GADSDEN CONSULTING

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY REPORT

LOCATION: CHATBURN ROAD, CLITHEROE, BB7 4SF
CLIENT: OAKMERE HOMES
JOB No: 26117

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1. Introduction

1.1 Background

Gadsden Consulting have been appointed by Oakmere Homes to undertake a Flood Risk Assessment and Drainage Strategy Report in support of a planning application for the construction 39 residential dwellings and associated infrastructure at Chatburn Road, Clitheroe, BB7 4SF.

The purpose of this report is to comment upon the flood risk status of the area and the likelihood of increased flood risk to the development land or the surrounding area as a result.

1.2 Planning Policy Context

Current planning policy for flood risk and surface water management is dictated by the National Planning Policy Framework (NPPF). This Flood Risk Assessment (FRA) has been prepared in accordance with the requirements of the NPPF.

The NPPF states "A Site Specific Flood Risk Assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems". The NPPF explains that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

A sequential, risk-based approach to the location of development is outlined in the NPPF with the aim to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- applying the Sequential Test
- if necessary, applying the Exception Test
- safeguarding land from development that is required for current and future flood management
- using opportunities offered by new development to reduce the causes and impacts of flooding
- where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.

1.3 Sequential Test

The NPPF states that the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding and that a sequential approach should be used in areas known to be at risk from any form of flooding. Development types are given a "Flood Risk Vulnerability Classification" in one of the following groups:

- Essential Infrastructure – including essential transport infrastructure, essential utility infrastructure, wind turbines
- Highly Vulnerable – including police, ambulance and fire stations, command centres, basements, caravan and mobile home parks for residential use and installations requiring hazardous consent.
- More Vulnerable – including hospitals, residential institutions, dwellings, educational facilities, landfill for hazardous substances and sites used for short stay holiday lets such as camping and caravans.
- Less Vulnerable – including shops, offices, restaurants, cafes and takeaways, general industry, storage and distribution, non-residential institutions, leisure facilities, agricultural and forestry activities.
- Water-Compatible Development – including flood control infrastructure, MOD installations etc

Table 1 below defines whether the development is appropriate based on the vulnerability classification and the environment agency's flood zone.

Table 1 - Flood Risk Vulnerability and Flood Zone Compatibility (extract from NPPF)

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

1.4 Climate Change

The NPPF explains that global sea level will continue to rise, depending on greenhouse gas emissions and the sensitivity of the climate system. It states that, in preparing an FRA, the allowances for the rates of relative sea level rise shown in Table 2 should be used as a starting point for considering flooding from the sea.

Table 2 - Recommended Contingency Allowances for Sea Level Rises

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
North west	Higher central	4.5 (158)	7.3 (219)	10 (300)	11.2 (336)	1.01
North west	Upper end	5.7 (200)	9.9 (297)	14.2 (426)	16.3 (489)	1.41

The Technical Guidance to NPPF also states that when "the Environment Agency, as a statutory consultee, uses the management catchment climate change allowances from the peak river flow map as benchmarks." For flood risk assessments where the development site falls within flood zones 2 and 3a, the central allowance should be used for the vulnerability classification of 'less vulnerable'.

Table 3 - Ribble Management Catchment Peak River Flow Allowances

	Central	Higher	Upper
2020s	16%	19%	27%
2050s	23%	29%	44%
2080s	36%	46%	71%

1.5 Local Policy Guidance

The NPPF sets out that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA). For this development, the relevant guidance is the Ribble Valley Borough Council Level 1 SFRA and this has been referred to in the production of this site specific FRA.

2. Site Characteristics & Development Proposal

2.1 Site Description

The site is approximately 1.80km north east of Clitheroe town centre. The site is bordered by public highways to the east and south, with residential properties to the west and a railway line to the north. Further north and east, beyond the railway line and highway respectively is agricultural land. Further south of the highway is residential properties.

The application site is roughly rectangular in shape and covers an area of approximately 2.90 hectares. The site is mainly agricultural land with a watercourse running from the south eastern corner, parallel to the eastern boundary, before turning through 90 degrees to the west just over halfway through the site. It runs roughly parallel to the northern boundary before exiting the site towards the north western corner.

The site is accessed from the existing highway to the south, known as Chatburn Road. The site currently vacant with no above ground structures present.

2.2 Development Proposal

It is proposed to construct 39 residential dwellings with associated infrastructure.

2.3 Topography

There is a banking from the northern boundary up to a bund that runs parallel to the railway line. The land then falls steeply to the south to the existing watercourse. Levels then rise from the watercourse to the highway to the south. Levels also fall steeply from the highway to the east towards the watercourse that runs parallel to this.

The topographical survey can be seen in Appendix A.

2.4 Existing Drainage

United Utilities records do not show any adopted surface water sewers within close proximity to the site.

Oakmere Homes have developed the adjacent site to the south west and installed foul drainage which ultimately discharges into the existing 225mm diameter adopted foul sewer within Chatburn Road.

The adjacent site drainage plan can be seen in Appendix B.

2.5 Hydrology

As previously stated, there is an unnamed watercourse running from the south eastern corner, parallel to the eastern boundary, before turning through 90 degrees to the west just over halfway through the site. It runs roughly parallel to the northern boundary before exiting the site towards the north western corner.

The River Ribble is approximately 1.10km to the north of the site.

2.6 Geology

Preliminary geological information has been sourced from the British Geological Survey website as well as the BEK Enviro Site investigation and Ground Assessment Report (BEK-26028-2, April 2026). A summary of this information is as follows:-

- Made Ground – no records of made ground on-site and none encountered during site investigations.
- Superficial geology – Till, Devensian-Diamicton. These sedimentary deposits are glacigenic in origin. They are detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods during the Quaternary.
- Bedrock – Clitheroe Limestone Formation And Hodder Mudstone Formation (Undifferentiated)-Mudstone. These sedimentary rocks are shallow-marine in origin. They are biogenic and detrital, generally comprising carbonate material (coral, shell fragments), forming beds and locally reefs.

LandIS Soilscapes website indicates the site to be underlain by ‘slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage’.

3. Existing Flood Hazards

3.1 Introduction

This section considers the following sources of flood hazards:

- Tidal
- Fluvial
- Groundwater
- Drainage systems

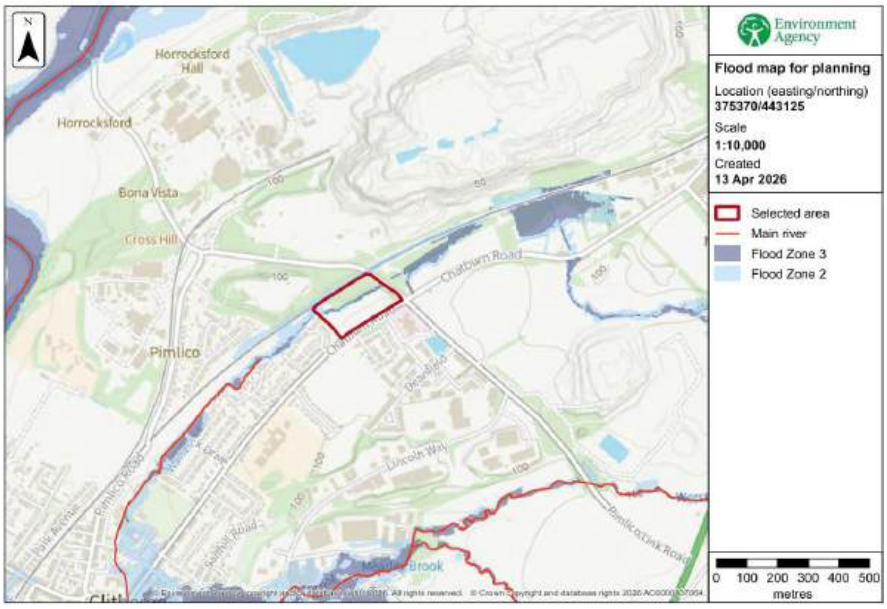
Product 4 flood risk information data has been sourced from the Environment Agency. This can be seen in Appendix C.

3.2 Tidal & Fluvial Flooding

The EA flood map shows the flood hazard from tidal and river sources. The latest flood information from the EA shows the riparian sections of the watercourse to be flood zones 2 and 3, with the remainder of the site in flood zone 1. EA Flood Zones are defined as follows: -

- **Flood Zone 1** (low probability) is defined as land assessed as having less than a 0.1% annual probability of flooding from a river or the sea.
- **Flood Zone 2** (medium probability) is defined as land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%) in any year.
- **Flood Zone 3** (high probability) is defined as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. The Technical Guidance to NPPF splits Flood Zone 3 in to two sub-categories:
    1. **Flood Zone 3a** (high probability) is defined as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
    2. **Flood Zone 3b** is defined as functional floodplain.

Map 1 - EA Flood Map for Planning (River & Sea)



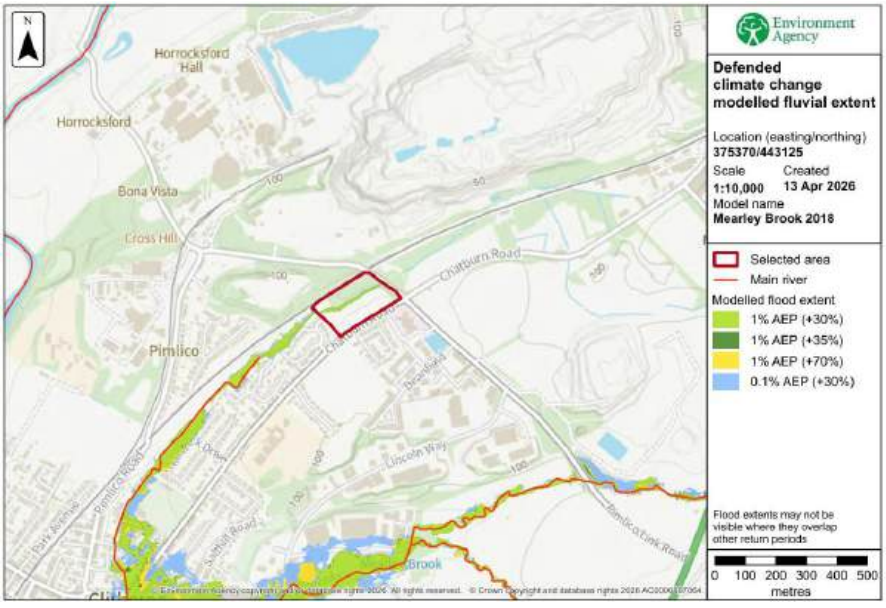
3.3 Tidal Flooding

Due to the sites location and elevation relative to the sea, tidal flooding is considered low for the site.

3.4 Fluvial Flooding

The map below shows the defended climate change modelled fluvial extents. This shows that the watercourse and riparian sections flood under all the modelled return period (1% AEP +30% CC to 0.1% AEP + 30% CC).

Map 2 – EA Defended Climate Change Modelled Fluvial Extent



The below defended modelled fluvial node locations map shows nodal points on the watercourse to the north of the site. The nodal points on-site are nodal points 7 & 8. The table below shows the return periods and corresponding water levels.

Map 3 - EA Defended Modelled Fluvial Node Locations

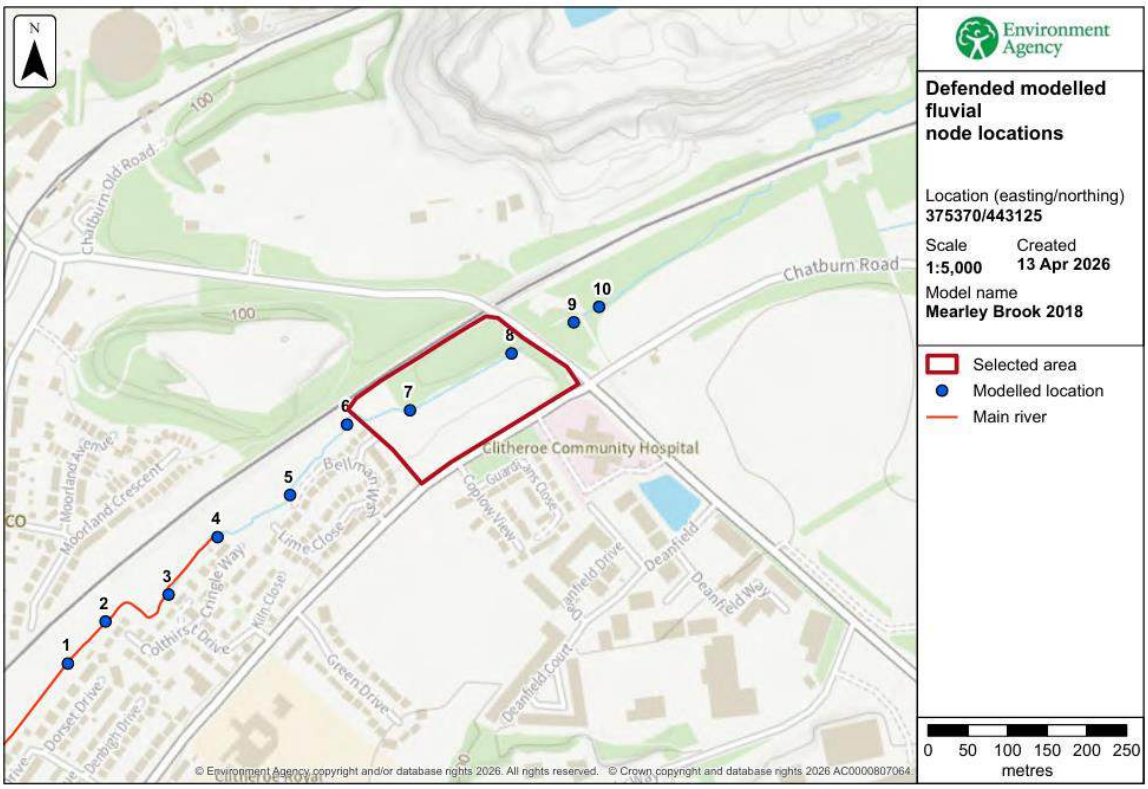


Table 4 -EA Defended Modelled Fluvial Return Periods and Water Levels

Label	Modelled location ID	Easting	Northing	50% AEP	20% AEP	10% AEP	5% AEP	4% AEP	3.33% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
1	982459	374875	442789	80.06	80.18	80.26	80.34	80.36	80.39	80.43	80.46	80.47	80.51	80.62
2	982392	374923	442841	80.47	80.57	80.64	80.70	80.72	80.73	80.78	80.81	80.83	80.89	81.03
3	982314	375002	442875	80.88	80.99	81.06	81.12	81.14	81.16	81.21	81.27	81.31	81.39	81.56
4	982332	375064	442947	81.61	81.72	81.79	81.85	81.87	81.89	81.94	81.97	81.98	82.03	82.16
5	982243	375155	443000	83.01	83.06	83.09	83.11	83.12	83.12	83.14	83.15	83.16	83.19	83.28
6	982225	375227	443089	84.24	84.30	84.35	84.40	84.42	84.44	84.48	84.51	84.53	84.58	84.68
7	982416	375306	443107	85.55	85.61	85.66	85.71	85.73	85.74	85.77	85.80	85.82	85.88	85.98
8	982421	375434	443178	87.68	87.72	87.75	87.78	87.79	87.80	87.83	87.84	87.86	87.91	87.99
9	982434	375512	443217	88.99	89.08	89.14	89.21	89.22	89.24	89.28	89.30	89.33	89.39	89.59
10	982252	375544	443236	89.47	89.58	89.66	89.74	89.76	89.78	89.85	89.91	89.96	90.08	90.22

The level on site for the 1% AEP is 85.82 & 87.86m AOD for nodal points 7 & 8 respectively.

No climate change allowances have been provided by the Environment Agency. The 1% AEP + 36% climate change event (central allowance) has been calculated by deriving a rating curve, adding a 36%

uplift to the 1% AEP peak river flow (as per table 3), and then using the rating curve to extrapolate the corresponding water level. The critical water level has been calculated as 85.900 and 87.924m AOD for nodal points 7 and 8 respectively.

The climate change flood level calculations can be seen in Appendix D.

3.5 Groundwater

The risk of groundwater flooding is unlikely as stated on the .gov.uk website. Groundwater was encountered at depths of 1.0-1.50m below ground level within 7 of the 9 boreholes during the ground investigations. The report states 'groundwater encountered during the site investigation is considered to represent water held within more permeable horizons of the superficial deposits given that groundwater was not encountered within all exploratory locations'.

3.6 Drainage Systems & Pluvial Flooding (Surface Water)

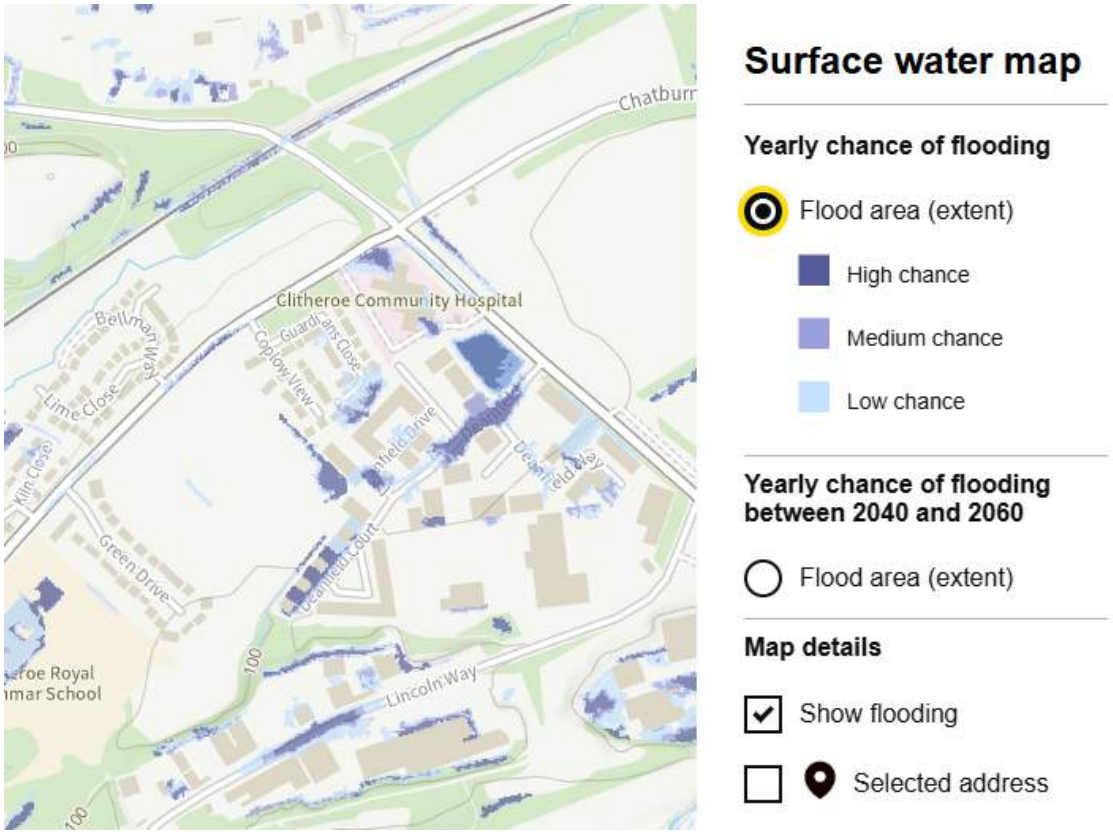
Surface Water (pluvial) flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and watercourses may be entirely overwhelmed.

The .gov.uk website states that there is a very low chance of surface water flooding currently, and between 2040 to 2060. The surface water flood map below shows localised areas to the north along the railway lines, and to the south along Chatburn Road, that are at risk of surface water flooding.

The risk levels are classified as follows:

- Very Low: Less than 0.1% chance of a flood each year
- Low: Between 0.1% and 1.0% chance of a flood each year
- Medium: Between 1% and 3.3% chance of a flood each year
- High: More than 3.3% chance of a flood each year

Map 4 - EA Surface Water Flood Map



4. Proposed Development

4.1 Introduction

As detailed in section 3 of this report the following flood hazards need to be considered in the development of this site: -

Table 5 – Flood Hazards & Mitigation Measures

Flood Hazard	Mitigation for Impact on Development
Tidal	N/A
Fluvial (Zone 3,2 & 1)	N/A – no development to be within flood zones 2 or 3
Groundwater	N/A
Surface Water	N/A - New Drainage network to be installed limiting discharge off site

4.2 Sequential Test & Exception Test

As previously discussed the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding.

The proposed development falls within flood zones 1, 2 & 3. The vulnerability classification is “more vulnerable”. No development will take place within flood zones 2 and 3 and therefore the development is deemed appropriate.

4.3 Proposed Levels

Critical flood levels have been calculated for nodal points 7 and 8 as 85.900 and 87.924m AOD respectively.

Nodal point 8 is at east of the site. Finished floor levels in this area should be a minimum of 88.524m AOD. This is the critical flood level with a 600mm freeboard.

Nodal point 7 is further to the west of the watercourse. Finished floor levels in this area should be a minimum of 86.500m AOD. This is the critical flood level with a 600mm freeboard.

Minimum finished floor levels should then be calculated linearly between the critical flood levels for the two nodal points, plus a 600mm freeboard. This would mean that finished floor levels centrally between the two nodal points should be a minimum of 87.512m AOD.

4.4 Proposed Drainage Strategy

Any proposed drainage scheme should minimise the rate of runoff from the site to greenfield runoff rates. Planning Policy guidance suggests the following hierarchy for surface water discharge: -

1. Into the ground (Infiltration)
2. To a surface water body;
3. To a surface water sewer;
4. To a combined sewer.

BRE365 soakaway testing has not been undertaken as the site investigation confirmed the site to be underlain by impermeable strata, with water being encountered at depths between 1.0-1.50m below ground level within 7 of the 9 boreholes.

The next option for discharge of surface water is to the on site watercourse at a controlled rate.

Driveways are to be constructed using permeable paving Surface water will pass through the stone layer beneath, before being picked up in a collector drain and taken to the formal network.

Surface water from house roof areas will pass through a bioretention planter before entering the formal drainage system.

Highways will be served by trapped gullies. With highway, roof and driveway areas all being served by geocellular attenuation baskets underneath the highway. All attenuation features have been designed for return periods of 100 years plus a 50% allowance for climate change and a 10% allowance for urban creep.

The flow will be restricted using a vortex flow control device to the 1 year greenfield runoff rate for the corresponding event, and Qbar for return periods above that up to the designed return period of 100 years plus a 50% allowance for climate change and a 10% allowance for urban creep.

Surface water will discharge into a wetland area. It will pass through this area before discharging into the existing on site watercourse.

The drainage design can be seen in Appendix E.

4.5 Future Flood Risk and Exceedance Routes

Flood risk to the new development will be low. The drainage network will be designed for return periods of up to and including the 1 in 100 year event with a 50% allowance for climate change and 10% allowance for urban creep.

If a storm occurred that were to overwhelm the drainage network, the surface water would first flood at the flow control manhole. Exceedance routes will be provided to guide any excess water away from the properties and towards the existing watercourse.

4.6 Future Management

The developer will establish a management company that will be responsible for the maintenance and upkeep of the highways, foul drainage, attenuation baskets and surface water drainage system (including attenuation baskets and wetland area) within the carriageway. See Appendix F for the management company maintenance pack.

Maintenance of driveways and roof water drainage will be the sole responsibility of the homeowners. A householder sustainable drainage maintenance plan will be included within the sales pack for each property making the homeowners aware of their responsibilities relating to surface water (see Appendix G).

5. Summary

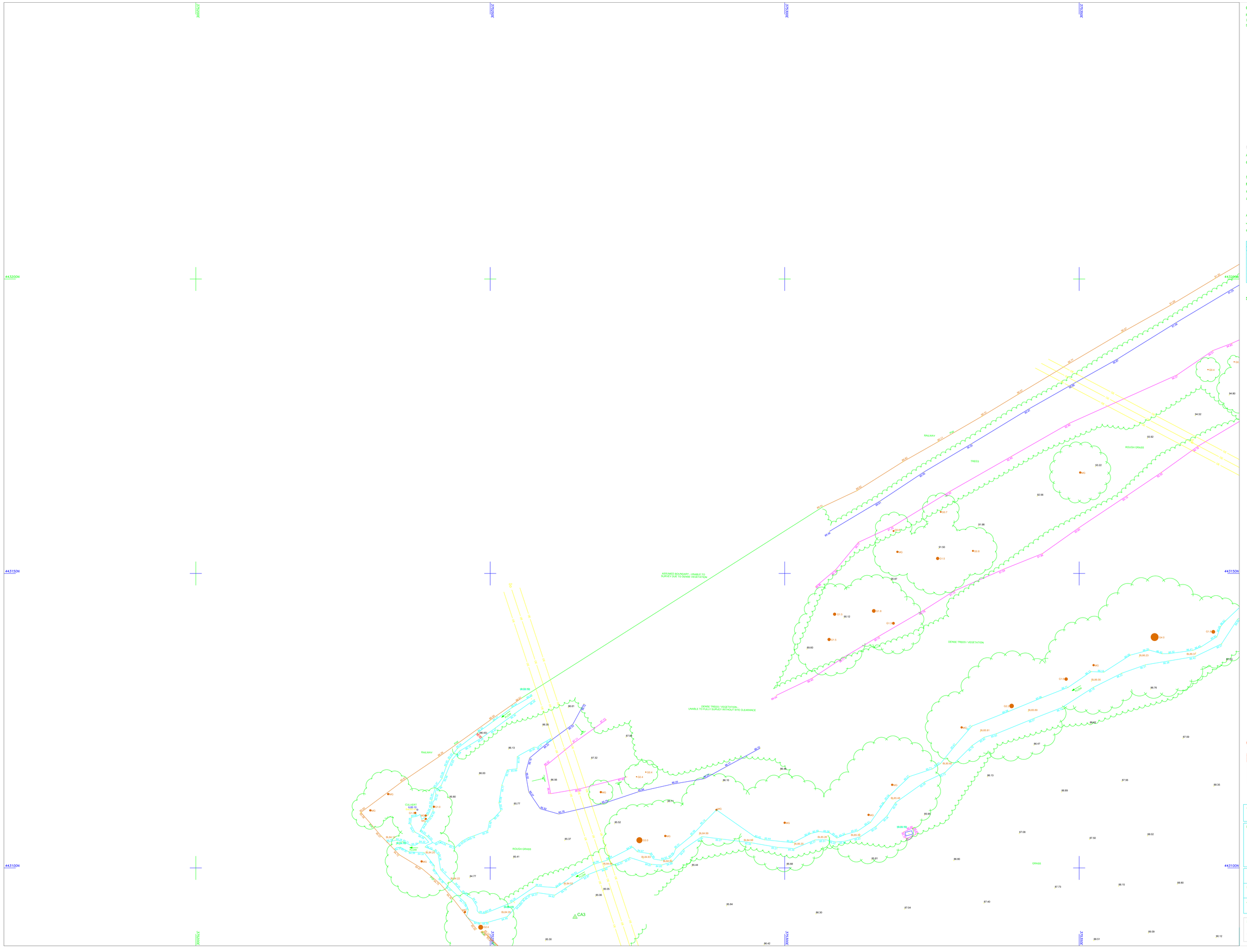
This report provides a detailed flood risk assessment and drainage strategy for the proposed housing development at Chatburn Road, Clitheroe, BB7 4SF. The report accounts for the following restrictions, measures and improvements:-

- The site falls within flood zones 3, 2 & 1.
- Only watercourse and riparian sections within flood zones 2 & 3.
- No development within flood zones 2 & 3.
- There is a risk of fluvial flooding on-site.
- The risk of tidal flooding is very low.
- The risk of groundwater flooding is very low.
- The risk of surface water flooding is very low.
- Critical flood levels for nodal points 7 & 7 have been calculated as 85.900 and 87.924m AOD respectively.
- FFLs to be installed at a minimum of 600mm above the critical levels within them areas. This will provide a 600mm freeboard.
- Infiltration drainage unsuitable as groundwater found within trial pits.
- Surface water to discharge into the existing watercourse at a controlled rate using a vortex flow control.
- Flow to be restricted to greenfield runoff for 1 year return period and Qbar for return periods above that up to 100 years with a 50% allowance for climate change and 10% allowance for urban creep.
- Attenuation to be provided for 1% AEP with a 50% climate change allowance and 10% allowance for urban creep.

- Owners to be responsible for plot drainage.
- Developer to form a management company to be responsible for management and maintenance of highway, foul and surface water drainage.

The development of this site and proposed drainage strategy as described in this report will have no detrimental effect on flood risk to the surrounding area and will be well protected from flooding due to the level of the minimum FFL and the installation of a formal drainage network providing attenuation.

Appendix A



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Note:

All levels relate to Existing Site Datum. Orientation to Existing Site Grid.

Survey Control Markers established for Mapping purposes only and should not be used for Construction without the written approval of Survey Operations Ltd.

Area within bold dashed line surveyed Jan 2026 and added to Survey Operations drawing number 24K187.

SURVEY STATIONS

Name	Easting	Northing	Height
CA1	375265.74	443001.57	90.06
CA2	375246.46	443049.06	86.77
CA3	375264.40	443091.65	85.29
SO2	375362.97	443042.62	93.49
PA1	375353.25	442992.16	92.66
PA2	375418.44	443010.95	93.29
PA3	375483.95	443104.45	94.02
PA4	375483.95	443104.45	94.02
PA5	375517.41	443140.73	94.69

STANDARD REFERENCE & ABBREVIATIONS

CARG.....Assumed Route
MH.....Air Brick
Av.....Air Valve
B/W.....Barbed Wire
BAR.....Barrier
BB.....Belisha Beacon
BH.....Borehole
BL.....Bed Level
Bll.....Bollard
BS.....Bus Stop
BT Box.....British Telecom Box
BT.....British Telecom Cc
BRTW.....Brick Retaining Wall
BW.....Brick Wall
C/B.....Close Boarded
C/I.....Corrugated Iron
C/P.....Chestnut Paling
CB.....Control Box
CBW.....Concrete Block Wall
CCTV.....Closed Circuit Tv
CD.....Cable Duct
CL.....Collar Light
CH/L.....Check Link
CHY.....Chimney
CL.....Cover Level
CM.....Cable Marker
COL.....Column
CONC.....Concrete
CP.....Catch Pit
CRTW.....Concrete Retaining Wall
CTV.....Cable Television
CUL.....Culvert
CW.....Concrete Block Wall
DC.....Drainage Channel
DPC.....Damp Proof Course
DR.....Drain
DRB.....Dry Stone Wall
ECP.....Electricity Cable Pit
EIC.....Electricity Inspection Cover
EJ.....Expansion Joint
EJB.....Electricity Junction Box
EL Sub Stn.Electricity Sub Station
EL.....Kerb Level
ELB.....Electricity Box
EP.....Electricity Pole
EW.....Earth Rod
ETL.....Electricity Transmission Line
FB.....Flower Bed
FH.....Fire Hydrant
FL.....Floor Level
FP.....Flagpole
GY.C.....Gully (of trees)
G.....Gulley
GAS.....Gas Inlet Pipe
GMK.....Gas Marker
GST.....Gas Stop Tap (Domestic)
GSV.....Gas Stop Valve (Mains)
HDC.....Housing
HT.....Height
HV.....High Voltage
I/R.....Iron Railing
IC.....Inspection Cover
IL.....Invert Level
IP.....Inlet Pipe
KO.....Kerb Outlet
LB.....Letter Box
LP.....Lamp Post
MG.....Multi Girth
MH.....Manhole
MKR.....Marker
MP.....Mooring Point
NP.....Street Name Plate
O/H.....Overhead
O/P.....Open Paling
OH.....Overhead Electric Wire
OP.....Outfall Pipe
OSBM.....Ordnance Survey Bench Mark
OT.....Overhead Telecom Wire
P/C.....Post & Chain
P/R.....Post & Rail
P/W.....Post & Wire
PAV.....Paving
PB.....Pillar Box
PC.....Pedestrian Crossing
PM.....Petrol Pump
PT.....Post or Pillar
RE.....Reading Eye
RG.....Road Sign
RTW.....Retaining Wall
RWP.....Rain Water Pipe
SAP.....Sapling
SL.....Sump Level
SNL.....Soffit Level
SP.....High Post
SPL.....Springing Level
SRTW.....Stone Retaining Wall
SV.....Stop Valve (unspecified)
SWP.....Soil Vent Pipe
SW.....Stone Wall
TAC.....Tarmac Paving
TB.....Traffic Bollard
TBM.....Temporary Bench Mark
TLB.....Traffic Light Control Box
TM.....Ticket Machine
TRE.....Tarmac
TP.....Telecommunications Pole
TPIT.....Trial Pit
TS.....Tram Screen
U/C.....Under Construction
U/G.....Underground
UTL.....Unable to Lift (BM,IC etc)
UTS.....Unable to Survey
VDP.....Vehicle Detector Pad
VP.....Vent Pipe
WAM.....Wire Mesh
WL.....Water Level
WO.....Water Owner
WS.....Wash Out
WP.....Waste Pipe
WST.....Water Stop Tap (Domestic)
WSV.....Water Stop Valve (Mains)

Sheet Layout

1	2
3	4

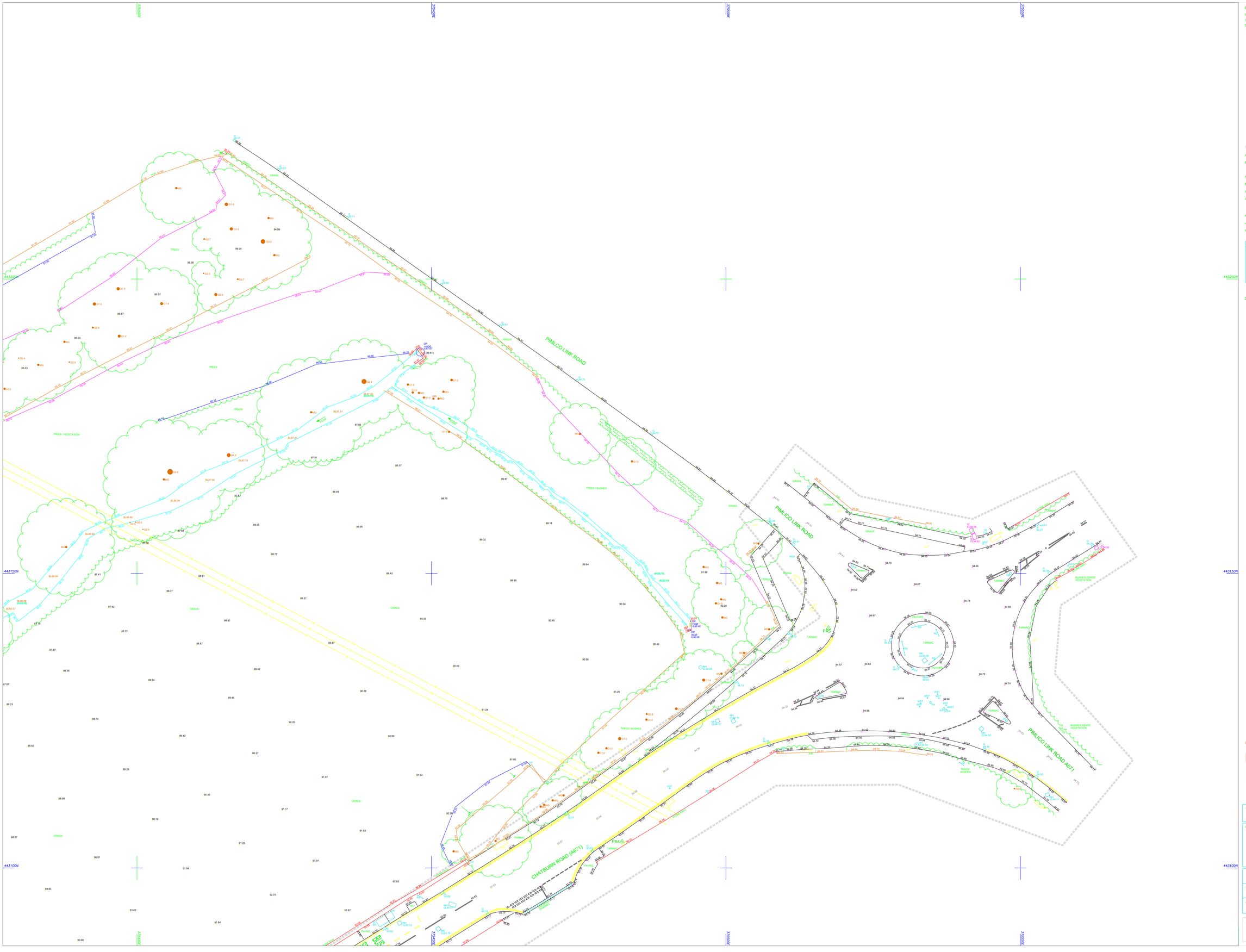
Survey OPERATIONS
Smith Street, Skelmersdale, Lancs, WN8 8LN
Tel: 01695 725662 Fax: 01695 51816
Email: mail@surveyops.co.uk - www.surveyops.co.uk

Client
Oakmere Homes

Drawing Title
Topographical Survey of Land at:
Chatburn Road Additional
Clitheroe
Sheet 1 of 4

Scale(s) 1:200	Surveyor PA
Date JAN 26	Drawn CD
Job Number 26A269	Checked TP

Sheet Size & Drg Number & Revision
A0 26A269/001



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N

Note:

All levels relate to Existing Site Datum. Orientation to Existing Site Grid.

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Area within bold dashed line surveyed Jan 2026 and added to Survey Operations drawing number 24K187.

STANDARD REFERENCE & ABBREVIATIONS

(ABS).....Assumed Route
AB.....Air Brick
Av.....Air Valve
B/W.....Barbed Wire
BAR.....Barrier
BB.....Bellshe Beacon
BH.....Borehole
BL.....Bed Level
Bll.....Bollard
BS.....Bus Stop
BT Box.....British Telecom Box
BT.....British Telecom CC
BRTW.....Brick Retaining Wall
BW.....Brick Wall
C/L.....Close Boarded
C/I.....Corrugated Iron
C/P.....Chestnut Paling
CB.....Control Box
CBW.....Concrete Block Wall
CCTV.....Closed Circuit TV
CD.....Cable Duct
CEL.....Celiar Light
CH/L.....Check Link
CHY.....Chimney
CL.....Cover Level
CM.....Cable Marker
COL.....Column
CONC.....Concrete
CP.....Catch Pit
CRTW.....Concrete Retaining Wall
CTV.....Cable Television
CUL.....Culvert
CW.....Concrete Block Wall
DC.....Drainage Channel
DPC.....Damp Proof Course
DR.....Drain
DRW.....Dry Stone Wall
ESP.....Electricity Cable Pit
ESC.....Electricity Inspection Cover
EJ.....Expansion Joint
EJB.....Electricity Junction Box
EL SUB PTN.Electricity Sub Station
EL.....Kerb Level
ELB.....Electricity Box
EP.....Electricity Pole
ER.....Earth Rod
ETL.....Electricity Transmission Line
FB.....Flower Bed
FH.....Fire Hydrant
FL.....Floor Level
FP.....Flagpole
G.....Gulph (of tree)
G.....Gulley
GAB.....Gabion
GIP.....Gas Inlet Pipe
GMKR.....Gas Marker
GOT.....Gas Stop Tap (Domestic)
GSV.....Gas Stop Valve (Mains)
HSE.....Housing
Ht.....Height
HT.....High Voltage
I/R.....Iron Railing
IC.....Inspection Cover
IL.....Invert Level
IP.....Inlet Pipe
KO.....Kerb Outlet
LB.....Letter Box
LP.....Lamp Post
MG.....Multi Gluth
MH.....Manhole
MKR.....Marker
MP.....Mooring Point
NP.....Street Name Plate
OHL.....Overhead
O/P.....Open Paling
OH.....Overhead Electric Wire
OP.....Outfall Pipe
ORNM.....Ordnance Survey Bench Mark
OT.....Overhead Telecom Wire
P/E.....Post & Chain
P/R.....Post & Rail
P/W.....Post & Wire
PAV.....Paving
PB.....Pillar Box
PC.....Pedestrian Crossing
PH.....Petrol Pump
PI.....Post or Pillar
RE.....Reading Eye
RH.....Road Sign
RTW.....Retaining Wall
RWP.....Rain Water Pipe
SAP.....Sapling
SL.....Sump Level
SNL.....Soffit Level
SP.....Sign Post
SPL.....Springing Level
SRTW.....Stone Retaining Wall
SV.....Stop Valve (unspecified)
SVP.....Soil Vent Pipe
TAR.....Tarmac
TBM.....Temporary Bench Mark
TCB.....Telephone Call Box
TKB.....Token Free Records
TOP.....Anchor Point (Boats/Poles)
TL.....Traffic Light
TLB.....Traffic Light Control Box
TW.....Ticket Machine
TWC.....Tarmac
TP.....Telecommunications Pole
UNIT.....Trial Pit
TR.....Trash Screen
UCO.....Under Construction
U/G.....Underground
UTL.....Unable to Lift (BM,IC etc)
UTS.....Unable to Survey
VAP.....Vehicle Activation Pad
VP.....Vent Pipe
W/B.....Wire Mesh
WL.....Water Level
WM.....Water Meter
WO.....Wash Out
WP.....Water Pipe
WSCT.....Water Stop Tap (domestic)
WSC.....Water Stop Valve (mains)

Sheet Layout

1	2
3	4

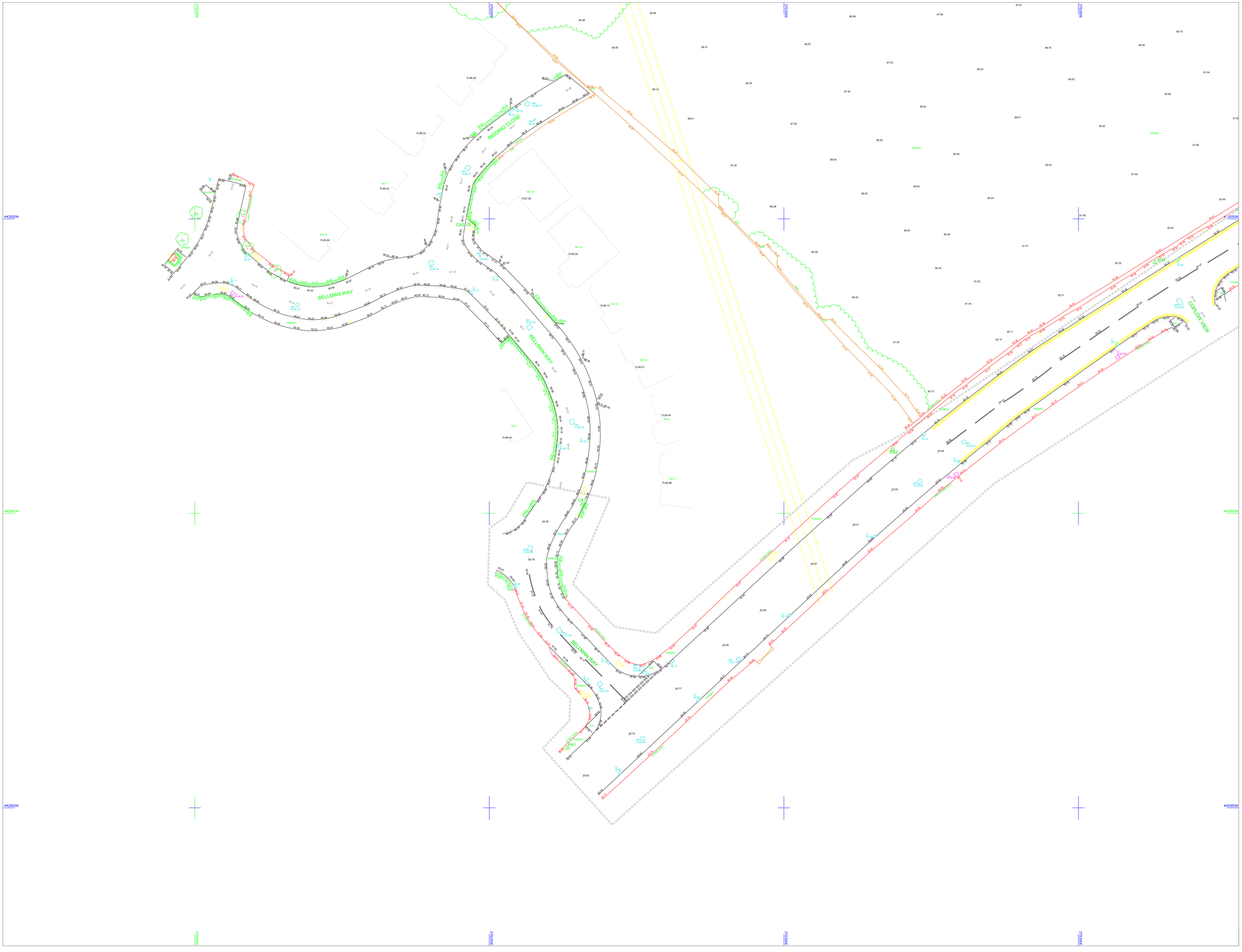
SurveY OPERATIONS
Smith Street, Skelmersdale, Lancs. WN8 8LN
Tel: 01695 725662 Fax: 01695 51816
Email: mail@survops.co.uk – www.survops.co.uk

Client
Oakmere Homes

Drawing Title
Topographical Survey of Land at:
Chatburn Road Additional
Clitheroe
Sheet 2 of 4

Scale(s) 1:200	Surveyor PA
Date JAN 26	Drawn CD
Job Number 26A269	Checked TP

Sheet Size & Drg Number & Revision
A0 26A269/002



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Notes:

All levels relate to Existing Site Datum. Orientation to Existing Site Grid.

Survey Control Markers established for Mapping purposes only and should not be used for Construction without the written approval of Survey Operations Ltd.

Area within bold dashed line surveyed Jan 2026 and added to Survey Operations drawing number 24K187.

SURVEY STATIONS

Name	Eastings	Northings	Height
CA1	375265.34	443051.57	86.09
CA2	375246.48	443049.06	86.27
CA3	375264.60	443091.65	85.29
SO2	375362.97	443042.02	93.49
PA1	375263.22	443060.10	92.66
PA2	375318.44	443010.90	93.29
SO1	375403.96	443104.45	94.02
PA3	375482.30	443104.45	94.02
PA5	375517.41	443140.73	94.69

STANDARD REFERENCE & ABBREVIATIONS

(AS)..... Assumed Route	IL..... Invert Level
AB..... Air Brick	IP..... Inlet Pipe
AV..... Air Valve	KO..... Kerb Outlet
B/W..... Barbed Wire	LB..... Letter Box
BAR..... Barrier	LP..... Lamp Post
BB..... Bellcho Beacon	MG..... Multi Girth
BH..... Borehole	MH..... Manhole
BL..... Bed Level	MKR..... Marker
BOL..... Bollard	MP..... Mooring Point
BS..... Bus Stop	NP..... Street Name Plate
BT Box..... British Telecom Box	OVH..... Overhead
BT..... British Telecom Pit	O/P..... Open Paling
BRTW..... Brick Retaining Wall	OW..... Overhead Electric Wire
BW..... Brick Wall	OF..... Outfall Pipe
C/B..... Close Boarded	OSBM..... Ordnance Survey Bench Mark
C/I..... Corrugated Iron	OT..... Overhead Telecom Wire
C/P..... Chestnut Paling	P/E..... Post & Chain
CB..... Control Box	P/R..... Post & Rail
CBW..... Concrete Block Wall	P/W..... Post & Wire
CCTV..... Closed Circuit TV	PAV..... Paving
CD..... Cable Duct	PB..... Pillar Box
CEL..... Cellar Light	PC..... Pedestrian Crossing
CH/L..... Check Link	PH..... Petrol Pump
CHY..... Chimney	PI..... Post or Pillar
CL..... Cover Level	RE..... Reading Eye
CM..... Cable Marker	RG..... Road Sign
COL..... Column	RTW..... Retaining Wall
CONC..... Concrete	RWP..... Rain Water Pipe
CP..... Catch Pit	SAP..... Sapling
CRTW..... Concrete Retaining Wall	SL..... Sump Level
CTV..... Cable Television	SOL..... Soffit Level
CUL..... Culvert	SP..... Sign Post
CW..... Concrete Block Wall	SPL..... Springing Level
DC..... Drainage Channel	SRTW..... Stone Retaining Wall
DPC..... Damp Proof Course	SV..... Stop Valve (unspecified)
DR..... Drain	SVP..... Soil Vent Pipe
DSW..... Dry Stone Wall	SW..... Stone Wall
ESP..... Electricity Cable Pit	TAR..... Tarmac Paving
ESI..... Electricity Inspection Cover	TB..... Traffic Bollard
E/J..... Expansion Joint	TBM..... Temporary Bench Mark
EJB..... Electricity Junction Box	TCB..... Telephone Call Box
EL SUB STA..... Electricity Sub Station	TCB..... Token Fire Records
EL..... Eaves Level	TCP..... Anchor Point (Bent/Poles)
ELB..... Electricity Box	TL..... Traffic Light
EP..... Electricity Pole	TLB..... Traffic Light Control Box
ER..... Earth Rod	TW..... Ticket Machine
ETL..... Electricity Transmission Line	TWC..... Tarmac
FB..... Flower Bed	TX..... Telecommunications Pole
FH..... Fire Hydrant	UCP..... Trial Pit
FL..... Flood Level	TR..... Trash Screen
FP..... Flagpole	UC..... Under Construction
G^^..... Girth (of tree)	U/G..... Underground
G..... Gulley	U/S..... Unable to Lift (BM,CP etc)
GAB..... Gabion	UTS..... Unable to Survey
GIP..... Gas Inlet Pipe	VDP..... Vehicle Detector Pad
GMKR..... Gas Marker	VP..... Vent Pipe
GOT..... Gas Stop Tap (Domestic)	W/B..... Wire Mesh
GSV..... Gas Stop Valve (Mains)	WL..... Water Level
HSE..... Housing	WM..... Water Meter
HT..... Height	WO..... Wash Out
HV..... High Voltage	WP..... Waste Pipe
I/R..... Iron Railing	WST..... Water Stop Tap (domestic)
IC..... Inspection Cover	WSV..... Water Stop Valve (mains)

Sheet Layout

1	2
3	4

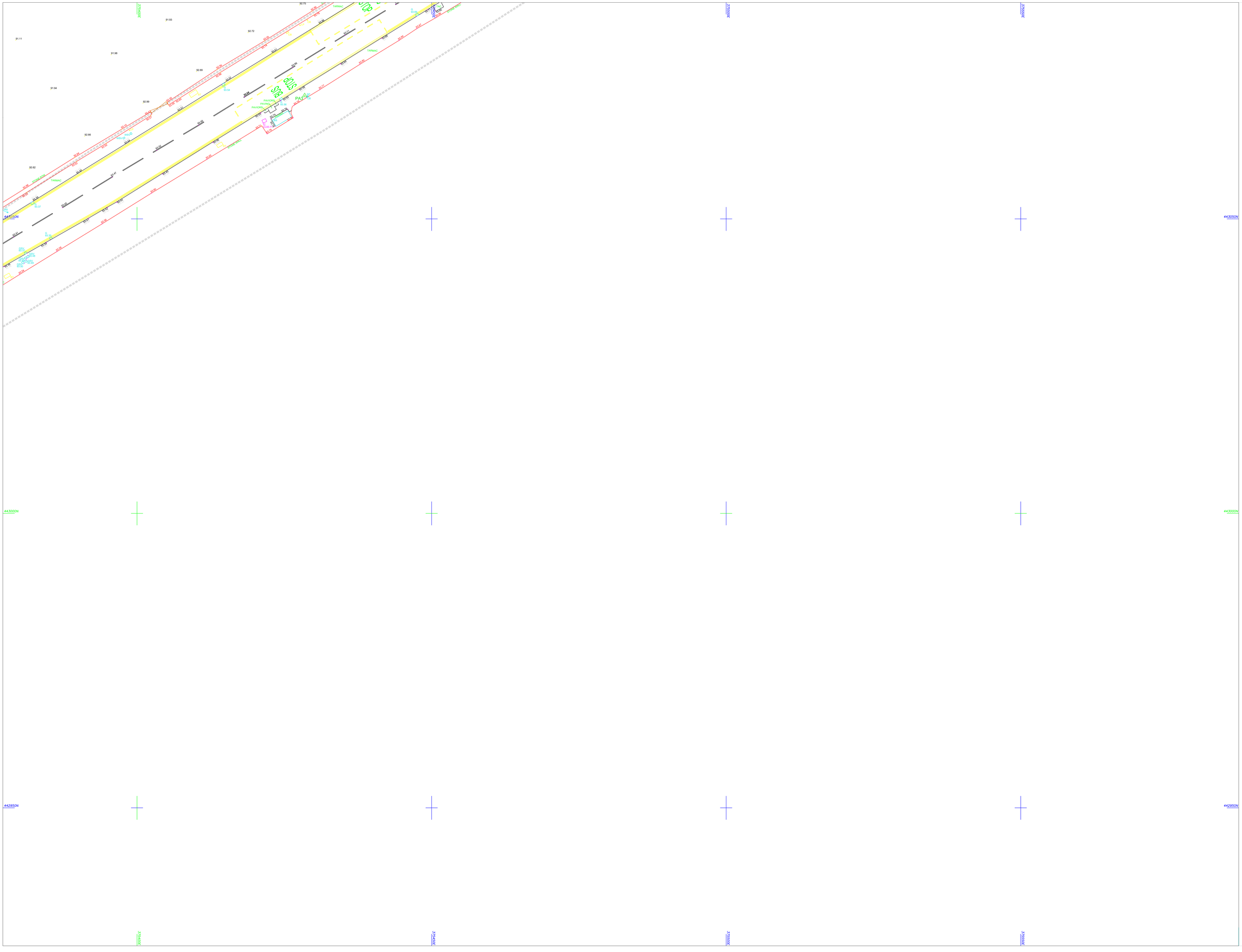
SurveY OPERATIONS
Smith Street, Skelmersdale, Lancs. WN8 8LN
Tel: 01695 725662 Fax: 01695 51816
Email: mail@survops.co.uk – www.survops.co.uk

Client: Oakmere Homes

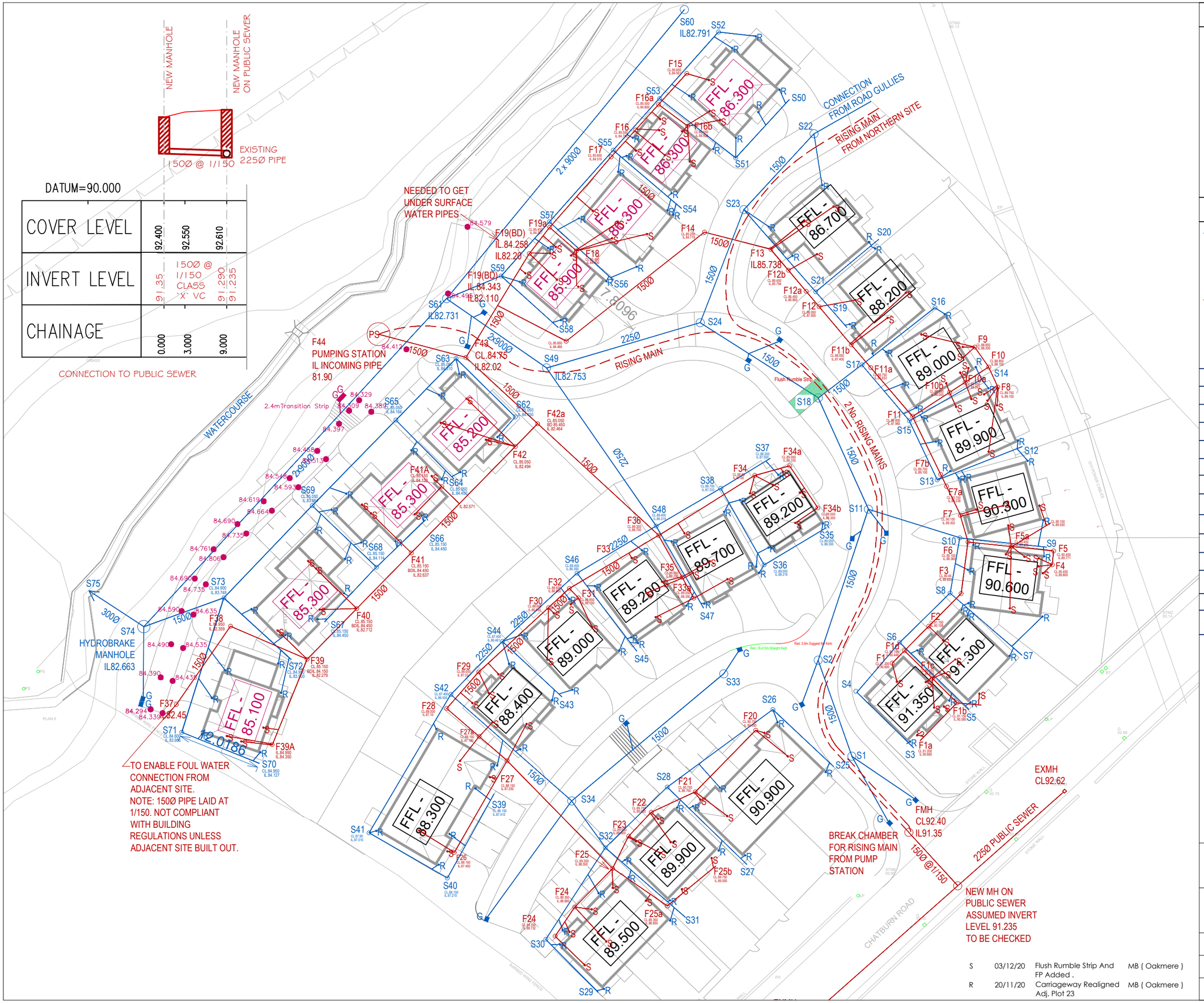
Drawing Title: Topographical Survey of Land at: Chatburn Road Additional, Clitheroe, Sheet 3 of 4

Scale(s) 1:200	Surveyor PA
Date JAN 26	Drawn CD
Job Number 26A269	Checked TP

Sheet Size & Drg Number & Revision: A0 26A269/003


375550E
375600E
375650E
375700E
375750E
443050N
443000N
442950N
BUS STOP
PAVING
TARMAC
91.11
91.93
91.96
92.72
92.75
91.94
92.69
92.99
92.66
92.62
91.71
91.78
91.85
91.92
92.05
92.12
92.19
92.26
92.33
92.40
92.47
92.54
92.61
92.68
92.75
92.82
92.89
92.96
93.03
93.10
93.17
93.24
93.31
93.38
93.45
93.52
93.59
93.66
93.73
93.80
93.87
93.94
94.01
94.08
94.15
94.22
94.29
94.36
94.43
94.50
94.57
94.64
94.71
94.78

Appendix B



NOTES

1. DRAWINGS ARE IN METRES UNLESS OTHERWISE STATED.
2. ALL DIMENSIONS ARE TO BE CHECKED BEFORE COMMENCEMENT OF WORK ON SITE.
3. FOR STANDARD DRAINAGE DETAILS REFER TO DRAWING 18376-530.
4. ALL ROAD GULLY CONNECTIONS TO BE 150Ø.
5. FOUL WATER CONNECTIONS GENERALLY 750mm BELOW FFL.

KEY

- PROPOSED SURFACE WATER DRAIN
- S1 — SURFACE WATER NODE
- R — RAIN WATER PIPE
- G — PROPOSED GULLY
- PROPOSED FOUL WATER DRAIN
- F1 — FOUL WATER NODE
- S — SOIL STACK

P	22/07/20	Level review (15-18)	MB (Oakmere)
N	29/05/20	Level review (Y Head)	MB (Oakmere)
M	22/05/20	Plot levels revised	MB (Oakmere)

L	19/05/20	Plot levels revised	SB	BF	BF
K	29/04/20	Plot levels revised	SB	BF	BF
J	28/03/20	General Amendents	SB	BF	BF
H	17/01/20	General Amendents	JJ	BF	BF
G	16/12/19	Plot level revised	JJ	BF	BF
F	02/12/19	Extended footpath	JJ	BF	BF
E	14/11/19	General Amendments	JJ	BF	BF
D	10/09/19	General Amendments	JJ	BF	BF
C	26/07/19	Minor Amendments	JJ	BF	BF
B	13/06/18	Levels added	JJ	BF	BF
A	30/05/18	Revised architects layout	JJ	BF	BF
0	27/02/18	First Issue	JJ	BF	BF

Rev	Date	Description	Drn	Chk	App
S	03/12/20	Flush Rumble Strip And FP Added .	MB (Oakmere)		
R	20/11/20	Carriageway Realigned Adj. Plot 23	MB (Oakmere)		

REFORD

Consulting Engineers Ltd

7 Hall Road, Fulwood, Preston, PR2 9QD

Mobile: 07970 265334

Email: r.e.ford@virginmedia.com

Company number: 9620365

VAT Reg. 215 5638 12

CHATBURN ROAD, CLITHEROE

DRAINAGE GENERAL ARRANGEMENT

SCALE: 1:500 @ A3

18376-500 | REV S

Appendix C

Flood risk assessment data

Location of site: 375370 / 443125 (shown as easting and northing coordinates)
Document created on: 13 April 2026
This information was previously known as a product 4.
Customer reference number: X81J21VNXXH3

Map showing the location that flood risk assessment data has been requested for.

How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

> **We recommend that you work with a flood risk consultant to get your flood risk assessment.**

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- past floods
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Information that's unavailable

This document **does not** contain:

- flood defences and attributes

We aren't able to display flood defence locations and attributes as there are no formal flood defences in the area of interest.

Surface water and other sources of flooding

When using the surface water map on the check your long term flood risk service the following considerations apply:

- surface water extents are suitable for use in planning
- surface water climate change scenarios may help to inform risk assessments, but the available data fall short of what is required to assess planned development
- surface water depth information should not be used for planning purposes

To find out about other factors that might affect the flood risk of this location, you should also check:

- reservoir flood risk
- groundwater flood risk - you could use the British Geological Survey groundwater flooding data, groundwater: current status and flood risk and the guide on mining and groundwater constraints for development - further information may be available from the lead local flood authority (LLFA)
- your local planning authority's SFRA, which includes future flood risk

Your Lead Local Flood Authority is Lancashire County.

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: Mearley Brook 2018
Scenario(s): Defended fluvial, defences removed fluvial, defended climate change fluvial
Date: 1 December 2017

This model contains the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occuring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

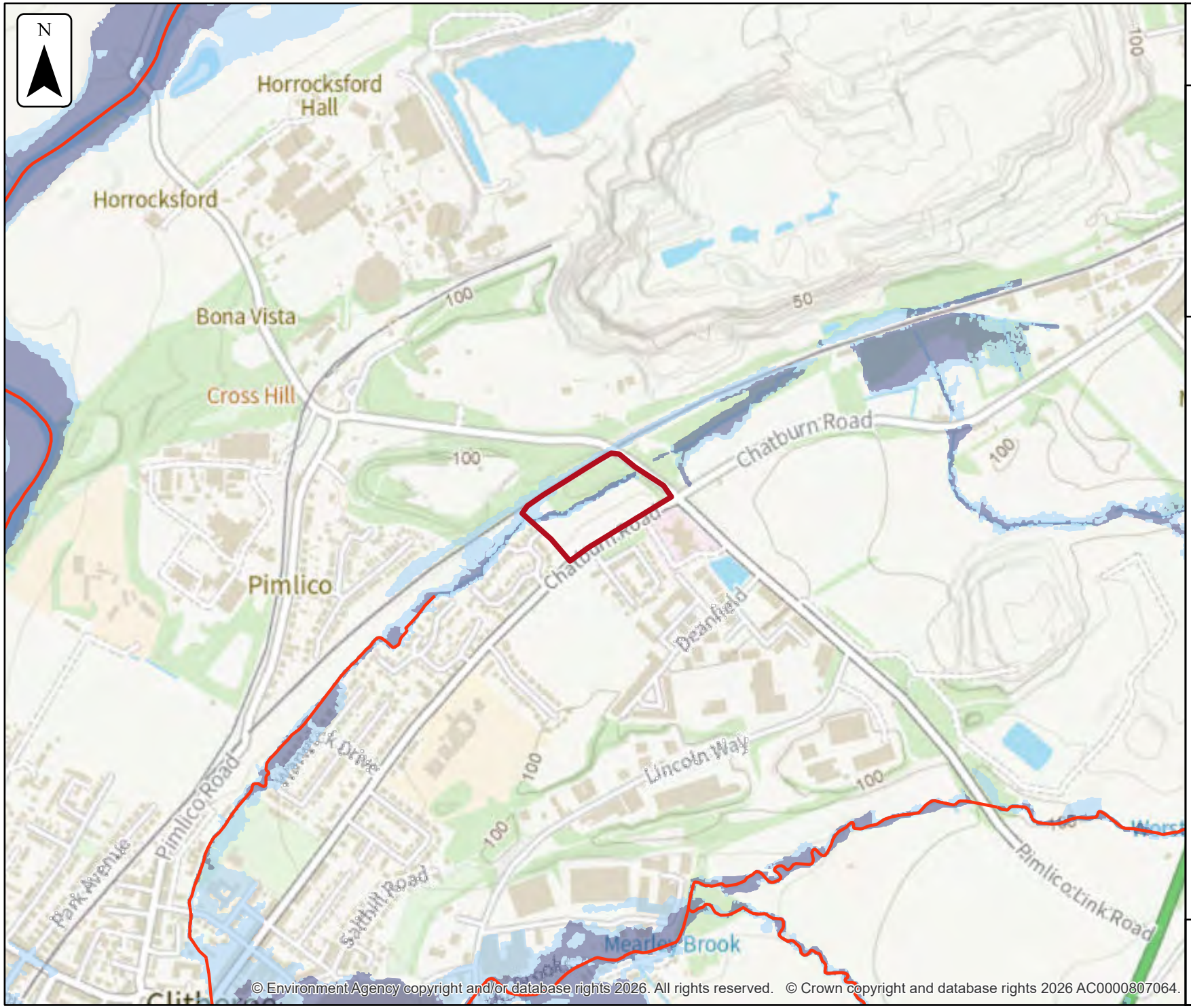
- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change



Environment Agency

Flood map for planning

Location (easting/northing)
375370/443125

Scale
1:10,000

Created
13 Apr 2026

- Selected area
- Main river
- Flood Zone 3
- Flood Zone 2

0 100 200 300 400 500
metres

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Past floods

Past flood events included in this document

The recorded flood outlines included in this document are for areas of land local to your site location that have been flooded by any of these sources:

- ephemeral water
- main rivers
- ordinary watercourses
- the sea
- unknown

Data limitations

The outlines do not include flooding from:

- drainage where rainfall has led to surface water ponding or overland runoff
- artificial, water-bearing sewer, water supply and wastewater treatment pipelines

Changes to flood defences

The defences (also known as assets) that were in place may also have changed. For example, assets may have been built more recently than the last recorded flood outline.

What the recorded flood outlines dataset is

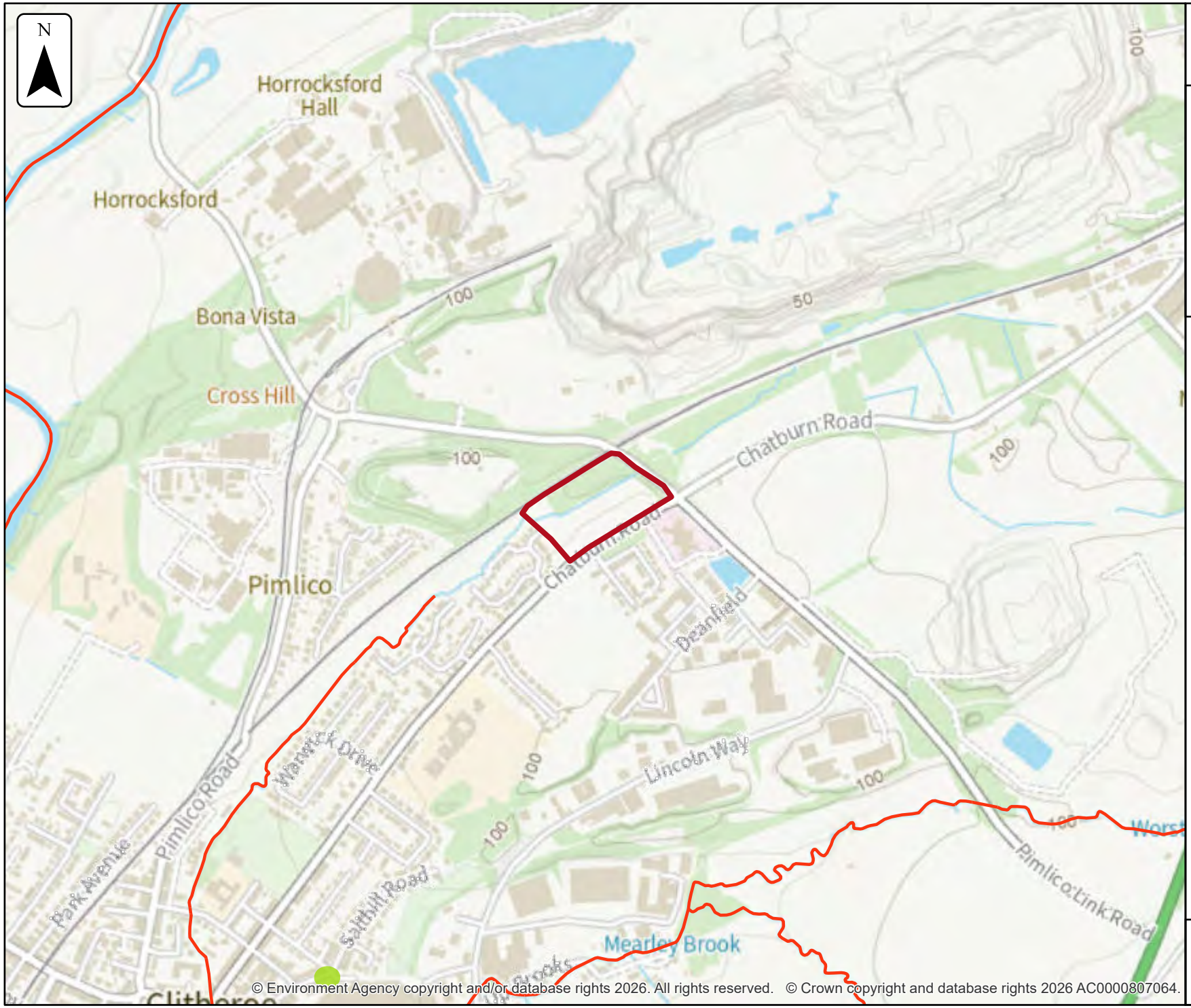
The recorded flood outlines are a geographical information system (GIS) data layer that show our verified records of areas that have flooded in the past from:

- rivers
- the sea
- groundwater
- surface water

Download the complete recorded flood outlines dataset, which includes data quality flags for outlines recorded after April 2020. This indicates the confidence we have in an outline.

Get flood information from other organisations

Contact Lancashire County Lead Local Flood Authority (LLFA) and your drainage board to get information about past flooding caused by surface water or drainage systems.



Environment Agency

Past floods

Location (easting/northing)
375370/443125

Scale
1:10,000

Created
13 Apr 2026

Selected area

Main river

Date of flood event

September, 1999

0 100 200 300 400 500
metres

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Data on past flood events

Start date	End date	Source of flood	Cause of flood	Affects location
29 September 1999	30 September 1999	main river	channel capacity exceeded (no raised defences)	No

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

The climate change data included in the models may not include the latest flood risk assessment climate change allowances. Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

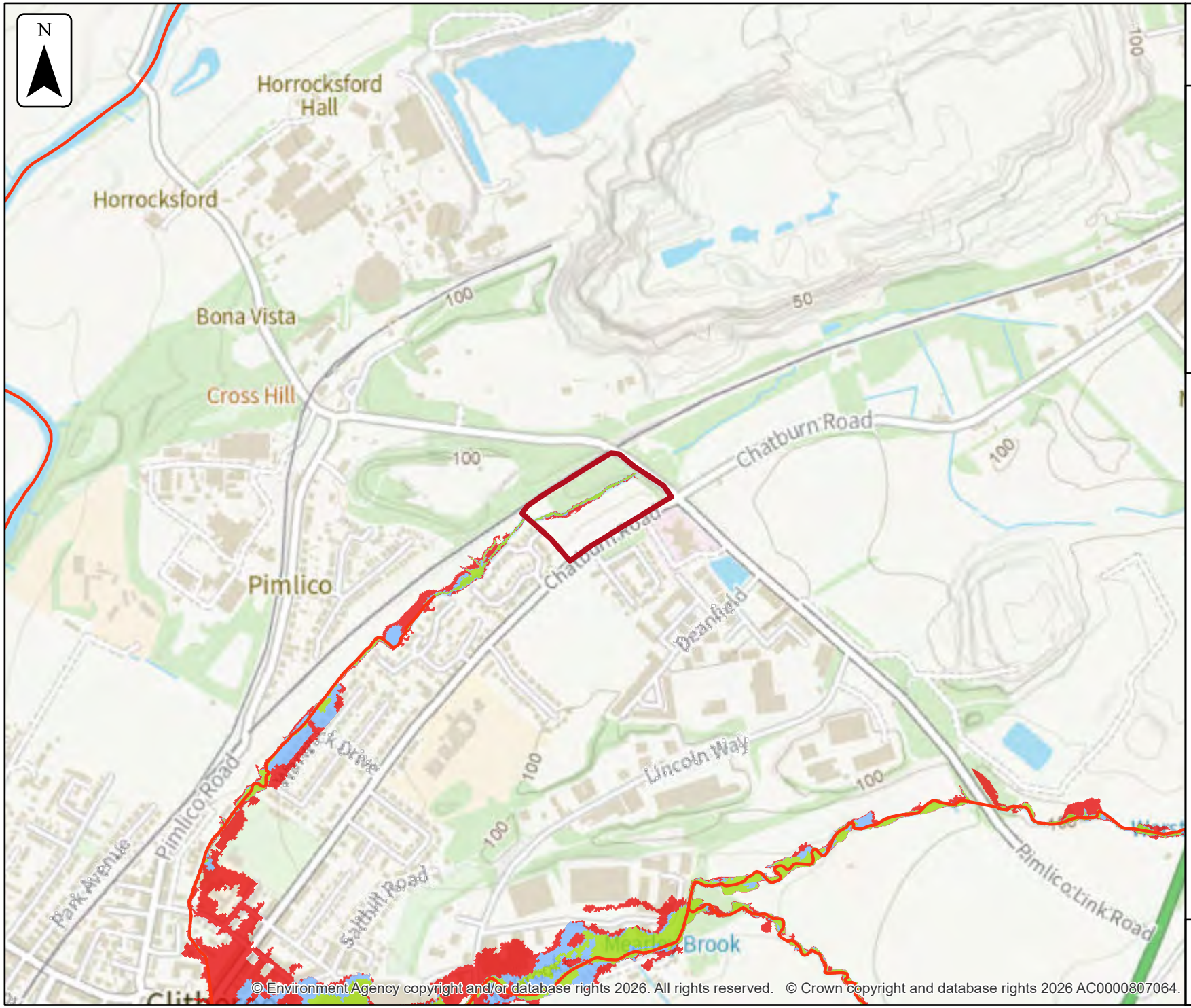
The following scenarios are included:

- Defended modelled fluvial: risk of flooding from rivers where there are flood defences
- Defences removed modelled fluvial: risk of flooding from rivers where flood defences have been removed
- Defended climate change modelled fluvial: risk of flooding from rivers where there are flood defences, including estimated impact of climate change

No data available

We do not have any height or depth data at this location for the following models:

Model name: Mearley Brook 2018
Scenario(s): Defences removed modelled fluvial, Defended climate change modelled fluvial, Defended modelled fluvial



Environment Agency

Defences removed modelled fluvial extent

Location (easting/northing)
375370/443125

Scale
1:10,000

Created
13 Apr 2026

Model name
Mearley Brook 2018

- Selected area
- Main river

Modelled flood extent

- 5% AEP
- 1% AEP
- 0.1% AEP

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres

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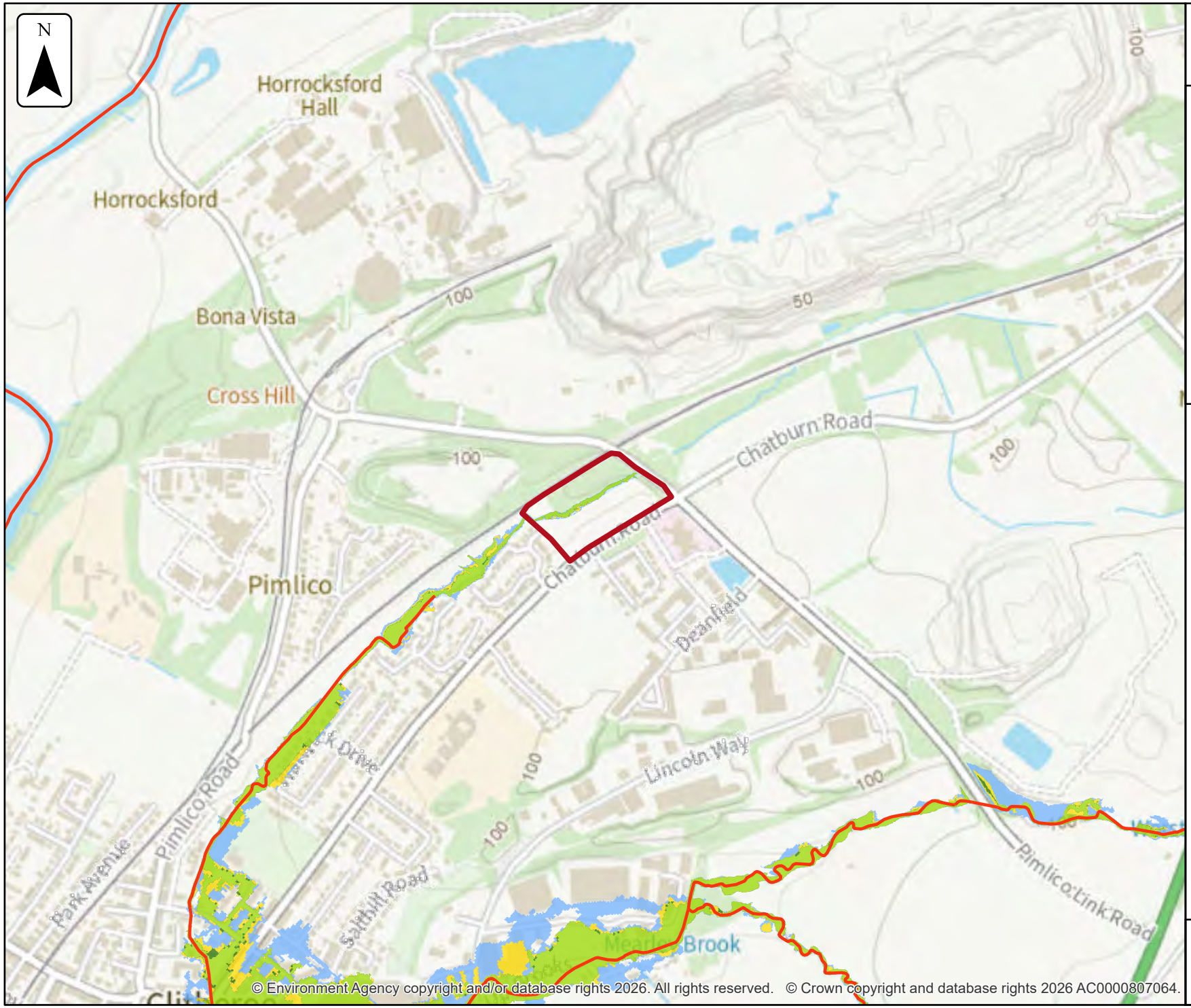

Environment Agency

Defended climate change modelled fluvial extent

Location (easting/northing)
375370/443125

Scale
1:10,000

Created
13 Apr 2026

Model name
Mearley Brook 2018

- Selected area
- Main river

Modelled flood extent

- 1% AEP (+30%)
- 1% AEP (+35%)
- 1% AEP (+70%)
- 0.1% AEP (+30%)

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres

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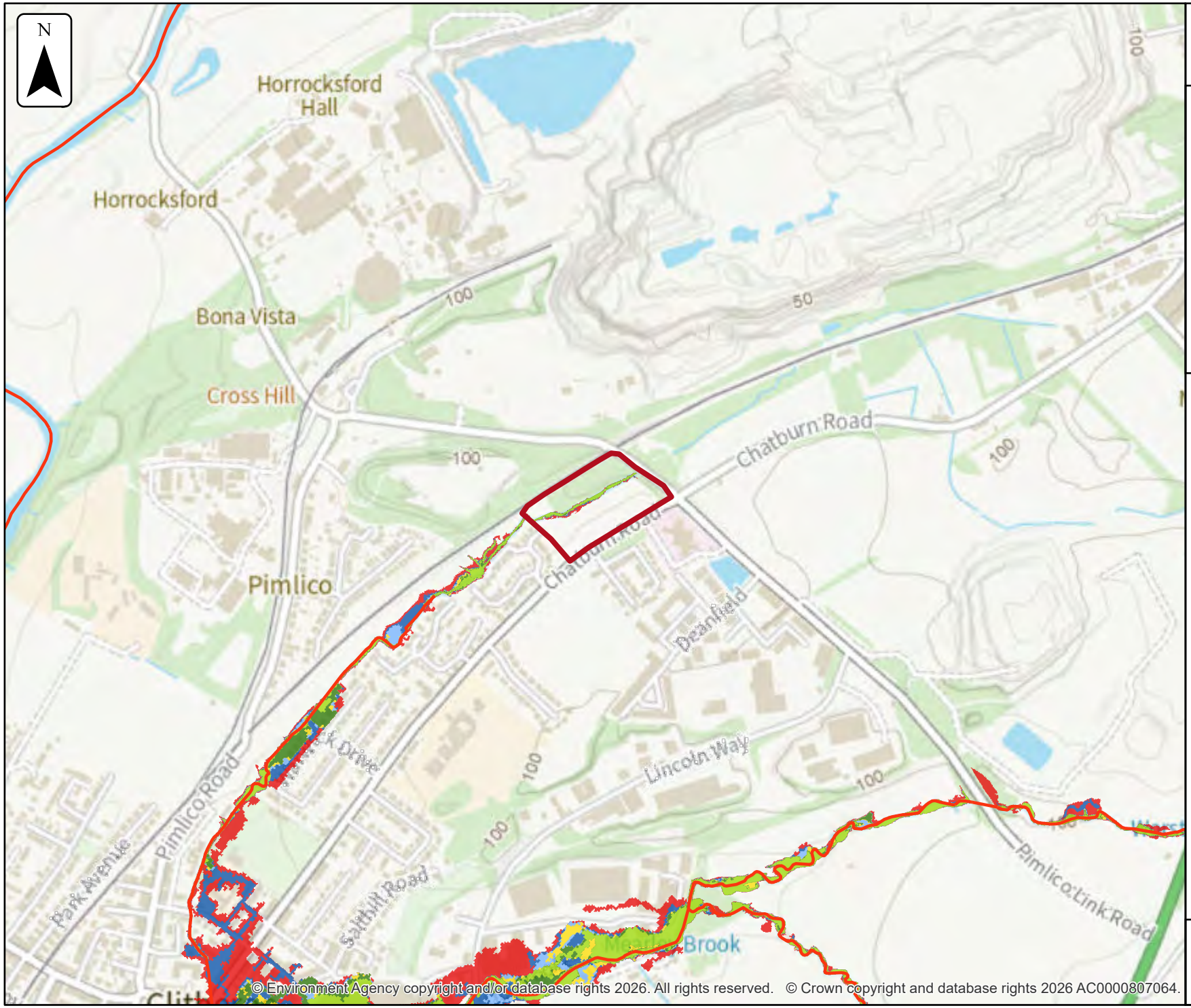

Environment Agency

Defended modelled fluvial extent

Location (easting/northing)
375370/443125

Scale
1:10,000

Created
13 Apr 2026

Model name
Mearley Brook 2018

- Selected area
- Main river

Modelled flood extent

- 5% AEP
- 2% AEP
- 1.33% AEP
- 1% AEP
- 0.5% AEP
- 0.1% AEP

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres

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Environment Agency

Defended modelled fluvial node locations

Location (easting/northing)
375370/443125

Scale
1:5,000

Created
13 Apr 2026

Model name
Mearley Brook 2018

Selected area
Modelled location
Main river

0 50 100 150 200 250
metres

Modelled node locations data

Defended

Label	Modelled location ID	Easting	Northing	50% AEP	20% AEP	10% AEP	5% AEP	4% AEP	3.33% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
1	982459	374875	442789	80.06	80.18	80.26	80.34	80.36	80.39	80.43	80.46	80.47	80.51	80.62
2	982392	374923	442841	80.47	80.57	80.64	80.70	80.72	80.73	80.78	80.81	80.83	80.89	81.03
3	982314	375002	442875	80.88	80.99	81.06	81.12	81.14	81.16	81.21	81.27	81.31	81.39	81.56
4	982332	375064	442947	81.61	81.72	81.79	81.85	81.87	81.89	81.94	81.97	81.98	82.03	82.16
5	982243	375155	443000	83.01	83.06	83.09	83.11	83.12	83.12	83.14	83.15	83.16	83.19	83.28
6	982225	375227	443089	84.24	84.30	84.35	84.40	84.42	84.44	84.48	84.51	84.53	84.58	84.68
7	982416	375306	443107	85.55	85.61	85.66	85.71	85.73	85.74	85.77	85.80	85.82	85.88	85.98
8	982421	375434	443178	87.68	87.72	87.75	87.78	87.79	87.80	87.83	87.84	87.86	87.91	87.99
9	982434	375512	443217	88.99	89.08	89.14	89.21	89.22	89.24	89.28	89.30	89.33	89.39	89.59
10	982252	375544	443236	89.47	89.58	89.66	89.74	89.76	89.78	89.85	89.91	89.96	90.08	90.22

Data in this table comes from the Mearley Brook 2018 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

Defended

Label	Modelled location ID	Easting	Northing	50% AEP	20% AEP	10% AEP	5% AEP	4% AEP	3.33% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
1	982459	374875	442789	1.0	1.33	1.60	1.88	1.96	2.05	2.31	2.54	2.71	3.22	4.99
2	982392	374923	442841	1.0	1.33	1.60	1.88	1.96	2.05	2.31	2.53	2.71	3.22	4.99
3	982314	375002	442875	1.0	1.33	1.60	1.88	1.96	2.05	2.31	2.53	2.71	3.22	4.99
4	982332	375064	442947	0.84	1.12	1.34	1.57	1.65	1.72	1.94	2.12	2.27	2.70	4.19
5	982243	375155	443000	0.84	1.12	1.34	1.58	1.65	1.72	1.94	2.12	2.27	2.70	4.19
6	982225	375227	443089	0.84	1.12	1.34	1.57	1.65	1.72	1.94	2.12	2.27	2.70	4.19
7	982416	375306	443107	0.84	1.12	1.34	1.58	1.65	1.72	1.94	2.12	2.27	2.70	4.19
8	982421	375434	443178	0.68	0.90	1.08	1.27	1.33	1.39	1.56	1.71	1.83	2.18	3.38
9	982434	375512	443217	0.68	0.90	1.08	1.27	1.33	1.39	1.56	1.71	1.83	2.18	3.38
10	982252	375544	443236	0.68	0.90	1.08	1.27	1.33	1.39	1.56	1.71	1.83	2.18	3.38

Data in this table comes from the Mearley Brook 2018 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

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Environment Agency

Defences removed modelled fluvial node locations

Location (easting/northing)
375370/443125

Scale
1:5,000

Created
13 Apr 2026

Model name
Mearley Brook 2018

- Selected area
- Modelled location
- Main river

0 50 100 150 200 250
metres

Modelled node locations data

Defences removed

Label	Modelled location ID	Easting	Northing	5% AEP	1% AEP	0.1% AEP	5% AEP	1% AEP	0.1% AEP
				Level	Level	Level	Flow	Flow	Flow
1	982459	374875	442789	80.34	80.47	80.62	1.88	2.71	4.99
2	982392	374923	442841	80.70	80.83	81.03	1.88	2.71	4.99
3	982314	375002	442875	81.12	81.31	81.56	1.88	2.71	4.99
4	982332	375064	442947	81.85	81.98	82.16	1.57	2.27	4.19
5	982243	375155	443000	83.11	83.16	83.28	1.58	2.27	4.19
6	982225	375227	443089	84.40	84.53	84.68	1.58	2.27	4.19
7	982416	375306	443107	85.71	85.82	85.98	1.58	2.27	4.19
8	982421	375434	443178	87.78	87.86	87.99	1.27	1.83	3.38
9	982434	375512	443217	89.21	89.33	89.59	1.27	1.83	3.38
10	982252	375544	443236	89.74	89.96	90.22	1.27	1.83	3.38

Data in this table comes from the Mearley Brook 2018 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
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Environment Agency

Defended climate change modelled fluvial node locations

Location (easting/northing)
375370/443125

Scale
1:5,000

Created
13 Apr 2026

Model name
Mearley Brook 2018

- Selected area
- Modelled location
- Main river

0 50 100 150 200 250
metres

Modelled node locations data

Defended climate change

Label	Modelled location ID	Easting	Northing	1% AEP (+30%)	1% AEP (+35%)	1% AEP (+70%)	0.1% AEP (+30%)
				Level	Level	Level	Level
1	982459	374875	442789	80.53	80.54	80.60	80.69
2	982392	374923	442841	80.92	80.93	81.0	81.14
3	982314	375002	442875	81.43	81.44	81.53	81.67
4	982332	375064	442947	82.06	82.07	82.14	82.25
5	982243	375155	443000	83.20	83.21	83.26	83.34
6	982225	375227	443089	84.60	84.60	84.66	84.76
7	982416	375306	443107	85.91	85.92	85.96	86.04
8	982421	375434	443178	87.93	87.94	87.98	88.06
9	982434	375512	443217	89.43	89.45	89.54	89.73
10	982252	375544	443236	90.12	90.13	90.19	90.32

Data in this table comes from the Mearley Brook 2018 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

Defended climate change

Label	Modelled location ID	Easting	Northing	1% AEP (+30%)	1% AEP (+35%)	1% AEP (+70%)	0.1% AEP (+30%)
				Flow	Flow	Flow	Flow
1	982459	374875	442789	3.52	3.65	4.60	6.49
2	982392	374923	442841	3.52	3.65	4.60	6.49
3	982314	375002	442875	3.52	3.65	4.60	6.49
4	982332	375064	442947	2.95	3.06	3.86	5.45
5	982243	375155	443000	2.95	3.07	3.86	5.45
6	982225	375227	443089	2.95	3.07	3.86	5.45
7	982416	375306	443107	2.95	3.07	3.86	5.45
8	982421	375434	443178	2.38	2.47	3.11	4.40
9	982434	375512	443217	2.38	2.47	3.11	4.40
10	982252	375544	443236	2.38	2.47	3.11	4.40

Data in this table comes from the Mearley Brook 2018 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

Your Lead Local Flood Authority is Lancashire County.

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

Find out more about flood risk activity permits

Help and advice

Contact the Cumbria and Lancashire Environment Agency team at inforequests.cmblnc@environment-agency.gov.uk for:

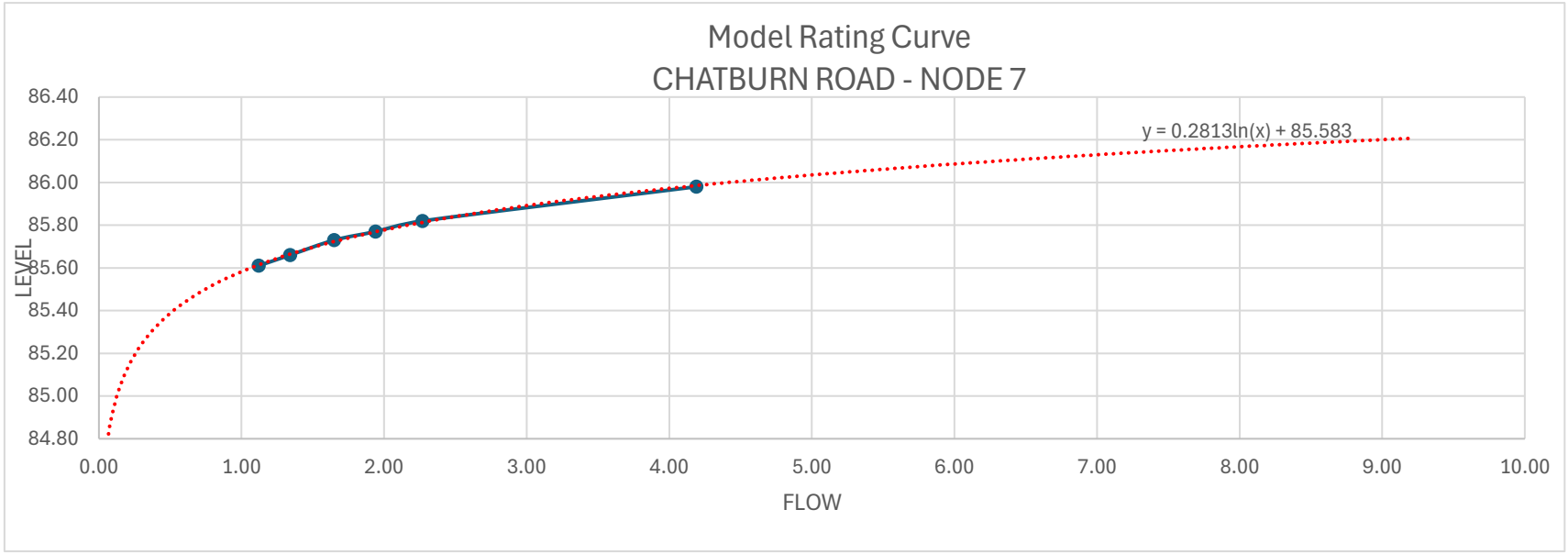
- more information about getting a product 5, 6, 7 or 8
- general help and advice about the site you're requesting data for

Appendix D

Node 7				
AEP	1:X	Level	Flow	Flow + 36% CC
20%	5	85.61	1.12	1.52
10%	10	85.66	1.34	1.82
4%	25	85.73	1.65	2.24
2%	50	85.77	1.94	2.64
1%	100	85.82	2.27	3.09
0.1%	1000	85.98	4.19	5.70

DESIRED FLOW RATE, X =	3.09
EQUATION TO PROJECT Y VALUE =	0.2813ln(x) + 85.583
WATER LEVEL @ 100YR + 36% CC, Y =	85.900

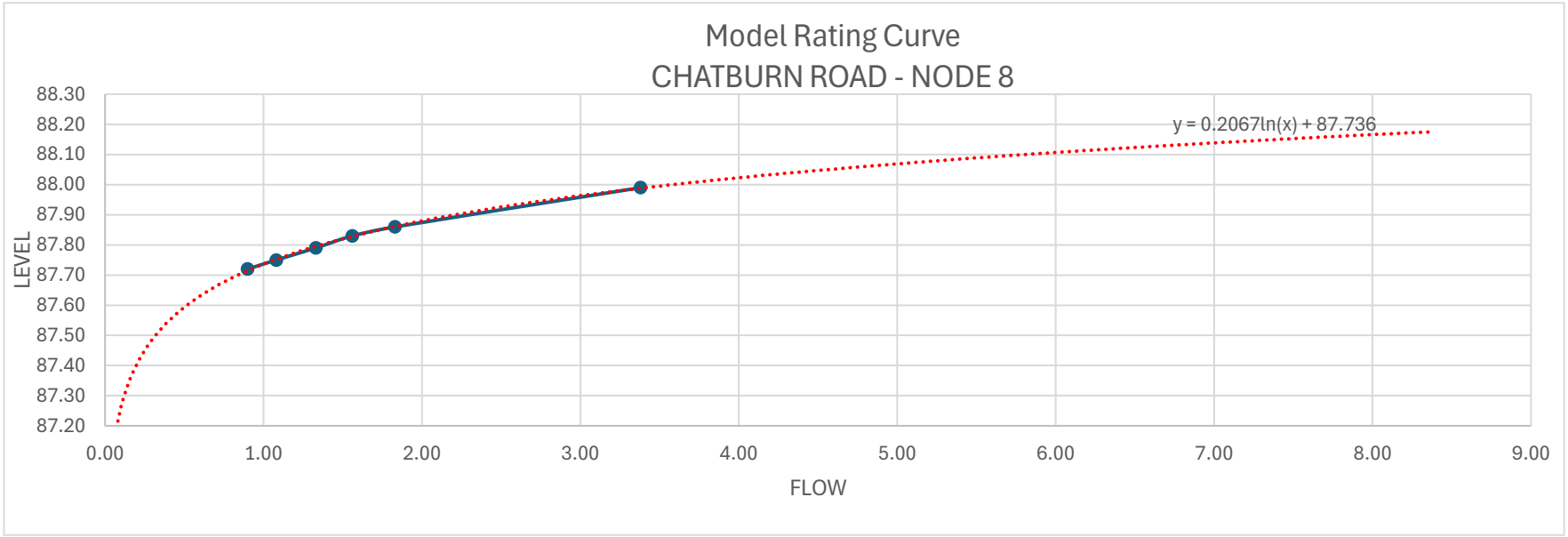
ln(x) = 1.127264531



Node 8				
AEP	1:X	Level	Flow	Flow + 36% CC
20%	5	87.72	0.90	1.22
10%	10	87.75	1.08	1.47
4%	25	87.79	1.33	1.81
2%	50	87.83	1.56	2.12
1%	100	87.86	1.83	2.49
0.1%	1000	87.99	3.38	4.60

DESIRED FLOW RATE, X =	2.49
EQUATION TO PROJECT Y VALUE =	0.2067ln(x) + 87.736
WATER LEVEL @ 100YR + 36% CC, Y =	87.924

ln(x) = 0.911800667



Appendix E

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)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.089	5.00	92.296	1500	375427.357	443098.655	1.796
2	0.055	5.00	91.836	1200	375459.314	443119.008	2.000
3	0.069	5.00	91.195	1200	375452.837	443129.113	2.000
4	0.053	5.00	89.916	1200	375433.615	443137.634	1.847
17	0.000	5.00	88.724	1500	375446.069	443174.385	2.561
18	0.000		88.498	2100	375422.760	443162.442	2.400
5	0.136	5.00	88.666	3000	375414.979	443150.354	2.632
6	0.024	5.00	88.457	1200	375401.420	443152.627	2.469
7	0.103	5.00	87.964	3000	375376.771	443132.769	2.884
8	0.050	5.00	86.881	2400	375335.068	443114.981	1.914
12	0.101	5.00	91.971	1200	375364.912	443055.473	2.221
13	0.018	5.00	91.334	1200	375342.244	443039.645	2.275
14	0.034	5.00	90.667	1200	375327.929	443047.514	2.500
15	0.141	5.00	88.242	1200	375312.682	443075.625	1.674
9	0.126	5.00	87.088	3000	375300.914	443091.293	2.228
10	0.037	5.00	86.548	2400	375281.515	443090.205	1.810
11	0.000		86.376	3000	375270.792	443080.262	1.676
16			86.000		375256.342	443094.389	1.700

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	1	2	37.888	0.600	90.500	90.124	0.376	100.8	150	5.63	50.0
1.001	2	3	12.003	0.600	89.836	89.716	0.120	100.0	225	5.78	50.0
1.002	3	4	21.026	0.600	89.195	88.144	1.051	20.0	225	5.90	50.0
1.003	4	5	22.563	0.600	88.069	87.166	0.903	25.0	300	6.02	50.0
3.000	17	18	26.191	0.600	86.163	86.098	0.065	402.9	4500	5.13	50.0
3.001	18	5	14.376	0.600	86.098	86.034	0.064	225.0	300	5.36	50.0
1.004	5	6	13.748	0.600	86.034	85.988	0.046	300.0	300	6.28	49.8

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	1.001	17.7	12.1	1.646	1.562	0.089	0.0	91	1.076
1.001	1.307	52.0	19.5	1.775	1.254	0.144	0.0	95	1.216
1.002	2.939	116.8	28.9	1.775	1.547	0.213	0.0	76	2.447
1.003	3.158	223.2	36.0	1.547	1.200	0.266	0.0	81	2.342
3.000	3.333	17996.2	0.0	1.361	1.200	0.000	0.0	0	0.000
3.001	1.044	73.8	0.0	2.100	2.332	0.000	0.0	0	0.000
1.004	0.902	63.8	54.2	2.332	2.169	0.402	0.0	214	1.009

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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)
1.005	6	7	31.653	0.600	85.988	85.848	0.140	225.6	300	6.78	48.2
1.006	7	8	45.338	0.600	85.080	84.967	0.113	400.0	4000	7.01	47.5
1.007	8	9	41.565	0.600	84.967	84.863	0.104	399.7	4000	7.23	46.9
2.000	12	13	27.647	0.600	89.750	89.059	0.691	40.0	150	5.29	50.0
2.001	13	14	16.335	0.600	89.059	88.242	0.817	20.0	150	5.41	50.0
2.002	14	15	31.980	0.600	88.167	86.568	1.599	20.0	225	5.59	50.0
2.003	15	9	19.595	0.600	86.568	85.588	0.980	20.0	225	5.70	50.0
1.008	9	10	19.429	0.600	84.860	84.738	0.122	159.3	450	7.43	46.3
1.009	10	11	14.623	0.600	84.738	84.700	0.038	384.8	450	7.66	45.6
1.010	11	16	20.208	0.600	84.700	84.300	0.400	50.5	375	7.80	44.9

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)
1.005	1.042	73.7	55.6	2.169	1.816	0.426	0.0	195	1.142
1.006	3.260	15648.0	68.1	1.684	0.714	0.529	0.0	36	0.478
1.007	3.261	15653.9	73.5	0.714	1.025	0.579	0.0	37	0.488
2.000	1.596	28.2	13.7	2.071	2.125	0.101	0.0	74	1.583
2.001	2.262	40.0	16.1	2.125	2.275	0.119	0.0	67	2.147
2.002	2.939	116.8	20.7	2.275	1.449	0.153	0.0	64	2.229
2.003	2.939	116.8	39.8	1.449	1.275	0.294	0.0	90	2.662
1.008	1.608	255.8	125.4	1.778	1.360	0.999	0.0	222	1.599
1.009	1.030	163.8	128.2	1.360	1.226	1.036	0.0	301	1.135
1.010	2.554	282.1	126.1	1.301	1.325	1.036	0.0	175	2.484

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	37.888	100.8	150	Circular_Default Sewer Type	92.296	90.500	1.646	91.836	90.124	1.562
1.001	12.003	100.0	225	Circular_Default Sewer Type	91.836	89.836	1.775	91.195	89.716	1.254
1.002	21.026	20.0	225	Circular_Default Sewer Type	91.195	89.195	1.775	89.916	88.144	1.547
1.003	22.563	25.0	300	Circular_Default Sewer Type	89.916	88.069	1.547	88.666	87.166	1.200
3.000	26.191	402.9	4500	Baskets	88.724	86.163	1.361	88.498	86.098	1.200
3.001	14.376	225.0	300	Circular_Default Sewer Type	88.498	86.098	2.100	88.666	86.034	2.332
1.004	13.748	300.0	300	Circular_Default Sewer Type	88.666	86.034	2.332	88.457	85.988	2.169
1.005	31.653	225.6	300	Circular_Default Sewer Type	88.457	85.988	2.169	87.964	85.848	1.816
1.006	45.338	400.0	4000	Baskets	87.964	85.080	1.684	86.881	84.967	0.714
1.007	41.565	399.7	4000	Baskets	86.881	84.967	0.714	87.088	84.863	1.025

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1500	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	5	3000	Manhole	Adoptable
3.000	17	1500	Manhole	Adoptable	18	2100	Manhole	Adoptable
3.001	18	2100	Manhole	Adoptable	5	3000	Manhole	Adoptable
1.004	5	3000	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.005	6	1200	Manhole	Adoptable	7	3000	Manhole	Adoptable
1.006	7	3000	Manhole	Adoptable	8	2400	Manhole	Adoptable
1.007	8	2400	Manhole	Adoptable	9	3000	Manhole	Adoptable

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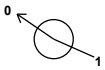
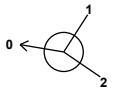
Pipeline Schedule

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)
2.000	27.647	40.0	150	Circular_Default Sewer Type	91.971	89.750	2.071	91.334	89.059	2.125
2.001	16.335	20.0	150	Circular_Default Sewer Type	91.334	89.059	2.125	90.667	88.242	2.275
2.002	31.980	20.0	225	Circular_Default Sewer Type	90.667	88.167	2.275	88.242	86.568	1.449
2.003	19.595	20.0	225	Circular_Default Sewer Type	88.242	86.568	1.449	87.088	85.588	1.275
1.008	19.429	159.3	450	Circular_Default Sewer Type	87.088	84.860	1.778	86.548	84.738	1.360
1.009	14.623	384.8	450	Circular_Default Sewer Type	86.548	84.738	1.360	86.376	84.700	1.226
1.010	20.208	50.5	375	Circular_Default Sewer Type	86.376	84.700	1.301	86.000	84.300	1.325

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	12	1200	Manhole	Adoptable	13	1200	Manhole	Adoptable
2.001	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
2.002	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
2.003	15	1200	Manhole	Adoptable	9	3000	Manhole	Adoptable
1.008	9	3000	Manhole	Adoptable	10	2400	Manhole	Adoptable
1.009	10	2400	Manhole	Adoptable	11	3000	Manhole	Adoptable
1.010	11	3000	Manhole	Adoptable	16		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	375427.357	443098.655	92.296	1.796	1500				
						0	1.000	90.500	150
2	375459.314	443119.008	91.836	2.000	1200		1	1.000	90.124	150
						0	1.001	89.836	225
3	375452.837	443129.113	91.195	2.000	1200		1	1.001	89.716	225
						0	1.002	89.195	225
4	375433.615	443137.634	89.916	1.847	1200		1	1.002	88.144	225
						0	1.003	88.069	300
17	375446.069	443174.385	88.724	2.561	1500				
						0	3.000	86.163	4500
18	375422.760	443162.442	88.498	2.400	2100		1	3.000	86.098	4500
						0	3.001	86.098	300
5	375414.979	443150.354	88.666	2.632	3000		1	3.001	86.034	300
							2	1.003	87.166	300
						0	1.004	86.034	300

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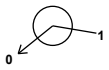
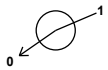
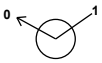
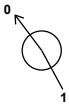
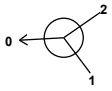
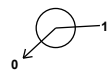
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
6	375401.420	443152.627	88.457	2.469	1200	1	1.004	85.988	300
									
						0	1.005	85.988	300
7	375376.771	443132.769	87.964	2.884	3000	1	1.005	85.848	300
						0	1.006	85.080	4000
8	375335.068	443114.981	86.881	1.914	2400	1	1.006	84.967	4000
									
						0	1.007	84.967	4000
12	375364.912	443055.473	91.971	2.221	1200				
						0	2.000	89.750	150
13	375342.244	443039.645	91.334	2.275	1200	1	2.000	89.059	150
									
						0	2.001	89.059	150
14	375327.929	443047.514	90.667	2.500	1200	1	2.001	88.242	150
						0	2.002	88.167	225
15	375312.682	443075.625	88.242	1.674	1200	1	2.002	86.568	225
									
						0	2.003	86.568	225
9	375300.914	443091.293	87.088	2.228	3000	1	2.003	85.588	225
						2	1.007	84.863	4000
									
						0	1.008	84.860	450
10	375281.515	443090.205	86.548	1.810	2400	1	1.008	84.738	450
									
						0	1.009	84.738	450
11	375270.792	443080.262	86.376	1.676	3000	1	1.009	84.700	450
						0	1.010	84.700	375
16	375256.342	443094.389	86.000	1.700		1	1.010	84.300	375

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	18.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	✓
Winter CV	0.840	Check Discharge Volume	✓

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Simulation Settings

100 year 360 minute (m³)

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	50	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 11 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	84.700	Product Number	CTL-SHE-0167-1630-2000-1630
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	16.3	Min Node Diameter (mm)	1500

Node 5 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	86.034	Product Number	CTL-SHE-0146-1250-2000-1250
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.5	Min Node Diameter (mm)	1500

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Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	92.024	1.524	48.3	4.2018	0.0000	FLOOD RISK
15 minute winter	2	11	90.164	0.328	63.5	0.5514	0.0000	SURCHARGED
15 minute winter	3	11	89.372	0.177	98.4	0.3229	0.0000	OK
15 minute winter	4	11	88.246	0.177	125.6	0.3016	0.0000	OK
180 minute winter	17	168	87.378	1.215	22.8	2.1478	0.0000	SURCHARGED
180 minute winter	18	168	87.378	1.280	46.1	4.4356	0.0000	SURCHARGED
180 minute winter	5	168	87.378	1.344	61.5	10.8929	0.0000	SURCHARGED
600 minute winter	6	600	86.127	0.139	14.0	0.1838	0.0000	OK
600 minute winter	7	600	86.124	1.044	20.6	8.1237	0.0000	OK
600 minute winter	8	600	86.124	1.157	24.9	5.8371	0.0000	OK
15 minute winter	12	12	91.593	1.843	54.8	3.7600	0.0000	SURCHARGED
15 minute winter	13	12	89.816	0.757	49.9	0.9761	0.0000	SURCHARGED
15 minute winter	14	11	88.291	0.124	63.9	0.1734	0.0000	OK
15 minute winter	15	12	87.271	0.703	137.4	1.9792	0.0000	SURCHARGED
600 minute winter	9	600	86.124	1.264	40.2	10.3630	0.0000	SURCHARGED
600 minute winter	10	600	86.123	1.385	30.0	6.8333	0.0000	SURCHARGED
600 minute winter	11	600	86.123	1.423	23.4	10.0575	0.0000	FLOOD RISK
15 minute summer	16	1	84.300	0.000	16.3	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	1	1.000	2	36.7	2.086	2.077	0.6603	
15 minute winter	2	1.001	3	63.2	1.590	1.216	0.4653	
15 minute winter	3	1.002	4	98.5	3.114	0.843	0.6641	
15 minute winter	4	1.003	5	125.9	3.097	0.564	0.9175	
180 minute winter	17	3.000	18	-22.8	-0.022	-0.001	147.1048	
180 minute winter	18	3.001	5	-46.1	-0.655	-0.625	1.0123	
180 minute winter	5	Hydro-Brake®	6	12.5				
600 minute winter	6	1.005	7	14.0	0.800	0.190	1.5766	
600 minute winter	7	1.006	8	15.0	0.212	0.001	199.5597	
600 minute winter	8	1.007	9	24.5	0.053	0.002	200.9936	
15 minute winter	12	2.000	13	41.6	2.366	1.477	0.4867	
15 minute winter	13	2.001	14	48.3	2.746	1.209	0.2874	
15 minute winter	14	2.002	15	63.3	2.236	0.542	0.9929	
15 minute winter	15	2.003	9	128.7	3.236	1.101	0.7792	
600 minute winter	9	1.008	10	28.8	0.548	0.113	3.0784	
600 minute winter	10	1.009	11	23.4	0.319	0.143	2.3169	
600 minute winter	11	Hydro-Brake®	16	16.3				662.5

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Design Settings

Frequency of use (kDU)	0.00	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	4000	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.200
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Dwellings	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	15	88.783	1200	375416.867	443146.956	1.335
2	5	88.526	1200	375403.045	443150.890	1.527
3	5	88.144	1200	375380.441	443129.810	1.539
4	5	87.281	1200	375346.950	443116.069	1.497
5	5	87.373	1200	375303.210	443086.386	2.073
6	5	86.998	1200	375296.003	443089.710	1.751
7	5	86.615	1200	375283.576	443089.338	1.451
8		86.255	1200	375268.713	443074.922	1.229

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	1	2	14.371	1.500	87.448	86.999	0.449	32.0	150
1.001	2	3	30.908	1.500	86.999	86.605	0.394	78.5	150
1.002	3	4	36.200	1.500	86.605	85.784	0.821	44.1	150
1.003	4	5	52.861	1.500	85.784	85.300	0.484	109.2	150
1.004	5	6	7.937	1.500	85.300	85.247	0.053	149.7	150
1.005	6	7	12.433	1.500	85.247	85.164	0.083	149.8	150
1.006	7	8	20.706	1.500	85.164	85.026	0.138	150.0	150

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.457	1.552	27.4	0.7	1.185	1.377	0.000	15	0.0	0.0	17	0.644
1.001	0.368	0.989	17.5	0.9	1.377	1.389	0.000	20	0.0	0.0	24	0.517
1.002	0.479	1.321	23.4	1.2	1.389	1.347	0.000	25	0.0	0.0	23	0.680
1.003	0.370	0.838	14.8	1.4	1.347	1.923	0.000	30	0.0	0.0	31	0.522
1.004	0.348	0.715	12.6	1.6	1.923	1.601	0.000	35	0.0	0.0	37	0.489
1.005	0.361	0.715	12.6	1.9	1.601	1.301	0.000	40	0.0	0.0	39	0.508
1.006	0.379	0.714	12.6	2.1	1.301	1.079	0.000	45	0.0	0.0	41	0.525

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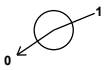
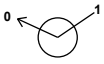
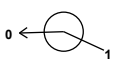
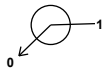
Pipeline Schedule

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	14.371	32.0	150	Circular_Default Sewer Type	88.783	87.448	1.185	88.526	86.999	1.377
1.001	30.908	78.5	150	Circular_Default Sewer Type	88.526	86.999	1.377	88.144	86.605	1.389
1.002	36.200	44.1	150	Circular_Default Sewer Type	88.144	86.605	1.389	87.281	85.784	1.347
1.003	52.861	109.2	150	Circular_Default Sewer Type	87.281	85.784	1.347	87.373	85.300	1.923
1.004	7.937	149.7	150	Circular_Default Sewer Type	87.373	85.300	1.923	86.998	85.247	1.601
1.005	12.433	149.8	150	Circular_Default Sewer Type	86.998	85.247	1.601	86.615	85.164	1.301
1.006	20.706	150.0	150	Circular_Default Sewer Type	86.615	85.164	1.301	86.255	85.026	1.079

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
1.004	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.005	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.006	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	375416.867	443146.956	88.783	1.335	1200				
						0	1.000	87.448	150
2	375403.045	443150.890	88.526	1.527	1200	1	1.000	86.999	150
						0	1.001	86.999	150
3	375380.441	443129.810	88.144	1.539	1200	1	1.001	86.605	150
						0	1.002	86.605	150
4	375346.950	443116.069	87.281	1.497	1200	1	1.002	85.784	150
									
						0	1.003	85.784	150
5	375303.210	443086.386	87.373	2.073	1200	1	1.003	85.300	150
									
						0	1.004	85.300	150
6	375296.003	443089.710	86.998	1.751	1200	1	1.004	85.247	150
									
						0	1.005	85.247	150
7	375283.576	443089.338	86.615	1.451	1200	1	1.005	85.164	150
									
						0	1.006	85.164	150

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
8	375268.713	443074.922	86.255	1.229	1200	1	1.006	85.026	150

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Appendix F

GADSDEN CONSULTING
CIVIL & STRUCTURAL ENGINEERS

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Sustainable Drainage Maintenance & Management Plan

Housing Development Chatburn Road, Clitheroe, BB7 4SF

1.0 Introduction

Sustainable drainage systems or SuDS are an environmentally friendly approach to managing rainfall that uses the landscape. SuDS aim to: -

- Control the flow, volume and frequency of water leaving a development site
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces
- Provide attractive surroundings for the community
- Create opportunities for wildlife

2.0 SuDS at this Development

The SuDS are designed to prevent flooding of the housing development and control the flow of water from the site. This site utilises attenuation in the form of geocellular attenuation baskets and vortex flow control units to slowly discharge surface water into the existing watercourse via a wetland area.

The highway serving the site is constructed using a mixture of bituminous macadam and impermeable paviours. The maintenance of the main carriageways will be the responsibility of the management company.

3.0 Managing the SuDS

The surface water drainage and SuDS requiring management and maintenance for this site are summarised in Tables 1 & 2 below: -

Table 1 – Maintenance Schedule (general)

	Maintenance Item	Action	Regularity
1	Monitoring Generally	Initial inspection of everything below to ensure the system is working effectively	After large storms and quarterly during first year
2	Impermeable Pavements	Brushing/sweeping of surface area to clear litter, grass cuttings, leaves and other debris	Once per year after Autumn leaf fall and as required
3	Impermeable Pavements	Removal of weeds using glyphosphate applied directly into weeds using an applicator	Annually and/or as required
4	Impermeable Pavements	Remedial work to depressions and cracked or broken block pavers. Replace blocks and replace jointing material	As required
5	Manholes, Geocellular Tanks, Pipes etc	Lift manhole covers, visual inspection. If debris/silt has built up arrange jetting. Arrange CCTV survey if performance deteriorates.	Annually and/or as required
6	Flow Control (Hydro-Brake)	Lift manhole cover, clear silt from silt trap, inspect Hydro-brake for blockages	Annually
7	Inlets and Outlets	Inspect and remove silt, litter and debris. Strim for 1m around	Monthly

Table 2 – Maintenance Schedule (wetland area – from SuDS Manual)

TABLE 23.1 Operation and maintenance requirements for ponds and wetlands

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay.	Every 1–5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25–50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows.	As required

Appendix G

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CIVIL & STRUCTURAL ENGINEERS

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Householder Sustainable Drainage Maintenance Plan

Development at Chatburn Road, Clitheroe, BB7 4SF

1.0 Introduction

Sustainable drainage systems or SuDS are an environmentally friendly approach to managing rainfall that uses the landscape. SuDS aim to: -

- Control the flow, volume and frequency of water leaving a development site
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces
- Provide attractive surroundings for the community
- Create opportunities for wildlife

2.0 Surface water drainage & SuDS serving this property

House and garage roof areas are served by downspouts and bioretention planters before entering the formal drainage network.

The driveway is constructed with a permeable finish. Surface water is to pass through the stone layer beneath before being collected in a perforated pipe and entering the formal drainage network.

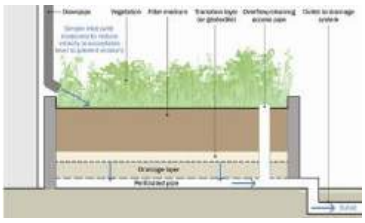
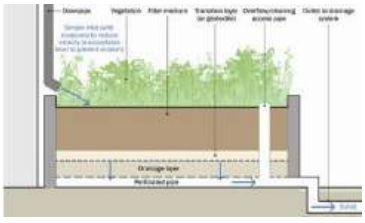
As the homeowner, you are responsible for the maintenance and upkeep of the system serving your property and permeable driveway until it enters the public sewer.

3.0 Management & Maintenance

The surface water drainage and SuDs requiring management and maintenance for this property are summarised in Table 1 below: -

Table 1 – Householder Maintenance Schedule

Maintenance Item	Regularity	Action	Purpose	Diagram
ACO or similar channel to driveway (if applicable)	Monthly	Remove litter, grass cuttings and other vegetation from the surface of the grills	Prevent grills becoming blocked allowing water to get away	
ACO or similar channel to driveway	Annually	Remove debris, grass cuttings etc from inside the channel itself. This can be easily done by lifting the lid to the corner unit and cleaning out the sump by hand wearing a suitable pair of gloves	Prevent the silt trap filling up and debris entering the tank	Corner unit Sump unit
Gullies to downspouts	Monthly	Remove litter, grass cuttings and other vegetation from the gulley grate	Prevent grate/cover becoming blocked allowing water to get away	
Gullies to downspouts	Annually	Remove debris, grass cuttings etc from inside the gulley itself. This can be easily done by lifting the cover and cleaning out the gulley by hand wearing a suitable pair of gloves	Prevent the trap filling up and debris entering the tank	
Inspection Chambers	Annually	-Remove silt from base of silt trap manhole	Prevent inspection chamber blocking up and affecting the performance of the system	

Permeable Paving	Monthly	Remove litter, grass cuttings and other vegetation from the surface	Prevent blockages within the openings that allowing water to get away	
Permeable Paving	As required	Lift paving, replace sub-base layer below and reinstate	On failure or deterioration of performance to ensure adequate infiltration (and voids in sub-base)	
Permeable Paving	As required	-Reconstruct filter drains below permeable paving if performance deteriorates. -Replace clogged geotextile membrane	On failure or deterioration of performance to ensure system is working effectively	
Bioretention Planter	Quarterly	-Inspect surfaces for silting and ponding -Check operation of underdrains by inspection of flows after rainfall -Inspect inlets and outlets	Prevent blockages and ensure system is working as designed	
Bioretention Planter	As required	-Remove litter, debris and weeds -Replace any plants to maintain density -Infill any holes or scour in the filter medium and improve erosion protection if required	Prevent blockages and ensure system is working as designed