advant ENGINEERS

LEEDS ROAD
HECKMONDWIKE
WEST YORKSHIRE
WF16 9DA

Flood Risk Assessment & Drainage Strategy

(Rev A)

6th March 2026

DOC No: 25014-DOC-001-B

Issue Sheet.

Prepared	Date		Checked	Date
MJM	28.05.25		MJM	28.05.25

Revisions	Comment	Date
A	Initial Issue	28.05.25
B	Drainage Layout Updated	06.03.26

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	49 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	5.0 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 49 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.

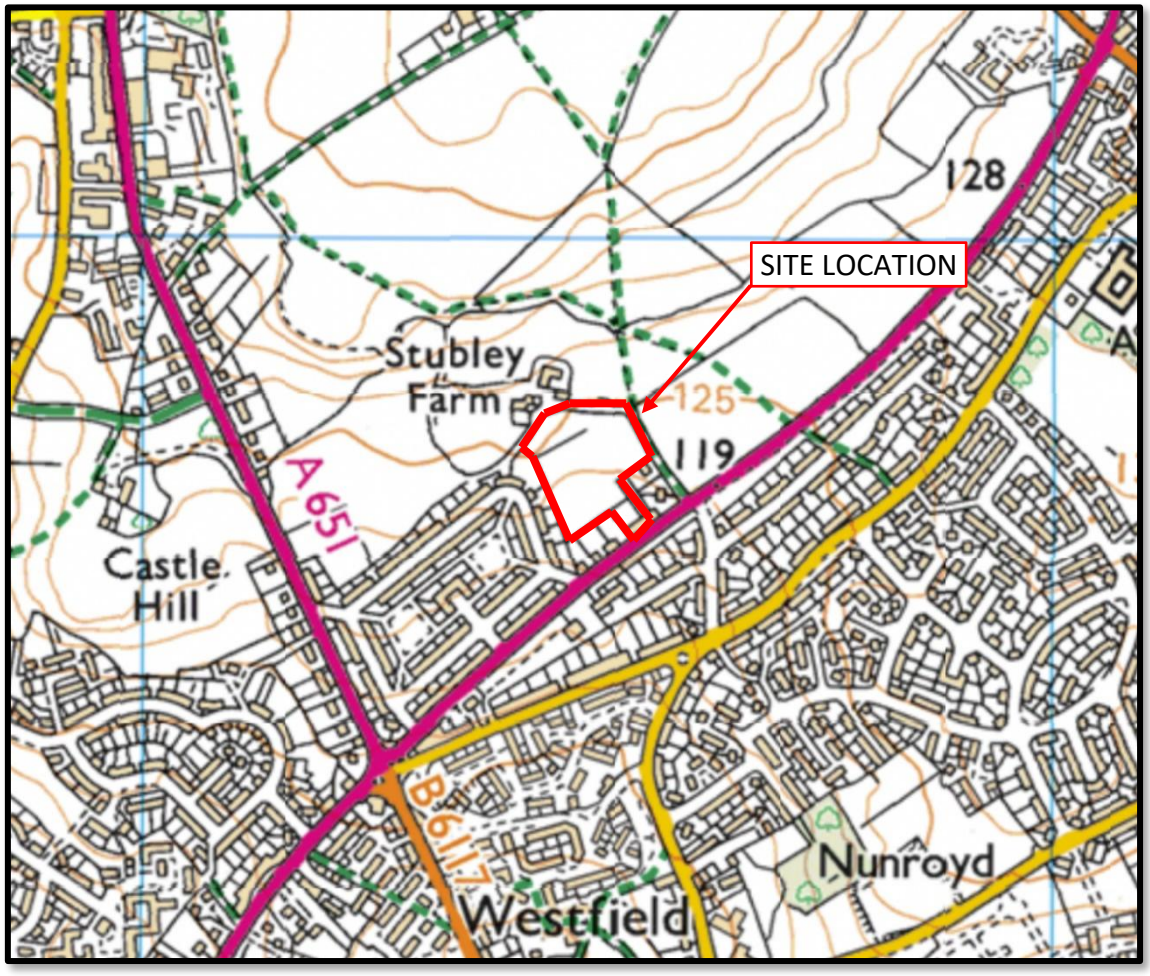
2.2 The site has existing residential dwellings along the western and southern boundaries, a farmhouse to the north and agricultural fields to the east of the site.

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.

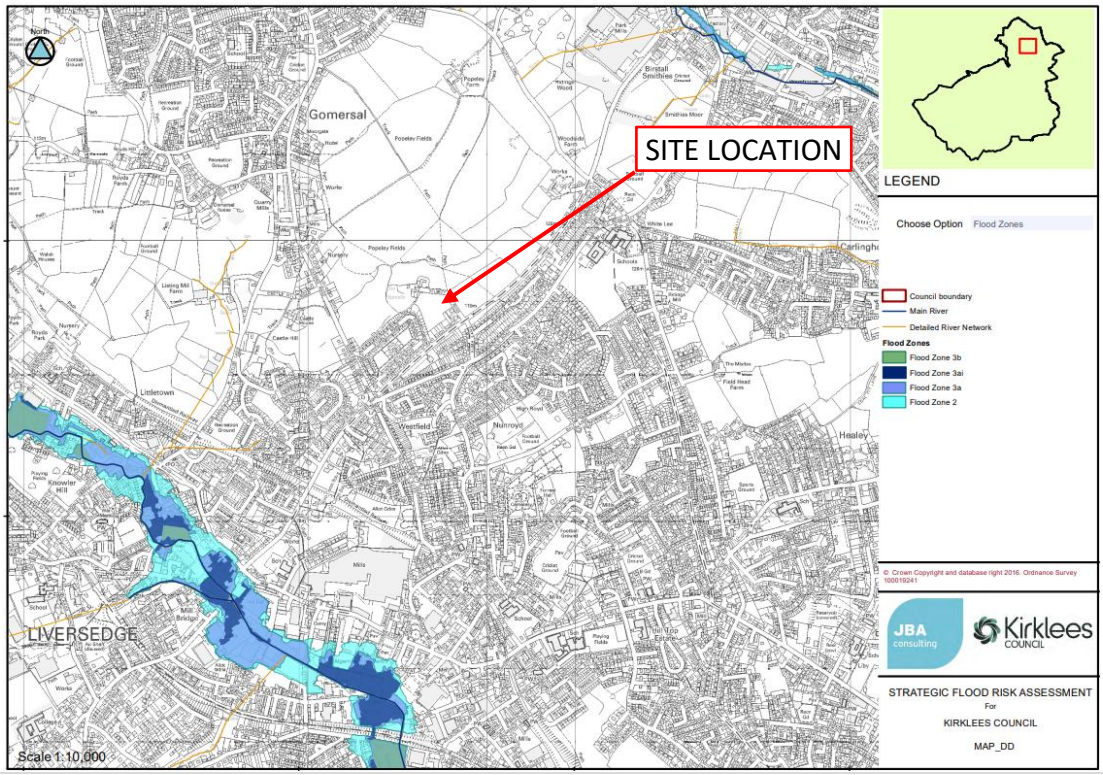
9 Sewerage Undertaker Consultation.

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.

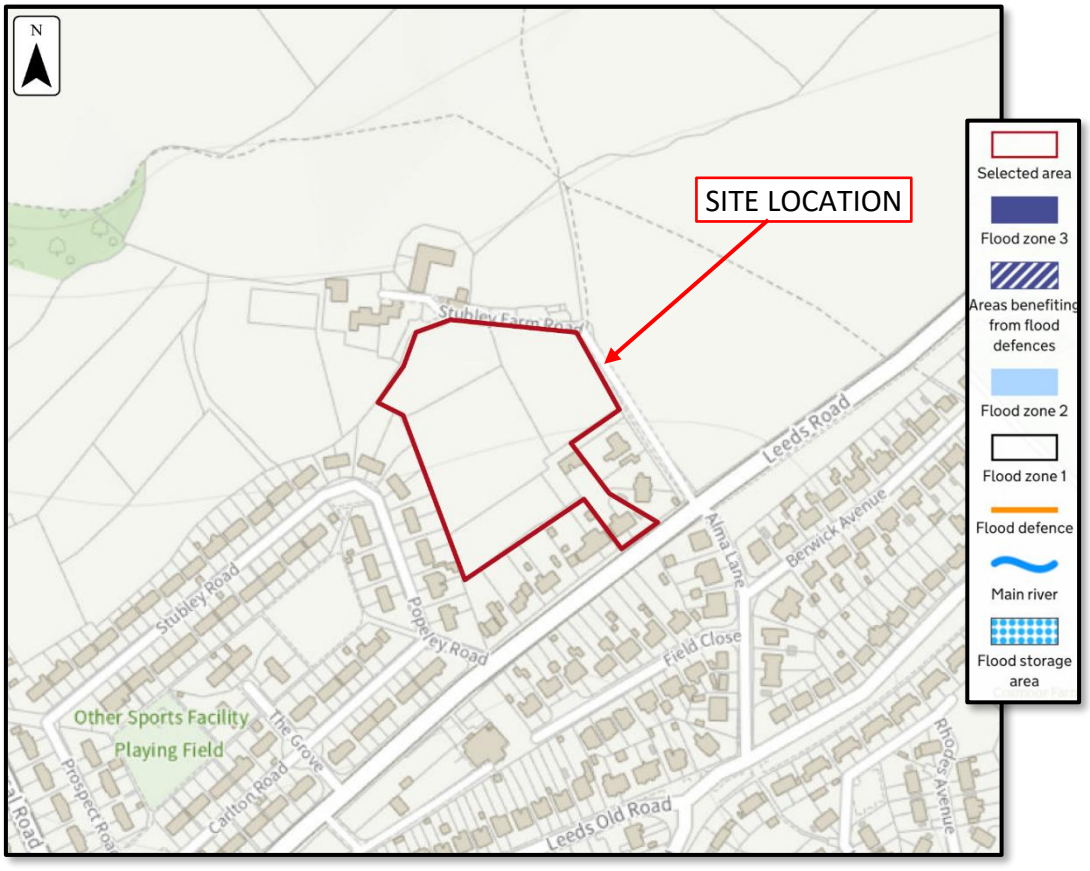


11 Flood Risk Assessment

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.

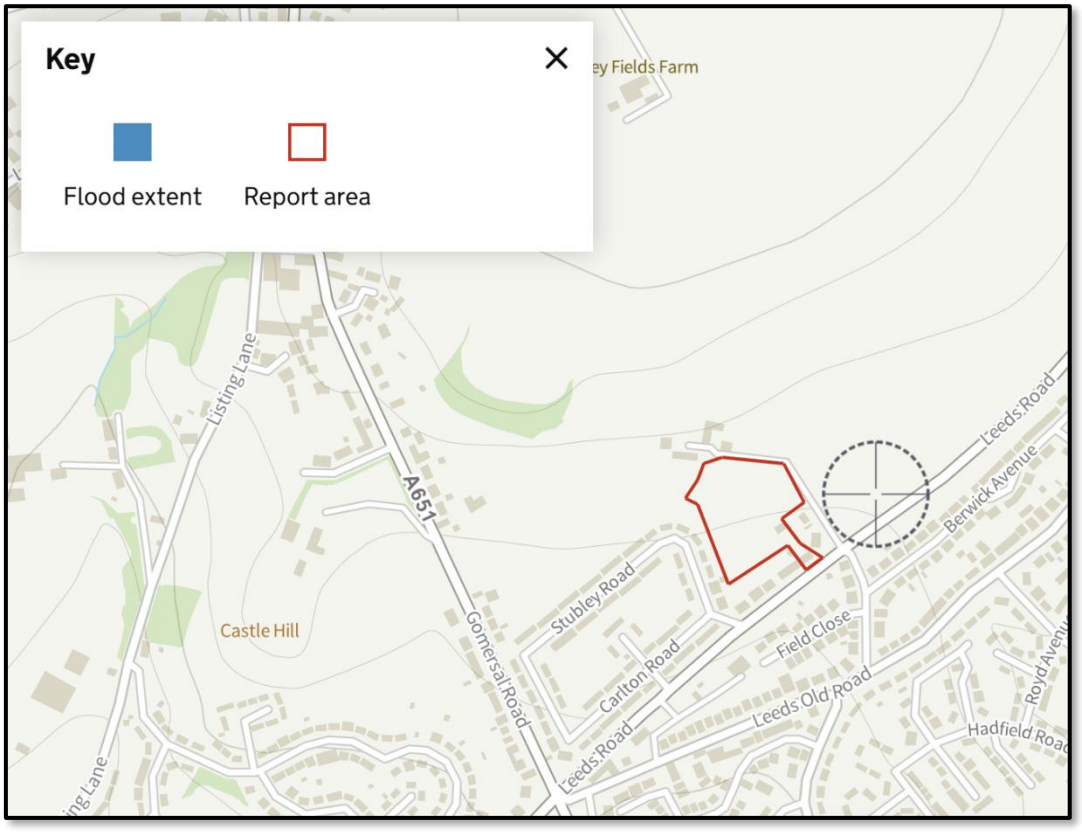
13 Exception Test

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

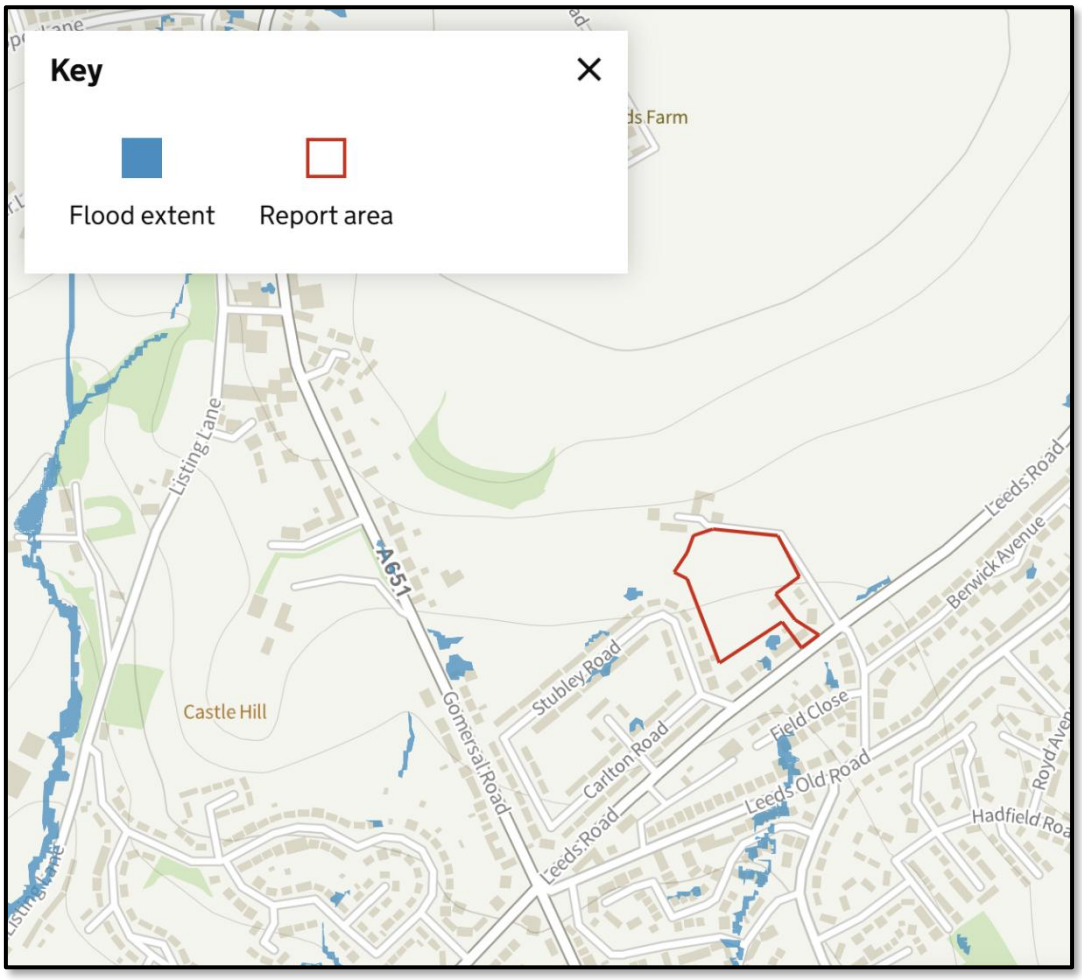
14 Sources of Potential Flooding

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.



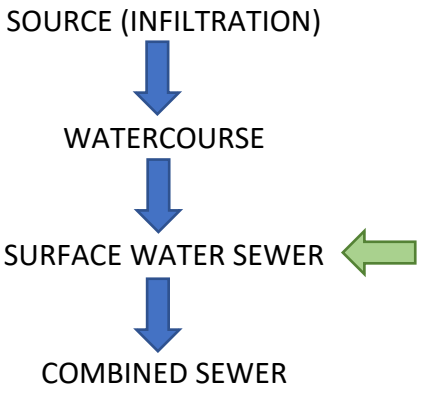
14.3 The (EA) flood mapping service on their website identifies the areas at risk from reservoirs flooding through failure to the reservoir or over topping, as per the map below the site would **NOT** be at risk of flooding should the reservoir breach.

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 **5.0 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 **5.0l/s** with attenuation on site for the 1 in 100 year + 45% 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

NOTES:
XXX

Revision notes:			
Rev:	Date:	Notes:	By:
..	..	..	..

Revision notes:			
Rev:	Date:	Notes:	By:
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Revision notes:			
Rev:	Date:	Notes:	By:
..	..	..	..

Date: -	Project: -	
Scale @ A1: ####	Drawing Number: -	Revision: -
Drawn By: -	Drawing Title: -	

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

Notes

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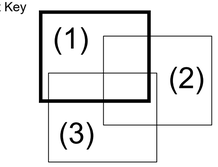
Grid : OS National Grid.
Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on R1

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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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
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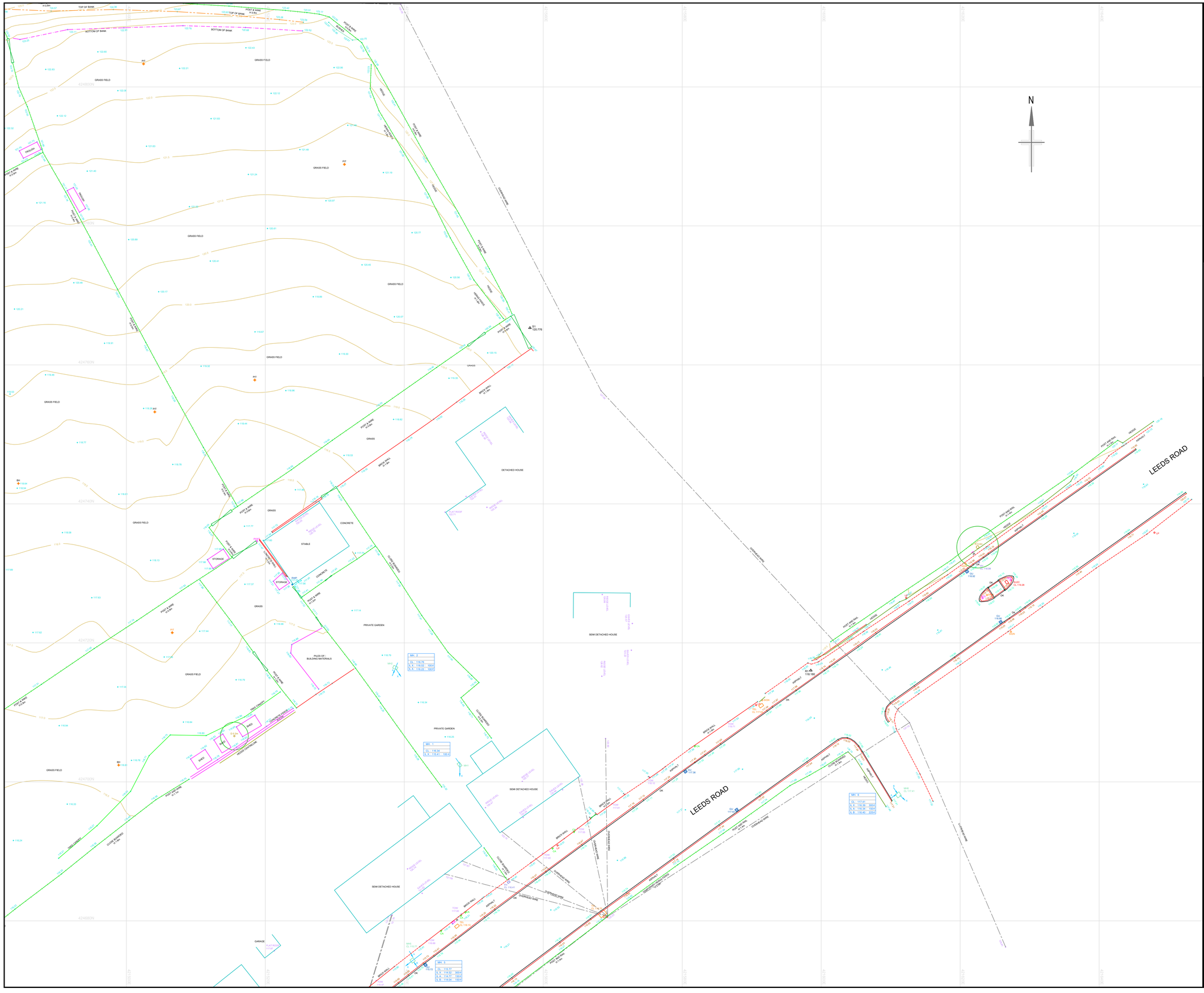

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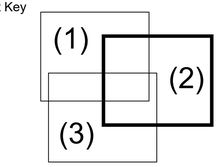

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Client
ORION HOMES LIMITED
HORBURY

Site
LEEDS ROAD
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Title
TOPOGRAPHICAL SURVEY

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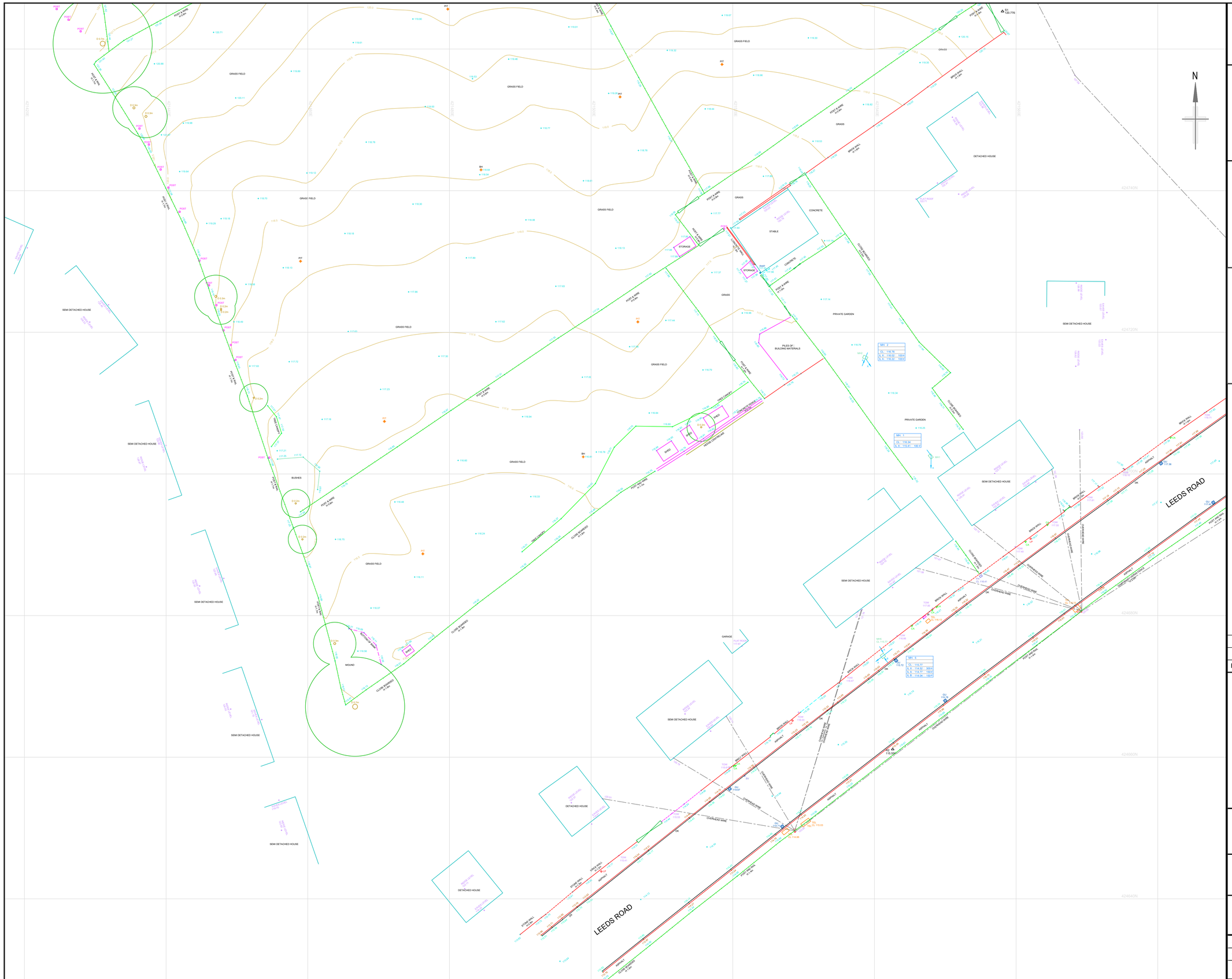

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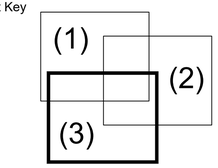

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INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

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

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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	003

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.

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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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 A0	Rev 01

DWG Ref

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

Appendix C
Extracts from Site Investigation

Appendix D
Sewer Records

COMBINED STAGE 1/STAGE 2

GEO-ENVIRONMENTAL REPORT

AT

195 LEEDS ROAD

HECKMONDWIKE

ON BEHALF OF

ORION HOMES LTD

ARP GEOTECHNICAL LTD

CHARTERED CONSULTING ENGINEERS

Northwest House 5/6 Northwest Business Park Servia Hill Leeds LS6 2QH

☎ 0113 245 8498 ✉ leeds@arpgeotechnical.co.uk 🌐 www.arpconsultingengineers.co.uk

CLIENT: ORION HOMES LTD

JOB NUMBER: ORH/25

PROJECT: 195 LEEDS ROAD, HECKMONDWIKE

REPORT TYPE: COMBINED STAGE 1/STAGE 2 GEO-ENVIRONMENTAL REPORT

REPORT REFERENCE: ORH/25r1

	Name	**Signature**
Prepared By:	J Race BSc CGeol FGS EurGeol	
Reviewed By:	O Gwilym BSc MSc FGS	
Authorised By:	M Harper BSc (Hons) MSc CEnv MIEnvSc	

ISSUE	**DATE**	**STATUS**
1	18th NOVEMBER 2024	V1 FINAL

CONTENTS

1.0 EXECUTIVE SUMMARY

The pertinent conclusions of the report are tabulated below. However, the information below is not exhaustive, and it is recommended the report is read in its entirety.

Proposed Development	Residential dwellings with private gardens.
Existing Site Description	Vast majority of site comprises undeveloped grassed grazing fields. Small area in the southeast is existing residential and outbuildings.
Site History	Only fields shown to have been present on majority of site. Limited residential development in a small area of the southeastern corner.
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.
Coal Mining	Potential risk from shallow workings beneath the site – rotary borehole investigation is recommended
Hydrogeology	Site underlain by Minor Aquifer. No abstractions within 1km.
Hydrology	No watercourses shown within 500m downslope of the site. No active abstractions for sensitive uses within 1km. Not at risk of river flooding.
Radon	Basic radon protection measures recommended, to minimise conveyancing issues.
Ground Gas	Gas monitoring is ongoing, and the results will be reported separately on completion.
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.
Ground Contamination	None detected; however, access was not available to the small existing residential area in the southeastern corner.
Contamination Action	Asbestos survey of existing buildings and outbuildings in the southeastern corner. Any made ground (other than natural aggregate) uncovered during the development works shall be

	inspected, sampled and tested. Works on the affected materials shall cease until the appraisal is complete and, if necessary, a Remediation Statement is to be prepared and approved by the Planning Authority before work is recommenced. Control of any imported soil is required.
Foundations	The natural firm to stiff clays (below any soft clay) are suitable for the use of strip/trench fill foundations. Tree survey required.
Excavations	Likely to remain stable in the short term. Groundwater ingress may occur but should be controllable by pumping. Bedrock as shallow as 1.4m in some areas, may require a breaker, as may have existing foundations and buried structures in the existing residential area.
Concrete	GEN1 designation for unreinforced buried concrete. For any reinforced buried concrete, other design-specific mixes will apply.
Soakaways	A Soakaway Feasibility Assessment was carried out for the site by ARP (reference ORH/25/JRjcl2 dated 7th November 2024). The report concluded that soakaways are not appropriate on the site.
Road Pavement	A design CBR value of 3% is considered applicable on the natural clay.

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

BY EMAIL

Our Ref: ORH/25/JRjcl2

07th November 2024

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

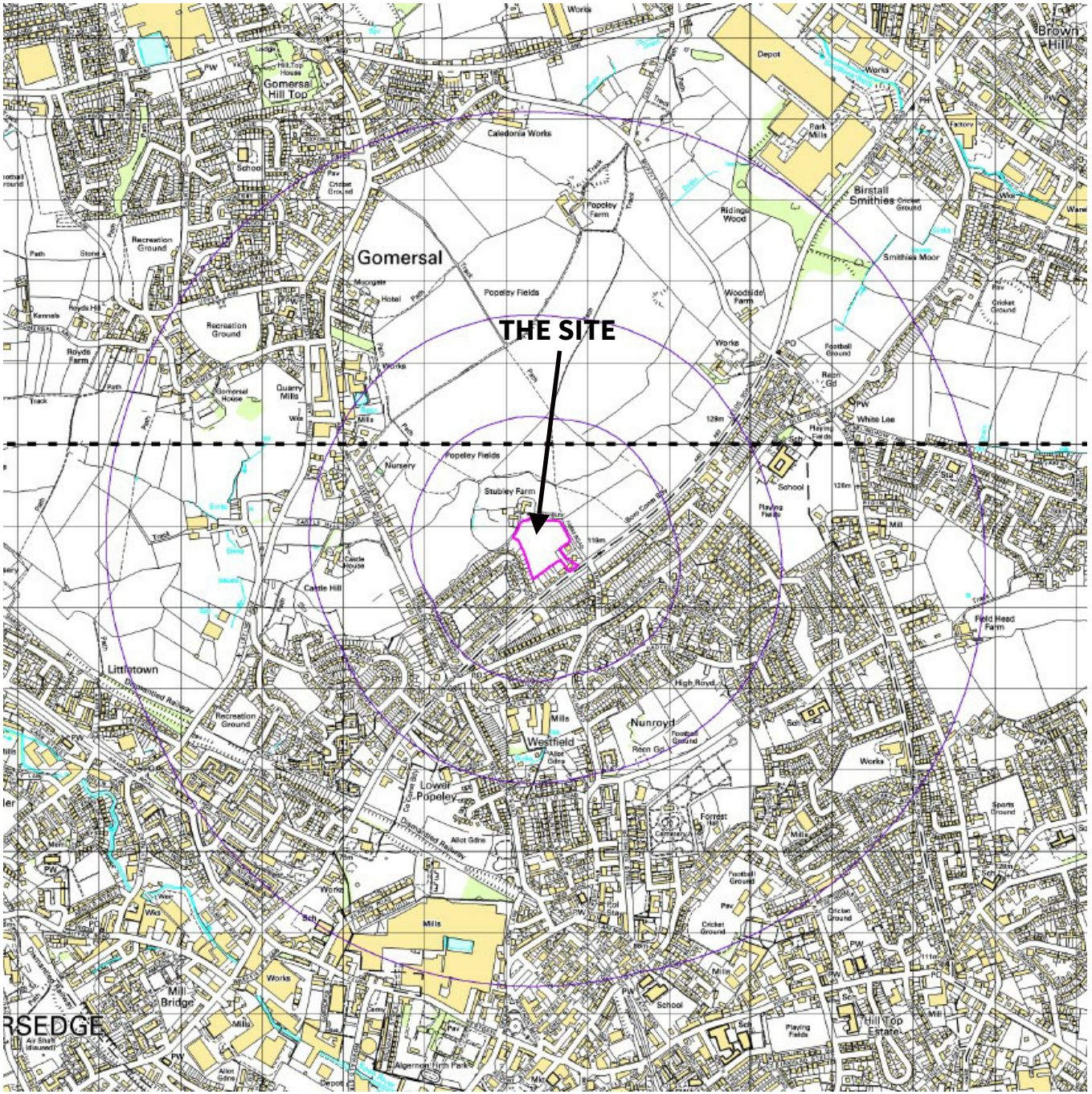
Based on the above assessment, it is recommended that soakaways are not used on the site, due to the adverse factors identified. These factors include the presence of strata on the site unlikely to have sufficient infiltration rates for the use of soakaways, the presence of a significant fault crossing 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

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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	JR
Scale	AS SHOWN
Job No.	**ORH/25**

0m 40m

Approximate Scale

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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**

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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.

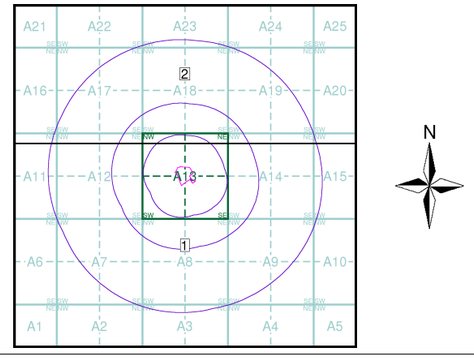
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page.

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



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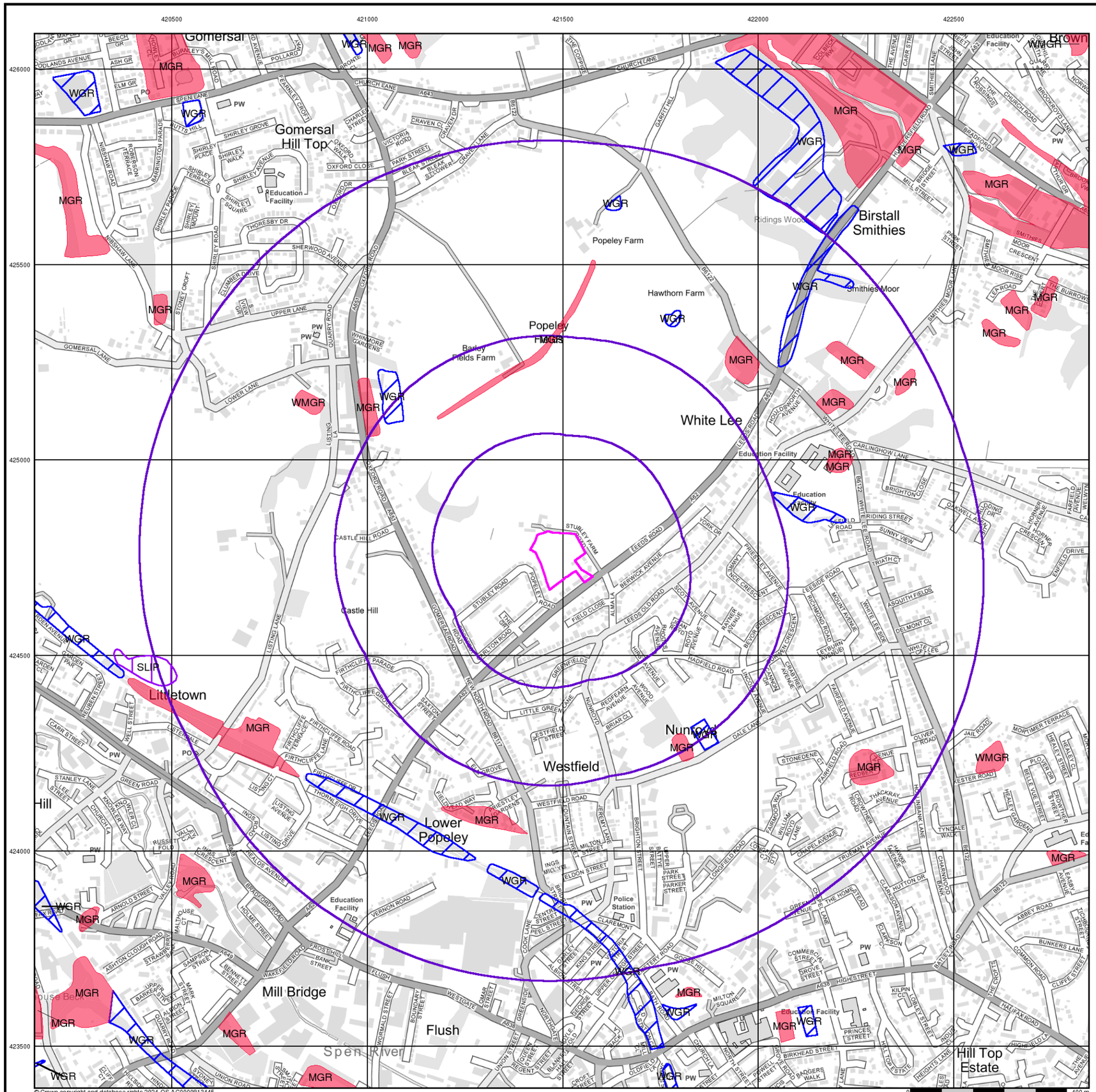
Search Buffer (m):	1000

Site Details

195, Leeds Road, HECKMONDWIKE, WF16 9DB



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Artificial Ground and Landslip

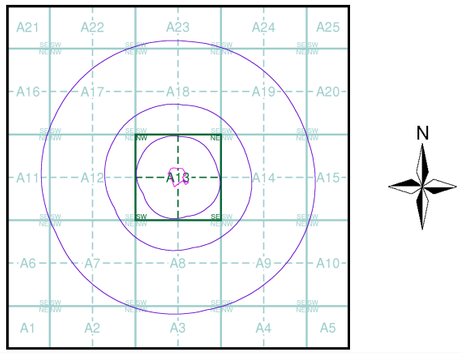
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions 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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Search Buffer (m):	1000

Site Details

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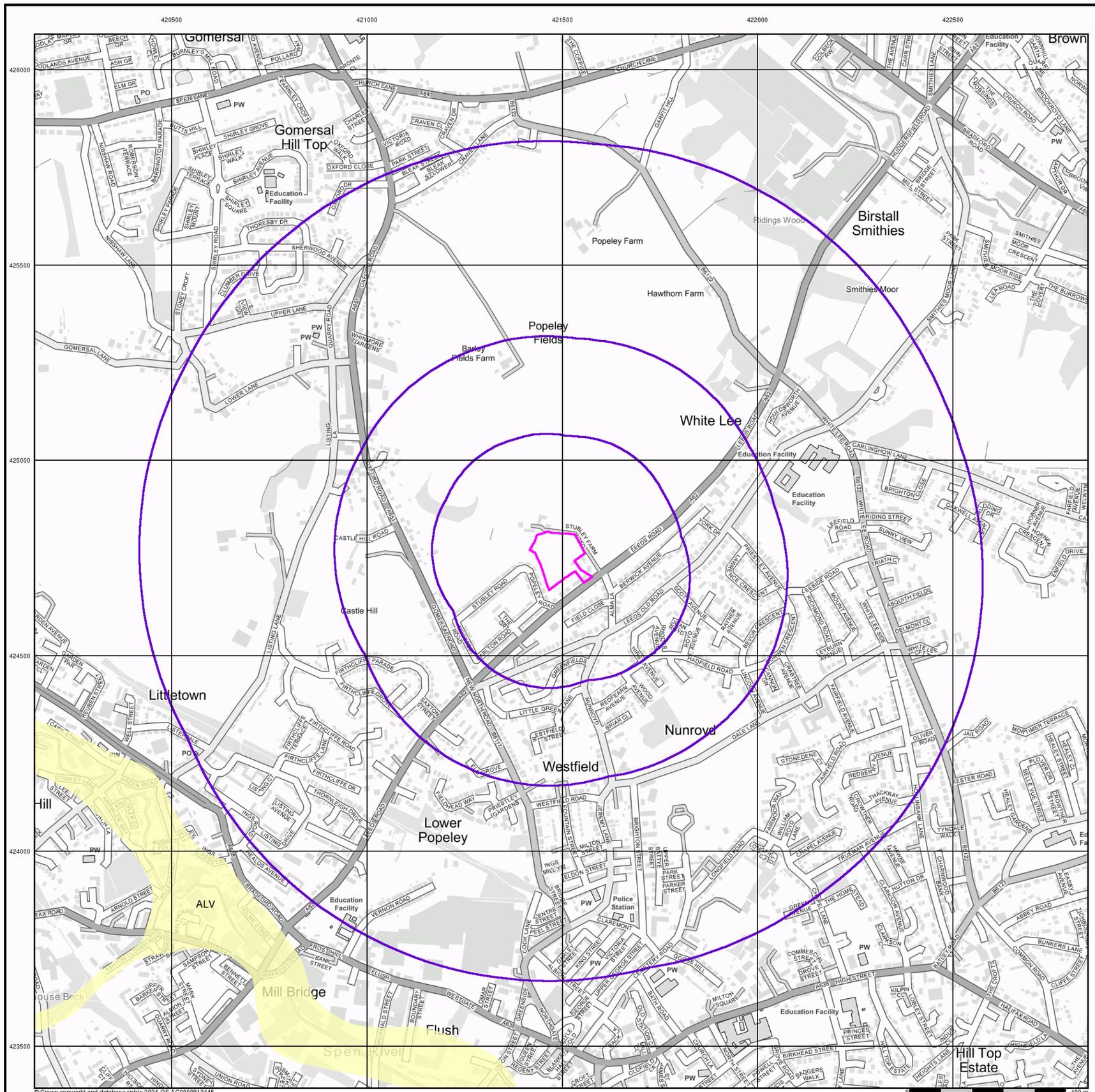
Web: www.envirocheck.co.uk



ARP GEOTECHNICAL LTD

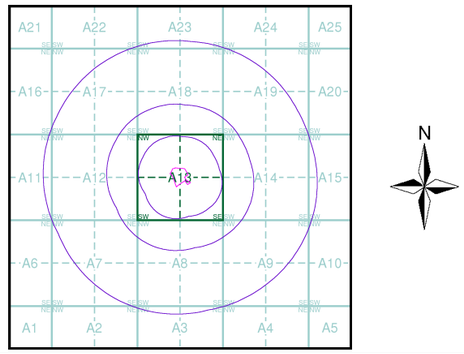
Superficial Geology

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



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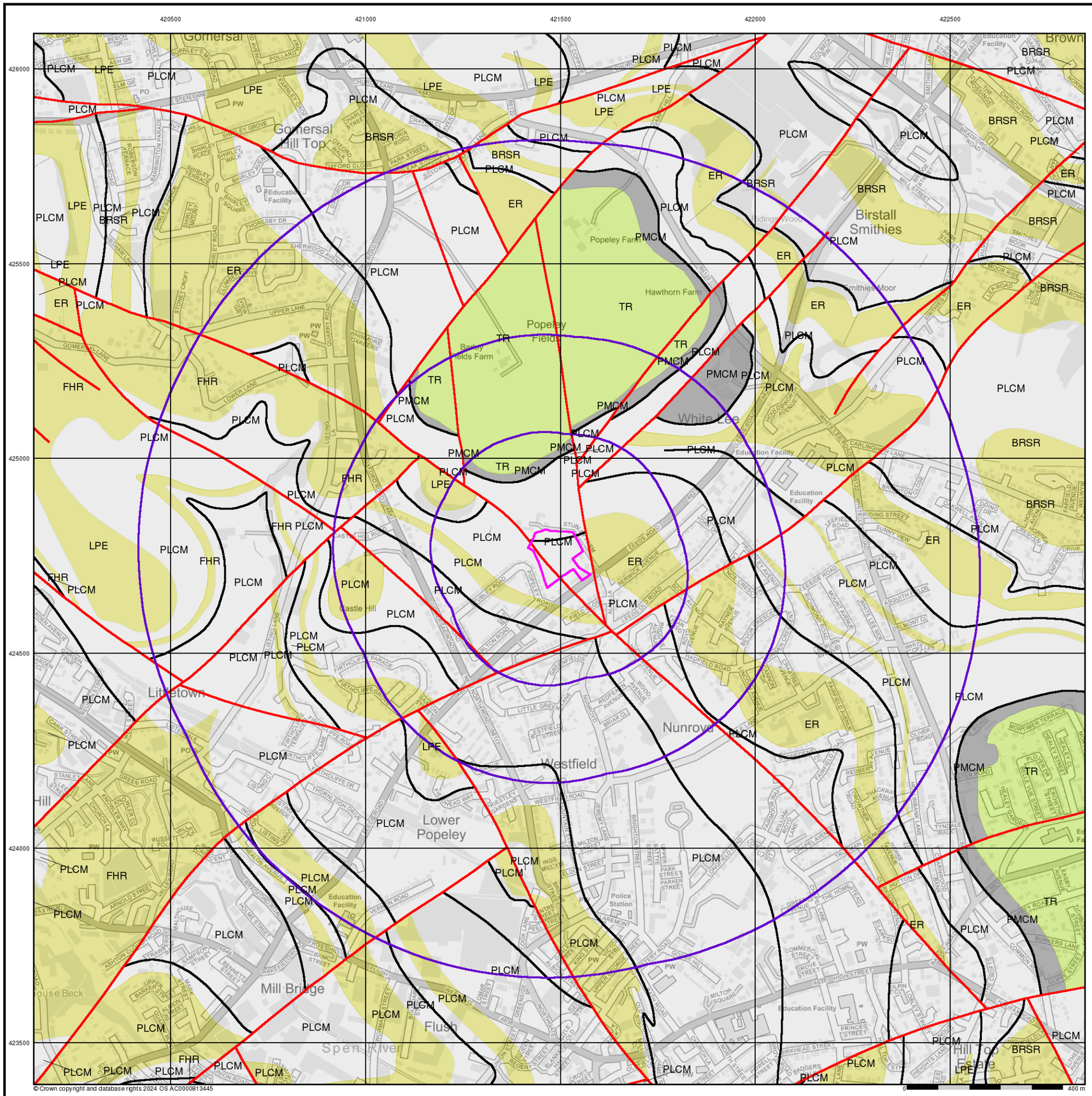


ARP GEOTECHNICAL LTD

Bedrock and Faults

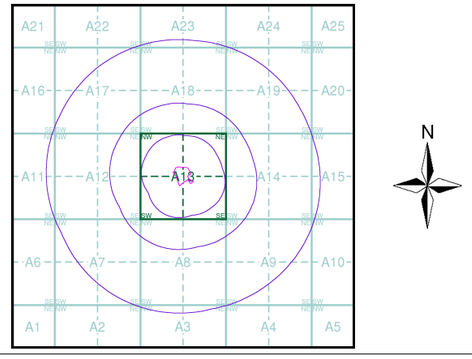
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

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



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Slice:	A
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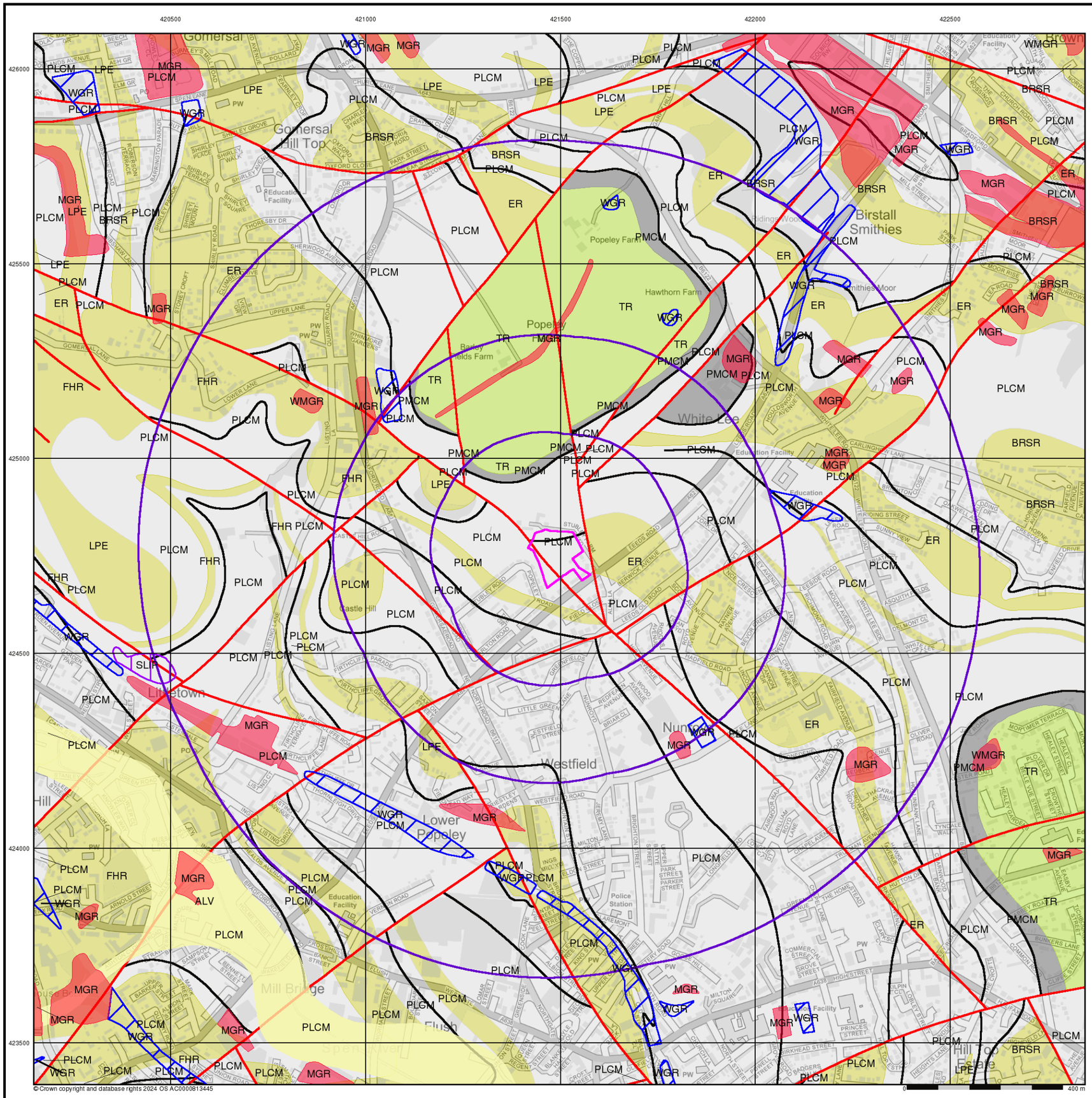

ARP GEOTECHNICAL LTD

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

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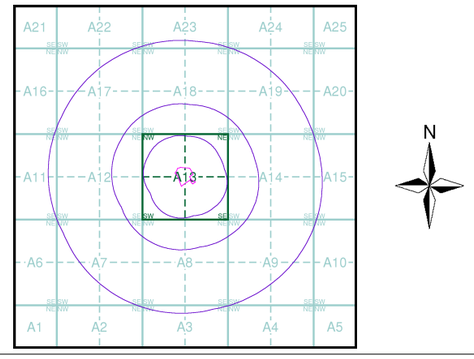
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A

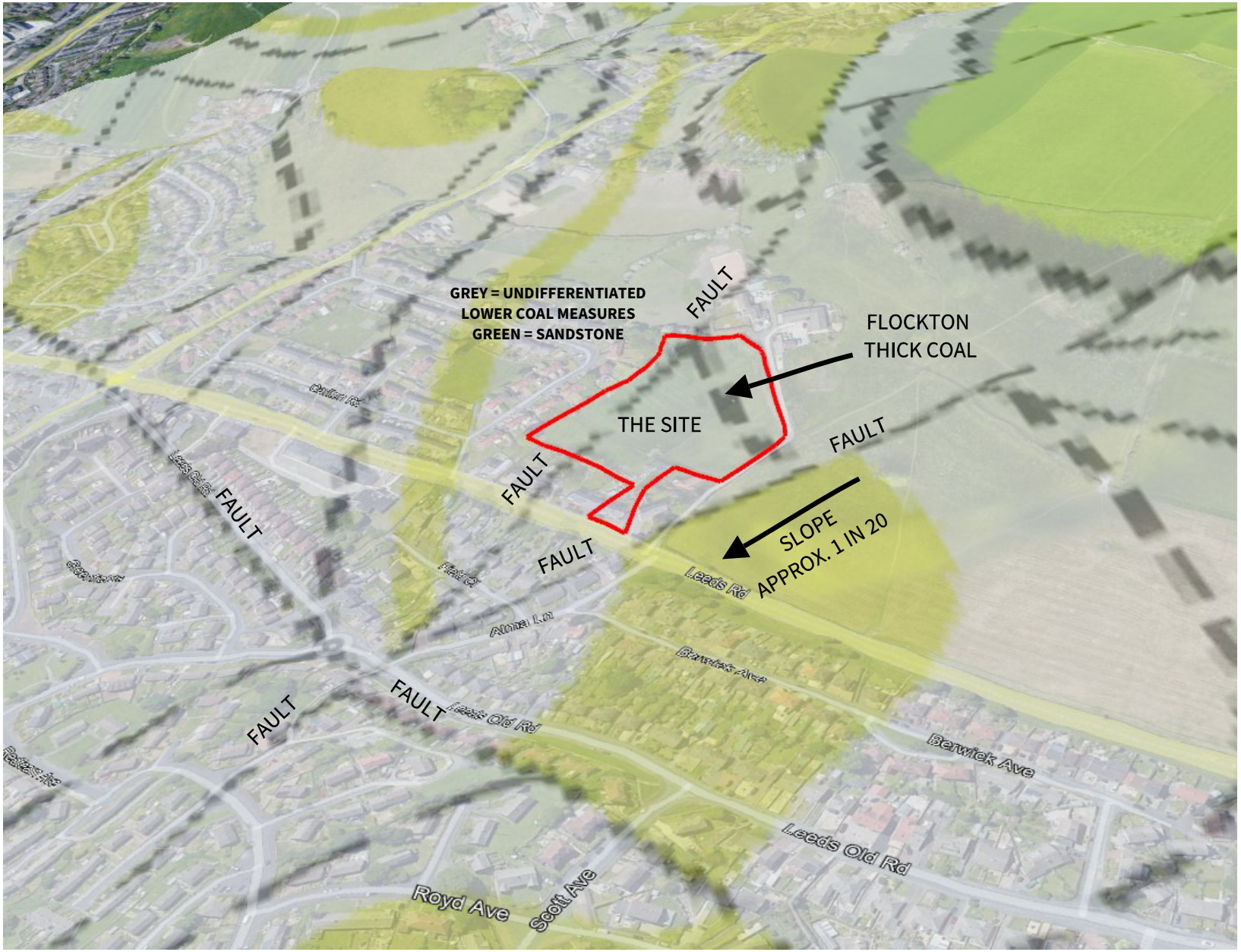


Order Details

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



ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS
Northwest House 5-6 Northwest Business Park Servia Hill · Leeds LS6 2QH
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	Scale
JR	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/)

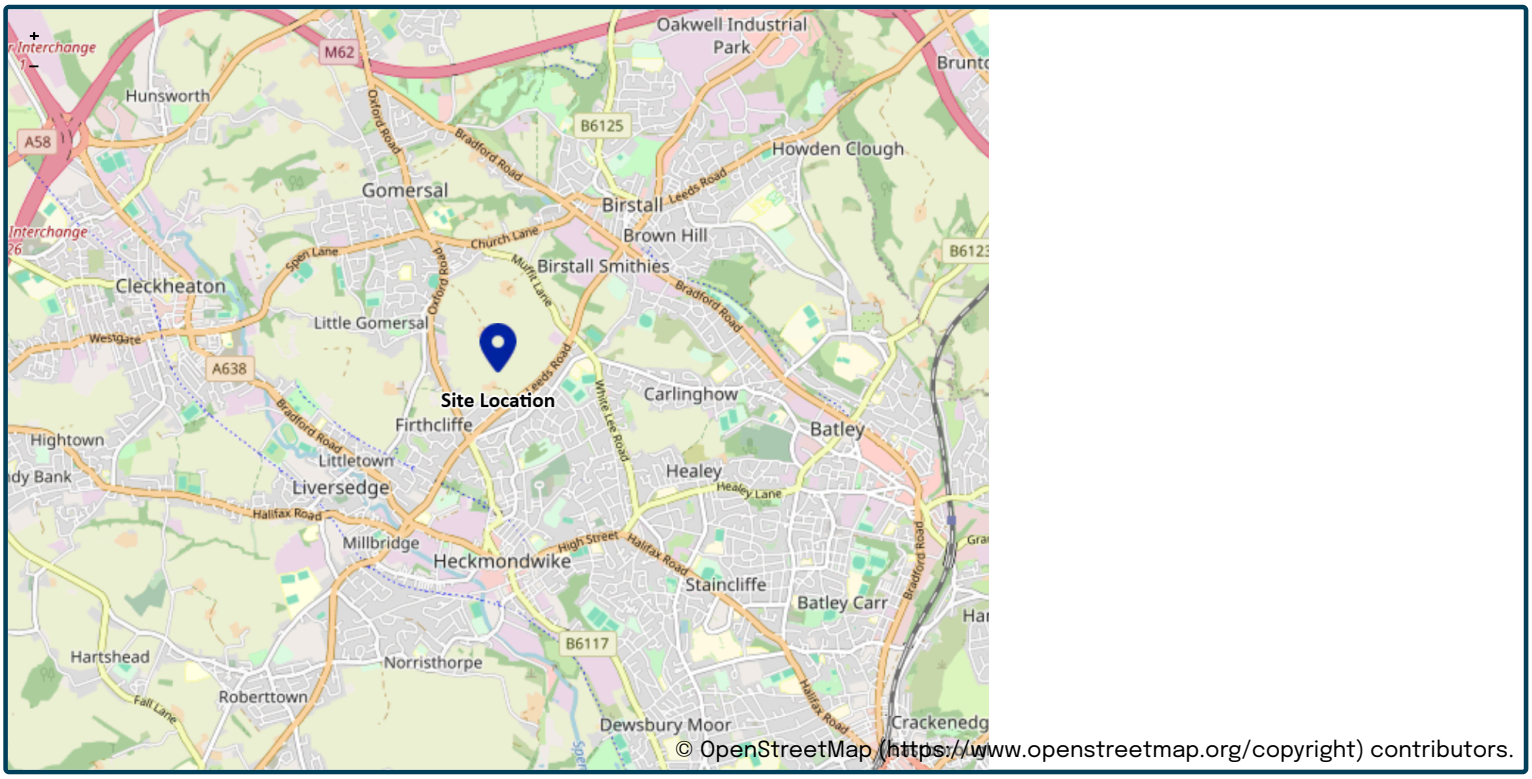
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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 TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
S1	S1	A 119.804	1350Ø	Type C	D400	121.289	119.804	1.260	421456.664	424776.195
S2	S2	A 119.431 B 119.431	1350Ø	Type C	D400	121.278	119.431	1.473	421482.578	424794.510
S3	S3	A 117.759 B 117.759 C 117.759	1500Ø	Type C	D400	119.166	117.759	1.032	421506.664	424760.049
S4	S4	A 117.027 B 117.027	1500Ø	Type C	D400	118.429	117.027	1.027	421515.626	424747.401
S5	S5	A 115.72 B 115.72 C 115.87	1500Ø	Type B	D400	117.916	115.720	1.821	421490.388	424728.920
S6	S6	A 115.10 B 115.10	1500Ø	Type B		117.612	115.100	2.137	421504.692	424710.025
S7	S7	A 115.05 B 115.05	1500Ø	Type B	D400	117.643	115.050	2.218	421529.865	424728.374
S8	S8	A 115.00 B 115.00	1500Ø	Type B	D400	117.202	115.000	1.827	421538.496	424717.309
S9	S9	A 114.80 B 114.85	2100Ø	Type B	D400	116.759	114.800	1.809	421560.006	424694.383
S10	S10	A 114.75 B 114.75	1200Ø	Type B	D400	116.705	114.750	1.805	421563.060	424690.488
S11	S11	A 114.50	1350Ø	Type C	B125	115.824	114.500	1.174	421541.290	424674.107
S12	S12	A 116.10	1350Ø	Type C	D400	117.671	116.100	1.271	421478.058	424720.194
S13	S13	A 119.270	1350Ø	Type C	D400	120.153	119.270	0.658	421525.986	424773.539
S14	S14	A 115.075 B 115.075	1350Ø	Type C		116.915	115.075	1.465	421517.251	424719.303
F1	F1	A 119.00	1350Ø	Type C	D400	121.422	119.000	2.272	421482.791	424797.147
F2	F2	A 117.40 B 117.40	1350Ø	Type C	D400	120.298	117.400	2.748	421495.355	424778.775
F3	F3	A 115.104 B 115.104 C 115.104	1200Ø	Type A	D400	119.084	115.104	3.831	421509.609	424759.031
F4	F4	A 114.636 B 114.636	1350Ø	Unknown	D400	120.840	114.636	6.054	421539.639	424781.312
F5	F5	A 114.548	1200Ø	Type A		120.659	114.548	5.961	421543.925	424775.713
F6	F6	A 115.70	1200Ø	Type B	D400	117.910	115.700	2.060	421488.410	424728.571
F7	F7	A 115.245 B 115.245	1200Ø	Type A	D400	118.538	115.245	3.142	421516.029	424749.666

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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5. DISCREPANCIES MUST BE REPORTED BACK TO THE ENGINEER PRIOR TO CONSTRUCTION.
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

NEW MANHOLE ON EXISTING HIGHWAY DRAIN

STUBLEY FARM ROAD

REV		BY	DATE
C	LAYOUT UPDATED	MJM	06.03.26
B	LAYOUT UPDATED	MJM	04.02.26
A	INITIAL ISSUE	MJM	29.05.25

FOR APPROVAL

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

advant ENGINEERS
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Horbury, Wakefield, West Yorkshire, WF4 5RA
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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	C

Appendix H
Drainage Calculations

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Size (mm)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
S1	0.137	1350	Type C	121.289	119.804	1.260	421456.664	424776.195
S2	0.106	1350	Type C	121.278	119.431	1.623	421482.578	424794.510
S13	0.087	1350	Type C	120.153	119.270	0.658	421525.986	424773.539
S3	0.016	1500	Type C	119.166	117.759	1.182	421506.664	424760.049
S4	0.076	1500	Type C	118.429	117.027	1.027	421515.626	424747.401
S12	0.095	1350	Type C	117.671	116.100	1.271	421478.058	424720.194
S5	0.078	1500	Type B	117.916	115.720	1.821	421490.388	424728.920
S6	0.000	1500	Type B	117.612	115.100	2.137	421504.692	424710.025
S14	0.000	1350	Type C	116.915	115.075	1.465	421517.251	424719.303
S7	0.023	1500	Type B	117.643	115.050	2.218	421529.865	424728.374
S8	0.052	1500	Type B	117.202	115.000	1.827	421538.496	424717.309
S9	0.000	2100	Type B	116.759	114.800	1.809	421560.006	424694.383
S10	0.000	1200	Type B	116.705	114.750	1.805	421563.060	424690.488
S11	0.000	1350	Type C	115.824	114.500	1.174	421541.290	424674.107

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (mm)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	S1	119.804	S2	119.431	Circ	225	31.732	85	0.600	1.260	1.623
1.001	S2	119.431	S3	117.759	Circ	375	42.044	25	0.600	1.473	1.032
2.000	S13	119.270	S3	117.759	Circ	225	23.565	16	0.600	0.658	1.182
1.002	S3	117.759	S4	117.027	Circ	375	15.502	21	0.600	1.032	1.027
1.003	S4	117.027	S5	115.720	Circ	375	31.282	24	0.600	1.027	1.821
3.000	S12	116.100	S5	115.870	Circ	300	15.105	66	0.600	1.271	1.746
1.004	S5	115.720	S6	115.100	Circ	375	23.698	38	0.600	1.821	2.137
1.005	S6	115.100	S14	115.075	Circ	375	15.614	623	0.600	2.137	1.465
1.006	S14	115.075	S7	115.050	Circ	375	15.538	623	0.600	1.465	2.218
1.007	S7	115.050	S8	115.000	Circ	375	14.033	281	0.600	2.218	1.827
1.008	S8	115.000	S9	114.850	Circ	375	31.437	210	0.600	1.827	1.534
1.009	S9	114.800	S10	114.750	Circ	150	4.949	99	0.600	1.809	1.805
1.010	S10	114.750	S11	114.500	Circ	150	27.245	109	0.600	1.805	1.174

Outfall Details

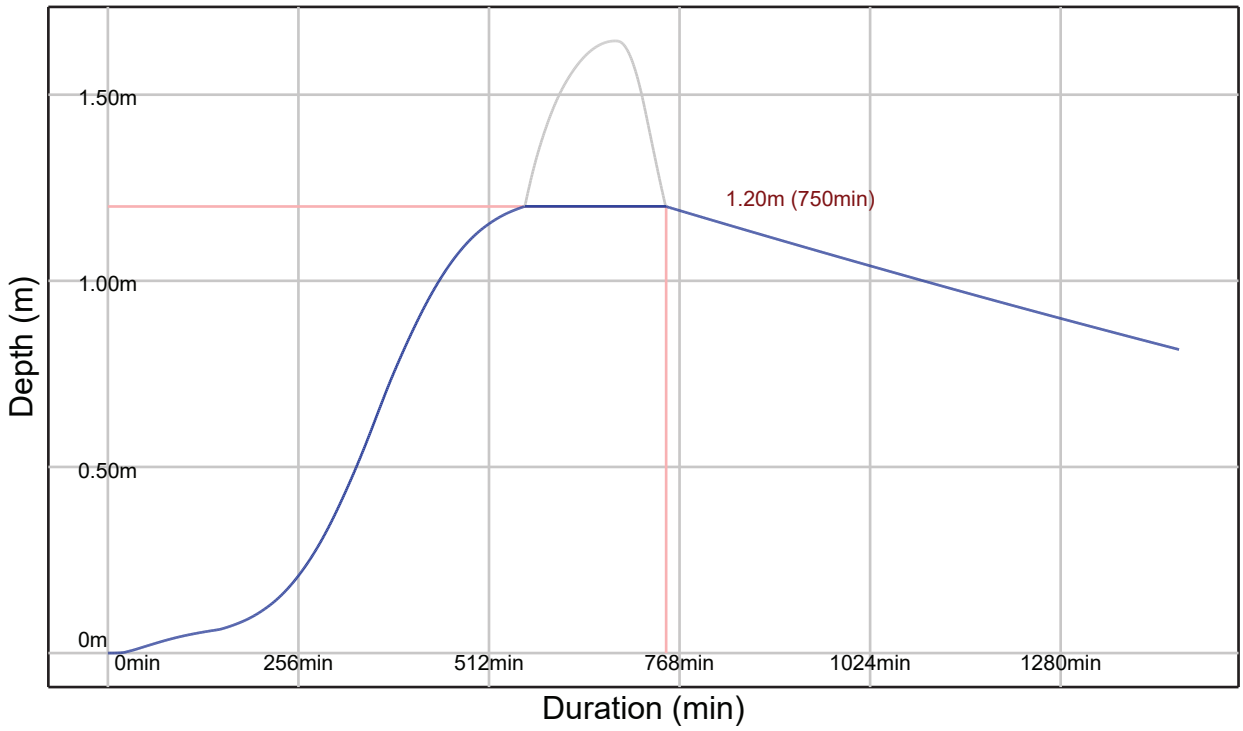
Outfall Manhole S11 : Free Discharge

Flow Control Details

Tank Structure at Manhole S14

Tank Invert (m)	Tank Height (m)	Porosity Ratio (%)	Area (m2)	Effective Area (m2) Area x Porosity Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
115.075	1.200	95.00	439.791	417.801	501.361	0.00000000	0.00000000	2.00

Tank 1 at S14 (100Yr+45% 720Min Winter)

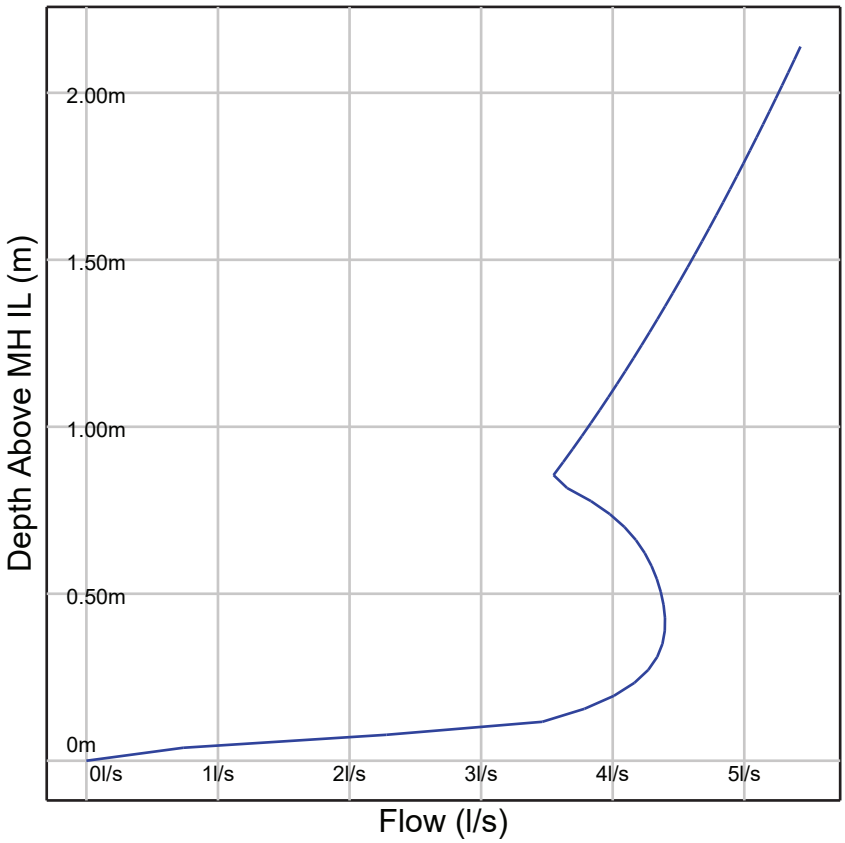


Controls within Manhole S9

Hydro-Brake® Optimum Control

Model Ref	Design Depth (m)	Design Flow (l/s)	Invert Offset (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0094-5000-1800-5000	1.800	5.000	0.000	0.413	4.398	0.839	3.520

Hydro-Brake® Optimum Control from S9 to S10



Simulation Settings

FSR: M5-60=19.00, R=0.35, Locale=England and Wales

Summer (Cv: 1.00), Winter (Cv: 1.00)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (1, +0%), (2, +0%), (30, +0%), (100, +0%), (100, +45%)

Manhole Flood Risk Freeboard: 0.300m

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
1Yr 15Min Winter	33.289	0.00	0.07	30Yr 720Min Winter	4.832	0.00	0.00
1Yr 15Min Summer	33.289	0.00	0.07	30Yr 960Min Summer	3.892	0.00	0.00
1Yr 30Min Winter	21.560	0.00	0.00	30Yr 960Min Winter	3.892	0.00	0.00
1Yr 30Min Summer	21.560	0.00	0.00	30Yr 1440Min Summer	2.866	0.00	0.00
1Yr 60Min Summer	13.523	0.00	0.00	30Yr 1440Min Winter	2.866	0.00	0.00
1Yr 60Min Winter	13.523	0.00	0.00	30Yr 2160Min Summer	2.108	0.00	0.00
1Yr 120Min Winter	8.362	0.00	0.00	30Yr 2160Min Winter	2.108	0.00	0.00
1Yr 120Min Summer	8.362	0.00	0.00	30Yr 2880Min Summer	1.693	0.00	0.00
1Yr 180Min Winter	6.304	0.00	0.00	30Yr 2880Min Winter	1.693	0.00	0.00
1Yr 180Min Summer	6.304	0.00	0.00	30Yr 4320Min Summer	1.242	0.00	0.00
1Yr 240Min Summer	5.165	0.00	-0.03	30Yr 4320Min Winter	1.242	0.00	0.00
1Yr 240Min Winter	5.165	0.00	-0.03	30Yr 5760Min Summer	0.996	0.00	0.00
1Yr 360Min Summer	3.897	0.00	0.00	30Yr 5760Min Winter	0.996	0.00	0.00
1Yr 360Min Winter	3.897	0.00	0.00	30Yr 7200Min Summer	0.839	0.00	0.00
1Yr 480Min Winter	3.187	0.00	0.00	30Yr 7200Min Winter	0.839	0.00	0.00
1Yr 480Min Summer	3.187	0.00	0.00	30Yr 8640Min Summer	0.730	0.00	0.00
1Yr 600Min Summer	2.727	0.00	0.00	30Yr 8640Min Winter	0.730	0.00	0.00
1Yr 600Min Winter	2.727	0.00	0.00	30Yr 10080Min Summer	0.648	0.00	0.00
1Yr 720Min Summer	2.401	0.00	0.00	30Yr 10080Min Winter	0.648	0.00	0.00
1Yr 720Min Winter	2.401	0.00	0.00	100Yr 15Min Summer	89.024	0.00	0.54
1Yr 960Min Summer	1.963	0.00	0.00	100Yr 15Min Winter	89.024	0.00	0.58
1Yr 960Min Winter	1.963	0.00	0.00	100Yr 30Min Summer	59.849	0.00	0.54
1Yr 1440Min Summer	1.479	0.00	0.00	100Yr 30Min Winter	59.849	0.00	0.54
1Yr 1440Min Winter	1.479	0.00	0.00	100Yr 60Min Summer	38.413	0.00	1.02
1Yr 2160Min Summer	1.115	0.00	0.00	100Yr 60Min Winter	38.413	0.00	1.00
1Yr 2160Min Winter	1.115	0.00	0.00	100Yr 120Min Summer	23.812	0.00	1.17
1Yr 2880Min Summer	0.913	0.00	0.00	100Yr 120Min Winter	23.812	0.00	1.16
1Yr 2880Min Winter	0.913	0.00	0.00	100Yr 180Min Summer	17.737	0.00	1.14
1Yr 4320Min Summer	0.689	0.00	0.00	100Yr 180Min Winter	17.737	0.00	1.14
1Yr 4320Min Winter	0.689	0.00	0.00	100Yr 240Min Summer	14.290	0.00	1.06
1Yr 5760Min Summer	0.565	0.00	0.00	100Yr 240Min Winter	14.290	0.00	1.07
1Yr 5760Min Winter	0.565	0.00	0.00	100Yr 360Min Summer	10.505	0.00	0.88
1Yr 7200Min Summer	0.484	0.00	0.00	100Yr 360Min Winter	10.505	0.00	0.88
1Yr 7200Min Winter	0.484	0.00	0.00	100Yr 480Min Summer	8.441	0.00	0.67
1Yr 8640Min Summer	0.427	0.00	0.00	100Yr 480Min Winter	8.441	0.00	0.68
1Yr 8640Min Winter	0.427	0.00	0.00	100Yr 600Min Summer	7.118	0.00	0.45
1Yr 10080Min Summer	0.383	0.00	0.00	100Yr 600Min Winter	7.118	0.00	0.46
1Yr 10080Min Winter	0.383	0.00	0.00	100Yr 720Min Summer	6.190	0.00	0.22
2Yr 15Min Winter	38.602	0.00	0.14	100Yr 720Min Winter	6.190	0.00	0.23
2Yr 15Min Summer	38.602	0.00	0.13	100Yr 960Min Summer	4.959	0.00	0.03
2Yr 30Min Summer	25.141	0.00	0.00	100Yr 960Min Winter	4.959	0.00	0.03
2Yr 30Min Winter	25.141	0.00	0.00	100Yr 1440Min Summer	3.622	0.00	0.00
2Yr 60Min Summer	15.824	0.00	0.05	100Yr 1440Min Winter	3.622	0.00	0.00
2Yr 60Min Winter	15.824	0.00	0.05	100Yr 2160Min Summer	2.640	0.00	0.00
2Yr 120Min Winter	9.788	0.00	0.03	100Yr 2160Min Winter	2.640	0.00	0.00
2Yr 120Min Summer	9.788	0.00	0.03	100Yr 2880Min Summer	2.107	0.00	0.00
2Yr 180Min Summer	7.366	0.00	0.00	100Yr 2880Min Winter	2.107	0.00	0.00
2Yr 180Min Winter	7.366	0.00	0.00	100Yr 4320Min Summer	1.530	0.00	0.00
2Yr 240Min Summer	6.020	0.00	0.00	100Yr 4320Min Winter	1.530	0.00	0.00
2Yr 240Min Winter	6.020	0.00	0.00	100Yr 5760Min Summer	1.218	0.00	0.00
2Yr 360Min Summer	4.524	0.00	-0.03	100Yr 5760Min Winter	1.218	0.00	0.00
2Yr 360Min Winter	4.524	0.00	-0.02	100Yr 7200Min Summer	1.019	0.00	0.00
2Yr 480Min Summer	3.690	0.00	0.00	100Yr 7200Min Winter	1.019	0.00	0.00
2Yr 480Min Winter	3.690	0.00	0.00	100Yr 8640Min Summer	0.882	0.00	0.00

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
2Yr 600Min Summer	3.151	0.00	0.00	100Yr 8640Min Winter	0.882	0.00	0.00
2Yr 600Min Winter	3.151	0.00	0.00	100Yr 10080Min Summer	0.781	0.00	0.00
2Yr 720Min Summer	2.768	0.00	0.00	100Yr 10080Min Winter	0.781	0.00	0.00
2Yr 720Min Winter	2.768	0.00	0.00	100Yr+45% 15Min Summer	129.084	0.00	1.01
2Yr 960Min Summer	2.257	0.00	0.00	100Yr+45% 15Min Winter	129.084	0.00	1.10
2Yr 960Min Winter	2.257	0.00	0.00	100Yr+45% 30Min Summer	86.782	0.00	1.25
2Yr 1440Min Summer	1.693	0.00	0.00	100Yr+45% 30Min Winter	86.782	0.00	1.31
2Yr 1440Min Winter	1.693	0.00	0.00	100Yr+45% 60Min Summer	55.699	0.00	1.57
2Yr 2160Min Summer	1.270	0.00	0.00	100Yr+45% 60Min Winter	55.699	0.00	1.59
2Yr 2160Min Winter	1.270	0.00	0.00	100Yr+45% 120Min Summer	34.527	0.00	1.62
2Yr 2880Min Summer	1.035	0.00	0.00	100Yr+45% 120Min Winter	34.527	0.00	1.64
2Yr 2880Min Winter	1.035	0.00	0.00	100Yr+45% 180Min Summer	25.719	0.00	1.59
2Yr 4320Min Summer	0.777	0.00	0.00	100Yr+45% 180Min Winter	25.719	0.00	1.60
2Yr 4320Min Winter	0.777	0.00	0.00	100Yr+45% 240Min Summer	20.720	0.00	1.52
2Yr 5760Min Summer	0.634	0.00	0.00	100Yr+45% 240Min Winter	20.720	0.00	1.54
2Yr 5760Min Winter	0.634	0.00	0.00	100Yr+45% 360Min Summer	15.232	0.00	1.37
2Yr 7200Min Summer	0.542	0.00	0.00	100Yr+45% 360Min Winter	15.232	0.00	1.38
2Yr 7200Min Winter	0.542	0.00	0.00	100Yr+45% 480Min Summer	12.240	0.00	1.23
2Yr 8640Min Summer	0.476	0.00	0.00	100Yr+45% 480Min Winter	12.240	0.00	1.23
2Yr 8640Min Winter	0.476	0.00	0.00	100Yr+45% 600Min Summer	10.322	0.00	1.09
2Yr 10080Min Summer	0.427	0.00	0.00	100Yr+45% 600Min Winter	10.322	0.00	1.07
2Yr 10080Min Winter	0.427	0.00	0.00	100Yr+45% 720Min Summer	8.975	0.00	0.96
30Yr 15Min Summer	68.836	0.00	0.48	100Yr+45% 720Min Winter	8.975	0.00	0.92
30Yr 15Min Winter	68.836	0.00	0.50	100Yr+45% 960Min Summer	7.191	0.00	0.64
30Yr 30Min Summer	45.828	0.00	0.20	100Yr+45% 960Min Winter	7.191	0.00	0.64
30Yr 30Min Winter	45.828	0.00	0.19	100Yr+45% 1440Min Summer	5.252	0.00	0.08
30Yr 60Min Summer	29.238	0.00	0.40	100Yr+45% 1440Min Winter	5.252	0.00	0.10
30Yr 60Min Winter	29.238	0.00	0.39	100Yr+45% 2160Min Summer	3.828	0.00	0.00
30Yr 120Min Summer	18.112	0.00	0.53	100Yr+45% 2160Min Winter	3.828	0.00	0.00
30Yr 120Min Winter	18.112	0.00	0.53	100Yr+45% 2880Min Summer	3.055	0.00	0.00
30Yr 180Min Summer	13.534	0.00	0.50	100Yr+45% 2880Min Winter	3.055	0.00	0.00
30Yr 180Min Winter	13.534	0.00	0.50	100Yr+45% 4320Min Summer	2.218	0.00	0.00
30Yr 240Min Summer	10.952	0.00	0.41	100Yr+45% 4320Min Winter	2.218	0.00	0.00
30Yr 240Min Winter	10.952	0.00	0.41	100Yr+45% 5760Min Summer	1.765	0.00	0.00
30Yr 360Min Summer	8.106	0.00	0.21	100Yr+45% 5760Min Winter	1.765	0.00	0.00
30Yr 360Min Winter	8.106	0.00	0.21	100Yr+45% 7200Min Summer	1.478	0.00	0.00
30Yr 480Min Summer	6.544	0.00	0.09	100Yr+45% 7200Min Winter	1.478	0.00	0.00
30Yr 480Min Winter	6.544	0.00	0.09	100Yr+45% 8640Min Summer	1.279	0.00	0.00
30Yr 600Min Summer	5.539	0.00	0.04	100Yr+45% 8640Min Winter	1.279	0.00	0.00
30Yr 600Min Winter	5.539	0.00	0.04	100Yr+45% 10080Min Winter	1.132	0.00	0.00
30Yr 720Min Summer	4.832	0.00	0.00	100Yr+45% 10080Min Summer	1.132	0.00	0.00

Simulation Results

Return Period (yrs) + Climate Change (%):

1yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	8	119.916	0.112	26.985		OK
S2	15 min Summer	8	119.516	0.085	47.650		OK
S13	15 min Summer	8	119.323	0.054	17.212		OK
S3	15 min Summer	8	117.857	0.099	67.574		OK
S4	15 min Summer	8	117.138	0.110	81.987		OK
S12	15 min Summer	8	116.174	0.074	18.619		OK
S5	15 min Winter	7	115.940	0.220	95.717		OK
S6	15 min Winter	6	115.902	0.802	36.817		Surcharged
S14	360 min Summer	260	115.286	0.211	3.896		OK
S7	360 min Summer	259	115.286	0.236	4.058		OK
S8	360 min Summer	259	115.286	0.286	4.393		OK
S9	360 min Summer	259	115.286	0.486	4.395		Surcharged
S10	180 min Winter	158	114.802	0.052	4.397		OK
S11	180 min Winter	158	114.551	0.051	4.397		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S1	S2	0.099	1.595	26.756	0.475	OK
1.001	15 min Summer	8	S2	S3	0.092	2.252	47.316	0.118	OK
2.000	15 min Summer	8	S13	S3	0.076	1.446	17.143	0.130	OK
1.002	15 min Summer	8	S3	S4	0.105	2.664	67.059	0.154	OK
1.003	15 min Winter	8	S4	S5	0.160	2.353	75.191	0.183	OK
3.000	15 min Summer	8	S12	S5	0.073	1.390	18.480	0.135	OK
1.004	15 min Winter	8	S5	S6	0.297	1.618	117.581	0.362	OK
1.005	15 min Summer	9	S6	S14	0.216	2.365	146.688	1.852	OK
1.006	360 min Summer	260	S14	S7	0.223	0.492	5.944	0.075	OK
1.007	360 min Summer	259	S7	S8	0.261	0.545	6.042	0.051	OK
1.008	360 min Summer	259	S8	S9	0.330	0.411	5.988	0.044	OK
1.009	180 min Winter	158	S9	S10	0.050	0.844	4.397	0.247	OK
1.010	180 min Winter	158	S10	S11	0.051	0.821	4.397	0.259	OK

Return Period (yrs) + Climate Change (%):

2yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	8	119.927	0.123	31.292		OK
S2	15 min Summer	8	119.522	0.092	55.257		OK
S13	15 min Summer	8	119.327	0.058	19.959		OK
S3	15 min Summer	8	117.866	0.107	78.388		OK
S4	15 min Summer	8	117.146	0.119	95.134		OK
S12	15 min Summer	8	116.180	0.080	21.592		OK
S5	15 min Winter	7	115.988	0.268	111.484		OK
S6	15 min Winter	7	115.902	0.802	114.087		Surcharged
S14	360 min Winter	286	115.331	0.256	3.870		OK
S7	360 min Winter	286	115.331	0.281	4.047		OK
S8	360 min Winter	286	115.331	0.331	4.378		OK
S9	360 min Winter	286	115.330	0.530	4.378		Surcharged
S10	1440 min Summer	844	114.802	0.052	4.397		OK
S11	1440 min Summer	844	114.551	0.051	4.397		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S1	S2	0.107	1.661	31.028	0.551	OK
1.001	15 min Summer	8	S2	S3	0.099	2.340	54.892	0.137	OK
2.000	15 min Summer	8	S13	S3	0.082	1.507	19.883	0.150	OK
1.002	15 min Summer	8	S3	S4	0.113	2.769	77.824	0.178	OK
1.003	15 min Winter	8	S4	S5	0.188	2.398	87.300	0.213	OK
3.000	15 min Winter	8	S12	S5	0.095	1.414	19.797	0.144	OK
1.004	15 min Winter	8	S5	S6	0.321	1.708	136.035	0.419	OK
1.005	360 min Winter	285	S6	S14	0.243	0.737	18.527	0.234	OK
1.006	360 min Winter	286	S14	S7	0.268	0.490	5.805	0.073	OK
1.007	360 min Winter	286	S7	S8	0.306	0.546	5.981	0.050	OK
1.008	360 min Winter	286	S8	S9	0.353	0.413	5.953	0.043	OK
1.009	1440 min Summer	844	S9	S10	0.050	0.844	4.397	0.247	OK
1.010	1440 min Summer	844	S10	S11	0.051	0.821	4.397	0.259	OK

Return Period (yrs) + Climate Change (%):

30yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	8	119.990	0.186	55.803		OK
S2	15 min Summer	8	119.554	0.123	98.456		OK
S13	15 min Summer	8	119.347	0.078	35.593		OK
S3	15 min Summer	8	117.908	0.149	139.855		OK
S4	15 min Summer	8	117.192	0.164	169.908		OK
S12	15 min Summer	8	116.300	0.200	38.503		OK
S5	15 min Summer	8	116.289	0.569	236.751		Surcharged
S6	15 min Winter	6	116.082	0.982	141.858		Surcharged
S14	480 min Winter	454	115.640	0.565	3.334		Surcharged
S7	480 min Winter	454	115.640	0.590	3.464		Surcharged
S8	480 min Winter	454	115.640	0.640	3.753		Surcharged
S9	480 min Winter	454	115.640	0.840	3.753		Surcharged
S10	2880 min Winter	1514	114.802	0.052	4.397		OK
S11	4320 min Summer	2880	114.551	0.051	4.397		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S1	S2	0.155	1.904	55.247	0.980	OK
1.001	15 min Summer	8	S2	S3	0.136	2.704	97.929	0.245	OK
2.000	15 min Summer	8	S13	S3	0.113	1.768	35.484	0.268	OK
1.002	15 min Summer	8	S3	S4	0.157	3.195	139.038	0.319	OK
1.003	15 min Summer	8	S4	S5	0.270	2.366	168.911	0.412	OK
3.000	15 min Summer	9	S12	S5	0.250	1.445	41.951	0.306	OK
1.004	15 min Winter	9	S5	S6	0.375	2.163	238.901	0.736	Surcharged
1.005	180 min Summer	105	S6	S14	0.375	1.065	84.389	1.066	Surcharged
1.006	60 min Winter	49	S14	S7	0.375	0.459	7.740	0.098	Surcharged
1.007	60 min Winter	44	S7	S8	0.375	0.512	8.426	0.071	Surcharged
1.008	30 min Winter	26	S8	S9	0.375	0.535	14.138	0.103	Surcharged
1.009	2880 min Winter	1514	S9	S10	0.050	0.844	4.397	0.247	OK
1.010	4320 min Summer	2880	S10	S11	0.051	0.821	4.397	0.259	OK

Return Period (yrs) + Climate Change (%):

100yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	9	120.219	0.415	69.215		Surcharged
S2	15 min Summer	9	119.570	0.139	123.001		OK
S13	15 min Summer	8	119.359	0.089	46.031		OK
S3	15 min Summer	8	117.928	0.169	176.120		OK
S4	15 min Summer	9	117.261	0.233	214.390		OK
S12	15 min Summer	9	116.675	0.575	47.759		Surcharged
S5	15 min Summer	9	116.643	0.923	302.999		Surcharged
S6	15 min Winter	6	116.152	1.052	183.030		Surcharged
S14	600 min Winter	572	115.863	0.788	3.426		Surcharged
S7	600 min Winter	572	115.863	0.813	3.551		Surcharged
S8	600 min Winter	572	115.863	0.863	3.844		Surcharged
S9	600 min Winter	572	115.863	1.063	3.845		Surcharged
S10	7200 min Summer	4394	114.802	0.052	4.397		OK
S11	7200 min Summer	4394	114.551	0.051	4.397		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	9	S1	S2	0.182	2.013	69.407	1.232	OK
1.001	15 min Summer	9	S2	S3	0.154	2.879	123.236	0.308	OK
2.000	15 min Summer	8	S13	S3	0.129	1.943	45.902	0.347	OK
1.002	15 min Summer	9	S3	S4	0.201	3.130	176.100	0.404	OK
1.003	15 min Summer	9	S4	S5	0.304	2.324	215.253	0.524	OK
3.000	15 min Winter	9	S12	S5	0.300	1.434	46.591	0.339	Surcharged
1.004	15 min Winter	9	S5	S6	0.375	2.639	291.474	0.898	Surcharged
1.005	30 min Winter	24	S6	S14	0.375	2.515	224.281	2.832	Surcharged
1.006	60 min Winter	37	S14	S7	0.375	0.457	8.090	0.102	Surcharged
1.007	30 min Winter	22	S7	S8	0.375	0.472	10.182	0.086	Surcharged
1.008	15 min Winter	14	S8	S9	0.375	0.630	21.328	0.155	Surcharged
1.009	7200 min Summer	3756	S9	S10	0.050	0.844	4.397	0.247	OK
1.010	7200 min Summer	4394	S10	S11	0.051	0.821	4.397	0.259	OK

Return Period (yrs) + Climate Change (%):

100yr+45%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	9	120.832	1.028	100.361		Surcharged
S2	15 min Summer	9	119.600	0.170	176.371		OK
S13	15 min Summer	8	119.380	0.110	66.748		OK
S3	15 min Summer	10	118.241	0.483	225.332		Surcharged
S4	15 min Summer	10	117.996	0.969	279.040		Surcharged
S12	15 min Summer	9	117.392	1.292	69.249		Flood Risk
S5	15 min Summer	10	117.339	1.619	389.805		Surcharged
S6	720 min Winter	682	116.720	1.620	4.522		Surcharged
S14	720 min Winter	682	116.719	1.644	4.524		Surcharged
S7	720 min Winter	682	116.719	1.669	4.695		Surcharged
S8	720 min Winter	682	116.719	1.719	5.090		Surcharged
S9	720 min Winter	682	116.719	1.919	5.091		Flood Risk
S10	720 min Winter	682	114.806	0.056	5.093		OK
S11	720 min Winter	682	114.555	0.055	5.093		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	9	S1	S2	0.197	2.669	98.661	1.751	OK
1.001	15 min Summer	9	S2	S3	0.272	2.963	176.521	0.441	OK
2.000	15 min Summer	8	S13	S3	0.168	2.176	66.584	0.503	OK
1.002	15 min Summer	10	S3	S4	0.375	3.003	232.785	0.534	Surcharged
1.003	15 min Winter	10	S4	S5	0.375	2.458	271.513	0.662	Surcharged
3.000	15 min Winter	8	S12	S5	0.300	1.314	62.023	0.452	Surcharged
1.004	15 min Winter	10	S5	S6	0.375	3.446	380.600	1.173	Surcharged
1.005	15 min Winter	13	S6	S14	0.375	4.325	384.591	4.856	Surcharged
1.006	60 min Summer	31	S14	S7	0.375	0.471	7.381	0.093	Surcharged
1.007	30 min Winter	18	S7	S8	0.375	0.474	8.106	0.068	Surcharged
1.008	15 min Winter	11	S8	S9	0.375	0.652	24.907	0.181	Surcharged
1.009	720 min Winter	682	S9	S10	0.055	0.874	5.093	0.286	OK
1.010	720 min Winter	682	S10	S11	0.056	0.855	5.093	0.300	OK

Appendix I
Flood Exceedance Plan

N

Stubley Farm Cottage

STUBLEY FARM ROAD

LEEDS 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 121.000
FFL 121.300
FFL 120.700
FFL 120.400
FFL 120.400
FFL 120.700
FFL 120.400
FFL 119.100
FFL 121.000
FFL 118.600
FFL 118.200
FFL 118.300
FFL 118.150
FFL 118.000
FFL 117.400
FFL 116.500
FFL 117.100

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

117.0m

NEW MANHOLE ON EXISTING FOUL SEWER

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

NEW MANHOLE ON EXISTING HIGHWAY DRAIN

NOTES

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2. THIS DRAWING MAY NOT BE REPRODUCED IN ANY FORM WITHOUT PRIOR WRITTEN AGREEMENT FROM ADVANT ENGINEERS.
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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	

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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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