of the site. **Condition satisfied.**

Conclusion

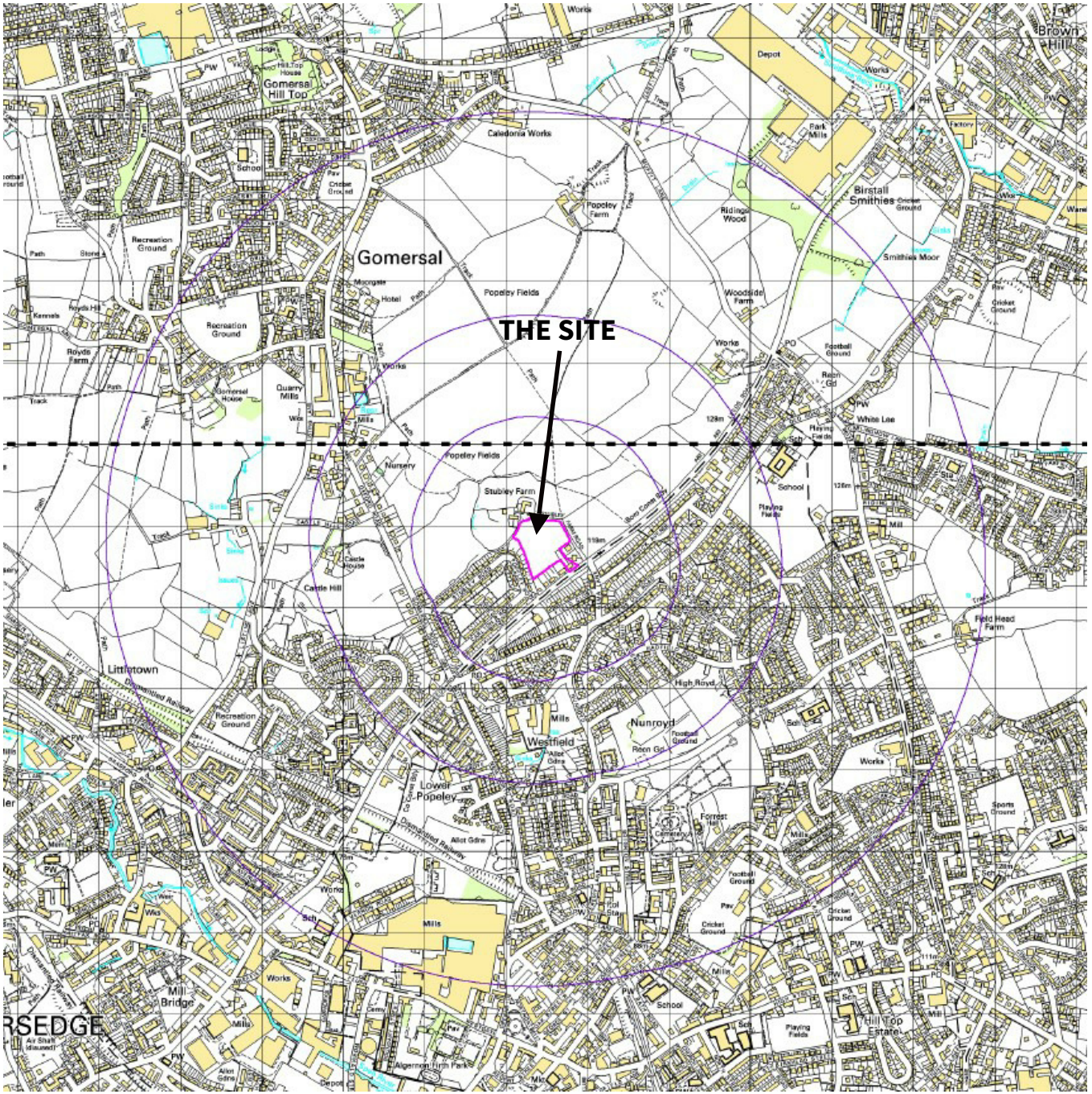
Based on the above assessment, it is recommended that soakaways are not used on the site, due to the adverse factors identified. These factors include the presence of strata on the site unlikely to have sufficient infiltration rates for the use of soakaways, the presence of a significant fault crossing the site, the recorded presence of underground coal workings (including at shallow depth), and the potential to flood nearby below ground structures such as basements.

We trust the above is satisfactory, but if you wish to discuss anything further, please do not hesitate to contact us at your convenience.

Yours sincerely
for ARP GEOTECHNICAL LTD

J Race
BSc (Hons) CGeol FGS EurGeol

Encs



0m 500m

Approximate Scale

ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS
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Telephone : 0113 245 8498 Fax : 0113 244 3864 E-Mail : leeds@arpassociates.co.uk

Project
LAND AT 195 LEEDS ROAD
HECKMONDWIKE

Client
ORION HOMES LTD

Title
SITE LOCATION PLAN

Date
OCTOBER 2024

Drawn	Scale
JR	AS SHOWN

Job No.
ORH/25

0m 40m

Approximate Scale

ARP GEOTECHNICAL LTD
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Project	LAND AT 195 LEEDS ROAD HECKMONDWIKE
Client	ORION HOMES LTD
Title	AERIAL PHOTOGRAPH
Date	OCTOBER 2024
Drawn: JR	Scale: AS SHOWN
Job No.	**ORH/25**

ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS
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Telephone : 0113 245 8498 Fax : 0113 244 3864 E-Mail : leeds@arpassociates.co.uk

Project
LAND AT 195 LEEDS ROAD
HECKMONDWIKE

Client
ORION HOMES LTD

Title
INDICATIVE PROPOSED LAYOUT

Date
OCTOBER 2024

Drawn	Scale
JR	NOT TO SCALE

Job No.
ORH/25

Geology 1:10,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene
	WGR	Worked Ground (Undivided)	Void	Holocene - Holocene
	WMGR	Infilled Ground	Artificial Deposit	Holocene - Holocene
	SLIP	Landslide Deposit	Unknown/Unclassified Entry	Quaternary - Quaternary

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Sand and Gravel	Flandrian - Pleistocene

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	PMCM	Pennine Middle Coal Measures Formation	Mudstone, Siltstone and Sandstone	Bolsovian - Duckmantian
	TR	Thornhill Rock	Sandstone	Duckmantian - Duckmantian
	PLCM	Pennine Lower Coal Measures Formation	Mudstone, Siltstone and Sandstone	Langsettian - Langsettian
	ER	Emley Rock	Sandstone	Langsettian - Langsettian
	PLCM	Pennine Lower Coal Measures Formation	Sandstone	Langsettian - Langsettian
	LPE	Lepton Edge Rock	Sandstone	Langsettian - Langsettian
	FHR	Falhouse Rock	Sandstone	Langsettian - Langsettian
	BRSR	Birstall Rock	Sandstone	Langsettian - Langsettian
	Fault			
	Rock			

ARP GEOTECHNICAL LTD

Geology 1:10,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:10,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around a site. This mapping may be more up to date than previously published paper maps.

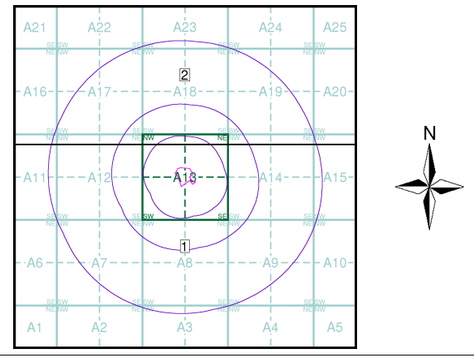
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page.

Please Note: Not all of the layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:10,000 Maps Coverage

Map ID:	2	**Map ID:**	1
Map Name:	SE22NW	**Map Name:**	SE22SW
Map Date:	1995	**Map Date:**	1999
Bedrock Geology:	Available	**Bedrock Geology:**	Available
Superficial Geology:	Available	**Superficial Geology:**	Available
Artificial Geology:	Available	**Artificial Geology:**	Available
Faults:	Available	**Faults:**	Available
Landslip:	Not Available	**Landslip:**	Available
Rock Segments:	Available	**Rock Segments:**	Available

Geology 1:10,000 Maps - Slice A



Order Details

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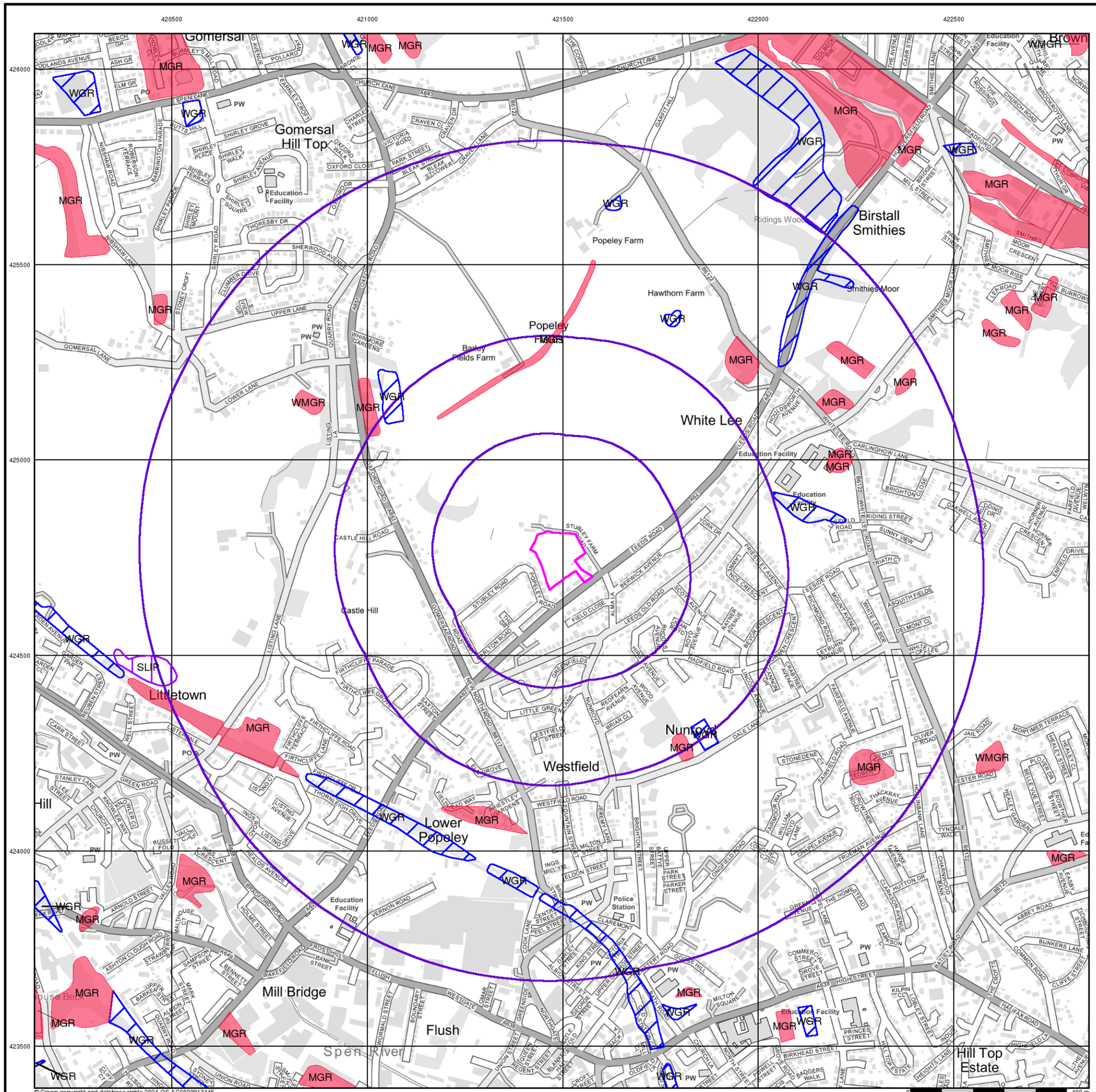
Customer Ref:	ORH/25
National Grid Reference:	421500, 424740
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	1000

Site Details

195, Leeds Road, HECKMONDWIKE, WF16 9DB



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Artificial Ground and Landslip

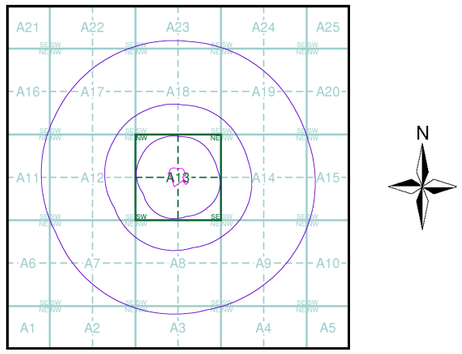
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



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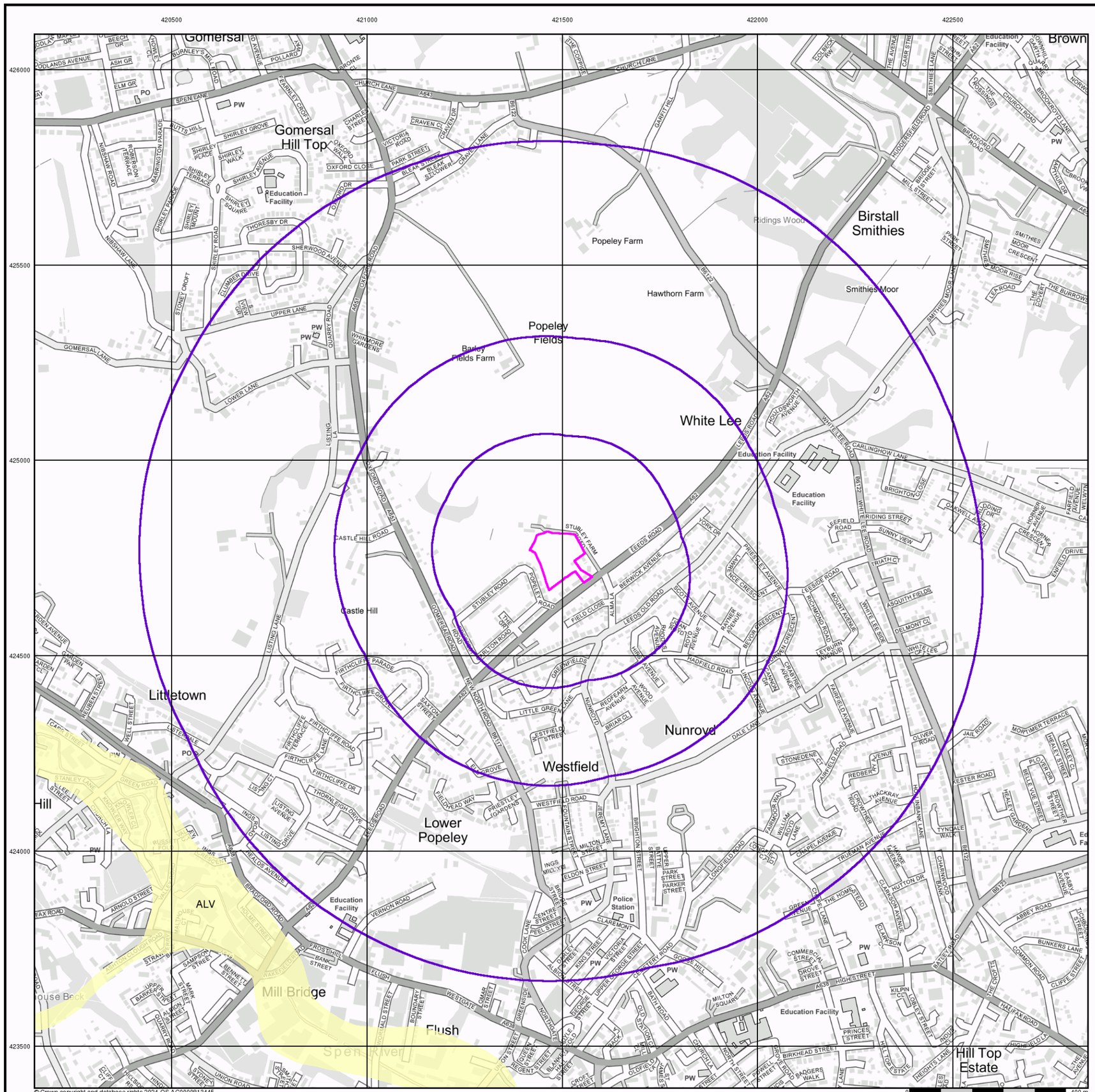
Customer Ref:	ORH/25
National Grid Reference:	421500, 424740
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	1000

Site Details

195, Leeds Road, HECKMONDWIKE, WF16 9DB

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



ARP GEOTECHNICAL LTD

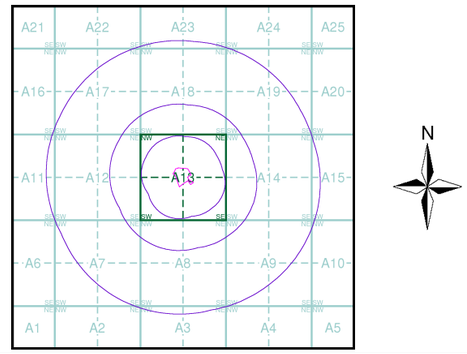
Superficial Geology

BGS 1:10,000 Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details

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Customer Ref:	ORH/25
National Grid Reference:	421500, 424740
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	1000

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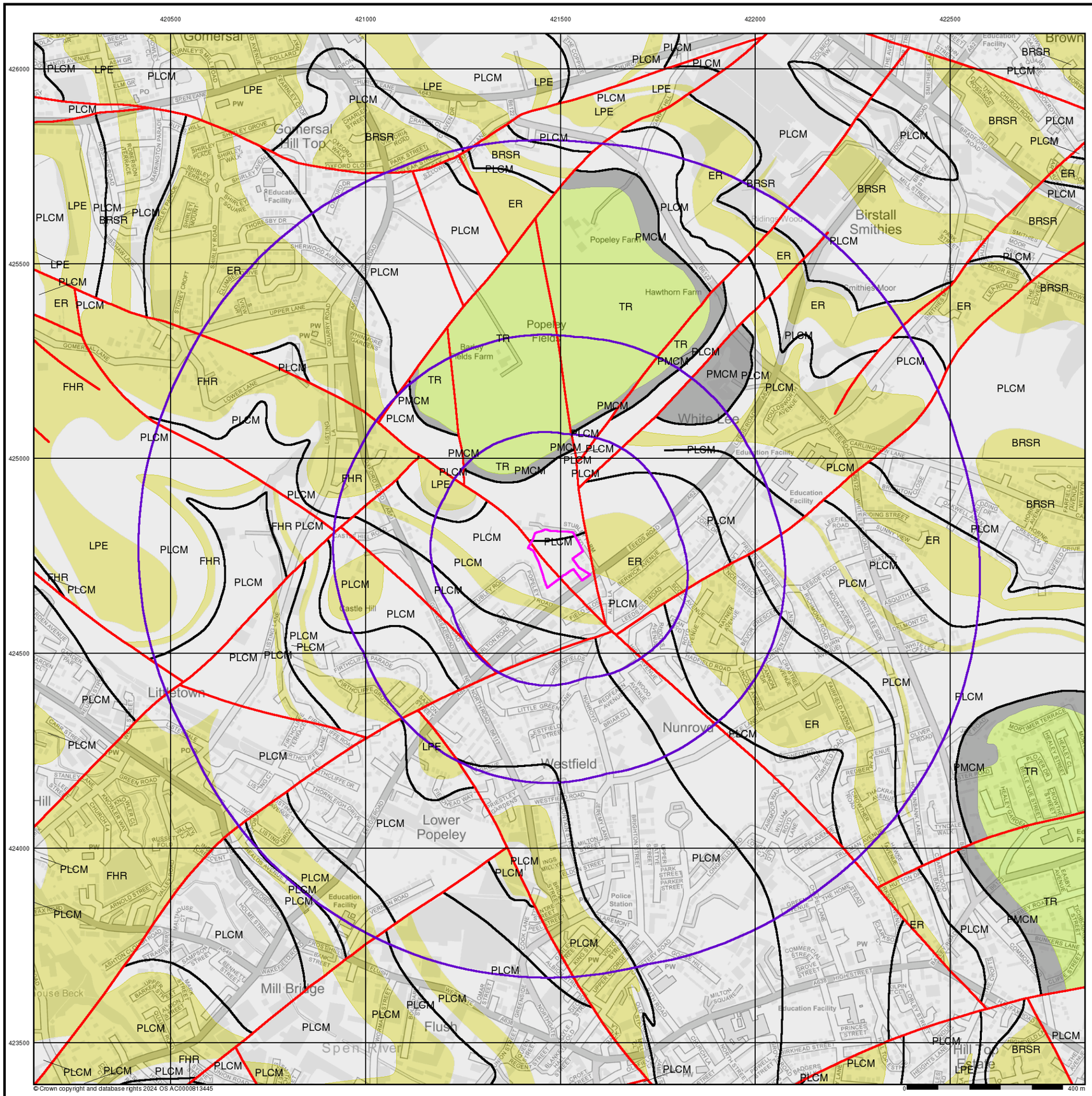


ARP GEOTECHNICAL LTD

Bedrock and Faults

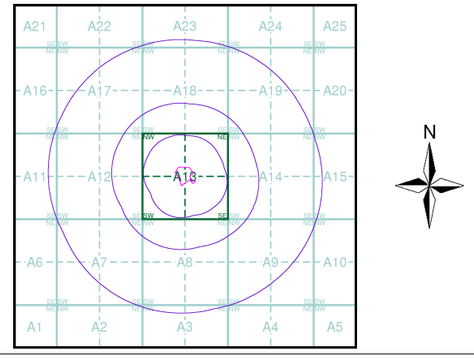
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults and thin beds mapped as lines such as coal seams and mineral veins. These are not restricted by age and could relate to features of any of the 1:10,000 geology datasets.

Bedrock and Faults Map - Slice A



Order Details

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Site Area (Ha):	1.33
Search Buffer (m):	1000

Site Details

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Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
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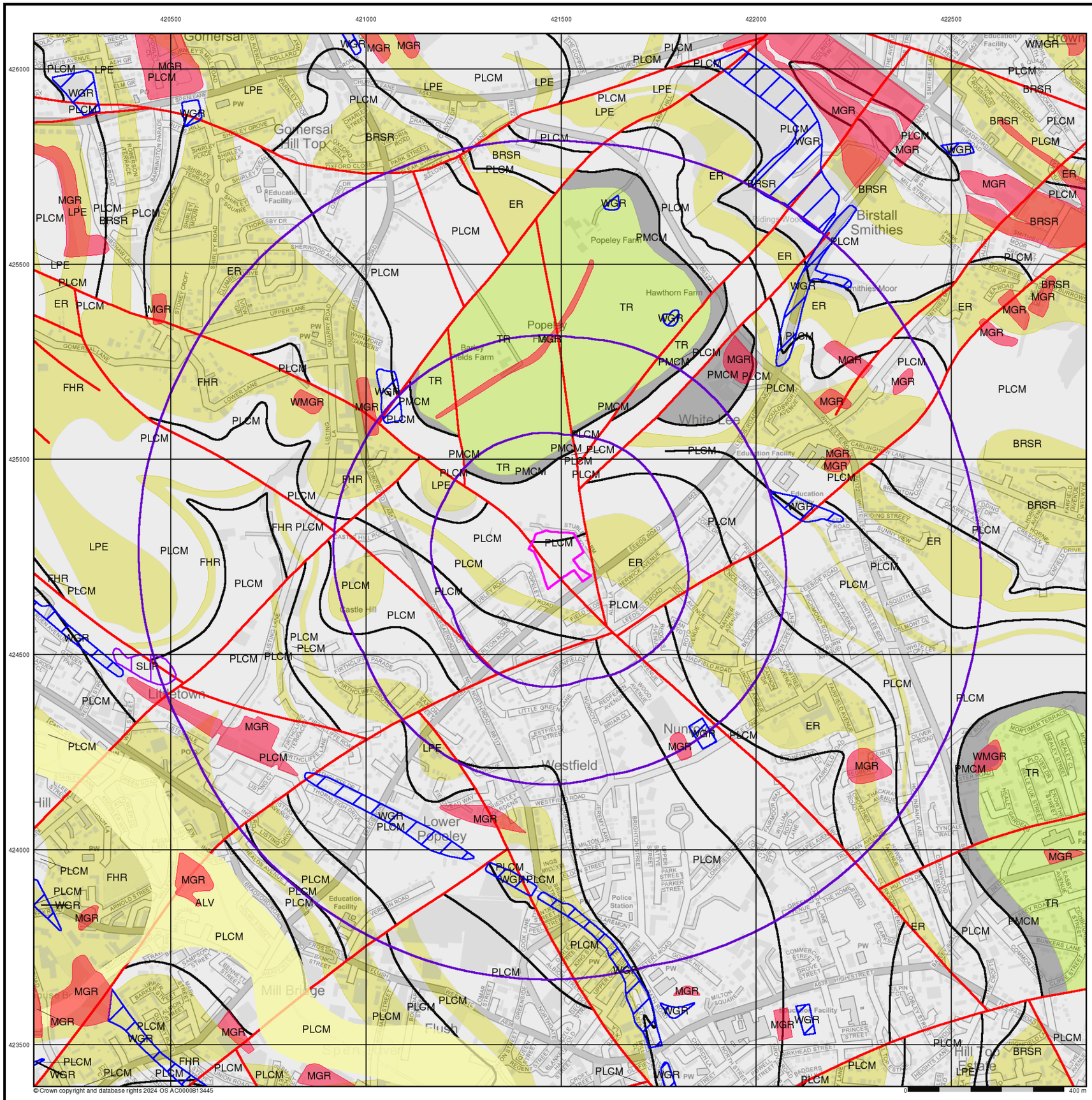


ARP GEOTECHNICAL LTD

Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

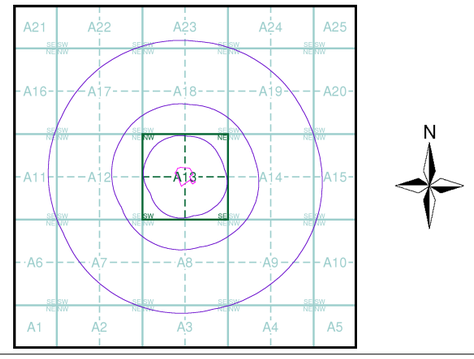
Additional Information

More information on 1:10,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A

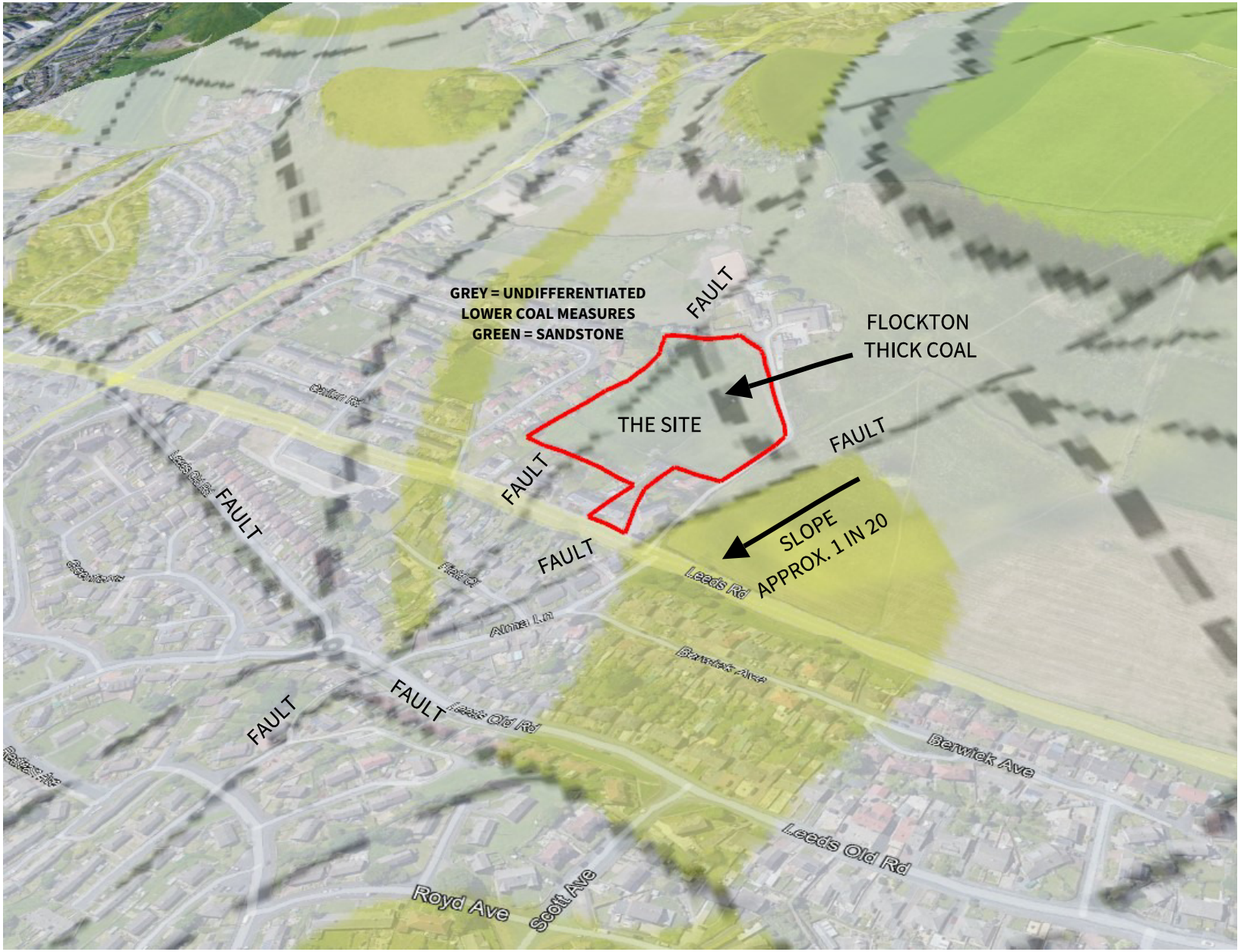


Order Details

Order Number:	360382419_1_1
Customer Ref:	ORH/25
National Grid Reference:	421500, 424740
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	1000

Site Details

195, Leeds Road, HECKMONDWIKE, WF16 9DB



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ARP GEOTECHNICAL LTD
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Telephone : 0113 245 8498 Fax : 0113 244 3864 E-Mail : leeds@arpassociates.co.uk

Project	LAND AT 195 LEEDS ROAD HECKMONDWIKE
Client	ORION HOMES LTD
Title	OBLIQUE VIEW GEOLOGICAL MAP
Date	OCTOBER 2024
Drawn	JR
Scale	NTS
Job No.	**ORH/25**

Appendix F
Greenfield Calc

Greenfield runoff rate estimation tool

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

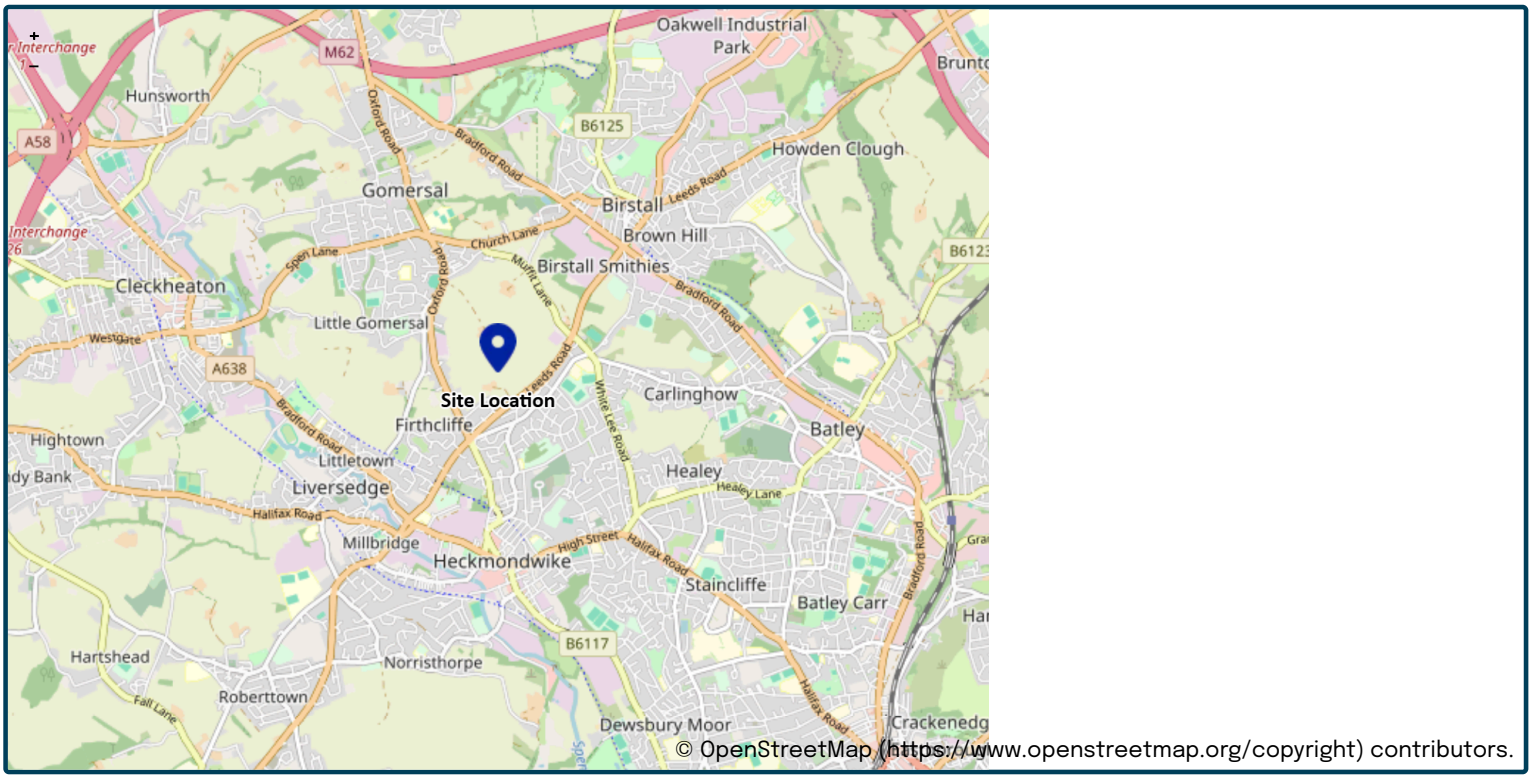
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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	29/05/2025
Calculated by	Michael Micklethwaite
Reference	25014
Model version	2.0.1

Location

Site name	Leeds Road
Site location	Heckmondwike



Site easting	421483
Site northing	424771

Site details

Total site area (ha)	1.33 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	730 mm		730
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	6.7 l/s		

Growth curve factors

	My value		Map value
Hydrological region	3		3
1 year growth factor	0.86		
2 year growth factor	0.94		
10 year growth factor	1.45		
30 year growth factor	1.75		
100 year growth factor	2.08		
200 year growth factor	2.37		

Results

Method	IH124
Flow rate 1 year (l/s)	5.8 l/s
Flow rate 2 year (l/s)	6.3 l/s
Flow rate 10 years (l/s)	9.8 l/s
Flow rate 30 years (l/s)	11.8 l/s
Flow rate 100 years (l/s)	14 l/s
Flow rate 200 years (l/s)	16 l/s

Appendix G
Drainage Layout Plan

PHASE: 0

MH No.	DIAGRAM	CONDUIT INVERTS (m)	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER LEVEL	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
S1	20	A 119.00	1350Ø	Type B	D400	120.752	119.000	1.527	421454.420	424768.199
S2	0	A 118.00 B 118.075	1200Ø	Type A	D400	121.487	118.000	3.187	421480.599	424787.044
S3	5	A 117.865 B 117.865 C 118.015	1350Ø	Type B	D400	119.841	117.865	1.676	421499.769	424760.209
S4	14	A 116.10 B 116.10	1350Ø	Type B	D400	118.582	116.100	2.182	421514.506	424739.822
S5	16	A 116.15	1350Ø	Type C	D400	117.521	116.150	1.146	421481.081	424715.697
S6	18	A 115.90 B 115.975 C 116.05	1350Ø	Type B	D400	117.885	115.900	1.610	421491.521	424723.232
S7	17	A 115.40 B 115.40	1350Ø	Type B	D400	117.319	115.400	1.544	421497.011	424715.236
S9	19	A 115.35 B 115.35	1350Ø	Type B	D400	117.479	115.350	1.754	421513.816	424726.378
S10	15	A 118.55	1350Ø	Type C	D400	120.164	118.550	1.464	421514.680	424770.569
S11	24	A 115.10	1350Ø	Type C	D400	116.628	115.100	1.378	421560.830	424688.833
S12	23	A 115.25 B 115.25	1200Ø	Unknown	D400	117.036	115.250	1.411	421539.817	424716.414
S13	22	A 115.33 B 115.33	1200Ø	Type B	D400	118.028	115.330	2.323	421521.451	424730.805
S14	21	A 115.15 B 115.15	1350Ø	Type C	D400	116.710	115.150	1.410	421557.168	424694.867
F1	1	A 119.52	1350Ø	Type B	D400	121.507	119.520	1.837	421481.532	424789.624
F2	73	A 118.00 B 118.00	1350Ø	Type C	D400	119.644	118.000	1.494	421503.530	424759.817
F3	75	A 116.40 B 116.40	1350Ø	Type B	D400	118.146	116.400	1.596	421520.980	424735.461
F4	74	A 115.80 B 115.80	1350Ø	Type B	D400	117.490	115.800	1.540	421530.524	424726.759
F5	76	A 115.40 B 115.40	1350Ø	Type C	D400	116.802	115.400	1.252	421522.047	424716.092
F6	78	A 115.20	1350Ø	Type C	D400	116.798	115.200	1.448	421523.731	424712.948
F7	77	A 117.00 B 117.00	1350Ø	Type B	D400	118.816	117.000	1.666	421513.150	424746.274

NOTES

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6. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ADVANT ENGINEERS DRAWINGS AND SPECIFICATIONS.

KEY

- EXISTING FOUL SEWER
- EXISTING SW SEWER
- PROPOSED FOUL SEWER
- PROPOSED SURFACE WATER SEWER
- SEWER EASEMENT
- ATTENUATION TANK

NEW MANHOLE ON EXISTING FOUL SEWER

FLOW CONTROL MANHOLE HEAD=1.5m FLOW=6.5l/s

NEW MANHOLE ON EXISTING HIGHWAY DRAIN

Tank 1 Area:275m² Depth:1.40m Volume:385m³

STUBLEY FARM ROAD

LEEDS ROAD

Road 1 Road 2 Road 3 Road 4 Road 5 Road 6 Path 1 Path 2 Path 3 Path 4 Path 5

REV		BY	DATE
A	INITIAL ISSUE	MJM	29.05.25
REV	AMENDMENTS	BY	DATE

FOR APPROVAL

STATUS		CHK'D
PRELIMINARY		MJM
FOR COMMENT		
FOR APPROVAL		
FOR CONSTRUCTION		
AS BUILT		

advant ENGINEERS
Unit 6 Benton Office Park, Bennett Avenue
Horbury, Wakefield, West Yorkshire, WF4 5RA
01924 654108
wakefield@advantengineers.co.uk

CLIENT
ORION HOMES LTD

CONTRACT
LEEDS ROAD
HECKMONDWIKE
WF16 9DA

TITLE
S104 DRAINAGE LAYOUT PLAN

DRAWN	MJM	CHK'D	MJM
SCALE	1:250 @ A1	DATE	29.05.25

JOB No	DRG No	REV
25014	104	A

Appendix H
Drainage Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.350	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100	150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.136	5.00	120.752	1350	421454.420	424768.199	1.752
S2	0.052	5.00	121.487	1200	421480.599	424787.044	3.487
S10	0.057	5.00	120.164	1350	421514.680	424770.569	1.614
S3	0.078	5.00	119.841	1350	421499.769	424760.209	1.976
S4	0.055	5.00	118.582	1350	421514.506	424739.822	2.482
S5	0.110	5.00	117.521	1350	421481.081	424715.697	1.371
S6			117.885	1350	421491.521	424723.232	1.985
S7	0.050	5.00	117.319	1350	421497.011	424715.236	1.919
S9	0.013	5.00	117.479	1350	421513.816	424726.378	2.129
S13	0.020	5.00	118.028	1200	421521.451	424730.805	2.698
S12	0.036	5.00	117.036	1200	421539.817	424716.414	1.786
S14			116.710	1350	421557.168	424694.867	1.560
S11			116.628	1350	421560.830	424688.833	1.528

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	32.256	0.600	119.000	118.075	0.925	34.9	225	5.24	50.0
1.001	S2	S3	32.979	0.600	118.000	117.865	0.135	244.3	300	5.79	50.0
2.000	S10	S3	18.157	0.600	118.550	118.015	0.535	33.9	150	5.17	50.0
1.002	S3	S4	25.156	0.600	117.865	116.100	1.765	14.3	300	5.89	50.0
1.003	S4	S6	28.347	0.600	116.100	115.975	0.125	226.8	300	6.35	50.0
3.000	S5	S6	12.875	0.600	116.150	116.050	0.100	128.8	225	5.19	50.0
1.004	S6	S7	9.699	0.600	115.900	115.400	0.500	19.4	375	6.38	50.0
1.005	S7	S9	20.163	0.600	115.400	115.350	0.050	403.3	375	6.76	50.0
1.006	S9	S13	8.826	0.600	115.350	115.330	0.020	441.3	375	6.93	50.0
1.007	S13	S12	23.333	0.600	115.330	115.250	0.080	291.7	375	7.30	50.0
1.008	S12	S14	27.665	0.600	115.250	115.150	0.100	276.7	375	7.73	50.0
1.009	S14	S11	7.058	0.600	115.150	115.100	0.050	141.2	150	7.86	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.222	88.4	18.4	1.527	3.187	0.136	0.0	69	1.759
1.001	1.001	70.8	25.5	3.187	1.676	0.188	0.0	125	0.923
2.000	1.733	30.6	7.7	1.464	1.676	0.057	0.0	51	1.448
1.002	4.185	295.8	43.8	1.676	2.182	0.323	0.0	78	3.031
1.003	1.040	73.5	51.3	2.182	1.610	0.378	0.0	185	1.121
3.000	1.151	45.7	14.9	1.146	1.610	0.110	0.0	88	1.032
1.004	4.130	456.1	66.1	1.610	1.544	0.488	0.0	96	2.972
1.005	0.896	98.9	72.9	1.544	1.754	0.538	0.0	240	0.976
1.006	0.856	94.5	74.6	1.754	2.323	0.551	0.0	252	0.945
1.007	1.056	116.6	77.4	2.323	1.411	0.571	0.0	224	1.126
1.008	1.084	119.7	82.3	1.411	1.185	0.607	0.0	229	1.165
1.009	0.844	14.9	82.3	1.410	1.378	0.607	0.0	150	0.859

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	32.256	34.9	225	Circular	120.752	119.000	1.527	121.487	118.075	3.187
1.001	32.979	244.3	300	Circular	121.487	118.000	3.187	119.841	117.865	1.676
2.000	18.157	33.9	150	Circular	120.164	118.550	1.464	119.841	118.015	1.676
1.002	25.156	14.3	300	Circular	119.841	117.865	1.676	118.582	116.100	2.182
1.003	28.347	226.8	300	Circular	118.582	116.100	2.182	117.885	115.975	1.610
3.000	12.875	128.8	225	Circular	117.521	116.150	1.146	117.885	116.050	1.610
1.004	9.699	19.4	375	Circular	117.885	115.900	1.610	117.319	115.400	1.544
1.005	20.163	403.3	375	Circular	117.319	115.400	1.544	117.479	115.350	1.754

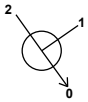
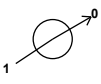
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	S3	1350	Manhole	Adoptable
2.000	S10	1350	Manhole	Adoptable	S3	1350	Manhole	Adoptable
1.002	S3	1350	Manhole	Adoptable	S4	1350	Manhole	Adoptable
1.003	S4	1350	Manhole	Adoptable	S6	1350	Manhole	Adoptable
3.000	S5	1350	Manhole	Adoptable	S6	1350	Manhole	Adoptable
1.004	S6	1350	Manhole	Adoptable	S7	1350	Manhole	Adoptable
1.005	S7	1350	Manhole	Adoptable	S9	1350	Manhole	Adoptable

Pipeline Schedule

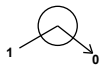
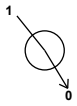
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.006	8.826	441.3	375	Circular	117.479	115.350	1.754	118.028	115.330	2.323
1.007	23.333	291.7	375	Circular	118.028	115.330	2.323	117.036	115.250	1.411
1.008	27.665	276.7	375	Circular	117.036	115.250	1.411	116.710	115.150	1.185
1.009	7.058	141.2	150	Circular	116.710	115.150	1.410	116.628	115.100	1.378

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	S9	1350	Manhole	Adoptable	S13	1200	Manhole	Adoptable
1.007	S13	1200	Manhole	Adoptable	S12	1200	Manhole	Adoptable
1.008	S12	1200	Manhole	Adoptable	S14	1350	Manhole	Adoptable
1.009	S14	1350	Manhole	Adoptable	S11	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	421454.420	424768.199	120.752	1.752	1350				
						0	1.000	119.000	225
S2	421480.599	424787.044	121.487	3.487	1200		1	1.000	118.075	225
									
						0	1.001	118.000	300
S10	421514.680	424770.569	120.164	1.614	1350				
						0	2.000	118.550	150
S3	421499.769	424760.209	119.841	1.976	1350		1	2.000	118.015	150
							2	1.001	117.865	300
						0	1.002	117.865	300
S4	421514.506	424739.822	118.582	2.482	1350		1	1.002	116.100	300
						0	1.003	116.100	300
S5	421481.081	424715.697	117.521	1.371	1350				
						0	3.000	116.150	225
S6	421491.521	424723.232	117.885	1.985	1350		1	3.000	116.050	225
							2	1.003	115.975	300
						0	1.004	115.900	375
S7	421497.011	424715.236	117.319	1.919	1350		1	1.004	115.400	375
						0	1.005	115.400	375
S9	421513.816	424726.378	117.479	2.129	1350		1	1.005	115.350	375
									
						0	1.006	115.350	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S13	421521.451	424730.805	118.028	2.698	1200	1	1.006	115.330	375
									
						0	1.007	115.330	375
S12	421539.817	424716.414	117.036	1.786	1200	1	1.007	115.250	375
									
						0	1.008	115.250	375
S14	421557.168	424694.867	116.710	1.560	1350	1	1.008	115.150	375
									
						0	1.009	115.150	150
S11	421560.830	424688.833	116.628	1.528	1350	1	1.009	115.100	150
									

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	1440
M5-60 (mm)	20.000	Additional Storage (m³/ha)	0.0
Ratio-R	0.400	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Node S14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	115.700	Product Number	CTL-SHE-0112-6500-1500-6500
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.5	Min Node Diameter (mm)	1200

Node S9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	115.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	536

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	275.0	0.0	1.400	275.0	0.0	1.401	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	30 year 15 minute summer	268.706	76.035
1 year 15 minute winter	76.857	30.991	30 year 15 minute winter	188.566	76.035
1 year 30 minute summer	71.439	20.215	30 year 30 minute summer	174.929	49.499
1 year 30 minute winter	50.133	20.215	30 year 30 minute winter	122.757	49.499
1 year 60 minute summer	48.435	12.800	30 year 60 minute summer	116.589	30.811
1 year 60 minute winter	32.179	12.800	30 year 60 minute winter	77.459	30.811
1 year 120 minute summer	30.053	7.942	30 year 120 minute summer	70.438	18.615
1 year 120 minute winter	19.966	7.942	30 year 120 minute winter	46.797	18.615
1 year 180 minute summer	23.233	5.979	30 year 180 minute summer	53.298	13.715
1 year 180 minute winter	15.102	5.979	30 year 180 minute winter	34.645	13.715
1 year 240 minute summer	18.475	4.882	30 year 240 minute summer	41.604	10.995
1 year 240 minute winter	12.274	4.882	30 year 240 minute winter	27.641	10.995
1 year 360 minute summer	14.169	3.646	30 year 360 minute summer	31.221	8.034
1 year 360 minute winter	9.210	3.646	30 year 360 minute winter	20.295	8.034
1 year 480 minute summer	11.185	2.956	30 year 480 minute summer	24.324	6.428
1 year 480 minute winter	7.431	2.956	30 year 480 minute winter	16.160	6.428
1 year 600 minute summer	9.182	2.511	30 year 600 minute summer	19.756	5.404
1 year 600 minute winter	6.274	2.511	30 year 600 minute winter	13.498	5.404
1 year 720 minute summer	8.203	2.199	30 year 720 minute summer	17.490	4.687
1 year 720 minute winter	5.513	2.199	30 year 720 minute winter	11.754	4.687
1 year 960 minute summer	6.768	1.782	30 year 960 minute summer	14.215	3.743
1 year 960 minute winter	4.483	1.782	30 year 960 minute winter	9.416	3.743
1 year 1440 minute summer	4.949	1.326	30 year 1440 minute summer	10.161	2.723
1 year 1440 minute winter	3.326	1.326	30 year 1440 minute winter	6.829	2.723

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 15 minute summer	348.738	98.681	100 year +45% CC 15 minute summer	505.670	143.087
100 year 15 minute winter	244.728	98.681	100 year +45% CC 15 minute winter	354.856	143.087
100 year 30 minute summer	228.965	64.789	100 year +45% CC 30 minute summer	332.000	93.944
100 year 30 minute winter	160.677	64.789	100 year +45% CC 30 minute winter	232.982	93.944
100 year 60 minute summer	153.288	40.510	100 year +45% CC 60 minute summer	222.268	58.739
100 year 60 minute winter	101.841	40.510	100 year +45% CC 60 minute winter	147.669	58.739
100 year 120 minute summer	92.562	24.461	100 year +45% CC 120 minute summer	134.215	35.469
100 year 120 minute winter	61.496	24.461	100 year +45% CC 120 minute winter	89.169	35.469
100 year 180 minute summer	69.806	17.964	100 year +45% CC 180 minute summer	101.219	26.047
100 year 180 minute winter	45.376	17.964	100 year +45% CC 180 minute winter	65.795	26.047
100 year 240 minute summer	54.269	14.342	100 year +45% CC 240 minute summer	78.690	20.795
100 year 240 minute winter	36.055	14.342	100 year +45% CC 240 minute winter	52.280	20.795
100 year 360 minute summer	40.484	10.418	100 year +45% CC 360 minute summer	58.701	15.106
100 year 360 minute winter	26.315	10.418	100 year +45% CC 360 minute winter	38.157	15.106
100 year 480 minute summer	31.414	8.302	100 year +45% CC 480 minute summer	45.550	12.038
100 year 480 minute winter	20.871	8.302	100 year +45% CC 480 minute winter	30.262	12.038
100 year 600 minute summer	25.431	6.956	100 year +45% CC 600 minute summer	36.875	10.086
100 year 600 minute winter	17.376	6.956	100 year +45% CC 600 minute winter	25.195	10.086
100 year 720 minute summer	22.452	6.017	100 year +45% CC 720 minute summer	32.556	8.725
100 year 720 minute winter	15.089	6.017	100 year +45% CC 720 minute winter	21.879	8.725
100 year 960 minute summer	18.166	4.784	100 year +45% CC 960 minute summer	26.340	6.936
100 year 960 minute winter	12.033	4.784	100 year +45% CC 960 minute winter	17.448	6.936
100 year 1440 minute summer	12.896	3.456	100 year +45% CC 1440 minute summer	18.700	5.012
100 year 1440 minute winter	8.667	3.456	100 year +45% CC 1440 minute winter	12.567	5.012

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	119.072	0.072	19.1	0.1033	0.0000	OK
15 minute winter	S2	10	118.130	0.130	26.2	0.1466	0.0000	OK
15 minute winter	S10	10	118.604	0.054	8.0	0.0767	0.0000	OK
15 minute winter	S3	10	117.943	0.078	44.7	0.1115	0.0000	OK
15 minute winter	S4	11	116.296	0.196	52.1	0.2807	0.0000	OK
15 minute winter	S5	10	116.245	0.095	15.5	0.1364	0.0000	OK
15 minute winter	S6	11	115.998	0.098	66.8	0.1407	0.0000	OK
15 minute winter	S7	8	115.865	0.465	73.5	0.6648	0.0000	SURCHARGED
1440 minute winter	S9	1020	115.764	0.414	4.5	114.3479	0.0000	SURCHARGED
1440 minute winter	S13	1020	115.764	0.434	1.9	0.4905	0.0000	SURCHARGED
1440 minute winter	S12	1020	115.764	0.514	2.0	0.5809	0.0000	SURCHARGED
1440 minute winter	S14	1020	115.764	0.614	2.0	0.8780	0.0000	SURCHARGED
15 minute summer	S11	1	115.100	0.000	0.0	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)
15 minute winter	S1	1.000	S2	18.8	1.747	0.213	0.3469	
15 minute winter	S2	1.001	S3	25.8	1.203	0.365	0.7198	
15 minute winter	S10	2.000	S3	7.9	1.425	0.257	0.1003	
15 minute winter	S3	1.002	S4	44.3	1.455	0.150	0.7956	
15 minute winter	S4	1.003	S6	52.0	1.129	0.708	1.3047	
15 minute winter	S5	3.000	S6	15.3	1.000	0.334	0.1966	
15 minute winter	S6	1.004	S7	66.9	1.496	0.147	0.6105	
15 minute winter	S7	1.005	S9	80.3	1.968	0.811	1.1221	
1440 minute winter	S9	1.006	S13	1.8	0.232	0.019	0.9735	
1440 minute winter	S13	1.007	S12	1.9	0.189	0.016	2.5736	
1440 minute winter	S12	1.008	S14	2.0	0.068	0.017	3.0514	
1440 minute winter	S14	Hydro-Brake®	S11	2.0				55.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	119.117	0.117	46.9	0.1668	0.0000	OK
15 minute winter	S2	10	118.219	0.219	64.7	0.2482	0.0000	OK
15 minute winter	S10	10	118.642	0.092	19.7	0.1319	0.0000	OK
15 minute winter	S3	10	117.990	0.125	110.2	0.1794	0.0000	OK
15 minute winter	S4	11	116.692	0.591	128.7	0.8464	0.0000	SURCHARGED
15 minute winter	S5	10	116.321	0.171	37.9	0.2440	0.0000	OK
15 minute winter	S6	11	116.094	0.194	164.0	0.2777	0.0000	OK
15 minute winter	S7	6	116.012	0.612	180.6	0.8752	0.0000	SURCHARGED
600 minute winter	S9	435	115.997	0.647	17.5	178.7365	0.0000	SURCHARGED
600 minute winter	S13	435	115.996	0.666	6.0	0.7537	0.0000	SURCHARGED
600 minute winter	S12	435	115.996	0.746	6.3	0.8439	0.0000	SURCHARGED
600 minute winter	S14	435	115.996	0.846	6.3	1.2103	0.0000	SURCHARGED
15 minute summer	S11	1	115.100	0.000	0.0	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)
15 minute winter	S1	1.000	S2	46.6	1.991	0.527	0.7688	
15 minute winter	S2	1.001	S3	63.7	1.531	0.900	1.3703	
15 minute winter	S10	2.000	S3	19.4	1.775	0.634	0.1988	
15 minute winter	S3	1.002	S4	109.6	1.911	0.371	1.2364	
15 minute winter	S4	1.003	S6	127.7	1.816	1.738	1.9435	
15 minute winter	S5	3.000	S6	37.4	1.225	0.817	0.3924	
15 minute winter	S6	1.004	S7	164.4	1.721	0.361	0.8138	
15 minute winter	S7	1.005	S9	182.2	2.189	1.841	1.8179	
600 minute winter	S9	1.006	S13	5.9	0.275	0.063	0.9735	
600 minute winter	S13	1.007	S12	6.0	0.158	0.052	2.5736	
600 minute winter	S12	1.008	S14	6.3	0.134	0.053	3.0514	
600 minute winter	S14	Hydro-Brake®	S11	6.3				166.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	119.136	0.136	60.9	0.1947	0.0000	OK
15 minute winter	S2	10	118.271	0.271	84.0	0.3070	0.0000	OK
15 minute winter	S10	10	118.662	0.112	25.5	0.1603	0.0000	OK
15 minute winter	S3	11	118.027	0.162	142.8	0.2318	0.0000	OK
15 minute winter	S4	11	117.026	0.926	165.2	1.3245	0.0000	SURCHARGED
15 minute winter	S5	10	116.388	0.238	49.2	0.3410	0.0000	SURCHARGED
15 minute winter	S6	11	116.210	0.310	212.4	0.4430	0.0000	OK
480 minute winter	S7	368	116.197	0.797	26.2	1.1399	0.0000	SURCHARGED
480 minute winter	S9	376	116.196	0.846	26.6	233.9555	0.0000	SURCHARGED
480 minute winter	S13	376	116.196	0.866	6.4	0.9797	0.0000	SURCHARGED
480 minute winter	S12	376	116.196	0.946	6.6	1.0698	0.0000	SURCHARGED
480 minute winter	S14	376	116.196	1.046	6.6	1.4961	0.0000	SURCHARGED
15 minute summer	S11	1	115.100	0.000	0.2	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)
15 minute winter	S1	1.000	S2	60.5	1.994	0.685	0.9980	
15 minute winter	S2	1.001	S3	82.6	1.559	1.167	1.7370	
15 minute winter	S10	2.000	S3	25.1	1.858	0.821	0.2455	
15 minute winter	S3	1.002	S4	140.4	2.279	0.475	1.3737	
15 minute winter	S4	1.003	S6	165.4	2.348	2.250	1.9760	
15 minute winter	S5	3.000	S6	48.2	1.252	1.053	0.4785	
15 minute winter	S6	1.004	S7	213.1	1.956	0.467	1.0068	
480 minute winter	S7	1.005	S9	26.0	0.820	0.263	2.2239	
480 minute winter	S9	1.006	S13	6.4	0.299	0.068	0.9735	
480 minute winter	S13	1.007	S12	6.5	0.237	0.055	2.5736	
480 minute winter	S12	1.008	S14	6.6	0.222	0.055	3.0514	
480 minute winter	S14	Hydro-Brake®	S11	6.5				229.0

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	11	120.026	1.026	88.4	1.4679	0.0000	SURCHARGED
15 minute winter	S2	12	119.178	1.178	111.3	1.3321	0.0000	SURCHARGED
15 minute winter	S10	12	119.472	0.922	37.0	1.3198	0.0000	SURCHARGED
15 minute winter	S3	12	118.811	0.945	182.4	1.3530	0.0000	SURCHARGED
15 minute winter	S4	11	117.959	1.859	211.7	2.6607	0.0000	SURCHARGED
15 minute winter	S5	11	116.980	0.830	71.4	1.1877	0.0000	SURCHARGED
480 minute winter	S6	464	116.696	0.796	34.6	1.1389	0.0000	SURCHARGED
480 minute winter	S7	464	116.696	1.296	37.4	1.8543	0.0000	SURCHARGED
480 minute winter	S9	464	116.696	1.346	38.0	371.9955	0.0000	SURCHARGED
480 minute winter	S13	464	116.696	1.366	6.4	1.5445	0.0000	SURCHARGED
480 minute winter	S12	464	116.695	1.445	6.8	1.6347	0.0000	SURCHARGED
480 minute winter	S14	464	116.695	1.545	6.7	2.2111	0.0000	FLOOD RISK
15 minute summer	S11	1	115.100	0.000	5.7	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)
15 minute winter	S1	1.000	S2	79.2	2.002	0.897	1.2829	
15 minute winter	S2	1.001	S3	105.9	1.513	1.496	2.3224	
15 minute winter	S10	2.000	S3	32.0	1.859	1.045	0.3197	
15 minute winter	S3	1.002	S4	180.0	2.556	0.608	1.7715	
15 minute winter	S4	1.003	S6	210.7	2.993	2.868	1.9962	
15 minute winter	S5	3.000	S6	67.3	1.693	1.471	0.5121	
480 minute winter	S6	1.004	S7	33.9	0.756	0.074	1.0698	
480 minute winter	S7	1.005	S9	37.1	0.889	0.375	2.2239	
480 minute winter	S9	1.006	S13	6.4	0.329	0.068	0.9735	
480 minute winter	S13	1.007	S12	6.4	0.211	0.055	2.5736	
480 minute winter	S12	1.008	S14	6.7	0.168	0.056	3.0514	
480 minute winter	S14	Hydro-Brake®	S11	6.5				381.2

Appendix I
Flood Exceedance Plan

N

Stubley Farm Cottage

STUBLEY FARM ROAD

Road 1
Road 2
Road 3
Road 4
Road 5
Road 6
Path 1
Path 2
Path 3

FFL 122.350
FFL 121.900
FFL 121.900
FFL 121.450
FFL 121.450
FFL 121.450
FFL 120.700
FFL 121.000
FFL 121.300
FFL 120.400
FFL 120.400
FFL 120.700
FFL 118.600
FFL 118.300
FFL 118.150
FFL 118.000
FFL 117.400
FFL 116.500
FFL 117.100
FFL 121.000
FFL 119.100
FFL 118.200

Tank 1
Area:275m²
Depth:1.40m
Volume:385m³

NEW MANHOLE ON EXISTING FOUL SEWER

FLOW CONTROL MANHOLE
HEAD=1.5m
FLOW=6.5l/s

NEW MANHOLE ON EXISTING HIGHWAY DRAIN

117.0m

LEEDS ROAD

NOTES

1. THIS DRAWING IS PRODUCED FOR USE IN THIS PROJECT ONLY AND MAY NOT BE USED FOR ANY OTHER PURPOSE. THE CONSULTING ENGINEERS ACCEPT NO LIABILITY FOR THE USE OF THIS DRAWING OTHER THAN THE PURPOSE FOR WHICH IT WAS INTENDED IN CONNECTION WITH THIS PROJECT AS RECORDED ON THE TITLE BLOCK FIELDS 'PURPOSE FOR ISSUE' AND 'FILE STATUS CODE'.
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6. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ADVANT ENGINEERS DRAWINGS AND SPECIFICATIONS.

KEY

FLOOD EXCEEDANCE EVENT

FLOOD FLOW PATH

REV		BY	DATE
A	INITIAL ISSUE	MJM	29.05.25
REV	AMENDMENTS	BY	DATE

FOR APPROVAL

STATUS	CHK'D
PRELIMINARY	MJM
FOR COMMENT	
FOR APPROVAL	
FOR CONSTRUCTION	
AS BUILT	

advant ENGINEERS

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CLIENT

ORION HOMES LTD

CONTRACT

LEEDS ROAD
HECKMONDWIKE
WF16 9DA

TITLE

FLOOD EXCEEDANCE LAYOUT PLAN

DRAWN	MJM	CHK'D	MJM
SCALE	1:250 @ A1	DATE	29.05.25

JOB No	DRG No	REV
25014	105	A

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