



**Land at St Mary's Gate Retail Park,
Whitworth Road,
Rochdale,
OL12 0TY**

Proposed Commercial Development

Outline Drainage Strategy

For: Glenbrook Investments

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1.0 INTRODUCTION

- 1.1 Integra Consulting has been commissioned by Glenbrook Investments to undertake an Outline Drainage Strategy for the land at Whitworth Road, Rochdale OL12 0TY. This document has been prepared to accompany the detailed planning application for the proposed re-development of the site for commercial / retail use by the construction of a 'Drive Thru' facility with associated hard surfaced car parking and areas of soft landscape (refer to Appendix 5).
- 1.2 The objective of the Outline Drainage Strategy is to identify the proposed surface and foul water drainage strategies for the development site. The potential flooding issues and any consequent implications on the proposed site development are also considered.
- 1.3 The Outline Drainage Strategy has been undertaken in accordance with the pro-forma guidance contained in:
- Department for Communities and Local Government document 'National Planning Practice Guidance: Flood Risk and Coastal Change'
 - Level 1 Strategic Flood Risk Assessment for Greater Manchester (update) prepared by JBA Consulting dated March 2019
 - Rochdale Borough's Strategy for Flood Risk Management 2014 - 2024 prepared by Rochdale MBC dated March 2014
 - Greater Manchester Surface Water Management Plan prepared by JBA Consulting dated January 2012
 - DEFRA / Environment Agency publication SC030219 'Rainfall Runoff Management for Developments' dated October 2013.
- 1.4 To date, consultations have been undertaken with the Environment Agency (EA).

2.0 STANDARDS AND LIMITATIONS

This report has been prepared solely for use by Glenbrook Investments.

It shall not be relied upon or transferred to any other party without the prior written authorisation of Integra Consulting.

The findings and opinions in the report are based on information derived from a variety of different sources. Integra Consulting do not accept any liability for the accuracy or otherwise of any information provided by third parties.

It should be noted that some of the aspects considered in this study may be subject to change with time. Therefore, if the development is delayed or postponed, consideration may need to be given to reviewing such issues to confirm that no changes have taken place, either at the site or within relevant legislation.

Further consultations with statutory bodies are likely as the scheme progresses. It should be noted that even where responses have been received from Regulators, these could be subject to change at a later date.

3.0 CURRENT SITUATION

3.1 Site Location and Description

The circa 0.34 hectare site is located approximately 0.6km north west of the centre of Rochdale at National Grid reference 389786, 413897 as shown on the site location plan in Appendix 1.

The site is bound to the north and west by public pavements extending along Queen Street and Whitehall Street respectively. Its eastern boundary is delineated by pavements extending along Duke Street whilst its southern boundary is adjoined by a public car park associated with nearby retail units (refer to existing site plan in Appendix 2). The River Roch (designated by the Environment Agency as 'main river') lies circa 450m south of the site through multiple third party ownerships.

The surface topography across the site slopes gently from circa 141.5m AOD adjacent to the northern site boundary with Queen Street to circa 139m AOD at its southern boundary. The existing topographical survey can be found in Appendix 2.

A hard surfaced car parking area occupies the current site.

3.2 Flooding

Current Environment Agency flood data indicates the proposed development site to lie wholly in Flood Zone 1 (refer to Appendix 3 for details).

EA / DEFRA flood mapping generally indicates no risk of surface water flooding with only an isolated linear extent at a low risk of surface water flooding adjacent to the eastern site boundary.

EA / DEFRA flood mapping does not indicate any areas of the proposed development platform at elevated risk of reservoir flooding.

3.3 Existing Sewers

The United Utilities sewer plan in Appendix 4 indicates the following adopted sewer infrastructure at and adjacent to the site:

- 300mm diameter combined sewer extending from south west to north east beneath Queen Street
- 450mm diameter combined sewer extending from north west to south east beneath Whitworth Road
- 375mm diameter combined sewer extending from north west to south east beneath Whitehall Street
- 500mm x 520mm combined sewer extending from north west to south east beneath Whitehall Street

It is noted that private 600mm diameter surface water sewers (culverted watercourse) are also noted to extend from north west to south east beneath Whitworth Road and from north east to south west to the south of the development site.

4.0 PROPOSED DEVELOPMENT

4.1 Development Proposals

It is proposed to submit a detailed planning application for the proposed re-development of the site for commercial / retail use by the construction of a 'Drive Thru' facility with associated hard surfaced car parking and areas of soft landscape (refer to Appendix 5 for details of the proposed site plan).

4.2 Surface Water Drainage

The issue of surface water drainage to the proposed development has been considered with reference to the hierarchy of surface water disposal as noted in the Building Regulations H3:

- i) Sustainable Urban Drainage Systems (SUDS)
- ii) Discharge of surface water off site direct to watercourse
- iii) Discharge to adopted sewer

SUDS are made up of one or more structures built to manage surface water runoff. They are used in conjunction with good management of the site to prevent flooding and pollution. There are four general methods of control:

- Filter strips and swales
- Filter drains and permeable surfaces
- Infiltration devices
- Basins and Ponds

A Phase 1 geo-environmental desk study has been undertaken by Integra Consulting (refer to Appendix 7 for Phase 1 desk study details). The desk study indicates the site to be underlain by superficial deposits of impermeable Diamicton commonly known as boulder clay which is in turn underlain by the Old Lawrence Rock (sandstone of the Lower Pennine Coal Measure Formation) overlying mudstone and siltstone which are again associated with the Lower Pennine Coal Measure Formation. The desk study confirms that the documented geology strongly demonstrates that soakaway drainage will not function effectively on this site.

Although no specific infiltration testing in line with BRE 365 has been undertaken, it is evident from the above noted desk study data that the underlying soils at shallow depth beneath the site are not suitable for the use of post-development soakaway surface water drainage techniques. Furthermore, there is potential for the presence of contamination associated with made ground and asbestos containing materials arising from various previous phases of on-site development.

It is however noted that a culverted watercourse extends directly from north west to south east directly to the east of the site beneath Whitworth Road in addition to extending from north east to south west beneath the existing car park to the south of the site. It is therefore proposed to discharge suitably attenuated site surface water to the 600mm diameter culverted watercourse that extends from north west to south east beneath Whitworth Road subject to an existing drainage survey. This proposal is in line with feedback received from United Utilities via their formal wastewater pre-application process (refer to Appendix 4 for details).

In the event that there were any unforeseen issues in discharging suitably attenuated surface water to the culverted watercourse noted above, it would be proposed to discharge suitably attenuated surface water to the 375mm diameter combined sewer that extends from north west to south east beneath Whitehall Street potentially using the existing site connection. A survey of the existing private on-site sewer network has been undertaken and the results are provided in Appendix 6 of this report.

In line with the requirements of the North West SuDS Pro-Forma and section 24.5 of The SuDS Manual, it is proposed to limit post-development surface water runoff to greenfield runoff rates based on a high runoff soil type (FSR Soil Type 5) - refer to Appendix 8 for details.

Based on the nature of this proposed commercial / retail development, a climate change factor of 30% on peak rainfall intensity has been adopted.

Estimated preliminary surface water storage volumes to cater for a 1 in 30 year event is circa 70 m³ whilst on site storage to cater for a 1 in 100 year plus 30% climate change event is approximately 140 m³ (refer to Appendix 9 for details).

The post-development surface water drainage strategy will naturally need to be agreed in principle with the LLFA officer and United Utilities. Discharge of post-development surface water into the adjacent culverted watercourse system will also naturally require a formal permit from the LLFA.

Ultimately the final design of the drainage system will be subject to the finalised site arrangement, further targeted site investigation and subsequent development of a detailed drainage scheme.

The post-development surface water drainage system will be designed to ensure that:

- There is no surcharge in the 1 in 1 year event:
- Surface water flows remain on site up to a 1 in 100 year + 30% climate change storm event.
- Sufficient surface water storage will be available to ensure there is no risk to property

4.3 National Planning Policy Framework and Technical Guidance

The commercial / retail site development proposals are classed as 'less vulnerable' in Table 2 of the Flood Risk and Coastal Change guidance.

'Less vulnerable' developments in Flood Zone 1 are classed as appropriate according to Table 3 of the Flood Risk and Coastal Change guidance.

Proposed post development levels will be engineered in order to protect the development and not provide any increased flood risk elsewhere.

Types of flooding that could affect the site are:

River- the site wholly lies in Flood Zone 1

Sea – there is no risk of flooding from the sea

Groundwater – there are no springs or weep areas on the site

Sewers – there have been no local reports of sewer surcharge

4.4 Strategic Flood Risk Assessment & EA Mapping Review

From our review of both Rochdale Borough's Strategy for Flood Risk Management 2014 - 2024 prepared by Rochdale MBC dated March 2014 and the Greater Manchester Surface Water Management Plan prepared by JBA Consulting dated January 2012, the site lies outside any Critical Drainage Areas.

There are no groundwater protection zones in the vicinity of the site and there is negligible residual fluvial risk. The site is not noted to lie within a flood warning area.

4.5 Safe Access and Egress

Safe access / egress from the site in extreme conditions will be via the entrance on Duke Street.

4.6 Foul Water Drainage

We would propose to discharge post-development foul drainage from the new 'Drive Thru' unit to the existing adjacent adopted 375mm diameter combined sewerage system beneath Whitehall Street, potentially utilising the existing site connection.

The foul drainage network will naturally comply with Building Regulations 2010 – Approved Document H1 and the calculations for post-development foul water discharge will be based on Sewers for Adoption 8th Edition.

5.0 SuDS DESIGN STATEMENT

5.1 SuDS Requirements

SuDS measures are required on the proposed development to comply with the National Planning Policy Framework (NPPF), DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems and the SuDS guidance in the Level 1 Strategic Flood Risk Assessment for Greater Manchester (update) prepared by JBA Consulting dated March 2019.

The key conceptual SUDS design criteria for the development are covered in Non-Statutory Technical Standards for Sustainable Drainage under sections S1 to S9 based on the brownfield nature of the development site.

Peak Flow Control

S3 of the DEFRA Technical Standards stipulates that for brownfield developments, the peak runoff from the development for the 1 in 1 year and 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate for the same rainfall event but should never exceed the rate of discharge from the development prior to re-development for that event.

Volume Control

Requirement S5 stipulates that the runoff volume in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event but should never exceed the runoff volume from the development site prior to development.

Flood Risk within the Development

S7 stipulates that the drainage system shall be designed such that no flooding shall occur on any part of the site during a 1 in 30 year storm event whilst the S8 requirement stipulates that, during a 1 in 100 year enhanced rainfall event, no flooding of any building shall occur.

S9 stipulates that site levels shall be designed such that flows which are as a result of rainfall events exceeding the 1 in 100 year enhanced rainfall event, are managed in exceedance routes that minimise the risks to people and property.

Water Quality

In addition to the above measures contained within the DEFRA guidance addressing water quantity issues, designing for water quality is also a requirement of the on-site SUDS measures. Reference is made to CIRIA Report 'C753 – The SUDS Manual', specifically Chapters 4 and 26.

5.2 Proposed SUDS Methodology & Drainage Design Principles

As detailed in section 4.2, discharge of surface water direct to the ground in the form of infiltration measures is deemed infeasible due to the underlying permeability of the natural strata. Accordingly, controlled discharge to the adjacent existing culverted watercourse system beneath Whitworth Road is the proposed method of post-development surface water discharge.

Peak Flow Control

In line with the requirements of the North West SuDS Pro-Forma and section 24.5 of The SuDS Manual, it is proposed to limit post-development surface water runoff to greenfield runoff rates based on a high runoff soil type (FSR Soil Type 5). Post-development surface water flow from the proposed development site shall therefore be limited to 3.8 litres per second thereby providing a significant betterment in relation to the existing unattenuated runoff rate.

Volume Control

The proposed discharge flow rate will apply for all flood events from the 1 in 1 year to the 1 in 100 year (enhanced) event. This is deemed to equate to a significant betterment over the development site.

Flood Risk within the Development

To cater for excess surface water runoff, the proposed method of attenuation on the site is to utilise underground crate storage beneath the external areas of the development platform with a downstream piped drainage system discharging attenuated site surface water into the existing adjacent culverted watercourse system beneath Whitworth Road.

It is proposed to accommodate the 1 in 100 year (enhanced) event storage volume within the underground crate storage. Accordingly, this will ensure that criteria S7 and S8 are met.

Appendix 9 contains calculations of an in principle surface water storage volume of circa 140m³ for the development. It is proposed to accommodate the 1 in 100 year (enhanced) event storage volume within the underground crate storage. Accordingly, this will ensure that criteria S7 and S8 are met.

The site is to discharge post-development surface water into underground crate storage within the 'red line' site boundary which in turn will discharge through a flow control chamber to limit the discharge to a runoff rate of 3.8 litres per second. Downstream of the crate storage / flow control chamber, the attenuated surface water flow will discharge to the adjacent culverted watercourse system beneath Whitworth Road.

Water Quality

In assessing the level of treatment required to ensure sufficient water quality improvement prior to discharge to watercourse, reference is made to Chapter 26 of CIRIA C753 – The SuDS Manual and specifically, Table 26.2 which details the pollution hazard indices for different site uses:

Based on the proposed development (the closest suitable development definition in Table 26.2 is 'commercial yard and delivery areas...'), the pollution hazard level is noted as 'medium', with pollution hazard indices being:

Total Suspended Solids 0.7

Metals 0.6

Hydrocarbons 0.7

In line with the requirements stipulated in Table 26.2 and Table 26.3 of the SuDS Manual, it is proposed to utilise 2 No proprietary water treatment systems at the retail development site in the form of the Hydro International Up-Flo Filter Vault system in combination with the Hydro International twin walled HDPE chamber 'Downstream Defender' (refer to Appendix 10 for details).

It is proposed that the 'Up-Flo Filter' unit is located immediately downstream of the surface water attenuation storage. The filter unit itself will be specified in order that it has sufficient capacity to accommodate the design flows directly downstream of the below ground attenuation storage and hydrobrake system.

The 'Downstream Defender' unit will be located immediately downstream of the 'Up-Flo Filter' unit and will also have sufficient capacity to accommodate the design flows directly downstream of the below ground attenuation storage and hydro brake system.

The simple index approach in line with the requirements of The SuDS Manual has been followed in order to verify that the SuDS treatment train provided by the combination of the 'Up-Flo Filter' and the 'Downstream Defender' provides a suitable level of water treatment for the proposed retail development at the subject site.

Step 1 – Define Pollution Hazard Indices

With reference to Table 26.2 of the SuDS Manual, the land use category relevant to the subject site is '*Commercial yards and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways*'.

Accordingly, the designated pollution hazard level for the development site is 'medium' with the following pollution hazard indices applying:

Total Suspended Solids (TSS): 0.7

Metals: 0.6

Hydrocarbons: 0.7

Step 2 – Determine SuDS pollution mitigation indices

Up-Flo Filter:

In terms of the relevant SuDS mitigation indices, the attached data sheet information (refer to Appendix 10) shows that the Up-Flo Filter delivers high removal of a variety of pollutants including:

Sediment or Total Suspended Solids (TSS):

SuDS Pollution Mitigation Index = 0.8

Sediment Bound Heavy Metals and Nutrients:

SuDS Pollution Mitigation Index = 0.69

Liquid Hydrocarbons:

SuDS Pollution Mitigation Index = 0.4

Downstream Defender:

In terms of the relevant SuDS mitigation indices, the attached data sheet information (refer to Appendix 10) shows that the Downstream Defender delivers high removal of a variety of pollutants including:

Sediment or Total Suspended Solids (TSS):

SuDS Pollution Mitigation Index = 0.5

Sediment Bound Heavy Metals and Nutrients:

SuDS Pollution Mitigation Index = 0.4

Liquid Hydrocarbons:

SuDS Pollution Mitigation Index = 0.8

Utilising the Simple Index Approach in line with Chapter 26 of CIRIA C753
The SuDS Manual, the aggregated Surface Water Mitigation Index is as set
out below:

Sediment or Total Suspended Solids (TSS):

SuDS Pollution Mitigation Index = $0.8 + (0.5 \times 0.5) = 1.05$

Sediment Bound Heavy Metals and Nutrients:

SuDS Pollution Mitigation Index = $0.69 + (0.5 \times 0.4) = 0.89$

Liquid Hydrocarbons:

SuDS Pollution Mitigation Index = $0.4 + (0.5 \times 0.8) = 0.8$

In combination, the above SuDS Mitigation Indices for the Up-Flo Filter and the Downstream Defender demonstrate that this proposed SuDS treatment system exceeds the relevant pollution hazard indices in relation to the proposed land use for total suspended solids, heavy metals and hydrocarbons.

Accordingly, the proposed use of the Hydro International Up-Flo Filter Vault system together with the twin walled HDPE chamber 'Downstream Defender' is deemed to provide a sufficient SuDS treatment train without the need for any further measures to be employed on this retail development site

5.3 Management and Maintenance of SuDS Drainage System

The management and maintenance of the above noted SuDS measures to serve the proposed development will be undertaken by a maintenance management company to be appointed for the project. The appointment of the maintenance and management company is to be confirmed at the completion of the build phase. All parts of the drainage network are to be accessible and are to be constructed from materials that are suitable and robust for the lifetime of the development.

The maintenance activities required for the drainage network are as follows:

5.3.1 Cellular Storage Structure

The maintenance for the cellular storage structure is as follows:

Operation	Frequency
Inspect and identify any areas that are not operating correctly and if required take remedial actions	Monthly for three months then six monthly intervals
Debris caused from catchment surface (where it may cause risk to performance)	Monthly
Where rainfall infiltration into cellular storage from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required but at least twice a year
Remove sediment from upstream surface water network by jetting	Annually or as required
Repair / check all inlets, outlets, overflows and vents	As required
Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after severe storms

5.3.2 Flow Control

The maintenance for the flow control is as follows:

Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required take remedial actions	Monthly for three months then at six monthly intervals
Debris removal from catchment surface (where it may cause risk to performance)	Monthly
Check control chamber for blockage or silt, algae or other matter by jetting	As required, but at least four times a year
Remove sediment from upstream drainage network and sediment from within manhole by jetting	As required, but at least twice a year
Repair / check all inlets and control mechanics	As required
Inspect / check all inlets and control mechanics to ensure that they are operating as designed	Twice a year as a minimum and after severe storm events

5.3.3 Flow Control Chamber Design Criteria

In addition to the above maintenance methods, the flow control chamber will be designed so it works effectively throughout the lifespan of the development and will have precautionary features to ensure maintenance work can be carried out promptly and efficiently to ensure no control failure which may otherwise subsequently lead to flooding.

Details of the flow control chamber are as follows:

- High Water Level Alarm: Alarm installed and directed to site maintenance team
- Spares: Control spares to be kept on site for efficient maintenance

5.3.4 Up-Flo-Filter

The maintenance for the Hydro International Up-Flo Filter is as follows (refer to Appendix 10 for Operation and Maintenance manual details):

Operation	Frequency
Inspection	Regularly during first year of installation to determine the site-specific rate of pollutant accumulation. After the initial year then every six months.
Oil and floatables removal	Twice a year or as needed or following a spill in the drainage area.
Sediment removal	Every six to twelve months and also following a spill in the drainage area.
Media Pack Replacement	Once per year or as needed in the event of continuous base conditions.
Drain Down Filter Replacement	Once per year with Media Pack replacement or as needed in the event of continuous base conditions.

5.3.5 Downstream Defender

The maintenance for the Hydro International Downstream Defender is as follows – it is noted that, for most cleanouts, it is not necessary to remove the entire volume of liquid in the vessel as only removing the first few centimetres of oils/floatables and the sediment storage volume is required (refer to Appendix 10 for Operation and Maintenance manual details):

Operation	Frequency
Inspection	Regularly during first year of installation to determine the site-specific rate of pollutant accumulation. After the initial year then every six months.
Oil and floatables removal	Annually along with sediment removal or following a spill in the drainage area
Sediment removal	Annually or as needed. Also following a spill in the drainage area.

5.3.6 Flood Routes

A visual monthly inspection of flood routes should be made in order to check that routes are not blocked by new fences, walls, soil or other rubbish with removal undertaken as necessary.

5.3.7 Spillage – Emergency Action

Most spillages on development sites are of compounds that do not pose a serious risk to the environment as they enter the drainage system in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommend by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then the spillage should be isolated using soil, turf or fabric and outlet pipes from chambers downstream of the spillage blocked with bungs. Bungs for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric. The Environment Agency should be contacted immediately.

5.3.8 Linked and Further Maintenance

The maintenance of the drainage network and SuDS features is to be linked with the landscape maintenance plan for the proposed development.

5.3.9 Maintenance Activities

A log of all maintenance activities is to be kept and made available to the Local Planning Authority (LPA) and / or the Lead Local Flood Authority (LLFA) on request.

6.0 CONCLUSIONS

6.1 Flooding

Following review of the Environment Agency flood maps and data, it has been confirmed that the site lies wholly in Flood Zone 1.

There are to be no off site surface water flood routes generated by the development during an enhanced 1 in 100 year storm. All surface water run-off will remain on site in the 1 in 100 year + 30% climate change event.

6.2 Site Surface Water Drainage

It is proposed to discharge suitably attenuated site surface water to the 600mm diameter culverted watercourse system that extends from north west to south east beneath Whitworth Road.

In line with the requirements of the North West SuDS Pro-Forma and section 24.5 of The SuDS Manual, it is proposed to limit post-development surface water runoff to greenfield runoff rates based on a high runoff soil type (FSR Soil Type 5).

It is proposed to discharge suitably attenuated post-development surface water into underground crate storage within the 'red line' site boundary which in turn will discharge through a flow control chamber to limit the discharge to a runoff rate of 3.8 litres per second, all subject to detailed drainage design.

6.3 Site Foul Water Drainage

We would propose that post-development foul drainage discharges from the new retail unit to the existing adjacent adopted combined sewerage system beneath Whitehall Street to the west of the site.

6.4 Flood Risk Management Measures

There will be a site management Health and Safety document prepared in respect of the site.

6.5 Off Site Impacts

All roofed and paved areas are to be drained into the site surface water drainage system. The design of the site surface water system will ensure that no off site flood flows are generated by the proposed development in the 1% plus climate change event.

6.6 Residual Risk

With careful design of the drainage elements as described above, there will be no residual flood related risks remaining after the development has been completed.

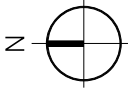
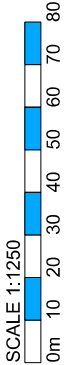
The proposed building envelope will naturally fully lie in Flood Zone 1.

A post-development safe emergency access can be maintained at all times during a flood event with emergency access from Duke Street.

APPENDIX

APPENDIX 1

SITE LOCATION PLANS



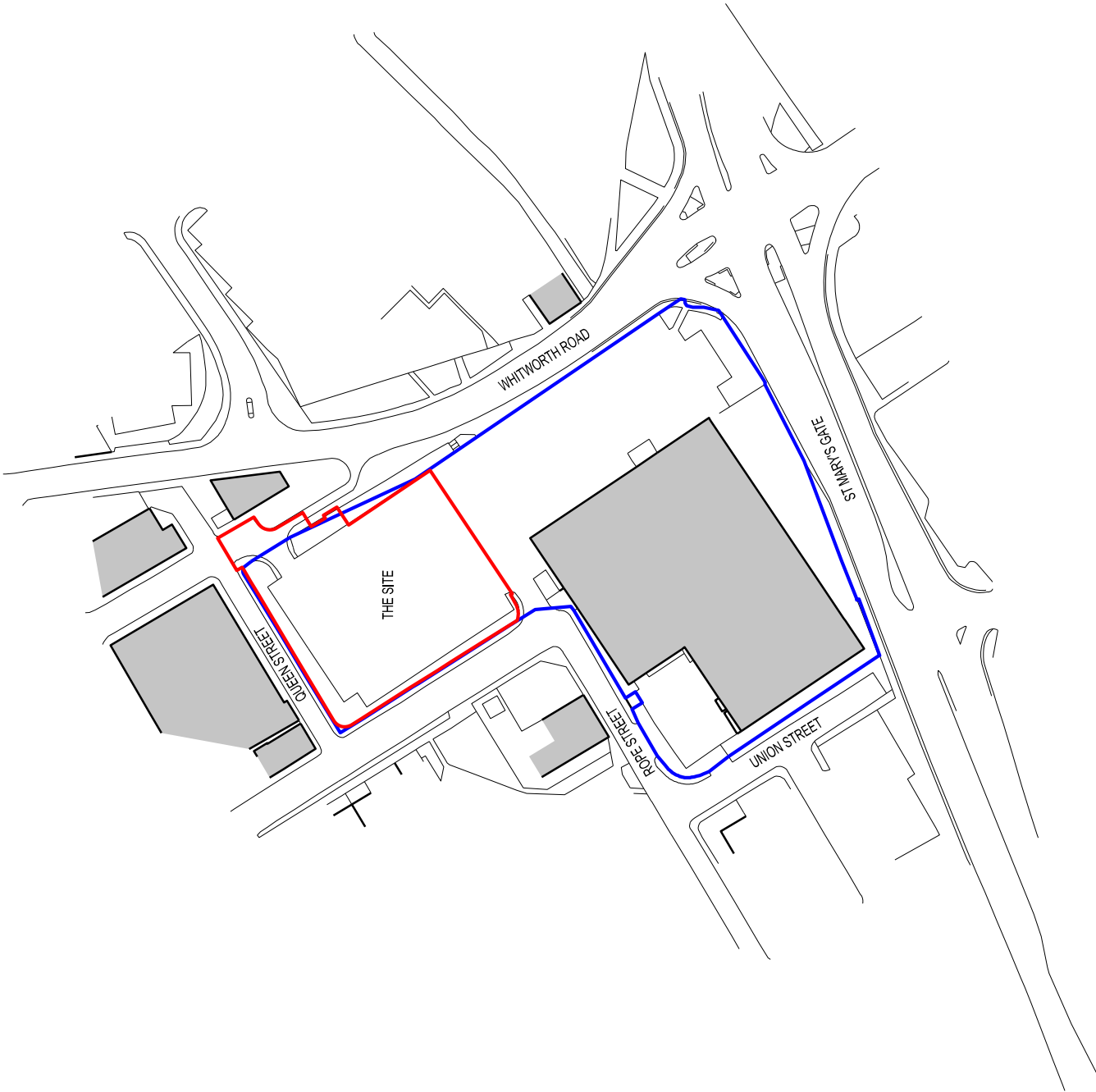
ORDNANCE SURVEY LICENCE
REPRODUCED FROM ORDNANCE SURVEY MASTERMAP DIGITAL DATA BY
PERMISSION OF ORDNANCE SURVEYS ON BEHALF OF HER MAJESTY'S
STATIONARY OFFICE. © CROWN COPYRIGHT 2010. ALL RIGHTS RESERVED.
REFERENCE NUMBER 10006896.

NOTES
THIS DRAWING HAS BEEN CREATED USING OS
TOPOGRAPHICAL INFORMATION.

LEGEND:

ESTATE DEMISE

PLANNING BOUNDARY
c. 0.34 Ha
c. 0.84 Ac



REV.	DATE	NOTES	INT.
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CLIENT / PROJECT
 **GLENBROOK**
ST. MARY'S GATE
ROCHDALE

DRAWING TITLE
LOCATION PLAN

STATUS
PLANNING

DATE	DRAWN	SCALE @ A3
07.02.23	AJP	1:1250

PROJECT NUMBER	UNIT / BLOCK	CU/SER CODE	TYPE & NUMBER	REVISION LETTER
----------------	--------------	-------------	---------------	-----------------

DRAWING NO.

11390	PL	L01
-------	----	-----

Site Location Plans	L	GA Plans	P	Elevations
Sections	S	Details	D	Profile Colour

THE RATCLIFFE GROVES PARTNERSHIP

MANCHESTER
105 MANCHESTER ROAD
ST. MARY'S GATE BL3 0TD
T: 0161 791 6009 E: manchester@gguk.com
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LONDON WC1R 4EB
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Recent aerial photograph



Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2023. All Rights Reserved.

Capture Date: 23/05/2019

Site Area: 0.23ha



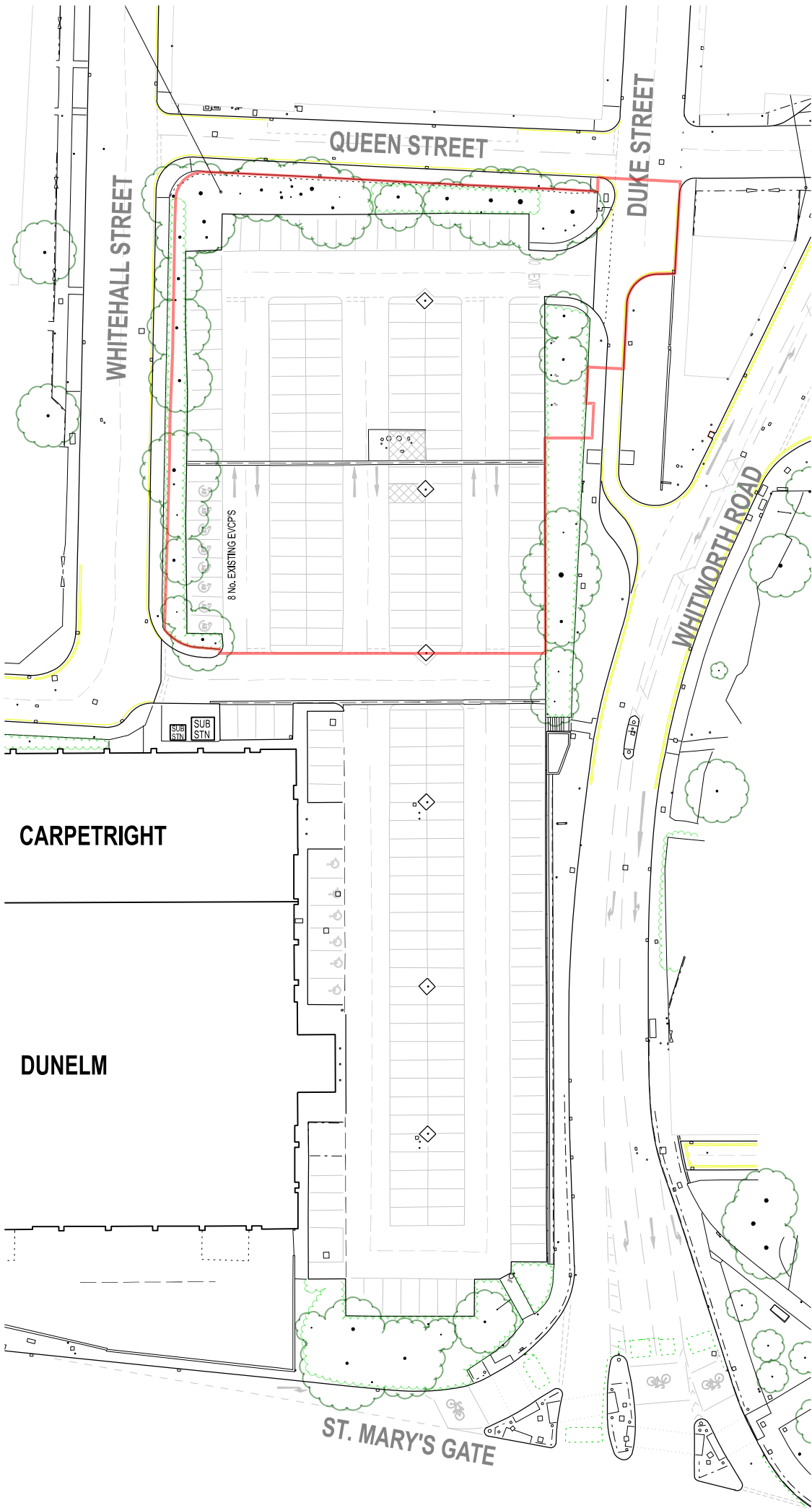
APPENDIX 2

EXISTING SITE PLAN / TOPOGRAPHICAL SURVEY

SCALE 1:500
0m 5 10 15 20 25 30



NOTES
SITE PLAN BASED ON TOPOGRAPHIC SURVEY BY SURVEY OPERATIONS. REFER TO DRAWING A0 21G200/001 FOR FULL DETAILS



REV. DATE NOTES INIT.

CLIENT / PROJECT
GLENBROOK
ST. MARY'S GATE
ROCHDALE

DRAWING TITLE
EXISTING SITE PLAN

STATUS
PLANNING

DATE 07.02.23 DRAWN AJP SCALE @ A3 1:500

PROJECT NUMBER	UNIT / BLOCK	CI / SFB CODE	TYPE & NUMBER	REVISION LETTER
11390	PL		L02	

Site Location Plans	L	GA Plans	P	Elevations	E
Sections	S	Details	D	Prefix Colour	C

THE RATCLIFFE GROVES PARTNERSHIP
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APPENDIX 3

ENVIRONMENT AGENCY FLOOD MAPPING

Flood map for planning

Your reference
Rochdale

Location (easting/northing)
389791/413889

Created
19 Feb 2023 16:48

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference

Rochdale

Location (easting/northing)

389791/413889

Scale

1:2500

Created

19 Feb 2023 16:48

Selected area

Flood zone 3

Flood zone 2

Flood zone 1

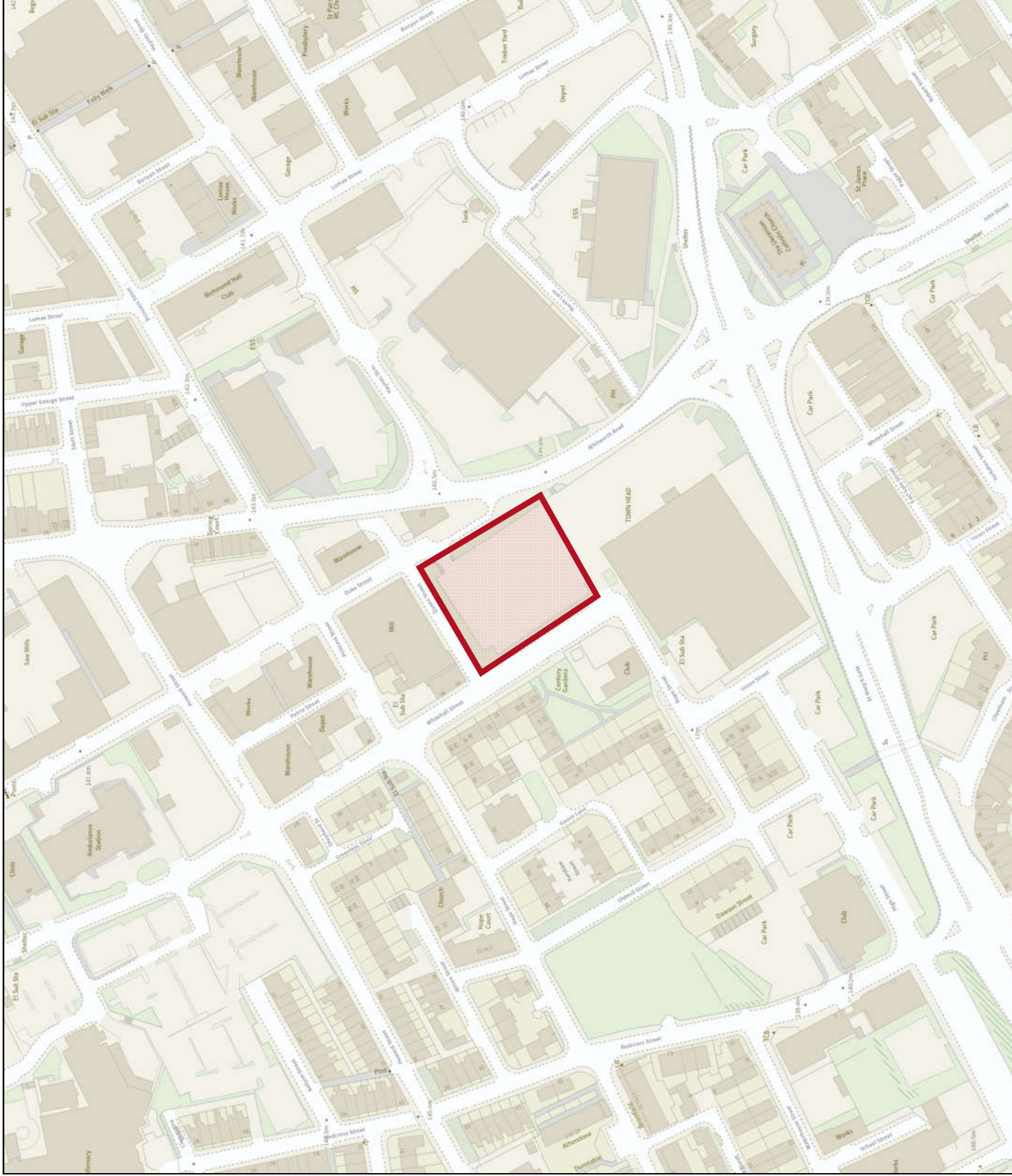
Flood defence

Main river

Water storage area



Page 2 of 2



APPENDIX 4

UNITED UTILITIES SEWER PLAN & PRE-APP CORRESPONDENCE

Integra Consulting

**14-32
Hewitt Street,
Manchester,
M15 4GB**

FAO:

How to contact us:

**United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP**

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

**Your Ref: Rochdale
Our Ref: UUPS-ORD-455140
Date: 04/01/2023**

Dear Sirs

Location: St Mary's Gate Rochdale

I acknowledge with thanks your request dated 31/12/2022 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



**Karen McCormack
Property Searches Manager**

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

Neville Shaw

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 09 March 2023 13:17
To: Neville Shaw
Subject: Pre Development Enquiry for: land at St Marys Gate Retails Park Rochdale OL12 0TY
UU Reference Number : 03690706

Good afternoon, Neville

Pre Development Enquiry for: land at St Marys Gate Retails Park Rochdale OL12 0TY UU Reference Number : 03690706

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 375mm diameter public combined sewer within Whitehall Street located to the West of your proposed development at an unrestricted rate.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**

3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

For guidance, The [North West SuDS Pro-Forma](#) provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

<https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs>

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

<https://www.gov.uk/government/publications/groundwater-protection-position-statements>

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

Waterbody

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you contact the Lead Local Flood Authority and/or Environment Agency to discuss a point of discharge to the culverted watercourse located 30m East, or 40m South of the proposed site.

We would encourage you to identify and engage with any third party landowner and riparian owner to agree access and discharge rights to the water body if this is not in your ownership.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging

surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 375mm diameter public combined sewer within Whitehall Street located West of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of proposed development. However, due to the accuracy of the records and the public sewer transfer legislation in 2011, not all public sewers are shown on our records so we would ask that you proceed with caution and carry out your own site investigation works. If any uncharted sewers are identified while carrying out your works we would ask that you contact United Utilities at the earliest opportunity so that we can offer guidance and update our records.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/>

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/>

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don't hesitate to contact us further.

Many thanks and kind regards,



Gary Jaundrell
Developer Engineer
Developer Services & Metering
Customer Services
T: 07388 715 589
[unitedutilities.com](https://www.unitedutilities.com)

If you have received a great service today why not tell us?
Visit: [unitedutilities.com/wow](https://www.unitedutilities.com/wow)

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry <https://www.unitedutilities.com/builders-developers/> or you can email us at WastewaterDeveloperServices@uuplc.co.uk

Coronavirus

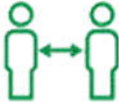
Prevent the spread



Wash your hands



Disinfect common surfaces



Practise social distancing



Stay home if you have symptoms

[Click for our message to customers](#)

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]

Sent: 01/03/2023 10:25

To: nevilleshaw@integraconsulting.co.uk

Subject: Land at St Marys Gate Retails Park Rochdale OL12 0TY

PRE DEVELOPMENT APPLICATION AT: [Land at St Marys Gate Retails Park Rochdale OL12 0TY](#) – UU Ref

Please accept this email as receipt of your application received on 28.02.2023 for the above development. This has now been logged on our system and the job reference is 03690706 we would ask that you quote this reference in all future correspondence.

I have reviewed your application (and attachments) and can confirm this is suitable to be passed to Gary Jaundrell for technical assessment. You will receive their response within 8 working days.

Kind regards

 United Utilities Water for the North West	Lucie Gaskell Customer Advisor Advanced Developer Services & Metering Customer Services Direct Tel: 01925 233050 Tel: 0345 072 6067 unitedutilities.com
---	---

If you have received a great service today why not tell us?

Visit: [unitedutilities.com/wow](https://www.unitedutilities.com/wow)

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry <https://www.unitedutilities.com/builders-developers/> or you can email us at WastewaterDeveloperServices@uuplc.co.uk



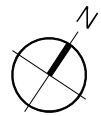
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www.unitedutilities.com/subsidiaries

APPENDIX 5

PROPOSED SITE PLAN

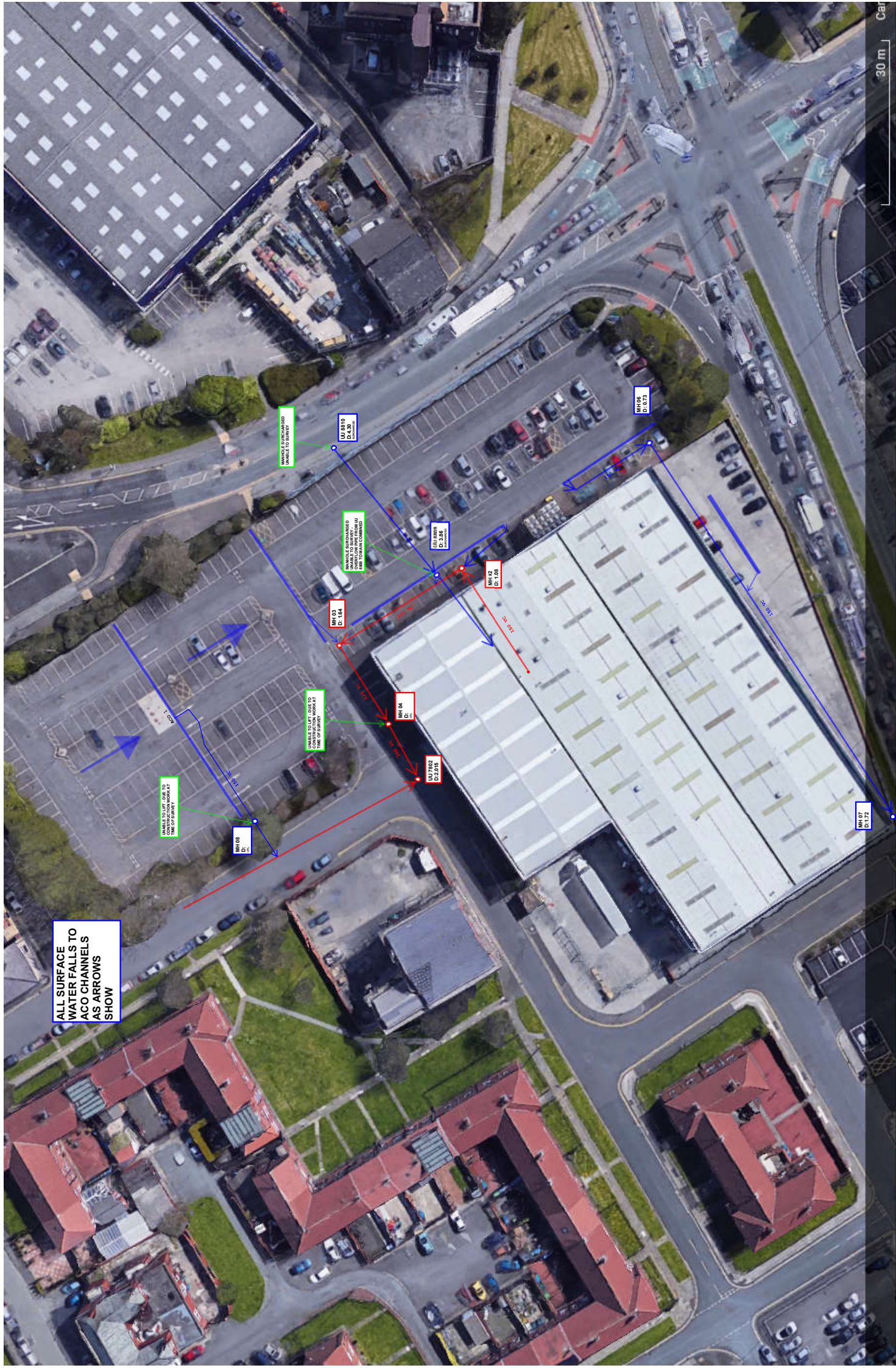


DELIVERIES



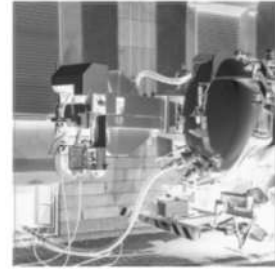
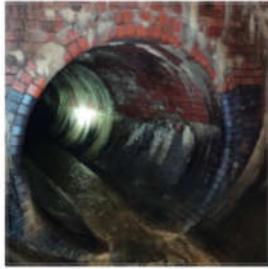
APPENDIX 6

EXISTING DRAINAGE SURVEY



ALL SURFACE
WATER FALLS TO
ASO CHANNELS
AS ARROWS
SHOW

30 m



LAYER SURVEYS LTD
SEE THE COMPLETE PICTURE

DRAINAGE SURVEY



Job Number
LAYERSERV0001592

Surveyed by (Operator)
CHRIS LUCOCK

Base Unit
ELFEIYII63

Date
19/01/2023

Client Details:

Integra Consulting
Suite 4,
14-32 Hewitt Street,
Manchester,
M15 4GB

Client Contact Name: Neville Shaw
Client Contact Tel: 07740 723 258

Site Details:

St Mary's Gate,
Rochdale,
OL12 6RY

Site Contact Name: Neville Shaw
Site Contact Tel: 07740 723 258

Contractor Details:

Layer Surveys Ltd
Francis House
Meadowcroft Business Park
Pope Lane
Preston
Lancashire
PR4 4BA

Office Contact Number: 01772 611634

Purpose of Survey:

Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
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Page 7	Survey Run Sheet(Survey 2 - MH 02 to BRANCH B)
Page 11	Survey Run Sheet(Survey 3 - MH 01 to MAIN CARRIER)
Page 13	Survey Run Sheet(Survey 4 - MH 03 to BRANCH B)
Page 16	Survey Run Sheet(Survey 5 - MH 03 to MH 02)
Page 19	Survey Run Sheet(Survey 6 - MH 03 to MH 04)
Page 22	Survey Run Sheet(Survey 7 - MH 04 to UU 7802)
Page 24	Survey Run Sheet(Survey 8 - MH 06 to BRANCH A)
Page 27	Survey Run Sheet(Survey 9 - MH 06 to MH 07)
Page 30	Survey Run Sheet(Survey 10 - ACO 1 to MH 08)
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Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) GULLY X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/1	Base Unit ELFEIYII63	Section Number 1
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 01 End Node GULLY Total length 10.29 metres	

Scale **1:0.54**
Direction **Upstream**

Start Node Ref:MH 01 | I/L :mm | Depth: 1.08mm

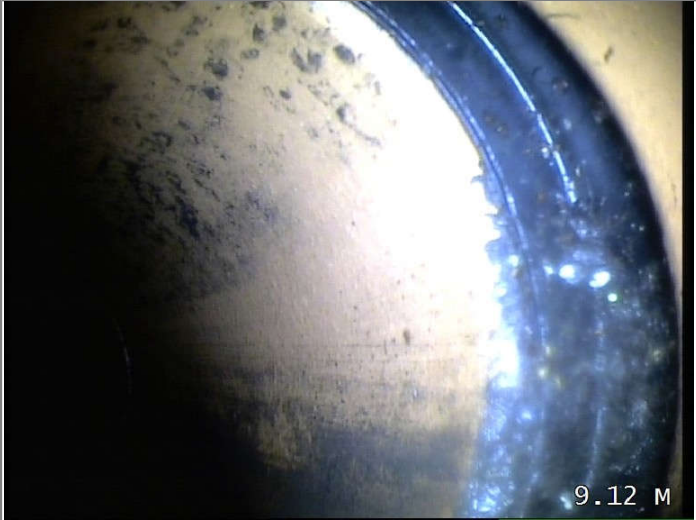
Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH S1	7384333	Comment / 0
0.00	WL	Water level 5% height/diameter	7384334	Comment / 0
0.02	JDM	Joint displaced medium	7384335	Structural / 1
7.31	WL	Water level 10% height/diameter - Remark: PIPE DIPPED - HOLDING WATER	7384336	Comment / 0
8.33	JN	Junction at 3 o'clock, diameter 100mm	7384337	Comment / 0
8.60	JDM	Joint displaced medium - Remark: SEAL VISABLE	7384338	Structural / 1
8.93	LL	Line of drain/sewer deviates left	7384339	Comment / 0
9.12	JDL	Joint displaced large - Remark: SEAL VISABLE	7384340	Structural / 1
9.55	WL	Water level 25% height/diameter - Remark: HOLDING WATER - PIPE DIPPED	7384341	Comment / 0
10.29	GYF	Finish node type, gully, reference ACO CHANNEL - BACK INLET GULLY	7384342	Comment / 0

End Node Ref:GULLY | I/L :mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 0.00 M Start node type, manhole, reference MH S1		 0.00 M Water level 5% height/diameter	
 0.02 M Joint displaced medium		 7.33 M Water level 10% height/diameter - Remark: PIPE DIPPED - HOLDING WATER	
 8.33 M Junction at 3 o'clock, diameter 100mm		 8.62 M Joint displaced medium - Remark: SEAL VISABLE	



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
			
Line of drain/sewer deviates left			
			
Joint displaced large - Remark: SEAL VISABLE			
			
Water level 25% height/diameter - Remark: HOLDING WATER - PIPE DIPPED			
			
Finish node type, gully, reference ACO CHANNEL - BACK INLET GULLY			



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) BRANCH B X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 2/2	Base Unit ELFEIYII63	Section Number 2
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 02 End Node BRANCH B Total length 22.71 metres	
Scale 1:1.19 Direction Upstream				

Start Node Ref:MH 02 I/L :mm Depth: 1.08mm						
Position	Code	Description		Photo	Type/Grade	
0.00	MH	Start node type, manhole, reference MH S1		7384343	Comment / 0	
0.00	WL	Water level 5% height/diameter		7384344	Comment / 0	
2.69	CL (S01)	Crack longitudinal at 3 o'clock, Start		7384345	Structural / 2	
2.71	CL (S02)	Crack longitudinal at 9 o'clock, Start		7384346	Structural / 2	
3.62	CL (F01)	Crack longitudinal at 3 o'clock, Finished		7384347	Structural / 2	
3.62	CL (F02)	Crack longitudinal at 9 o'clock, Finished		7384348	Structural / 2	
13.36	JN	Junction at 3 o'clock, diameter 100mm		7384350	Comment / 0	
18.33	JN	Junction at 3 o'clock, diameter 100mm		7384352	Comment / 0	
19.10	JN	Junction at 3 o'clock, diameter 100mm		7384353	Comment / 0	
20.21	JN	Junction at 3 o'clock, diameter 100mm		7384354	Comment / 0	
20.98	DEX	Other settled deposits 5% cross-sectional area loss - Remark: FOUL WASTE DEPOSITS		7384355	Service / 2	
22.05	JN	Junction at 3 o'clock, diameter 100mm		7384357	Comment / 0	
22.71	LU	Line of drain/sewer deviates up - Remark: REST BEND		7384358	Comment / 0	
22.71	OCF	Finish node type, other special chamber, reference REST BEND		7384359	Comment / 0	
End Node Ref:BRANCH B I/L :mm						



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 0.00 M Start node type, manhole, reference MH S1			
 0.00 M Water level 5% height/diameter			
 2.83 M Crack longitudinal at 3 o'clock, Start			
 2.71 M Crack longitudinal at 9 o'clock, Start			
 3.62 M Crack longitudinal at 3 o'clock, Finished			
 3.62 M Crack longitudinal at 9 o'clock, Finished			



Job Number
LAYERSERV0001592

Surveyed by (Operator)
CHRIS LUCOCK

Base Unit
ELFEIYI163

Date
19/01/2023



Junction at 3 o'clock, diameter 100mm



Junction at 3 o'clock, diameter 100mm



Junction at 3 o'clock, diameter 100mm



Junction at 3 o'clock, diameter 100mm



Other settled deposits 5% cross-sectional area loss - Remark: FOUL WASTE DEPOSITS



Junction at 3 o'clock, diameter 100mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
			
Line of drain/sewer deviates up - Remark: REST BEND			
			
Finish node type, other special chamber, reference REST BEND			



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) MH 01 X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/0	Base Unit ELFEIYII63	Section Number 3
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 225mm Material Vitrified clay Category		Start Node MH 01 End Node MAIN CARRIER Total length 1.86 metres	

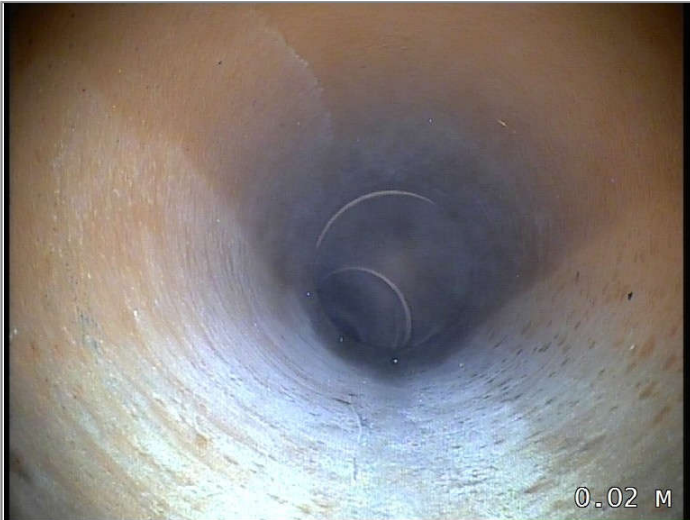
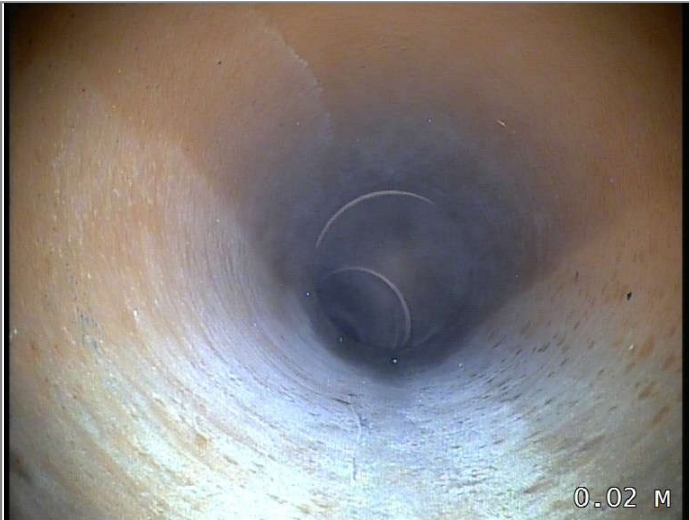
Scale **1:0.10**
Direction **Downstream**

Start Node Ref:MH 01 | I/L :mm

Position	Code	Description	Photo	Type/Grade
	0.00	MH	Start node type, manhole, reference MH 01	7384364 Comment / 0
	0.00	WL	Water level 5% height/diameter	7384365 Comment / 0
	0.02	LU	Line of drain/sewer deviates up	7384366 Comment / 0
	0.02	SC	Dimensions of drain/sewer changes to 150mm	7384410 Comment / 0
	1.31	LL	Line of drain/sewer deviates left	7384367 Comment / 0
	1.86	OFF	Finish node type, outfall, reference MAIN CARRIER	7384368 Comment / 0

End Node Ref:MAIN CARRIER | I/L :mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 0.02 M Start node type, manhole, reference MH 01	 0.02 M Water level 5% height/diameter		
 0.02 M Line of drain/sewer deviates up	 0.02 M Dimensions of drain/sewer changes to 150mm		
 1.31 M Line of drain/sewer deviates left	 1.86 M Finish node type, outfall, reference MAIN CARRIER		



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) BRANCH B X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/4	Base Unit ELFEIYII63	Section Number 4
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 03 End Node BRANCH B Total length 6.19 metres	

Scale **1:0.32**
Direction **Upstream**

Start Node Ref:MH 03 | I/L :mm | Depth: 1.64mm

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 03	7384369	Comment / 0
0.00	WL	Water level 5% height/diameter	7384370	Comment / 0
0.02	JDM	Joint displaced medium	7384371	Structural / 1
1.71	JDM	Joint displaced medium	7384372	Structural / 1
4.62	LL	Line of drain/sewer deviates left	7384373	Comment / 0
4.81	OJL	Open joint large	7384374	Structural / 1
5.67	LL	Line of drain/sewer deviates left	7384375	Comment / 0
5.74	FM	Fracture multiple from 12 to 12 o'clock	7384376	Structural / 4
6.19	GYF	Finish node type, gully, reference ACO CHANNEL	7384377	Comment / 0

End Node Ref:BRANCH B | I/L :mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 0.00 M Start node type, manhole, reference MH 03	 0.00 M Water level 5% height/diameter		
 0.05 M Joint displaced medium	 1.74 M Joint displaced medium		
 4.48 M Line of drain/sewer deviates left	 4.81 M Open joint large		



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
---------------------------------------	---	--------------------------------	---------------------------



Line of drain/sewer deviates left



Fracture multiple from 12 to 12 o'clock



Finish node type, gully, reference ACO CHANNEL



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) MH 02 X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/3	Base Unit ELFEIYII63	Section Number 5
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Combined Catchment	Shape/Size 225mm Material Vitrified clay Category		Start Node MH 03 End Node MH 02 Total length 25.29 metres	
Scale 1:1.33 Direction Upstream				

Start Node Ref:MH 03 | I/L :mm | Depth: 1.64mm

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 03	7384378	Comment / 0
0.00	WL	Water level 5% height/diameter	7384379	Comment / 0
0.14	OJM	Open joint medium	7384380	Structural / 1
18.52	JN	Junction at 10 o'clock, diameter 150mm	7384381	Comment / 0
19.30	JDM	Joint displaced medium	7384383	Structural / 1
19.37	WL	Water level 10% height/diameter - Remark: HOLDING WATER - PIPE DIPPED	7384382	Comment / 0
20.00	OJM	Open joint medium	7384384	Structural / 1
21.63	JDM	Joint displaced medium	7384385	Structural / 1
22.51	FC	Fracture circumferential from 12 to 12 o'clock	7384386	Structural / 3
25.29	MHF	Finish node type, manhole, reference MH 02	7384387	Comment / 0

End Node Ref:MH 02 | I/L :mm | Depth: 1.08mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
			
Start node type, manhole, reference MH 03			
			
Water level 5% height/diameter			
			
Open joint medium			
			
Junction at 10 o'clock, diameter 150mm			
			
Joint displaced medium			
			
Water level 10% height/diameter - Remark: HOLDING WATER - PIPE DIPPED			



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
	Open joint medium		Joint displaced medium
	Fracture circumferential from 12 to 12 o'clock		Finish node type, manhole, reference MH 02



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) MH 03 X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 2/1	Base Unit ELFEIYII63	Section Number 6

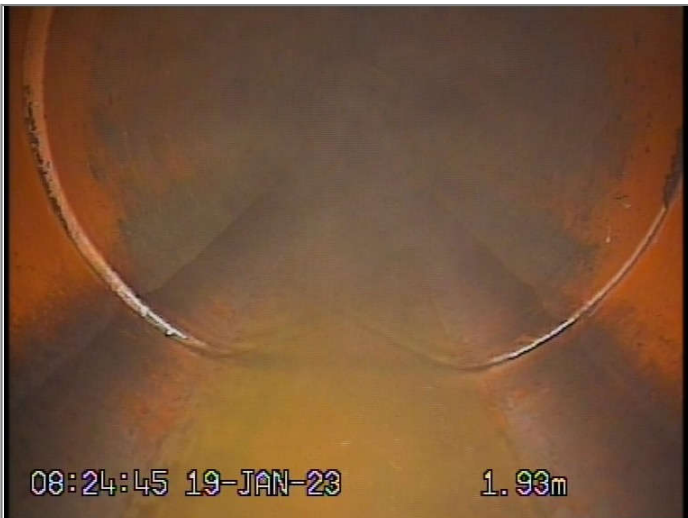
Road St Mary's Gate, Place Rochdale, Location OL12 6RY	Division District Location Details
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Purpose Duty Combined Catchment	Shape/Size 225mm Material Vitrified clay Category	Start Node MH 03 End Node MH 04 Total length 18.43 metres
--	---	--

Scale 1:0.97 Direction Downstream
--

Start Node Ref:MH 03 I/L :mm Depth: 1.64mm					
Position	Code	Description	Photo	Type/Grade	
0.00	MH	Start node type, manhole, reference MH 03	7384411	Comment / 0	
0.00	WL	Water level 10% height/diameter	7384412	Comment / 0	
1.93	WL	Water level 5% height/diameter	7384413	Comment / 0	
3.74	JN	Junction at 10 o'clock, diameter 150mm	7384414	Comment / 0	
15.24	RF	Roots fine	7384415	Service / 2	
16.91	JDM	Joint displaced medium	7384416	Structural / 1	
18.43	MHF	Finish node type, manhole, reference MH 04	7384440	Comment / 0	
End Node Ref:MH 04 I/L :mm					



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 08:24:27 19-JAN-23 -0.03m Start node type, manhole, reference MH 03	 08:24:27 19-JAN-23 -0.03m Water level 10% height/diameter		
 08:24:45 19-JAN-23 1.93m Water level 5% height/diameter	 08:25:12 19-JAN-23 3.74m Junction at 10 o'clock, diameter 150mm		
 08:26:39 19-JAN-23 15.24m Roots fine	 08:27:16 19-JAN-23 16.91m Joint displaced medium		



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 08:27:46 19-JAN-23 18.43m Finish node type, manhole, reference MH 04			



Layer Surveys Ltd
Francis House
Meadowcroft Business Park
Pope Lane
Preston
Lancashire
PR4 4BA

Start Node Ref:MH 04 | I/L :mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYI63	Date 19/01/2023
			
Start node type, manhole, reference UU 7802 A			
			
Water level 5% height/diameter			
			
Water level 10% height/diameter - Remark: HOLDING WATER			
			
Water level 25% height/diameter - Remark: HOLDING WATER - PIPE DIPPED , Start			
			
Water level 25% height/diameter - Remark: HOLDING WATER - PIPE DIPPED , Finished			
			
Finish node type, manhole, reference UU 7802			



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) BRANCH A X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 3/1	Base Unit ELFEIYII63	Section Number 8
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 06 End Node BRANCH A Total length 16.99 metres	

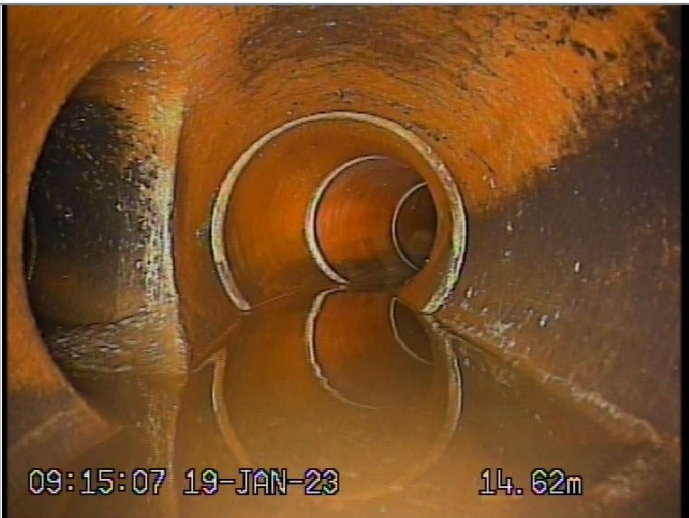
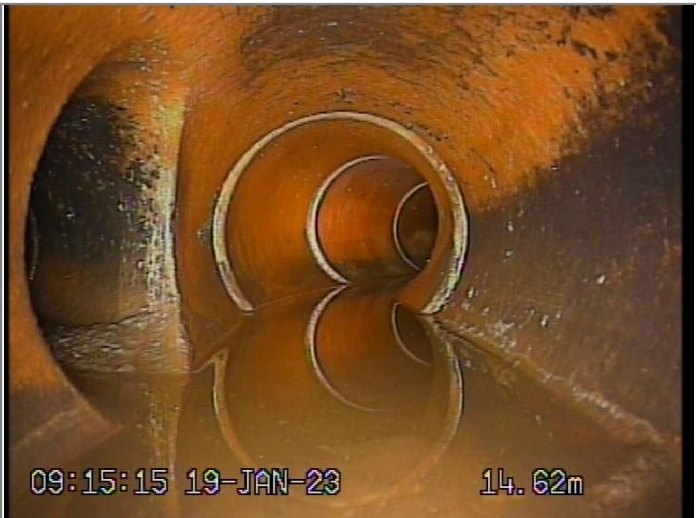
Scale **1:0.89**
Direction **Upstream**

Start Node Ref:MH 06 | I/L :mm | Depth: 0.73mm

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH 06	7384483	Comment / 0
0.00	WL	Water level 5% height/diameter	7384484	Comment / 0
1.94	WL (S01)	Water level 10% height/diameter, Start	7384485	Comment / 0
10.97	DES	Settled deposits fine 10% cross-sectional area loss	7384488	Service / 3
14.62	WL (F01)	Water level 10% height/diameter, Finished	7384489	Comment / 0
14.62	JN	Junction at 9 o'clock, diameter 100mm	7384490	Comment / 0
15.32	JDM	Joint displaced medium	7384492	Structural / 1
15.35	LR	Line of drain/sewer deviates right	7384491	Comment / 0
16.44	OJL	Open joint large	7384493	Structural / 1
16.99	GYF	Finish node type, gully, reference ACO CHANNEL	7384494	Comment / 0

End Node Ref:BRANCH A | I/L :mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 09:12:29 19-JAN-23 0.00m Start node type, manhole, reference MH 06			
 09:12:29 19-JAN-23 0.00m Water level 5% height/diameter			
 09:13:00 19-JAN-23 1.94m Water level 10% height/diameter, Start			
 09:14:17 19-JAN-23 10.27m Settled deposits fine 10% cross-sectional area loss			
 09:15:07 19-JAN-23 14.62m Water level 10% height/diameter, Finished			
 09:15:15 19-JAN-23 14.62m Junction at 9 o'clock, diameter 100mm			

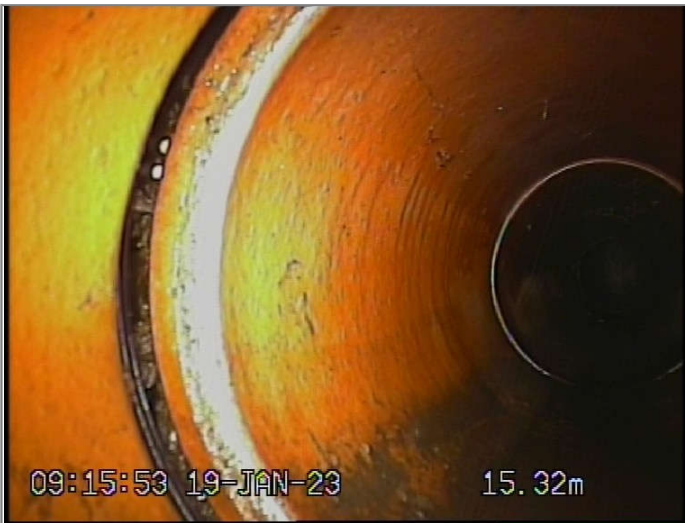


Job Number
LAYERSERV0001592

Surveyed by (Operator)
CHRIS LUCOCK

Base Unit
ELFEIYII63

Date
19/01/2023



Joint displaced medium



Line of drain/sewer deviates right



Open joint large



Finish node type, gully, reference ACO CHANNEL



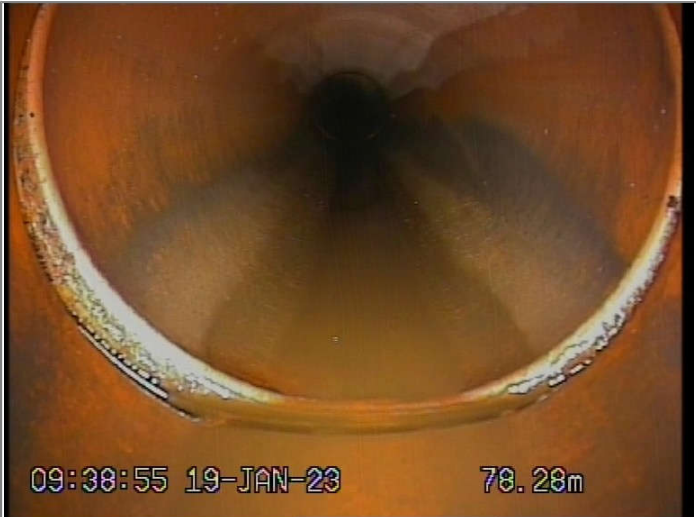
Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) MH 06 X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/1	Base Unit ELFEIYII63	Section Number 9
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Surface water Catchment		Shape/Size 150mm Material Vitrified clay Category		Start Node MH 06 End Node MH 07 Total length 83.44 metres
Scale 1:4.38 Direction Downstream				

Start Node Ref:MH 06 I/L :mm Depth: 0.73mm						
Position	Code	Description		Photo	Type/Grade	
0.00	MH	Start node type, manhole, reference MH 06		7384497	Comment / 0	
0.00	WL	Water level 5% height/diameter		7384498	Comment / 0	
25.86	JN	Junction at 9 o'clock, diameter 150mm		7384501	Comment / 0	
40.38	JDM	Joint displaced medium		7384504	Structural / 1	
51.71	JDM	Joint displaced medium		7384508	Structural / 1	
53.33	JN	Junction at 9 o'clock, diameter 150mm		7384510	Comment / 0	
57.75	JDM	Joint displaced medium		7384512	Structural / 1	
63.75	JN	Junction at 9 o'clock, diameter 150mm		7384513	Comment / 0	
71.17	JDM	Joint displaced medium		7384530	Structural / 1	
78.28	JDM	Joint displaced medium		7384531	Structural / 1	
83.44	MHF	Finish node type, manhole, reference MH 07		7384542	Comment / 0	
End Node Ref:MH 07 I/L :mm Depth: 1.72mm						



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
Start node type, manhole, reference MH 06		Water level 5% height/diameter	
Junction at 9 o'clock, diameter 150mm			
Joint displaced medium		Joint displaced medium	
Joint displaced medium			
Junction at 9 o'clock, diameter 150mm			



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 09:29:51 19-JAN-23 57.75m Joint displaced medium			
 09:30:57 19-JAN-23 63.75m Junction at 9 o'clock, diameter 150mm			
 09:32:17 19-JAN-23 71.57m Joint displaced medium			
 09:38:55 19-JAN-23 78.28m Joint displaced medium			
 09:39:51 19-JAN-23 83.44m Finish node type, manhole, reference MH 07			



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) ACO 1 X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/4	Base Unit ELFEIYII63	Section Number 10
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node ACO 1 End Node MH 08 Total length 25.93 metres	

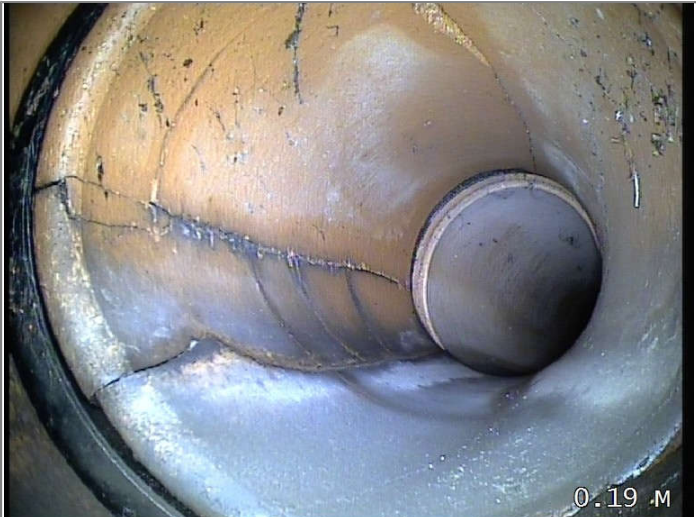
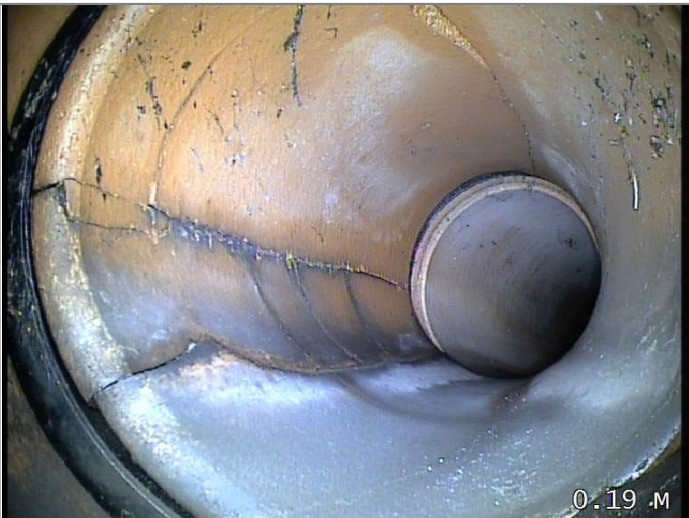
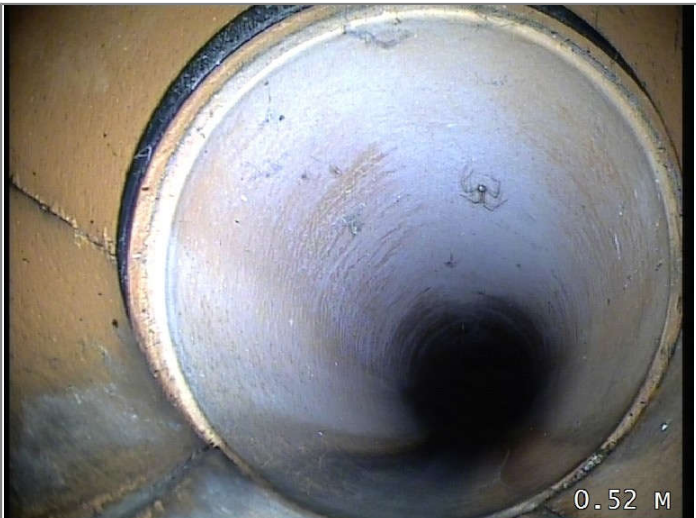
Scale **1:1.36**
Direction **Downstream**

Start Node Ref:ACO 1 | I/L :mm

Position	Code	Description	Photo	Type/Grade
0.00	GY	Start node type, gully, reference ACO 1	7385111	Comment / 0
0.00	WL	Water level 5% height/diameter	7385112	Comment / 0
0.17	JDM	Joint displaced medium - Remark: SEAL VISABLE	7385113	Structural / 1
0.19	FM (S01)	Fracture multiple from 7 to 1 o'clock, Start	7385116	Structural / 4
0.19	LR	Line of drain/sewer deviates right	7385117	Comment / 0
0.52	JDM	Joint displaced medium - Remark: SEAL VISABLE	7385120	Structural / 1
0.67	FM (F01)	Fracture multiple from 7 to 1 o'clock, Finished	7385121	Structural / 4
2.02	OJM	Open joint medium	7385122	Structural / 1
2.55	CC	Crack circumferential from 2 to 10 o'clock	7385123	Structural / 2
3.50	JDM	Joint displaced medium - Remark: SEAL VISABLE	7385130	Structural / 1
3.50	LR	Line of drain/sewer deviates right	7385131	Comment / 0
4.19	JDM	Joint displaced medium	7385132	Structural / 1
4.57	FM	Fracture multiple from 10 to 5 o'clock	7385133	Structural / 4
5.95	OJM	Open joint medium	7385139	Structural / 1
8.81	OJM	Open joint medium	7385140	Structural / 1
20.21	JN	Junction at 3 o'clock, diameter 150mm	7385147	Comment / 0
23.19	JDL	Joint displaced large	7385150	Structural / 1
23.50	JDM	Joint displaced medium	7385151	Structural / 1
25.00	JDM	Joint displaced medium	7385158	Structural / 1
25.93	MHF	Finish node type, manhole, reference MH 08	7385159	Comment / 0

End Node Ref:MH 08 | I/L :mm



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 0.00 M Start node type, gully, reference ACO 1		 0.00 M Water level 5% height/diameter	
 0.17 M Joint displaced medium - Remark: SEAL VISABLE		 0.19 M Fracture multiple from 7 to 1 o'clock, Start	
 0.19 M Line of drain/sewer deviates right		 0.52 M Joint displaced medium - Remark: SEAL VISABLE	



Job Number
LAYERSERV0001592

Surveyed by (Operator)
CHRIS LUCOCK

Base Unit
ELFEIYI63

Date
19/01/2023



Fracture multiple from 7 to 1 o'clock, Finished



Open joint medium



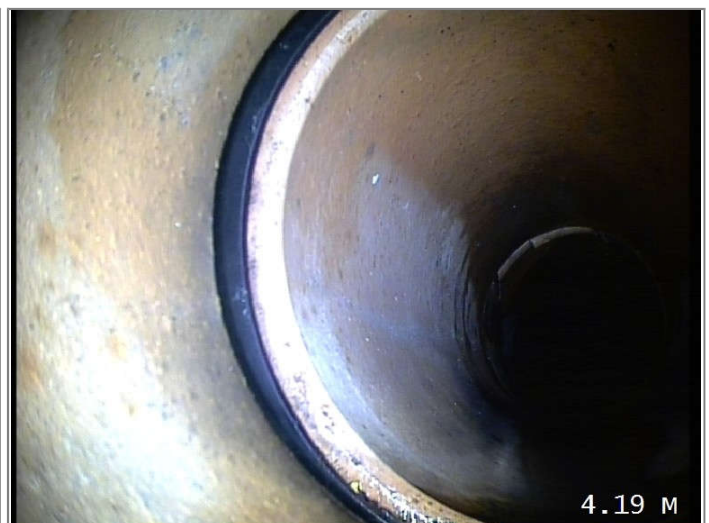
Crack circumferential from 2 to 10 o'clock



Joint displaced medium - Remark: SEAL VISABLE



Line of drain/sewer deviates right



Joint displaced medium



Job Number
LAYERSERV0001592

Surveyed by (Operator)
CHRIS LUCOCK

Base Unit
ELFEIYII63

Date
19/01/2023



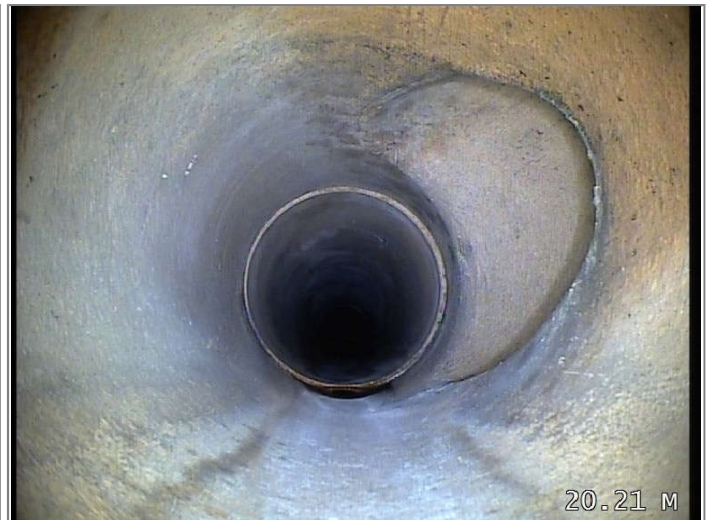
Fracture multiple from 10 to 5 o'clock



Open joint medium



Open joint medium



Junction at 3 o'clock, diameter 150mm



Joint displaced large



Joint displaced medium



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 24.98 M Joint displaced medium		 25.93 M Finish node type, manhole, reference MH 08	



Surveyed by (Operator) CHRIS LUCOCK	Job Number LAYERSERV0001592	Pipe Length Reference(PLR) MH 08 X	Date 19/01/2023	Pre Cleaned Not Cleaned
Weather 1 - Dry	Customer Present	Service Grade/Structural Grade 0/2	Base Unit ELFEIYII63	Section Number 11
Road St Mary's Gate, Place Rochdale, Location OL12 6RY		Division District Location Details		
Purpose Duty Surface water Catchment	Shape/Size 150mm Material Vitrified clay Category		Start Node MH 08 End Node MAIN CARRIER Total length 6.05 metres	

Scale **1:0.32**
Direction **Downstream**

Start Node Ref:MH 08 | I/L :mm

Position	Code	Description	Photo	Type/Grade
	0.00	CC	Crack circumferential from 1 to 10 o'clock	7385211 Structural / 2
	0.00	MH	Start node type, manhole, reference MH 08	7385199 Comment / 0
	0.00	WL	Water level 5% height/diameter	7385201 Comment / 0
	0.64	JDM	Joint displaced medium	7385213 Structural / 1
	1.24	JDM	Joint displaced medium	7385227 Structural / 1
	4.10	JDM	Joint displaced medium - Remark: SEAL VISABLE	7385237 Structural / 1
	5.50	LD	Line of drain/sewer deviates down	7385247 Comment / 0
	6.05	OFF	Finish node type, outfall, reference MAIN CARRIER	7385248 Comment / 0

End Node Ref:MAIN CARRIER | I/L :mm



Job Number
LAYERSERV0001592

Surveyed by (Operator)
CHRIS LUCOCK

Base Unit
ELFEIYII63

Date
19/01/2023



Crack circumferential from 1 to 10 o'clock



Start node type, manhole, reference MH 08



Water level 5% height/diameter



Joint displaced medium



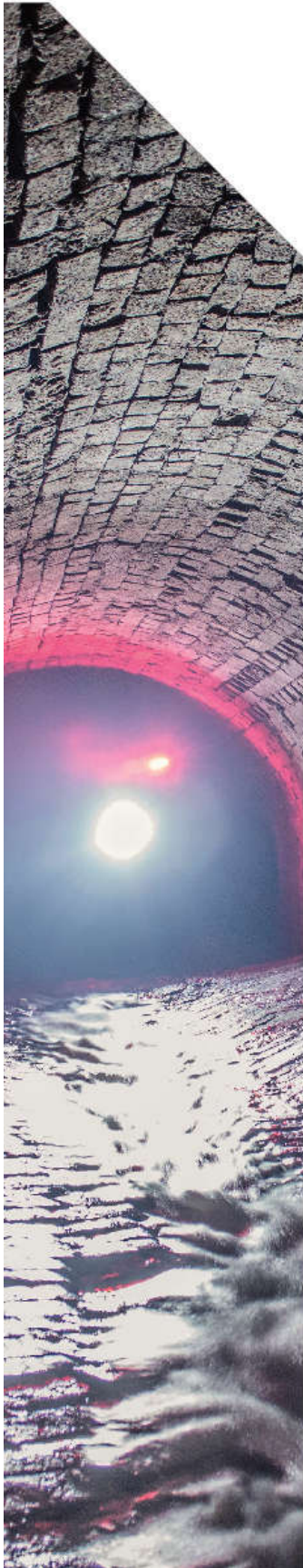
Joint displaced medium



Joint displaced medium - Remark: SEAL VISABLE



Job Number LAYERSERV0001592	Surveyed by (Operator) CHRIS LUCOCK	Base Unit ELFEIYII63	Date 19/01/2023
 5.50 M Line of drain/sewer deviates down		 6.05 M Finish node type, outfall, reference MAIN CARRIER	



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Pope Lane, Preston, PR4 4BA

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Layer Surveys Ltd Manhole Survey Card

Card No	01	Map No	
Catchment		MH No	MH 02
Location	ST MARYS GATE		
Town	ROCHDALE		

★ PU	Status		Syphon	★ C	Function	★ MH	MH Type	20/01/2023	Date of Survey
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COVER DETAILS

☒ Square	☐ Rectangle	☐ Triangle	☐ Dbl Triangle	☐ Circular	☐ Oval	☐ Other	☐ Multiple	☐ Hinged	☐ Lockable
Cover Level		m	H / M / L Cover Duty	★ H	Initials	CL			

PIPE DETAILS

Incoming Pipes

Clockwise from pipe X	Pipe	Depth from Invert (m)	Upstream / Downstream MH Ref	Shape	Size (mm)		Pipe Mat	Lining Mat	Back Drop Dia (mm)	Back Drop Depth (m)
	A	1.07		C	150	X	VC			
	B	1.02		C	150	X	VC			
	C					X				
	D					X				
	E					X				
	F					X				

Outgoing Pipes

X	1.08		C	225	X	VC			
Y					X				

Cover Opening at narrowest	690 X 690	mm	Chamber Dimension	1000 X 900	mm	Evidence of Surcharge	N
Shaft at narrowest		mm	Shaft Depth (from CL)		mm	OX / H2S / METH Toxic atmosphere	N

MANHOLE CONSTRUCTION DETAILS

☐ Pre Cast Concrete	☐ In Situ Concrete	☒ Brick	☐ GRP	☐ Arch	☐ Corbel	☐ Taper	☐ Side Entry
☒ Reducing Slab	☐ Segments	☐ No. of Landings	☐ No. of Step Irons	☐ No. of Ladders			
☐ No. of Regulating Brick Courses							

CONDITION INFORMATION (specific in remark)

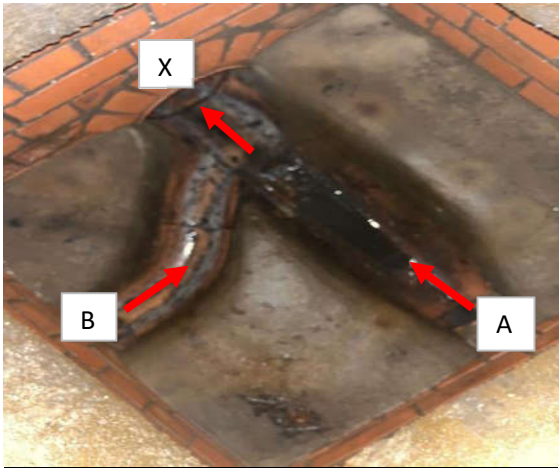
	Cover	Shaft	Irons / Ladders	Chamber	Benching	Channel	
OK	☒	☒	☒	☒	☒	☒	
Needs attention	☐	☐	☐	☐	☐	☐	
Urgent attention	☐	☐	☐	☐	☐	☐	
Depth of Flow	10	mm	Depth of Silt	0	mm	Height of Surcharge from CL	N

REMARKS

LOCATION SKETCH



PLAN OF MANHOLE



STATUS	PU : Public	PR : Private	WC : Culverted Watercourse	} Applies to main outlet
	24 : Section 24	HD : Highway Drain		
FUNCTION	F : Foul	C : Combined	S : Surface Water	} Applies to main outlet
MANHOLE TYPE	IF : Infall	MH : Manhole	CP : Catchpit	CSO : Consented Sewer Overflow
	LH : Lamphole	RE : Rodding Eye	SO : Storm Overflow	DS : Dual system Manhole
	GU : Gully	OF : Outfall	SA : Soakaway	PS : Pumping Station
COVER DUTY	L : Light Duty	M : Medium Duty	H : Heavy Duty	
SHAPE	C : Circular	E : Egg	R : Rectangular	
	S : Square	T : Trapezoidal	A : Arched	
	B : Barrel	H : Horseshoe (Inverted U)	U : U-shaped with flat top	
	X : Other (state in words)			
PIPE (OR LINING) MATERIAL	AK : Alkathene	AC : Asbestos Cement	BR : Brick	
	CI : Cast Iron	SI : Spun (Grey) Iron	CO : Concrete	
	CSB : Concrete Segments (Bolted)	CSU : Concrete Segments (Unbolted)	CC : Concrete Box Culvert	
	DI : Ductile Iron	GRC : Glass Reinforced Concrete	GRP : Glass Reinforced Plastic	
	PSC : Plastic/Steel Composite	PVC : Polyvinyl Chloride	PE : Polyethylene	
	RPN : Reinforced Plastic Matrix	ST : Steel	VC : Vitrified Clay	
	PP : Polypropylene	PF : Pitch Fibre	MAC : Masonry, Coursed	
	MAR : Masonry, Randon Courses	XXX : Other (State in remarks)		
LINING	BL : Bitumen	RL : Resin	IS : Insituform	
	CL : Cement	PI : Plastic		

Layer Surveys Ltd

Head Office: Francis House, Meadowcroft Business Park, Pope Lane, Preston, PR4 4BA
T: 01772 611634



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SEE THE COMPLETE PICTURE

Layer Surveys Ltd Manhole Survey Card

Card No	02	Map No	
Catchment		MH No	MH UU8809
Location	ST MARYS GATE		
Town	ROCHDALE		

★ PU	Status		Syphon	★ C	Function	★ MH	MH Type	20/01/2023	Date of Survey
---------	--------	--	--------	--------	----------	---------	---------	------------	----------------

COVER DETAILS

☒ Square	☐ Rectangle	☐ Triangle	☒ Dbl Triangle	☐ Circular	☐ Oval	☐ Other	☐ Multiple	☐ Hinged	☐ Lockable
Cover Level		m	H / M / L Cover Duty	★ H	Initials	CL			

PIPE DETAILS

Incoming Pipes

Clockwise from pipe X	Pipe	Depth from Invert (m)	Upstream / Downstream MH Ref	Shape	Size (mm)		Pipe Mat	Lining Mat	Back Drop Dia (mm)	Back Drop Depth (m)
	A				Height	Width				
	B					X				
	C					X				
	D					X				
	E					X				
	F					X				

Outgoing Pipes

X	1.09		C	225	X		VC			
Y					X					

Cover Opening at narrowest	610 X 610	mm	Chamber Dimension	1200	mm	Evidence of Surcharge	N
Shaft at narrowest	610 X 610	mm	Shaft Depth (from CL)	1270	mm	OX / H2S / METH Toxic atmosphere	N

MANHOLE CONSTRUCTION DETAILS

☒ Pre Cast Concrete	☐ In Situ Concrete	☐ Brick	☐ GRP	☐ Arch	☐ Corbel	☐ Taper	☐ Side Entry
☒ Reducing Slab	☐ Segments	☐ No. of Landings	☐ No. of Step Irons	☐ No. of Ladders			
☐ No. of Regulating Brick Courses							

CONDITION INFORMATION (specific in remark)

	Cover	Shaft	Irons / Ladders	Chamber	Benching	Channel	
OK	☒	☒	☒	☐	☒	☒	
Needs attention	☐	☐	☐	☒	☐	☐	
Urgent attention	☐	☐	☐	☐	☐	☐	
Depth of Flow	10	mm	Depth of Silt	0	mm	Height of Surcharge from CL	2080

REMARKS

MANHOLE SURCHARGED UNABLE TO SEE PIPES
DEPT TO BOTTOM IS 3.86

LOCATION SKETCH



PLAN OF MANHOLE



STATUS	PU : Public	PR : Private	WC : Culverted Watercourse	} Applies to main outlet
	24 : Section 24	HD : Highway Drain		
FUNCTION	F : Foul	C : Combined	S : Surface Water	} Applies to main outlet
MANHOLE TYPE	IF : Infall	MH : Manhole	CP : Catchpit	CSO : Consented Sewer Overflow
	LH : Lamphole	RE : Rodding Eye	SO : Storm Overflow	DS : Dual system Manhole
	GU : Gully	OF : Outfall	SA : Soakaway	PS : Pumping Station
COVER DUTY	L : Light Duty	M : Medium Duty	H : Heavy Duty	
SHAPE	C : Circular	E : Egg	R : Rectangular	
	S : Square	T : Trapezoidal	A : Arched	
	B : Barrel	H : Horseshoe (Inverted U)	U : U-shaped with flat top	
	X : Other (state in words)			
PIPE (OR LINING) MATERIAL	AK : Alkathene	AC : Asbestos Cement	BR : Brick	
	CI : Cast Iron	SI : Spun (Grey) Iron	CO : Concrete	
	CSB : Concrete Segments (Bolted)	CSU : Concrete Segments (Unbolted)	CC : Concrete Box Culvert	
	DI : Ductile Iron	GRC : Glass Reinforced Concrete	GRP : Glass Reinforced Plastic	
	PSC : Plastic/Steel Composite	PVC : Polyvinyl Chloride	PE : Polyethylene	
	RPN : Reinforced Plastic Matrix	ST : Steel	VC : Vittrified Clay	
	PP : Polypropylene	PF : Pitch Fibre	MAC : Masonry, Coursed	
	MAR : Masonry, Randon Courses	XXX : Other (State in remarks)		
LINING	BL : Bitumen	RL : Resin	IS : Insituform	
	CL : Cement	PI : Plastic		

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Card No	03	Map No	
Catchment		MH No	MH 03
Location	ST MARYS GATE		
Town	ROCHDALE		

★ PU	Status		Syphon	★ C	Function	★ MH	MH Type	20/01/2023	Date of Survey
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COVER DETAILS

☒ Square	☐ Rectangle	☐ Triangle	☐ Dbl Triangle	☐ Circular	☐ Oval	☐ Other	☐ Multiple	☐ Hinged	☐ Lockable
Cover Level		m	H / M / L Cover Duty	★ H	Initials	CL			

PIPE DETAILS

Incoming Pipes

Clockwise from pipe X	Pipe	Depth from Invert (m)	Upstream / Downstream MH Ref	Shape	Size (mm)		Pipe Mat	Lining Mat	Back Drop Dia (mm)	Back Drop Depth (m)
	A	1.62		C	225	X	VC			
	B	1.49		C	150	X	VC			
	C					X				
	D					X				
	E					X				
	F					X				

Outgoing Pipes

X	1.63		C	225	X	VC			
Y					X				

Cover Opening at narrowest	690 X 690	mm	Chamber Dimension	1050 X 750	mm	Evidence of Surcharge	N
Shaft at narrowest	600 X 600	mm	Shaft Depth (from CL)	590	mm	OX / H2S / METH Toxic atmosphere	N

MANHOLE CONSTRUCTION DETAILS

☐ Pre Cast Concrete	☐ In Situ Concrete	☒ Brick	☐ GRP	☐ Arch	☐ Corbel	☐ Taper	☐ Side Entry
☒ Reducing Slab	☐ Segments	☐ No. of Landings	☐ No. of Step Irons	☐ No. of Ladders			
☐ 4	No. of Regulating Brick Courses						

CONDITION INFORMATION (specific in remark)

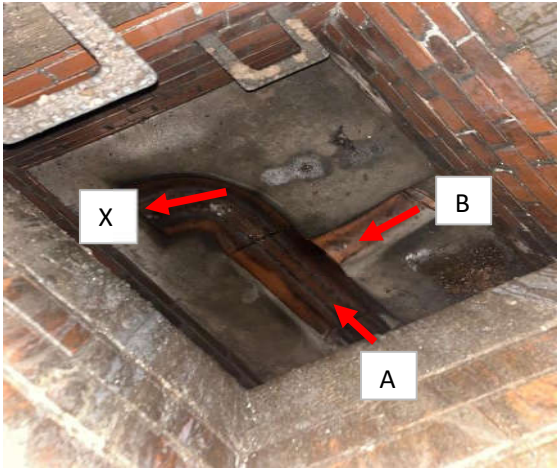
	Cover	Shaft	Irons / Ladders	Chamber	Benching	Channel	
OK	☒	☒	☒	☒	☒	☒	
Needs attention	☐	☐	☐	☐	☐	☐	
Urgent attention	☐	☐	☐	☐	☐	☐	
Depth of Flow	10	mm	Depth of Silt	0	mm	Height of Surcharge from CL	N

REMARKS

LOCATION SKETCH



PLAN OF MANHOLE



STATUS	PU : Public	PR : Private	WC : Culverted Watercourse	} Applies to main outlet
	24 : Section 24	HD : Highway Drain		
FUNCTION	F : Foul	C : Combined	S : Surface Water	} Applies to main outlet
MANHOLE TYPE	IF : Infall	MH : Manhole	CP : Catchpit	CSO :Consented Sewer Overflow
	LH : Lamphole	RE : Rodding Eye	SO : Storm Overflow	DS :Dual system Manhole
	GU : Gully	OF : Outfall	SA : Soakaway	PS :Pumping Station
COVER DUTY	L : Light Duty	M : Medium Duty	H : Heavy Duty	
SHAPE	C : Circular	E : Egg	R : Rectangular	
	S : Square	T : Trapezoidal	A : Arched	
	B : Barrel	H : Horseshoe (Inverted U)	U : U-shaped with flat top	
	X : Other (state in words)			
PIPE (OR LINING) MATERIAL	AK : Alkathene	AC : Asbestos Cement	BR : Brick	
	CI : Cast Iron	SI : Spun (Grey) Iron	CO : Concrete	
	CSB : Concrete Segments (Bolted)	CSU : Concrete Segments (Unbolted)	CC : Concrete Box Culvert	
	DI : Ductile Iron	GRC : Glass Reinforced Concrete	GRP : Glass Reinforced Plastic	
	PSC : Plastic/Steel Composite	PVC : Polyvinyl Chloride	PE : Polyethylene	
	RPN : Reinforced Plastic Matrix	ST : Steel	VC : Vitrified Clay	
	PP : Polypropylene	PF : Pitch Fibre	MAC : Masonry, Coursed	
	MAR : Masonry, Randon Courses	XXX : Other (State in remarks)		
LINING	BL : Bitumen	RL : Resin	IS : Insituform	
	CL : Cement	PI : Plastic		

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Card No	04	Map No	
Catchment		MH No	MH UU7802
Location	ST MARYS GATE		
Town	ROCHDALE		

★ PU	Status		Syphon	★ C	Function	★ MH	MH Type	20/01/2023	Date of Survey
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COVER DETAILS

☒ Square	☐ Rectangle	☐ Triangle	☐ Dbl Triangle	☐ Circular	☐ Oval	☐ Other	☐ Multiple	☒ Hinged	☐ Lockable
Cover Level		m	H / M / L Cover Duty	★ H	Initials	CL			

PIPE DETAILS

Incoming Pipes

Clockwise from pipe X	Pipe	Depth from Invert (m)	Upstream / Downstream MH Ref	Shape	Size (mm)		Pipe Mat	Lining Mat	Back Drop Dia (mm)	Back Drop Depth (m)
	A	2.04		C	375	X	CON			
	B	1.90		C	225	X	VC			
	C	1.85		C	300	X	VC			
	D	1.86		C	150	X	VC			
	E					X				
	F					X				

Outgoing Pipes

X	2.05		C	450	X	CON			
Y					X				

Cover Opening at narrowest	600 X 600	mm	Chamber Dimension	1050	mm	Evidence of Surcharge	N
Shaft at narrowest	600 X 600	mm	Shaft Depth (from CL)	650	mm	OX / H2S / METH Toxic atmosphere	N

MANHOLE CONSTRUCTION DETAILS

☒ Pre Cast Concrete	☐ In Situ Concrete	☐ Brick	☐ GRP	☐ Arch	☐ Corbel	☐ Taper	☐ Side Entry
☒ Reducing Slab	☐ Segments	☐ No. of Landings	☐ No. of Step Irons	☐ No. of Ladders			
☐ 3 No. of Regulating Brick Courses							

CONDITION INFORMATION (specific in remark)

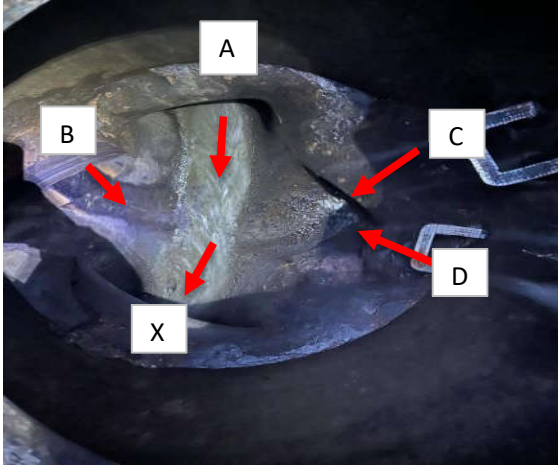
	Cover	Shaft	Irons / Ladders	Chamber	Benching	Channel	
OK	☒	☒	☒	☒	☒	☒	
Needs attention	☐	☐	☐	☐	☐	☐	
Urgent attention	☐	☐	☐	☐	☐	☐	
Depth of Flow	10	mm	Depth of Silt	0	mm	Height of Surcharge from CL	N

REMARKS

LOCATION SKETCH



PLAN OF MANHOLE



STATUS	PU : Public	PR : Private	WC : Culverted Watercourse	} Applies to main outlet
	24 : Section 24	HD : Highway Drain		
FUNCTION	F : Foul	C : Combined	S : Surface Water	} Applies to main outlet
MANHOLE TYPE	IF : Infall	MH : Manhole	CP : Catchpit	CSO : Consented Sewer Overflow
	LH : Lamphole	RE : Rodding Eye	SO : Storm Overflow	DS : Dual system Manhole
	GU : Gully	OF : Outfall	SA : Soakaway	PS : Pumping Station
COVER DUTY	L : Light Duty	M : Medium Duty	H : Heavy Duty	
SHAPE	C : Circular	E : Egg	R : Rectangular	
	S : Square	T : Trapezoidal	A : Arched	
	B : Barrel	H : Horseshoe (Inverted U)	U : U-shaped with flat top	
	X : Other (state in words)			
PIPE (OR LINING) MATERIAL	AK : Alkathene	AC : Asbestos Cement	BR : Brick	
	CI : Cast Iron	SI : Spun (Grey) Iron	CO : Concrete	
	CSB : Concrete Segments (Bolted)	CSU : Concrete Segments (Unbolted)	CC : Concrete Box Culvert	
	DI : Ductile Iron	GRC : Glass Reinforced Concrete	GRP : Glass Reinforced Plastic	
	PSC : Plastic/Steel Composite	PVC : Polyvinyl Chloride	PE : Polyethylene	
	RPN : Reinforced Plastic Matrix	ST : Steel	VC : Vitrified Clay	
	PP : Polypropylene	PF : Pitch Fibre	MAC : Masonry, Coursed	
	MAR : Masonry, Random Courses	XXX : Other (State in remarks)		
LINING	BL : Bitumen	RL : Resin	IS : Insituform	
	CL : Cement	PI : Plastic		

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Card No	05	Map No	
Catchment		MH No	MH 06
Location	ST MARYS GATE		
Town	ROCHDALE		

★ PU	Status		Syphon	★ SW	Function	★ MH	MH Type	20/01/2023	Date of Survey
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COVER DETAILS

☒ Square	☐ Rectangle	☐ Triangle	☐ Dbl Triangle	☐ Circular	☐ Oval	☐ Other	☐ Multiple	☐ Hinged	☐ Lockable
Cover Level		m	H / M / L Cover Duty	★ H	Initials	CL			

PIPE DETAILS

Incoming Pipes

Clockwise from pipe X	Pipe	Depth from Invert (m)	Upstream / Downstream MH Ref	Shape	Size (mm)		Pipe Mat	Lining Mat	Back Drop Dia (mm)	Back Drop Depth (m)
	A	0.71		C	150	X	VC			
	B					X				
	C					X				
	D					X				
	E					X				
	F					X				

Outgoing Pipes

X	0.73		C	150	X		VC			
Y					X					

Cover Opening at narrowest	690 X 690	mm	Chamber Dimension	900 X 900	mm	Evidence of Surcharge	N
Shaft at narrowest	600 X 600	mm	Shaft Depth (from CL)	430	mm	OX / H2S / METH Toxic atmosphere	N

MANHOLE CONSTRUCTION DETAILS

☐ Pre Cast Concrete	☐ In Situ Concrete	☒ Brick	☐ GRP	☐ Arch	☐ Corbel	☐ Taper	☐ Side Entry
☒ Reducing Slab	☐ Segments	☐ No. of Landings	☐ No. of Step Irons	☐ No. of Ladders			
☐ No. of Regulating Brick Courses							

CONDITION INFORMATION (specific in remark)

OK	☒	Cover	☒	Shaft	☒	Irons / Ladders	☒	Chamber	☒	Benching	☒	Channel	☒
Needs attention	☐		☐		☐		☐		☐		☐		
Urgent attention	☐		☐		☐		☐		☐		☐		
Depth of Flow	10	mm	Depth of Silt	0	mm	Height of Surcharge from CL	N	mm					

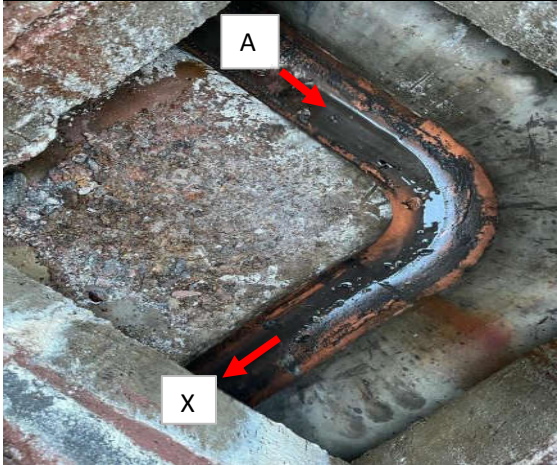
REMARKS

★ See Overleaf for Key

LOCATION SKETCH



PLAN OF MANHOLE



STATUS	PU : Public	PR : Private	WC : Culverted Watercourse	} Applies to main outlet
	24 : Section 24	HD : Highway Drain		
FUNCTION	F : Foul	C : Combined	S : Surface Water	} Applies to main outlet
MANHOLE TYPE	IF : Infall	MH : Manhole	CP : Catchpit	CSO :Consented Sewer Overflow
	LH : Lamphole	RE : Rodding Eye	SO : Storm Overflow	DS :Dual system Manhole
	GU : Gully	OF : Outfall	SA : Soakaway	PS :Pumping Station
COVER DUTY	L : Light Duty	M : Medium Duty	H : Heavy Duty	
SHAPE	C : Circular	E : Egg	R : Rectangular	
	S : Square	T : Trapezoidal	A : Arched	
	B : Barrel	H : Horseshoe (Inverted U)	U : U-shaped with flat top	
	X : Other (state in words)			
PIPE (OR LINING) MATERIAL	AK : Alkathene	AC : Asbestos Cement	BR : Brick	
	CI : Cast Iron	SI : Spun (Grey) Iron	CO : Concrete	
	CSB : Concrete Segments (Bolted)	CSU : Concrete Segments (Unbolted)	CC : Concrete Box Culvert	
	DI : Ductile Iron	GRC : Glass Reinforced Concrete	GRP : Glass Reinforced Plastic	
	PSC : Plastic/Steel Composite	PVC : Polyvinyl Chloride	PE : Polyethylene	
	RPN : Reinforced Plastic Matrix	ST : Steel	VC : Vitrified Clay	
	PP : Polypropylene	PF : Pitch Fibre	MAC : Masonry, Coursed	
	MAR : Masonry, Randon Courses	XXX : Other (State in remarks)		
LINING	BL : Bitumen	RL : Resin	IS : Insituform	
	CL : Cement	PI : Plastic		

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Card No	06	Map No	
Catchment		MH No	MH UU8810
Location	ST MARYS GATE		
Town	ROCHDALE		

★ PU	Status		Syphon	★ SW	Function	★ MH	MH Type	20/01/2023	Date of Survey
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COVER DETAILS

☒ Square	☐ Rectangle	☐ Triangle	☐ Dbl Triangle	☐ Circular	☐ Oval	☐ Other	☐ Multiple	☒ Hinged	☐ Lockable
Cover Level		m	H / M / L Cover Duty	★ H	Initials	CL			

PIPE DETAILS

Incoming Pipes

Clockwise from pipe X	Pipe	Depth from Invert (m)	Upstream / Downstream MH Ref	Shape	Size (mm)		Pipe Mat	Lining Mat	Back Drop Dia (mm)	Back Drop Depth (m)
	A				Height	Width				
	B					X				
	C					X				
	D					X				
	E					X				
	F					X				

Outgoing Pipes

X					X				
Y					X				

Cover Opening at narrowest	600 X 600	mm	Chamber Dimension	1050	mm	Evidence of Surcharge	N
Shaft at narrowest	600 X 600	mm	Shaft Depth (from CL)	990	mm	OX / H2S / METH Toxic atmosphere	N

MANHOLE CONSTRUCTION DETAILS

☒ Pre Cast Concrete	☐ In Situ Concrete	☐ Brick	☐ GRP	☐ Arch	☐ Corbel	☐ Taper	☐ Side Entry
☒ Reducing Slab	☐ Segments	☐ No. of Landings	☐ No. of Step Irons	☐ No. of Ladders			
☐ No. of Regulating Brick Courses	7						

CONDITION INFORMATION (specific in remark)

	Cover	Shaft	Irons / Ladders	Chamber	Benching	Channel	
OK	☒	☒	☒	☐	☒	☒	
Needs attention	☐	☐	☐	☐	☐	☐	
Urgent attention	☐	☐	☐	☒	☐	☐	
Depth of Flow	10	mm	Depth of Silt	0	mm	Height of Surcharge from CL	3800

REMARKS

MANHOLE IS SURGHARGED UNABLE TO SEE BRANCHES
DEPTH IS 4.30

LOCATION SKETCH



PLAN OF MANHOLE



STATUS	PU : Public	PR : Private	WC : Culverted Watercourse	} Applies to main outlet
	24 : Section 24	HD : Highway Drain		
FUNCTION	F : Foul	C : Combined	S : Surface Water	} Applies to main outlet
MANHOLE TYPE	IF : Infall	MH : Manhole	CP : Catchpit	CSO :Consented Sewer Overflow
	LH : Lamphole	RE : Rodding Eye	SO : Storm Overflow	DS :Dual system Manhole
	GU : Gully	OF : Outfall	SA : Soakaway	PS :Pumping Station
COVER DUTY	L : Light Duty	M : Medium Duty	H : Heavy Duty	
SHAPE	C : Circular	E : Egg	R : Rectangular	
	S : Square	T : Trapezoidal	A : Arched	
	B : Barrel	H : Horseshoe (Inverted U)	U : U-shaped with flat top	
	X : Other (state in words)			
PIPE (OR LINING) MATERIAL	AK : Alkathene	AC : Asbestos Cement	BR : Brick	
	CI : Cast Iron	SI : Spun (Grey) Iron	CO : Concrete	
	CSB : Concrete Segments (Bolted)	CSU : Concrete Segments (Unbolted)	CC : Concrete Box Culvert	
	DI : Ductile Iron	GRC : Glass Reinforced Concrete	GRP : Glass Reinforced Plastic	
	PSC : Plastic/Steel Composite	PVC : Polyvinyl Chloride	PE : Polyethylene	
	RPN : Reinforced Plastic Matrix	ST : Steel	VC : Vitrified Clay	
	PP : Polypropylene	PF : Pitch Fibre	MAC : Masonry, Coursed	
	MAR : Masonry, Randon Courses	XXX : Other (State in remarks)		
LINING	BL : Bitumen	RL : Resin	IS : Insituform	
	CL : Cement	PI : Plastic		

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Layer Surveys Ltd Manhole Survey Card

Card No	07	Map No	
Catchment		MH No	MH 07
Location	ST MARYS GATE		
Town	ROCHDALE		

★ PU	Status		Syphon	★ SW	Function	★ MH	MH Type	20/01/2023	Date of Survey
---------	--------	--	--------	---------	----------	---------	---------	------------	----------------

COVER DETAILS

☒ Square	☐ Rectangle	☐ Triangle	☒ Dbl Triangle	☐ Circular	☐ Oval	☐ Other	☐ Multiple	☐ Hinged	☐ Lockable
Cover Level		m	H / M / L Cover Duty	★ H	Initials	CL			

PIPE DETAILS

Incoming Pipes

Clockwise from pipe X	Pipe	Depth from Invert (m)	Upstream / Downstream MH Ref	Shape	Size (mm)		Pipe Mat	Lining Mat	Back Drop Dia (mm)	Back Drop Depth (m)
	A	1.68		C	150	X	VC			
	B					X				
	C					X				
	D					X				
	E					X				
	F					X				

Outgoing Pipes

X	1.72		C	225	X	VC			
Y					X				

Cover Opening at narrowest	610 X 610	mm	Chamber Dimension	1050	mm	Evidence of Surcharge	N
Shaft at narrowest	610 X 610	mm	Shaft Depth (from CL)	450	mm	OX / H2S / METH Toxic atmosphere	N

MANHOLE CONSTRUCTION DETAILS

☒ Pre Cast Concrete	☐ In Situ Concrete	☐ Brick	☐ GRP	☐ Arch	☐ Corbel	☐ Taper	☐ Side Entry
☒ Reducing Slab	☐ Segments	☐ No. of Landings	☐ No. of Step Irons	☐ No. of Ladders			
☐ No. of Regulating Brick Courses	2						

CONDITION INFORMATION (specific in remark)

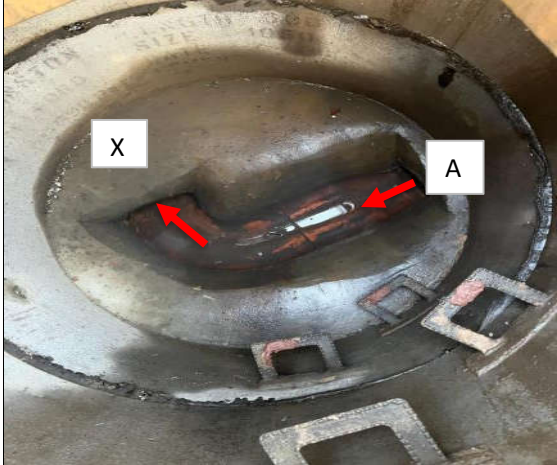
	Cover	Shaft	Irons / Ladders	Chamber	Benching	Channel	
OK	☒	☒	☒	☒	☒	☒	
Needs attention	☐	☐	☐	☐	☐	☐	
Urgent attention	☐	☐	☐	☐	☐	☐	
Depth of Flow	10	mm	Depth of Silt	0	mm	Height of Surcharge from CL	N

REMARKS

LOCATION SKETCH



PLAN OF MANHOLE



STATUS	PU : Public	PR : Private	WC : Culverted Watercourse	} Applies to main outlet
	24 : Section 24	HD : Highway Drain		
FUNCTION	F : Foul	C : Combined	S : Surface Water	} Applies to main outlet
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COVER DUTY	L : Light Duty	M : Medium Duty	H : Heavy Duty	
SHAPE	C : Circular	E : Egg	R : Rectangular	
	S : Square	T : Trapezoidal	A : Arched	
	B : Barrel	H : Horseshoe (Inverted U)	U : U-shaped with flat top	
	X : Other (state in words)			
PIPE (OR LINING) MATERIAL	AK : Alkathene	AC : Asbestos Cement	BR : Brick	
	CI : Cast Iron	SI : Spun (Grey) Iron	CO : Concrete	
	CSB : Concrete Segments (Bolted)	CSU : Concrete Segments (Unbolted)	CC : Concrete Box Culvert	
	DI : Ductile Iron	GRC : Glass Reinforced Concrete	GRP : Glass Reinforced Plastic	
	PSC : Plastic/Steel Composite	PVC : Polyvinyl Chloride	PE : Polyethylene	
	RPN : Reinforced Plastic Matrix	ST : Steel	VC : Vitrified Clay	
	PP : Polypropylene	PF : Pitch Fibre	MAC : Masonry, Coursed	
	MAR : Masonry, Randon Courses	XXX : Other (State in remarks)		
LINING	BL : Bitumen	RL : Resin	IS : Insituform	
	CL : Cement	PI : Plastic		

APPENDIX 7

INTEGRA CONSULTING PHASE 1 GEO-ENVIRONMENTAL DESK STUDY



**Land at St Mary's Gate Retail Park,
Whitworth Road,
Rochdale,
OL12 0TY**

Proposed Commercial Development

Phase 1 Site Investigation Report

For: Glenbrook Investments

Integra Consulting
Suite 4
14-32 Hewitt Street
Manchester
M15 4GB

Ref: 3361-SI
Job: 3361
Rev: -
By: NS
Date: Jan 23

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APPENDIX B: NOTES ON LIMITATIONS

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APPENDIX D: COMMERCIAL ENVIRONMENTAL DATA

APPENDIX E: SITE PHOTOGRAPHS

1.0 INTRODUCTION

Integra Consulting is providing consultancy services to **GLENBROOK INVESTMENTS** (the *Client*) in connection with the proposed re-development of a parcel of land fronting on to Queen Street and Whitehall Street, St Mary's Gate, Rochdale, OL12 0TY.

It is understood that the site is to be re-developed for commercial / retail use by the construction of a 'Drive-Thru' facility, with associated hard paved car parking and areas of soft landscaping / cultivation.

The existing and proposed site layouts are illustrated on **RADCLIFFE GROVE PARTNERSHIP** architectural drawings contained herein.

The proposed development falls within the administrative jurisdiction of **ROCHDALE BOROUGH COUNCIL**.

This Phase I Desk Study was required as a preliminary to planning an intrusive phase of investigation. The report was devised to generally comply with the relevant principles and requirements of a as a wide range of guidance including BS5930:1999 as amended 2007: "*Code of Practice for Site Investigations*", BS10175: 2011 "*Investigation of Potentially Contaminated Sites - Code of Practice*", and the DEFRA/Environment Agency Report CLR11 "*Model Procedures for the Management of Land Contamination*".

This report should be read in conjunction with the Notes on Limitations, given in Appendix B.

2.0 PURPOSE & AIMS OF THE STUDY

The primary aim of the Phase I Desk Study was to assess whether the site is likely to be affected by contamination to an extent that it may pose a risk to human health and/or the built environment and/or the wider natural environment or is affected by any other natural or man-made features which may impact on the proposed redevelopment.

Specific tasks undertaken to achieve these objectives were as follows:

- Undertaking of a review of available historical mapping, environmental databases, and Environment Agency data
- Undertaking of a site walkover inspection
- Development of Preliminary Conceptual Model
- Development of a Phase 2 intrusive investigation strategy

3.0 SITE DATA

3.1 Site Location

The site comprises a rectangular shaped parcel of land located immediately to the south of Queen Street, and east of Whitehall Street, St Mary's Gate, Rochdale, OL12 0TY as illustrated in Appendix A.

The **ORDNANCE SURVEY** coordinates for the approximate site centre are 389786 413897. It stands at an approximate elevation of c. 140m AOD.

3.2 Site Description & Walkover Observations

The site was visited during January 2023 on completion of a review of all relevant historical and environmental mapping data (provided in Appendix D).

The site is located within a mixed commercial context. It comprises a rectangular shaped parcel of land (currently utilised as for car parking), which extends to the approximate dimensions of c. 64m x 40m; its long axis being on a northeast – southwest alignment.

It is bound to the north and west by public pavements extending along Queen Street and Whitehall Street respectively. Its eastern boundary is delineated by pavements extending along Duke Street whilst its southern boundary is adjoined by a public car park associated with nearby retail units.

The surface topography across the site was seen to be generally flat with surface cover comprising well-maintained bituminous paving, and with areas of soft landscaping / cultivation extending along its western, northern, and eastern boundaries.

2 No street / security lighting towers are set within the hard paved cover.

Given that the site has previously been developed, there is a potential for the presence of buried services to exist beneath the site.

There was no visual evidence of the presence of native and/or non-native plant species within, or adjoining, the site boundary.

Vehicle and pedestrian access can be made via Duke Street to the east.

The information obtained from the visit is summarised in Table 1 hereunder.

Table 1: Summary of Walkover Observations

FEATURE		OBSERVATION
Current Use of Land		Car parking facility
Context		Commercial context
Topography / Surfaces		The surface topography across the site was seen to be sensibly flat with surface cover comprising well-maintained bituminous paving with areas of soft landscaping / cultivation extending along its western, northern, and eastern boundaries. 2nr tall street / security lights are set within the hard paved cover.
Dimensions		c. 64m x 40m; its long axis being on a northeast – southwest alignment
Access		Vehicle and pedestrian access can be made via Duke Street to the east.
Buildings Adjacent to the Site		Commercial
Services		Given that the site has previously been developed, the presence of 2nr tall streetlights within the site, and taking into account the adjoining commercial properties, there is a potential for the presence of buried services to exist beneath the site.
Boundary	NW	Public pavements extending along Queen Street
	West	Public pavements extending along Whitehall Street
	South	Car parking associated with nearby retail units
	East	Public pavements extending along Duke Street
Material storage		None observed
Waste disposal		None observed
Other potential contamination		Hydrocarbons associated with on site car parking
Ecology*		None observed

**These comments on the ecology are for initial preliminary assessment only and are based on observations undertaken by a person who is a trained ecologist but who has not undertaken a comprehensive Phase I Habitat Survey or similar.*

4.0 SITE HISTORY

The history of the site and its immediate surrounds was investigated by consultation with a range of archive resources. Geographical information, historical mapping and environmental data were primarily based on a GroundSure Environmental Report (Reference No. CMAPS-AAG-1078975-4165-030123, dated January 2023), presented in Appendix D.

A summary of the historical mapping data is given hereunder:

Table 2: Historical Map Review

YEAR	SCALE	ON SITE	ADJACENT TO SITE	<250M
1851 1851 1890 1890-1891 1891 1892	1:1,056 1:10,560 1:10,560 1:10,560 1:2,500 1:500	Site developed for commercial / light industrial land uses. Boiler Works located within NE section of the site. Duke Street crossing the site on a NE-SW alignment	Adjacent land fully developed for mixed commercial / light industrial land uses. Phoenix Foundry to the S.	Surrounding area fully developed for mixed commercial / light industrial land uses. Wardleworth Workhouse c.30m SW. Public house c. 30m E Public house c.20m NW Coal & timber yard c. 80m S. Boiler Works c.100m N. Cotton Mill c. 30m N. Town Head Mills c. 50m SE. 2nr Reservoirs c. 50m E. Victoria Foundry c. 200m NE Corporation Highway Depot & associated grounds c. 180m NE Silk Mill C. 130m W. Tannery c. 80m SE
1908-1909 1910	1:10,560 1:2,500	No significant change	Land to the S renamed Phoenix Machine Works	Atlas Iron Works – Textile Works c. 130m N Timber yard c. 150m N Burial grounds c. 120m SW
1928	1:10,560	No significant change	No significant change	No significant change
1930 1938	1:2,500 1:10,560	Site renamed warehouse	No significant change	No significant change
1949-1954	1:10,560	No significant change	No significant change	No significant change
1956 1957-1959 1958-1959	1:10,560 1:1,250 1:1,250	Site redeveloped as a warehouse with Castle Street extending along its S boundary	Land to the S redeveloped for continued commercial land use, renamed Works	Significant redevelopments undertaken within the surrounding area with associated infrastructure Former corporation depot fully redeveloped for mixed

				commercial residential land uses. Reservoirs no longer shown Factory c.130m N Expensive parcel of amenity land c. 150m NW
1967-1968	1:10,560	No significant change	No significant change	No significant change
1973-1974	1:1,250	Site shown to be clear of former structures	Land to the S redeveloped / extended as an engineering works	Significant redevelopments undertaken within the surrounding area with associated infrastructure
1975-1979	1:10,000			
1976-1977	1:1,250			
1975-1978	1:1,250			
1983-1987	1:1,250	No significant change	No significant change	Former Cotton Mill to the E no longer shown Engineering works to the S no longer shown Site of former cotton mill redeveloped for commercial land uses
1985-1989	1:1,250			
1987-1989	1:10,000			
1988-1992	1:1,250			
1989-1993	1:1,250	No significant change	No significant change	No significant change
1992-1993	1:1,250			
1992	1:10,000			
1995	1:1,250			
1995	1:1,250	Site utilised as a car parking facility	Land to the SE utilised as a car parking facility associated with the adjoining retail units	Significant redevelopment works undertaken within the surrounding area
2001	1:10,000			
2003	1:1,250			
2010	1:10,000			
2023	1:10,000			

5.0 ENVIRONMENTAL SETTING

5.1 Documented Geology

The geology of the site was researched by reference to the 1:50000 scale **BRITISH GEOLOGICAL SURVEY** (BGS) Sheet 076 Rochdale (2008) 1: 50,000 Scale Solid and Drift Editions and Crofts. R.D. *et.al* (2010) 'Geology of the Rochdale district — a brief explanation of the geological map. Sheet explanation of the British Geological Survey. 1:50 000 sheet 76 Rochdale (England and Wales)'. Keyworth, Nottingham. British Geological Survey.

The **BGS** 1:10, 000 Scale Drift Geological map indicate that the overall site is underlain with natural drift deposits comprising impermeable diamicton (*boulder clay*) comprising gravel sand silt and clay deposits of glacial origin (*Pleistocene Epoch - Late Quaternary - Devensian Sub Age*).

The solid geology is documented to comprise the Old Lawrence Rock overlying dark grey, fissile, argillaceous mudstone and siltstone. Both geological units associated with the Pennine Lower Coal Measure Formation (*Westphalian A: Langsettian Substage*).

There are no documented geological lines of weakness within 500m of the study site.

The 'Indicative Atlas of Radon in England and Wales' (Miles. J.C.H *et.al*, 2007) Map 13 'Northern Welsh Marches and Liverpool', shows the site to be situated within an area where it is believed that less than 1% of the properties within the area are affected by Radon and therefore Radon Protection Measures will not be required for new structures in contact with the ground.

Geological Information obtained from the GroundSure Environmental Report is presented in Appendix D, and summarised hereunder:

Table 3: Summary of Geological Data from GroundSure Report

GEOLOGY		
Data	Distance	Comments
Artificial Ground	N/A	If present, artificial ground and/or reworked ground deposits associated with the development of the site & its immediate surroundings
Superficial Deposits / Drift Geology	On Site	Diamicton of glacial origin
Permeability of Diamicton	Maximum Permeability	Diamicton = High
	Minimum Permeability	Diamicton = Low
Bedrock and Solid Geology	On Site	Old Lawrence Rock – Sandstone of the Pennine Lower Coal Measure Formation
Permeability of Bedrock: On Site	Minimum Permeability	Moderate
	Maximum Permeability	High
Geological Lines of Weakness	On Site	No records
	<250m	No records
Radon Affected Area	On Site	The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level
Radon Protection	On Site	No radon protective measures are necessary
MINING, GROUNDWORKINGS AND NATURAL CAVITIES		
Data	Distance	Comments

Natural cavities	<500m	No records
BritPits	<500m	171m N. Green Hayes Clay Pit – Ceased 474m E. Rock House Sand Pit - Ceased
Surface ground workings	<250m	32m E. Pond – 1851 60m E. Reservoir – 1949 65m E. Reservoir – 1968 66m E. Reservoir – 1908 - 1928 141m N. Pond – 1851 155m N. Clay Pit - 1851
Underground workings	<1000m	638m N. Unspecified Old Shaft – 1928 649m N. Unspecified Disused Shaft – 1968 662m N. Unspecified Old Shaft - 1890
Historical Mineral Planning Areas	<500m	No records
Non-coal mining	<1000m	No records
Mining cavities	<1000m	No records
Coal mining	On Site	The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site.
Brine areas	On Site	No records
Gypsum areas	On Site	No records
Tin mining	On Site	No records
Clay mining	On Site	No records
HAZARDS		
Data	Distance	Comments
Maximum shrink swell clays	On site	Very Low
Maximum running sands	On site	Very Low
Maximum compressible deposits	On site	Negligible
Maximum collapsible deposits	On site	Very Low
Maximum landslides	On site	Very Low
Maximum ground dissolution of soluble rocks	On site	Negligible

5.2 Historical Coal Mining

The appended environmental data, **BGS** mapping data and **COAL AUTHORITY** Gazetteer confirm that the site is located within an area which is believed to be underlain by productive coal measures which may have been worked in the past and therefore the Client is advised to commission a Coal Mining Risk Assessment.

5.3 Hydrology and Hydrogeology

Information on hydrology and hydrogeology obtained from a GroundSure Environmental Report is presented in Appendix D, and summarised hereunder:

Table 5: Summary of Hydrology and Hydrogeological Data from GroundSure Environmental Report

HYDROGEOLOGY AND HYDROLOGY		
Aquifer within Superficial Drift Deposits (Boulder Clay)	On site	Diamicton: Secondary Undifferentiated: Assigned where it is not possible to attribute either category A or B to a soil type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the soil type
Aquifer within Bedrock Deposits	On site	Old Lawrence Sandstone- Secondary A: Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
Groundwater Abstraction Licenses	<500m	No records
Surface Water Abstraction Licenses	<500m	No records
Potable Water Abstraction Licences	<500m	No records
Source Protection Zones	<500m	No records
Source Protection Zones (confined aquifer)	<500m	No records
Water Network (OS Mastermap)	<200m	No records
Surface water features	<250m	No records
WFD Surface water body catchments	On Site	On Site: River. Roch (Source to Spodden) GB112069064720 Roch Irk Medlock Irwell
WFD Surface water bodies	<250m	No records
WFD Groundwater bodies	<250m	On Site: Northern Manchester Carboniferous Aquifers
FLOODING		
Risk of Flooding from Rivers and Sea (RoFRaS)	<50m	No records
Historical Flood Events	<250m	No records
Flood Defences	<250m	No records
Areas Benefitting from Flood Defences	<100m	No records
Flood Storage Areas	<250m	No records
Flood Zone II	<50m	No records

Flood Zone III	<50m	No records
Surface water flooding: Highest risk	On Site	Negligible
	<50m	1 in 30 years, 0.3m – 1.0m
Groundwater flooding: Highest risk	On Site	Low
	<50m	Low

For simplified interpretation, the geological succession underlying the site may be regarded as a series of discrete units in terms of their hydrogeological significance, as illustrated hereunder:

Table 6: Hydrogeological Interpretation

UNIT	PROPERTIES	HYDROGEOLOGICAL DESIGNATION
Made / Reworked Ground	If present, likely to be generally granular and permeable and will permit vertical and lateral transmission of groundwater.	Unproductive Aquifer
Diamicton	Assigned where it is not possible to attribute either category A or B to a soil type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the soil type	Secondary Undifferentiated
Old Lawrence Sandstone	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers	Secondary A Aquifer

5.4 Potential for Soakaway Drainage

The documented geology strongly indicates that soakaway drainage will not function effectively on this site.

6.0 FURTHER ENVIRONMENTAL DATA

Environmental data was researched using several sources including Environment Agency Maps and GroundSure EnviroSight Report presented in Appendix D and is summarised hereunder in Table 6. This environmental data has been used to carry out a Preliminary Qualitative Risk Assessment (Tier 1) and formulate the preliminary conceptual model as discussed in Section 8.0 of this report.

Table 7: Summary of Environmental Data

POTENTIALLY CONTAMINATIVE USES IDENTIFIED FROM 1:10,000 SCALE MAPPING		
Data	Distance	Comments
Historical industrial land uses	<250m	There are 94 records pertaining to historical industrial land uses within the surrounding area, those shown to be within 100m of the study site are listed hereunder: On site> Unspecified Works 23m E. Unspecified Mills 24m E. Unspecified Commercial/Industrial 24m E. Unspecified Mills 25m E. Unspecified Mills 26m E. Unspecified Commercial/Industrial 27m E. Cotton Mills 28m E. Unspecified Mills 31m S. Unspecified works 50m E. Unspecified Commercial/Industrial 75m E. Chimney
Historical tanks	<250m	149m SW. Unspecified Tank 248m SW. Unspecified Tank 249m SW. Unspecified Tank
Historical energy features	<250m	32m NW. Electricity Substation 47m S. Electricity Substation 57m NW. Electricity Substation 174m NW. Electricity Substation
Historical petrol stations	<250m	No records
Historical garages	<250m	There are 94 records pertaining to historical garages within the surrounding area, those shown to be within 100m of the study site are listed hereunder: 56m NE. Garage 83m N. Garage 87m N. Garage
Historical military land	<250m	No records
Records of Current Industrial Land Use		
Data	Distance	Comments
Recent industrial land uses	<250m	16m NE. Frank Key 31m N. Boltons Textiles 35m N. Tri-Cast Composite Tubes Ltd 40m NW. Electricity Substation 48m S. Electricity Substation

		64m NW. Electricity Substation 78m NW. H Rothwell & Co 99m NW. Works 102m NW. Ringtag International 103m N. Discount Clearance centre 105m NW. Duke St' Auto Point 105m NW. Wren Prestige 123m N. Spring Court Auto Centre 125m NE. Electricity Substation 126m N. MOT Test Centre 134m NE. NRG Telecoms Ltd 142m E. Electricity Substation 157m N. Kwik Fit 170m S. TJ Booth 180m NE. Works 184m N. Sawmills 191m NE. Works 192m NW. Rochdale Ambulance Station 200m NE. Rochdale Re Tool Ltd 201m E. Works 206m NE Burns Motor Works 210m NE. Isaac Butterworth Ltd 216m SE. Rochdale Mobility 216m S. Mobile Planit 227m NE. Motaquip 227m NE. Motaquip Autocentre 234m N. Answer & Co 242m NE. Works 248m SW. EVM Sports & Prestige
Current or recent petrol stations	<250m	210m N. Gulf - Open
Electricity cables	<250m	No records
Gas pipelines	<250m	No records
Sites determined as Contaminated Land	<250m	No records
Control of Major Accident Hazards (COMAH)	<250m	No records
Regulated explosive sites	<250m	No records
Hazardous substance storage/usage	<250m	No records
Historical licensed industrial activities (IPC)	<250m	No records
Licensed industrial activities (Part A(1))	<250m	No records
Licensed pollutant release (Part A(2)/B)	<250m	28m N. Anwar and Co Ltd, - Status: Current Permit / Permit Type: Part B 206m N. Manson Timber, Whitworth Road, Status: Historical Permit / Permit Type: Part B
Radioactive Substance Authorisations	<250m	No records
Licensed Discharges to controlled waters	<250m	139m S. Permit Number: 01ROC0055 / Permit Version: 1 139m S. Permit Number: 01ROC0055 / Permit Version: 2 186m S. Permit Number: EPRQB3591EA / Permit Version: 1
Pollutant release to surface waters (Red list)	<250m	No records
Pollutant release to public sewer	<250m	No records
List 1 Dangerous Substances	<250m	No records
List 2 Dangerous Substances	<250m	No records
Pollution Incidents (EA/NRW)	<250m	No records
Pollution inventory substances	<250m	No records
Pollution inventory waste transfers	<250m	No records
Pollution inventory radioactive waste	<250m	No records
WASTE AND LANDFILL		
Data	Distance	Comments
Active or recent landfill	<250m	No records
Historical landfill (BGS records)	<250m	No records
Historical landfill (LA/mapping records)	<250m	No records
Historical landfill (EA/NRW records)	<250m	No records
Historical waste sites	<250m	No records
Licensed waste sites	<250m	No records
Waste exemptions	<250m	98m N. Whitworth Rd; WEX227128 210m NE. Balfour Beatty Living Places Ltd, WEX159308 210m NE. Balfour Beatty Living Places Ltd, WEX159308 222m NE. BBLP Princess Street Depot. EPR/XF0006V N/A001 243m S. 79 Yorkshire St', WEX156666 248m S. 79 Yorkshire St', EPR/PF0300H H/A001 249m S. Rochdale Pharmacy, WEX074442
ENVIRONMENTAL DESIGNATIONS		
Data	Distance	Comments
Sites of Special Scientific Interest (SSSI)	<500m	None
Conserved wetland sites (Ramsar sites)	<500m	None

Special Areas of Conservation (SAC)	<500m	None
Special Protection Areas (SPA)	<500m	None
National Nature Reserves (NNR)	<500m	None
Local Nature Reserves (LNR)	<500m	None
Designated Ancient Woodland	<500m	None
Biosphere Reserves	<500m	None
Forest Parks	<500m	None
Marine Conservation Zones	<500m	None
Green Belt	<500m	None
Proposed Ramsar sites	<500m	None
Possible Special Areas of Conservation (PSAC)	<500m	None
Potential Special Protection Areas (pSPA)	<500m	None
Nitrate Sensitive Areas	<500m	None
Nitrate Vulnerable Zones	<500m	None

7.0 PREVIOUS SITE INVESTIGATIONS / REPORTS

Searches and consultations have not established any evidence that ground investigation works have previously been undertaken on this site.

8.0 PRELIMINARY QUALITATIVE RISK ASSESSMENT (TIER 1)

8.1 Introduction

Based on the foregoing study, there is a 'Low - Moderate' potential for the presence of contamination associated with the historic land uses on the site and/or immediately adjoining the study site of the site, and previous land uses and hence a preliminary risk assessment was undertaken.

The risk assessment methodologies adopted by **Integra Consulting** are based on current available guidance from several sources and are included in Appendix D.

The Tier 1 Risk Assessment and Preliminary Conceptual Model (PCM) were formulated using the information discussed above and based on the following assumptions:

- It is understood that the site is to be redeveloped for commercial use by the construction of a 'Drive-Thru' facility with associated hard paved car parking and areas of soft landscaping / cultivation.

The existing and proposed layout are as illustrated on **RADCLIFFE GROVE PARTNERSHIP** architectural drawings contained herein.

- Drinking water will be from a mains supply.

In constructing the Preliminary Conceptual Model (PCM), **Integra Consulting** applied the guidance contained in CIRIA C552: 2001. This recommends use of a Risk Matrix which classifies risk based on the product of Probability of a source being present, and the Consequence of receptors being exposed to the source. Guidance tables setting out the classifications of probability and consequence together with a risk matrix are given in Tables 8 - 9 hereunder. In using this approach **Integra Consulting** recommends actual intrusive investigation of any Risk Classification of "Moderate" or over.

Table 8: Matrix of consequences against probability to gain a risk classification [CIRIA C552, 2001]

		CONSEQUENCE			
		SEVERE	MEDIUM	MILD	MINOR
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table 9: Classification Definitions (C552 CIRIA, 2001)

CLASSIFICATION	DEFINITION
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard. Or there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.

High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that harm would be relatively mild. Investigation (if not undertaken already) is normally required to clarify the risk and to determine to potential liability. Some remedial works may be required in the longer term.
Moderate / Low	
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

8.2 Preliminary Conceptual Model

By application of the risk assessment methodology outlined above, the following PCM was constructed.

Table 10: Preliminary Conceptual Model (PCM)

POLLUTANT LINKAGE	SOURCE	PATHWAY	RECEPTOR	PROBABILITY	CONSEQUENCE	RISK RATING
1	Boiler Works and other light industrial uses giving rise to risk of broad spectrum of heavy metals, aggressive pH, hydrocarbons, PAH's, asbestos in Made Ground associated with development of the site and the demolition of former structures etc	Soil and / or soil dust ingestion	Construction workers Future worker Offsite receptors	Likely	Medium	Moderate
2	Asbestos containing materials (ACM) in made ground soils associated with Boiler Works and construction / demolition of former structures etc	Fibre Inhalation	Construction workers Future worker Offsite receptors	Likely	Severe (ACM)	High
3	Inhalation of vapours associated with potential on-site made ground deposits, associated with development of the site and the demolition of former structures etc	Inhalation	Future residents	Unlikely	Medium	Low
4	Inhalation of ground gases from onsite or offsite sources i.e., made ground deposits associated with infilling of former reservoirs, demolition and infilling of basements of former structures etc	Inhalation	Future residents	Unlikely	Medium	Moderate
5	pH & Sulphate attack on concrete	Future building	Future building	Likely	Mild	Moderate / Low
6	Organic contamination associated with on site car parking facilities	Direct contact with water mains	Potable water supply	Unlikely	Medium	Low

The contaminants of concern associated with those risks which require intrusive investigation were researched by reference to published industry profiles, and are summarised hereunder:

Table 11: Summary of Contaminants of Concern based on PCM

LINKAGE NO.	METALS	NON-METALS	ORGANICS	GASES	OTHERS
PL1, PL2 PL5, PL6	Cd, Cr (total & hexavalent), Ni, Cu, Zn, Pb, Hg, Se, Mo, Sb	As, sulphates, sulphides, boron, free cyanide	TPHCWG, PAH's, BTEX, Volatiles (by PID), VOC's & SVOC's, SOM	-	pH Asbestos
PL3 & PL4	-	-	-	CH ₄ , CO ₂ , CO, H ₂ S	-
PL1, PL6	-	-	TPHCWG, PAH's, BTEX, Volatiles (by PID)	-	-
PL1-PL6	Cd, Cr (total), Ni, Cu, Zn, Pb, Hg, Se, Mo, Sb	As, sulphates, sulphides, boron, free cyanide	TPHCWG, BTEX PAH's, Volatiles (by PID), SOM	CH ₄ , CO ₂ , CO, H ₂ S	pH Asbestos

8.3 Summary of Risks

The foregoing analysis has identified a significant number of potential risks, and if present, these could adversely impact on human or environmental receptors, and since no previous site investigation has been undertaken, an intrusive phase of investigation is recommended to determine whether the postulated pollutant linkages are present on site.

9.0 AIMS AND PROPOSED SCOPE OF PHASE II INTRUSIVE INVESTIGATION

Based on the findings above, it is recommended that an intrusive investigation be undertaken. The Phase II Intrusive Investigation should include for exploratory holes to be sunk through made ground into the underlying natural strata.

The primary objectives of a ground investigations are to obtain enough data to reliably ascertain ground conditions on site, and to aid confirmation of the potential pollution linkages identified within the Preliminary Conceptual Model above. Sufficient soil and groundwater/soil leachate contamination data should be obtained to reliably allow the Preliminary Conceptual Model to be tested and refined by the performance of a quantitative risk assessment.

Using the guidance contained in BS10175: 2011 and R&D Technical Report P5-0066/TR: 2000, it is proposed that 5 No boreholes be sunk using light dynamic sampling methods to a notional depth of c.5m below ground level, or to refusal in rock head, whichever is the lesser.

Given the potential for the presence of underlying made ground deposits of an unknown thickness - composition, and given the nature of the development, it is recommended that 3 No light dynamic sampling boreholes be utilised for the installation of standpipes, thus enabling a programme of ground gas monitoring to be undertaken. To comply with CIRIA C665 for a “*Moderate*” risk site, it is proposed that gas monitoring is undertaken as a minimum on 4 No occasions, distributed over a period of 1 month.

The prime objective of any intrusive ground investigation is to provide reliable soil / groundwater, or soil leachate, contamination data and to assess the potential risk to human health and sensitive environmental receptors.

The proposed scope of works is summarised in Table 12 hereunder:

Table 12: Proposed Scope of Works

RISK	METHOD OF ASSESSMENT
Is the superficial ground impacted by contamination to the extent it may present a risk to human health?	Using the guidance contained in BS10175: 2011 and R&D Technical Report P5-0066/TR: 2000 it is proposed that 5 No boreholes be sunk using light dynamic sampling methods to a notional depth of c.5m bgl, or to refusal in rock head, whichever is the lesser. Broad spectrum contamination analyses will be performed on selective subsamples of recovered made ground (5 No analyses) to suite in Table 11
What are the geotechnical properties of the ground?	Standard Penetration Test's (SPT's) to be carried out at regular depth increments throughout the boreholes, with HSV tests to be carried out in cohesive strata on recovered soils. A programme of soil engineering laboratory testing will be carried out. The <i>in-situ</i> tests and soil engineering test data will be used in formulating suitable foundation solutions.
Is the site affected by migrating gas from made ground deposits?	The evidence of the desk study is that there is a low – moderate risk of the site being contaminated by ground gases and therefore 3nr boreholes will be utilised for the installation of gas / groundwater monitoring standpipes. CIRIA C665 recommends monitoring on 4 No occasions distributed over a period of 1-month.
Does the site pose a risk to the underlying aquifer	Soil water samples will be recovered from the standpipes and will be analysed to the suite proposed in Table 11. In the event that water does not accumulate in the standpipes, soil leachate analyses will be undertaken to the suite in Table 7. The results will be assessed against Drinking Water Standards and Environmental Quality Standards.

The layout of the proposed intrusive investigation is as annotated in Appendix A of this report.

Given that the site is to be re-developed for commercial use with associated soft landscaping, contamination data obtained as part of the above recommended Phase II intrusive investigation will be based on criteria contained in publication LQM/CIEH S4UL's for Human Health Risk Assessment (2015), applicable to the “*Commercial*” land use scenario. Given this document does not provide criteria for Lead contaminants, it is proposed that Lead results are compared to the C4SL published by DEFRA SP1010 Development of Category 4 Screening Levels for ‘*Commercial Land*’ use.

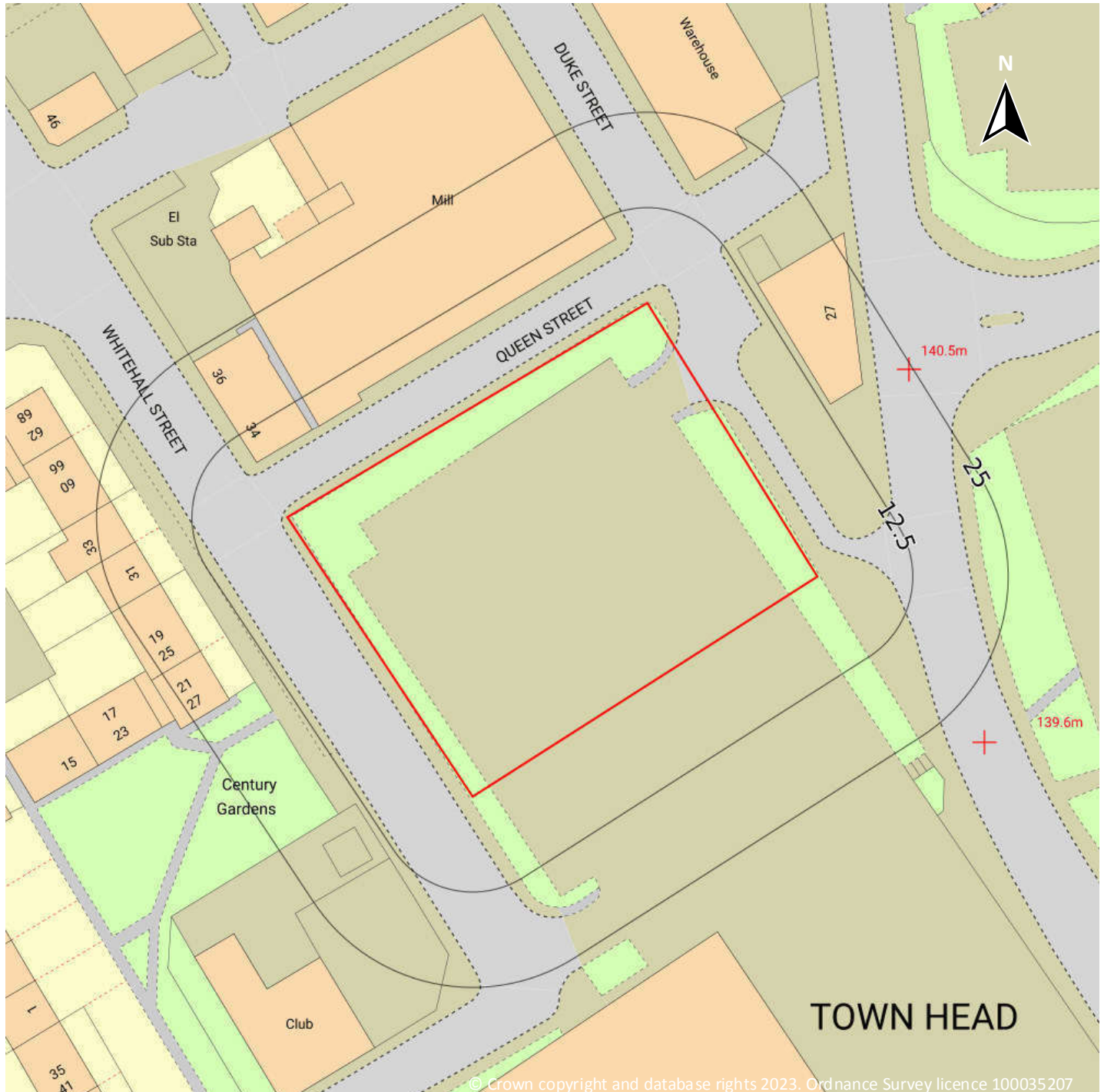
APPENDIX A: DRAWINGS:

SITE LOCATION PLAN

AERIAL PLATE

ARCHITECTURAL DRAWINGS

OS MasterMap site plan



Site Area: 0.23ha



Recent aerial photograph



Capture Date: 23/05/2019

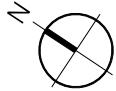
Site Area: 0.23ha



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SITE SPECIFIC HAZARDS

IN ACCORDANCE WITH THE REQUIREMENTS OF THE CDM REGULATIONS 2015 THE FOLLOWING SIGNIFICANT RESIDUAL HAZARDS HAVE NOT BEEN IDENTIFIED BY THE SURVEYOR. THE SURVEYOR HAS ADVISED THE CLIENT BY CONTRACTORS PLANNING TO UNDERTAKE THE WORKS SHOWN ON THIS DRAWING.



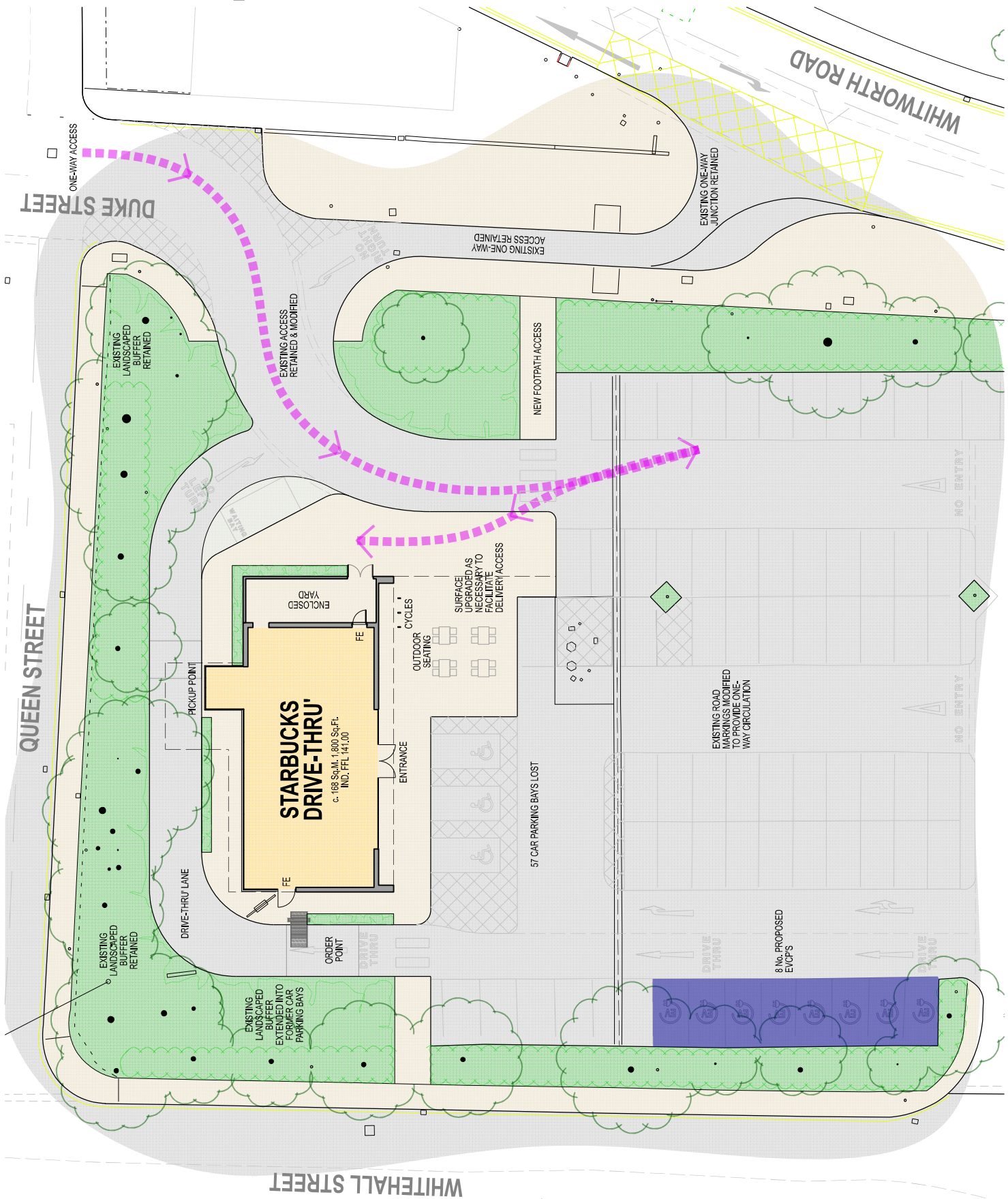
SCALE 1:250



NOTES

SITE PLAN BASED ON TOPOGRAPHIC SURVEY BY SURVEYOR. CHECK DIMENSIONS. REFER TO DRAWING A01/02/03/04 FOR FULL DETAILS

DELIVERIES



REV. DATE NOTES INIT.

CLIENT / PROJECT



GLENBROOK
ST. MARYS GATE
ROCHDALE

DRAWING TITLE

ENLARGED SITE PLAN
SCHEME FIVE

STATUS FOR INFORMATION

DATE 21.09.22
DRAWN SCALE @ A3
AJP 1:250

PROJECT NUMBER UNIT / BLOCK CODE TYPE & NUMBER REVISION LETTER

DRAWING NO.

11390 SC05 L02

Site Location Plans L GA Plans P Elevations
Sections S Details D Public Color C

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QUEEN STREET

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DUKE STREET

WHITWORTH ROAD

STARBUCKS
DRIVE-THRU
c. 168 Sq.M. 1,800 Sq.Ft.
IND. FFL 141.00

ENCLOSED
YARD

ENTRANCE

OUTDOOR
SEATING

SURFACE
UPGRADED AS
NECESSARY TO
FACILITATE
DELIVERY ACCESS

57 CAR PARKING BAYS LOST

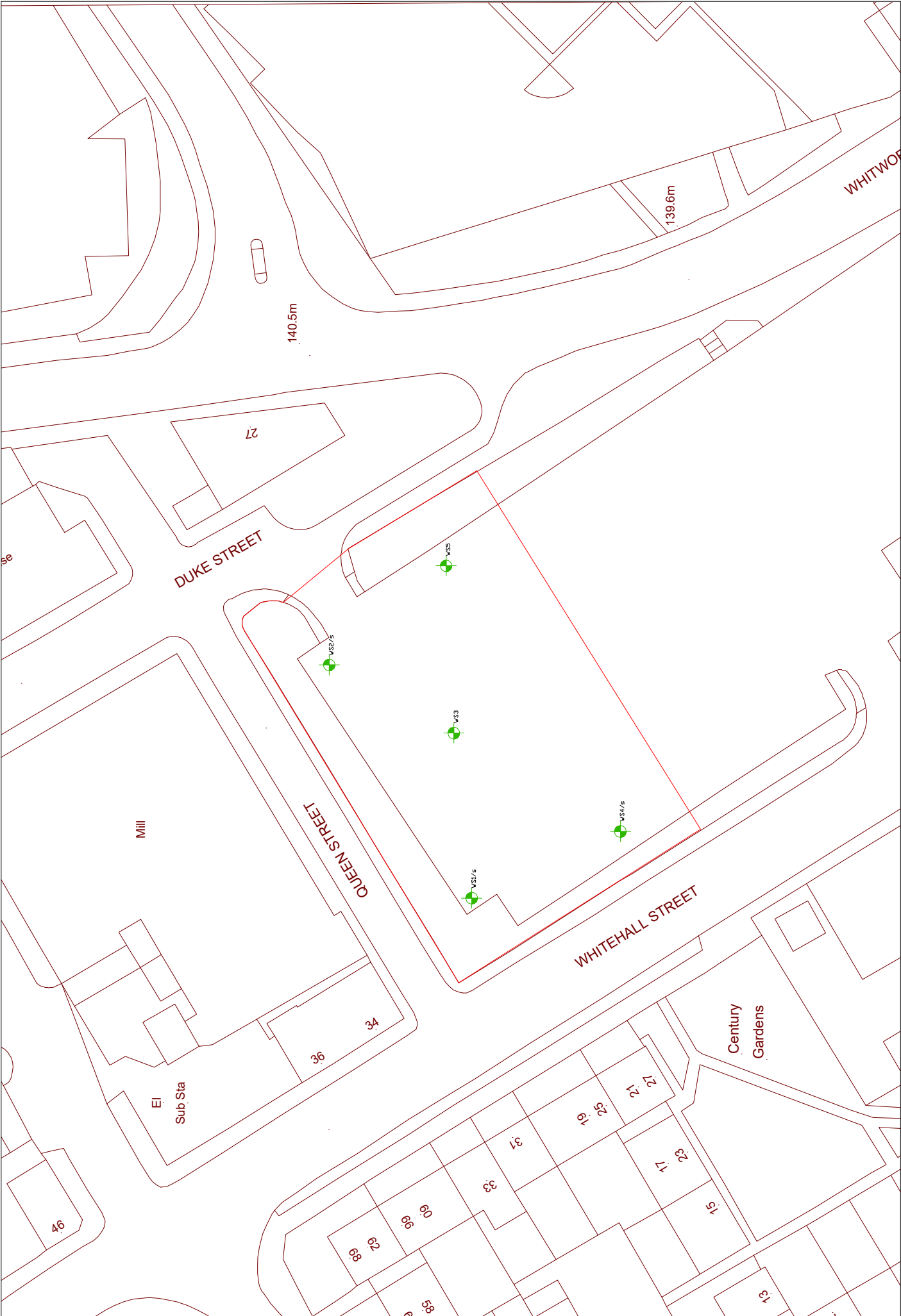
EXISTING ROAD
MARKINGS MODIFIED
TO PROVIDE ONE-
WAY CIRCULATION

8 No. PROPOSED
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NO ENTRY

NO ENTRY

NO ENTRY



APPENDIX B: NOTES ON LIMITATIONS

General

Integra Consulting has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from **Integra Consulting**, and a charge may be levied against such approval.

Integra Consulting accepts no responsibility or liability for:

- The consequences of this document being used for any purpose or project other than for which it was commissioned and/or
- The consequences of use of this document by any party with whom an agreement has not been executed.

Phase I Environmental Audits / Desk Studies

The work undertaken to provide the basis of a Phase 1 Desk Study report comprises a study of available documented information from a variety of sources (including the client), together with (where appropriate) a walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in a Desk Study report have been dictated by finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in the report, **Integra Consulting** reserves the right to review such information and to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out with the intention of providing enough information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated to potential human targets, building materials, the environment (including adjacent land), and surface and groundwater.

The amount of exploratory work and chemical testing undertaken may have been restricted by the timescale available, and the locations of the exploratory holes may have been restricted to areas unoccupied by the building(s) on the site, and further restricted by the existence of buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, several important engineering and environmental issues may need to be resolved.

For those reasons, if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised "hotspots" of contamination where concentrations may be significantly higher than those encountered.

Geoenvironmental Ground Investigations

The investigation of the site has been carried out to provide sufficient information within the agreed scope of the investigation, under the general headings of type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions, to provide a reasonable assessment of the environmental risks together with engineering and development implications.

If costs have been included in relation to the site remediation, these must be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of the site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be ground conditions present on the sites which have not been disclosed by this investigation, and which have therefore not been considered in this report.

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal, weather, or other effects.

The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

**APPENDIX C: CURRENT CONTAMINATED LAND GUIDANCE / LEGISLATION & RISK ASSESSMENT
METHODOLOGIES**

CURRENT CONTAMINATED LAND LEGISLATION / GUIDANCE & ENVIRONMENTAL RISK ASSESSMENT METHODOLOGY

LEGISLATION OVERVIEW

This report includes hazard identification and risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a "suitable for use approach". When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, or the wider environment given the current use and circumstances of the land.

Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

Significant harm is being caused or there is a significant possibility of such harm being caused;

or

Pollution of controlled waters is being, or is likely to be, caused."

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

"the entry into controlled waters of **any** poisonous, noxious or polluting matter or **any** solid waste matter".

To assist in establishing if there is a "significant possibility of significant harm" there must be a "significant pollutant linkage" for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of source-pathway-receptor is termed a "pollutant linkage or SPR linkage."

Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations, especially DEFRA Circular 01/2006 Contaminated Land (this replaces DETR Circular 02/2000). Part IIA defines the duties of Local Authorities in dealing with it. Except for situations of very high pollution risk, Part IIA places contaminated land responsibility on the planning and redevelopment process. In situations where there is very high pollution risk direct action from the Local Authority is usually necessary. Planning Policy Statement 23 (PPS23) provides guidance on the planning process and requires that sites which have been developed shall not be capable of being determined "contaminated land" under Part IIA.

The criteria for assessing levels of pollutants and hence determining whether a site represents a hazard are based on a range of techniques, models, and guidance. Within this context it is relevant to note that Government objectives are:

- (a) to identify and remove unacceptable risks to human health and the environment;
- (b) to seek to bring damaged land back into beneficial use;
- (c) to seek to ensure that the cost burdens faced by individuals, companies and society are proportionate, manageable, and economically sustainable.

These three objectives underlie the "suitable for use" approach to remediation of contaminated land. The "suitable for use" approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The "suitable for use" approach then consists of three elements:

- (a) ensuring that land is suitable for its current use - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise; the contaminated land regime provides the regulatory mechanisms to achieve this;
- (b) ensuring that land is made suitable for any new use, as planning permission is given for that new use - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and
- (c) limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought - in other words, recognising that the risks from contaminated land can be satisfactorily assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

The mere presence of pollutants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the current and proposed end use of the site.

RISK ASSESSMENT METHODOLOGY

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby "risk" is defined as:

- "(a) The probability, or frequency, or occurrence of a defined hazard; and

- (b) The magnitude (including the seriousness) of the consequences.”

The UK’s approach to the assessment of environmental risk is set out in by the Department of the Environment (2000) publication “A Guide to Risk Assessment and Risk Management for Environmental Protection.” This established an iterative, systematic staged process which comprises:

- (a) Hazard identification
- (b) Hazard assessment
- (c) Risk estimation
- (d) Risk evaluation
- (e) Risk Assessment

At each stage during the investigation process the above steps are repeated as more detailed information becomes available for the site.

CLR11- ‘Model Procedures for the Management of Land Contamination’, a document published by the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) outlines a tiered approach to the assessment of risks posed by contaminated land, as summarised hereunder:

Tier 1: Preliminary Risk Assessment

A Preliminary Risk Assessment is usually undertaken as part of a desk study, outlines potential risks posed by potential contamination to all receptors by defining plausible “pollution linkages” and developing a preliminary conceptual model (PCM). The purpose of this model is to define all possible complete pollution linkages, where the requisite source – pathway – target elements are present, and these elements being defined as:

- a contaminant (source) is a hazardous substance or agent, present at levels that have the potential to cause harm or damage a receptor
- a pathway is the means by or through which a contaminant meets, or otherwise affects, the receptor
- a receptor (target) is an entity (human being, aquatic environment, flora, and fauna etc) that is vulnerable to the adverse effects of the contaminant

This relationship is termed a “pollution linkage”. It should be recognised that for a health or environmental risk to exist, all three elements of the relationship or linkage must be present, i.e.

- if there is no contaminant, or contaminant present at levels below those considered to be harmful or damaging to a receptor, then there can be no adverse effect on a receptor
- if there is no receptor present that can be adversely affected by a contaminant, no harm or damage can arise
- even where both a contaminant and a receptor are present, no harm or damage will occur if there is no pathway by or through which a linkage between the two can be established

The absence of one or more of each component (source, pathway, receptor) would prevent a pollutant linkage being established and there would be no significant environmental risk.

The PCM is subject to continual refinement as additional data becomes available. As part of a Phase I Investigation (Desk Study and site walk over) a PCM is formed. Based on the PCM, potential pollutant linkages can be assessed. If the PCM and hazard assessment indicate that a pollution linkage is not of significance, then no further assessment or action is required due to this linkage. For each significant and possible linkage, a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is usually termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the PCM and assess the level of risk from each pollutant linkage. Risk assessment will usually include Tier 2 Generic Quantitative Risk Assessment and / or, if necessary, a Tier 3 Detailed Quantitative Risk Assessment.

Tier 2: Generic Quantitative Risk Assessment (GQRA)

GQRA requires an intrusive investigation to characterise the site assisting in the re-assessment of the source-pathway receptor linkage. The conceptual model should be refined accordingly.

Upon completion of an intrusive investigation, it must be decided whether Generic Assessment Criteria (GAC) are suitable for assessing the risk posed by potential contamination at the site. If GAC are deemed unacceptable for risk assessment purposes or cannot be developed a Tier 3 Detailed Quantitative Risk Assessment (DQRA) is required.

If GQRA reveals that unacceptable risks are not present, then no further action is required. If GQRA identifies a possibility of risk, a decision must be made whether further work is required or necessary for the purposes of risk assessment. If further risk assessment is deemed not suitable not required, an Options Appraisal should be undertaken. If further risk assessment is required, the scope nature of further risk assessment must be decided – it is possible that a Tier 3 DQRA will be undertaken in this scenario.

Tier 3: Detailed Quantitative Risk Assessment (DQRA)

DQRA is used when pollutant linkages require further assessment. DQRA is often undertaken for pollutant linkages where GAC are unavailable or inappropriate for or more conservative than the actual circumstances of the site. Site specific data is used to create Site Specific Assessment Criteria (SSAC) and enable a more accurate assessment of the risks. Further investigation may or may not be required to formulate SSAC depending on the site-specific conditions and information already obtained.

If DQRA reveals that unacceptable risks are not present, then no further action is required. If DQRA identifies a possibility of risk, a decision must be made whether further work is required or necessary for the purposes of risk assessment. If further risk assessment is deemed not suitable not required, an Options Appraisal should be undertaken. If further risk assessment is required, the scope and nature of further risk assessment must be decided at this point.

NOTE: A Tier 1 Preliminary Risk Assessment is undertaken as part of a Desk Study Report and a Preliminary Conceptual Model is developed for all pollutant linkages. However, the methodologies for assessing the risks to human health, risks to controlled waters and risk posed by ground gas using quantitative techniques vary considerably, therefore GQRA and DQRA for human health, controlled waters and ground gas must be undertaken separately. The risk assessment methodologies where quantitative assessment is used for risks to human health, risks to controlled waters and risks posed by ground gas, if relevant, are described hereunder.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED TO HUMAN HEALTH

Background

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the EA published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. These reports (CLR7-10) together with associated "SGV" documents have since been withdrawn (August 2008) and the following documents have been published as revised guidance to the CLEA assessment:

Environment Agency : 2008: Updated Technical Background to the CLEA model Science Report SC050021/SR3

Environment Agency : 2008: Human Health Toxicological Assessment of Contaminants in Soil SC050021/SR2

Additional guidance on statistical assessment replacing CLR 7 is provided in:

CL:AIRE :2008 Guidance on Comparing Data with a Critical Concentration

Other guidance/software used in spatial / statistical assessment is provided in:

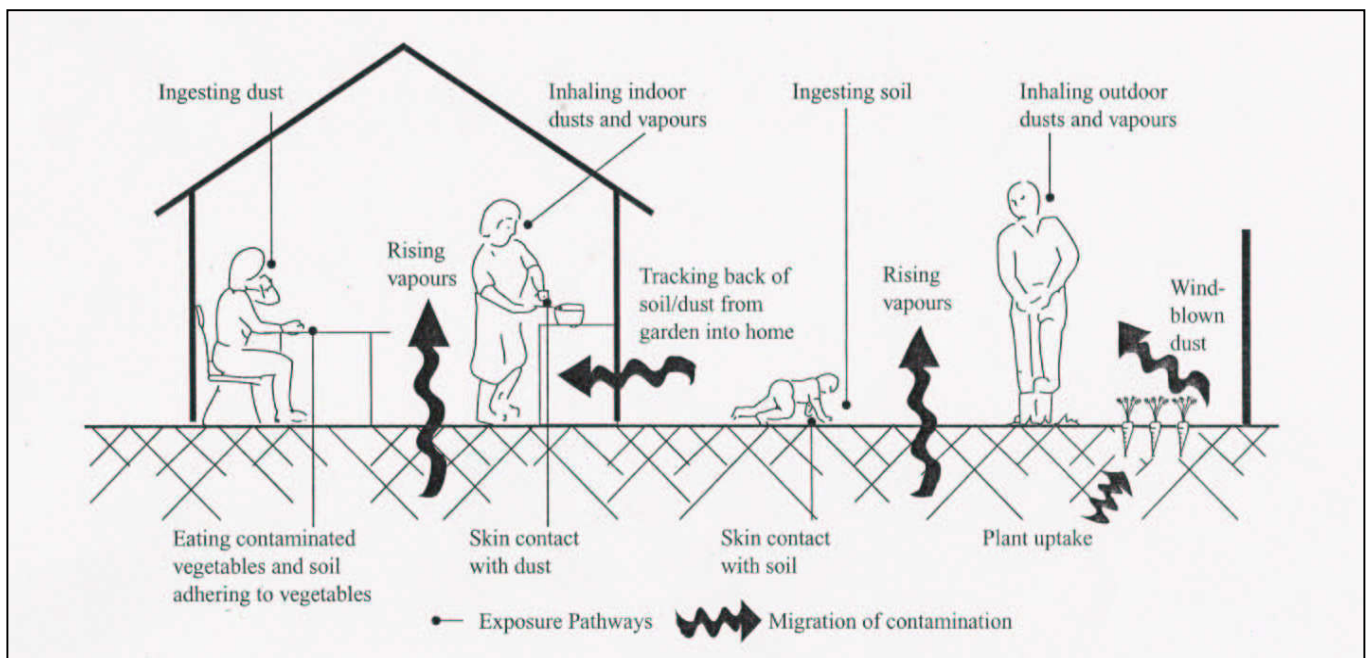
USEPA 2006: Data Quality Assessment: Statistical Methods for Practitioners

Spatial Analysis and Decision Assistance (SADA) – The University of Tennessee

A different approach to the statistical appraisal of data is required depending on whether the assessment of risk is to assess whether land is Contaminated Land in accordance with regulations, or whether the assessment is to determine whether the site is suitable for new development in according with Planning guidance. This is discussed further in CL:AIRE :2008 "Guidance on Comparing Data with a Critical Concentration".

A program for the derivation of GAC's based on the above guidance is provided by the Environment Agency and is entitled "CLEA Software Version 1.04".

The CLEA model has been developed to calculate an estimated tolerable daily soil intake (TDSI) for site users given a set 'default' exposure pathway. Ten human exposure pathways are covered in the CLEA model as presented below:



Ingestion

ingestion of outdoor soil

ingestion of indoor dust

ingestion of home grown produce

ingestion of soil attached to home grown produce

Dermal Contact

dermal contact with outdoor soil

dermal contact with indoor dust

Inhalation

inhalation of outdoor dust
inhalation of indoor dust
inhalation of outdoor soil vapour
inhalation of indoor soil vapour

It should be noted that there are other potential exposure pathways on some sites not included in the CLEA model e.g., certain organic compounds can pass through plastic water pipes into drinking water supply.

Where contaminated water is present at a depth less than 2.00mbgl and there is a potential risk of inhalation of vapours (only when volatile compounds are present) the risk from inhalation of vapours from soil water will be assessed using a UK compliant version of BP Risc v4.02.

The presence and/or significance of each of the above exposure pathways are dependent on the type of land use being considered and the nature of the contaminant under scrutiny. Accordingly, the CLEA model considers for principal 'default' land use types and makes a series of 'default' assumptions about human exposure frequency, duration and critical human target groups for each land use considered:

residential
allotments
commercial / industrial land use

The above land use categories defined in the CLEA are detailed below:

Residential: This generic scenario assumes a typical residential property consisting of a two-storey house built on a ground-bearing slab with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden area.

Allotments: This generic scenario assumes a plot of open space (about 250 m²), commonly made available by the local authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than a hectare. The tenants are assumed to be parents or grandparents and that young children make occasional accompanied visits to the plot.

Commercial/Industrial: There are many kinds of workplace and work-related activities. This generic scenario assumes a typical commercial or light industrial property consisting of a three-storey building at which employees spend most time indoors and are involved in office based or relatively light physical work.

Human Health Risk Assessment Methodology

Assessment of risk for the protection of human health is undertaken using the methodology as outlined previously, and summarised hereunder:

Tier 1 Preliminary Risk Assessment
Tier 2 Generic Quantitative Risk Assessment
Tier 3 Detailed Quantitative Risk Assessment

The Tier 1 Preliminary Risk Assessment is undertaken as part of the desk study report and includes the development of a Preliminary Conceptual Model. Tier 2 and Tier 3 Quantitative Risk Assessments are undertaken to develop and refine the Preliminary Conceptual Model aiding a more detailed assessment of the risk posed by contaminants revealed by site investigation and soil / soil water chemical analyses.

The methods used by Integra Consulting to derive assessment criteria, to statistically analyse chemical data and to compare chemical data to the derived assessment criteria are discussed hereunder.

Derivation of Generic Assessment Criteria (GAC) and Site-Specific Assessment Criteria (SSAC)

GAC's are derived based on the proposed land use and the associated applicable exposure pathways. It should be noted that there are difficulties in establishing soil concentrations of contaminants beyond which risks from exposure to these contaminants would be 'unacceptable' and the GAC value does not necessarily equate to the level for "significant possibility of significant harm" as defined in Part IIA of The Environmental Protection Act (1990) to determine whether land is "contaminated." This ultimately requires detailed 'toxicological' information of the health effects of individual contaminants and a scientific judgement on what constitutes an 'unacceptable' risk. The primary purpose of the CLEA derived GAC's are as 'minimal risk thresholds' for the assessment of human health risks in relation to land use.

Minimal risk thresholds calculated using generic input parameters for each of the above land uses are termed Generic Assessment Criteria (GAC) and are used for Generic Quantitative Risk Assessment (GQRA). However, further assessment may be required taking into consideration site specific factors such as the way the land is used, the soil type, the building characteristics, and the exact nature of the receptor, to determine whether there is a significant possibility of risk to human health to site users. Such an assessment is known as a Detailed Quantitative Risk Assessment (DQRA) and the resultant threshold concentrations are known as Site Specific Assessment Criteria (SSAC). Such assessments should be conducted with the agreement of the local authority (or the Environment Agency) since it is the authority that determines whether land is Contaminated Land or whether Planning Permission for a new development may be granted.

For the purposes of this report, assessment criteria have been derived in accordance with current guidance based on the conceptual model for the proposed land use using the CLEA v1.04 software. These criteria are not intended to indicate whether the site may be contaminated land, nor do they replace any published soil guideline values. However, the values are intended to provide guidance for the local authority on whether the site may be considered uncontaminated. If, based on the site's proposed future use, the site would be considered by the local authority to be uncontaminated and therefore, on the basis of soil concentrations, fit for purpose, then no further risk assessment based on soil concentrations and the risk to human health would be necessary. However, should these criteria be exceeded, or the conceptual site model vary from the model used in the risk assessment to derive these values then the risk assessment should be updated accordingly.

For contaminants routinely analysed where inhalation is a significant pathway (naphthalene, phenanthrene, Aromatic EC5-EC7, Aromatic EC7-EC8, Aromatic EC8-EC10, Aromatic EC10-EC12, Aromatic EC12-EC16, Aliphatic EC5-EC6, Aliphatic EC8-EC10, Aliphatic EC10-EC12, Aliphatic EC12-EC16), plots of the GAC as a function of Soil Organic Matter (SOM) are used to determine if they pose a potential risk to human health, which are presented hereunder. Where there is an exceedance further assessment may be undertaken.

Statistical Assessment of Soil Contamination Data & Comparison of Contamination Data to Threshold Values

In any site investigation only a small fraction of the soil on the site is analysed. Therefore, the mean derived from the contamination data for a contaminant may not be the same as the true mean for the contaminant distribution on the site. To improve the reliability of any assessment a statistical analysis is undertaken in line with the CL:AIRE document "Guidance on Comparing Soil Contamination Data with a Critical Concentration".

Statistical assessment of soil data is undertaken using programs based on the guidance in the CL:AIRE document or the USEPA software ProUCL v4.0.

Where the number of results in a dataset is less than four, a statistical assessment is not undertaken, and the assessment is performed by comparison of the maximum value(s) with a Health Criteria Value (HCV), such as Generic Assessment Criteria value(s).

For the Planning situation, the regulator needs to check whether the concentration of contaminants is low compared to the HCV. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is lower than the HCV.

For the Part IIA scenario the regulator needs to determine whether the concentration of contaminants is greater than the HCV. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is higher than the HCV. However, the regulator may proceed with determination if there is just a 51% probability, "on the balance of probabilities".

The Outlier Test used in the statistical assessment may not be able identify separate populations if numerous populations are present. To ensure that this is not the case a spatial assessment of the data will be undertaken using SADA.

If the screening levels are exceeded, then more sophisticated quantitative risk assessment or remedial action may be undertaken. The benefits of undertaking a quantitative risk assessment must be weighed against the likelihood that it will bring about cost savings in the proposed remediation.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED TO CONTROLLED WATER

Definition of Controlled Waters

The term 'controlled waters' is defined in Section 104 of the Water Resources Act 1991 as:

"Territorial Waters...which extend seawards for three miles..., coastal waters..., inland freshwaters, waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata."

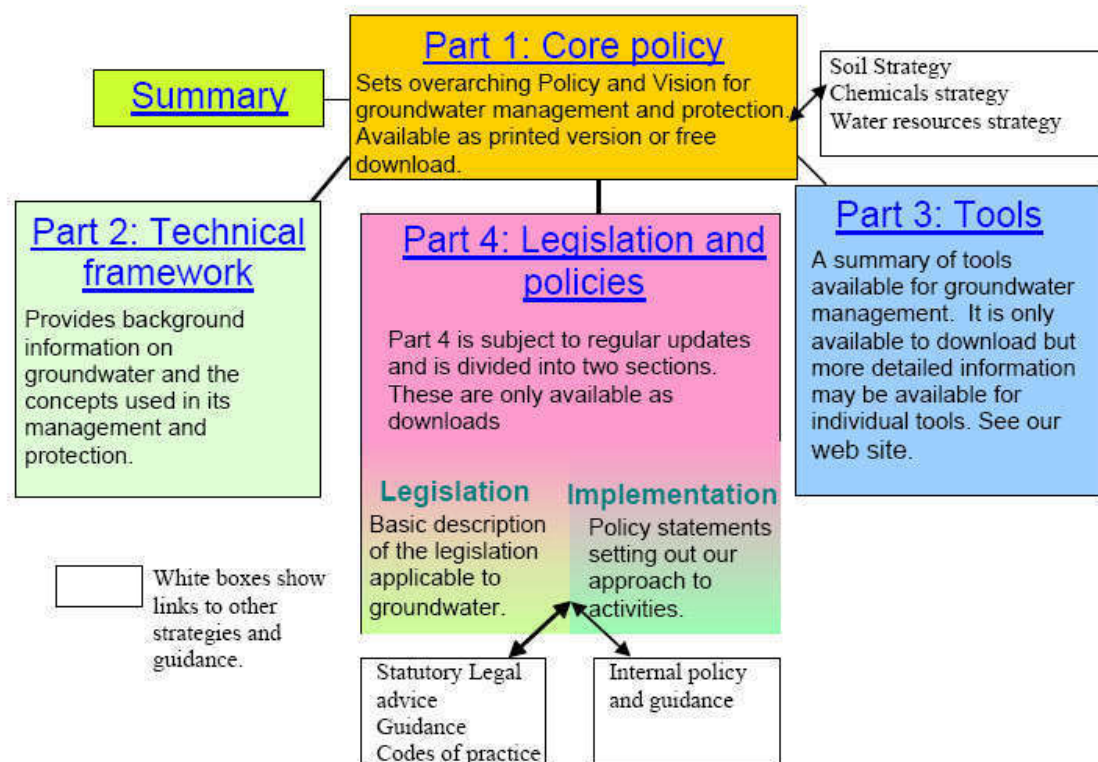
Note that the definition of groundwater under the Water Resources Act 1991 includes all water within underground strata (including soil / pore water in the unsaturated zone). The definition of groundwater under the Groundwater Directive however is limited to water in the saturated zone. For the purposes of Part IIA of the Environmental Protection Act 1990, the Environment Agency recommends that the groundwater within the saturated zone only is considered as the receptor (rather than soil / pore water).

Environment Agency Guidance

Legislation and guidance surrounding the protection of controlled waters in the UK is abundant and can be complex. The Environment Agency's overall position on groundwater is "To protect and manage groundwater resources for present and future generation in ways that are appropriate for the risks that we identify" (Groundwater Protection : Policy and Practice GP3, 2006). In brief, the core objectives of the existing legislation serve to enforce this position.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document was influential as it provided a focus for key developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was then revised in 1998, since which there have been substantial changes in legislation, driven by Europe. Key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991. Further to legislative changes, gaps identified in the 1998 PPPG required addressing. These changes are reflected in the forthcoming Environment Agency Policy document entitled Groundwater Protection : Policy and Practice (GP3), a draft version of which was available for public consultation (Parts 1 to 3) ending July 2006 with Part 4 issued in March 2008. Part 4 includes a section on key groundwater legislation and the Environment Agency's interpretation of it.

The following gives a breakdown of the structure of the document (taken from the Environment Agency GP3 draft consultation document, 2006)



Controlled Water Risk Assessment Methodology

The risk posed to controlled water is assessed by Integra Consulting in accordance with current guidance as outlined hereunder.

In order for a developer of a potentially contaminated site to fulfil their obligations under the legislation, a site assessment would be required to be undertaken in order to identify any potential risks to controlled waters and to derive suitable clean-up criteria if necessary to ensure the protection of controlled waters. The general approach for Groundwater Protection is detailed further in Part 3 of GP3.

When assessing groundwater impact the Environment Agency advocate the application of their framework methodology "Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination" Environment Agency (2006). The methodology has four levels of assessment as described below:

Level 1 considers whether contaminant concentrations in "pore water" in contaminated soil are enough to impact on the receptor, ignoring dilution, dispersion, and attenuation along the pathway. The "pore water" concentration is determined from:

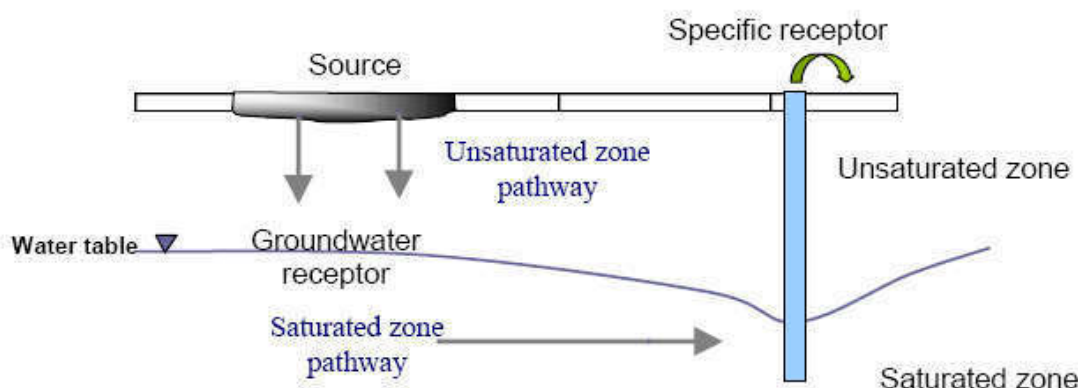
- measured "pore water" concentrations or perched water quality
- ii) soil leaching tests
- iii) theoretical calculations based on soil/water partitioning equations

Level 2 considers dilution by the receiving groundwater or surface water body and whether this is enough to reduce contaminant concentrations to acceptable levels. The remedial target is defined as the target concentration multiplied by a dilution factor (DF).

Levels 3 and 4 consider whether natural attenuation (including dispersion, retardation, and degradation) of the contaminant as it moves through the unsaturated and saturated zones to the receptor are enough to reduce contaminant concentrations to acceptable levels. The remedial target is defined as target concentration multiplied by a dilution factor (DF) and attenuation factor (AF). In Level 3 simple analytical models are used to calculate the significance of attenuation. The Environment Agency has released a "Remedial targets worksheet v3.1" to carry out basic calculations using a conservative approach up to Level 3 using basic principles assuming a simple migration of contaminants from the source zone into the aquifer receptor. Level 4 assessment uses more sophisticated numerical models and allows for the introduction of additional geological horizons and is used mainly to determine whether soil contaminants will reach their target within a specified timeframe. Use of such software should only be used once agreement has been obtained from the Environment Agency.

Three main stages apply to any risk assessment of controlled waters, these are:

1. Risk Screening (Tier 1 Preliminary Risk Assessment): The understanding of the Conceptual Site Model (CSM) is the key to assessing any site. Using a robust CSM, potential pathways or receptors may be screened out from any further assessment at an early stage. For example, if the pathway through the unsaturated zone is blocked by the presence of a significant thickness of low permeability clay. A greater understanding of the CSM is achieved with each tier of risk assessment. An example of a basic CSM is given below (taken from the Environment Agency GP3 draft consultation document, 2006):



2. Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Level 1): When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with screening criteria. Published values of screening criteria with which chemical test results can be compared are published in the following guidance:

Water Supply (Water Quality) Regulations 2000

The Private Water Supplies Regulations 1991

Environmental Quality Standards for surface waters based on The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives)

The Surface Waters (Abstraction for Drinking Water Classification) Regulations 1996

World Health Organisation Drinking Water Standards 2004

Should the Level 1 assessment indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

To devise suitable remedial solutions

To carry out more investigation, sampling, and analysis

To conduct a site specific Detailed Quantitative Risk Assessment (DQRA) to determine if the materials are suitable for their proposed use, or devise site specific clean-up level

3. Detailed Quantitative Risk Assessment (EA Remedial Targets Methodology Levels 2 to 4): The decision to carry out a DQRA will be dependant on the extent and implications of the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the previous levels of assessment. The conceptual model will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment, the remainder having been screened out.

Additional site-specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria, if derived, will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or compliance point. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED BY GROUND GAS

Origin of Ground and Landfill Gases

When carrying out a ground gas risk assessment, the origin or source of the gases is important as potential risks will vary depending on the source. This Appendix relates to the risk of the two main ground gases of concern; methane and carbon dioxide and does not apply to other ground gases (e.g., radon or vapours from hydrocarbon spills). Methane and carbon dioxide are major constituents of landfill gas but can also occur from a variety of anthropogenic and natural sources, as summarised in Table 5 below:

Gas	Source	Comments
Landfill Gas	Anaerobic decomposition of degradable waste within landfill sites. Typically, 60% methane and 40% carbon dioxide during methanogenic phase.	Composition varies over time, particularly in early stages. Contains a range of minor constituents (particularly carbon monoxide and hydrogen sulphide).
Landfill Associated Gases	- Anaerobic degradation of leachate external to the site; - Degassing of dissolved gases in groundwater; - Evolution of gases following interaction between leachate and groundwater	Can result in secondary (external) production of methane or carbon dioxide.
Made Ground	Anaerobic degradation of organic components	Very variable depending on source
Sewer Gas, Cess Pits	Anaerobic degradation of organic components of sewage producing methane and carbon dioxide.	Often characterised by hydrogen sulphide odour.
Mains Gas	Leakage from underground pipework or storage tanks. Mainly methane but often contains higher alkanes.	An odourise is added to permit detection of leaks. Typically, 90% CH ₄ , but 1 to 27% C ₂ -C ₄ alkanes, May also contain other trace gases e.g., CO, helium, and CO ₂ (from degradation of CH ₄ in the ground).

Gas	Source	Comments
Other Anthropogenic Sources	- Degradation of leaked or spilled hydrocarbons or other industrial chemicals; - Anaerobic degradation of organic contaminants in groundwaters (e.g., silage liquor); - Reactions between monitoring well construction components and environment; - Burial grounds/cemeteries.	Hydrocarbon spillages often have an 'oily' odour. Fuel spillages common – Petrol or Diesel and can contain a wide range of VOC's. Can degrade to produce methane / carbon dioxide.
Alluvium / Marsh / Peat Gas	Anaerobic microbial degradation of organic material (usually waterlogged vegetation / peat). Often associated with the presence of alluvial deposits or dredging's.	
Geogenic Gas	Natural seepages of carbon dioxide and hydrocarbon gases derived from geologic sources such as coal seams and deep oil / gas source formations. Can be present in solution in groundwaters.	Methane most common but can contain carbon dioxide and higher alkanes.
Mine Gases	Various types. Most common is "fire damp" with high methane, produced by the desorption of gas trapped in coal. "Black damp" (Scythe gas) with high carbon dioxide and denser than air. "White damp" is high in carbon monoxide.	Methane most common. Can contain higher alkanes, carbon dioxide and carbon monoxide. Often low in oxygen.
Natural Shallow Ground Gas	Various types - high carbon dioxide formed by subsurface aerobic activity leading to depleted oxygen and elevated carbon dioxide; - chemical degradation of rocks (e.g., carbonates) producing carbon dioxide; - carbon dioxide production in root zone of soils by plants.	Gases can be emitted from ground under falling barometric pressure conditions.

Table 5. Potential Sources of Ground Gases

This Appendix does not provide guidance for the assessment of risk when other gases are present due to 'Other Sources' from the above table (particularly organic compounds such as BTEX and VOC's or for the risk from radon or hydrogen sulphide).

To determine the origin of the gas a range of factors must be considered together, including;

1. Proximity of likely sources
2. Ground conditions (geology, hydrogeology, anthropogenic pathways etc)
3. Properties of gases present including:
 - Chemical composition
 - Physical properties
 - Ratios of components e.g., methane : carbon dioxide
4. Timeframe of activities such as infilling periods, capping works, installation of gas control systems etc

Identification of the originating source may be problematic given that there may be more than one source present and trace gas analysis may be required. Identification of the sources of the gases encountered during monitoring is usually carried out through a process of eliminating the most unlikely potential sources (given the site setting) and selecting those which are most likely.

Hazards Associated with Presence of Methane

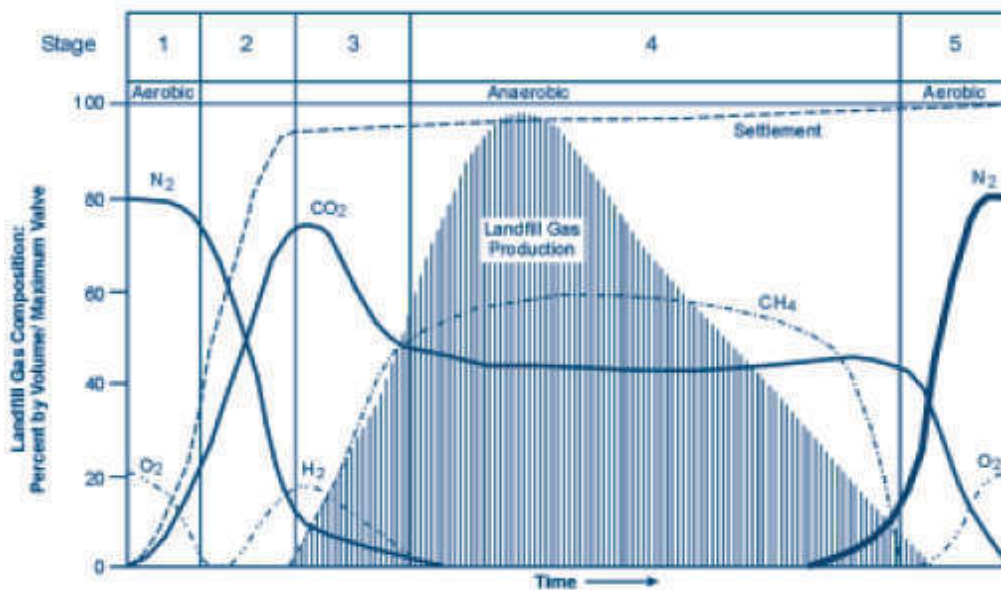
Methane gas is combustible and potentially explosive. When the concentration of methane in air is between the limits of 5.0%v/v and 15.0%v/v an explosive mixture is formed. The Lower Explosive Limit (LEL) of methane is 5.0%v/v, which is equivalent to 100% LEL. The 15.0%v/v limit is known as the Upper Explosive Limit (UEL), but concentrations above this level cannot be assumed to represent safe concentrations. Further, the LEL and UEL will vary (up and down) depending upon the proportion of other gases (including oxygen). However, the fact that methane is a colourless, odourless gas means that there is no simple indicator of the presence of the gas until such a time as explosive limits are reached, and an incident occurs. Methane is lighter than air and has a low toxicity. However, at high concentrations it can result in asphyxiation due to oxygen displacement.

Hazards Associated with Presence of Carbon Dioxide

Carbon dioxide is a colourless, odourless gas, which, although non-flammable, is both toxic and an asphyxiant. As carbon dioxide is denser than air, it will collect in low points and depressions. The UK Health & Safety Executive (HSE) has published information relating to concentrations of carbon dioxide that humans may be exposed to, which uses concentrations contained in the Control of Substances Hazardous to Health Regulations 2002 (as amended). These are the Long-Term Occupational Exposure Limit (LTOEL, 8-hour period) and the Short-Term Occupational Exposure Limit (STOEL, 15-minute period), which are 0.5% and 1.5% carbon dioxide, respectively.

Parameters Influencing the Rate of Ground Gas Production

The figure below is taken from EA guidance document LFTGN 03 illustrates typical ground gas generation curves from biodegradable materials:



The production of methane and carbon dioxide at a landfill site may be expected to be considerable and ongoing. Concentrations of methane will eventually decrease, followed by concentrations of carbon dioxide, but the duration and rate of gas production can vary markedly between sites. Five distinct phases of gas production occur during the process which are, in order of event as marked above, as follows:

1. An aerobic phase involving oxygen depletion and temperature increase through aerobic respiration;
2. The establishment of anaerobic conditions and the evolution of carbon dioxide and hydrogen through acidogenic activity;
3. Commencement of methanogenic activity; the establishment of populations of methanogenic bacteria;
4. A phase of stable methanogenic activity, which may go on for many tens of years;
5. A phase of decreasing methanogenic activity, representing depletion of the organic material and a return to aerobic conditions.

The time scale for the return to the normal ground gas concentrations will be highly variable, depending upon the types and quantities of materials present. In addition, the optimum parameters influencing the rate of decomposition and ground gas production within the ground at a site are as follows:

- High water content with adequate rainfall and water infiltration to provide moisture content between approximately 20 to 26%;
- Conditions that either are or are very close to anaerobic;
- High proportion of biodegradable materials;
- A pH between 6.5 and 8.5, ideally verging slightly on the acidic between pH 6 to 7;
- Temperature between 25°C and 55°C;
- The ratio of the biochemical and chemical oxygen demands (BOD:COD);
- High permeability;
- Small particle size, as finer subsurface materials possess a greater surface area to provide a growing 'face' for the micro-organisms, but high fines levels reduce permeability and reduces decomposition rate.

For this reason, it is vital that sources of methane and carbon dioxide are identified prior to the commencement of any work on a construction site, and that the ground gas regime is characterised at the worst temporal conditions a site may experience. From this, a risk assessment is carried out to identify the risk at the site from ground gases so that suitable protection measures can be designed and incorporated into a development to prevent a dangerous build-up of gas occurring.

Factors Influencing the Migration and Behaviour of Ground Gases

There are many factors that influence the migration of ground gases which can affect the risk from a gassing source:

- driving force – pressure differential along a pathway, diffusion and dissolved in solution;
- meteorological conditions – short term and seasonal conditions including atmospheric pressure changes (e.g., rapidly falling pressure causes gas to expand increasing emission rates), rainfall, frozen ground and thawing, temperature;
- geological and groundwater conditions – these can have the over riding influence on the direction/pathways and quantity of migrating gas;
- anthropogenic influences – man-made pathways include mine shafts, service runs/drains, foundation piles, underground voids/pits/basements, foundation/building design/construction

Current Guidance

Previous versions of Building Regulations Approved Document C provided statutory guidance stating that consideration should be given to appropriate action and / or specific solutions in situations where methane concentration exceeded 1%v/v or carbon dioxide concentrations exceeded 5%v/v. The latest Building Regulations Approved Document C (DoE 2004) no longer endorses this approach and recommends the use of a risk-based approach to interpreting a gas monitoring survey. This is in line with current EA guidance for landfill gas (LFTGN 03, 2004) which recommends the use of a structured risk-based approach like that outlined in CLR 11. On this basis, recent guidance has been produced in 2006 and 2007 with the aim of providing up to date advice in relation to residential and commercial development. The guidance does not address issues associated with gas derived from landfills, for this refer to "Guidance on the Management of Landfill Gas" (Environment Agency 2004) for an overview.

Recent guidance relevant to gas assessments for residential and commercial development includes;

Wilson et al. (CIRIA C665, December 2007) "Assessing Risks Posed by Hazardous Ground Gases for Buildings."

This document provides up to date advice on all aspects of ground gas risk assessment such as investigation, monitoring programmes, data collection and interpretation. The guidance presents separate methodologies for the characterisation of:

All development types except low rise housing with gardens (Situation A)

Low rise housing with gardens (Situation B)

Boyle and Witherington (NHBC / RSK Group, Report 10627-R01(04) January 2007) "Guidance on the Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present."

This document presents the "Traffic Lights System" detailed below and is relevant only for low rise properties (e.g., bungalows and town houses) that have a ventilated sub-floor void (i.e., Situation B as described in CIRIA C665).

British Standard (BS 8485, December 2007) "Code of Practice for the Characterization and Remediation from Ground Gas in Affected Developments"

This document provides an overview of gas characterisation and assessment. The Standard is intended to be used by designers of gas protection measures and regulators involved in the assessment of design solutions.

Further guidance, Wilson, and Card (CIEH) "Ground Gas Handbook for Designers and Regulators" providing practical guidance on ground gas assessments and the design and evaluation of protection measures, is expected to be published in March 2009.

Each of these documents continues to highlight the importance of, and give further guidance towards, carrying out a tiered risk-based decision-making process in accord with government policy on dealing with contamination from historic or natural sources and highlight the importance of the Conceptual Model in site characterisation.

Ground Gas Risk Assessment Methodology

Assessment of risk posed by ground gas is undertaken using the methodology as outlined previously, and summarised hereunder:

Tier 1 Preliminary Risk Assessment

Tier 2 Generic Quantitative Risk Assessment

Tier 3 Detailed Quantitative Risk Assessment

The methodology used in each of the above assessments with concern to ground gas is discussed hereunder.

Tier 1 Preliminary Risk Assessment

All potential sources of methane and carbon dioxide are identified in the Preliminary Conceptual Model and the generation potential determined. The background information discussed earlier is referred to in order to determine the potential for a source to generate ground gas.

CIRIA C665 provides idealised monitoring frequency / period dependant upon generation potential of gas source and sensitivity of the proposed land use as below:

Idealised Frequency and Period of Monitoring (after Table 5.5a and 5.5b, CIRIA C665)

		Generation Potential of Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	4/1	6/2	6/3	12/6	12/12
	Moderate (Flats)	6/2	6/3	9/6	12/12	24/24
	High (Residential with Gardens)	6/3	9/6	12/6	24/12	24/24

Notes

1. First number is the number of readings and the second is the minimum period in months (e.g., 6/2 – six sets of readings over two months).
2. At least two sets of readings must be at low (preferably under 1,000 mb) and falling pressure.

The monitoring programme is decided using the above table prior to the intrusive site investigation. However, if the intrusive investigation reveals that the potential source is better or worse than anticipated the monitoring programme should be modified accordingly. For example, if the made ground contains no evidence of organic material and comprises entirely granular brick fill, the potential for that made ground to generate ground gas is reduced considerably.

Tier 2 Generic Quantitative Risk Assessment

Generic Quantitative Risk Assessment is undertaken upon completion of the required gas monitoring period.

All three current guidance documents propose that both ground gas concentrations and flow rates are used to calculate the limiting gas well gas volume flow rates for methane and carbon dioxide, based on the ground gas conditions monitored for during the worse-case temporal conditions. This limiting gas well volume flow rate is termed the Gas Screening Value (GSV, note that this was termed borehole gas volume flow), and is calculated as follows:

$$\text{GSV (l/hr)} = [\text{gas well gas concentration (\%v/v)}] \times [\text{gas well flow rate (l/hr)}]$$

GSV's are compared to typical max concentrations and limiting gas screening values derived for either Situation A - All development except low rise housing with gardens, or Situation B low rise housing with gardens (NHBC Traffic Light System). Table 8.5 from CIRIA C665 is used for comparison of gas screening values for "Situation A Developments" and is presented hereunder:

Characteristic Situation (CIRIA R149)	Comparable Partners in Technology gas Regime (see Box 8.2)	Risk Classification	Gas Screening Value (CH ₄ or CO ₂) (l/hr) ¹	Additional Factors	Typical Source of Generation
1	A	Very low risk	<0.07	Typically, methane ≤ 1% and/or carbon dioxide ≤ 5%. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking susceptible to flooding, completed landfill (WMP 26B criteria)
5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
6	F	Very high risk	>70		Recent landfill site

Table 8.5 from CIRIA C665 Modified Wilson and Card Classification

Table 8.7 is used for comparison of gas screening values for "Situation B Developments" and is presented hereunder:

Traffic Light	Methane ¹		Carbon Dioxide ²	
	Typical max concentration ³ (% by volume)	Gas screening value ^{2,4} (litres/hour)	Typical concentration ³ (% max by volume)	Gas screening value ^{2,4} (litres/hour)
Green				
Amber 1	1	0.13	5	0.78
Amber 2	5	0.63	10	1.60
Red	20	1.60	30	3.10

Notes:

1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter will be the decoder as to what Traffic Light is allocated;
2. Borehole Gas Volume Flow Rate, in litres per hour as defined in Wilson and Card (1999), is the borehole flow rate multiplied by the concentration in the air stream of the gas being considered;
3. The Typical Maximum Concentration can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment considering site-specific conditions.

Table 8.7 from CIRIA C665 - NHBC Traffic light system for 150 mm void

Dependant on the outcome of the assessment of risk posed by ground gas it is determined whether gas protection measures are required for the proposed development, and or whether a detailed quantitative risk assessment is required for the site.

Selection & Design of Protective Measures

Table 8.6 and Box 8.4 of CIRIA C665 contain information on the detailed design of protection measures and were initially intended for the purposes of determining then level of protection measures a development requires. These tables and related text include some useful information on the design of gas protection measures, however BS8485:2007, which supersedes the guidance included within CIRIA C665, is used for selection of gas protection measures.

BS8485: 2007 uses a scoring system dependant on the Characteristic Situation / NHBC Traffic Light and proposed end use of the site. The scoring system is summarised in BS8485:2007 Table 2 as presented hereunder:

Characteristic situation, CS	gas	NHBC traffic light	Required gas protection			
			Non-managed property e.g., private housing	Public building (a)	Commercial buildings	Industrial buildings (b)
1		Green	0	0	0	0

2	Amber 1	3	3	2	1 (c)
3	Amber 2	4	3	2	2
4	Red	6 (d)	5(d)	4	3
5			6(e)	5	4
6				7	6

NOTE Traffic light indications are taken from NHBC Report no.:10627-RO1 (04) and are mainly applicable to low-rise residential housing¹. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.

a) Public buildings include, for example, managed apartments, schools, and hospitals.

b) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building.

c) Maximum methane concentration 20% otherwise consider and increase to CS3.

d) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g., high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g., in institutional and/or fully serviced contractual situations.

e) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any gas protection scheme

¹ The NHBC guidance and CIRIA C665 guidance refers to low rise housing (which is up to three storeys without lifts) that is constructed with a 150mm ventilated sub-floor void.

BS8485:2007 Table 2 Required gas protection by characteristic gas situation and type of building

Once a score is assigned, a combination of protection systems / elements is chosen from BS8485:2007 Table 3 shown below:

PROTECTION ELEMENT/SYSTEM		SCORE	COMMENTS
a) Venting/dilution (See Annex A BS8485)			
Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)A	Very good performance	2.5	Ventilation performance in accordance with Annex A (BS8485)
	Good performance	1	If passive ventilation is poor this is generally unacceptable, and some form of active system will be required.
	Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)A	2.5	There must be robust management systems in place to ensure the continued maintenance of any ventilation system. Active ventilation can always be designed to meet good performance.
	Ventilated car park (basement or undercroft)	4	Mechanically assisted systems come in two forms: extraction and positive pressurization.
b) Barriers			
Floor slabs			
Block and beam floor slab		0	It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum. Breaches in floor slabs such as joints must be effectively sealed against gas ingress in order to maintain these performances.
Reinforced concrete ground bearing slab		0.5	
Reinforced concrete ground bearing foundation raft with limited-service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended floor slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation B,C		0.5	The performance of membranes is heavily dependent on the quality of design of the installation, resistance to damage after installation, and the integrity of joints.
Proprietary gas resistant membrane to reasonable levels of workmanship /in line with good practice under independent inspection (CQA)B,C		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using handheld equipment		0.5	Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe.
Permanent monitoring and alarm system A	Installed in the underfloor venting/dilution system	2	
	Installed in the building	1	
e) Pathway Intervention			
Pathway intervention		-	This can consist of site protection measures for off-site or on-site sources (see Annex A, BS8485)
NOTE In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection			
It is possible to test ventilation systems by installing monitoring probes for post installation validation.			
If a 1 200g DPM material is to function as a gas barrier it should be installed according to BRE 212 /BRE 414 being taped and sealed to all penetrations			
Polymeric Materials> 1200 g (proportional to thickness) but their physical properties mean that they are more robust and resistant to damage.			

BS8485:2007 Table 3 Solution Scores

Where the gas situation is 4 or more (and for NHBC Red situations) the site requires a comprehensive risk assessment to confirm the scope of protection measures. These are higher risk sites and reliance on Table 2 and 3 alone is not enough.

For a site which is impacted by migratory gases from an off-site source, the development may be protected by imposing pathway intervention methods, which if successfully validated, could also remove the need for further analysis. It is essential that the gas regime in these circumstances has been fully characterised and that the only source impacting the site is located off site and that the pathway is clearly defined and its interception equally proven before construction commences. Pathway intervention methods may include vertical membrane installations, venting trenches, rows of stone columns, activated trenches and various proprietary systems. These systems are particularly relevant to domestic housing where there is limited scope for foundation type solutions.

CURRENT GUIDANCE ON REMEDIATION

When risk assessment of the site has been completed and it indicates that remedial works are required, the main guidance in managing this process is set out in the DEFRA/EA publication CLR11 (2004) "Model Procedures for the Management of Land Contamination." The stages of managing remediation are as follows:

- (a) Options Appraisal and develop Remediation Strategy;
- (b) Develop Implementation Plan and Verification Plan;
- (c) Remediation, Verification and Monitoring.

The Remediation Strategy sets out the remediation targets, identifies technically feasible remedial solutions and presents an evaluation of the options so that these can be assessed enabling that the most suitable solution is adopted. An outline of the proposed remedial method should be presented. Agreement should be sought of the appropriate statutory bodies for the Remediation Strategy before proceeding to the next stage.

The Implementation Plan is a detailed method statement setting out how the remediation is to be carried out including stating how the site will be managed, welfare procedures, health, and safety considerations together with practical measures such as details of temporary works, programme of works, waste management licences and regulatory consents required. Agreement should again be sought of the appropriate statutory bodies for this Plan.

The Verification Plan sets out the requirements for gathering data to demonstrate that the remediation has met the required remediation objectives and criteria. The Verification Plan presents the requirements for a wide range of issues including the level of supervision, sampling and testing regimes for treated materials, waste and imported materials, required monitoring works during and post remediation, how compliance with all licenses and consents will be checked etc. Agreement should again be sought of the appropriate statutory bodies for the Verification Plan. On completion of the remediation a Verification Report should be produced to provide a complete record of all remediation activities on site and the data collected as required in the Verification Plan. The Verification Report should demonstrate that the remediation has met the remedial targets to show that the site is suitable for the proposed use.

APPENDIX D: COMMERCIAL ENVIRONMENTAL DATA

Land off Queen Street & Whitehall Street, Rochdale, OL12 0TY

Order Details

Date: 03/01/2023
Your ref: CMAPS-AAG-1078975-4165-030123
Our Ref: CMAPS-AAG-1078975-4165-030123EDRGEO

Site Details

Location: 389786 413897
Area: 0.23 ha
Authority: [Rochdale Metropolitan Borough Council](#)



Summary of findings

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Aerial image

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OS MasterMap site plan

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groundsure.com/insightuserguide

Contact us with any questions at:

info@groundsure.com

08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
14	1.1	Historical industrial land uses	1	8	19	66	-
18	1.2	Historical tanks	0	0	3	4	-
19	1.3	Historical energy features	0	2	3	18	-
20	1.4	Historical petrol stations	0	0	0	0	-
20	1.5	Historical garages	0	0	8	22	-
21	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
22	2.1	Historical industrial land uses	2	9	25	91	-
27	2.2	Historical tanks	0	0	4	6	-
28	2.3	Historical energy features	0	8	5	41	-
30	2.4	Historical petrol stations	0	0	0	0	-
30	2.5	Historical garages	0	0	19	34	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
33	3.1	Active or recent landfill	0	0	0	0	-
33	3.2	Historical landfill (BGS records)	0	0	0	0	-
34	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
34	3.4	Historical landfill (EA/NRW records)	0	0	0	2	-
34	3.5	Historical waste sites	0	0	0	12	-
36	3.6	Licensed waste sites	0	0	0	16	-
41	3.7	Waste exemptions	0	0	12	49	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
47	4.1	Recent industrial land uses	0	6	30	-	-
50	4.2	Current or recent petrol stations	0	0	1	1	-
50	4.3	Electricity cables	0	0	0	0	-
50	4.4	Gas pipelines	0	0	0	0	-
51	4.5	Sites determined as Contaminated Land	0	0	0	0	-



51	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
51	4.7	Regulated explosive sites	0	0	0	0	-
51	4.8	Hazardous substance storage/usage	0	0	0	0	-
51	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
52	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
52	4.11	<u>Licensed pollutant release (Part A(2)/B)</u>	0	1	1	2	-
53	4.12	Radioactive Substance Authorisations	0	0	0	0	-
53	4.13	<u>Licensed Discharges to controlled waters</u>	0	0	3	6	-
54	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
55	4.15	Pollutant release to public sewer	0	0	0	0	-
55	4.16	List 1 Dangerous Substances	0	0	0	0	-
55	4.17	List 2 Dangerous Substances	0	0	0	0	-
55	4.18	<u>Pollution Incidents (EA/NRW)</u>	0	0	0	2	-
56	4.19	Pollution inventory substances	0	0	0	0	-
56	4.20	Pollution inventory waste transfers	0	0	0	0	-
56	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
57	5.1	<u>Superficial aquifer</u>	Identified (within 500m)				
59	5.2	<u>Bedrock aquifer</u>	Identified (within 500m)				
61	5.3	<u>Groundwater vulnerability</u>	Identified (within 50m)				
62	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
62	5.5	Groundwater vulnerability- local information	None (within 0m)				
63	5.6	<u>Groundwater abstractions</u>	0	0	0	0	3
64	5.7	<u>Surface water abstractions</u>	0	0	0	0	17
69	5.8	<u>Potable abstractions</u>	0	0	0	0	2
69	5.9	Source Protection Zones	0	0	0	0	-
70	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-
Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
71	6.1	Water Network (OS MasterMap)	0	0	0	-	-



71	6.2	Surface water features	0	0	0	-	-
72	6.3	<u>WFD Surface water body catchments</u>	1	-	-	-	-
72	6.4	<u>WFD Surface water bodies</u>	0	0	0	-	-
73	6.5	<u>WFD Groundwater bodies</u>	1	-	-	-	-

Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
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74	7.1	Risk of flooding from rivers and the sea	None (within 50m)				
74	7.2	Historical Flood Events	0	0	0	-	-
74	7.3	Flood Defences	0	0	0	-	-
75	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
75	7.5	Flood Storage Areas	0	0	0	-	-
76	7.6	Flood Zone 2	None (within 50m)				
76	7.7	Flood Zone 3	None (within 50m)				

Page	Section	Surface water flooding					
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77	8.1	<u>Surface water flooding</u>	1 in 30 year, 0.3m - 1.0m (within 50m)				
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Page	Section	Groundwater flooding					
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79	9.1	<u>Groundwater flooding</u>	Low (within 50m)				
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Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
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80	10.1	<u>Sites of Special Scientific Interest (SSSI)</u>	0	0	0	0	2
81	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
81	10.3	<u>Special Areas of Conservation (SAC)</u>	0	0	0	0	2
82	10.4	Special Protection Areas (SPA)	0	0	0	0	0
82	10.5	National Nature Reserves (NNR)	0	0	0	0	0
82	10.6	<u>Local Nature Reserves (LNR)</u>	0	0	0	0	1
82	10.7	<u>Designated Ancient Woodland</u>	0	0	0	0	2
83	10.8	Biosphere Reserves	0	0	0	0	0
83	10.9	Forest Parks	0	0	0	0	0
83	10.10	Marine Conservation Zones	0	0	0	0	0
83	10.11	<u>Green Belt</u>	0	0	0	0	2
84	10.12	Proposed Ramsar sites	0	0	0	0	0



84	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
84	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
84	10.15	Nitrate Sensitive Areas	0	0	0	0	0
85	10.16	Nitrate Vulnerable Zones	0	0	0	0	0
86	<u>10.17</u>	<u>SSSI Impact Risk Zones</u>	1	-	-	-	-
87	<u>10.18</u>	<u>SSSI Units</u>	0	0	0	0	2

Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
89	11.1	World Heritage Sites	0	0	0	-	-
90	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
90	11.3	National Parks	0	0	0	-	-
90	<u>11.4</u>	<u>Listed Buildings</u>	0	0	7	-	-
91	<u>11.5</u>	<u>Conservation Areas</u>	0	0	2	-	-
91	11.6	Scheduled Ancient Monuments	0	0	0	-	-
92	11.7	Registered Parks and Gardens	0	0	0	-	-

Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
93	<u>12.1</u>	<u>Agricultural Land Classification</u>	Urban (within 250m)				
94	12.2	Open Access Land	0	0	0	-	-
94	12.3	Tree Felling Licences	0	0	0	-	-
94	12.4	Environmental Stewardship Schemes	0	0	0	-	-
94	12.5	Countryside Stewardship Schemes	0	0	0	-	-

Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
95	13.1	Priority Habitat Inventory	0	0	0	-	-
95	13.2	Habitat Networks	0	0	0	-	-
96	<u>13.3</u>	<u>Open Mosaic Habitat</u>	0	0	1	-	-
96	13.4	Limestone Pavement Orders	0	0	0	-	-

Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
97	<u>14.1</u>	<u>10k Availability</u>	Identified (within 500m)				
98	<u>14.2</u>	<u>Artificial and made ground (10k)</u>	0	0	0	4	-
100	<u>14.3</u>	<u>Superficial geology (10k)</u>	1	0	3	4	-



101	14.4	Landslip (10k)	0	0	0	0	-
102	14.5	<u>Bedrock geology (10k)</u>	1	0	3	3	-
103	14.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
104	15.1	<u>50k Availability</u>	Identified (within 500m)				
105	15.2	Artificial and made ground (50k)	0	0	0	0	-
105	15.3	Artificial ground permeability (50k)	0	0	-	-	-
106	15.4	<u>Superficial geology (50k)</u>	1	0	1	2	-
107	15.5	<u>Superficial permeability (50k)</u>	Identified (within 50m)				
107	15.6	Landslip (50k)	0	0	0	0	-
107	15.7	Landslip permeability (50k)	None (within 50m)				
108	15.8	<u>Bedrock geology (50k)</u>	1	0	2	1	-
109	15.9	<u>Bedrock permeability (50k)</u>	Identified (within 50m)				
109	15.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
110	16.1	<u>BGS Boreholes</u>	1	0	10	-	-
Page	Section	Natural ground subsidence					
112	17.1	<u>Shrink swell clays</u>	Very low (within 50m)				
113	17.2	<u>Running sands</u>	Very low (within 50m)				
114	17.3	<u>Compressible deposits</u>	Negligible (within 50m)				
115	17.4	<u>Collapsible deposits</u>	Very low (within 50m)				
116	17.5	<u>Landslides</u>	Very low (within 50m)				
117	17.6	<u>Ground dissolution of soluble rocks</u>	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
119	18.1	Natural cavities	0	0	0	0	-
120	18.2	<u>BritPits</u>	0	0	1	1	-
120	18.3	<u>Surface ground workings</u>	0	1	6	-	-
121	18.4	<u>Underground workings</u>	0	0	0	0	3
121	18.5	Historical Mineral Planning Areas	0	0	0	0	-



121	18.6	Non-coal mining	0	0	0	0	0
122	18.7	Mining cavities	0	0	0	0	0
122	18.8	JPB mining areas	None (within 0m)				
122	18.9	<u>Coal mining</u>	Identified (within 0m)				
122	18.10	Brine areas	None (within 0m)				
123	18.11	Gypsum areas	None (within 0m)				
123	18.12	Tin mining	None (within 0m)				
123	18.13	Clay mining	None (within 0m)				

Page	Section	Radon					
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124 **19.1** **Radon** **Less than 1% (within 0m)**

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
126	20.1	<u>BGS Estimated Background Soil Chemistry</u>	1	0	-	-	-
126	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
126	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
127	21.1	Underground railways (London)	0	0	0	-	-
127	21.2	Underground railways (Non-London)	0	0	0	-	-
127	21.3	Railway tunnels	0	0	0	-	-
127	21.4	Historical railway and tunnel features	0	0	0	-	-
127	21.5	Royal Mail tunnels	0	0	0	-	-
128	21.6	Historical railways	0	0	0	-	-
128	21.7	Railways	0	0	0	-	-
128	21.8	Crossrail 1	0	0	0	0	-
128	21.9	Crossrail 2	0	0	0	0	-
128	21.10	HS2	0	0	0	0	-



Recent aerial photograph



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Capture Date: 23/05/2019

Site Area: 0.23ha



Recent site history - 2018 aerial photograph



Capture Date: 01/07/2018

Site Area: 0.23ha



Recent site history - 2012 aerial photograph

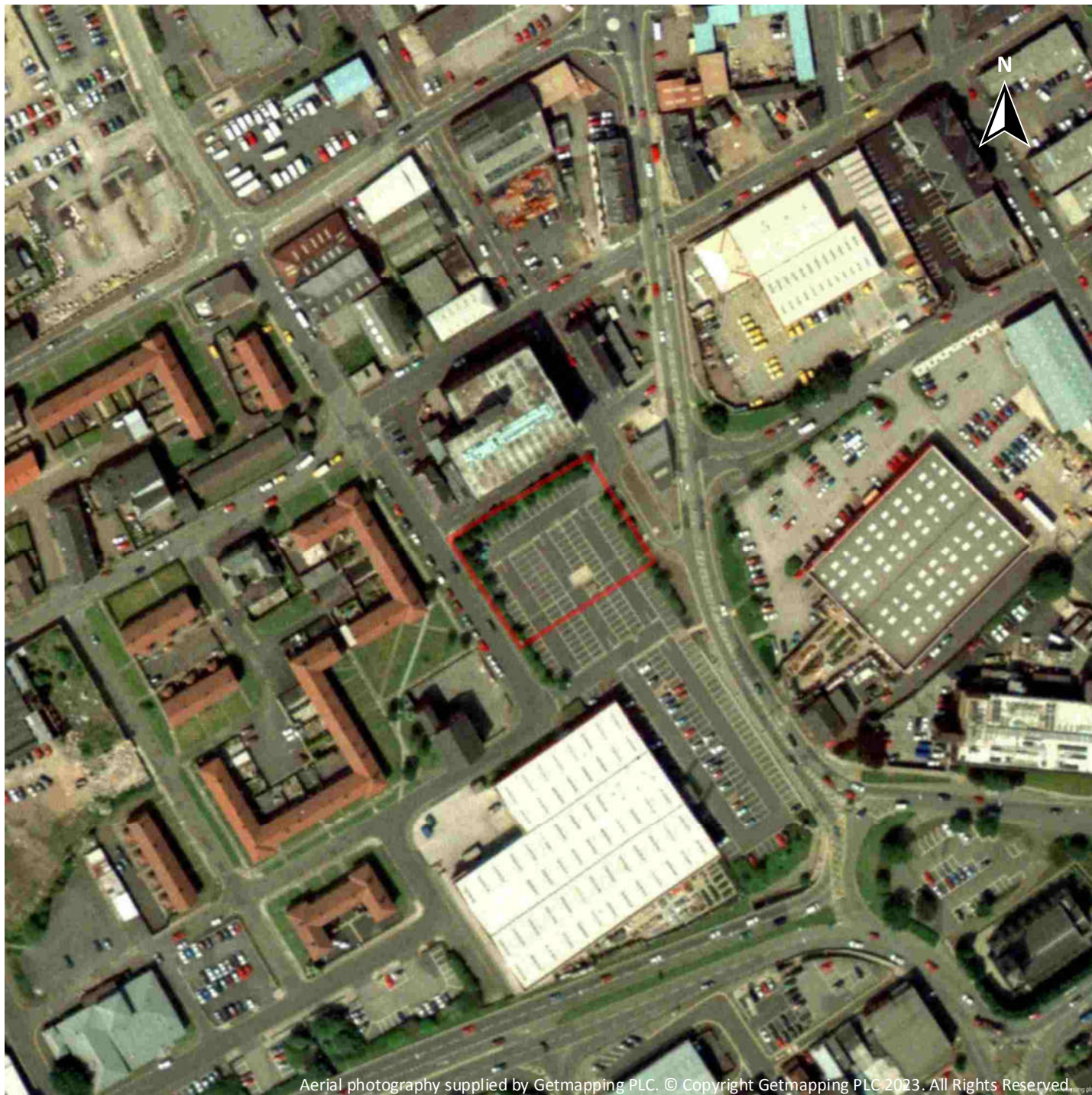


Capture Date: 26/03/2012

Site Area: 0.23ha



Recent site history - 2000 aerial photograph



Capture Date: 19/06/2000

Site Area: 0.23ha



Recent site history - 1999 aerial photograph

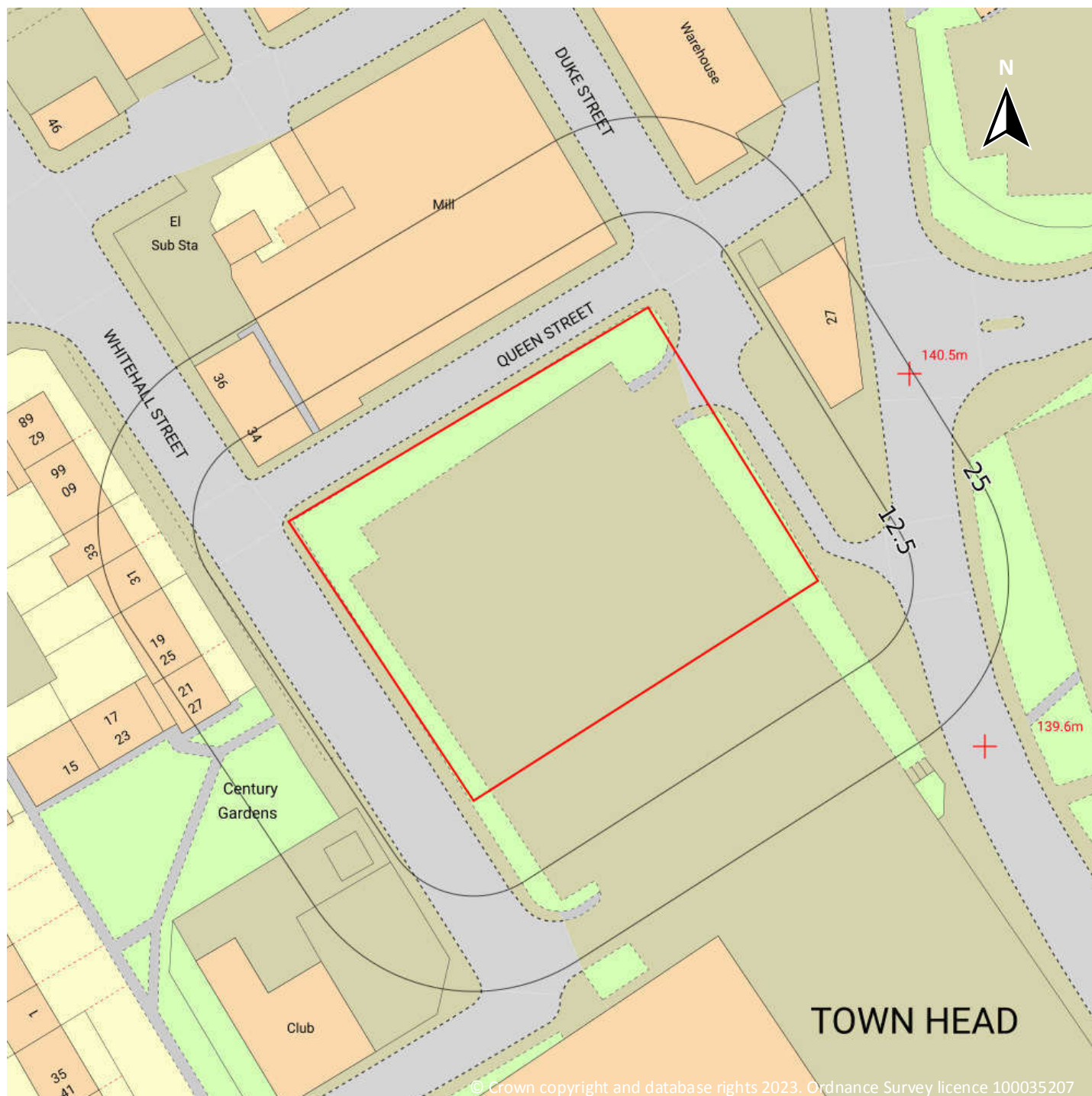


Capture Date: 10/09/1999

Site Area: 0.23ha



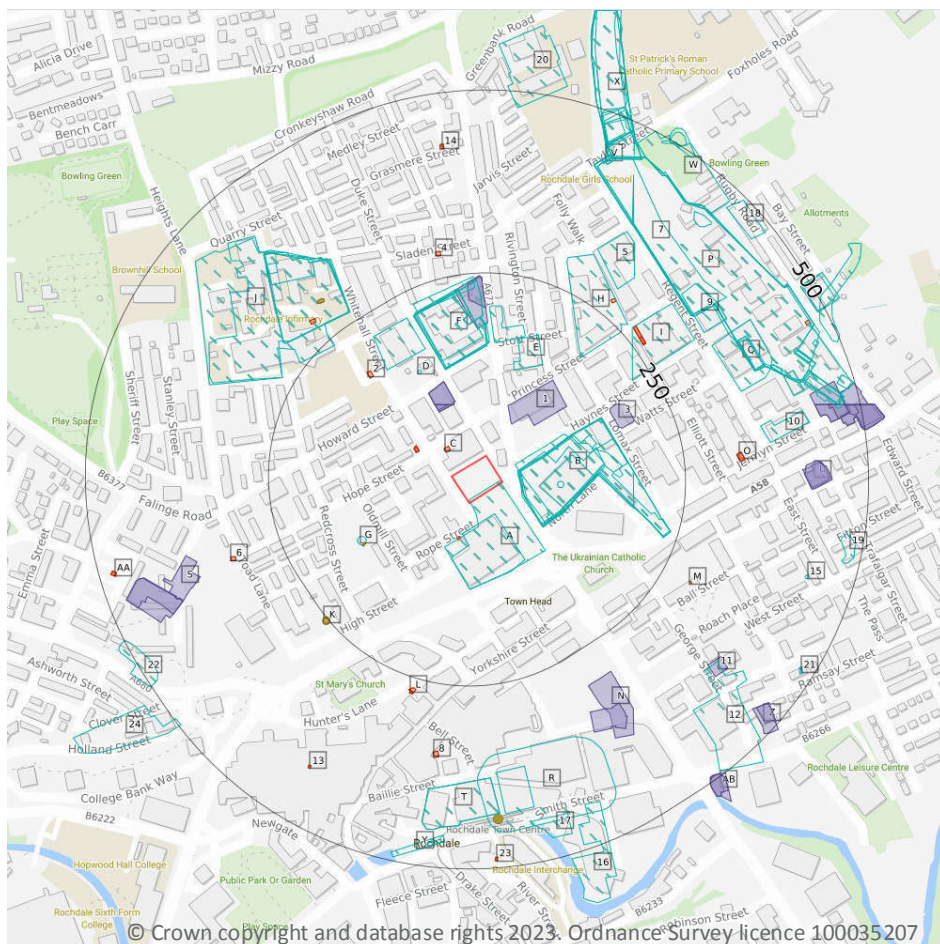
OS MasterMap site plan



Site Area: 0.23ha



1 Past land use



- Site Outline
- Search buffers in metres (m)
- Historical industrial land uses
- Historical tanks
- Historical energy features
- Historical garages

1.1 Historical industrial land uses

Records within 500m

94

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

ID	Location	Land use	Dates present	Group ID
A	On site	Unspecified Works	1975 - 1987	695987



ID	Location	Land use	Dates present	Group ID
B	23m E	Unspecified Mills	1949	774364
B	24m E	Unspecified Commercial/Industrial	1891	764450
B	24m E	Unspecified Mills	1938	736780
B	25m E	Unspecified Mill	1975	657139
B	26m E	Unspecified Commercial/Industrial	1968	764683
B	27m E	Cotton Mills	1851	659337
B	28m E	Unspecified Mills	1908 - 1928	783932
A	31m S	Unspecified Works	1992	724497
B	50m E	Unspecified Commercial/Industrial	1987 - 1992	716726
B	75m E	Chimney	1968 - 1975	744807
B	123m E	Pump	1851	675569
E	123m N	Woollen Mill	1851	670985
F	130m N	Unspecified Commercial/Industrial	1968	757307
F	130m N	Unspecified Mills	1949	789838
F	131m N	Unspecified Commercial/Industrial	1975 - 1987	706201
F	132m N	Unspecified Mills	1938	706053
F	132m N	Unspecified Commercial/Industrial	1891 - 1928	753030
D	143m NW	Pump	1851	675568
F	143m N	Unspecified Mills	1992	746909
G	145m SW	Chimney	1968	684526
E	155m N	Clay Pit	1851	676030
D	168m N	Ambulance Station	1992	676098
H	186m NE	Corporation Depot	1891	685836
F	217m N	Rope Walk	1851	641256
I	224m NE	Unspecified Mill	1976	657138
F	235m N	Shed	1851	659581
J	240m NW	Infirmary	1987 - 1992	707060
J	264m NW	Infirmary	1949	701004



ID	Location	Land use	Dates present	Group ID
J	264m NW	Infirmary	1975	724787
J	264m NW	Infirmary	1968	745287
J	265m NW	Infirmary And Dispensary	1908 - 1938	706331
5	290m NE	Unspecified Depot	1992	668799
J	332m NW	Infirmary And Dispensary	1891	709310
7	339m NE	Railway Sidings	1891	693892
P	339m NE	Railway Sidings	1938 - 1968	751485
P	340m NE	Railway Sidings	1949 - 1954	778967
P	341m NE	Railway Sidings	1928	720342
P	341m NE	Railway Sidings	1908	780765
Q	341m NE	Unspecified Works	1976	678976
9	342m NE	Unspecified Works	1976	678975
R	343m S	Bus Station	1987 - 1992	697681
10	361m E	Unspecified Works	1976	678972
J	366m NW	Industrial House	1851	676228
R	367m S	Police Station	1968 - 1975	754183
Q	372m NE	Railway Building	1938	738135
Q	374m NE	Railway Building	1954 - 1967	707061
Q	375m NE	Railway Building	1908 - 1928	772682
T	377m S	Unspecified Commercial/Industrial	1891 - 1908	754865
T	377m S	Unspecified Mills	1928 - 1938	757037
12	378m SE	Woollen Mill	1851	671039
Q	398m E	Railway Building	1908 - 1938	694963
Q	399m E	Railway Building	1954 - 1967	735115
Q	410m E	Unspecified Depot	1976	668803
P	428m NE	Unspecified Pit	1938	690673
V	431m N	Railway Building	1938	697081
V	431m N	Railway Building	1949	745574



ID	Location	Land use	Dates present	Group ID
V	431m N	Railway Building	1908	730672
V	431m N	Railway Building	1928	782360
Q	432m E	Railway Station	1938	775687
Q	433m E	Railway Station	1891 - 1928	743293
15	433m E	Pump	1851	675583
Q	434m E	Railway Building	1967	670149
Q	434m E	Railway Station	1954	729947
Q	436m E	Railway Buildings	1908 - 1928	714019
Q	436m E	Railway Buildings	1938	751928
Q	437m E	Railway Buildings	1954	744858
W	440m NE	Unspecified Works	1967 - 1976	752956
X	441m N	Railway Sidings	1938	759617
16	441m S	Bus Station	1968	707675
X	442m NE	Railway Sidings	1928	783719
X	442m NE	Railway Sidings	1908	788701
17	443m S	Fire Engine	1851	681278
V	455m N	Cuttings	1908 - 1928	705232
Y	455m S	Butts	1928	702088
V	455m N	Cuttings	1975 - 1992	777653
V	456m N	Cuttings	1968	781396
V	456m N	Cuttings	1949	769318
V	458m N	Cuttings	1938	742252
V	460m N	Cuttings	1890	769145
Y	461m S	Butts	1949	728062
Q	464m E	Railway Building	1908	670133
18	468m NE	Cuttings	1908	642612
19	469m E	Sand Pit	1851	643878
Q	476m E	Railway Building	1908 - 1938	735298



ID	Location	Land use	Dates present	Group ID
20	478m N	Cotton Mill	1851	644265
21	478m SE	Tannery	1851	691826
22	480m SW	Refuse Heap	1851	677423
Q	486m NE	Refuse Heap	1928 - 1938	730677
Q	487m NE	Unspecified Works	1967	678974
Q	489m NE	Unspecified Depot	1976	668801
W	491m NE	Unspecified Ground Workings	1908	648007
W	495m NE	Unspecified Pit	1928 - 1938	732181
24	497m SW	Rope Walk	1851	641260

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m

7

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

ID	Location	Land use	Dates present	Group ID
G	149m SW	Unspecified Tank	1972	84182
K	248m SW	Unspecified Tank	1988	103744
K	249m SW	Unspecified Tank	1995	94496
M	290m SE	Unspecified Tank	1975	96099
M	290m SE	Unspecified Tank	1983 - 1984	94527
J	296m NW	Tanks	1982 - 1988	94504
J	296m NW	Tanks	1996	92338

This data is sourced from Ordnance Survey / Groundsure.



1.3 Historical energy features

Records within 500m

23

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

ID	Location	Land use	Dates present	Group ID
C	32m NW	Electricity Substation	1972 - 1995	47023
A	47m S	Electricity Substation	1988 - 1995	49782
C	57m NW	Electricity Substation	1988	58663
C	57m NW	Electricity Substation	1985 - 1995	52063
2	174m NW	Electricity Substation	1982	45432
I	263m NE	Electricity Substation	1987	52256
I	263m NE	Electricity Substation	1996	50531
I	263m NE	Electricity Substation	1976	55298
L	264m S	Electricity Substation	1988 - 1995	51119
L	268m S	Electricity Substation	1972 - 1985	47001
H	271m NE	Electricity Substation	1982 - 1996	49316
4	281m N	Electricity Substation	1982 - 1996	57572
J	281m NW	Electricity Substation	1982 - 1996	59270
6	315m W	Electricity Substation	1972 - 1990	54892
O	322m E	Electricity Substation	1983 - 1996	58298
O	322m E	Electricity Substation	1975 - 1989	49947
8	342m S	Electricity Substation	1972 - 1995	52697
13	419m SW	Electricity Substation	1972	45431
14	423m N	Electricity Substation	1982 - 1996	56064
Q	467m NE	Electricity Substation	1987 - 1996	48646
AA	476m W	Electricity Substation	1972	48634



ID	Location	Land use	Dates present	Group ID
AA	477m W	Electricity Substation	1985 - 1990	53072
23	485m S	Electricity Substation	1998	45430

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m

0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m

30

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

ID	Location	Land use	Dates present	Group ID
1	56m NE	Garage	1982 - 1985	19290
D	83m N	Garage	1958 - 1959	17343
D	83m N	Garage	1982 - 1995	18975
D	83m N	Garage	1959	17012
D	87m N	Garage	1959 - 1985	19479
F	174m N	Garage	1988 - 1996	18167
3	175m NE	Garage	1985 - 1995	17319
F	202m N	Garage	1982	14943
N	298m SE	Garage	1985 - 1988	19618



ID	Location	Land use	Dates present	Group ID
N	330m SE	Garage	1995	18192
S	367m W	Garage	1967	15531
11	376m SE	Garage	1989 - 1996	19410
S	404m W	Garage	1959	16420
S	404m W	Garage	1959 - 1967	19003
U	410m E	Garage	1983 - 1984	19508
U	413m E	Garage	1993 - 1996	17734
U	413m E	Garage	1975 - 1989	18688
Q	436m E	Garage	1996	15596
Q	439m E	Garage	1996	16964
Q	439m E	Garage	1993	19287
Q	457m E	Garage	1989	15989
Z	461m SE	Garage Works	1983 - 1984	17868
Z	464m SE	Garage Works	1975	15382
Q	470m E	Garage	1996	15003
Q	476m E	Garage	1996	17026
Q	479m E	Garage	1983 - 1984	18765
Q	491m E	Garage	1989	15098
AB	493m SE	Garage	1957	15954
AB	494m SE	Garage	1957 - 1975	18151
AB	494m SE	Garage	1982	16436

This data is sourced from Ordnance Survey / Groundsure.

1.6 Historical military land

Records within 500m

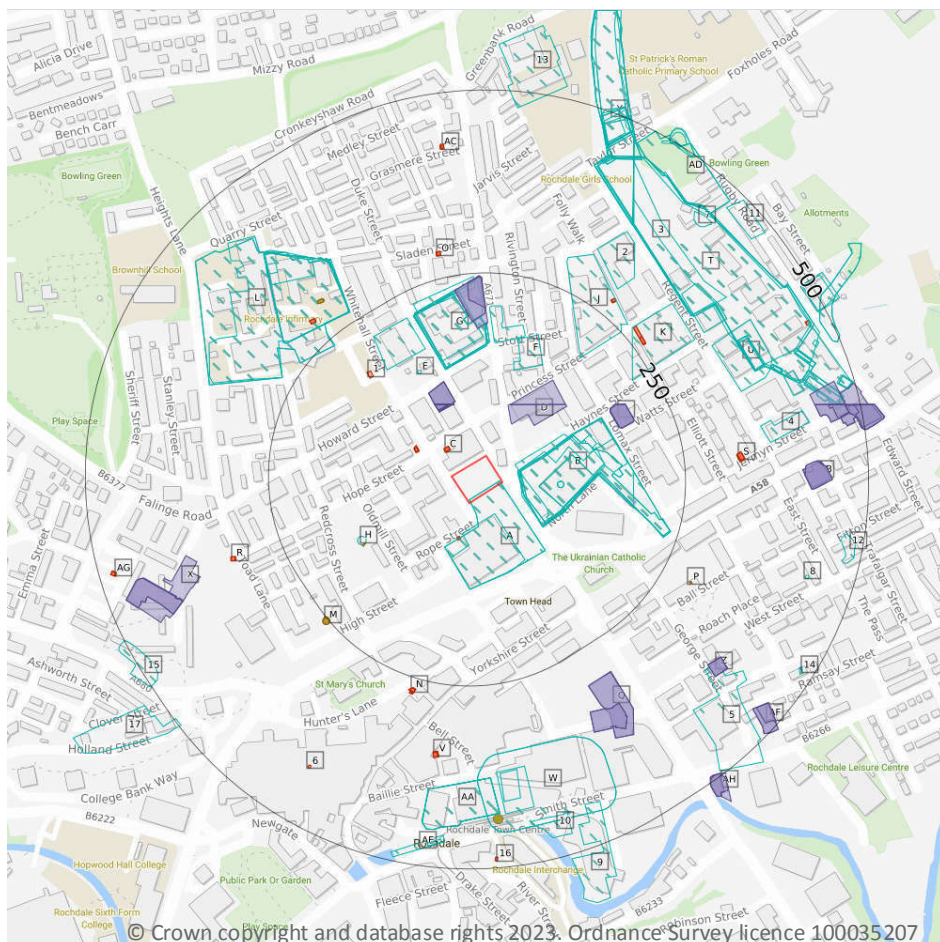
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Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.



2 Past land use - un-grouped



- Site Outline
- Search buffers in metres (m)
- Historical industrial land uses
- Historical tanks
- Historical energy features
- Historical garages

2.1 Historical industrial land uses

Records within 500m

127

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 22**

ID	Location	Land Use	Date	Group ID
A	On site	Unspecified Works	1987	695987
A	On site	Unspecified Works	1975	695987
B	23m E	Unspecified Mills	1949	774364



ID	Location	Land Use	Date	Group ID
B	24m E	Unspecified Mills	1938	736780
B	24m E	Unspecified Commercial/Industrial	1891	764450
B	25m E	Unspecified Mill	1975	657139
B	26m E	Unspecified Commercial/Industrial	1968	764683
B	27m E	Cotton Mills	1851	659337
B	28m E	Unspecified Mills	1928	783932
B	28m E	Unspecified Mills	1908	783932
A	31m S	Unspecified Works	1992	724497
B	50m E	Unspecified Commercial/Industrial	1992	716726
B	50m E	Unspecified Commercial/Industrial	1987	716726
B	75m E	Chimney	1975	744807
B	75m E	Chimney	1968	744807
B	123m E	Pump	1851	675569
F	123m N	Woollen Mill	1851	670985
G	130m N	Unspecified Mills	1949	789838
G	130m N	Unspecified Commercial/Industrial	1968	757307
G	131m N	Unspecified Commercial/Industrial	1987	706201
G	131m N	Unspecified Commercial/Industrial	1975	706201
G	132m N	Unspecified Mills	1938	706053
G	132m N	Unspecified Commercial/Industrial	1928	753030
G	132m N	Unspecified Commercial/Industrial	1908	753030
G	132m N	Unspecified Commercial/Industrial	1891	753030
E	143m NW	Pump	1851	675568
G	143m N	Unspecified Mills	1992	746909
H	145m SW	Chimney	1968	684526
F	155m N	Clay Pit	1851	676030
E	168m N	Ambulance Station	1992	676098
J	186m NE	Corporation Depot	1891	685836



ID	Location	Land Use	Date	Group ID
G	217m N	Rope Walk	1851	641256
K	224m NE	Unspecified Mill	1976	657138
G	235m N	Shed	1851	659581
L	240m NW	Infirmarv	1992	707060
L	240m NW	Infirmarv	1987	707060
L	264m NW	Infirmarv	1975	724787
L	264m NW	Infirmarv	1949	701004
L	264m NW	Infirmarv	1968	745287
L	265m NW	Infirmarv And Dispensary	1938	706331
L	265m NW	Infirmarv And Dispensary	1928	706331
L	265m NW	Infirmarv And Dispensary	1908	706331
2	290m NE	Unspecified Depot	1992	668799
L	332m NW	Infirmarv And Dispensary	1891	709310
3	339m NE	Railway Sidings	1891	693892
T	339m NE	Railway Sidings	1938	751485
T	340m NE	Railway Sidings	1954	778967
T	341m NE	Railway Sidings	1928	720342
T	341m NE	Railway Sidings	1908	780765
U	341m NE	Unspecified Works	1976	678976
T	342m NE	Unspecified Works	1976	678975
W	343m S	Bus Station	1992	697681
W	343m S	Bus Station	1987	697681
4	361m E	Unspecified Works	1976	678972
L	366m NW	Industrial House	1851	676228
W	367m S	Police Station	1975	754183
T	368m NE	Railway Sidings	1967	751485
W	370m S	Police Station	1968	754183
U	372m NE	Railway Building	1938	738135



ID	Location	Land Use	Date	Group ID
Y	373m NE	Railway Sidings	1949	778967
U	374m NE	Railway Building	1967	707061
U	374m NE	Railway Building	1954	707061
U	375m NE	Railway Building	1928	772682
U	375m NE	Railway Building	1908	772682
AA	377m S	Unspecified Mills	1938	757037
AA	377m S	Unspecified Mills	1928	757037
AA	377m S	Unspecified Commercial/Industrial	1908	754865
AA	377m S	Unspecified Commercial/Industrial	1891	754865
Y	378m NE	Railway Sidings	1968	751485
5	378m SE	Woollen Mill	1851	671039
U	398m E	Railway Building	1938	694963
U	399m E	Railway Building	1928	694963
U	399m E	Railway Building	1908	694963
U	399m E	Railway Building	1967	735115
U	399m E	Railway Building	1954	735115
U	410m E	Unspecified Depot	1976	668803
7	428m NE	Unspecified Pit	1938	690673
Y	431m N	Railway Building	1938	697081
Y	431m N	Railway Building	1949	745574
Y	431m N	Railway Building	1928	782360
Y	431m N	Railway Building	1908	730672
U	432m E	Railway Station	1938	775687
U	433m E	Railway Station	1928	743293
U	433m E	Railway Station	1908	743293
U	433m E	Railway Station	1891	743293
8	433m E	Pump	1851	675583
U	434m E	Railway Building	1967	670149



ID	Location	Land Use	Date	Group ID
U	434m E	Railway Station	1954	729947
U	436m E	Railway Buildings	1928	714019
U	436m E	Railway Buildings	1908	714019
U	436m E	Railway Buildings	1938	751928
U	437m E	Railway Buildings	1954	744858
AD	440m NE	Unspecified Works	1976	752956
AD	440m NE	Unspecified Works	1967	752956
Y	441m N	Railway Sidings	1938	759617
9	441m S	Bus Station	1968	707675
Y	442m NE	Railway Sidings	1928	783719
Y	442m NE	Railway Sidings	1908	788701
10	443m S	Fire Engine	1851	681278
Y	455m N	Cuttings	1928	705232
Y	455m N	Cuttings	1908	705232
AE	455m S	Butts	1928	702088
Y	455m N	Cuttings	1992	777653
Y	455m N	Cuttings	1987	777653
Y	455m N	Cuttings	1975	777653
Y	456m N	Cuttings	1968	781396
Y	456m N	Cuttings	1949	769318
Y	458m N	Cuttings	1938	742252
Y	460m N	Cuttings	1890	769145
AE	461m S	Butts	1949	728062
U	464m E	Railway Building	1908	670133
11	468m NE	Cuttings	1908	642612
12	469m E	Sand Pit	1851	643878
U	476m E	Railway Building	1938	735298
13	478m N	Cotton Mill	1851	644265



ID	Location	Land Use	Date	Group ID
14	478m SE	Tannery	1851	691826
U	479m E	Railway Building	1928	735298
U	479m E	Railway Building	1908	735298
15	480m SW	Refuse Heap	1851	677423
U	486m NE	Refuse Heap	1938	730677
U	486m NE	Refuse Heap	1928	730677
U	487m NE	Unspecified Works	1967	678974
U	489m NE	Unspecified Depot	1976	668801
AD	491m NE	Unspecified Ground Workings	1908	648007
AD	495m NE	Unspecified Pit	1938	732181
AD	497m NE	Unspecified Pit	1928	732181
17	497m SW	Rope Walk	1851	641260

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m

10

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 22**

ID	Location	Land Use	Date	Group ID
H	149m SW	Unspecified Tank	1972	84182
M	248m SW	Unspecified Tank	1988	103744
M	249m SW	Unspecified Tank	1995	94496
M	249m SW	Unspecified Tank	1995	94496
P	290m SE	Unspecified Tank	1975	96099
P	290m SE	Unspecified Tank	1984	94527
P	290m SE	Unspecified Tank	1983	94527
L	296m NW	Tanks	1982	94504



ID	Location	Land Use	Date	Group ID
L	296m NW	Tanks	1996	92338
L	296m NW	Tanks	1988	94504

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m

54

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 22**

ID	Location	Land Use	Date	Group ID
C	32m NW	Electricity Substation	1995	47023
C	32m NW	Electricity Substation	1995	47023
C	32m NW	Electricity Substation	1988	47023
C	32m NW	Electricity Substation	1985	47023
C	32m NW	Electricity Substation	1972	47023
A	47m S	Electricity Substation	1988	49782
A	48m S	Electricity Substation	1995	49782
A	48m S	Electricity Substation	1995	49782
C	57m NW	Electricity Substation	1988	58663
C	57m NW	Electricity Substation	1995	52063
C	57m NW	Electricity Substation	1995	52063
C	57m NW	Electricity Substation	1985	52063
1	174m NW	Electricity Substation	1982	45432
K	263m NE	Electricity Substation	1987	52256
K	263m NE	Electricity Substation	1996	50531
K	263m NE	Electricity Substation	1976	55298
N	264m S	Electricity Substation	1988	51119
N	264m S	Electricity Substation	1995	51119



ID	Location	Land Use	Date	Group ID
N	264m S	Electricity Substation	1995	51119
N	268m S	Electricity Substation	1985	47001
N	268m S	Electricity Substation	1972	47001
J	271m NE	Electricity Substation	1988	49316
J	271m NE	Electricity Substation	1982	49316
J	272m NE	Electricity Substation	1996	49316
O	281m N	Electricity Substation	1982	57572
L	281m NW	Electricity Substation	1996	59270
O	281m N	Electricity Substation	1988	57572
L	281m NW	Electricity Substation	1982	59270
L	281m NW	Electricity Substation	1988	59270
O	281m N	Electricity Substation	1996	57572
R	315m W	Electricity Substation	1972	54892
R	316m W	Electricity Substation	1985	54892
R	316m W	Electricity Substation	1990	54892
S	322m E	Electricity Substation	1984	58298
S	322m E	Electricity Substation	1983	58298
S	322m E	Electricity Substation	1975	49947
S	322m E	Electricity Substation	1989	49947
S	323m E	Electricity Substation	1996	58298
S	323m E	Electricity Substation	1993	58298
V	342m S	Electricity Substation	1988	52697
V	342m S	Electricity Substation	1985	52697
V	342m S	Electricity Substation	1972	52697
V	343m S	Electricity Substation	1995	52697
V	343m S	Electricity Substation	1995	52697
6	419m SW	Electricity Substation	1972	45431
AC	423m N	Electricity Substation	1988	56064

ID	Location	Land Use	Date	Group ID
AC	424m N	Electricity Substation	1982	56064
AC	424m N	Electricity Substation	1996	56064
U	467m NE	Electricity Substation	1987	48646
U	468m NE	Electricity Substation	1996	48646
AG	476m W	Electricity Substation	1972	48634
AG	477m W	Electricity Substation	1985	53072
AG	477m W	Electricity Substation	1990	53072
16	485m S	Electricity Substation	1998	45430

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m

0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m

53

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 22**

ID	Location	Land Use	Date	Group ID
D	56m NE	Garage	1985	19290
D	77m NE	Garage	1982	19290
E	83m N	Garage	1982	18975
E	83m N	Garage	1958	17343
E	83m N	Garage	1959	17343



ID	Location	Land Use	Date	Group ID
E	83m N	Garage	1959	17012
E	84m N	Garage	1995	18975
E	84m N	Garage	1995	18975
E	86m N	Garage	1988	18975
E	87m N	Garage	1959	19479
E	87m N	Garage	1985	19479
E	87m N	Garage	1972	19479
G	174m N	Garage	1996	18167
I	175m NE	Garage	1985	17319
I	175m NE	Garage	1995	17319
I	175m NE	Garage	1995	17319
I	176m NE	Garage	1988	17319
G	185m N	Garage	1988	18167
G	202m N	Garage	1982	14943
Q	298m SE	Garage	1985	19618
Q	298m SE	Garage	1988	19618
Q	330m SE	Garage	1995	18192
Q	330m SE	Garage	1995	18192
X	367m W	Garage	1967	15531
Z	376m SE	Garage	1989	19410
Z	376m SE	Garage	1996	19410
Z	376m SE	Garage	1993	19410
X	404m W	Garage	1959	16420
X	404m W	Garage	1959	19003
X	404m W	Garage	1967	19003
AB	410m E	Garage	1984	19508
AB	410m E	Garage	1983	19508
AB	413m E	Garage	1996	17734

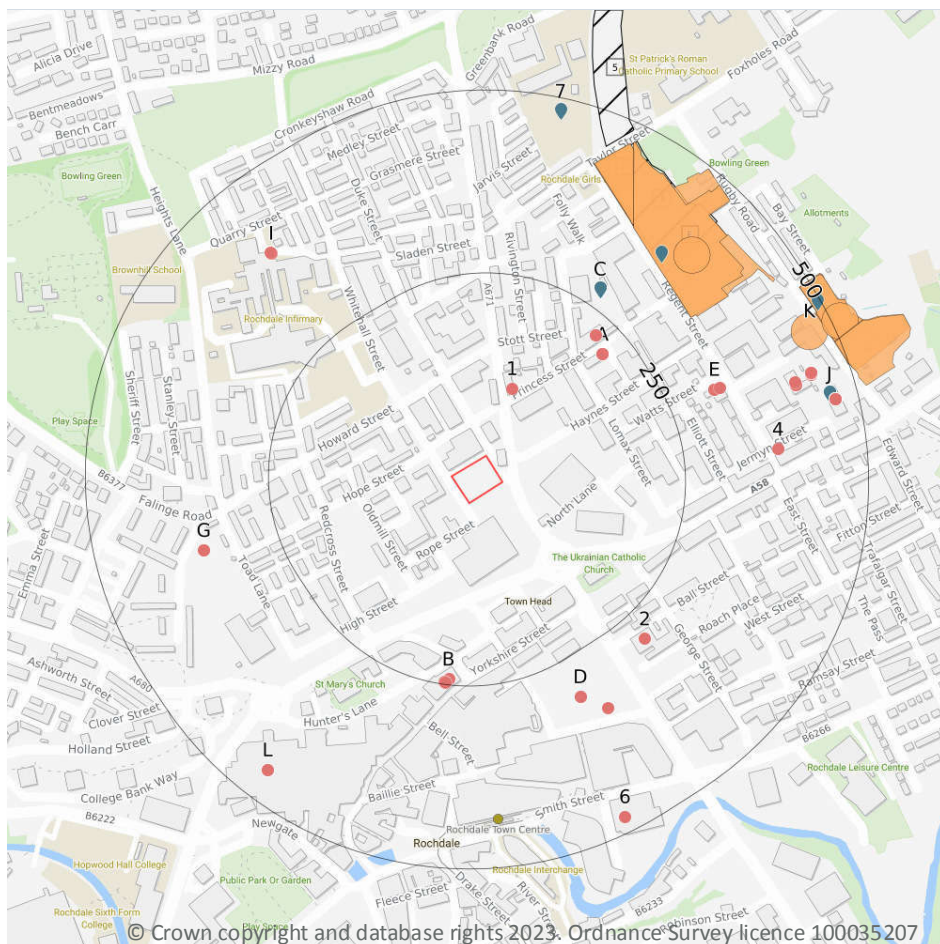


ID	Location	Land Use	Date	Group ID
AB	413m E	Garage	1993	17734
AB	413m E	Garage	1975	18688
AB	413m E	Garage	1989	18688
U	436m E	Garage	1996	15596
U	439m E	Garage	1996	16964
U	439m E	Garage	1993	19287
U	457m E	Garage	1989	15989
AF	461m SE	Garage Works	1984	17868
AF	461m SE	Garage Works	1983	17868
AF	464m SE	Garage Works	1975	15382
U	470m E	Garage	1996	15003
U	470m E	Garage	1993	19287
U	476m E	Garage	1996	17026
U	479m E	Garage	1984	18765
U	479m E	Garage	1983	18765
U	491m E	Garage	1989	15098
AH	493m SE	Garage	1957	15954
AH	494m SE	Garage	1957	18151
AH	494m SE	Garage	1975	18151
AH	494m SE	Garage	1982	16436

This data is sourced from Ordnance Survey / Groundsure.



3 Waste and landfill



- Site Outline
- Search buffers in metres (m)
- Historical landfill (EA/NRW)
- Historical waste sites
- Licensed waste sites
- Waste exemptions

3.1 Active or recent landfill

Records within 500m

0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m

0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.



3.3 Historical landfill (LA/mapping records)

Records within 500m

0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m

2

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

Features are displayed on the Waste and landfill map on **page 33**

ID	Location	Details		
3	351m NE	Site Address: Carrex Metals Limited, Regent Street, Rochdale, Greater Manchester Licence Holder Address: -	Waste Licence: - Site Reference: D085 Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: - Licence Holder: - First Recorded: - Last Recorded: -
5	453m N	Site Address: Disused Railway cutting between, Taylor Street and Greenbank Road, Rochdale Licence Holder Address: Rochdale MBC, Telegraph House, Baillie Street, Rochdale	Waste Licence: Yes Site Reference: D086, RD/LIC/504/88 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 20/04/1988 Licence Surrender: -	Operator: - Licence Holder: Rochdale Borough Planning and Estates Officer First Recorded 30/04/1988 Last Recorded: 31/10/1988

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m

12

Waste site records derived from Local Authority planning records and high detail historical mapping.

Features are displayed on the Waste and landfill map on **page 33**

ID	Location	Address	Further Details	Date
F	337m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1987
F	337m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1996
F	367m NE	Site Address: Taylor Street, ROCHDALE, Greater Manchester, OL12 0	Type of Site: Waste Transfer Station Planning application reference: D29276 Description: Scheme includes perimeter screen fencing & concrete hardstanding with reduction of level of part of site. Portable messroom included. An application (ref: D29276) for Detailed Planning permission was submitted to Rochdale B.C. on 15th January 1993. Data source: Historic Planning Application Data Type: Point	-
H	372m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1988
H	373m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1981
H	373m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1996
K	441m NE	Site Address: Topline House, 1, Lawton Street, ROCHDALE, Greater Manchester, OL12 0LQ	Type of Site: Recycling Unit (Conversion) Planning application reference: 11/D54898 Description: Scheme comprises change of use to non ferrous & ferrous metal reclaimers & processors, including construction of 1500mm high external storage area for waste tank. An application (ref: 11/D54898) for detailed planning permission was granted by Rochdale B. C. A detailed planning application has been granted. Data source: Historic Planning Application Data Type: Point	07/04/2012



ID	Location	Address	Further Details	Date
K	484m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1987
K	485m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1996
K	485m NE	Site Address: Eagle Works, Rugby Road, ROCHDALE, Greater Manchester, OL12 0D	Type of Site: Waste Transfer Station Planning application reference: 03/D41914 Description: Scheme comprises of a waste transfer station. An application (ref: 03/D41914) for Detailed Planning permission was submitted to Rochdale B.C. on 4th July 2003. Data source: Historic Planning Application Data Type: Point	-
K	491m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1987
K	492m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1996

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m

16

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

Features are displayed on the Waste and landfill map on **page 33**



ID	Location	Details		
C	275m NE	Site Name: Princess Street Depot Site Address: Highways And Maintenance Unit, Princess Street, Rochdale, Lancashire, OL12 0HA Correspondence Address: Highways And Maintenance Unit, Princess Street Depot, Rochdale, Lancashire, OL12 0HA	Type of Site: Transfer Station taking Non-Biodegradable Wastes Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MC001 EPR reference: - Operator: Alfred Mc Alpine Construction Ltd Waste Management licence No: 50089 Annual Tonnage: 24999	Issue Date: 31/07/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
C	275m NE	Site Name: Princess Street Depot Site Address: Highways And Maintenance Unit, Princess Street, Rochdale, Lancashire, OL12 0HA Correspondence Address: Highways And Maintenance Unit, Princess Street Depot, Rochdale, Lancashire, OL12 0HA	Type of Site: Transfer Station taking Non-Biodegradable Wastes Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MC001 EPR reference: - Operator: Alfred Mc Alpine Government Services Ltd Waste Management licence No: 50089 Annual Tonnage: 24999	Issue Date: 31/07/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
C	275m NE	Site Name: Princess Street Depot Site Address: Highways And Maintenance Unit, Princess Street, Rochdale, Lancashire, OL12 0HA Correspondence Address: Mr Nigel Dyer, Highways And Maintenance Unit, Princess Street Depot, Rochdale, Lancashire, OL12 0HA	Type of Site: Transfer Station taking Non-Biodegradable Wastes Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MC001 EPR reference: - Operator: Alfred Mc Alpine Construction Ltd Waste Management licence No: 50089 Annual Tonnage: 24999	Issue Date: 31/07/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued

ID	Location	Details		
C	275m NE	Site Name: Rochdale Depot Site Address: Rochdale Depot, Princess Street, Rochdale, Lancashire, OL12 0HA Correspondence Address: -	Type of Site: Household, Commercial & Industrial Waste T Stn Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: BAL161 EPR reference: EA/EPR/AB3006UT/T001 Operator: Balfour Beatty Living Places Limited Waste Management licence No: 50089 Annual Tonnage: 24999	Issue Date: 31/07/2002 Effective Date: 11/12/2013 Modified: 31/01/2008 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred
C	275m NE	Site Name: Princess Street Depot Site Address: Princess Street Depot, Princess Street, Rochdale, Lancashire, OL12 0HA Correspondence Address: -	Type of Site: Household, Commercial & Industrial Waste T Stn Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: BAL081 EPR reference: EA/EPR/FP3298VC/T001 Operator: Balfour Beatty Workplace Ltd Waste Management licence No: 50089 Annual Tonnage: 24999	Issue Date: 31/07/2002 Effective Date: 31/12/2009 Modified: 31/01/2008 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred
C	275m NE	Site Name: Princess Street Depot Site Address: Highways And Maintenance Unit, Princess Street, Rochdale, Lancashire, OL12 0HA Correspondence Address: -	Type of Site: Household, Commercial & Industrial Waste T Stn Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MC001 EPR reference: - Operator: Alfred Mc Alpine Government Services Ltd Waste Management licence No: 50089 Annual Tonnage: 0	Issue Date: 31/07/2002 Effective Date: - Modified: 31/01/2008 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified

ID	Location	Details		
C	275m NE	Site Name: Rochdale Depot Site Address: Rochdale Depot, Princess Street, Rochdale, Lancashire, OL12 0HA Correspondence Address: -	Type of Site: Household, Commercial & Industrial Waste T Stn Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: BAL161 EPR reference: EA/EPR/AB3006UT/T001 Operator: Balfour Beatty Living Places Ltd Waste Management licence No: 50089 Annual Tonnage: 24999	Issue Date: 31/07/2002 Effective Date: 11/12/2013 Modified: 31/01/2008 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred
F	364m NE	Site Name: Regent Street Transfer Station L Site Address: Land/premises At, Regent Street, Rochdale, Lancashire, OL12 0HQ Correspondence Address: -	Type of Site: Household, Commercial & Industrial Waste T Stn Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAS003 EPR reference: EA/EPR/TP3496CG/T003 Operator: P Casey Enviro Ltd Waste Management licence No: 53747 Annual Tonnage: 6250	Issue Date: 24/12/1991 Effective Date: 22/04/2004 Modified: 28/09/2001 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred
F	364m NE	Site Name: Regent Street Transfer Station L Site Address: Land/premises At, Regent Street, Rochdale, Lancashire, OL12 0HQ Correspondence Address: -	Type of Site: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAS003 EPR reference: EA/EPR/TP3496CG/T003 Operator: P Casey Enviro Ltd Waste Management licence No: 53747 Annual Tonnage: 6250	Issue Date: 24/12/1991 Effective Date: 22/04/2004 Modified: 28/09/2001 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred

ID	Location	Details		
J	462m E	Site Name: C A R. I. P Limited Site Address: 3, Jermyn Street, Rochdale, Manchester, Lancashire, OL12 0DP Correspondence Address: 21, Lichfield Terrace, Rochdale, Manchester, OL16 4XL	Type of Site: Metal Recycling Site (Vehicle Dismantler) Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAR011 EPR reference: - Operator: Car. I. P. Ltd Waste Management licence No: 50467 Annual Tonnage: 0	Issue Date: 04/09/2006 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
J	462m E	Site Name: C A R. I. P Limited Site Address: 3, Jermyn Street, Rochdale, Manchester, OL12 0DP Correspondence Address: -	Type of Site: ELV Facility Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAR011 EPR reference: EA/EPR/YP3694CC/A001 Operator: Car I P Ltd Waste Management licence No: 50467 Annual Tonnage: 2500	Issue Date: 04/09/2006 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
J	462m E	Site Name: CAR.I.P Limited Site Address: 3, Jermyn Street, Rochdale, Manchester, OL12 0DP Correspondence Address: -	Type of Site: ELV Facility Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAR011 EPR reference: EA/EPR/YP3694CC/V002 Operator: CAR.I.P Limited Waste Management licence No: 50467 Annual Tonnage: 2500	Issue Date: 04/09/2006 Effective Date: - Modified: 19/09/2017 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified
J	462m E	Site Name: C A R. I. P Limited Site Address: 3, Jermyn Street, Rochdale, Manchester, OL12 0DP Correspondence Address: -	Type of Site: ELV Facility Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAR011 EPR reference: EA/EPR/YP3694CC/A001 Operator: Car. I. P. Ltd Waste Management licence No: 50467 Annual Tonnage: 2500	Issue Date: 04/09/2006 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued



ID	Location	Details		
J	462m E	Site Name: C A R. I. P. Limited Site Address: 3, Jermyn Street, Rochdale, Manchester, OL12 0DP Correspondence Address: -	Type of Site: ELV Facility Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAR011 EPR reference: EA/EPR/YP3694CC/V002 Operator: C A R. I. P. Limited Waste Management licence No: 50467 Annual Tonnage: 2500	Issue Date: 04/09/2006 Effective Date: - Modified: 19/09/2017 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified
7	480m N	Site Name: Regent Street Transfer Station Site Address: Regent Street, Rochdale, Lancashire, OL12 0HQ Correspondence Address: Lancashire House, 24, Winckley Square, Preston, Lancashire, PR1 3JJ	Type of Site: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LA001 EPR reference: - Operator: S I T A (Lancashire) Ltd Waste Management licence No: 53747 Annual Tonnage: 6250	Issue Date: 24/12/1991 Effective Date: 29/09/2001 Modified: 28/09/2001 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified
K	494m NE	Site Name: D Howarth Vehicle Dismantlers Site Address: 80, Rugby Road, Rochdale, Lancashire, OL12 0DY Correspondence Address: -	Type of Site: Metal Recycling Site (Vehicle Dismantler) Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: DHO001 EPR reference: EA/EPR/HP3096CF/V002 Operator: Howarth Dennis Waste Management licence No: 53753 Annual Tonnage: 2100	Issue Date: 25/02/1994 Effective Date: - Modified: 31/03/2003 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m

61

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 33**



ID	Location	Site	Reference	Category	Sub-Category	Description
1	98m N	48, WHITWORTH ROAD, ROCHDALE, OL12 0EZ	WEX227128	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
A	210m NE	Balfour Beatty Living Places Ltd, Princess Street Depot, Princess Street, Rochdale, OL12 0HA	WEX159308	Using waste exemption	Not on a Farm	Use of waste for a specified purpose
A	210m NE	Balfour Beatty Living Places Ltd, Princess Street Depot, Princess Street, Rochdale, OL12 0HA	WEX159308	Using waste exemption	Not on a Farm	Use of waste in construction
A	210m NE	Balfour Beatty Living Places Ltd, Princess Street Depot, Princess Street, Rochdale, OL12 0HA	WEX159308	Storing waste exemption	Not on a Farm	Storage of waste in secure containers
A	210m NE	Balfour Beatty Living Places Ltd, Princess Street Depot, Princess Street, Rochdale, OL12 0HA	WEX159308	Storing waste exemption	Not on a Farm	Storage of waste in a secure place
A	222m NE	BBLP Princess Street Depot Princess Street OL12 0HA	EPR/XF0006V N/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in secure containers
A	222m NE	BBLP Princess Street Depot Princess Street OL12 0HA	EPR/XF0006V N/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in a secure place
A	222m NE	BBLP Princess Street Depot Princess Street OL12 0HA	EPR/XF0006V N/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
A	222m NE	BBLP Princess Street Depot Princess Street OL12 0HA	EPR/XF0006V N/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste for a specified purpose
B	243m S	79, YORKSHIRE STREET, ROCHDALE, OL16 1DB	WEX156666	Treating waste exemption	Not on a Farm	Sorting and de-naturing of controlled drugs for disposal
B	248m S	79 Yorkshire Street Rochdale Rochdale OL16 1DB	EPR/PF0300H H/A001	Treating waste exemption	Non-Agricultural Waste Only	Sorting and de-naturing of controlled drugs for disposal
B	249m S	Rochdale Pharmacy, 79 Yorkshire St, Rochdale, OL16 1DB	WEX074442	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
2	290m SE	Arien House John Street Rochdale OL16 2HP	EA/EPR/VP375 5EF/A001	Treating waste exemption	Non-Agricultural Waste Only	Repair or refurbishment of WEEE
D	305m SE	-	WEX253596	Using waste exemption	Not on a farm	Use of waste in construction



ID	Location	Site	Reference	Category	Sub-Category	Description
D	305m SE	-	WEX253596	Treating waste exemption	Not on a farm	Screening and blending of waste
E	315m E	PIONEER HOUSE, REGENT STREET, ROCHDALE, OL12 OHQ	WEX321341	Treating waste exemption	Not on a Farm	Treatment of waste toner cartridges by sorting, dismantling, cleaning or refilling
E	315m E	PIONEER HOUSE, REGENT STREET, ROCHDALE, OL12 OHQ	WEX254255	Treating waste exemption	Not on a farm	Treatment of waste toner cartridges by sorting, dismantling, cleaning or refilling
E	315m E	PIONEER HOUSE, REGENT STREET, ROCHDALE, OL12 OHQ	WEX254255	Storing waste exemption	Not on a farm	Storage of waste in a secure place
E	315m E	PIONEER HOUSE, REGENT STREET, ROCHDALE, OL12 OHQ	WEX194890	Treating waste exemption	Not on a farm	Treatment of waste toner cartridges by sorting, dismantling, cleaning or refilling
E	315m E	PIONEER HOUSE, REGENT STREET, ROCHDALE, OL12 OHQ	WEX113338	Storing waste exemption	Not on a farm	Storage of waste in a secure place
E	315m E	PIONEER HOUSE, REGENT STREET, ROCHDALE, OL12 OHQ	WEX113338	Treating waste exemption	Not on a farm	Treatment of waste toner cartridges by sorting, dismantling, cleaning or refilling
E	315m E	PIONEER HOUSE, REGENT STREET, ROCHDALE, OL12 OHQ	WEX031551	Treating waste exemption	Not on a farm	Treatment of waste toner cartridges by sorting, dismantling, cleaning or refilling
E	323m E	Pioneer House Regent Street ROCHDALE Lancashire OL12 OHQ	EPR/EH0276CE /A001	Treating waste exemption	Non-Agricultural Waste Only	Treatment of waste toner cartridges by sorting, dismantling, cleaning or refilling
D	338m SE	-	WEX283043	Using waste exemption	Not on a farm	Use of waste in construction
G	353m W	-	WEX249707	Treating waste exemption	Not on a farm	Screening and blending of waste
G	353m W	-	WEX249707	Using waste exemption	Not on a farm	Use of waste in construction
4	379m E	Unit 3 Jermyn Street ROCHDALE Lancashire OL12 ODP	EPR/CE5088VK /A001	Treating waste exemption	Non-Agricultural Waste Only	Recovery of scrap metal



ID	Location	Site	Reference	Category	Sub-Category	Description
I	391m NW	WHITEHALL STREET, ROCHDALE, OL12 0NB	WEX219682	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
I	391m NW	WHITEHALL STREET, ROCHDALE, OL12 0NB	WEX223016	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
I	391m NW	WHITEHALL STREET, ROCHDALE, OL12 0NB	WEX074492	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
I	391m NW	Rochdale Infirmary, WHITEHALL STREET, ROCHDALE, OL12 0NB	WEX076565	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
I	393m NW	Rochdale Infirmary Whitehall Street Rochdale Lancashire OL12 0NB	EPR/TF0130NR /A001	Treating waste exemption	Non-Agricultural Waste Only	Sorting and de-naturing of controlled drugs for disposal
J	421m E	A & A COMPLEX, UNIT 4, LAWTON STREET, ROCHDALE, OL12 0LQ	WEX283159	Treating waste exemption	Not on a Farm	Preparatory treatments (baling, sorting, shredding etc)
J	421m E	A & A COMPLEX, UNIT 4, LAWTON STREET, ROCHDALE, OL12 0LQ	WEX283159	Treating waste exemption	Not on a farm	Sorting mixed waste
J	421m E	Qu Part, Yard 1, A&A Complex, Rochdale, ol120lq	WEX235179	Using waste exemption	Not on a farm	Use of depolluted end-of- life vehicles for vehicle parts
J	421m E	A & A COMPLEX, UNIT 4, LAWTON STREET, ROCHDALE, OL12 0LQ	WEX142637	Treating waste exemption	Not on a farm	Sorting mixed waste
J	421m E	A & A COMPLEX, UNIT 4, LAWTON STREET, ROCHDALE, OL12 0LQ	WEX142637	Treating waste exemption	Not on a farm	Preparatory treatments (baling, sorting, shredding etc)
J	422m E	Qu Part, Yard 1, A&A Complex, Rochdale, ol120lq	WEX090331	Using waste exemption	Not on a farm	Use of depolluted end-of- life vehicles for vehicle parts
J	445m E	Unit 1 A and A Complex Lawton Street ROCHDALE Lancashire OL12 0LQ	EPR/HF0800C G/A001	Treating waste exemption	Both agricultural and non-agricultural waste	Sorting mixed waste
J	445m E	Unit 1 A and A Complex Lawton Street ROCHDALE Lancashire OL12 0LQ	EPR/HF0800C G/A001	Treating waste exemption	Both agricultural and non-agricultural waste	Preparatory treatments (baling, sorting, shredding etc)



ID	Location	Site	Reference	Category	Sub-Category	Description
J	446m E	Unit 1 A and A Complex Lawton Street ROCHDALE Lancashire OL12 0LQ	EPR/BF0204CY /A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in secure containers
J	446m E	Unit 1 A and A Complex Lawton Street ROCHDALE Lancashire OL12 0LQ	EPR/BF0204CY /A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in a secure place
J	446m E	Unit 1 A and A Complex Lawton Street ROCHDALE Lancashire OL12 0LQ	EPR/BF0204CY /A001	Treating waste exemption	Non-Agricultural Waste Only	Sorting mixed waste
J	446m E	Unit 1 A and A Complex Lawton Street ROCHDALE Lancashire OL12 0LQ	EPR/BF0204CY /A001	Treating waste exemption	Non-Agricultural Waste Only	Preparatory treatments (baling, sorting, shredding etc)
J	446m E	Unit 1 A and A Complex Lawton Street ROCHDALE Lancashire OL12 0LQ	EPR/BF0204CY /A001	Treating waste exemption	Non-Agricultural Waste Only	Recovery of scrap metal
L	458m SW	LINEAR NETWORK - ROCHDALE	EPR/UF0907S M/A001	Disposing of waste exemption	Non-Agricultural Waste Only	Deposit of waste from dredging of inland waters
L	458m SW	LINEAR NETWORK - ROCHDALE	EPR/UF0907S M/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX218147	Using waste exemption	Not on a farm	Use of depolluted end-of- life vehicles for vehicle parts
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX218147	Treating waste exemption	Not on a farm	Recovery of scrap metal
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX218147	Storing waste exemption	Not on a farm	Storage of waste in secure containers
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX218147	Storing waste exemption	Not on a farm	Storage of waste in a secure place
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX323208	Treating waste exemption	Not on a Farm	Recovery of scrap metal
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX323208	Treating waste exemption	Not on a Farm	Preparatory treatments (baling, sorting, shredding etc)
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX189381	Treating waste exemption	Not on a farm	Preparatory treatments (baling, sorting, shredding etc)
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX189381	Treating waste exemption	Not on a farm	Recovery of scrap metal

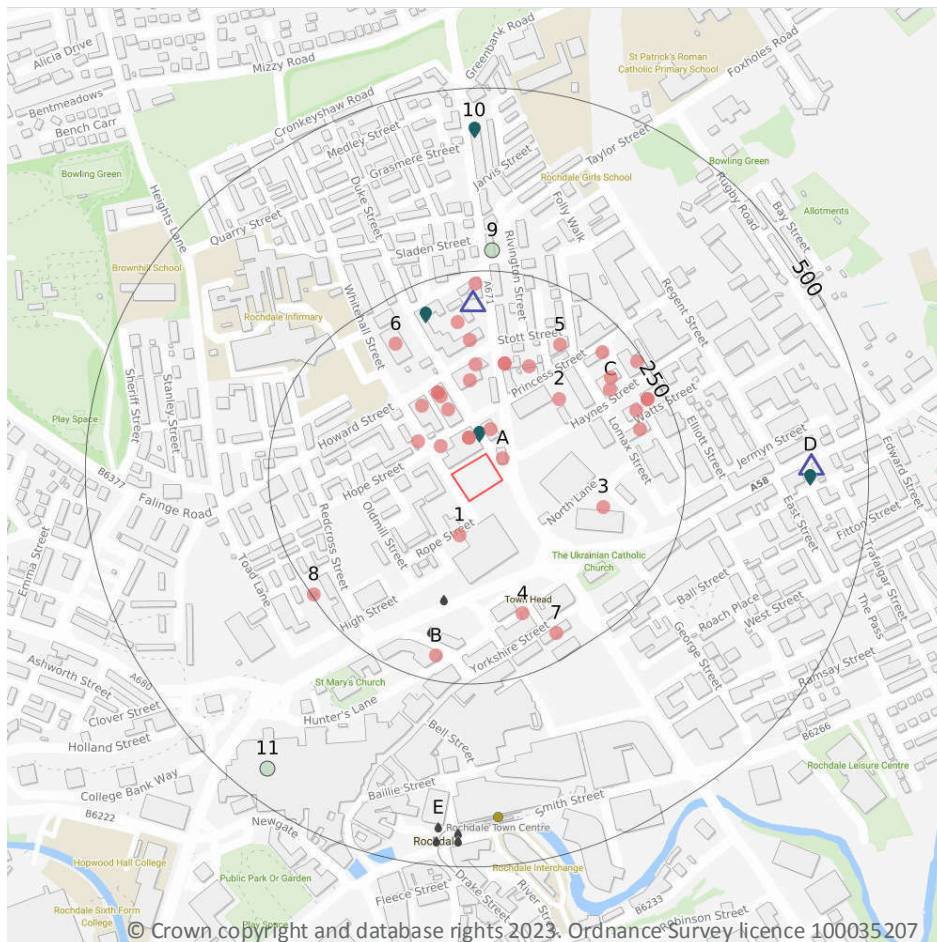


ID	Location	Site	Reference	Category	Sub-Category	Description
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX073188	Storing waste exemption	Not on a farm	Storage of waste in secure containers
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX073188	Storing waste exemption	Not on a farm	Storage of waste in a secure place
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX073188	Treating waste exemption	Not on a farm	Recovery of scrap metal
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX073188	Using waste exemption	Not on a farm	Use of depolluted end-of-life vehicles for vehicle parts
J	468m E	UNIT 3, JERMYN STREET, ROCHDALE, OL12 0DP	WEX033235	Treating waste exemption	Not on a farm	Recovery of scrap metal
6	479m SE	Willmot Dixon Office, Off John Street, Rochdale, OL16 1YH	WEX159260	Using waste exemption	Not on a Farm	Use of waste in construction

This data is sourced from the Environment Agency and Natural Resources Wales.



4 Current industrial land use



- Site Outline
- Search buffers in metres (m)
- Recent industrial land uses
- △ Current or recent petrol stations
- Licensed pollutant release (Part A(2)/B)
- Licensed Discharges to controlled waters
- Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m

36

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 47**

ID	Location	Company	Address	Activity	Category
A	16m NE	Frank Key	27, Whitworth Road, Rochdale, Greater Manchester, OL12 0RA	Construction and Tool Hire	Hire Services
A	31m N	Boltons Textiles	Duke Street Mill, Duke Street, Rochdale, Greater Manchester, OL12 0LW	Textiles, Fabrics, Silk and Machinery	Industrial Products
A	31m N	Bolton Textiles	Duke Street Mill, Duke Street, Rochdale, Greater Manchester, OL12 0LW	Carpets, Flooring, Rugs and Soft Furnishings	Consumer Products



ID	Location	Company	Address	Activity	Category
A	35m N	Tri-cast Composite Tubes Ltd	Watson Works, Duke Street, Rochdale, Greater Manchester, OL12 0LT	Hobby, Sports and Pastime Products	Consumer Products
A	40m NW	Electricity Sub Station	Greater Manchester, OL12	Electrical Features	Infrastructure and Facilities
1	48m S	Electricity Sub Station	Greater Manchester, OL12	Electrical Features	Infrastructure and Facilities
A	64m NW	Electricity Sub Station	Greater Manchester, OL12	Electrical Features	Infrastructure and Facilities
A	78m NW	H Rothwell & Co Ltd	Duke Street, Rochdale, Greater Manchester, OL12 0LS	General Construction Supplies	Industrial Products
A	99m NW	Works	Greater Manchester, OL12	Unspecified Works Or Factories	Industrial Features
A	102m NW	Ringtag International	50, Whitehall Street, Rochdale, Greater Manchester, OL12 0LN	Textiles, Fabrics, Silk and Machinery	Industrial Products
A	103m N	Discount Clearance Centre	80, Howard Street, Rochdale, Greater Manchester, OL12 0LU	Distribution and Haulage	Transport, Storage and Delivery
A	105m NW	Duke Street Autopoint Ltd	Duke Street, Rochdale, Greater Manchester, OL12 0LT	Vehicle Repair, Testing and Servicing	Repair and Servicing
A	105m NW	Wren Prestige	Duke Street, Rochdale, Greater Manchester, OL12 0LT	New Vehicles	Motoring
A	123m N	Spring Court Auto Centre & Motorcycle Centre	Spring Court Autocare, Howard Street, Rochdale, Greater Manchester, OL12 0LU	Vehicle Repair, Testing and Servicing	Repair and Servicing
2	125m NE	Electricity Sub Station	Greater Manchester, OL12	Electrical Features	Infrastructure and Facilities
A	126m N	M O T Test & Repair Centre	70, Whitworth Road, Rochdale, Greater Manchester, OL12 0EZ	Vehicle Repair, Testing and Servicing	Repair and Servicing
A	126m N	The M O T & Repair Centre	70, Whitworth Road, Rochdale, Greater Manchester, OL12 0EZ	Vehicle Repair, Testing and Servicing	Repair and Servicing
A	134m NE	N R G Telecom Ltd	33, Princess Street, Rochdale, Greater Manchester, OL12 0HA	Radar and Telecommunications Equipment	Industrial Products



ID	Location	Company	Address	Activity	Category
3	142m E	Electricity Sub Station	Greater Manchester, OL12	Electrical Features	Infrastructure and Facilities
A	157m N	Kwik-Fit (GB) Limited	Whitworth Road, Rochdale, Greater Manchester, OL12 0QX	Vehicle Repair, Testing and Servicing	Repair and Servicing
4	170m S	T J Booth Associates	20a, Eastgate Street, Rochdale, Greater Manchester, OL16 1DH	Civil Engineers	Engineering Services
5	180m NE	Works	Greater Manchester, OL12	Unspecified Works Or Factories	Industrial Features
A	184m N	Saw Mills	Greater Manchester, OL12	Wood Products Including Charcoal, Paper, Card and Board	Industrial Products
C	191m NE	Works	Greater Manchester, OL12	Unspecified Works Or Factories	Industrial Features
6	192m NW	Rochdale Ambulance Station	Greater Manchester, OL12	Ambulance and Medical Transportation Services	Health Support Services
C	200m NE	Rochdale Re-tool Ltd	Unit 5e, Princess Street, Rochdale, Greater Manchester, OL12 0HA	Tools Including Machine Shops	Industrial Products
C	201m E	Works	Greater Manchester, OL12	Unspecified Works Or Factories	Industrial Features
C	206m NE	Burns Motor Works	Unit 1, Haynes Street, Rochdale, Greater Manchester, OL12 0UW	Vehicle Repair, Testing and Servicing	Repair and Servicing
C	210m NE	Isaac Butterworth Ltd	Units 2 and 3, Princess Street, Rochdale, Greater Manchester, OL12 0HA	Industrial Engineers	Engineering Services
7	216m SE	Rochdale Mobility	140, Yorkshire Street, Rochdale, Greater Manchester, OL16 1LD	Disability and Mobility Equipment	Consumer Products
B	216m S	Mobile Planet	7, Cheetham Street, Rochdale, Greater Manchester, OL16 1DG	Electrical Equipment Repair and Servicing	Repair and Servicing
C	227m NE	Motaquip	Unit 2, Haynes Street, Rochdale, Greater Manchester, OL12 0UW	Vehicle Parts and Accessories	Motoring
C	227m NE	Motaquip Autocentre	Unit 2, Haynes Street, Rochdale, Greater Manchester, OL12 0UW	Vehicle Repair, Testing and Servicing	Repair and Servicing
A	234m N	Anwar & Co Failsworth Service Station	111, Whitworth Road, Rochdale, Greater Manchester, OL12 0RA	Petrol and Fuel Stations	Road and Rail



ID	Location	Company	Address	Activity	Category
C	242m NE	Works	Greater Manchester, OL12	Unspecified Works Or Factories	Industrial Features
8	248m SW	E V M Sports & Prestige	Waterhouse Street, Rochdale, Greater Manchester, OL12 0AF	Secondhand Vehicles	Motoring

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m

2

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 47**

ID	Location	Company	Address	LPG	Status
A	210m N	GULF	111, Whitworth Road, Rochdale, Greater Manchester, OL12 0RA	No	Open
D	421m E	SHELL	278, Yorkshire Street, Rochdale, Greater Manchester, OL16 2DR	No	Open

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m

0

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m

0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.



4.5 Sites determined as Contaminated Land

Records within 500m**0**

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m**0**

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m**0**

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m**0**

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m**0**

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m

0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m

4

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 47**

ID	Location	Address	Details	
A	28m N	Anwar and Co Ltd, Whitworth Road Service Station, 111 Whitworth Road, Rochdale, Lancashire, OL12 0RA	Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
A	206m N	Manson Timber, Whitworth Road, Rochdale	Process: Timber Manufacture Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
D	419m E	Ceylon Service Station, 278 Yorkshire Street, Rochdale, Lancashire, OL16 2DR	Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
10	442m N	Imperial Dry Cleaners, 160 Whitworth Road, Rochdale, Lancashire, OL12 0JG	Process: Dry Cleaning Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m

0

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m

9

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 47**

ID	Location	Address	Details	
B	139m S	ST MARYS GATE/CHEETHAM STREET CSO, 16 CHEETHAM STREET, (ST MARYS GATE), ROCHDALE, GREATER MANCHESTER, OL16 1DG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0055 Permit Version: 1 Receiving Water: -	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/04/1991 Revocation Date: 31/12/1994
B	139m S	ST MARYS GATE/CHEETHAM STREET CSO, 16 CHEETHAM STREET, (ST MARYS GATE), ROCHDALE, GREATER MANCHESTER, OL16 1DG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0055 Permit Version: 2 Receiving Water: .	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 14/04/2020
B	186m S	ST MARYS GATE/CHEETHAM STREET CSO, 16 CHEETHAM STREET, (ST MARYS GATE), ROCHDALE, GREATER MANCHESTER, OL16 1DG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: EPRQB3591EA Permit Version: 1 Receiving Water: LORD BURN, TRIB OF RIVER ROCH	Status: VARIED UNDER EPR 2010 Issue date: 15/04/2020 Effective Date: 15/04/2020 Revocation Date: -
E	448m S	DRAKE STREET CSO (35038), DRAKE STREET (THE WELLINGTON), ROCHDALE, GREATER MANCHESTER, OL16 1RE	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0078 Permit Version: 4 Receiving Water: CULVERTED RIVER ROCH VIA SWS	Status: VARIED UNDER EPR 2010 Issue date: 01/10/2020 Effective Date: 01/10/2020 Revocation Date: -



ID	Location	Address	Details	
E	455m S	PENN ST W44, ROCHDALE, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0079 Permit Version: 1 Receiving Water: -	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/04/1991 Revocation Date: 31/12/1994
E	455m S	PENN ST W44, ROCHDALE, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0079 Permit Version: 2 Receiving Water: -	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 01/01/1995 Revocation Date: 29/04/2019
E	465m S	DRAKE STREET CSO (35038), DRAKE STREET (THE WELLINGTON), ROCHDALE, GREATER MANCHESTER, OL16 1RE	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0078 Permit Version: 1 Receiving Water: -	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/04/1991 Revocation Date: 31/12/1994
E	465m S	DRAKE STREET CSO (35038), DRAKE STREET (THE WELLINGTON), ROCHDALE, GREATER MANCHESTER, OL16 1RE	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0078 Permit Version: 2 Receiving Water: RIVER ROCH	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 01/01/1995 Effective Date: 01/01/1995 Revocation Date: 29/06/2006
E	467m S	DRAKE STREET CSO (35038), DRAKE STREET (THE WELLINGTON), ROCHDALE, GREATER MANCHESTER, OL16 1RE	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0078 Permit Version: 3 Receiving Water: RIVER ROCH	Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: 11/07/2005 Effective Date: 30/06/2006 Revocation Date: 30/09/2020

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m

0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.



4.15 Pollutant release to public sewer

Records within 500m

0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m

0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m

0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m

2

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 47**

ID	Location	Details	
9	278m N	Incident Date: 06/07/2001 Incident Identification: 14171 Pollutant: Inert Materials and Wastes Pollutant Description: Construction and Demolition Materials and Wastes	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
11	457m SW	Incident Date: 22/11/2001 Incident Identification: 44441 Pollutant: Pollutant Not Identified Pollutant Description: Not Identified	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m**0**

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m**0**

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

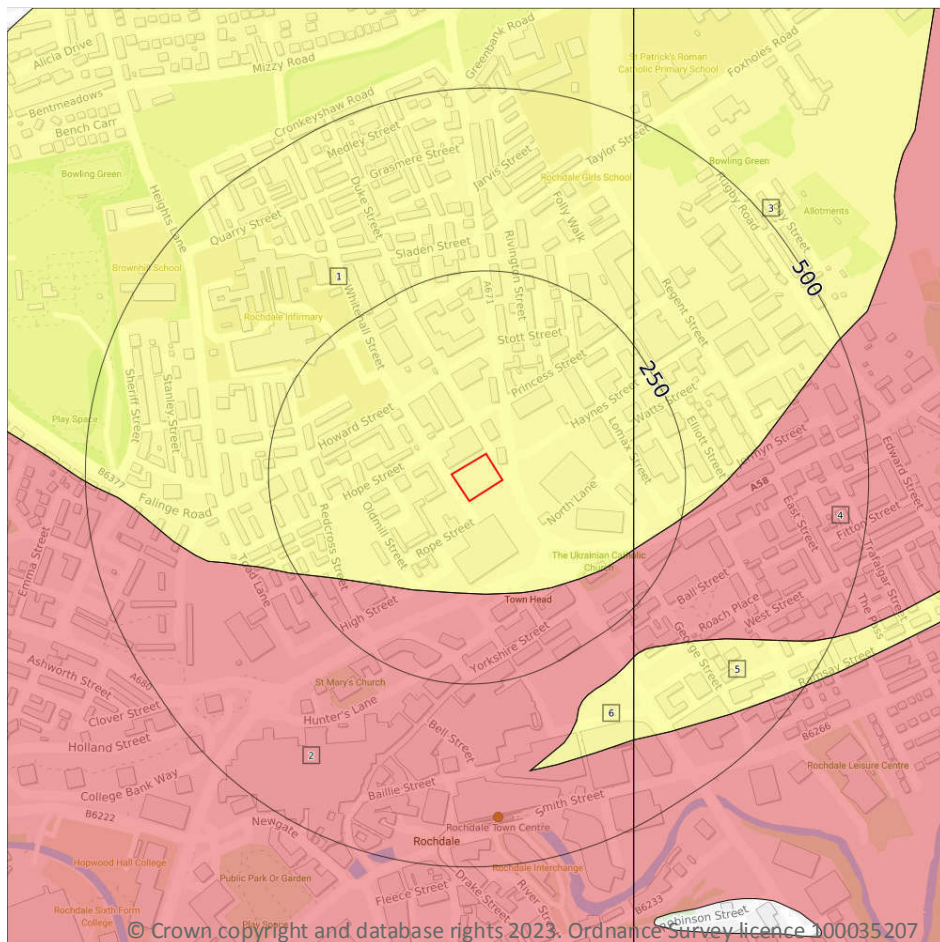
4.21 Pollution inventory radioactive waste

Records within 500m**0**

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



- Site Outline**
- Search buffers in metres (m)**
- Principal
 - Secondary A
 - Secondary B
 - Secondary Undifferentiated
 - Unproductive
 - Unknown

5.1 Superficial aquifer

Records within 500m

6

Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 57**

ID	Location	Designation	Description
1	On site	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
2	126m S	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

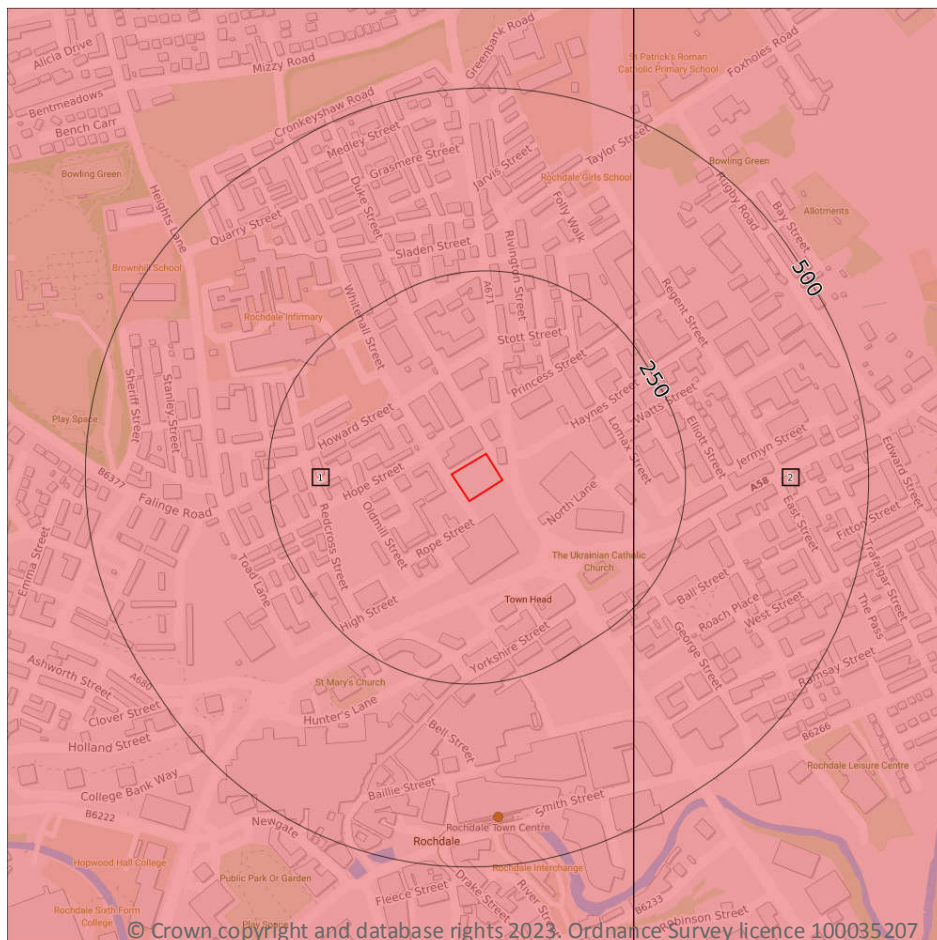


ID	Location	Designation	Description
3	179m E	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
4	203m SE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
5	301m SE	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
6	301m SE	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.



Bedrock aquifer



- Site Outline**
- Search buffers in metres (m)**
- Principal
 - Secondary A
 - Secondary B
 - Secondary Undifferentiated
 - Unproductive

5.2 Bedrock aquifer

Records within 500m

2

Aquifer status of groundwater held within bedrock geology.

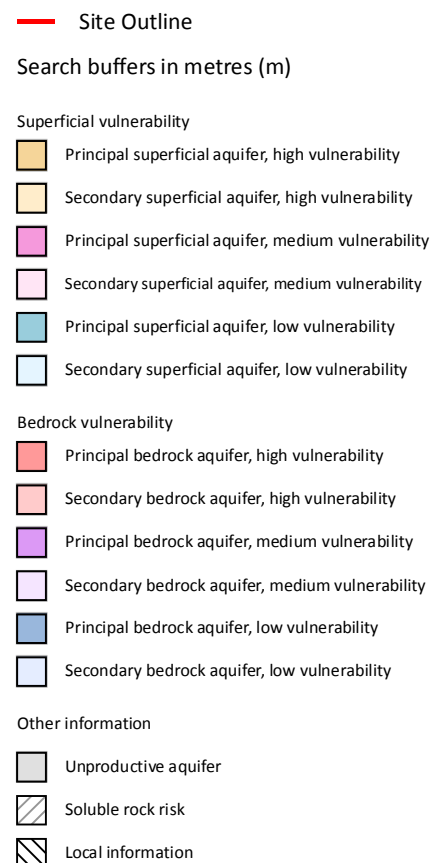
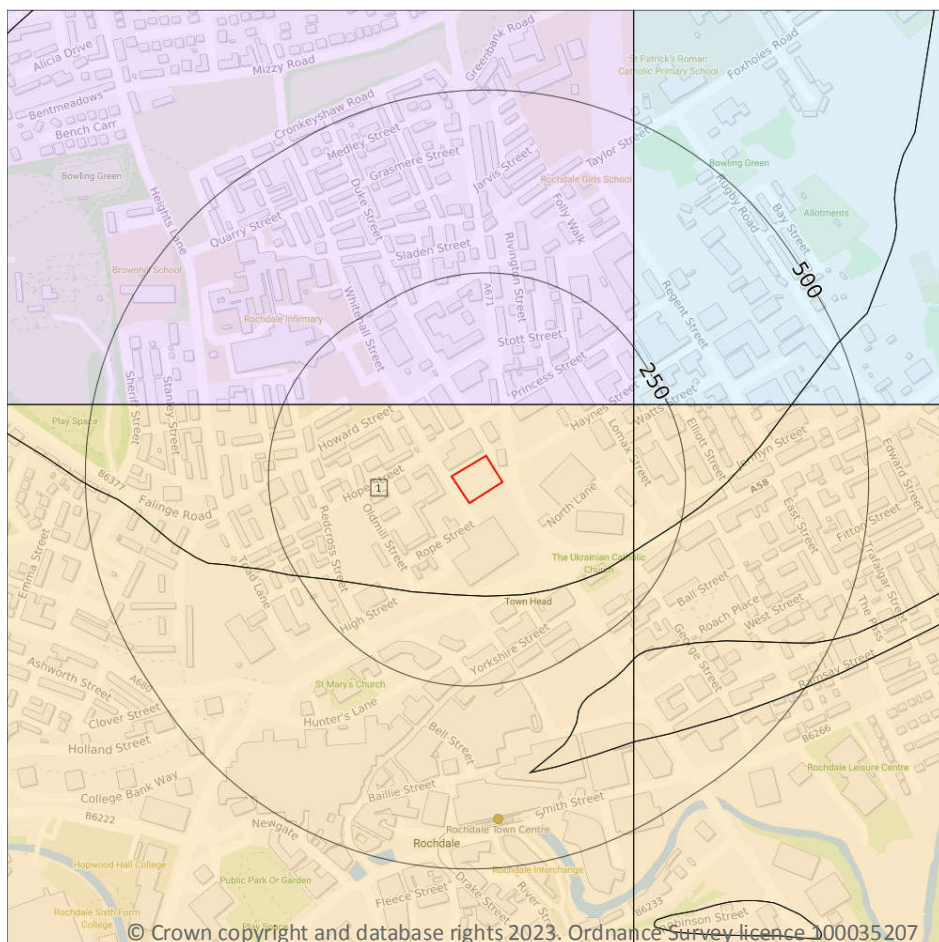
Features are displayed on the Bedrock aquifer map on **page 59**

ID	Location	Designation	Description
1	On site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	179m E	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.



Groundwater vulnerability



5.3 Groundwater vulnerability

Records within 50m

1

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 61**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: >550mm/year	Vulnerability: High Aquifer type: Secondary Thickness: >10m Patchiness value: >90% Recharge potential: High	Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	0
------------------------	----------

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.

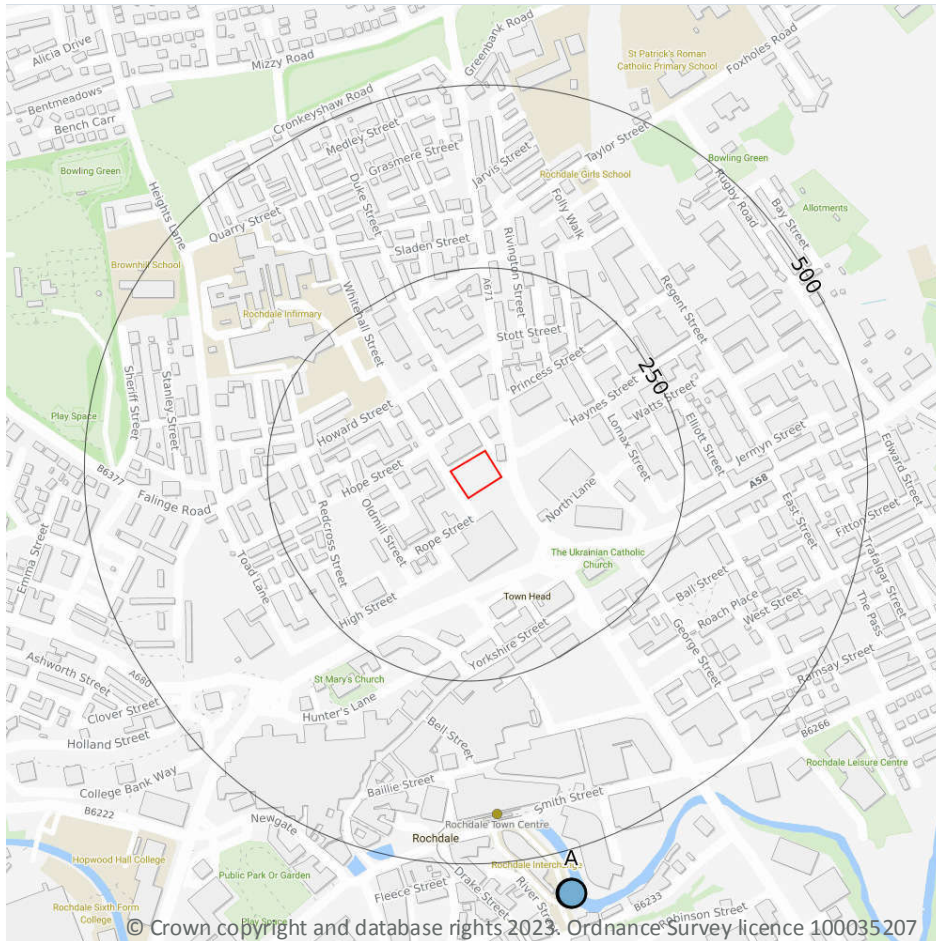
5.5 Groundwater vulnerability- local information

Records on site	0
------------------------	----------

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones



- Site Outline
- Search buffers in metres (m)
- Source Protection Zone 1
Inner catchment
- Source Protection Zone 2
Outer catchment
- Source Protection Zone 3
Total catchment
- Source Protection Zone 4
Zone of Special Interest
- Source Protection Zone 1c
Inner catchment - confined aquifer
- Source Protection Zone 2c
Outer catchment - confined aquifer
- Source Protection Zone 3c
Total catchment - confined aquifer
- Drinking water abstraction licences
Polygon features
- Drinking water abstraction licences
Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

5.6 Groundwater abstractions

Records within 2000m

3

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 63**

ID	Location	Details	
-	1125m W	Status: Historical Licence No: 2569002050 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, SPOTLAND, ROCHDALE" Data Type: Point Name: ALEXANDER DREW & SONS LTD Easting: 388700 Northing: 413500	Annual Volume (m ³): - Max Daily Volume (m ³): - Original Application No: - Original Start Date: 10/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 02/05/2000 Version End Date: -
-	1125m W	Status: Historical Licence No: 2569002050 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, SPOTLAND, ROCHDALE Data Type: Point Name: ALEXANDER DREW LTD. Easting: 388700 Northing: 413500	Annual Volume (m ³): - Max Daily Volume (m ³): - Original Application No: - Original Start Date: 10/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/04/2003 Version End Date: -
-	1125m W	Status: Historical Licence No: 2569002050 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES SPOTLAND ROCHDALE Data Type: Point Name: ALEXANDER DREW LTD Easting: 388700 Northing: 413500	Annual Volume (m ³): 500000 Max Daily Volume (m ³): 2100 Original Application No: - Original Start Date: 10/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/04/2003 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m

17

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 63**



ID	Location	Details	
A	558m S	Status: Active Licence No: NW/069/0002/003 Details: Transfer Between Sources (Post Water Act 2003) Direct Source: Surface, Non-Tidal - North West Region Point: RIVER ROCH AT ROCHDALE WEIR Data Type: Point Name: Transport for Greater Manchester Easting: 389916 Northing: 413325	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: NPS/WR/007633 Original Start Date: 15/06/2010 Expiry Date: 31/03/2026 Issue No: 2 Version Start Date: 23/06/2011 Version End Date: -
A	558m S	Status: Active Licence No: NW/069/0002/001 Details: Hydroelectric Power Generation Direct Source: Surface, Non-Tidal - North West Region Point: RIVER ROCH AT ROCHDALE WEIR Data Type: Point Name: Transport for Greater Manchester Easting: 389917 Northing: 413325	Annual Volume (m³): 36,100,000 Max Daily Volume (m³): 164,160 Original Application No: NPS/WR/007499 Original Start Date: 15/06/2010 Expiry Date: 31/03/2026 Issue No: 2 Version Start Date: 01/04/2015 Version End Date: -
-	875m N	Status: Historical Licence No: 2569002268 Details: Non-Evaporative Cooling Direct Source: "Surface, Non-Tidal - North West Region" Point: "FOXHOLES BROOK AT FIELDHOUSE INDUSTRIAL ESTATE, ROCHDALE" Data Type: Point Name: RIVERSIDE TRADING LTD Easting: 389700 Northing: 414800	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 10/11/1998 Version End Date: -
-	875m N	Status: Historical Licence No: 2569002268 Details: Non-Evaporative Cooling Direct Source: Surface, Non-Tidal - North West Region Point: FOXHOLES BROOK AT FIELDHOUSE INDUSTRIAL ESTATE, ROCHDALE Data Type: Point Name: RIVERSIDE TRADING LTD Easting: 389700 Northing: 414800	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 10/11/1998 Version End Date: -

ID	Location	Details	
-	983m E	Status: Historical Licence No: 2569002249 Details: Process water Direct Source: "Surface, Non-Tidal - North West Region" Point: "RIVER ROCH AT MELLOROID WORKS, BELFIELD ROAD" Data Type: Point Name: BRITISH MILLERAIN 1922 CO LTD Easting: 390800 Northing: 413800	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 04/11/1991 Expiry Date: - Issue No: 100 Version Start Date: 04/11/1991 Version End Date: -
-	983m E	Status: Historical Licence No: 2569002249 Details: Process water Direct Source: Surface, Non-Tidal - North West Region Point: RIVER ROCH AT MELLOROID WORKS, BELFIELD ROAD Data Type: Point Name: BRITISH MILLERAIN 1922 CO LTD Easting: 390800 Northing: 413800	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 04/11/1991 Expiry Date: - Issue No: 100 Version Start Date: 04/11/1991 Version End Date: -
-	983m E	Status: Historical Licence No: 2569002249 Details: Process Water Direct Source: Surface, Non-Tidal - North West Region Point: RIVER ROCH AT MELLOROID WORKS BELFIELD ROAD Data Type: Point Name: BRITISH MILLERAIN 1922 CO LTD Easting: 390800 Northing: 413800	Annual Volume (m³): 213662 Max Daily Volume (m³): 1136.49 Original Application No: - Original Start Date: 04/11/1991 Expiry Date: - Issue No: 100 Version Start Date: 04/11/1991 Version End Date: -
-	1523m N	Status: Historical Licence No: 2569002193 Details: Potable Water Supply - Direct Direct Source: "Surface, Non-Tidal - North West Region" Point: "WATERGROVE, BROWN HOUSE WHAM, HAMER PASTURE AND BUCKLEY[12]" Data Type: Point Name: UNITED UTILITIES WATER PLC Easting: 390200 Northing: 415400	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 22/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/03/1966 Version End Date: -



ID	Location	Details	
-	1523m N	Status: Active Licence No: 2569002193 Details: Potable Water Supply - Direct Direct Source: Surface, Non-Tidal - North West Region Point: WATERGROVE, BROWN HOUSE WHAM, HAMER PASTURE AND BUCKLEY[12 Data Type: Point Name: United Utilities Water Ltd Easting: 390200 Northing: 415400	Annual Volume (m ³): 5,909,800 Max Daily Volume (m ³): 5,909,800 Original Application No: 1592 Original Start Date: 22/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/03/1966 Version End Date: -
-	1650m S	Status: Historical Licence No: 2569002076 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: ROCHDALE CANAL AT ROCHDALE, LANCS Data Type: Point Name: J & J MAKIN CONVERTORS LTD Easting: 390300 Northing: 412300	Annual Volume (m ³): - Max Daily Volume (m ³): - Original Application No: - Original Start Date: 18/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/04/1993 Version End Date: -
-	1662m W	Status: Historical Licence No: 2569002018 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Surface, Non-Tidal - North West Region Point: LODGE FED BY R SPODDEN AT ROCHDALE Data Type: Point Name: FLEXITALLIC LTD Easting: 388200 Northing: 414500	Annual Volume (m ³): 1500211.393 Max Daily Volume (m ³): 4546.095 Original Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 11/04/1997 Version End Date: -
-	1662m W	Status: Historical Licence No: 2569002018 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: LODGE FED BY R SPODDEN AT ROCHDALE Data Type: Point Name: FLEXITALLIC LTD Easting: 388200 Northing: 414500	Annual Volume (m ³): 1500211.393 Max Daily Volume (m ³): 4546.095 Original Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 11/04/1997 Version End Date: -
-	1662m W	Status: Historical Licence No: 2569002018 Details: Process Water Direct Source: Surface, Non-Tidal - North West Region Point: LODGE FED BY R SPODDEN AT ROCHDALE Data Type: Point Name: FLEXITALLIC LTD Easting: 388200 Northing: 414500	Annual Volume (m ³): 1500211.393 Max Daily Volume (m ³): 4546.095 Original Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 11/04/1997 Version End Date: -



ID	Location	Details	
-	1927m S	Status: Historical Licence No: 2569002107 Details: Boiler Feed Direct Source: "Surface, Non-Tidal - North West Region" Point: "ROCHDALE CANAL AT QUEENSWAY,ROCHDALE" Data Type: Point Name: SEALOCRETE PLA LTD Easting: 390070 Northing: 411960	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 02/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 20/12/1993 Version End Date: -
-	1927m S	Status: Historical Licence No: 2569002107 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: "Surface, Non-Tidal - North West Region" Point: "ROCHDALE CANAL AT QUEENSWAY,ROCHDALE" Data Type: Point Name: SEALOCRETE PLA LTD Easting: 390070 Northing: 411960	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 02/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 20/12/1993 Version End Date: -
-	1927m S	Status: Historical Licence No: 2569002107 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: ROCHDALE CANAL AT QUEENSWAY,ROCHDALE Data Type: Point Name: SEALOCRETE PLA LTD Easting: 390070 Northing: 411960	Annual Volume (m³): 10455.8 Max Daily Volume (m³): 45.46 Original Application No: - Original Start Date: 02/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2008 Version End Date: -
-	1927m S	Status: Historical Licence No: 2569002107 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Surface, Non-Tidal - North West Region Point: ROCHDALE CANAL AT QUEENSWAY,ROCHDALE Data Type: Point Name: SEALOCRETE PLA LTD Easting: 390070 Northing: 411960	Annual Volume (m³): 10455.8 Max Daily Volume (m³): 45.46 Original Application No: - Original Start Date: 02/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2008 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.



5.8 Potable abstractions

Records within 2000m

2

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 63**

ID	Location	Details	
-	1523m N	Status: Historical Licence No: 2569002193 Details: Potable Water Supply - Direct Direct Source: "Surface, Non-Tidal - North West Region" Point: "WATERGROVE, BROWN HOUSE WHAM, HAMER PASTURE AND BUCKLEY[12]" Data Type: Point Name: UNITED UTILITIES WATER PLC Easting: 390200 Northing: 415400	Annual Volume (m ³): - Max Daily Volume (m ³): - Original Application No: - Original Start Date: 22/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/03/1966 Version End Date: -
-	1523m N	Status: Active Licence No: 2569002193 Details: Potable Water Supply - Direct Direct Source: Surface, Non-Tidal - North West Region Point: WATERGROVE, BROWN HOUSE WHAM, HAMER PASTURE AND BUCKLEY[12] Data Type: Point Name: United Utilities Water Ltd Easting: 390200 Northing: 415400	Annual Volume (m ³): 5,909,800 Max Daily Volume (m ³): 5,909,800 Original Application No: 1592 Original Start Date: 22/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/03/1966 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m

0

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

This data is sourced from the Environment Agency and Natural Resources Wales.



5.10 Source Protection Zones (confined aquifer)

Records within 500m

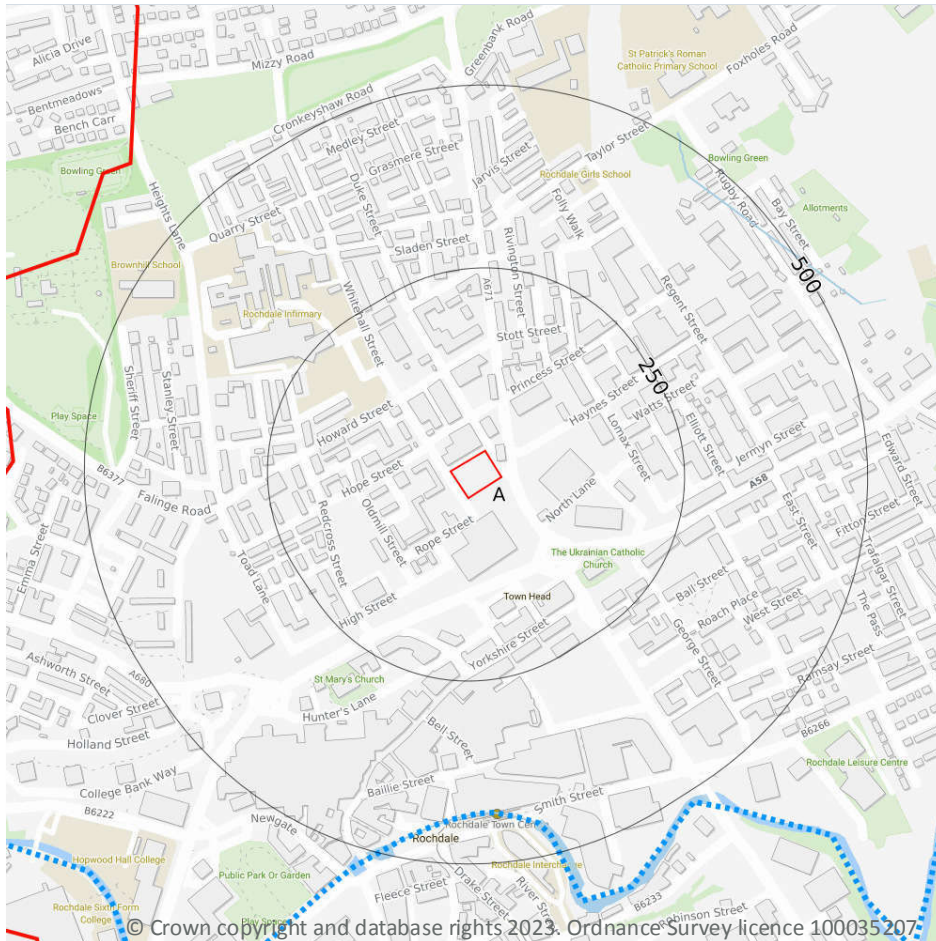
0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.



6 Hydrology



- Site Outline
- Search buffers in metres (m)
- Water Network (OS MasterMap)
- Surface water features (wider than 5m)
- Surface water features (narrower than 5m)
- ⋯ WFD River, canal and surface water transfer water bodies
- WFD Lake water bodies
- WFD Transitional and coastal water bodies
- WFD Surface water body catchments boundaries
- WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m

0

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m

0

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site

1

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 71**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
A	On site	River	Roch (Source to Spodden)	GB112069064720	Roch Irk Medlock	Irwell

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified

1

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 71**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
1	431m S	River	Roch (Source to Spodden)	GB112069064720	Moderate	Fail	Moderate	2019

This data is sourced from the Environment Agency and Natural Resources Wales.



6.5 WFD Groundwater bodies

Records on site

1

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 71**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
A	On site	Northern Manchester Carboniferous Aquifers	<u>GB41202G101800</u>	Poor	Poor	Good	2019

This data is sourced from the Environment Agency and Natural Resources Wales.



7 River and coastal flooding

7.1 Risk of flooding from rivers and the sea

Records within 50m

0

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m within the Risk of Flooding from Rivers and Sea (RoFRaS)/Flood Risk Assessment Wales (FRAW) models. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition. The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance).

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m

0

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m

0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.



7.4 Areas Benefiting from Flood Defences

Records within 250m**0**

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.5 Flood Storage Areas

Records within 250m**0**

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones

7.6 Flood Zone 2

Records within 50m

0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.7 Flood Zone 3

Records within 50m

0

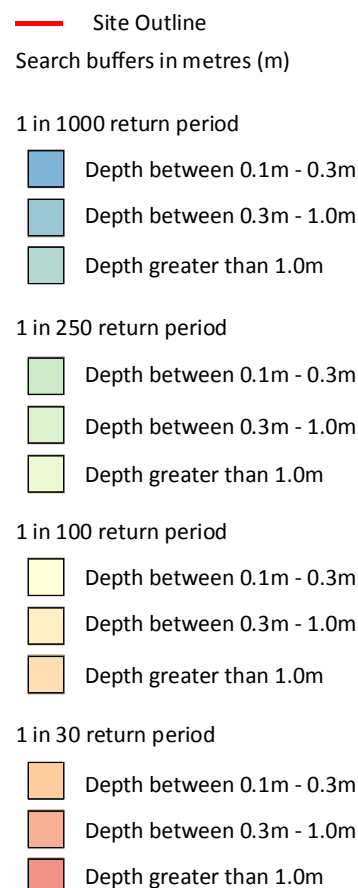
Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding



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8.1 Surface water flooding

Highest risk on site

Negligible

Highest risk within 50m

1 in 30 year, 0.3m - 1.0m

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 77**

The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

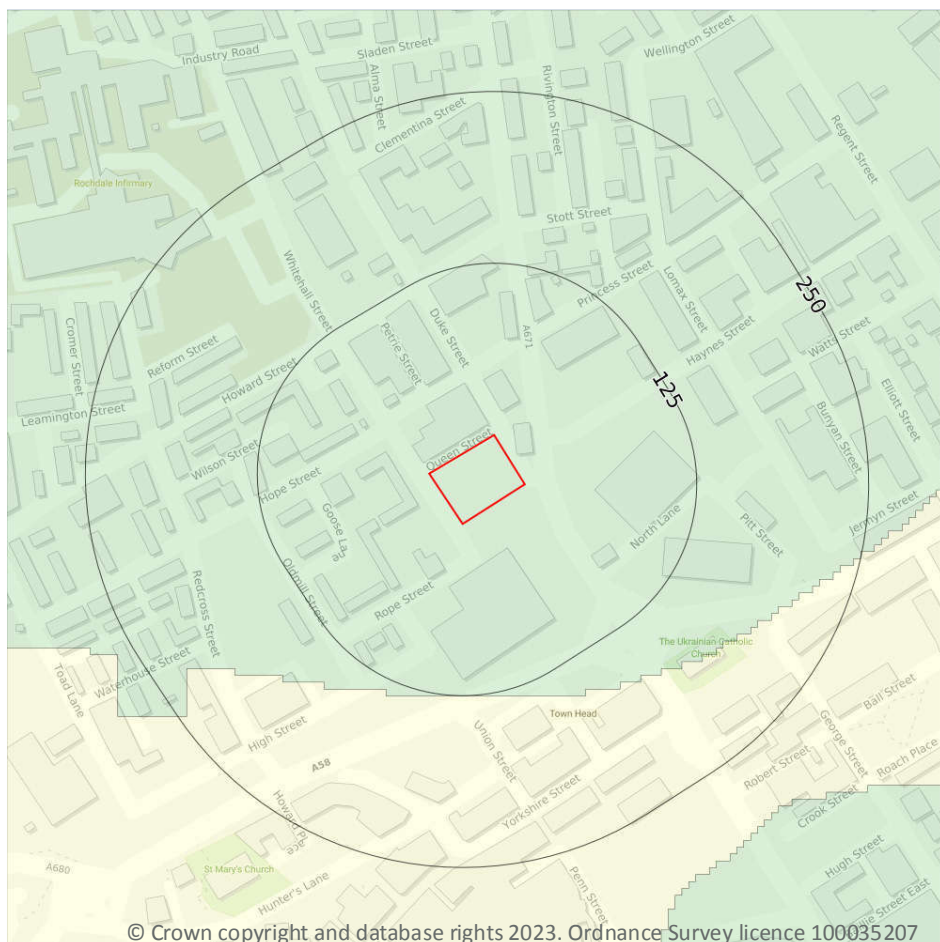


The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Negligible
1 in 250 year	Negligible
1 in 100 year	Negligible
1 in 30 year	Negligible

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



— Site Outline
Search buffers in metres (m)

- High
- Moderate - High
- Moderate
- Low
- Negligible

9.1 Groundwater flooding

Highest risk on site

Low

Highest risk within 50m

Low

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 79**

This data is sourced from Ambiantal Risk Analytics.

10 Environmental designations



- Site Outline
- Search buffers in metres (m)
- Sites of Special Scientific Interest (SSSI)
- + Special Areas of Conservation (SAC)
- + Local Nature Reserves (LNR)
- X Designated Ancient Woodland
- Green Belt

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m

2

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

Features are displayed on the Environmental designations map on **page 80**

ID	Location	Name	Data source
-	1546m S	Rochdale Canal	Natural England



ID	Location	Name	Data source
-	1861m E	Rochdale Canal	Natural England

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m

0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m

2

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

Features are displayed on the Environmental designations map on **page 80**

ID	Location	Name	Features of interest	Habitat description	Data source
-	1546m S	Rochdale Canal	Floating water-plantain.	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites); Inland water bodies (Standing water, Running water)	Natural England
-	1861m E	Rochdale Canal	Floating water-plantain.	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites); Inland water bodies (Standing water, Running water)	Natural England

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m

0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m

0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m

1

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

Features are displayed on the Environmental designations map on **page 80**

ID	Location	Name	Data source
-	1823m NW	Healey Dell	Natural England

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m

2

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

Features are displayed on the Environmental designations map on **page 80**



ID	Location	Name	Woodland Type
-	1680m NE	Buckley Wood	Ancient & Semi-Natural Woodland
-	1702m NE	Buckley Wood	Ancient Replanted Woodland

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m **0**

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m **0**

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m **0**

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m **2**

Areas designated to prevent urban sprawl by keeping land permanently open.

Features are displayed on the Environmental designations map on **page 80**

ID	Location	Name	Local Authority name
1	1006m NE	Merseyside and Greater Manchester	Rochdale



ID	Location	Name	Local Authority name
-	1683m NW	Merseyside and Greater Manchester	Rochdale

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m

0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m

0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m

0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m

0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate



Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

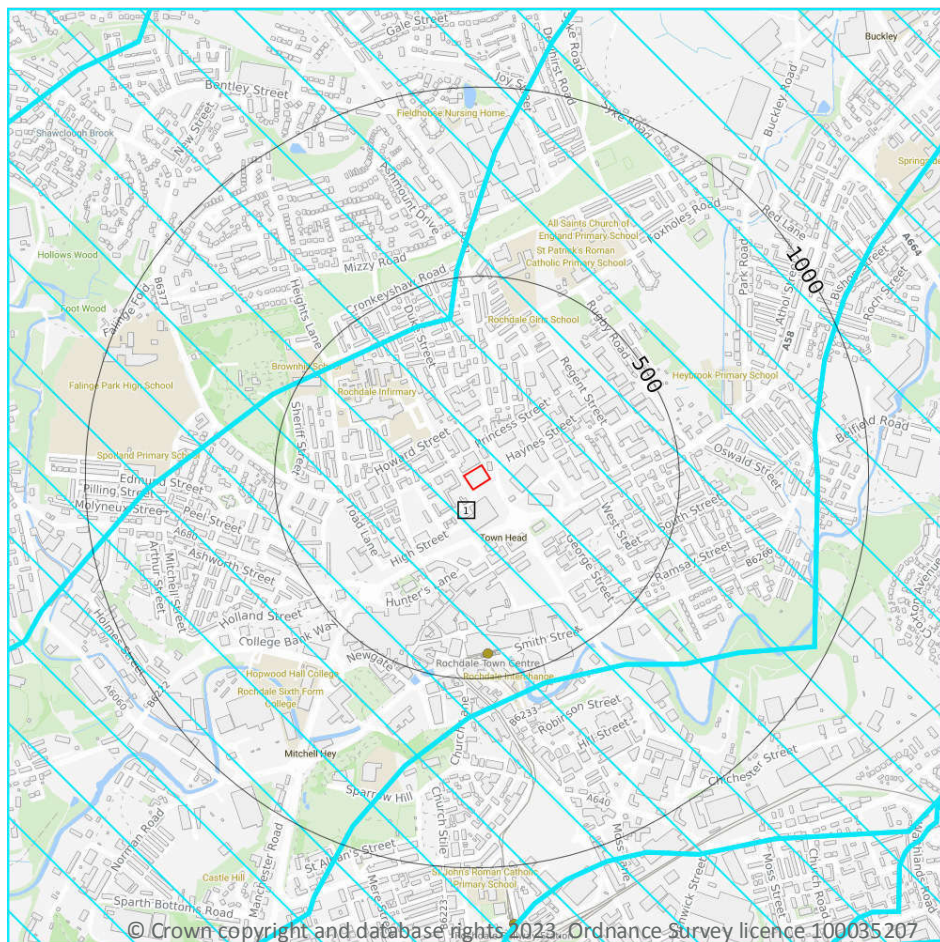
Records within 2000m

0

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units



- Site Outline
- Search buffers in metres (m)
- SSSI Impact Risk Zones
- SSSI Units
- Not recorded
- Favourable
- Unfavourable - Recovering
- Unfavourable - No change
- Unfavourable - Declining
- Partially destroyed
- Destroyed

10.17 SSSI Impact Risk Zones

Records on site

1

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 86**

ID	Location	Type of developments requiring consultation
1	On site	Infrastructure - Pipelines, pylons and overhead cables. any transport proposal including road, rail and by water (excluding routine maintenance). airports, helipads and other aviation proposals. Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, review of minerals permissions (romp), extensions, variations to conditions etc. oil & gas exploration/extraction. Air pollution - Any industrial/agricultural development that could cause air pollution (incl: industrial processes, livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 200m², manure stores > 250t). Combustion - General combustion processes >20mw energy input. incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion. Waste - Landfill. incl: inert landfill, non-hazardous landfill, hazardous landfill. Composting - Any composting proposal with more than 75000 tonnes maximum annual operational throughput. incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management. Water supply - Large infrastructure such as warehousing / industry where total net additional gross internal floorspace following development is 1,000m² or more.

This data is sourced from Natural England.

10.18 SSSI Units

Records within 2000m	2
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Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

Features are displayed on the SSSI Impact Zones and Units map on **page 86**

ID: -
 Location: 1546m S
 SSSI name: Rochdale Canal
 Unit name: Failsworth
 Broad habitat: Standing Open Water And Canals
 Condition: Unfavourable - Recovering
 Reportable features:

Feature name	Feature condition	Date of assessment
Population of Schedule 8 plant - Luronium natans, Floating Water-plantain	Unfavourable - Recovering	25/11/2010



ID: -
Location: 1861m E
SSSI name: Rochdale Canal
Unit name: Failsworth
Broad habitat: Standing Open Water And Canals
Condition: Unfavourable - Recovering
Reportable features:

Feature name	Feature condition	Date of assessment
Population of Schedule 8 plant - Luronium natans, Floating Water-plantain	Unfavourable - Recovering	25/11/2010

This data is sourced from Natural England and Natural Resources Wales.



11 Visual and cultural designations



- Site Outline
- Search buffers in metres (m)
- Listed buildings
- Conservation areas
- Conservation areas - no data
- National Parks
- Areas of Outstanding Natural Beauty
- Registered parks and gardens
- Scheduled Monuments
- World Heritage Sites

11.1 World Heritage Sites

Records within 250m

0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m

0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m

0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m

7

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 89**

ID	Location	Name	Grade	Reference Number	Listed date
1	111m W	Hope Chapel and Parsons House Parson's House, Central Rochdale, Rochdale, OL12	II*	1057694	12/02/1985
3	180m S	1 and 3, Whitehall Street (See Details For Further Address information), Milkstone and Deepish, Rochdale, OL12	II	1084259	12/02/1985
4	182m SE	Ukrainian Catholic Church of Saint Mary, Central Rochdale, Rochdale, OL16	II	1346258	12/02/1985



ID	Location	Name	Grade	Reference Number	Listed date
5	222m S	128, Yorkshire Street, Milkstone and Deeplish, Rochdale, OL16	II	1084226	16/03/1984
6	233m SE	170, 172 and 174, Yorkshire Street, Central Rochdale, Rochdale, OL16	II	1346257	12/02/1985
8	241m SE	Town Head House Department of Social Services, Town Head offices, Milkstone and Deeplish, Rochdale, OL16	II	1084282	12/02/1985
9	246m E	188a, 190 and 190a, Yorkshire Street (See Details For Further Address information), Central Rochdale, Rochdale, OL16	II	1084227	12/02/1985

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m

2

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

Features are displayed on the Visual and cultural designations map on **page 89**

ID	Location	Name	District	Date of designation
2	132m S	Town Head	Rochdale	2008
7	239m SW	Toad Lane	Rochdale	23/11/1977

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m

0

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.



11.7 Registered Parks and Gardens

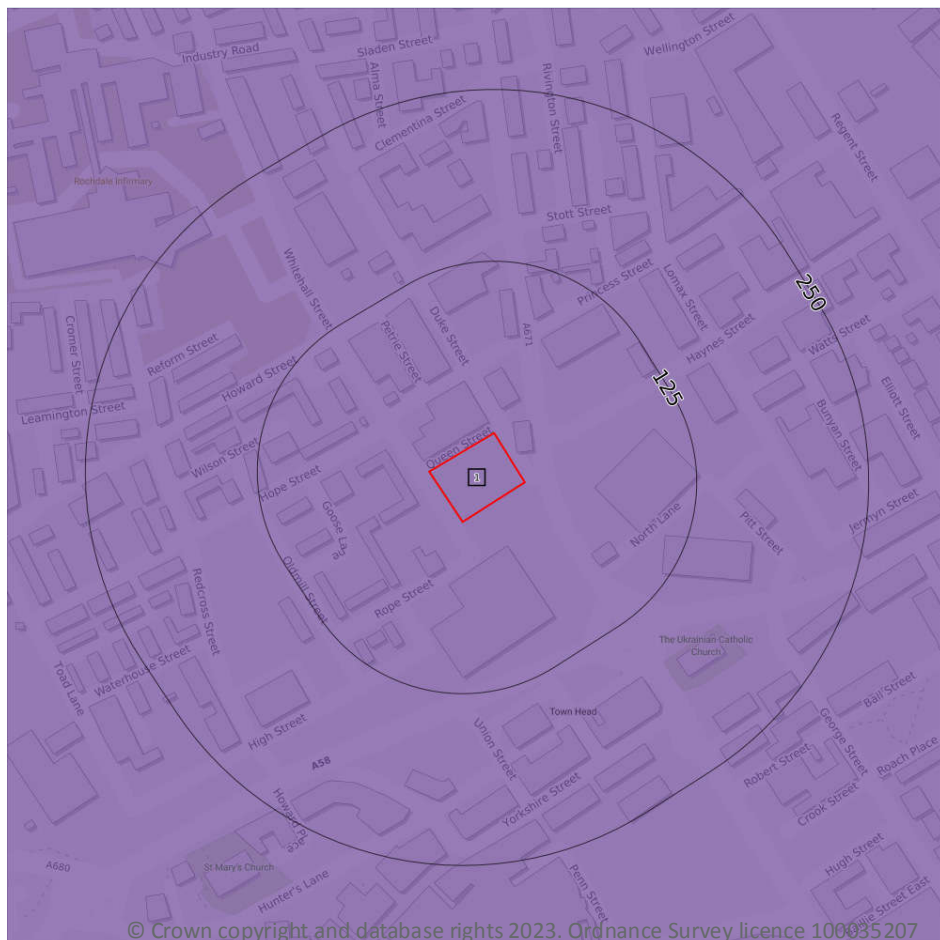
Records within 250m**0**

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.



12 Agricultural designations



- Site Outline
- Search buffers in metres (m)
- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m

1

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 93**

ID	Location	Classification	Description
1	On site	Urban	-

This data is sourced from Natural England.



12.2 Open Access Land

Records within 250m**0**

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m**0**

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m**0**

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. The schemes identified may be historical schemes that have now expired, or may still be active.

This data is sourced from Natural England.

12.5 Countryside Stewardship Schemes

Records within 250m**0**

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.



13 Habitat designations



- Site Outline
- Search buffers in metres (m)
- Priority Habitat Inventory
- Open Mosaic Habitat
- Limestone Pavement Orders
- Habitat Networks
- Primary Habitat
- Restorable Habitat
- Associated Habitats
- Habitat Restoration-Creation
- Network Enhancement Zone 1
- Network Enhancement Zone 2

13.1 Priority Habitat Inventory

Records within 250m

0

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m

0

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

This data is sourced from Natural England.



13.3 Open Mosaic Habitat

Records within 250m

1

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

Features are displayed on the Habitat designations map on **page 95**

ID	Location	Site reference	Identification confidence	Primary source	Secondary source	Tertiary source
1	127m SW	NLUD Ref: 422500030	Low	National Land Use Database - Previously Developed Land	UK Perspectives Aerial Photography	-

This data is sourced from Natural England.

13.4 Limestone Pavement Orders

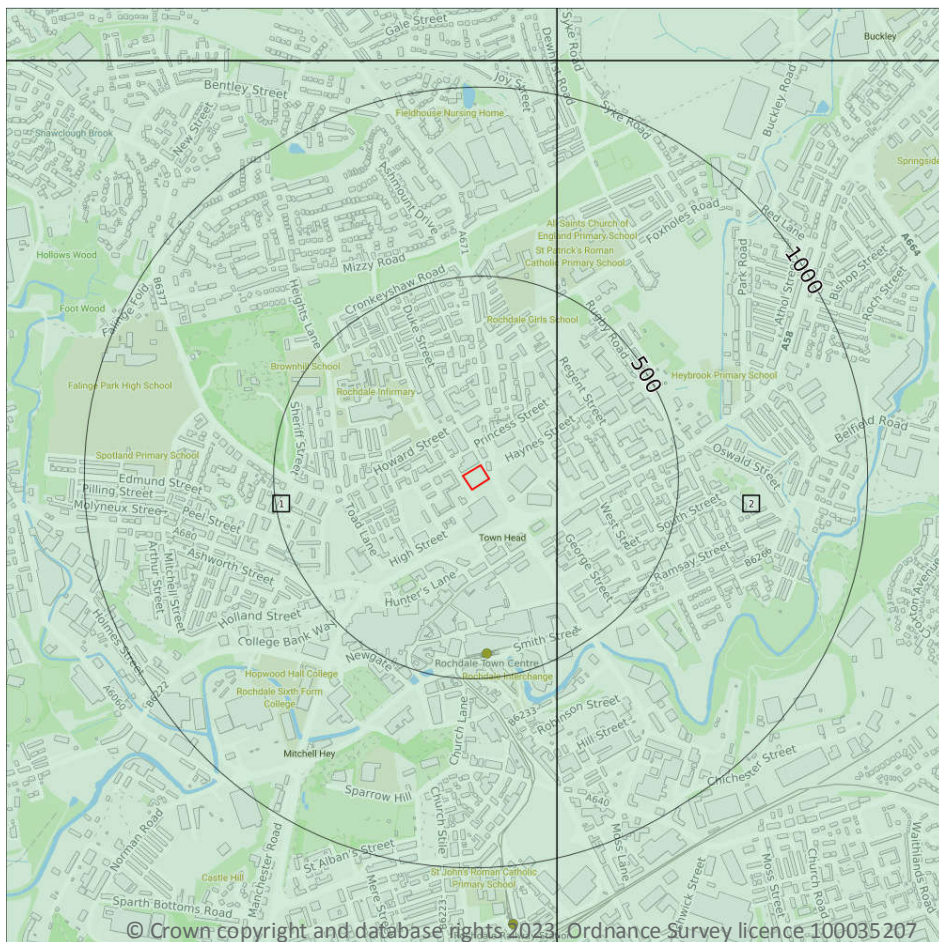
Records within 250m

0

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability



— Site Outline
Search buffers in metres (m)

- Full coverage
- Partial coverage
- No coverage

14.1 10k Availability

Records within 500m

2

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

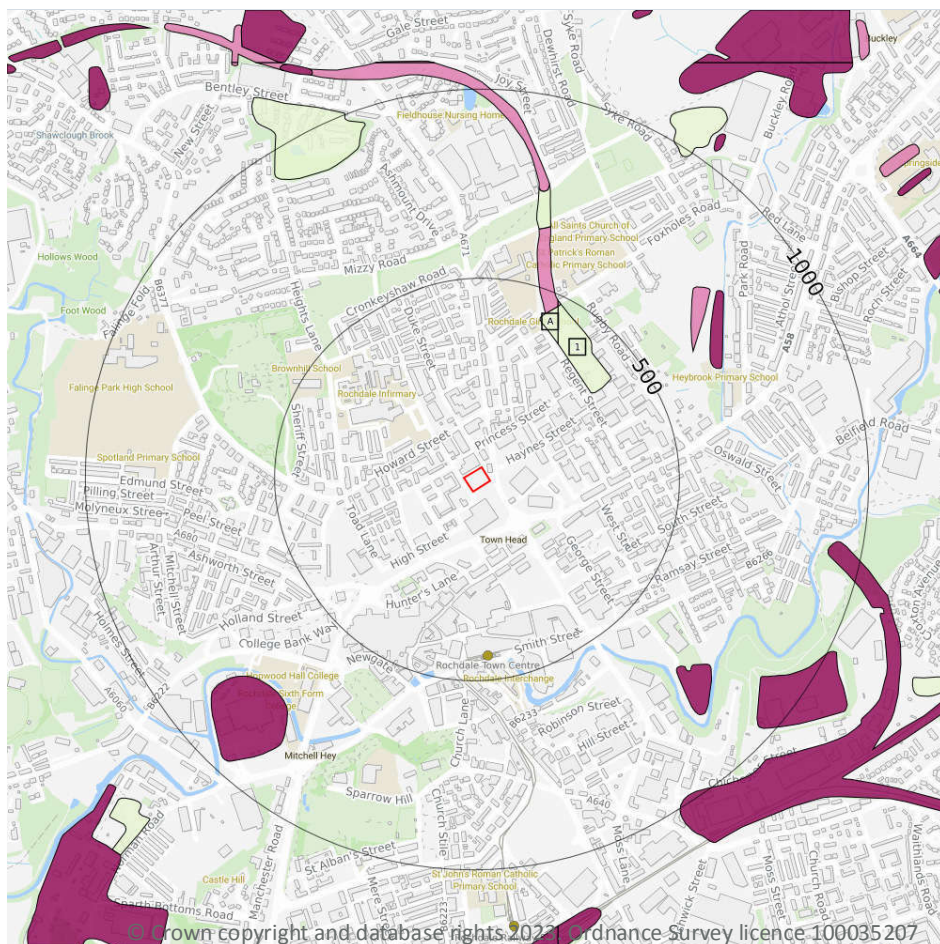
Features are displayed on the Geology 1:10,000 scale - Availability map on **page 97**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	SD81SE
2	179m E	Full	Full	Full	Full	SD91SW

This data is sourced from the British Geological Survey.



Geology 1:10,000 scale - Artificial and made ground



— Site Outline
Search buffers in metres (m)

- Reclaimed ground
- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

14.2 Artificial and made ground (10k)

Records within 500m

4

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 98**

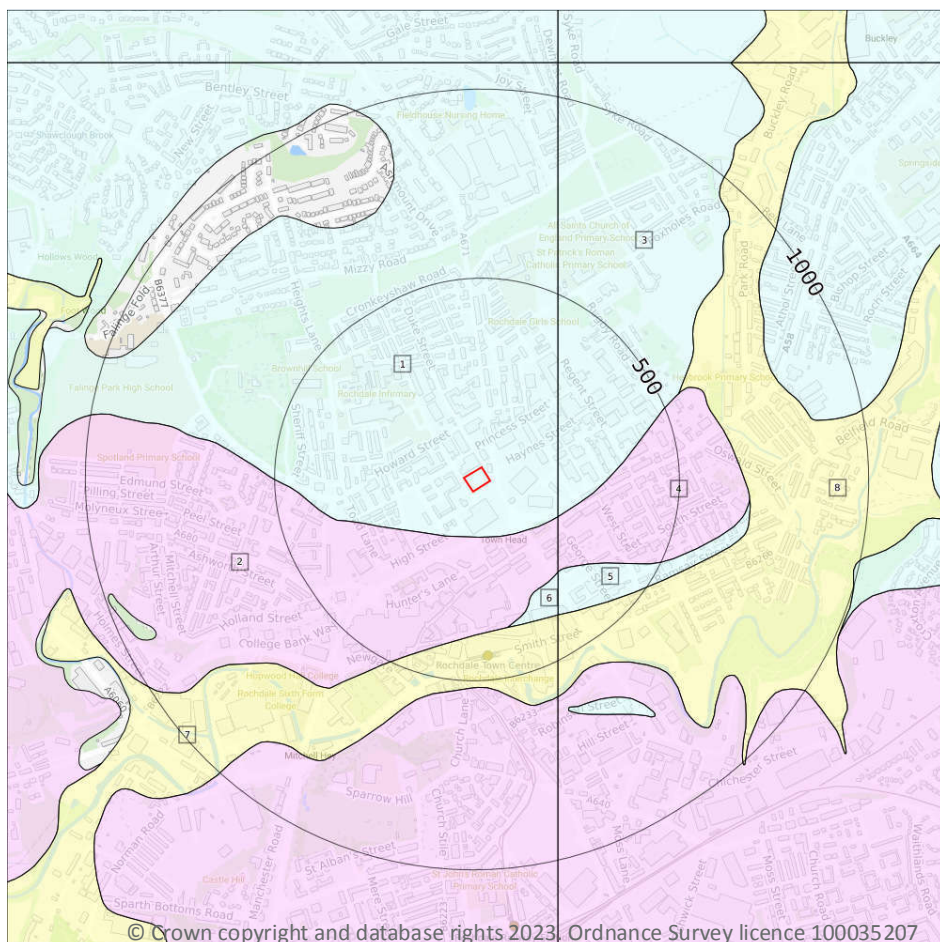
ID	Location	LEX Code	Description	Rock description
1	350m NE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
A	384m NE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
A	440m N	WGR-VOID	Worked Ground (Undivided)	Void
A	471m NE	WGR-VOID	Worked Ground (Undivided)	Void



This data is sourced from the British Geological Survey.



Geology 1:10,000 scale - Superficial



— Site Outline
Search buffers in metres (m)

Landslip (10k)

Superficial geology (10k)
Please see table for more details.

14.3 Superficial geology (10k)

Records within 500m

8

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 100**

ID	Location	LEX Code	Description	Rock description
1	On site	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
2	120m S	GFDUD-XSV	Glaciofluvial Deposits, Devensian - Sand And Gravel	Sand And Gravel
3	179m E	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton



ID	Location	LEX Code	Description	Rock description
4	203m SE	GFDUD-XSV	Glaciofluvial Deposits, Devensian - Sand And Gravel	Sand And Gravel
5	300m SE	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
6	301m SE	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
7	370m S	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel
8	395m SE	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel

This data is sourced from the British Geological Survey.

14.4 Landslip (10k)

Records within 500m

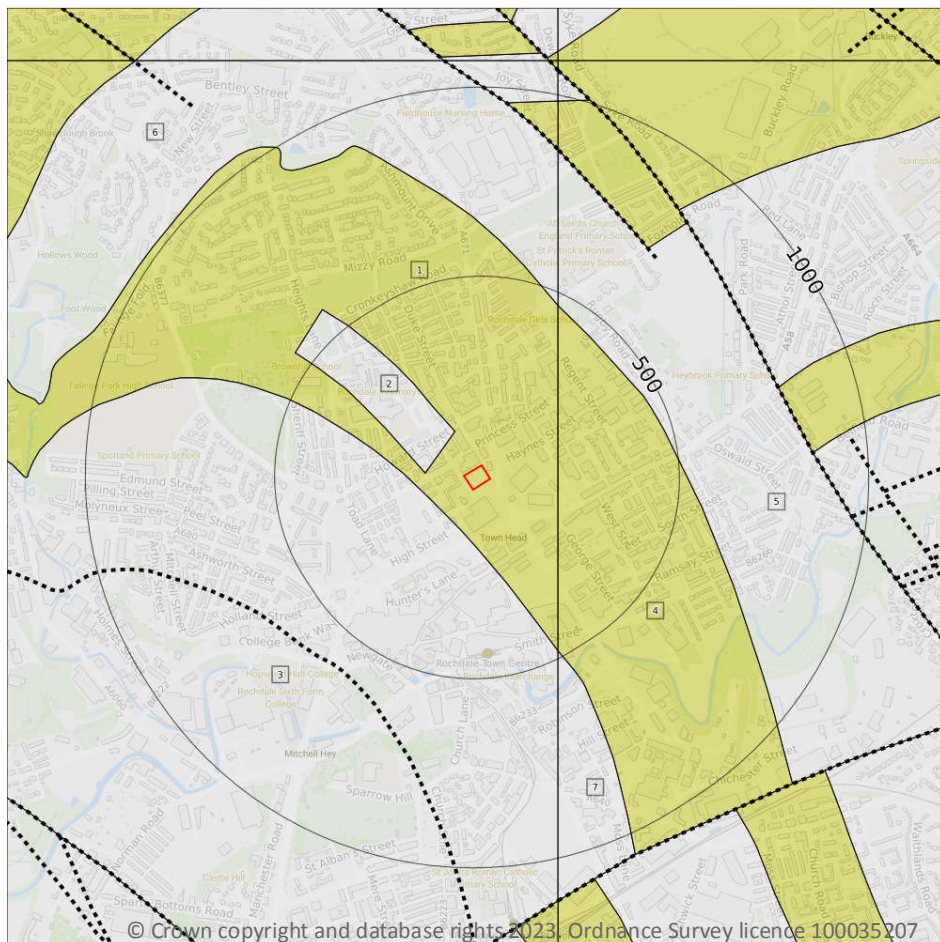
0

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.



Geology 1:10,000 scale - Bedrock



— Site Outline
Search buffers in metres (m)
..... Bedrock faults and other linear features (10k)
Bedrock geology (10k)
Please see table for more details.

14.5 Bedrock geology (10k)

Records within 500m

7

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 102**

ID	Location	LEX Code	Description	Rock age
1	On site	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian Sub-age
2	87m NW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
3	98m SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age



ID	Location	LEX Code	Description	Rock age
4	179m E	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian Sub-age
5	440m NE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
6	468m NE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
7	482m SE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age

This data is sourced from the British Geological Survey.

14.6 Bedrock faults and other linear features (10k)

Records within 500m

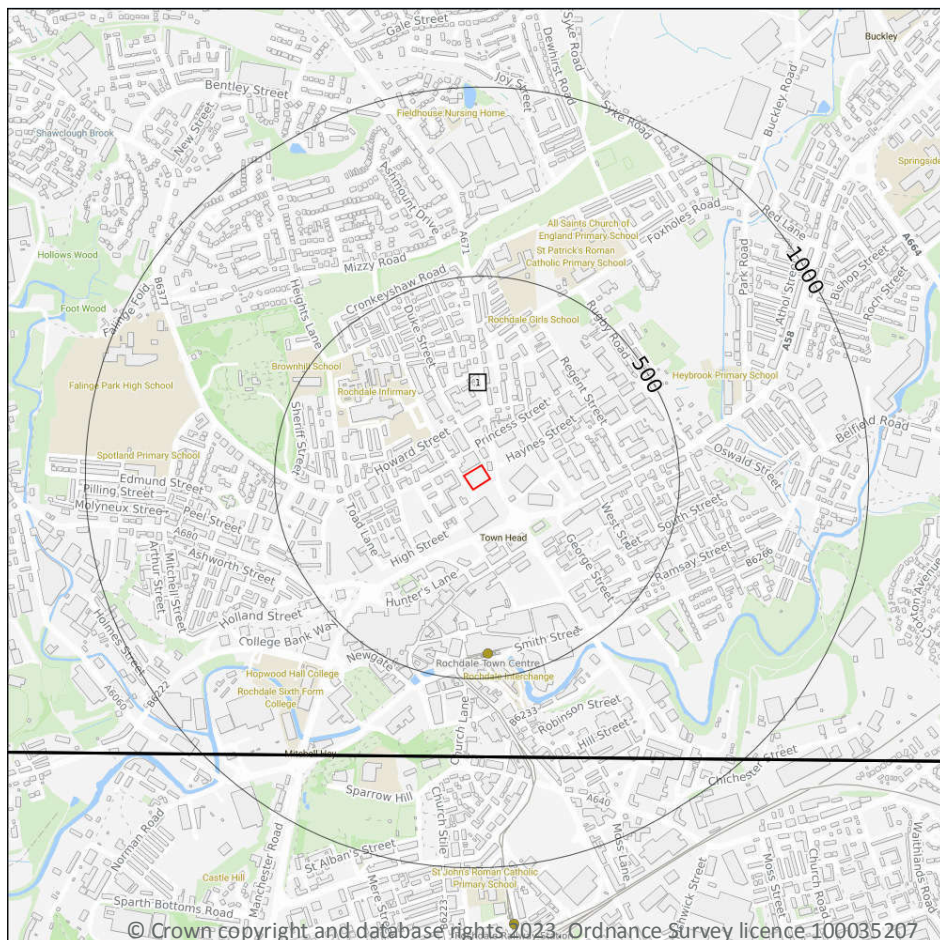
0

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.



15 Geology 1:50,000 scale - Availability



15.1 50k Availability

Records within 500m

1

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 104**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	No coverage	Full	Full	Full	EW076_rochdale_v4

This data is sourced from the British Geological Survey.



Geology 1:50,000 scale - Artificial and made ground

15.2 Artificial and made ground (50k)

Records within 500m

0

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

Records within 50m

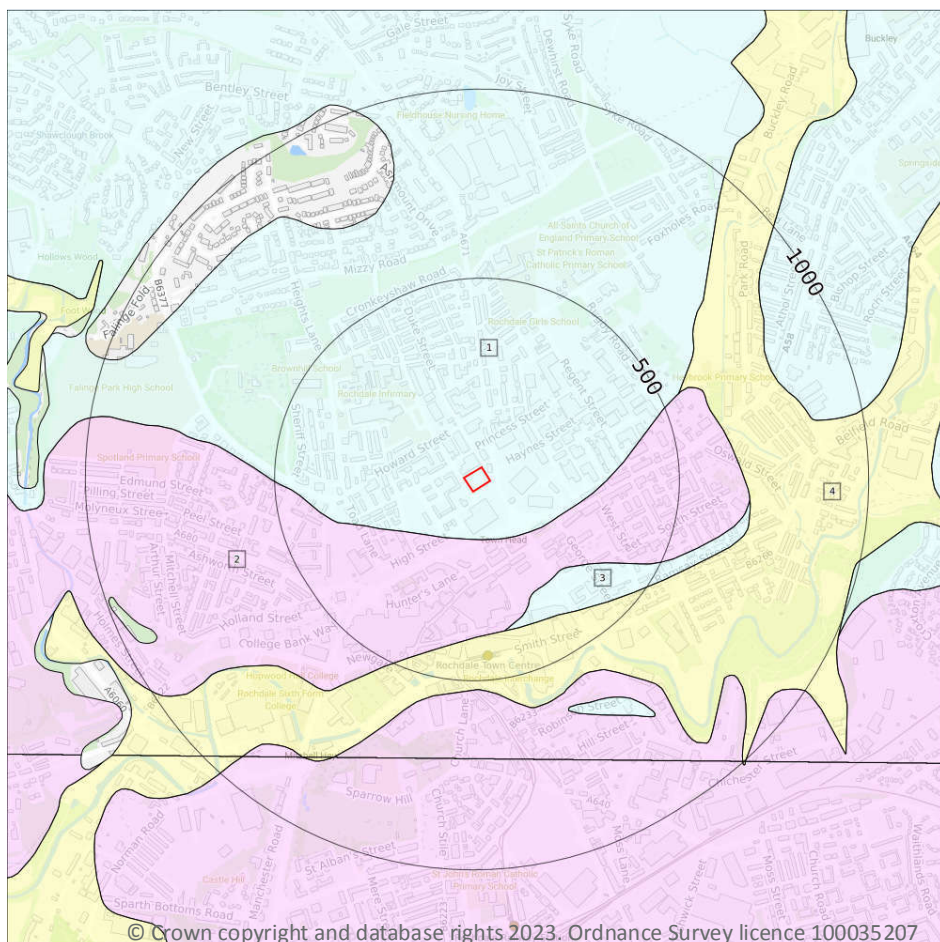
0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.



Geology 1:50,000 scale - Superficial



— Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m

4

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 106**

ID	Location	LEX Code	Description	Rock description
1	On site	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
2	126m S	GFDUD-XSV	GLACIOFLUVIAL DEPOSITS, DEVENSIAN	SAND AND GRAVEL
3	301m SE	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON



ID	Location	LEX Code	Description	Rock description
4	378m S	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	1
---------------------------	----------

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Mixed	High	Low

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	0
----------------------------	----------

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

15.7 Landslip permeability (50k)

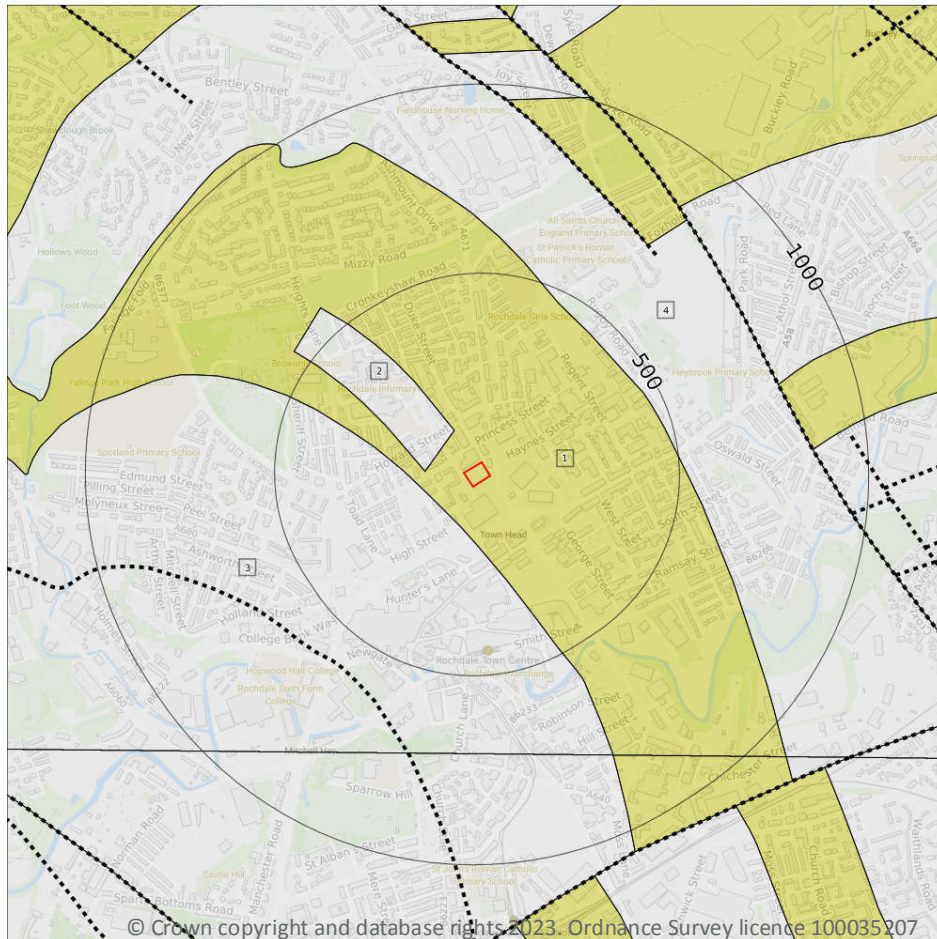
Records within 50m	0
---------------------------	----------

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.



Geology 1:50,000 scale - Bedrock



— Site Outline
Search buffers in metres (m)
..... Bedrock faults and other linear features (50k)
Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m

4

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 108**

ID	Location	LEX Code	Description	Rock age
1	On site	OL-SDST	OLD LAWRENCE ROCK - SANDSTONE	WESTPHALIAN
2	86m NW	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
3	98m SW	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN



ID	Location	LEX Code	Description	Rock age
4	440m NE	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m

1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Fracture	High	Moderate

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m

0

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.



16 Boreholes



— Site Outline
Search buffers in metres (m)

- Confidential
- 0 - 10m
- 10 - 30m
- 30m+
- Unknown

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16.1 BGS Boreholes

Records within 250m

11

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on **page 110**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	On site	389800 413900	HOLCROFT CASTING & FORGING LTD (2 WELLS &)	-1.0	N	30282
A	123m SE	389900 413800	ROCHDALE GSC. 4	24.95	N	29778

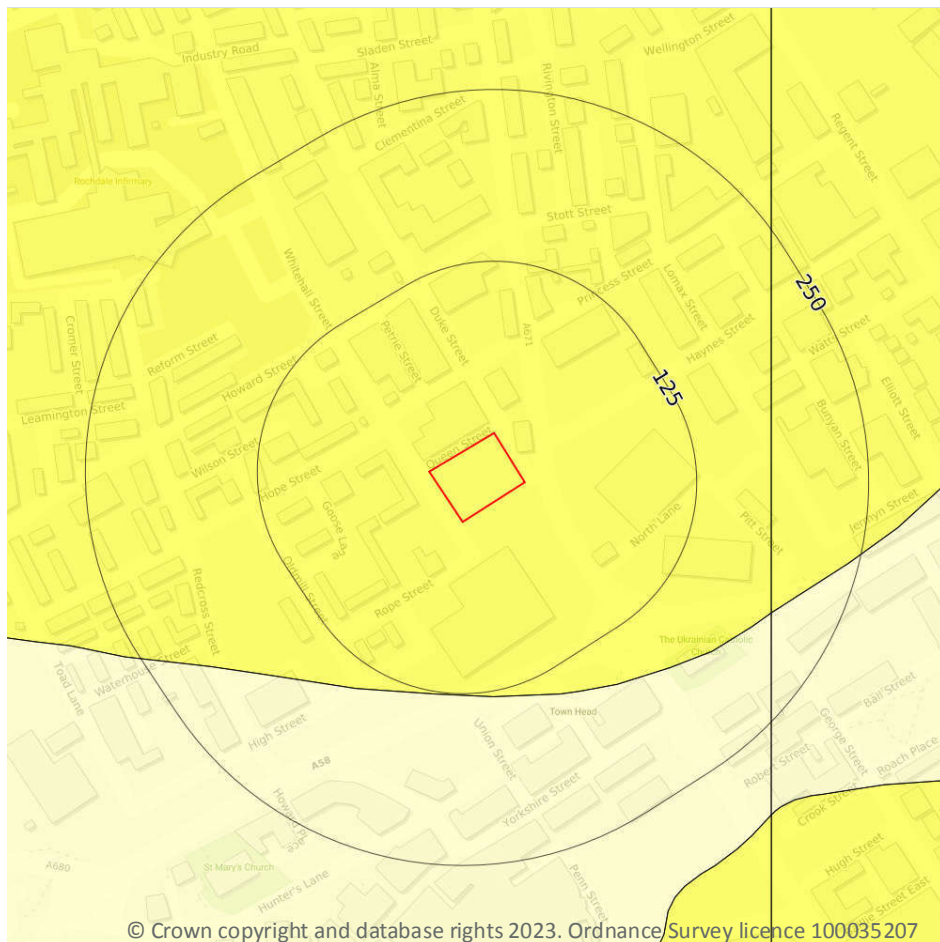


ID	Location	Grid reference	Name	Length	Confidential	Web link
A	123m SE	389900 413800	ROCHDALE GSC. 2	25.0	N	29777
A	123m SE	389900 413800	ROCHDALE GSC. 6	16.0	N	29779
A	123m SE	389900 413800	ROCHDALE GSC. 9	16.0	N	29782
A	123m SE	389900 413800	ROCHDALE GSC. 8	16.0	N	29781
A	123m SE	389900 413800	ROCHDALE GSC. 7	15.9	N	29780
2	211m NW	389570 414010	ROCHDALE INFIRMARY BH8	4.3	N	30218
3	218m W	389540 413850	FALINGE RD ROCHDALE 2	6.24	N	29899
4	219m NW	389600 414060	ROCHDALE INFIRMARY BH11	6.25	N	30221
5	244m SW	389540 413780	FALINGE RD ROCHDALE 4	4.88	N	29901

This data is sourced from the British Geological Survey.



17 Natural ground subsidence - Shrink swell clays



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☐ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

17.1 Shrink swell clays

Records within 50m

1

The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

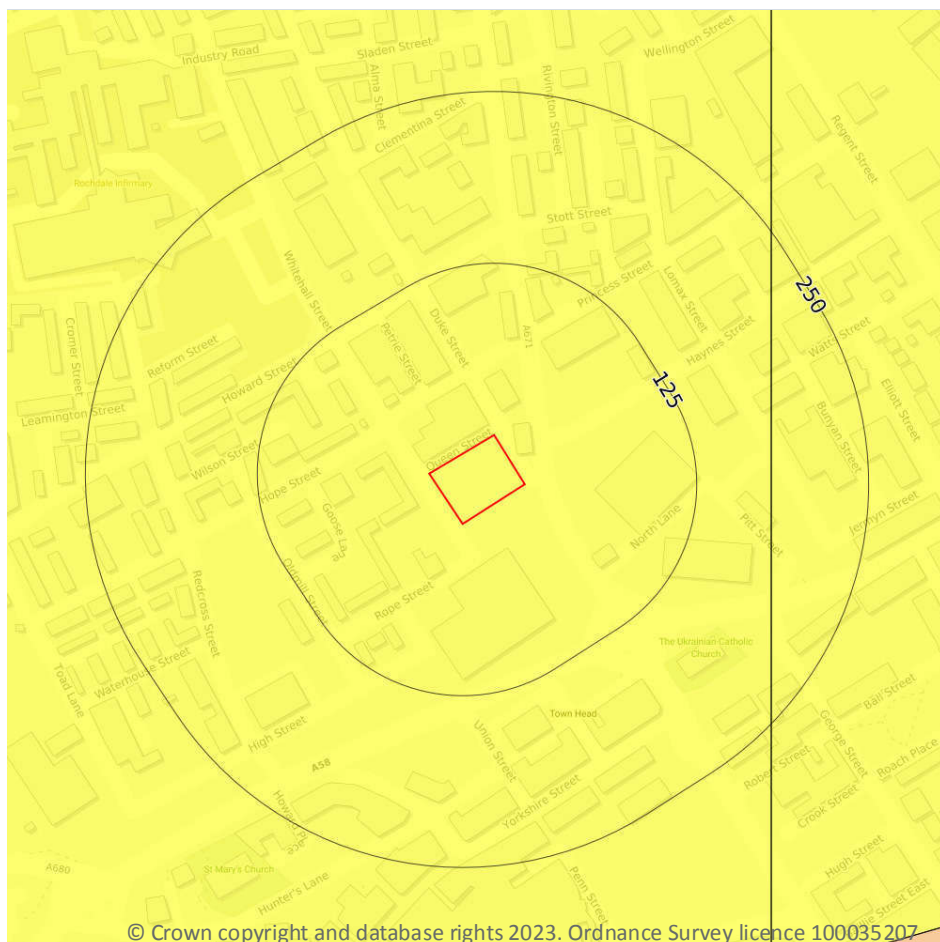
Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 112**

Location	Hazard rating	Details
On site	Very low	Ground conditions predominantly low plasticity.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Running sands



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☒ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

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17.2 Running sands

Records within 50m

1

The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

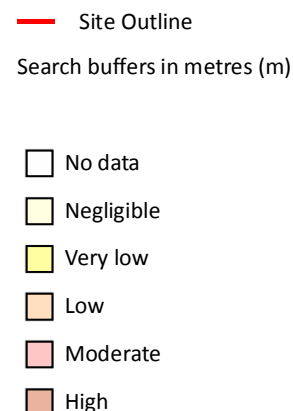
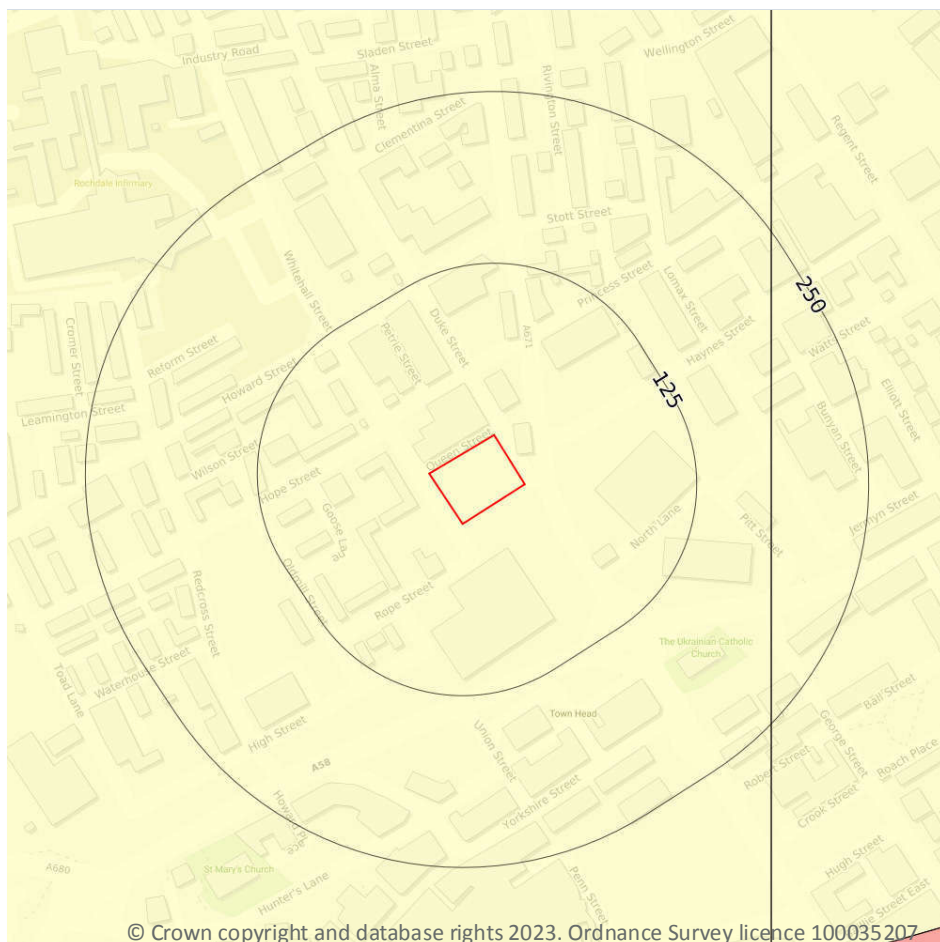
Features are displayed on the Natural ground subsidence - Running sands map on **page 113**

Location	Hazard rating	Details
On site	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Compressible deposits



17.3 Compressible deposits

Records within 50m

1

The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

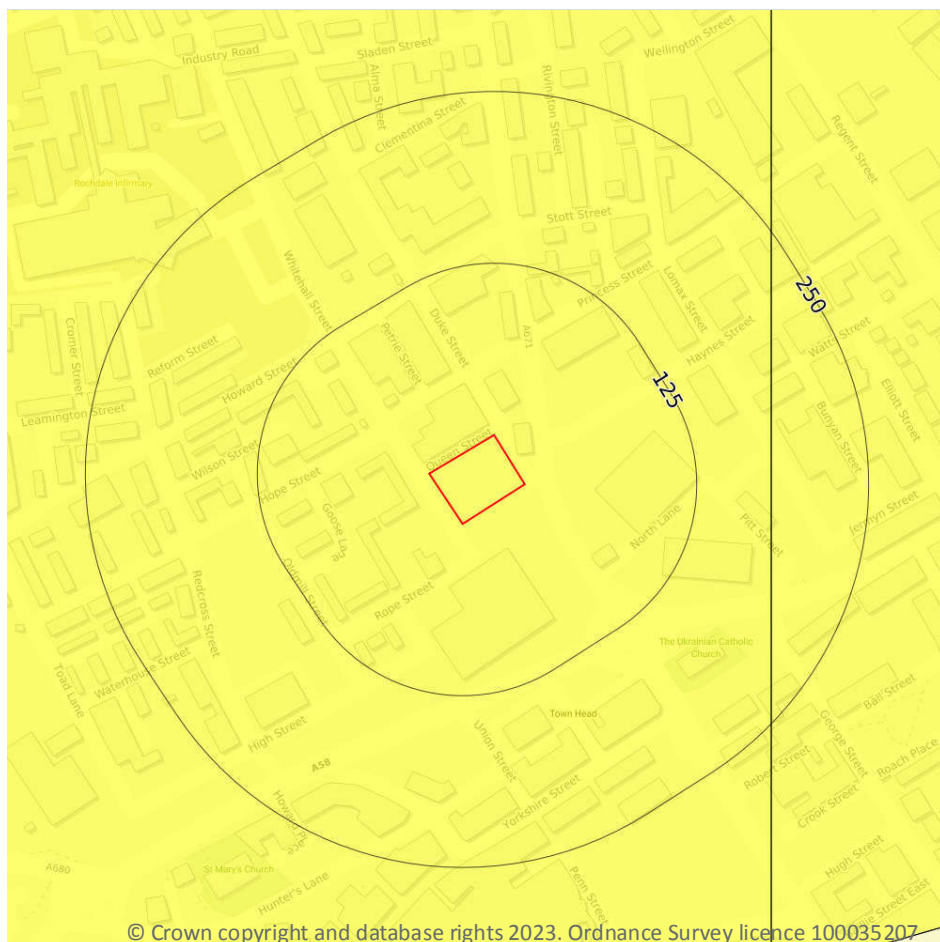
Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 114**

Location	Hazard rating	Details
On site	Negligible	Compressible strata are not thought to occur.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Collapsible deposits



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☒ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

17.4 Collapsible deposits

Records within 50m

1

The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

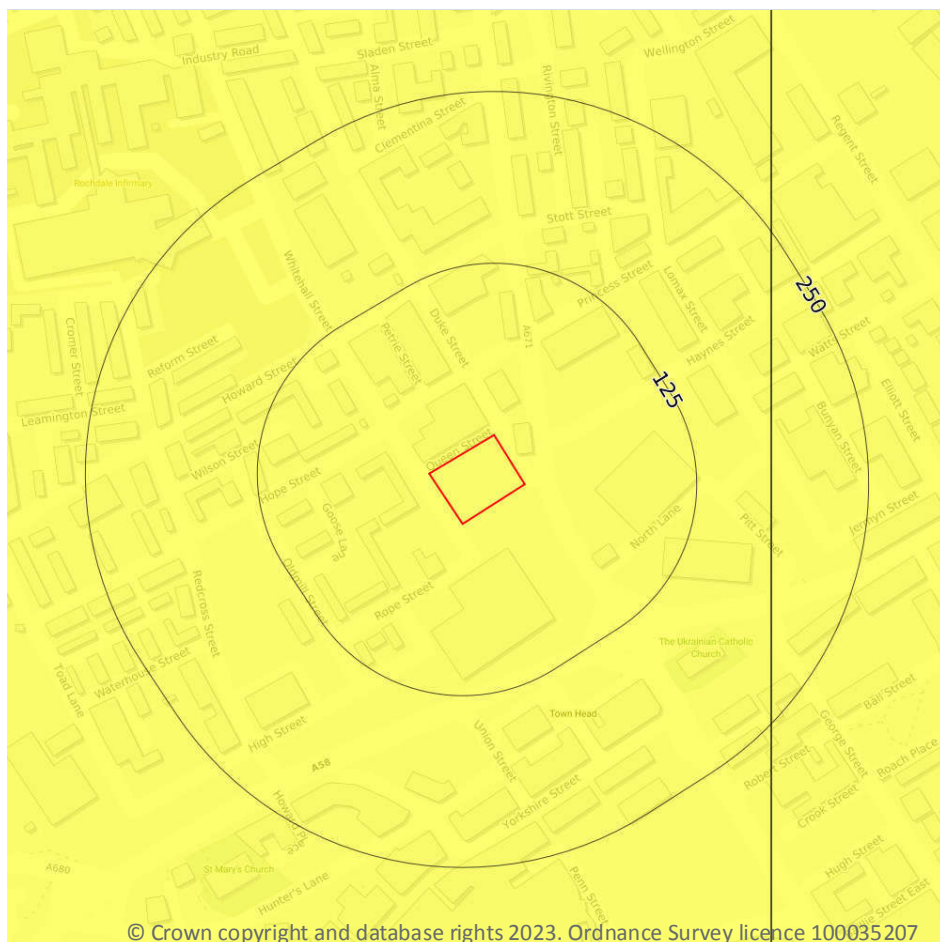
Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 115**

Location	Hazard rating	Details
On site	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Landslides



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☒ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

17.5 Landslides

Records within 50m

1

The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

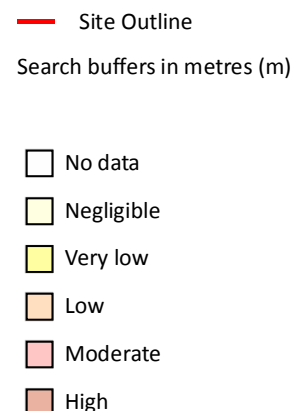
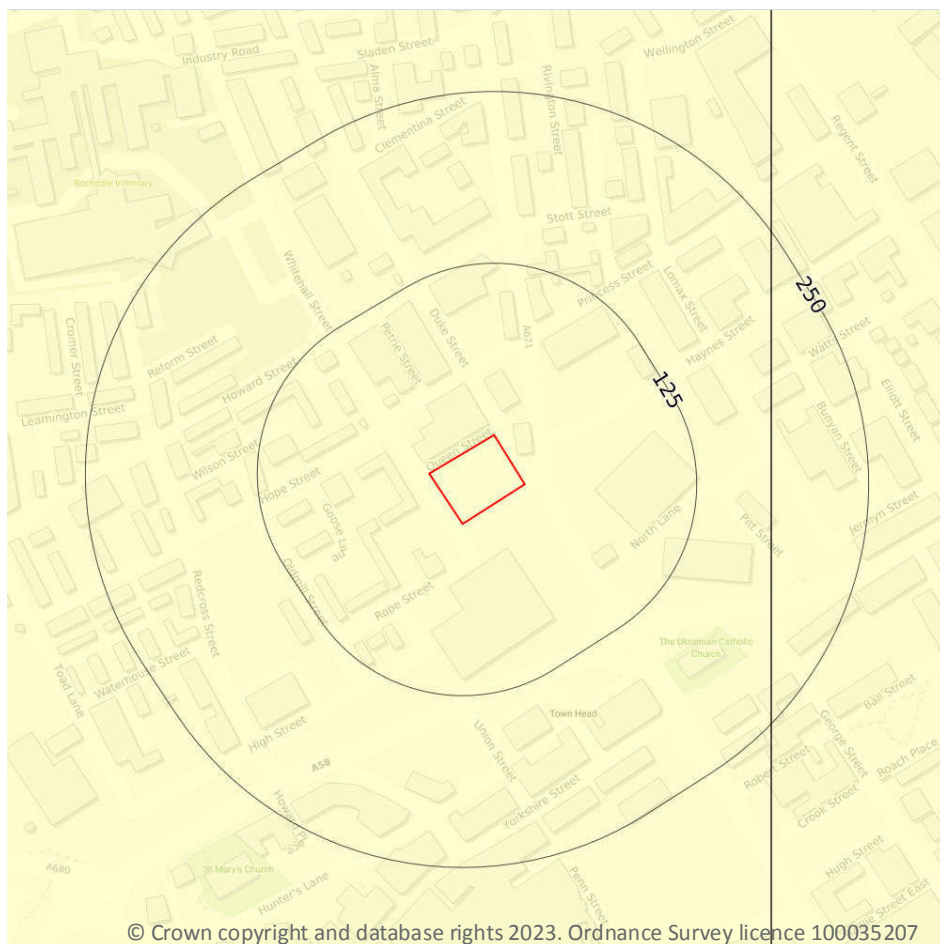
Features are displayed on the Natural ground subsidence - Landslides map on **page 116**

Location	Hazard rating	Details
On site	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Ground dissolution of soluble rocks



17.6 Ground dissolution of soluble rocks

Records within 50m

1

The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

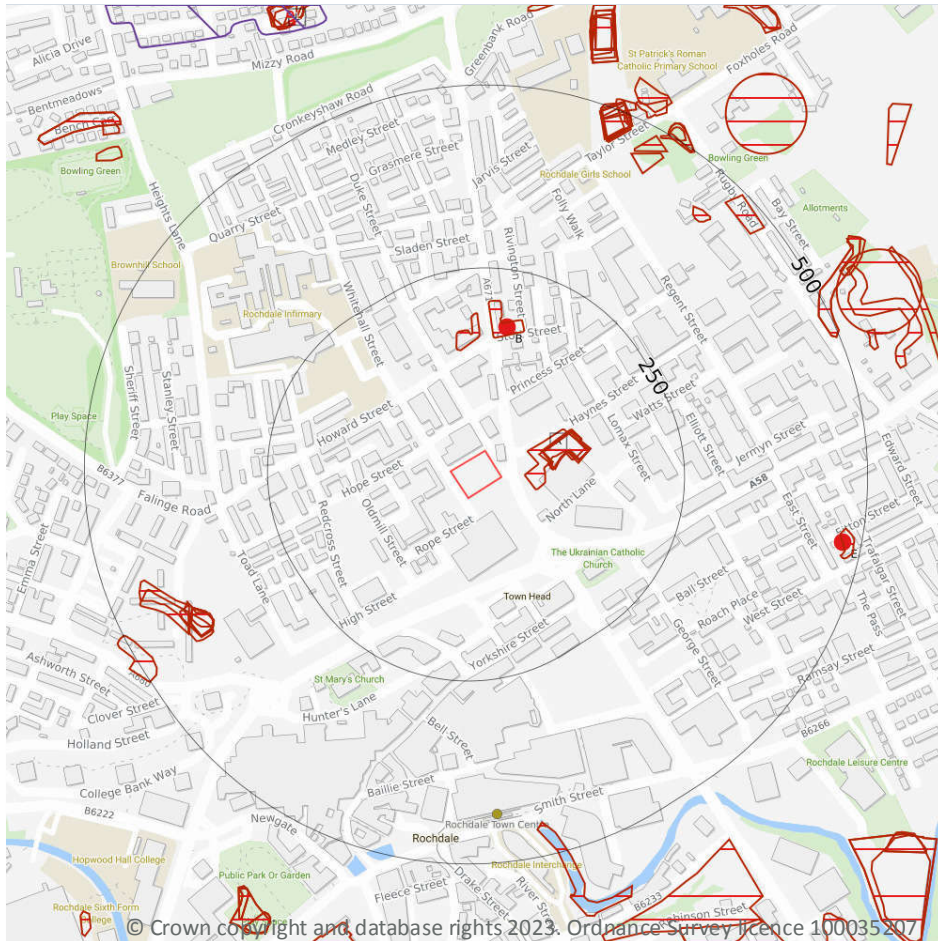
Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 117**

Location	Hazard rating	Details
On site	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.

This data is sourced from the British Geological Survey.



18 Mining, ground workings and natural cavities



- Site Outline
- Search buffers in metres (m)
- ▢ Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- ▢ Surface ground workings
- ▢ Underground workings
- ▢ Historical Mineral Planning Areas
- Mining Cavities
- Non Coal Mining
- ▢ Sporadic underground mining of restricted extent possible
- ▢ Localised small scale underground mining possible
- ▢ Small scale mining possible
- ▢ Underground mining known or likely within or in close proximity
- ▢ Underground mining known within or in very close proximity

18.1 Natural cavities

Records within 500m

0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

18.2 BritPits

Records within 500m

2

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

Features are displayed on the Mining, ground workings and natural cavities map on **page 119**

ID	Location	Details	Description
B	171m N	Name: Green Hayes Clay Pit Address: Town Head, ROCHDALE, Lancashire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
E	474m E	Name: Rock House Sand Pit Address: Town Head, ROCHDALE, Lancashire Commodity: Sand Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m

7

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 119**

ID	Location	Land Use	Year of mapping	Mapping scale
A	32m E	Ponds	1851	1:10560
A	60m E	Reservoir	1949	1:10560
A	65m E	Reservoir	1938	1:10560
A	66m E	Reservoir	1928	1:10560
A	66m E	Reservoir	1908	1:10560
B	141m N	Pond	1851	1:10560



ID	Location	Land Use	Year of mapping	Mapping scale
B	155m N	Clay Pit	1851	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m

3

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining, ground workings and natural cavities map on **page 119**

ID	Location	Land Use	Year of mapping	Mapping scale
L	638m N	Unspecified Old Shaft	1928	1:10560
L	649m N	Unspecified Disused Shaft	1968	1:10560
-	662m N	Unspecified Old Shaft	1890	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m

0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m

0

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.



18.7 Mining cavities

Records within 1000m

0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Stantec UK Ltd.

18.8 JPB mining areas

Records on site

0

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site

1

Areas which could be affected by past, current or future coal mining.

Location	Details
On site	The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site

0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0
-----------------	---

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0
-----------------	---

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

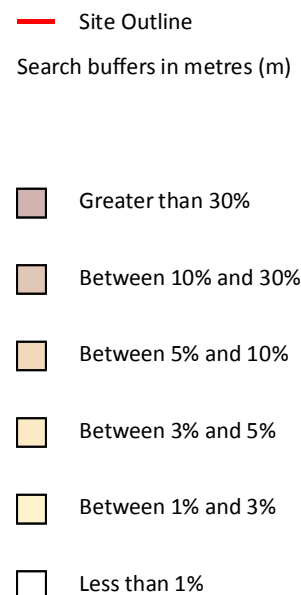
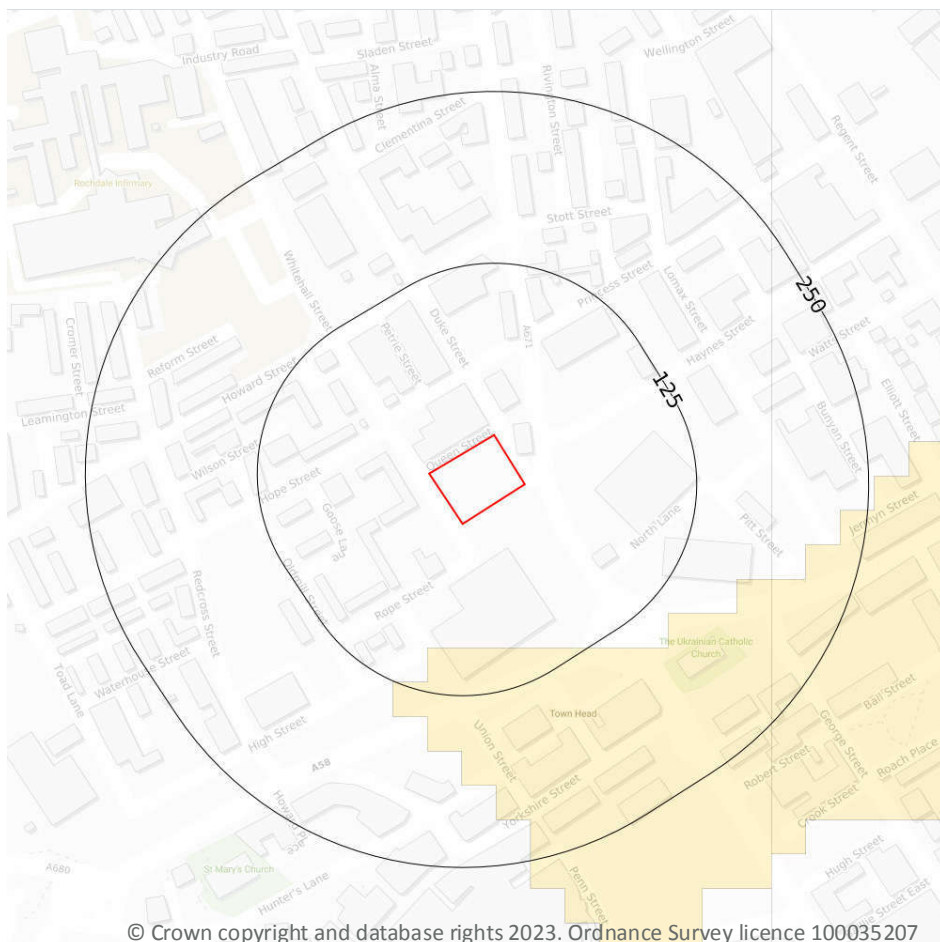
18.13 Clay mining

Records on site	0
-----------------	---

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon



19.1 Radon

Records on site

1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on **page 124**

Location	Estimated properties affected	Radon Protection Measures required
On site	Less than 1%	None



This data is sourced from the British Geological Survey and UK Health Security Agency.



20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m

1

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km². In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km²; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	15 - 25 mg/kg	No data	600 - 1200 mg/kg	360 - 720 mg/kg	3.0 - 6.0 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m

0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km²).

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

Records within 50m

0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km².

This data is sourced from the British Geological Survey.



21 Railway infrastructure and projects

21.1 Underground railways (London)

Records within 250m**0**

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m**0**

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m**0**

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m**0**

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m**0**

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.



This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m

0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m

0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m

0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m

0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m

0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 Ltd.



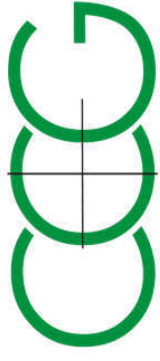
Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see <https://www.groundsure.com/sources-reference>.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: <https://www.groundsure.com/terms-and-conditions-jan-2020/>.





Site Details:

Land off Queen Street &
Whitehall Street, Rochdale,
OL12 0TY

Client Ref: CMAPS-AAG-1078975-4165-030123
Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: 1056 Scale Town Plan

Map date: 1851

Scale: 1:1,056

Printed at: 1:1,056



Surveyed N/A
Revised N/A
Edition N/A
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Levelled N/A



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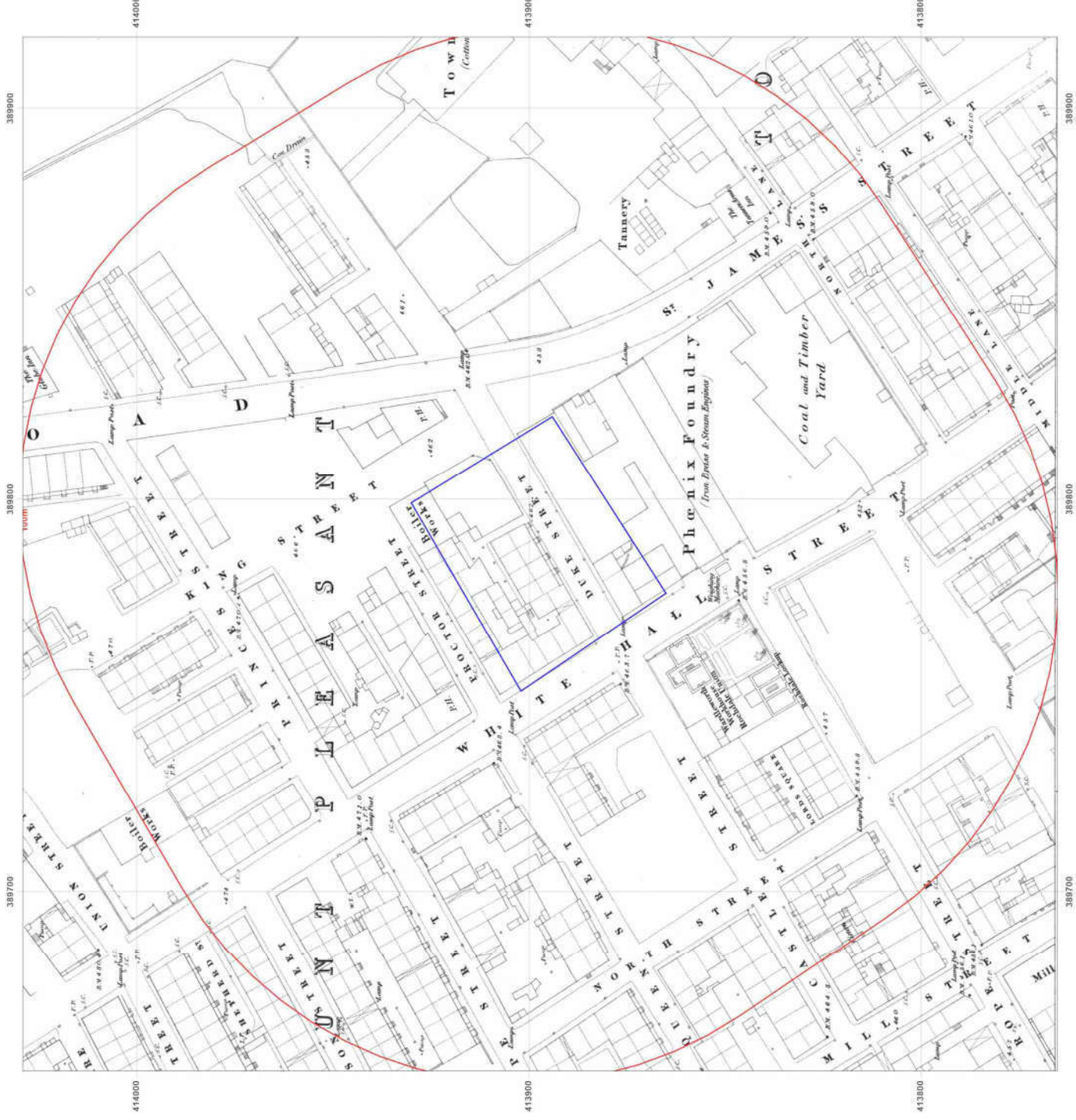
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Production date: 03 January 2023

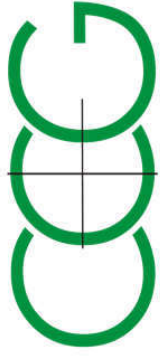
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www.groundsure.com/sites/default/files/groundsure_legend.pdf



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www.groundsurre.com/sites/default/files/groundsurre_legend.pdf



Site Details:

Land off Queen Street &
Whitehall Street, Rochdale,
OL12 0TY

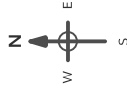
Client Ref: CMAPS-AAG-1078975-4165-030123
Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: County Series Town Plan

Map date: 1892

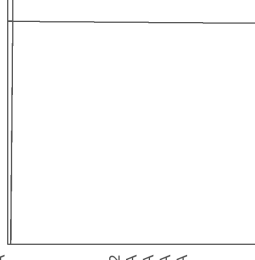
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Edition N/A
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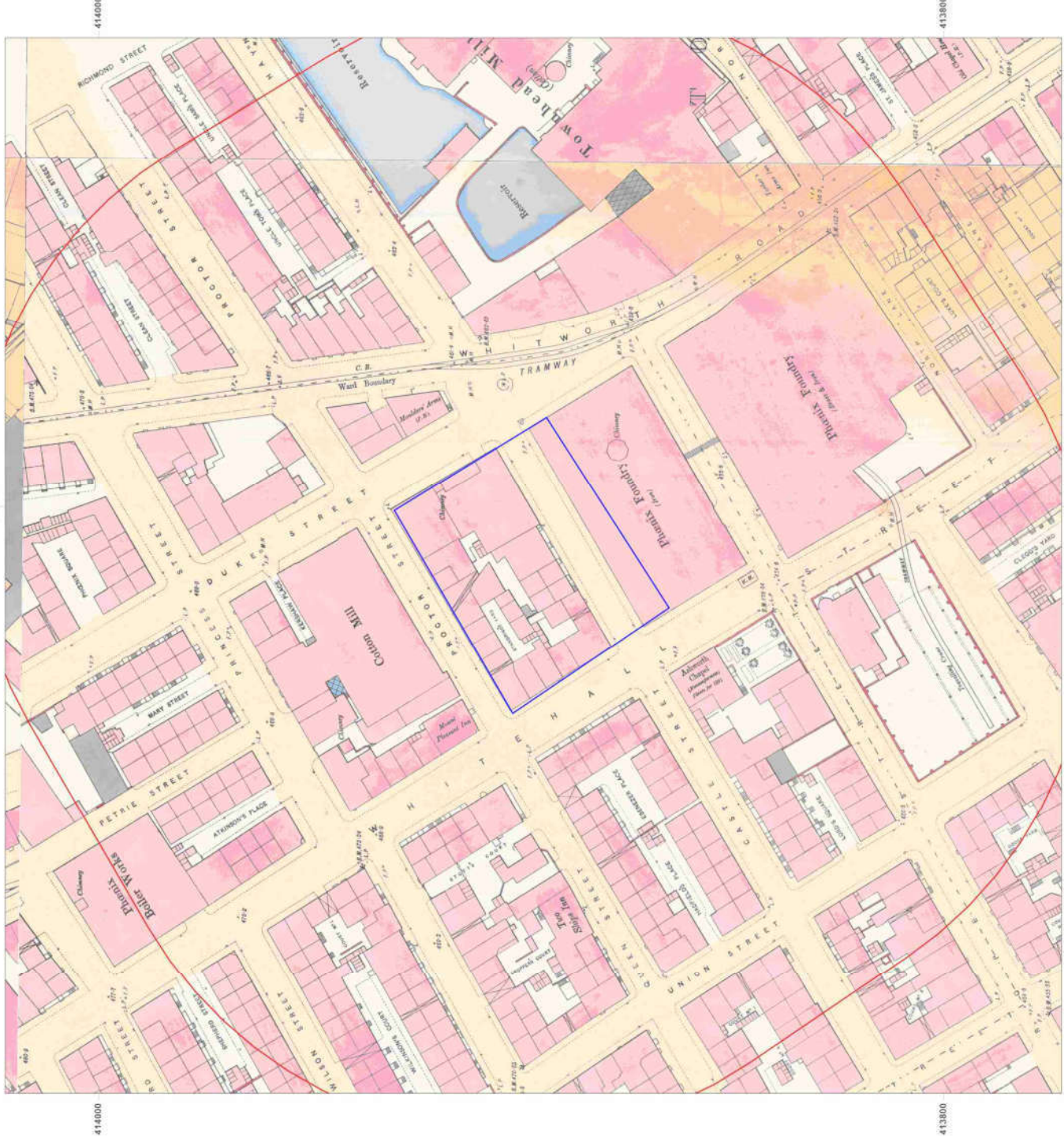
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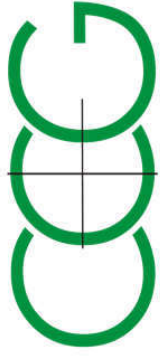
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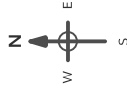
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: County Series

Map date: 1910

Scale: 1:2,500

Printed at: 1:2,500



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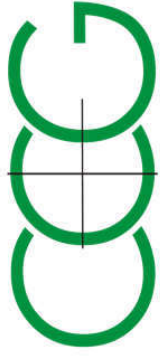
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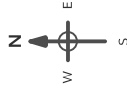
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: County Series

Map date: 1930

Scale: 1:2,500

Printed at: 1:2,500



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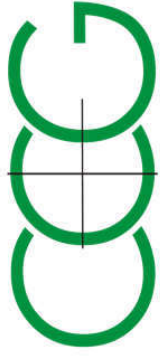
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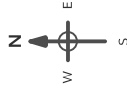
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: National Grid

Map date: 1957-1959

Scale: 1:1,250

Printed at: 1:2,000



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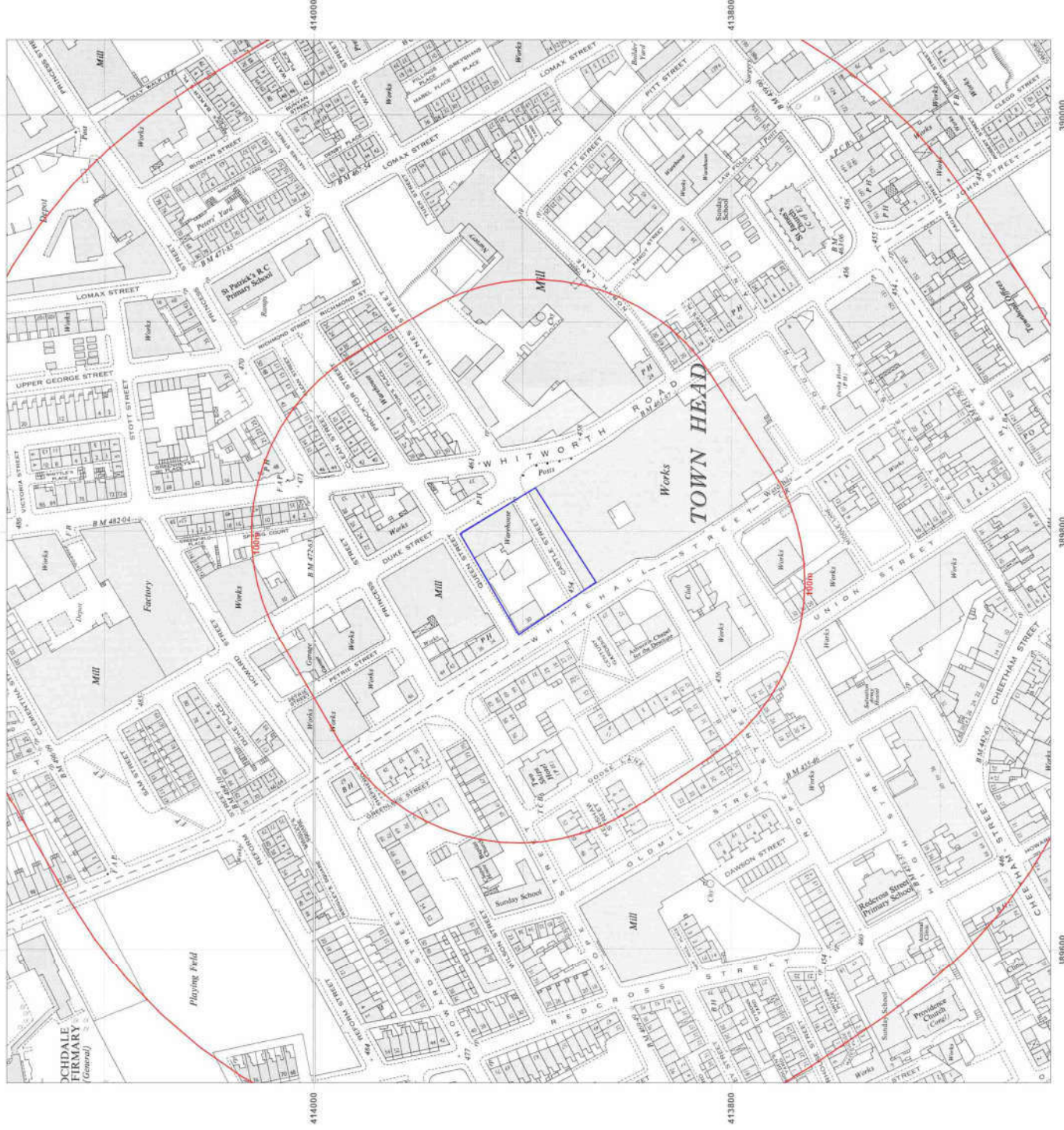
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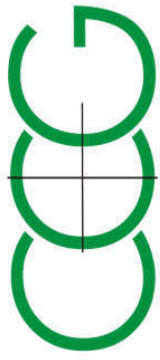
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Client Ref: CMAPS-AAG-1078975-4165-030123
Report Ref: CMAPS-AAG-1078975-4165-030123HIS
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Map Name: National Grid
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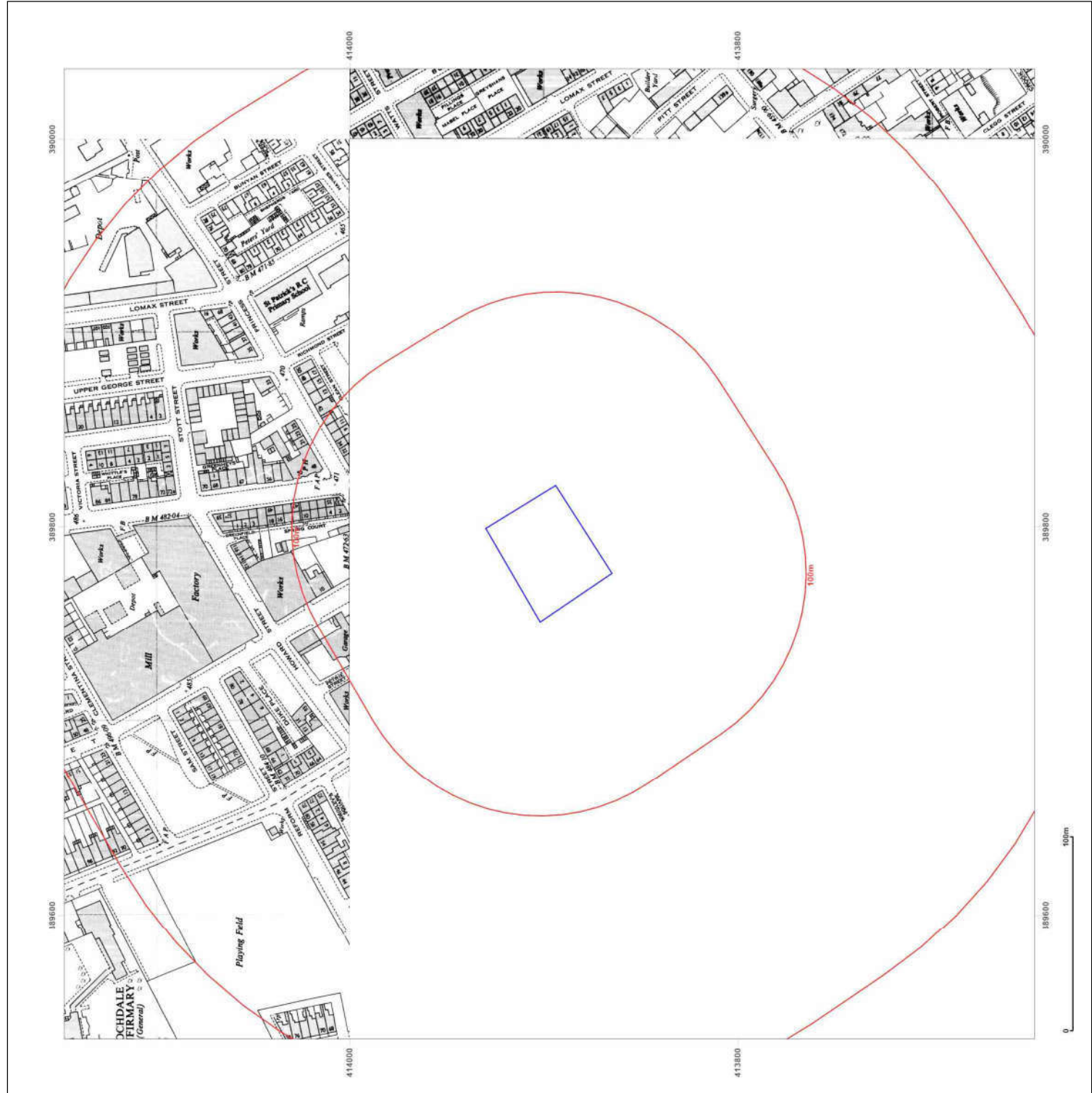
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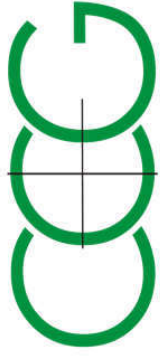
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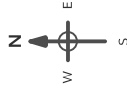
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Map Name: National Grid

Map date: 1958-1959

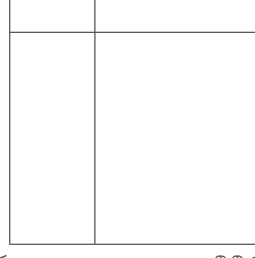
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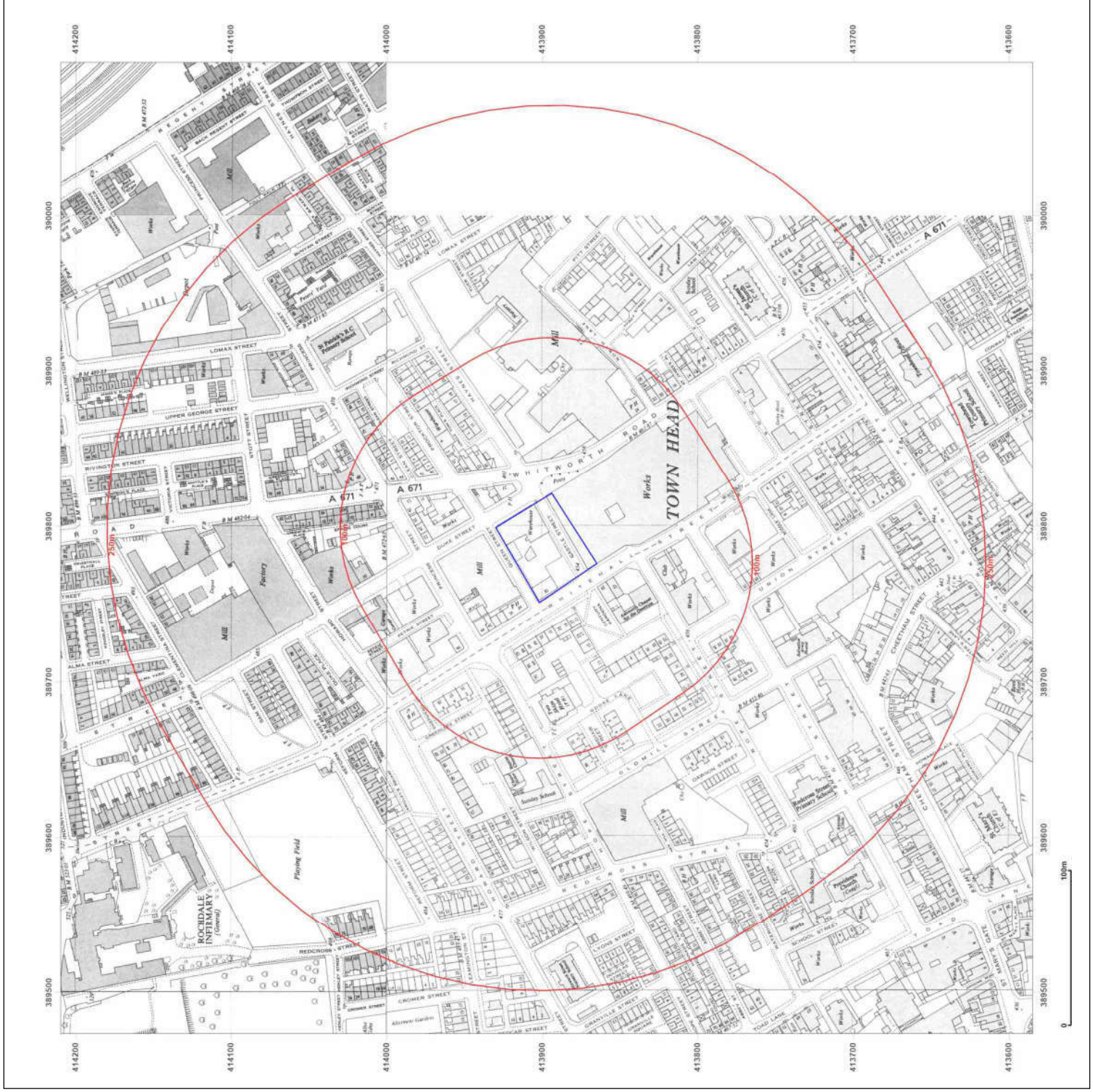
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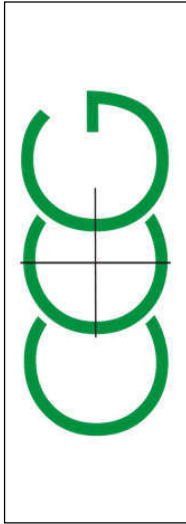
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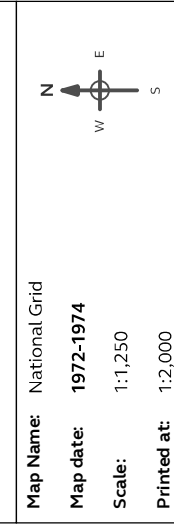
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Report Ref: CMAPS-AAG-1078975-4165-030123/HIS
Grid Ref: 389786, 413897

Map Name:	National Grid
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Map date: 1972-1974

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A	Surveyed N/A
Revised N/A	Revised N/A
Edition N/A	Edition N/A
Copyright 1974	Copyright 1974
Levelled N/A	Levelled N/A

		Surveyed 1959 Revised 1971 Edition N/A Copyright 1972 Levelled 1962	Surveyed N/A Revised N/A Edition N/A Copyright 1974 Levelled N/A
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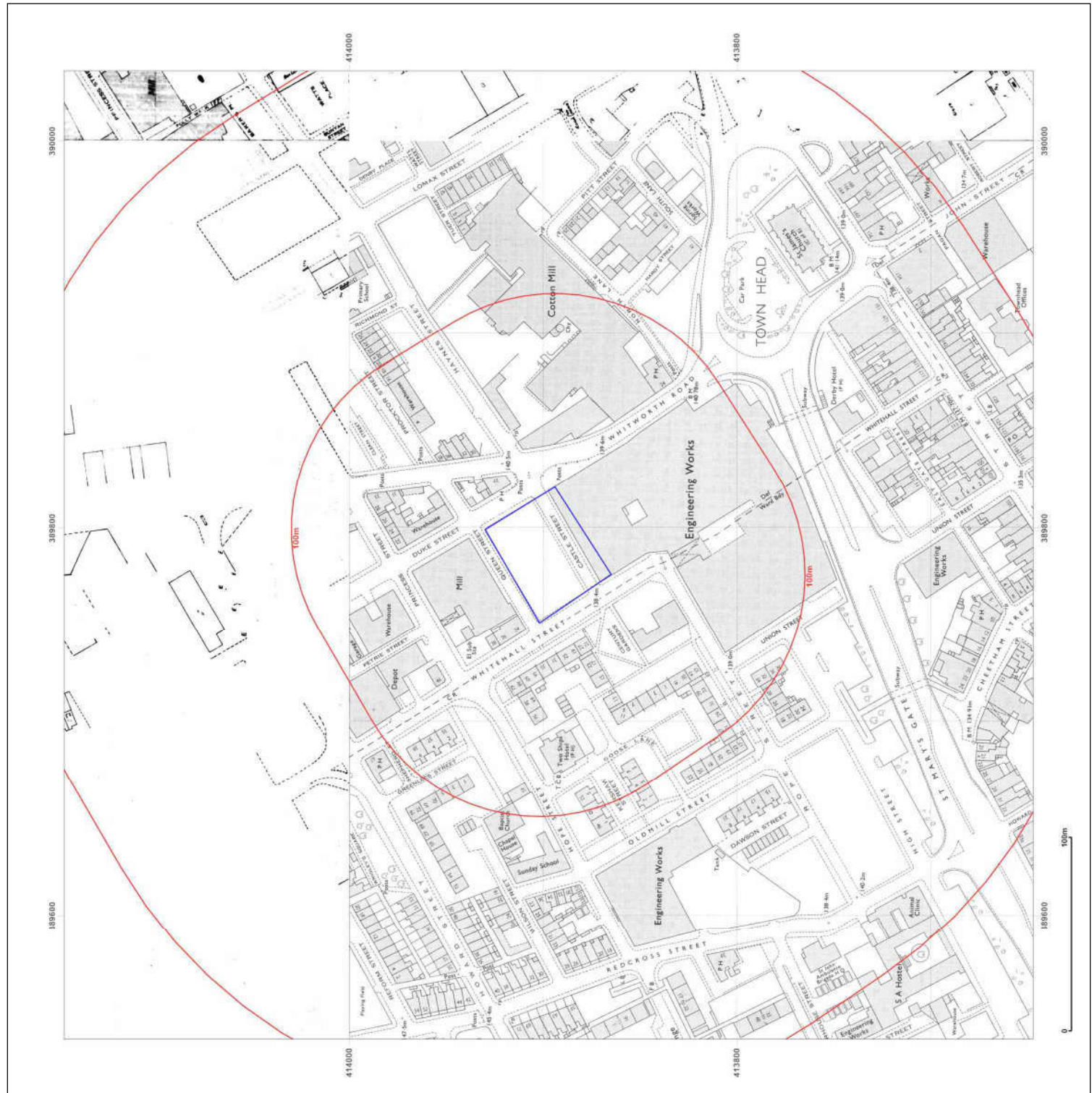
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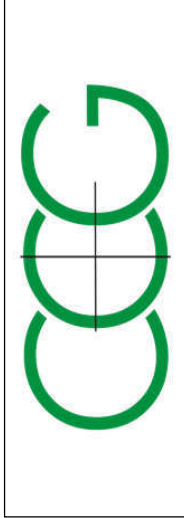
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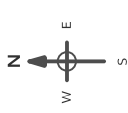
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: National Grid
Map date: 1976-1977
Scale: 1:1,250
Printed at: 1:2,000

Surveyed N/A
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Edition N/A
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Levelled 1962



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Edition N/A
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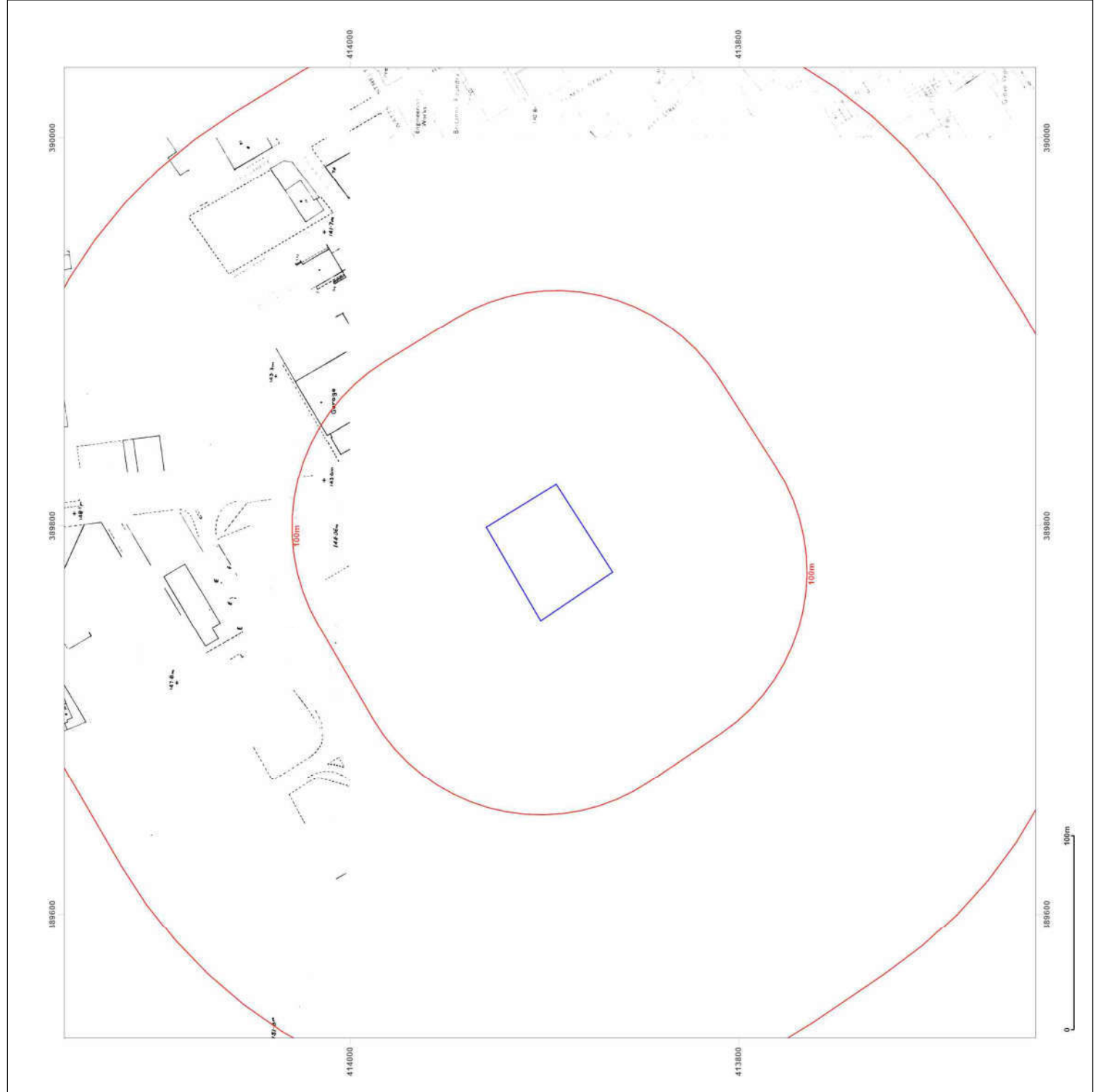
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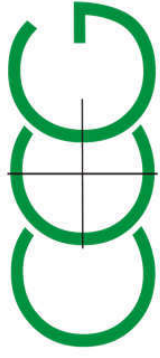
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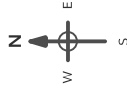
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: National Grid

Map date: 1982-1987

Scale: 1:1,250

Printed at: 1:2,000



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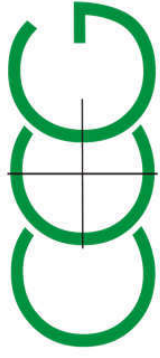
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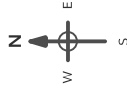
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Report Ref: CMAPS-AAG-1078975-4165-030123/HIS
Grid Ref: 389786, 413897

Map Name: National Grid

Map date: 1985-1989

Scale: 1:1,250

Printed at: 1:2,000



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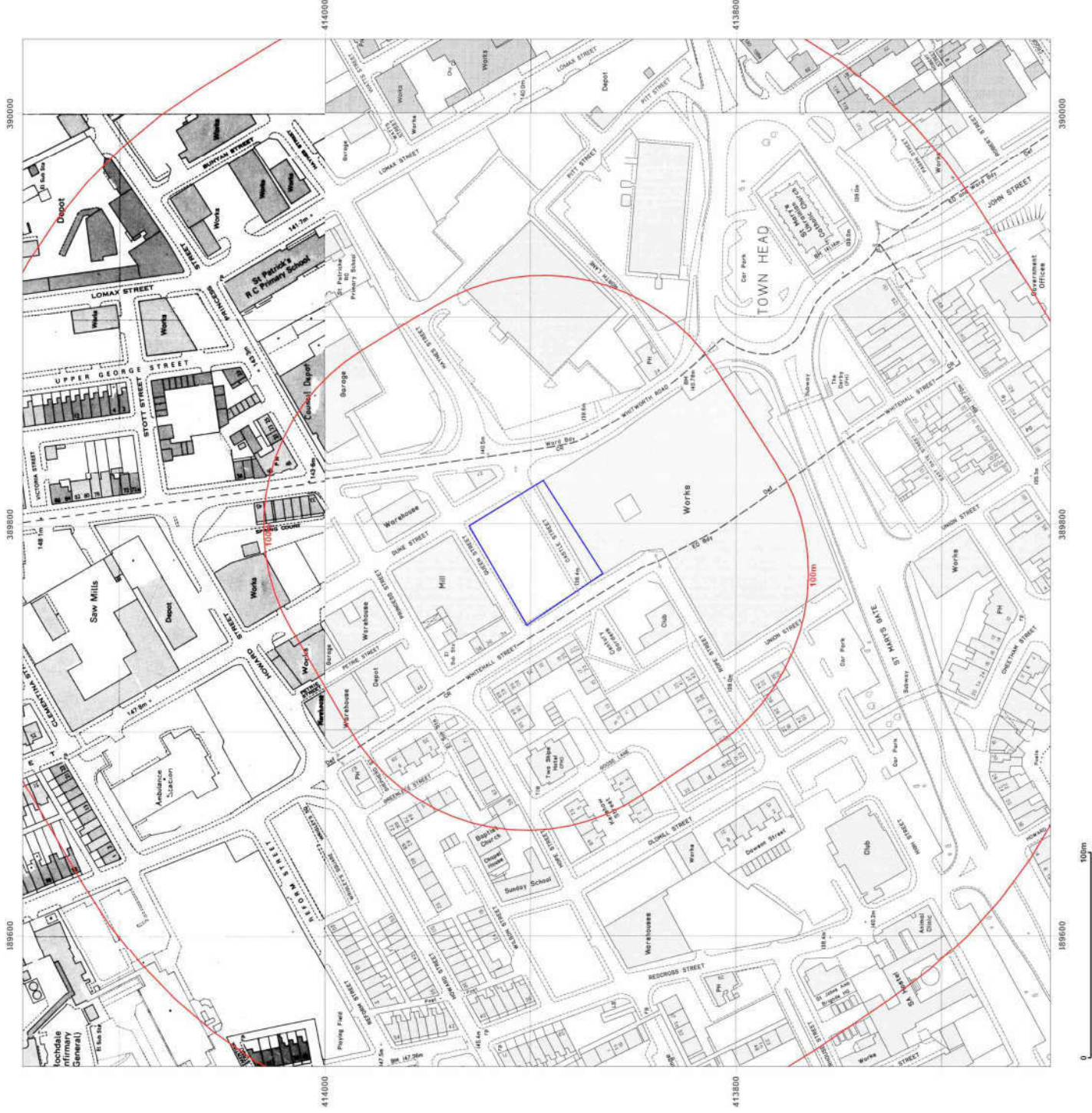
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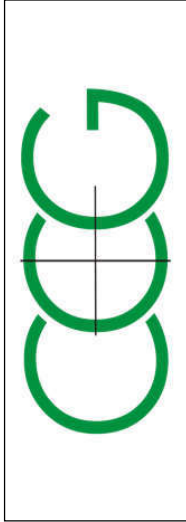
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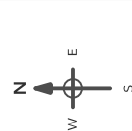
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Client Ref: CMAPS-AAG-1078975-4165-030123
Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name:	National Grid
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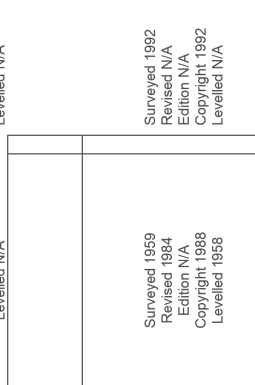
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Scale: 1:1,250

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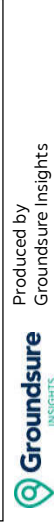
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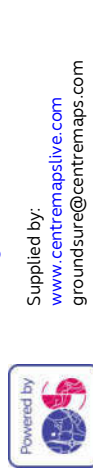


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Revised 1984	Revised N/A
Edition N/A	Edition N/A
Copyright 1988	Copyright 1992
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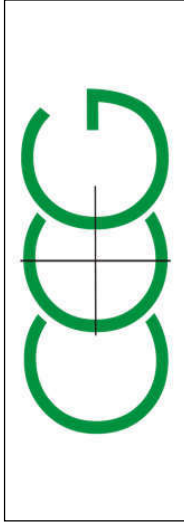
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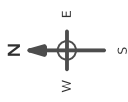


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Client Ref: CMAPS-AAG-1078975-4165-030123
Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: National Grid
Map date: 1989-1993
Scale: 1:1,250
Printed at: 1:2,000



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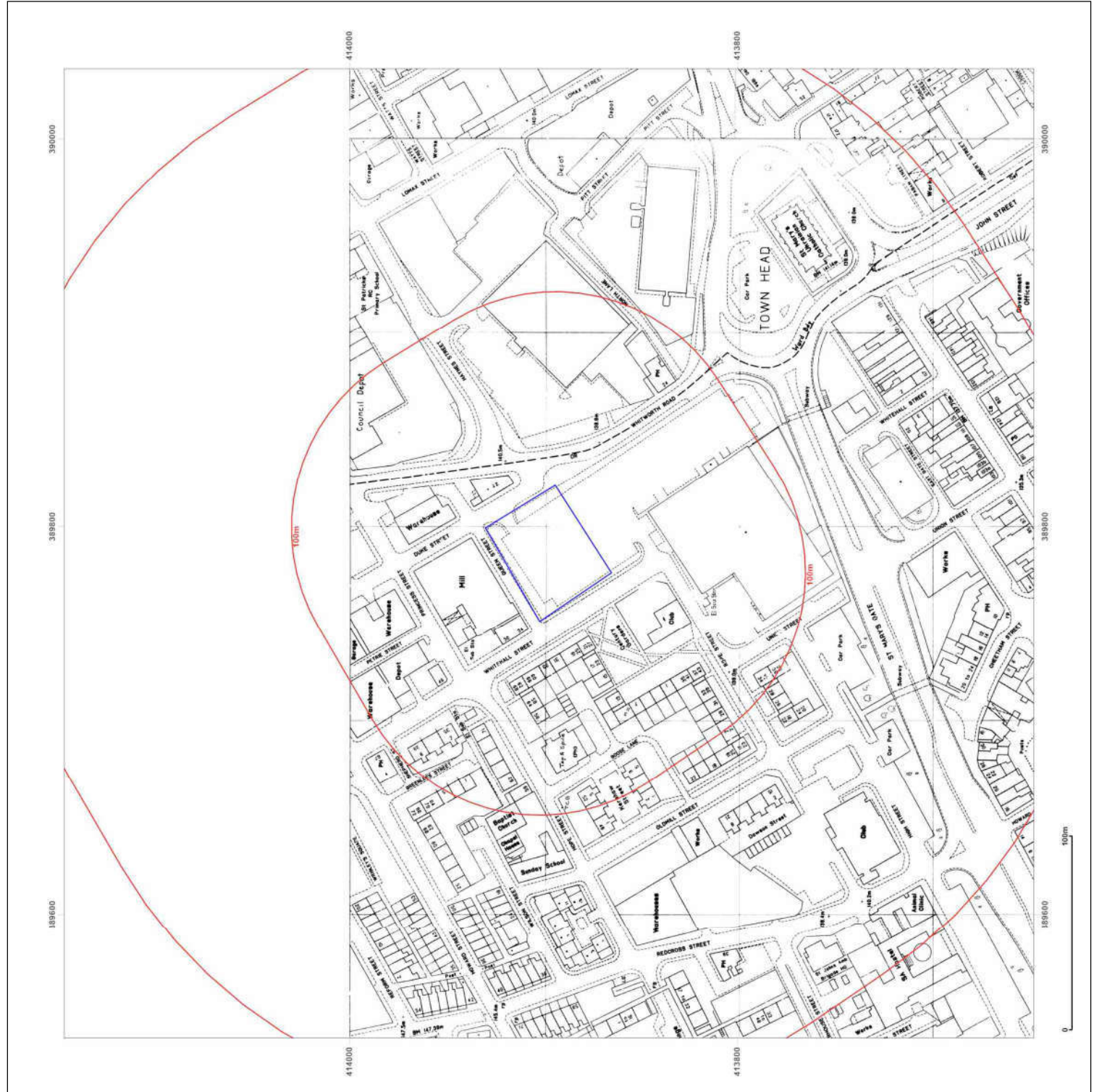


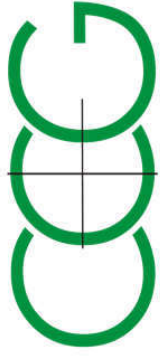
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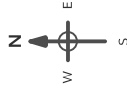
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Grid Ref: 389786, 413897

Map Name: National Grid

Map date: 1992-1993

Scale: 1:1,250

Printed at: 1:2,000



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Revised N/A
Edition N/A
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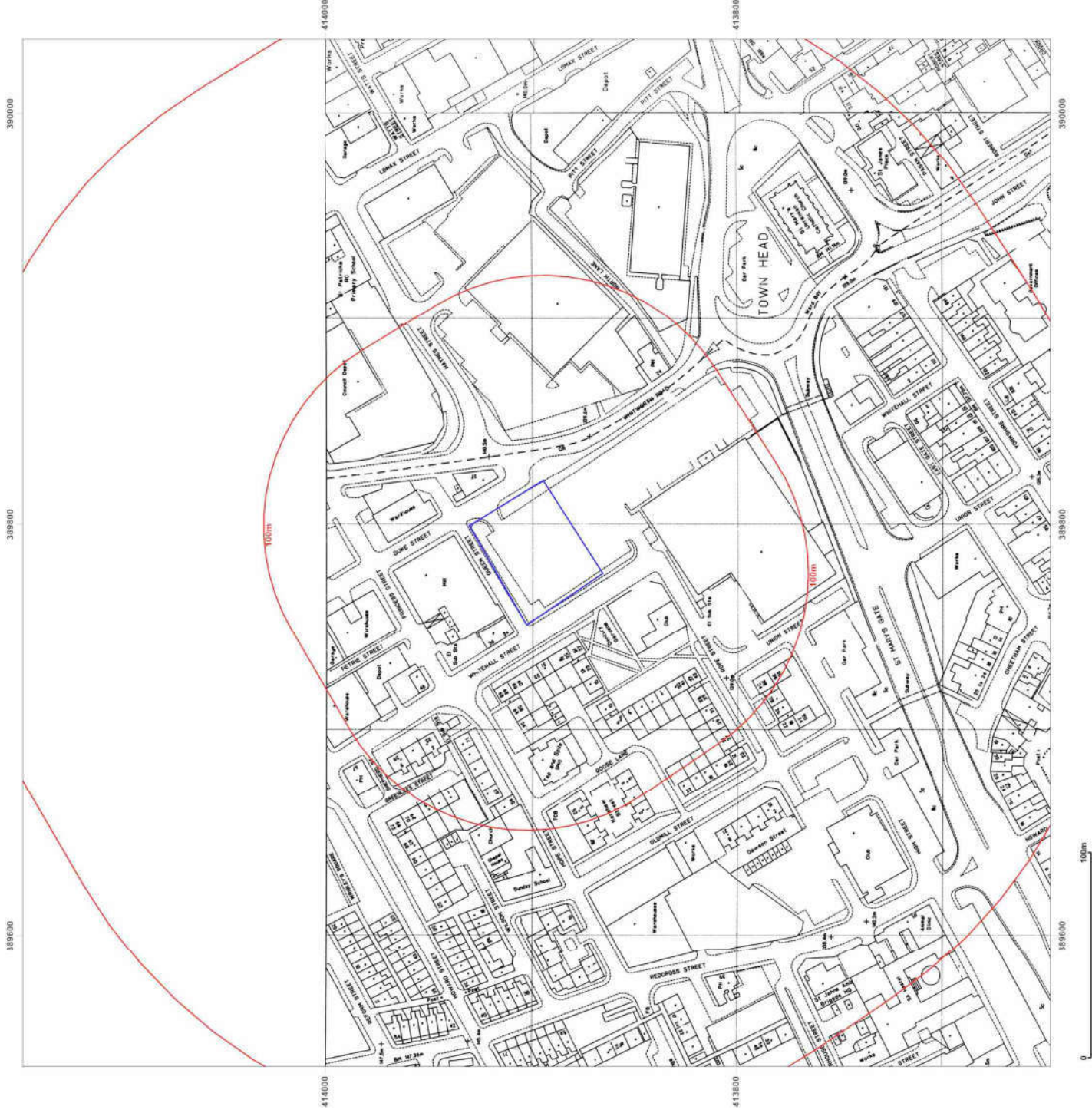
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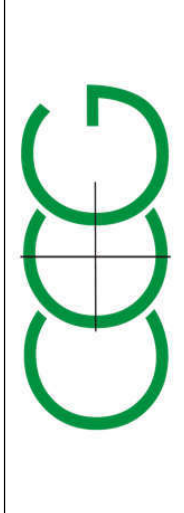
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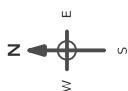


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Map Name: National Grid
Map date: 1995
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Edition N/A
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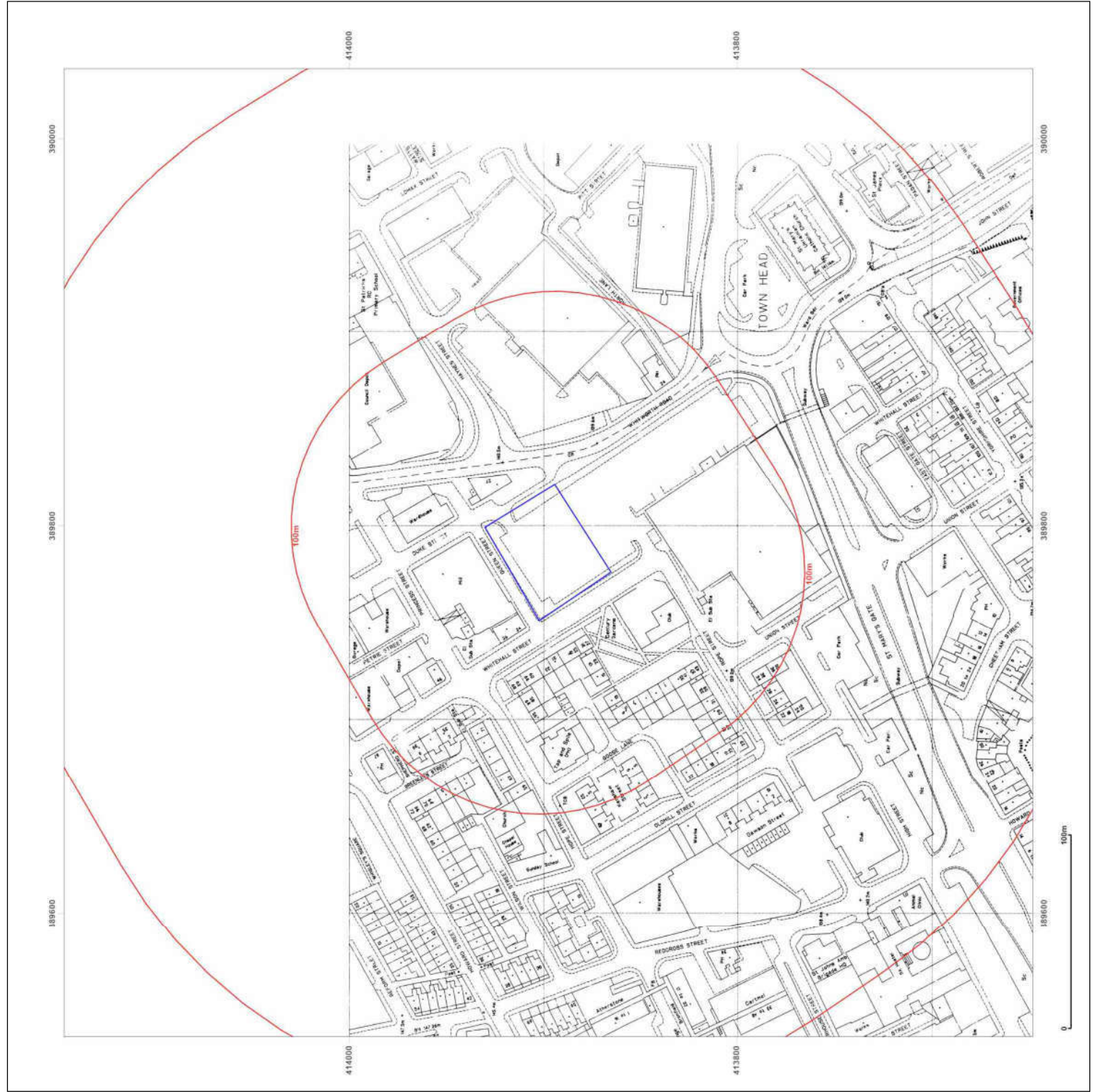


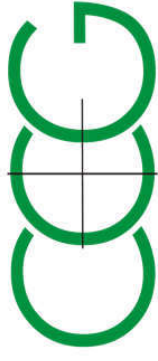
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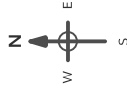
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Grid Ref: 389786, 413897

Map Name: National Grid

Map date: 1995

Scale: 1:1,250

Printed at: 1:2,000



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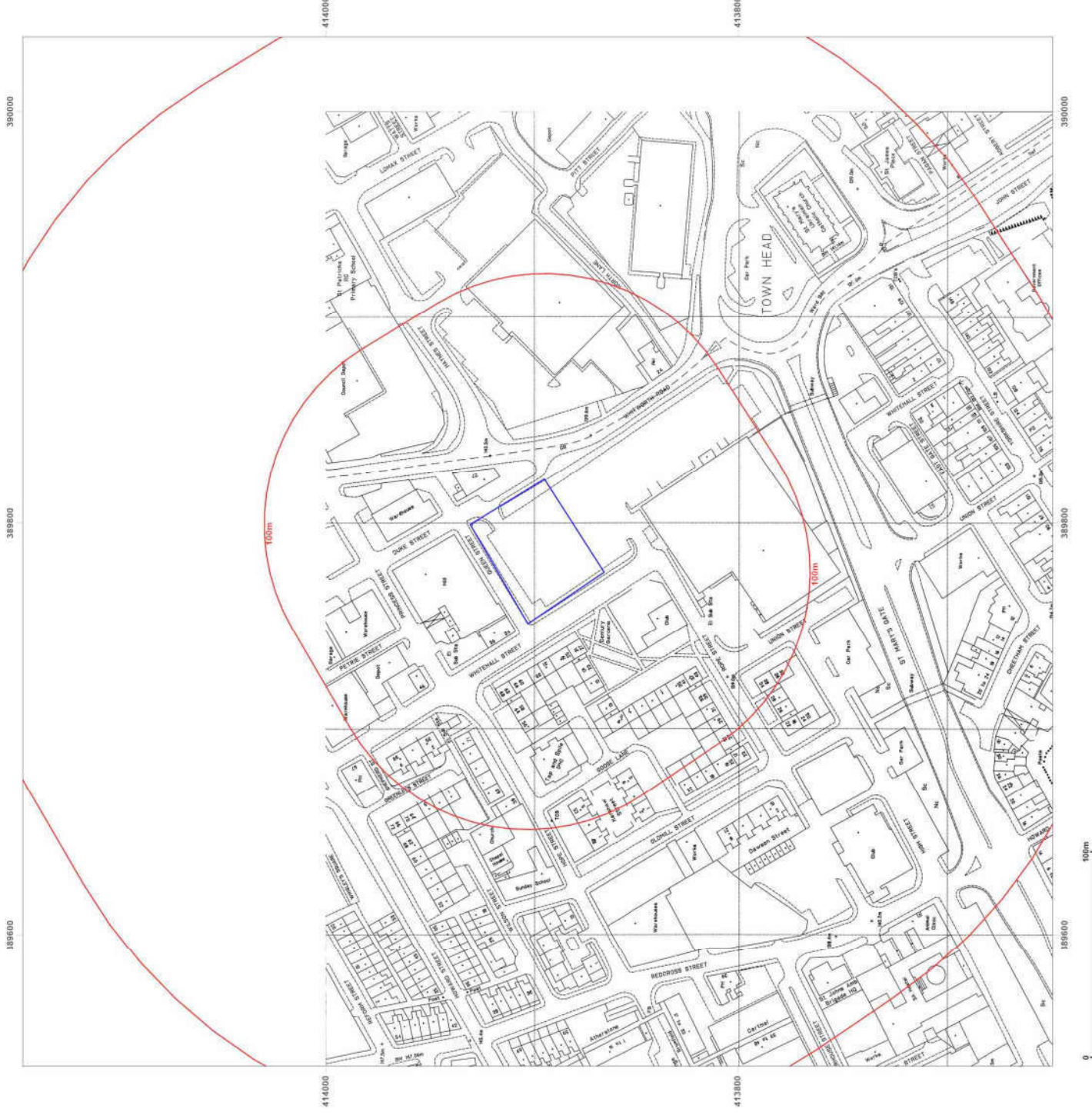
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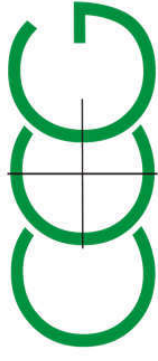
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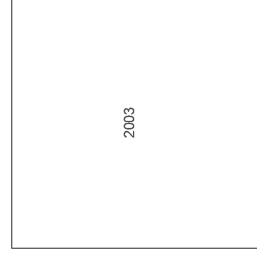
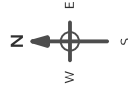
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



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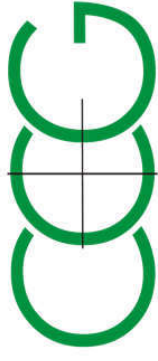
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Production date: 03 January 2023

Map legend available at:

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OL12 0TY

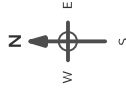
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Grid Ref: 389786, 413897

Map Name: County Series

Map date: 1851

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1848
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Edition 1851
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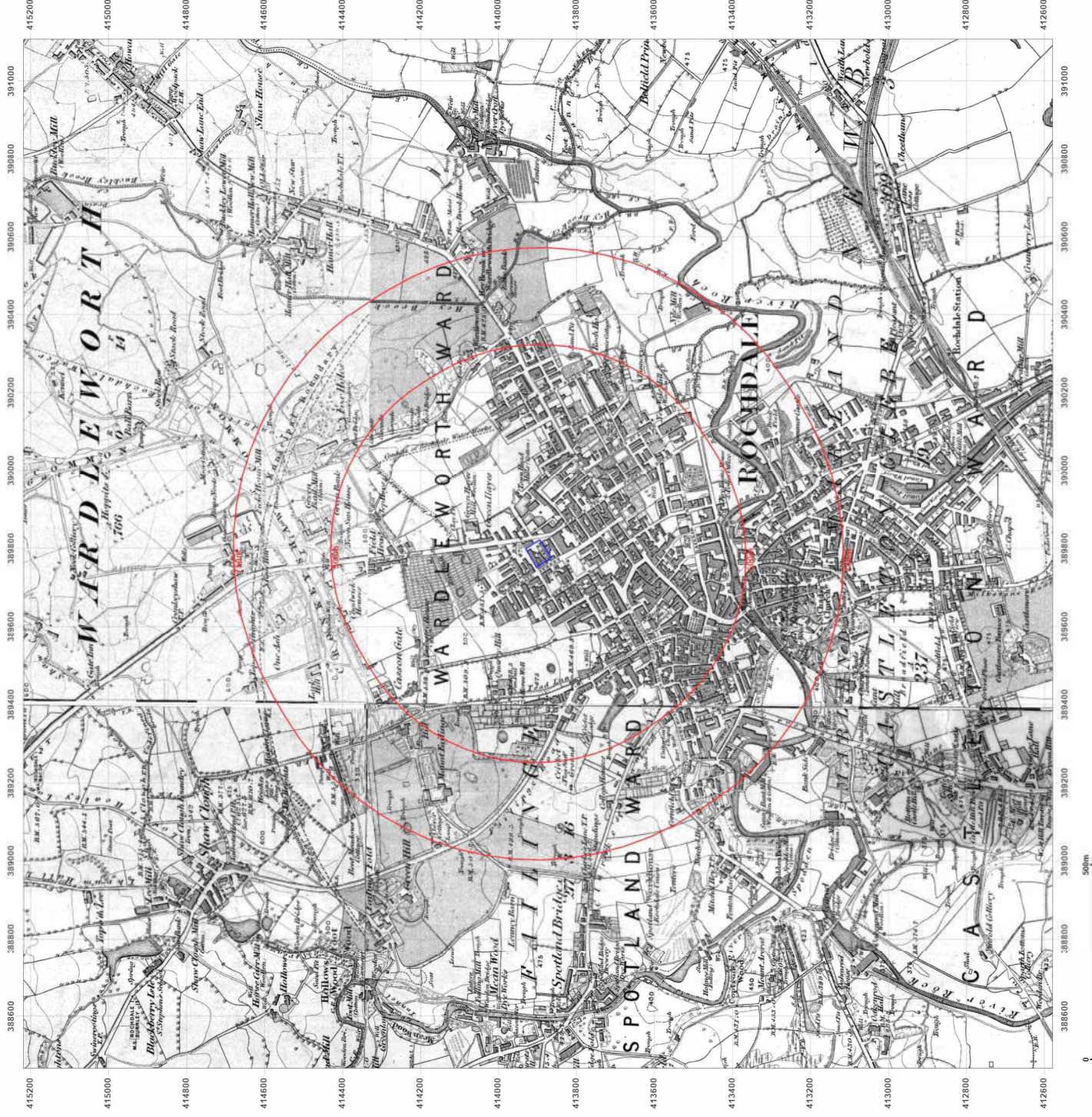
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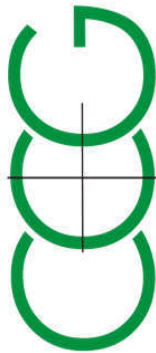
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: County Series

Map date: 1890

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1890
Edition N/A
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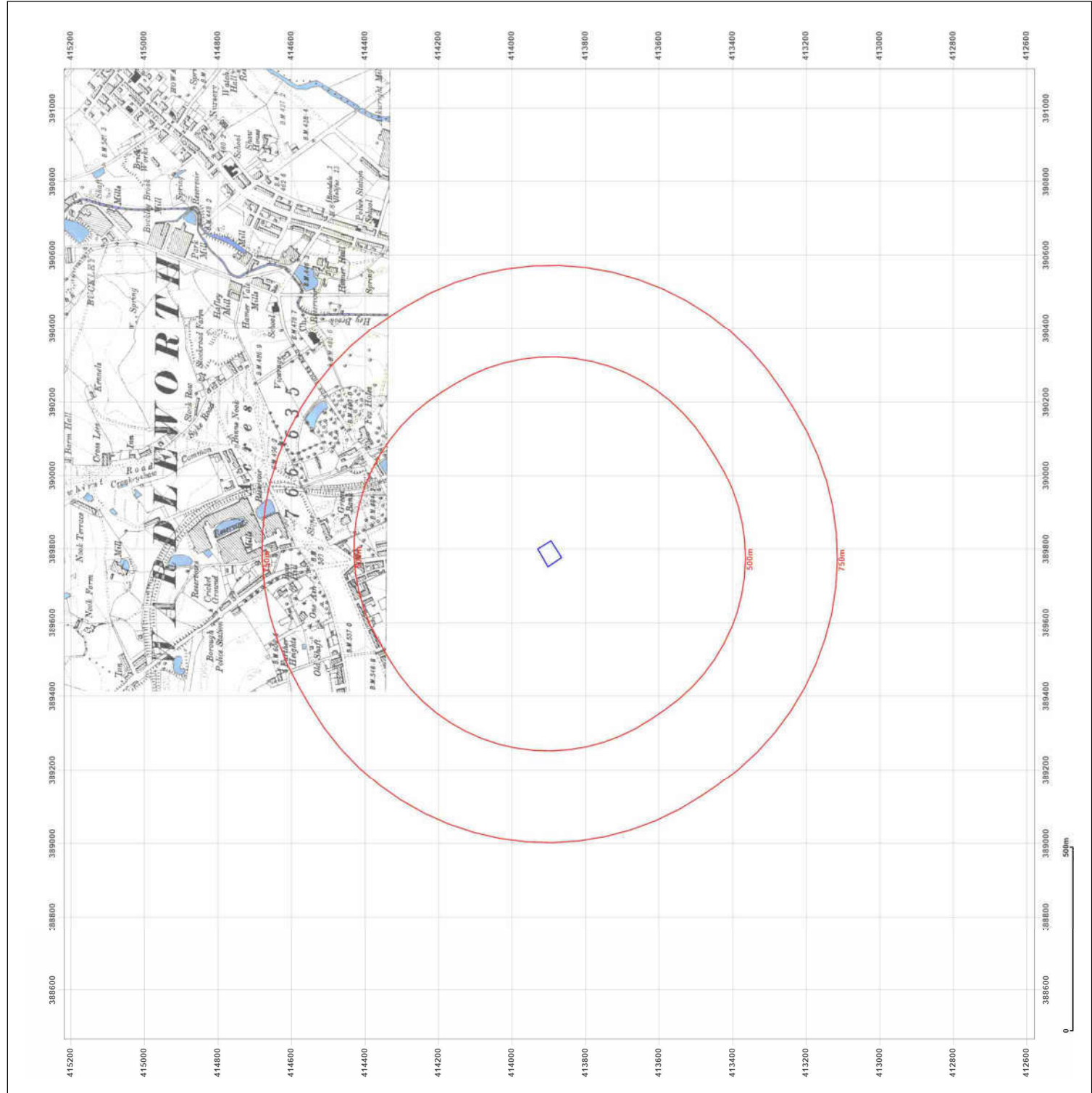


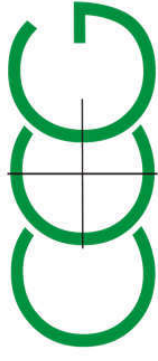
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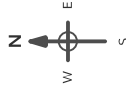
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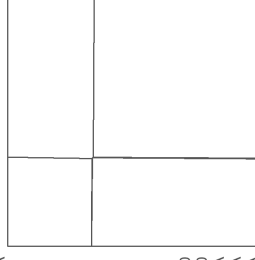
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Printed at: 1:10,560



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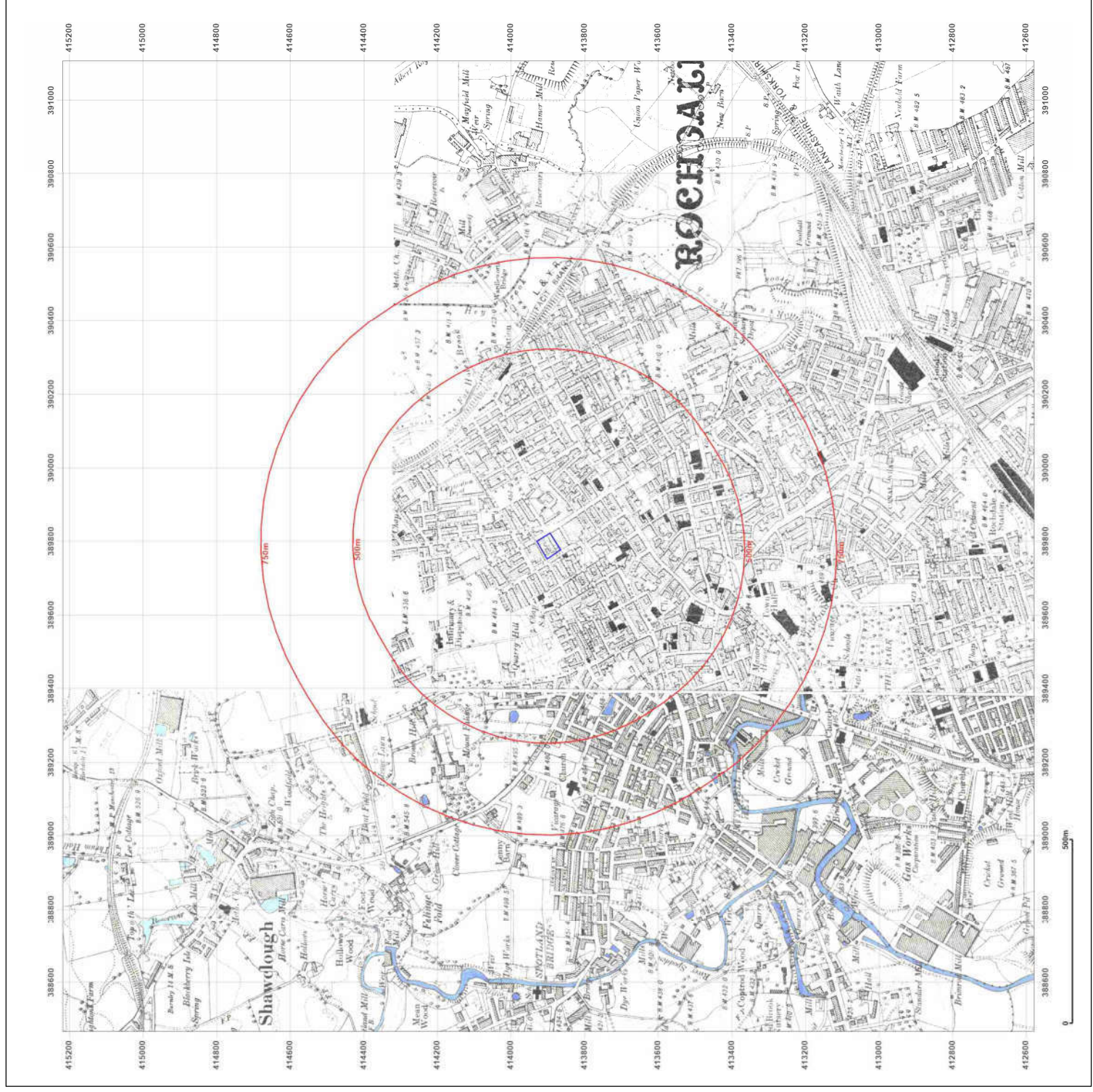
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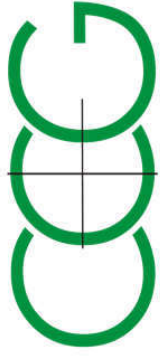
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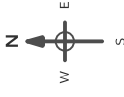
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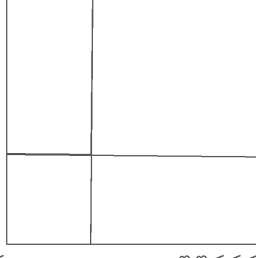
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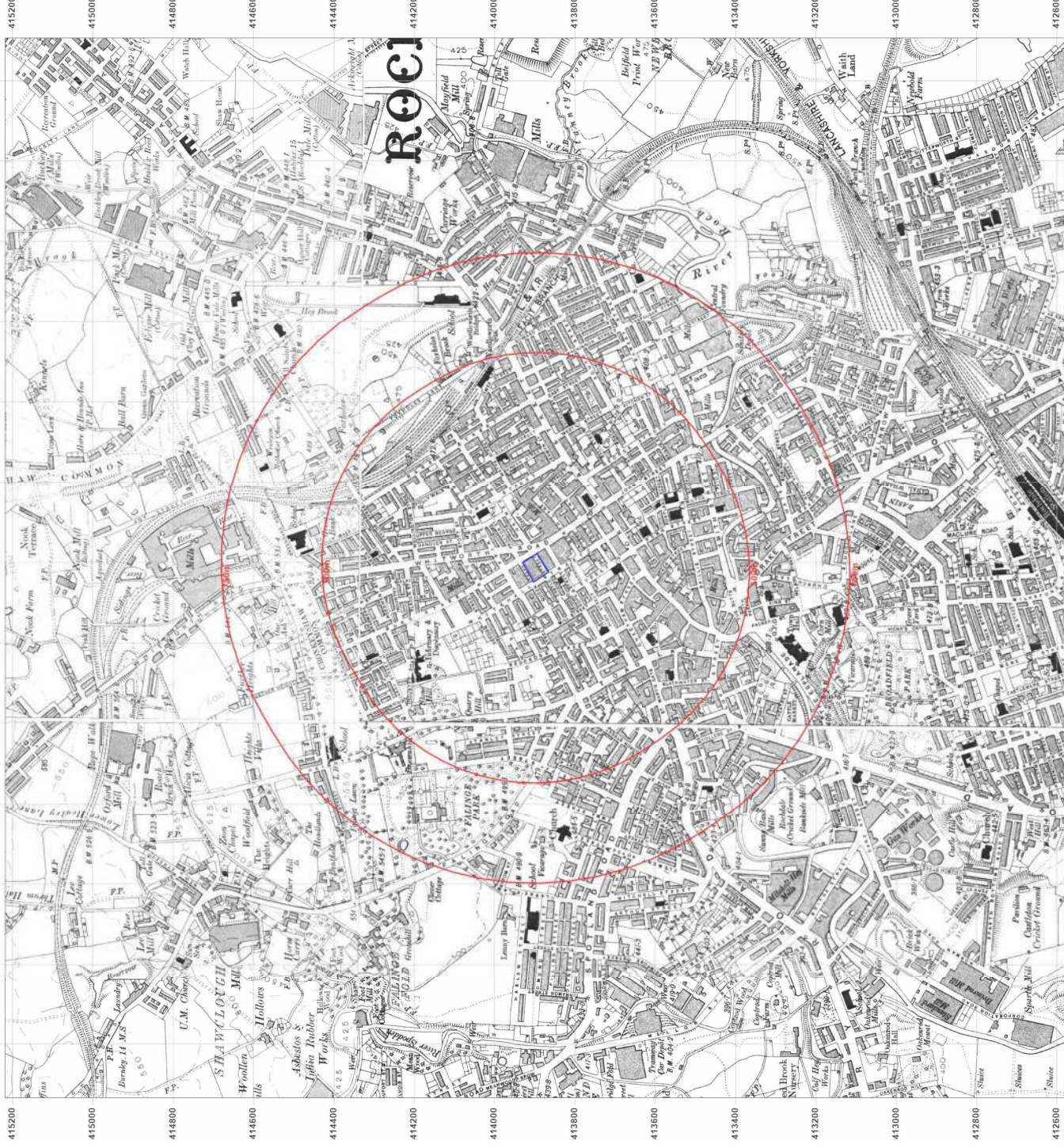
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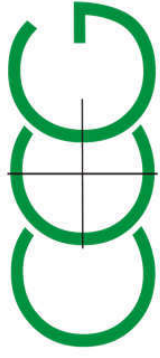
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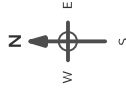
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Map Name: County Series

Map date: 1928

Scale: 1:10,560

Printed at: 1:10,560



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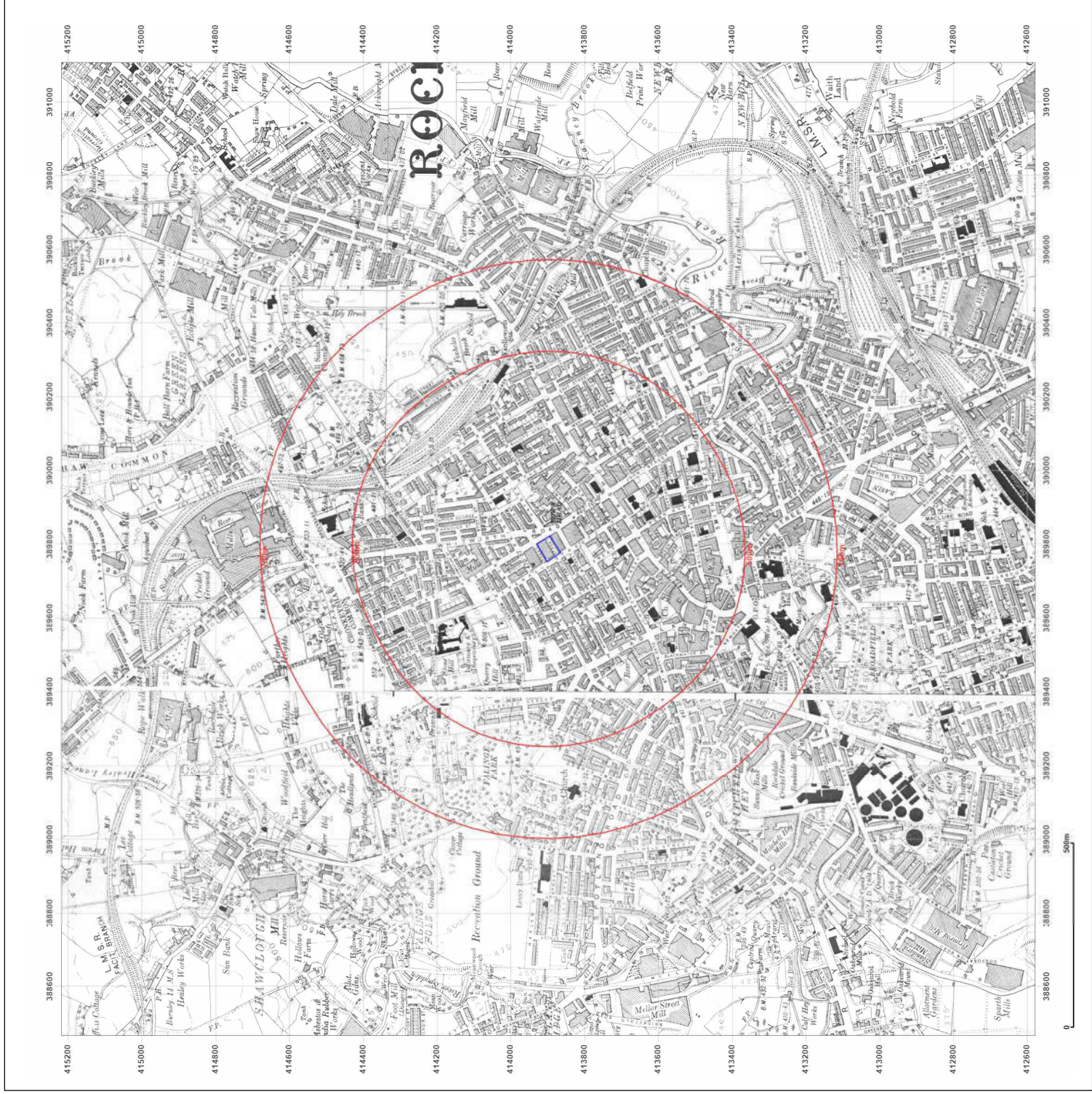
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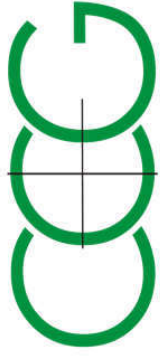
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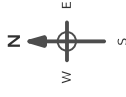
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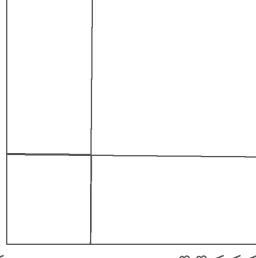
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Printed at: 1:10,560



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Edition N/A
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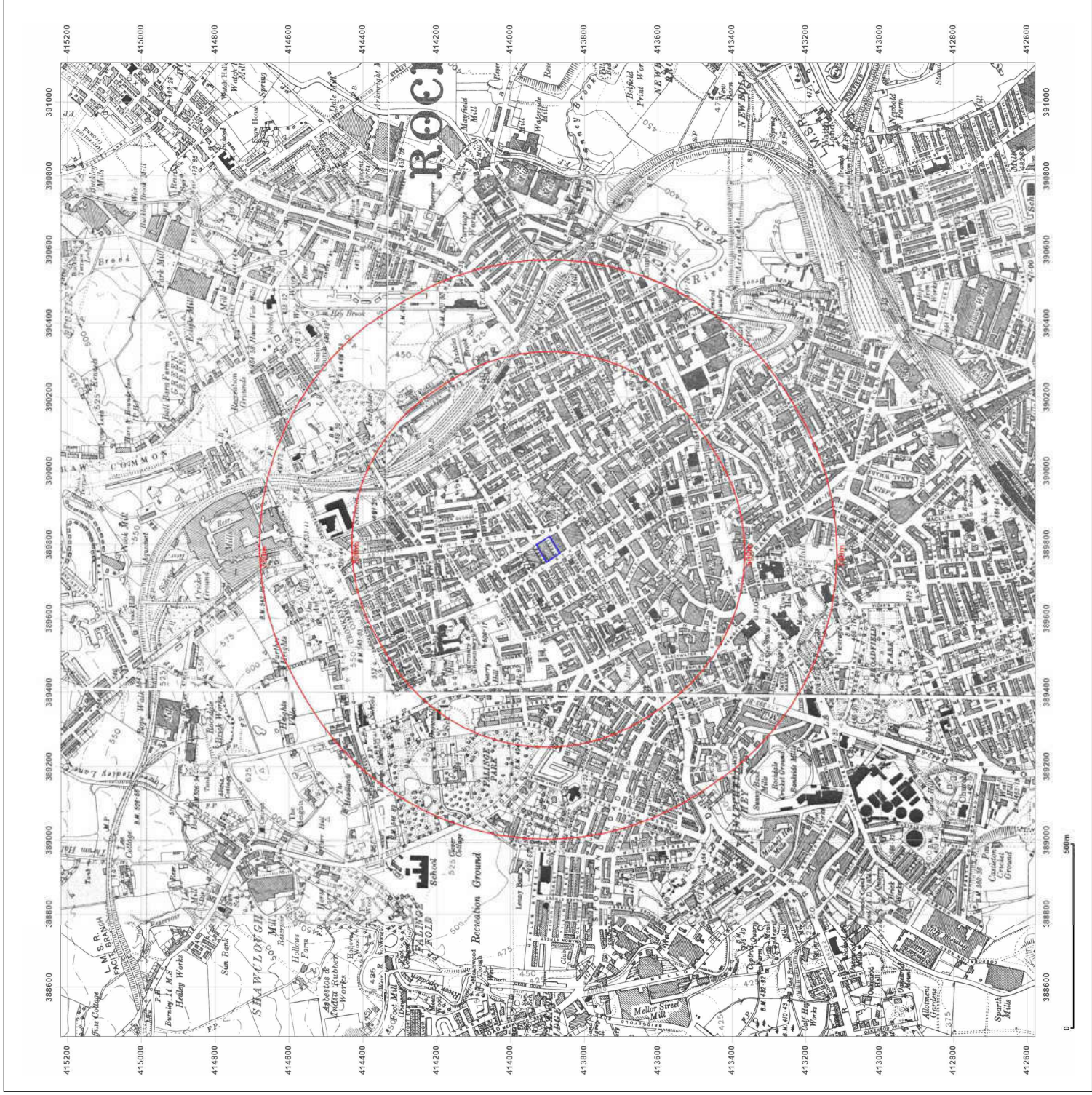
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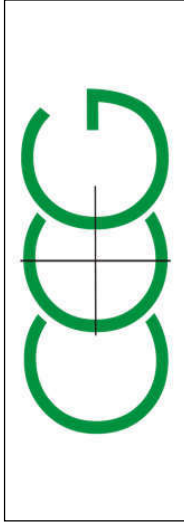
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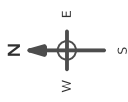


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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: Provisional
Map date: 1949-1954
Scale: 1:10,560
Printed at: 1:10,560



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Revised 1949
Edition N/A
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Surveyed 1954
Revised 1954
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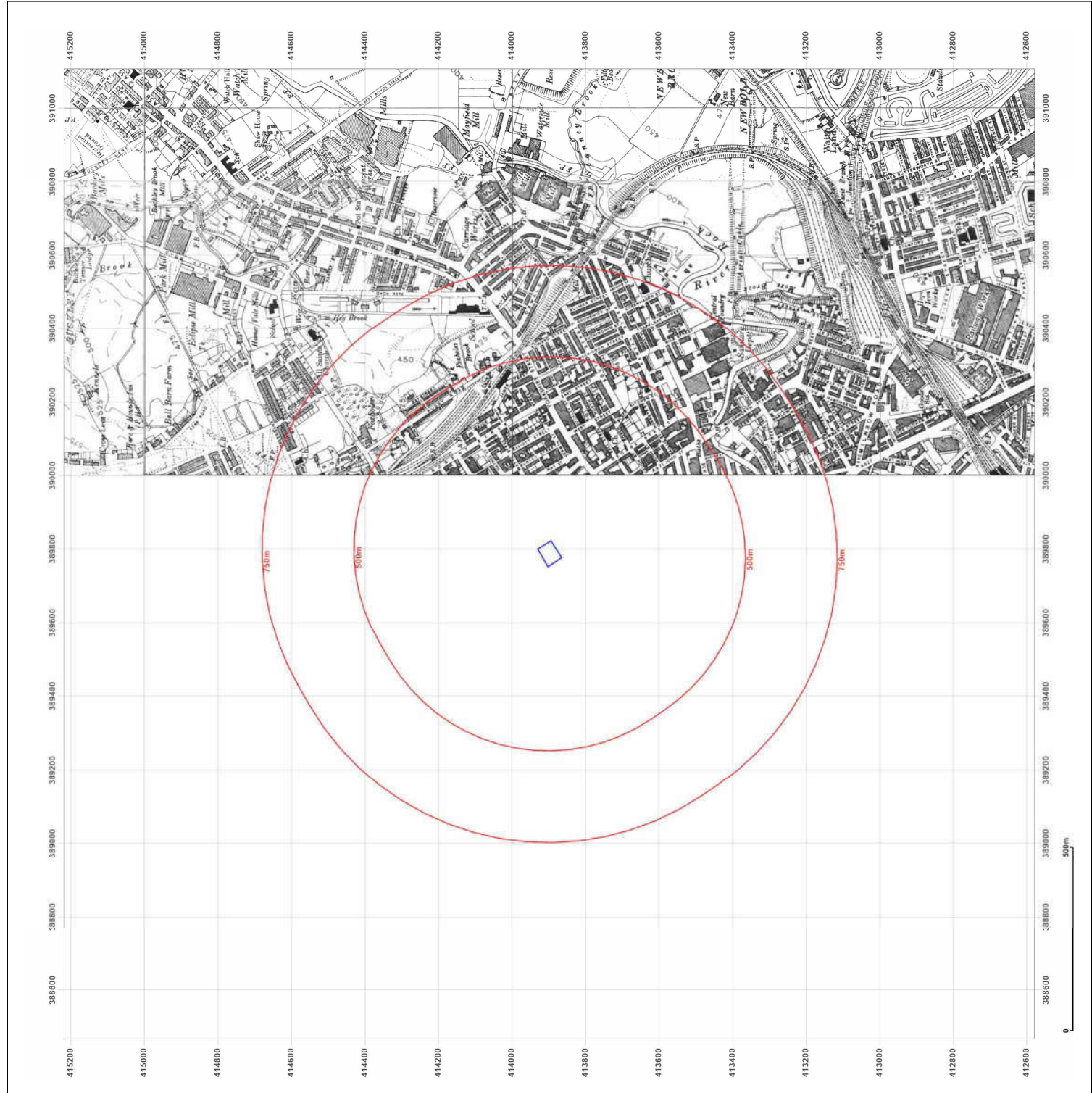
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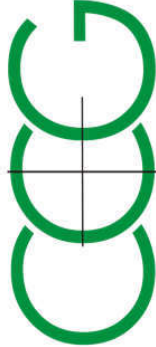
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Report Ref: CMAPS-AAG-1078975-4165-030123HIS
Grid Ref: 389786, 413897

Map Name: Provisional
Map date: 1956
Scale: 1:10,560
Printed at: 1:10,560

Surveyed N/A
Revised 1955
Edition N/A
Copyright 1956
Levelled N/A

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Edition 1956
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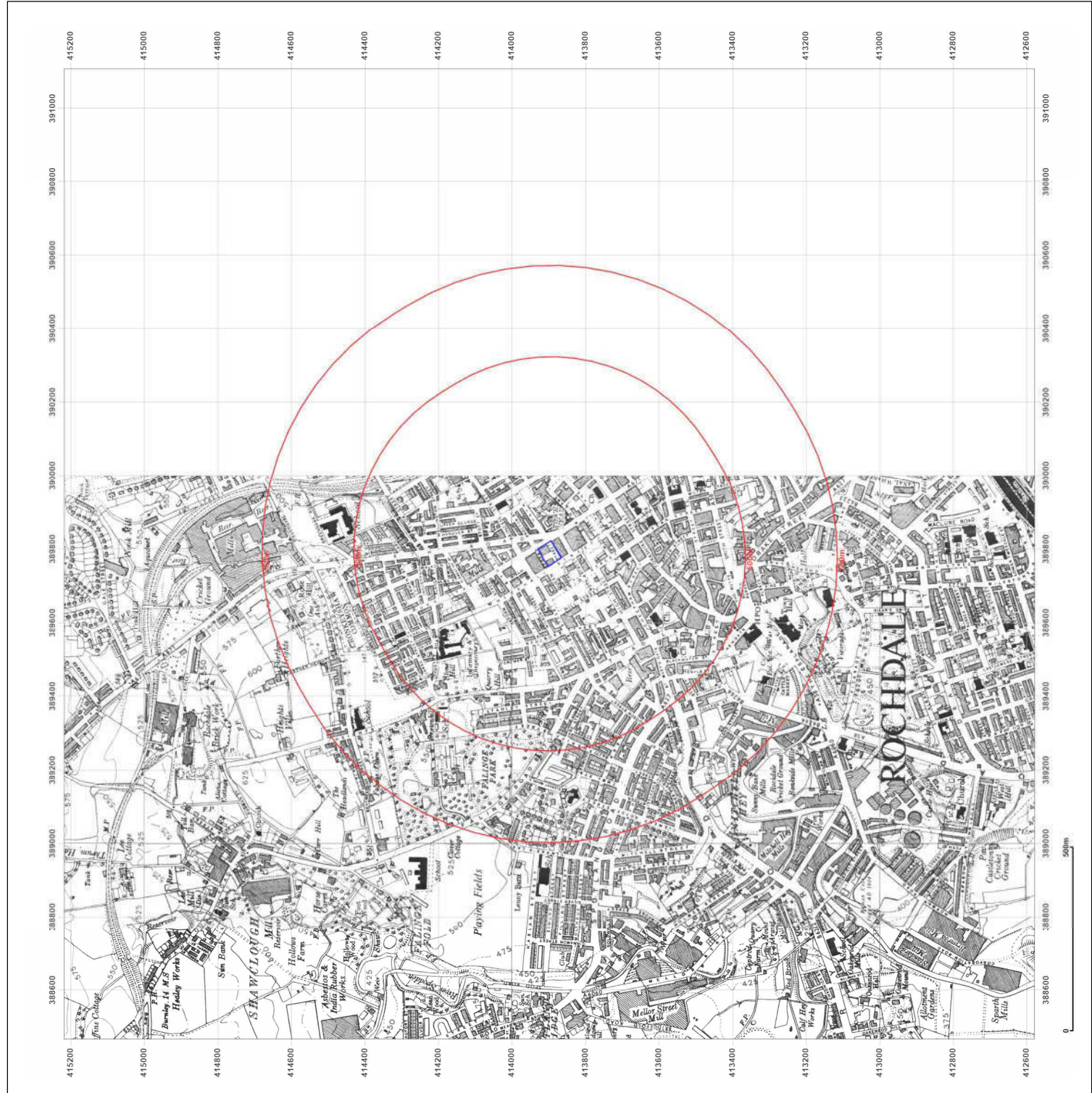


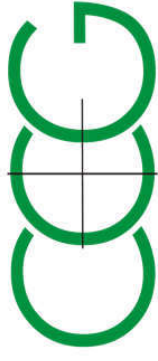
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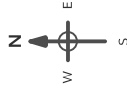
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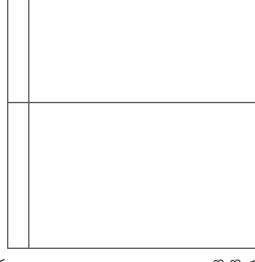
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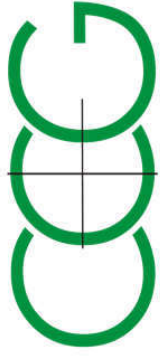
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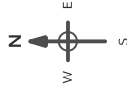
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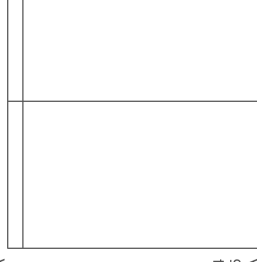
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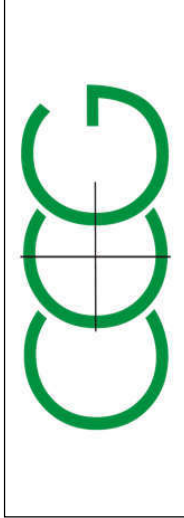
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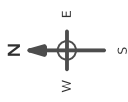


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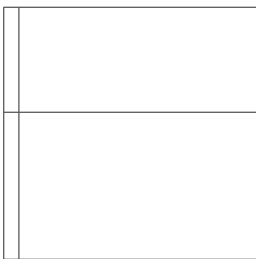
Land off Queen Street &
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Grid Ref: 389786, 413897

Map Name: National Grid
Map date: 1987-1989
Scale: 1:10,000
Printed at: 1:10,000



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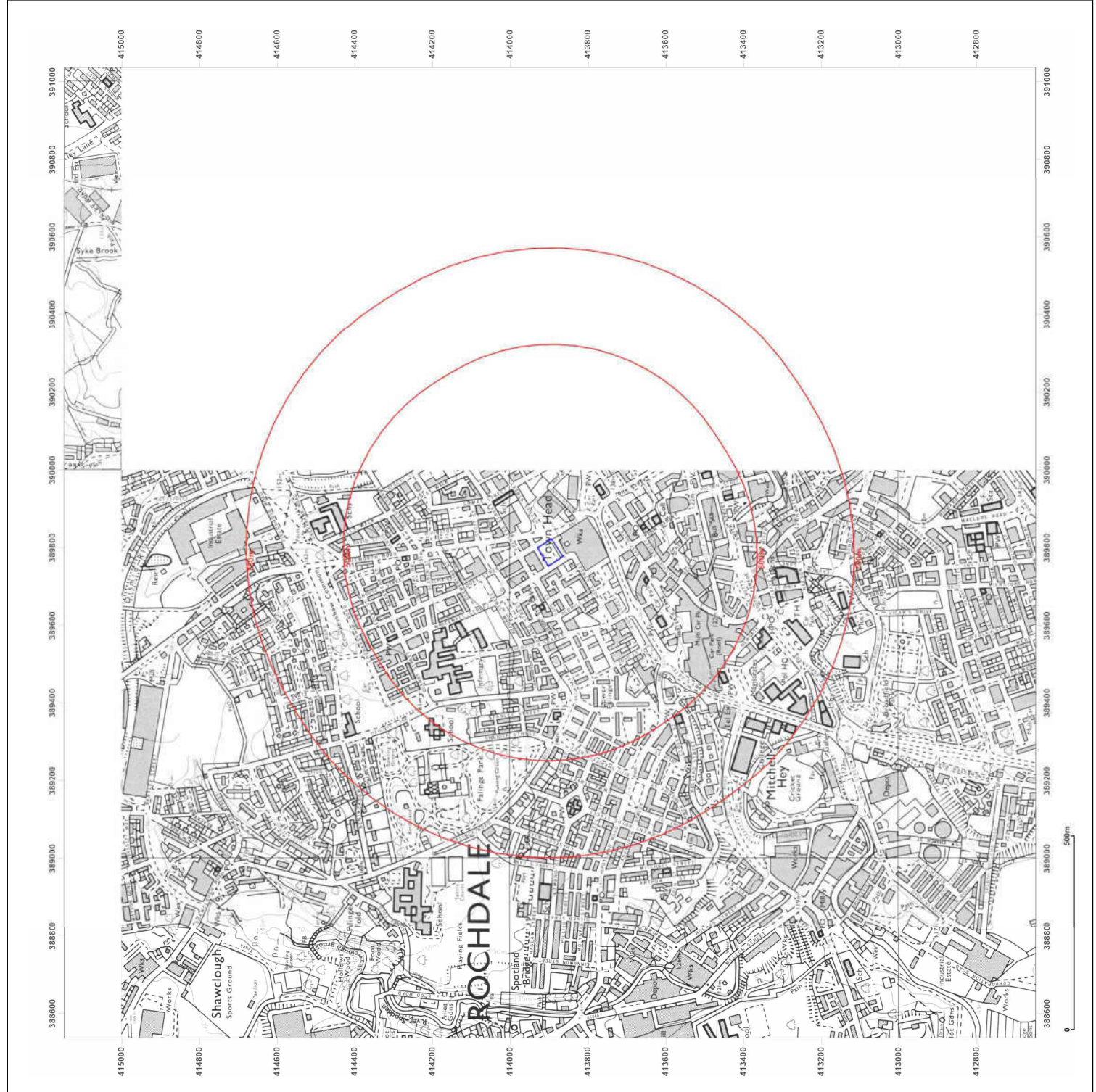


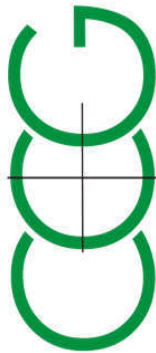
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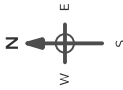


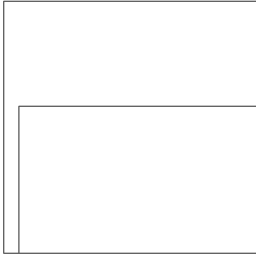
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Grid Ref: 389786, 413897

Map Name: National Grid
Map date: 1992
Scale: 1:10,000
Printed at: 1:10,000





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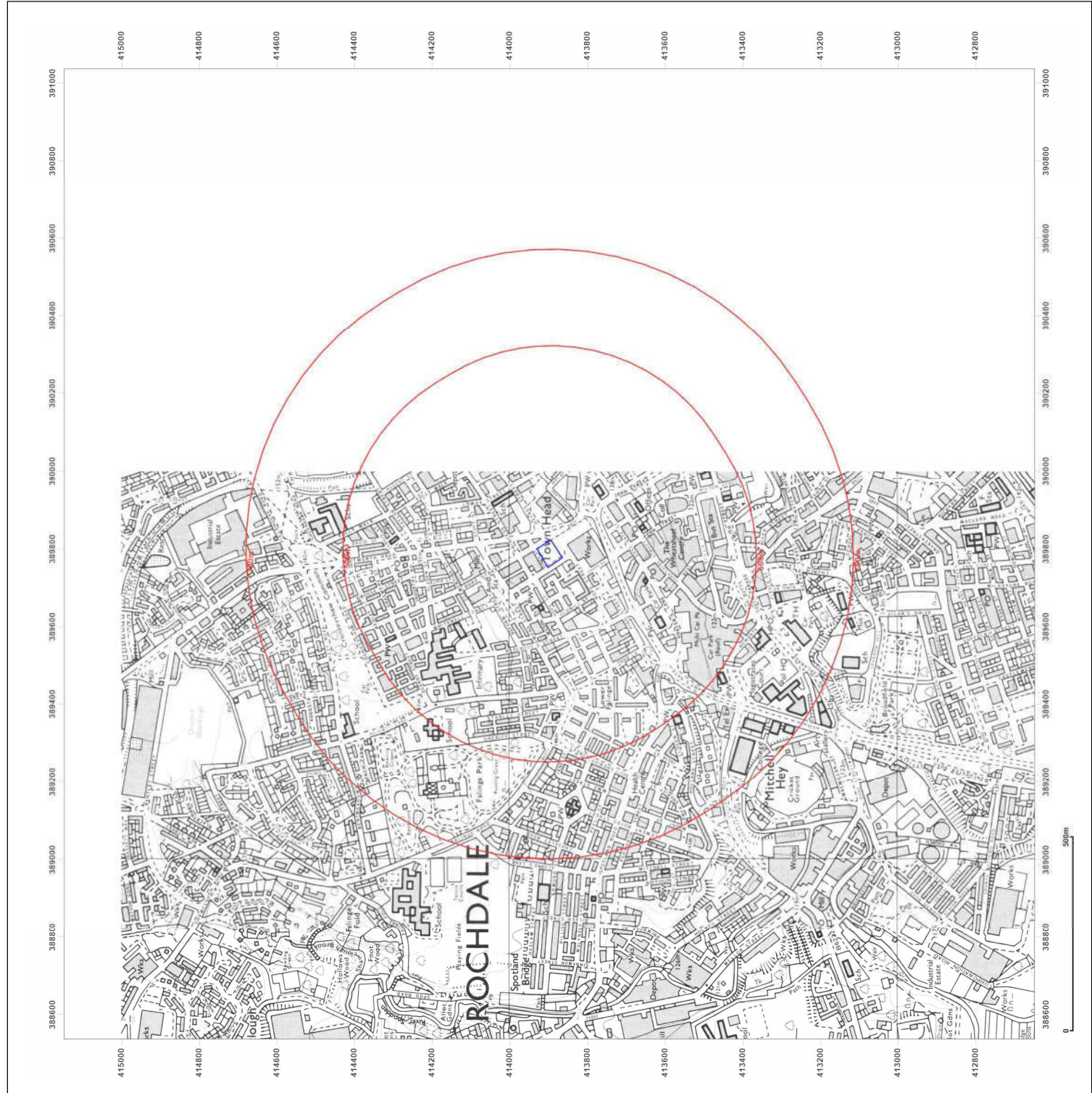


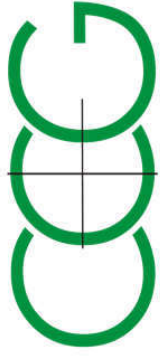
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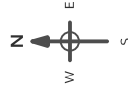
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Map Name: National Grid

Map date: 2001

Scale: 1:10,000

Printed at: 1:10,000



2001



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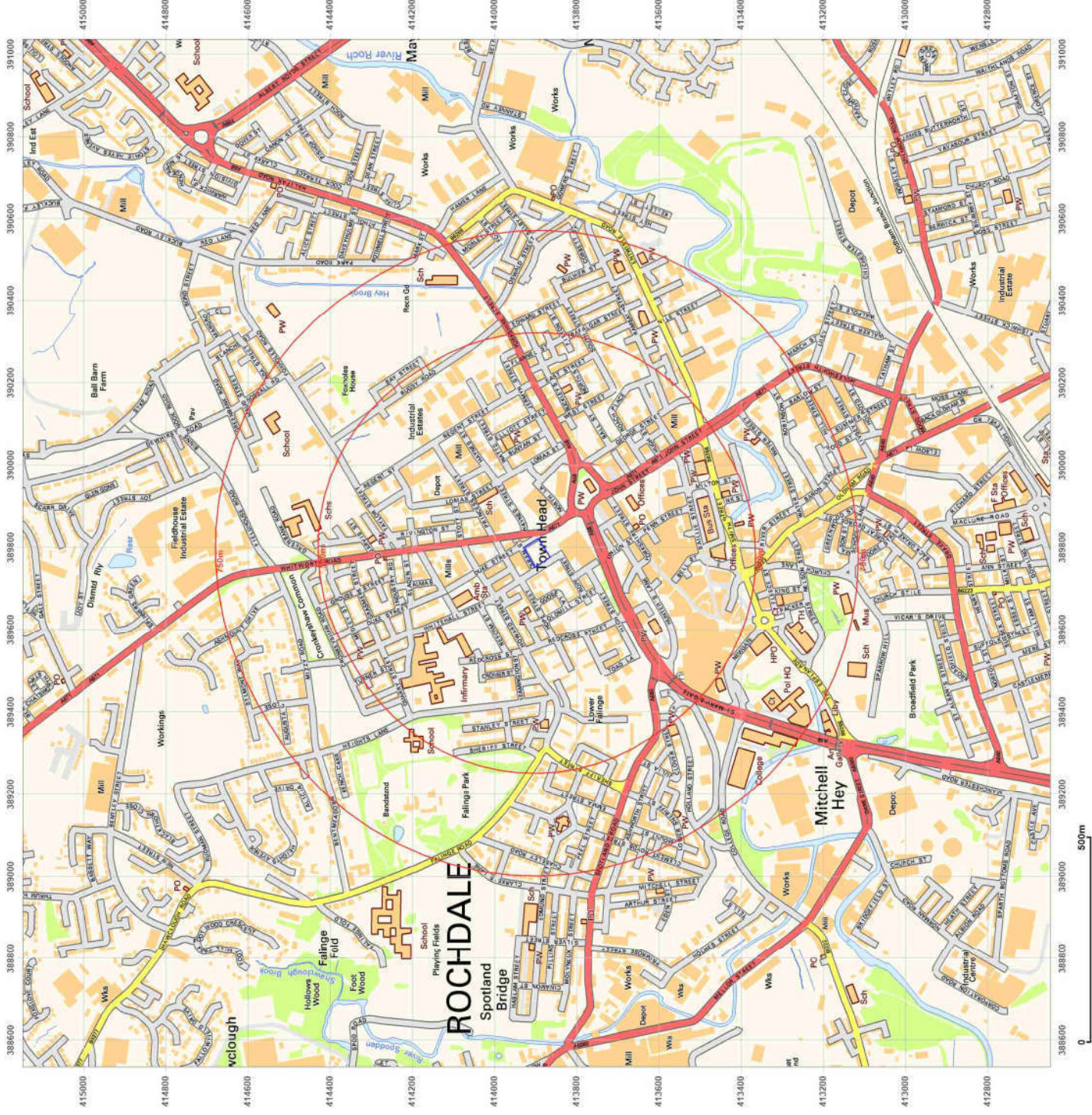
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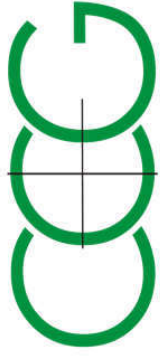
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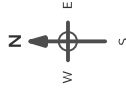
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Grid Ref: 389786, 413897

Map Name: National Grid

Map date: 2010

Scale: 1:10,000

Printed at: 1:10,000



2010



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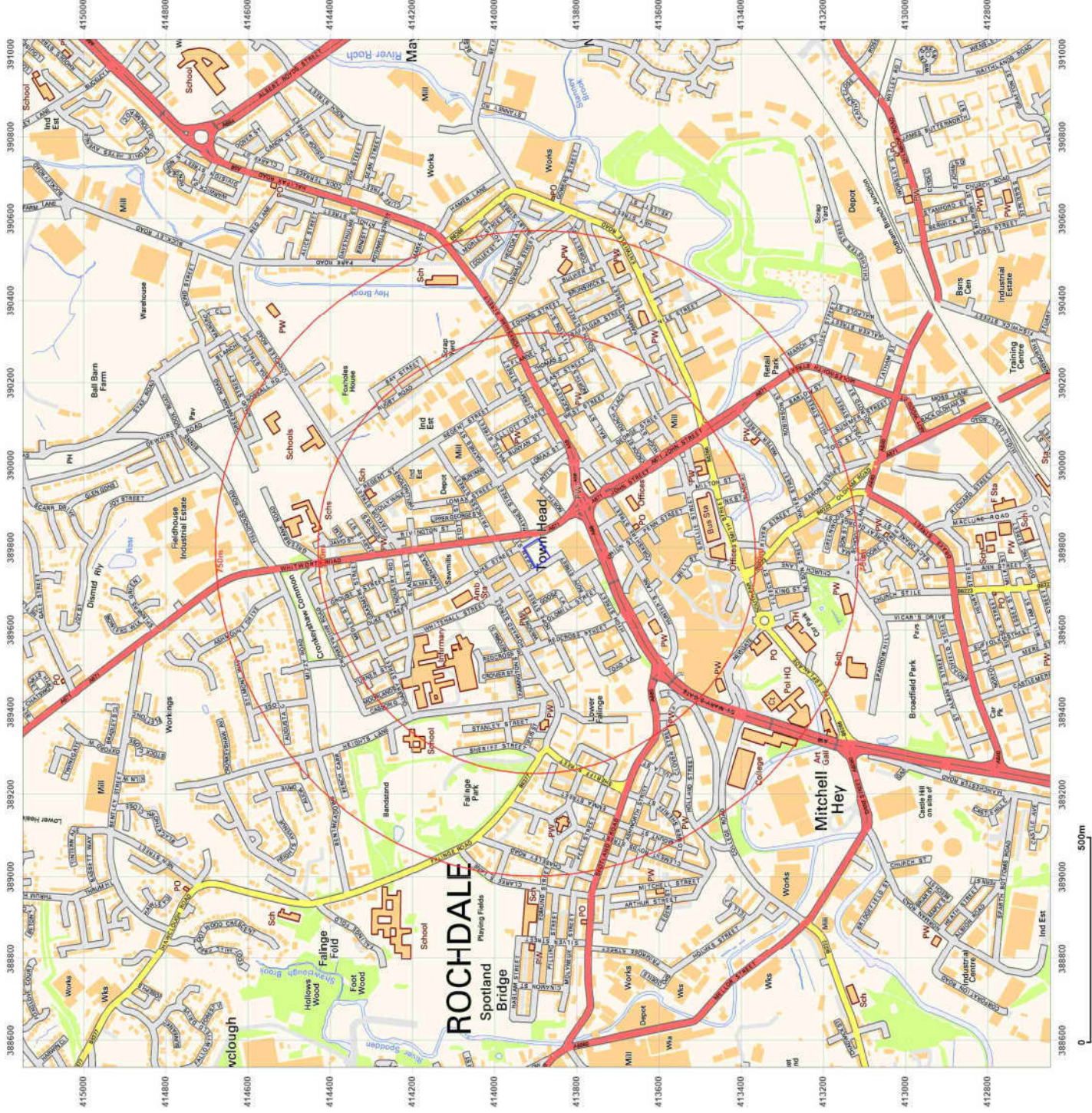
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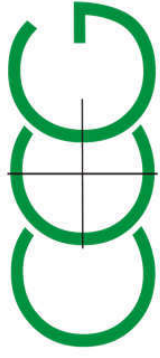
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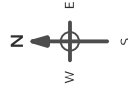
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Map Name: National Grid

Map date: 2023

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Printed at: 1:10,000



2023



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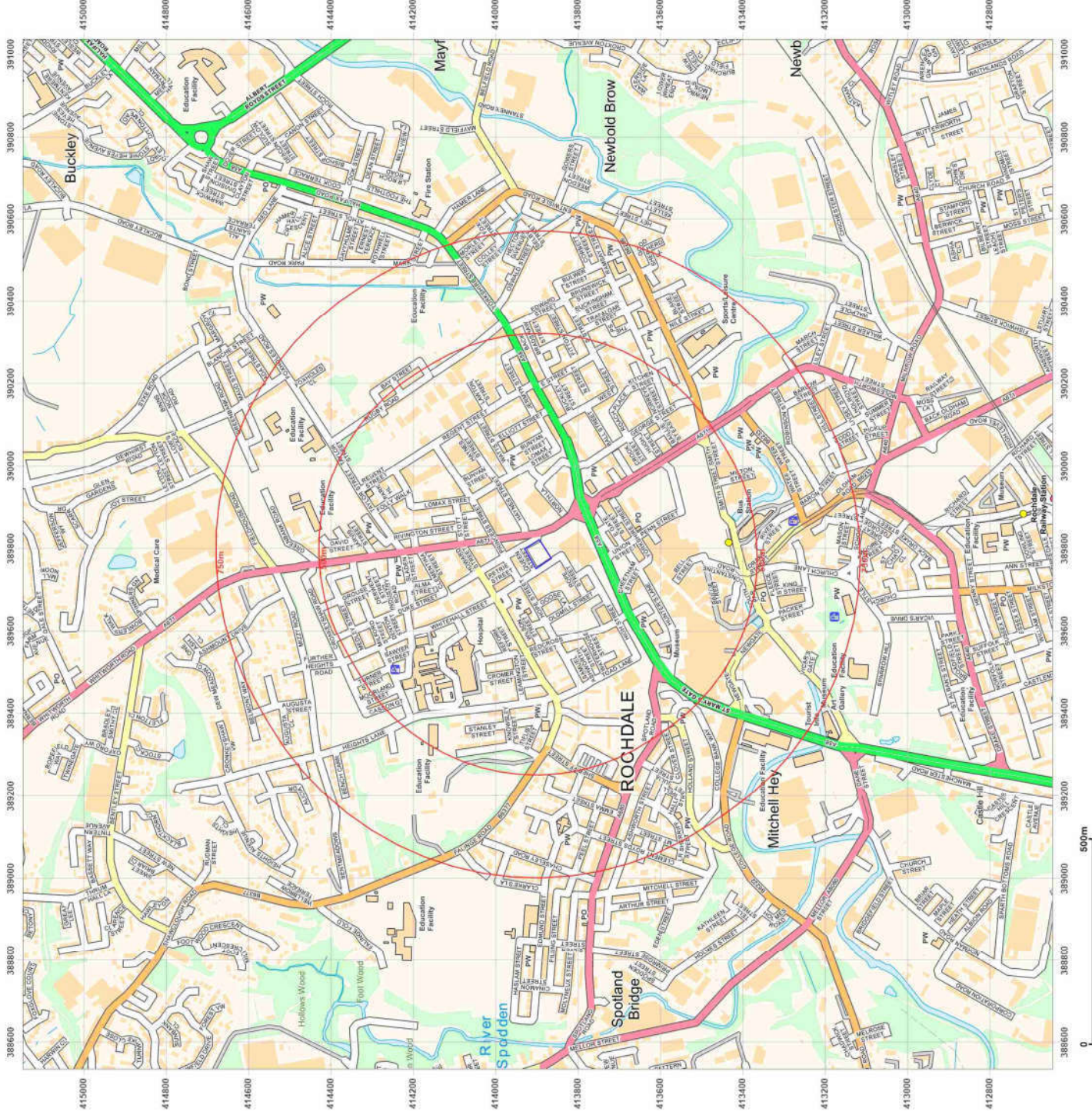
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APPENDIX E: SITE PHOTOGRAPHS



1. Roadway leading into study site off Duke Street
2. Northern section of the study site, fronting onto Queen Street





3. As Figure 1 above, shown landscaped verge extending along Queen Street frontage
4. Western section of the study site showing landscaped verge fronting onto Whitehall Street





5. Study site as seen from its western boundary
6. Western section of the study site as seen from its eastern boundary





7. Eastern section of the study site showing landscaped verge fronting onto Duke Street
8. Showing presence of buried services with hard paved surface





9. As Figure 7 above
10. As above



APPENDIX 8

GREENFIELD RUN OFF RATE (SOIL TYPE 5)

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Jan Skibniewski

Site name: St Mary's Gate Retail Park,

Site location: Rochdale
Near OL12 0EU

Site Details

Latitude: 53.62139° N

Longitude: 2.15577° W

Reference: 517053727

Date: Feb 24 2023 17:09

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.

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.34

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics Default Edited

SOIL type: 4 5

HOST class: N/A N/A

SPR/SPRHOST: 0.47 0.53

Hydrological characteristics Default Edited

SAAR (mm): 1147 1147

Hydrological region: 10 10

Growth curve factor 1 year: 0.87 0.87

Growth curve factor 30 years: 1.7 1.7

Growth curve factor 100 years: 2.08 2.08

Growth curve factor 200 years: 2.37 2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates Default Edited

Q_{BAR} (l/s): 2.93 3.8

1 in 1 year (l/s): 2.54 3.3

1 in 30 years (l/s): 4.97 6.45

1 in 100 year (l/s): 6.08 7.9

1 in 200 years (l/s): 6.93 9

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX 9

SURFACE WATER ATTENUATION CALCULATIONS

Integra Consulting Calculations						Job No	Date
						3361	24.02.23
						Sheet 01	By JS
Job Title St Mary's Gate Retail Park, Rochdale							
Storm Water Flood Model M5-60 = 18.50 r = 0.35 Return, T = 30 CC Factor = 0.00 Area (m²) = 2730 Limit (l/s) = 3.8 Totals 68 68							
D (mins)	M5-D (mm)	MT-D (mm)	Rate (mm/hr)	Flow (l/s)	CC Flow (l/s)	Storage (m ³)	CC Storage (m ³)
10.00	9.29	13.74	82.41	62.09	62.09	34.98	34.98
15.00	11.16	16.73	66.92	50.42	50.42	41.96	41.96
20.00	12.56	18.96	56.88	42.86	42.86	46.87	46.87
25.00	13.69	20.76	49.83	37.55	37.55	50.62	50.62
30.00	14.64	22.28	44.56	33.58	33.58	53.60	53.60
35.00	15.46	23.60	40.45	30.48	30.48	56.03	56.03
40.00	16.19	24.76	37.14	27.99	27.99	58.05	58.05
45.00	16.84	25.81	34.41	25.93	25.93	59.75	59.75
50.00	17.44	26.76	32.11	24.20	24.20	61.19	61.19
55.00	17.99	27.64	30.15	22.72	22.72	62.42	62.42
60.00	18.50	28.45	28.45	21.43	21.43	63.48	63.48
65.00	18.98	29.20	26.96	20.31	20.31	64.39	64.39
70.00	19.43	29.91	25.64	19.32	19.32	65.17	65.17
75.00	19.85	30.57	24.46	18.43	18.43	65.83	65.83
80.00	20.25	31.20	23.40	17.63	17.63	66.40	66.40
85.00	20.63	31.80	22.45	16.91	16.91	66.87	66.87
90.00	21.00	32.36	21.58	16.26	16.26	67.27	67.27
95.00	21.34	32.91	20.78	15.66	15.66	67.60	67.60
100.00	21.68	33.42	20.05	15.11	15.11	67.86	67.86
105.00	22.00	33.92	19.38	14.60	14.60	68.06	68.06
110.00	22.31	34.39	18.76	14.13	14.13	68.21	68.21
115.00	22.61	34.85	18.18	13.70	13.70	68.31	68.31
120.00	22.90	35.29	17.64	13.29	13.29	68.36	68.36
125.00	23.18	35.71	17.14	12.92	12.92	68.37	68.37
130.00	23.45	36.12	16.67	12.56	12.56	68.34	68.34
135.00	23.71	36.52	16.23	12.23	12.23	68.28	68.28
140.00	23.97	36.90	15.81	11.92	11.92	68.18	68.18
145.00	24.22	37.27	15.42	11.62	11.62	68.04	68.04
150.00	24.46	37.63	15.05	11.34	11.34	67.88	67.88
155.00	24.69	37.98	14.70	11.08	11.08	67.69	67.69
160.00	24.92	38.32	14.37	10.83	10.83	67.47	67.47
165.00	25.15	38.65	14.06	10.59	10.59	67.23	67.23
170.00	25.37	38.98	13.76	10.37	10.37	66.97	66.97
175.00	25.58	39.29	13.47	10.15	10.15	66.68	66.68
180.00	25.79	39.60	13.20	9.95	9.95	66.37	66.37
185.00	26.00	39.89	12.94	9.75	9.75	66.04	66.04
190.00	26.20	40.19	12.69	9.56	9.56	65.69	65.69
195.00	26.40	40.47	12.45	9.38	9.38	65.32	65.32
200.00	26.59	40.75	12.22	9.21	9.21	64.93	64.93

205.00	26.78	41.02	12.01	9.05	9.05	64.53	64.53
210.00	26.97	41.28	11.80	8.89	8.89	64.11	64.11
215.00	27.15	41.54	11.59	8.74	8.74	63.67	63.67
220.00	27.33	41.80	11.40	8.59	8.59	63.22	63.22
225.00	27.51	42.05	11.21	8.45	8.45	62.76	62.76
230.00	27.68	42.29	11.03	8.31	8.31	62.28	62.28
235.00	27.85	42.53	10.86	8.18	8.18	61.79	61.79
240.00	28.02	42.76	10.69	8.06	8.06	61.28	61.28
245.00	28.19	42.99	10.53	7.93	7.93	60.76	60.76
250.00	28.35	43.22	10.37	7.82	7.82	60.24	60.24
255.00	28.51	43.44	10.22	7.70	7.70	59.70	59.70
260.00	28.67	43.66	10.08	7.59	7.59	59.15	59.15
265.00	28.83	43.87	9.93	7.48	7.48	58.58	58.58
270.00	28.98	44.08	9.80	7.38	7.38	58.01	58.01
275.00	29.13	44.29	9.66	7.28	7.28	57.43	57.43
280.00	29.28	44.49	9.53	7.18	7.18	56.84	56.84
285.00	29.43	44.69	9.41	7.09	7.09	56.24	56.24
290.00	29.58	44.88	9.29	7.00	7.00	55.63	55.63
295.00	29.72	45.08	9.17	6.91	6.91	55.01	55.01
300.00	29.86	45.26	9.05	6.82	6.82	54.38	54.38
305.00	30.00	45.45	8.94	6.74	6.74	53.75	53.75
310.00	30.14	45.63	8.83	6.66	6.66	53.10	53.10
315.00	30.28	45.81	8.73	6.58	6.58	52.45	52.45
320.00	30.41	45.99	8.62	6.50	6.50	51.79	51.79
325.00	30.55	46.17	8.52	6.42	6.42	51.13	51.13
330.00	30.68	46.34	8.43	6.35	6.35	50.46	50.46
335.00	30.81	46.51	8.33	6.28	6.28	49.78	49.78
340.00	30.94	46.68	8.24	6.21	6.21	49.09	49.09
345.00	31.07	46.94	8.16	6.15	6.15	48.67	48.67
350.00	31.20	47.12	8.08	6.09	6.09	48.01	48.01
355.00	31.32	47.29	7.99	6.02	6.02	47.34	47.34
360.00	31.45	47.46	7.91	5.96	5.96	46.66	46.66
365.00	31.57	47.63	7.83	5.90	5.90	45.98	45.98
370.00	31.69	47.80	7.75	5.84	5.84	45.30	45.30
375.00	31.81	47.96	7.67	5.78	5.78	44.61	44.61
380.00	31.93	48.13	7.60	5.73	5.73	43.91	43.91
385.00	32.05	48.29	7.53	5.67	5.67	43.21	43.21
390.00	32.16	48.45	7.45	5.62	5.62	42.51	42.51
395.00	32.28	48.61	7.38	5.56	5.56	41.80	41.80
400.00	32.39	48.77	7.32	5.51	5.51	41.09	41.09
405.00	32.51	48.92	7.25	5.46	5.46	40.37	40.37
410.00	32.62	49.08	7.18	5.41	5.41	39.65	39.65
415.00	32.73	49.23	7.12	5.36	5.36	38.92	38.92
420.00	32.84	49.38	7.05	5.32	5.32	38.19	38.19
425.00	32.95	49.53	6.99	5.27	5.27	37.46	37.46
430.00	33.06	49.68	6.93	5.22	5.22	36.72	36.72
435.00	33.17	49.83	6.87	5.18	5.18	35.98	35.98
440.00	33.27	49.98	6.81	5.13	5.13	35.24	35.24
445.00	33.38	50.12	6.76	5.09	5.09	34.49	34.49
450.00	33.48	50.26	6.70	5.05	5.05	33.74	33.74

455.00	33.59	50.41	6.65	5.01	5.01	32.99	32.99
460.00	33.69	50.55	6.59	4.97	4.97	32.23	32.23
465.00	33.79	50.69	6.54	4.93	4.93	31.47	31.47
470.00	33.90	50.82	6.49	4.89	4.89	30.70	30.70
475.00	34.00	50.96	6.44	4.85	4.85	29.93	29.93
480.00	34.10	51.10	6.39	4.81	4.81	29.16	29.16
485.00	34.20	51.23	6.34	4.78	4.78	28.39	28.39
490.00	34.29	51.37	6.29	4.74	4.74	27.61	27.61
495.00	34.39	51.50	6.24	4.70	4.70	26.83	26.83
500.00	34.49	51.63	6.20	4.67	4.67	26.05	26.05
505.00	34.58	51.76	6.15	4.63	4.63	25.27	25.27
510.00	34.68	51.89	6.10	4.60	4.60	24.48	24.48
515.00	34.78	52.02	6.06	4.57	4.57	23.69	23.69
520.00	34.87	52.15	6.02	4.53	4.53	22.90	22.90
525.00	34.96	52.28	5.97	4.50	4.50	22.10	22.10
530.00	35.06	52.40	5.93	4.47	4.47	21.30	21.30
535.00	35.15	52.53	5.89	4.44	4.44	20.50	20.50
540.00	35.24	52.65	5.85	4.41	4.41	19.70	19.70
545.00	35.33	52.77	5.81	4.38	4.38	18.89	18.89
550.00	35.42	52.90	5.77	4.35	4.35	18.08	18.08
555.00	35.51	53.02	5.73	4.32	4.32	17.27	17.27
560.00	35.60	53.14	5.69	4.29	4.29	16.46	16.46
565.00	35.69	53.26	5.66	4.26	4.26	15.64	15.64
570.00	35.78	53.38	5.62	4.23	4.23	14.83	14.83
575.00	35.86	53.49	5.58	4.21	4.21	14.01	14.01
580.00	35.95	53.61	5.55	4.18	4.18	13.18	13.18
585.00	36.04	53.73	5.51	4.15	4.15	12.36	12.36
590.00	36.12	53.84	5.48	4.13	4.13	11.53	11.53
595.00	36.21	53.96	5.44	4.10	4.10	10.70	10.70
600.00	36.29	54.07	5.41	4.07	4.07	9.87	9.87
605.00	36.38	54.19	5.37	4.05	4.05	9.04	9.04
610.00	36.46	54.30	5.34	4.02	4.02	8.21	8.21
615.00	36.54	54.41	5.31	4.00	4.00	7.37	7.37
620.00	36.63	54.52	5.28	3.98	3.98	6.53	6.53
625.00	36.71	54.63	5.24	3.95	3.95	5.69	5.69
630.00	36.79	54.74	5.21	3.93	3.93	4.85	4.85
635.00	36.87	54.85	5.18	3.91	3.91	4.01	4.01
640.00	36.95	54.96	5.15	3.88	3.88	3.16	3.16
645.00	37.03	55.07	5.12	3.86	3.86	2.31	2.31
650.00	37.11	55.17	5.09	3.84	3.84	1.46	1.46
655.00	37.19	55.28	5.06	3.82	3.82	0.61	0.61
660.00	37.27	55.39	5.04	3.79	3.79	-0.24	-0.24
665.00	37.35	55.49	5.01	3.77	3.77	-1.10	-1.10
670.00	37.43	55.60	4.98	3.75	3.75	-1.95	-1.95
675.00	37.50	55.70	4.95	3.73	3.73	-2.81	-2.81
680.00	37.58	55.80	4.92	3.71	3.71	-3.67	-3.67
685.00	37.66	55.91	4.90	3.69	3.69	-4.53	-4.53
690.00	37.74	56.01	4.87	3.67	3.67	-5.40	-5.40
695.00	37.81	56.11	4.84	3.65	3.65	-6.26	-6.26
700.00	37.89	56.21	4.82	3.63	3.63	-7.13	-7.13

705.00	37.96	56.31	4.79	3.61	3.61	-7.99	-7.99
710.00	38.04	56.41	4.77	3.59	3.59	-8.86	-8.86
715.00	38.11	56.51	4.74	3.57	3.57	-9.73	-9.73
720.00	38.19	56.61	4.72	3.55	3.55	-10.61	-10.61
725.00	38.26	56.71	4.69	3.54	3.54	-11.48	-11.48
730.00	38.33	56.81	4.67	3.52	3.52	-12.35	-12.35
735.00	38.40	56.90	4.65	3.50	3.50	-13.23	-13.23
740.00	38.48	57.00	4.62	3.48	3.48	-14.11	-14.11
745.00	38.55	57.10	4.60	3.46	3.46	-14.99	-14.99
750.00	38.62	57.19	4.58	3.45	3.45	-15.87	-15.87
755.00	38.69	57.29	4.55	3.43	3.43	-16.75	-16.75
760.00	38.76	57.38	4.53	3.41	3.41	-17.63	-17.63
765.00	38.83	57.47	4.51	3.40	3.40	-18.52	-18.52
770.00	38.91	57.57	4.49	3.38	3.38	-19.40	-19.40
775.00	38.98	57.66	4.46	3.36	3.36	-20.29	-20.29
780.00	39.05	57.75	4.44	3.35	3.35	-21.18	-21.18
785.00	39.11	57.85	4.42	3.33	3.33	-22.07	-22.07
790.00	39.18	57.94	4.40	3.32	3.32	-22.96	-22.96
795.00	39.25	58.03	4.38	3.30	3.30	-23.85	-23.85
800.00	39.32	58.12	4.36	3.28	3.28	-24.75	-24.75
805.00	39.39	58.21	4.34	3.27	3.27	-25.64	-25.64
810.00	39.46	58.30	4.32	3.25	3.25	-26.54	-26.54
815.00	39.52	58.39	4.30	3.24	3.24	-27.44	-27.44
820.00	39.59	58.48	4.28	3.22	3.22	-28.33	-28.33
825.00	39.66	58.57	4.26	3.21	3.21	-29.23	-29.23
830.00	39.73	58.66	4.24	3.19	3.19	-30.13	-30.13
835.00	39.79	58.74	4.22	3.18	3.18	-31.04	-31.04
840.00	39.86	58.83	4.20	3.17	3.17	-31.94	-31.94
845.00	39.92	58.92	4.18	3.15	3.15	-32.84	-32.84
850.00	39.99	59.00	4.17	3.14	3.14	-33.75	-33.75
855.00	40.05	59.09	4.15	3.12	3.12	-34.65	-34.65
860.00	40.12	59.18	4.13	3.11	3.11	-35.56	-35.56
865.00	40.18	59.26	4.11	3.10	3.10	-36.47	-36.47
870.00	40.25	59.35	4.09	3.08	3.08	-37.38	-37.38
875.00	40.31	59.43	4.08	3.07	3.07	-38.29	-38.29
880.00	40.38	59.52	4.06	3.06	3.06	-39.20	-39.20
885.00	40.44	59.60	4.04	3.04	3.04	-40.11	-40.11
890.00	40.50	59.68	4.02	3.03	3.03	-41.03	-41.03
895.00	40.57	59.77	4.01	3.02	3.02	-41.94	-41.94
900.00	40.63	59.85	3.99	3.01	3.01	-42.86	-42.86
905.00	40.69	59.93	3.97	2.99	2.99	-43.77	-43.77
910.00	40.75	60.01	3.96	2.98	2.98	-44.69	-44.69
915.00	40.82	60.10	3.94	2.97	2.97	-45.61	-45.61
920.00	40.88	60.18	3.92	2.96	2.96	-46.53	-46.53
925.00	40.94	60.26	3.91	2.95	2.95	-47.45	-47.45
930.00	41.00	60.34	3.89	2.93	2.93	-48.37	-48.37
935.00	41.06	60.42	3.88	2.92	2.92	-49.29	-49.29
940.00	41.12	60.50	3.86	2.91	2.91	-50.22	-50.22
945.00	41.18	60.58	3.85	2.90	2.90	-51.14	-51.14
950.00	41.24	60.66	3.83	2.89	2.89	-52.06	-52.06

955.00	41.30	60.74	3.82	2.88	2.88	-52.99	-52.99
960.00	41.36	60.82	3.80	2.86	2.86	-53.92	-53.92
965.00	41.42	60.89	3.79	2.85	2.85	-54.85	-54.85
970.00	41.48	60.97	3.77	2.84	2.84	-55.77	-55.77
975.00	41.54	61.05	3.76	2.83	2.83	-56.70	-56.70
980.00	41.60	61.13	3.74	2.82	2.82	-57.63	-57.63
985.00	41.66	61.20	3.73	2.81	2.81	-58.56	-58.56
990.00	41.72	61.28	3.71	2.80	2.80	-59.50	-59.50
995.00	41.78	61.36	3.70	2.79	2.79	-60.43	-60.43
1000.00	41.83	61.43	3.69	2.78	2.78	-61.36	-61.36
1005.00	41.89	61.51	3.67	2.77	2.77	-62.30	-62.30
1010.00	41.95	61.58	3.66	2.76	2.76	-63.23	-63.23
1015.00	42.01	61.66	3.64	2.75	2.75	-64.17	-64.17
1020.00	42.06	61.73	3.63	2.74	2.74	-65.10	-65.10
1025.00	42.12	61.81	3.62	2.73	2.73	-66.04	-66.04
1030.00	42.18	61.88	3.60	2.72	2.72	-66.98	-66.98
1035.00	42.23	61.96	3.59	2.71	2.71	-67.92	-67.92
1040.00	42.29	62.03	3.58	2.70	2.70	-68.86	-68.86
1045.00	42.35	62.10	3.57	2.69	2.69	-69.80	-69.80
1050.00	42.40	62.18	3.55	2.68	2.68	-70.74	-70.74
1055.00	42.46	62.25	3.54	2.67	2.67	-71.68	-71.68
1060.00	42.52	62.32	3.53	2.66	2.66	-72.63	-72.63
1065.00	42.57	62.40	3.52	2.65	2.65	-73.57	-73.57
1070.00	42.63	62.47	3.50	2.64	2.64	-74.51	-74.51
1075.00	42.68	62.54	3.49	2.63	2.63	-75.46	-75.46
1080.00	42.74	62.61	3.48	2.62	2.62	-76.40	-76.40
1085.00	42.79	62.68	3.47	2.61	2.61	-77.35	-77.35
1090.00	42.85	62.75	3.45	2.60	2.60	-78.30	-78.30
1095.00	42.90	62.83	3.44	2.59	2.59	-79.25	-79.25
1100.00	42.95	62.90	3.43	2.58	2.58	-80.19	-80.19
1105.00	43.01	62.97	3.42	2.58	2.58	-81.14	-81.14
1110.00	43.06	63.04	3.41	2.57	2.57	-82.09	-82.09
1115.00	43.12	63.11	3.40	2.56	2.56	-83.04	-83.04
1120.00	43.17	63.18	3.38	2.55	2.55	-83.99	-83.99
1125.00	43.22	63.24	3.37	2.54	2.54	-84.95	-84.95
1130.00	43.28	63.31	3.36	2.53	2.53	-85.90	-85.90
1135.00	43.33	63.38	3.35	2.52	2.52	-86.85	-86.85
1140.00	43.38	63.45	3.34	2.52	2.52	-87.81	-87.81
1145.00	43.43	63.52	3.33	2.51	2.51	-88.76	-88.76
1150.00	43.49	63.59	3.32	2.50	2.50	-89.72	-89.72
1155.00	43.54	63.66	3.31	2.49	2.49	-90.67	-90.67
1160.00	43.59	63.72	3.30	2.48	2.48	-91.63	-91.63
1165.00	43.64	63.79	3.29	2.48	2.48	-92.59	-92.59
1170.00	43.69	63.86	3.27	2.47	2.47	-93.54	-93.54
1175.00	43.75	63.93	3.26	2.46	2.46	-94.50	-94.50
1180.00	43.80	63.99	3.25	2.45	2.45	-95.46	-95.46
1185.00	43.85	64.06	3.24	2.44	2.44	-96.42	-96.42
1190.00	43.90	64.12	3.23	2.44	2.44	-97.38	-97.38
1195.00	43.95	64.19	3.22	2.43	2.43	-98.34	-98.34
1200.00	44.00	64.26	3.21	2.42	2.42	-99.30	-99.30

1205.00	44.05	64.32	3.20	2.41	2.41	-100.26	-100.26
1210.00	44.10	64.39	3.19	2.41	2.41	-101.23	-101.23
1215.00	44.15	64.45	3.18	2.40	2.40	-102.19	-102.19
1220.00	44.20	64.52	3.17	2.39	2.39	-103.15	-103.15
1225.00	44.25	64.58	3.16	2.38	2.38	-104.12	-104.12
1230.00	44.30	64.65	3.15	2.38	2.38	-105.08	-105.08
1235.00	44.35	64.71	3.14	2.37	2.37	-106.05	-106.05
1240.00	44.40	64.78	3.13	2.36	2.36	-107.01	-107.01
1245.00	44.45	64.84	3.12	2.35	2.35	-107.98	-107.98
1250.00	44.50	64.90	3.12	2.35	2.35	-108.95	-108.95
1255.00	44.55	64.97	3.11	2.34	2.34	-109.91	-109.91
1260.00	44.60	65.03	3.10	2.33	2.33	-110.88	-110.88
1265.00	44.65	65.09	3.09	2.33	2.33	-111.85	-111.85
1270.00	44.70	65.16	3.08	2.32	2.32	-112.82	-112.82
1275.00	44.75	65.22	3.07	2.31	2.31	-113.79	-113.79
1280.00	44.79	65.28	3.06	2.31	2.31	-114.76	-114.76
1285.00	44.84	65.35	3.05	2.30	2.30	-115.73	-115.73
1290.00	44.89	65.41	3.04	2.29	2.29	-116.70	-116.70
1295.00	44.94	65.47	3.03	2.29	2.29	-117.67	-117.67
1300.00	44.99	65.53	3.02	2.28	2.28	-118.64	-118.64
1305.00	45.03	65.59	3.02	2.27	2.27	-119.62	-119.62
1310.00	45.08	65.65	3.01	2.27	2.27	-120.59	-120.59
1315.00	45.13	65.72	3.00	2.26	2.26	-121.56	-121.56
1320.00	45.18	65.78	2.99	2.25	2.25	-122.54	-122.54
1325.00	45.22	65.84	2.98	2.25	2.25	-123.51	-123.51
1330.00	45.27	65.90	2.97	2.24	2.24	-124.49	-124.49
1335.00	45.32	65.96	2.96	2.23	2.23	-125.46	-125.46
1340.00	45.37	66.02	2.96	2.23	2.23	-126.44	-126.44
1345.00	45.41	66.08	2.95	2.22	2.22	-127.42	-127.42
1350.00	45.46	66.14	2.94	2.21	2.21	-128.39	-128.39
1355.00	45.51	66.20	2.93	2.21	2.21	-129.37	-129.37
1360.00	45.55	66.26	2.92	2.20	2.20	-130.35	-130.35
1365.00	45.60	66.32	2.92	2.20	2.20	-131.33	-131.33
1370.00	45.64	66.38	2.91	2.19	2.19	-132.31	-132.31
1375.00	45.69	66.44	2.90	2.18	2.18	-133.29	-133.29
1380.00	45.74	66.50	2.89	2.18	2.18	-134.27	-134.27
1385.00	45.78	66.55	2.88	2.17	2.17	-135.25	-135.25
1390.00	45.83	66.61	2.88	2.17	2.17	-136.23	-136.23
1395.00	45.87	66.67	2.87	2.16	2.16	-137.21	-137.21
1400.00	45.92	66.73	2.86	2.15	2.15	-138.19	-138.19
1405.00	45.96	66.79	2.85	2.15	2.15	-139.17	-139.17
1410.00	46.01	66.85	2.84	2.14	2.14	-140.16	-140.16
1415.00	46.05	66.90	2.84	2.14	2.14	-141.14	-141.14
1420.00	46.10	66.96	2.83	2.13	2.13	-142.12	-142.12
1425.00	46.14	67.02	2.82	2.13	2.13	-143.11	-143.11
1430.00	46.19	67.08	2.81	2.12	2.12	-144.09	-144.09
1435.00	46.23	67.13	2.81	2.12	2.12	-145.08	-145.08
1440.00	46.28	67.19	2.80	2.11	2.11	-146.06	-146.06
1445.00	46.32	67.25	2.79	2.10	2.10	-147.05	-147.05
1450.00	46.37	67.30	2.79	2.10	2.10	-148.03	-148.03

1455.00	46.41	67.36	2.78	2.09	2.09	-149.02	-149.02
1460.00	46.45	67.42	2.77	2.09	2.09	-150.01	-150.01
1465.00	46.50	67.47	2.76	2.08	2.08	-151.00	-151.00
1470.00	46.54	67.53	2.76	2.08	2.08	-151.98	-151.98
1475.00	46.59	67.59	2.75	2.07	2.07	-152.97	-152.97
1480.00	46.63	67.64	2.74	2.07	2.07	-153.96	-153.96
1485.00	46.67	67.70	2.74	2.06	2.06	-154.95	-154.95
1490.00	46.72	67.75	2.73	2.06	2.06	-155.94	-155.94
1495.00	46.76	67.81	2.72	2.05	2.05	-156.93	-156.93
1500.00	46.80	67.86	2.71	2.05	2.05	-157.92	-157.92
1505.00	46.85	67.92	2.71	2.04	2.04	-158.91	-158.91
1510.00	46.89	67.97	2.70	2.04	2.04	-159.90	-159.90
1515.00	46.93	68.03	2.69	2.03	2.03	-160.89	-160.89
1520.00	46.97	68.08	2.69	2.02	2.02	-161.88	-161.88
1525.00	47.02	68.14	2.68	2.02	2.02	-162.88	-162.88
1530.00	47.06	68.19	2.67	2.01	2.01	-163.87	-163.87
1535.00	47.10	68.25	2.67	2.01	2.01	-164.86	-164.86
1540.00	47.14	68.30	2.66	2.01	2.01	-165.86	-165.86
1545.00	47.19	68.35	2.65	2.00	2.00	-166.85	-166.85
1550.00	47.23	68.41	2.65	2.00	2.00	-167.84	-167.84
1555.00	47.27	68.46	2.64	1.99	1.99	-168.84	-168.84
1560.00	47.31	68.51	2.64	1.99	1.99	-169.83	-169.83
1565.00	47.35	68.57	2.63	1.98	1.98	-170.83	-170.83
1570.00	47.40	68.62	2.62	1.98	1.98	-171.82	-171.82
1575.00	47.44	68.67	2.62	1.97	1.97	-172.82	-172.82
1580.00	47.48	68.73	2.61	1.97	1.97	-173.82	-173.82
1585.00	47.52	68.78	2.60	1.96	1.96	-174.81	-174.81
1590.00	47.56	68.83	2.60	1.96	1.96	-175.81	-175.81
1595.00	47.60	68.89	2.59	1.95	1.95	-176.81	-176.81
1600.00	47.64	68.94	2.59	1.95	1.95	-177.80	-177.80
1605.00	47.69	68.99	2.58	1.94	1.94	-178.80	-178.80
1610.00	47.73	69.04	2.57	1.94	1.94	-179.80	-179.80
1615.00	47.77	69.09	2.57	1.93	1.93	-180.80	-180.80
1620.00	47.81	69.15	2.56	1.93	1.93	-181.80	-181.80
1625.00	47.85	69.20	2.56	1.93	1.93	-182.80	-182.80
1630.00	47.89	69.25	2.55	1.92	1.92	-183.80	-183.80
1635.00	47.93	69.30	2.54	1.92	1.92	-184.80	-184.80
1640.00	47.97	69.35	2.54	1.91	1.91	-185.80	-185.80
1645.00	48.01	69.40	2.53	1.91	1.91	-186.80	-186.80
1650.00	48.05	69.46	2.53	1.90	1.90	-187.80	-187.80
1655.00	48.09	69.51	2.52	1.90	1.90	-188.80	-188.80
1660.00	48.13	69.56	2.51	1.89	1.89	-189.80	-189.80
1665.00	48.17	69.61	2.51	1.89	1.89	-190.81	-190.81
1670.00	48.21	69.66	2.50	1.89	1.89	-191.81	-191.81
1675.00	48.25	69.71	2.50	1.88	1.88	-192.81	-192.81
1680.00	48.29	69.76	2.49	1.88	1.88	-193.81	-193.81
1685.00	48.33	69.81	2.49	1.87	1.87	-194.82	-194.82
1690.00	48.37	69.86	2.48	1.87	1.87	-195.82	-195.82
1695.00	48.41	69.91	2.47	1.86	1.86	-196.83	-196.83
1700.00	48.45	69.96	2.47	1.86	1.86	-197.83	-197.83

1705.00	48.49	70.01	2.46	1.86	1.86	-198.83	-198.83
1710.00	48.53	70.06	2.46	1.85	1.85	-199.84	-199.84
1715.00	48.57	70.11	2.45	1.85	1.85	-200.85	-200.85
1720.00	48.61	70.16	2.45	1.84	1.84	-201.85	-201.85
1725.00	48.64	70.21	2.44	1.84	1.84	-202.86	-202.86
1730.00	48.68	70.26	2.44	1.84	1.84	-203.86	-203.86
1735.00	48.72	70.31	2.43	1.83	1.83	-204.87	-204.87
1740.00	48.76	70.36	2.43	1.83	1.83	-205.88	-205.88
1745.00	48.80	70.41	2.42	1.82	1.82	-206.88	-206.88
1750.00	48.84	70.45	2.42	1.82	1.82	-207.89	-207.89
1755.00	48.88	70.50	2.41	1.82	1.82	-208.90	-208.90
1760.00	48.92	70.55	2.41	1.81	1.81	-209.91	-209.91
1765.00	48.95	70.60	2.40	1.81	1.81	-210.92	-210.92
1770.00	48.99	70.65	2.39	1.80	1.80	-211.92	-211.92
1775.00	49.03	70.70	2.39	1.80	1.80	-212.93	-212.93
1780.00	49.07	70.74	2.38	1.80	1.80	-213.94	-213.94
1785.00	49.11	70.79	2.38	1.79	1.79	-214.95	-214.95
1790.00	49.14	70.84	2.37	1.79	1.79	-215.96	-215.96
1795.00	49.18	70.89	2.37	1.79	1.79	-216.97	-216.97
1800.00	49.22	70.94	2.36	1.78	1.78	-217.98	-217.98
1805.00	49.26	70.98	2.36	1.78	1.78	-218.99	-218.99
1810.00	49.29	71.03	2.35	1.77	1.77	-220.00	-220.00
1815.00	49.33	71.08	2.35	1.77	1.77	-221.02	-221.02
1820.00	49.37	71.13	2.34	1.77	1.77	-222.03	-222.03
1825.00	49.41	71.17	2.34	1.76	1.76	-223.04	-223.04
1830.00	49.44	71.22	2.34	1.76	1.76	-224.05	-224.05
1835.00	49.48	71.27	2.33	1.76	1.76	-225.06	-225.06
1840.00	49.52	71.31	2.33	1.75	1.75	-226.08	-226.08
1845.00	49.56	71.36	2.32	1.75	1.75	-227.09	-227.09
1850.00	49.59	71.41	2.32	1.75	1.75	-228.10	-228.10
1855.00	49.63	71.46	2.31	1.74	1.74	-229.12	-229.12
1860.00	49.67	71.50	2.31	1.74	1.74	-230.13	-230.13
1865.00	49.70	71.55	2.30	1.73	1.73	-231.14	-231.14
1870.00	49.74	71.59	2.30	1.73	1.73	-232.16	-232.16
1875.00	49.78	71.64	2.29	1.73	1.73	-233.17	-233.17
1880.00	49.81	71.69	2.29	1.72	1.72	-234.19	-234.19
1885.00	49.85	71.73	2.28	1.72	1.72	-235.20	-235.20
1890.00	49.89	71.78	2.28	1.72	1.72	-236.22	-236.22
1895.00	49.92	71.82	2.27	1.71	1.71	-237.23	-237.23
1900.00	49.96	71.87	2.27	1.71	1.71	-238.25	-238.25
1905.00	50.00	71.92	2.27	1.71	1.71	-239.27	-239.27
1910.00	50.03	71.96	2.26	1.70	1.70	-240.28	-240.28
1915.00	50.07	72.01	2.26	1.70	1.70	-241.30	-241.30
1920.00	50.10	72.05	2.25	1.70	1.70	-242.32	-242.32
1925.00	50.14	72.10	2.25	1.69	1.69	-243.33	-243.33
1930.00	50.18	72.14	2.24	1.69	1.69	-244.35	-244.35
1935.00	50.21	72.19	2.24	1.69	1.69	-245.37	-245.37
1940.00	50.25	72.23	2.23	1.68	1.68	-246.39	-246.39
1945.00	50.28	72.28	2.23	1.68	1.68	-247.40	-247.40
1950.00	50.32	72.32	2.23	1.68	1.68	-248.42	-248.42

1955.00	50.35	72.37	2.22	1.67	1.67	-249.44	-249.44
1960.00	50.39	72.41	2.22	1.67	1.67	-250.46	-250.46
1965.00	50.43	72.46	2.21	1.67	1.67	-251.48	-251.48
1970.00	50.46	72.50	2.21	1.66	1.66	-252.50	-252.50
1975.00	50.50	72.55	2.20	1.66	1.66	-253.52	-253.52
1980.00	50.53	72.59	2.20	1.66	1.66	-254.54	-254.54
1985.00	50.57	72.63	2.20	1.65	1.65	-255.56	-255.56
1990.00	50.60	72.68	2.19	1.65	1.65	-256.58	-256.58
1995.00	50.64	72.72	2.19	1.65	1.65	-257.60	-257.60
2000.00	50.67	72.77	2.18	1.64	1.64	-258.62	-258.62
2005.00	50.71	72.81	2.18	1.64	1.64	-259.64	-259.64
2010.00	50.74	72.85	2.17	1.64	1.64	-260.66	-260.66
2015.00	50.78	72.90	2.17	1.64	1.64	-261.68	-261.68
2020.00	50.81	72.94	2.17	1.63	1.63	-262.71	-262.71
2025.00	50.85	72.98	2.16	1.63	1.63	-263.73	-263.73
2030.00	50.88	73.03	2.16	1.63	1.63	-264.75	-264.75
2035.00	50.91	73.07	2.15	1.62	1.62	-265.77	-265.77
2040.00	50.95	73.11	2.15	1.62	1.62	-266.79	-266.79
2045.00	50.98	73.16	2.15	1.62	1.62	-267.82	-267.82
2050.00	51.02	73.20	2.14	1.61	1.61	-268.84	-268.84
2055.00	51.05	73.24	2.14	1.61	1.61	-269.86	-269.86
2060.00	51.09	73.29	2.13	1.61	1.61	-270.89	-270.89
2065.00	51.12	73.33	2.13	1.61	1.61	-271.91	-271.91
2070.00	51.15	73.37	2.13	1.60	1.60	-272.94	-272.94
2075.00	51.19	73.41	2.12	1.60	1.60	-273.96	-273.96
2080.00	51.22	73.46	2.12	1.60	1.60	-274.98	-274.98
2085.00	51.26	73.50	2.12	1.59	1.59	-276.01	-276.01
2090.00	51.29	73.54	2.11	1.59	1.59	-277.03	-277.03
2095.00	51.32	73.58	2.11	1.59	1.59	-278.06	-278.06
2100.00	51.36	73.63	2.10	1.59	1.59	-279.08	-279.08
2105.00	51.39	73.67	2.10	1.58	1.58	-280.11	-280.11
2110.00	51.43	73.71	2.10	1.58	1.58	-281.14	-281.14
2115.00	51.46	73.75	2.09	1.58	1.58	-282.16	-282.16
2120.00	51.49	73.80	2.09	1.57	1.57	-283.19	-283.19
2125.00	51.53	73.84	2.08	1.57	1.57	-284.21	-284.21
2130.00	51.56	73.88	2.08	1.57	1.57	-285.24	-285.24
2135.00	51.59	73.92	2.08	1.57	1.57	-286.27	-286.27
2140.00	51.63	73.96	2.07	1.56	1.56	-287.30	-287.30
2145.00	51.66	74.00	2.07	1.56	1.56	-288.32	-288.32
2150.00	51.69	74.05	2.07	1.56	1.56	-289.35	-289.35
2155.00	51.73	74.09	2.06	1.55	1.55	-290.38	-290.38
2160.00	51.76	74.13	2.06	1.55	1.55	-291.41	-291.41
2165.00	51.79	74.17	2.06	1.55	1.55	-292.43	-292.43
2170.00	51.82	74.21	2.05	1.55	1.55	-293.46	-293.46
2175.00	51.86	74.25	2.05	1.54	1.54	-294.49	-294.49
2180.00	51.89	74.29	2.04	1.54	1.54	-295.52	-295.52
2185.00	51.92	74.33	2.04	1.54	1.54	-296.55	-296.55
2190.00	51.96	74.37	2.04	1.54	1.54	-297.58	-297.58
2195.00	51.99	74.42	2.03	1.53	1.53	-298.61	-298.61
2200.00	52.02	74.46	2.03	1.53	1.53	-299.64	-299.64

2205.00	52.05	74.50	2.03	1.53	1.53	-300.67	-300.67
2210.00	52.09	74.54	2.02	1.52	1.52	-301.70	-301.70
2215.00	52.12	74.58	2.02	1.52	1.52	-302.73	-302.73
2220.00	52.15	74.62	2.02	1.52	1.52	-303.76	-303.76
2225.00	52.18	74.66	2.01	1.52	1.52	-304.79	-304.79
2230.00	52.22	74.70	2.01	1.51	1.51	-305.82	-305.82
2235.00	52.25	74.74	2.01	1.51	1.51	-306.85	-306.85
2240.00	52.28	74.78	2.00	1.51	1.51	-307.88	-307.88
2245.00	52.31	74.82	2.00	1.51	1.51	-308.91	-308.91
2250.00	52.34	74.86	2.00	1.50	1.50	-309.94	-309.94
2255.00	52.38	74.90	1.99	1.50	1.50	-310.97	-310.97
2260.00	52.41	74.94	1.99	1.50	1.50	-312.01	-312.01
2265.00	52.44	74.98	1.99	1.50	1.50	-313.04	-313.04
2270.00	52.47	75.02	1.98	1.49	1.49	-314.07	-314.07
2275.00	52.50	75.06	1.98	1.49	1.49	-315.10	-315.10
2280.00	52.54	75.10	1.98	1.49	1.49	-316.14	-316.14
2285.00	52.57	75.14	1.97	1.49	1.49	-317.17	-317.17
2290.00	52.60	75.18	1.97	1.48	1.48	-318.20	-318.20
2295.00	52.63	75.22	1.97	1.48	1.48	-319.23	-319.23
2300.00	52.66	75.26	1.96	1.48	1.48	-320.27	-320.27
2305.00	52.69	75.29	1.96	1.48	1.48	-321.30	-321.30
2310.00	52.73	75.33	1.96	1.47	1.47	-322.33	-322.33
2315.00	52.76	75.37	1.95	1.47	1.47	-323.37	-323.37
2320.00	52.79	75.41	1.95	1.47	1.47	-324.40	-324.40
2325.00	52.82	75.45	1.95	1.47	1.47	-325.44	-325.44
2330.00	52.85	75.49	1.94	1.46	1.46	-326.47	-326.47
2335.00	52.88	75.53	1.94	1.46	1.46	-327.51	-327.51
2340.00	52.91	75.57	1.94	1.46	1.46	-328.54	-328.54
2345.00	52.94	75.61	1.93	1.46	1.46	-329.58	-329.58
2350.00	52.98	75.64	1.93	1.46	1.46	-330.61	-330.61
2355.00	53.01	75.68	1.93	1.45	1.45	-331.65	-331.65
2360.00	53.04	75.72	1.93	1.45	1.45	-332.68	-332.68
2365.00	53.07	75.76	1.92	1.45	1.45	-333.72	-333.72
2370.00	53.10	75.80	1.92	1.45	1.45	-334.75	-334.75
2375.00	53.13	75.84	1.92	1.44	1.44	-335.79	-335.79
2380.00	53.16	75.88	1.91	1.44	1.44	-336.83	-336.83
2385.00	53.19	75.91	1.91	1.44	1.44	-337.86	-337.86
2390.00	53.22	75.95	1.91	1.44	1.44	-338.90	-338.90
2395.00	53.25	75.99	1.90	1.43	1.43	-339.94	-339.94
2400.00	53.28	76.03	1.90	1.43	1.43	-340.97	-340.97
2405.00	53.31	76.07	1.90	1.43	1.43	-342.01	-342.01
2410.00	53.34	76.10	1.89	1.43	1.43	-343.05	-343.05
2415.00	53.38	76.14	1.89	1.43	1.43	-344.08	-344.08
2420.00	53.41	76.18	1.89	1.42	1.42	-345.12	-345.12
2425.00	53.44	76.22	1.89	1.42	1.42	-346.16	-346.16
2430.00	53.47	76.25	1.88	1.42	1.42	-347.20	-347.20
2435.00	53.50	76.29	1.88	1.42	1.42	-348.24	-348.24
2440.00	53.53	76.33	1.88	1.41	1.41	-349.27	-349.27
2445.00	53.56	76.37	1.87	1.41	1.41	-350.31	-350.31
2450.00	53.59	76.40	1.87	1.41	1.41	-351.35	-351.35

2455.00	53.62	76.44	1.87	1.41	1.41	-352.39	-352.39
2460.00	53.65	76.48	1.87	1.41	1.41	-353.43	-353.43
2465.00	53.68	76.52	1.86	1.40	1.40	-354.47	-354.47
2470.00	53.71	76.55	1.86	1.40	1.40	-355.51	-355.51
2475.00	53.74	76.59	1.86	1.40	1.40	-356.55	-356.55
2480.00	53.77	76.63	1.85	1.40	1.40	-357.59	-357.59
2485.00	53.80	76.66	1.85	1.39	1.39	-358.63	-358.63
2490.00	53.83	76.70	1.85	1.39	1.39	-359.67	-359.67
2495.00	53.86	76.74	1.85	1.39	1.39	-360.71	-360.71
2500.00	53.89	76.77	1.84	1.39	1.39	-361.75	-361.75
2505.00	53.92	76.81	1.84	1.39	1.39	-362.79	-362.79
2510.00	53.95	76.85	1.84	1.38	1.38	-363.83	-363.83
2515.00	53.98	76.88	1.83	1.38	1.38	-364.87	-364.87
2520.00	54.00	76.92	1.83	1.38	1.38	-365.91	-365.91
2525.00	54.03	76.96	1.83	1.38	1.38	-366.95	-366.95
2530.00	54.06	76.99	1.83	1.38	1.38	-367.99	-367.99
2535.00	54.09	77.03	1.82	1.37	1.37	-369.03	-369.03
2540.00	54.12	77.07	1.82	1.37	1.37	-370.07	-370.07
2545.00	54.15	77.10	1.82	1.37	1.37	-371.11	-371.11
2550.00	54.18	77.14	1.82	1.37	1.37	-372.16	-372.16
2555.00	54.21	77.18	1.81	1.37	1.37	-373.20	-373.20
2560.00	54.24	77.21	1.81	1.36	1.36	-374.24	-374.24
2565.00	54.27	77.25	1.81	1.36	1.36	-375.28	-375.28
2570.00	54.30	77.28	1.80	1.36	1.36	-376.33	-376.33
2575.00	54.33	77.32	1.80	1.36	1.36	-377.37	-377.37
2580.00	54.36	77.36	1.80	1.36	1.36	-378.41	-378.41
2585.00	54.39	77.39	1.80	1.35	1.35	-379.45	-379.45
2590.00	54.41	77.43	1.79	1.35	1.35	-380.50	-380.50
2595.00	54.44	77.46	1.79	1.35	1.35	-381.54	-381.54
2600.00	54.47	77.50	1.79	1.35	1.35	-382.58	-382.58
2605.00	54.50	77.53	1.79	1.35	1.35	-383.63	-383.63
2610.00	54.53	77.57	1.78	1.34	1.34	-384.67	-384.67
2615.00	54.56	77.61	1.78	1.34	1.34	-385.71	-385.71
2620.00	54.59	77.64	1.78	1.34	1.34	-386.76	-386.76
2625.00	54.62	77.68	1.78	1.34	1.34	-387.80	-387.80
2630.00	54.64	77.71	1.77	1.34	1.34	-388.85	-388.85
2635.00	54.67	77.75	1.77	1.33	1.33	-389.89	-389.89
2640.00	54.70	77.78	1.77	1.33	1.33	-390.93	-390.93
2645.00	54.73	77.82	1.77	1.33	1.33	-391.98	-391.98
2650.00	54.76	77.85	1.76	1.33	1.33	-393.02	-393.02
2655.00	54.79	77.89	1.76	1.33	1.33	-394.07	-394.07
2660.00	54.82	77.92	1.76	1.32	1.32	-395.11	-395.11
2665.00	54.84	77.96	1.76	1.32	1.32	-396.16	-396.16
2670.00	54.87	77.99	1.75	1.32	1.32	-397.20	-397.20
2675.00	54.90	78.03	1.75	1.32	1.32	-398.25	-398.25
2680.00	54.93	78.06	1.75	1.32	1.32	-399.30	-399.30
2685.00	54.96	78.10	1.75	1.31	1.31	-400.34	-400.34
2690.00	54.99	78.13	1.74	1.31	1.31	-401.39	-401.39
2695.00	55.01	78.17	1.74	1.31	1.31	-402.43	-402.43
2700.00	55.04	78.20	1.74	1.31	1.31	-403.48	-403.48

2705.00	55.07	78.24	1.74	1.31	1.31	-404.53	-404.53
2710.00	55.10	78.27	1.73	1.31	1.31	-405.57	-405.57
2715.00	55.13	78.30	1.73	1.30	1.30	-406.62	-406.62
2720.00	55.15	78.34	1.73	1.30	1.30	-407.66	-407.66
2725.00	55.18	78.37	1.73	1.30	1.30	-408.71	-408.71
2730.00	55.21	78.41	1.72	1.30	1.30	-409.76	-409.76
2735.00	55.24	78.44	1.72	1.30	1.30	-410.81	-410.81
2740.00	55.26	78.48	1.72	1.29	1.29	-411.85	-411.85
2745.00	55.29	78.51	1.72	1.29	1.29	-412.90	-412.90
2750.00	55.32	78.54	1.71	1.29	1.29	-413.95	-413.95
2755.00	55.35	78.58	1.71	1.29	1.29	-415.00	-415.00
2760.00	55.38	78.61	1.71	1.29	1.29	-416.04	-416.04
2765.00	55.40	78.65	1.71	1.29	1.29	-417.09	-417.09
2770.00	55.43	78.68	1.70	1.28	1.28	-418.14	-418.14
2775.00	55.46	78.71	1.70	1.28	1.28	-419.19	-419.19
2780.00	55.49	78.75	1.70	1.28	1.28	-420.24	-420.24
2785.00	55.51	78.78	1.70	1.28	1.28	-421.28	-421.28
2790.00	55.54	78.81	1.69	1.28	1.28	-422.33	-422.33
2795.00	55.57	78.85	1.69	1.28	1.28	-423.38	-423.38
2800.00	55.60	78.88	1.69	1.27	1.27	-424.43	-424.43
2805.00	55.62	78.92	1.69	1.27	1.27	-425.48	-425.48
2810.00	55.65	78.95	1.69	1.27	1.27	-426.53	-426.53
2815.00	55.68	78.98	1.68	1.27	1.27	-427.58	-427.58
2820.00	55.70	79.02	1.68	1.27	1.27	-428.63	-428.63
2825.00	55.73	79.05	1.68	1.27	1.27	-429.68	-429.68
2830.00	55.76	79.08	1.68	1.26	1.26	-430.73	-430.73
2835.00	55.79	79.12	1.67	1.26	1.26	-431.78	-431.78
2840.00	55.81	79.15	1.67	1.26	1.26	-432.83	-432.83
2845.00	55.84	79.18	1.67	1.26	1.26	-433.88	-433.88
2850.00	55.87	79.22	1.67	1.26	1.26	-434.93	-434.93
2855.00	55.89	79.25	1.67	1.25	1.25	-435.98	-435.98
2860.00	55.92	79.28	1.66	1.25	1.25	-437.03	-437.03
2865.00	55.95	79.31	1.66	1.25	1.25	-438.08	-438.08
2870.00	55.97	79.35	1.66	1.25	1.25	-439.13	-439.13
2875.00	56.00	79.38	1.66	1.25	1.25	-440.18	-440.18
2880.00	56.03	79.41	1.65	1.25	1.25	-441.23	-441.23

Notes to User

Only values shown blue to be edited

Sheet only for england and wales

In M5-D	J0	J1	J2	Cr	In (MT-D/M5-D)	MT-D/M5-D
2.23	0.1699	0.0028	0.000114	0.205744	0.39116	1.478695
2.41	0.1644	0.005831	-0.00013	0.212758	0.404495	1.498546
2.53	0.1644	0.005831	-0.00013	0.216461	0.411535	1.509133
2.62	0.1644	0.005831	-0.00013	0.219057	0.41647	1.516599
2.68	0.1644	0.005831	-0.00013	0.220976	0.42012	1.522144
2.74	0.1644	0.005831	-0.00013	0.222446	0.422914	1.526403
2.78	0.1644	0.005831	-0.00013	0.223597	0.425101	1.529745
2.82	0.1644	0.005831	-0.00013	0.224511	0.42684	1.532407
2.86	0.1644	0.005831	-0.00013	0.225244	0.428233	1.534544
2.89	0.1644	0.005831	-0.00013	0.225834	0.429355	1.536267
2.92	0.1644	0.005831	-0.00013	0.226309	0.430259	1.537655
2.94	0.1644	0.005831	-0.00013	0.22669	0.430982	1.538768
2.97	0.1644	0.005831	-0.00013	0.226992	0.431556	1.539652
2.99	0.1644	0.005831	-0.00013	0.227227	0.432004	1.540341
3.01	0.1644	0.005831	-0.00013	0.227406	0.432344	1.540865
3.03	0.1644	0.005831	-0.00013	0.227536	0.432591	1.541246
3.04	0.1644	0.005831	-0.00013	0.227624	0.432758	1.541503
3.06	0.1644	0.005831	-0.00013	0.227674	0.432854	1.541651
3.08	0.1644	0.005831	-0.00013	0.227692	0.432888	1.541703
3.09	0.1644	0.005831	-0.00013	0.227681	0.432866	1.54167
3.11	0.1644	0.005831	-0.00013	0.227644	0.432796	1.541561
3.12	0.1644	0.005831	-0.00013	0.227584	0.432681	1.541385
3.13	0.1644	0.005831	-0.00013	0.227503	0.432527	1.541148
3.14	0.1644	0.005831	-0.00013	0.227403	0.432338	1.540855
3.15	0.1644	0.005831	-0.00013	0.227286	0.432116	1.540513
3.17	0.1644	0.005831	-0.00013	0.227154	0.431864	1.540126
3.18	0.1644	0.005831	-0.00013	0.227008	0.431586	1.539698
3.19	0.1644	0.005831	-0.00013	0.226848	0.431284	1.539232
3.20	0.1644	0.005831	-0.00013	0.226678	0.430959	1.538732
3.21	0.1644	0.005831	-0.00013	0.226496	0.430613	1.5382
3.22	0.1644	0.005831	-0.00013	0.226304	0.430249	1.53764
3.22	0.1644	0.005831	-0.00013	0.226103	0.429867	1.537052
3.23	0.1644	0.005831	-0.00013	0.225894	0.429468	1.536441
3.24	0.1644	0.005831	-0.00013	0.225676	0.429055	1.535806
3.25	0.1644	0.005831	-0.00013	0.225452	0.428628	1.53515
3.26	0.1644	0.005831	-0.00013	0.22522	0.428188	1.534475
3.27	0.1644	0.005831	-0.00013	0.224983	0.427736	1.533782
3.27	0.1644	0.005831	-0.00013	0.224739	0.427273	1.533072
3.28	0.1644	0.005831	-0.00013	0.22449	0.4268	1.532346

3.29	0.1644	0.005831	-0.00013	0.224236	0.426317	1.531606
3.29	0.1644	0.005831	-0.00013	0.223977	0.425824	1.530852
3.30	0.1644	0.005831	-0.00013	0.223713	0.425323	1.530085
3.31	0.1644	0.005831	-0.00013	0.223446	0.424815	1.529307
3.31	0.1644	0.005831	-0.00013	0.223174	0.424299	1.528518
3.32	0.1644	0.005831	-0.00013	0.222899	0.423775	1.527718
3.33	0.1644	0.005831	-0.00013	0.222621	0.423246	1.526909
3.33	0.1644	0.005831	-0.00013	0.222339	0.42271	1.526091
3.34	0.1644	0.005831	-0.00013	0.222054	0.422168	1.525265
3.34	0.1644	0.005831	-0.00013	0.221766	0.421621	1.52443
3.35	0.1644	0.005831	-0.00013	0.221475	0.421068	1.523588
3.36	0.1644	0.005831	-0.00013	0.221182	0.420511	1.52274
3.36	0.1644	0.005831	-0.00013	0.220887	0.41995	1.521885
3.37	0.1644	0.005831	-0.00013	0.220589	0.419384	1.521024
3.37	0.1644	0.005831	-0.00013	0.220289	0.418814	1.520157
3.38	0.1644	0.005831	-0.00013	0.219988	0.41824	1.519285
3.38	0.1644	0.005831	-0.00013	0.219684	0.417662	1.518408
3.39	0.1644	0.005831	-0.00013	0.219378	0.417081	1.517526
3.39	0.1644	0.005831	-0.00013	0.219071	0.416497	1.51664
3.40	0.1644	0.005831	-0.00013	0.218762	0.41591	1.51575
3.40	0.1644	0.005831	-0.00013	0.218452	0.415321	1.514856
3.41	0.1644	0.005831	-0.00013	0.21814	0.414728	1.513959
3.41	0.1644	0.005831	-0.00013	0.217827	0.414133	1.513058
3.41	0.1644	0.005831	-0.00013	0.217513	0.413535	1.512154
3.42	0.1644	0.005831	-0.00013	0.217198	0.412936	1.511248
3.42	0.1644	0.005831	-0.00013	0.216881	0.412334	1.510338
3.43	0.1644	0.005831	-0.00013	0.216563	0.41173	1.509426
3.43	0.1644	0.005831	-0.00013	0.216245	0.411124	1.508512
3.44	0.2644	-0.00162	3.15E-06	0.217077	0.412707	1.510902
3.44	0.2644	-0.00162	3.15E-06	0.216897	0.412364	1.510384
3.44	0.2644	-0.00162	3.15E-06	0.216719	0.412025	1.509872
3.45	0.2644	-0.00162	3.15E-06	0.216542	0.411689	1.509365
3.45	0.2644	-0.00162	3.15E-06	0.216368	0.411357	1.508865
3.46	0.2644	-0.00162	3.15E-06	0.216195	0.411029	1.508369
3.46	0.2644	-0.00162	3.15E-06	0.216024	0.410704	1.507879
3.46	0.2644	-0.00162	3.15E-06	0.215855	0.410383	1.507395
3.47	0.2644	-0.00162	3.15E-06	0.215688	0.410065	1.506915
3.47	0.2644	-0.00162	3.15E-06	0.215522	0.40975	1.506441
3.47	0.2644	-0.00162	3.15E-06	0.215358	0.409438	1.505971
3.48	0.2644	-0.00162	3.15E-06	0.215196	0.409129	1.505507
3.48	0.2644	-0.00162	3.15E-06	0.215035	0.408824	1.505047
3.48	0.2644	-0.00162	3.15E-06	0.214876	0.408521	1.504591
3.49	0.2644	-0.00162	3.15E-06	0.214718	0.408221	1.50414
3.49	0.2644	-0.00162	3.15E-06	0.214562	0.407924	1.503693
3.50	0.2644	-0.00162	3.15E-06	0.214407	0.40763	1.503251
3.50	0.2644	-0.00162	3.15E-06	0.214254	0.407338	1.502813
3.50	0.2644	-0.00162	3.15E-06	0.214102	0.40705	1.502379
3.50	0.2644	-0.00162	3.15E-06	0.213951	0.406763	1.501948
3.51	0.2644	-0.00162	3.15E-06	0.213802	0.406479	1.501522
3.51	0.2644	-0.00162	3.15E-06	0.213654	0.406198	1.5011

3.51	0.2644	-0.00162	3.15E-06	0.213507	0.405919	1.500681
3.52	0.2644	-0.00162	3.15E-06	0.213362	0.405643	1.500267
3.52	0.2644	-0.00162	3.15E-06	0.213218	0.405369	1.499855
3.52	0.2644	-0.00162	3.15E-06	0.213075	0.405097	1.499448
3.53	0.2644	-0.00162	3.15E-06	0.212933	0.404827	1.499044
3.53	0.2644	-0.00162	3.15E-06	0.212792	0.40456	1.498643
3.53	0.2644	-0.00162	3.15E-06	0.212653	0.404295	1.498246
3.53	0.2644	-0.00162	3.15E-06	0.212514	0.404032	1.497852
3.54	0.2644	-0.00162	3.15E-06	0.212377	0.403771	1.497461
3.54	0.2644	-0.00162	3.15E-06	0.212241	0.403512	1.497073
3.54	0.2644	-0.00162	3.15E-06	0.212106	0.403255	1.496689
3.55	0.2644	-0.00162	3.15E-06	0.211972	0.403	1.496307
3.55	0.2644	-0.00162	3.15E-06	0.211839	0.402747	1.495929
3.55	0.2644	-0.00162	3.15E-06	0.211707	0.402496	1.495553
3.55	0.2644	-0.00162	3.15E-06	0.211576	0.402247	1.495181
3.56	0.2644	-0.00162	3.15E-06	0.211446	0.402	1.494811
3.56	0.2644	-0.00162	3.15E-06	0.211317	0.401755	1.494444
3.56	0.2644	-0.00162	3.15E-06	0.211188	0.401511	1.49408
3.56	0.2644	-0.00162	3.15E-06	0.211061	0.401269	1.493719
3.57	0.2644	-0.00162	3.15E-06	0.210935	0.401029	1.49336
3.57	0.2644	-0.00162	3.15E-06	0.210809	0.40079	1.493004
3.57	0.2644	-0.00162	3.15E-06	0.210685	0.400554	1.492651
3.57	0.2644	-0.00162	3.15E-06	0.210561	0.400318	1.4923
3.58	0.2644	-0.00162	3.15E-06	0.210438	0.400085	1.491951
3.58	0.2644	-0.00162	3.15E-06	0.210316	0.399853	1.491605
3.58	0.2644	-0.00162	3.15E-06	0.210195	0.399623	1.491262
3.58	0.2644	-0.00162	3.15E-06	0.210075	0.399394	1.490921
3.59	0.2644	-0.00162	3.15E-06	0.209955	0.399167	1.490582
3.59	0.2644	-0.00162	3.15E-06	0.209837	0.398941	1.490246
3.59	0.2644	-0.00162	3.15E-06	0.209719	0.398717	1.489911
3.59	0.2644	-0.00162	3.15E-06	0.209601	0.398494	1.489579
3.60	0.2644	-0.00162	3.15E-06	0.209485	0.398272	1.48925
3.60	0.2644	-0.00162	3.15E-06	0.209369	0.398052	1.488922
3.60	0.2644	-0.00162	3.15E-06	0.209254	0.397834	1.488597
3.60	0.2644	-0.00162	3.15E-06	0.20914	0.397617	1.488274
3.61	0.2644	-0.00162	3.15E-06	0.209027	0.397401	1.487952
3.61	0.2644	-0.00162	3.15E-06	0.208914	0.397186	1.487633
3.61	0.2644	-0.00162	3.15E-06	0.208802	0.396973	1.487316
3.61	0.2644	-0.00162	3.15E-06	0.20869	0.396761	1.487001
3.61	0.2644	-0.00162	3.15E-06	0.20858	0.396551	1.486688
3.62	0.2644	-0.00162	3.15E-06	0.208469	0.396342	1.486377
3.62	0.2644	-0.00162	3.15E-06	0.20836	0.396133	1.486068
3.62	0.2644	-0.00162	3.15E-06	0.208251	0.395927	1.48576
3.62	0.2644	-0.00162	3.15E-06	0.208143	0.395721	1.485455
3.62	0.2644	-0.00162	3.15E-06	0.208036	0.395517	1.485151
3.63	0.2644	-0.00162	3.15E-06	0.207929	0.395313	1.484849
3.63	0.2644	-0.00162	3.15E-06	0.207822	0.395111	1.484549
3.63	0.2644	-0.00162	3.15E-06	0.207717	0.39491	1.484251
3.63	0.2644	-0.00162	3.15E-06	0.207612	0.394711	1.483955
3.63	0.2644	-0.00162	3.15E-06	0.207507	0.394512	1.48366

3.64	0.2644	-0.00162	3.15E-06	0.207403	0.394314	1.483367
3.64	0.2644	-0.00162	3.15E-06	0.2073	0.394118	1.483076
3.64	0.2644	-0.00162	3.15E-06	0.207197	0.393923	1.482786
3.64	0.2644	-0.00162	3.15E-06	0.207095	0.393728	1.482498
3.64	0.2644	-0.00162	3.15E-06	0.206993	0.393535	1.482211
3.65	0.2644	-0.00162	3.15E-06	0.206892	0.393343	1.481927
3.65	0.2644	-0.00162	3.15E-06	0.206792	0.393152	1.481643
3.65	0.2644	-0.00162	3.15E-06	0.206692	0.392962	1.481362
3.65	0.2644	-0.00162	3.15E-06	0.206592	0.392773	1.481081
3.65	0.2644	-0.00162	3.15E-06	0.206493	0.392584	1.480803
3.66	0.2644	-0.00162	3.15E-06	0.206395	0.392397	1.480526
3.66	0.2644	-0.00162	3.15E-06	0.206297	0.392211	1.48025
3.66	0.2644	-0.00162	3.15E-06	0.206199	0.392026	1.479976
3.66	0.2644	-0.00162	3.15E-06	0.206102	0.391842	1.479703
3.66	0.2644	-0.00162	3.15E-06	0.206006	0.391658	1.479432
3.66	0.2644	-0.00162	3.15E-06	0.20591	0.391476	1.479162
3.67	0.2644	-0.00162	3.15E-06	0.205815	0.391294	1.478894
3.67	0.2644	-0.00162	3.15E-06	0.20572	0.391114	1.478627
3.67	0.2644	-0.00162	3.15E-06	0.205625	0.390934	1.478361
3.67	0.2644	-0.00162	3.15E-06	0.205531	0.390755	1.478096
3.67	0.2644	-0.00162	3.15E-06	0.205437	0.390577	1.477833
3.68	0.2644	-0.00162	3.15E-06	0.205344	0.3904	1.477572
3.68	0.2644	-0.00162	3.15E-06	0.205252	0.390224	1.477311
3.68	0.2644	-0.00162	3.15E-06	0.205159	0.390048	1.477052
3.68	0.2644	-0.00162	3.15E-06	0.205068	0.389874	1.476795
3.68	0.2644	-0.00162	3.15E-06	0.204976	0.3897	1.476538
3.68	0.2644	-0.00162	3.15E-06	0.204885	0.389527	1.476283
3.69	0.2644	-0.00162	3.15E-06	0.204795	0.389355	1.476029
3.69	0.2644	-0.00162	3.15E-06	0.204705	0.389184	1.475776
3.69	0.2644	-0.00162	3.15E-06	0.204615	0.389013	1.475524
3.69	0.2644	-0.00162	3.15E-06	0.204526	0.388844	1.475274
3.69	0.2644	-0.00162	3.15E-06	0.204437	0.388675	1.475025
3.69	0.2644	-0.00162	3.15E-06	0.204348	0.388507	1.474777
3.70	0.2644	-0.00162	3.15E-06	0.20426	0.388339	1.47453
3.70	0.2644	-0.00162	3.15E-06	0.204173	0.388173	1.474284
3.70	0.2644	-0.00162	3.15E-06	0.204085	0.388007	1.47404
3.70	0.2644	-0.00162	3.15E-06	0.203999	0.387842	1.473796
3.70	0.2644	-0.00162	3.15E-06	0.203912	0.387677	1.473554
3.70	0.2644	-0.00162	3.15E-06	0.203826	0.387514	1.473313
3.70	0.2644	-0.00162	3.15E-06	0.20374	0.387351	1.473073
3.71	0.2644	-0.00162	3.15E-06	0.203655	0.387188	1.472834
3.71	0.2644	-0.00162	3.15E-06	0.20357	0.387027	1.472596
3.71	0.2644	-0.00162	3.15E-06	0.203485	0.386866	1.472359
3.71	0.2644	-0.00162	3.15E-06	0.203401	0.386706	1.472123
3.71	0.2644	-0.00162	3.15E-06	0.203317	0.386546	1.471888
3.71	0.2644	-0.00162	3.15E-06	0.203234	0.386387	1.471655
3.72	0.2644	-0.00162	3.15E-06	0.203151	0.386229	1.471422
3.72	0.2644	-0.00162	3.15E-06	0.203068	0.386072	1.47119
3.72	0.2644	-0.00162	3.15E-06	0.202985	0.385915	1.470959
3.72	0.2644	-0.00162	3.15E-06	0.202903	0.385759	1.47073

3.72	0.2644	-0.00162	3.15E-06	0.202821	0.385603	1.470501
3.72	0.2644	-0.00162	3.15E-06	0.20274	0.385448	1.470273
3.72	0.2644	-0.00162	3.15E-06	0.202659	0.385294	1.470047
3.73	0.2644	-0.00162	3.15E-06	0.202578	0.38514	1.469821
3.73	0.2644	-0.00162	3.15E-06	0.202497	0.384987	1.469596
3.73	0.2644	-0.00162	3.15E-06	0.202417	0.384835	1.469372
3.73	0.2644	-0.00162	3.15E-06	0.202337	0.384683	1.469149
3.73	0.2644	-0.00162	3.15E-06	0.202258	0.384532	1.468927
3.73	0.2644	-0.00162	3.15E-06	0.202179	0.384381	1.468706
3.73	0.2644	-0.00162	3.15E-06	0.2021	0.384231	1.468485
3.74	0.2644	-0.00162	3.15E-06	0.202021	0.384082	1.468266
3.74	0.2644	-0.00162	3.15E-06	0.201943	0.383933	1.468047
3.74	0.2644	-0.00162	3.15E-06	0.201865	0.383785	1.46783
3.74	0.2644	-0.00162	3.15E-06	0.201787	0.383637	1.467613
3.74	0.2644	-0.00162	3.15E-06	0.20171	0.38349	1.467397
3.74	0.2644	-0.00162	3.15E-06	0.201633	0.383344	1.467182
3.74	0.2644	-0.00162	3.15E-06	0.201556	0.383198	1.466968
3.74	0.2644	-0.00162	3.15E-06	0.20148	0.383052	1.466755
3.75	0.2644	-0.00162	3.15E-06	0.201403	0.382908	1.466542
3.75	0.2644	-0.00162	3.15E-06	0.201327	0.382763	1.466331
3.75	0.2644	-0.00162	3.15E-06	0.201252	0.382619	1.46612
3.75	0.2644	-0.00162	3.15E-06	0.201176	0.382476	1.46591
3.75	0.2644	-0.00162	3.15E-06	0.201101	0.382333	1.465701
3.75	0.2644	-0.00162	3.15E-06	0.201027	0.382191	1.465492
3.75	0.2644	-0.00162	3.15E-06	0.200952	0.38205	1.465285
3.76	0.2644	-0.00162	3.15E-06	0.200878	0.381908	1.465078
3.76	0.2644	-0.00162	3.15E-06	0.200804	0.381768	1.464872
3.76	0.2644	-0.00162	3.15E-06	0.20073	0.381628	1.464667
3.76	0.2644	-0.00162	3.15E-06	0.200657	0.381488	1.464462
3.76	0.2644	-0.00162	3.15E-06	0.200584	0.381349	1.464259
3.76	0.2644	-0.00162	3.15E-06	0.200511	0.38121	1.464056
3.76	0.2644	-0.00162	3.15E-06	0.200438	0.381072	1.463853
3.76	0.2644	-0.00162	3.15E-06	0.200366	0.380935	1.463652
3.77	0.2644	-0.00162	3.15E-06	0.200293	0.380797	1.463451
3.77	0.2644	-0.00162	3.15E-06	0.200222	0.380661	1.463251
3.77	0.2644	-0.00162	3.15E-06	0.20015	0.380525	1.463052
3.77	0.2644	-0.00162	3.15E-06	0.200079	0.380389	1.462853
3.77	0.2644	-0.00162	3.15E-06	0.200007	0.380254	1.462656
3.77	0.2644	-0.00162	3.15E-06	0.199937	0.380119	1.462458
3.77	0.2644	-0.00162	3.15E-06	0.199866	0.379985	1.462262
3.77	0.2644	-0.00162	3.15E-06	0.199796	0.379851	1.462066
3.77	0.2644	-0.00162	3.15E-06	0.199725	0.379717	1.461871
3.78	0.2644	-0.00162	3.15E-06	0.199655	0.379584	1.461677
3.78	0.2644	-0.00162	3.15E-06	0.199586	0.379452	1.461483
3.78	0.2644	-0.00162	3.15E-06	0.199516	0.37932	1.46129
3.78	0.2644	-0.00162	3.15E-06	0.199447	0.379188	1.461098
3.78	0.2644	-0.00162	3.15E-06	0.199378	0.379057	1.460906
3.78	0.2644	-0.00162	3.15E-06	0.199309	0.378926	1.460715
3.78	0.2644	-0.00162	3.15E-06	0.199241	0.378796	1.460525
3.78	0.2644	-0.00162	3.15E-06	0.199172	0.378666	1.460335

3.79	0.2644	-0.00162	3.15E-06	0.199104	0.378537	1.460146
3.79	0.2644	-0.00162	3.15E-06	0.199036	0.378408	1.459958
3.79	0.2644	-0.00162	3.15E-06	0.198969	0.378279	1.45977
3.79	0.2644	-0.00162	3.15E-06	0.198901	0.378151	1.459583
3.79	0.2644	-0.00162	3.15E-06	0.198834	0.378023	1.459397
3.79	0.2644	-0.00162	3.15E-06	0.198767	0.377896	1.459211
3.79	0.2644	-0.00162	3.15E-06	0.1987	0.377769	1.459026
3.79	0.2644	-0.00162	3.15E-06	0.198634	0.377642	1.458841
3.79	0.2644	-0.00162	3.15E-06	0.198568	0.377516	1.458657
3.80	0.2644	-0.00162	3.15E-06	0.198501	0.37739	1.458473
3.80	0.2644	-0.00162	3.15E-06	0.198435	0.377265	1.458291
3.80	0.2644	-0.00162	3.15E-06	0.19837	0.37714	1.458108
3.80	0.2644	-0.00162	3.15E-06	0.198304	0.377015	1.457927
3.80	0.2644	-0.00162	3.15E-06	0.198239	0.376891	1.457746
3.80	0.2644	-0.00162	3.15E-06	0.198174	0.376767	1.457565
3.80	0.2644	-0.00162	3.15E-06	0.198109	0.376644	1.457385
3.80	0.2644	-0.00162	3.15E-06	0.198044	0.376521	1.457206
3.80	0.2644	-0.00162	3.15E-06	0.19798	0.376398	1.457027
3.81	0.2644	-0.00162	3.15E-06	0.197915	0.376276	1.456849
3.81	0.2644	-0.00162	3.15E-06	0.197851	0.376154	1.456672
3.81	0.2644	-0.00162	3.15E-06	0.197787	0.376033	1.456495
3.81	0.2644	-0.00162	3.15E-06	0.197724	0.375911	1.456318
3.81	0.2644	-0.00162	3.15E-06	0.19766	0.375791	1.456142
3.81	0.2644	-0.00162	3.15E-06	0.197597	0.37567	1.455967
3.81	0.2644	-0.00162	3.15E-06	0.197534	0.37555	1.455792
3.81	0.2644	-0.00162	3.15E-06	0.197471	0.37543	1.455618
3.81	0.2644	-0.00162	3.15E-06	0.197408	0.375311	1.455444
3.81	0.2644	-0.00162	3.15E-06	0.197345	0.375192	1.455271
3.82	0.2644	-0.00162	3.15E-06	0.197283	0.375073	1.455098
3.82	0.2644	-0.00162	3.15E-06	0.19722	0.374955	1.454926
3.82	0.2644	-0.00162	3.15E-06	0.197158	0.374837	1.454754
3.82	0.2644	-0.00162	3.15E-06	0.197097	0.374719	1.454583
3.82	0.2644	-0.00162	3.15E-06	0.197035	0.374602	1.454413
3.82	0.2644	-0.00162	3.15E-06	0.196973	0.374485	1.454243
3.82	0.2644	-0.00162	3.15E-06	0.196912	0.374369	1.454073
3.82	0.2644	-0.00162	3.15E-06	0.196851	0.374252	1.453904
3.82	0.2644	-0.00162	3.15E-06	0.19679	0.374136	1.453735
3.82	0.2644	-0.00162	3.15E-06	0.196729	0.374021	1.453567
3.83	0.2644	-0.00162	3.15E-06	0.196668	0.373906	1.4534
3.83	0.2644	-0.00162	3.15E-06	0.196608	0.373791	1.453233
3.83	0.2644	-0.00162	3.15E-06	0.196548	0.373676	1.453066
3.83	0.2644	-0.00162	3.15E-06	0.196488	0.373562	1.4529
3.83	0.2644	-0.00162	3.15E-06	0.196428	0.373448	1.452735
3.83	0.2644	-0.00162	3.15E-06	0.196368	0.373334	1.452569
3.83	0.2644	-0.00162	3.15E-06	0.196308	0.373221	1.452405
3.83	0.2644	-0.00162	3.15E-06	0.196249	0.373108	1.452241
3.83	0.2644	-0.00162	3.15E-06	0.196189	0.372995	1.452077
3.83	0.2644	-0.00162	3.15E-06	0.19613	0.372882	1.451914
3.84	0.2644	-0.00162	3.15E-06	0.196071	0.37277	1.451751
3.84	0.2644	-0.00162	3.15E-06	0.196013	0.372659	1.451589

3.84	0.2644	-0.00162	3.15E-06	0.195954	0.372547	1.451427
3.84	0.2644	-0.00162	3.15E-06	0.195895	0.372436	1.451265
3.84	0.2644	-0.00162	3.15E-06	0.195837	0.372325	1.451104
3.84	0.2644	-0.00162	3.15E-06	0.195779	0.372214	1.450944
3.84	0.2644	-0.00162	3.15E-06	0.195721	0.372104	1.450784
3.84	0.2644	-0.00162	3.15E-06	0.195663	0.371994	1.450624
3.84	0.2644	-0.00162	3.15E-06	0.195605	0.371884	1.450465
3.84	0.2644	-0.00162	3.15E-06	0.195548	0.371775	1.450307
3.85	0.2644	-0.00162	3.15E-06	0.19549	0.371666	1.450148
3.85	0.2644	-0.00162	3.15E-06	0.195433	0.371557	1.44999
3.85	0.2644	-0.00162	3.15E-06	0.195376	0.371448	1.449833
3.85	0.2644	-0.00162	3.15E-06	0.195319	0.37134	1.449676
3.85	0.2644	-0.00162	3.15E-06	0.195262	0.371232	1.44952
3.85	0.2644	-0.00162	3.15E-06	0.195206	0.371124	1.449364
3.85	0.2644	-0.00162	3.15E-06	0.195149	0.371017	1.449208
3.85	0.2644	-0.00162	3.15E-06	0.195093	0.37091	1.449053
3.85	0.2644	-0.00162	3.15E-06	0.195037	0.370803	1.448898
3.85	0.2644	-0.00162	3.15E-06	0.194981	0.370696	1.448743
3.85	0.2644	-0.00162	3.15E-06	0.194925	0.37059	1.448589
3.85	0.2644	-0.00162	3.15E-06	0.194869	0.370484	1.448436
3.86	0.2644	-0.00162	3.15E-06	0.194813	0.370378	1.448282
3.86	0.2644	-0.00162	3.15E-06	0.194758	0.370273	1.44813
3.86	0.2644	-0.00162	3.15E-06	0.194702	0.370168	1.447977
3.86	0.2644	-0.00162	3.15E-06	0.194647	0.370063	1.447825
3.86	0.2644	-0.00162	3.15E-06	0.194592	0.369958	1.447674
3.86	0.2644	-0.00162	3.15E-06	0.194537	0.369854	1.447523
3.86	0.2644	-0.00162	3.15E-06	0.194482	0.369749	1.447372
3.86	0.2644	-0.00162	3.15E-06	0.194428	0.369645	1.447221
3.86	0.2644	-0.00162	3.15E-06	0.194373	0.369542	1.447071
3.86	0.2644	-0.00162	3.15E-06	0.194319	0.369438	1.446922
3.86	0.2644	-0.00162	3.15E-06	0.194265	0.369335	1.446773
3.87	0.2644	-0.00162	3.15E-06	0.19421	0.369232	1.446624
3.87	0.2644	-0.00162	3.15E-06	0.194156	0.36913	1.446475
3.87	0.2644	-0.00162	3.15E-06	0.194103	0.369027	1.446327
3.87	0.2644	-0.00162	3.15E-06	0.194049	0.368925	1.446179
3.87	0.2644	-0.00162	3.15E-06	0.193995	0.368823	1.446032
3.87	0.2644	-0.00162	3.15E-06	0.193942	0.368722	1.445885
3.87	0.2644	-0.00162	3.15E-06	0.193888	0.36862	1.445739
3.87	0.2644	-0.00162	3.15E-06	0.193835	0.368519	1.445592
3.87	0.2644	-0.00162	3.15E-06	0.193782	0.368418	1.445446
3.87	0.2644	-0.00162	3.15E-06	0.193729	0.368318	1.445301
3.87	0.2644	-0.00162	3.15E-06	0.193676	0.368217	1.445156
3.87	0.2644	-0.00162	3.15E-06	0.193624	0.368117	1.445011
3.88	0.2644	-0.00162	3.15E-06	0.193571	0.368017	1.444867
3.88	0.2644	-0.00162	3.15E-06	0.193519	0.367917	1.444723
3.88	0.2644	-0.00162	3.15E-06	0.193466	0.367818	1.444579
3.88	0.2644	-0.00162	3.15E-06	0.193414	0.367719	1.444436
3.88	0.2644	-0.00162	3.15E-06	0.193362	0.36762	1.444293
3.88	0.2644	-0.00162	3.15E-06	0.19331	0.367521	1.44415
3.88	0.2644	-0.00162	3.15E-06	0.193258	0.367422	1.444008

3.88	0.2644	-0.00162	3.15E-06	0.193207	0.367324	1.443866
3.88	0.2644	-0.00162	3.15E-06	0.193155	0.367226	1.443724
3.88	0.2644	-0.00162	3.15E-06	0.193104	0.367128	1.443583
3.88	0.2644	-0.00162	3.15E-06	0.193052	0.36703	1.443442
3.88	0.2644	-0.00162	3.15E-06	0.193001	0.366933	1.443301
3.89	0.2644	-0.00162	3.15E-06	0.19295	0.366836	1.443161
3.89	0.2644	-0.00162	3.15E-06	0.192899	0.366739	1.443021
3.89	0.2644	-0.00162	3.15E-06	0.192848	0.366642	1.442882
3.89	0.2644	-0.00162	3.15E-06	0.192797	0.366546	1.442742
3.89	0.2644	-0.00162	3.15E-06	0.192747	0.366449	1.442603
3.89	0.2644	-0.00162	3.15E-06	0.192696	0.366353	1.442465
3.89	0.2644	-0.00162	3.15E-06	0.192646	0.366257	1.442327
3.89	0.2644	-0.00162	3.15E-06	0.192595	0.366162	1.442189
3.89	0.2644	-0.00162	3.15E-06	0.192545	0.366066	1.442051
3.89	0.2644	-0.00162	3.15E-06	0.192495	0.365971	1.441914
3.89	0.2644	-0.00162	3.15E-06	0.192445	0.365876	1.441777
3.89	0.2644	-0.00162	3.15E-06	0.192395	0.365781	1.44164
3.89	0.2644	-0.00162	3.15E-06	0.192346	0.365687	1.441504
3.90	0.2644	-0.00162	3.15E-06	0.192296	0.365592	1.441368
3.90	0.2644	-0.00162	3.15E-06	0.192246	0.365498	1.441232
3.90	0.2644	-0.00162	3.15E-06	0.192197	0.365404	1.441097
3.90	0.2644	-0.00162	3.15E-06	0.192148	0.365311	1.440962
3.90	0.2644	-0.00162	3.15E-06	0.192098	0.365217	1.440827
3.90	0.2644	-0.00162	3.15E-06	0.192049	0.365124	1.440692
3.90	0.2644	-0.00162	3.15E-06	0.192	0.365031	1.440558
3.90	0.2644	-0.00162	3.15E-06	0.191952	0.364938	1.440424
3.90	0.2644	-0.00162	3.15E-06	0.191903	0.364845	1.440291
3.90	0.2644	-0.00162	3.15E-06	0.191854	0.364752	1.440157
3.90	0.2644	-0.00162	3.15E-06	0.191806	0.36466	1.440025
3.90	0.2644	-0.00162	3.15E-06	0.191757	0.364568	1.439892
3.90	0.2644	-0.00162	3.15E-06	0.191709	0.364476	1.43976
3.91	0.2644	-0.00162	3.15E-06	0.19166	0.364384	1.439627
3.91	0.2644	-0.00162	3.15E-06	0.191612	0.364293	1.439496
3.91	0.2644	-0.00162	3.15E-06	0.191564	0.364202	1.439364
3.91	0.2644	-0.00162	3.15E-06	0.191516	0.36411	1.439233
3.91	0.2644	-0.00162	3.15E-06	0.191469	0.364019	1.439102
3.91	0.2644	-0.00162	3.15E-06	0.191421	0.363929	1.438972
3.91	0.2644	-0.00162	3.15E-06	0.191373	0.363838	1.438841
3.91	0.2644	-0.00162	3.15E-06	0.191326	0.363748	1.438711
3.91	0.2644	-0.00162	3.15E-06	0.191278	0.363658	1.438581
3.91	0.2644	-0.00162	3.15E-06	0.191231	0.363568	1.438452
3.91	0.2644	-0.00162	3.15E-06	0.191184	0.363478	1.438323
3.91	0.2644	-0.00162	3.15E-06	0.191136	0.363388	1.438194
3.91	0.2644	-0.00162	3.15E-06	0.191089	0.363299	1.438065
3.91	0.2644	-0.00162	3.15E-06	0.191042	0.363209	1.437937
3.92	0.2644	-0.00162	3.15E-06	0.190996	0.36312	1.437809
3.92	0.2644	-0.00162	3.15E-06	0.190949	0.363031	1.437681
3.92	0.2644	-0.00162	3.15E-06	0.190902	0.362943	1.437554
3.92	0.2644	-0.00162	3.15E-06	0.190856	0.362854	1.437426
3.92	0.2644	-0.00162	3.15E-06	0.190809	0.362766	1.437299

3.92	0.2644	-0.00162	3.15E-06	0.190763	0.362678	1.437173
3.92	0.2644	-0.00162	3.15E-06	0.190717	0.36259	1.437046
3.92	0.2644	-0.00162	3.15E-06	0.19067	0.362502	1.43692
3.92	0.2644	-0.00162	3.15E-06	0.190624	0.362414	1.436794
3.92	0.2644	-0.00162	3.15E-06	0.190578	0.362327	1.436669
3.92	0.2644	-0.00162	3.15E-06	0.190532	0.36224	1.436543
3.92	0.2644	-0.00162	3.15E-06	0.190487	0.362153	1.436418
3.92	0.2644	-0.00162	3.15E-06	0.190441	0.362066	1.436293
3.92	0.2644	-0.00162	3.15E-06	0.190395	0.361979	1.436169
3.93	0.2644	-0.00162	3.15E-06	0.19035	0.361892	1.436044
3.93	0.2644	-0.00162	3.15E-06	0.190304	0.361806	1.43592
3.93	0.2644	-0.00162	3.15E-06	0.190259	0.36172	1.435796
3.93	0.2644	-0.00162	3.15E-06	0.190214	0.361634	1.435673
3.93	0.2644	-0.00162	3.15E-06	0.190168	0.361548	1.43555
3.93	0.2644	-0.00162	3.15E-06	0.190123	0.361462	1.435427
3.93	0.2644	-0.00162	3.15E-06	0.190078	0.361376	1.435304
3.93	0.2644	-0.00162	3.15E-06	0.190033	0.361291	1.435181
3.93	0.2644	-0.00162	3.15E-06	0.189989	0.361206	1.435059
3.93	0.2644	-0.00162	3.15E-06	0.189944	0.361121	1.434937
3.93	0.2644	-0.00162	3.15E-06	0.189899	0.361036	1.434815
3.93	0.2644	-0.00162	3.15E-06	0.189855	0.360951	1.434694
3.93	0.2644	-0.00162	3.15E-06	0.18981	0.360867	1.434572
3.93	0.2644	-0.00162	3.15E-06	0.189766	0.360782	1.434451
3.93	0.2644	-0.00162	3.15E-06	0.189722	0.360698	1.43433
3.94	0.2644	-0.00162	3.15E-06	0.189677	0.360614	1.43421
3.94	0.2644	-0.00162	3.15E-06	0.189633	0.36053	1.434089
3.94	0.2644	-0.00162	3.15E-06	0.189589	0.360446	1.433969
3.94	0.2644	-0.00162	3.15E-06	0.189545	0.360363	1.43385
3.94	0.2644	-0.00162	3.15E-06	0.189501	0.360279	1.43373
3.94	0.2644	-0.00162	3.15E-06	0.189458	0.360196	1.433611
3.94	0.2644	-0.00162	3.15E-06	0.189414	0.360113	1.433491
3.94	0.2644	-0.00162	3.15E-06	0.18937	0.36003	1.433372
3.94	0.2644	-0.00162	3.15E-06	0.189327	0.359947	1.433254
3.94	0.2644	-0.00162	3.15E-06	0.189283	0.359865	1.433135
3.94	0.2644	-0.00162	3.15E-06	0.18924	0.359782	1.433017
3.94	0.2644	-0.00162	3.15E-06	0.189196	0.3597	1.432899
3.94	0.2644	-0.00162	3.15E-06	0.189153	0.359618	1.432781
3.94	0.2644	-0.00162	3.15E-06	0.18911	0.359536	1.432664
3.94	0.2644	-0.00162	3.15E-06	0.189067	0.359454	1.432547
3.95	0.2644	-0.00162	3.15E-06	0.189024	0.359372	1.43243
3.95	0.2644	-0.00162	3.15E-06	0.188981	0.359291	1.432313
3.95	0.2644	-0.00162	3.15E-06	0.188938	0.359209	1.432196
3.95	0.2644	-0.00162	3.15E-06	0.188896	0.359128	1.43208
3.95	0.2644	-0.00162	3.15E-06	0.188853	0.359047	1.431964
3.95	0.2644	-0.00162	3.15E-06	0.18881	0.358966	1.431848
3.95	0.2644	-0.00162	3.15E-06	0.188768	0.358885	1.431732
3.95	0.2644	-0.00162	3.15E-06	0.188725	0.358804	1.431617
3.95	0.2644	-0.00162	3.15E-06	0.188683	0.358724	1.431501
3.95	0.2644	-0.00162	3.15E-06	0.188641	0.358643	1.431386
3.95	0.2644	-0.00162	3.15E-06	0.188599	0.358563	1.431271

3.95	0.2644	-0.00162	3.15E-06	0.188556	0.358483	1.431157
3.95	0.2644	-0.00162	3.15E-06	0.188514	0.358403	1.431042
3.95	0.2644	-0.00162	3.15E-06	0.188472	0.358323	1.430928
3.95	0.2644	-0.00162	3.15E-06	0.188431	0.358244	1.430814
3.95	0.2644	-0.00162	3.15E-06	0.188389	0.358164	1.430701
3.96	0.2644	-0.00162	3.15E-06	0.188347	0.358085	1.430587
3.96	0.2644	-0.00162	3.15E-06	0.188305	0.358006	1.430474
3.96	0.2644	-0.00162	3.15E-06	0.188264	0.357927	1.430361
3.96	0.2644	-0.00162	3.15E-06	0.188222	0.357848	1.430248
3.96	0.2644	-0.00162	3.15E-06	0.188181	0.357769	1.430135
3.96	0.2644	-0.00162	3.15E-06	0.188139	0.35769	1.430023
3.96	0.2644	-0.00162	3.15E-06	0.188098	0.357612	1.42991
3.96	0.2644	-0.00162	3.15E-06	0.188057	0.357533	1.429798
3.96	0.2644	-0.00162	3.15E-06	0.188016	0.357455	1.429686
3.96	0.2644	-0.00162	3.15E-06	0.187975	0.357377	1.429575
3.96	0.2644	-0.00162	3.15E-06	0.187934	0.357299	1.429463
3.96	0.2644	-0.00162	3.15E-06	0.187893	0.357221	1.429352
3.96	0.2644	-0.00162	3.15E-06	0.187852	0.357143	1.429241
3.96	0.2644	-0.00162	3.15E-06	0.187811	0.357066	1.42913
3.96	0.2644	-0.00162	3.15E-06	0.18777	0.356989	1.429019
3.96	0.2644	-0.00162	3.15E-06	0.18773	0.356911	1.428909
3.97	0.2644	-0.00162	3.15E-06	0.187689	0.356834	1.428799
3.97	0.2644	-0.00162	3.15E-06	0.187649	0.356757	1.428689
3.97	0.2644	-0.00162	3.15E-06	0.187608	0.35668	1.428579
3.97	0.2644	-0.00162	3.15E-06	0.187568	0.356603	1.428469
3.97	0.2644	-0.00162	3.15E-06	0.187527	0.356527	1.42836
3.97	0.2644	-0.00162	3.15E-06	0.187487	0.35645	1.428251
3.97	0.2644	-0.00162	3.15E-06	0.187447	0.356374	1.428141
3.97	0.2644	-0.00162	3.15E-06	0.187407	0.356298	1.428033
3.97	0.2644	-0.00162	3.15E-06	0.187367	0.356222	1.427924
3.97	0.2644	-0.00162	3.15E-06	0.187327	0.356146	1.427815
3.97	0.2644	-0.00162	3.15E-06	0.187287	0.35607	1.427707
3.97	0.2644	-0.00162	3.15E-06	0.187247	0.355994	1.427599
3.97	0.2644	-0.00162	3.15E-06	0.187208	0.355919	1.427491
3.97	0.2644	-0.00162	3.15E-06	0.187168	0.355843	1.427384
3.97	0.2644	-0.00162	3.15E-06	0.187128	0.355768	1.427276
3.97	0.2644	-0.00162	3.15E-06	0.187089	0.355693	1.427169
3.97	0.2644	-0.00162	3.15E-06	0.187049	0.355617	1.427062
3.98	0.2644	-0.00162	3.15E-06	0.18701	0.355543	1.426955
3.98	0.2644	-0.00162	3.15E-06	0.18697	0.355468	1.426848
3.98	0.2644	-0.00162	3.15E-06	0.186931	0.355393	1.426741
3.98	0.2644	-0.00162	3.15E-06	0.186892	0.355318	1.426635
3.98	0.2644	-0.00162	3.15E-06	0.186853	0.355244	1.426529
3.98	0.2644	-0.00162	3.15E-06	0.186814	0.35517	1.426423
3.98	0.2644	-0.00162	3.15E-06	0.186775	0.355095	1.426317
3.98	0.2644	-0.00162	3.15E-06	0.186736	0.355021	1.426211
3.98	0.2644	-0.00162	3.15E-06	0.186697	0.354947	1.426106
3.98	0.2644	-0.00162	3.15E-06	0.186658	0.354874	1.426
3.98	0.2644	-0.00162	3.15E-06	0.186619	0.3548	1.425895
3.98	0.2644	-0.00162	3.15E-06	0.18658	0.354726	1.42579

3.98	0.2644	-0.00162	3.15E-06	0.186542	0.354653	1.425685
3.98	0.2644	-0.00162	3.15E-06	0.186503	0.354579	1.425581
3.98	0.2644	-0.00162	3.15E-06	0.186465	0.354506	1.425476
3.98	0.2644	-0.00162	3.15E-06	0.186426	0.354433	1.425372
3.98	0.2644	-0.00162	3.15E-06	0.186388	0.35436	1.425268
3.98	0.2644	-0.00162	3.15E-06	0.186349	0.354287	1.425164
3.99	0.2644	-0.00162	3.15E-06	0.186311	0.354214	1.425061
3.99	0.2644	-0.00162	3.15E-06	0.186273	0.354142	1.424957
3.99	0.2644	-0.00162	3.15E-06	0.186235	0.354069	1.424854
3.99	0.2644	-0.00162	3.15E-06	0.186197	0.353997	1.424751
3.99	0.2644	-0.00162	3.15E-06	0.186159	0.353924	1.424648
3.99	0.2644	-0.00162	3.15E-06	0.186121	0.353852	1.424545
3.99	0.2644	-0.00162	3.15E-06	0.186083	0.35378	1.424442
3.99	0.2644	-0.00162	3.15E-06	0.186045	0.353708	1.42434
3.99	0.2644	-0.00162	3.15E-06	0.186007	0.353636	1.424237
3.99	0.2644	-0.00162	3.15E-06	0.185969	0.353565	1.424135
3.99	0.2644	-0.00162	3.15E-06	0.185932	0.353493	1.424033
3.99	0.2644	-0.00162	3.15E-06	0.185894	0.353422	1.423931
3.99	0.2644	-0.00162	3.15E-06	0.185857	0.35335	1.42383
3.99	0.2644	-0.00162	3.15E-06	0.185819	0.353279	1.423728
3.99	0.2644	-0.00162	3.15E-06	0.185782	0.353208	1.423627
3.99	0.2644	-0.00162	3.15E-06	0.185744	0.353137	1.423526
3.99	0.2644	-0.00162	3.15E-06	0.185707	0.353066	1.423425
3.99	0.2644	-0.00162	3.15E-06	0.18567	0.352995	1.423324
4.00	0.2644	-0.00162	3.15E-06	0.185633	0.352924	1.423223
4.00	0.2644	-0.00162	3.15E-06	0.185595	0.352854	1.423123
4.00	0.2644	-0.00162	3.15E-06	0.185558	0.352783	1.423023
4.00	0.2644	-0.00162	3.15E-06	0.185521	0.352713	1.422922
4.00	0.2644	-0.00162	3.15E-06	0.185484	0.352642	1.422822
4.00	0.2644	-0.00162	3.15E-06	0.185447	0.352572	1.422723
4.00	0.2644	-0.00162	3.15E-06	0.185411	0.352502	1.422623
4.00	0.2644	-0.00162	3.15E-06	0.185374	0.352432	1.422523
4.00	0.2644	-0.00162	3.15E-06	0.185337	0.352362	1.422424
4.00	0.2644	-0.00162	3.15E-06	0.1853	0.352293	1.422325
4.00	0.2644	-0.00162	3.15E-06	0.185264	0.352223	1.422226
4.00	0.2644	-0.00162	3.15E-06	0.185227	0.352154	1.422127
4.00	0.2644	-0.00162	3.15E-06	0.185191	0.352084	1.422028
4.00	0.2644	-0.00162	3.15E-06	0.185154	0.352015	1.42193
4.00	0.2644	-0.00162	3.15E-06	0.185118	0.351946	1.421831
4.00	0.2644	-0.00162	3.15E-06	0.185082	0.351876	1.421733
4.00	0.2644	-0.00162	3.15E-06	0.185045	0.351807	1.421635
4.00	0.2644	-0.00162	3.15E-06	0.185009	0.351739	1.421537
4.00	0.2644	-0.00162	3.15E-06	0.184973	0.35167	1.421439
4.01	0.2644	-0.00162	3.15E-06	0.184937	0.351601	1.421341
4.01	0.2644	-0.00162	3.15E-06	0.184901	0.351533	1.421244
4.01	0.2644	-0.00162	3.15E-06	0.184865	0.351464	1.421147
4.01	0.2644	-0.00162	3.15E-06	0.184829	0.351396	1.421049
4.01	0.2644	-0.00162	3.15E-06	0.184793	0.351327	1.420952
4.01	0.2644	-0.00162	3.15E-06	0.184757	0.351259	1.420856
4.01	0.2644	-0.00162	3.15E-06	0.184721	0.351191	1.420759

4.01	0.2644	-0.00162	3.15E-06	0.184685	0.351123	1.420662
4.01	0.2644	-0.00162	3.15E-06	0.18465	0.351055	1.420566
4.01	0.2644	-0.00162	3.15E-06	0.184614	0.350988	1.42047
4.01	0.2644	-0.00162	3.15E-06	0.184578	0.35092	1.420373
4.01	0.2644	-0.00162	3.15E-06	0.184543	0.350852	1.420277
4.01	0.2644	-0.00162	3.15E-06	0.184507	0.350785	1.420182
4.01	0.2644	-0.00162	3.15E-06	0.184472	0.350717	1.420086
4.01	0.2644	-0.00162	3.15E-06	0.184436	0.35065	1.41999
4.01	0.2644	-0.00162	3.15E-06	0.184401	0.350583	1.419895
4.01	0.2644	-0.00162	3.15E-06	0.184366	0.350516	1.4198
4.01	0.2644	-0.00162	3.15E-06	0.184331	0.350449	1.419705
4.01	0.2644	-0.00162	3.15E-06	0.184295	0.350382	1.41961
4.01	0.2644	-0.00162	3.15E-06	0.18426	0.350315	1.419515
4.02	0.2644	-0.00162	3.15E-06	0.184225	0.350249	1.41942
4.02	0.2644	-0.00162	3.15E-06	0.18419	0.350182	1.419326
4.02	0.2644	-0.00162	3.15E-06	0.184155	0.350115	1.419231
4.02	0.2644	-0.00162	3.15E-06	0.18412	0.350049	1.419137
4.02	0.2644	-0.00162	3.15E-06	0.184085	0.349983	1.419043
4.02	0.2644	-0.00162	3.15E-06	0.184051	0.349917	1.418949
4.02	0.2644	-0.00162	3.15E-06	0.184016	0.34985	1.418855
4.02	0.2644	-0.00162	3.15E-06	0.183981	0.349784	1.418762
4.02	0.2644	-0.00162	3.15E-06	0.183946	0.349719	1.418668
4.02	0.2644	-0.00162	3.15E-06	0.183912	0.349653	1.418575
4.02	0.2644	-0.00162	3.15E-06	0.183877	0.349587	1.418482
4.02	0.2644	-0.00162	3.15E-06	0.183843	0.349521	1.418388
4.02	0.2644	-0.00162	3.15E-06	0.183808	0.349456	1.418295
4.02	0.2644	-0.00162	3.15E-06	0.183774	0.34939	1.418203
4.02	0.2644	-0.00162	3.15E-06	0.183739	0.349325	1.41811
4.02	0.2644	-0.00162	3.15E-06	0.183705	0.34926	1.418017
4.02	0.2644	-0.00162	3.15E-06	0.183671	0.349195	1.417925
4.02	0.2644	-0.00162	3.15E-06	0.183637	0.349129	1.417833
4.02	0.2644	-0.00162	3.15E-06	0.183602	0.349064	1.417741
4.02	0.2644	-0.00162	3.15E-06	0.183568	0.349	1.417649
4.02	0.2644	-0.00162	3.15E-06	0.183534	0.348935	1.417557
4.03	0.2644	-0.00162	3.15E-06	0.1835	0.34887	1.417465
4.03	0.2644	-0.00162	3.15E-06	0.183466	0.348805	1.417373

Location Index	
England and Wales	1
Scotland and Ireland	2

From Design and Analysis of Urban Storm Drainage, The Wallingford Procedure, Vol 1					
Table 6.1 Values of Constants to calculate Cr					
Geographic Location	Range of M5-D	Location Index	J0	J1	J2
England and Wales	0-10	1	0.1699	0.0028	0.000114
	11-30		0.1644	0.005831	-0.00013
	31-75		0.2644	-0.00162	3.15E-06
	76-150		0.2718	-0.00195	6.19E-06
	>150		0.1454	-0.00019	1.14E-07

Integra Consulting						Job No	Date
						3361	24.02.23
						Sheet	By
Calculations						01	JS
Job Title St Mary's Gate Retail Park, Rochdale							
Storm Water Flood Model							
M5-60 = 18.50		r = 0.35		Return, T = 100		Area (m²) = 2730	
				CC Factor = 0.30		Limit (l/s) = 3.8	
				Totals		100	143
D (mins)	M5-D (mm)	MT-D (mm)	Rate (mm/hr)	Flow (l/s)	CC Flow (l/s)	Storage (m³)	CC Storage (m³)
10.00	9.29	17.60	105.58	79.55	103.41	45.45	59.77
15.00	11.16	21.61	86.45	65.14	84.68	55.21	72.80
20.00	12.56	24.61	73.82	55.62	72.31	62.18	82.21
25.00	13.69	27.03	64.87	48.88	63.54	67.61	89.61
30.00	14.64	29.07	58.14	43.81	56.95	72.02	95.67
35.00	15.46	30.84	52.87	39.84	51.79	75.68	100.78
40.00	16.19	32.41	48.62	36.63	47.62	78.79	105.17
45.00	16.84	33.82	45.09	33.98	44.17	81.47	108.99
50.00	17.44	35.10	42.12	31.73	41.26	83.80	112.37
55.00	17.99	36.27	39.57	29.81	38.76	85.85	115.36
60.00	18.50	37.36	37.36	28.15	36.59	87.65	118.05
65.00	18.98	38.36	35.41	26.68	34.69	89.25	120.47
70.00	19.43	39.31	33.69	25.39	33.00	90.66	122.65
75.00	19.85	40.19	32.15	24.23	31.50	91.93	124.63
80.00	20.25	41.03	30.77	23.19	30.14	93.05	126.44
85.00	20.63	41.82	29.52	22.24	28.91	94.05	128.09
90.00	21.00	42.57	28.38	21.38	27.80	94.95	129.59
95.00	21.34	43.28	27.34	20.60	26.78	95.74	130.96
100.00	21.68	43.96	26.38	19.87	25.84	96.45	132.22
105.00	22.00	44.61	25.49	19.21	24.97	97.07	133.38
110.00	22.31	45.24	24.67	18.59	24.17	97.62	134.43
115.00	22.61	45.83	23.91	18.02	23.42	98.10	135.40
120.00	22.90	46.41	23.20	17.48	22.73	98.52	136.28
125.00	23.18	46.96	22.54	16.98	22.08	98.88	137.09
130.00	23.45	47.49	21.92	16.52	21.47	99.18	137.83
135.00	23.71	48.00	21.34	16.08	20.90	99.43	138.50
140.00	23.97	48.50	20.79	15.66	20.36	99.64	139.10
145.00	24.22	48.98	20.27	15.27	19.85	99.80	139.65
150.00	24.46	49.44	19.78	14.90	19.37	99.91	140.15
155.00	24.69	49.89	19.31	14.55	18.92	99.99	140.59
160.00	24.92	50.33	18.87	14.22	18.49	100.03	140.99
165.00	25.15	50.75	18.45	13.90	18.08	100.04	141.34
170.00	25.37	51.16	18.06	13.60	17.69	100.01	141.64
175.00	25.58	51.56	17.68	13.32	17.31	99.95	141.91
180.00	25.79	51.94	17.31	13.05	16.96	99.86	142.13
185.00	26.00	52.32	16.97	12.79	16.62	99.74	142.32
190.00	26.20	52.69	16.64	12.54	16.30	99.60	142.47
195.00	26.40	53.05	16.32	12.30	15.99	99.43	142.59
200.00	26.59	53.39	16.02	12.07	15.69	99.23	142.68

205.00	26.78	53.73	15.73	11.85	15.40	99.01	142.74
210.00	26.97	54.06	15.45	11.64	15.13	98.77	142.76
215.00	27.15	54.39	15.18	11.44	14.87	98.50	142.76
220.00	27.33	54.70	14.92	11.24	14.61	98.22	142.73
225.00	27.51	55.01	14.67	11.05	14.37	97.91	142.68
230.00	27.68	55.31	14.43	10.87	14.13	97.59	142.60
235.00	27.85	55.60	14.20	10.70	13.91	97.25	142.50
240.00	28.02	55.89	13.97	10.53	13.69	96.89	142.37
245.00	28.19	56.17	13.76	10.37	13.47	96.51	142.22
250.00	28.35	56.45	13.55	10.21	13.27	96.11	142.05
255.00	28.51	56.72	13.35	10.06	13.07	95.70	141.86
260.00	28.67	56.98	13.15	9.91	12.88	95.28	141.65
265.00	28.83	57.24	12.96	9.76	12.69	94.84	141.42
270.00	28.98	57.49	12.78	9.63	12.51	94.38	141.17
275.00	29.13	57.74	12.60	9.49	12.34	93.92	140.90
280.00	29.28	57.98	12.42	9.36	12.17	93.43	140.62
285.00	29.43	58.22	12.26	9.24	12.01	92.94	140.31
290.00	29.58	58.45	12.09	9.11	11.85	92.43	140.00
295.00	29.72	58.68	11.93	8.99	11.69	91.91	139.66
300.00	29.86	58.90	11.78	8.88	11.54	91.38	139.31
305.00	30.00	59.12	11.63	8.76	11.39	90.84	138.95
310.00	30.14	59.34	11.49	8.65	11.25	90.28	138.57
315.00	30.28	59.55	11.34	8.55	11.11	89.72	138.18
320.00	30.41	59.76	11.21	8.44	10.98	89.14	137.77
325.00	30.55	59.96	11.07	8.34	10.84	88.56	137.35
330.00	30.68	60.17	10.94	8.24	10.72	87.96	136.92
335.00	30.81	60.36	10.81	8.15	10.59	87.35	136.48
340.00	30.94	60.56	10.69	8.05	10.47	86.74	136.02
345.00	31.07	60.96	10.60	7.99	10.39	86.71	136.32
350.00	31.20	61.18	10.49	7.90	10.27	86.15	135.93
355.00	31.32	61.39	10.38	7.82	10.16	85.58	135.54
360.00	31.45	61.60	10.27	7.74	10.06	85.01	135.14
365.00	31.57	61.81	10.16	7.66	9.95	84.43	134.73
370.00	31.69	62.01	10.06	7.58	9.85	83.84	134.31
375.00	31.81	62.21	9.95	7.50	9.75	83.25	133.88
380.00	31.93	62.41	9.85	7.43	9.65	82.66	133.44
385.00	32.05	62.61	9.76	7.35	9.56	82.05	133.00
390.00	32.16	62.81	9.66	7.28	9.46	81.44	132.55
395.00	32.28	63.00	9.57	7.21	9.37	80.83	132.10
400.00	32.39	63.19	9.48	7.14	9.28	80.21	131.63
405.00	32.51	63.38	9.39	7.08	9.20	79.58	131.16
410.00	32.62	63.57	9.30	7.01	9.11	78.95	130.68
415.00	32.73	63.76	9.22	6.95	9.03	78.32	130.20
420.00	32.84	63.94	9.13	6.88	8.95	77.68	129.71
425.00	32.95	64.12	9.05	6.82	8.87	77.03	129.21
430.00	33.06	64.30	8.97	6.76	8.79	76.38	128.71
435.00	33.17	64.48	8.89	6.70	8.71	75.73	128.20
440.00	33.27	64.66	8.82	6.64	8.64	75.07	127.68
445.00	33.38	64.83	8.74	6.59	8.56	74.40	127.16
450.00	33.48	65.01	8.67	6.53	8.49	73.74	126.64

455.00	33.59	65.18	8.60	6.48	8.42	73.06	126.10
460.00	33.69	65.35	8.52	6.42	8.35	72.39	125.57
465.00	33.79	65.52	8.45	6.37	8.28	71.70	125.02
470.00	33.90	65.69	8.39	6.32	8.21	71.02	124.47
475.00	34.00	65.85	8.32	6.27	8.15	70.33	123.92
480.00	34.10	66.02	8.25	6.22	8.08	69.64	123.36
485.00	34.20	66.18	8.19	6.17	8.02	68.94	122.80
490.00	34.29	66.34	8.12	6.12	7.96	68.24	122.23
495.00	34.39	66.50	8.06	6.07	7.90	67.54	121.66
500.00	34.49	66.66	8.00	6.03	7.84	66.83	121.08
505.00	34.58	66.82	7.94	5.98	7.78	66.12	120.49
510.00	34.68	66.98	7.88	5.94	7.72	65.40	119.91
515.00	34.78	67.13	7.82	5.89	7.66	64.68	119.32
520.00	34.87	67.29	7.76	5.85	7.61	63.96	118.72
525.00	34.96	67.44	7.71	5.81	7.55	63.24	118.12
530.00	35.06	67.59	7.65	5.77	7.50	62.51	117.51
535.00	35.15	67.74	7.60	5.72	7.44	61.78	116.91
540.00	35.24	67.89	7.54	5.68	7.39	61.04	116.29
545.00	35.33	68.04	7.49	5.64	7.34	60.31	115.68
550.00	35.42	68.19	7.44	5.61	7.29	59.57	115.06
555.00	35.51	68.34	7.39	5.57	7.24	58.82	114.43
560.00	35.60	68.48	7.34	5.53	7.19	58.08	113.80
565.00	35.69	68.62	7.29	5.49	7.14	57.33	113.17
570.00	35.78	68.77	7.24	5.45	7.09	56.57	112.53
575.00	35.86	68.91	7.19	5.42	7.04	55.82	111.89
580.00	35.95	69.05	7.14	5.38	7.00	55.06	111.25
585.00	36.04	69.19	7.10	5.35	6.95	54.30	110.61
590.00	36.12	69.33	7.05	5.31	6.91	53.54	109.96
595.00	36.21	69.47	7.01	5.28	6.86	52.77	109.30
600.00	36.29	69.60	6.96	5.24	6.82	52.00	108.64
605.00	36.38	69.74	6.92	5.21	6.77	51.23	107.98
610.00	36.46	69.88	6.87	5.18	6.73	50.46	107.32
615.00	36.54	70.01	6.83	5.15	6.69	49.68	106.65
620.00	36.63	70.14	6.79	5.11	6.65	48.91	105.98
625.00	36.71	70.28	6.75	5.08	6.61	48.12	105.31
630.00	36.79	70.41	6.71	5.05	6.57	47.34	104.64
635.00	36.87	70.54	6.66	5.02	6.53	46.56	103.96
640.00	36.95	70.67	6.63	4.99	6.49	45.77	103.27
645.00	37.03	70.80	6.59	4.96	6.45	44.98	102.59
650.00	37.11	70.93	6.55	4.93	6.41	44.19	101.90
655.00	37.19	71.05	6.51	4.90	6.38	43.39	101.21
660.00	37.27	71.18	6.47	4.88	6.34	42.60	100.52
665.00	37.35	71.30	6.43	4.85	6.30	41.80	99.82
670.00	37.43	71.43	6.40	4.82	6.27	41.00	99.12
675.00	37.50	71.55	6.36	4.79	6.23	40.19	98.42
680.00	37.58	71.68	6.32	4.77	6.19	39.39	97.72
685.00	37.66	71.80	6.29	4.74	6.16	38.58	97.01
690.00	37.74	71.92	6.25	4.71	6.13	37.77	96.30
695.00	37.81	72.04	6.22	4.69	6.09	36.96	95.59
700.00	37.89	72.16	6.19	4.66	6.06	36.15	94.87

705.00	37.96	72.28	6.15	4.64	6.03	35.33	94.15
710.00	38.04	72.40	6.12	4.61	5.99	34.52	93.43
715.00	38.11	72.52	6.09	4.59	5.96	33.70	92.71
720.00	38.19	72.64	6.05	4.56	5.93	32.88	91.99
725.00	38.26	72.76	6.02	4.54	5.90	32.05	91.26
730.00	38.33	72.87	5.99	4.51	5.87	31.23	90.53
735.00	38.40	72.99	5.96	4.49	5.84	30.40	89.80
740.00	38.48	73.10	5.93	4.47	5.81	29.58	89.07
745.00	38.55	73.22	5.90	4.44	5.78	28.75	88.33
750.00	38.62	73.33	5.87	4.42	5.75	27.92	87.59
755.00	38.69	73.45	5.84	4.40	5.72	27.08	86.85
760.00	38.76	73.56	5.81	4.38	5.69	26.25	86.11
765.00	38.83	73.67	5.78	4.35	5.66	25.41	85.36
770.00	38.91	73.78	5.75	4.33	5.63	24.58	84.62
775.00	38.98	73.89	5.72	4.31	5.60	23.74	83.87
780.00	39.05	74.00	5.69	4.29	5.58	22.89	83.12
785.00	39.11	74.11	5.66	4.27	5.55	22.05	82.36
790.00	39.18	74.22	5.64	4.25	5.52	21.21	81.61
795.00	39.25	74.33	5.61	4.23	5.49	20.36	80.85
800.00	39.32	74.44	5.58	4.21	5.47	19.52	80.09
805.00	39.39	74.55	5.56	4.19	5.44	18.67	79.33
810.00	39.46	74.65	5.53	4.17	5.42	17.82	78.57
815.00	39.52	74.76	5.50	4.15	5.39	16.96	77.80
820.00	39.59	74.86	5.48	4.13	5.37	16.11	77.03
825.00	39.66	74.97	5.45	4.11	5.34	15.26	76.26
830.00	39.73	75.07	5.43	4.09	5.32	14.40	75.49
835.00	39.79	75.18	5.40	4.07	5.29	13.54	74.72
840.00	39.86	75.28	5.38	4.05	5.27	12.68	73.95
845.00	39.92	75.39	5.35	4.03	5.24	11.82	73.17
850.00	39.99	75.49	5.33	4.01	5.22	10.96	72.39
855.00	40.05	75.59	5.30	4.00	5.20	10.10	71.61
860.00	40.12	75.69	5.28	3.98	5.17	9.24	70.83
865.00	40.18	75.79	5.26	3.96	5.15	8.37	70.05
870.00	40.25	75.89	5.23	3.94	5.13	7.50	69.26
875.00	40.31	75.99	5.21	3.93	5.10	6.63	68.47
880.00	40.38	76.09	5.19	3.91	5.08	5.77	67.69
885.00	40.44	76.19	5.17	3.89	5.06	4.89	66.90
890.00	40.50	76.29	5.14	3.88	5.04	4.02	66.10
895.00	40.57	76.39	5.12	3.86	5.02	3.15	65.31
900.00	40.63	76.49	5.10	3.84	4.99	2.27	64.52
905.00	40.69	76.58	5.08	3.83	4.97	1.40	63.72
910.00	40.75	76.68	5.06	3.81	4.95	0.52	62.92
915.00	40.82	76.78	5.03	3.79	4.93	-0.36	62.12
920.00	40.88	76.87	5.01	3.78	4.91	-1.24	61.32
925.00	40.94	76.97	4.99	3.76	4.89	-2.12	60.52
930.00	41.00	77.07	4.97	3.75	4.87	-3.00	59.71
935.00	41.06	77.16	4.95	3.73	4.85	-3.88	58.91
940.00	41.12	77.25	4.93	3.72	4.83	-4.76	58.10
945.00	41.18	77.35	4.91	3.70	4.81	-5.65	57.29
950.00	41.24	77.44	4.89	3.69	4.79	-6.54	56.48

955.00	41.30	77.54	4.87	3.67	4.77	-7.42	55.67
960.00	41.36	77.63	4.85	3.66	4.75	-8.31	54.86
965.00	41.42	77.72	4.83	3.64	4.73	-9.20	54.04
970.00	41.48	77.81	4.81	3.63	4.71	-10.09	53.23
975.00	41.54	77.90	4.79	3.61	4.70	-10.98	52.41
980.00	41.60	78.00	4.78	3.60	4.68	-11.88	51.59
985.00	41.66	78.09	4.76	3.58	4.66	-12.77	50.77
990.00	41.72	78.18	4.74	3.57	4.64	-13.66	49.95
995.00	41.78	78.27	4.72	3.56	4.62	-14.56	49.13
1000.00	41.83	78.36	4.70	3.54	4.61	-15.46	48.31
1005.00	41.89	78.45	4.68	3.53	4.59	-16.35	47.48
1010.00	41.95	78.53	4.67	3.52	4.57	-17.25	46.65
1015.00	42.01	78.62	4.65	3.50	4.55	-18.15	45.83
1020.00	42.06	78.71	4.63	3.49	4.54	-19.05	45.00
1025.00	42.12	78.80	4.61	3.48	4.52	-19.96	44.17
1030.00	42.18	78.89	4.60	3.46	4.50	-20.86	43.34
1035.00	42.23	78.97	4.58	3.45	4.48	-21.76	42.50
1040.00	42.29	79.06	4.56	3.44	4.47	-22.67	41.67
1045.00	42.35	79.15	4.54	3.42	4.45	-23.57	40.83
1050.00	42.40	79.23	4.53	3.41	4.43	-24.48	40.00
1055.00	42.46	79.32	4.51	3.40	4.42	-25.39	39.16
1060.00	42.52	79.40	4.49	3.39	4.40	-26.29	38.32
1065.00	42.57	79.49	4.48	3.37	4.39	-27.20	37.48
1070.00	42.63	79.57	4.46	3.36	4.37	-28.11	36.64
1075.00	42.68	79.66	4.45	3.35	4.36	-29.02	35.80
1080.00	42.74	79.74	4.43	3.34	4.34	-29.94	34.96
1085.00	42.79	79.83	4.41	3.33	4.32	-30.85	34.11
1090.00	42.85	79.91	4.40	3.31	4.31	-31.76	33.26
1095.00	42.90	79.99	4.38	3.30	4.29	-32.68	32.42
1100.00	42.95	80.08	4.37	3.29	4.28	-33.59	31.57
1105.00	43.01	80.16	4.35	3.28	4.26	-34.51	30.72
1110.00	43.06	80.24	4.34	3.27	4.25	-35.43	29.87
1115.00	43.12	80.32	4.32	3.26	4.23	-36.34	29.02
1120.00	43.17	80.40	4.31	3.25	4.22	-37.26	28.17
1125.00	43.22	80.49	4.29	3.23	4.20	-38.18	27.31
1130.00	43.28	80.57	4.28	3.22	4.19	-39.10	26.46
1135.00	43.33	80.65	4.26	3.21	4.18	-40.02	25.60
1140.00	43.38	80.73	4.25	3.20	4.16	-40.94	24.75
1145.00	43.43	80.81	4.23	3.19	4.15	-41.87	23.89
1150.00	43.49	80.89	4.22	3.18	4.13	-42.79	23.03
1155.00	43.54	80.97	4.21	3.17	4.12	-43.72	22.17
1160.00	43.59	81.05	4.19	3.16	4.11	-44.64	21.31
1165.00	43.64	81.13	4.18	3.15	4.09	-45.57	20.45
1170.00	43.69	81.20	4.16	3.14	4.08	-46.49	19.59
1175.00	43.75	81.28	4.15	3.13	4.07	-47.42	18.72
1180.00	43.80	81.36	4.14	3.12	4.05	-48.35	17.86
1185.00	43.85	81.44	4.12	3.11	4.04	-49.28	16.99
1190.00	43.90	81.52	4.11	3.10	4.03	-50.21	16.13
1195.00	43.95	81.59	4.10	3.09	4.01	-51.14	15.26
1200.00	44.00	81.67	4.08	3.08	4.00	-52.07	14.39

1205.00	44.05	81.75	4.07	3.07	3.99	-53.00	13.52
1210.00	44.10	81.82	4.06	3.06	3.97	-53.93	12.65
1215.00	44.15	81.90	4.04	3.05	3.96	-54.87	11.78
1220.00	44.20	81.98	4.03	3.04	3.95	-55.80	10.91
1225.00	44.25	82.05	4.02	3.03	3.94	-56.73	10.04
1230.00	44.30	82.13	4.01	3.02	3.92	-57.67	9.16
1235.00	44.35	82.20	3.99	3.01	3.91	-58.60	8.29
1240.00	44.40	82.28	3.98	3.00	3.90	-59.54	7.41
1245.00	44.45	82.35	3.97	2.99	3.89	-60.48	6.54
1250.00	44.50	82.43	3.96	2.98	3.88	-61.42	5.66
1255.00	44.55	82.50	3.94	2.97	3.86	-62.36	4.78
1260.00	44.60	82.57	3.93	2.96	3.85	-63.30	3.90
1265.00	44.65	82.65	3.92	2.95	3.84	-64.24	3.02
1270.00	44.70	82.72	3.91	2.94	3.83	-65.18	2.14
1275.00	44.75	82.79	3.90	2.94	3.82	-66.12	1.26
1280.00	44.79	82.87	3.88	2.93	3.80	-67.06	0.38
1285.00	44.84	82.94	3.87	2.92	3.79	-68.00	-0.51
1290.00	44.89	83.01	3.86	2.91	3.78	-68.95	-1.39
1295.00	44.94	83.09	3.85	2.90	3.77	-69.89	-2.28
1300.00	44.99	83.16	3.84	2.89	3.76	-70.83	-3.16
1305.00	45.03	83.23	3.83	2.88	3.75	-71.78	-4.05
1310.00	45.08	83.30	3.82	2.87	3.74	-72.72	-4.94
1315.00	45.13	83.37	3.80	2.87	3.73	-73.67	-5.83
1320.00	45.18	83.44	3.79	2.86	3.72	-74.62	-6.72
1325.00	45.22	83.51	3.78	2.85	3.70	-75.57	-7.61
1330.00	45.27	83.58	3.77	2.84	3.69	-76.51	-8.50
1335.00	45.32	83.66	3.76	2.83	3.68	-77.46	-9.39
1340.00	45.37	83.73	3.75	2.82	3.67	-78.41	-10.28
1345.00	45.41	83.80	3.74	2.82	3.66	-79.36	-11.17
1350.00	45.46	83.87	3.73	2.81	3.65	-80.31	-12.07
1355.00	45.51	83.94	3.72	2.80	3.64	-81.26	-12.96
1360.00	45.55	84.00	3.71	2.79	3.63	-82.22	-13.86
1365.00	45.60	84.07	3.70	2.78	3.62	-83.17	-14.75
1370.00	45.64	84.14	3.69	2.78	3.61	-84.12	-15.65
1375.00	45.69	84.21	3.67	2.77	3.60	-85.07	-16.55
1380.00	45.74	84.28	3.66	2.76	3.59	-86.03	-17.44
1385.00	45.78	84.35	3.65	2.75	3.58	-86.98	-18.34
1390.00	45.83	84.42	3.64	2.75	3.57	-87.94	-19.24
1395.00	45.87	84.48	3.63	2.74	3.56	-88.89	-20.14
1400.00	45.92	84.55	3.62	2.73	3.55	-89.85	-21.05
1405.00	45.96	84.62	3.61	2.72	3.54	-90.81	-21.95
1410.00	46.01	84.69	3.60	2.72	3.53	-91.76	-22.85
1415.00	46.05	84.75	3.59	2.71	3.52	-92.72	-23.75
1420.00	46.10	84.82	3.58	2.70	3.51	-93.68	-24.66
1425.00	46.14	84.89	3.57	2.69	3.50	-94.64	-25.56
1430.00	46.19	84.95	3.56	2.69	3.49	-95.60	-26.47
1435.00	46.23	85.02	3.55	2.68	3.48	-96.56	-27.37
1440.00	46.28	85.09	3.55	2.67	3.47	-97.52	-28.28
1445.00	46.32	85.15	3.54	2.66	3.46	-98.48	-29.19
1450.00	46.37	85.22	3.53	2.66	3.45	-99.44	-30.09

1455.00	46.41	85.28	3.52	2.65	3.44	-100.40	-31.00
1460.00	46.45	85.35	3.51	2.64	3.44	-101.37	-31.91
1465.00	46.50	85.41	3.50	2.64	3.43	-102.33	-32.82
1470.00	46.54	85.48	3.49	2.63	3.42	-103.29	-33.73
1475.00	46.59	85.54	3.48	2.62	3.41	-104.26	-34.65
1480.00	46.63	85.61	3.47	2.62	3.40	-105.22	-35.56
1485.00	46.67	85.67	3.46	2.61	3.39	-106.19	-36.47
1490.00	46.72	85.74	3.45	2.60	3.38	-107.15	-37.38
1495.00	46.76	85.80	3.44	2.59	3.37	-108.12	-38.30
1500.00	46.80	85.87	3.43	2.59	3.36	-109.09	-39.21
1505.00	46.85	85.93	3.43	2.58	3.36	-110.05	-40.13
1510.00	46.89	85.99	3.42	2.57	3.35	-111.02	-41.04
1515.00	46.93	86.06	3.41	2.57	3.34	-111.99	-41.96
1520.00	46.97	86.12	3.40	2.56	3.33	-112.96	-42.88
1525.00	47.02	86.18	3.39	2.55	3.32	-113.93	-43.79
1530.00	47.06	86.25	3.38	2.55	3.31	-114.90	-44.71
1535.00	47.10	86.31	3.37	2.54	3.30	-115.86	-45.63
1540.00	47.14	86.37	3.37	2.54	3.30	-116.84	-46.55
1545.00	47.19	86.43	3.36	2.53	3.29	-117.81	-47.47
1550.00	47.23	86.50	3.35	2.52	3.28	-118.78	-48.39
1555.00	47.27	86.56	3.34	2.52	3.27	-119.75	-49.31
1560.00	47.31	86.62	3.33	2.51	3.26	-120.72	-50.23
1565.00	47.35	86.68	3.32	2.50	3.26	-121.69	-51.16
1570.00	47.40	86.74	3.32	2.50	3.25	-122.67	-52.08
1575.00	47.44	86.80	3.31	2.49	3.24	-123.64	-53.00
1580.00	47.48	86.87	3.30	2.49	3.23	-124.61	-53.93
1585.00	47.52	86.93	3.29	2.48	3.22	-125.59	-54.85
1590.00	47.56	86.99	3.28	2.47	3.22	-126.56	-55.78
1595.00	47.60	87.05	3.27	2.47	3.21	-127.54	-56.70
1600.00	47.64	87.11	3.27	2.46	3.20	-128.51	-57.63
1605.00	47.69	87.17	3.26	2.46	3.19	-129.49	-58.56
1610.00	47.73	87.23	3.25	2.45	3.18	-130.47	-59.48
1615.00	47.77	87.29	3.24	2.44	3.18	-131.44	-60.41
1620.00	47.81	87.35	3.24	2.44	3.17	-132.42	-61.34
1625.00	47.85	87.41	3.23	2.43	3.16	-133.40	-62.27
1630.00	47.89	87.47	3.22	2.43	3.15	-134.38	-63.20
1635.00	47.93	87.53	3.21	2.42	3.15	-135.36	-64.13
1640.00	47.97	87.59	3.20	2.41	3.14	-136.34	-65.06
1645.00	48.01	87.65	3.20	2.41	3.13	-137.31	-65.99
1650.00	48.05	87.71	3.19	2.40	3.12	-138.29	-66.92
1655.00	48.09	87.77	3.18	2.40	3.12	-139.27	-67.86
1660.00	48.13	87.82	3.17	2.39	3.11	-140.26	-68.79
1665.00	48.17	87.88	3.17	2.39	3.10	-141.24	-69.72
1670.00	48.21	87.94	3.16	2.38	3.09	-142.22	-70.66
1675.00	48.25	88.00	3.15	2.38	3.09	-143.20	-71.59
1680.00	48.29	88.06	3.14	2.37	3.08	-144.18	-72.52
1685.00	48.33	88.12	3.14	2.36	3.07	-145.16	-73.46
1690.00	48.37	88.17	3.13	2.36	3.07	-146.15	-74.40
1695.00	48.41	88.23	3.12	2.35	3.06	-147.13	-75.33
1700.00	48.45	88.29	3.12	2.35	3.05	-148.12	-76.27

1705.00	48.49	88.35	3.11	2.34	3.05	-149.10	-77.21
1710.00	48.53	88.40	3.10	2.34	3.04	-150.08	-78.15
1715.00	48.57	88.46	3.09	2.33	3.03	-151.07	-79.08
1720.00	48.61	88.52	3.09	2.33	3.02	-152.05	-80.02
1725.00	48.64	88.57	3.08	2.32	3.02	-153.04	-80.96
1730.00	48.68	88.63	3.07	2.32	3.01	-154.03	-81.90
1735.00	48.72	88.69	3.07	2.31	3.00	-155.01	-82.84
1740.00	48.76	88.74	3.06	2.31	3.00	-156.00	-83.78
1745.00	48.80	88.80	3.05	2.30	2.99	-156.99	-84.72
1750.00	48.84	88.86	3.05	2.30	2.98	-157.97	-85.67
1755.00	48.88	88.91	3.04	2.29	2.98	-158.96	-86.61
1760.00	48.92	88.97	3.03	2.29	2.97	-159.95	-87.55
1765.00	48.95	89.02	3.03	2.28	2.96	-160.94	-88.49
1770.00	48.99	89.08	3.02	2.28	2.96	-161.93	-89.44
1775.00	49.03	89.14	3.01	2.27	2.95	-162.92	-90.38
1780.00	49.07	89.19	3.01	2.27	2.94	-163.91	-91.33
1785.00	49.11	89.25	3.00	2.26	2.94	-164.90	-92.27
1790.00	49.14	89.30	2.99	2.26	2.93	-165.89	-93.22
1795.00	49.18	89.36	2.99	2.25	2.93	-166.88	-94.16
1800.00	49.22	89.41	2.98	2.25	2.92	-167.87	-95.11
1805.00	49.26	89.47	2.97	2.24	2.91	-168.86	-96.06
1810.00	49.29	89.52	2.97	2.24	2.91	-169.85	-97.00
1815.00	49.33	89.58	2.96	2.23	2.90	-170.85	-97.95
1820.00	49.37	89.63	2.95	2.23	2.89	-171.84	-98.90
1825.00	49.41	89.68	2.95	2.22	2.89	-172.83	-99.85
1830.00	49.44	89.74	2.94	2.22	2.88	-173.82	-100.80
1835.00	49.48	89.79	2.94	2.21	2.88	-174.82	-101.75
1840.00	49.52	89.85	2.93	2.21	2.87	-175.81	-102.70
1845.00	49.56	89.90	2.92	2.20	2.86	-176.81	-103.65
1850.00	49.59	89.95	2.92	2.20	2.86	-177.80	-104.60
1855.00	49.63	90.01	2.91	2.19	2.85	-178.79	-105.55
1860.00	49.67	90.06	2.91	2.19	2.85	-179.79	-106.50
1865.00	49.70	90.11	2.90	2.18	2.84	-180.79	-107.45
1870.00	49.74	90.17	2.89	2.18	2.83	-181.78	-108.41
1875.00	49.78	90.22	2.89	2.18	2.83	-182.78	-109.36
1880.00	49.81	90.27	2.88	2.17	2.82	-183.77	-110.31
1885.00	49.85	90.33	2.88	2.17	2.82	-184.77	-111.27
1890.00	49.89	90.38	2.87	2.16	2.81	-185.77	-112.22
1895.00	49.92	90.43	2.86	2.16	2.80	-186.77	-113.18
1900.00	49.96	90.48	2.86	2.15	2.80	-187.76	-114.13
1905.00	50.00	90.54	2.85	2.15	2.79	-188.76	-115.09
1910.00	50.03	90.59	2.85	2.14	2.79	-189.76	-116.04
1915.00	50.07	90.64	2.84	2.14	2.78	-190.76	-117.00
1920.00	50.10	90.69	2.83	2.14	2.78	-191.76	-117.96
1925.00	50.14	90.74	2.83	2.13	2.77	-192.76	-118.91
1930.00	50.18	90.80	2.82	2.13	2.76	-193.76	-119.87
1935.00	50.21	90.85	2.82	2.12	2.76	-194.76	-120.83
1940.00	50.25	90.90	2.81	2.12	2.75	-195.76	-121.79
1945.00	50.28	90.95	2.81	2.11	2.75	-196.76	-122.75
1950.00	50.32	91.00	2.80	2.11	2.74	-197.76	-123.70

1955.00	50.35	91.05	2.79	2.11	2.74	-198.76	-124.66
1960.00	50.39	91.10	2.79	2.10	2.73	-199.76	-125.62
1965.00	50.43	91.15	2.78	2.10	2.73	-200.76	-126.58
1970.00	50.46	91.21	2.78	2.09	2.72	-201.76	-127.54
1975.00	50.50	91.26	2.77	2.09	2.72	-202.77	-128.51
1980.00	50.53	91.31	2.77	2.08	2.71	-203.77	-129.47
1985.00	50.57	91.36	2.76	2.08	2.70	-204.77	-130.43
1990.00	50.60	91.41	2.76	2.08	2.70	-205.77	-131.39
1995.00	50.64	91.46	2.75	2.07	2.69	-206.78	-132.35
2000.00	50.67	91.51	2.75	2.07	2.69	-207.78	-133.32
2005.00	50.71	91.56	2.74	2.06	2.68	-208.79	-134.28
2010.00	50.74	91.61	2.73	2.06	2.68	-209.79	-135.24
2015.00	50.78	91.66	2.73	2.06	2.67	-210.79	-136.21
2020.00	50.81	91.71	2.72	2.05	2.67	-211.80	-137.17
2025.00	50.85	91.76	2.72	2.05	2.66	-212.80	-138.14
2030.00	50.88	91.81	2.71	2.04	2.66	-213.81	-139.10
2035.00	50.91	91.86	2.71	2.04	2.65	-214.82	-140.07
2040.00	50.95	91.91	2.70	2.04	2.65	-215.82	-141.03
2045.00	50.98	91.96	2.70	2.03	2.64	-216.83	-142.00
2050.00	51.02	92.00	2.69	2.03	2.64	-217.83	-142.96
2055.00	51.05	92.05	2.69	2.03	2.63	-218.84	-143.93
2060.00	51.09	92.10	2.68	2.02	2.63	-219.85	-144.90
2065.00	51.12	92.15	2.68	2.02	2.62	-220.86	-145.87
2070.00	51.15	92.20	2.67	2.01	2.62	-221.86	-146.83
2075.00	51.19	92.25	2.67	2.01	2.61	-222.87	-147.80
2080.00	51.22	92.30	2.66	2.01	2.61	-223.88	-148.77
2085.00	51.26	92.35	2.66	2.00	2.60	-224.89	-149.74
2090.00	51.29	92.39	2.65	2.00	2.60	-225.90	-150.71
2095.00	51.32	92.44	2.65	1.99	2.59	-226.91	-151.68
2100.00	51.36	92.49	2.64	1.99	2.59	-227.91	-152.65
2105.00	51.39	92.54	2.64	1.99	2.58	-228.92	-153.62
2110.00	51.43	92.59	2.63	1.98	2.58	-229.93	-154.59
2115.00	51.46	92.64	2.63	1.98	2.57	-230.94	-155.56
2120.00	51.49	92.68	2.62	1.98	2.57	-231.95	-156.53
2125.00	51.53	92.73	2.62	1.97	2.56	-232.96	-157.50
2130.00	51.56	92.78	2.61	1.97	2.56	-233.98	-158.48
2135.00	51.59	92.83	2.61	1.97	2.56	-234.99	-159.45
2140.00	51.63	92.87	2.60	1.96	2.55	-236.00	-160.42
2145.00	51.66	92.92	2.60	1.96	2.55	-237.01	-161.39
2150.00	51.69	92.97	2.59	1.95	2.54	-238.02	-162.37
2155.00	51.73	93.02	2.59	1.95	2.54	-239.03	-163.34
2160.00	51.76	93.06	2.59	1.95	2.53	-240.05	-164.31
2165.00	51.79	93.11	2.58	1.94	2.53	-241.06	-165.29
2170.00	51.82	93.16	2.58	1.94	2.52	-242.07	-166.26
2175.00	51.86	93.20	2.57	1.94	2.52	-243.08	-167.24
2180.00	51.89	93.25	2.57	1.93	2.51	-244.10	-168.21
2185.00	51.92	93.30	2.56	1.93	2.51	-245.11	-169.19
2190.00	51.96	93.34	2.56	1.93	2.50	-246.12	-170.17
2195.00	51.99	93.39	2.55	1.92	2.50	-247.14	-171.14
2200.00	52.02	93.44	2.55	1.92	2.50	-248.15	-172.12

2205.00	52.05	93.48	2.54	1.92	2.49	-249.17	-173.10
2210.00	52.09	93.53	2.54	1.91	2.49	-250.18	-174.07
2215.00	52.12	93.57	2.53	1.91	2.48	-251.20	-175.05
2220.00	52.15	93.62	2.53	1.91	2.48	-252.21	-176.03
2225.00	52.18	93.67	2.53	1.90	2.47	-253.23	-177.01
2230.00	52.22	93.71	2.52	1.90	2.47	-254.24	-177.98
2235.00	52.25	93.76	2.52	1.90	2.47	-255.26	-178.96
2240.00	52.28	93.80	2.51	1.89	2.46	-256.27	-179.94
2245.00	52.31	93.85	2.51	1.89	2.46	-257.29	-180.92
2250.00	52.34	93.89	2.50	1.89	2.45	-258.31	-181.90
2255.00	52.38	93.94	2.50	1.88	2.45	-259.32	-182.88
2260.00	52.41	93.99	2.50	1.88	2.44	-260.34	-183.86
2265.00	52.44	94.03	2.49	1.88	2.44	-261.36	-184.84
2270.00	52.47	94.08	2.49	1.87	2.44	-262.38	-185.82
2275.00	52.50	94.12	2.48	1.87	2.43	-263.39	-186.80
2280.00	52.54	94.17	2.48	1.87	2.43	-264.41	-187.78
2285.00	52.57	94.21	2.47	1.86	2.42	-265.43	-188.77
2290.00	52.60	94.26	2.47	1.86	2.42	-266.45	-189.75
2295.00	52.63	94.30	2.47	1.86	2.41	-267.47	-190.73
2300.00	52.66	94.35	2.46	1.85	2.41	-268.49	-191.71
2305.00	52.69	94.39	2.46	1.85	2.41	-269.51	-192.70
2310.00	52.73	94.43	2.45	1.85	2.40	-270.52	-193.68
2315.00	52.76	94.48	2.45	1.85	2.40	-271.54	-194.66
2320.00	52.79	94.52	2.44	1.84	2.39	-272.56	-195.65
2325.00	52.82	94.57	2.44	1.84	2.39	-273.58	-196.63
2330.00	52.85	94.61	2.44	1.84	2.39	-274.60	-197.61
2335.00	52.88	94.66	2.43	1.83	2.38	-275.62	-198.60
2340.00	52.91	94.70	2.43	1.83	2.38	-276.65	-199.58
2345.00	52.94	94.74	2.42	1.83	2.37	-277.67	-200.57
2350.00	52.98	94.79	2.42	1.82	2.37	-278.69	-201.55
2355.00	53.01	94.83	2.42	1.82	2.37	-279.71	-202.54
2360.00	53.04	94.87	2.41	1.82	2.36	-280.73	-203.52
2365.00	53.07	94.92	2.41	1.81	2.36	-281.75	-204.51
2370.00	53.10	94.96	2.40	1.81	2.35	-282.77	-205.50
2375.00	53.13	95.01	2.40	1.81	2.35	-283.80	-206.48
2380.00	53.16	95.05	2.40	1.81	2.35	-284.82	-207.47
2385.00	53.19	95.09	2.39	1.80	2.34	-285.84	-208.46
2390.00	53.22	95.14	2.39	1.80	2.34	-286.86	-209.45
2395.00	53.25	95.18	2.38	1.80	2.34	-287.89	-210.43
2400.00	53.28	95.22	2.38	1.79	2.33	-288.91	-211.42
2405.00	53.31	95.26	2.38	1.79	2.33	-289.93	-212.41
2410.00	53.34	95.31	2.37	1.79	2.32	-290.96	-213.40
2415.00	53.38	95.35	2.37	1.78	2.32	-291.98	-214.39
2420.00	53.41	95.39	2.37	1.78	2.32	-293.00	-215.38
2425.00	53.44	95.44	2.36	1.78	2.31	-294.03	-216.37
2430.00	53.47	95.48	2.36	1.78	2.31	-295.05	-217.36
2435.00	53.50	95.52	2.35	1.77	2.31	-296.08	-218.35
2440.00	53.53	95.56	2.35	1.77	2.30	-297.10	-219.34
2445.00	53.56	95.61	2.35	1.77	2.30	-298.13	-220.33
2450.00	53.59	95.65	2.34	1.76	2.29	-299.15	-221.32

2455.00	53.62	95.69	2.34	1.76	2.29	-300.18	-222.31
2460.00	53.65	95.73	2.33	1.76	2.29	-301.20	-223.30
2465.00	53.68	95.77	2.33	1.76	2.28	-302.23	-224.29
2470.00	53.71	95.82	2.33	1.75	2.28	-303.25	-225.28
2475.00	53.74	95.86	2.32	1.75	2.28	-304.28	-226.27
2480.00	53.77	95.90	2.32	1.75	2.27	-305.31	-227.27
2485.00	53.80	95.94	2.32	1.75	2.27	-306.33	-228.26
2490.00	53.83	95.98	2.31	1.74	2.27	-307.36	-229.25
2495.00	53.86	96.03	2.31	1.74	2.26	-308.39	-230.24
2500.00	53.89	96.07	2.31	1.74	2.26	-309.41	-231.24
2505.00	53.92	96.11	2.30	1.73	2.25	-310.44	-232.23
2510.00	53.95	96.15	2.30	1.73	2.25	-311.47	-233.22
2515.00	53.98	96.19	2.29	1.73	2.25	-312.50	-234.22
2520.00	54.00	96.23	2.29	1.73	2.24	-313.52	-235.21
2525.00	54.03	96.27	2.29	1.72	2.24	-314.55	-236.21
2530.00	54.06	96.32	2.28	1.72	2.24	-315.58	-237.20
2535.00	54.09	96.36	2.28	1.72	2.23	-316.61	-238.20
2540.00	54.12	96.40	2.28	1.72	2.23	-317.64	-239.19
2545.00	54.15	96.44	2.27	1.71	2.23	-318.67	-240.19
2550.00	54.18	96.48	2.27	1.71	2.22	-319.69	-241.18
2555.00	54.21	96.52	2.27	1.71	2.22	-320.72	-242.18
2560.00	54.24	96.56	2.26	1.71	2.22	-321.75	-243.18
2565.00	54.27	96.60	2.26	1.70	2.21	-322.78	-244.17
2570.00	54.30	96.64	2.26	1.70	2.21	-323.81	-245.17
2575.00	54.33	96.68	2.25	1.70	2.21	-324.84	-246.16
2580.00	54.36	96.72	2.25	1.69	2.20	-325.87	-247.16
2585.00	54.39	96.76	2.25	1.69	2.20	-326.90	-248.16
2590.00	54.41	96.81	2.24	1.69	2.20	-327.93	-249.16
2595.00	54.44	96.85	2.24	1.69	2.19	-328.96	-250.15
2600.00	54.47	96.89	2.24	1.68	2.19	-329.99	-251.15
2605.00	54.50	96.93	2.23	1.68	2.19	-331.03	-252.15
2610.00	54.53	96.97	2.23	1.68	2.18	-332.06	-253.15
2615.00	54.56	97.01	2.23	1.68	2.18	-333.09	-254.15
2620.00	54.59	97.05	2.22	1.67	2.18	-334.12	-255.15
2625.00	54.62	97.09	2.22	1.67	2.17	-335.15	-256.15
2630.00	54.64	97.13	2.22	1.67	2.17	-336.18	-257.15
2635.00	54.67	97.17	2.21	1.67	2.17	-337.21	-258.14
2640.00	54.70	97.21	2.21	1.66	2.16	-338.25	-259.14
2645.00	54.73	97.25	2.21	1.66	2.16	-339.28	-260.14
2650.00	54.76	97.29	2.20	1.66	2.16	-340.31	-261.15
2655.00	54.79	97.32	2.20	1.66	2.15	-341.34	-262.15
2660.00	54.82	97.36	2.20	1.65	2.15	-342.38	-263.15
2665.00	54.84	97.40	2.19	1.65	2.15	-343.41	-264.15
2670.00	54.87	97.44	2.19	1.65	2.14	-344.44	-265.15
2675.00	54.90	97.48	2.19	1.65	2.14	-345.48	-266.15
2680.00	54.93	97.52	2.18	1.65	2.14	-346.51	-267.15
2685.00	54.96	97.56	2.18	1.64	2.14	-347.54	-268.15
2690.00	54.99	97.60	2.18	1.64	2.13	-348.58	-269.16
2695.00	55.01	97.64	2.17	1.64	2.13	-349.61	-270.16
2700.00	55.04	97.68	2.17	1.64	2.13	-350.65	-271.16

2705.00	55.07	97.72	2.17	1.63	2.12	-351.68	-272.16
2710.00	55.10	97.76	2.16	1.63	2.12	-352.71	-273.17
2715.00	55.13	97.79	2.16	1.63	2.12	-353.75	-274.17
2720.00	55.15	97.83	2.16	1.63	2.11	-354.78	-275.17
2725.00	55.18	97.87	2.15	1.62	2.11	-355.82	-276.18
2730.00	55.21	97.91	2.15	1.62	2.11	-356.85	-277.18
2735.00	55.24	97.95	2.15	1.62	2.10	-357.89	-278.18
2740.00	55.26	97.99	2.15	1.62	2.10	-358.93	-279.19
2745.00	55.29	98.03	2.14	1.61	2.10	-359.96	-280.19
2750.00	55.32	98.06	2.14	1.61	2.10	-361.00	-281.20
2755.00	55.35	98.10	2.14	1.61	2.09	-362.03	-282.20
2760.00	55.38	98.14	2.13	1.61	2.09	-363.07	-283.21
2765.00	55.40	98.18	2.13	1.61	2.09	-364.11	-284.21
2770.00	55.43	98.22	2.13	1.60	2.08	-365.14	-285.22
2775.00	55.46	98.26	2.12	1.60	2.08	-366.18	-286.22
2780.00	55.49	98.29	2.12	1.60	2.08	-367.22	-287.23
2785.00	55.51	98.33	2.12	1.60	2.08	-368.25	-288.23
2790.00	55.54	98.37	2.12	1.59	2.07	-369.29	-289.24
2795.00	55.57	98.41	2.11	1.59	2.07	-370.33	-290.25
2800.00	55.60	98.45	2.11	1.59	2.07	-371.36	-291.25
2805.00	55.62	98.48	2.11	1.59	2.06	-372.40	-292.26
2810.00	55.65	98.52	2.10	1.59	2.06	-373.44	-293.27
2815.00	55.68	98.56	2.10	1.58	2.06	-374.48	-294.27
2820.00	55.70	98.60	2.10	1.58	2.05	-375.51	-295.28
2825.00	55.73	98.63	2.09	1.58	2.05	-376.55	-296.29
2830.00	55.76	98.67	2.09	1.58	2.05	-377.59	-297.30
2835.00	55.79	98.71	2.09	1.57	2.05	-378.63	-298.30
2840.00	55.81	98.75	2.09	1.57	2.04	-379.67	-299.31
2845.00	55.84	98.78	2.08	1.57	2.04	-380.71	-300.32
2850.00	55.87	98.82	2.08	1.57	2.04	-381.75	-301.33
2855.00	55.89	98.86	2.08	1.57	2.04	-382.79	-302.34
2860.00	55.92	98.90	2.07	1.56	2.03	-383.82	-303.35
2865.00	55.95	98.93	2.07	1.56	2.03	-384.86	-304.36
2870.00	55.97	98.97	2.07	1.56	2.03	-385.90	-305.37
2875.00	56.00	99.01	2.07	1.56	2.02	-386.94	-306.38
2880.00	56.03	99.04	2.06	1.55	2.02	-387.98	-307.39

Notes to User

Only values shown blue to be edited

Sheet only for england and wales

In M5-D	J0	J1	J2	Cr	In (MT-D/M5-D)	MT-D/M5-D
2.23	0.1699	0.0028	0.000114	0.205744	0.63887	1.894339
2.41	0.1644	0.005831	-0.00013	0.212758	0.66065	1.936051
2.53	0.1644	0.005831	-0.00013	0.216461	0.672149	1.958441
2.62	0.1644	0.005831	-0.00013	0.219057	0.680208	1.974289
2.68	0.1644	0.005831	-0.00013	0.220976	0.686169	1.986093
2.74	0.1644	0.005831	-0.00013	0.222446	0.690733	1.995177
2.78	0.1644	0.005831	-0.00013	0.223597	0.694306	2.002318
2.82	0.1644	0.005831	-0.00013	0.224511	0.697145	2.008011
2.86	0.1644	0.005831	-0.00013	0.225244	0.699421	2.012587
2.89	0.1644	0.005831	-0.00013	0.225834	0.701254	2.016279
2.92	0.1644	0.005831	-0.00013	0.226309	0.702729	2.019256
2.94	0.1644	0.005831	-0.00013	0.22669	0.703911	2.021644
2.97	0.1644	0.005831	-0.00013	0.226992	0.704848	2.02354
2.99	0.1644	0.005831	-0.00013	0.227227	0.70558	2.02502
3.01	0.1644	0.005831	-0.00013	0.227406	0.706135	2.026145
3.03	0.1644	0.005831	-0.00013	0.227536	0.706539	2.026963
3.04	0.1644	0.005831	-0.00013	0.227624	0.706811	2.027515
3.06	0.1644	0.005831	-0.00013	0.227674	0.706967	2.027832
3.08	0.1644	0.005831	-0.00013	0.227692	0.707023	2.027944
3.09	0.1644	0.005831	-0.00013	0.227681	0.706988	2.027873
3.11	0.1644	0.005831	-0.00013	0.227644	0.706873	2.02764
3.12	0.1644	0.005831	-0.00013	0.227584	0.706686	2.027261
3.13	0.1644	0.005831	-0.00013	0.227503	0.706434	2.026751
3.14	0.1644	0.005831	-0.00013	0.227403	0.706124	2.026124
3.15	0.1644	0.005831	-0.00013	0.227286	0.705762	2.025389
3.17	0.1644	0.005831	-0.00013	0.227154	0.705351	2.024558
3.18	0.1644	0.005831	-0.00013	0.227008	0.704897	2.023639
3.19	0.1644	0.005831	-0.00013	0.226848	0.704403	2.022639
3.20	0.1644	0.005831	-0.00013	0.226678	0.703872	2.021566
3.21	0.1644	0.005831	-0.00013	0.226496	0.703308	2.020425
3.22	0.1644	0.005831	-0.00013	0.226304	0.702713	2.019223
3.22	0.1644	0.005831	-0.00013	0.226103	0.702089	2.017963
3.23	0.1644	0.005831	-0.00013	0.225894	0.701438	2.016651
3.24	0.1644	0.005831	-0.00013	0.225676	0.700763	2.015291
3.25	0.1644	0.005831	-0.00013	0.225452	0.700066	2.013886
3.26	0.1644	0.005831	-0.00013	0.22522	0.699347	2.012439
3.27	0.1644	0.005831	-0.00013	0.224983	0.698609	2.010954
3.27	0.1644	0.005831	-0.00013	0.224739	0.697853	2.009434
3.28	0.1644	0.005831	-0.00013	0.22449	0.69708	2.00788

3.29	0.1644	0.005831	-0.00013	0.224236	0.69629	2.006296
3.29	0.1644	0.005831	-0.00013	0.223977	0.695486	2.004684
3.30	0.1644	0.005831	-0.00013	0.223713	0.694668	2.003045
3.31	0.1644	0.005831	-0.00013	0.223446	0.693838	2.001381
3.31	0.1644	0.005831	-0.00013	0.223174	0.692994	1.999694
3.32	0.1644	0.005831	-0.00013	0.222899	0.69214	1.997986
3.33	0.1644	0.005831	-0.00013	0.222621	0.691275	1.996258
3.33	0.1644	0.005831	-0.00013	0.222339	0.690399	1.994512
3.34	0.1644	0.005831	-0.00013	0.222054	0.689515	1.992748
3.34	0.1644	0.005831	-0.00013	0.221766	0.688621	1.990968
3.35	0.1644	0.005831	-0.00013	0.221475	0.687719	1.989173
3.36	0.1644	0.005831	-0.00013	0.221182	0.686809	1.987363
3.36	0.1644	0.005831	-0.00013	0.220887	0.685891	1.985541
3.37	0.1644	0.005831	-0.00013	0.220589	0.684967	1.983706
3.37	0.1644	0.005831	-0.00013	0.220289	0.684036	1.98186
3.38	0.1644	0.005831	-0.00013	0.219988	0.683099	1.980004
3.38	0.1644	0.005831	-0.00013	0.219684	0.682156	1.978137
3.39	0.1644	0.005831	-0.00013	0.219378	0.681207	1.976262
3.39	0.1644	0.005831	-0.00013	0.219071	0.680253	1.974378
3.40	0.1644	0.005831	-0.00013	0.218762	0.679294	1.972485
3.40	0.1644	0.005831	-0.00013	0.218452	0.678331	1.970586
3.41	0.1644	0.005831	-0.00013	0.21814	0.677363	1.96868
3.41	0.1644	0.005831	-0.00013	0.217827	0.676391	1.966767
3.41	0.1644	0.005831	-0.00013	0.217513	0.675415	1.964848
3.42	0.1644	0.005831	-0.00013	0.217198	0.674436	1.962925
3.42	0.1644	0.005831	-0.00013	0.216881	0.673452	1.960996
3.43	0.1644	0.005831	-0.00013	0.216563	0.672466	1.959062
3.43	0.1644	0.005831	-0.00013	0.216245	0.671476	1.957125
3.44	0.2644	-0.00162	3.15E-06	0.217077	0.674062	1.962192
3.44	0.2644	-0.00162	3.15E-06	0.216897	0.673502	1.961093
3.44	0.2644	-0.00162	3.15E-06	0.216719	0.672948	1.960007
3.45	0.2644	-0.00162	3.15E-06	0.216542	0.6724	1.958933
3.45	0.2644	-0.00162	3.15E-06	0.216368	0.671858	1.957872
3.46	0.2644	-0.00162	3.15E-06	0.216195	0.671322	1.956822
3.46	0.2644	-0.00162	3.15E-06	0.216024	0.670791	1.955784
3.46	0.2644	-0.00162	3.15E-06	0.215855	0.670266	1.954758
3.47	0.2644	-0.00162	3.15E-06	0.215688	0.669747	1.953743
3.47	0.2644	-0.00162	3.15E-06	0.215522	0.669232	1.952738
3.47	0.2644	-0.00162	3.15E-06	0.215358	0.668723	1.951744
3.48	0.2644	-0.00162	3.15E-06	0.215196	0.668219	1.95076
3.48	0.2644	-0.00162	3.15E-06	0.215035	0.66772	1.949787
3.48	0.2644	-0.00162	3.15E-06	0.214876	0.667226	1.948823
3.49	0.2644	-0.00162	3.15E-06	0.214718	0.666736	1.947869
3.49	0.2644	-0.00162	3.15E-06	0.214562	0.666251	1.946924
3.50	0.2644	-0.00162	3.15E-06	0.214407	0.66577	1.945989
3.50	0.2644	-0.00162	3.15E-06	0.214254	0.665294	1.945062
3.50	0.2644	-0.00162	3.15E-06	0.214102	0.664822	1.944145
3.50	0.2644	-0.00162	3.15E-06	0.213951	0.664354	1.943236
3.51	0.2644	-0.00162	3.15E-06	0.213802	0.663891	1.942335
3.51	0.2644	-0.00162	3.15E-06	0.213654	0.663432	1.941443

3.51	0.2644	-0.00162	3.15E-06	0.213507	0.662976	1.940559
3.52	0.2644	-0.00162	3.15E-06	0.213362	0.662525	1.939683
3.52	0.2644	-0.00162	3.15E-06	0.213218	0.662077	1.938815
3.52	0.2644	-0.00162	3.15E-06	0.213075	0.661633	1.937954
3.53	0.2644	-0.00162	3.15E-06	0.212933	0.661193	1.937101
3.53	0.2644	-0.00162	3.15E-06	0.212792	0.660756	1.936256
3.53	0.2644	-0.00162	3.15E-06	0.212653	0.660323	1.935417
3.53	0.2644	-0.00162	3.15E-06	0.212514	0.659893	1.934586
3.54	0.2644	-0.00162	3.15E-06	0.212377	0.659467	1.933762
3.54	0.2644	-0.00162	3.15E-06	0.212241	0.659044	1.932944
3.54	0.2644	-0.00162	3.15E-06	0.212106	0.658625	1.932134
3.55	0.2644	-0.00162	3.15E-06	0.211972	0.658209	1.931329
3.55	0.2644	-0.00162	3.15E-06	0.211839	0.657796	1.930532
3.55	0.2644	-0.00162	3.15E-06	0.211707	0.657386	1.929741
3.55	0.2644	-0.00162	3.15E-06	0.211576	0.656979	1.928955
3.56	0.2644	-0.00162	3.15E-06	0.211446	0.656575	1.928177
3.56	0.2644	-0.00162	3.15E-06	0.211317	0.656174	1.927404
3.56	0.2644	-0.00162	3.15E-06	0.211188	0.655776	1.926637
3.56	0.2644	-0.00162	3.15E-06	0.211061	0.655381	1.925876
3.57	0.2644	-0.00162	3.15E-06	0.210935	0.654989	1.925121
3.57	0.2644	-0.00162	3.15E-06	0.210809	0.654599	1.924371
3.57	0.2644	-0.00162	3.15E-06	0.210685	0.654212	1.923627
3.57	0.2644	-0.00162	3.15E-06	0.210561	0.653828	1.922888
3.58	0.2644	-0.00162	3.15E-06	0.210438	0.653447	1.922155
3.58	0.2644	-0.00162	3.15E-06	0.210316	0.653068	1.921427
3.58	0.2644	-0.00162	3.15E-06	0.210195	0.652692	1.920704
3.58	0.2644	-0.00162	3.15E-06	0.210075	0.652318	1.919987
3.59	0.2644	-0.00162	3.15E-06	0.209955	0.651947	1.919274
3.59	0.2644	-0.00162	3.15E-06	0.209837	0.651578	1.918567
3.59	0.2644	-0.00162	3.15E-06	0.209719	0.651212	1.917864
3.59	0.2644	-0.00162	3.15E-06	0.209601	0.650848	1.917166
3.60	0.2644	-0.00162	3.15E-06	0.209485	0.650487	1.916473
3.60	0.2644	-0.00162	3.15E-06	0.209369	0.650128	1.915785
3.60	0.2644	-0.00162	3.15E-06	0.209254	0.649771	1.915101
3.60	0.2644	-0.00162	3.15E-06	0.20914	0.649416	1.914422
3.61	0.2644	-0.00162	3.15E-06	0.209027	0.649063	1.913747
3.61	0.2644	-0.00162	3.15E-06	0.208914	0.648713	1.913077
3.61	0.2644	-0.00162	3.15E-06	0.208802	0.648365	1.912411
3.61	0.2644	-0.00162	3.15E-06	0.20869	0.648019	1.91175
3.61	0.2644	-0.00162	3.15E-06	0.20858	0.647675	1.911092
3.62	0.2644	-0.00162	3.15E-06	0.208469	0.647333	1.910439
3.62	0.2644	-0.00162	3.15E-06	0.20836	0.646993	1.90979
3.62	0.2644	-0.00162	3.15E-06	0.208251	0.646655	1.909145
3.62	0.2644	-0.00162	3.15E-06	0.208143	0.64632	1.908504
3.62	0.2644	-0.00162	3.15E-06	0.208036	0.645986	1.907867
3.63	0.2644	-0.00162	3.15E-06	0.207929	0.645654	1.907234
3.63	0.2644	-0.00162	3.15E-06	0.207822	0.645324	1.906604
3.63	0.2644	-0.00162	3.15E-06	0.207717	0.644996	1.905979
3.63	0.2644	-0.00162	3.15E-06	0.207612	0.644669	1.905357
3.63	0.2644	-0.00162	3.15E-06	0.207507	0.644345	1.904739

3.64	0.2644	-0.00162	3.15E-06	0.207403	0.644022	1.904125
3.64	0.2644	-0.00162	3.15E-06	0.2073	0.643702	1.903514
3.64	0.2644	-0.00162	3.15E-06	0.207197	0.643382	1.902906
3.64	0.2644	-0.00162	3.15E-06	0.207095	0.643065	1.902303
3.64	0.2644	-0.00162	3.15E-06	0.206993	0.64275	1.901702
3.65	0.2644	-0.00162	3.15E-06	0.206892	0.642436	1.901106
3.65	0.2644	-0.00162	3.15E-06	0.206792	0.642123	1.900512
3.65	0.2644	-0.00162	3.15E-06	0.206692	0.641813	1.899922
3.65	0.2644	-0.00162	3.15E-06	0.206592	0.641504	1.899335
3.65	0.2644	-0.00162	3.15E-06	0.206493	0.641197	1.898752
3.66	0.2644	-0.00162	3.15E-06	0.206395	0.640891	1.898171
3.66	0.2644	-0.00162	3.15E-06	0.206297	0.640587	1.897594
3.66	0.2644	-0.00162	3.15E-06	0.206199	0.640284	1.89702
3.66	0.2644	-0.00162	3.15E-06	0.206102	0.639983	1.896449
3.66	0.2644	-0.00162	3.15E-06	0.206006	0.639684	1.895881
3.66	0.2644	-0.00162	3.15E-06	0.20591	0.639386	1.895317
3.67	0.2644	-0.00162	3.15E-06	0.205815	0.639089	1.894755
3.67	0.2644	-0.00162	3.15E-06	0.20572	0.638794	1.894196
3.67	0.2644	-0.00162	3.15E-06	0.205625	0.638501	1.89364
3.67	0.2644	-0.00162	3.15E-06	0.205531	0.638209	1.893087
3.67	0.2644	-0.00162	3.15E-06	0.205437	0.637918	1.892537
3.68	0.2644	-0.00162	3.15E-06	0.205344	0.637629	1.89199
3.68	0.2644	-0.00162	3.15E-06	0.205252	0.637341	1.891445
3.68	0.2644	-0.00162	3.15E-06	0.205159	0.637055	1.890904
3.68	0.2644	-0.00162	3.15E-06	0.205068	0.63677	1.890365
3.68	0.2644	-0.00162	3.15E-06	0.204976	0.636486	1.889828
3.68	0.2644	-0.00162	3.15E-06	0.204885	0.636204	1.889295
3.69	0.2644	-0.00162	3.15E-06	0.204795	0.635923	1.888764
3.69	0.2644	-0.00162	3.15E-06	0.204705	0.635643	1.888236
3.69	0.2644	-0.00162	3.15E-06	0.204615	0.635364	1.88771
3.69	0.2644	-0.00162	3.15E-06	0.204526	0.635087	1.887187
3.69	0.2644	-0.00162	3.15E-06	0.204437	0.634811	1.886666
3.69	0.2644	-0.00162	3.15E-06	0.204348	0.634537	1.886148
3.70	0.2644	-0.00162	3.15E-06	0.20426	0.634263	1.885632
3.70	0.2644	-0.00162	3.15E-06	0.204173	0.633991	1.885119
3.70	0.2644	-0.00162	3.15E-06	0.204085	0.63372	1.884609
3.70	0.2644	-0.00162	3.15E-06	0.203999	0.63345	1.8841
3.70	0.2644	-0.00162	3.15E-06	0.203912	0.633182	1.883594
3.70	0.2644	-0.00162	3.15E-06	0.203826	0.632915	1.883091
3.70	0.2644	-0.00162	3.15E-06	0.20374	0.632648	1.88259
3.71	0.2644	-0.00162	3.15E-06	0.203655	0.632383	1.882091
3.71	0.2644	-0.00162	3.15E-06	0.20357	0.632119	1.881594
3.71	0.2644	-0.00162	3.15E-06	0.203485	0.631857	1.8811
3.71	0.2644	-0.00162	3.15E-06	0.203401	0.631595	1.880608
3.71	0.2644	-0.00162	3.15E-06	0.203317	0.631335	1.880118
3.71	0.2644	-0.00162	3.15E-06	0.203234	0.631075	1.87963
3.72	0.2644	-0.00162	3.15E-06	0.203151	0.630817	1.879145
3.72	0.2644	-0.00162	3.15E-06	0.203068	0.63056	1.878662
3.72	0.2644	-0.00162	3.15E-06	0.202985	0.630304	1.878181
3.72	0.2644	-0.00162	3.15E-06	0.202903	0.630048	1.877702

3.72	0.2644	-0.00162	3.15E-06	0.202821	0.629794	1.877225
3.72	0.2644	-0.00162	3.15E-06	0.20274	0.629541	1.87675
3.72	0.2644	-0.00162	3.15E-06	0.202659	0.62929	1.876277
3.73	0.2644	-0.00162	3.15E-06	0.202578	0.629039	1.875806
3.73	0.2644	-0.00162	3.15E-06	0.202497	0.628789	1.875338
3.73	0.2644	-0.00162	3.15E-06	0.202417	0.62854	1.874871
3.73	0.2644	-0.00162	3.15E-06	0.202337	0.628292	1.874406
3.73	0.2644	-0.00162	3.15E-06	0.202258	0.628045	1.873943
3.73	0.2644	-0.00162	3.15E-06	0.202179	0.627799	1.873483
3.73	0.2644	-0.00162	3.15E-06	0.2021	0.627554	1.873024
3.74	0.2644	-0.00162	3.15E-06	0.202021	0.62731	1.872567
3.74	0.2644	-0.00162	3.15E-06	0.201943	0.627067	1.872112
3.74	0.2644	-0.00162	3.15E-06	0.201865	0.626825	1.871658
3.74	0.2644	-0.00162	3.15E-06	0.201787	0.626584	1.871207
3.74	0.2644	-0.00162	3.15E-06	0.20171	0.626344	1.870758
3.74	0.2644	-0.00162	3.15E-06	0.201633	0.626104	1.87031
3.74	0.2644	-0.00162	3.15E-06	0.201556	0.625866	1.869864
3.74	0.2644	-0.00162	3.15E-06	0.20148	0.625628	1.86942
3.75	0.2644	-0.00162	3.15E-06	0.201403	0.625392	1.868978
3.75	0.2644	-0.00162	3.15E-06	0.201327	0.625156	1.868537
3.75	0.2644	-0.00162	3.15E-06	0.201252	0.624921	1.868099
3.75	0.2644	-0.00162	3.15E-06	0.201176	0.624687	1.867662
3.75	0.2644	-0.00162	3.15E-06	0.201101	0.624454	1.867226
3.75	0.2644	-0.00162	3.15E-06	0.201027	0.624222	1.866793
3.75	0.2644	-0.00162	3.15E-06	0.200952	0.62399	1.866361
3.76	0.2644	-0.00162	3.15E-06	0.200878	0.62376	1.865931
3.76	0.2644	-0.00162	3.15E-06	0.200804	0.62353	1.865502
3.76	0.2644	-0.00162	3.15E-06	0.20073	0.623301	1.865075
3.76	0.2644	-0.00162	3.15E-06	0.200657	0.623073	1.86465
3.76	0.2644	-0.00162	3.15E-06	0.200584	0.622846	1.864226
3.76	0.2644	-0.00162	3.15E-06	0.200511	0.62262	1.863804
3.76	0.2644	-0.00162	3.15E-06	0.200438	0.622394	1.863384
3.76	0.2644	-0.00162	3.15E-06	0.200366	0.622169	1.862965
3.77	0.2644	-0.00162	3.15E-06	0.200293	0.621945	1.862548
3.77	0.2644	-0.00162	3.15E-06	0.200222	0.621722	1.862132
3.77	0.2644	-0.00162	3.15E-06	0.20015	0.6215	1.861718
3.77	0.2644	-0.00162	3.15E-06	0.200079	0.621278	1.861305
3.77	0.2644	-0.00162	3.15E-06	0.200007	0.621057	1.860894
3.77	0.2644	-0.00162	3.15E-06	0.199937	0.620837	1.860485
3.77	0.2644	-0.00162	3.15E-06	0.199866	0.620618	1.860077
3.77	0.2644	-0.00162	3.15E-06	0.199796	0.620399	1.85967
3.77	0.2644	-0.00162	3.15E-06	0.199725	0.620181	1.859265
3.78	0.2644	-0.00162	3.15E-06	0.199655	0.619964	1.858861
3.78	0.2644	-0.00162	3.15E-06	0.199586	0.619748	1.858459
3.78	0.2644	-0.00162	3.15E-06	0.199516	0.619532	1.858058
3.78	0.2644	-0.00162	3.15E-06	0.199447	0.619317	1.857659
3.78	0.2644	-0.00162	3.15E-06	0.199378	0.619103	1.857261
3.78	0.2644	-0.00162	3.15E-06	0.199309	0.618889	1.856864
3.78	0.2644	-0.00162	3.15E-06	0.199241	0.618676	1.856469
3.78	0.2644	-0.00162	3.15E-06	0.199172	0.618464	1.856075

3.79	0.2644	-0.00162	3.15E-06	0.199104	0.618253	1.855683
3.79	0.2644	-0.00162	3.15E-06	0.199036	0.618042	1.855292
3.79	0.2644	-0.00162	3.15E-06	0.198969	0.617832	1.854902
3.79	0.2644	-0.00162	3.15E-06	0.198901	0.617623	1.854514
3.79	0.2644	-0.00162	3.15E-06	0.198834	0.617414	1.854127
3.79	0.2644	-0.00162	3.15E-06	0.198767	0.617206	1.853742
3.79	0.2644	-0.00162	3.15E-06	0.1987	0.616999	1.853357
3.79	0.2644	-0.00162	3.15E-06	0.198634	0.616792	1.852974
3.79	0.2644	-0.00162	3.15E-06	0.198568	0.616586	1.852592
3.80	0.2644	-0.00162	3.15E-06	0.198501	0.616381	1.852212
3.80	0.2644	-0.00162	3.15E-06	0.198435	0.616176	1.851833
3.80	0.2644	-0.00162	3.15E-06	0.19837	0.615972	1.851455
3.80	0.2644	-0.00162	3.15E-06	0.198304	0.615768	1.851078
3.80	0.2644	-0.00162	3.15E-06	0.198239	0.615565	1.850703
3.80	0.2644	-0.00162	3.15E-06	0.198174	0.615363	1.850329
3.80	0.2644	-0.00162	3.15E-06	0.198109	0.615162	1.849956
3.80	0.2644	-0.00162	3.15E-06	0.198044	0.614961	1.849584
3.80	0.2644	-0.00162	3.15E-06	0.19798	0.61476	1.849214
3.81	0.2644	-0.00162	3.15E-06	0.197915	0.614561	1.848844
3.81	0.2644	-0.00162	3.15E-06	0.197851	0.614362	1.848476
3.81	0.2644	-0.00162	3.15E-06	0.197787	0.614163	1.848109
3.81	0.2644	-0.00162	3.15E-06	0.197724	0.613965	1.847744
3.81	0.2644	-0.00162	3.15E-06	0.19766	0.613768	1.847379
3.81	0.2644	-0.00162	3.15E-06	0.197597	0.613571	1.847016
3.81	0.2644	-0.00162	3.15E-06	0.197534	0.613375	1.846654
3.81	0.2644	-0.00162	3.15E-06	0.197471	0.61318	1.846293
3.81	0.2644	-0.00162	3.15E-06	0.197408	0.612985	1.845933
3.81	0.2644	-0.00162	3.15E-06	0.197345	0.61279	1.845574
3.82	0.2644	-0.00162	3.15E-06	0.197283	0.612596	1.845216
3.82	0.2644	-0.00162	3.15E-06	0.19722	0.612403	1.84486
3.82	0.2644	-0.00162	3.15E-06	0.197158	0.612211	1.844504
3.82	0.2644	-0.00162	3.15E-06	0.197097	0.612018	1.84415
3.82	0.2644	-0.00162	3.15E-06	0.197035	0.611827	1.843797
3.82	0.2644	-0.00162	3.15E-06	0.196973	0.611636	1.843445
3.82	0.2644	-0.00162	3.15E-06	0.196912	0.611445	1.843093
3.82	0.2644	-0.00162	3.15E-06	0.196851	0.611255	1.842744
3.82	0.2644	-0.00162	3.15E-06	0.19679	0.611066	1.842395
3.82	0.2644	-0.00162	3.15E-06	0.196729	0.610877	1.842047
3.83	0.2644	-0.00162	3.15E-06	0.196668	0.610689	1.8417
3.83	0.2644	-0.00162	3.15E-06	0.196608	0.610501	1.841354
3.83	0.2644	-0.00162	3.15E-06	0.196548	0.610314	1.841009
3.83	0.2644	-0.00162	3.15E-06	0.196488	0.610127	1.840666
3.83	0.2644	-0.00162	3.15E-06	0.196428	0.609941	1.840323
3.83	0.2644	-0.00162	3.15E-06	0.196368	0.609756	1.839982
3.83	0.2644	-0.00162	3.15E-06	0.196308	0.60957	1.839641
3.83	0.2644	-0.00162	3.15E-06	0.196249	0.609386	1.839301
3.83	0.2644	-0.00162	3.15E-06	0.196189	0.609202	1.838963
3.83	0.2644	-0.00162	3.15E-06	0.19613	0.609018	1.838625
3.84	0.2644	-0.00162	3.15E-06	0.196071	0.608835	1.838288
3.84	0.2644	-0.00162	3.15E-06	0.196013	0.608652	1.837953

3.84	0.2644	-0.00162	3.15E-06	0.195954	0.60847	1.837618
3.84	0.2644	-0.00162	3.15E-06	0.195895	0.608289	1.837284
3.84	0.2644	-0.00162	3.15E-06	0.195837	0.608107	1.836952
3.84	0.2644	-0.00162	3.15E-06	0.195779	0.607927	1.83662
3.84	0.2644	-0.00162	3.15E-06	0.195721	0.607747	1.836289
3.84	0.2644	-0.00162	3.15E-06	0.195663	0.607567	1.835959
3.84	0.2644	-0.00162	3.15E-06	0.195605	0.607388	1.83563
3.84	0.2644	-0.00162	3.15E-06	0.195548	0.607209	1.835302
3.85	0.2644	-0.00162	3.15E-06	0.19549	0.607031	1.834975
3.85	0.2644	-0.00162	3.15E-06	0.195433	0.606853	1.834649
3.85	0.2644	-0.00162	3.15E-06	0.195376	0.606676	1.834324
3.85	0.2644	-0.00162	3.15E-06	0.195319	0.606499	1.833999
3.85	0.2644	-0.00162	3.15E-06	0.195262	0.606323	1.833676
3.85	0.2644	-0.00162	3.15E-06	0.195206	0.606147	1.833354
3.85	0.2644	-0.00162	3.15E-06	0.195149	0.605971	1.833032
3.85	0.2644	-0.00162	3.15E-06	0.195093	0.605796	1.832711
3.85	0.2644	-0.00162	3.15E-06	0.195037	0.605622	1.832391
3.85	0.2644	-0.00162	3.15E-06	0.194981	0.605448	1.832072
3.85	0.2644	-0.00162	3.15E-06	0.194925	0.605274	1.831754
3.85	0.2644	-0.00162	3.15E-06	0.194869	0.605101	1.831437
3.86	0.2644	-0.00162	3.15E-06	0.194813	0.604928	1.831121
3.86	0.2644	-0.00162	3.15E-06	0.194758	0.604756	1.830805
3.86	0.2644	-0.00162	3.15E-06	0.194702	0.604584	1.830491
3.86	0.2644	-0.00162	3.15E-06	0.194647	0.604413	1.830177
3.86	0.2644	-0.00162	3.15E-06	0.194592	0.604242	1.829864
3.86	0.2644	-0.00162	3.15E-06	0.194537	0.604071	1.829552
3.86	0.2644	-0.00162	3.15E-06	0.194482	0.603901	1.82924
3.86	0.2644	-0.00162	3.15E-06	0.194428	0.603731	1.82893
3.86	0.2644	-0.00162	3.15E-06	0.194373	0.603562	1.82862
3.86	0.2644	-0.00162	3.15E-06	0.194319	0.603393	1.828312
3.86	0.2644	-0.00162	3.15E-06	0.194265	0.603224	1.828004
3.87	0.2644	-0.00162	3.15E-06	0.19421	0.603056	1.827696
3.87	0.2644	-0.00162	3.15E-06	0.194156	0.602889	1.82739
3.87	0.2644	-0.00162	3.15E-06	0.194103	0.602722	1.827085
3.87	0.2644	-0.00162	3.15E-06	0.194049	0.602555	1.82678
3.87	0.2644	-0.00162	3.15E-06	0.193995	0.602388	1.826476
3.87	0.2644	-0.00162	3.15E-06	0.193942	0.602222	1.826173
3.87	0.2644	-0.00162	3.15E-06	0.193888	0.602057	1.82587
3.87	0.2644	-0.00162	3.15E-06	0.193835	0.601892	1.825569
3.87	0.2644	-0.00162	3.15E-06	0.193782	0.601727	1.825268
3.87	0.2644	-0.00162	3.15E-06	0.193729	0.601562	1.824968
3.87	0.2644	-0.00162	3.15E-06	0.193676	0.601398	1.824668
3.87	0.2644	-0.00162	3.15E-06	0.193624	0.601235	1.82437
3.88	0.2644	-0.00162	3.15E-06	0.193571	0.601071	1.824072
3.88	0.2644	-0.00162	3.15E-06	0.193519	0.600909	1.823775
3.88	0.2644	-0.00162	3.15E-06	0.193466	0.600746	1.823479
3.88	0.2644	-0.00162	3.15E-06	0.193414	0.600584	1.823183
3.88	0.2644	-0.00162	3.15E-06	0.193362	0.600422	1.822889
3.88	0.2644	-0.00162	3.15E-06	0.19331	0.600261	1.822595
3.88	0.2644	-0.00162	3.15E-06	0.193258	0.6001	1.822301

3.88	0.2644	-0.00162	3.15E-06	0.193207	0.59994	1.822009
3.88	0.2644	-0.00162	3.15E-06	0.193155	0.599779	1.821717
3.88	0.2644	-0.00162	3.15E-06	0.193104	0.59962	1.821426
3.88	0.2644	-0.00162	3.15E-06	0.193052	0.59946	1.821135
3.88	0.2644	-0.00162	3.15E-06	0.193001	0.599301	1.820846
3.89	0.2644	-0.00162	3.15E-06	0.19295	0.599142	1.820557
3.89	0.2644	-0.00162	3.15E-06	0.192899	0.598984	1.820268
3.89	0.2644	-0.00162	3.15E-06	0.192848	0.598826	1.819981
3.89	0.2644	-0.00162	3.15E-06	0.192797	0.598668	1.819694
3.89	0.2644	-0.00162	3.15E-06	0.192747	0.598511	1.819408
3.89	0.2644	-0.00162	3.15E-06	0.192696	0.598354	1.819122
3.89	0.2644	-0.00162	3.15E-06	0.192646	0.598198	1.818838
3.89	0.2644	-0.00162	3.15E-06	0.192595	0.598041	1.818554
3.89	0.2644	-0.00162	3.15E-06	0.192545	0.597886	1.81827
3.89	0.2644	-0.00162	3.15E-06	0.192495	0.59773	1.817987
3.89	0.2644	-0.00162	3.15E-06	0.192445	0.597575	1.817705
3.89	0.2644	-0.00162	3.15E-06	0.192395	0.59742	1.817424
3.89	0.2644	-0.00162	3.15E-06	0.192346	0.597266	1.817143
3.90	0.2644	-0.00162	3.15E-06	0.192296	0.597112	1.816863
3.90	0.2644	-0.00162	3.15E-06	0.192246	0.596958	1.816584
3.90	0.2644	-0.00162	3.15E-06	0.192197	0.596804	1.816305
3.90	0.2644	-0.00162	3.15E-06	0.192148	0.596651	1.816027
3.90	0.2644	-0.00162	3.15E-06	0.192098	0.596498	1.81575
3.90	0.2644	-0.00162	3.15E-06	0.192049	0.596346	1.815473
3.90	0.2644	-0.00162	3.15E-06	0.192	0.596194	1.815197
3.90	0.2644	-0.00162	3.15E-06	0.191952	0.596042	1.814921
3.90	0.2644	-0.00162	3.15E-06	0.191903	0.595891	1.814647
3.90	0.2644	-0.00162	3.15E-06	0.191854	0.59574	1.814372
3.90	0.2644	-0.00162	3.15E-06	0.191806	0.595589	1.814099
3.90	0.2644	-0.00162	3.15E-06	0.191757	0.595438	1.813826
3.90	0.2644	-0.00162	3.15E-06	0.191709	0.595288	1.813554
3.91	0.2644	-0.00162	3.15E-06	0.19166	0.595138	1.813282
3.91	0.2644	-0.00162	3.15E-06	0.191612	0.594989	1.813011
3.91	0.2644	-0.00162	3.15E-06	0.191564	0.59484	1.81274
3.91	0.2644	-0.00162	3.15E-06	0.191516	0.594691	1.812471
3.91	0.2644	-0.00162	3.15E-06	0.191469	0.594542	1.812201
3.91	0.2644	-0.00162	3.15E-06	0.191421	0.594394	1.811933
3.91	0.2644	-0.00162	3.15E-06	0.191373	0.594246	1.811665
3.91	0.2644	-0.00162	3.15E-06	0.191326	0.594099	1.811397
3.91	0.2644	-0.00162	3.15E-06	0.191278	0.593951	1.811131
3.91	0.2644	-0.00162	3.15E-06	0.191231	0.593804	1.810864
3.91	0.2644	-0.00162	3.15E-06	0.191184	0.593658	1.810599
3.91	0.2644	-0.00162	3.15E-06	0.191136	0.593511	1.810334
3.91	0.2644	-0.00162	3.15E-06	0.191089	0.593365	1.810069
3.91	0.2644	-0.00162	3.15E-06	0.191042	0.593219	1.809805
3.92	0.2644	-0.00162	3.15E-06	0.190996	0.593074	1.809542
3.92	0.2644	-0.00162	3.15E-06	0.190949	0.592929	1.80928
3.92	0.2644	-0.00162	3.15E-06	0.190902	0.592784	1.809017
3.92	0.2644	-0.00162	3.15E-06	0.190856	0.592639	1.808756
3.92	0.2644	-0.00162	3.15E-06	0.190809	0.592495	1.808495

3.92	0.2644	-0.00162	3.15E-06	0.190763	0.592351	1.808235
3.92	0.2644	-0.00162	3.15E-06	0.190717	0.592207	1.807975
3.92	0.2644	-0.00162	3.15E-06	0.19067	0.592064	1.807716
3.92	0.2644	-0.00162	3.15E-06	0.190624	0.591921	1.807457
3.92	0.2644	-0.00162	3.15E-06	0.190578	0.591778	1.807199
3.92	0.2644	-0.00162	3.15E-06	0.190532	0.591635	1.806941
3.92	0.2644	-0.00162	3.15E-06	0.190487	0.591493	1.806684
3.92	0.2644	-0.00162	3.15E-06	0.190441	0.591351	1.806428
3.92	0.2644	-0.00162	3.15E-06	0.190395	0.59121	1.806172
3.93	0.2644	-0.00162	3.15E-06	0.19035	0.591068	1.805916
3.93	0.2644	-0.00162	3.15E-06	0.190304	0.590927	1.805662
3.93	0.2644	-0.00162	3.15E-06	0.190259	0.590786	1.805407
3.93	0.2644	-0.00162	3.15E-06	0.190214	0.590646	1.805154
3.93	0.2644	-0.00162	3.15E-06	0.190168	0.590505	1.8049
3.93	0.2644	-0.00162	3.15E-06	0.190123	0.590365	1.804648
3.93	0.2644	-0.00162	3.15E-06	0.190078	0.590226	1.804396
3.93	0.2644	-0.00162	3.15E-06	0.190033	0.590086	1.804144
3.93	0.2644	-0.00162	3.15E-06	0.189989	0.589947	1.803893
3.93	0.2644	-0.00162	3.15E-06	0.189944	0.589808	1.803642
3.93	0.2644	-0.00162	3.15E-06	0.189899	0.58967	1.803392
3.93	0.2644	-0.00162	3.15E-06	0.189855	0.589531	1.803143
3.93	0.2644	-0.00162	3.15E-06	0.18981	0.589393	1.802894
3.93	0.2644	-0.00162	3.15E-06	0.189766	0.589255	1.802645
3.93	0.2644	-0.00162	3.15E-06	0.189722	0.589118	1.802397
3.94	0.2644	-0.00162	3.15E-06	0.189677	0.58898	1.80215
3.94	0.2644	-0.00162	3.15E-06	0.189633	0.588843	1.801903
3.94	0.2644	-0.00162	3.15E-06	0.189589	0.588707	1.801657
3.94	0.2644	-0.00162	3.15E-06	0.189545	0.58857	1.801411
3.94	0.2644	-0.00162	3.15E-06	0.189501	0.588434	1.801165
3.94	0.2644	-0.00162	3.15E-06	0.189458	0.588298	1.80092
3.94	0.2644	-0.00162	3.15E-06	0.189414	0.588162	1.800676
3.94	0.2644	-0.00162	3.15E-06	0.18937	0.588027	1.800432
3.94	0.2644	-0.00162	3.15E-06	0.189327	0.587891	1.800188
3.94	0.2644	-0.00162	3.15E-06	0.189283	0.587756	1.799946
3.94	0.2644	-0.00162	3.15E-06	0.18924	0.587622	1.799703
3.94	0.2644	-0.00162	3.15E-06	0.189196	0.587487	1.799461
3.94	0.2644	-0.00162	3.15E-06	0.189153	0.587353	1.79922
3.94	0.2644	-0.00162	3.15E-06	0.18911	0.587219	1.798979
3.94	0.2644	-0.00162	3.15E-06	0.189067	0.587085	1.798738
3.95	0.2644	-0.00162	3.15E-06	0.189024	0.586952	1.798498
3.95	0.2644	-0.00162	3.15E-06	0.188981	0.586819	1.798258
3.95	0.2644	-0.00162	3.15E-06	0.188938	0.586686	1.798019
3.95	0.2644	-0.00162	3.15E-06	0.188896	0.586553	1.797781
3.95	0.2644	-0.00162	3.15E-06	0.188853	0.586421	1.797543
3.95	0.2644	-0.00162	3.15E-06	0.18881	0.586288	1.797305
3.95	0.2644	-0.00162	3.15E-06	0.188768	0.586156	1.797068
3.95	0.2644	-0.00162	3.15E-06	0.188725	0.586025	1.796831
3.95	0.2644	-0.00162	3.15E-06	0.188683	0.585893	1.796595
3.95	0.2644	-0.00162	3.15E-06	0.188641	0.585762	1.796359
3.95	0.2644	-0.00162	3.15E-06	0.188599	0.585631	1.796124

3.95	0.2644	-0.00162	3.15E-06	0.188556	0.5855	1.795889
3.95	0.2644	-0.00162	3.15E-06	0.188514	0.585369	1.795654
3.95	0.2644	-0.00162	3.15E-06	0.188472	0.585239	1.79542
3.95	0.2644	-0.00162	3.15E-06	0.188431	0.585109	1.795187
3.95	0.2644	-0.00162	3.15E-06	0.188389	0.584979	1.794954
3.96	0.2644	-0.00162	3.15E-06	0.188347	0.58485	1.794721
3.96	0.2644	-0.00162	3.15E-06	0.188305	0.58472	1.794489
3.96	0.2644	-0.00162	3.15E-06	0.188264	0.584591	1.794257
3.96	0.2644	-0.00162	3.15E-06	0.188222	0.584462	1.794026
3.96	0.2644	-0.00162	3.15E-06	0.188181	0.584333	1.793795
3.96	0.2644	-0.00162	3.15E-06	0.188139	0.584205	1.793564
3.96	0.2644	-0.00162	3.15E-06	0.188098	0.584077	1.793334
3.96	0.2644	-0.00162	3.15E-06	0.188057	0.583949	1.793105
3.96	0.2644	-0.00162	3.15E-06	0.188016	0.583821	1.792876
3.96	0.2644	-0.00162	3.15E-06	0.187975	0.583693	1.792647
3.96	0.2644	-0.00162	3.15E-06	0.187934	0.583566	1.792419
3.96	0.2644	-0.00162	3.15E-06	0.187893	0.583439	1.792191
3.96	0.2644	-0.00162	3.15E-06	0.187852	0.583312	1.791964
3.96	0.2644	-0.00162	3.15E-06	0.187811	0.583185	1.791737
3.96	0.2644	-0.00162	3.15E-06	0.18777	0.583059	1.79151
3.96	0.2644	-0.00162	3.15E-06	0.18773	0.582933	1.791284
3.97	0.2644	-0.00162	3.15E-06	0.187689	0.582807	1.791058
3.97	0.2644	-0.00162	3.15E-06	0.187649	0.582681	1.790833
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3.97	0.2644	-0.00162	3.15E-06	0.187568	0.58243	1.790384
3.97	0.2644	-0.00162	3.15E-06	0.187527	0.582305	1.79016
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3.97	0.2644	-0.00162	3.15E-06	0.187447	0.582055	1.789713
3.97	0.2644	-0.00162	3.15E-06	0.187407	0.581931	1.78949
3.97	0.2644	-0.00162	3.15E-06	0.187367	0.581806	1.789268
3.97	0.2644	-0.00162	3.15E-06	0.187327	0.581682	1.789046
3.97	0.2644	-0.00162	3.15E-06	0.187287	0.581558	1.788824
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3.97	0.2644	-0.00162	3.15E-06	0.187208	0.581311	1.788382
3.97	0.2644	-0.00162	3.15E-06	0.187168	0.581188	1.788162
3.97	0.2644	-0.00162	3.15E-06	0.187128	0.581065	1.787942
3.97	0.2644	-0.00162	3.15E-06	0.187089	0.580942	1.787722
3.97	0.2644	-0.00162	3.15E-06	0.187049	0.58082	1.787503
3.98	0.2644	-0.00162	3.15E-06	0.18701	0.580697	1.787284
3.98	0.2644	-0.00162	3.15E-06	0.18697	0.580575	1.787066
3.98	0.2644	-0.00162	3.15E-06	0.186931	0.580453	1.786848
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3.98	0.2644	-0.00162	3.15E-06	0.186697	0.579725	1.785548
3.98	0.2644	-0.00162	3.15E-06	0.186658	0.579605	1.785332
3.98	0.2644	-0.00162	3.15E-06	0.186619	0.579484	1.785117
3.98	0.2644	-0.00162	3.15E-06	0.18658	0.579364	1.784903

3.98	0.2644	-0.00162	3.15E-06	0.186542	0.579244	1.784689
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3.98	0.2644	-0.00162	3.15E-06	0.186465	0.579005	1.784261
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3.99	0.2644	-0.00162	3.15E-06	0.186007	0.577584	1.781729
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3.99	0.2644	-0.00162	3.15E-06	0.185894	0.577233	1.781104
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3.99	0.2644	-0.00162	3.15E-06	0.185782	0.576884	1.780482
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3.99	0.2644	-0.00162	3.15E-06	0.185707	0.576652	1.780069
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4.00	0.2644	-0.00162	3.15E-06	0.185595	0.576306	1.779452
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4.02	0.2644	-0.00162	3.15E-06	0.184085	0.571617	1.771128
4.02	0.2644	-0.00162	3.15E-06	0.184051	0.571509	1.770937
4.02	0.2644	-0.00162	3.15E-06	0.184016	0.571401	1.770745
4.02	0.2644	-0.00162	3.15E-06	0.183981	0.571293	1.770554
4.02	0.2644	-0.00162	3.15E-06	0.183946	0.571185	1.770364
4.02	0.2644	-0.00162	3.15E-06	0.183912	0.571078	1.770173
4.02	0.2644	-0.00162	3.15E-06	0.183877	0.57097	1.769983
4.02	0.2644	-0.00162	3.15E-06	0.183843	0.570863	1.769794
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4.02	0.2644	-0.00162	3.15E-06	0.183774	0.570649	1.769415
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4.02	0.2644	-0.00162	3.15E-06	0.183671	0.570329	1.768849
4.02	0.2644	-0.00162	3.15E-06	0.183637	0.570223	1.768661
4.02	0.2644	-0.00162	3.15E-06	0.183602	0.570117	1.768474
4.02	0.2644	-0.00162	3.15E-06	0.183568	0.570011	1.768286
4.02	0.2644	-0.00162	3.15E-06	0.183534	0.569905	1.768099
4.03	0.2644	-0.00162	3.15E-06	0.1835	0.569799	1.767912
4.03	0.2644	-0.00162	3.15E-06	0.183466	0.569694	1.767725

Location Index	
England and Wales	1
Scotland and Ireland	2

From Design and Analysis of Urban Storm Drainage, The Wallingford Procedure, Vol 1					
Table 6.1 Values of Constants to calculate Cr					
Geographic Location	Range of M5-D	Location Index	J0	J1	J2
England and Wales	0-10	1	0.1699	0.0028	0.000114
	11-30		0.1644	0.005831	-0.00013
	31-75		0.2644	-0.00162	3.15E-06
	76-150		0.2718	-0.00195	6.19E-06
	>150		0.1454	-0.00019	1.14E-07

APPENDIX 10

SuDS TREATMENT TRAIN - HYDRO INTERNATIONAL UP-FLO FILTER AND DOWNSTREAM DEFENDER DATA

The Up-Flo™ Filter is an innovative surface water filtration technology that delivers a high performance multi-stage treatment train within a single device. The Up-Flo™ Filter combines sedimentation and screening with fluidised bed filtration technology to deliver high levels of performance.

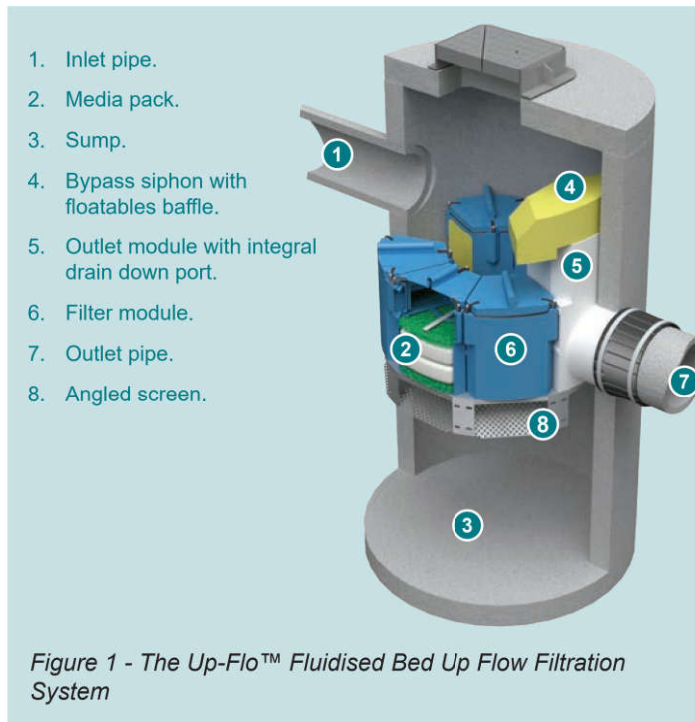


Figure 1 - The Up-Flo™ Fluidised Bed Up Flow Filtration System

Components and Filter Media

The Up-Flo™ Filter packs a 4-5 stage treatment train into a single device that can be fitted into a standard manhole. Settleable solids are collected in the chamber sump, whilst floatable material gathers in the central chamber.

An angled 4 mm perforated screen prevents coarse material from reaching the filter media. The media itself can be tailored to target specific pollutant groups and, where required, promote reactive filtration. The fluidised bed technology prevents blinding, clogging and compaction of the media surface, whilst ensuring that no wormholes can form to short-circuit the treatment process.

Filter media options include:

Filter Sand:

A good all-round media to target sediment and sediment-bound pollutants.



CPZ™ Mix:

An engineered media to promote reactive filtration for enhanced treatment of metals, nutrients and organics.



Watch a short video showing the Up-Flo™ Filter operation at:

<http://www.hydro-int.com/uk/products/flo-filter>

Repeatable, Reliable Performance

The Up-Flo™ Filter combines multiple sequential treatment processes to deliver sedimentation, screening and filtration all in one compact unit to remove a wide variety of pollutants including:

Very Fine Particles



Greater than 80% removal of fine sand and silt particles to a mass-median particle size of 22 µm.

See Technical Abstract: Performance Verification of Sediment Removal with Sil-Co-Sil 106 for your media of choice.

Gross Pollutants



Inclusion of the angled screen and protected bypass syphon effectively removes gross pollutants, including litter and leaf debris.

Liquid and Sediment Bound Hydrocarbons



Removal of various forms of hydrocarbons, including polycyclic aromatic hydrocarbons (PAHs).

Heavy Metals



Greater than 70% removal of metals commonly found in surface water runoff.

See Technical Abstract: Field Evaluation of Metals Removal.

Nutrients



Greater than 70% removal of phosphorus and other nutrients.

See Technical Abstract: Field Evaluation of Phosphorus Removal.

Design Data

Up-Flo™ Filter

Fluidised Bed Up Flow Filtration System

Sizing

The modular design of the Up-Flo™ Filter ensures that project specific treatment goals are easily met. Intended for intercepting pollutants at or close to source, the modular components are standardised for installation into a standard 1.2 m diameter manhole. For larger catchment areas, custom built vaults can be created to accommodate additional filter modules.

For design purposes, the selected number of modules required should be such that the total Treatment Flow Rate is greater or equal to the site's Water Quality Flow Rate.

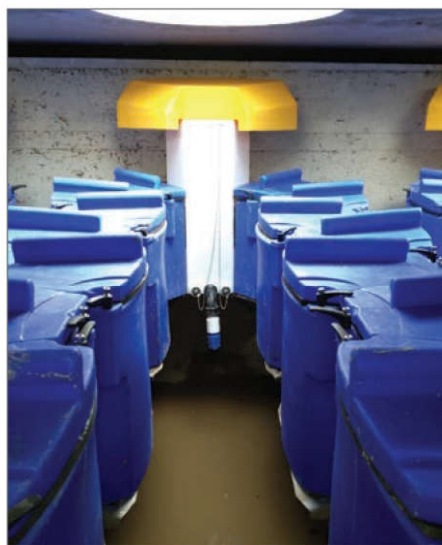
The hydraulic capacity of the system should be considered with respect to the peak discharge flow rate from the site or pipe full flow rate.

Model	Chamber Size (m)	Number of Filter Modules	Treatment Flow Rate (l/s) ^{a)}	Hydraulic Capacity (l/s) ^{b)}	Operating Head (mm) ^{c)}	Oil Storage Capacity (l)	Sediment Storage Capacity (m³)
Manhole	1.2 m diameter	1-6	1.3 - 7.8	170	750	190	0.7
Vault	Site specific	7-19	7.8 - 24.7	170	750	Site specific	Site specific

Notes:

- a) Treatment flow rates based on >80% removal of Sil-Co-Sil 106 fine sand and silt ($D_{50} = 22 \mu\text{m}$).
- b) Maximum flow rate that can pass through the chamber without surcharge to the upstream network.
- c) Driving head for filter media.

Table 1 - Up-Flo™ Filter design information.



Expert Design Service

Hydro's professional engineers are on hand to provide free support with the correct sizing and application of the Up-Flo™ Filter within in each drainage design.

We can also provide estimated maintenance intervals, whole life cost estimates and predicted pollutant removal performance.

Call the StormTrain® Hotline on: 01275 337955 or email stormtrain@hydro-int.com

Design Data

Up-Flo™ Filter

Fluidised Bed Up Flow Filtration System

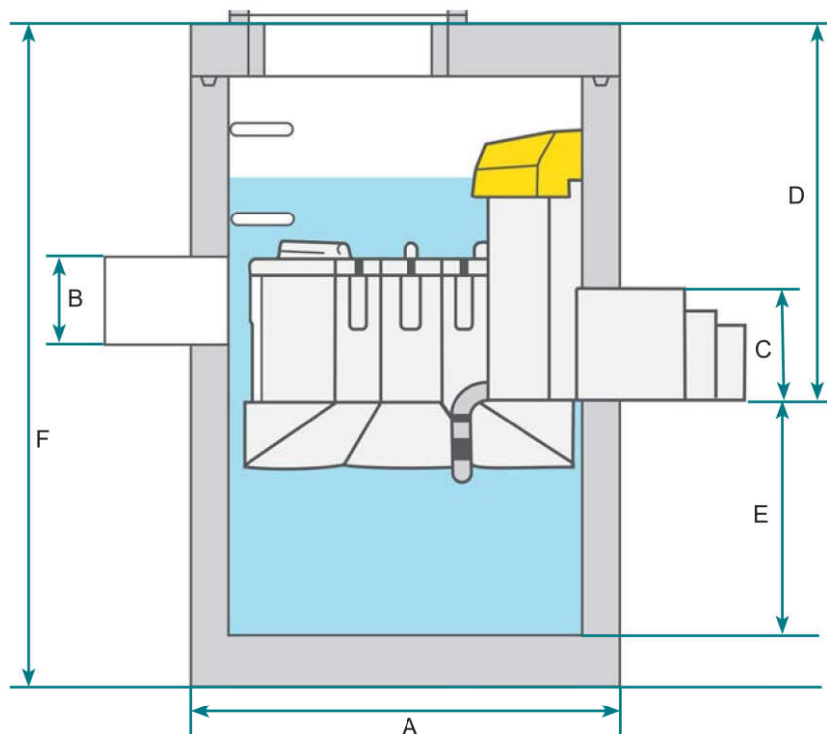
Easy Installation for Trouble-free Construction

The Up-Flo™ Filter is typically delivered to site as a pre-cast concrete manhole, complete with innovative manhole sealing system and internal components already installed. Installation is therefore similar to any other manhole installation on site.

The relative position of the filter modules and the inlet / outlet pipes can be adjusted to suit site conditions.

The outlet adapter allows a variety of different outlet pipe sizes to be easily connected (see Table 2).

Full installation guidelines are available.



Dimensions and Weights

The dimensions in Table 2 are given as a guide for standard manhole configurations. Vault configurations are site specific.

Detailed general arrangement drawings are available for download from <http://www.hydro-int.com/uk/products/flo-filter>

Unit	External Diameter of Unit (mm) (A)	Inlet Pipe Diameter (mm) ^{c)} (B)	Outlet Pipe Diameter (mm) ^{c)} (C)	Depth (m)			Lift Weight (t)
				Depth to Outlet Invert (m BGL) (D)	Sump Depth (m) (E)	Component Depth ^{a)} (m) (F)	
1.2 m Sealed Manhole System with HD Cover Slab	1460	300	225-375	1.150	1.100	2.560	n/a
HD Cover Slab ^{b)}						0.230	0.60
Base Section						1.145	1.85
Top Section						1.330	1.60

Notes:

- a) Base and Top Section component depths are shown as the total height during transportation / before assembly on site. The total depth is the depth of the assembled unit.
- b) Cover slabs are heavy duty, suited for highways loading and are supplied with one or two access openings for maintenance.
- c) Stub pipes are provided.

Table 2 - Up-Flo™ Filter dimensions and weights.

Design Data

Up-Flo™ Filter

Fluidised Bed Up Flow Filtration System

Simple and Cost-effective Maintenance

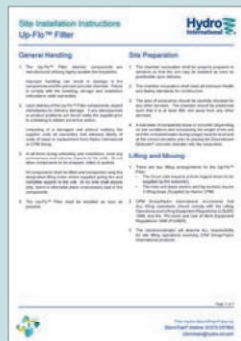
The gentle and effective action of the Up-Flo™ Filter ensures the filtration media have a much longer life than comparable media filters, so maintenance is infrequent, cost-effective and simple, with just three easy steps:

- 1) Floatable debris and litter is skimmed from the water surface.
- 2) Sediment collected in the sump is removed with a standard vacuum tanker.
- 3) Filter media packs are exchanged with no specialist lifting or handling equipment required.

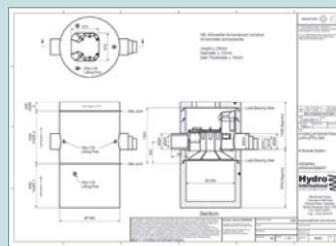
Up-Flo™ Filter Technical Guidance



Case Studies



Installation and
Maintenance Guidelines



General Arrangement Drawings

The Hydro StormTrain® Series of Surface Water Treatment Devices

The Up-Flo™ Filter is one of the Hydro StormTrain® Series of surface water treatment devices. Each device delivers proven, measureable and repeatable surface water treatment performance. Each can be used independently to meet the specific needs of a site or combined to form a management train. They can be used alongside natural SuDS features to protect, enable or enhance them.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodynamic
Vortex Separator

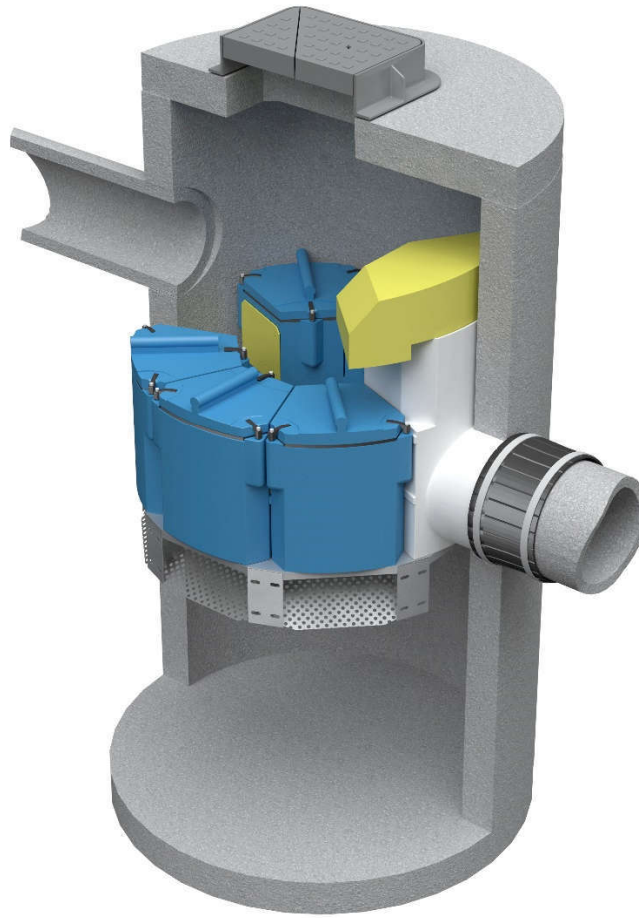


Up-Flo™ Filter
Fluidised Bed Up Flow
Filtration System



Hydro Biofilter™
Biofiltration System

Patent: www.hydro-int.com/patents



Up-Flo™ Filter

Operation & Maintenance Manual

Site Name:

Location on Site:

Hydro International Ref No:

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International's Up-Flo™ Filter. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International have a policy of continuous product development and reserve the right to amend specifications without notice.

Up-Flo™ Filter Operation & Maintenance Manual

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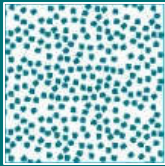
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Your Up-Flo™ Filter

Your Up-Flo™ Filter is an advanced stormwater treatment solution that combines sedimentation and screening with fluidised bed filtration to deliver exceptional surface water pollution removal.

Its innovative design delivers high efficiency across a wide range of flows in a much smaller footprint than conventional or other swirl-type devices and is the perfect choice for your site. Your Up-Flo™ Filter will remove and retain pollutants including:

Targeted Pollutants

	Very fine particles		Liquid and sediment bound heavy metals
	Gross pollutants		Liquid and sediment bound nutrients
	Liquid and sediment bound hydrocarbons		

How it Works

The Up-Flo™ Filter is a modular high-rate Stormwater filtration device. As shown below, it is installed into a 1200 mm diameter catch basin structure. Each Filter Module has a screen and support bracket that is attached to the concrete manhole and each contains a Media Pack that includes flow distribution and filtration media. Modules can attach to each other to form a “ring” of up to six modules. Up to two of the modules are attached to an Outlet Module that has a Bypass Hood and filtered Drain Down. The modular design can be supplied in different configurations depending on the application.

An upward flow path through the Filter Modules allows stormwater to be screened and filtered. In addition to the screening and filtering processes, gross pollutants will also settle into the sump or float to the surface of the water held within the manhole. The standard units are designed with a 900 mm sump to allow for sediment and gross pollutant accumulations between maintenance intervals.

This manual describes the operation of the Up-Flo™ Filter and provides general maintenance requirements that will ensure the filter will continue to operate and perform as intended. In general, a minimum of two inspections are required the first year to monitor sediment and gross pollutant accumulations in the manhole structure and inspect the Filter Media Pack and Drain Down Filter. The frequency of the maintenance interval is site specific as it will depend on the rate of pollutant accumulations. The first year of inspections and monitoring pollutant accumulations will determine future maintenance intervals.

- 1) Inlet pipe.
- 2) Media pack.
- 3) Sump.
- 4) Bypass siphon with floatables baffle.
- 5) Outlet module with integral drain down port.
- 6) Filter module.
- 7) Outlet pipe.
- 8) Angled screen.

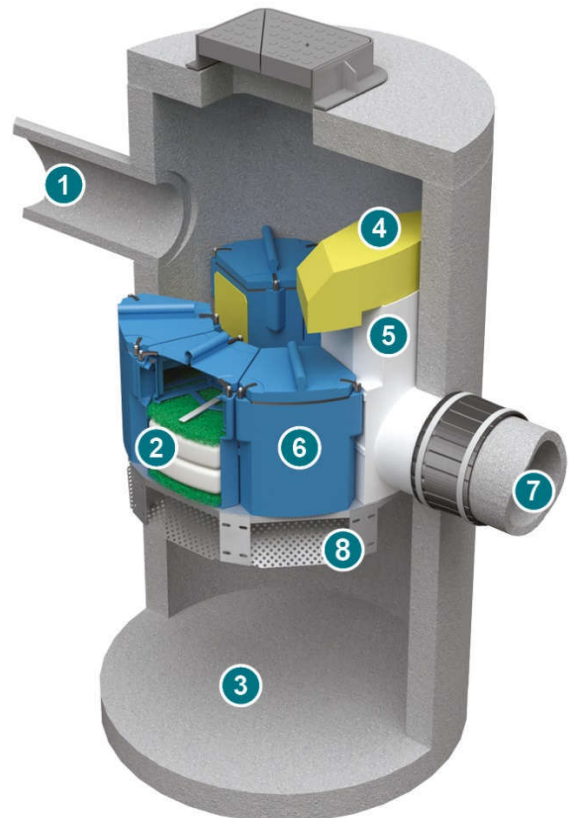


Figure 1 – the Up-Flo™ fluidised bed up flow filtration system – manhole configuration.

Benefits of the Up-Flo™ Filter

Exceptional treatment on any catchment

The Up-Flo™ Filter's modular filtration components allow you to adapt your design to meet the needs of any catchment area, capturing the specific levels of trash, silt and sediment, oils, metals and nutrients required.

Two-stage treatment in a single unit

The Up-Flo™ Filter combines pre-treatment, screening and filtration, delivering highly efficient multi-stage treatment in one device.

Save site space

The Up-Flo™ Filter's higher loading rates result in a smaller treatment footprint, which saves construction time and money, and makes for an easier installation.

Cut maintenance

No moving parts means that there's less opportunity for treatment disruption or breakage, while the system design is suited to long-term maintenance. Longer media life means longer service intervals, and media bags are easily removed and replaced while media cartridge modules stay put during maintenance.

Applications

The Up-Flo™ Filter is especially useful in high-density urban environments, where high pollutant loadings need to be managed in limited space or where it is difficult to control the quality of surface water runoff using conventional or natural SuDS techniques alone.

The Up-Flo™ Filter is perfectly suited to industrial sites, locations contributing runoff to wetlands/protected regions, or any area requiring a high level of treatment.

The Up-Flo™ Filter provides an effective solution in both newbuild or retrofit situations for residential, commercial or industrial developments, highways or car parks.

Make it Smart

Get Monitoring Alerts from your Up-Flo™ Filter

Your Up-Flo™ Filter will need regular inspection and maintenance to change the media packs, remove floatable debris, sediment and screenings from the sump.

Save time and money by only visiting your Up-Flo™ Filter when it actually needs emptying - add Smart Monitoring and receive automated alerts for maintenance.



Make it Smart

Add Hydro-Logic® Smart Monitoring and your Up-Flo™ Filter will let you know when it needs maintenance.



Maintenance Services

Hydro International offer service contracts to inspect, replace media packs and empty your Up-Flo™ Filter. Contracts can be tailored to your requirements.

To find out more about Smart Monitoring or our maintenance services, please call us on **+44 (0)1275 878371** or email **sudsservices@hydro-int.com**

Operation

Introduction

The Up-Flo™ Filter operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirements and is fabricated with durable noncorrosive components. Personnel is not required to operate the unit and maintenance is limited to periodic inspections, sediment and floatables removal, Media Pack replacement and Drain Down Filter replacement.

Pollutant Capture

The Up-Flo™ Filter is designed to operate as a “treatment train” by incorporating multiple treatment technologies into a single device. Trash and gross debris are removed by sedimentation and screening before they are introduced to the filtration media, preventing surface blinding of the filter media. The Up-Flo™ Filter is a wet-sump device. Between storm events, oil and floatables are stored on the water surface separate from the sediment storage volume in the sump (see Figure 1). The high-capacity bypass siphon acts as a floatables baffle to prevent washout of captured floatable pollutants during high-intensity events.

Reduced Clogging

The Up-Flo™ Filter has been designed to minimise the occurrence of clogging and blinding. The Up-Flo™ Filter employs a unique Drain Down design that allows the water level in the chamber to drop below the filter media between events. The Drain Down mechanism creates a reverse flow that flushes captured pollutants off the surface of the filter bag, helping to prevent blinding. By allowing the water to drain out, the drain-down mechanism also reduces the weight of the filter bags. This makes the bags easier and safer to remove during maintenance operations.

Overflow Protection

The Angled Screens are designed to prevent ragging and blinding. The Angled Screens are situated below the Filter Modules, sheltering them from the direct path of the influent. Coarse debris settles in the sump before the runoff flows up through the screens, protecting them from blinding. In the unlikely event of a blockage, the high capacity Siphonic Bypass is designed to convey high enough flow that large storm events will not create upstream flooding.

Maintenance

Overview

The Up-Flo™ Filter protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the proper functioning of the Up-Flo™ Filter. The Up-Flo™ Filter design allows for easy and safe inspection, monitoring and clean-out procedures. It has a wide central opening between the Filter Modules for easy and comfortable access to all of the components (See Figure 1).

Completion of all the maintenance activities for a typical manhole Up-Flo™ Filter takes less than one hour. Maintenance activities include inspection, floatables removal, oil removal, sediment removal, Media Pack replacement, and Drain Down Filter replacement.

Maintenance intervals are determined from monitoring the Up-Flo™ Filter during its first year of operation. Depending on the site, some maintenance activities may have to be performed on a more frequent basis than others. In the case of inspection and floatables removal, a Jet Vac truck is not required. Otherwise, a Jet Vac truck is normally required for oil removal, removal of sediment from the sump, and replacement of the Media Packs and Drain Down Filter. In most cases, entry into the Up-Flo™ Filter vessel is required for replacement of the Media Packs and Drain Down Filter, and Confined Space Entry procedures will have to be followed. Media Packs should not be installed in the modules until construction activities are complete and site stabilisation is effective.

We can provide full inspection and maintenance services for your Up-Flo™ Filter providing peace of mind and saving you time and money.



Make it Smart

Add Hydro-Logic® Smart Monitoring and your Up-Flo™ Filter will let you know when it needs maintenance.



You can also make your Up-Flo™ 'Smart' by adding a Smart Monitoring Hydro-Logic® Flexi Logger to provide monitoring and alerts when maintenance is required.

To find out more about Smart Monitoring or our maintenance services, please call us on
+44 (0)1275 878371 or email
sudsservices@hydro-int.com

Determining Your Maintenance Schedule

Hydro International recommends that inspections be performed at least every six months during the first year of operation. Use the following guidelines for determining maintenance intervals:

- **Floatables and Oil Monitoring:** The water surface in the Up-Flo™ Filter should be monitored for accumulation of floatables and oil. Floatables should not be allowed to accumulate to the point where they completely cover the surface of the water. Oil should not be allowed to accumulate to the point where it has formed a measurable thickness on the surface of the water. The rate of floatables and oil accumulation can be estimated by dividing the surface area covered by floatables and/or oil by the number of months since the Up-Flo™ Filter was installed.
- **Sediment Monitoring:** A simple probe, such as the Sludge-Judge®, should be used to determine the depth of sediment in the sump. The maximum allowable sediment depth in a typical 1200 mm diameter manhole equipped with an Up-Flo™ Filter is 400 mm. In any case, sediment must be removed before it blocks the inlet to the Drain Down Filter. The rate of sediment accumulation can be estimated by dividing the measured depth of sediment by the number of months since the Up-Flo™ Filter was installed.
- **Media Pack Monitoring:** Filter bags should be weighed to determine the amount of particles that have been captured in the bags. Filter bags from one or two modules should be weighed. Spent filter bags weigh approximately 24 kgs wet. The rate of filter bag clogging can be estimated by subtracting the wet weight of a new bag (approximately 17 kg for filter sand and 14 kg for CPZ) from the measured wet weight of the bags being checked and dividing by the number of months since the bags were installed.
- **Drain Down Filter Monitoring:** The water level in the Up-Flo™ Filter should be monitored to ensure that the Drain Down Filter is operating properly. One to two days after a significant rainfall, the water level inside the vessel should have dropped to a point where it is equal with the base of the Filter Modules. If the water level has not reached that point, then the Drain Down Filter has either become clogged or blinded by trash or debris. If there is no evidence of trash or debris around the Drain Down Filter inlet, then it has likely become clogged with particles. The rate of Drain Down Filter clogging can be estimated by noting the number of months since the Up-Flo™ Filter was installed.

Hydro International recommends a maximum maintenance interval of one year for all maintenance activities but, based on the first-year monitoring, a shorter maintenance interval for some maintenance activities may be appropriate.

Service - Inspection

Inspection is a simple process that requires monitoring pollutant accumulations. Maintenance crews should be familiar with the Up-Flo™ Filter and its components prior to inspection.

Scheduling

- Inspection may be conducted during any season of the year but should occur shortly after a predicted rainfall to ensure components are operating properly.

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)
- Scale to measure the weight of the filter bags
- Tools to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge Judge®)
- Hydro International Up-Flo™ Filter Maintenance Log
- Trash bags for removed floatables

Up-Flo™ Filter Capacities

Model	Chamber Size (m)	Number of Filter Modules	Treatment Flow Rate (l/s) ^{a)}	Hydraulic Capacity (l/s) ^{b)}	Operating Head (mm) ^{c)}	Oil Storage Capacity (l)	Sediment Storage Capacity (m ³)
Manhole	1.2m Diameter	1-6	1.3-7.8	170	750	190	0.7

Table 1. Up-Flo Filter Design Information

- a) Treatment flow rates based on >80% removal of Sil-Co-Sil 106 fine sand and silt ($D_{50} = 22\mu\text{m}$)
- b) Maximum flow rate that can pass through the chamber without surcharge to the upstream network
- c) Driving head for filter media

Inspection Guidance Procedures

1. Set up any necessary safety equipment (such as traffic cones) to provide access to the Up-Flo™ Filter. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole or vault.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Such as water level higher than the filter modules or open filter module lids
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the chamber.
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel. Maximum sediment depth is 400 mm.
6. Remove the Filter Module lid by turning the cam latch and remove the Filter Media Pack. Weigh the filter bags from one or two modules. Filter bags should be replaced if the wet weight exceeds 24kgs.
7. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or a high standing water level.
8. Securely replace the grate or lid.
9. Remove safety equipment.
10. Notify us of any irregularities noted during inspection by calling us on +44 (0)1275 878371 or emailing us at sudsservices@hydro-int.com.

Service – Oil, Floatables and Sump Cleanout

A Jet Vac truck is used to remove captured sediment, oil and floatables.

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a Jet Vac truck hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump cleanout may typically be done during any season of the year - before and after rainy season.
- Floatables and sump cleanout should occur as soon as possible following a contaminated spill in the contributing drainage area

Recommended Equipment

- Safety Equipment (traffic cones, etc).
- Tools to remove grate or lid.
- Pole with skimmer or net (if only floatables are being removed).
- Sediment probe (such as a Sludge Judge®).
- Jet Vac truck (flexible hose preferred).
- Pressure nozzle attachment or other screen-cleaning device.
- Hydro International Up-Flo™ Filter Maintenance Log.

Oil, Floatables and Sediment Clean Out Guidance Procedures

1. Set up any necessary safety equipment (such as traffic cones) around the access of the Up-Flo™ Filter. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole or vault.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. If the standing water level in the sump is above the base of the Filter Modules tug the Pull Chain(s) to release the Drain Down Plug(s). Allow the excess water to drain out of the chamber.
5. Use the skimmer pole to fit the Drain Down plug back into the open port.
6. Once all floatables have been removed, drop the Jet Vac truck hose to the base of the sump. Vacuum out the sediment and gross debris from the sump floor.
7. Retract the Jet Vac truck hose from the vessel.
8. Inspect the Angled Screens for blockages and ragging. If present, remove the obstruction or ragged materials from the surface using a hose or other screen-cleaning device.
9. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Note any apparent irregularities such as damaged components or blockages.
10. Securely replace the grate or lid.
11. Remove safety equipment.

12. Notify us of any irregularities noted during inspection by calling us on +44 (0) 1275 878371 or e-mailing us at sudsservices@hydro-int.com.

Service – Replacement of Media Packs and Drain Down Filter

Unless the Up-Flo™ Filter has been installed as a very shallow unit, it is necessary to have a competent person enter the vessel to replace Media Packs.

Scheduling

- Call Hydro International to order replacement Media Packs and Drain Down filter prior to scheduling maintenance.
- Because Media Pack replacement requires entry into the Up-Flo™ chamber, maintenance events should be scheduled during dry weather.
- Media Pack replacement should occur immediately after a contaminated spill in the contributing drainage area.

Recommended Equipment

- Safety Equipment (traffic cones, etc).
- Crowbar to remove grate or lid.
- Pole with skimmer or net (if floatables removal is not to be done with Jet Vac truck hose).
- Sediment probe (such as a Sludge Judge®).
- Jet Vac truck (flexible hose preferred).
- Confined Space Entry Equipment.
- Up-Flo™ Filter Replacement Media Packs (available from Hydro International).
- Hydro International Up-Flo™ Filter Maintenance Log.
- Screwdriver (flat head).
- Replacement Drain Down Filter components supplied by Hydro International.

Media Pack and Drain Down Filter Replacement Guidance Procedures

1. Follow Floatables and Sump Cleanout Procedures, 1 – 10.
2. Following Confined Space Entry procedures, enter the Up-Flo™ Filter Chamber.
3. Open the Filter Module by turning the three cam latches on the front and sides of the module. Remove the lid (1) to gain access to the Media Pack.
4. Remove and discard the spent Media Pack. The Media Pack contents include:
 - A top layer of green (2) Flow-Distributing Media.
 - Two Media Bags (3) equipped with nylon handles.
 - A bottom layer of green (2) Flow-Distributing Media.
5. Insert a new Media Pack, supplied by Hydro International.
 - First, insert a bottom layer of green Flow-Distributing Media. Be sure that the media sits snugly and level at the bottom of the Filter Module.
 - Next, insert the first of two replacement Media Bags. Smooth the bag out with your hands to make sure that the bag extends snugly to the walls and corners of the Filter Module.
 - Insert the second Media Bag, following the same procedure.
 - Insert the top layer of green Flow-Distributing Media. Be sure that the piece fits snugly against the walls and corners of the Filter Module.

- Put the lid on and secure the three latches. Check to make sure that the latches are closed properly.
- 6. Use a screwdriver to unscrew the Drain Down Filter from the face of the Outlet Module. **DO NOT DISCARD THIS PIECE.**
- 7. Install new Drain Down Filter supplied by Hydro International.
- 8. Exit the Up-Flo™ Filter chamber and securely replace the grate or lid.
- 9. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables, oil and gross debris removed, and the depth of sediment measured. Note the number of Media Packs replaced. Note any irregularities such as damaged components or blockages.
- 10. Remove safety equipment.
- 11. Dispose of spent media packs at your local landfill, following local regulations.
- 12. Return the spent Drain Down Filter to Hydro International.
- 13. Notify us of any irregularities noted during inspection by calling us on +44 (0) 1275 878371 or e-mailing us at sudsservices@hydro-int.com.

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Twice per year, or as needed - Following a contaminated spill in the drainage area
Sediment Removal	- Twice per year or as needed - Following a contaminated spill in the drainage area
Media Pack Replacement	- Once per year or as needed - Following a contaminated spill in the drainage area
Drain Down Filter Replacement	- Once per year with Media Pack replacement - As needed, in the event of continuous base flow conditions

Up-Flo™ Filter Installation Log

Hydro International Reference Number			
Site Name			
Site Location			
Owner		Contractor	
Contact Name		Contact Name	
Company Name		Company Name	
Address		Address	
Telephone		Telephone	
Fax		Fax	
Installation Date			
Total Number of Up-Flo™ Filter Modules			

Up-Flo™ Filter Installation Location Record

Site Map	
Site Plan (include vehicle restrictions and lift heights)	

Photo 1

Photo 2

Up-Flo™ Filter Inspection and Maintenance Log

(Master Performance Control Record)

Date	Initials	Area / Depth of Floatables & Oils	Sediment Depth Measured (mm)	Volume of Sediment Removed (m ³)	Number of Media Packs Replaced	Site Activity and Comments

Up-Flo™ Filter Inspection and Maintenance Log

(Master Performance Control Record)

Date	Initials	Area / Depth of Floatables & Oils	Sediment Depth Measured (mm)	Volume of Sediment Removed (m ³)	Number of Media Packs Replaced	Site Activity and Comments

Up-Flo™ Filter Inspection and Maintenance Log

(Master Performance Control Record)

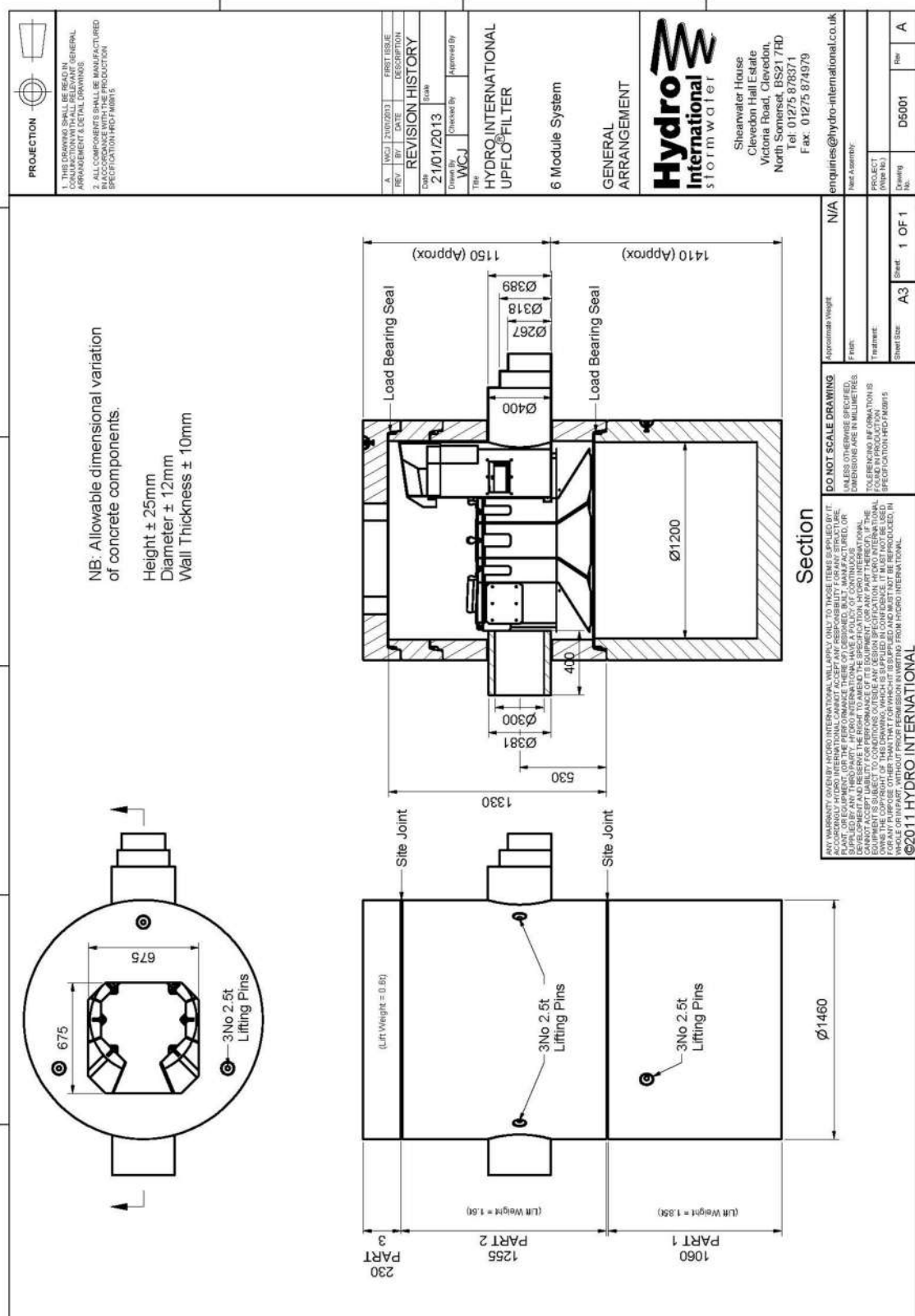
Date	Initials	Area / Depth of Floatables & Oils	Sediment Depth Measured (mm)	Volume of Sediment Removed (m ³)	Number of Media Packs Replaced	Site Activity and Comments

Up-Flo™ Filter Inspection and Maintenance Log

(Master Performance Control Record)

Date	Initials	Area / Depth of Floatables & Oils	Sediment Depth Measured (mm)	Volume of Sediment Removed (m ³)	Number of Media Packs Replaced	Site Activity and Comments

Typical General Arrangement Drawing



Contact

We're committed to excellence in water management, and we want to make sure that you are fully supported throughout your system's lifetime.

If you would like to discuss the operation and maintenance of your Up-Flo™ Filter or would like to learn more about how we can help you to optimise and maintain your sustainable drainage assets to ensure effective, long-term environmental compliance, please contact one of our support specialists:

Tel: +44 (0)1275 878371

E-mail: sudsservices@hydro-int.com

hydro-int.com

Downstream Defender® Advanced Hydrodynamic Vortex Separator

The Downstream Defender® is an advanced hydrodynamic vortex separator for the effective and reliable removal of fine particles, oils and other floatable debris from surface water runoff.

Its innovative design delivers high efficiency across a wide range of flows in a much smaller footprint than conventional or other swirl-type devices and it is the perfect choice for any catchment likely to convey high quantities of contamination.

1. Access for removal of floatables and sediments.
2. Inlet pipe.
3. Inlet chute.
4. Centre shaft.
5. Dip plate.
6. Centre cone.
7. Benching skirt.
8. Floatables and oil storage.
9. Isolated sediment storage zone.
10. Outlet pipe.

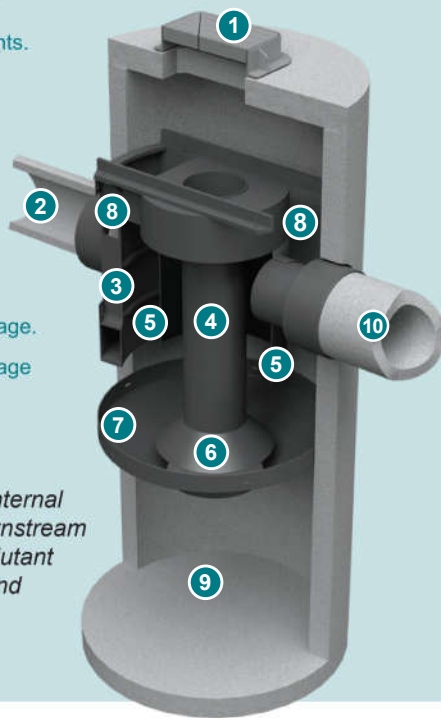


Figure 1 - The unique internal components of the Downstream Defender® enhance pollutant removal performance and prevent wash out.

Unique Flow Modifying Components

The Downstream Defender® consists of a choice of concrete or HDPE chamber with unique flow modifying internal components. It is these internal components that differentiate the Downstream Defender® from catchpits, sedimentation basins or sedimentation sumps. They facilitate advanced hydrodynamic vortex separation by reducing turbulence, lengthening the flow path to increase chamber residence time and introducing shear planes.

The internal components also ensure that the pollutant storage zones are isolated and protected from high flows that could cause pollutant re-entrainment or wash out.

Compared to devices that have poorly designed internal components, the Downstream Defender® captures and retains more of the annual pollutant load.

Watch a short video showing the Downstream Defender® components and operation at:

<http://www.hydro-int.com/en-gb/products/downstream-defender-0>



Repeatable, Reliable Performance

The Downstream Defender® delivers high removal of pollutants through advanced, hydrodynamic separation across a wide range of flows. The device has a proven track record of tackling an assortment of pollutants including:

Sediment (or Total Suspended Solids)



The Downstream Defender® is a highly effective sediment/TSS removal device. It can be sized in a number of ways to suit the application and level of protection required (see Table 1). **SuDS Mitigation Index = 0.5.**

Sediment Bound Hydrocarbons (including Polycyclic Aromatic Hydrocarbons - PAHs)



PAHs have low solubility in water and are readily adsorbed onto sediment particles. Effective removal of sediment particles will also ensure the removal of many PAHs.

Gross Pollutants



100% removal of floatable debris, such as food wrappers, Styrofoam cups and drinks cartons

Liquid Hydrocarbons



Effective spill containment device that meets the BS EN 858-1:2002 Class I and Class II effluent targets at low flow rates. Note these systems are not considered oil separators according to the BS EN 858-1 and must not be used in applications where full certification is required. **SuDS Mitigation Index = 0.8.**

Sediment Bound Heavy Metals and Nutrients

Heavy Metals

Nutrients

As an efficient device for removal of fine sediment, the Downstream Defender® is also effective for the removal of sediment bound pollutants. **SuDS Mitigation Index (Metals) = 0.4.**

No Risk of Pollutant Wash Out

The Downstream Defender® has been specially designed to isolate the pollutant storage zones and is proven to prevent pollutant wash out.

Sizing

The Downstream Defender® can be sized for different treatment goals and objectives.

For design purposes, the selected model's Treatment Flow Rate should be greater than or equal to the site's Water Quality Flow Rate.

The hydraulic capacity of the selected model should be considered with respect to the peak discharge flow rate from the site.

Model Diameter (m)	Treatment Flow Rate - Fine (l/s) ^(a)	Treatment Flow Rate - Coarse (l/s) ^(b)	Hydraulic Capacity (l/s) ^(c)	Minimum Oil Storage Capacity (l)	Minimum Sediment Storage Capacity (m³) ^(e)	Maximum Headloss at Treatment Flow Rate - Coarse (mm)
1.2	30	38	120	283	0.39	150
1.8	69	85	270	1356	0.73	225
2.55	138	171	542	2535	2.89	300
3.0	190	237	750	4693	3.10	375

Notes:

- a) Treatment Flow Rate - Fine is based on an annualised removal efficiency of >50% of all particles up to 1000 microns with a mass-median particle size (D₅₀) of 75 microns and a specific gravity of 2.65.
- b) Treatment Flow Rate - Coarse is based on an annualised removal efficiency of >80% of all particles between 50 and 1000 microns with a mass-median particle size (D₅₀) of 146 microns and a specific gravity of 2.65.
- c) Maximum flow rate that can pass through the chamber with a maximum headloss of 500mm.
- d) Alternative sizing based on different sediment grades available on request.
- e) Additional sediment storage capacity can be provided to extend maintenance intervals if required.

Table 1 - Downstream Defender® design information.

Expert Design Service

Hydro International's professional engineers are on hand to provide free support with the correct sizing and selection of the Downstream Defender® within each drainage design.

We can also provide estimated maintenance intervals, whole life cost estimates and predicted pollutant removal performance.

Call the StormTrain® Hotline on: 01275 337955 or email stormtrain@hydro-int.com

Design Data

Downstream Defender®

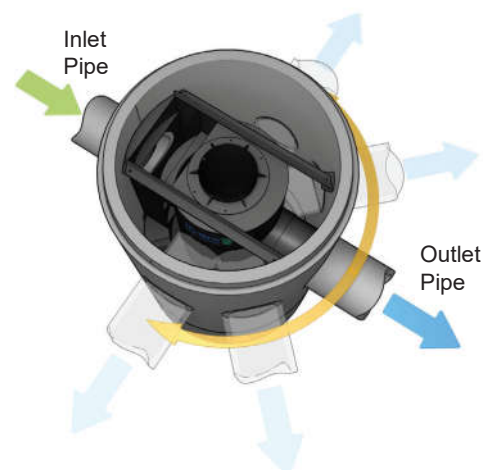
Advanced Hydrodynamic Vortex Separator

Setting Out

The Downstream Defender® can accommodate a change in pipe direction to suit site specific requirements. Combined with the high rate internal bypass, this helps to avoid the need for additional manholes on site. Head loss across the chamber is kept to a minimum (see Table 1). The inlet and outlet pipes should be sized in accordance with Table 2 (opposite), and a minimum of 90 degrees between inlet and outlet is required.

Inlet and outlet pipe connections are at the same invert level.

Additional manhole sections can be provided to extend the chamber to meet site cover and invert levels or provide additional pollutant storage where required.



Easy to Install

The Downstream Defender® is delivered to site as a near finished manhole with internal components already installed. Installation is therefore similar to any other manhole installation on site. Full installation guidelines are available.

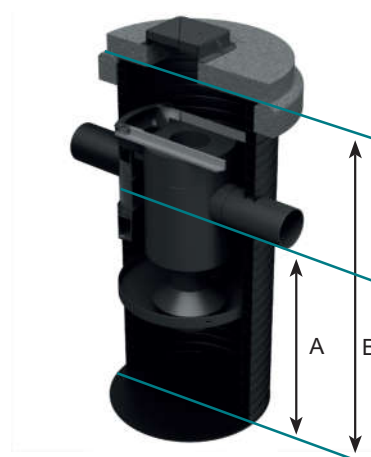
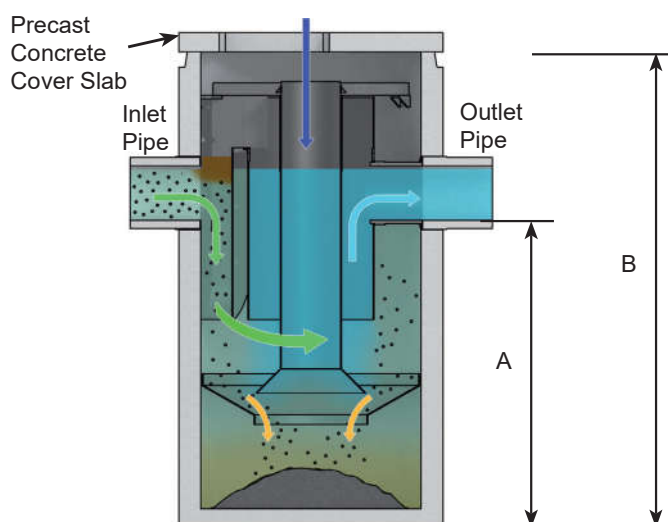
We can provide structural concrete systems for simple plug-and-play installation or choice of lightweight single and twin wall plastic chambers.

Easy to Maintain

Maintenance of the Downstream Defender® is simple, safe and cost-effective. Maintenance is carried out from the surface, using a standard vacuum tanker and personnel are not required to enter the device.

With a large capacity to store sediments and oils (see Table 1), and with a proven ability to prevent wash out, maintenance intervals can be years rather than months - depending on site conditions. The unit can also be fitted with a [Hydro-Logic™ Smart Monitoring](#) system to alert the site operator when maintenance is required and provide peace of mind that the unit is operating normally at other times.

Additional pollutant storage can be built into the chamber to extend maintenance intervals if required.



Dimensions and Weights

General arrangement drawings of all units are available for download from:
<http://www.hydro-int.com/en-gb/products/downstream-defender-0>

Model	Material	Chamber Diameter - Internal (mm)	Chamber Diameter - External (mm)	Inlet and Outlet ID (mm)	Depth to invert (m) (A) ⁽¹⁾	Chamber Depth (m) (B) ⁽²⁾	Max Component Lift Weight (kg)
PQL1320.1000	Concrete	1200	1460	300	1.916	2.830	2200
PQL1320.1030	Concrete	1800	2160	450	2.495	4.029	5450
PQL1320.1060	Concrete	2550	2850	600	2.95	4.95	8700
PQL1320.1090	Concrete	3000	3350	750	3.12	5.20	12100
PQL1320.1020	HDPE Single Wall	1188	1200	300	1.55	2.3	140
PQL1320.1051	HDPE Single Wall	1776	1812	500	2.11	3.41	460
PQL1320.1081	HDPE Single Wall	2530	2570	600	2.94	4.8	900
PQL1320.1111	HDPE Single Wall	2974	3000	800	3.13	5.3	1300
PQL1320.1025	HDPE Twin Wall	1200	1300	300	1.56	2.22	400
PQL1320.1055	HDPE Twin Wall	1800	2200	560	2.467	3.75	1100

Notes:
1) Minimum depth to invert shown. Depth to invert can be increased if required.
2) Minimum chamber depth shown. Additional sediment storage capacity or increased depth to invert can be provided if required.

Table 2 - Downstream Defender® unit types, dimensions and weights.

The Hydro StormTrain® Series of Surface Water Treatment Devices

The Downstream Defender® is one of the Hydro StormTrain® Series of surface water treatment devices. Each device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific needs of a site or combined to form a management train. They can be used alongside natural SuDS features to protect, enable or enhance them.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodynamic
Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow
Filtration System



Hydro Biofilter™
Biofiltration System

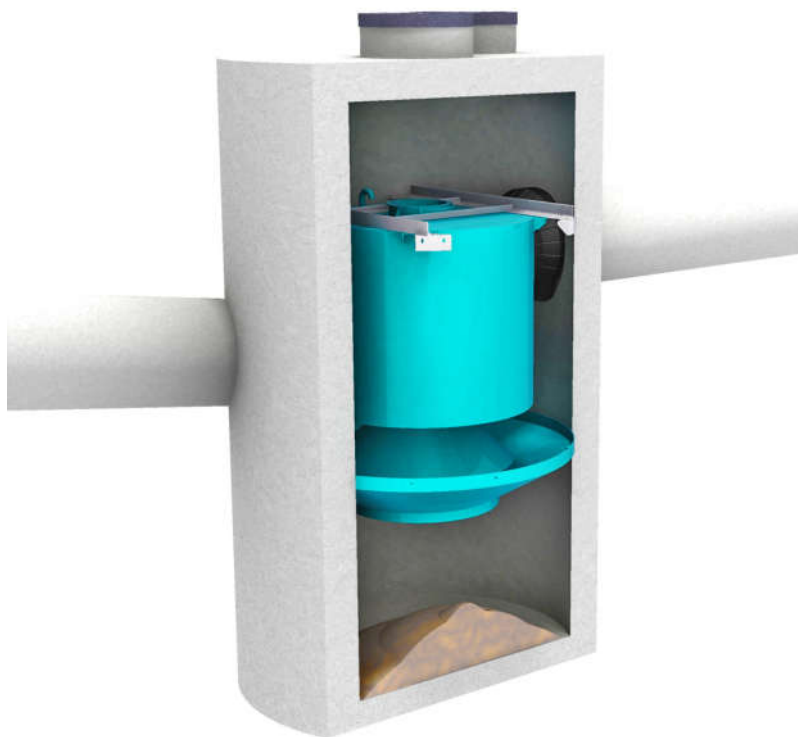
Patent: www.hydro-int.com/patents

Tel: +44 (0)1275 337955 stormtrain@hydro-int.com

Hydro International
Shearwater House, Clevedon Hall Estate, Victoria Road, Clevedon, BS21 7RD

Downstream Defender® Design Data O/0819

hydro-int.com/stormtrain



Operation and Maintenance Manual

Downstream Defender[®]

Vortex Separator for Stormwater Treatment

Turning Water Around ...[®]

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4	Operation - Introduction - Pollutant Capture and Retention - Wet Sump - Blockage Protection
4	Maintenance - Overview - Determining Your Maintenance Schedule
5	Maintenance Procedures - Inspection - Floatables and Sediment Cleanout
8	Downstream Defender® Installation Log
9	Downstream Defender® Inspection and Maintenance Log

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's Downstream Defender®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc have a policy of continuous product development and reserve the right to amend specifications without notice.

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Downstream Defender® by Hydro International

The Downstream Defender® is an advanced Hydrodynamic Vortex Separator designed to provide high removal efficiencies of settleable solids and their associated pollutants, oil, and floatables over a wide range of flow rates.

The Downstream Defender® has unique, flow-modifying internal components developed from extensive full-scale testing, CFD modeling and over thirty years of hydrodynamic separation experience in wastewater, combined sewer and stormwater applications. These internal components distinguish the Downstream Defender® from simple swirl-type devices and conventional oil/grit separators by minimizing turbulence and headlosses, enhancing separation, and preventing washout of previously stored pollutants.

The high removal efficiencies and inherent low headlosses of the Downstream Defender® allow for a small footprint making it a compact and economical solution for the treatment of non-point source pollution.

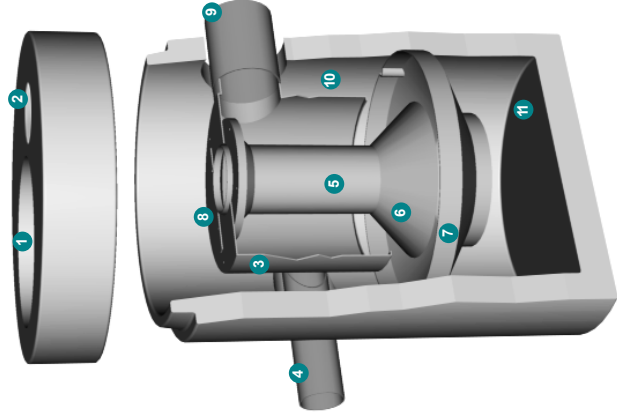
- Benefits of the Downstream Defender®**
- Removes sediment, floatables, oil and grease
 - No pollutant washouts
 - Small footprint
 - No loss of treatment capacity between clean-outs
 - Low headloss
 - Efficient over a wide range of flows
 - Easy to install
 - Low maintenance

Applications

- New developments and retrofits
- Utility yards
- Streets and roadways
- Parking lots
- Pre-treatment for filters, infiltration and storage
- Industrial and commercial facilities
- Wetlands protection

Downstream Defender® Components

1. Central Access Port
2. Floatables Access Port (6-ft., 8-ft. and 10-ft. models only)
3. Dip Plate
4. Tangential Inlet
5. Center Shaft
6. Center Cone
7. Benching Skirt
8. Floatables Lid
9. Outlet Pipe
10. Floatables Storage
11. Isolated Sediment Storage Zone



HYDRO MAINTENANCE SERVICES

Hydro International has been engineering stormwater treatment systems for over 30 years. We understand the mechanics of removing pollutants from stormwater and how to keep systems running at an optimal level.

NOBODY KNOWS OUR SYSTEMS BETTER THAN WE DO



AVOID SERVICE NEGLIGENCE

Sanitation services providers not intimately familiar with stormwater treatment systems are at risk of the following:

- Inadvertently breaking parts or failing to clean/replace system components appropriately.
- Charging you for more frequent maintenance because they lacked the tools to service your system properly in the first place.
- Billing you for replacement parts that might have been covered under your Hydro warranty plan
- Charging for maintenance that may not yet have been required.

LEAVE THE DIRTY WORK TO US

Trash, sediment and polluted water is stored inside treatment systems until they are removed by our team with a vactor truck. Sometimes teams must physically enter the system chambers in order to prepare the system for maintenance and install any replacement parts. Services include but are not limited to:

- Solids removal
- Removal of liquid pollutants
- Replacement media installation (when applicable)



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BETTER TOOLS, BETTER RESULTS

Not all vactor trucks are created equal. Appropriate tools and suction power are needed to service stormwater systems appropriately. Companies who don't specialize in stormwater treatment won't have the tools to properly clean systems or install new parts.



SERVICE WARRANTY

Make sure you're not paying for service that is covered under your warranty plan. Only Hydro International's service teams can identify tune-ups that should be on us, not you.

TREATMENT SYSTEMS SERVICED BY HYDRO:

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- Stormwater separators
- Baffle boxes
- Biofilters/biorention systems
- Storage structures
- Catch basins
- Stormwater ponds
- Permeable pavement



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Operation

Introduction

The Downstream Defender® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The Downstream Defender® has been designed to allow for easy and safe access for inspection/monitoring and clean-out procedures. Entry into the unit or removal of the internal components is not necessary for maintenance, thus safety concerns related to confined-space entry are avoided.

Pollutant Capture and Retention

The internal components of the Downstream Defender® have been designed to protect the oil, floatables and sediment storage volumes so that separator performance is not reduced as pollutants accumulate between clean-outs. Additionally, the Downstream Defender® is designed and installed into the storm drain system so that the vessel remains wet between storm events. Oil and floatables are stored on the water surface in the outer annulus separate from the sediment storage volume in the sump of the unit providing the option for separate oil disposal, and accessories such as adsorbent pads. Since the oil/floatables and sediment storage volumes are isolated from the active separation region, the potential for re-suspension and washout of stored pollutants between clean-outs is minimized.

Wet Sump

The sump of the Downstream Defender® retains a standing water level between storm events. The water in the sump prevents stored sediment from solidifying in the base of the unit. The clean-out procedure becomes more difficult and labor intensive if the system allows fine sediment to dry-out and consolidate. Dried sediment must be manually removed by maintenance crews. This is a labor intensive operation in a hazardous environment.

Blockage Protection

The Downstream Defender® has large clear openings and no internal restrictions or weirs, minimizing the risk of blockage and hydraulic losses. In addition to increasing the system headloss, orifices and internal weirs can increase the risk of blockage within the unit.

Maintenance

Overview

The Downstream Defender® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the Downstream Defender®. The Downstream Defender® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the Downstream Defender® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

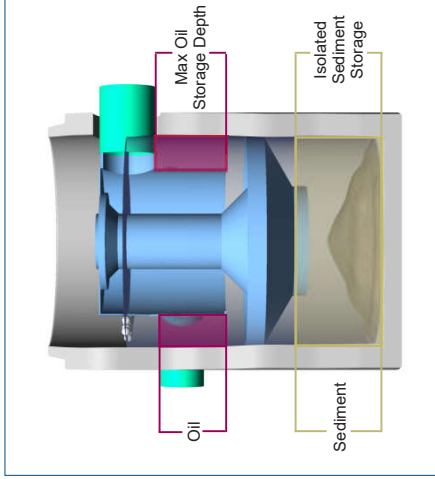


Fig. 1 Pollutant storage volumes of the Downstream Defender®.

Inspection Procedures

Inspection is a simple process that does not involve entry into the Downstream Defender®. Maintenance crews should be familiar with the Downstream Defender® and its components prior to inspection.

Scheduling

- It is important to inspect your Downstream Defender® every six months during the first year of operation to determine your site-specific rate of pollutant accumulation
- Typically, inspection may be conducted during any season of the year
- Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge Judge®)
- Trash bag for removed floatables
- Downstream Defender® Maintenance Log

Determining Your Maintenance Schedule

The frequency of cleanout is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil/floatables removal, for a 6-ft Downstream Defender® typically takes less than 30 minutes and removes a combined water/oil volume of about 500 gallons.

Table 1. Downstream Defender® Pollutant Storage Capacities and Max. Cleanout Depths.

Unit Diameter	Total Oil Storage	Oil Clean-out Depth	Total Sediment Storage	Sediment Clean-out Depth	Max. Liquid Volume Removed
(feet)	(gallons)	(inches)	(gallons)	(inches)	(gallons)
4	70	<16	141	<18	384
6	216	<23	424	<24	1,239
8	540	<33	939	<30	2,884
10	1,050	<42	1,757	<36	5,546
12	1,770	<49	2,970	<42	9,460

NOTES

1. Refer to Downstream Defender® Clean-out Detail (Fig. 1) for measurement of depths.
2. Oil accumulation is typically less than sediment, however, removal of oil and sediment during the same service is recommended.
3. Remove floatables first, then remove sediment storage volume.
4. Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.



Fig. 4



Fig. 5



Fig. 6

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the lids to the manhole (Fig. 4). NOTE: The 4-ft Downstream Defender® will only have one lid.

7. Securely replace the grate or lid.
8. Take down safety equipment.
9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Cleanup

Floatables cleanup is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.6).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump cleanup are typically conducted once a year during any season.
- If sediment depths are greater than 75% of maximum clean-out depths stated in Table 1, sediment removal is required.
- Floatables and sump cleanup should occur as soon as possible following a spill in the contributing drainage area.



Fig. 7 View over center shaft into sediment storage zone.



Fig. 8 View of outer annulus of floatables and oil collection zone.

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (If only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (6-inch flexible hose recommended)
- Downstream Defender® Maintenance Log

7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
9. Securely replace the grate or lid.

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the lids to the manhole (NOTE: The 4-ft Downstream Defender® will only have one lid).
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Using the Floatables Port for access, remove oil and floatables stored on the surface of the water with the vactor hose or the skimmer net (Fig.9).
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (Fig.9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump via the Central Access Port. Vactor out the sediment and gross debris off the sump floor (Fig.6).

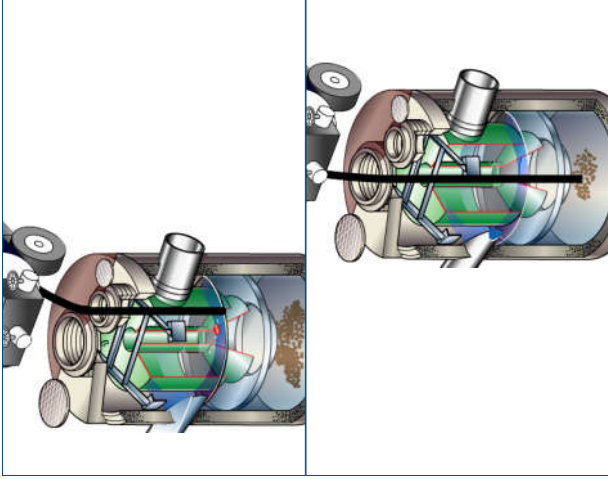


Fig. 9 Floatables and sediment are removed with a vactor hose

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area

NOTE: For most cleanouts it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is required.



Downstream Defender® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL (CIRCLE ONE): 4-FT 6-FT 8-FT 10-FT CUSTOM



Downstream Defender® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment * Depth Measured	Volume of Sediment Removed	Site Activity and Comments

*Note: Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.

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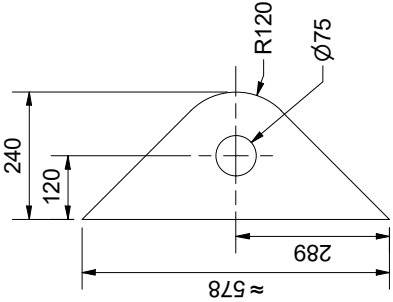
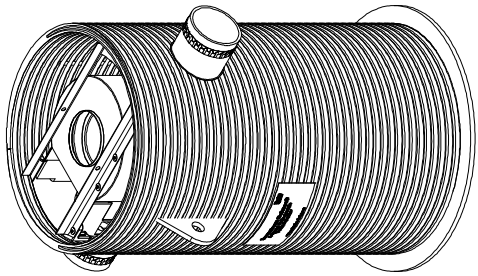
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stormwaterinquiry@hydro-int.com

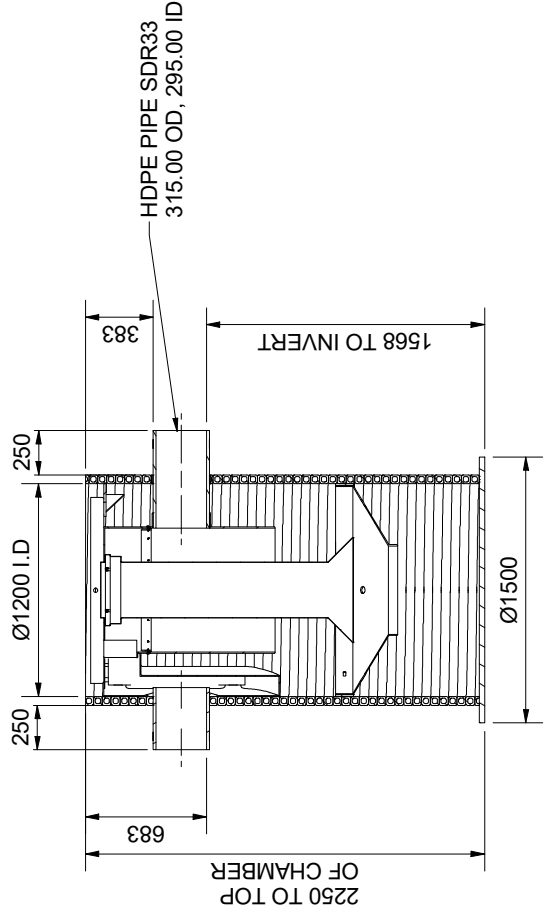
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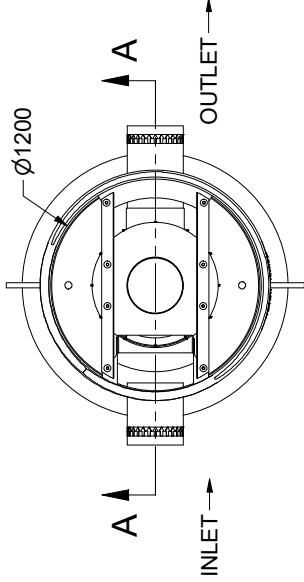
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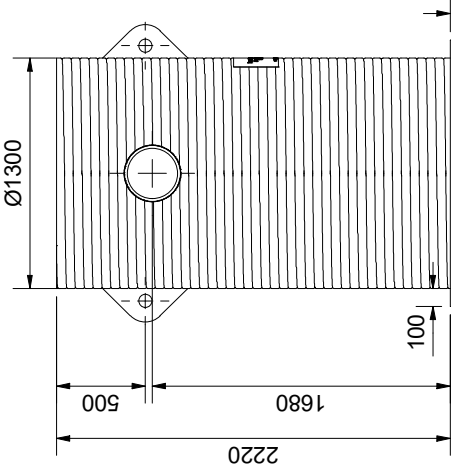
LIFTING LUG DETAIL
30mm THICK
SCALE 1:10



SECTION A-A
SCALE 1:30



PLAN VIEW



FRONT VIEW

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TOLERANCES ARE:
± 1 MM UNLESS
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ANGLES ± 5°



PROJECTION

COMMENTS:
1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT GENERAL ARRANGEMENT & DETAIL DRAWINGS
2. ALL COMPONENTS SHALL BE MANUFACTURED IN ACCORDANCE WITH PRODUCTION SPECIFICATION FM09.15
3. ALL COMPONENTS SHALL BE MANUFACTURED FROM HDPE (BLACK PER8) UNLESS SHOWN OTHERWISE
4. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING NUMBER DDT25002-1, 1200
5. ALL CHAMBER COMPONENTS SHALL BE LEAK TESTED USING EITHER AN AIR OR WATER TEST PROCEDURE

REVISION HISTORY			
REV	BY	DESCRIPTION	DATE
A	CRA	FIRST ISSUE	05 FEB 19

DATE: 15/10/2018
SCALE: 1:30

DRAWN BY: WCJ
CHECKED BY: DGE
APPROVED BY: WCJ

HYDRO INTERNATIONAL
DOWNSTREAM
DEFENDER®

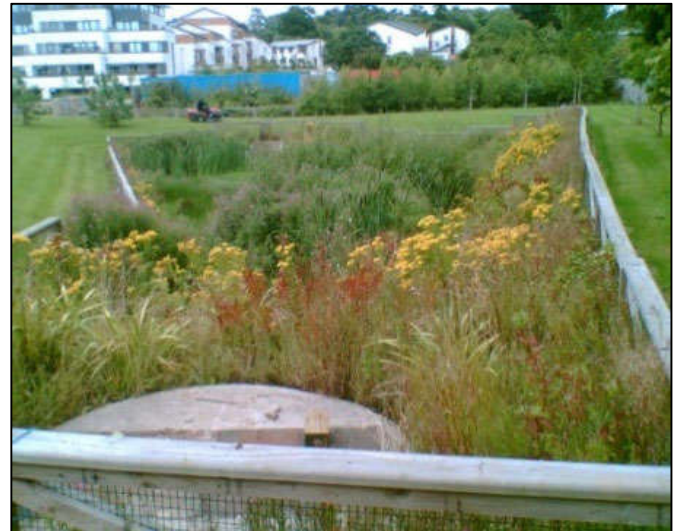
1200 TWIN WALL
4 KN TUBE CHAMBER

GENERAL ARRANGEMENT

Hydro International

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Cleveland, UK
BS21 7RD
Tel: +44 (0)1275 878371
Fax: +44 (0)1275 874979
hydro-int.com

WEIGHT: N/A	MATERIAL: HDPE
NEXT ASSEMBLY: -PQL 1320, 1025	
DRAWING NO.: TW 1320-1025-01001	
SHEET SIZE: A3	SHEET: 1 OF 1
Rev: A	A



A Guide to The SuDS Manual (C753) Simple Index Approach

The SuDS Manual (C753) Simple Index Approach

Introduction

In Table 26.1 of The SuDS Manual (C753) four risk based approaches for water quality management are specified:

1. Simple Index Approach
2. Risk Screening (generally used to determine if Simple Index Approach is appropriate)
3. Detailed Risk Assessment
4. Process-Based Treatment Modelling

With the intention that the simpler approaches are applied in lower risk scenarios, with more sophisticated assessments only used when appropriate to the risk.

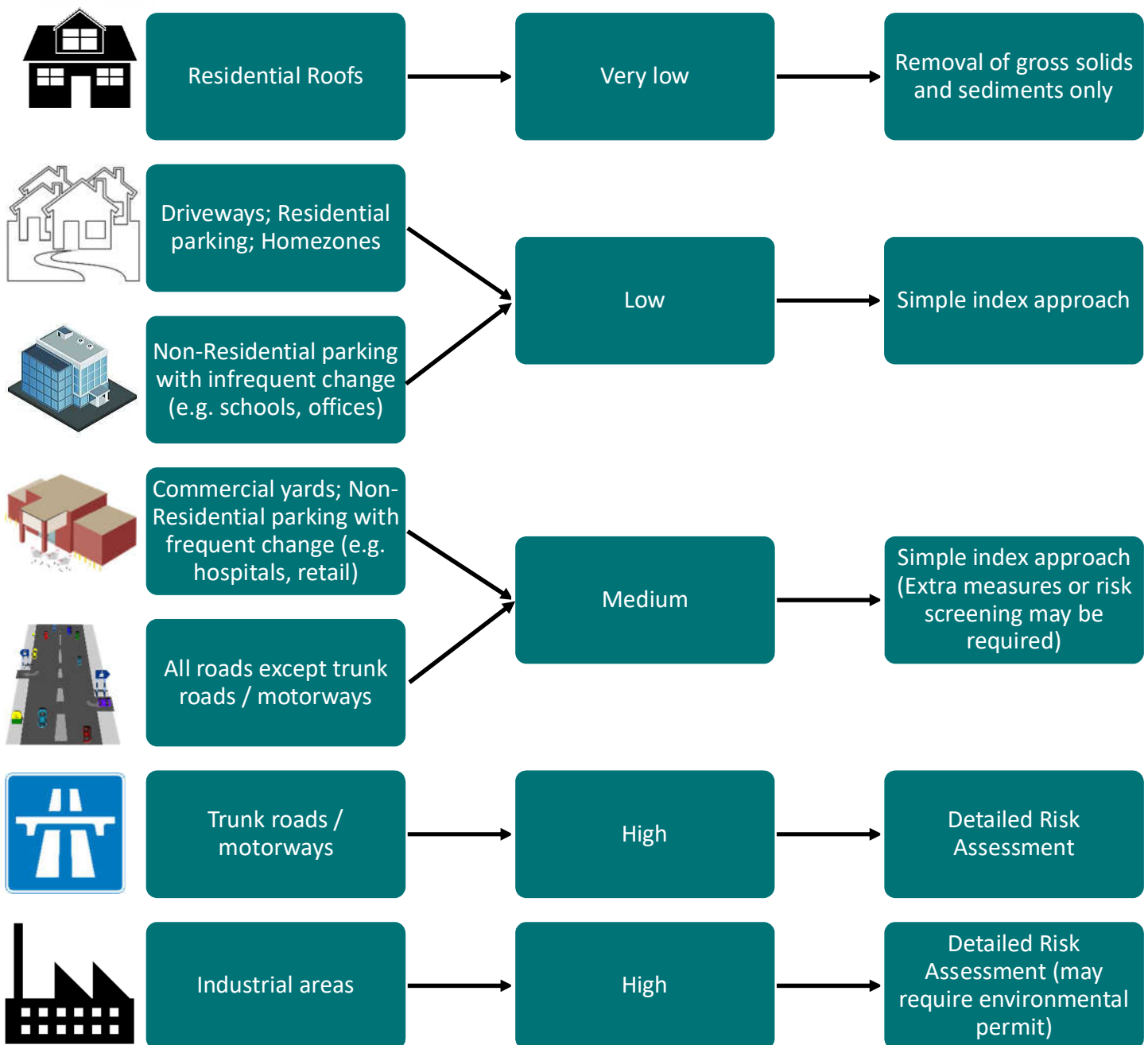


Figure 1: Applying the Risk Based Water Quality Management Approaches (Source: After Table 4.3 of the SuDS Manual)

Applying the Simple Index Approach (SIA)

The Simple Index Approach (SIA) recommended in Section 26.7.1 of The SuDS Manual (C753) was developed from that set out by Middlesex University (as outlined in Annex 5 of Chapter 26 of The SuDS Manual) and follows a three step approach:

Step 1 – Allocate suitable pollution hazard indices for the proposed land use categories

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected¹ surface waters or groundwater, consider the need for a more precautionary approach.

Note:

- 1 Designated as those protected for the supply of drinking water (see SuDS Manual Table 4.3).

Step 1: Define pollution hazard indices

Pollution hazard indices are presented in Table 26.2 of The SuDS Manual and reproduced here for simplicity. The indices range from 0 (no pollution of this type) to 1 (high pollution hazard for this contaminant type).

Table 1: Pollution hazard indices for different land use classes (Source: Reproduced from The SuDS Manual Table 26.2)

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Liquid Hydrocarbons (free floating oils)
Residential Roofs	Very low	0.2	0.2	0.05
Other Roofs (typically commercial / industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) and non-residential car parks with infrequent change (e.g. schools, offices) – i.e. <300 traffic movements / day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential parking with frequent change (e.g. hospitals, retail); all roads except low traffic roads and trunk roads / motorways¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites); sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways¹	High	0.8 ²	0.8 ²	0.9 ²
Notes: 1. Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009) 2. These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (see also The SuDS Manual Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help to determine the most appropriate treatment approach to the development of a design solution. Also consider spill protection – contact Hydro International to find out more about our specialist treatment and containment options for high pollution hazard sites. Where a site land use falls outside of these categories, the indices should be adapted (and agreed with the drainage approving / adopting body) or else a more detailed risk assessment should be carried out. Equivalent indices should be developed for other contaminants of interest of any given site. For assistance with development of indices or detailed site analysis, contact Hydro International.				

Step 2: Determine SuDS Pollution Mitigation Indices

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for that contaminant type):

$$\text{Total SuDS Mitigation Index (for each contaminant)} \geq \text{Pollution hazard index (for each contaminant)}$$

If the mitigation index of an individual component is insufficient, two components (or more) in series will be required, with a factor of 0.5 used to account for the reduced performance of secondary or tertiary components, in line with the following equation:

$$\text{Total SuDS Mitigation Index} = \text{Mitigation Index}_1 + 0.5 (\text{Mitigation Index}_2)$$

Where *Mitigation Index_n* = *Mitigation Index for Component n*.

If the only runoff destination is to surface water (i.e. there is no infiltration from the SuDS to groundwater), the surface water mitigation indices should be used.

Where the principal destination of the runoff is to groundwater, then the groundwater indices should be used. This will be the case, even for infiltration systems that are designed to discharge to surface waters once the infiltration capacity is exceeded – In this scenario, the overflow will often not need to be treated prior to discharge to surface waters as the risk will be low (highly contaminated flows will have been treated prior to infiltration) and dilution will be high.

In England and Wales, if the principal runoff destination is intended to be to surface water, but some infiltration (even in small amounts) may occur through unlined components, then the groundwater indices should be used for the proportion of runoff that discharges to groundwater and the surface water indices used for the proportion of runoff that discharges to surface waters. In Scotland & Northern Ireland, groundwater risk management is not a requirement for this scenario.

Table 2: SuDS mitigation indices for discharges to surface waters (Source: Extended and reproduced from The SuDS Manual Table 26.3)

Type of SuDS Component	Mitigation Indices ¹		
	TSS	Metals	Liquid Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond ^{3,4}	0.7 ³	0.7	0.5
Wetland ⁴	0.8 ³	0.8	0.8
First Defense® Vortex Separator	0.5 ^a	0.33 ^c	0.4 ^d
Downstream Defender® Advanced Vortex Separator	0.5 ^a	0.4 ^c	0.8 ^a
Up-Flo™ Filter	0.8 ^a	0.69 ^{c, e}	0.4 ^d
Hydro-Biofilter™ Bioretention System	0.8 ^b	0.8 ^b	0.8 ^d

Notes:

- 1) SuDS components only deliver these indices if they are designed and constructed for both hydraulics and treatment in accordance with the relevant technical chapters of the SuDS Manual (C753) and the Guidance on Construction of SuDS (C768). Designers and installers of SuDS components should be able to demonstrate competence in their respective areas.
- 2) Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3) Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment (TSS) should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4) Where a wetland is not specifically designed to provide significantly enhanced treatment performance, it should be considered as having the same mitigation indices as a pond.
- 5) Performance basis for Hydro StormTrain® Series of Proprietary Treatment Devices:
 - a) Derived from 3rd party testing and / or verification programmes. Test reports available on request.
 - b) Derived from testing and / or monitoring. Test reports available on request.
 - c) Derived from partitioning of sediment bound and dissolved contaminants and associated testing. Evidence available on request.
 - d) Based on typical values for components of this type.
 - e) Dependant on filter media used.
- 6) SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA's Regulatory Method 08 (WAT-RM-08) provides further information on the regulation of surface water discharges from built developments in Scotland.

Table 3: SuDS mitigation indices for discharges to groundwater (Source: Extended and reproduced from The SuDS Manual Table 26.4)

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	Mitigation Indices		
	TSS	Metals	Liquid Hydrocarbons
A layer of dense vegetation underlain by soil with good contaminant attenuation potential ² of at least 300mm in depth ³	0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300mm in depth ³	0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment) underlain by soil with good contaminant attenuation potential ² of at least 300mm in depth ³	0.4 ⁴	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment and including a geotextile at the base separating the foundation from the subgrade) underlain by soil with good contaminant attenuation potential ² of at least 300mm in depth ³	0.7 ⁴	0.6	0.7
Bioretention underlain by soil with good contaminant attenuation potential ² of at least 300mm in depth ³	0.8 ⁴	0.8	0.8
Flow through Proprietary Treatment System prior to infiltration SuDS	TSS	Metals	Liquid Hydrocarbons
First Defense® Vortex Separator	0.5 ^a	0.33 ^c	0.4 ^d
Downstream Defender® Advanced Vortex Separator	0.5 ^a	0.4 ^c	0.8 ^a
Up-Flo™ Filter	0.8 ^a	0.69 ^{c,e}	0.4 ^d
Hydro-Biofilter™ Bioretention System	0.8 ^b	0.8 ^b	0.8 ^d

Notes:

SuDS components only deliver these indices if they are designed and constructed in accordance with the relevant technical chapters of the SuDS Manual (C753) and the Guidance on Construction of SuDS (C768). Designers and installers of SuDS components should be able to demonstrate competence in their respective areas.

- 1) All designs must include a minimum of 1m unsaturated depth of aquifer material between the infiltration surface and the maximum likely groundwater level (as required by infiltration design – see The SuDS Manual Chapter 25).
- 2) For example as recommended in Sniffer (2008a and 2008b), Scott Wilson (2010) or other appropriate guidance.
- 3) Alternative depths may be considered where it can be demonstrated that the combination of the proposed depth and soil characteristics will provide equivalent protection to the underlying groundwater – see note 1.
- 4) If significant amounts of sediment are allowed to enter an infiltration system, there will be a high risk of rapid clogging and subsequent system failure. It is recommended to remove sediment prior to the infiltration system as far as reasonably practical.
- 5) Performance basis for the Hydro StormTrain® Series of Proprietary Treatment Devices:
 - a) Derived from 3rd party testing and / or verification programmes. Test reports available on request.
 - b) Derived from testing and / or monitoring. Test reports available on request.
 - c) Derived from partitioning of sediment bound and dissolved contaminants and associated testing. Evidence available on request.
 - d) Based on typical values for components of this type.
 - e) Dependant on filter media used.
- 6) SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA's Regulatory Method 08 (WAT-RM-08) provides further information on the regulation of surface water discharges from built developments in Scotland.

IMPORTANT NOTES:

- Where the indices are not considered representative by the designer, a more detailed risk assessment can be undertaken.
- Components should always be designed for treatment, as described in the relevant technical guidance set out in the individual component chapters of The SuDS Manual. **If they are incorrectly designed, constructed or inadequately maintained, their treatment performance could be significantly adversely affected.**
- Where the infiltration component itself does not provide sufficient pollution mitigation, the design should include upstream SuDS components that are lined to prevent infiltration from occurring until sufficient treatment has taken place.

Step 3: Consider the need for a precautionary approach where discharges are to protected waters

Reference should be made to local standards, planning requirements and guidance, particularly with reference to discharges to protected waters where more detailed risk assessments or enhanced treatment may be required.

Case Studies:



Small is Beautiful

A First Defense® provided a much-needed small footprint solution to meeting regulatory requirements on a confined site for a new commercial office development in Perkins Township, Ohio. TSS was the main pollutant of concern and although the Simple Index Approach was not in use in Ohio at the time of installation, retrospectively considering this approach would give:

TSS Hazard Index (Office Development) = 0.5
First Defense® TSS Mitigation Index = 0.5

Mitigation Index ≥ Hazard Index



Pollution Protection in Whisky Country

Poor drainage, flooding and freezing weather led to a landslip and extreme surface degradation along a section of the narrow A95 near Elgin. Although it pre-dated the new SuDS Manual risk based approach, treatment was vital as the surface water runoff destination was to an area world-renowned for the production of single malt whiskey and an important salmon fishery. A Downstream Defender® advanced hydrodynamic vortex separator minimises the risk of sediment and hydrocarbon pollution reaching the sensitive watercourse.

Downstream Defender® Mitigation Indices:
TSS = 0.5
Heavy Metals = 0.4
Liquid Hydrocarbons = 0.8



Fine Filtration enables Mixed-Use Development

Environment Agency planning conditions for a new commercial access road to retail and light commercial units as part of a mixed-use development in Faversham, Kent, required treatment prior to infiltration. A bypass separator provides important spill protection for liquid hydrocarbons, prior to an Up-Flo™ Filter that ensures fine filtration of sediments and associated contaminants, such as Polycyclic Aromatic Hydrocarbons (PAHs). Although the installation pre-dates the Simple Index Approach, retrospective consideration of the approach gives:

Contaminant	TSS	Metals	PAHs
Hazard Indices	0.7	0.6	0.7
Up-Flo™ Filter Mitigation Indices	0.8	0.69	0.72



Stringent Quality Control, Naturally

Hydro Biofilter™ have brought attractive landscaping and stringent surface water quality control to a sensitive location in Barry, South Wales. 3 units were retrofitted to the Business Support Centre car park as part of a wide urban regeneration scheme, effectively removing pollutants prior to discharge into the adjacent, rejuvenated harbourside.

Contaminant	TSS	Metals	Hydro-carbons
Hazard Indices	0.7	0.6	0.7
Hydro Biofilter™ Mitigation Indices	0.8	0.8	0.8

Simple Index Approach (SIA) Tool

A SIA spreadsheet tool has been developed by HR Wallingford on behalf of the Scottish Environment Protection Agency (SEPA) to support the implementation of the Simple Index Approach. The tool is freely available to download at www.susdrain.org/resources/SuDS_Manual.html.

The spreadsheet tool works through the Simple Index Approach Design Steps:

Step 1: Define pollution hazard indices

		Pollution Hazard Indices			
Runoff Area Land Use Description		Hazard Level	Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): 	Non-residential car parking with frequent change (eg hospitals, retail)	Medium	0.7	0.6	0.7
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
Landuse Pollution Hazard Index		Medium	0.7	0.6	0.7

Step 2: Determine SuDS Pollution Mitigation Indices

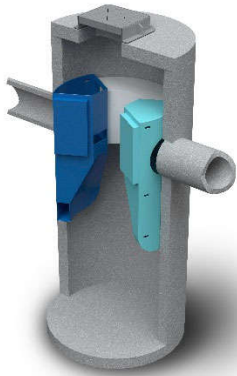
				Pollution Mitigation Indices		
SuDS Component Description				Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list:	Pond or wetland	0		0.7	0.7	0.5
	None	0		0	0	0
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:						
Downstream Defender		SuDS Component 1	SuDS Component 1	0.5	0.4	0.8
		SuDS Component 2				
		SuDS Component 3				
Aggregated Surface Water Pollution Mitigation Index				0.85	0.75	>0.95

Calculation of Total SuDS Mitigation Indices and Results

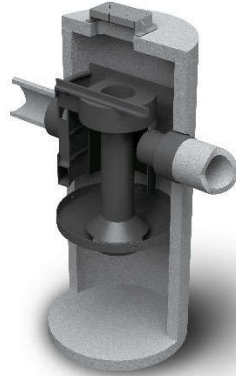
				Combined Pollution Mitigation Indices		
				Total Suspended	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area				0.85	0.75	>0.95
				Sufficiency of Pollution Mitigation Indices		
				Suspended Solids	Metals	Hydrocarbons
				Sufficient	Sufficient	Sufficient

The Hydro StormTrain® Series of Surface Water Treatment Devices

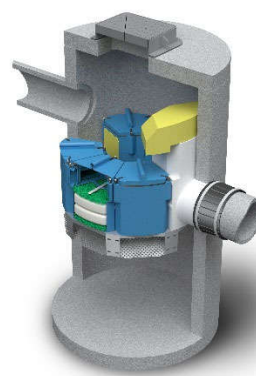
Each Hydro StormTrain® device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific treatment needs of a site; or can be combined with one another or in conjunction with other SuDS components to form a mangament train; or can be used to protect and enhance SuDS features less suited to providing the first stage of treatment or more prone to failure due to sedimentation or shock loads associated with spills.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodynamic
Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow
Filtration System



Hydro Biofilter™
Bioretention System

Learn more...

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Hydro International is a global leader in sustainable technologies for the control and treatment of stormwater and wastewater. For more than 30 years, Hydro has been at the forefront of water industry innovation and product development. From housing developments and municipal sewage works to paper mills and public highways, thousands of Hydro products are operating in countries all over the world. With strong bases in both the United States and the United Kingdom, and a network of partners and agents, Hydro is strategically placed to deliver winning technological solutions to customers wherever they are in the world.